APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

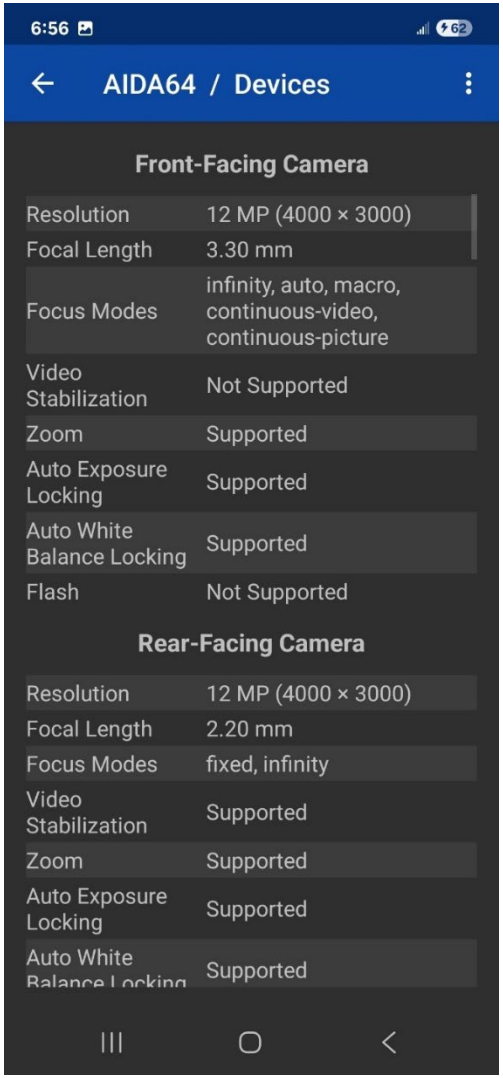
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
[1.pre] A video processing apparatus comprising:	To the extent the preamble is construed as a limitation, each of the Accused Samsung '645 Products[1] is a video processing apparatus. For example, the Samsung Galaxy S25 includes front and back cameras for recording video, a display for displaying video, and one or more processors (e.g., a CPU, ISP, and/or DSP) with image and video processing capability:

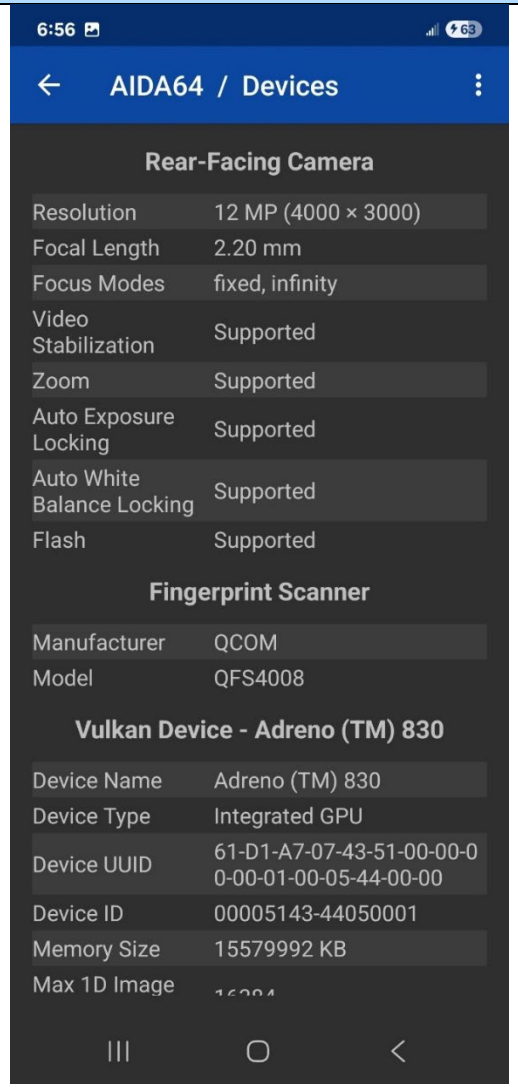
MAIN CAMERA	Triple	50 MP, f/1.8, 24mm (wide), 1/1.56", 1.0µm, dual pixel PDAF, OIS
		10 MP, f/2.4, 67mm (telephoto), 1/3.94", 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55" 1.4µm, Super Steady video
	Features	Best Face, LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/120/240fps, 10-bit HDR, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), 1/3.2", 1.12µm, dual pixel PDAF
	Features	HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

[1] The Accused Samsung '645 Products include the Galaxy A Quantum, Galaxy A03s, Galaxy A04s, Galaxy A10s, Galaxy A11, Galaxy A12, Galaxy A12s (aka Nacho), Galaxy A13, Galaxy A13 5G, Galaxy A14, Galaxy A14 5G, Galaxy A20, Galaxy A20e, Galaxy A20s, Galaxy A21, Galaxy A21s, Galaxy A22, Galaxy A22s 5G, Galaxy A23, Galaxy A23 5G, Galaxy A24 4G, Galaxy A30, Galaxy A30s, Galaxy A32, Galaxy A32 5G, Galaxy A33 5G, Galaxy A34, Galaxy A36 5G, Galaxy A40, Galaxy A42 5G, Galaxy A50, Galaxy A50s, Galaxy A51, Galaxy A51 5G, Galaxy A51 5G UW, Galaxy A52, Galaxy A52 5G, Galaxy A53 5G, Galaxy A54 5G, Galaxy A60, Galaxy A70, Galaxy A70s, Galaxy A71, Galaxy A71 5G, Galaxy A71 5G UW, Galaxy A72, Galaxy A73 5G, Galaxy A8, Galaxy A8+, Galaxy A80, Galaxy A90 5G, Galaxy Fold, Galaxy Fold 5G, Galaxy Note10, Galaxy Note10 5G, Galaxy Note10 Lite, Galaxy Note10+, Galaxy Note10+ 5G, Galaxy Note20, Galaxy Note20 5G, Galaxy Note20 Ultra, Galaxy Note20 Ultra 5G, Galaxy Note9, Galaxy S10, Galaxy S10 5G, Galaxy S10 Lite, Galaxy S10+, Galaxy S10e, Galaxy S20, Galaxy S20 5G, Galaxy S205G UW, Galaxy S20 FE, Galaxy S20 FE 5G, Galaxy S20 Ultra, Galaxy S20 Ultra 5G, Galaxy S20+, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22 5G, Galaxy S22 Ultra 5G, Galaxy S22+ 5G, Galaxy S23, Galaxy S23 FE, Galaxy S23 Ultra, Galaxy S23+, Galaxy S24, Galaxy S24+, Galaxy S24 Ultra, Galaxy S25, Galaxy S25+, Galaxy S25 Ultra, Galaxy S9, Galaxy S9+, Galaxy Xcover FieldPro, Galaxy Xcover Pro, Galaxy Xcover6 Pro, Galaxy Z Flip, Galaxy Z Flip 5G, Galaxy Z Flip3 5G, Galaxy Z Flip4, Galaxy Z Flip5, Galaxy Z Flip6, Galaxy Z Fold2 5G, Galaxy Z Fold3 5G, Galaxy Z Fold4, Galaxy Z Fold5, Galaxy Z Fold6, Galaxy A15 5G, Galaxy A25 5G, Galaxy A35 5G, Galaxy Z Fold7, Galaxy Z Flip7, Galaxy Z Flip7 FE, Galaxy Tab Active Pro, Galaxy Tab Active3, Galaxy Tab Active4 Pro, Galaxy Tab S5e, Galaxy Tab S6, Galaxy Tab S6 5G, Galaxy Tab S7, Galaxy Tab S7+, Galaxy Tab S8, Galaxy Tab S8 Ultra, Galaxy Tab S8+, Galaxy Tab S9, Galaxy Tab S9 FE, Galaxy Tab S9 FE+, Galaxy Tab S9 Ultra, Galaxy Tab S9+, Galaxy Tab A9+ 5G, Galaxy Tab Active5 5G, Galaxy Tab S10 Ultra, Galaxy Tab S10+, Galaxy Tab S10 FE+, and Galaxy Tab S10 FE. Maxell reserves the right to accuse additional products as discovery proceeds in this investigation.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.gsmarena.com/samsung_galaxy_s25-13610.php DISPLAY — Type: Dynamic LTPO AMOLED 2X, 120Hz, HDR10+, 2600 nits (peak); Size: 6.2 inches, 94.4 cm^2 (~91.1% screen-to-body ratio); Resolution: 1080 x 2340 pixels, 19.5:9 ratio (~416 ppi density); Protection: Corning Gorilla Glass Victus 2; Always-on display PLATFORM — OS: Android 15, up to 7 major Android upgrades, One UI 7; Chipset: Qualcomm SM8750-AB Snapdragon 8 Elite (3 nm); CPU: Octa-core (2x4.47 GHz Oryon V2 Phoenix L + 6x3.53 GHz Oryon V2 Phoenix M); GPU: Adreno 830 *Id.* In addition, the AIDA64 Reports show that each of the Accused Samsung '645 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (e.g., CPU, ISP, or DSP) processes video.

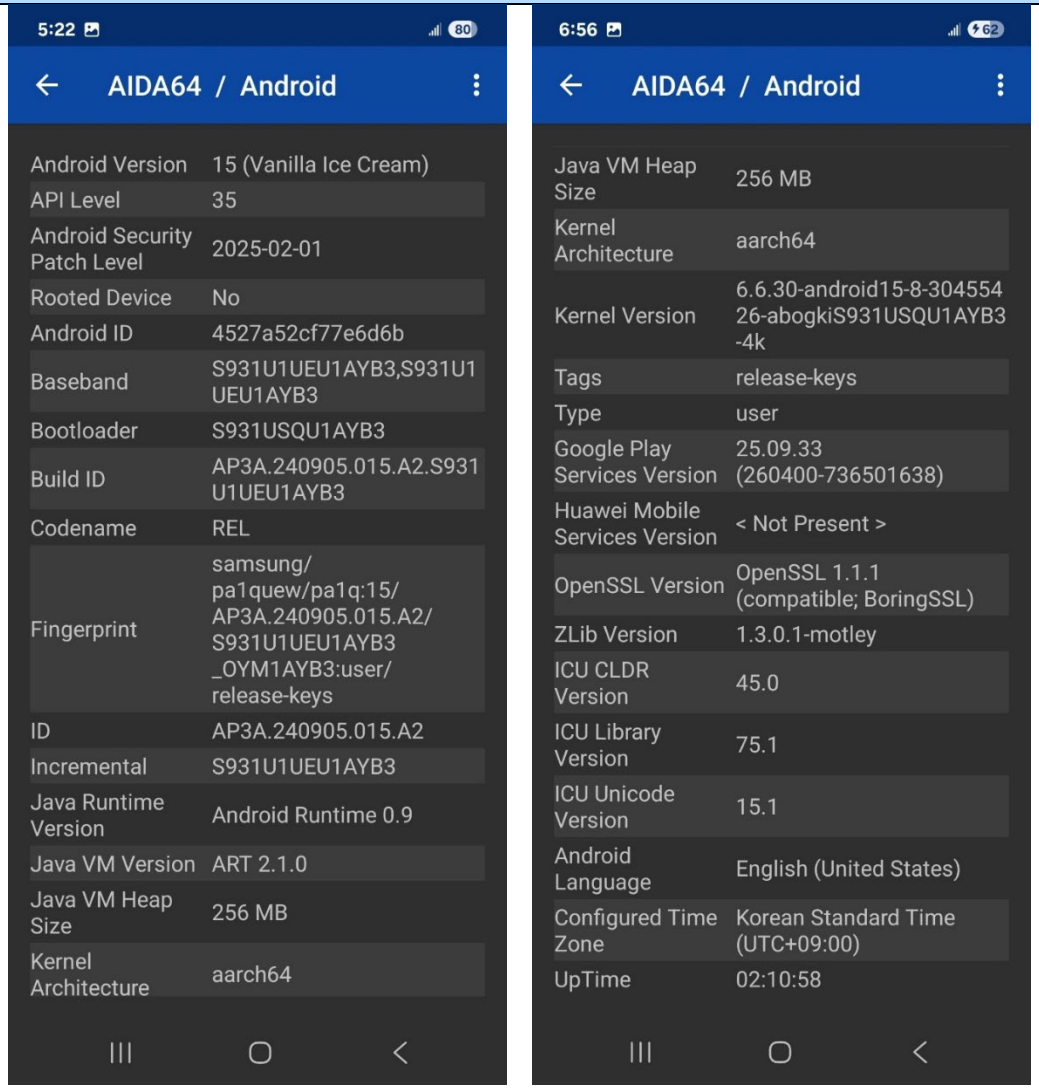
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement





(Screenshot of AIDA 64 Report – Camera)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



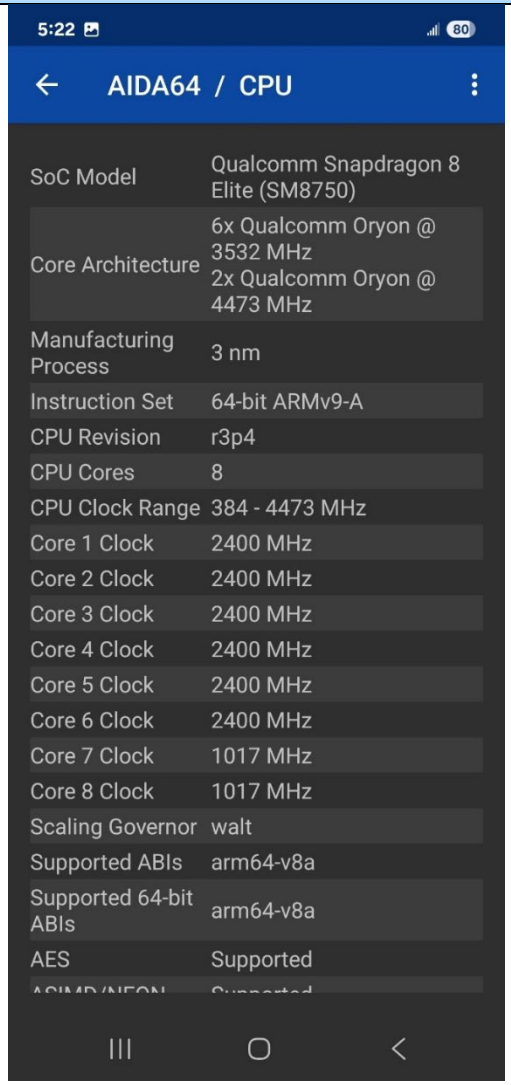
(Screenshot of AIDA 64 Report – Android)

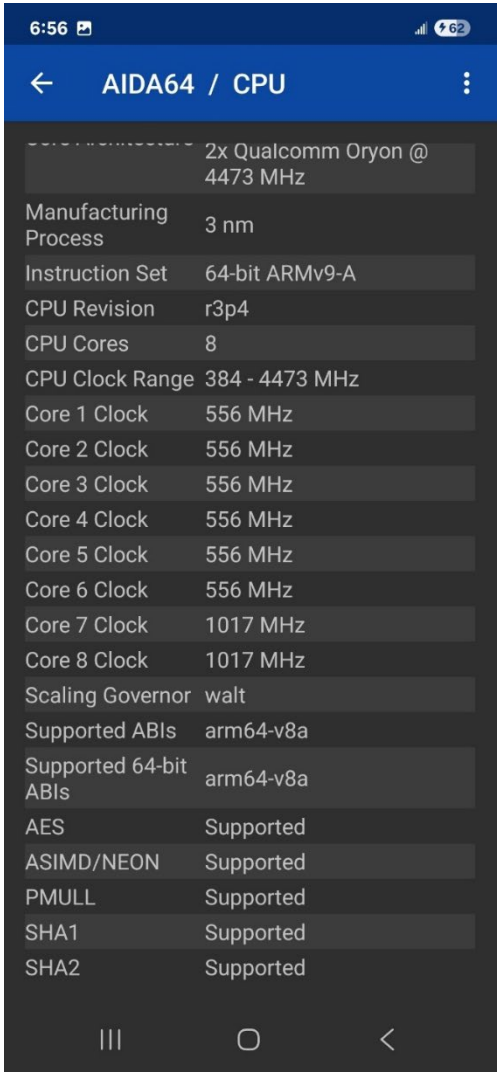
APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The AIDA64 Reports and tech specs show that the Accused Samsung '645 Products contain one or more processors.

IPR2025-01312; Samsung
Ex. 1014 - Page 5

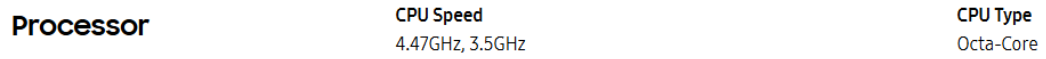
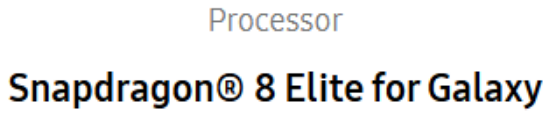
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

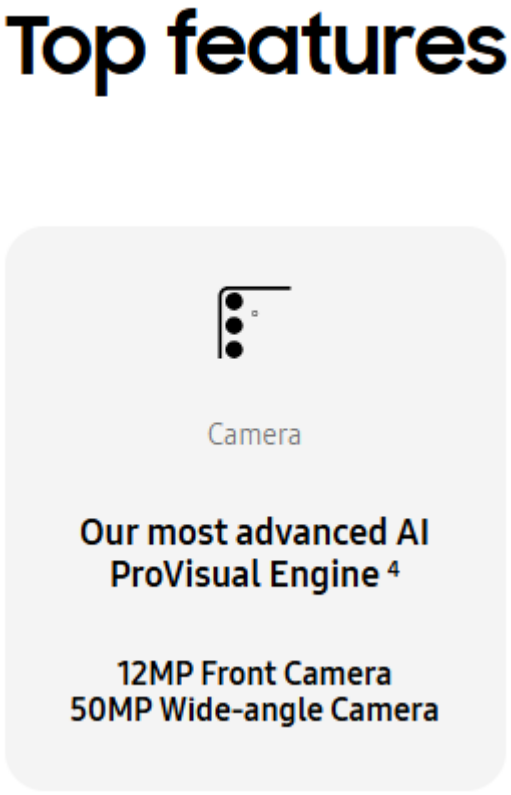




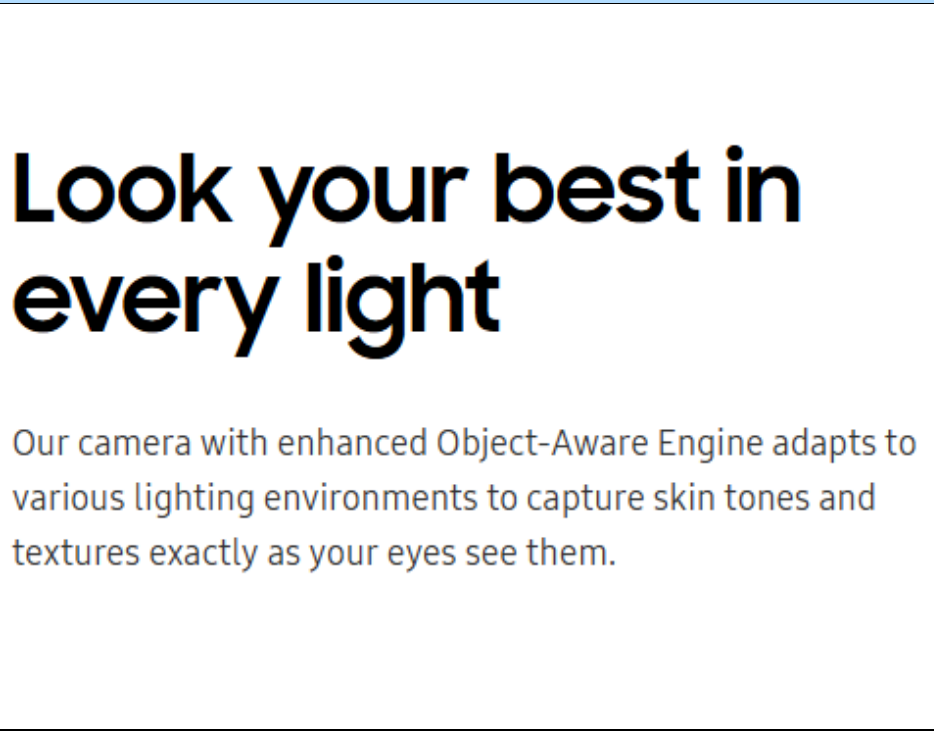
(Screenshot of AIDA 64 Report – Processor)

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

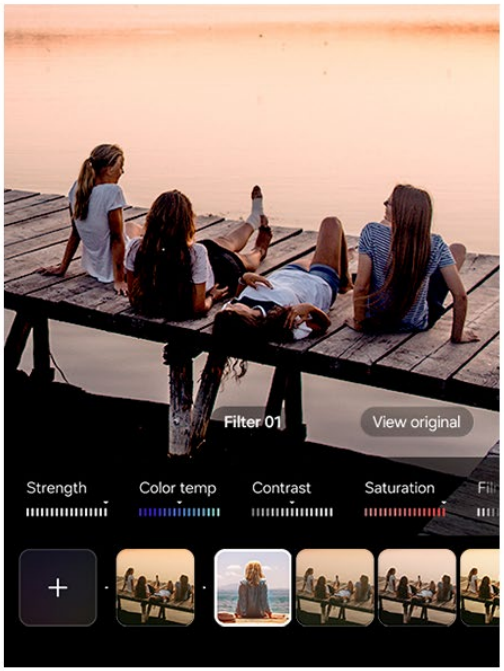
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/uk/smartphones/galaxy-s25/specs/  https://www.samsung.com/uk/smartphones/galaxy-s25/compare/

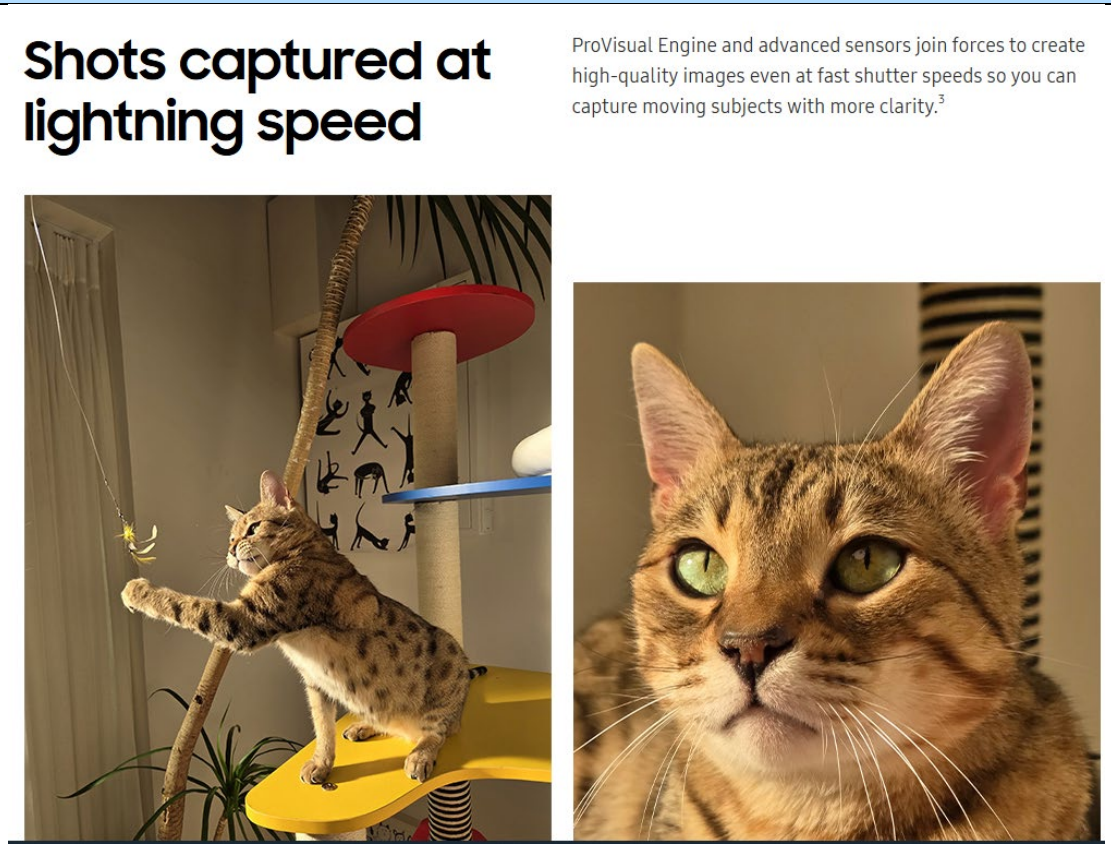
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 ProVisual Engine is now boosted by our powerful processor. Experience our advanced creative system for video and photo capturing, viewing and editing that you have to see to believe.[20] Shoot in improved 10-bit HDR for a stunning videography experience. Our advanced processor also delivers more precise noise removal meaning you won't have to worry about grainy night footage again.[3,4]

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

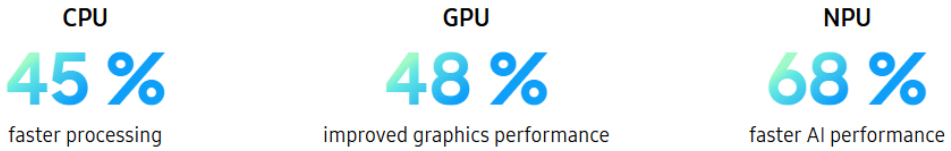
APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 **Filters just for you** Bring pics to life with personalized filters. Galaxy AI analyzes your photo and creates a filter to match. Use it instantly or customize further with tweaks to the saturation, brightness and more. How to use Filters

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25/ Further, as an example, the Qualcomm Snapdragon 8 Elite Mobile Platform in the Samsung Galaxy S25 includes a processor for processing image signals:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Introducing our most powerful processor, customized for Galaxy. With improved real-time ray tracing and Vulkan optimization, dive deep into the action with ultra-smooth gameplay thanks to Snapdragon® 8 Elite Mobile Platform for Galaxy.[21,22,23,24]  https://www.samsung.com/us/smartphones/galaxy-s25/

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Powerhouse Qualcomm Oryon CPU defines a new mobile era

The first-in-mobile Qualcomm Oryon CPU delivers a 45% performance boost, 44% greater power efficiency, and the mobile industry's largest shared data cache. Our Qualcomm® Adreno GPU with newly sliced architecture achieves 40% enhanced performance and 40% improved efficiency. System-wide, experience an overall power savings of 27%.

Multimodal Gen AI at your fingertips

The Qualcomm® AI Engine boasts the fastest Qualcomm® Hexagon NPU, delivering a 45% AI performance improvement and 45% better performance per watt. Plus, multimodal Gen AI support and longer token inputs will help you become an expert on any topic.

AI-powered camera redefines photography

Our AI ISP is directly fused with the Qualcomm® Hexagon™ NPU to offer industry-leading camera features, like limitless Semantic Segmentation at 4K resolution. Plus, our on-device video object eraser, can remove unwanted elements from videos, while Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions.

Power and efficiency for revolutionary gaming

Mobile-first support for Unreal Engine 5's Nanite solution enables astonishing film-quality 3D environments in smartphone gaming —while maximizing efficiency. Plus, support for Unreal's Chaos Physics Engine delivers lifelike object interactions and simulations, even in complex scenes.

Studio-quality audio

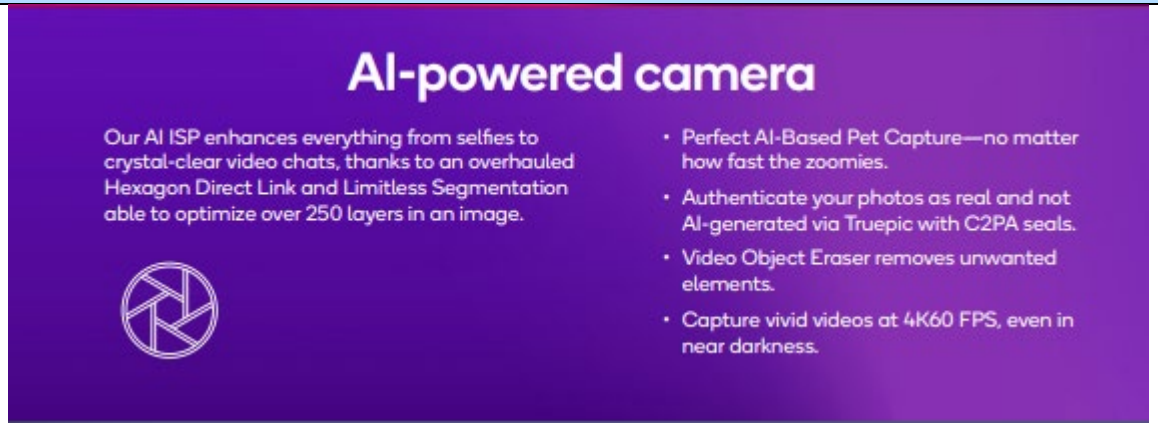
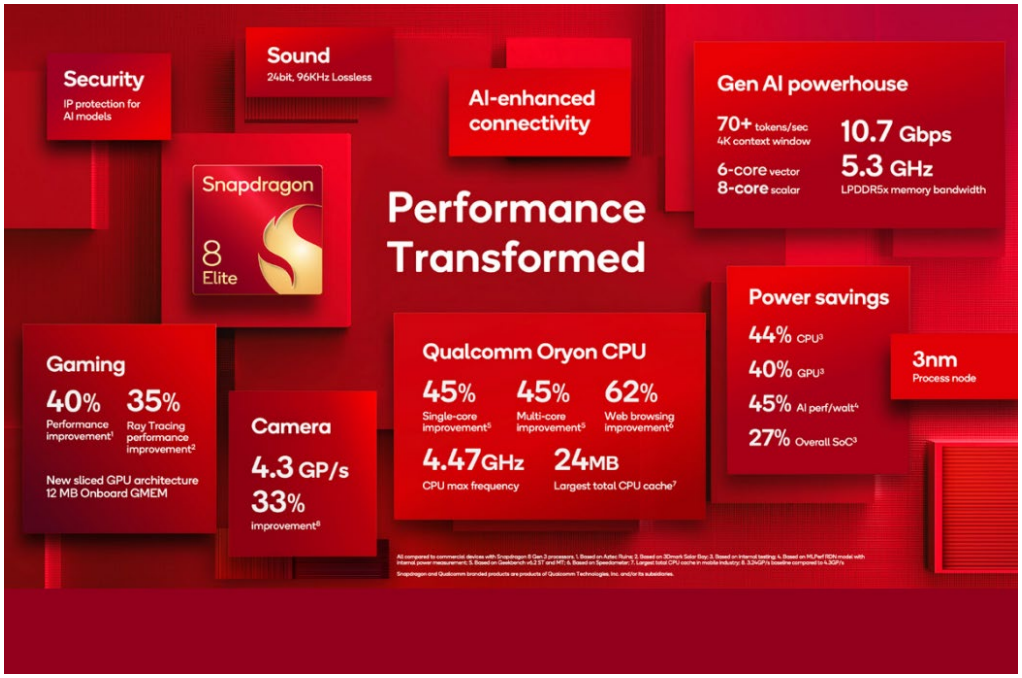
Our Snapdragon Sound™ Technology Suite with Qualcomm® aptX™ Lossless Technology delivers up to 24-bit 48kHz bluetooth music streaming and up to 24-bit 96kHz Wi-Fi music streaming. Qualcomm® Expanded Personal Area Network (XPAN) technology enables whole-building untethered audio coverage -- aided by ultra-low power Wi-Fi 7.

Fully integrated, AI-enhanced connectivity

The Snapdragon X80 5G Modem-RF System with a dedicated AI tensor accelerator achieves multi-gigabit 5G speeds in more places with the first 4x6 MIMO solution, and 30% more accurate location positioning. And, our 40% more efficient Qualcomm® FastConnect™ 7900 Mobile Connectivity System is the first to integrate Wi-Fi ranging, Bluetooth® wireless technology, and UWB proximity technologies for object tracking, building access control, and more.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• Our Qualcomm Spectra™ AI ISP features: • Limitless Real-time Semantic Segmentation for photo/video frame • Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions. • Ultra-low Light video capture • Video Object Eraser can remove unwanted elements from videos • Real-time AI Relighting make you appear professional wherever you are • Truepic photo capture with C2PA standard support lets you snap a photo with Truepic's cryptographic seal to prove the photo is real and not Gen AI (https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform)

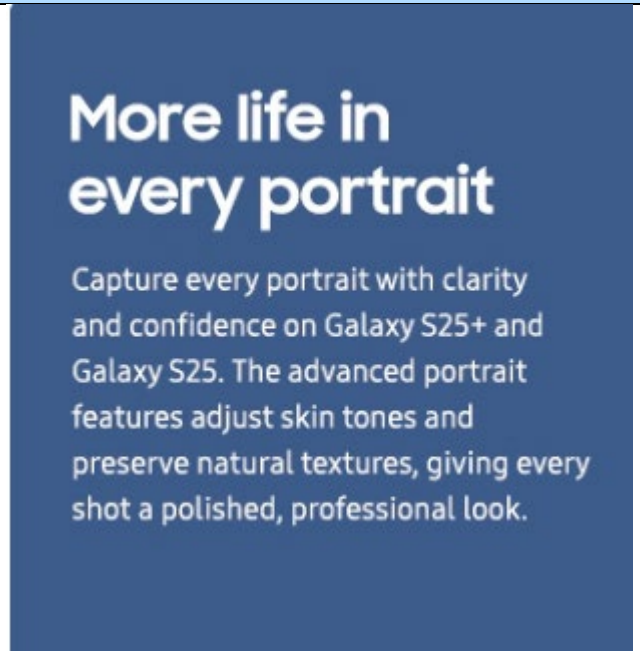

PERFORMANCE, TRANSFORMED
AI-powered camera
Multimodal Gen AI
Revolutionary gaming
Snapdragon
8
Elite
Powerhouse processing
Studio-quality audio
Fully integrated AI-enhanced connectivity
The Snapdragon® 8 Elite Mobile Platform is the pinnacle of Snapdragon innovation, delivering revolutionary power, speed, efficiency, and support for multimodal generative AI.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Camera Qualcomm Spectra™ Image Signal Processor • AI-ISP, Triple 18-bit ISPs Limitless real-time Semantic Segmentation photo and video processing Engine for Visual Analytics 4.0, including hardware acceleration for iToF depth sensors up to 4K 60 FPS Support for the latest HDR, DCG+VS, DCG, Staggered, QDOL, Less Blanking, and Multiframe HDR image sensors Support for triple video capture from HDR image sensors, with seamless switching between any HDR mode • Up to 48 MP triple camera @ 30 FPS with Zero Shutter Lag • Up to 108 MP single camera @ 30 FPS with Zero Shutter Lag • Up to 320-megapixel photo capture AI-based face detection, AI for 3A (auto-focus, autoexposure, and auto-white balance) Rec. 2020 color gamut photo and video capture Up to 10-bit color depth photo and video capture 10-bit HEIF: HEIC photo capture, HEVC video capture Google Ultra HDR photo capture Video capture HDR formats: HDR10+, HDR10, HLG, Dolby Vision 8K HDR video playback @ 60 FPS 4K video capture @ 120 FPS Slow-mo video capture at 1080p @ 480 FPS Hardware Bokeh Engine 2 for video capture

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	(https://docs.qualcomm.com/bundle/publicresource/87-83196-1_REV_D_Snapdragon_8_Elite_Mobile_Platform_Product_Brief.pdf) **AI-powered camera redefines photography** Infuse brilliance into mobile capture with our AI ISP, enhancing everything from selfies to crystal-clear video chats thanks to an overhauled Hexagon Direct Link. The first AI-powered Limitless Segmentation recognizes and enhances virtually anything in the frame, including faces, hair, clothing, objects, backgrounds, and beyond. Even furry friends appear crisp and cute—no matter how fast the zoomies—thanks to AI-Based Pet Capture. • Our powerful AI ISP is deeply integrated with the Hexagon NPU for enhanced, intuitive capture. • Limitless Segmentation can segment an image in over 250 layers, each optimized to perfection. • Real-time Insight AI captures and enhances natural skin and sky tones even in the most challenging conditions. • Truepic with C2PA adds cryptographic seals so you can authenticate your photos as real and not AI-generated—now including videos and audio recordings. • Video Object Eraser can remove unwanted elements from video footage—on-device. • Capture vivid videos at 4K60 FPS, even in near darkness. (https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Snapdragon-8-Elite-Platform-Product-Brief.pdf) Let's dive deeper into why Snapdragon 8 Elite is a game-changer: • **Incredible power:** Experience a 45% boost in performance with the Qualcomm Oryon CPU, giving you lightning-fast apps and incredible multitasking.[1] • **AI at your fingertips:** The Qualcomm® Hexagon™ NPU increases AI performance by 45%, handling everything from voice commands to image prompts. Your device is ready to adapt to your every move. • **Photography, reimagined:** With features like 4K Semantic Segmentation, Video Object Eraser, and real-time AI lighting adjustments, the Snapdragon 8 Elite camera tech turns your mobile photos into pro-level masterpieces. https://www.qualcomm.com/snapdragon/news/snapdragon-8-elite--the-power-behind-the-name

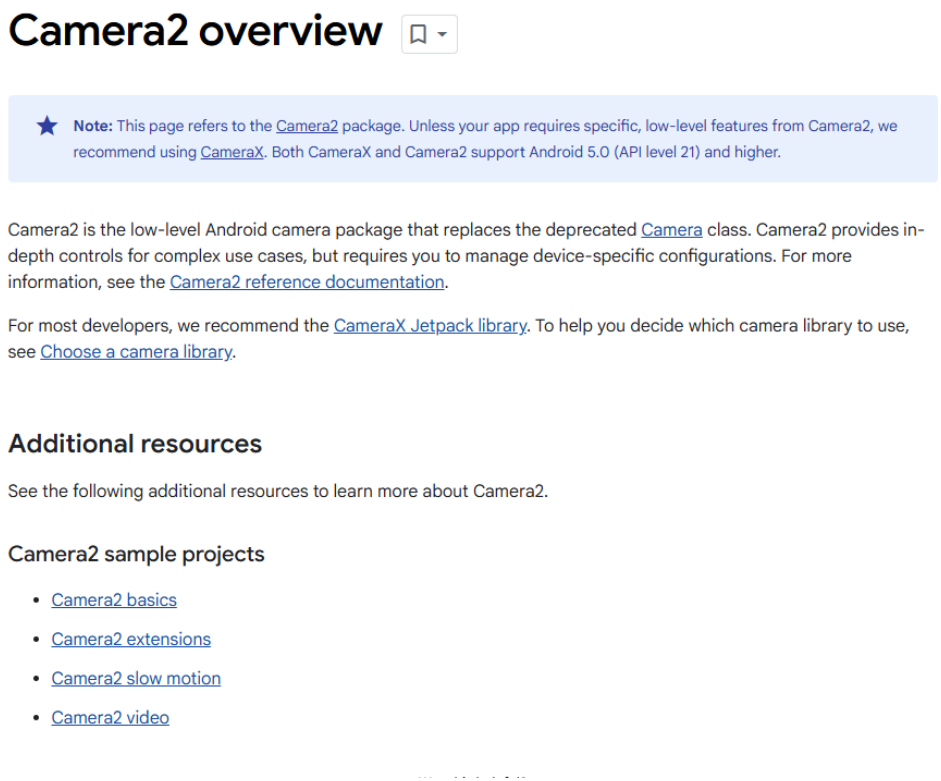
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Specifications

Qualcomm® Artificial Intelligence (AI) Engine	**GPU Name:** Qualcomm® Adreno™ **CPU Name:** Qualcomm® Oryon™ **Qualcomm® Hexagon™ Processor Features:** Qualcomm® Hexagon™ Scalar Accelerator, Qualcomm® Hexagon™ Tensor Accelerator, Qualcomm® Hexagon™ Vector eXtensions (HVX), Dedicated power delivery system, Micro Tile Inferencing, Hexagon Direct Link, Fused AI Accelerator architecture **Qualcomm® Sensing Hub Features:** Dual-core AI processor, Dual always-sensing cameras
CPU	**Name:** Qualcomm® Oryon™ **Architecture:** 64-bit **Clock Speed:** 4.47 GHz[1]
GPU	**Name:** Qualcomm® Adreno™ **APIs:** OpenGL® ES 3.2, Vulkan® 1.3, OpenCL™ 3.0 FP
Cellular Modem-RF	**Modem Name:** Snapdragon® X80 5G Modem-RF System **Peak Download Speed:** 10 Gbps **Peak Upload Speed:** 3.5 Gbps **Cellular Modem-RF Specs:** 8 carriers (mmWave), 2x2 MIMO (mmWave), 4x6 MIMO (Sub-6) **Performance Enhancement Technologies:** Qualcomm® Wideband Envelope Tracking, Qualcomm® 5G Ultra-Low Latency Suite, Qualcomm® 5G AI Processor Gen 2 with dedicated tensor accelerator, Qualcomm® Power RF Efficiency Suite, Qualcomm® 5G AI Suite Gen 3, Qualcomm® RF Uplink Optimization, Qualcomm® Smart Transmit™ Gen 5 technology, Qualcomm® 5G PowerSave Gen 5 **Cellular Technology:** 5G NR, Dynamic Spectrum Sharing (DSS), LTE, WCDMA, LAA, GSM/EDGE, EN-DC, CBRS, NR DC **Multi SIM:** Global 5G Multi-SIM, Dual SIM support Qualcomm® DSDA Gen 2 (Dual Data)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform Further, the Samsung Galaxy S25 includes an operating system that when executed on a processor provides a video processing apparatus:  https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products is configured to run Camera2.java, which provides evidence of a video processing apparatus:  (https://developer.android.com/media/camera/camera2)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Android Developers > Develop > API reference

Was this helpful?

android.hardware.camera2

Added in API level 21

Kotlin | **Java**

The android.hardware.camera2 package provides an interface to individual camera devices connected to an Android device. It replaces the deprecated `Camera` class.

This package models a camera device as a pipeline, which takes in input requests for capturing a single frame, captures the single image per the request, and then outputs one capture result metadata packet, plus a set of output image buffers for the request. The requests are processed in-order, and multiple requests can be in flight at once. Since the camera device is a pipeline with multiple stages, having multiple requests in flight is required to maintain full framerate on most Android devices.

To enumerate, query, and open available camera devices, obtain a `CameraManager` instance.

Individual `CameraDevices` provide a set of static property information that describes the hardware device and the available settings and output parameters for the device. This information is provided through the `CameraCharacteristics` object, and is available through `getCameraCharacteristics(String)`

To capture or stream images from a camera device, the application must first create a `camera capture session` with a set of output Surfaces for use with the camera device, with `createCaptureSession(SessionConfiguration)`. Each Surface has to be pre-configured with an `appropriate size and format` (if applicable) to match the sizes and formats available from the camera device. A target Surface can be obtained from a variety of classes, including `SurfaceView`, `SurfaceTexture` via `Surface(SurfaceTexture)`, `MediaCodec`, `MediaRecorder`, `Allocation`, and `ImageReader`.

Generally, camera preview images are sent to `SurfaceView` or `TextureView` (via its `SurfaceTexture`). Capture of JPEG images or RAW buffers for `DngCreator` can be done with `ImageReader` with the `JPEG` and `RAW_SENSOR` formats. Application-driven processing of camera data in OpenGL ES, or directly in managed or native code is best done through `SurfaceTexture`, or `ImageReader` with a `YUV_420_888` format, respectively.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	By default, YUV-format buffers provided by the camera are using the JFIF YUV<->RGB transform matrix (equivalent to Rec.601 full-range encoding), and after conversion to RGB with this matrix, the resulting RGB data is in the sRGB colorspace. Captured JPEG images may contain an ICC profile to specify their color space information; if not, they should be assumed to be in the sRGB space as well. On some devices, the output colorspace can be changed via `setColorSpace(Named)`. Note that although the YUV->RGB transform is the JFIF matrix (Rec.601 full-range), due to legacy and compatibility reasons, the output is in the sRGB colorspace, which uses the Rec.709 color primaries. Image processing code can safely treat the output RGB as being in the sRGB colorspace. The application then needs to construct a `CaptureRequest`, which defines all the capture parameters needed by a camera device to capture a single image. The request also lists which of the configured output Surfaces should be used as targets for this capture. The CameraDevice has a `factory method` for creating a `request builder` for a given use case, which is optimized for the Android device the application is running on. Once the request has been set up, it can be handed to the active capture session either for a one-shot `capture` or for an endlessly `repeating` use. Both methods also have a variant that accepts a list of requests to use as a burst capture / repeating burst. Repeating requests have a lower priority than captures, so a request submitted through `capture()` while there's a repeating request configured will be captured before any new instances of the currently repeating (burst) capture will begin capture. After processing a request, the camera device will produce a `TotalCaptureResult` object, which contains information about the state of the camera device at time of capture, and the final settings used. These may vary somewhat from the request, if rounding or resolving contradictory parameters was necessary. The camera device will also send a frame of image data into each of the output `Surfaces` included in the request. These are produced asynchronously relative to the output CaptureResult, sometimes substantially later.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Classes

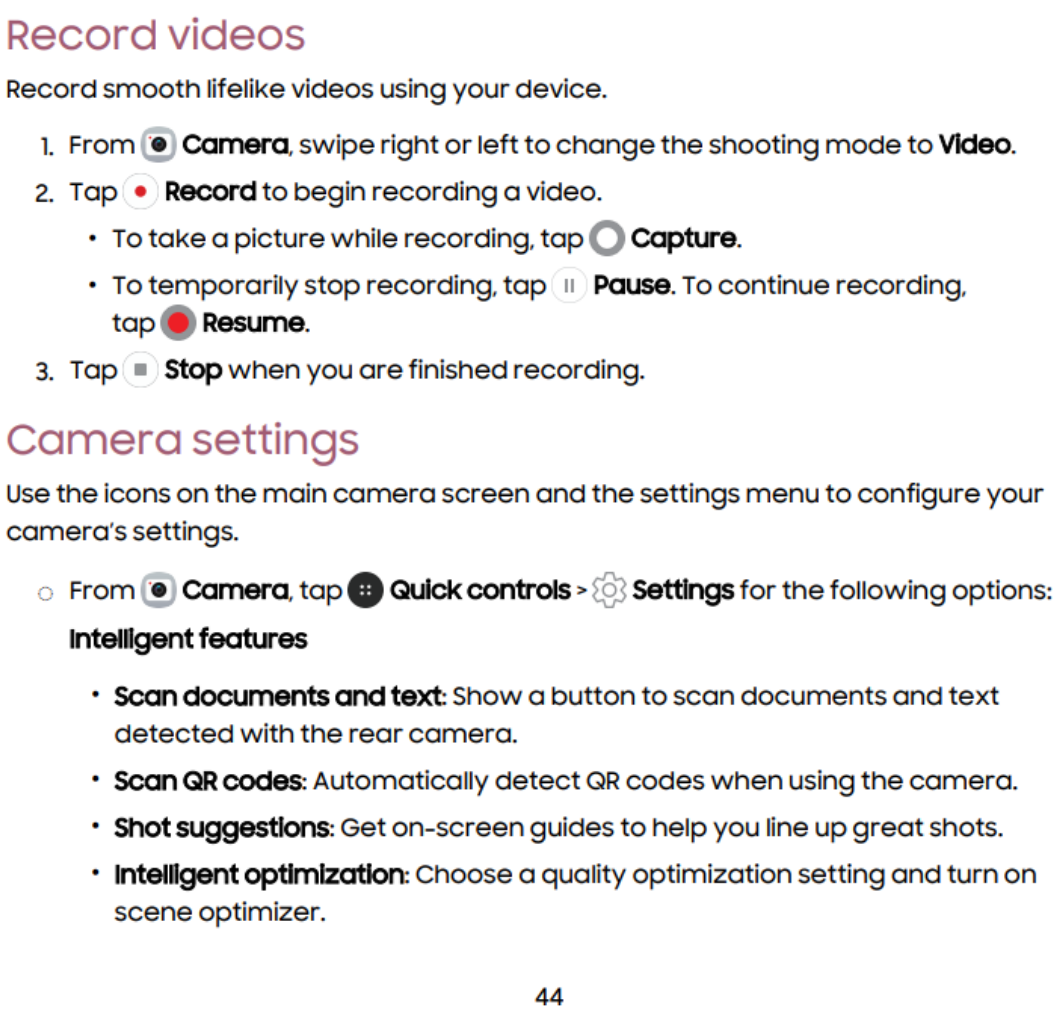
CameraCaptureSession	A configured capture session for a `CameraDevice`, used for capturing images from the camera or reprocessing images captured from the camera in the same session previously.
CameraCaptureSession.CaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraCaptureSession.StateCallback	A callback object for receiving updates about the state of a camera capture session.
CameraCharacteristics	The properties describing a `CameraDevice`.
CameraCharacteristics.Key<T>	A `Key` is used to do camera characteristics field lookups with `CameraCharacteristics.get`.
CameraConstrainedHighSpeedCaptureSession	A constrained high speed capture session for a `CameraDevice`, used for capturing high speed images from the `CameraDevice` for high speed video recording use case.
CameraDevice	The CameraDevice class is a representation of a single camera connected to an Android device, allowing for fine-grain control of image capture and post-processing at high frame rates.
CameraDevice.CameraDeviceSetup	CameraDeviceSetup is a limited representation of `CameraDevice` that can be used to query device specific information which would otherwise need a CameraDevice instance.
CameraDevice.StateCallback	A callback objects for receiving updates about the state of a camera device.
CameraExtensionCharacteristics	Allows clients to query availability and supported resolutions of camera extensions.
CameraExtensionSession	A camera capture session that enables access to device-specific camera extensions, which often use multi-frame bursts and sophisticated post-process algorithms for image capture.
CameraExtensionSession.ExtensionCaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraExtensionSession.StateCallback	A callback object for receiving updates about the state of a camera extension session.

See https://developer.android.com/reference/android/hardware/camera2/package-summary

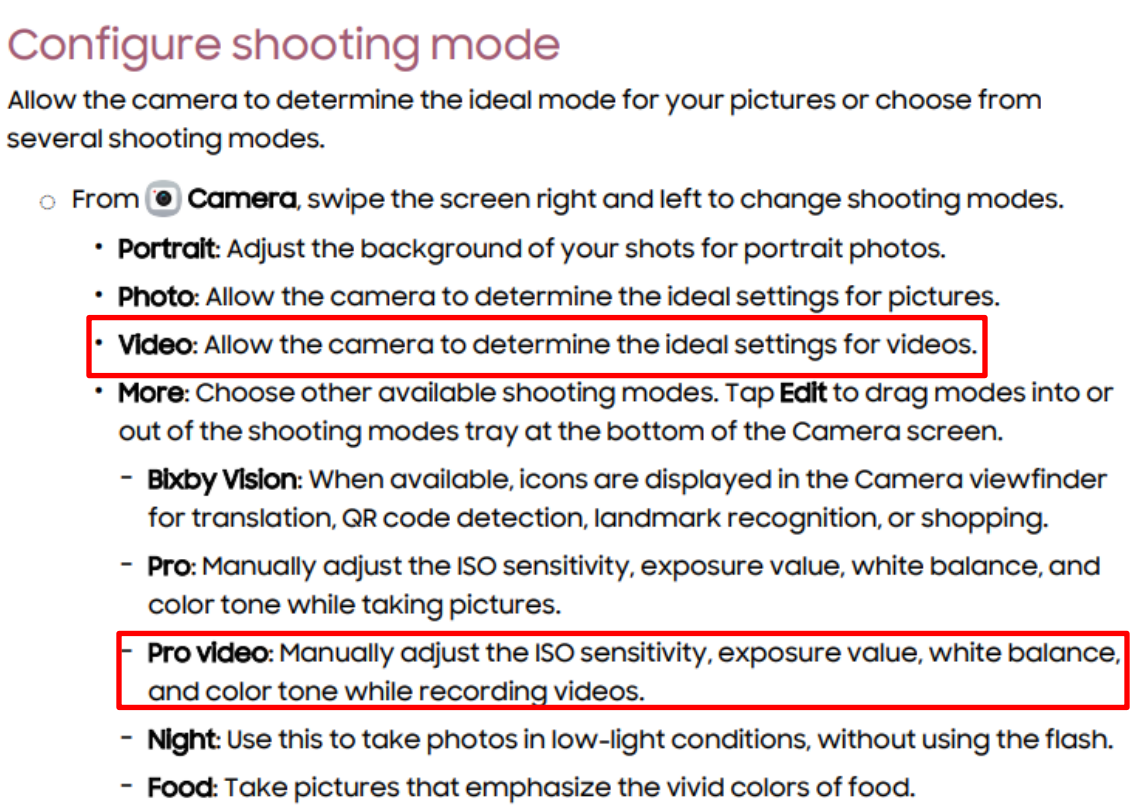
APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
[1.a] an input unit to which a video signal containing contents is input;	Each of the Accused Samsung '645 Products includes an input unit to which a video signal containing contents is input. For example, the Samsung Galaxy S25 has front and rear cameras, and corresponding image sensor and image processing circuitry (e.g., CPU, ISP, and/or DSP), that receive video input signals. MAIN CAMERA — Triple: 50 MP, f/1.8, 24mm (wide), 1/1.56", 1.0µm, dual pixel PDAF, OIS; 10 MP, f/2.4, 67mm (telephoto), 1/3.94", 1.0µm, PDAF, OIS, 3x optical zoom; 12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55" 1.4µm, Super Steady video Features: Best Face, LED flash, auto-HDR, panorama Video: 8K@24/30fps, 4K@30/60fps, 1080p@30/60/120/240fps, 10-bit HDR, HDR10+, stereo sound rec., gyro-EIS SELFIE CAMERA — Single: 12 MP, f/2.2, 26mm (wide), 1/3.2", 1.12µm, dual pixel PDAF Features: HDR, HDR10+ Video: 4K@30/60fps, 1080p@30fps https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Galaxy S25  Samsung Galaxy S25 User Guide at 7. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Record videos Record smooth lifelike videos using your device. 1. From Camera, swipe right or left to change the shooting mode to Video. 2. Tap Record to begin recording a video. • To take a picture while recording, tap Capture. • To temporarily stop recording, tap Pause. To continue recording, tap Resume. 3. Tap Stop when you are finished recording. Camera settings Use the icons on the main camera screen and the settings menu to configure your camera's settings. ○ From Camera, tap Quick controls > Settings for the following options: Intelligent features • Scan documents and text: Show a button to scan documents and text detected with the rear camera. • Scan QR codes: Automatically detect QR codes when using the camera. • Shot suggestions: Get on-screen guides to help you line up great shots. • Intelligent optimization: Choose a quality optimization setting and turn on scene optimizer. 44 *Id.* at 44.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Videos • **Auto FPS**: Record brighter videos in low-light conditions by automatically optimizing the frame rate in Video mode. • **Video stabilization**: Activate anti-shake to keep the focus steady when the camera is moving. • **Advanced video options**: Enhance your videos with advanced recording formats. - **Video format**: Choose a format for recorded videos. - **High bitrate videos**: Record videos in higher bit rate with the Pro video shooting mode. - **HDR**: Optimize videos by recording in HDR10+. Playback devices must support HDR10+ video. 45 Camera and Gallery - **Log**: Choose when to record in log format for more dynamic editing. - **Zoom-in mic**: Match the mic zoom to the camera zoom while recording videos. - **360 audio recording**: Capture immersive 3D sound through your Bluetooth headphones with 360 audio recording. - **Audio playback**: Allow music and other audio to play while you record. *Id.* at 45-46.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

Configure shooting mode

Allow the camera to determine the ideal mode for your pictures or choose from several shooting modes.

- From **Camera**, swipe the screen right and left to change shooting modes.
  - **Portrait**: Adjust the background of your shots for portrait photos.
  - **Photo**: Allow the camera to determine the ideal settings for pictures.
  - **Video**: Allow the camera to determine the ideal settings for videos.
  - **More**: Choose other available shooting modes. Tap **Edit** to drag modes into or out of the shooting modes tray at the bottom of the Camera screen.
    - **Bixby Vision**: When available, icons are displayed in the Camera viewfinder for translation, QR code detection, landmark recognition, or shopping.
    - **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures.
    - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos.
    - **Night**: Use this to take photos in low-light conditions, without using the flash.
    - **Food**: Take pictures that emphasize the vivid colors of food.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Panorama**: Create a linear image by taking pictures in either a horizontal or vertical direction. - **Slow motion**: Record videos at a high frame rate for viewing in slow motion. - **Hyperlapse**: Create a time lapse video by recording at various frame rates. The frame rate is adjusted depending on the scene being recorded and the movement of the device. - **Portrait video**: Adjust the background of your shots for portrait videos. - **Dual rec**: Access advanced features such as lock onto a subject, change between different rear camera lenses, and more. - **Single take**: Capture multiple pictures and video clips from different angles. *Id.* at 43-44.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Camera

Rear Camera - Resolution (Multiple)
50.0 MP + 10.0 MP + 12.0 MP

Rear Camera - F Number (Multiple)
F1.8 , F2.4 , F2.2

Rear Camera - Auto Focus
Yes

Rear Camera - OIS
Yes

Rear Camera - Zoom
Optical Zoom 3x, Optical quality Zoom 2x (Enabled by Adaptive Pixel sensor) , Digital Zoom up to 30x

Front Camera - Resolution
12.0 MP

Front Camera - F Number
F2.2

Front Camera - Auto Focus
Yes

Rear Camera - Flash
Yes

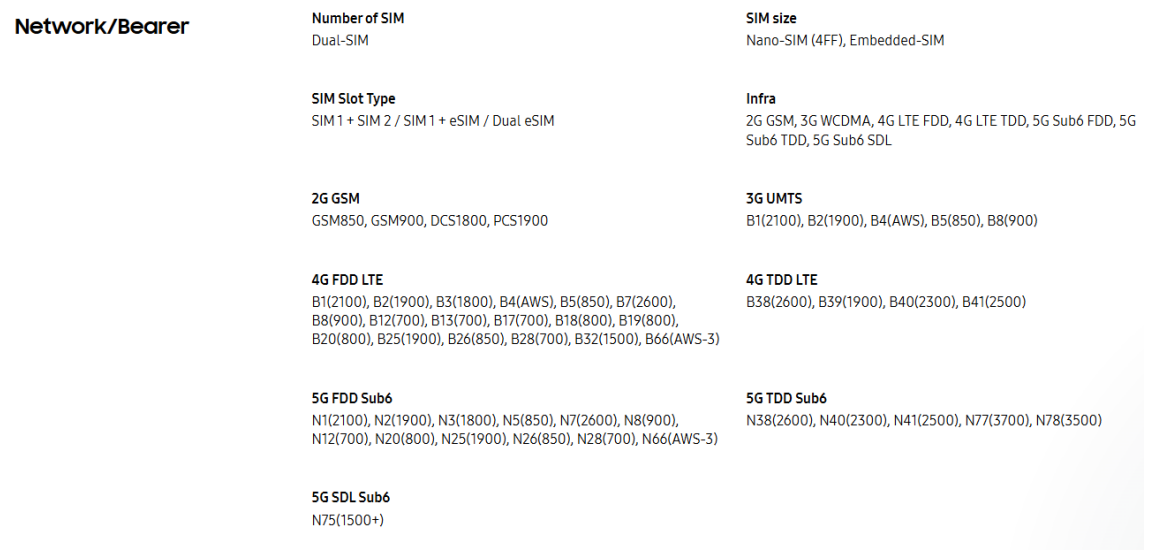
Video Recording Resolution
UHD 8K (7680 x 4320)@30fps

Slow Motion
240fps @FHD, 120fps @FHD, 120fps @UHD

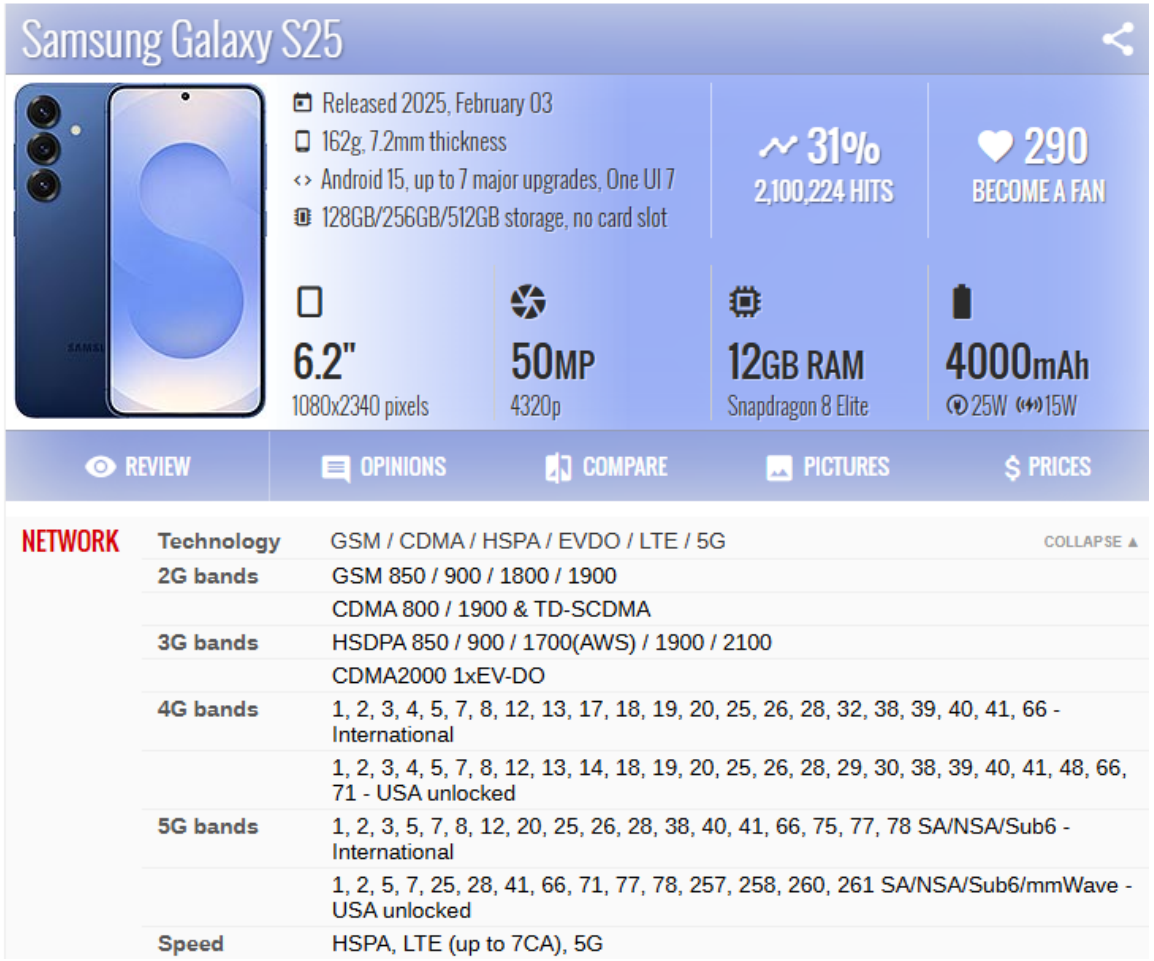
Samsung Galaxy S25 tech specs, https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

In addition, the Samsung Galaxy S25 is configured to receive wireless video signals, e.g., via cellular RF transmissions. *See*, *e.g.*:

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	In addition, the Samsung Galaxy S25 includes a WiFi modem for receiving WiFi transmissions, which may include video signals containing content:

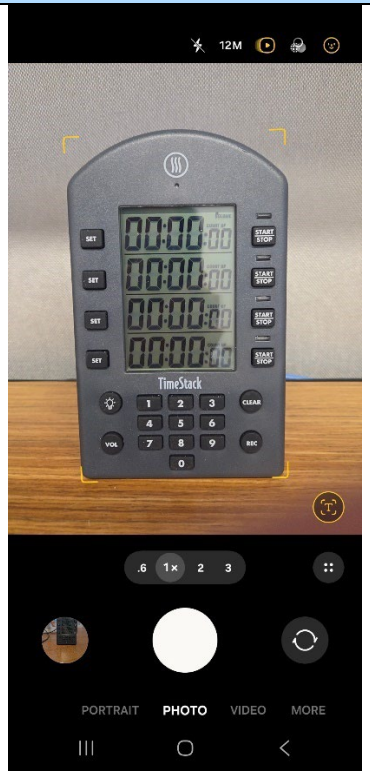
Connectivity

Wi-Fi Connectivity	**USB**	**Bluetooth®**
802.11a/b/g/n/ac/ax/be 2.4GHz+5GHz+6GHz, EHT320, MIMO, 4096-QAM	USB 3.2 Gen 1	Bluetooth v5.4
Location Technology	**Earjack**	**MHL**
GPS,Glonass,Beidou,Galileo	USB Type-C	No
Wi-Fi Direct	**NFC**	**PC Sync.**
Yes	Yes	Smart Switch (PC version)
USB Interface		
USB Type-C		

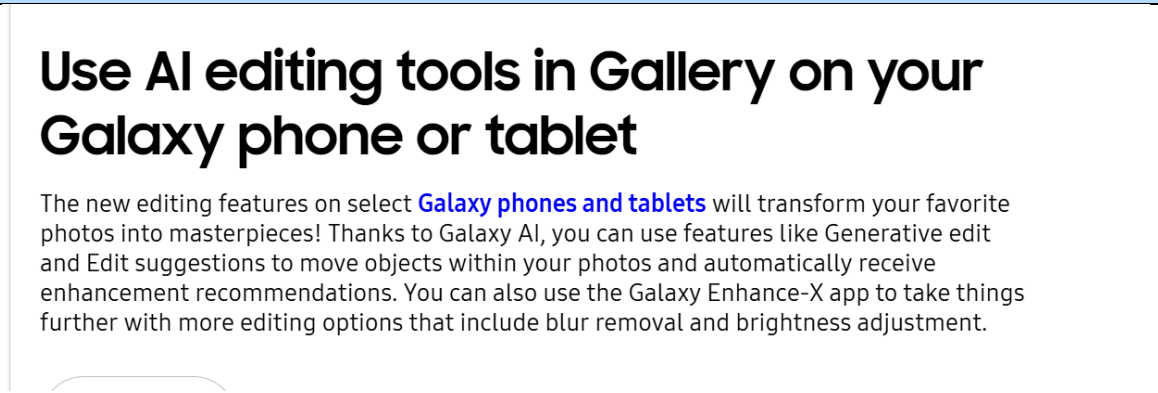
https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e/7, tri-band, Wi-Fi Direct
	Bluetooth	5.4, A2DP, LE
	Positioning	GPS, GLONASS, BDS, GALILEO, QZSS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, DisplayPort 1.2, OTG

https://www.gsmarena.com/samsung_galaxy_s25-13610.php

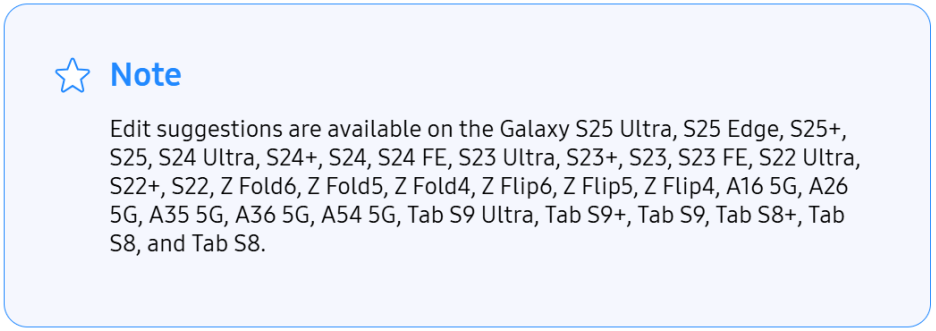
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (Screenshot showing video input functions in preview mode)
[1.b] a detector which detects whether pattern portions other than contents are contained in the video signal input to the input unit;	Each of the Accused Samsung '645 Products includes a detector which detects whether pattern portions other than contents are contained in the video signal input to the input unit. For example, all of the Accused Samsung '645 Products are equipped with white balance correction, which is activated when an object that appears white in person is detected in an image. The white balance correction adjusts for the color temperature of the light source so

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	that an object that appears white in person also appears white in the image. As a result, the Accused Samsung '645 Products are necessarily configured to detect with a patterned portion (e.g. white object, white snow) formed of a single color of black or white is input, and contain one or more processors for doing same (e.g., CPU, ISP, and/or DSP). Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part." If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/

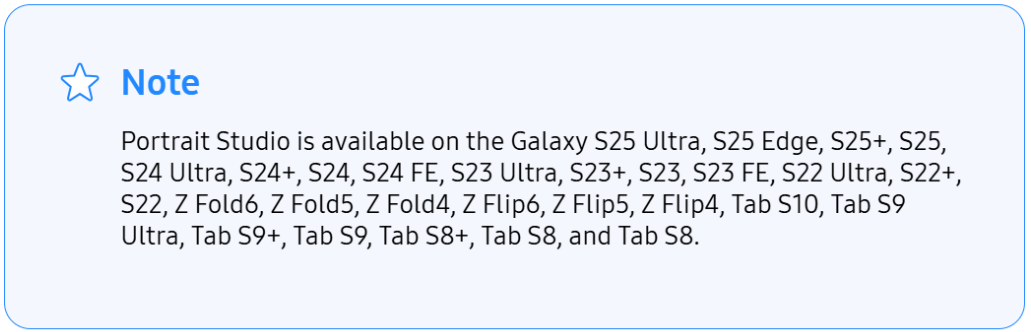
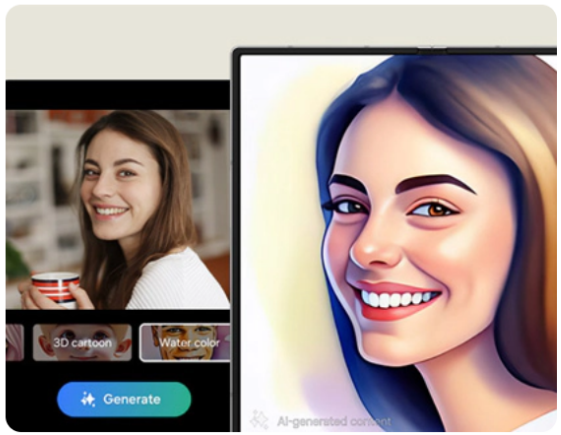
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

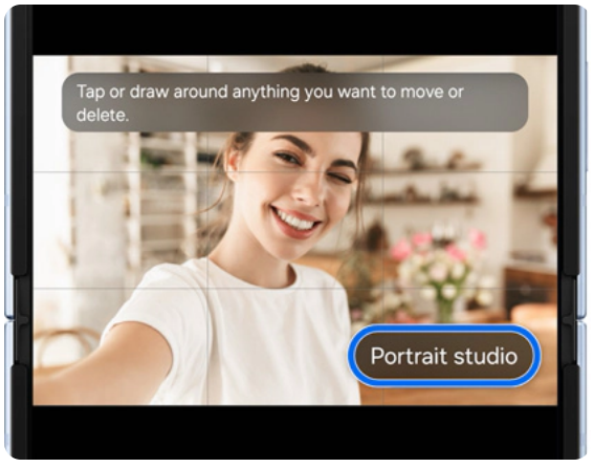
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

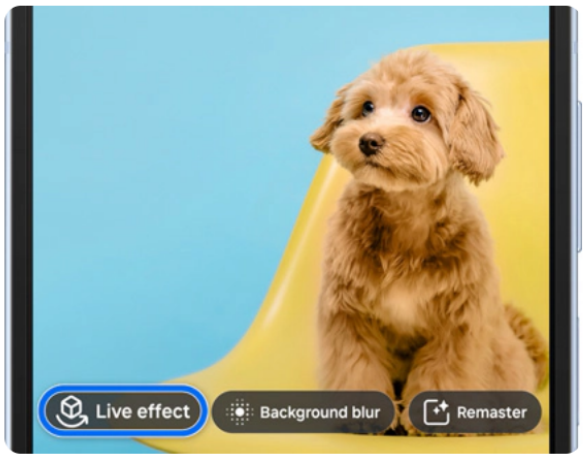
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions  **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

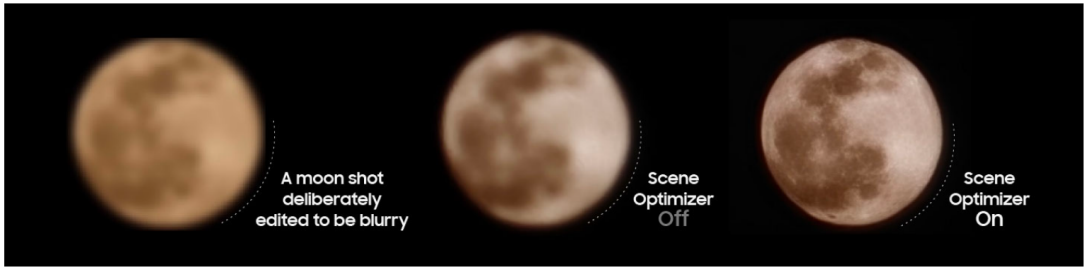
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

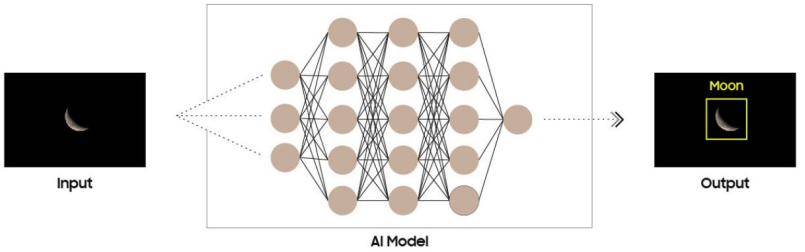
APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

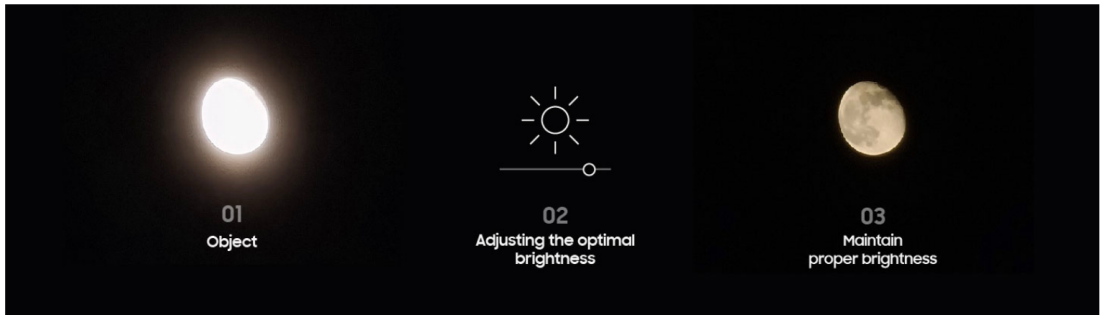
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

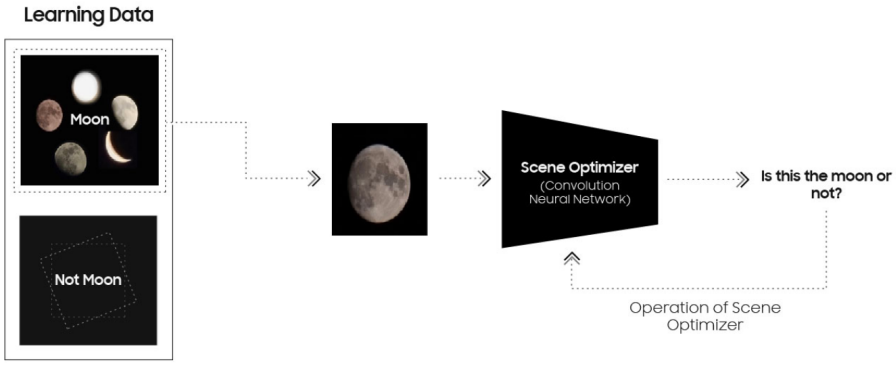
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

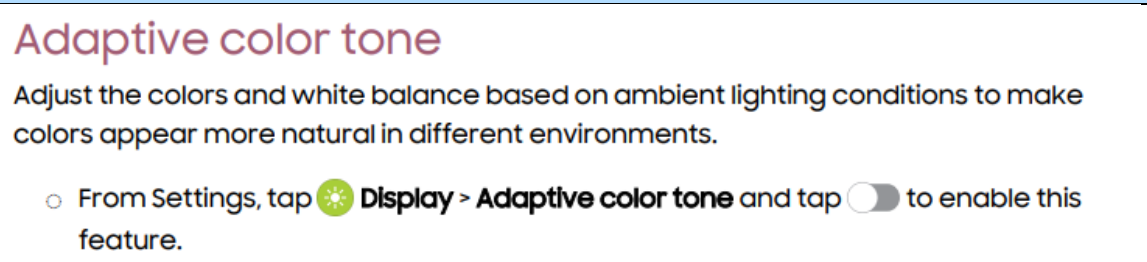
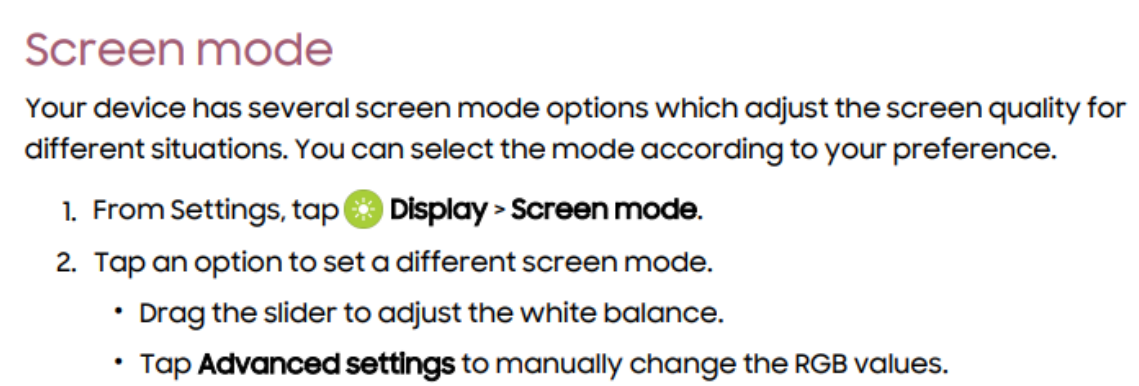
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

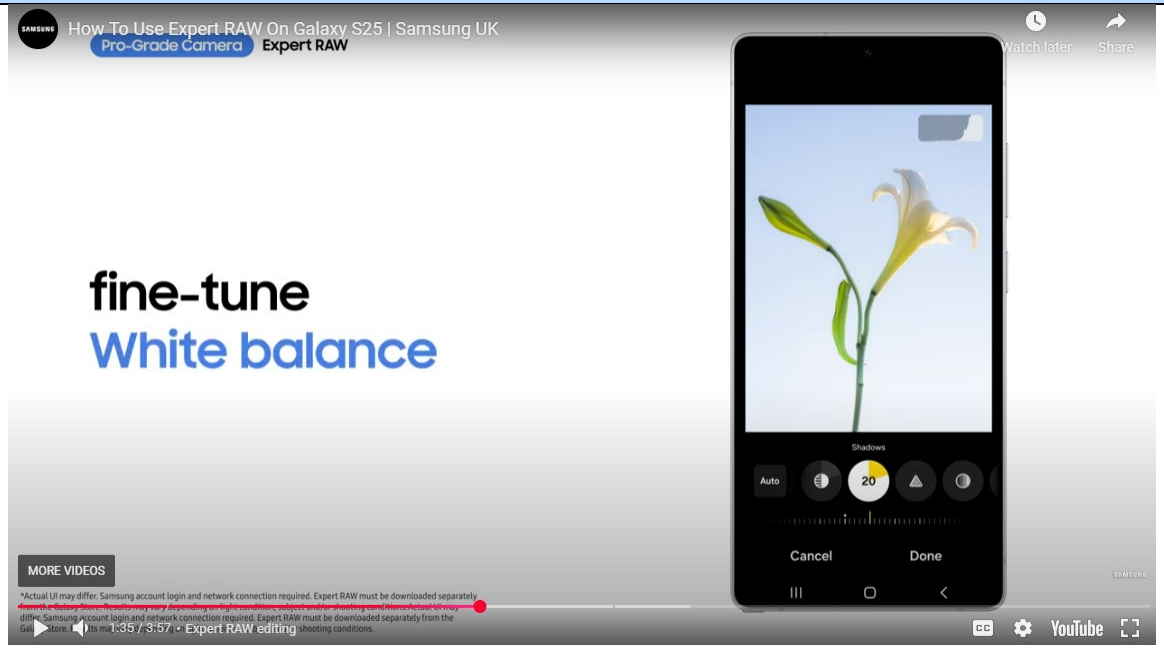
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 116.  *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility. The camera pipeline also supports triggers that the app framework can initiate to turn on things such as auto-focus. It also sends notifications back to the app framework, notifying apps of events such as an auto-focus lock or errors.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

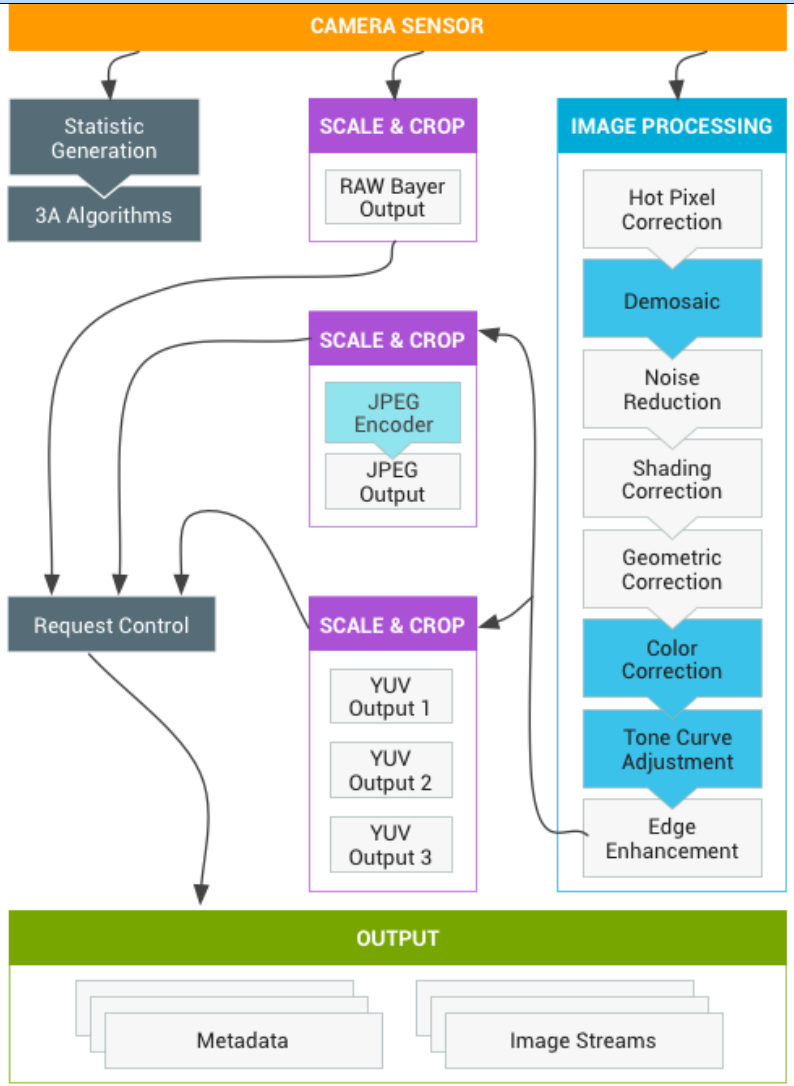


Figure 2. Camera pipeline

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

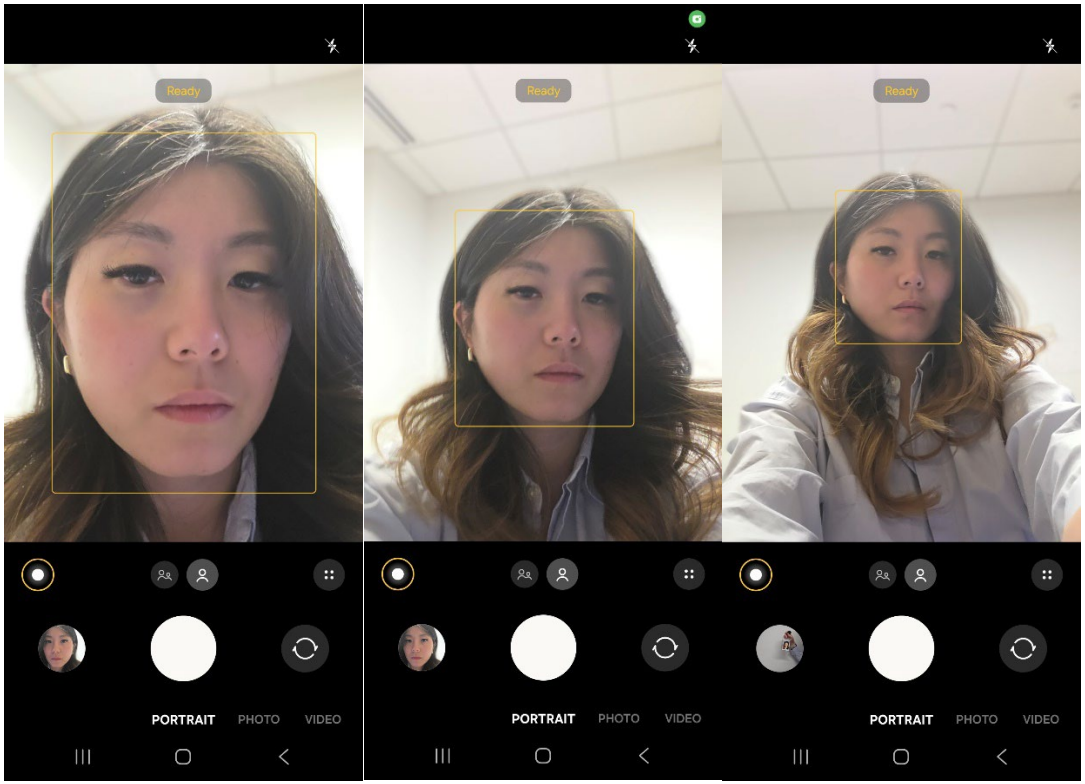
Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

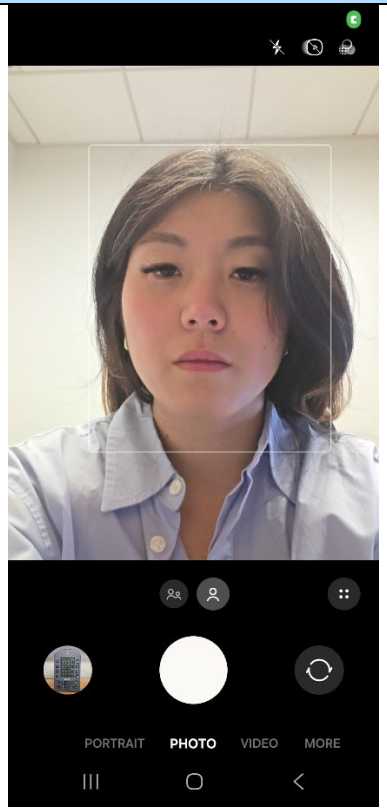
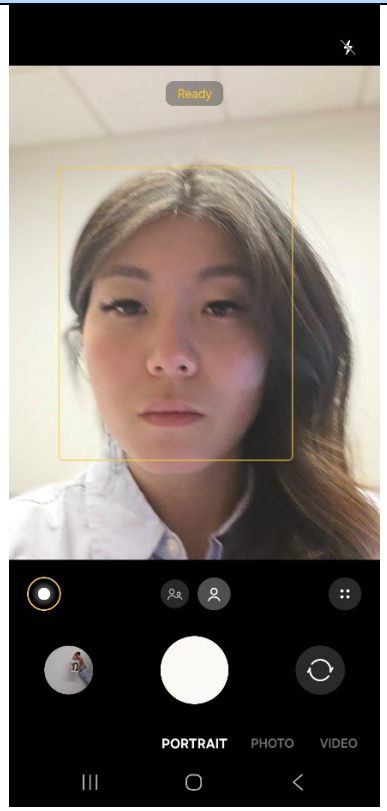
The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

See for example the various modes in the Samsung Galaxy S25 where pattern portion formed of a single color of black or white are necessarily detected:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a detector that detects pattern portions, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting pattern portions in video signal that is input. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting pattern portions) in substantially the same way (e.g., performing image processing). The performance of this function achieves substantially the same result, for example, the detection of pattern portions. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	perform image processing and detection of pattern portions. These components and/or software operate together and function in substantially the same way to facilitate pattern detection. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a detector.
[1.c] a corrector which corrects the video signal input to the input unit; and	Each of the Accused Samsung '645 Products includes a corrector which corrects the video signal input to the input unit. For example, the Accused Samsung '645 Products perform color correction with the SoC in order to control color temperature of an input video signal. For example, color correction and white balance transforms to approximately CIE standard illuminant D65 or F2 control color temperature of an input video signal:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

COLOR_CORRECTION_MODE

Added in API level 21

```
public static final Key<Integer> COLOR_CORRECTION_MODE
```

The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.

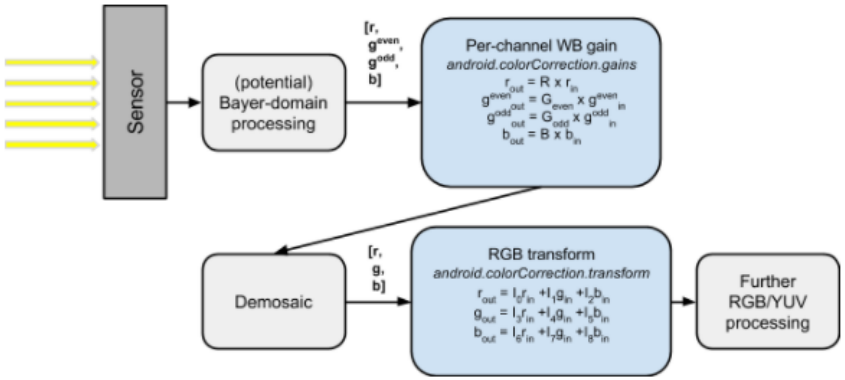
When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.

We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX.

When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct.

Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame.

The expected processing pipeline is as follows:



https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE

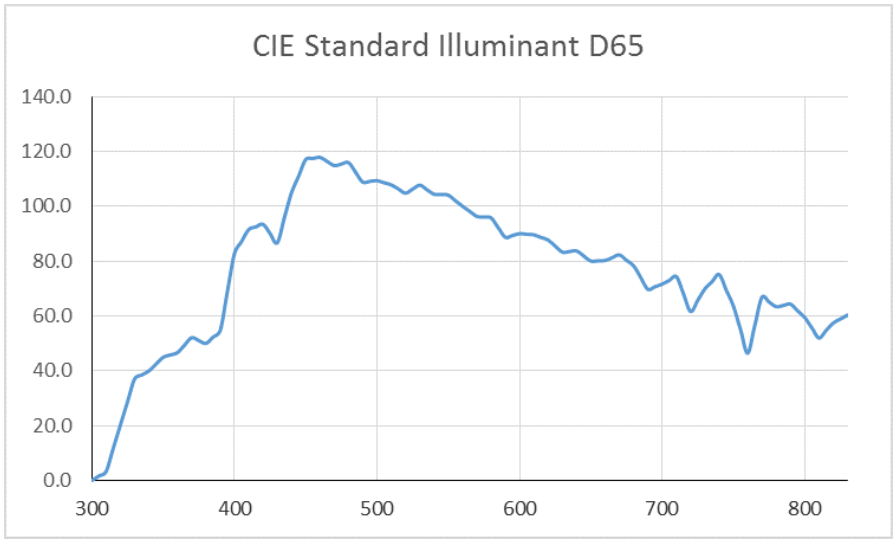
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

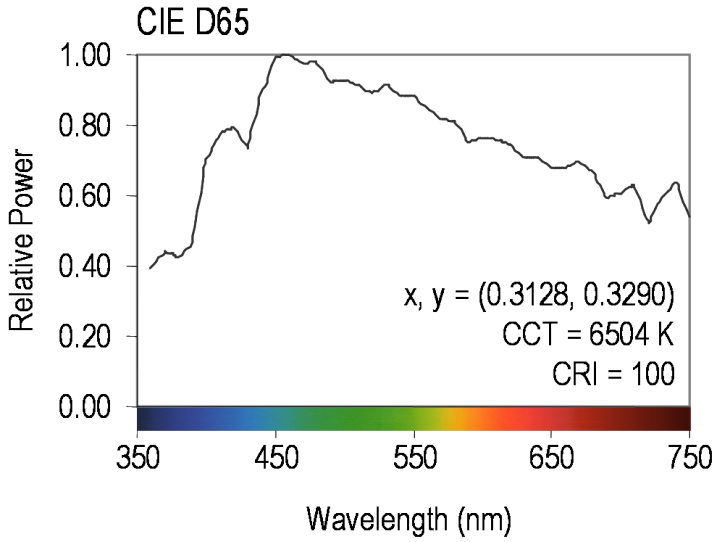
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

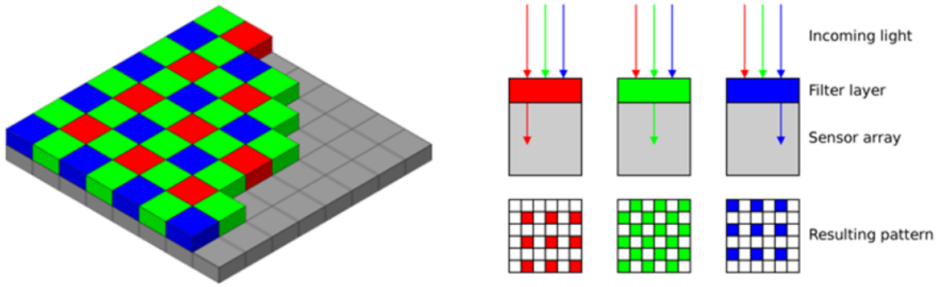
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_AWB_MODE_DAYLIGHT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_DAYLIGHT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT
	
	CONTROL_AWB_MODE_FLUORESCENT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_FLUORESCENT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Upon information and belief, the color correction applied by each of the Accused Samsung '645 Products controls color temperature of an input video signal. For example, white balance transforms that approximately match CIE standard illuminants such as D65 or F6 control color temperature of an input video signal. *See Numerical modeling of color perception of optical radiation*, Mathematical Modelling and Geometry, April 2018 (https://www.researchgate.net/publication/325391159_Numerical_modeling_of_color_perception_of_optical_radiation) ("The CIE standardized the illuminants A and D65 (correlated color temperature of approximately 6504 K) as its primary colorimetric illuminants and one of them should be used whenever possible. Figures 5 and 6 from [2, 5] shows the relative spectral power distribution of CIE Standard Illuminants A and D65.").  Figure 5: Relative spectral power distribution of CIE Standard Illuminant D65.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://en.wikipedia.org/wiki/Illuminant_D65 Additionally, on information and belief, the Samsung Galaxy S25 includes an image signal processor (ISP) and/or digital signal processor (DSP) that corrects a video signal input to the input unit, for example, by performing white balance correction. Further, the Accused Samsung '645 Products including a combination or hardware and software to implement numerous image corrections tools such as AI tools and/or Scene Optimizer that perform numerous types of corrections:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	3. WB (White Balance)[3] This block helps the camera adjust the color balance and render them accurately. It ensures that an image has a uniform WB Gain and that the RGB of the grey (achromatic) areas are adjusted to the same value (to depict the grey as grey). The sensor output fed to ISP has twice as many green channels as any other. This is the reason why the raw image before the application of WB Gain looks green overall. (Refer to 'De-mosaic' below) **4. De-mosaic (= Bayer Interpolation, Color Interpolation)** Most smartphone cameras use the Bayer type (or pattern) sensor. The Bayer sensor, as illustrated below [2] is 3 color filter combination sensor mounted on top of a photodiode array.  https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	FD (Face Detection) This block detects faces in an image/video and passes their coordinates to the next block. The face coordinates can be used in other algorithms or solutions to implement different features. **[Example of application] Using FD information in AWB (Auto White Balance) and AE (Auto Exposure) algorithm blocks** 1. When a face is detected, it compares and corrects the difference between the face brightness and the targeted brightness of the whole image. It utilizes the face coordinates received, to adjust the face brightness, etc. 2. When multiple sources are detected illuminating a face and the face is overly affected by these lights, this FD data can be used to correct the color on it. For example, if a face is detected in a low-color temperature light setup giving off a slightly reddish glow, the face coordinates are used to adjust the color of the face. https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145 Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part."

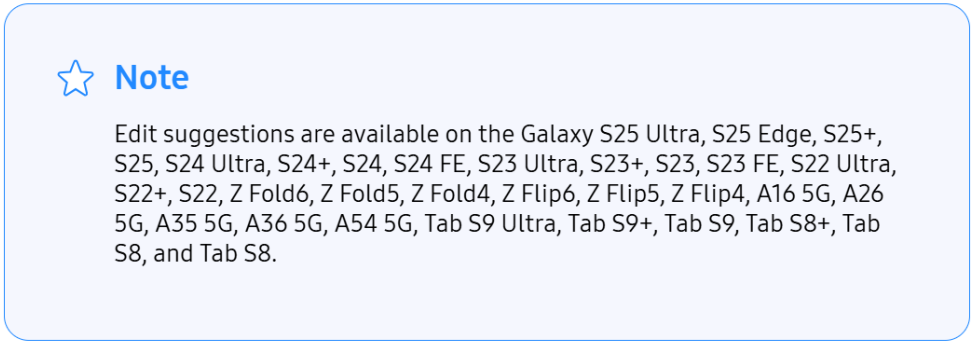
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about AI Edit suggestions using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/ **Use AI editing tools in Gallery on your Galaxy phone or tablet** The new editing features on select **Galaxy phones and tablets** will transform your favorite photos into masterpieces! Thanks to Galaxy AI, you can use features like Generative edit and Edit suggestions to move objects within your photos and automatically receive enhancement recommendations. You can also use the Galaxy Enhance-X app to take things further with more editing options that include blur removal and brightness adjustment.

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

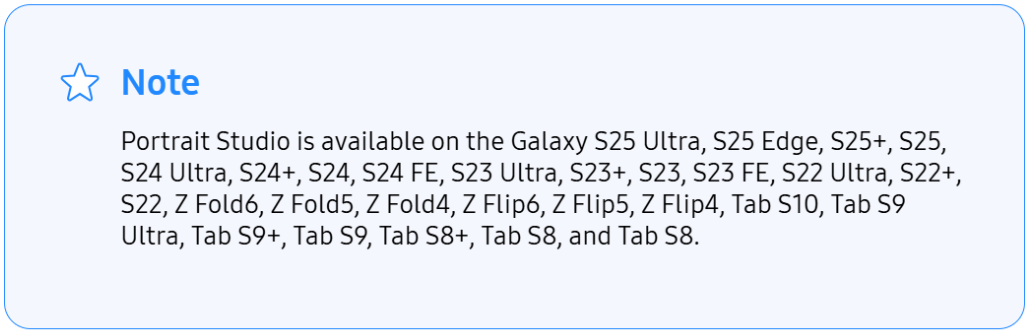
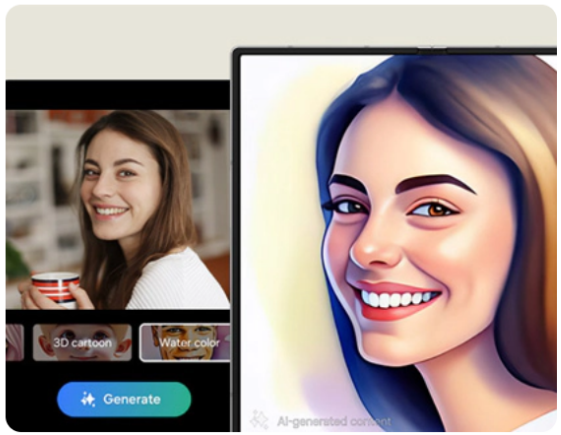
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

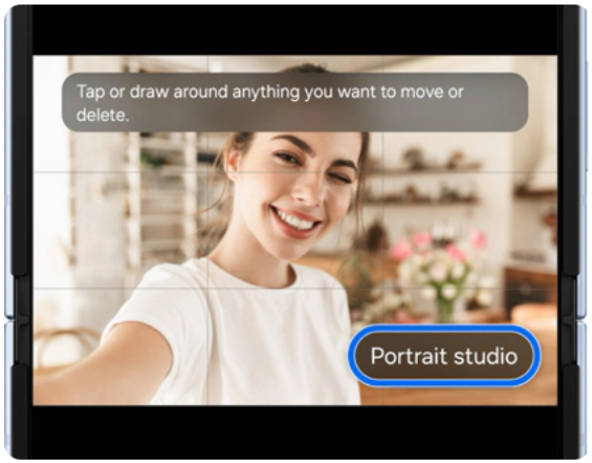
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit  Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

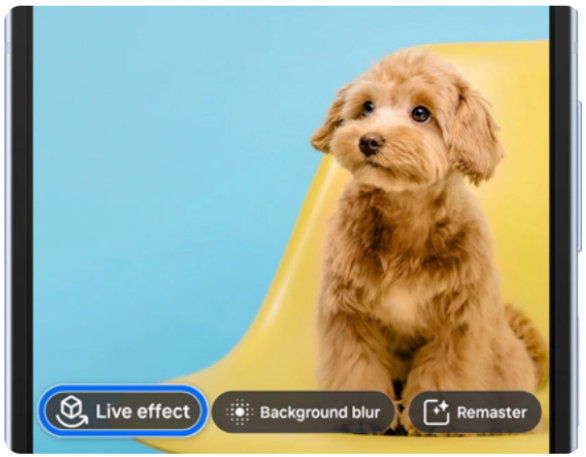
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions  **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

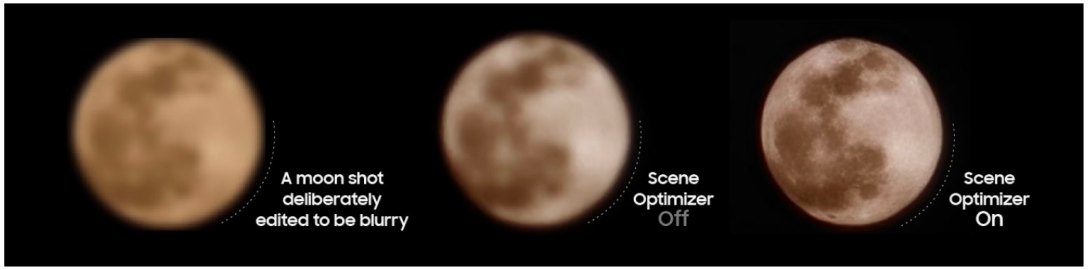
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

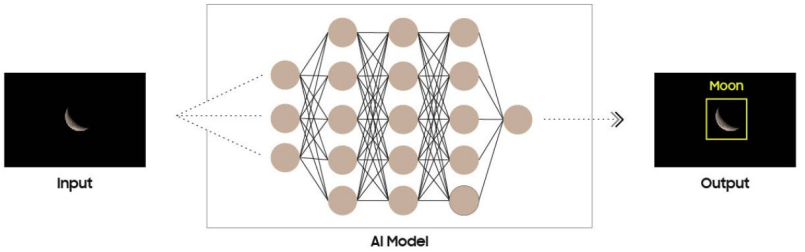
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

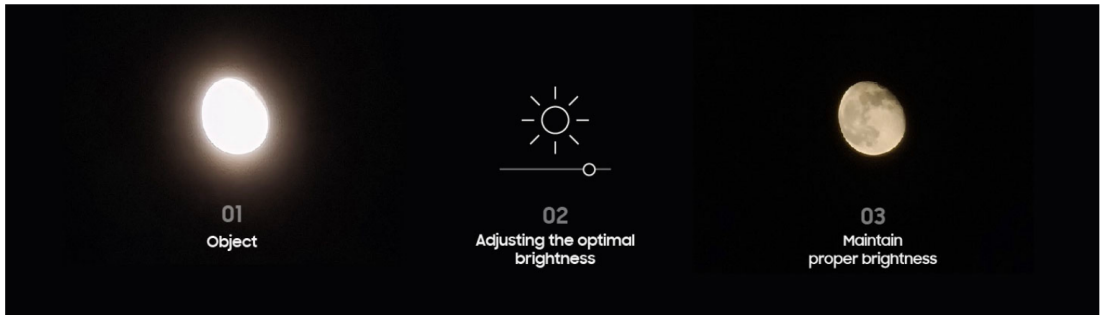
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

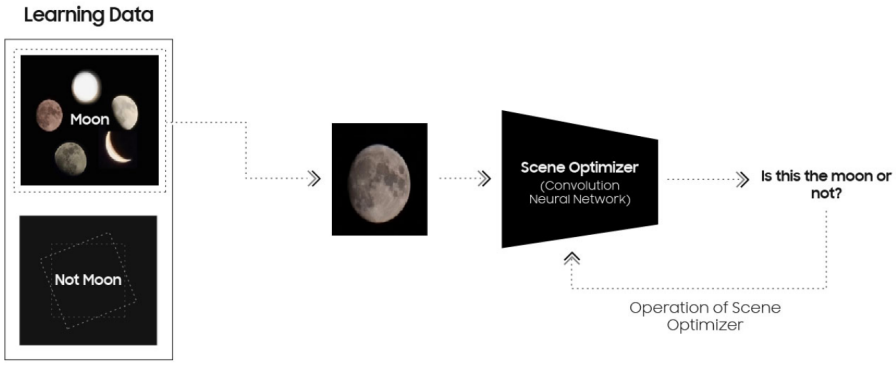
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Document Scan https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap Display > **Adaptive color tone** and tap to enable this feature. *Id*. at 116.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Screen mode

Your device has several screen mode options which adjust the screen quality for different situations. You can select the mode according to your preference.

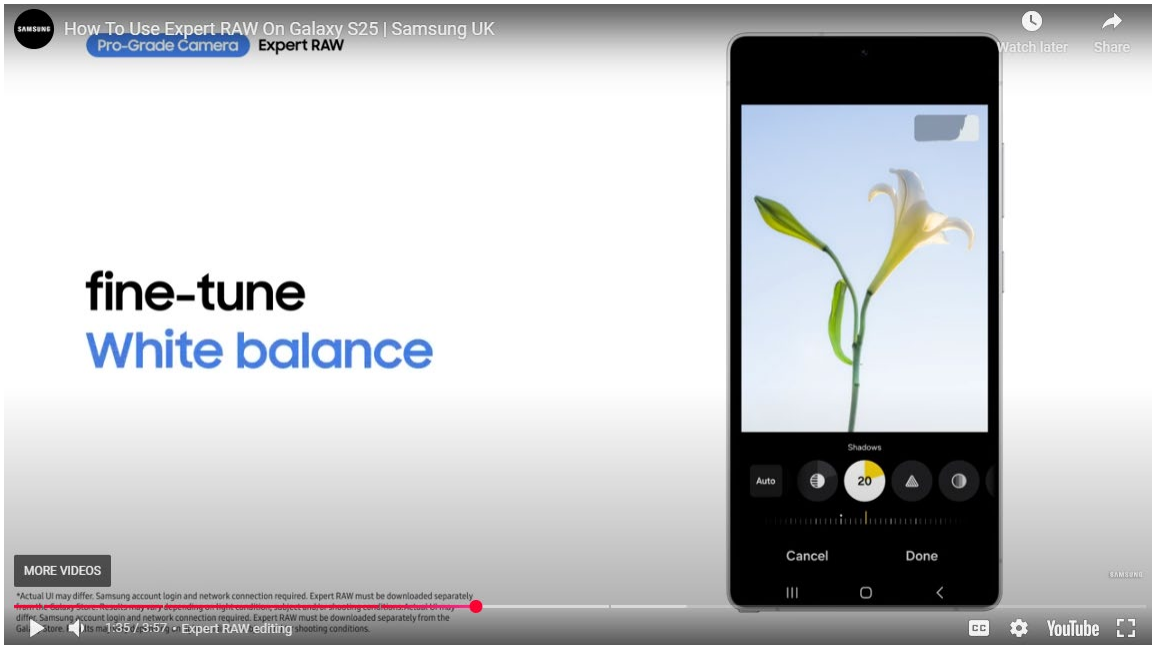
1. From Settings, tap **Display** > **Screen mode**.
2. Tap an option to set a different screen mode.
   - Drag the slider to adjust the white balance.
   - Tap **Advanced settings** to manually change the RGB values.

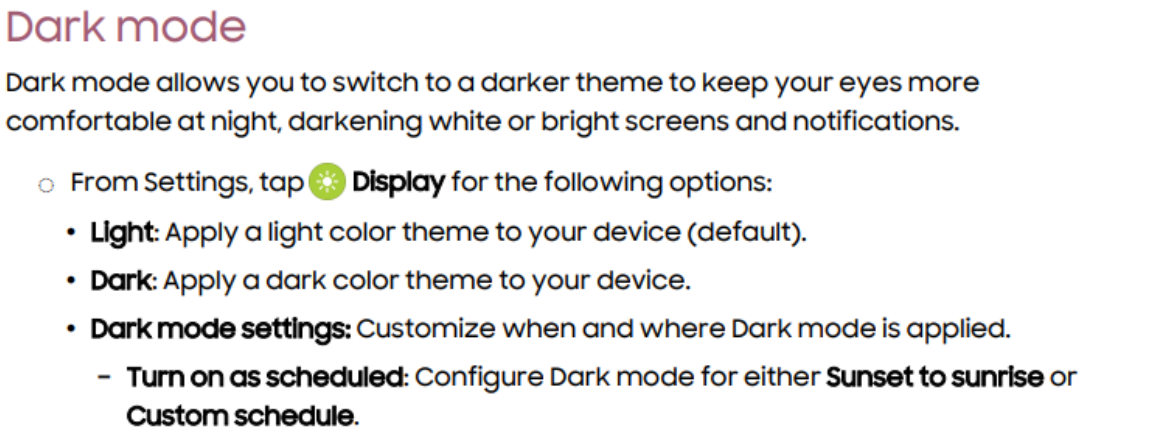
Id. at 117.

Intelligent features

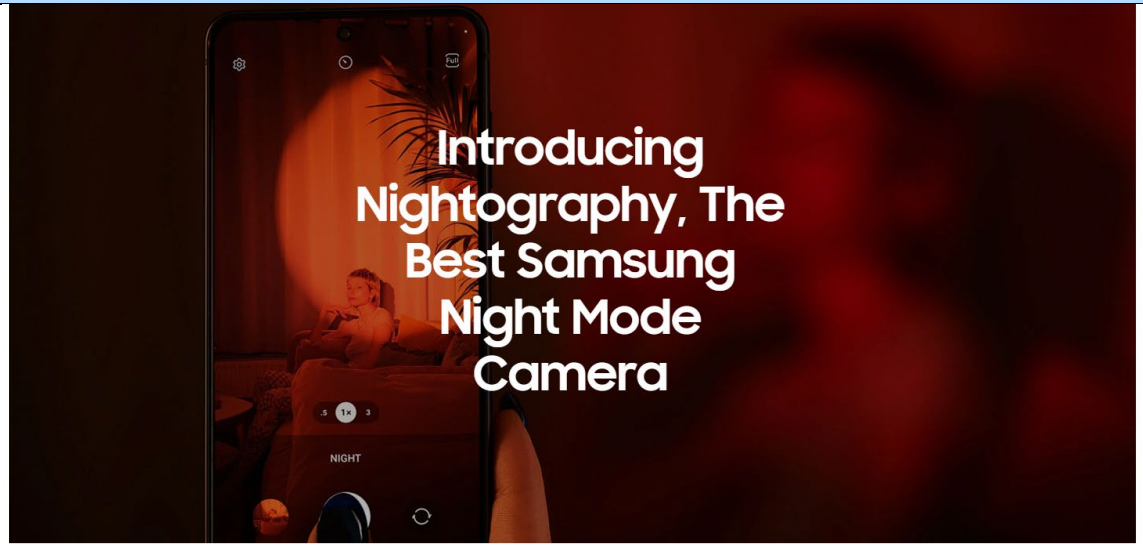
- **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame.
- **Scan QR codes**: Automatically detects QR codes when using the camera.
- **Shot suggestions**: Get on-screen guides to help you line up great shots.
- **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera.

https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images.

What does Night Mode do?

Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

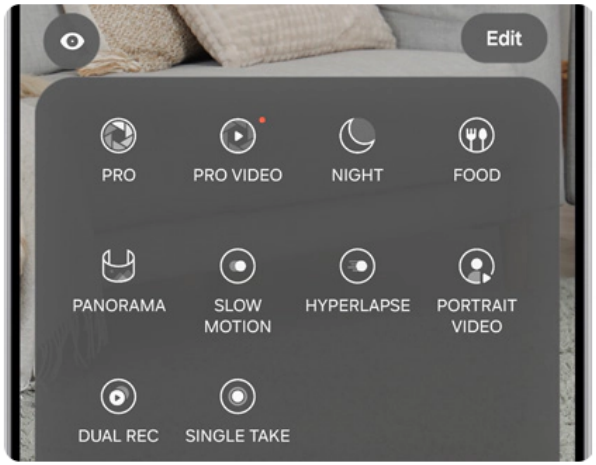
Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Further, all of the Accused Samsung '645 Products have Portrait Mode (with various filters such as a beauty filter), which is activated when the face of an individual is nearby and certain light conditions are met, as well as a face detection mode, in which a bounding box is generated when a face is detected and FD-AWB, FD-AE, and/or FD-AF is performed.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

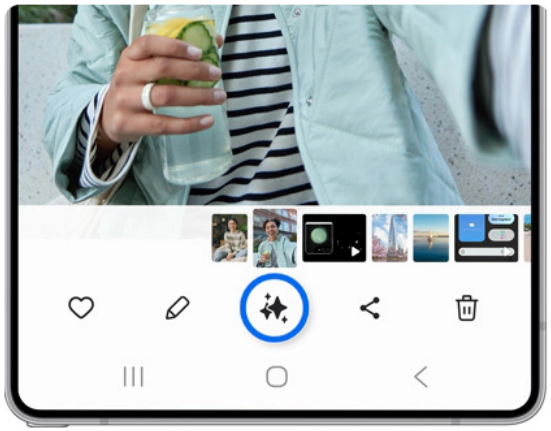
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Portrait Studio

If you'd like to change up your portraits using unique styles, just follow the steps below.

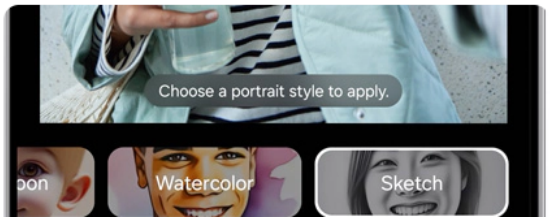
1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit.

2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.

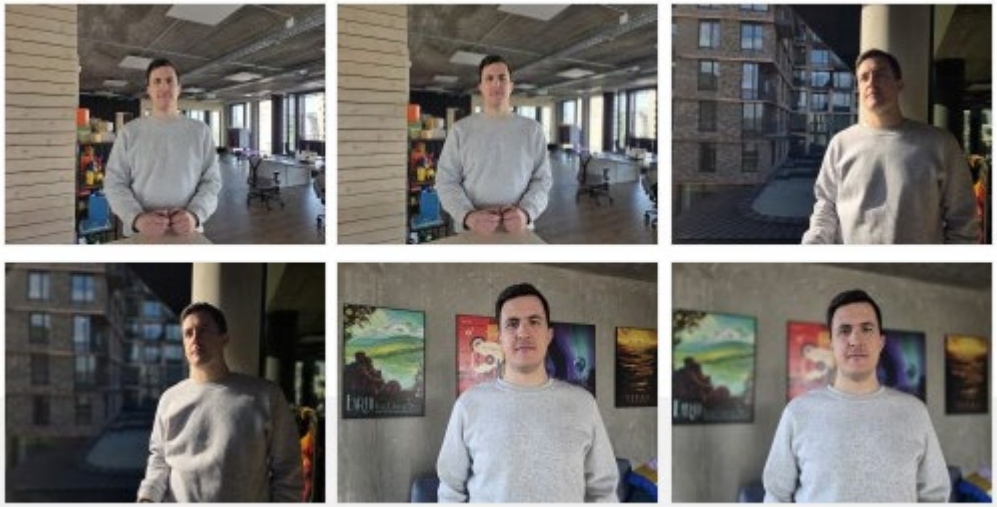


3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch.

4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.



https://www.samsung.com/us/support/answer/ANS10004857/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php) As an additional example, the Accused Samsung '645 Products include a corrector for correcting the video signal in scanner or equivalent camera mode:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a corrector which corrects the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of correcting the video signal that is input. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, correcting video signal) in substantially the same way (e.g., performing image processing). The performance of this function achieves substantially the same result, for example, the correction of video signals. For example, the Accused Samsung '645 Products include image

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and correction of video signals. These components and/or software operate together and function in substantially the same way to facilitate video correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a corrector.
[1.d] a controller which controls the corrector to cause the corrector to correct the video signal input to the input unit when the pattern portions are not contained, and	Each of the Accused Samsung '645 Products a controller which controls the corrector to cause the corrector to correct the video signal input to the input unit when the pattern portions are not contained. For example, on information and belief, the Samsung Galaxy S25 includes an image signal processor (ISP) and/or digital signal processor (DSP) that corrects a video signal input to the input unit, for example, by performing white balance correction. For example, the white balance is corrected in accordance with the detected lighting conditions, e.g. fluorescent lighting, incandescent lighting, sunny outdoor lighting, cloudy outdoor lighting. Upon information and belief, certain corrections are applied when pattern portions are contained and certain corrections are performed when pattern portions are not contained. For example, foliage or snow scene corrections are not performed when pattern portions corresponding to such scenes are not detected but additional image corrections are performed (e.g., face corrections and portrait mode corrections are applied). Similarly, certain white balance corrections are not performed when a white or black background is not contained but additional white balance corrections are applied to the content. Further, text scanning corrections are not performed when text is not detected but additional image corrections are applied. Moreover, image corrections to the foreground (e.g., the face of a person or object being captured) are applied but corrections to the background are not applied if a white or black background is not detected. Further if the face is close to the camera such that a background is not detected, then the face corrections are applied but background corrections are not applied and background pattern portions are not contained. Further, different corrections are performed on face versus clothes or background such that if the clothes are not detected then only facial corrections will be performed.

<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
Upon information and belief, different corrections are performed to different portions of the image signal confirming that certain corrections are not performed when there is no detection of that specific pattern portion in a specific portion of the image.

Exemplary patterns and corrections or no corrections are identified below:
<table>
<tr><th>Input</th><th>Pattern</th><th>Pattern Contained</th><th>Video with Contents</th><th>Correction</th></tr>
<tr><td> 
Portrait Photo</td><td>Snow</td><td>No</td><td>Cloth</td><td>Corrections based on the selected camera's parameters</td></tr>
<tr><td> 

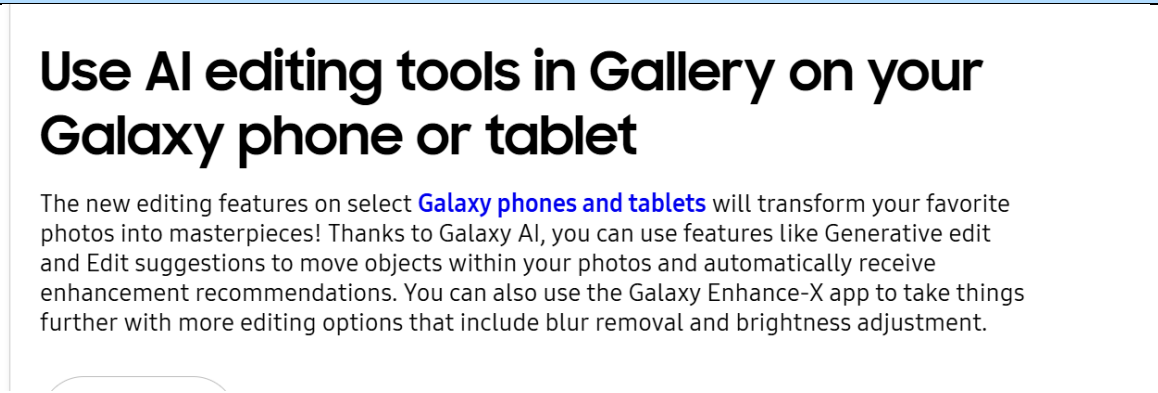
Person in front of a white wall</td><td>Snow</td><td>No</td><td>Face</td><td>Beauty face correction applied</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
<table>
<tr><td> 

Book Scan</td><td>Snow</td><td>No</td><td>Scanned image</td><td>Scan correction applied</td></tr>
<tr><td> 

Face close up</td><td>Stair</td><td>No</td><td>Face</td><td>Beauty face correction applied</td></tr>
</table>
Additional examples include not performing AI corrections or performing certain AI corrections on certain portions of the image, such as enhancing details optimizing brightness performing zoom lock when the moon is not detected. Similarly, additional AI corrections are not performed to certain portions of the image when specific pattern portions are not detected. For example, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer perform certain</td></tr>
</table>

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	corrections on portions where pattern portions are detected and not perform corrections on portions where pattern portions are not contained, such as to optimize the photograph and/or to "fill in the photo's missing part." If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

Use Edit suggestions

Note

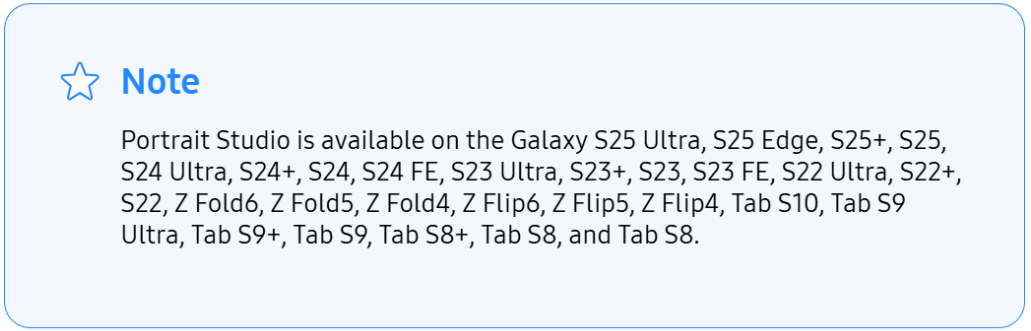
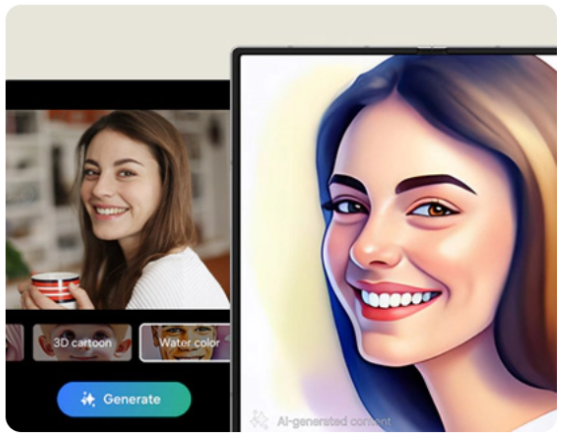
Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.

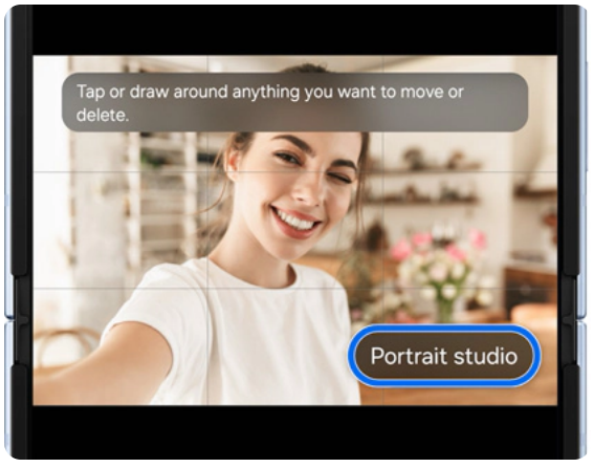


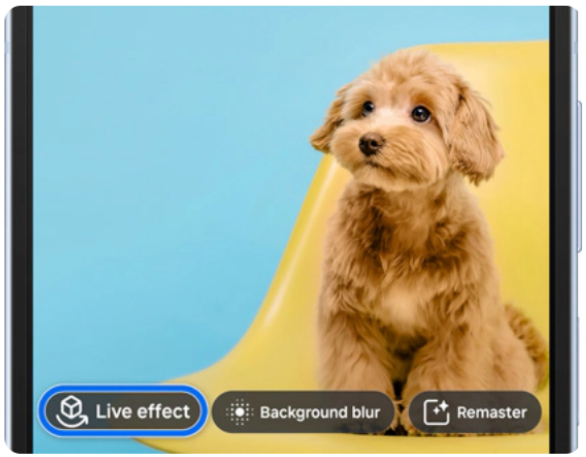
Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all.

1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

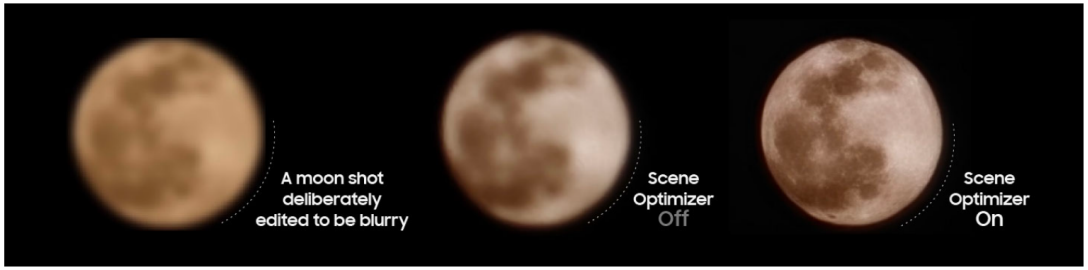
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

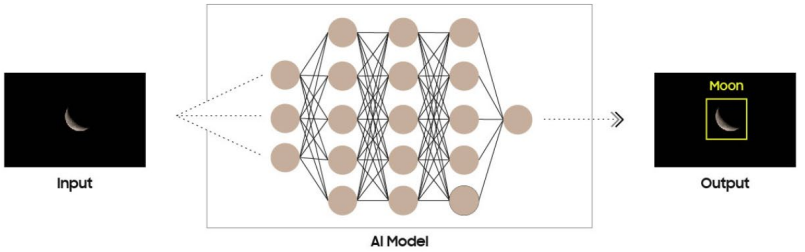
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

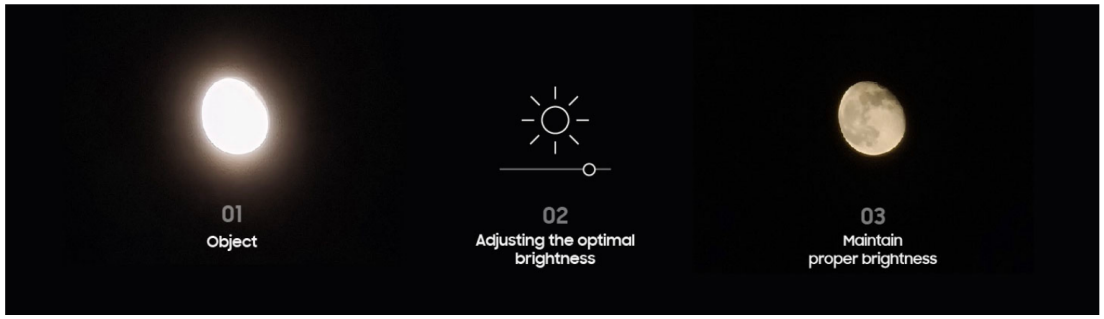
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

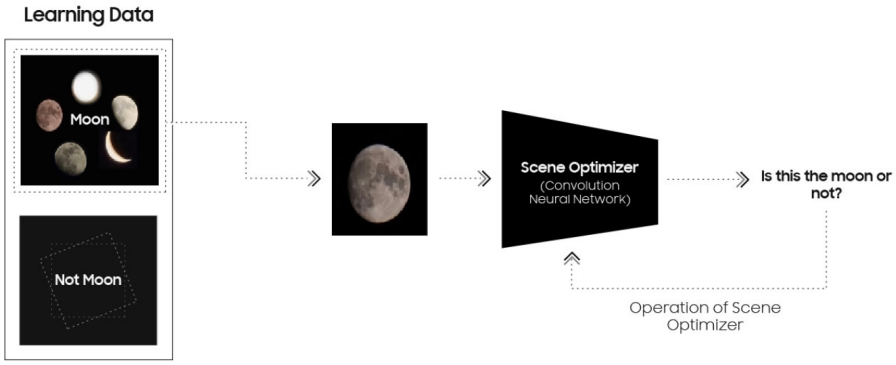
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

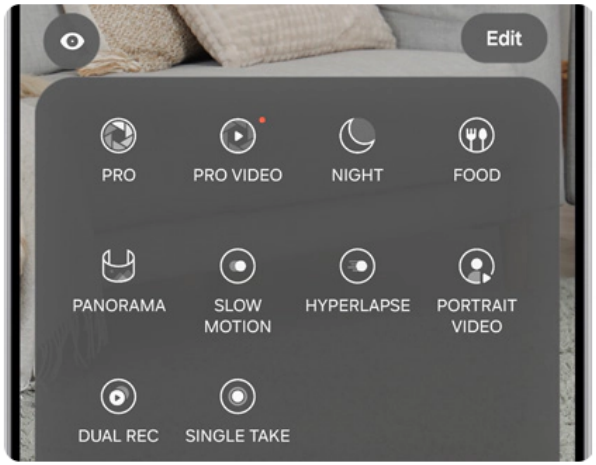
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Document Scan https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

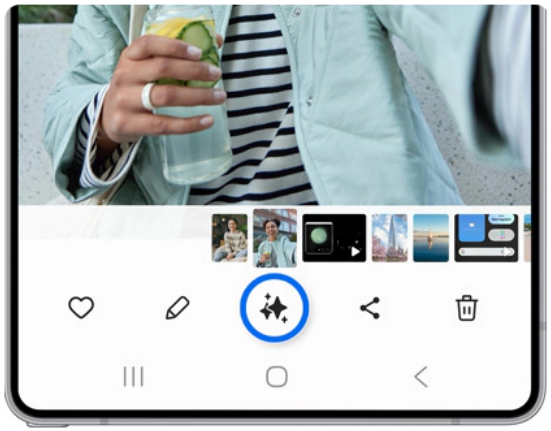
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Portrait Studio

If you'd like to change up your portraits using unique styles, just follow the steps below.

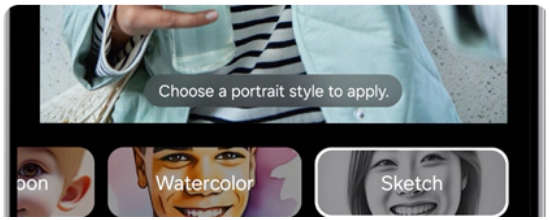
1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit.

2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.

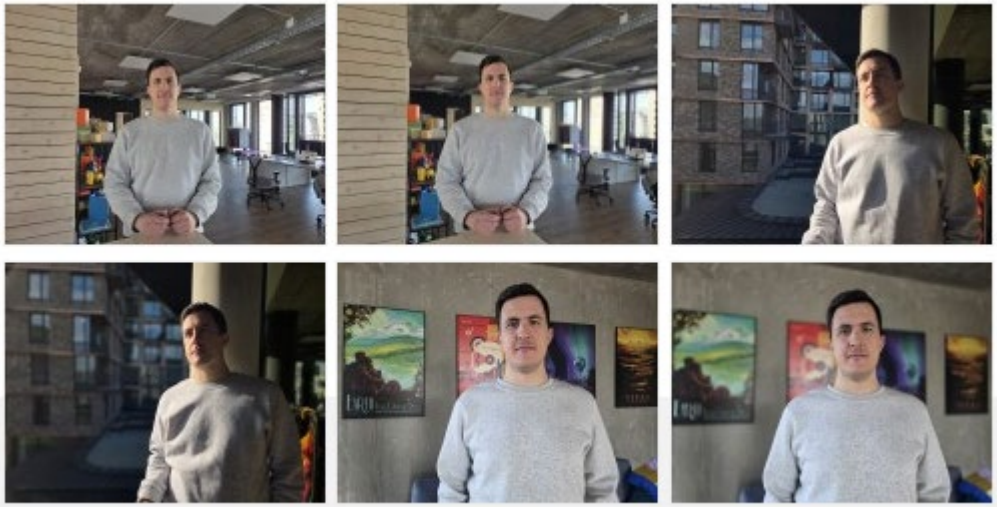


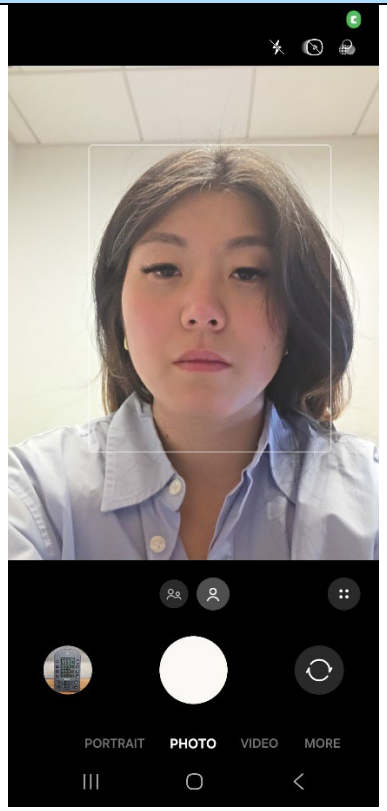
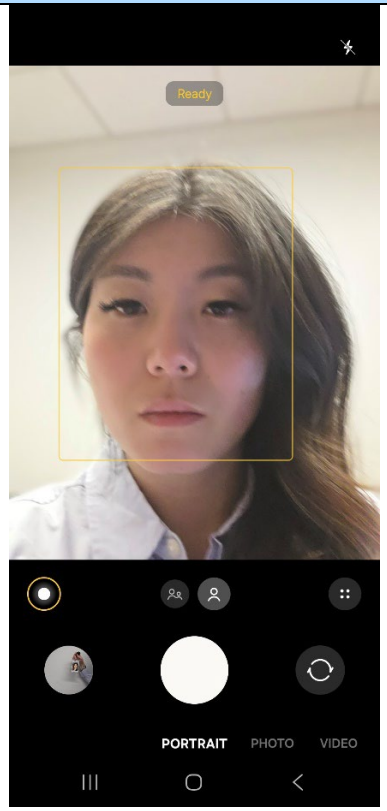
3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch.

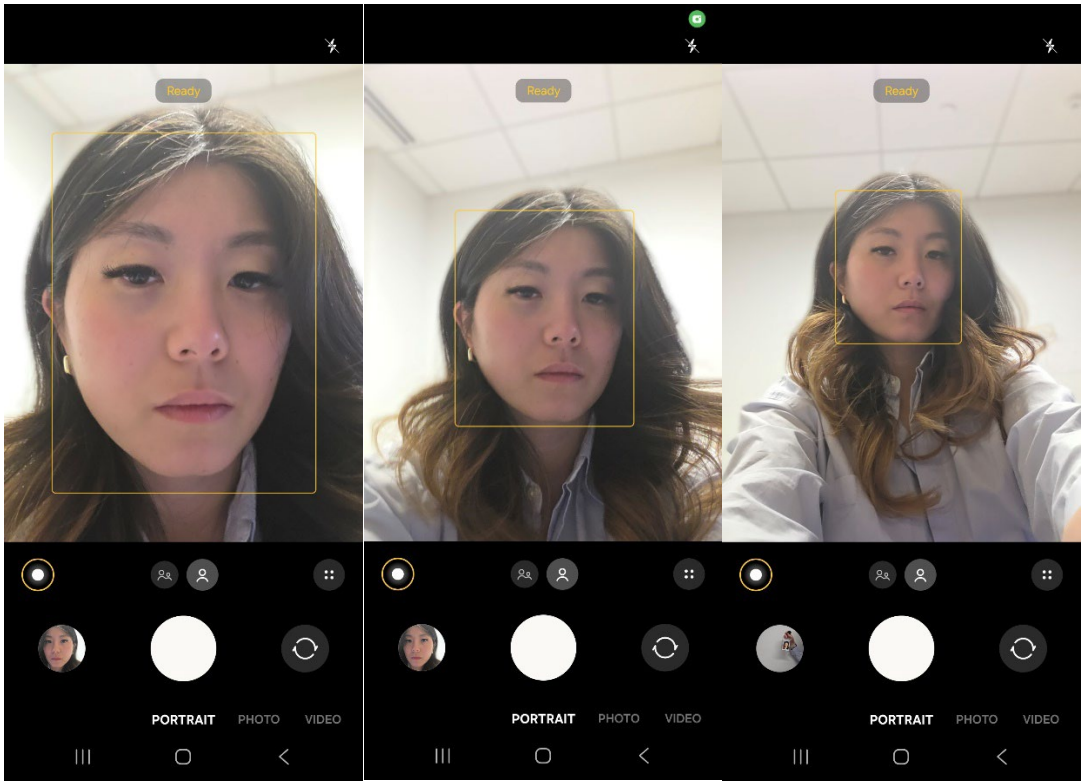
4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.



https://www.samsung.com/us/support/answer/ANS10004857/

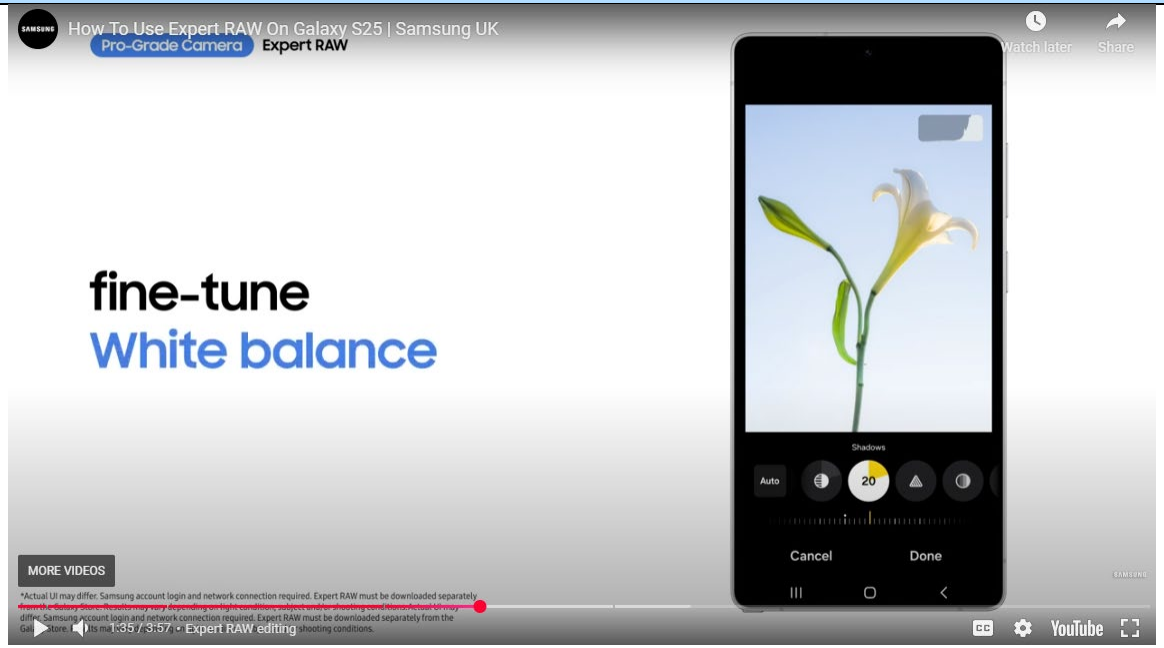
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. Further, in Portrait Mode, pattern portions (e.g., face) are not contained in the background so corrections of bookeh effect or blurring effect is performed to the background. As an additional example, the Accused Samsung '645 Products performs white balance corrections on the face when a face is detected but does not perform these corrections to the background or the clothes. Similarly, the Accused Samsung '645 Products perform corrections on the background or the chromatic clothes but does not perform these corrections on the face.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes. - **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap Display > **Adaptive color tone** and tap to enable this feature. *Id*. at 116. Screen mode Your device has several screen mode options which adjust the screen quality for different situations. You can select the mode according to your preference. 1. From Settings, tap Display > **Screen mode**. 2. Tap an option to set a different screen mode. • Drag the slider to adjust the white balance. • Tap **Advanced settings** to manually change the RGB values. *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility. The camera pipeline also supports triggers that the app framework can initiate to turn on things such as auto-focus. It also sends notifications back to the app framework, notifying apps of events such as an auto-focus lock or errors.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

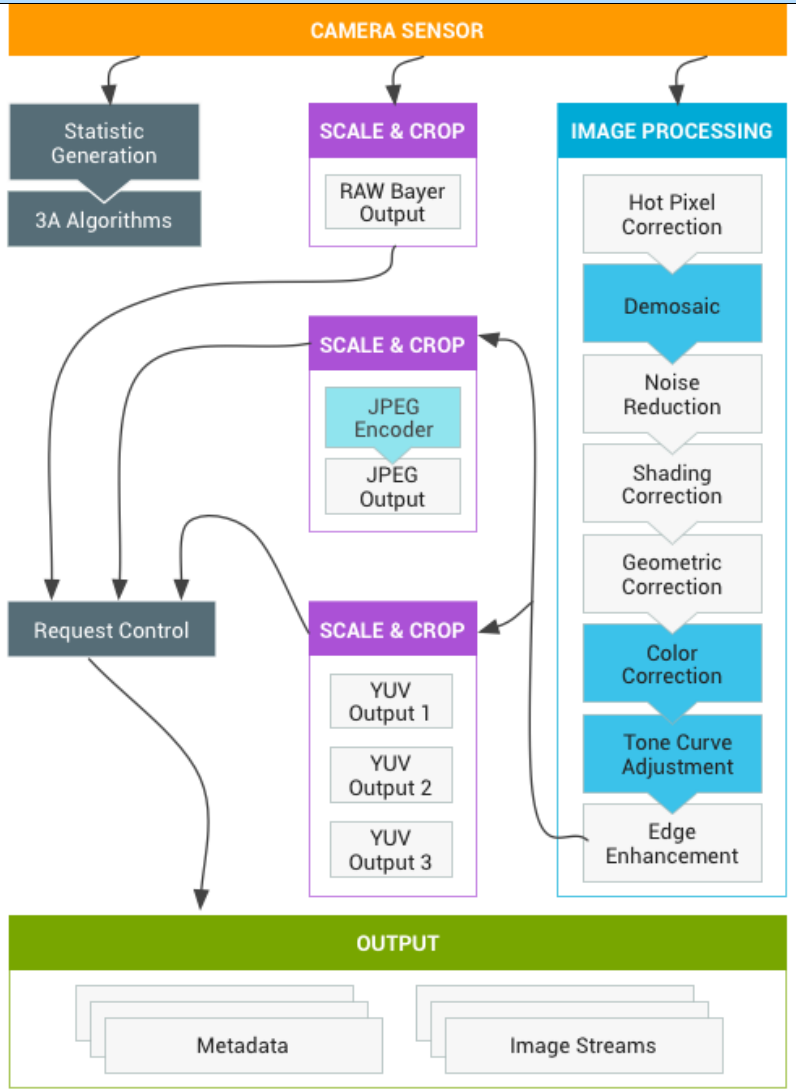


Figure 2. Camera pipeline

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products include a controller for correcting the video signal in scanner or equivalent camera mode when text or white or black background is detected: **Scan and edit documents on your Galaxy phone or tablet**  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result.

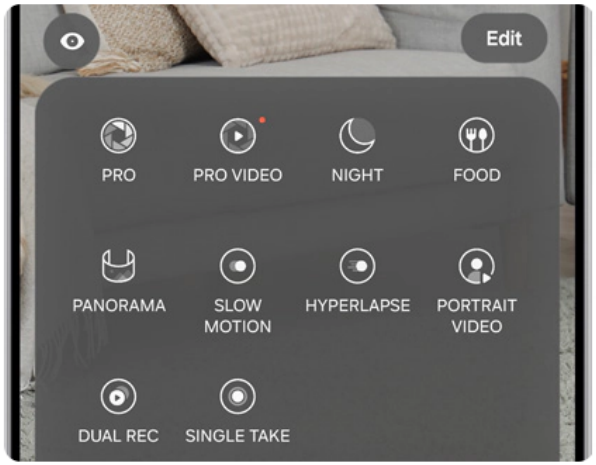
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a controller that controls the corrector to cause the corrector to correct the video signal input to the input unit when the pattern portions are not contained, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling the corrected to correct video signal. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, controlling corrector) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, the correction of video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and correction of video signal. These components and/or software operate together and function in substantially the same way to facilitate video signal correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[1.e] [a controller] . . . which controls the corrector to cause the corrector not to correct the video signal when the pattern portions are contained.	The controller within each of the Accused Samsung '645 Products controls the corrector to cause the corrector not to correct the video signal when the pattern portions are contained. For example, upon information and belief, certain corrections are applied when pattern portions are contained and certain corrections are performed when pattern portions are not contained. For example, foliage or snow scene corrections are not performed when pattern portions corresponding to such scenes are not detected but additional image corrections are performed (e.g., face corrections and portrait mode corrections are applied). Similarly, certain white balance corrections are not performed when a white or black background is not contained but additional white balance corrections are applied to the content. Further, text scanning corrections are not performed when text is not detected but additional image corrections are applied. Moreover, image corrections to the foreground (e.g., the face of a person or object being captured) are applied but corrections to the background are not applied if a white or black background is not detected. Further if the face is close to the

<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>camera such that a background is not detected, then the face corrections are applied but background corrections are not applied and background pattern portions are not contained.

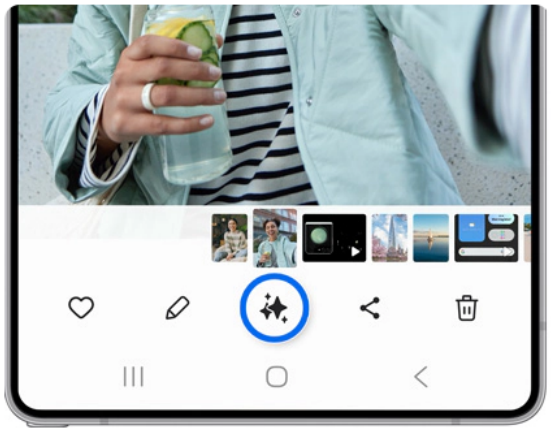
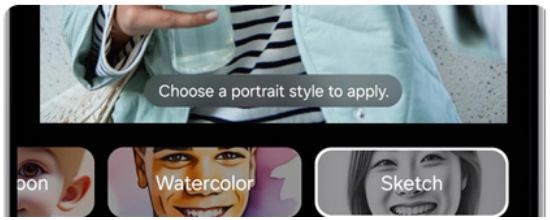
For example, each of the Accused Samsung '645 Products performs color temperature corrections based on detection of face, in Portrait Mode, and/or based on zoom value detection that causes the cameras to switch and make corrections based on the selected camera's parameters. In this mode, when an individual wearing clothing containing a chromatic color (e.g., a red patterned shirt) stands in front of a white or black patterned background (e.g., snow, foliage, or a wall), the background is corrrected (e.g., blurred), while the individual and his or her colored clothing is not.
<table>
<tr><th>Input</th><th>Pattern</th><th>Pattern Contained</th><th>Video with Contents</th><th>Correction</th></tr>
<tr><td> 
Portrait Photo</td><td>Cloud</td><td>Yes</td><td>Cloth</td><td>No Correction.
No Blur</td></tr>
</table>
</td></tr>
</table>

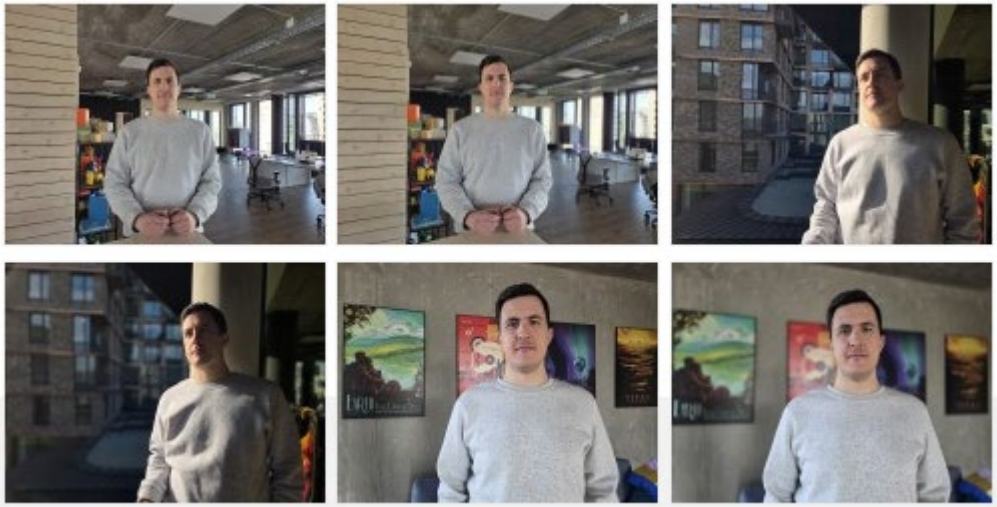
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Person in front of a white wall	Wall	Yes	Face	No Correction. No Blur
	 Book Scan	Text	Yes	Scanned image	No Correction. No Blur

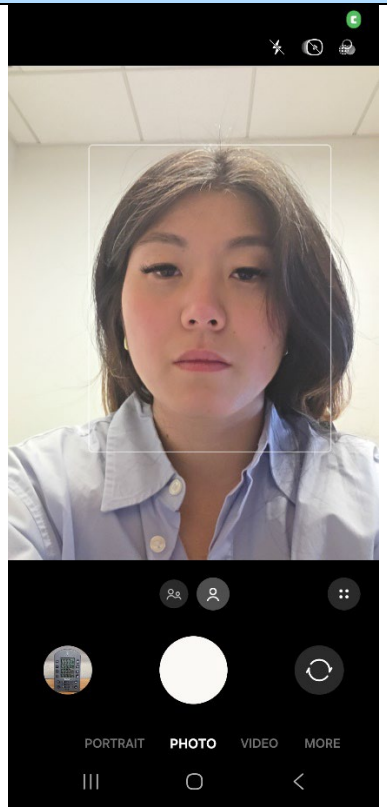
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Face close up	Cloth	Yes	Face	No White balance correction.

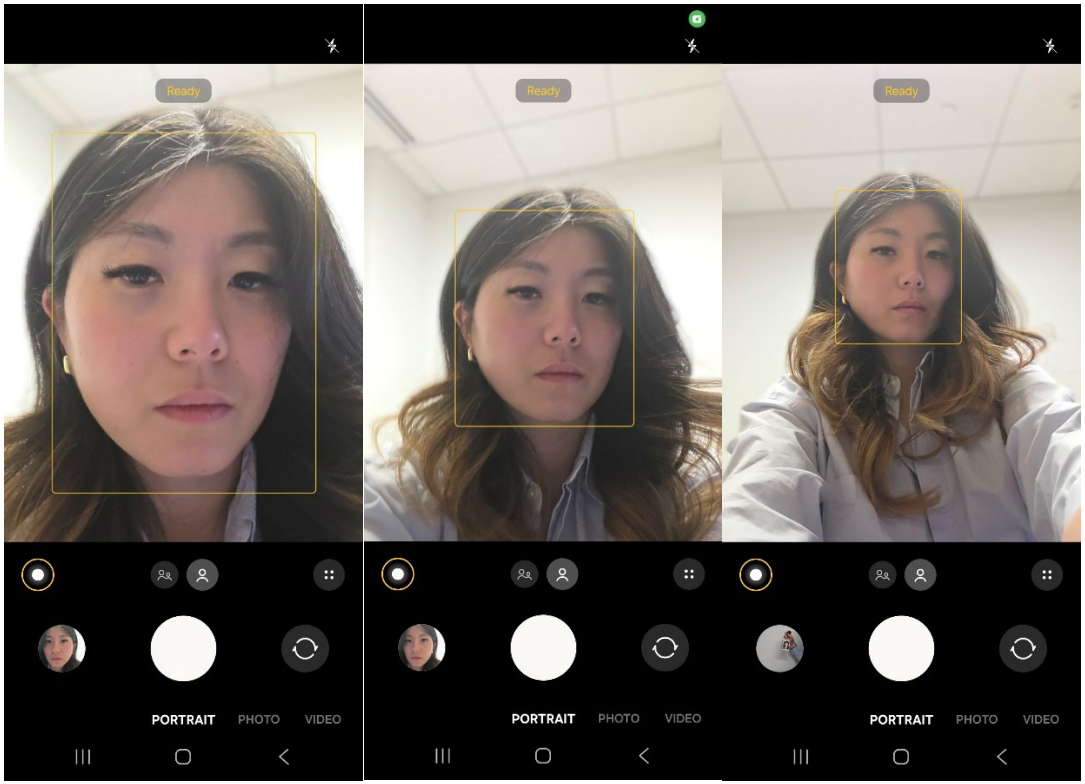
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

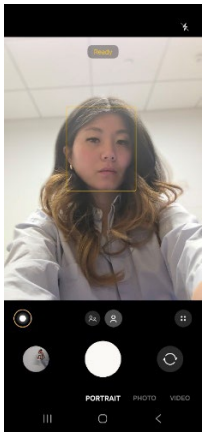
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio If you'd like to change up your portraits using unique styles, just follow the steps below. 1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit. 2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.  3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch. 4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.  https://www.samsung.com/us/support/answer/ANS10004857/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products performs white balance corrections on the face when a face is detected but does not perform these corrections to the background or the clothes. Similarly, the Accused Samsung '645 Products perform corrections on the background or the chromatic clothes but does not perform these corrections on the face.

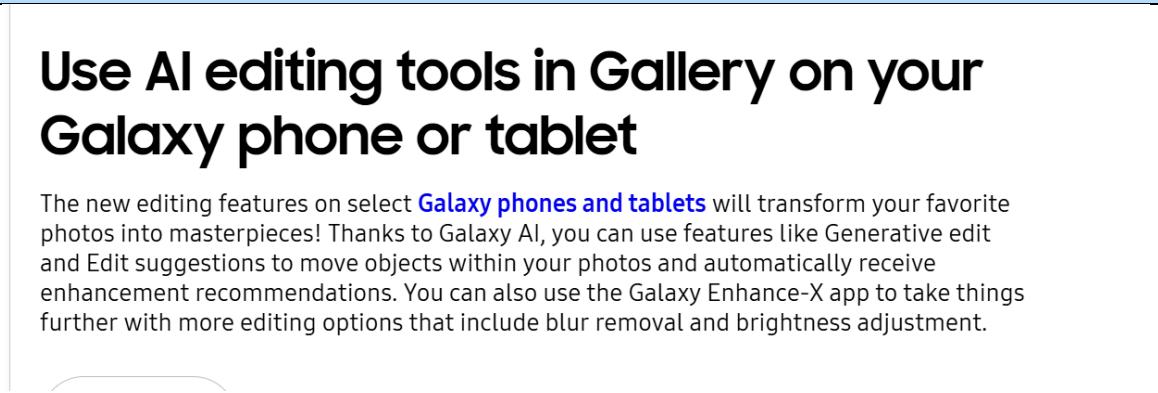
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes. Upon information and belief, different corrections are performed to different portions of the image signal confirming that certain corrections are not performed when there is no detection of that specific pattern portion in a specific portion of the image. Exemplary patterns and corrections or no corrections are identified below:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Input	Pattern	Pattern Contained	Video with Contents	Correction
 Portrait Photo	Snow	No	Cloth	Corrections based on the selected camera's parameters
 Person in front of a white wall	Snow	No	Face	Beauty face correction applied

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Book Scan	Snow	No	Scanned image	Scan correction applied
	 Face close up	Stair	No	Face	Beauty face correction applied
	Additional examples include not performing AI corrections or performing certain AI corrections on certain portions of the image, such as enhancing details optimizing brightness performing zoom lock when the moon is not detected. Similarly, additional AI corrections are not performed to certain portions of the image when specific pattern portions are detected. For example, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to not perform certain				

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	corrections on portions where pattern portions are detected (e.g., auto zoom is disabled when moon is detected so as to not perform zoom corrections and/or auto focus is disabled, 3A algorithms are not performed when face is detected instead FD-3A algorithms are performed. Similarly, text recognition is not performed if pattern portion of face is detected. Thus, different types of AI corrections are not performed when specific pattern portions are contained. If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

Use Edit suggestions

Note

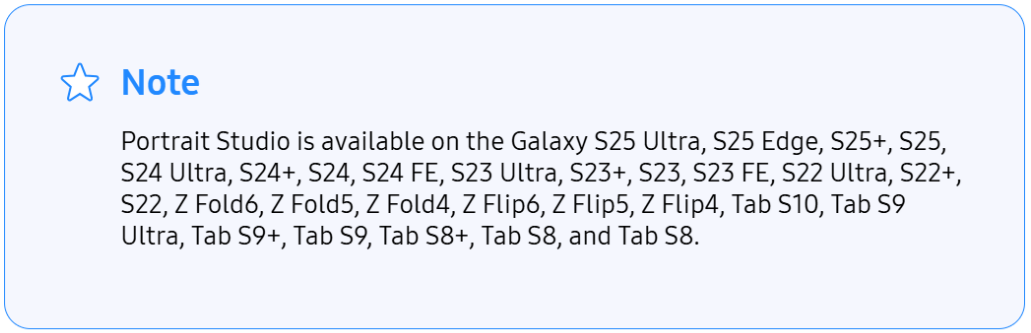
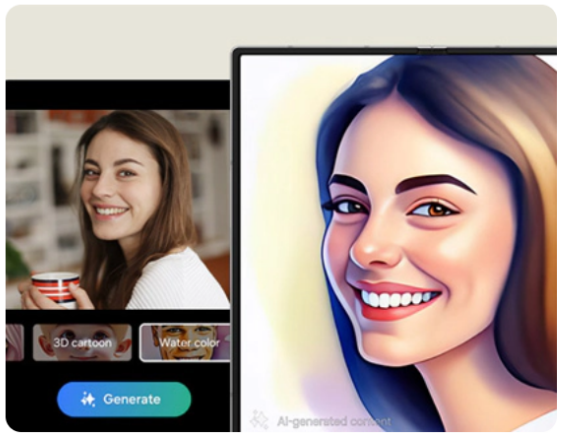
Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.

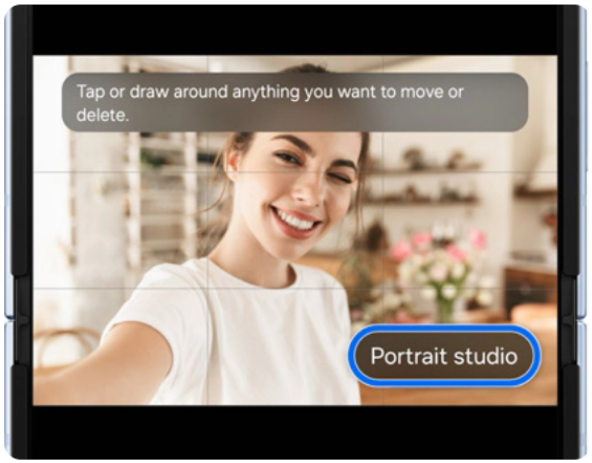


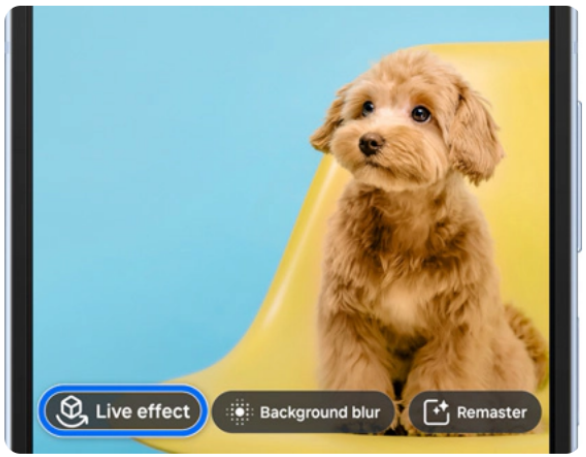
Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all.

1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

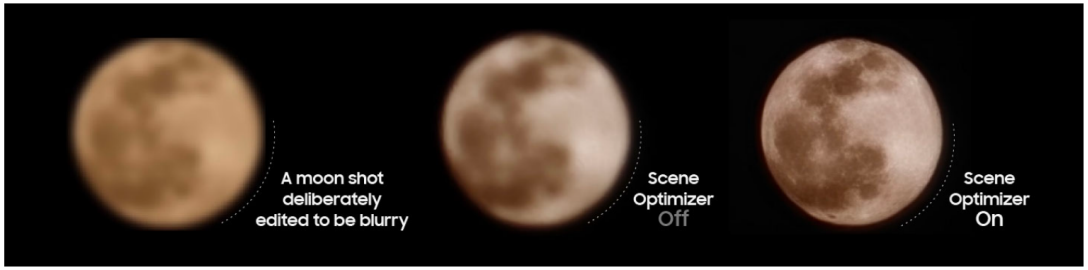
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

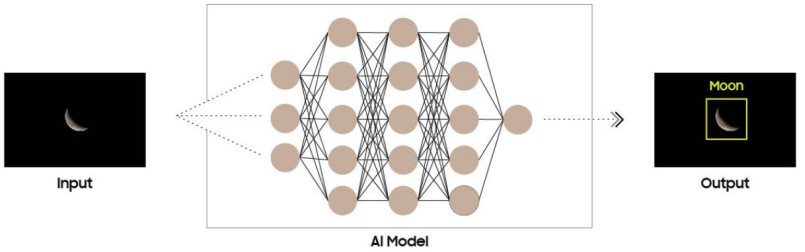
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

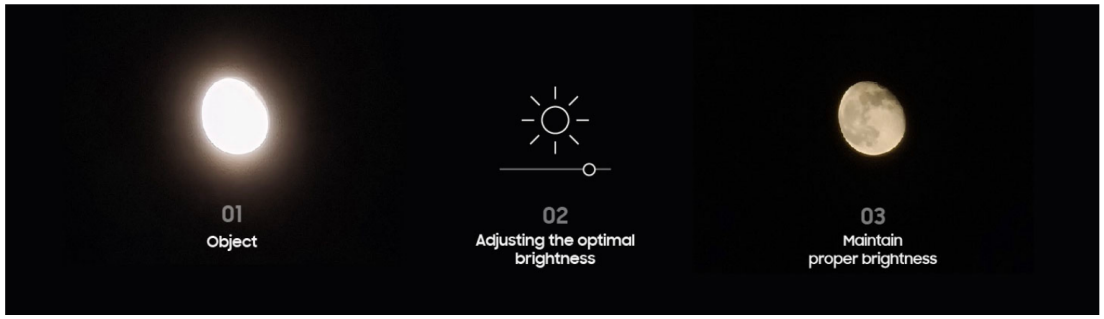
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

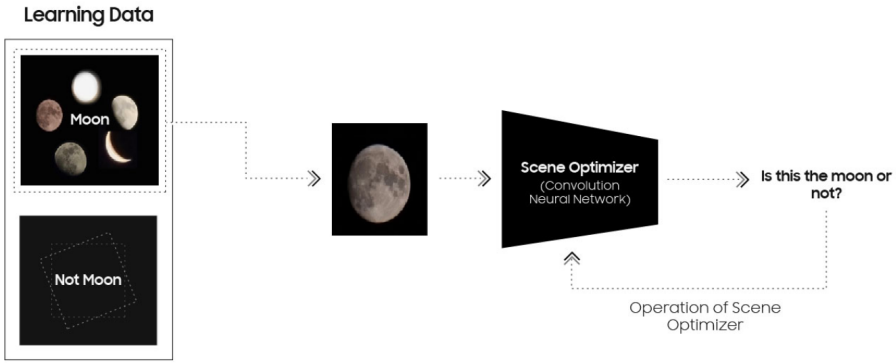
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Further, in Portrait Mode, pattern portions (e.g., face) are not contained in the background so corrections of bookeh effect or blurring effect is performed to the background. As an additional example, the Accused Samsung '645 Products detects white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene. In this scenario, color temperature corrections would occur based on a white patterned background, but not occur for chromatic colors in the scene. CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev `public static final int CONTROL_SCENE_MODE_FACE_PRIORITY` If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines. If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework). Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.
	
	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)
	
	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)

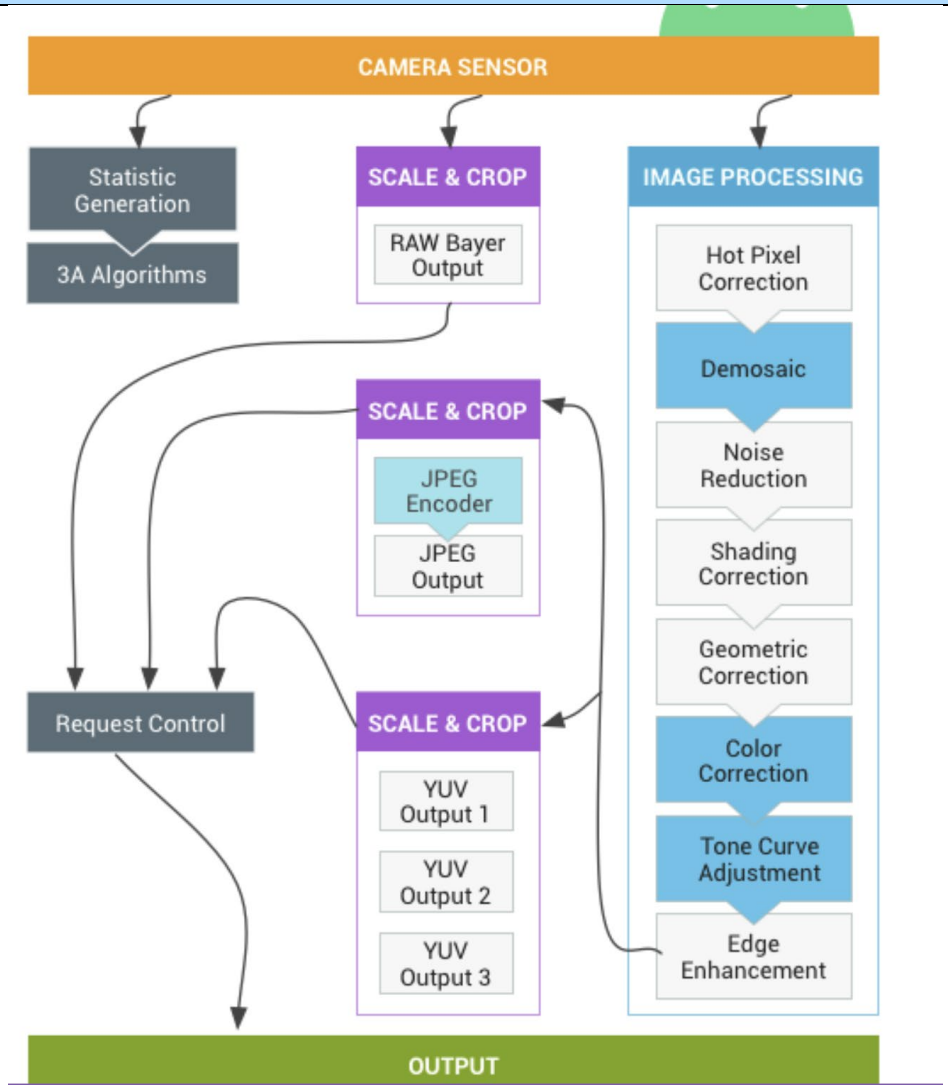
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)
	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)
	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_MODE Added in API level 21 `public static final Key<Integer> COLOR_CORRECTION_MODE` The mode control selects how the image data is converted from the sensor's native color into linear sRGB color. When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed. *See* https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

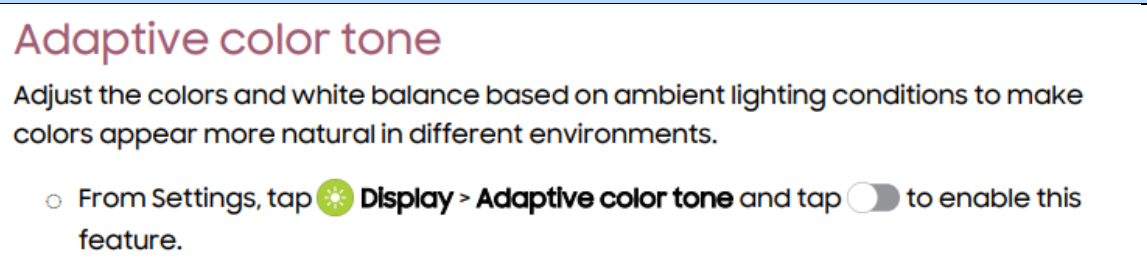
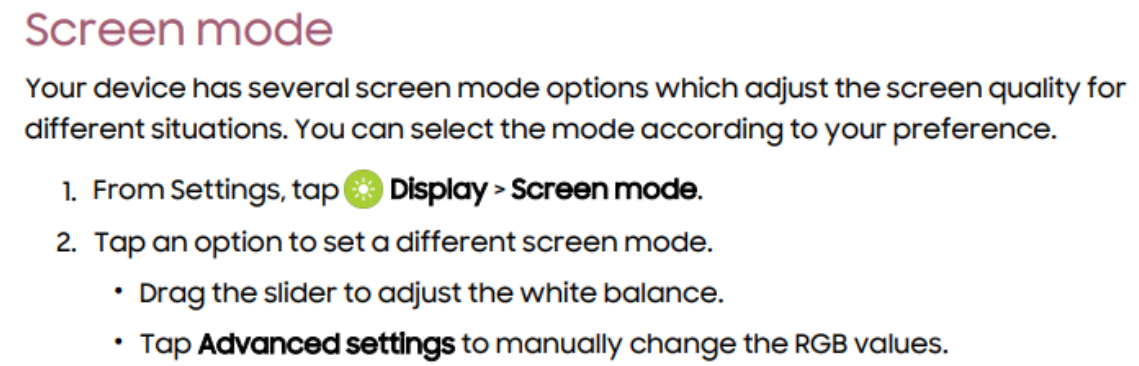
See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

As an additional example, the Accused Samsung '645 Products stop update of the data for correcting video signal of the background in scanner or equivalent camera mode. For

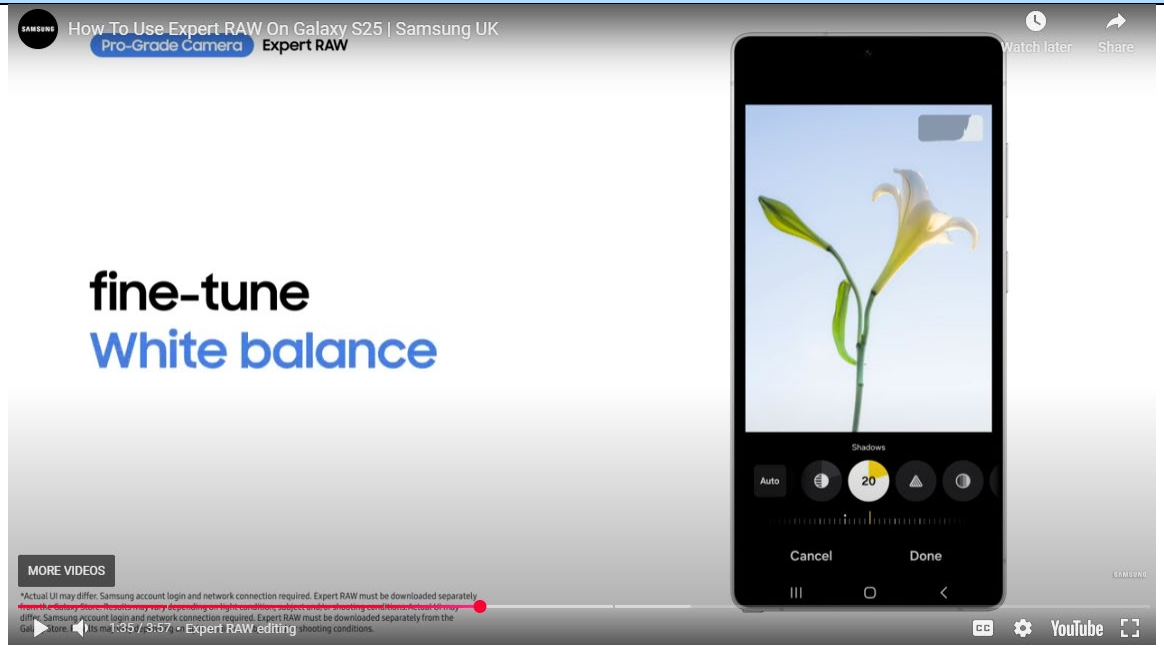
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	example, upon information and belief the corrections applied to the scanned page are not applied to the colorful background: **Scan and edit documents on your Galaxy phone or tablet**  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result.

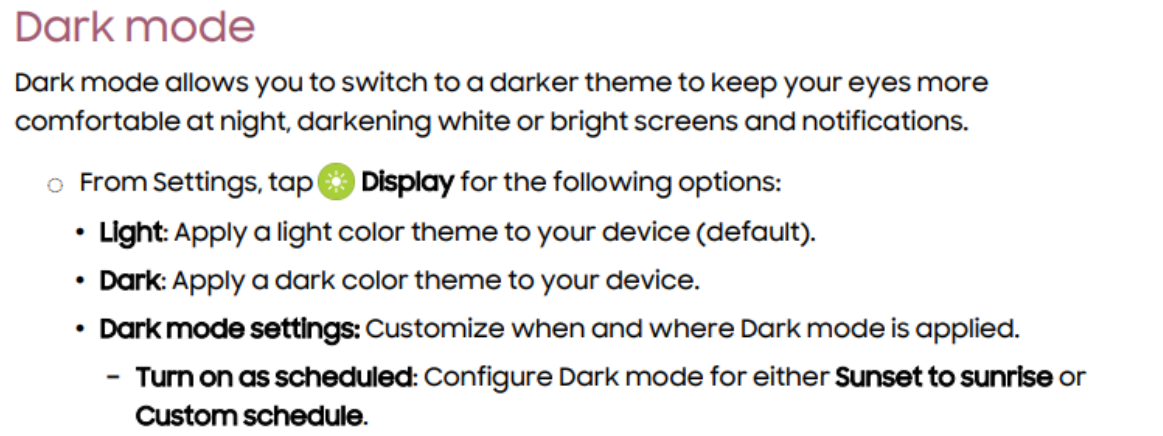
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a controller that controls the corrector to cause the corrector to not correct the video signal input to the input unit when the pattern portions are contained, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling the corrected to correct video signal. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, controlling corrector) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, not correcting the video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate pattern detection and no correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[2.] The video processing apparatus according to claim 1, comprising: a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal, wherein the corrector corrects the video signal according to the level or distribution detected by the characteristic point detector.	Each of the Accused Samsung '645 Products includes a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal, wherein the corrector corrects the video signal according to the level or distribution detected by the characteristic point detector. For example, each of the Accused Samsung '645 Products includes an image sensor and/or associated processor(s) (e.g., ISP and/or DSP) that luminance, hue, and saturation levels, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime surroundings, flash lighting and make image corrections accordingly. As another example, the Samsung Galaxy S25 includes an ambient light sensor and/or associated processor(s) (e.g., ISP and/or DSP) that detect a color of light or lighting conditions in the surroundings, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	surroundings, flash lighting. Further, the Accused Samsung '645 Products perform Auto Exposure based on detecting level of luminance. **Sensors** Accelerometer, Barometer, Fingerprint Sensor, Gyro Sensor, Geomagnetic Sensor, Hall Sensor, Light Sensor, Proximity Sensor https://www.samsung.com/uk/smartphones/galaxy-s25/specs/ - **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

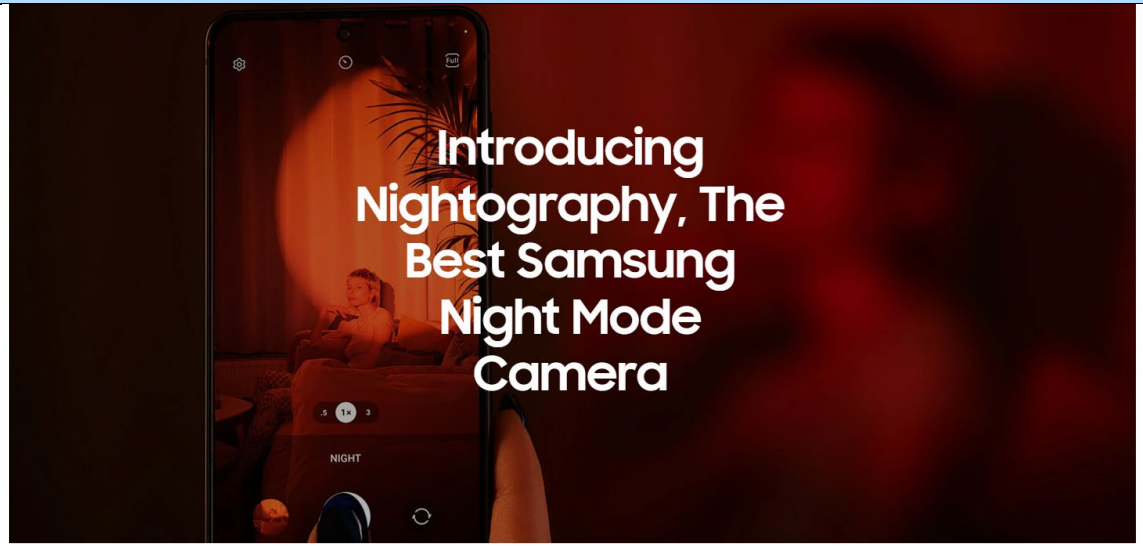
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 116.  *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images.

What does Night Mode do?

Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products supports the following color formats:

5.1.7. Video Codecs

- For acceptable quality of web video streaming and video-conference services, device implementations SHOULD use a hardware VP8 codec that meets the requirements.

If device implementations include a video decoder or encoder:

- [C-1-1] Video codecs MUST support output and input bytebuffer sizes that accommodate the largest feasible compressed and uncompressed frame as dictated by the standard and configuration but also not overallocate.
- [C-1-2] Video encoders and decoders MUST support YUV420 8:8:8 flexible color formats (`COLOR_FormatYUV420Flexible`) through `CodecCapabilities`.
- [C-1-3] Video encoders and decoders MUST support at least one of a planar or semiplanar YUV420 8:8:8 color format: `COLOR_FormatYUV420PackedPlanar` (equivalent to `COLOR_FormatYUV420Planar`) or `COLOR_FormatYUV420PackedSemiPlanar` (equivalent to `COLOR_FormatYUV420SemiPlanar`). They are STRONGLY RECOMMENDED to support both.
- [C-SR-1] Video encoders and decoders are STRONGLY RECOMMENDED to support at least one of a hardware optimized planar or semiplanar YUV420 8:8:8 color format (YV12, NV12, NV21 or equivalent vendor optimized format.)
- [C-1-5] Video decoders that support a high bit-depth format (9+ bits per channel) MUST support outputting an 8-bit equivalent format if requested by the application. This MUST be reflected by supporting an YUV420 8:8:8 color format via `android.media.MediaCodecInfo`.

If device implementations advertise HDR profile support through `Display.HdrCapabilities`, they:

- [C-2-1] MUST support HDR static metadata parsing and handling.

If device implementations advertise intra refresh support through `FEATURE_IntraRefresh` in the `MediaCodecInfo.CodecCapabilities` class, they:

- [C-3-1] MUST support the refresh periods in the range of 10 - 60 frames and accurately operate within 20% of configured refresh period.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

See https://source.android.com/docs/compatibility/15/android-15-cdd

5.1.8. Video Codecs List

Format/Codec	Details	File Types/Container Formats to be supported
H.263		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
H.264 AVC	See section 5.2 and 5.3 for details	• 3GPP (.3gp) • MPEG-4 (.mp4) • MPEG-2 TS (.ts, not seekable) • Matroska (.mkv, decode only)
H.265 HEVC	See section 5.3 for details	• MPEG-4 (.mp4) • Matroska (.mkv, decode only)
MPEG-2	Main Profile	• MPEG2-TS (.ts, not seekable) • MPEG-4 (.mp4, decode only) • Matroska (.mkv, decode only)
MPEG-4 SP		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
VP8	See section 5.2 and 5.3 for details	• WebM (.webm) • Matroska (.mkv)
VP9	See section 5.3 for details	• WebM (.webm) • Matroska (.mkv)

Id.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, the Accused Samsung '645 Products detects a color of light in the surroundings while performing color corrections:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

COLOR_CORRECTION_MODE

Added in API level 21

```
public static final Key<Integer> COLOR_CORRECTION_MODE
```

The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.

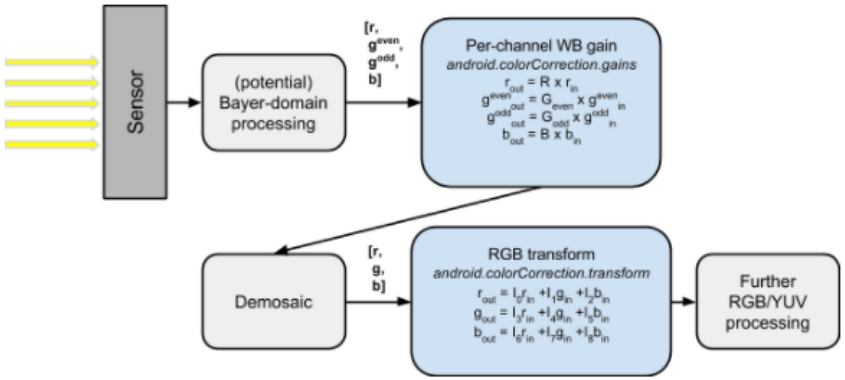
When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.

We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX.

When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct.

Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame.

The expected processing pipeline is as follows:



https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

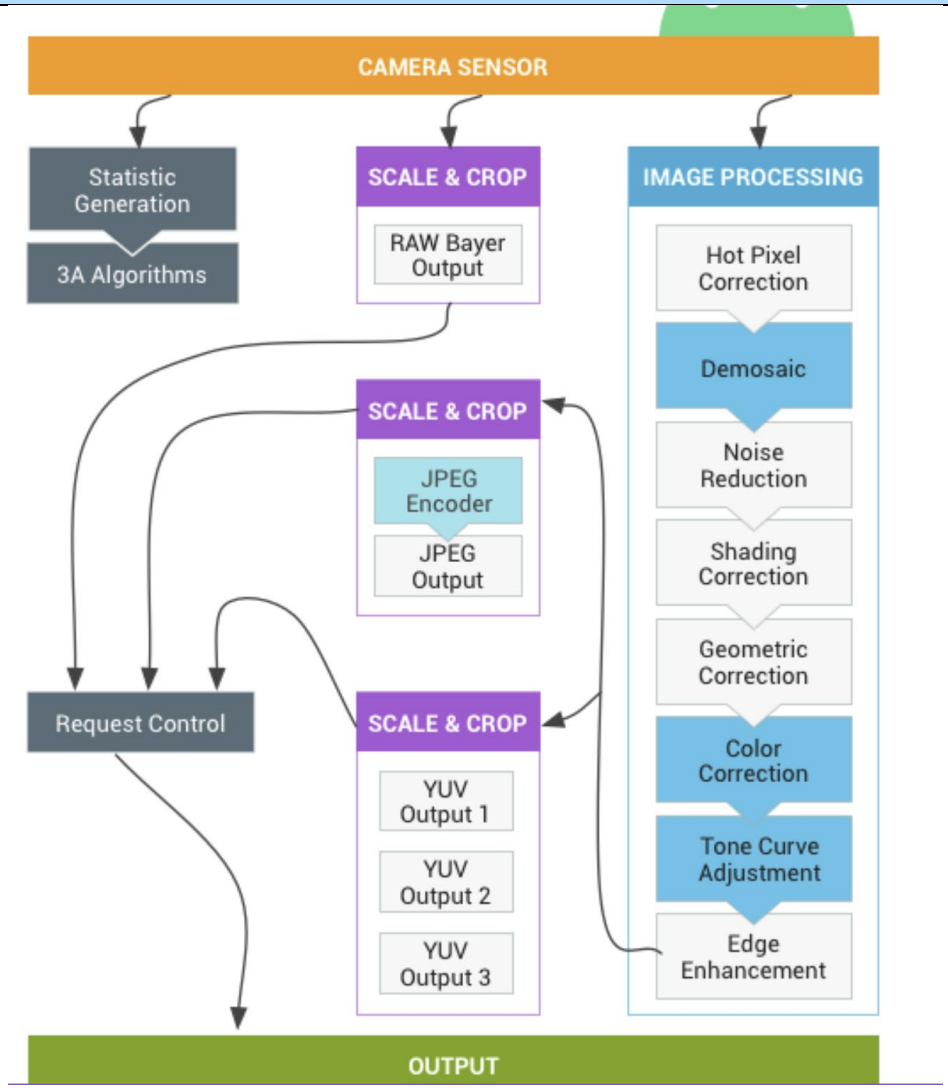
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_AWB_MODE_DAYLIGHT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_DAYLIGHT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT
	
	CONTROL_AWB_MODE_FLUORESCENT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_FLUORESCENT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene. *See* https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

Doctrine of Equivalents

To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a characteristic point detector that detects a level or distribution of at least one of luminance, hue and saturation of the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting a level or distribution of luminance, hue, or saturation. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting levels or distribution and performing corrections accordingly) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, not correcting the video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate luminance/hue/saturation level/distribution detection and correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[3.pre] A video processing apparatus comprising:	To the extent the preamble is construed as a limitation, each of the Accused Samsung '645 Products is a video processing apparatus. For example, the Samsung Galaxy S25 includes front and back cameras for recording video, a display for displaying video, and one or more processors (e.g., a CPU, ISP, and/or DSP) with image and video processing capability:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, 24mm (wide), 1/1.56", 1.0µm, dual pixel PDAF, OIS
		10 MP, f/2.4, 67mm (telephoto), 1/3.94", 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55" 1.4µm, Super Steady video
	Features	Best Face, LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/120/240fps, 10-bit HDR, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), 1/3.2", 1.12µm, dual pixel PDAF
	Features	HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

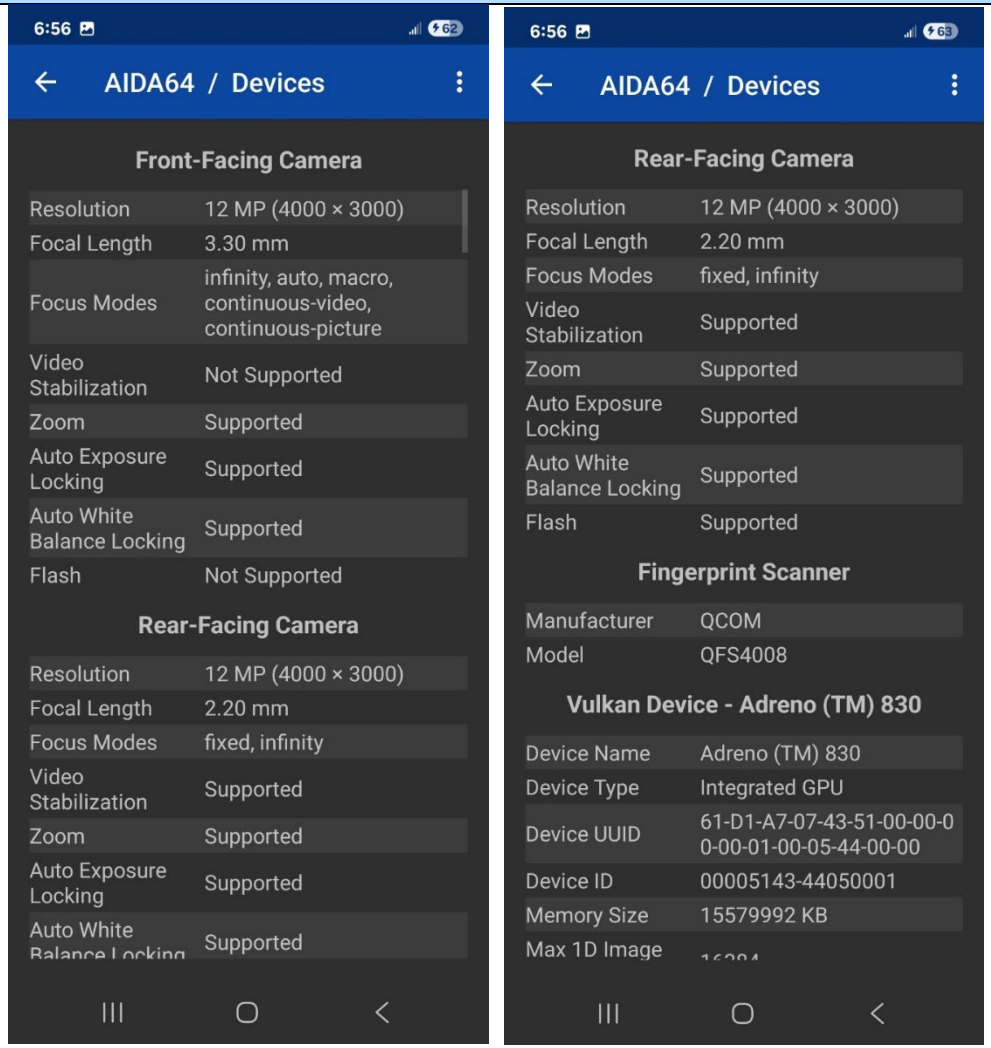
https://www.gsmarena.com/samsung_galaxy_s25-13610.php

DISPLAY	Type	Dynamic LTPO AMOLED 2X, 120Hz, HDR10+, 2600 nits (peak)
	Size	6.2 inches, 94.4 cm^2 (~91.1% screen-to-body ratio)
	Resolution	1080 x 2340 pixels, 19.5:9 ratio (~416 ppi density)
	Protection	Corning Gorilla Glass Victus 2
		Always-on display
PLATFORM	OS	Android 15, up to 7 major Android upgrades, One UI 7
	Chipset	Qualcomm SM8750-AB Snapdragon 8 Elite (3 nm)
	CPU	Octa-core (2x4.47 GHz Oryon V2 Phoenix L + 6x3.53 GHz Oryon V2 Phoenix M)
	GPU	Adreno 830

Id.

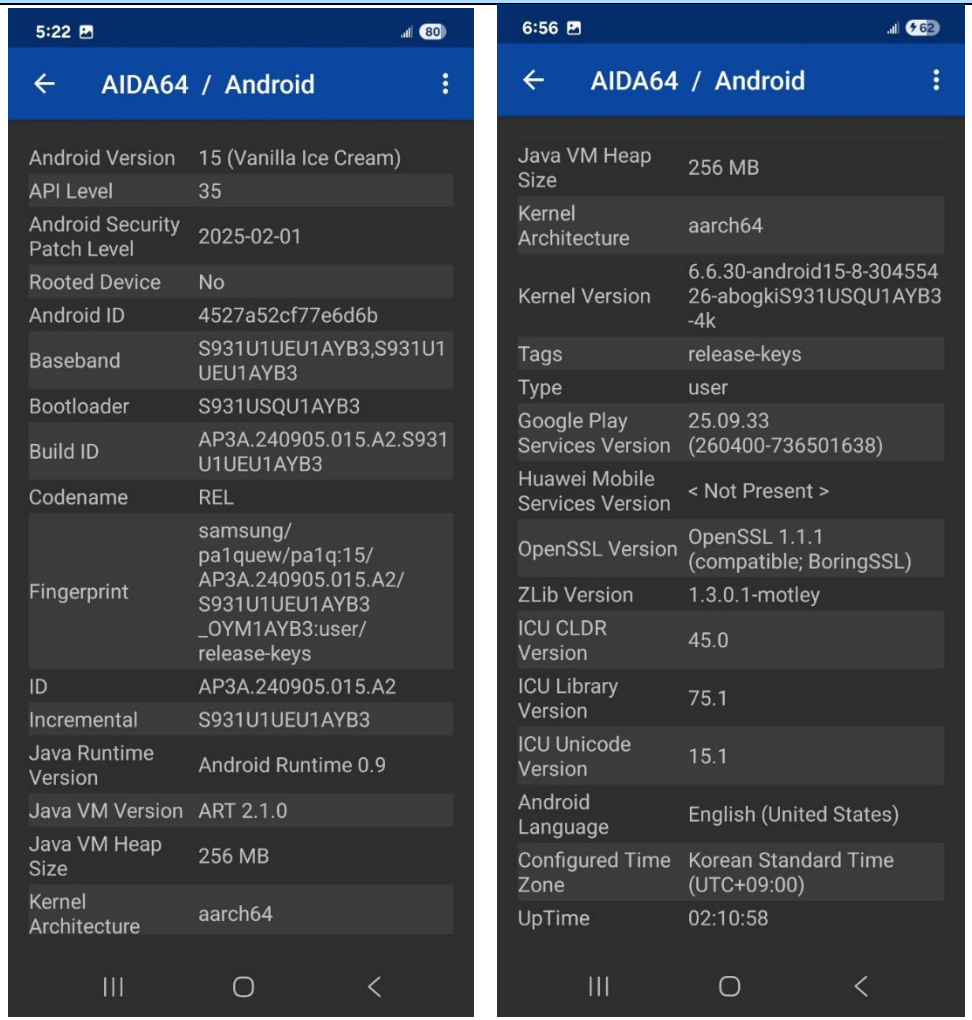
In addition, the AIDA64 Reports show that each of the Accused Samsung '645 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (e.g., CPU, ISP, or DSP) processes video.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



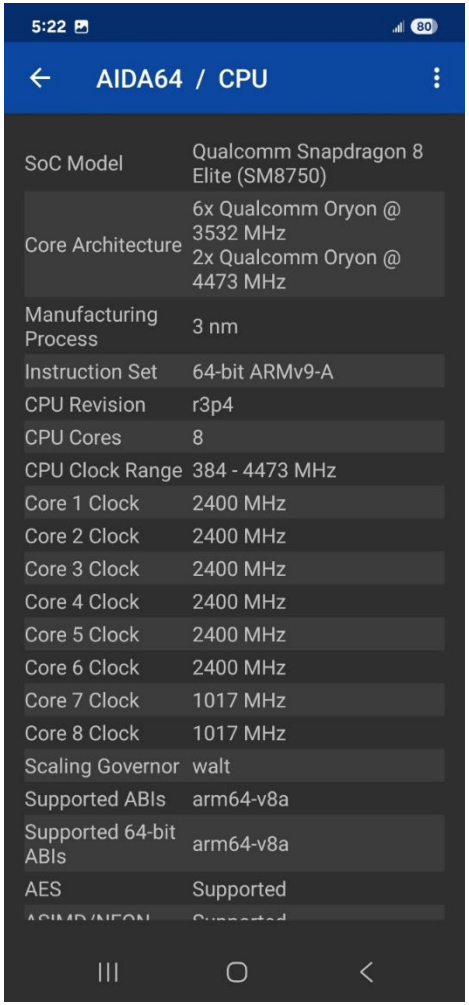
(Screenshot of AIDA 64 Report – Camera)

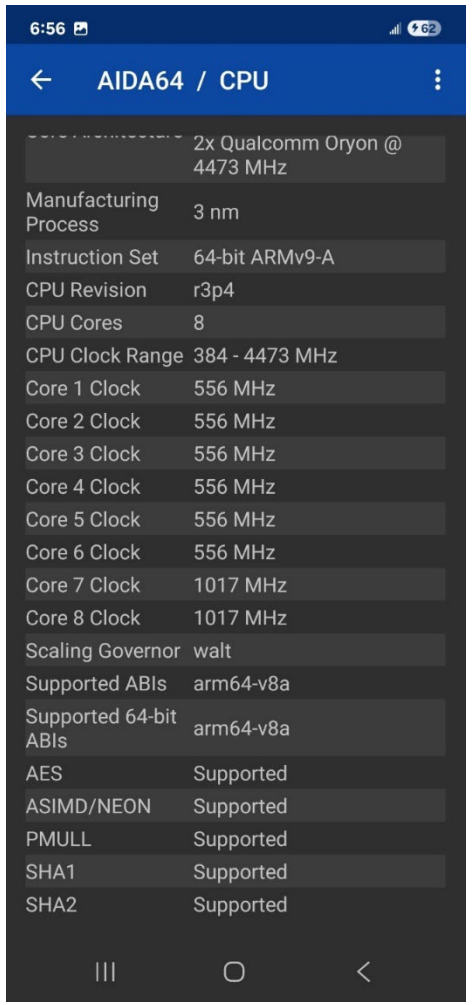
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



(Screenshot of AIDA 64 Report – Android)

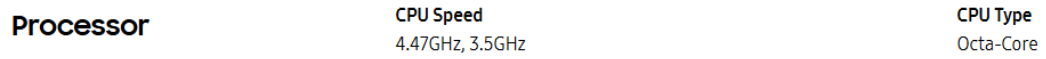
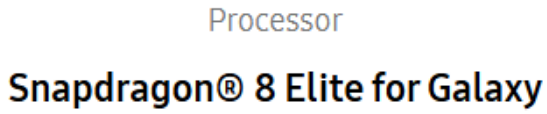
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The AIDA64 Reports and tech specs show that the Accused Samsung '645 Products contain one or more processors.

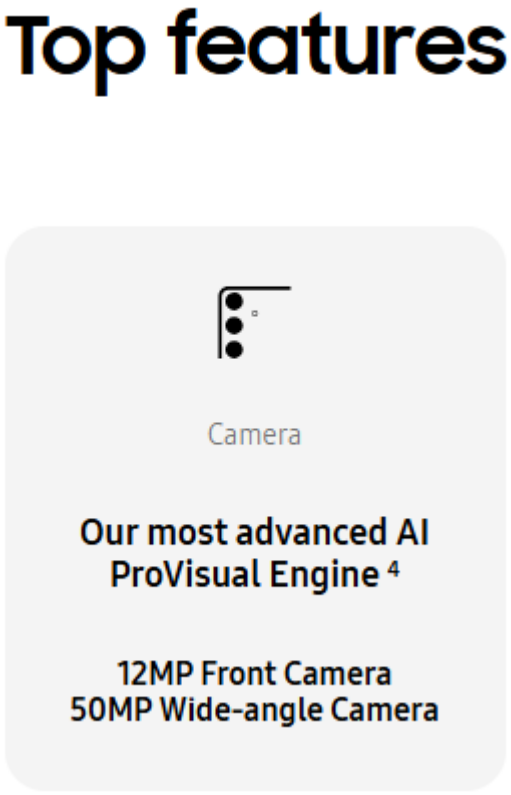




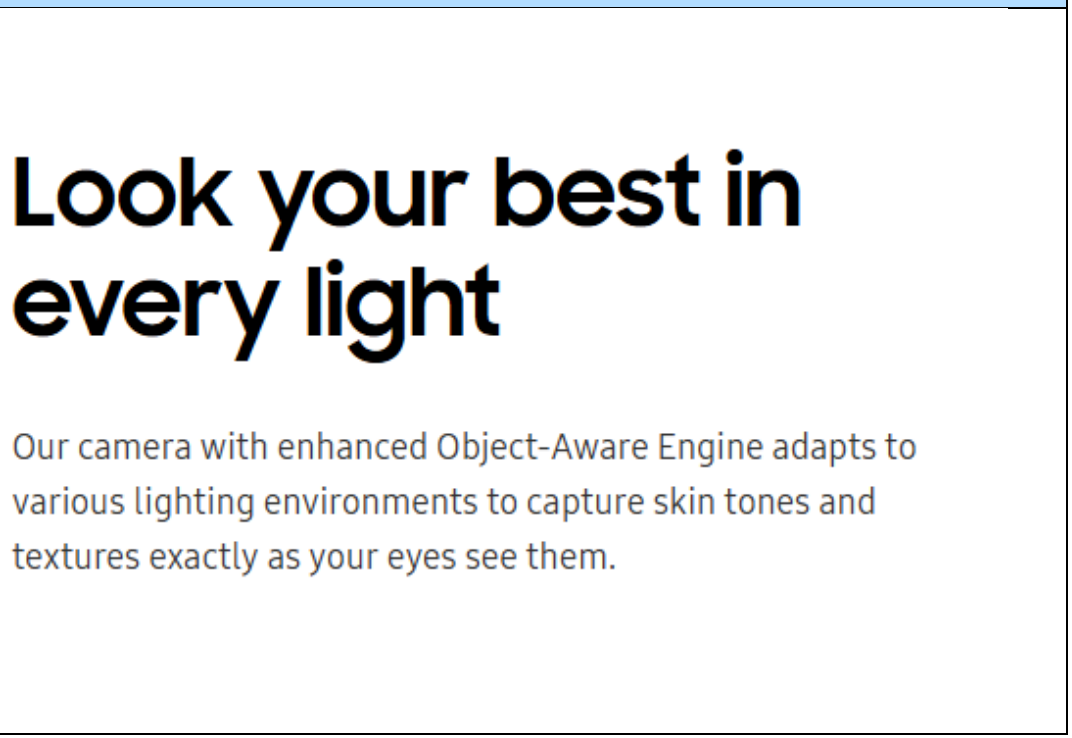
(Screenshot of AIDA 64 Report – Processor)

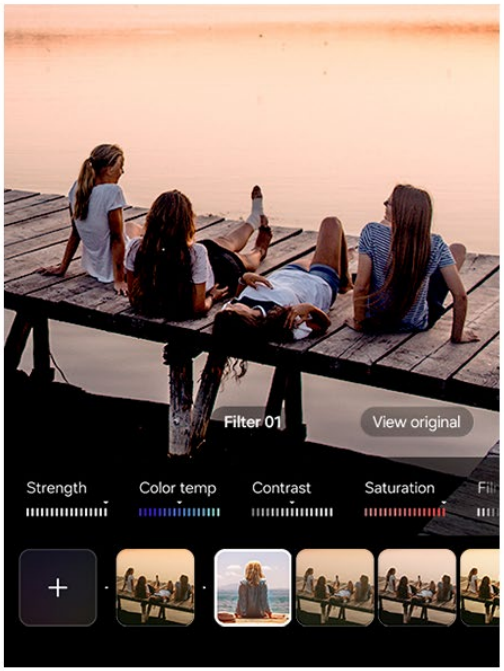
APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

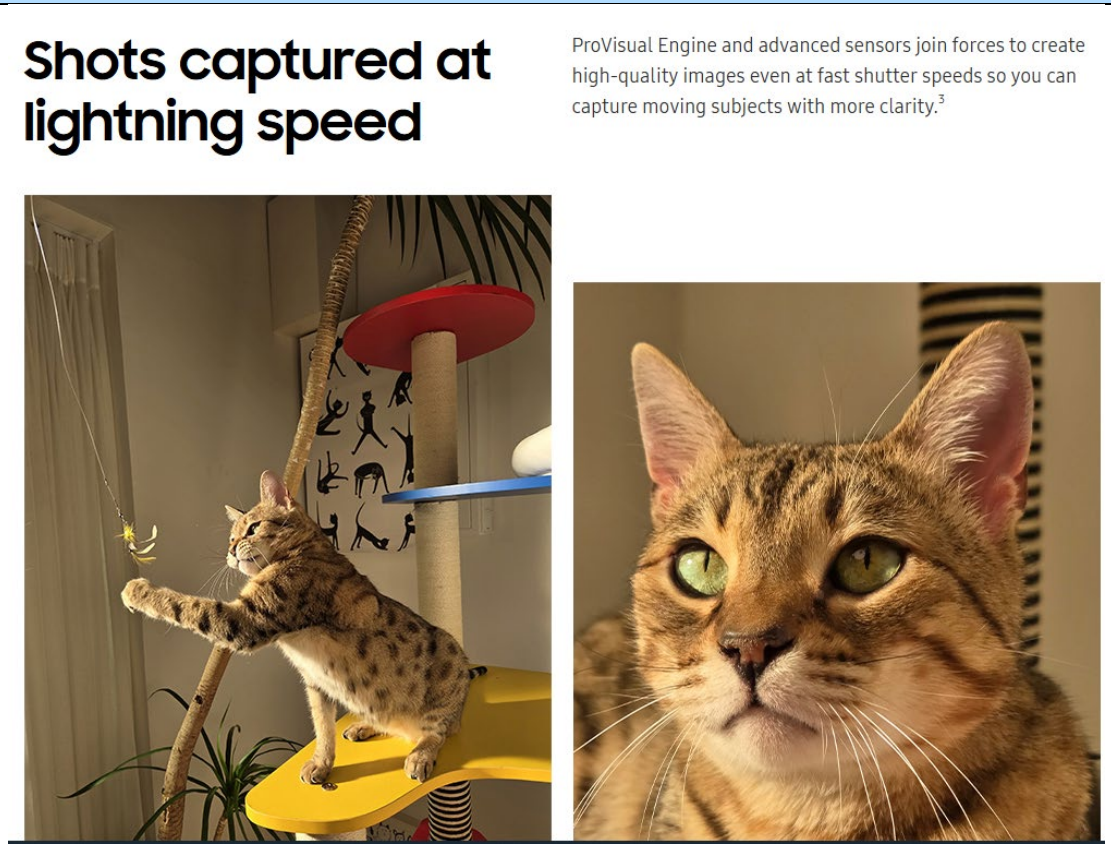
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/uk/smartphones/galaxy-s25/specs/  https://www.samsung.com/uk/smartphones/galaxy-s25/compare/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 ProVisual Engine is now boosted by our powerful processor. Experience our advanced creative system for video and photo capturing, viewing and editing that you have to see to believe.[20] Shoot in improved 10-bit HDR for a stunning videography experience. Our advanced processor also delivers more precise noise removal meaning you won't have to worry about grainy night footage again.[3,4]

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 **Filters just for you** Bring pics to life with personalized filters. Galaxy AI analyzes your photo and creates a filter to match. Use it instantly or customize further with tweaks to the saturation, brightness and more. How to use Filters

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25/ Further, as an example, the Qualcomm Snapdragon 8 Elite Mobile Platform in the Samsung Galaxy S25 includes a processor for processing image signals:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Introducing our most powerful processor, customized for Galaxy. With improved real-time ray tracing and Vulkan optimization, dive deep into the action with ultra-smooth gameplay thanks to Snapdragon® 8 Elite Mobile Platform for Galaxy.[21,22,23,24] CPU 45 % faster processing GPU 48 % improved graphics performance NPU 68 % faster AI performance https://www.samsung.com/us/smartphones/galaxy-s25/

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Powerhouse Qualcomm Oryon CPU defines a new mobile era

The first-in-mobile Qualcomm Oryon CPU delivers a 45% performance boost, 44% greater power efficiency, and the mobile industry's largest shared data cache. Our Qualcomm® Adreno GPU with newly sliced architecture achieves 40% enhanced performance and 40% improved efficiency. System-wide, experience an overall power savings of 27%.

Multimodal Gen AI at your fingertips

The Qualcomm® AI Engine boasts the fastest Qualcomm® Hexagon NPU, delivering a 45% AI performance improvement and 45% better performance per watt. Plus, multimodal Gen AI support and longer token inputs will help you become an expert on any topic.

AI-powered camera redefines photography

Our AI ISP is directly fused with the Qualcomm® Hexagon™ NPU to offer industry-leading camera features, like limitless Semantic Segmentation at 4K resolution. Plus, our on-device video object eraser, can remove unwanted elements from videos, while Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions.

Power and efficiency for revolutionary gaming

Mobile-first support for Unreal Engine 5's Nanite solution enables astonishing film-quality 3D environments in smartphone gaming —while maximizing efficiency. Plus, support for Unreal's Chaos Physics Engine delivers lifelike object interactions and simulations, even in complex scenes.

Studio-quality audio

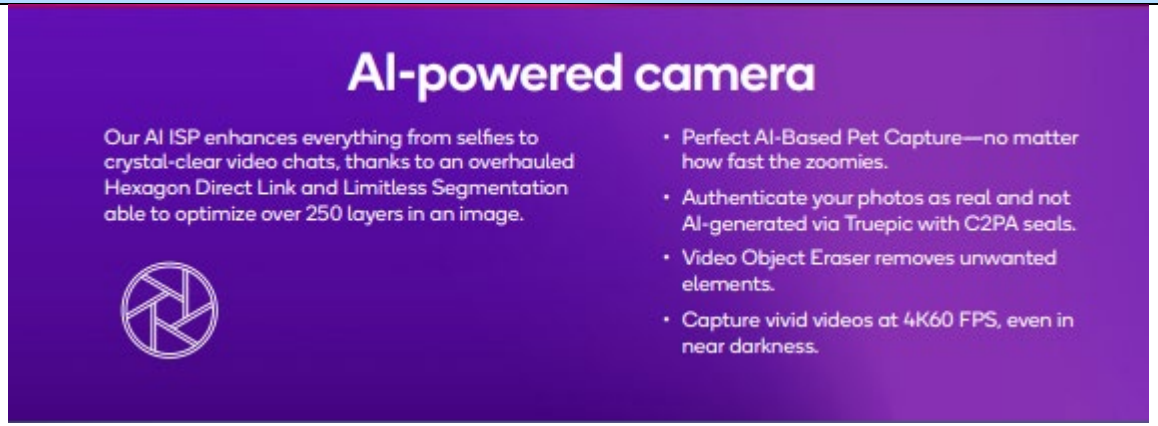
Our Snapdragon Sound™ Technology Suite with Qualcomm® aptX™ Lossless Technology delivers up to 24-bit 48kHz bluetooth music streaming and up to 24-bit 96kHz Wi-Fi music streaming. Qualcomm® Expanded Personal Area Network (XPAN) technology enables whole-building untethered audio coverage -- aided by ultra-low power Wi-Fi 7.

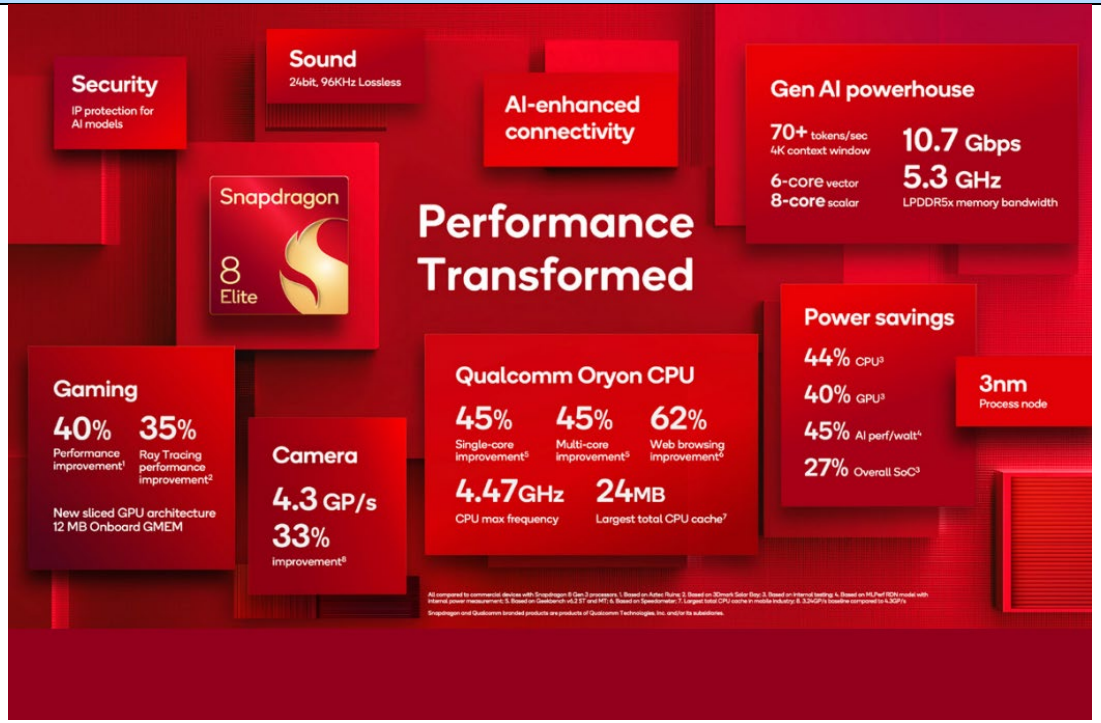
Fully integrated, AI-enhanced connectivity

The Snapdragon X80 5G Modem-RF System with a dedicated AI tensor accelerator achieves multi-gigabit 5G speeds in more places with the first 4x6 MIMO solution, and 30% more accurate location positioning. And, our 40% more efficient Qualcomm® FastConnect™ 7900 Mobile Connectivity System is the first to integrate Wi-Fi ranging, Bluetooth® wireless technology, and UWB proximity technologies for object tracking, building access control, and more.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• Our Qualcomm Spectra™ AI ISP features: • Limitless Real-time Semantic Segmentation for photo/video frame • Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions. • Ultra-low Light video capture • Video Object Eraser can remove unwanted elements from videos • Real-time AI Relighting make you appear professional wherever you are • Truepic photo capture with C2PA standard support lets you snap a photo with Truepic's cryptographic seal to prove the photo is real and not Gen AI (https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform)

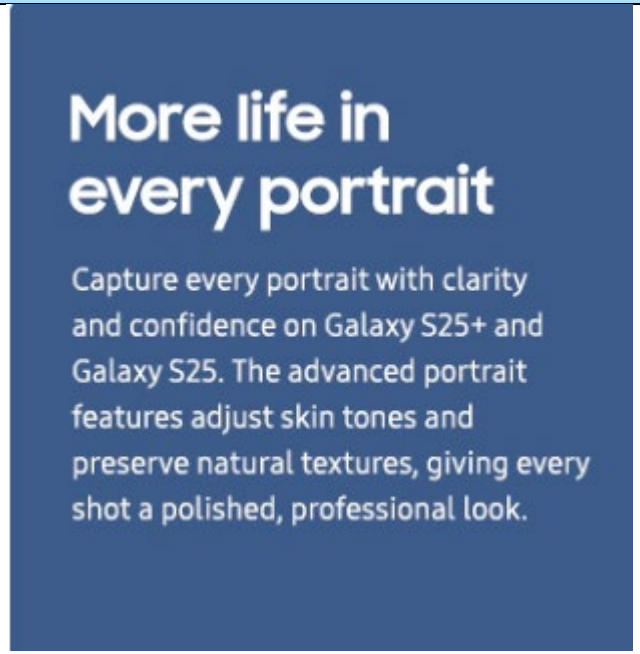

PERFORMANCE, TRANSFORMED
AI-powered camera
Multimodal Gen AI
Revolutionary gaming
Snapdragon
8
Elite
Powerhouse processing
Studio-quality audio
Fully integrated AI-enhanced connectivity
The Snapdragon® 8 Elite Mobile Platform is the pinnacle of Snapdragon innovation, delivering revolutionary power, speed, efficiency, and support for multimodal generative AI.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Camera Qualcomm Spectra™ Image Signal Processor • AI-ISP, Triple 18-bit ISPs Limitless real-time Semantic Segmentation photo and video processing Engine for Visual Analytics 4.0, including hardware acceleration for iToF depth sensors up to 4K 60 FPS Support for the latest HDR, DCG+VS, DCG, Staggered, QDOL, Less Blanking, and Multiframe HDR image sensors Support for triple video capture from HDR image sensors, with seamless switching between any HDR mode • Up to 48 MP triple camera @ 30 FPS with Zero Shutter Lag • Up to 108 MP single camera @ 30 FPS with Zero Shutter Lag • Up to 320-megapixel photo capture AI-based face detection, AI for 3A (auto-focus, autoexposure, and auto-white balance) Rec. 2020 color gamut photo and video capture Up to 10-bit color depth photo and video capture 10-bit HEIF: HEIC photo capture, HEVC video capture Google Ultra HDR photo capture Video capture HDR formats: HDR10+, HDR10, HLG, Dolby Vision 8K HDR video playback @ 60 FPS 4K video capture @ 120 FPS Slow-mo video capture at 1080p @ 480 FPS Hardware Bokeh Engine 2 for video capture

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	(https://docs.qualcomm.com/bundle/publicresource/87-83196-1_REV_D_Snapdragon_8_Elite_Mobile_Platform_Product_Brief.pdf) **AI-powered camera redefines photography** Infuse brilliance into mobile capture with our AI ISP, enhancing everything from selfies to crystal-clear video chats thanks to an overhauled Hexagon Direct Link. The first AI-powered Limitless Segmentation recognizes and enhances virtually anything in the frame, including faces, hair, clothing, objects, backgrounds, and beyond. Even furry friends appear crisp and cute—no matter how fast the zoomies—thanks to AI-Based Pet Capture. • Our powerful AI ISP is deeply integrated with the Hexagon NPU for enhanced, intuitive capture. • Limitless Segmentation can segment an image in over 250 layers, each optimized to perfection. • Real-time Insight AI captures and enhances natural skin and sky tones even in the most challenging conditions. • Truepic with C2PA adds cryptographic seals so you can authenticate your photos as real and not AI-generated—now including videos and audio recordings. • Video Object Eraser can remove unwanted elements from video footage—on-device. • Capture vivid videos at 4K60 FPS, even in near darkness. (https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Snapdragon-8-Elite-Platform-Product-Brief.pdf) Let's dive deeper into why Snapdragon 8 Elite is a game-changer: • **Incredible power:** Experience a 45% boost in performance with the Qualcomm Oryon CPU, giving you lightning-fast apps and incredible multitasking.[1] • **AI at your fingertips:** The Qualcomm® Hexagon™ NPU increases AI performance by 45%, handling everything from voice commands to image prompts. Your device is ready to adapt to your every move. • **Photography, reimagined:** With features like 4K Semantic Segmentation, Video Object Eraser, and real-time AI lighting adjustments, the Snapdragon 8 Elite camera tech turns your mobile photos into pro-level masterpieces. https://www.qualcomm.com/snapdragon/news/snapdragon-8-elite--the-power-behind-the-name

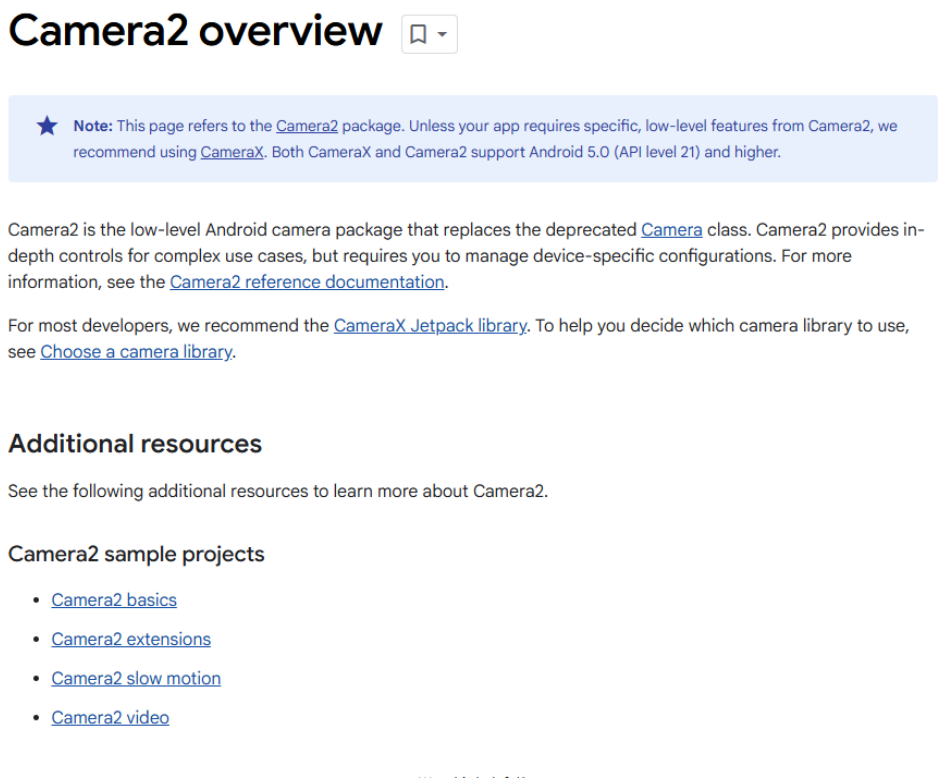
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Specifications

Qualcomm® Artificial Intelligence (AI) Engine	**GPU Name:** Qualcomm® Adreno™ **CPU Name:** Qualcomm® Oryon™ **Qualcomm® Hexagon™ Processor Features:** Qualcomm® Hexagon™ Scalar Accelerator, Qualcomm® Hexagon™ Tensor Accelerator, Qualcomm® Hexagon™ Vector eXtensions (HVX), Dedicated power delivery system, Micro Tile Inferencing, Hexagon Direct Link, Fused AI Accelerator architecture **Qualcomm® Sensing Hub Features:** Dual-core AI processor, Dual always-sensing cameras
CPU	**Name:** Qualcomm® Oryon™ **Architecture:** 64-bit **Clock Speed:** 4.47 GHz[1]
GPU	**Name:** Qualcomm® Adreno™ **APIs:** OpenGL® ES 3.2, Vulkan® 1.3, OpenCL™ 3.0 FP
Cellular Modem-RF	**Modem Name:** Snapdragon® X80 5G Modem-RF System **Peak Download Speed:** 10 Gbps **Peak Upload Speed:** 3.5 Gbps **Cellular Modem-RF Specs:** 8 carriers (mmWave), 2x2 MIMO (mmWave), 4x6 MIMO (Sub-6) **Performance Enhancement Technologies:** Qualcomm® Wideband Envelope Tracking, Qualcomm® 5G Ultra-Low Latency Suite, Qualcomm® 5G AI Processor Gen 2 with dedicated tensor accelerator, Qualcomm® Power RF Efficiency Suite, Qualcomm® 5G AI Suite Gen 3, Qualcomm® RF Uplink Optimization, Qualcomm® Smart Transmit™ Gen 5 technology, Qualcomm® 5G PowerSave Gen 5 **Cellular Technology:** 5G NR, Dynamic Spectrum Sharing (DSS), LTE, WCDMA, LAA, GSM/EDGE, EN-DC, CBRS, NR DC **Multi SIM:** Global 5G Multi-SIM, Dual SIM support Qualcomm® DSDA Gen 2 (Dual Data)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform Further, the Samsung Galaxy S25 includes an operating system that when executed on a processor provides a video processing apparatus:  https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products is configured to run Camera2.java, which provides evidence of a video processing apparatus:  (https://developer.android.com/media/camera/camera2)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Android Developers > Develop > API reference

Was this helpful?

android.hardware.camera2

Added in API level 21

Kotlin | **Java**

The android.hardware.camera2 package provides an interface to individual camera devices connected to an Android device. It replaces the deprecated `Camera` class.

This package models a camera device as a pipeline, which takes in input requests for capturing a single frame, captures the single image per the request, and then outputs one capture result metadata packet, plus a set of output image buffers for the request. The requests are processed in-order, and multiple requests can be in flight at once. Since the camera device is a pipeline with multiple stages, having multiple requests in flight is required to maintain full framerate on most Android devices.

To enumerate, query, and open available camera devices, obtain a `CameraManager` instance.

Individual `CameraDevices` provide a set of static property information that describes the hardware device and the available settings and output parameters for the device. This information is provided through the `CameraCharacteristics` object, and is available through `getCameraCharacteristics(String)`

To capture or stream images from a camera device, the application must first create a `camera capture session` with a set of output Surfaces for use with the camera device, with `createCaptureSession(SessionConfiguration)`. Each Surface has to be pre-configured with an `appropriate size and format` (if applicable) to match the sizes and formats available from the camera device. A target Surface can be obtained from a variety of classes, including `SurfaceView`, `SurfaceTexture` via `Surface(SurfaceTexture)`, `MediaCodec`, `MediaRecorder`, `Allocation`, and `ImageReader`.

Generally, camera preview images are sent to `SurfaceView` or `TextureView` (via its `SurfaceTexture`). Capture of JPEG images or RAW buffers for `DngCreator` can be done with `ImageReader` with the `JPEG` and `RAW_SENSOR` formats. Application-driven processing of camera data in OpenGL ES, or directly in managed or native code is best done through `SurfaceTexture`, or `ImageReader` with a `YUV_420_888` format, respectively.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	By default, YUV-format buffers provided by the camera are using the JFIF YUV<->RGB transform matrix (equivalent to Rec.601 full-range encoding), and after conversion to RGB with this matrix, the resulting RGB data is in the sRGB colorspace. Captured JPEG images may contain an ICC profile to specify their color space information; if not, they should be assumed to be in the sRGB space as well. On some devices, the output colorspace can be changed via `setColorSpace(Named)`. Note that although the YUV->RGB transform is the JFIF matrix (Rec.601 full-range), due to legacy and compatibility reasons, the output is in the sRGB colorspace, which uses the Rec.709 color primaries. Image processing code can safely treat the output RGB as being in the sRGB colorspace. The application then needs to construct a `CaptureRequest`, which defines all the capture parameters needed by a camera device to capture a single image. The request also lists which of the configured output Surfaces should be used as targets for this capture. The CameraDevice has a `factory method` for creating a `request builder` for a given use case, which is optimized for the Android device the application is running on. Once the request has been set up, it can be handed to the active capture session either for a one-shot `capture` or for an endlessly `repeating` use. Both methods also have a variant that accepts a list of requests to use as a burst capture / repeating burst. Repeating requests have a lower priority than captures, so a request submitted through `capture()` while there's a repeating request configured will be captured before any new instances of the currently repeating (burst) capture will begin capture. After processing a request, the camera device will produce a `TotalCaptureResult` object, which contains information about the state of the camera device at time of capture, and the final settings used. These may vary somewhat from the request, if rounding or resolving contradictory parameters was necessary. The camera device will also send a frame of image data into each of the output `Surfaces` included in the request. These are produced asynchronously relative to the output CaptureResult, sometimes substantially later.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Classes

CameraCaptureSession	A configured capture session for a `CameraDevice`, used for capturing images from the camera or reprocessing images captured from the camera in the same session previously.
CameraCaptureSession.CaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraCaptureSession.StateCallback	A callback object for receiving updates about the state of a camera capture session.
CameraCharacteristics	The properties describing a `CameraDevice`.
CameraCharacteristics.Key<T>	A `Key` is used to do camera characteristics field lookups with `CameraCharacteristics.get`.
CameraConstrainedHighSpeedCaptureSession	A constrained high speed capture session for a `CameraDevice`, used for capturing high speed images from the `CameraDevice` for high speed video recording use case.
CameraDevice	The CameraDevice class is a representation of a single camera connected to an Android device, allowing for fine-grain control of image capture and post-processing at high frame rates.
CameraDevice.CameraDeviceSetup	CameraDeviceSetup is a limited representation of `CameraDevice` that can be used to query device specific information which would otherwise need a CameraDevice instance.
CameraDevice.StateCallback	A callback objects for receiving updates about the state of a camera device.
CameraExtensionCharacteristics	Allows clients to query availability and supported resolutions of camera extensions.
CameraExtensionSession	A camera capture session that enables access to device-specific camera extensions, which often use multi-frame bursts and sophisticated post-process algorithms for image capture.
CameraExtensionSession.ExtensionCaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraExtensionSession.StateCallback	A callback object for receiving updates about the state of a camera extension session.

See https://developer.android.com/reference/android/hardware/camera2/package-summary

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
[3.a] an input unit to which a video signal containing contents is input;	Each of the Accused Samsung '645 Products includes an input unit that receives a video signal containing content. For example, the Samsung Galaxy S25 has front and rear cameras, and corresponding image sensor and image processing circuitry (e.g., CPU, ISP, and/or DSP), that receive video input signals. MAIN CAMERA — Triple: 50 MP, f/1.8, 24mm (wide), 1/1.56", 1.0µm, dual pixel PDAF, OIS 10 MP, f/2.4, 67mm (telephoto), 1/3.94", 1.0µm, PDAF, OIS, 3x optical zoom 12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55" 1.4µm, Super Steady video Features: Best Face, LED flash, auto-HDR, panorama Video: 8K@24/30fps, 4K@30/60fps, 1080p@30/60/120/240fps, 10-bit HDR, HDR10+, stereo sound rec., gyro-EIS SELFIE CAMERA — Single: 12 MP, f/2.2, 26mm (wide), 1/3.2", 1.12µm, dual pixel PDAF Features: HDR, HDR10+ Video: 4K@30/60fps, 1080p@30fps https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Galaxy S25 

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Samsung Galaxy S25 User Guide at 7. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

IPR2025-01312; Samsung
Ex. 1014 - Page 229

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Record videos

Record smooth lifelike videos using your device.

1. From **Camera**, swipe right or left to change the shooting mode to **Video**.
2. Tap **Record** to begin recording a video.
   - To take a picture while recording, tap **Capture**.
   - To temporarily stop recording, tap **Pause**. To continue recording, tap **Resume**.
3. Tap **Stop** when you are finished recording.

Camera settings

Use the icons on the main camera screen and the settings menu to configure your camera's settings.

- From **Camera**, tap **Quick controls** > **Settings** for the following options:

Intelligent features

- **Scan documents and text**: Show a button to scan documents and text detected with the rear camera.
- **Scan QR codes**: Automatically detect QR codes when using the camera.
- **Shot suggestions**: Get on-screen guides to help you line up great shots.
- **Intelligent optimization**: Choose a quality optimization setting and turn on scene optimizer.

44

Id. at 44.

Videos

- **Auto FPS**: Record brighter videos in low-light conditions by automatically optimizing the frame rate in Video mode.
- **Video stabilization**: Activate anti-shake to keep the focus steady when the camera is moving.
- **Advanced video options**: Enhance your videos with advanced recording formats.
  - **Video format**: Choose a format for recorded videos.
  - **High bitrate videos**: Record videos in higher bit rate with the Pro video shooting mode.
  - **HDR**: Optimize videos by recording in HDR10+. Playback devices must support HDR10+ video.

45

Camera and Gallery

  - **Log**: Choose when to record in log format for more dynamic editing.
  - **Zoom-in mic**: Match the mic zoom to the camera zoom while recording videos.
  - **360 audio recording**: Capture immersive 3D sound through your Bluetooth headphones with 360 audio recording.
  - **Audio playback**: Allow music and other audio to play while you record.

Id. at 45-46.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Configure shooting mode Allow the camera to determine the ideal mode for your pictures or choose from several shooting modes. ○ From **Camera**, swipe the screen right and left to change shooting modes. • **Portrait**: Adjust the background of your shots for portrait photos. • **Photo**: Allow the camera to determine the ideal settings for pictures. • **Video**: Allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. Tap **Edit** to drag modes into or out of the shooting modes tray at the bottom of the Camera screen. - **Bixby Vision**: When available, icons are displayed in the Camera viewfinder for translation, QR code detection, landmark recognition, or shopping. - **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. - **Night**: Use this to take photos in low-light conditions, without using the flash. - **Food**: Take pictures that emphasize the vivid colors of food.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Panorama**: Create a linear image by taking pictures in either a horizontal or vertical direction. - **Slow motion**: Record videos at a high frame rate for viewing in slow motion. - **Hyperlapse**: Create a time lapse video by recording at various frame rates. The frame rate is adjusted depending on the scene being recorded and the movement of the device. - **Portrait video**: Adjust the background of your shots for portrait videos. - **Dual rec**: Access advanced features such as lock onto a subject, change between different rear camera lenses, and more. - **Single take**: Capture multiple pictures and video clips from different angles. *Id.* at 43-44.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Camera

Rear Camera - Resolution (Multiple)
50.0 MP + 10.0 MP + 12.0 MP

Rear Camera - F Number (Multiple)
F1.8 , F2.4 , F2.2

Rear Camera - Auto Focus
Yes

Rear Camera - OIS
Yes

Rear Camera - Zoom
Optical Zoom 3x, Optical quality Zoom 2x (Enabled by Adaptive Pixel sensor) , Digital Zoom up to 30x

Front Camera - Resolution
12.0 MP

Front Camera - F Number
F2.2

Front Camera - Auto Focus
Yes

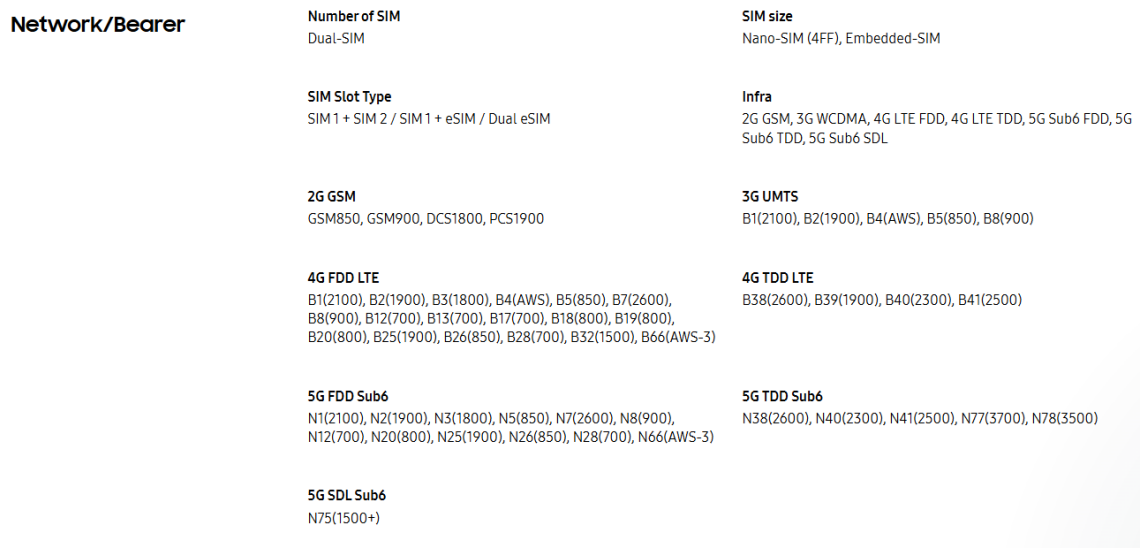
Rear Camera - Flash
Yes

Video Recording Resolution
UHD 8K (7680 x 4320)@30fps

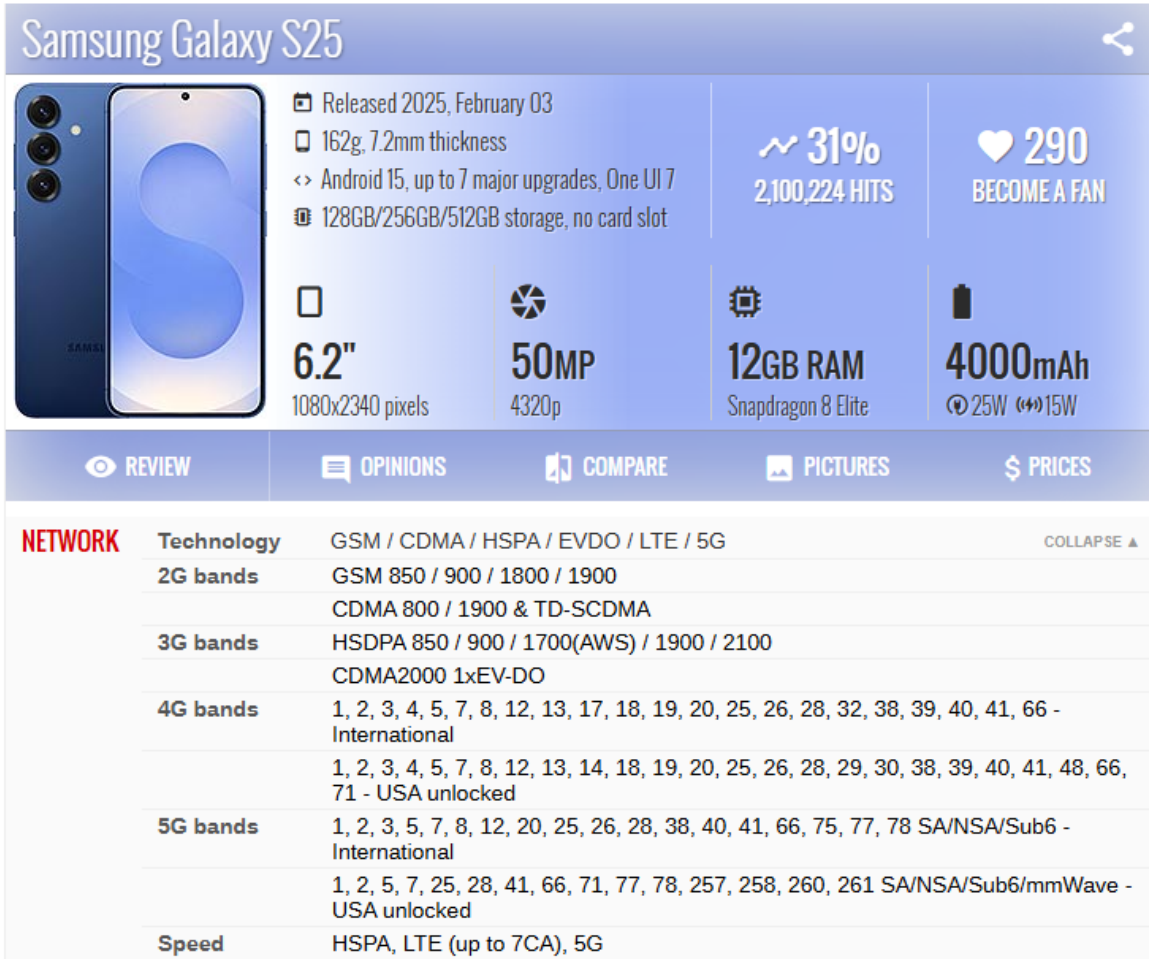
Slow Motion
240fps @FHD, 120fps @FHD, 120fps @UHD

Samsung Galaxy S25 tech specs, https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

In addition, the Samsung Galaxy S25 is configured to receive wireless video signals, e.g., via cellular RF transmissions. *See*, *e.g.*:

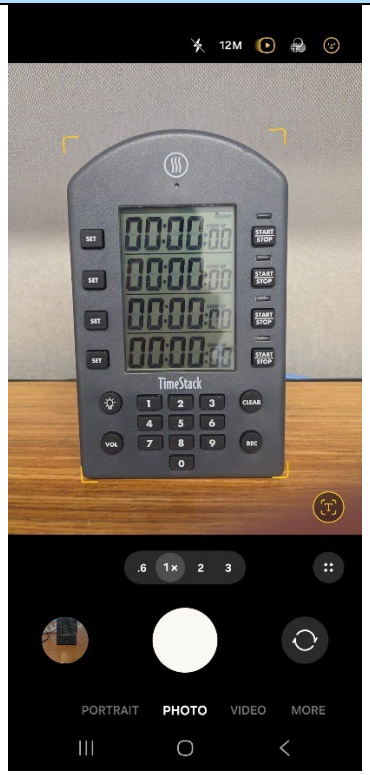
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

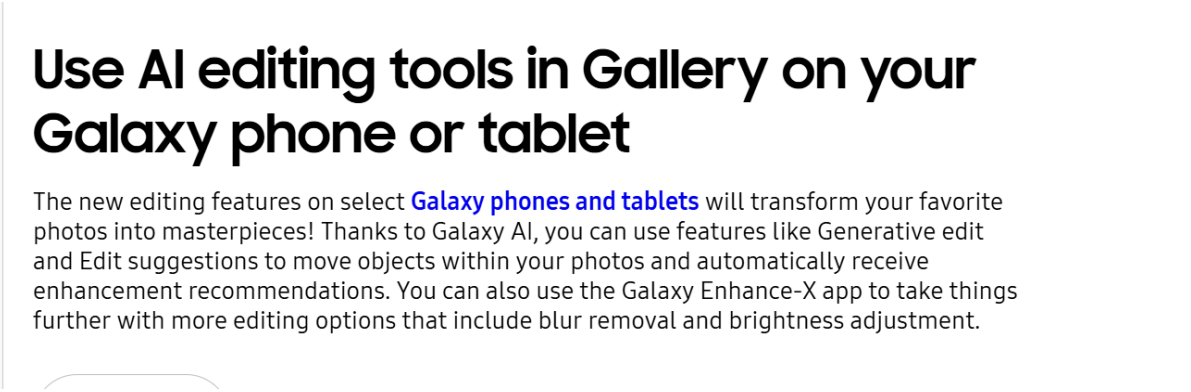


https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	In addition, the Samsung Galaxy S25 includes a WiFi modem for receiving WiFi transmissions, which may include video signals containing content: Connectivity **Wi-Fi Connectivity** 802.11a/b/g/n/ac/ax/be 2.4GHz+5GHz+6GHz, EHT320, MIMO, 4096-QAM **USB** USB 3.2 Gen 1 **Bluetooth®** Bluetooth v5.4 **Location Technology** GPS,Glonass,Beidou,Galileo **Earjack** USB Type-C **MHL** No **Wi-Fi Direct** Yes **NFC** Yes **PC Sync.** Smart Switch (PC version) **USB Interface** USB Type-C https://www.samsung.com/uk/smartphones/galaxy-s25/specs/ COMMS WLAN: Wi-Fi 802.11 a/b/g/n/ac/6e/7, tri-band, Wi-Fi Direct Bluetooth: 5.4, A2DP, LE Positioning: GPS, GLONASS, BDS, GALILEO, QZSS NFC: Yes Radio: No USB: USB Type-C 3.2, DisplayPort 1.2, OTG https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (Screenshot showing video input functions in preview mode)
[3.b] a detector which detects whether pattern portions other than contents are contained in the video signal input to the input unit;	Each of the Accused Samsung '645 Products includes a detector which detects whether pattern portions other than contents are contained in the video signal input to the input unit. For example, all of the Accused Samsung '645 Products are equipped with white balance correction, which is activated when an object that appears white in person is detected in an image. The white balance correction adjusts for the color temperature of the light source so

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	that an object that appears white in person also appears white in the image. As a result, the Accused Samsung '645 Products are necessarily configured to detect with a patterned portion (e.g. white object, white snow) formed of a single color of black or white is input, and contain one or more processors for doing same (e.g., CPU, ISP, and/or DSP). Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part." If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/  https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Edit suggestions

Note

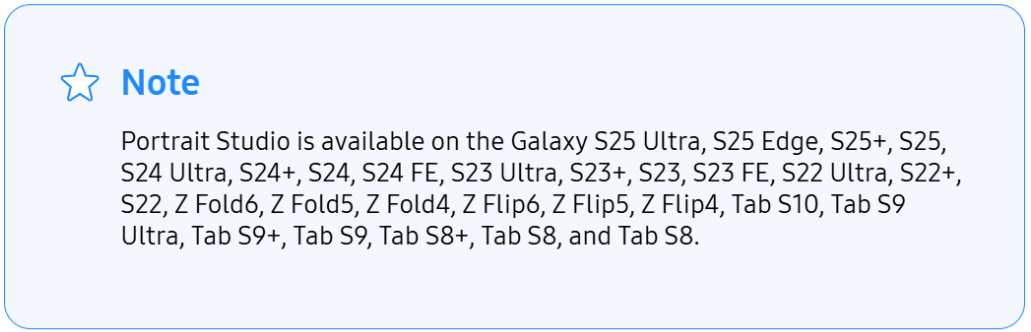
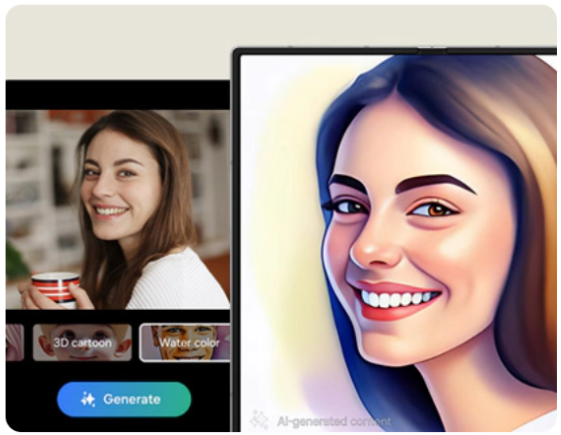
Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.

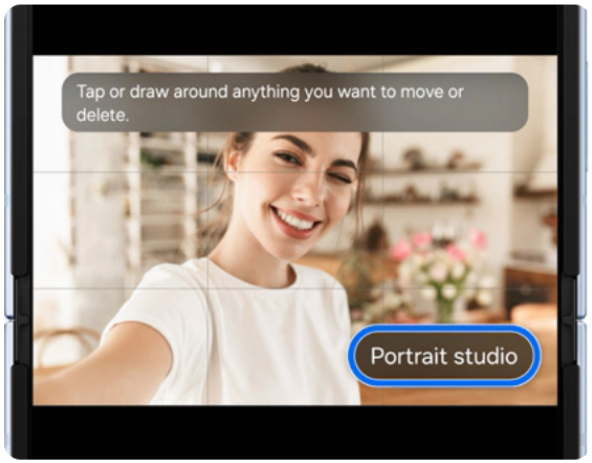


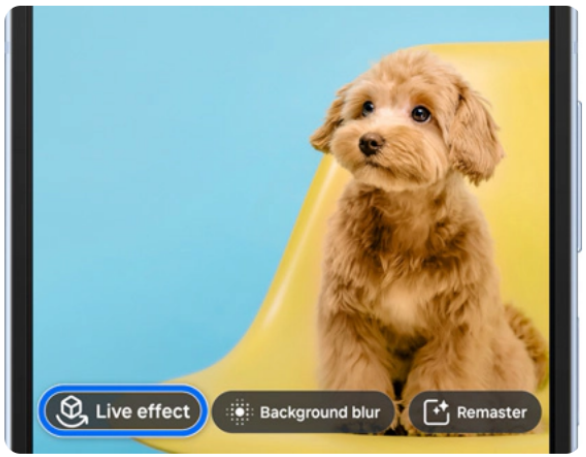
Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all.

1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

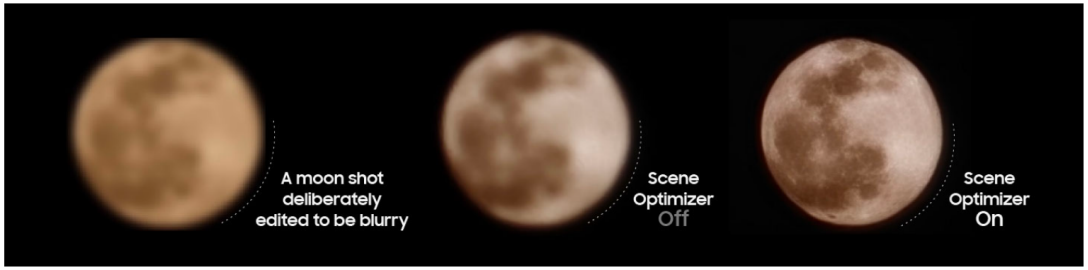
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

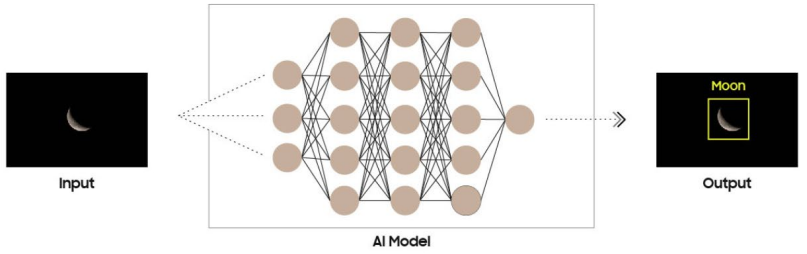
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

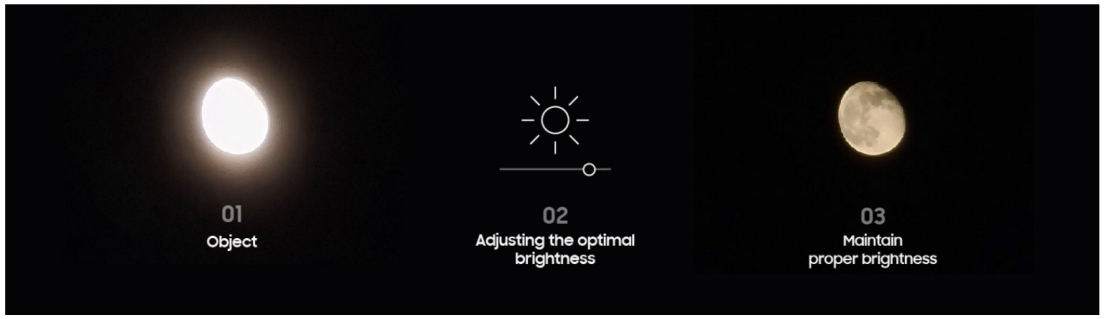
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

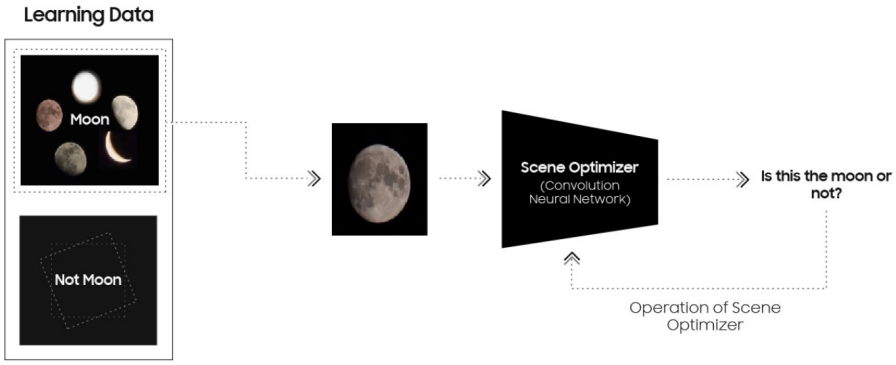
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

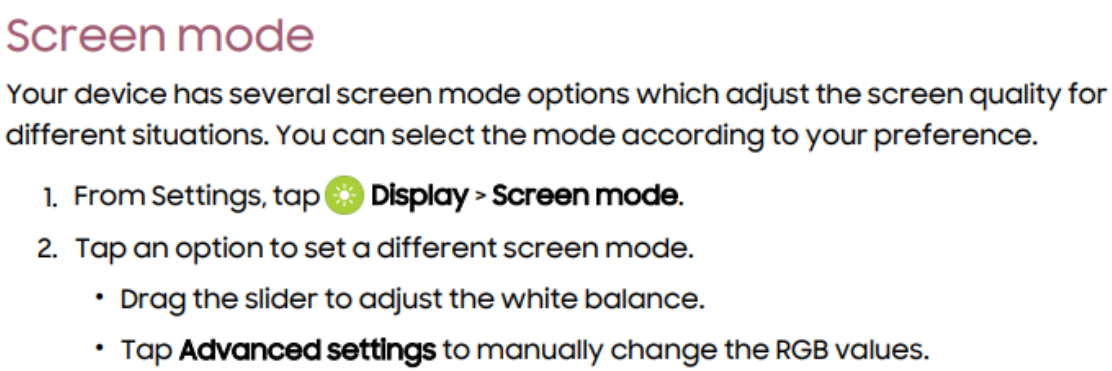
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

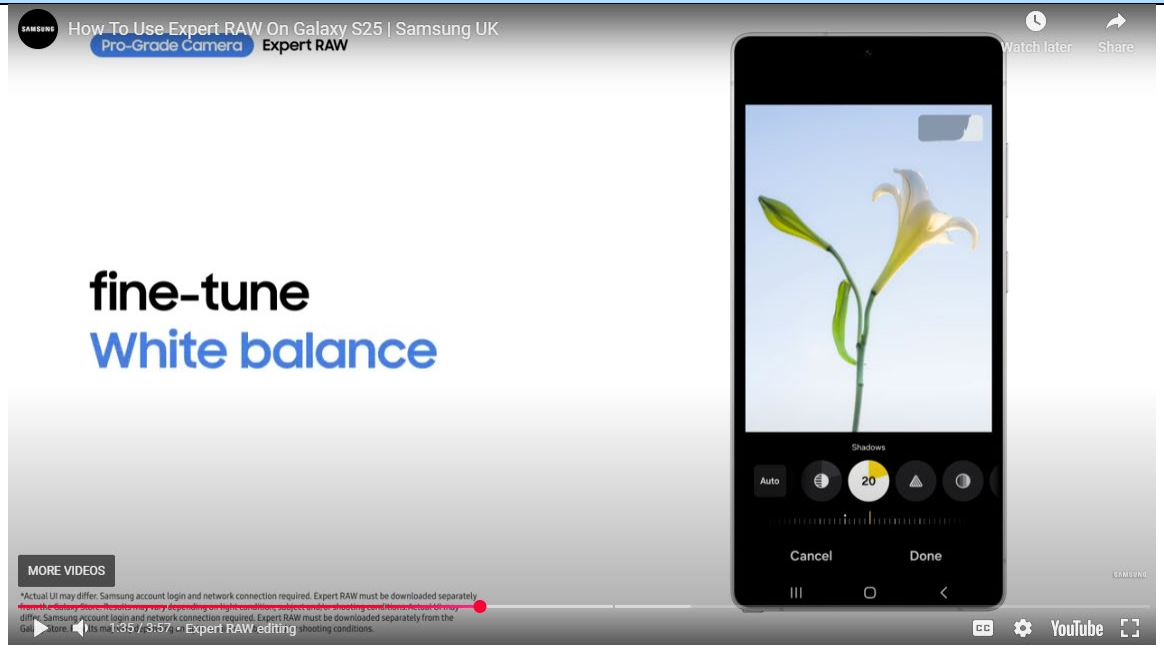
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 116.  *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

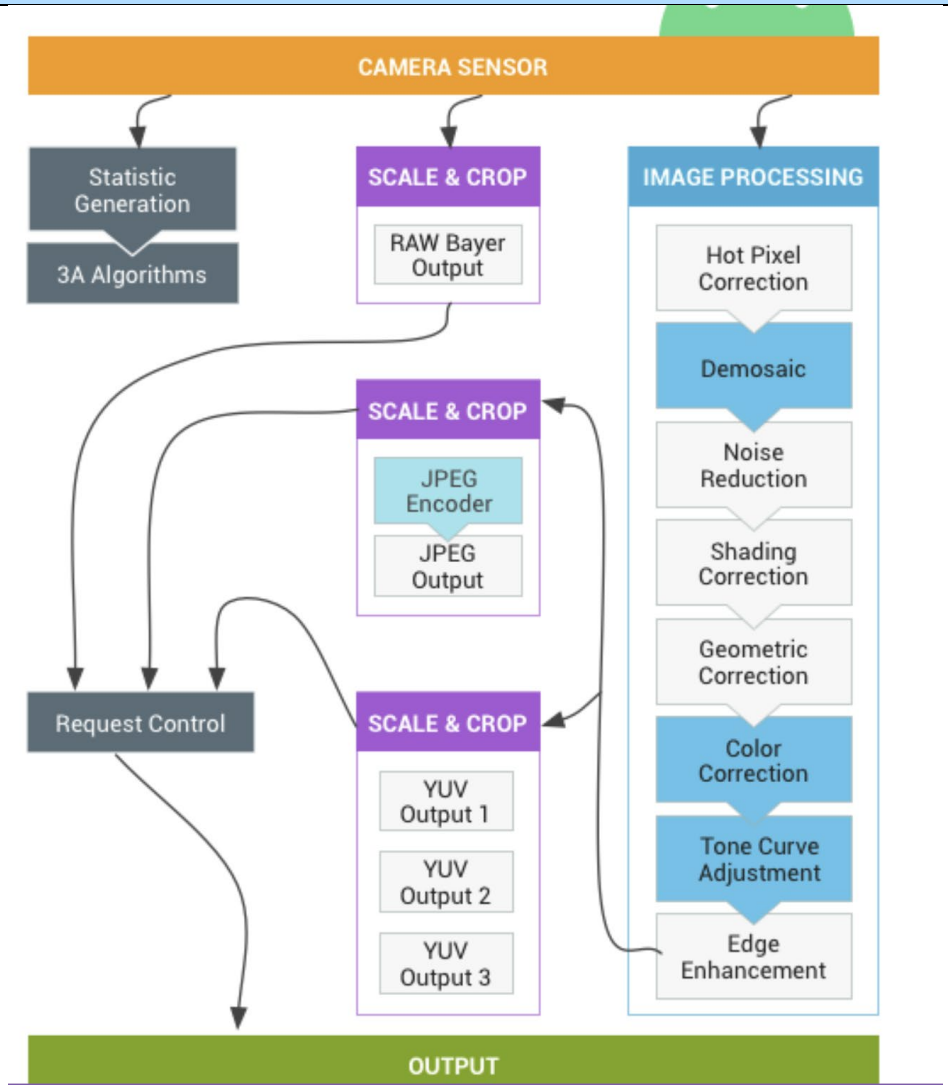
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

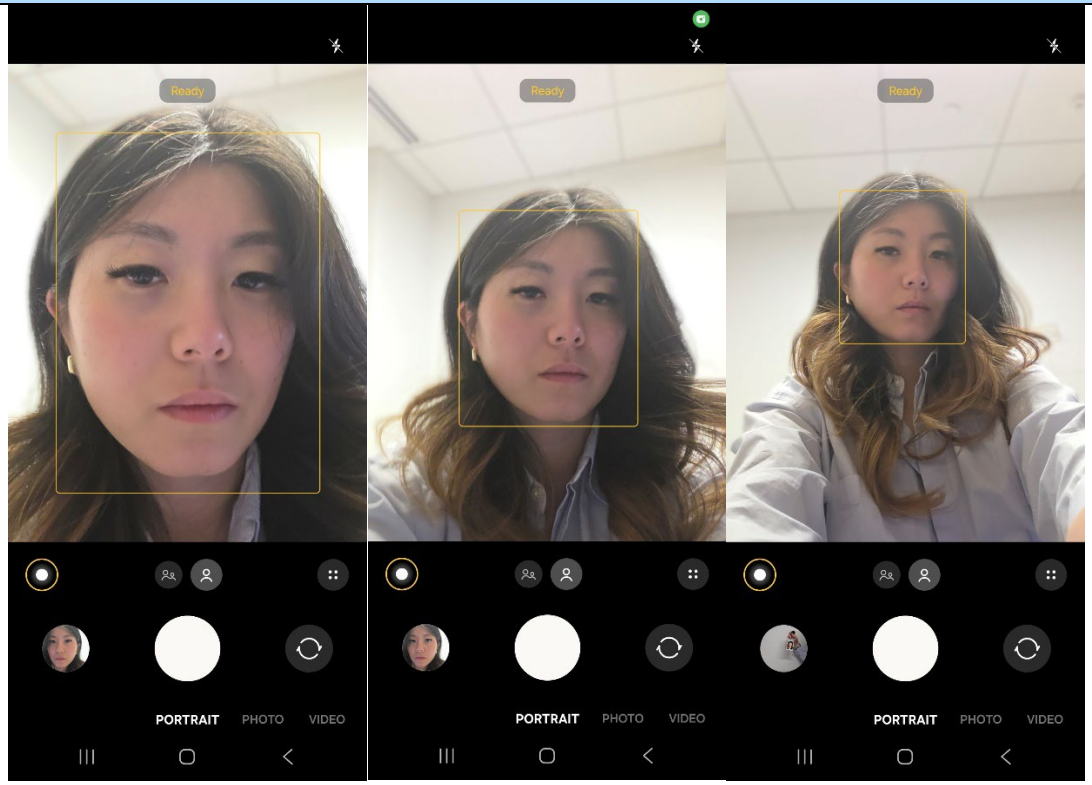
Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

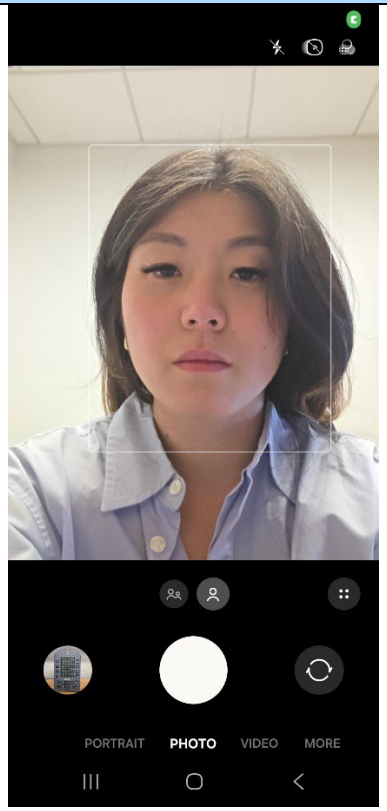
The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

See for example the various modes in the Samsung Galaxy S25 where pattern portion formed of a single color of black or white are necessarily detected:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes being distinguished from pattern portions, i.e., background or clothes.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a detector that detects pattern portions, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting pattern portions in video signal that is input. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting pattern portions) in substantially the same way (e.g., performing image

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	processing). The performance of this function achieves substantially the same result, for example, the detection of pattern portions. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and detection of pattern portions. These components and/or software operate together and function in substantially the same way to facilitate pattern detection. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a detector.
[3.c] a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal input to the input unit;	Each of the Accused Samsung '645 Products includes a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal input to the input unit. For example, each of the Accused Samsung '645 Products includes an image sensor and/or associated processor(s) (e.g., ISP and/or DSP) that luminance, hue, and saturation levels, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime surroundings, flash lighting and make image corrections accordingly. As another example, the Samsung Galaxy S25 includes an ambient light sensor and/or associated processor(s) (e.g., ISP and/or DSP) that detect a color of light or lighting conditions in the surroundings, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime surroundings, flash lighting. **Sensors** Accelerometer, Barometer, Fingerprint Sensor, Gyro Sensor, Geomagnetic Sensor, Hall Sensor, Light Sensor, Proximity Sensor https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap Display > Adaptive color tone and tap to enable this feature. *Id*. at 116.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Screen mode

Your device has several screen mode options which adjust the screen quality for different situations. You can select the mode according to your preference.

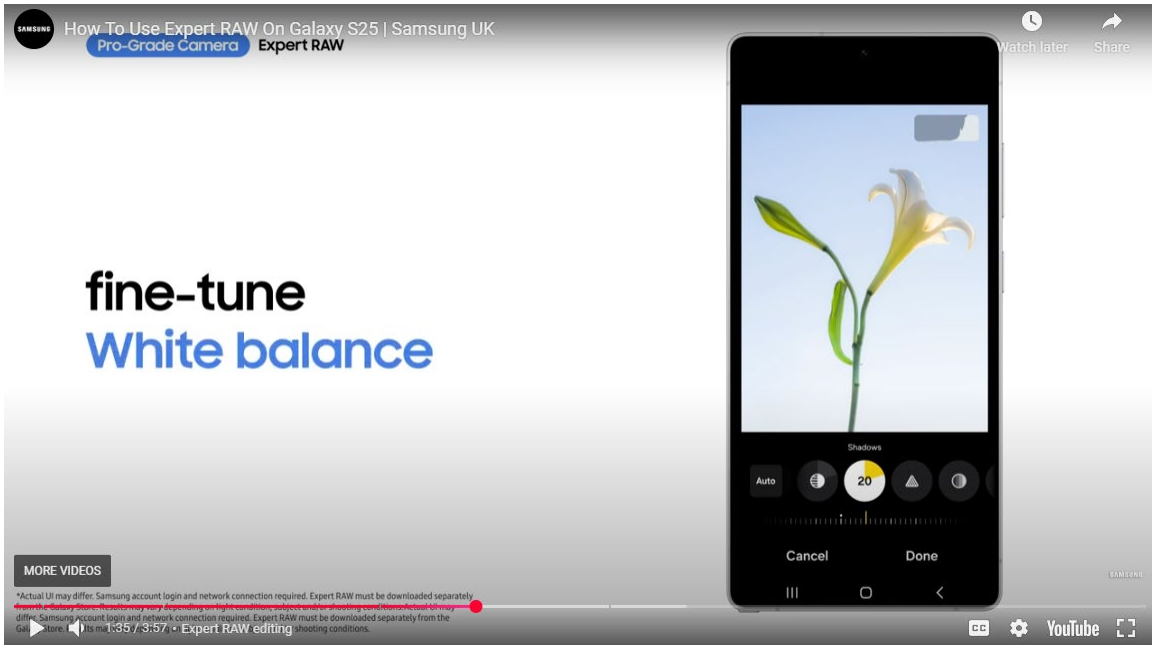
1. From Settings, tap **Display** > **Screen mode**.
2. Tap an option to set a different screen mode.
   - Drag the slider to adjust the white balance.
   - Tap **Advanced settings** to manually change the RGB values.

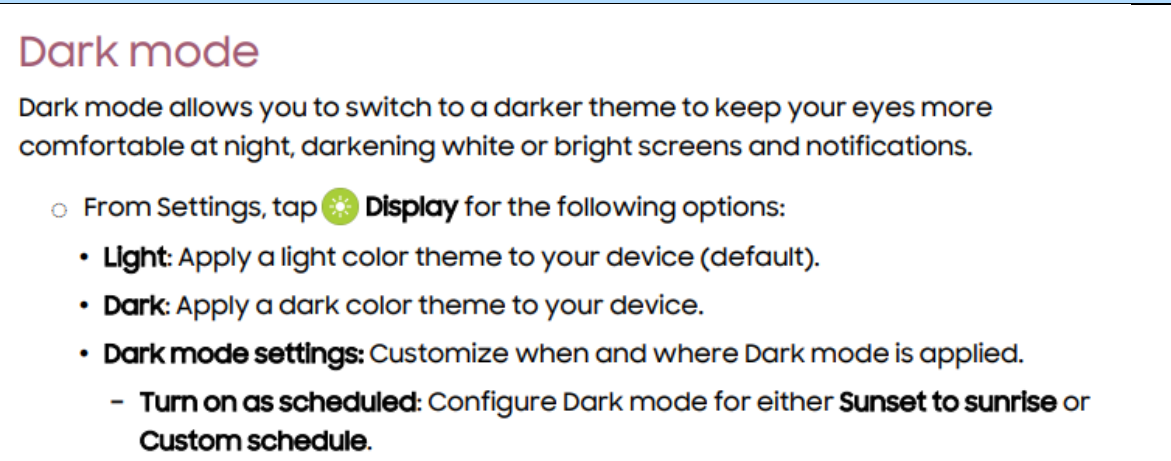
Id. at 117.

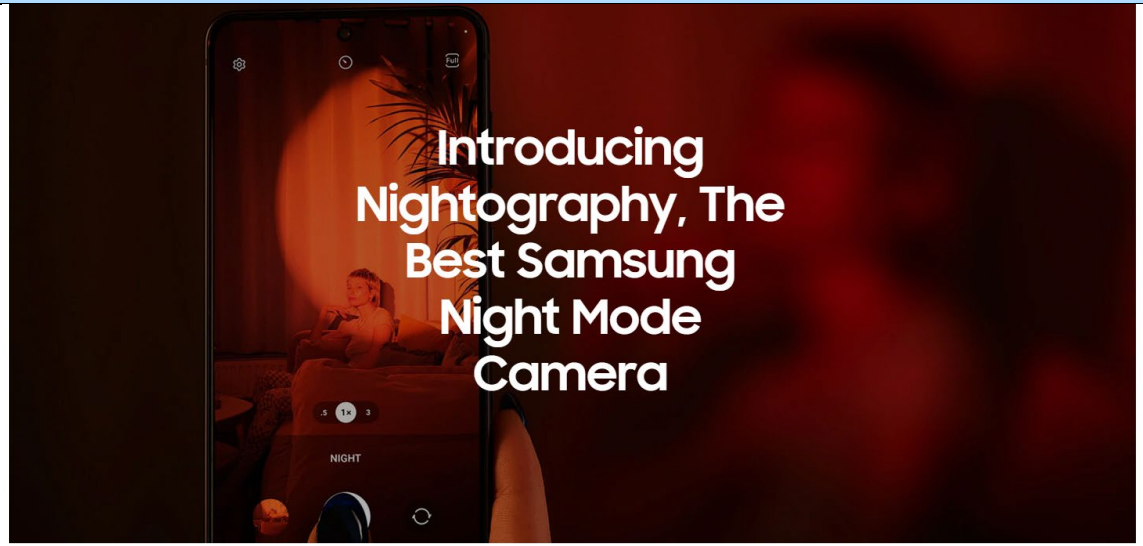
Intelligent features

- **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame.
- **Scan QR codes**: Automatically detects QR codes when using the camera.
- **Shot suggestions**: Get on-screen guides to help you line up great shots.
- **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera.

https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images. **What does Night Mode do?** Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel. https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products supports the following color formats:

5.1.7. Video Codecs

- For acceptable quality of web video streaming and video-conference services, device implementations SHOULD use a hardware VP8 codec that meets the requirements.

If device implementations include a video decoder or encoder:

- [C-1-1] Video codecs MUST support output and input bytebuffer sizes that accommodate the largest feasible compressed and uncompressed frame as dictated by the standard and configuration but also not overallocate.
- [C-1-2] Video encoders and decoders MUST support YUV420 8:8:8 flexible color formats (`COLOR_FormatYUV420Flexible`) through `CodecCapabilities`.
- [C-1-3] Video encoders and decoders MUST support at least one of a planar or semiplanar YUV420 8:8:8 color format: `COLOR_FormatYUV420PackedPlanar` (equivalent to `COLOR_FormatYUV420Planar`) or `COLOR_FormatYUV420PackedSemiPlanar` (equivalent to `COLOR_FormatYUV420SemiPlanar`). They are STRONGLY RECOMMENDED to support both.
- [C-SR-1] Video encoders and decoders are STRONGLY RECOMMENDED to support at least one of a hardware optimized planar or semiplanar YUV420 8:8:8 color format (YV12, NV12, NV21 or equivalent vendor optimized format.)
- [C-1-5] Video decoders that support a high bit-depth format (9+ bits per channel) MUST support outputting an 8-bit equivalent format if requested by the application. This MUST be reflected by supporting an YUV420 8:8:8 color format via `android.media.MediaCodecInfo`.

If device implementations advertise HDR profile support through `Display.HdrCapabilities`, they:

- [C-2-1] MUST support HDR static metadata parsing and handling.

If device implementations advertise intra refresh support through `FEATURE_IntraRefresh` in the `MediaCodecInfo.CodecCapabilities` class, they:

- [C-3-1] MUST support the refresh periods in the range of 10 - 60 frames and accurately operate within 20% of configured refresh period.

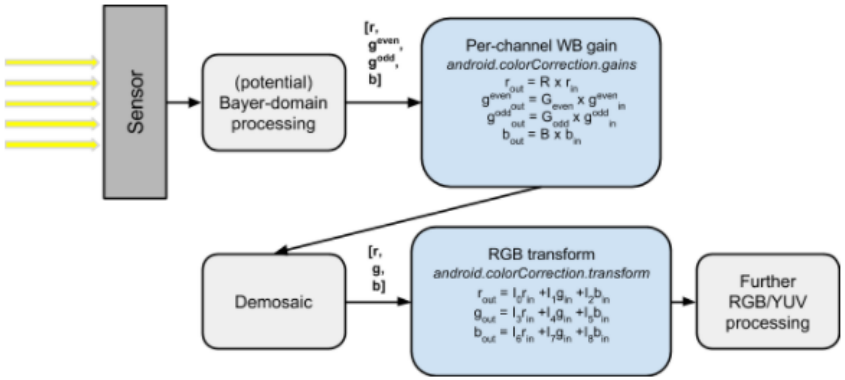
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

See https://source.android.com/docs/compatibility/15/android-15-cdd

5.1.8. Video Codecs List

Format/Codec	Details	File Types/Container Formats to be supported
H.263		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
H.264 AVC	See section 5.2 and 5.3 for details	• 3GPP (.3gp) • MPEG-4 (.mp4) • MPEG-2 TS (.ts, not seekable) • Matroska (.mkv, decode only)
H.265 HEVC	See section 5.3 for details	• MPEG-4 (.mp4) • Matroska (.mkv, decode only)
MPEG-2	Main Profile	• MPEG2-TS (.ts, not seekable) • MPEG-4 (.mp4, decode only) • Matroska (.mkv, decode only)
MPEG-4 SP		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
VP8	See section 5.2 and 5.3 for details	• WebM (.webm) • Matroska (.mkv)
VP9	See section 5.3 for details	• WebM (.webm) • Matroska (.mkv)

Id.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, the Accused Samsung '645 Products detects a color of light in the surroundings while performing color corrections: COLOR_CORRECTION_MODE — Added in API level 21 `public static final Key<Integer> COLOR_CORRECTION_MODE` The mode control selects how the image data is converted from the sensor's native color into linear sRGB color. When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed. We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX. When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct. Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame. The expected processing pipeline is as follows: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

CONTROL_AWB_MODE_DAYLIGHT

Added in API level 21

```
public static final int CONTROL_AWB_MODE_DAYLIGHT
```

The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.

While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT

CONTROL_AWB_MODE_FLUORESCENT

Added in API level 21

```
public static final int CONTROL_AWB_MODE_FLUORESCENT
```

The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.

While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene. CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev `public static final int CONTROL_SCENE_MODE_FACE_PRIORITY` If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines. If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework). Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.
	
	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)
	
	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)

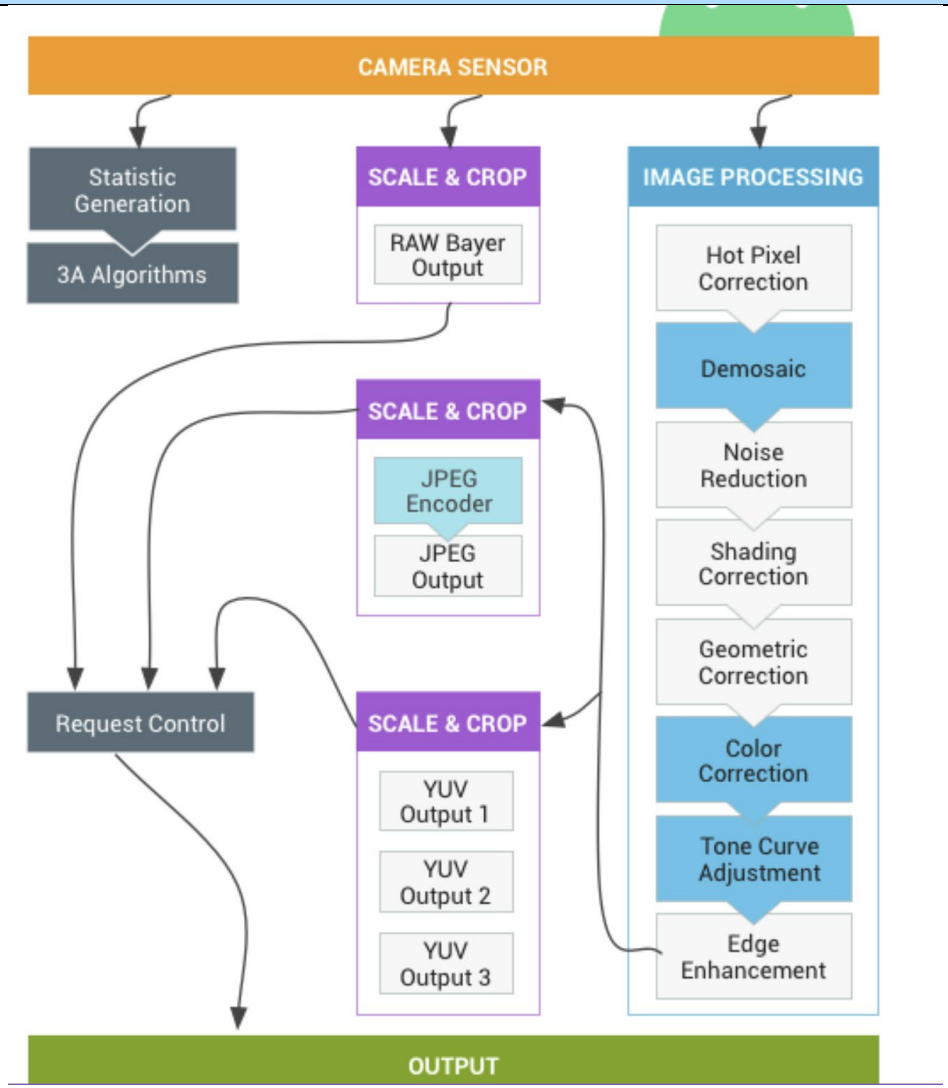
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)
	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)
	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_MODE Added in API level 21 `public static final Key<Integer> COLOR_CORRECTION_MODE` The mode control selects how the image data is converted from the sensor's native color into linear sRGB color. When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed. *See* https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a characteristic point detector that detects a level or distribution of at least one of luminance, hue and saturation of the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting a level or distribution of luminance, hue, or saturation. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting levels or distribution) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, not correcting the video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate luminance/hue/saturation level/distribution detection. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[3.d] a corrector which changes correction characteristics according to a result of detection output from the characteristic point detector, and	Each of the Accused Samsung '645 Products includes a corrector which changes correction characteristics according to a result of detection output from the characteristic point detector, and corrects the video signal input to the input unit. For example, as a part of Android, the Accused Samsung '645 Products perform color correction with the SoC in order to control color temperature of an input video signal. Upon

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
corrects the video signal input to the input unit; and	information and belief these corrections are based on one or more of luminance, hue, saturation levels/distributions. For example, color correction and white balance transforms to approximately CIE standard illuminant D65 or F2 control color temperature of an input video signal:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

COLOR_CORRECTION_MODE

Added in API level 21

```
public static final Key<Integer> COLOR_CORRECTION_MODE
```

The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.

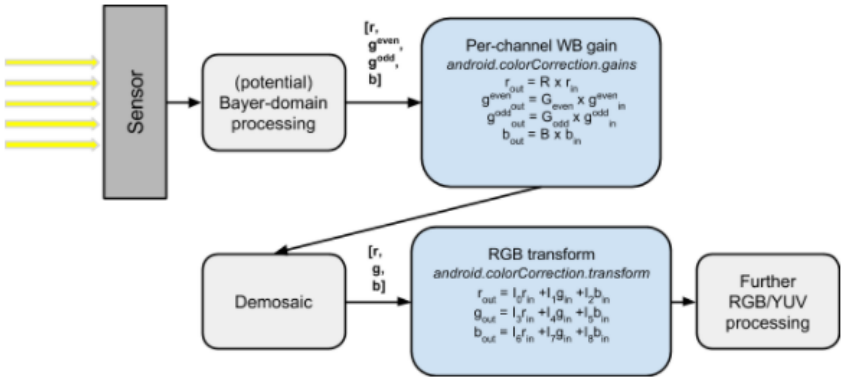
When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.

We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX.

When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct.

Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame.

The expected processing pipeline is as follows:



https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE

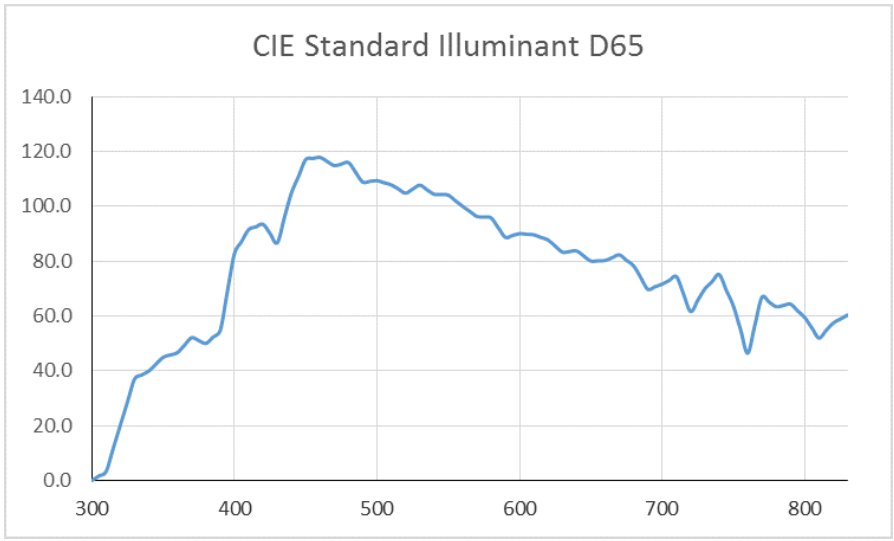
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

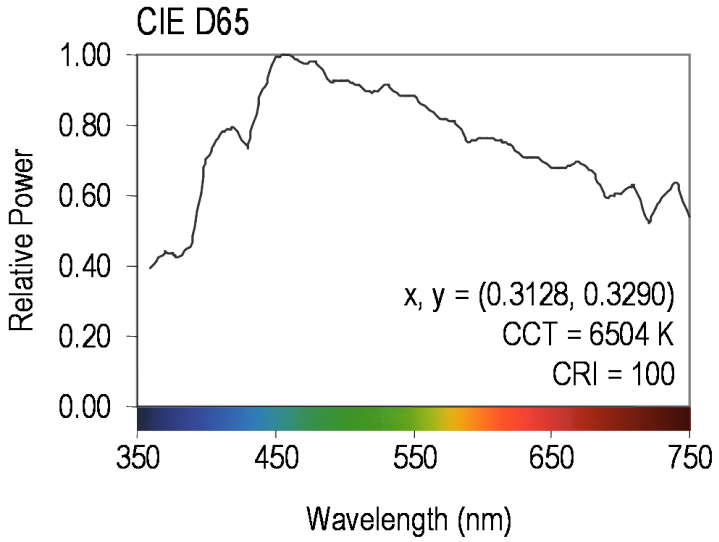
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

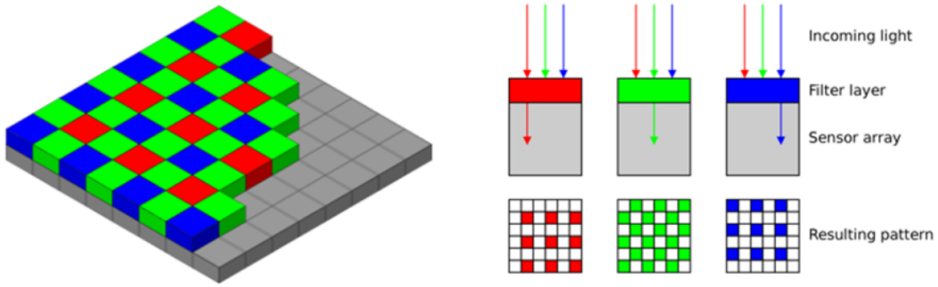
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_AWB_MODE_DAYLIGHT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_DAYLIGHT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT
	
	CONTROL_AWB_MODE_FLUORESCENT
	Added in API level 21
	
	`public static final int CONTROL_AWB_MODE_FLUORESCENT`
	
	The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.
	
	While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.
	
	The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.
	
	https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Upon information and belief, the color correction applied by each of the Accused Samsung '645 Products controls color temperature of an input video signal. For example, white balance transforms that approximately match CIE standard illuminants such as D65 or F6 control color temperature of an input video signal. *See Numerical modeling of color perception of optical radiation*, Mathematical Modelling and Geometry, April 2018 (https://www.researchgate.net/publication/325391159_Numerical_modeling_of_color_perception_of_optical_radiation) ("The CIE standardized the illuminants A and D65 (correlated color temperature of approximately 6504 K) as its primary colorimetric illuminants and one of them should be used whenever possible. Figures 5 and 6 from [2, 5] shows the relative spectral power distribution of CIE Standard Illuminants A and D65.").  Figure 5: Relative spectral power distribution of CIE Standard Illuminant D65.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://en.wikipedia.org/wiki/Illuminant_D65 Additionally, on information and belief, the Samsung Galaxy S25 includes an image signal processor (ISP) and/or digital signal processor (DSP) that corrects a video signal input to the input unit, for example, by performing white balance correction. Further, the Accused Samsung '645 Products including a combination or hardware and software to implement numerous image corrections tools such as AI tools and/or Scene Optimizer that perform numerous types of corrections:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	3. WB (White Balance)[3] This block helps the camera adjust the color balance and render them accurately. It ensures that an image has a uniform WB Gain and that the RGB of the grey (achromatic) areas are adjusted to the same value (to depict the grey as grey). The sensor output fed to ISP has twice as many green channels as any other. This is the reason why the raw image before the application of WB Gain looks green overall. (Refer to 'De-mosaic' below) **4. De-mosaic (= Bayer Interpolation, Color Interpolation)** Most smartphone cameras use the Bayer type (or pattern) sensor. The Bayer sensor, as illustrated below [2] is 3 color filter combination sensor mounted on top of a photodiode array.  https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145

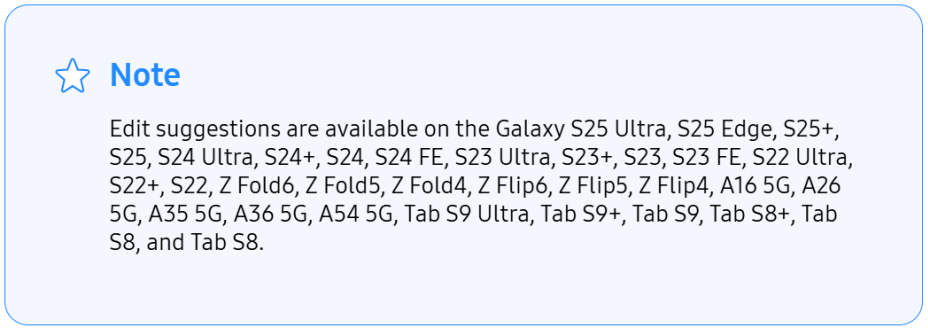
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	FD (Face Detection) This block detects faces in an image/video and passes their coordinates to the next block. The face coordinates can be used in other algorithms or solutions to implement different features. **[Example of application] Using FD information in AWB (Auto White Balance) and AE (Auto Exposure) algorithm blocks** 1. When a face is detected, it compares and corrects the difference between the face brightness and the targeted brightness of the whole image. It utilizes the face coordinates received, to adjust the face brightness, etc. 2. When multiple sources are detected illuminating a face and the face is overly affected by these lights, this FD data can be used to correct the color on it. For example, if a face is detected in a low-color temperature light setup giving off a slightly reddish glow, the face coordinates are used to adjust the color of the face. https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145 Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part."

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/ **Use AI editing tools in Gallery on your Galaxy phone or tablet** The new editing features on select **Galaxy phones and tablets** will transform your favorite photos into masterpieces! Thanks to Galaxy AI, you can use features like Generative edit and Edit suggestions to move objects within your photos and automatically receive enhancement recommendations. You can also use the Galaxy Enhance-X app to take things further with more editing options that include blur removal and brightness adjustment.

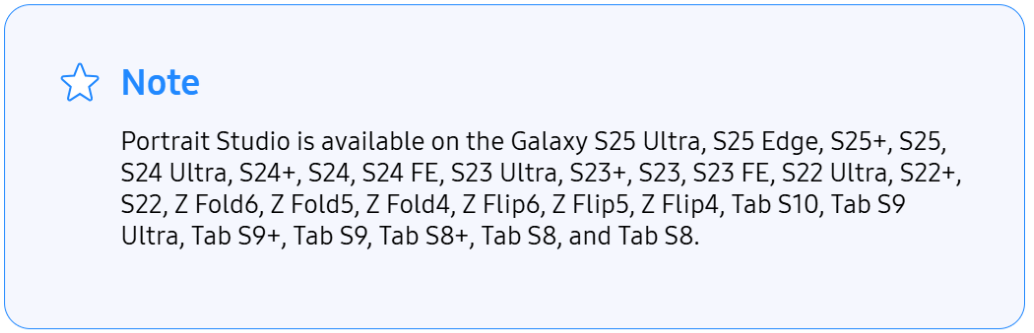
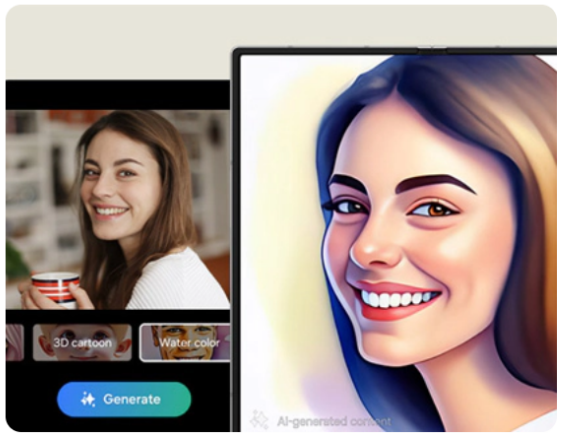
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

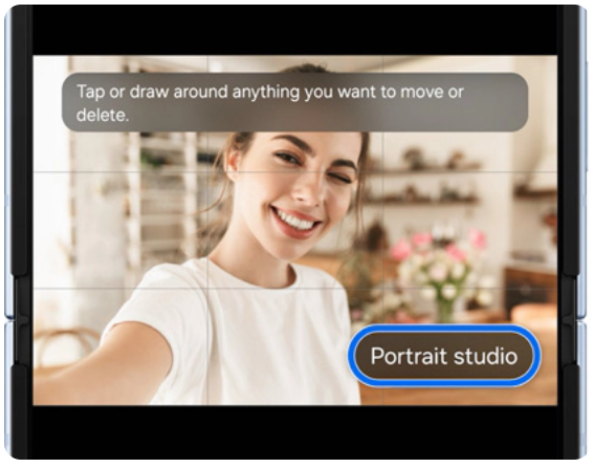
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

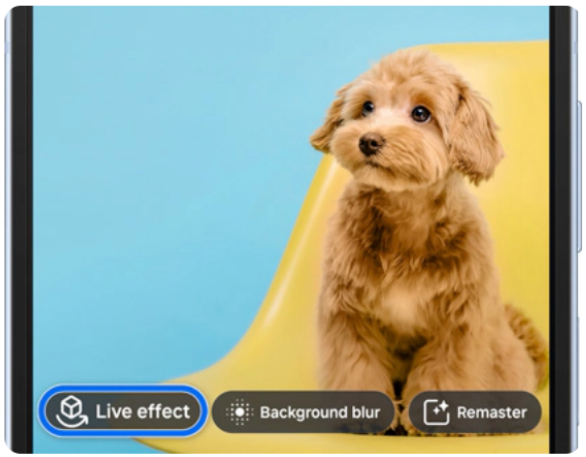
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions   **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

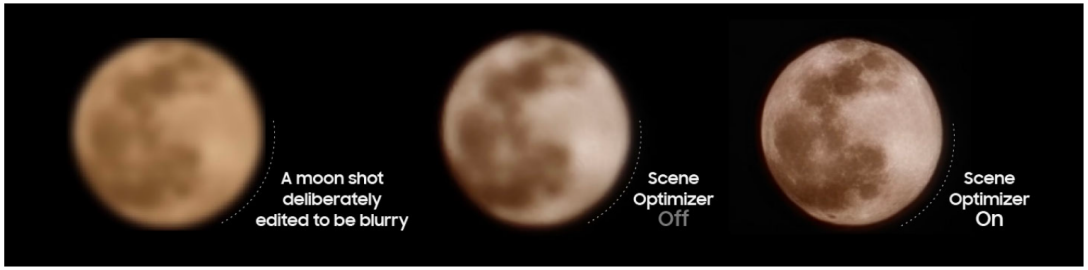
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

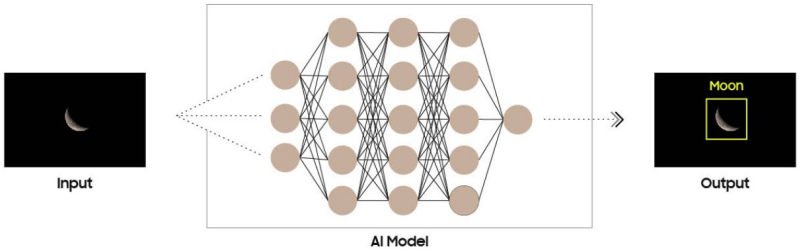
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

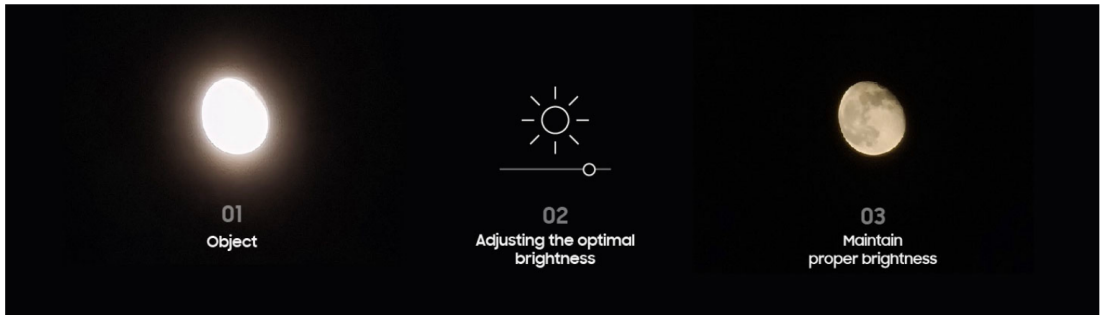
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

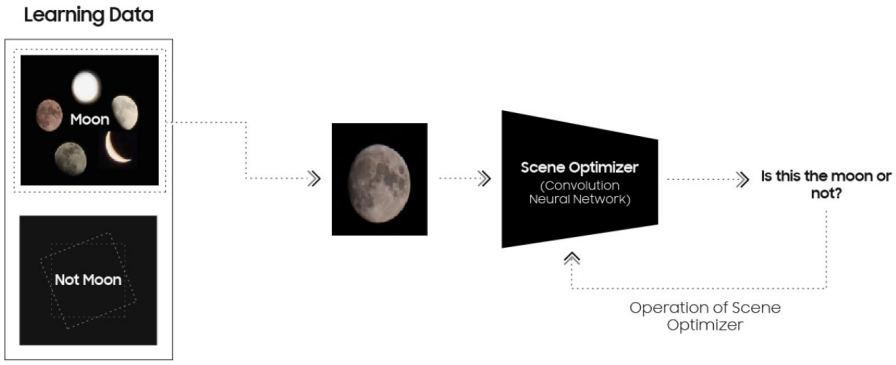
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

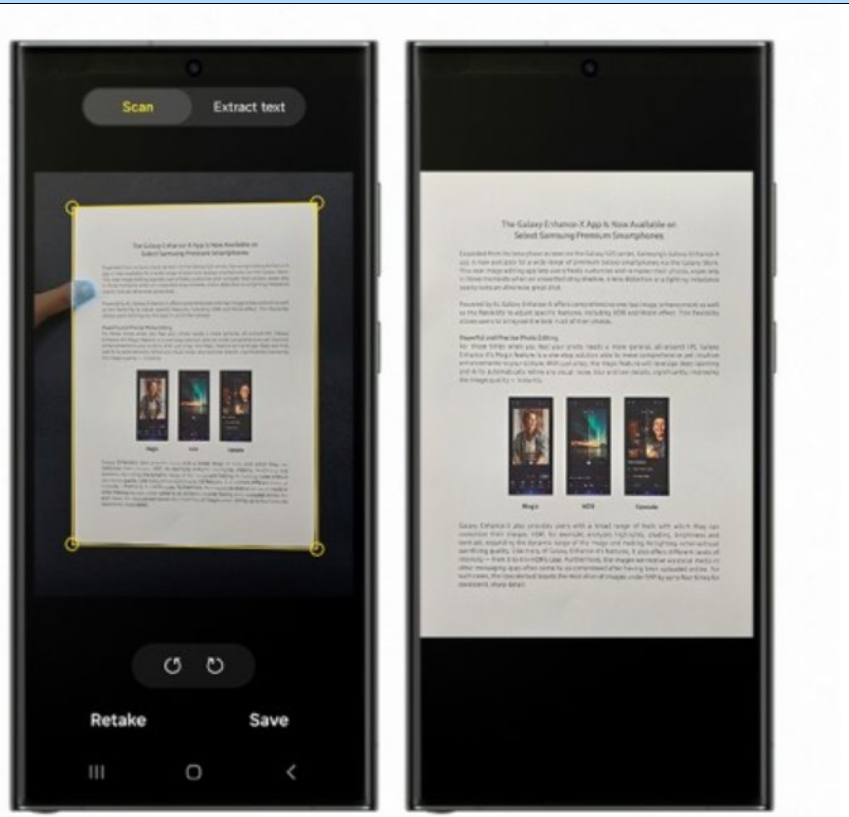
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

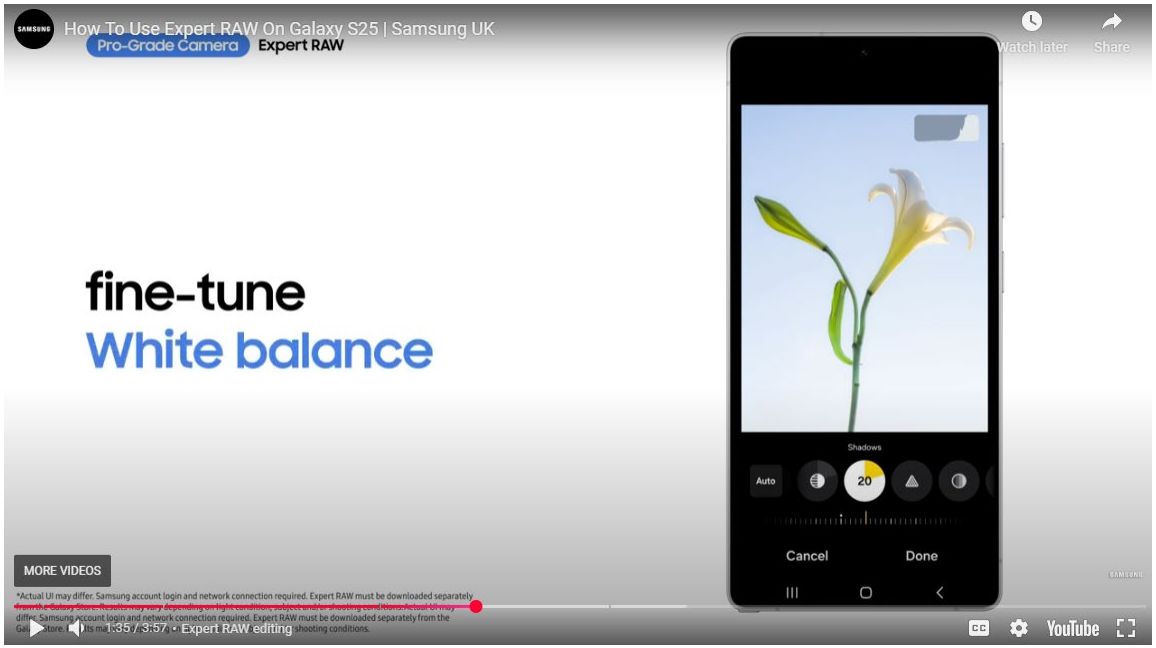
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

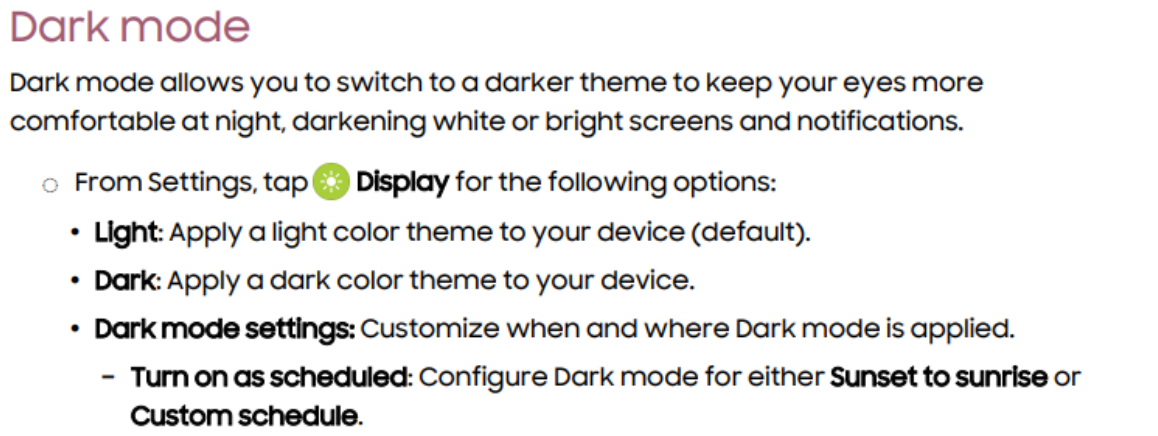
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Document Scan https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

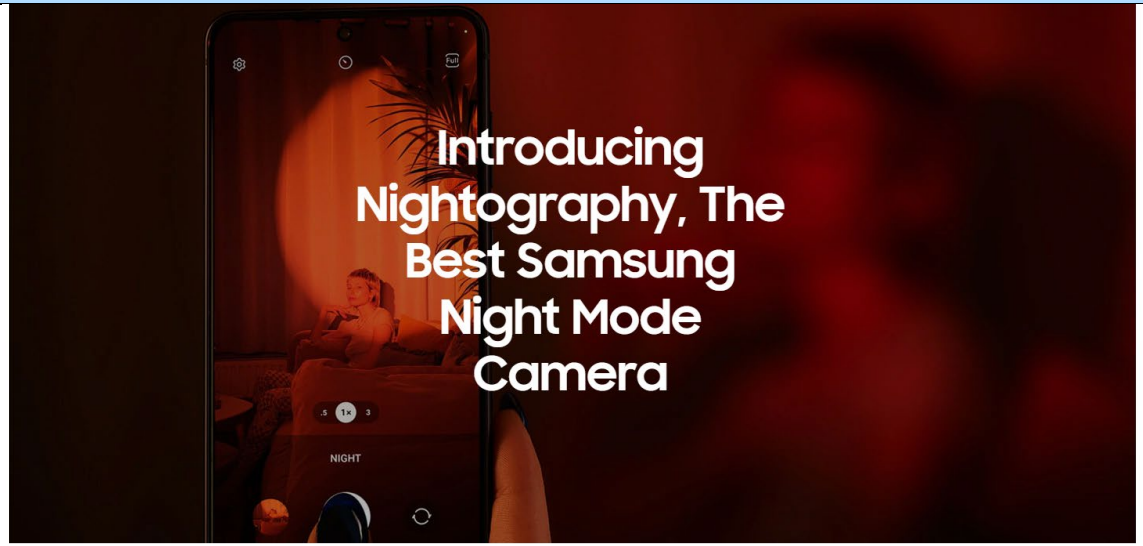
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap Display > Adaptive color tone and tap to enable this feature. *Id*. at 116.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Screen mode Your device has several screen mode options which adjust the screen quality for different situations. You can select the mode according to your preference. 1. From Settings, tap Display > Screen mode. 2. Tap an option to set a different screen mode. • Drag the slider to adjust the white balance. • Tap **Advanced settings** to manually change the RGB values. *Id*. at 117. Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images.

What does Night Mode do?

Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

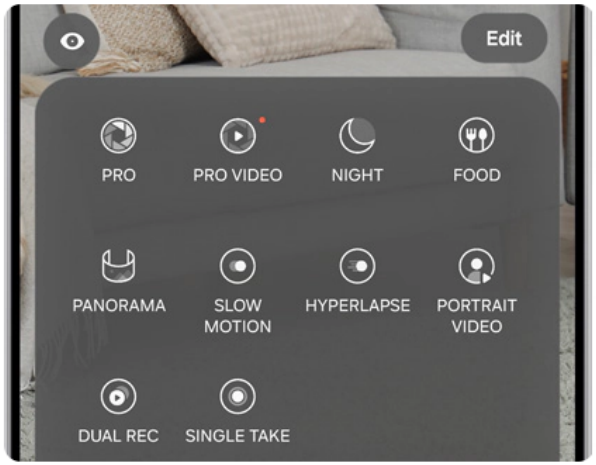
Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Further, all of the Accused Samsung '645 Products have Portrait Mode (with various filters such as a beauty filter), which is activated when the face of an individual is nearby and certain light conditions are met, as well as a face detection mode, in which a bounding box is generated when a face is detected and FD-AWB is performed.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

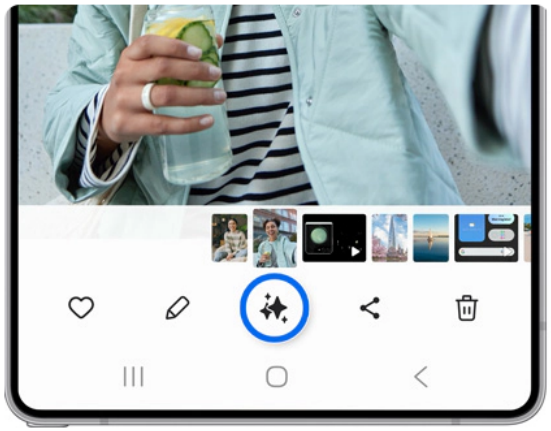
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Portrait Studio

If you'd like to change up your portraits using unique styles, just follow the steps below.

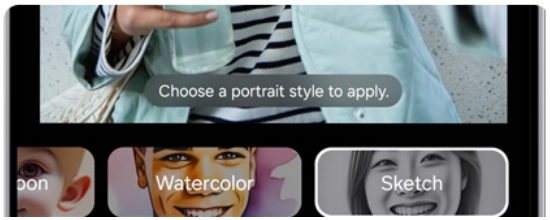
1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit.

2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.

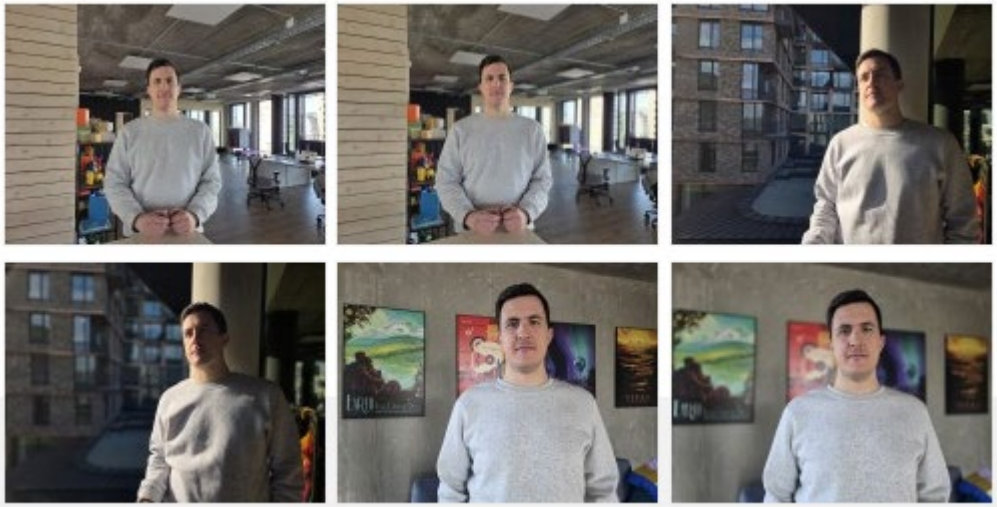


3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch.

4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.



https://www.samsung.com/us/support/answer/ANS10004857/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php) As an additional example, the Accused Samsung '645 Products include a corrector for correcting the video signal in scanner or equivalent camera mode:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

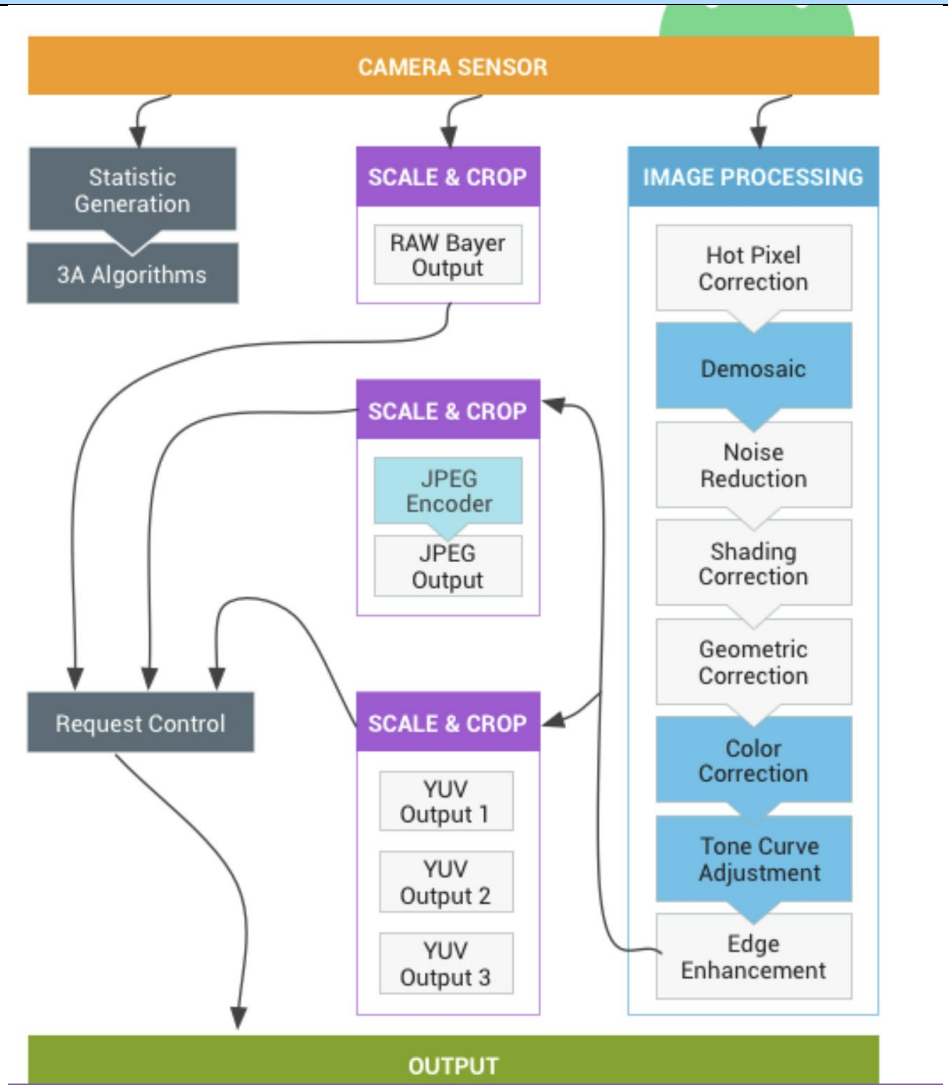
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

Doctrine of Equivalents

To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the

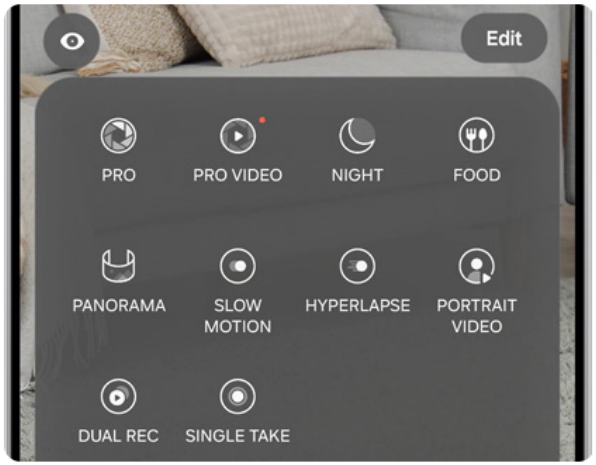
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a corrector which corrects the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of correcting the video signal that is input using luminance/saturation/hue levels/distribution. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, correcting video signal) in substantially the same way (e.g., performing image processing). The performance of this function achieves substantially the same result, for example, the correction of video signals. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and correction of video signals. These components and/or software operate together and function in substantially the same way to facilitate video correction based on luminance/saturation/hue levels/distribution. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a corrector.
[3.e] a controller which controls the corrector to cause the corrector not to change the correction characteristics in the corrector when the pattern portions are contained.	Each of the Accused Samsung '645 Products include a controller which controls the corrector to cause the corrector not to change the correction characteristics in the corrector when the pattern portions are contained. For example, upon information and belief, certain corrections are applied when pattern portions are contained and certain corrections are performed when pattern portions are not contained. For example, foliage or snow scene corrections are not performed when pattern portions corresponding to such scenes are not detected but additional image corrections are performed (e.g., face corrections and portrait mode corrections are applied). Similarly, certain white balance corrections are not performed when a white or black background is not contained but additional white balance corrections are applied to the content. Further, text

<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>
scanning corrections are not performed when text is not detected but additional image corrections are applied. Moreover, image corrections to the foreground (e.g., the face of a person or object being captured) are applied but corrections to the background are not applied if a white or black background is not detected. Further if the face is close to the camera such that a background is not detected, then the face corrections are applied but background corrections are not applied and background pattern portions are not contained. Thus, upon information and belief, when certain corrections are not performed when pattern portions are contained, the controller controls the corrector to not change correction characteristics for certain corrections because those corrections are not being performed.

For example, each of the Accused Samsung '645 Products performs color temperature corrections based on detection of face, in Portrait Mode, and/or based on zoom value detection that causes the cameras to switch and make corrections based on the selected camera's parameters. In this mode, when an individual wearing clothing containing a chromatic color (e.g., a red patterned shirt) stands in front of a white or black patterned background (e.g., snow, foliage, or a wall), the background is corrrected (e.g., blurred), while the individual and his or her colored clothing is not.
<table>
<tr><th>Input</th><th>Pattern</th><th>Pattern Contained</th><th>Video with Contents</th><th>Correction</th></tr>
<tr><td> 
Portrait Photo</td><td>Cloud</td><td>Yes</td><td>Cloth</td><td>No Correction.
No Blur</td></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Person in front of a white wall	Wall	Yes	Face	No Correction. No Blur
	 Book Scan	Text	Yes	Scanned image	No Correction. No Blur

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Face close up	Cloth	Yes	Face	No White balance correction.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

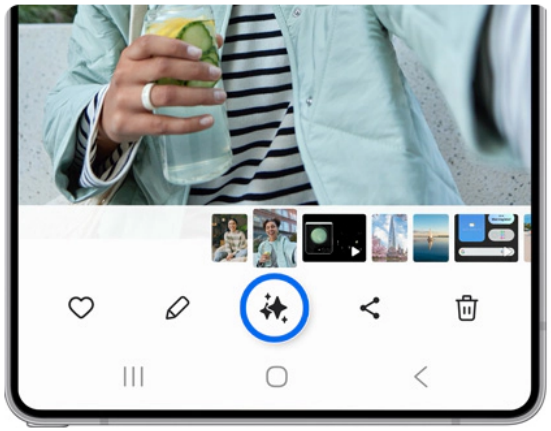
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Portrait Studio

If you'd like to change up your portraits using unique styles, just follow the steps below.

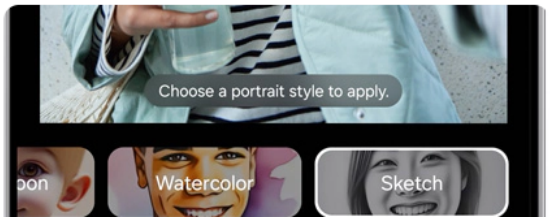
1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit.

2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.



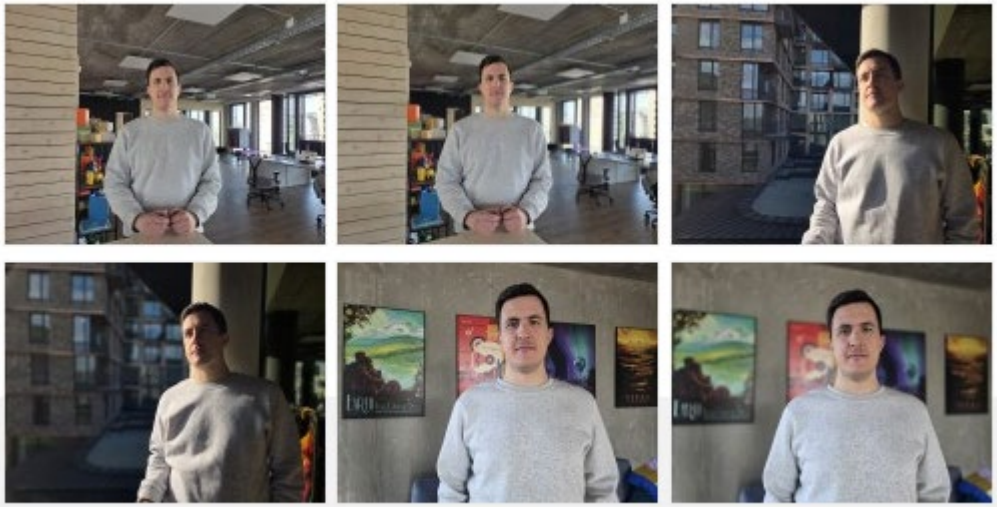
3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch.

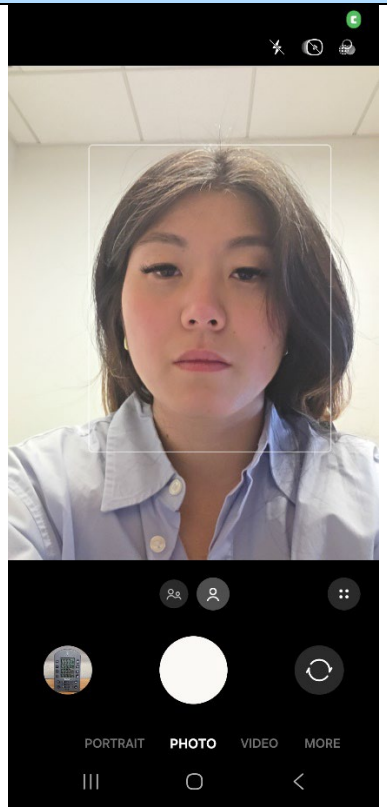
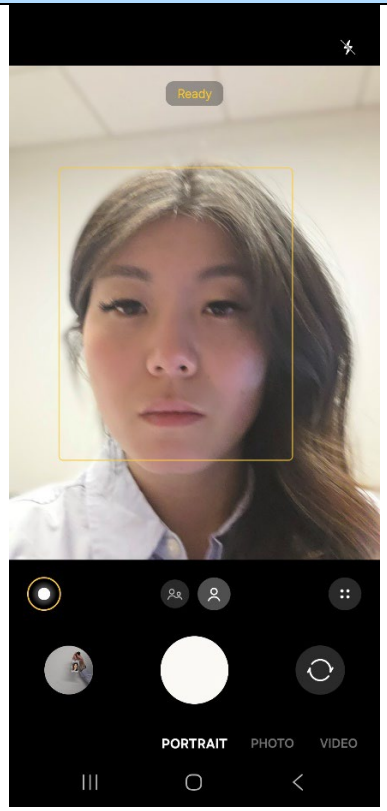
4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.

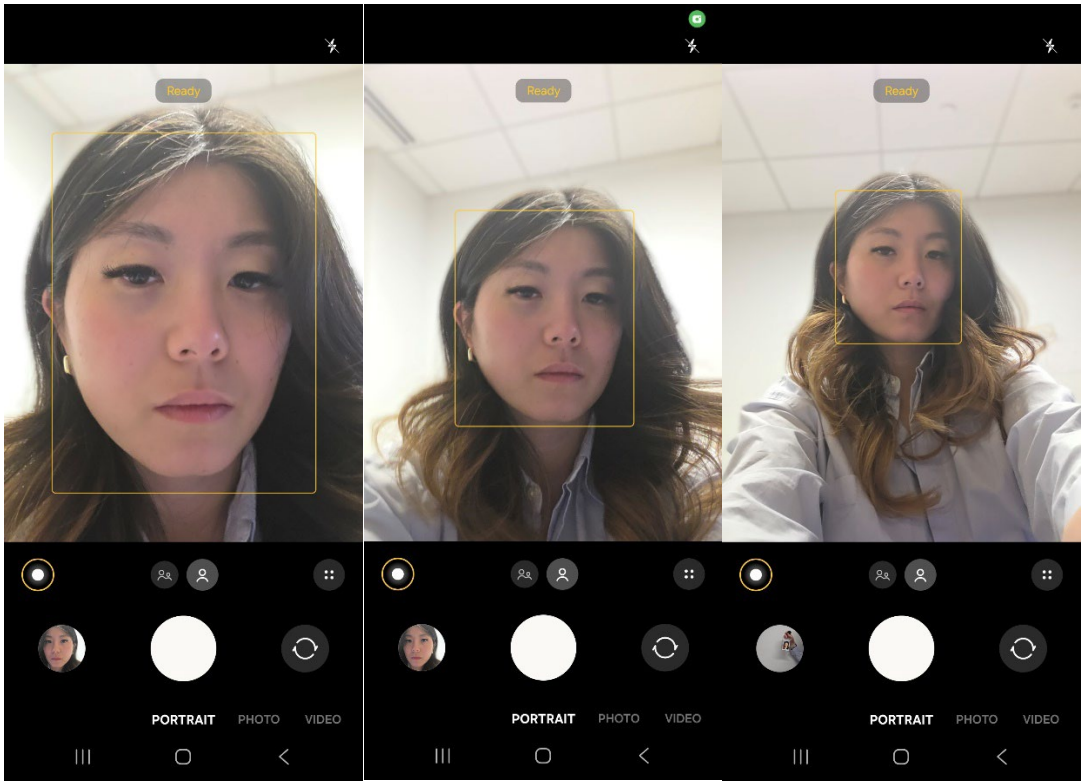


https://www.samsung.com/us/support/answer/ANS10004857/

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products performs white balance corrections on the face when a face is detected but does not perform these corrections to the background or the clothes. Similarly, the Accused Samsung '645 Products perform corrections on the background or the chromatic clothes but does not perform these corrections on the face.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes. As an additional example, the Accused Samsung '645 Products detects white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	white attributes in the scene. In this scenario, color temperature corrections would occur based on a white patterned background, but not occur for chromatic colors in the scene.
	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

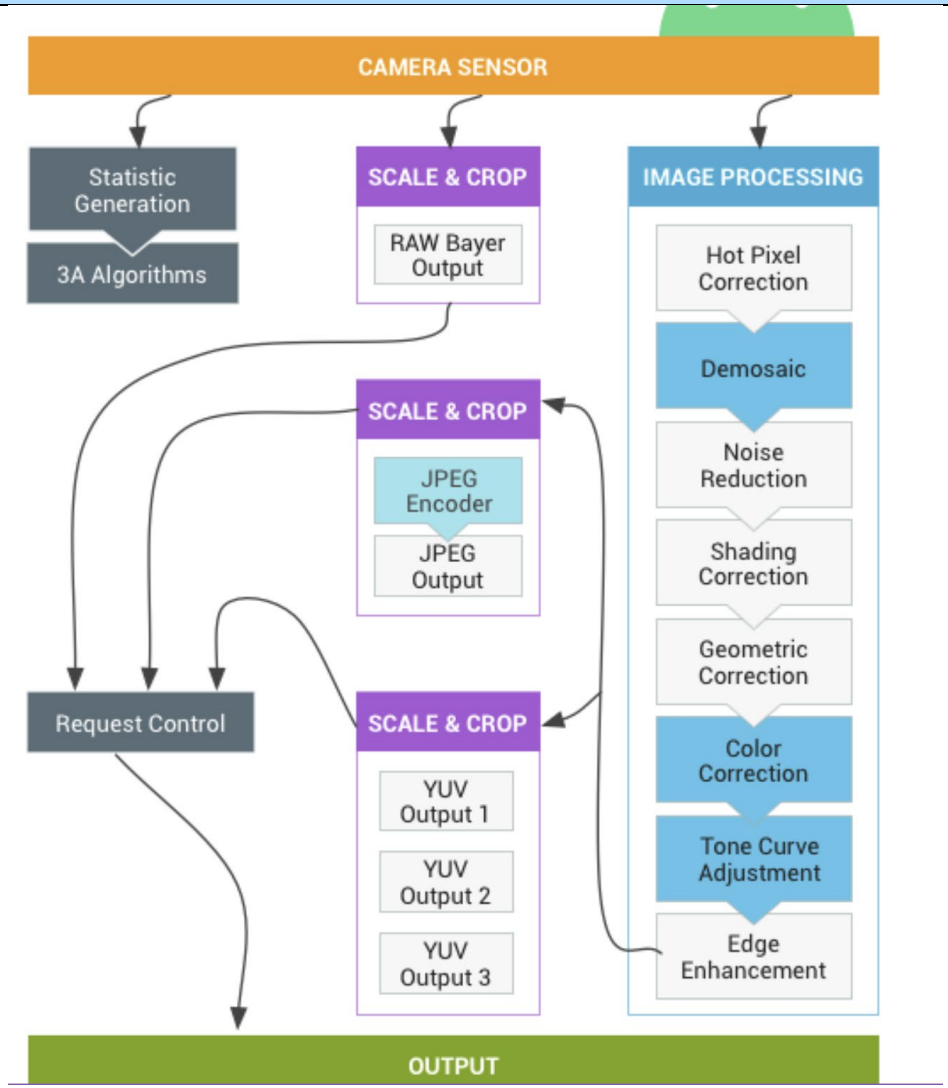
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products stop update of the data for correcting video signal of the background in scanner or equivalent camera mode. For example, upon information and belief the corrections applied to the scanned page are not applied to the colorful background: **Scan and edit documents on your Galaxy phone or tablet**  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result.

<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a controller that controls the corrector to cause the corrector to not correct the video signal input to the input unit when the pattern portions are contained, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling the corrected to correct video signal. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, controlling corrector) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, controlling corrector to not change correction characteristics. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate control of the corrector. That this functionality may be divided across several components (including software and/or hardware, e.g., one or more processors) does not preclude these components from collectively functioning as a controller.</td></tr>
<tr><td>[4.] The video processing apparatus according to claim 1, wherein the pattern portions are wallpaper areas or no-picture areas having a single color added to left and right of the contents or above and below the contents and displayed.</td><td>Each of the Accused Samsung '645 Products includes a video processing apparatus, wherein the pattern portions are wallpaper areas or no-picture areas having a single color added to left and right of the contents or above and below the contents and displayed first detector which detects a color of light in the surroundings.

For example, the pattern portions can correspond to the white background and/or black background, wallpaper areas, and/or no-picture areas when a person is standing in front or an object is placed in front of a wall or snow such that the picture area is the person or object in the foreground and the pattern portion is the background. As an additional example, the pattern portion can be the white page in a picture of the text in scanning mode.
<table>
<tr><th>Input</th><th>Pattern</th><th>Pattern Contained</th><th>Video with Contents</th><th>Correction</th></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Person in front of a white wall	Single red color area	No	Face	Beauty face correction applied
	 Book Scan	Wall paper	No	Scanned image	Scan correction applied

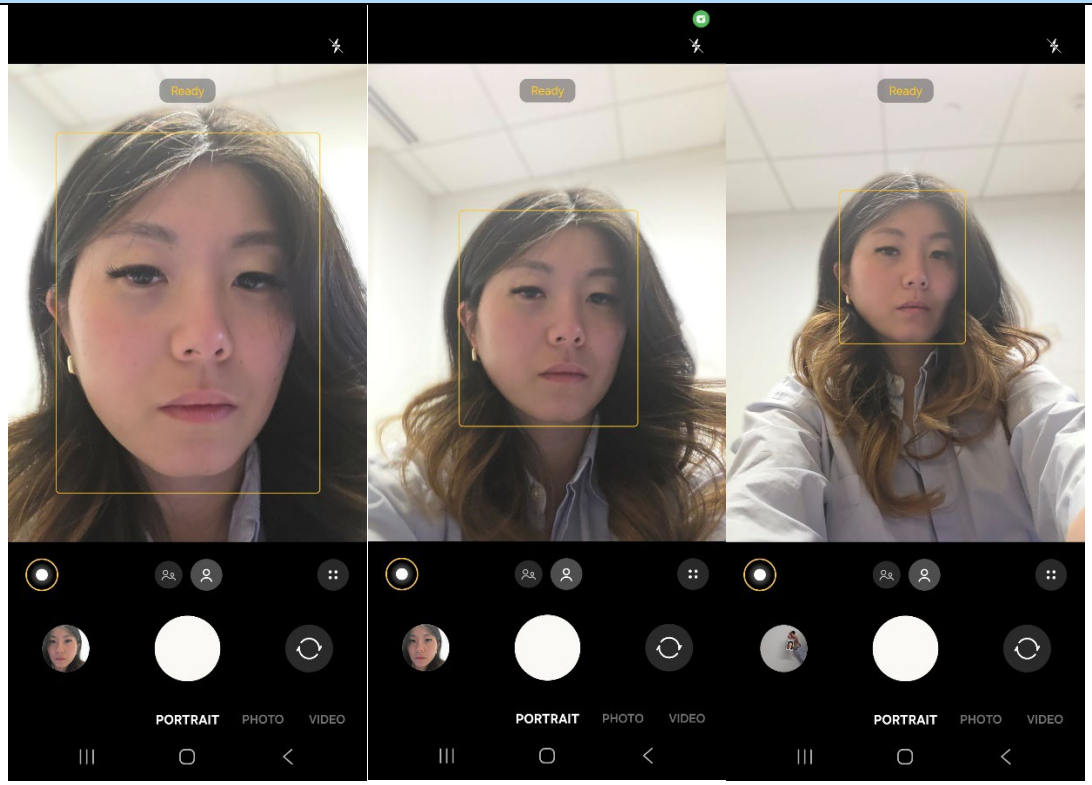
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

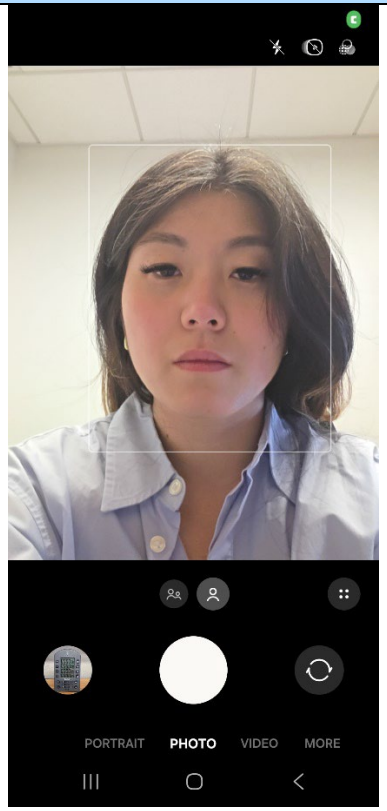
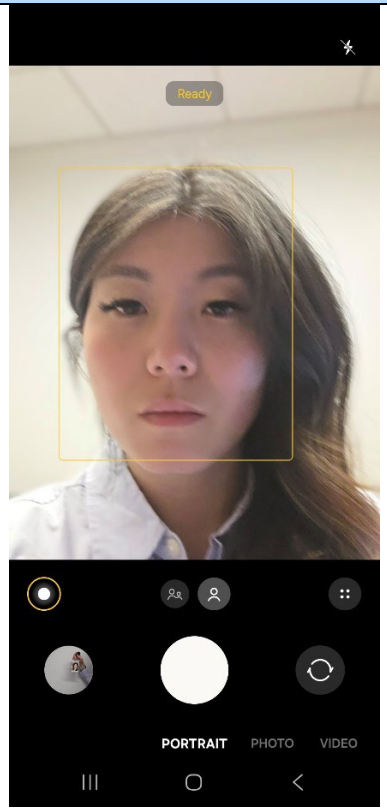
 Face close up	Single red color area	No	Face	Beauty face correction applied

Input	Pattern	Pattern Contained	Video with Contents	Correction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Person in front of a white wall	Wall paper	Yes	Face	No blur
	 Book Scan	Single white/black color area	Yes	Scanned image	No blur

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Face close up	Wall paper	Yes	Face	No white balance correction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/
[5.pre] A video processing apparatus comprising:	To the extent the preamble is construed as a limitation, each of the Accused Samsung '645 Products is a video processing apparatus. For example, the Samsung Galaxy S25 includes front and back cameras for recording video, a display for displaying video, and one or more processors (e.g., a CPU, ISP, and/or DSP) with image and video processing capability:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

MAIN CAMERA	Triple	50 MP, f/1.8, 24mm (wide), 1/1.56", 1.0µm, dual pixel PDAF, OIS
		10 MP, f/2.4, 67mm (telephoto), 1/3.94", 1.0µm, PDAF, OIS, 3x optical zoom
		12 MP, f/2.2, 13mm, 120˚ (ultrawide), 1/2.55" 1.4µm, Super Steady video
	Features	Best Face, LED flash, auto-HDR, panorama
	Video	8K@24/30fps, 4K@30/60fps, 1080p@30/60/120/240fps, 10-bit HDR, HDR10+, stereo sound rec., gyro-EIS
SELFIE CAMERA	Single	12 MP, f/2.2, 26mm (wide), 1/3.2", 1.12µm, dual pixel PDAF
	Features	HDR, HDR10+
	Video	4K@30/60fps, 1080p@30fps

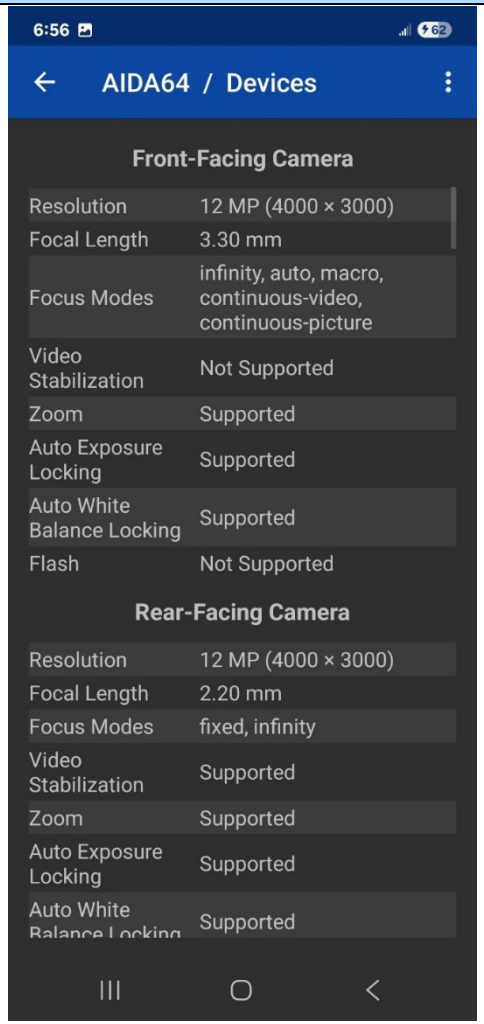
https://www.gsmarena.com/samsung_galaxy_s25-13610.php

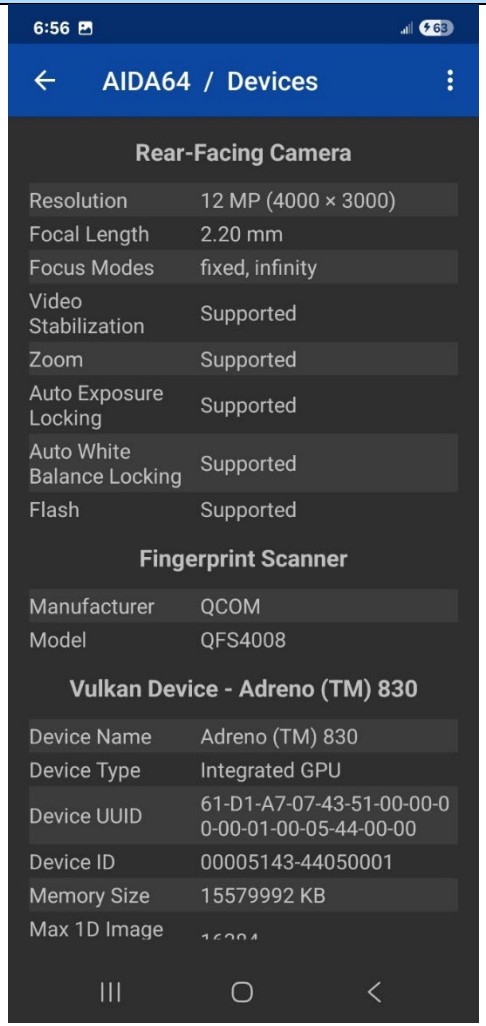
DISPLAY	Type	Dynamic LTPO AMOLED 2X, 120Hz, HDR10+, 2600 nits (peak)
	Size	6.2 inches, 94.4 cm^2 (~91.1% screen-to-body ratio)
	Resolution	1080 x 2340 pixels, 19.5:9 ratio (~416 ppi density)
	Protection	Corning Gorilla Glass Victus 2
		Always-on display
PLATFORM	OS	Android 15, up to 7 major Android upgrades, One UI 7
	Chipset	Qualcomm SM8750-AB Snapdragon 8 Elite (3 nm)
	CPU	Octa-core (2x4.47 GHz Oryon V2 Phoenix L + 6x3.53 GHz Oryon V2 Phoenix M)
	GPU	Adreno 830

Id.

In addition, the AIDA64 Reports show that each of the Accused Samsung '645 Products contains a front-facing and rear-facing camera for recording video, and associated software, which in conjunction with one or more processors (e.g., CPU, ISP, or DSP) processes video.

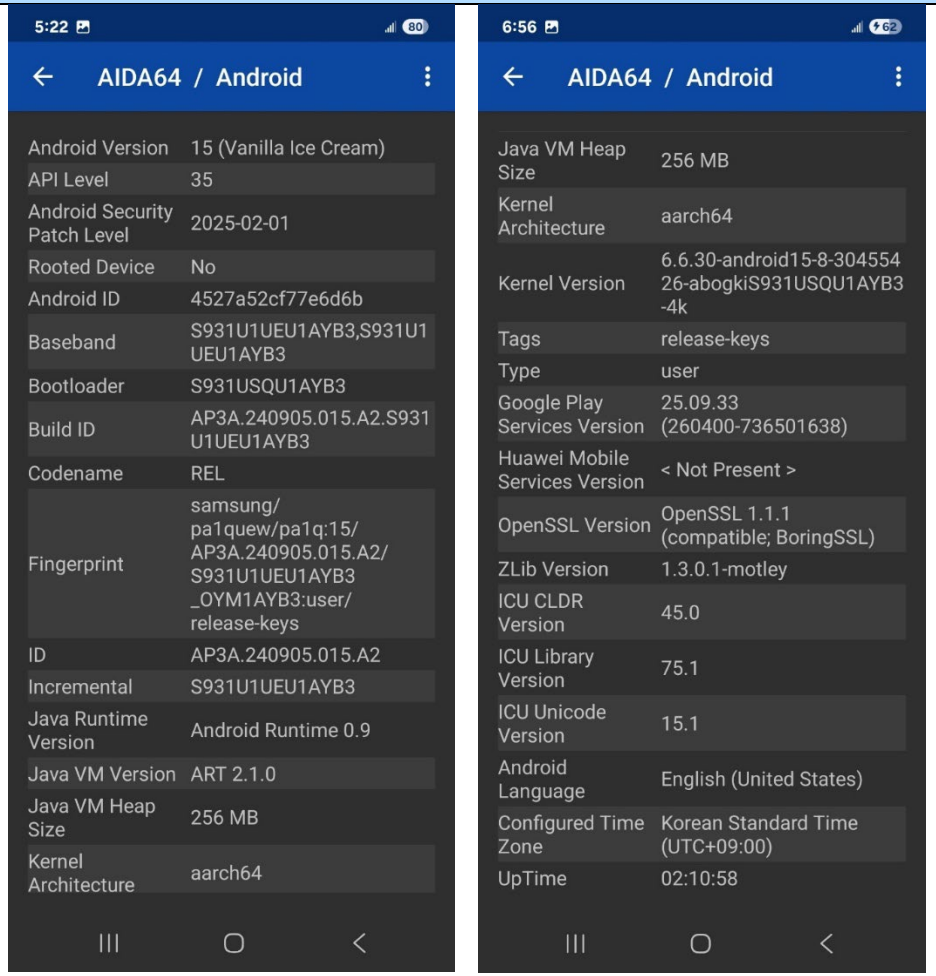
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement





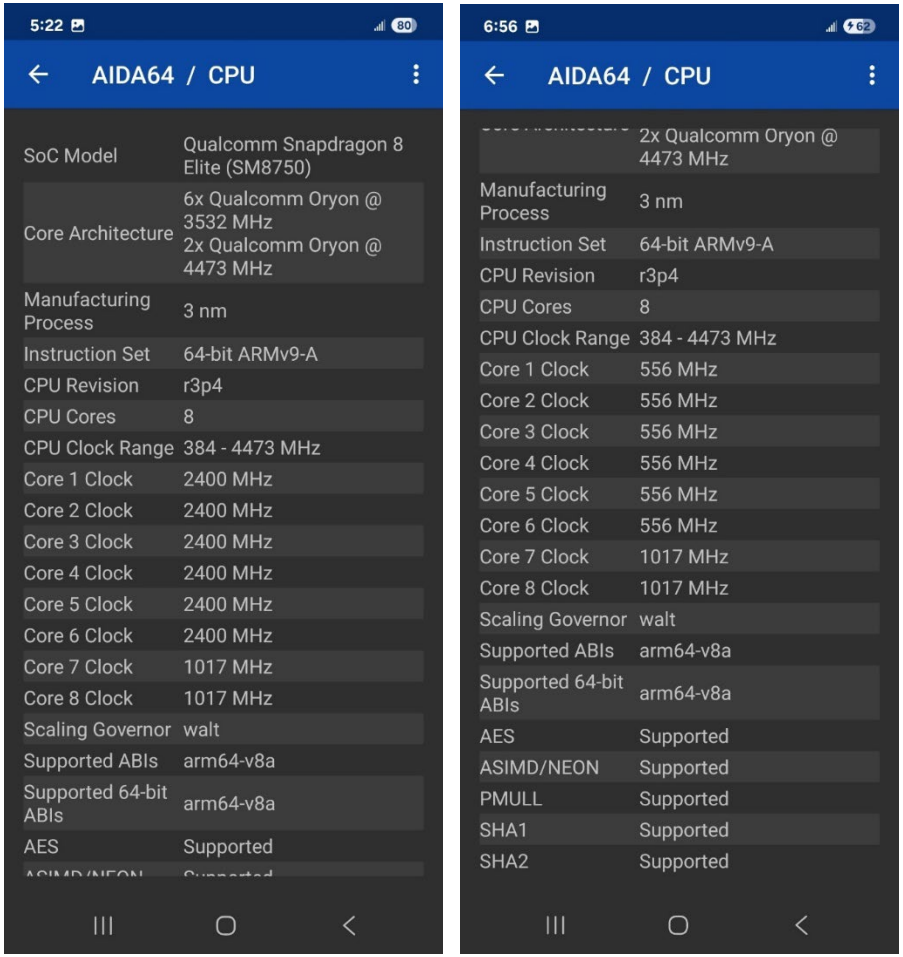
(Screenshot of AIDA 64 Report – Camera)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

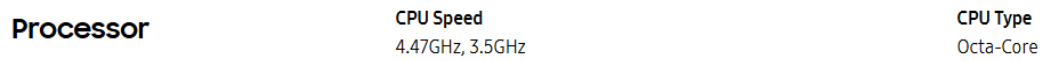
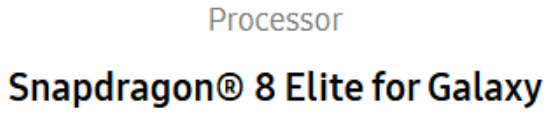


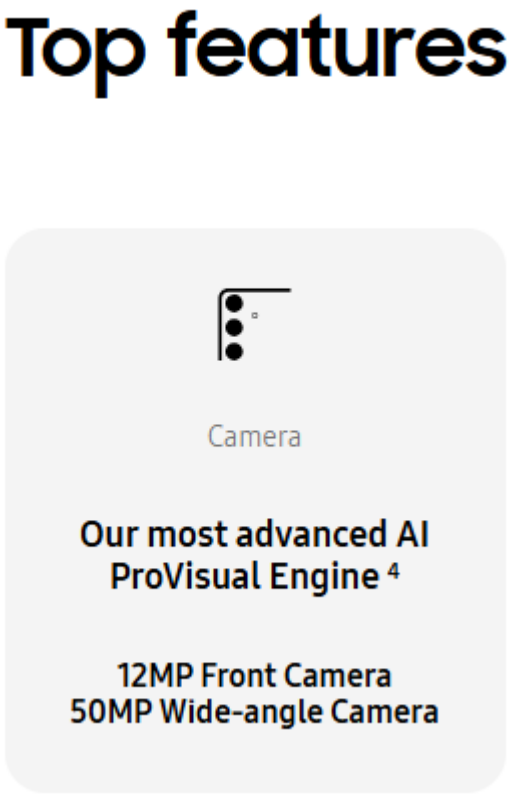
(Screenshot of AIDA 64 Report – Android)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The AIDA64 Reports and tech specs show that the Accused Samsung '645 Products contain one or more processors.

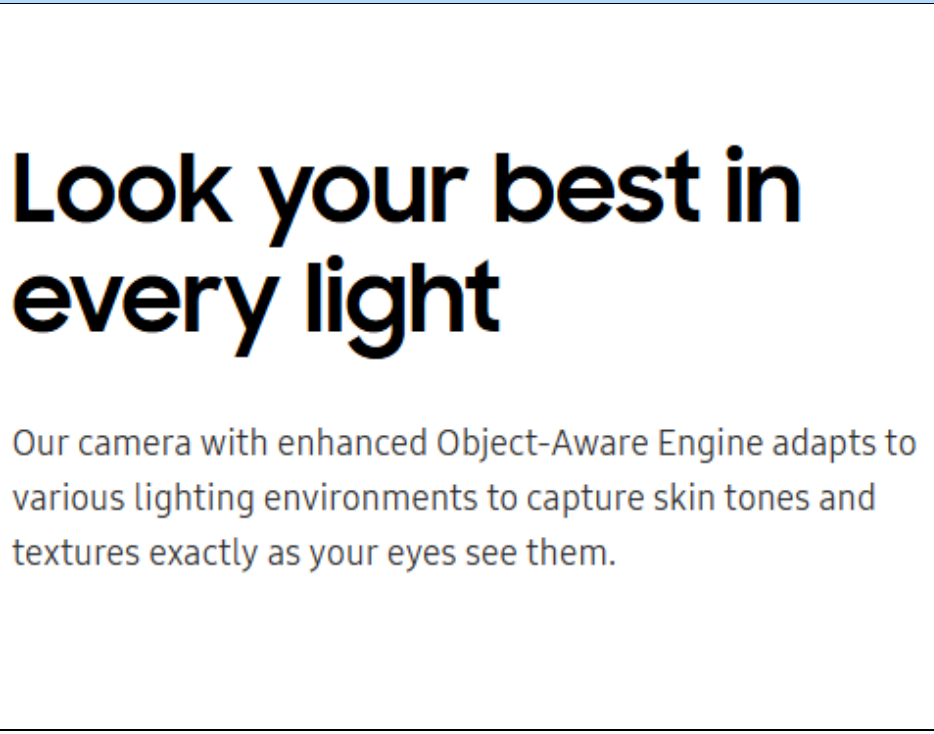


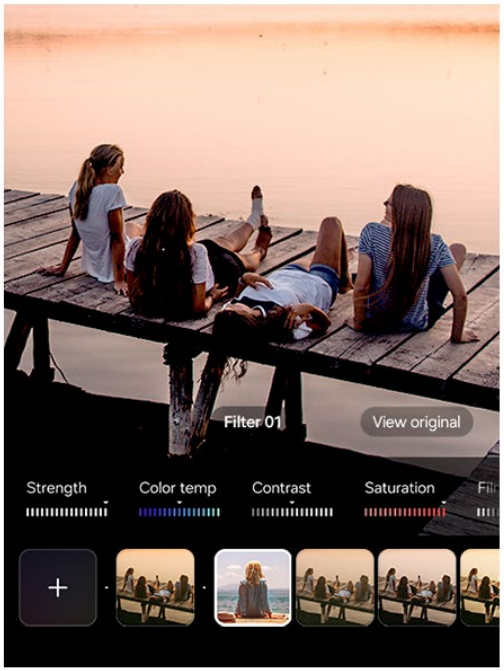
(Screenshot of AIDA 64 Report – Processor)

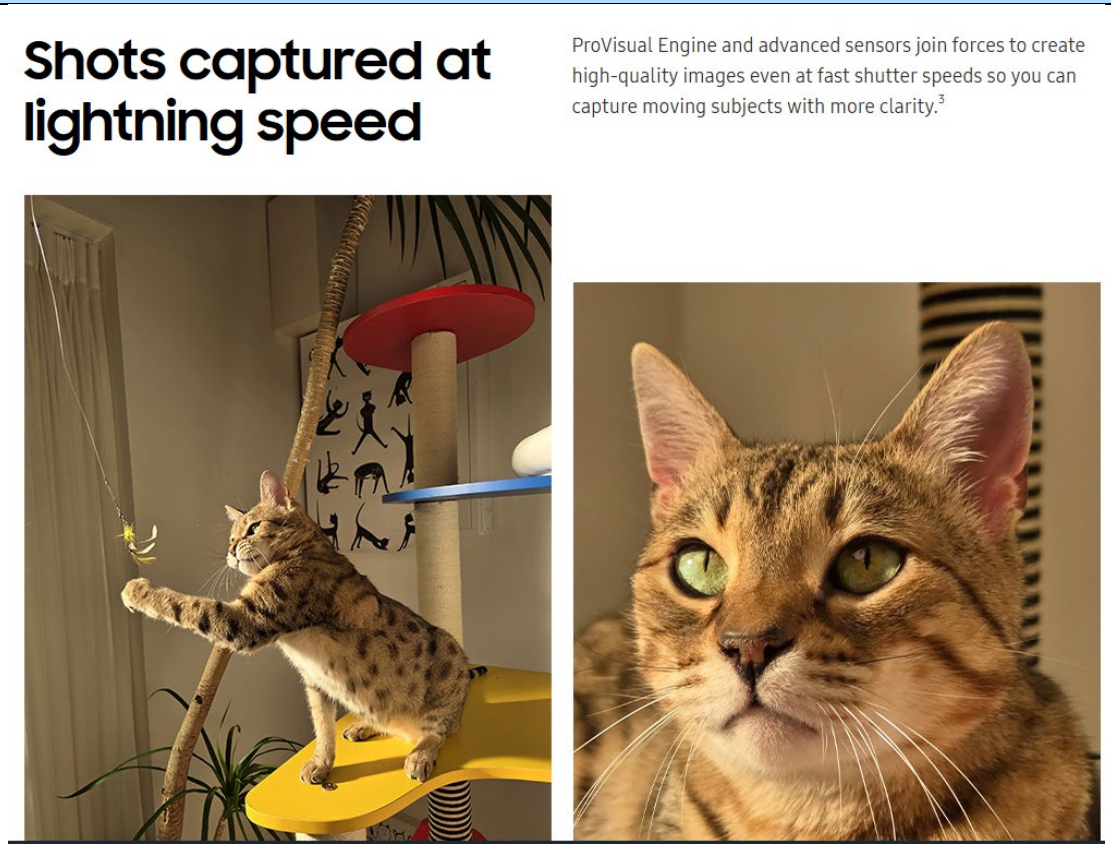
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/uk/smartphones/galaxy-s25/specs/  https://www.samsung.com/uk/smartphones/galaxy-s25/compare/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

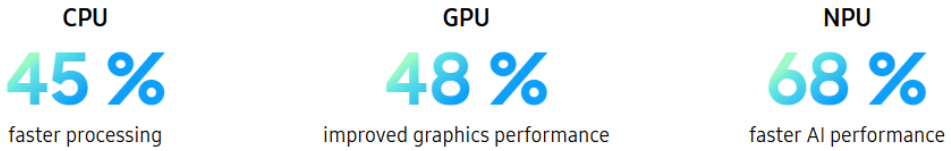
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 ProVisual Engine is now boosted by our powerful processor. Experience our advanced creative system for video and photo capturing, viewing and editing that you have to see to believe.[20] Shoot in improved 10-bit HDR for a stunning videography experience. Our advanced processor also delivers more precise noise removal meaning you won't have to worry about grainy night footage again.[3,4]

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 **Filters just for you** Bring pics to life with personalized filters. Galaxy AI analyzes your photo and creates a filter to match. Use it instantly or customize further with tweaks to the saturation, brightness and more. How to use Filters

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25/ Further, as an example, the Qualcomm Snapdragon 8 Elite Mobile Platform in the Samsung Galaxy S25 includes a processor for processing image signals:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Introducing our most powerful processor, customized for Galaxy. With improved real-time ray tracing and Vulkan optimization, dive deep into the action with ultra-smooth gameplay thanks to Snapdragon® 8 Elite Mobile Platform for Galaxy.[21,22,23,24]  https://www.samsung.com/us/smartphones/galaxy-s25/

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Powerhouse Qualcomm Oryon CPU defines a new mobile era

The first-in-mobile Qualcomm Oryon CPU delivers a 45% performance boost, 44% greater power efficiency, and the mobile industry's largest shared data cache. Our Qualcomm® Adreno GPU with newly sliced architecture achieves 40% enhanced performance and 40% improved efficiency. System-wide, experience an overall power savings of 27%.



Multimodal Gen AI at your fingertips

The Qualcomm® AI Engine boasts the fastest Qualcomm® Hexagon NPU, delivering a 45% AI performance improvement and 45% better performance per watt. Plus, multimodal Gen AI support and longer token inputs will help you become an expert on any topic.



AI-powered camera redefines photography

Our AI ISP is directly fused with the Qualcomm® Hexagon™ NPU to offer industry-leading camera features, like limitless Semantic Segmentation at 4K resolution. Plus, our on-device video object eraser, can remove unwanted elements from videos, while Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions.



Power and efficiency for revolutionary gaming

Mobile-first support for Unreal Engine 5's Nanite solution enables astonishing film-quality 3D environments in smartphone gaming —while maximizing efficiency. Plus, support for Unreal's Chaos Physics Engine delivers lifelike object interactions and simulations, even in complex scenes.



Studio-quality audio

Our Snapdragon Sound™ Technology Suite with Qualcomm® aptX™ Lossless Technology delivers up to 24-bit 48kHz bluetooth music streaming and up to 24-bit 96kHz Wi-Fi music streaming. Qualcomm® Expanded Personal Area Network (XPAN) technology enables whole-building untethered audio coverage -- aided by ultra-low power Wi-Fi 7.

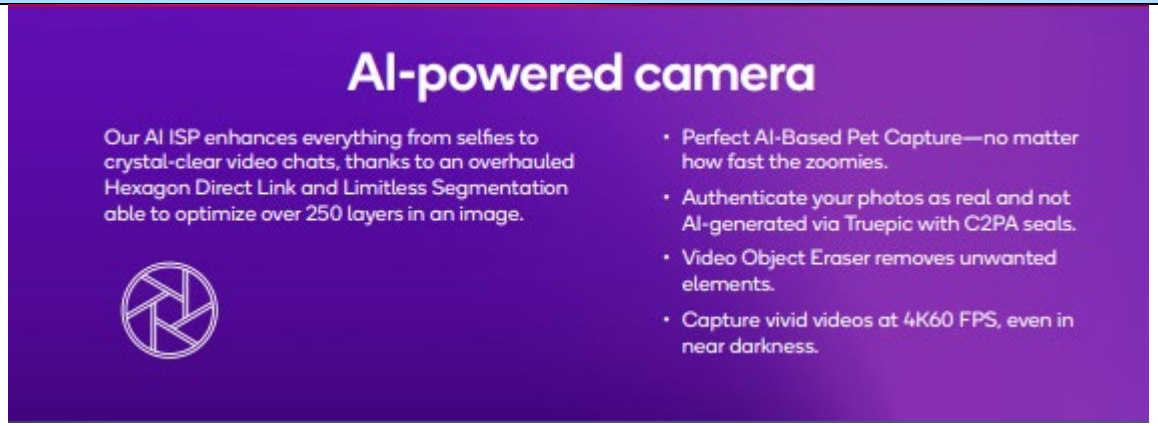


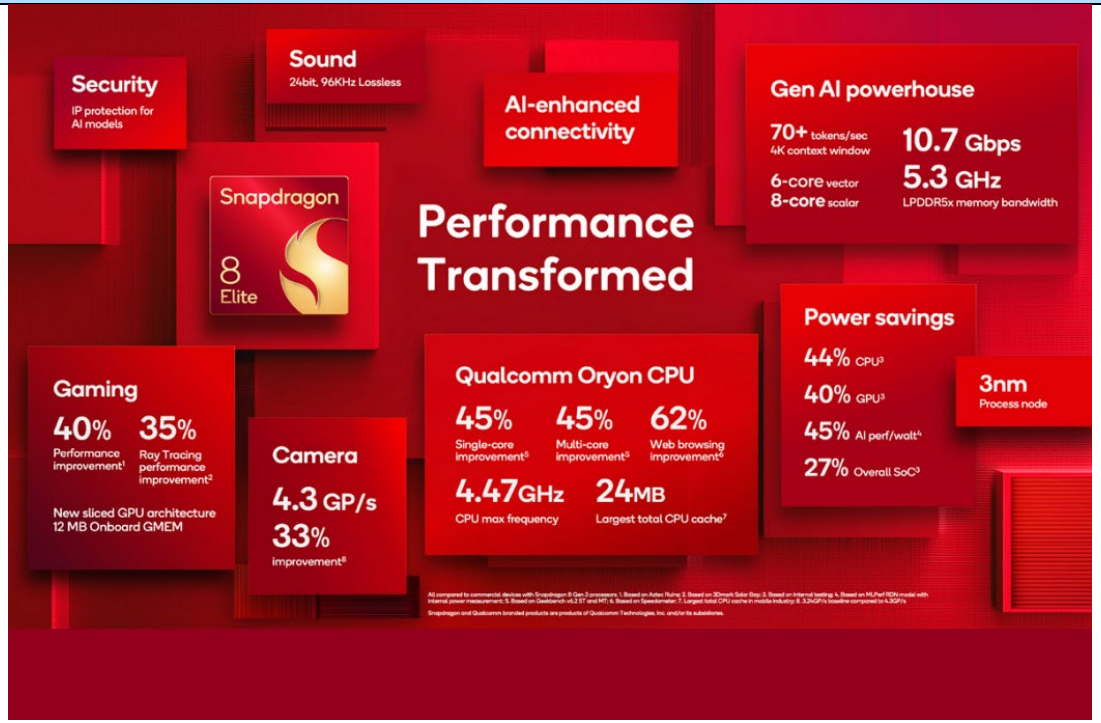
Fully integrated, AI-enhanced connectivity

The Snapdragon X80 5G Modem-RF System with a dedicated AI tensor accelerator achieves multi-gigabit 5G speeds in more places with the first 4x6 MIMO solution, and 30% more accurate location positioning. And, our 40% more efficient Qualcomm® FastConnect™ 7900 Mobile Connectivity System is the first to integrate Wi-Fi ranging, Bluetooth® wireless technology, and UWB proximity technologies for object tracking, building access control, and more.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• Our Qualcomm Spectra™ AI ISP features: • Limitless Real-time Semantic Segmentation for photo/video frame • Insight AI provides real-time skin and sky adjustments to create more natural color and lighting in uncertain conditions. • Ultra-low Light video capture • Video Object Eraser can remove unwanted elements from videos • Real-time AI Relighting make you appear professional wherever you are • Truepic photo capture with C2PA standard support lets you snap a photo with Truepic's cryptographic seal to prove the photo is real and not Gen AI (https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform)

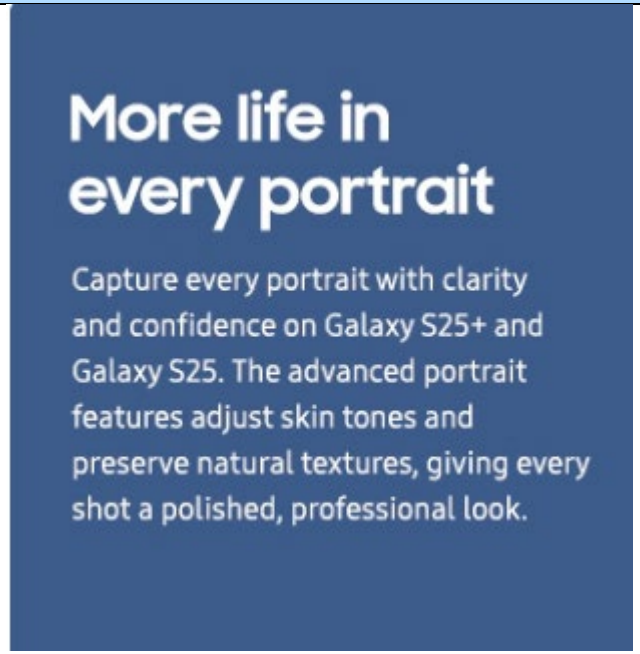

PERFORMANCE, TRANSFORMED
AI-powered camera
Multimodal Gen AI
Revolutionary gaming
Snapdragon
8
Elite
Powerhouse processing
Studio-quality audio
Fully integrated AI-enhanced connectivity
The Snapdragon® 8 Elite Mobile Platform is the pinnacle of Snapdragon innovation, delivering revolutionary power, speed, efficiency, and support for multimodal generative AI.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

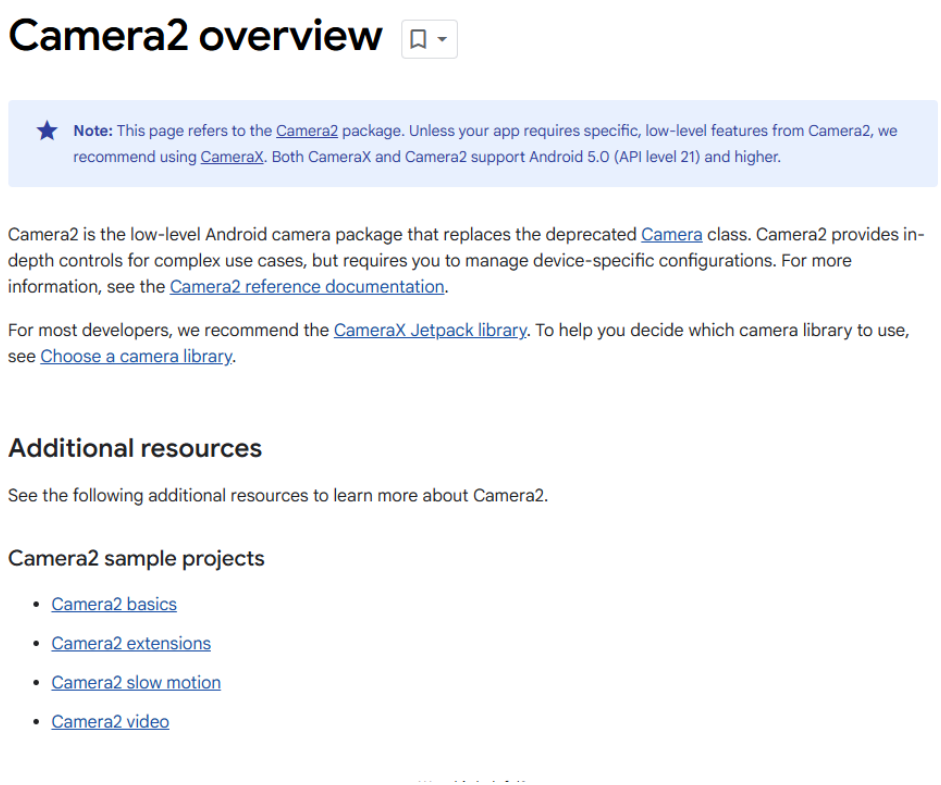
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Camera Qualcomm Spectra™ Image Signal Processor • AI-ISP, Triple 18-bit ISPs Limitless real-time Semantic Segmentation photo and video processing Engine for Visual Analytics 4.0, including hardware acceleration for iToF depth sensors up to 4K 60 FPS Support for the latest HDR, DCG+VS, DCG, Staggered, QDOL, Less Blanking, and Multiframe HDR image sensors Support for triple video capture from HDR image sensors, with seamless switching between any HDR mode • Up to 48 MP triple camera @ 30 FPS with Zero Shutter Lag • Up to 108 MP single camera @ 30 FPS with Zero Shutter Lag • Up to 320-megapixel photo capture AI-based face detection, AI for 3A (auto-focus, autoexposure, and auto-white balance) Rec. 2020 color gamut photo and video capture Up to 10-bit color depth photo and video capture 10-bit HEIF: HEIC photo capture, HEVC video capture Google Ultra HDR photo capture Video capture HDR formats: HDR10+, HDR10, HLG, Dolby Vision 8K HDR video playback @ 60 FPS 4K video capture @ 120 FPS Slow-mo video capture at 1080p @ 480 FPS Hardware Bokeh Engine 2 for video capture

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	(https://docs.qualcomm.com/bundle/publicresource/87-83196-1_REV_D_Snapdragon_8_Elite_Mobile_Platform_Product_Brief.pdf) **AI-powered camera redefines photography** Infuse brilliance into mobile capture with our AI ISP, enhancing everything from selfies to crystal-clear video chats thanks to an overhauled Hexagon Direct Link. The first AI-powered Limitless Segmentation recognizes and enhances virtually anything in the frame, including faces, hair, clothing, objects, backgrounds, and beyond. Even furry friends appear crisp and cute—no matter how fast the zoomies—thanks to AI-Based Pet Capture. • Our powerful AI ISP is deeply integrated with the Hexagon NPU for enhanced, intuitive capture. • Limitless Segmentation can segment an image in over 250 layers, each optimized to perfection. • Real-time Insight AI captures and enhances natural skin and sky tones even in the most challenging conditions. • Truepic with C2PA adds cryptographic seals so you can authenticate your photos as real and not AI-generated—now including videos and audio recordings. • Video Object Eraser can remove unwanted elements from video footage—on-device. • Capture vivid videos at 4K60 FPS, even in near darkness. (https://www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/Snapdragon-8-Elite-Platform-Product-Brief.pdf) Let's dive deeper into why Snapdragon 8 Elite is a game-changer: • **Incredible power:** Experience a 45% boost in performance with the Qualcomm Oryon CPU, giving you lightning-fast apps and incredible multitasking.[1] • **AI at your fingertips:** The Qualcomm® Hexagon™ NPU increases AI performance by 45%, handling everything from voice commands to image prompts. Your device is ready to adapt to your every move. • **Photography, reimagined:** With features like 4K Semantic Segmentation, Video Object Eraser, and real-time AI lighting adjustments, the Snapdragon 8 Elite camera tech turns your mobile photos into pro-level masterpieces. https://www.qualcomm.com/snapdragon/news/snapdragon-8-elite--the-power-behind-the-name

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Specifications **Qualcomm® Artificial Intelligence (AI) Engine** **GPU Name:** Qualcomm® Adreno™ **CPU Name:** Qualcomm® Oryon™ **Qualcomm® Hexagon™ Processor Features:** Qualcomm® Hexagon™ Scalar Accelerator, Qualcomm® Hexagon™ Tensor Accelerator, Qualcomm® Hexagon™ Vector eXtensions (HVX), Dedicated power delivery system, Micro Tile Inferencing, Hexagon Direct Link, Fused AI Accelerator architecture **Qualcomm® Sensing Hub Features:** Dual-core AI processor, Dual always-sensing cameras **CPU** **Name:** Qualcomm® Oryon™ **Architecture:** 64-bit **Clock Speed:** 4.47 GHz[1] **GPU** **Name:** Qualcomm® Adreno™ **APIs:** OpenGL® ES 3.2, Vulkan® 1.3, OpenCL™ 3.0 FP **Cellular Modem-RF** **Modem Name:** Snapdragon® X80 5G Modem-RF System **Peak Download Speed:** 10 Gbps **Peak Upload Speed:** 3.5 Gbps **Cellular Modem-RF Specs:** 8 carriers (mmWave), 2x2 MIMO (mmWave), 4x6 MIMO (Sub-6) **Performance Enhancement Technologies:** Qualcomm® Wideband Envelope Tracking, Qualcomm® 5G Ultra-Low Latency Suite, Qualcomm® 5G AI Processor Gen 2 with dedicated tensor accelerator, Qualcomm® Power RF Efficiency Suite, Qualcomm® 5G AI Suite Gen 3, Qualcomm® RF Uplink Optimization, Qualcomm® Smart Transmit™ Gen 5 technology, Qualcomm® 5G PowerSave Gen 5 **Cellular Technology:** 5G NR, Dynamic Spectrum Sharing (DSS), LTE, WCDMA, LAA, GSM/EDGE, EN-DC, CBRS, NR DC **Multi SIM:** Global 5G Multi-SIM, Dual SIM support Qualcomm® DSDA Gen 2 (Dual Data)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.qualcomm.com/products/mobile/snapdragon/smartphones/snapdragon-8-series-mobile-platforms/snapdragon-8-elite-mobile-platform Further, the Samsung Galaxy S25 includes an operating system that when executed on a processor provides a video processing apparatus:  https://www.samsung.com/us/smartphones/galaxy-s25

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products is configured to run Camera2.java, which provides evidence of a video processing apparatus:  (https://developer.android.com/media/camera/camera2)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Android Developers > Develop > API reference

Was this helpful?

android.hardware.camera2

Added in API level 21

Kotlin | **Java**

The android.hardware.camera2 package provides an interface to individual camera devices connected to an Android device. It replaces the deprecated `Camera` class.

This package models a camera device as a pipeline, which takes in input requests for capturing a single frame, captures the single image per the request, and then outputs one capture result metadata packet, plus a set of output image buffers for the request. The requests are processed in-order, and multiple requests can be in flight at once. Since the camera device is a pipeline with multiple stages, having multiple requests in flight is required to maintain full framerate on most Android devices.

To enumerate, query, and open available camera devices, obtain a `CameraManager` instance.

Individual `CameraDevices` provide a set of static property information that describes the hardware device and the available settings and output parameters for the device. This information is provided through the `CameraCharacteristics` object, and is available through `getCameraCharacteristics(String)`

To capture or stream images from a camera device, the application must first create a `camera capture session` with a set of output Surfaces for use with the camera device, with `createCaptureSession(SessionConfiguration)`. Each Surface has to be pre-configured with an `appropriate size and format` (if applicable) to match the sizes and formats available from the camera device. A target Surface can be obtained from a variety of classes, including `SurfaceView`, `SurfaceTexture` via `Surface(SurfaceTexture)`, `MediaCodec`, `MediaRecorder`, `Allocation`, and `ImageReader`.

Generally, camera preview images are sent to `SurfaceView` or `TextureView` (via its `SurfaceTexture`). Capture of JPEG images or RAW buffers for `DngCreator` can be done with `ImageReader` with the `JPEG` and `RAW_SENSOR` formats. Application-driven processing of camera data in OpenGL ES, or directly in managed or native code is best done through `SurfaceTexture`, or `ImageReader` with a `YUV_420_888` format, respectively.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	By default, YUV-format buffers provided by the camera are using the JFIF YUV<->RGB transform matrix (equivalent to Rec.601 full-range encoding), and after conversion to RGB with this matrix, the resulting RGB data is in the sRGB colorspace. Captured JPEG images may contain an ICC profile to specify their color space information; if not, they should be assumed to be in the sRGB space as well. On some devices, the output colorspace can be changed via `setColorSpace(Named)`. Note that although the YUV->RGB transform is the JFIF matrix (Rec.601 full-range), due to legacy and compatibility reasons, the output is in the sRGB colorspace, which uses the Rec.709 color primaries. Image processing code can safely treat the output RGB as being in the sRGB colorspace. The application then needs to construct a `CaptureRequest`, which defines all the capture parameters needed by a camera device to capture a single image. The request also lists which of the configured output Surfaces should be used as targets for this capture. The CameraDevice has a `factory method` for creating a `request builder` for a given use case, which is optimized for the Android device the application is running on. Once the request has been set up, it can be handed to the active capture session either for a one-shot `capture` or for an endlessly `repeating` use. Both methods also have a variant that accepts a list of requests to use as a burst capture / repeating burst. Repeating requests have a lower priority than captures, so a request submitted through `capture()` while there's a repeating request configured will be captured before any new instances of the currently repeating (burst) capture will begin capture. After processing a request, the camera device will produce a `TotalCaptureResult` object, which contains information about the state of the camera device at time of capture, and the final settings used. These may vary somewhat from the request, if rounding or resolving contradictory parameters was necessary. The camera device will also send a frame of image data into each of the output `Surfaces` included in the request. These are produced asynchronously relative to the output CaptureResult, sometimes substantially later.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Classes

CameraCaptureSession	A configured capture session for a `CameraDevice`, used for capturing images from the camera or reprocessing images captured from the camera in the same session previously.
CameraCaptureSession.CaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraCaptureSession.StateCallback	A callback object for receiving updates about the state of a camera capture session.
CameraCharacteristics	The properties describing a `CameraDevice`.
CameraCharacteristics.Key<T>	A `Key` is used to do camera characteristics field lookups with `CameraCharacteristics.get`.
CameraConstrainedHighSpeedCaptureSession	A constrained high speed capture session for a `CameraDevice`, used for capturing high speed images from the `CameraDevice` for high speed video recording use case.
CameraDevice	The CameraDevice class is a representation of a single camera connected to an Android device, allowing for fine-grain control of image capture and post-processing at high frame rates.
CameraDevice.CameraDeviceSetup	CameraDeviceSetup is a limited representation of `CameraDevice` that can be used to query device specific information which would otherwise need a CameraDevice instance.
CameraDevice.StateCallback	A callback objects for receiving updates about the state of a camera device.
CameraExtensionCharacteristics	Allows clients to query availability and supported resolutions of camera extensions.
CameraExtensionSession	A camera capture session that enables access to device-specific camera extensions, which often use multi-frame bursts and sophisticated post-process algorithms for image capture.
CameraExtensionSession.ExtensionCaptureCallback	A callback object for tracking the progress of a `CaptureRequest` submitted to the camera device.
CameraExtensionSession.StateCallback	A callback object for receiving updates about the state of a camera extension session.

See https://developer.android.com/reference/android/hardware/camera2/package-summary

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
[5.a] an input unit to which a video signal containing contents is input;	Each of the Accused Samsung '645 Products includes an input unit that receives a video signal containing content. For example, the Samsung Galaxy S25 has front and rear cameras, and corresponding image sensor and image processing circuitry (e.g., CPU, ISP, and/or DSP), that receive video input signals.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Galaxy S25 

APPENDIX 6: AUGUST 12, 2025 INFRINGEMENT CONTENTIONS APPLYING CLAIMS 1-8 OF U.S. PATENT NO. 7,952,645 TO ACCUSED SAMSUNG '645 PRODUCTS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Samsung Galaxy S25 User Guide at 7. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

IPR2025-01312; Samsung
Ex. 1014 - Page 393

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Record videos

Record smooth lifelike videos using your device.

1. From **Camera**, swipe right or left to change the shooting mode to **Video**.
2. Tap **Record** to begin recording a video.
   - To take a picture while recording, tap **Capture**.
   - To temporarily stop recording, tap **Pause**. To continue recording, tap **Resume**.
3. Tap **Stop** when you are finished recording.

Camera settings

Use the icons on the main camera screen and the settings menu to configure your camera's settings.

- From **Camera**, tap **Quick controls** > **Settings** for the following options:

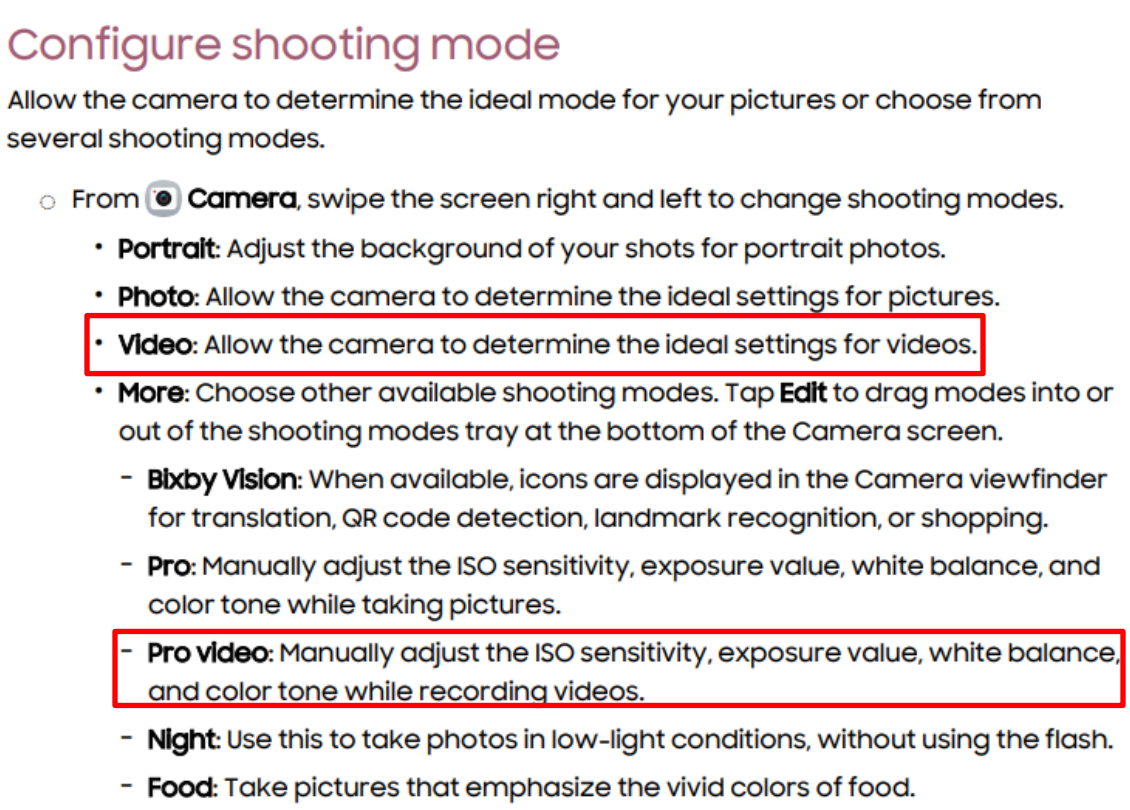
Intelligent features

- **Scan documents and text**: Show a button to scan documents and text detected with the rear camera.
- **Scan QR codes**: Automatically detect QR codes when using the camera.
- **Shot suggestions**: Get on-screen guides to help you line up great shots.
- **Intelligent optimization**: Choose a quality optimization setting and turn on scene optimizer.

44

Id. at 44.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Videos • **Auto FPS**: Record brighter videos in low-light conditions by automatically optimizing the frame rate in Video mode. • **Video stabilization**: Activate anti-shake to keep the focus steady when the camera is moving. • **Advanced video options**: Enhance your videos with advanced recording formats. - **Video format**: Choose a format for recorded videos. - **High bitrate videos**: Record videos in higher bit rate with the Pro video shooting mode. - **HDR**: Optimize videos by recording in HDR10+. Playback devices must support HDR10+ video. 45 Camera and Gallery - **Log**: Choose when to record in log format for more dynamic editing. - **Zoom-in mic**: Match the mic zoom to the camera zoom while recording videos. - **360 audio recording**: Capture immersive 3D sound through your Bluetooth headphones with 360 audio recording. - **Audio playback**: Allow music and other audio to play while you record. *Id.* at 45-46.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Panorama**: Create a linear image by taking pictures in either a horizontal or vertical direction. - **Slow motion**: Record videos at a high frame rate for viewing in slow motion. - **Hyperlapse**: Create a time lapse video by recording at various frame rates. The frame rate is adjusted depending on the scene being recorded and the movement of the device. - **Portrait video**: Adjust the background of your shots for portrait videos. - **Dual rec**: Access advanced features such as lock onto a subject, change between different rear camera lenses, and more. - **Single take**: Capture multiple pictures and video clips from different angles. *Id.* at 43-44.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Camera

Rear Camera - Resolution (Multiple)
50.0 MP + 10.0 MP + 12.0 MP

Rear Camera - F Number (Multiple)
F1.8 , F2.4 , F2.2

Rear Camera - Auto Focus
Yes

Rear Camera - OIS
Yes

Rear Camera - Zoom
Optical Zoom 3x, Optical quality Zoom 2x (Enabled by Adaptive Pixel sensor) , Digital Zoom up to 30x

Front Camera - Resolution
12.0 MP

Front Camera - F Number
F2.2

Front Camera - Auto Focus
Yes

Rear Camera - Flash
Yes

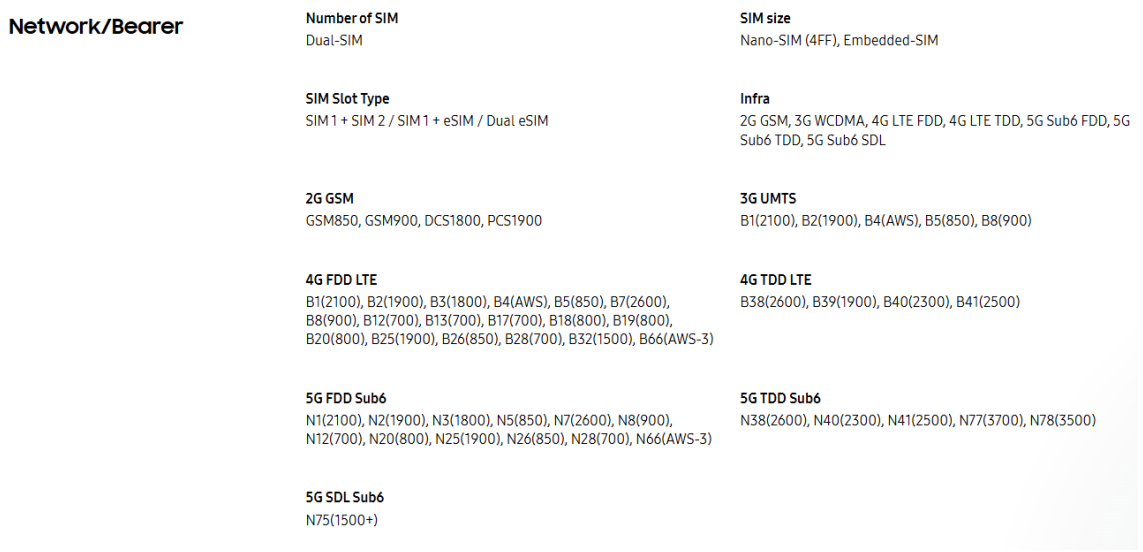
Video Recording Resolution
UHD 8K (7680 x 4320)@30fps

Slow Motion
240fps @FHD, 120fps @FHD, 120fps @UHD

Samsung Galaxy S25 tech specs, https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

In addition, the Samsung Galaxy S25 is configured to receive wireless video signals, e.g., via cellular RF transmissions. *See*, *e.g.*:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Network/Bearer

Number of SIM
Dual-SIM

SIM size
Nano-SIM (4FF), Embedded-SIM

SIM Slot Type
SIM 1 + SIM 2 / SIM 1 + eSIM / Dual eSIM

Infra
2G GSM, 3G WCDMA, 4G LTE FDD, 4G LTE TDD, 5G Sub6 FDD, 5G Sub6 TDD, 5G Sub6 SDL

2G GSM
GSM850, GSM900, DCS1800, PCS1900

3G UMTS
B1(2100), B2(1900), B4(AWS), B5(850), B8(900)

4G FDD LTE
B1(2100), B2(1900), B3(1800), B4(AWS), B5(850), B7(2600), B8(900), B12(700), B13(700), B17(700), B18(800), B19(800), B20(800), B25(1900), B26(850), B28(700), B32(1500), B66(AWS-3)

4G TDD LTE
B38(2600), B39(1900), B40(2300), B41(2500)

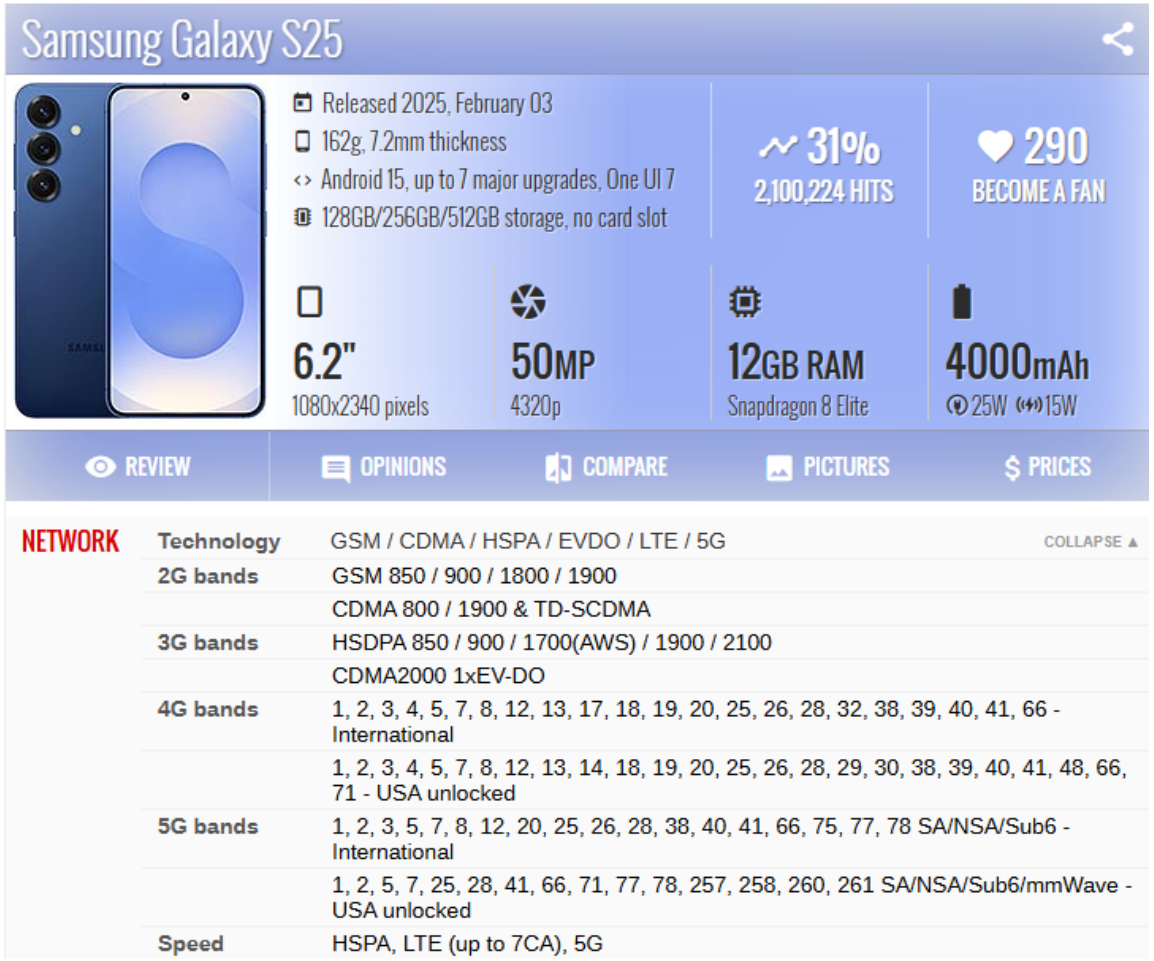
5G FDD Sub6
N1(2100), N2(1900), N3(1800), N5(850), N7(2600), N8(900), N12(700), N20(800), N25(1900), N26(850), N28(700), N66(AWS-3)

5G TDD Sub6
N38(2600), N40(2300), N41(2500), N77(3700), N78(3500)

5G SDL Sub6
N75(1500+)

https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



https://www.gsmarena.com/samsung_galaxy_s25-13610.php

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	In addition, the Samsung Galaxy S25 includes a WiFi modem for receiving WiFi transmissions, which may include video signals containing content:

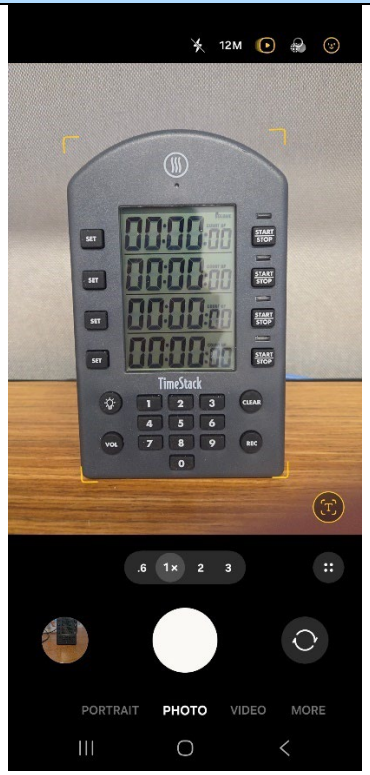
Connectivity

Wi-Fi Connectivity	**USB**	**Bluetooth®**
802.11a/b/g/n/ac/ax/be 2.4GHz+5GHz+6GHz, EHT320, MIMO, 4096-QAM	USB 3.2 Gen 1	Bluetooth v5.4
Location Technology	**Earjack**	**MHL**
GPS,Glonass,Beidou,Galileo	USB Type-C	No
Wi-Fi Direct	**NFC**	**PC Sync.**
Yes	Yes	Smart Switch (PC version)
USB Interface		
USB Type-C		

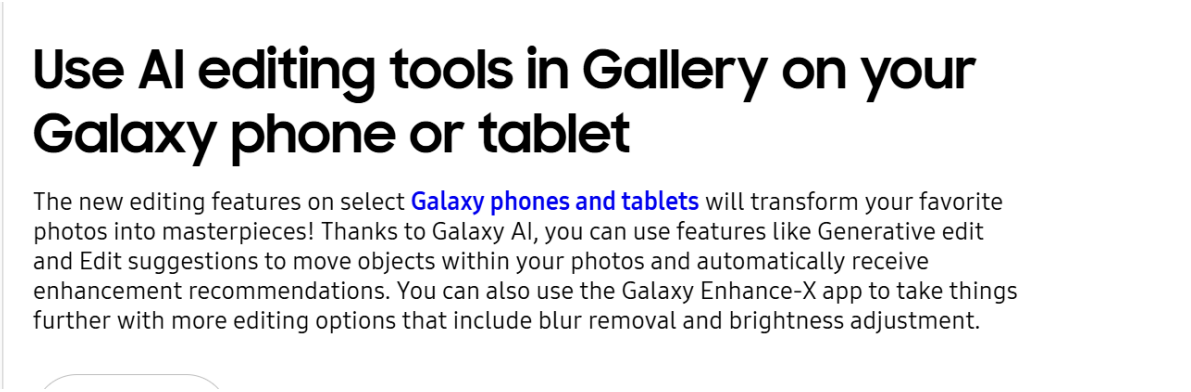
https://www.samsung.com/uk/smartphones/galaxy-s25/specs/

COMMS	WLAN	Wi-Fi 802.11 a/b/g/n/ac/6e/7, tri-band, Wi-Fi Direct
	Bluetooth	5.4, A2DP, LE
	Positioning	GPS, GLONASS, BDS, GALILEO, QZSS
	NFC	Yes
	Radio	No
	USB	USB Type-C 3.2, DisplayPort 1.2, OTG

https://www.gsmarena.com/samsung_galaxy_s25-13610.php

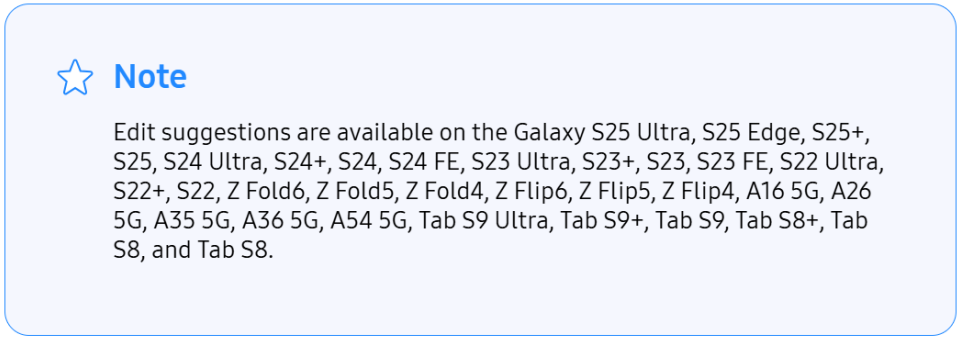
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (Screenshot showing video input functions in preview mode)
[5.b] a pattern portion detector which detects whether a pattern portion other than contents is contained in the video signal input to the input unit;	Each of the Accused Samsung '645 Products includes a pattern portion detector which detects whether a pattern portion other than contents are contained in the video signal input to the input unit. For example, all of the Accused Samsung '645 Products are equipped with white balance correction, which is activated when an object that appears white in person is detected in an image. The white balance correction adjusts for the color temperature of the light source so

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	that an object that appears white in person also appears white in the image. As a result, the Accused Samsung '645 Products are necessarily configured to detect with a patterned portion (e.g. white object, white snow) formed of a single color of black or white is input, and contain one or more processors for doing same (e.g., CPU, ISP, and/or DSP). Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part." If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about **AI Edit suggestions** using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion.

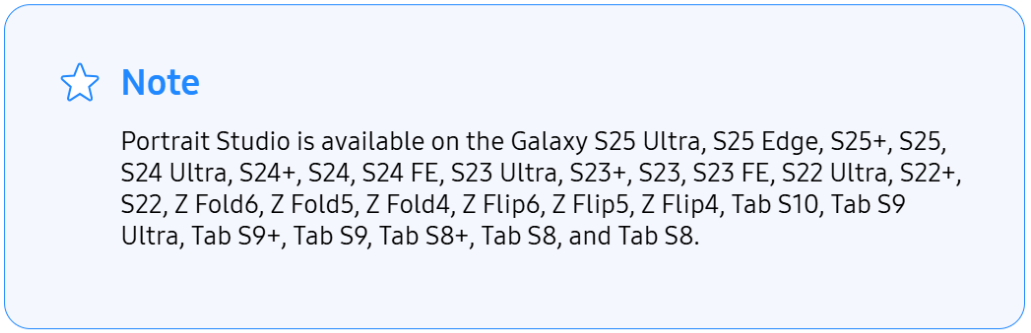
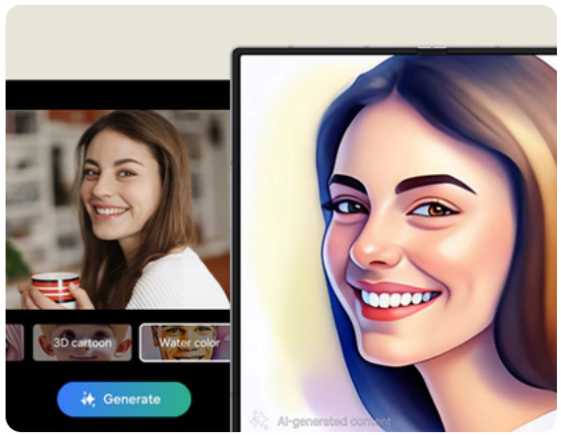
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/  https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

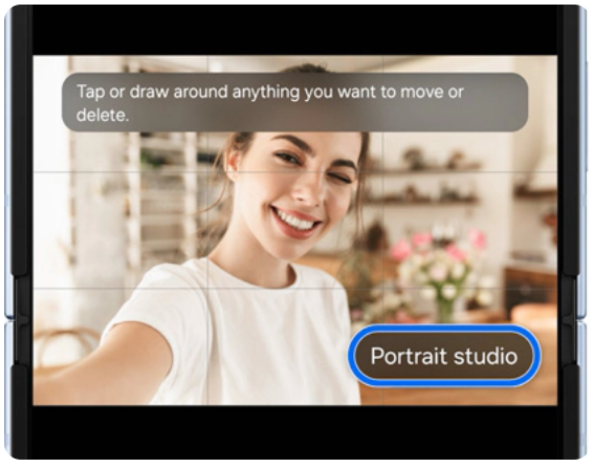
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

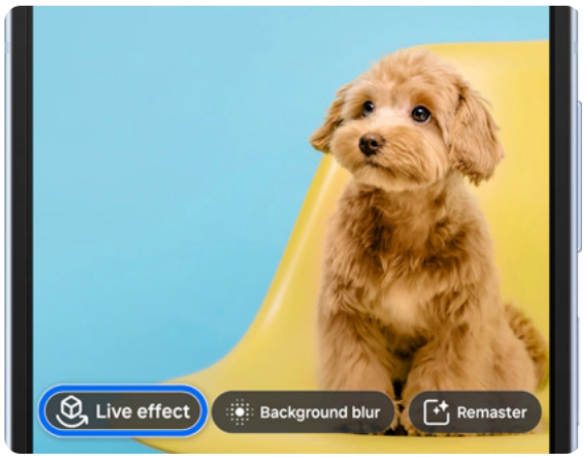
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions   **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

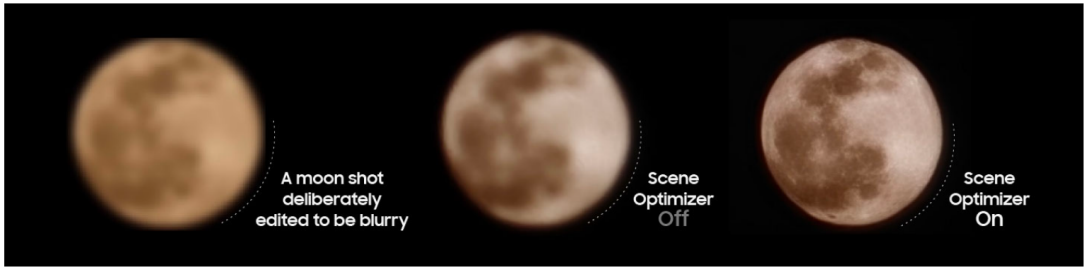
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

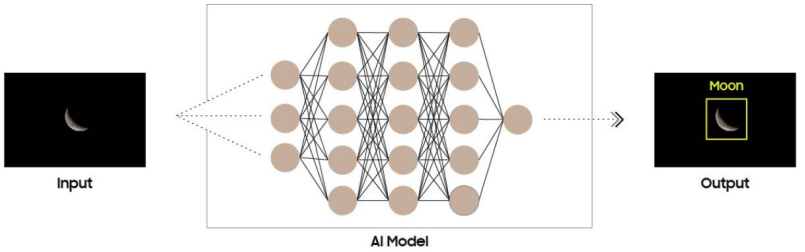
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

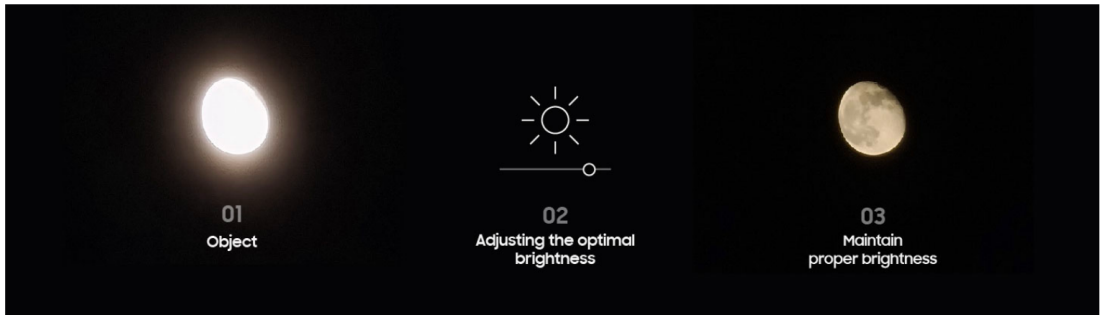
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

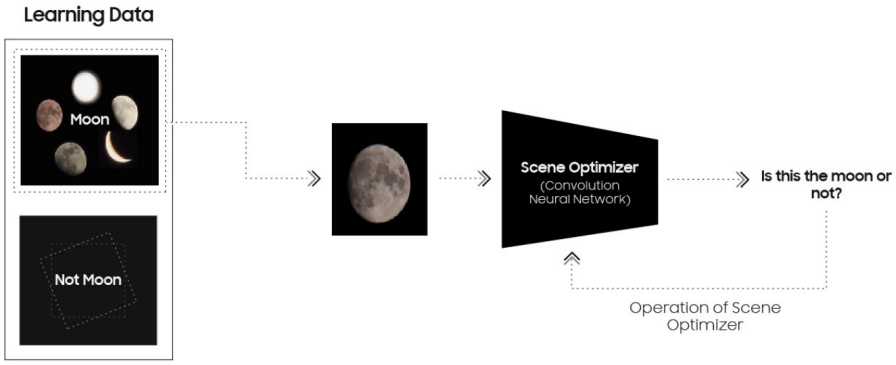
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

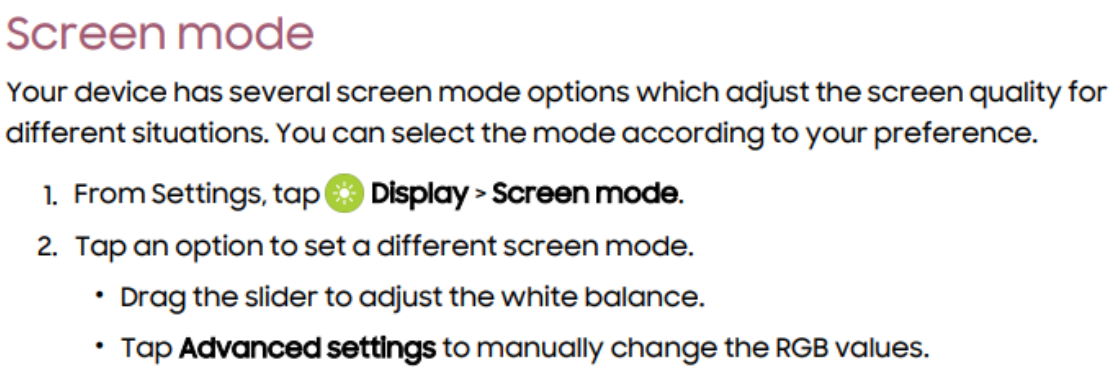
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

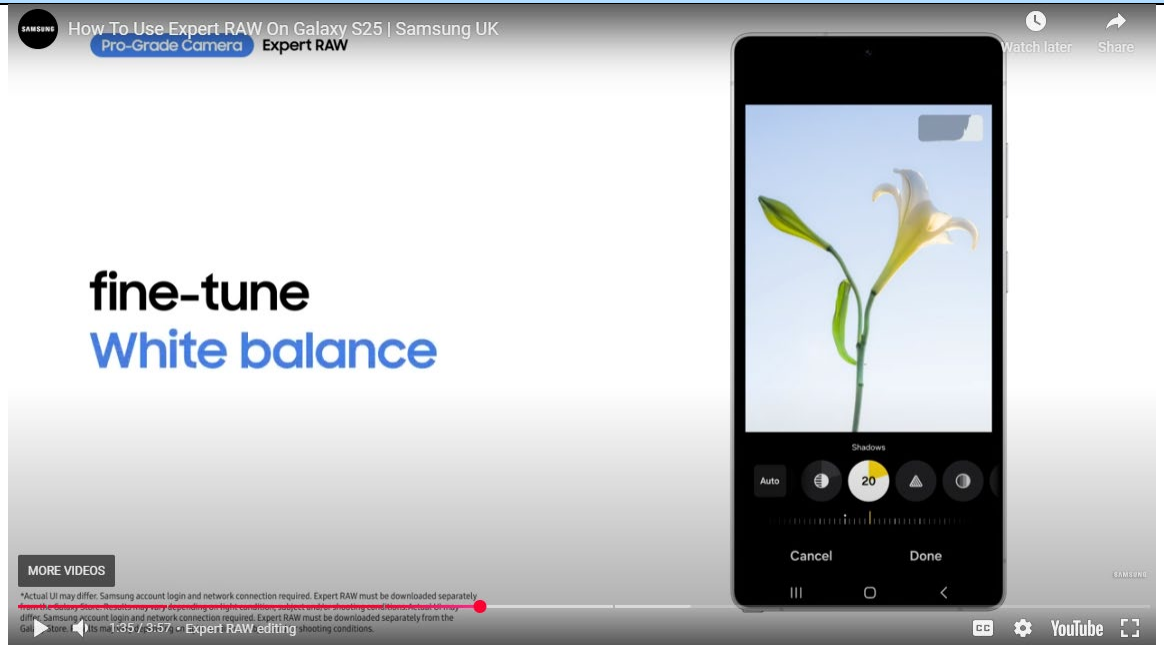
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 116.  *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

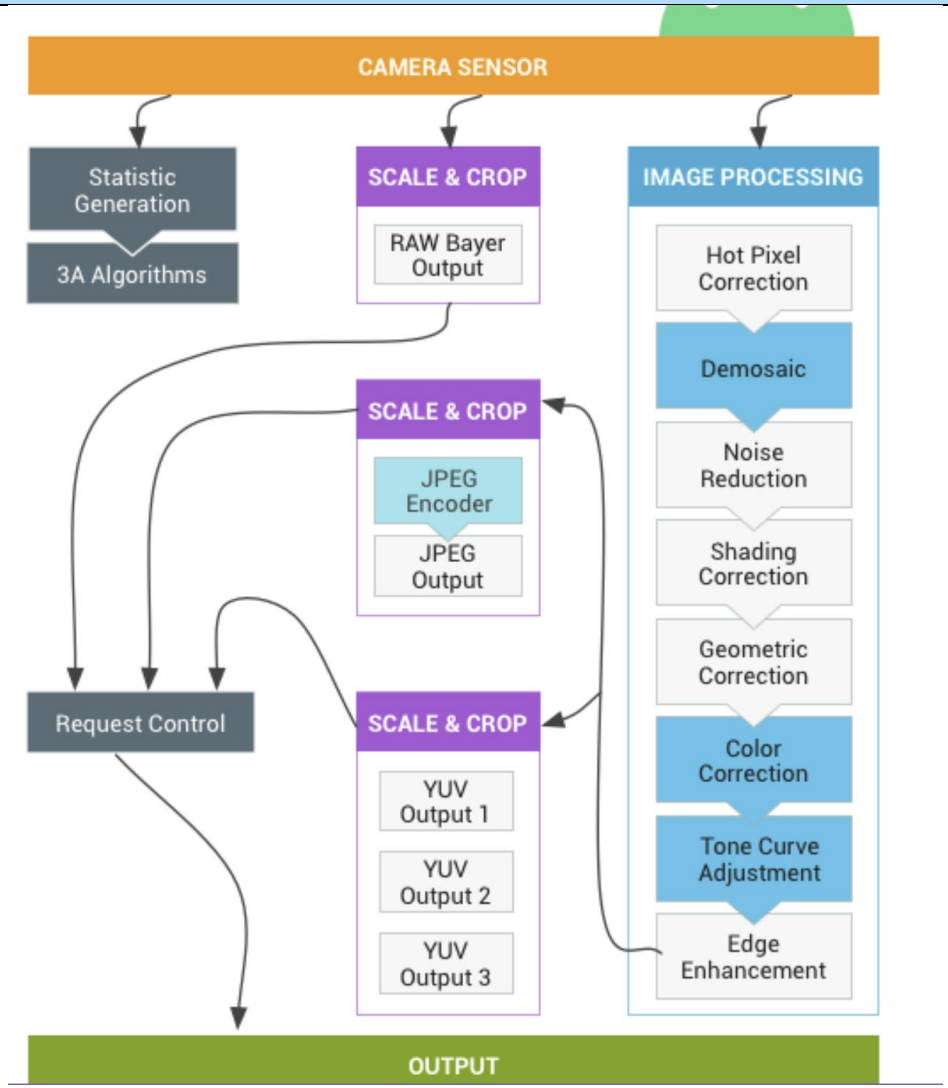
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

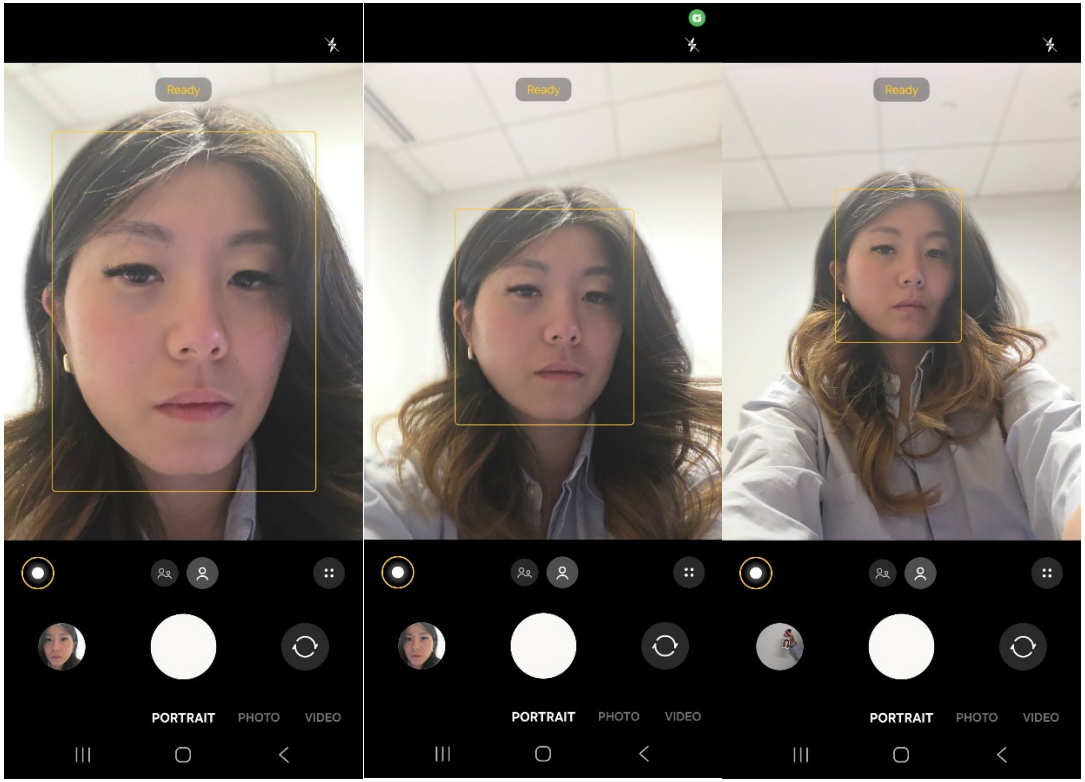
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

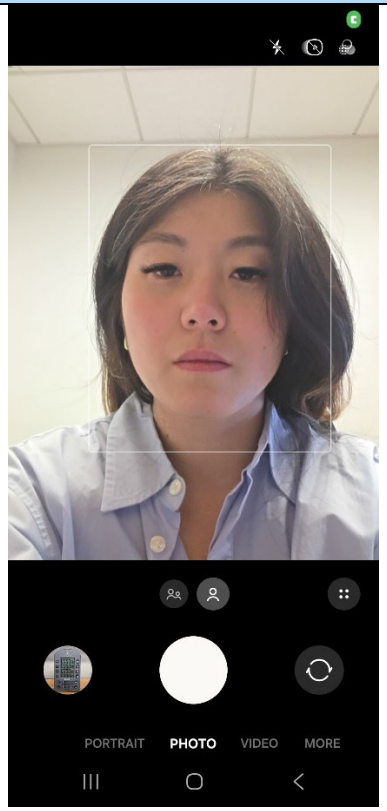
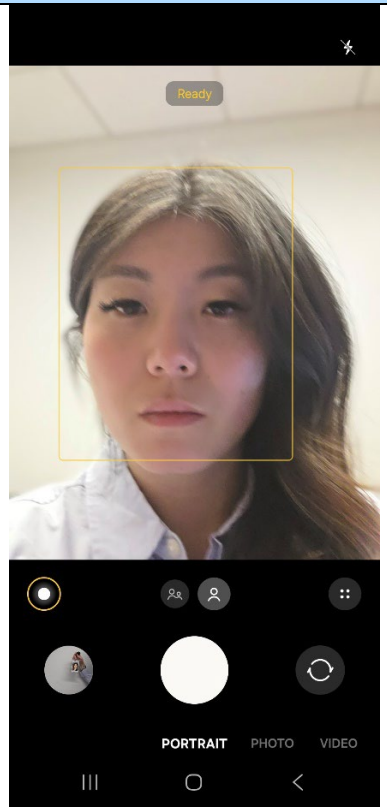
Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

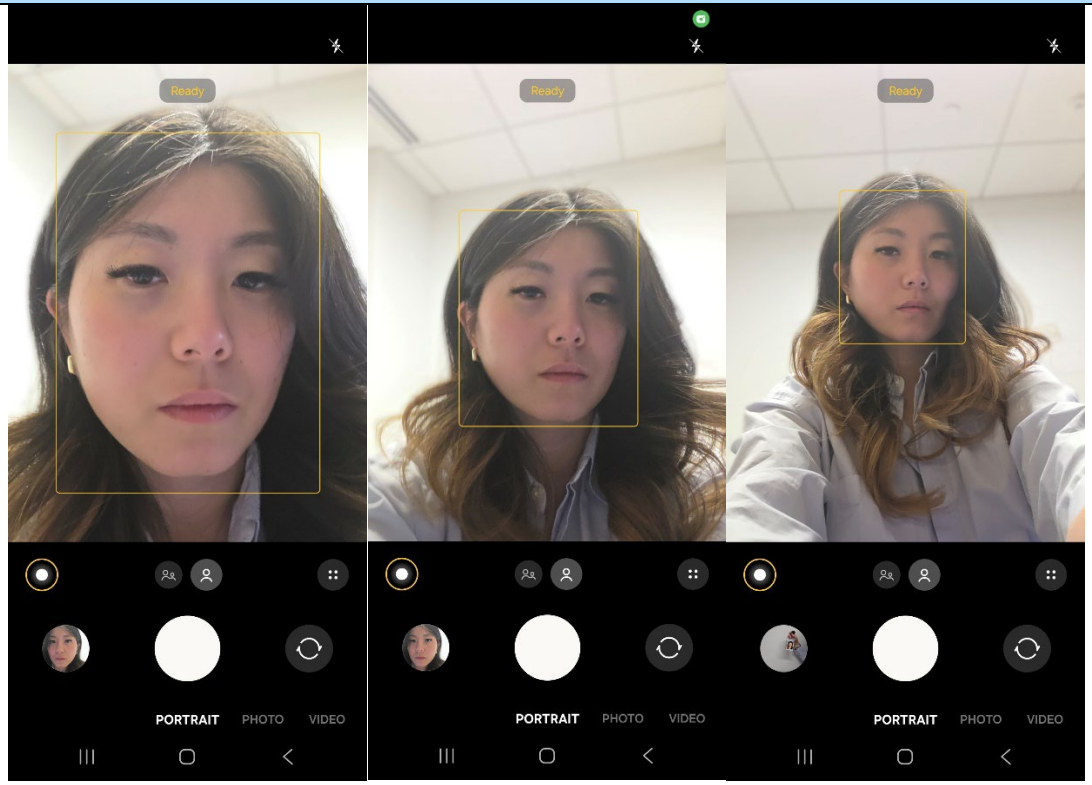
See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

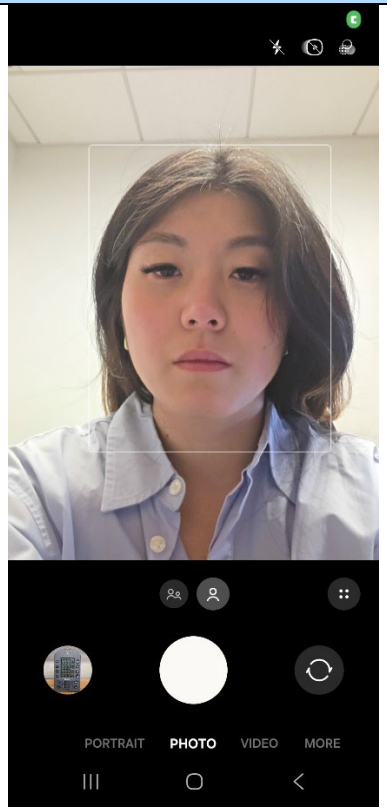
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	See for example the various modes in the Samsung Galaxy S25 where pattern portion formed of a single color of black or white are necessarily detected:  Demonstration of face detection, with the bounding box shown identifying the face at three different sizes

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a detector that detects pattern portions, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting pattern portions in video signal that is input. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting pattern portions) in substantially the same way (e.g., performing image

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	processing). The performance of this function achieves substantially the same result, for example, the detection of pattern portions. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and detection of pattern portions. These components and/or software operate together and function in substantially the same way to facilitate pattern detection. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a detector.
[5.c] a no-picture area detector which detects whether the pattern portions are no-picture areas having a single color;	Each of the Accused Samsung '645 Products includes a no-picture area detector which detects whether the pattern portions are no-picture areas having a single color. For example, the pattern portions can correspond to the white background and/or black background, wallpaper areas, and/or no-picture areas when a person is standing in front or an object is placed in front of a wall or snow such that the picture area is the person or object in the foreground and the pattern portion is the white/black/snow/foliage background. As an additional example, the pattern portion can be the white page in a picture of the text in scanning mode.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/
[5.d] a corrector which corrects the video signal input to the input unit; and	Each of the Accused Samsung '645 Products includes a corrector which corrects the video signal input to the input unit. For example, as a part of Android, the Accused Samsung '645 Products perform color correction with the SoC in order to control color temperature of an input video signal. For example, color correction and white balance transforms to approximately CIE standard illuminant D65 or F2 control color temperature of an input video signal:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

COLOR_CORRECTION_MODE

Added in API level 21

```
public static final Key<Integer> COLOR_CORRECTION_MODE
```

The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.

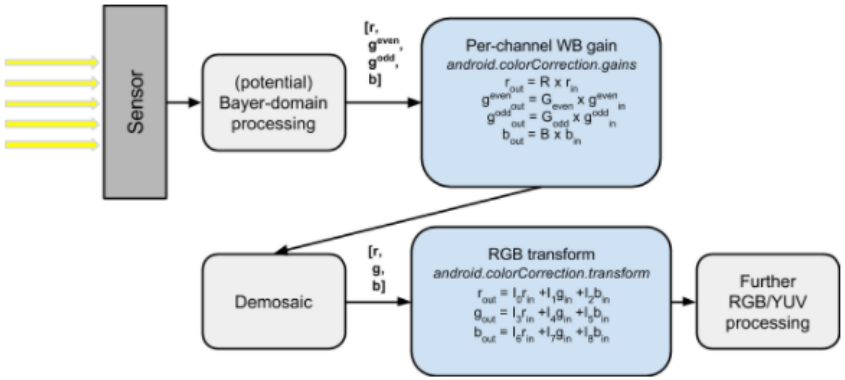
When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.

We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX.

When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct.

Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame.

The expected processing pipeline is as follows:



https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

CONTROL_AWB_MODE_DAYLIGHT

Added in API level 21

```
public static final int CONTROL_AWB_MODE_DAYLIGHT
```

The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.

While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT

CONTROL_AWB_MODE_FLUORESCENT

Added in API level 21

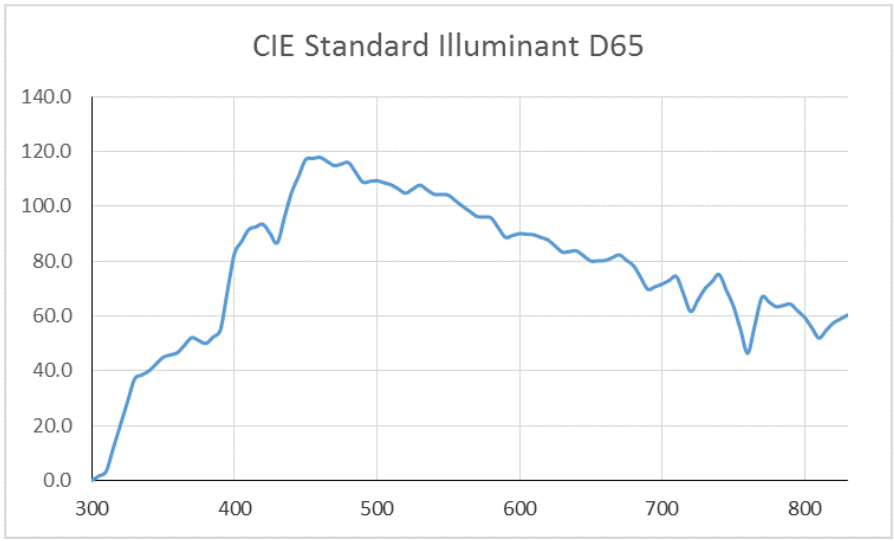
```
public static final int CONTROL_AWB_MODE_FLUORESCENT
```

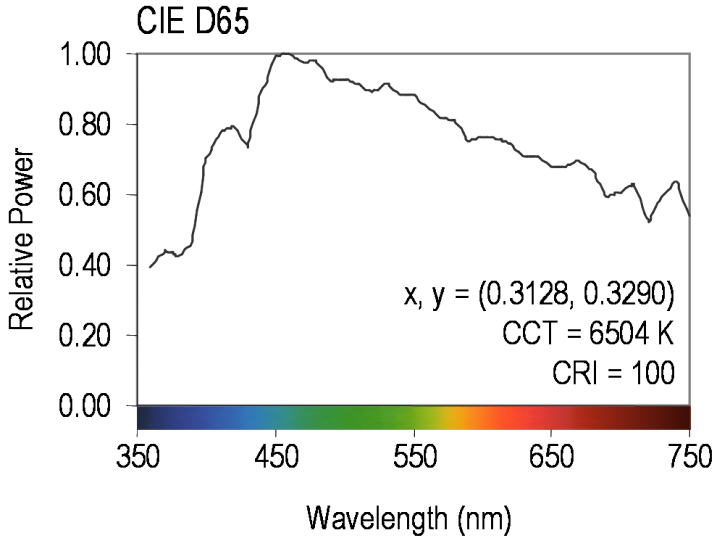
The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.

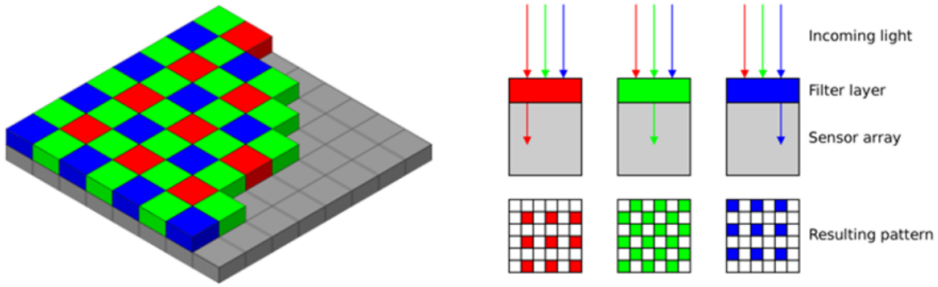
While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Upon information and belief, the color correction applied by each of the Accused Samsung '645 Products controls color temperature of an input video signal. For example, white balance transforms that approximately match CIE standard illuminants such as D65 or F6 control color temperature of an input video signal. *See Numerical modeling of color perception of optical radiation*, Mathematical Modelling and Geometry, April 2018 (https://www.researchgate.net/publication/325391159_Numerical_modeling_of_color_perception_of_optical_radiation) ("The CIE standardized the illuminants A and D65 (correlated color temperature of approximately 6504 K) as its primary colorimetric illuminants and one of them should be used whenever possible. Figures 5 and 6 from [2, 5] shows the relative spectral power distribution of CIE Standard Illuminants A and D65.").  Figure 5: Relative spectral power distribution of CIE Standard Illuminant D65.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://en.wikipedia.org/wiki/Illuminant_D65 Additionally, on information and belief, the Samsung Galaxy S25 includes an image signal processor (ISP) and/or digital signal processor (DSP) that corrects a video signal input to the input unit, for example, by performing white balance correction. Further, the Accused Samsung '645 Products including a combination or hardware and software to implement numerous image corrections tools such as AI tools and/or Scene Optimizer that perform numerous types of corrections:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	3. WB (White Balance)[3] This block helps the camera adjust the color balance and render them accurately. It ensures that an image has a uniform WB Gain and that the RGB of the grey (achromatic) areas are adjusted to the same value (to depict the grey as grey). The sensor output fed to ISP has twice as many green channels as any other. This is the reason why the raw image before the application of WB Gain looks green overall. (Refer to 'De-mosaic' below) **4. De-mosaic (= Bayer Interpolation, Color Interpolation)** Most smartphone cameras use the Bayer type (or pattern) sensor. The Bayer sensor, as illustrated below [2] is 3 color filter combination sensor mounted on top of a photodiode array.  https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145

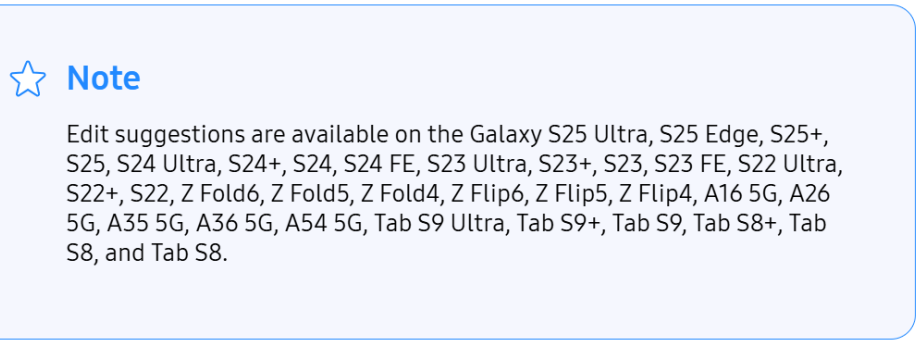
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	FD (Face Detection) This block detects faces in an image/video and passes their coordinates to the next block. The face coordinates can be used in other algorithms or solutions to implement different features. **[Example of application] Using FD information in AWB (Auto White Balance) and AE (Auto Exposure) algorithm blocks** 1. When a face is detected, it compares and corrects the difference between the face brightness and the targeted brightness of the whole image. It utilizes the face coordinates received, to adjust the face brightness, etc. 2. When multiple sources are detected illuminating a face and the face is overly affected by these lights, this FD data can be used to correct the color on it. For example, if a face is detected in a low-color temperature light setup giving off a slightly reddish glow, the face coordinates are used to adjust the color of the face. https://r2.community.samsung.com/t5/CamCyclopedia/ISP-Image-Signal-Processor/ba-p/13485145 Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part."

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about AI Edit suggestions using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/ **Use AI editing tools in Gallery on your Galaxy phone or tablet** The new editing features on select **Galaxy phones and tablets** will transform your favorite photos into masterpieces! Thanks to Galaxy AI, you can use features like Generative edit and Edit suggestions to move objects within your photos and automatically receive enhancement recommendations. You can also use the Galaxy Enhance-X app to take things further with more editing options that include blur removal and brightness adjustment.

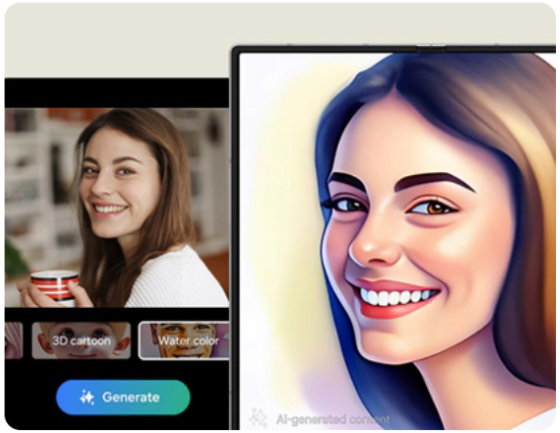
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

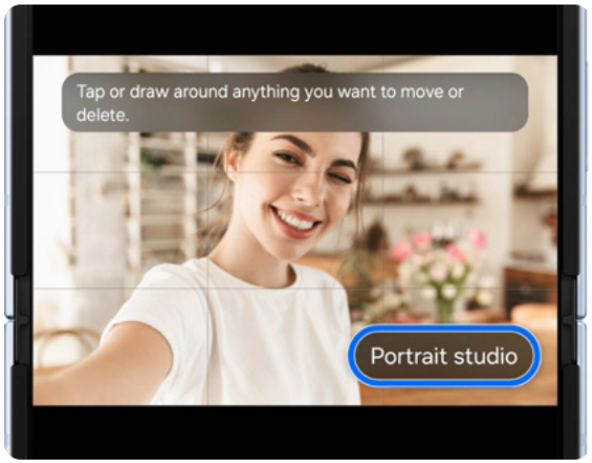
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

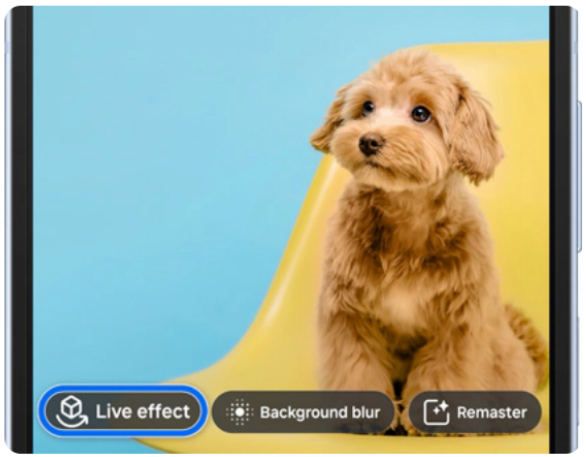
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions  **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

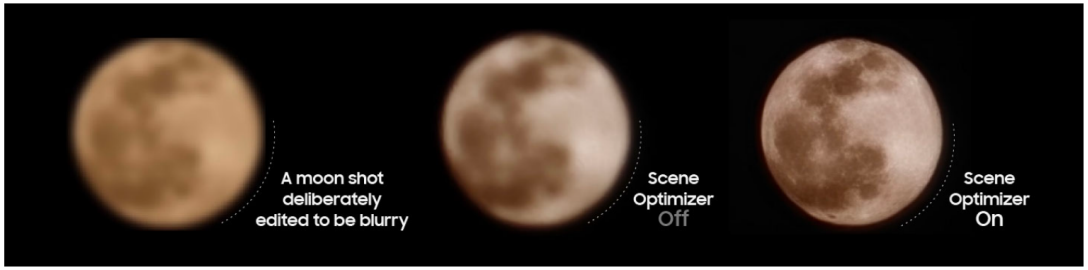
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

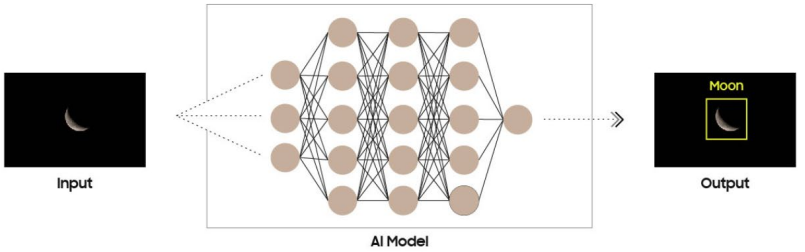
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

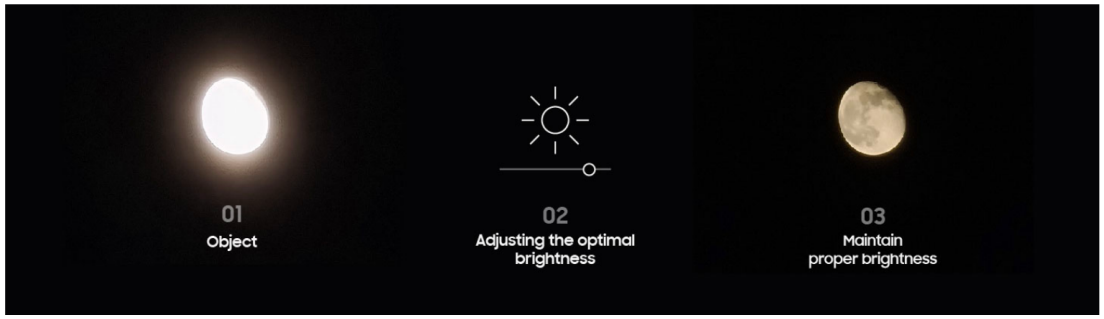
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

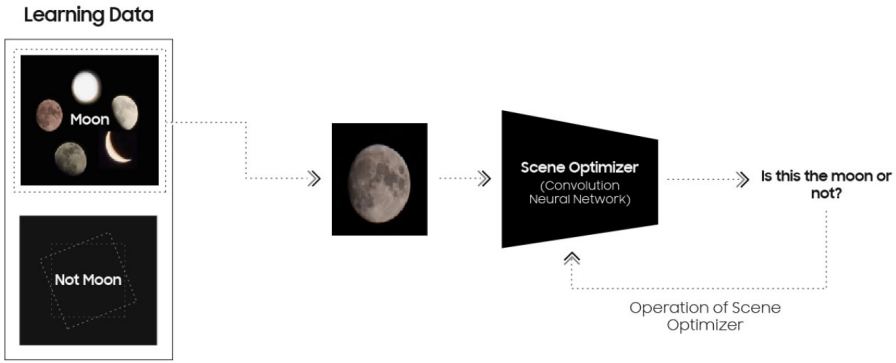
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

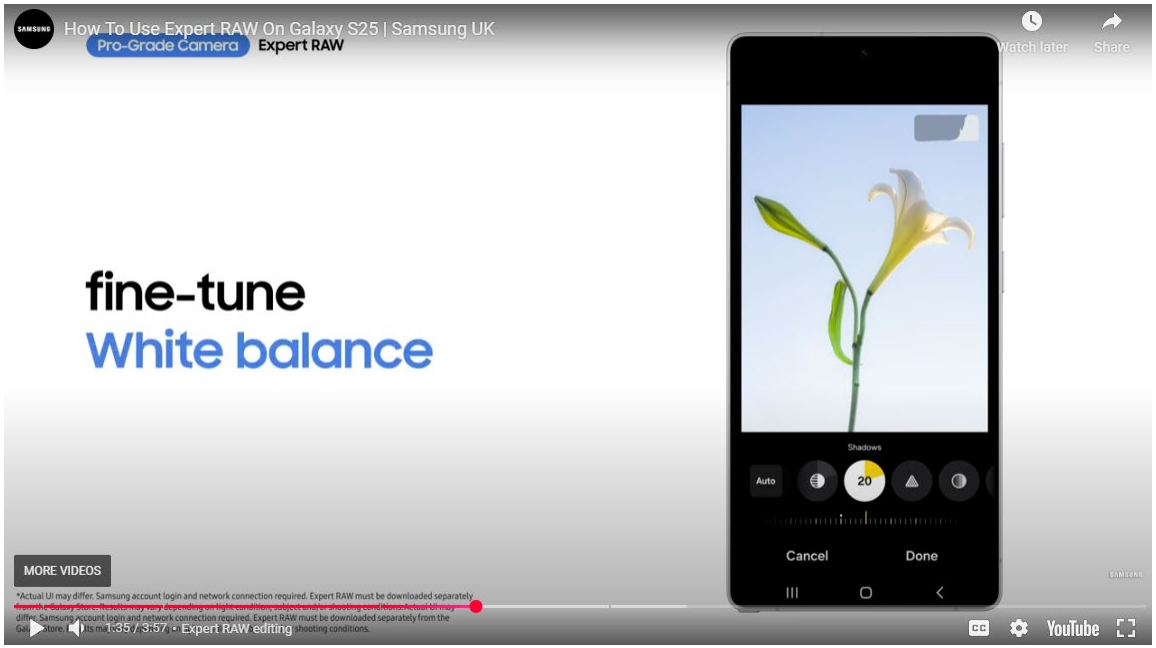
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

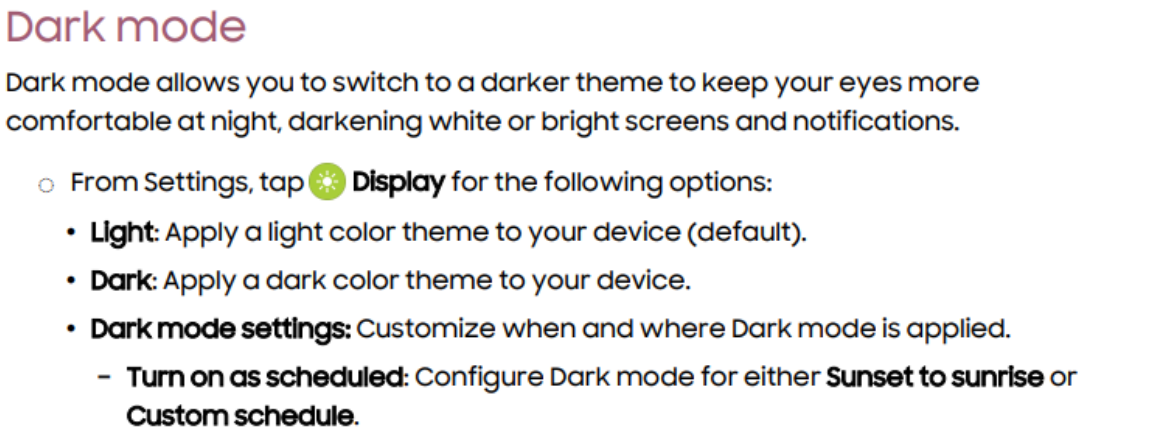
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

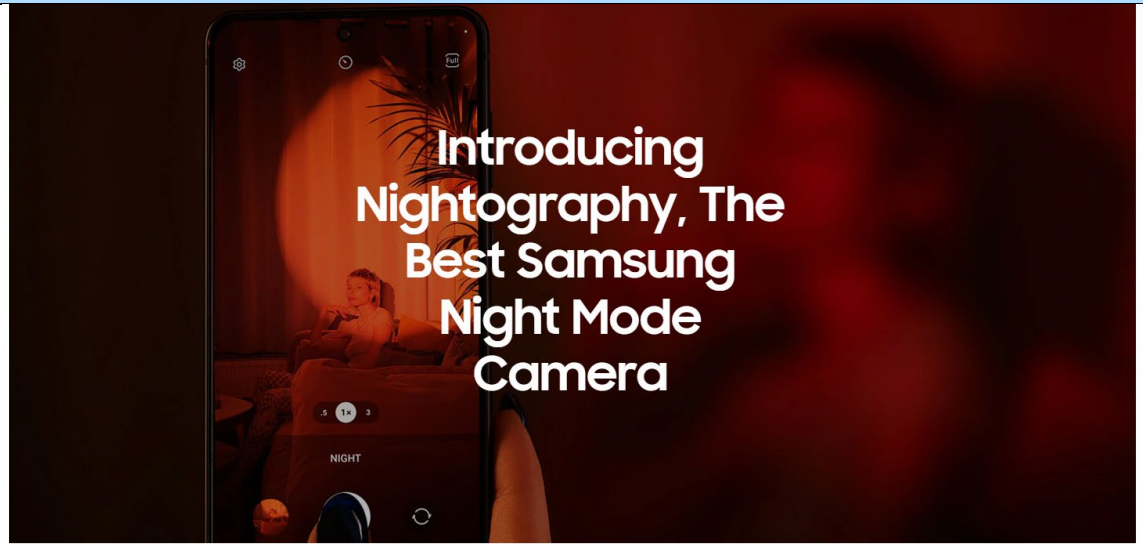
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap Display > Adaptive color tone and tap to enable this feature. *Id*. at 116.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Screen mode Your device has several screen mode options which adjust the screen quality for different situations. You can select the mode according to your preference. 1. From Settings, tap **Display** > **Screen mode**. 2. Tap an option to set a different screen mode. • Drag the slider to adjust the white balance. • Tap **Advanced settings** to manually change the RGB values. *Id*. at 117. **Intelligent features** • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images.

What does Night Mode do?

Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

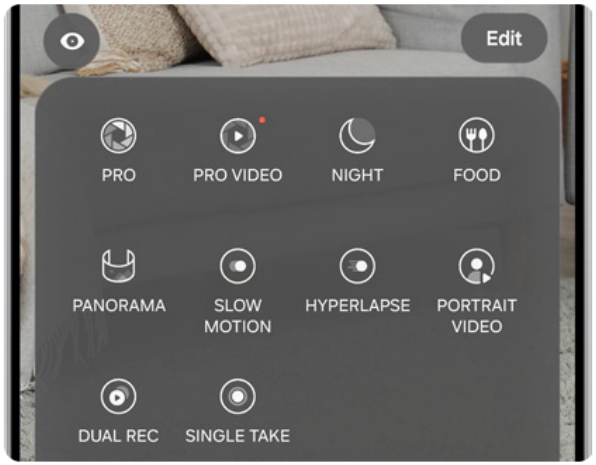
Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

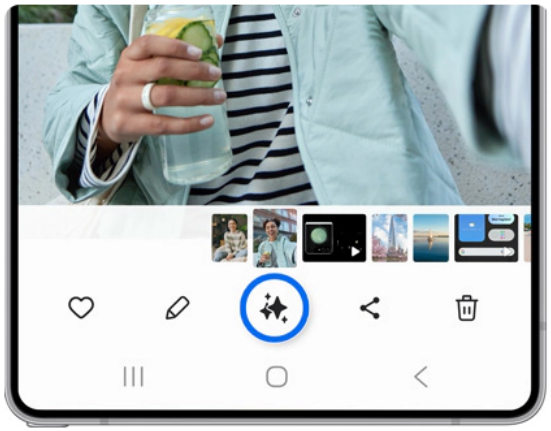
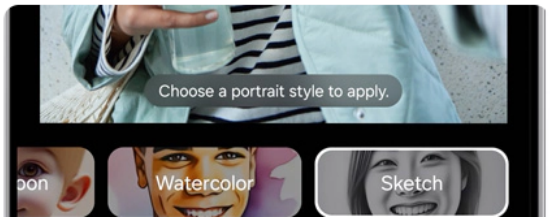
1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

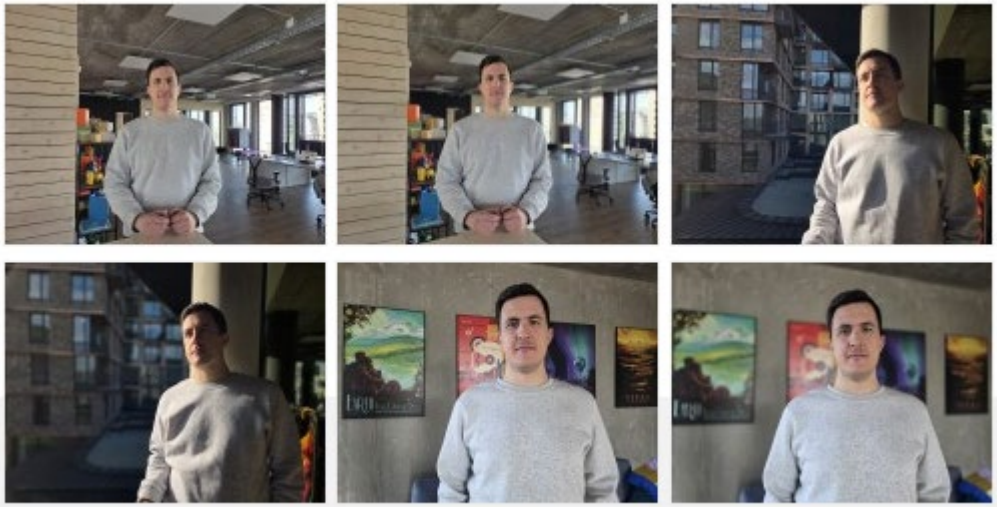
https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Further, all of the Accused Samsung '645 Products have Portrait Mode (with various filters such as a beauty filter), which is activated when the face of an individual is nearby and certain light conditions are met, as well as a face detection mode, in which a bounding box is generated when a face is detected and FD-AWB is performed.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio If you'd like to change up your portraits using unique styles, just follow the steps below. 1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit. 2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.  3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch. 4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.  https://www.samsung.com/us/support/answer/ANS10004857/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php) As an additional example, the Accused Samsung '645 Products include a corrector for correcting the video signal in scanner or equivalent camera mode:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a corrector which corrects the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of correcting the video signal that is input. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, correcting video signal) in substantially the same way (e.g., performing image processing). The performance of this function achieves substantially the same result, for example, the

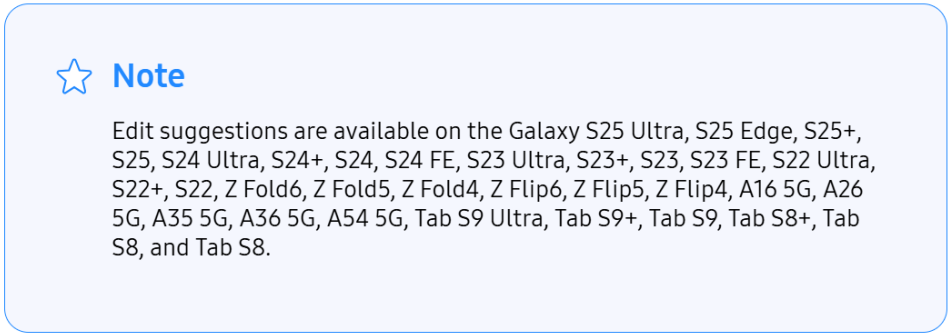
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	correction of video signals. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing and correction of video signals. These components and/or software operate together and function in substantially the same way to facilitate video correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a corrector.
[5.e] a controller which controls the corrector to cause the corrector to correct the video signal input to the input unit when the pattern portions are not contained and when the pattern portions are the no-picture areas, and	Each of the Accused Samsung '645 Products includes a controller which controls the corrector to cause the corrector to correct the video signal input to the input unit when the pattern portions are not contained and when the pattern portions are the no-picture areas. For example, on information and belief, the Samsung Galaxy S25 includes an image signal processor (ISP) and/or digital signal processor (DSP) that corrects a video signal input to the input unit, for example, by performing white balance correction. For example, the white balance is corrected in accordance with the detected lighting conditions, e.g. fluorescent lighting, incandescent lighting, sunny outdoor lighting, cloudy outdoor lighting. Similarly, upon information and belief, the Accused Samsung '645 Products detects pattern portions such as text, foliage, fireworks, faces, food, moon, and uses AI Optimizer to detect pattern portions other than content to optimize the photograph and/or to "fill in the photo's missing part."

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	If you're unsure how to edit a photo or video in the Gallery app, let AI Edit Suggestion help you out. This feature lets you move and delete unwanted objects in order to create an entirely new image. You can also use additional options such as remastering, colorizing, removing reflections, and adding portrait effects to transform and elevate your photos and videos. You can learn more about AI Edit suggestions using our guide. Generative edit is an AI editing tool that lets you customize your images. Just find your desired image in the Gallery app, tap the **Photo Assist** icon (the three stars), and then tap or draw around an object in the photo you'd like to adjust. You can move the object around to another part of the photo. When you tap **Generate**, AI will fill in the photo's missing parts. **Note:** Generative edit requires an internet connection and will resize photos to 12MP. Drawing Assist lets you bring your drawings to life. You can create AI sketches using Air command, Samsung Notes, Gallery, and the AI Select feature in the Edge panel. Portrait Studio on the Z Fold6 and Z Flip6 lets you add extra flair to your selfies. Select your desired selfie in the Gallery app, then tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image. You can select from the available styles at the bottom of the screen, and then tap **Generate** to create a new image. Live Effects will bring your photos to life with animations on the Z Fold6 and Z Flip6. Select a photo in the Gallery app, then swipe up to view more details, and then tap **3D photo**. AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. https://www.samsung.com/us/support/answer/ANS10000753/ **Use AI editing tools in Gallery on your Galaxy phone or tablet** The new editing features on select **Galaxy phones and tablets** will transform your favorite photos into masterpieces! Thanks to Galaxy AI, you can use features like Generative edit and Edit suggestions to move objects within your photos and automatically receive enhancement recommendations. You can also use the Galaxy Enhance-X app to take things further with more editing options that include blur removal and brightness adjustment.

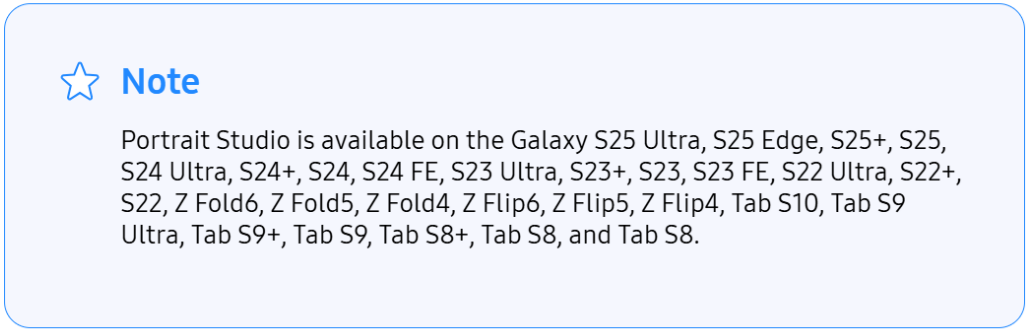
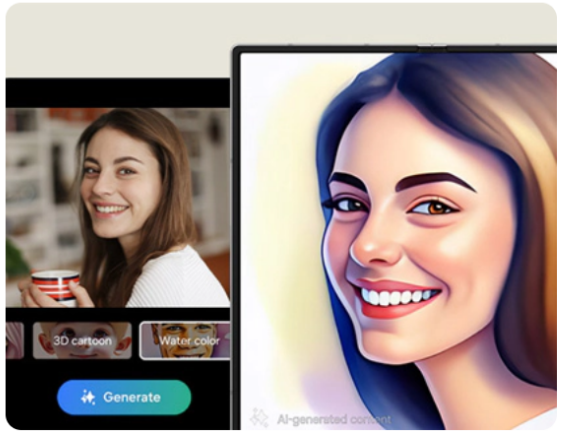
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a detector to detect pattern portions to perform "Generative edit," provide "Edit suggestions," implement Portrait Studio, and/or generate photo effects.

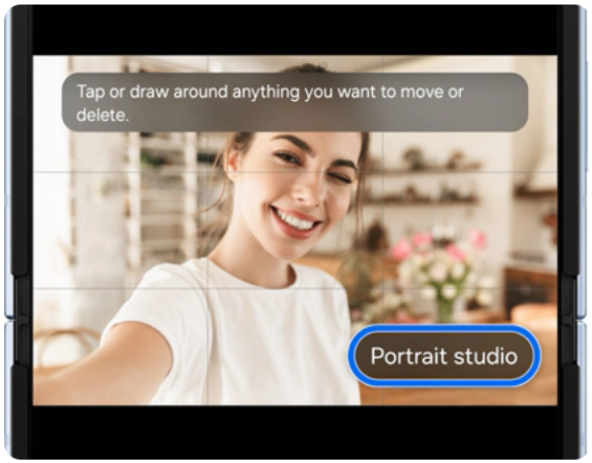
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Generative edit Note Generative edit is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions.

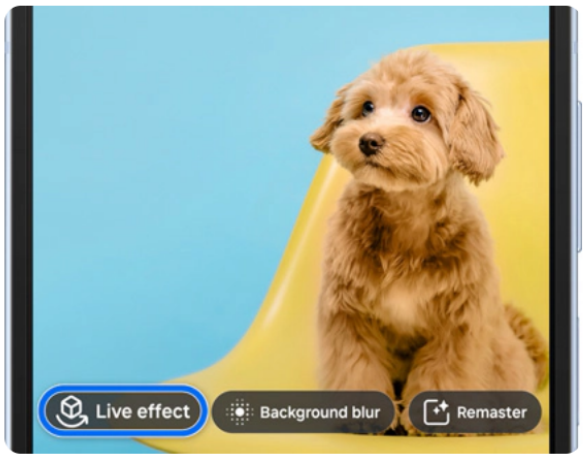
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Generative edit allows you to move or delete objects from your pictures in order to create an entirely new image. Galaxy AI will then fill in the background and any missing portions. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit. 2 Tap the **Edit** icon (the pencil), and then tap the **Generative edit** icon (the blue circle with three stars). **Note**: You may be required to tap **OK** on the prompt. 3 Using your finger, outline your desired object. Tap **Deselect** to start over if needed. 4 Next, touch and hold the outlined object, and then drag it into a different part of the image. Tap **Return** (the back arrow) to move the object back to its original position, or tap **Remove** (the eraser icon) to erase the object. Repeat this process to move or remove additional objects. 5 If needed, adjust the **slider** at the bottom of the screen to straighten the picture. 6 When you're finished, tap **Generate**. Galaxy AI will fill in the image's background and adjust the objects that have been moved. 7 Touch and hold **View original** to compare the original image with the newly generated image. 8 When you're finished, tap **Done**, and then tap **Save as copy** to save the image. https://www.samsung.com/us/support/answer/ANS10000934/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Edit suggestions   **Note** Edit suggestions are available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, A16 5G, A26 5G, A35 5G, A36 5G, A54 5G, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  Galaxy AI will analyze your pictures and provide editing suggestions to enhance them! The individual suggestion will vary depending on the image, or there may not be any suggestions at all. 1 Navigate to and open the **Gallery** app, and then select a picture you'd like to edit.

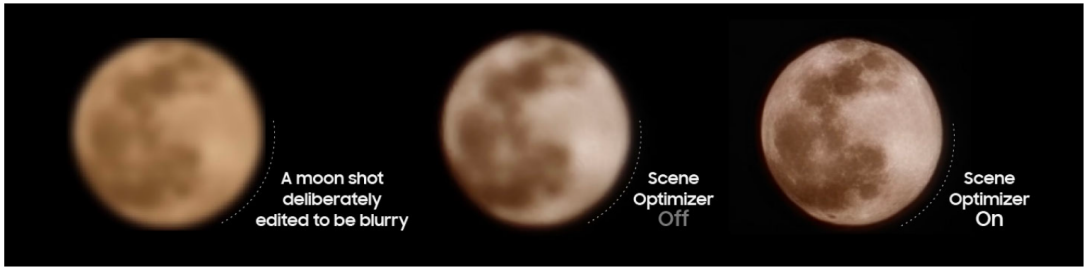
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	- **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

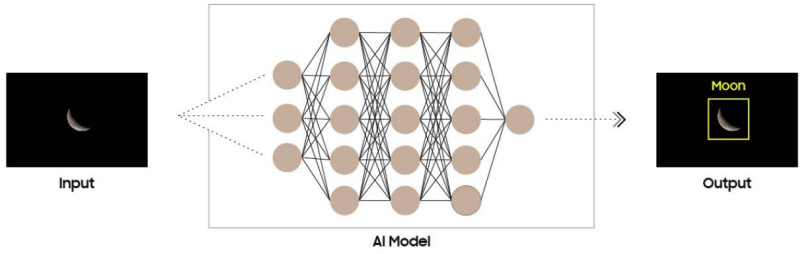
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Use Portrait Studio  **Note** Portrait Studio is available on the Galaxy S25 Ultra, S25 Edge, S25+, S25, S24 Ultra, S24+, S24, S24 FE, S23 Ultra, S23+, S23, S23 FE, S22 Ultra, S22+, S22, Z Fold6, Z Fold5, Z Fold4, Z Flip6, Z Flip5, Z Flip4, Tab S10, Tab S9 Ultra, Tab S9+, Tab S9, Tab S8+, Tab S8, and Tab S8.  After you've taken a selfie, you can add some extra flair to it with Portrait Studio.

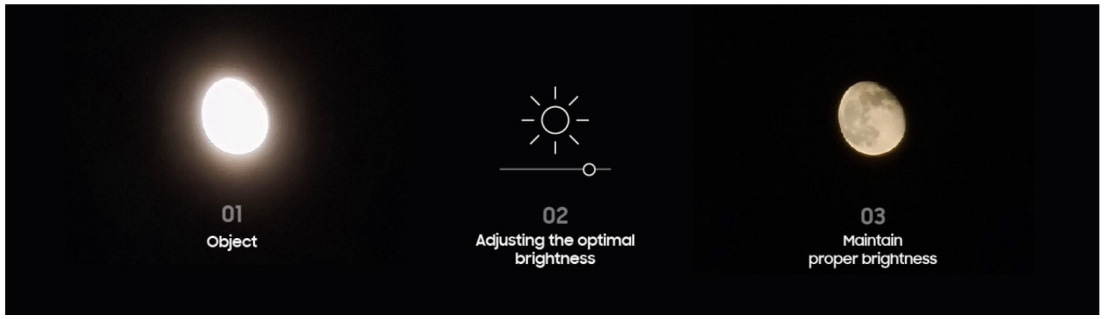
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	After you've taken a selfie, you can add some extra flair to it with Portrait Studio. 1 Open the **Gallery** app, and then find and select your desired selfie. 2 Tap the **Photo Assist** icon (the stars), and then tap **Generative portrait** on the image.  3 Select from the available styles at the bottom of the screen, such as Comic, 3D cartoon, or Watercolor. 4 Then, tap **Generate**. https://www.samsung.com/us/support/answer/ANS10000934/

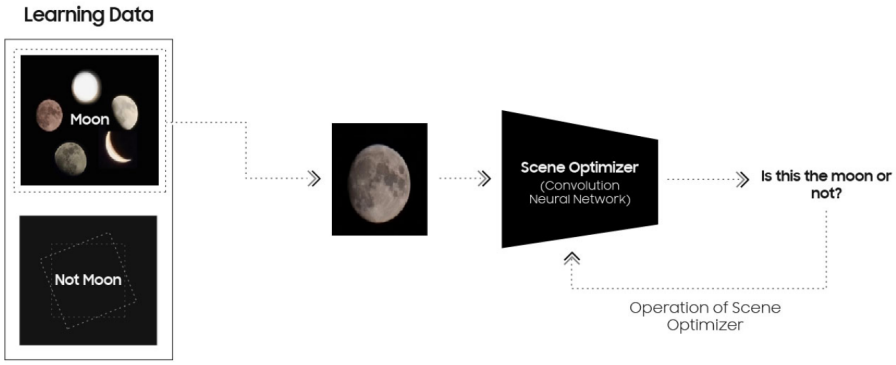
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Live Effect will bring your photos to life with animations. The effect may differ depending on the photo. 1 Open the **Gallery** app, and then find and select a photo. 2 Swipe up to view more details, and then tap **3D photo** on the image.  3 AI will generate the photo's effects. You may see a zooming motion, a panning motion, or a swivel motion. 4 You can share the generated photo by tapping **Share** at the bottom of the screen. https://www.samsung.com/us/support/answer/ANS10000753/ Further, the Accused Samsung '645 Products include a Scene Optimizer to detect pattern portions and perform corrections.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	How Samsung Galaxy Cameras Combine Super Resolution Technologies With AI Technology to Produce High-Quality Images of the Moon Samsung is committed to delivering best-in-class camera experiences in all conditions. Since the introduction of the Galaxy S10, the Samsung Galaxy series has harnessed artificial intelligence (AI) technologies in its cameras to help users capture every epic moment anytime, anywhere. As part of this, Samsung developed the Scene Optimizer feature, a camera functionality which uses advanced AI to recognize objects and thus deliver the best results to users. Since the introduction of the Galaxy S21 series, Scene Optimizer has been able to recognize the moon as a specific object during the photo-taking process, and applies the feature's detail enhancement engine to the shot. When you're taking a photo of the moon, your Galaxy device's[1] camera system will harness this deep learning-based AI technology, as well as multi-frame processing in order to further enhance details. Read on to learn more about the multiple steps, processes and technologies that go in to delivering high-quality images of the moon.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Understanding Super Resolution and Scene Optimizer In order to take a clear photo of the moon, Galaxy cameras harness Super Resolution to synthesize more than 10 images taken at 25x zoom or higher. The image taken at 25x zoom or above needs to eliminate noise and enhance clarity and other details. Super Resolution technology helps produce images through multi-frame composition. When Scene Optimizer is turned on and the moon has been recognized as an object, the camera will deliver users a bright and clear image through the detail enhancement engine of Scene Optimizer on top of the Super Resolution technology.  **AI Deep Learning for Moon Object Recognition** The engine for recognizing the moon was built based on a variety of moon shapes and details, from full through to crescent moons, and is based on images taken from our view from the Earth. It uses an AI deep learning model to detect the presence of the moon and identify the area it occupies – as denoted by the square box - in the relevant image. Once the AI model has completed its learning, it can detect the area occupied by the moon even in images that were not used in training.

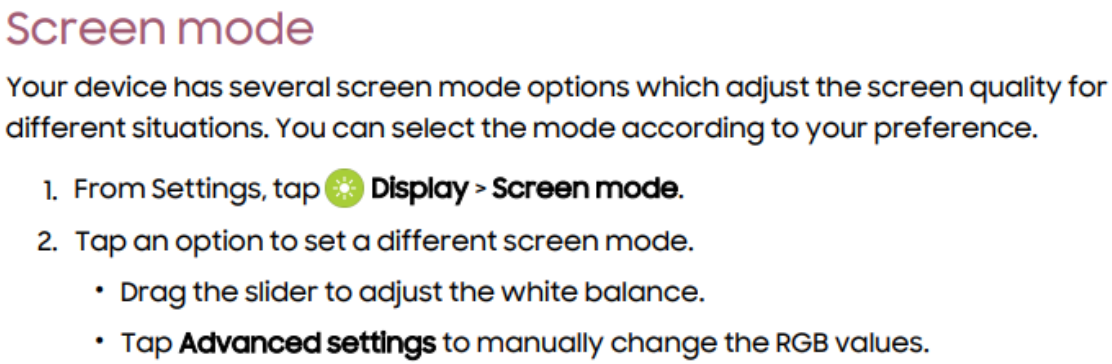
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 However, the moon will not be properly recognized by the camera and Scene Optimizer technology if it is obscured by clouds, or if the moon object itself is the side that is not visible from the Earth.  https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The Brightness Control Process Once the device has recognized the moon after zooming in, it will control the brightness of the display in order to present the moon more clearly while maintaining optimal brightness. Accordingly, when users take photos of the moon at early evening time, the sky around the moon will appear darker than the actual sky color because the device will darken the object background brightness in order to help make the moon appear more clearly. Once your device recognizes the moon, it will continuously adjust focus to stay directly on the moon.  **Capturing the Most Stable Images Possible** Samsung introduced the Zoom Lock feature, which automatically reduces the effects of a shaking device without the need for a tripod. Combining OIS and VDIS technologies, Zoom Lock is able to minimize the image blur that can be caused by shaking hands and helps users take truly epic moon shots. While zooming in and touching the display or maintaining a focus on the moon for longer than 1.5 seconds, the Zoom Lock feature will be automatically activated. The border line of the zoom map on the upper right side of the screen will change from white to yellow, and the moon will be fixed on the display.

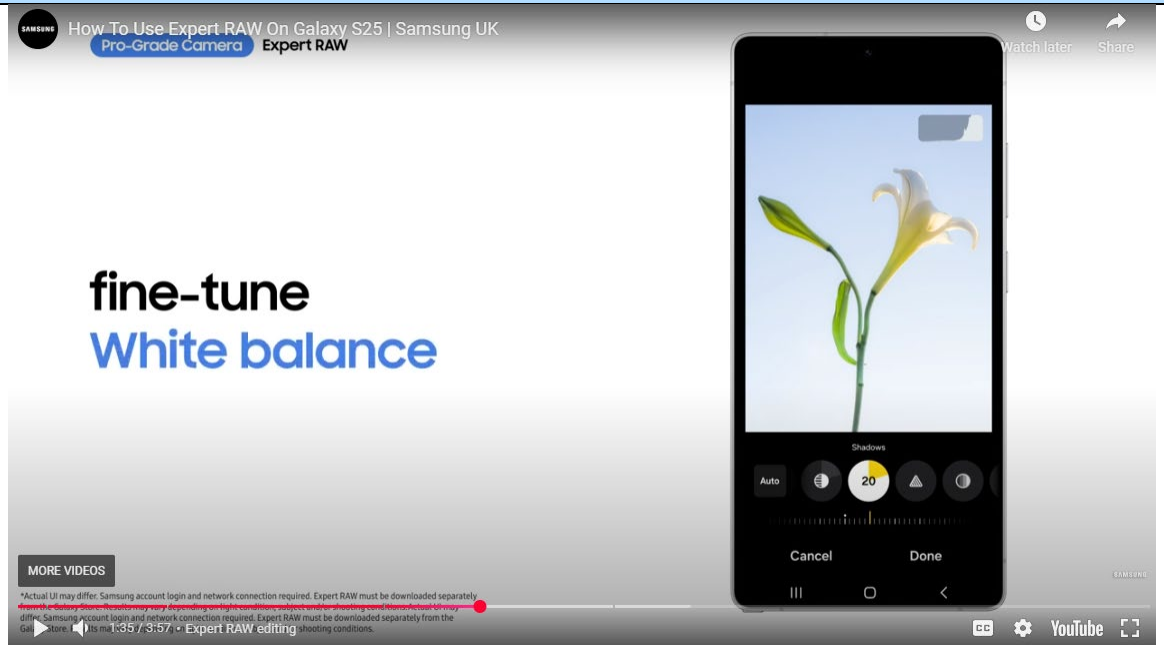
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Next, the camera takes multiple pictures and then synthesizes them into a single, bright image with reduced noise. After Multi-frame Processing has taken place, Galaxy camera further harnesses Scene Optimizer's deep-learning-based AI detail enhancement engine to effectively eliminate remaining noise and enhance the image details even further. https://www.samsungmobilepress.com/feature-stories/how-samsung-galaxy-cameras-combine-super-resolution-technologies-with-ai-technology-to-produce-high-quality-images-of-the-moon/ For example, as an example the Accused Samsung '645 Products include AI Stereo Depth Mapping, that distinguishes between pattern portions (e.g., hair or clothing) and content (e.g., face) or vice versa.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Become the ultimate photographer with Samsung AI Tap into the tools that help take perfect pictures, capture nighttime photos and make shareable content Samsung's Galaxy S23 Ultra series uses AI Stereo Depth Mapping, a software-based feature that relies on AI algorithms to improve image output when you click a photo. This algorithm essentially creates a depth map that automatically measures the distance between objects in an image, so it doesn't miss out on the smaller elements. For example, imagine a picture of a person on the Galaxy S23 ultra whose face is in focus, but their hair or clothing, which normal cameras may treat as background elements, might not be. AI Stereo Depth Mapping fixes this common problem, making sure all these elements are clear and in focus. https://www.samsung.com/us/explore/photography/become-the-ultimate-photographer-with-samsung-AI/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://news.samsung.com/global/one-ui-6-update-7-tips-for-making-the-most-of-ai-camera-on-your-galaxy

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 116.  *Id*. at 117.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Intelligent features • **Scan documents and text**: Automatically show a button when a document is detected to scan it. Tap the option to enable Auto scanning, which will scan a document without a tap. You'll also have the option to remove unwanted objects, in case your fingers are in the frame. • **Scan QR codes**: Automatically detects QR codes when using the camera. • **Shot suggestions**: Get on-screen guides to help you line up great shots. • **Intelligent optimization**: Set the quality optimization options to prioritize quality or speed in Photo mode. You can also enable Scene optimizer to automatically adjust exposure, contrast, white balance, and more based on what is detected in the camera frame. The Scene optimizer is only available when using the rear camera. https://www.samsung.com/us/support/answer/ANS10004601/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 https://www.youtube.com/watch?v=QlOmlA8dc5w As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

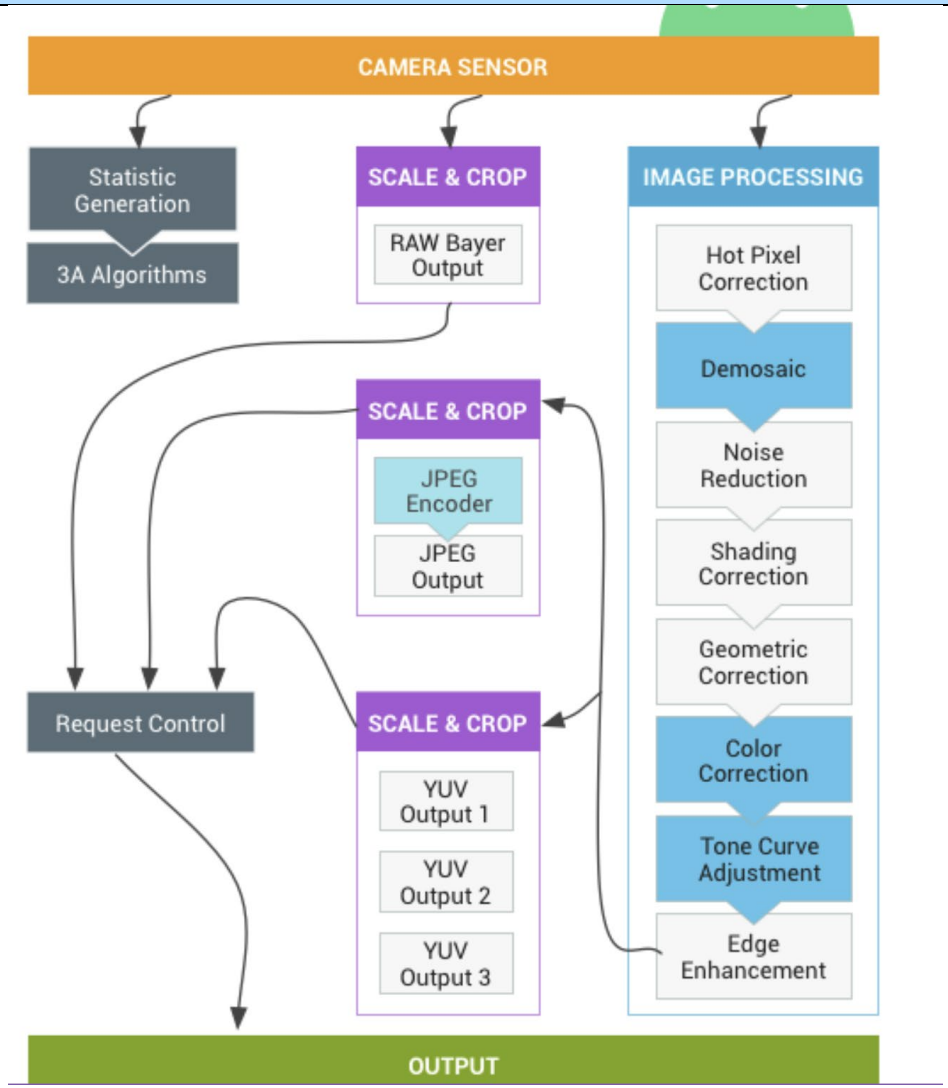
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

Input	Pattern (No picture area)	Pattern Contained	Video with Contents	Correction

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Portrait Photo	Text	No	Cloth	Corrections based on the selected camera's parameters
	 Person in front of a white wall	Text	No	Face	Beauty face correction applied

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

 Book Scan	White wall	No	Scanned image	Scan correction applied
 Face close up	Text	No	Face	Beauty face correction applied

As an additional example, the Accused Samsung '645 Products include a controller for correcting the video signal in scanner or equivalent camera mode when text or white or black background is detected:

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/
[5.f] [a controller] . . . which controls the corrector to cause the corrector not to correct the video signal when the pattern portions are not the no-picture areas.	The controller within each of the Accused Samsung '645 Products controls the corrector to cause the corrector not to correct the video signal when the pattern portions are not the no-picture areas. For example, upon information and belief, certain corrections are applied when pattern portions are contained and certain corrections are performed when pattern portions are not contained. For example, foliage or snow scene corrections are not performed when pattern portions corresponding to such scenes are not detected but additional image corrections are performed (e.g., face corrections and portrait mode corrections are applied). Similarly, certain white balance corrections are not performed when a white or black background is not contained but additional white balance corrections are applied to the content. Further, text scanning corrections are not performed when text is not detected but additional image corrections are applied. Moreover, image corrections to the foreground (e.g., the face of a person or object being captured) are applied but corrections to the background are not

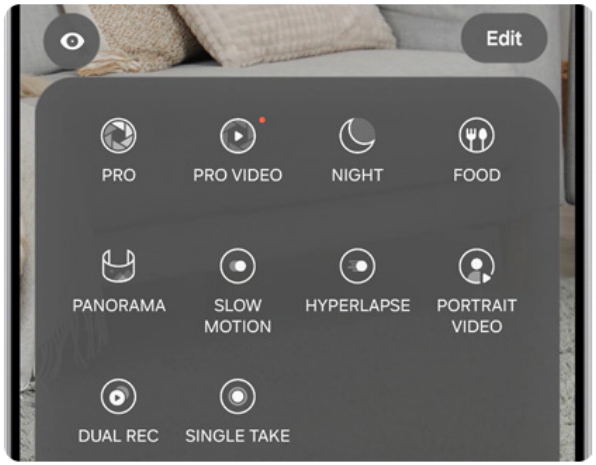
<table>
<tr><th>U.S. Patent No. 7,952,645</th><th>Exemplary Evidence of Infringement</th></tr>
<tr><td></td><td>applied if a white or black background is not detected. Further if the face is close to the camera such that a background is not detected, then the face corrections are applied but background corrections are not applied and background pattern portions are not contained.

For example, each of the Accused Samsung '645 Products performs color temperature corrections based on detection of face, in Portrait Mode, and/or based on zoom value detection that causes the cameras to switch and make corrections based on the selected camera's parameters. In this mode, when an individual wearing clothing containing a chromatic color (e.g., a red patterned shirt) stands in front of a white or black patterned background (e.g., snow, foliage, or a wall), the background is corrrected (e.g., blurred), while the individual and his or her colored clothing is not.

<table>
<tr><th>Input</th><th>Pattern</th><th>Pattern are not the no-picture areas</th><th>Video with Contents</th><th>Correction</th></tr>
<tr><td> 
Portrait Photo</td><td>Cloud</td><td>Yes</td><td>Cloth</td><td>No Correction.
No Blur</td></tr>
</table>
</td></tr>
</table>

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Person in front of a white wall	Cloth	Yes	Face	No Correction. No Blur
	 Book Scan	Cloth	Yes	Scanned image	No Correction. No Blur

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement				
	 Face close up	Cloth	Yes	Face	No White balance correction.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Pick a shooting mode You can easily switch between shooting modes at the bottom of the Camera app's screen. For instance, you can select Night mode to capture photos in dim lighting without using the flash. 1 Open the **Camera** app, and then look for the available shooting modes at the bottom of the screen. 2 Swipe left or right to browse through the shooting modes, and then tap a mode to select it. 3 The selected shooting mode will be highlighted, indicating that it is currently active. Below is a list of available shooting modes: 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	• **Portrait**: Add and adjust background effects for photos. • **Photo**: Take photos and allow the camera to determine the ideal settings for pictures. • **Video**: Record videos and allow the camera to determine the ideal settings for videos. • **More**: Choose other available shooting modes. To add a mode to the bottom of the app's screen, tap **Edit**, and then drag the desired mode to the bottom. Tap **Save**. ○ **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. ○ **Pro Video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking videos. ○ **Portrait Video**: Add and adjust background effects for portrait videos. https://www.samsung.com/us/support/answer/ANS10004601/

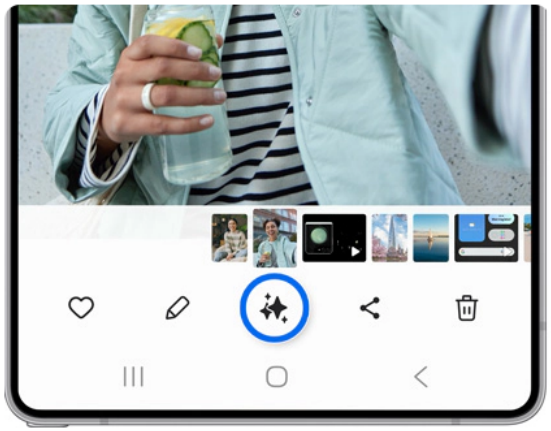
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Use Portrait Studio

If you'd like to change up your portraits using unique styles, just follow the steps below.

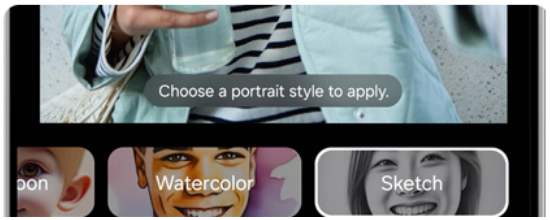
1 Navigate to open the **Gallery** app, and then select a portrait photo you'd like to edit.

2 Tap the **Photo assist** icon (the stars), and then swipe to Portrait studio at the bottom of the screen.

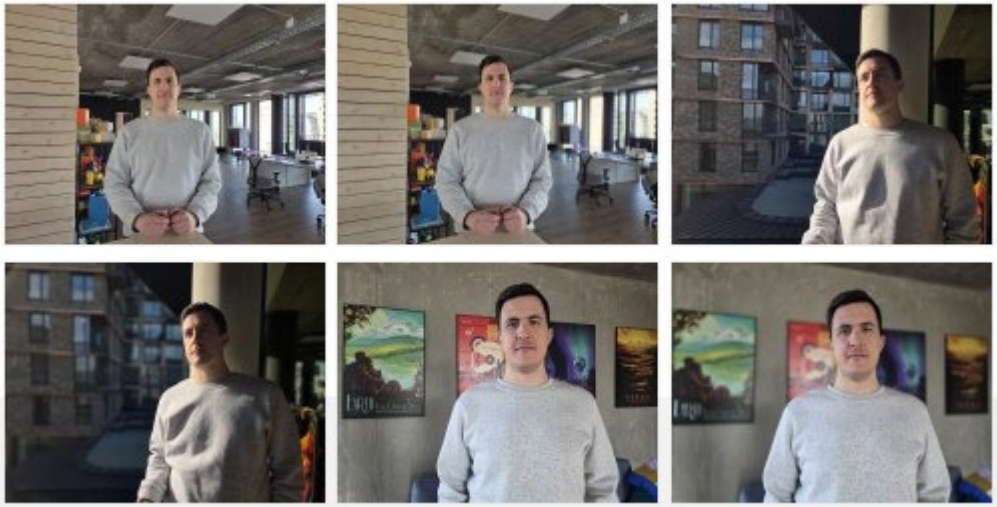


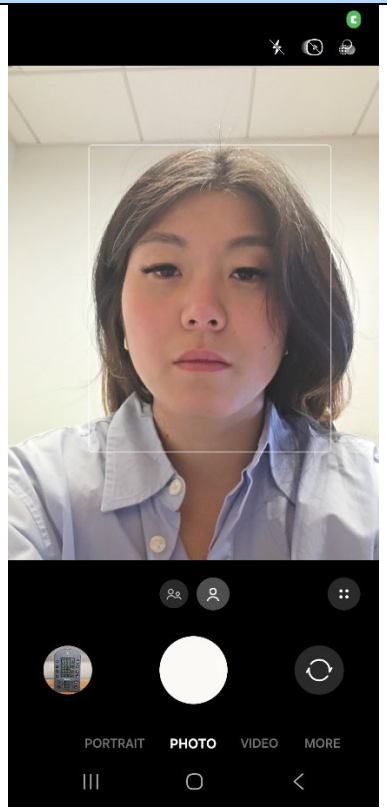
3 Next, select your desired portrait style, such as Comic, 3D cartoon, Watercolor, or Sketch.

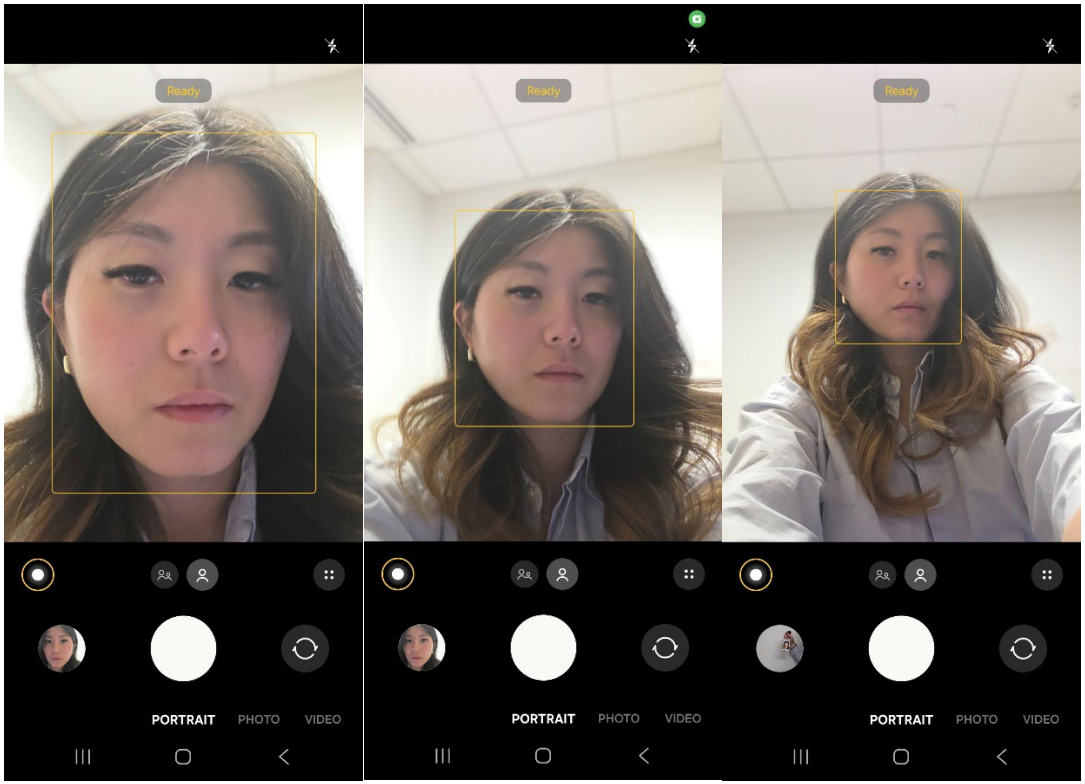
4 Tap **Generate**. The results will differ depending on the portrait style that has been selected.



https://www.samsung.com/us/support/answer/ANS10004857/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 (https://www.gsmarena.com/samsung_galaxy_s25-review-2794p5.php)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products performs white balance corrections on the face when a face is detected but does not perform these corrections to the background or the clothes. Similarly, the Accused Samsung '645 Products perform corrections on the background or the chromatic clothes but does not perform these corrections on the face.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes. As an additional example, the Accused Samsung '645 Products detects white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	white attributes in the scene. In this scenario, color temperature corrections would occur based on a white patterned background, but not occur for chromatic colors in the scene.
	CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev
	`public static final int CONTROL_SCENE_MODE_FACE_PRIORITY`
	If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines.
	If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework).
	Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.
	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	Optimized for nighttime photos of fireworks.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.
	
	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)
	
	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)

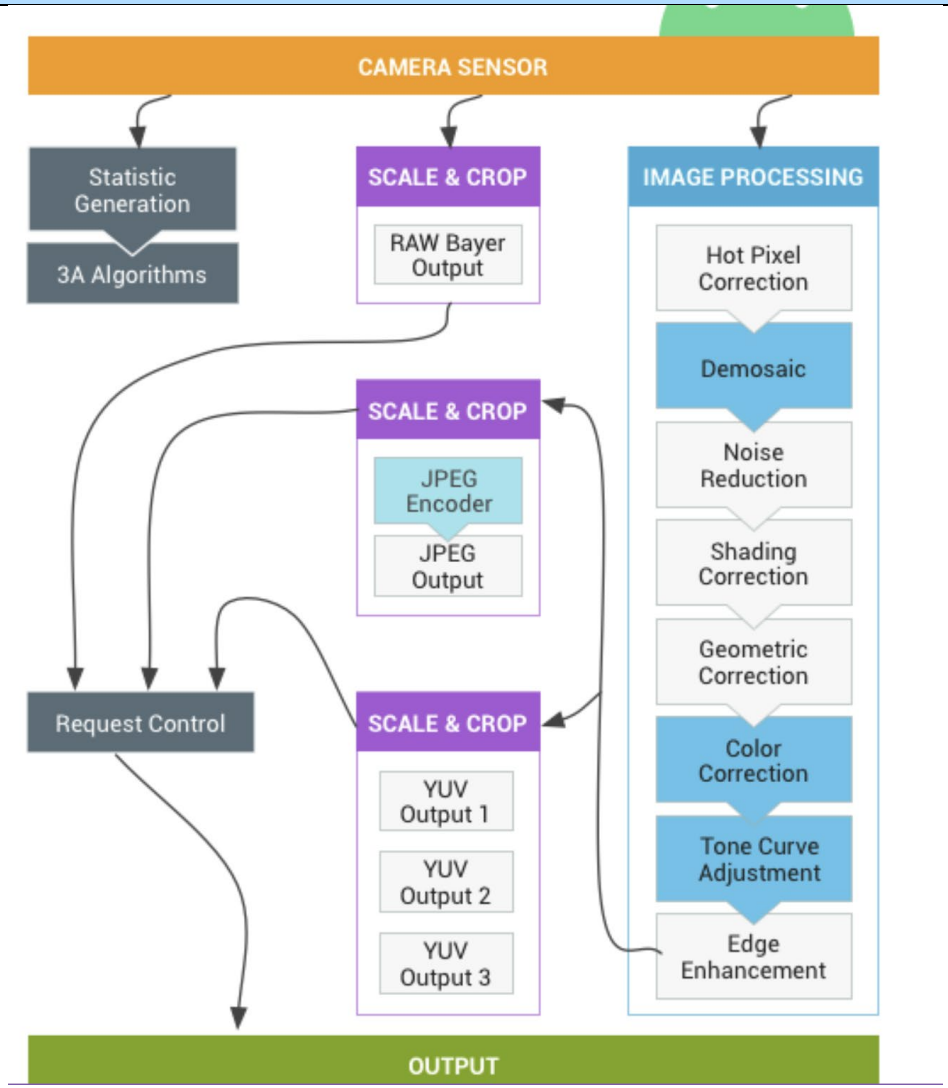
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)
	
	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)
	
	COLOR_CORRECTION_MODE Added in API level 21
	
	`public static final Key<Integer> COLOR_CORRECTION_MODE`
	
	The mode control selects how the image data is converted from the sensor's native color into linear sRGB color.
	
	When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed.
	
	See https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

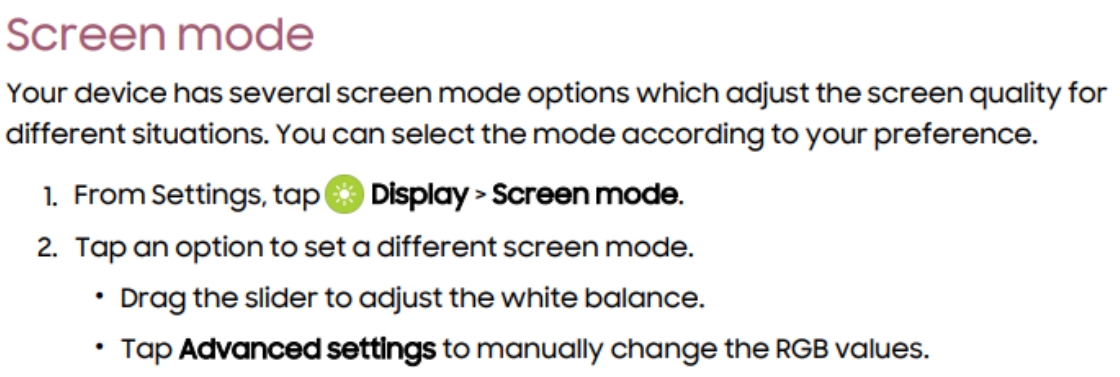
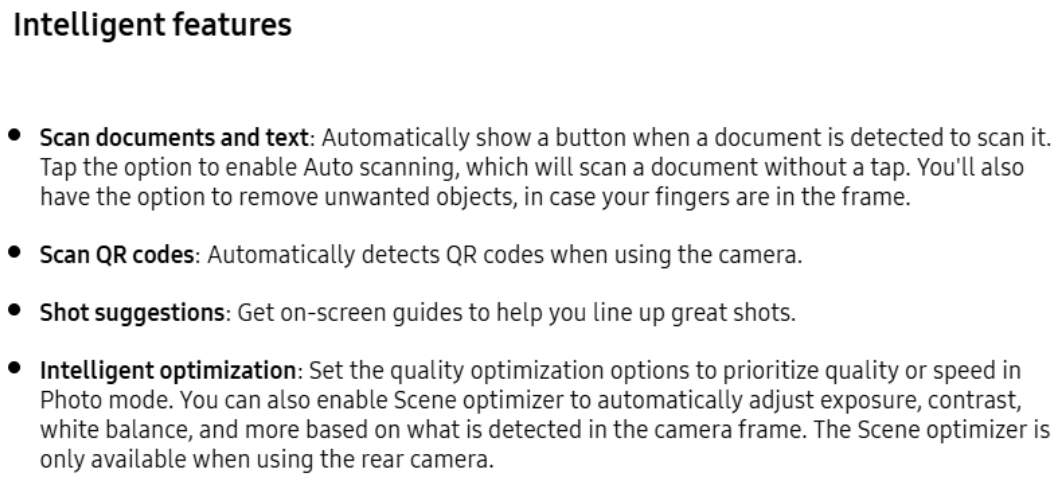
- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

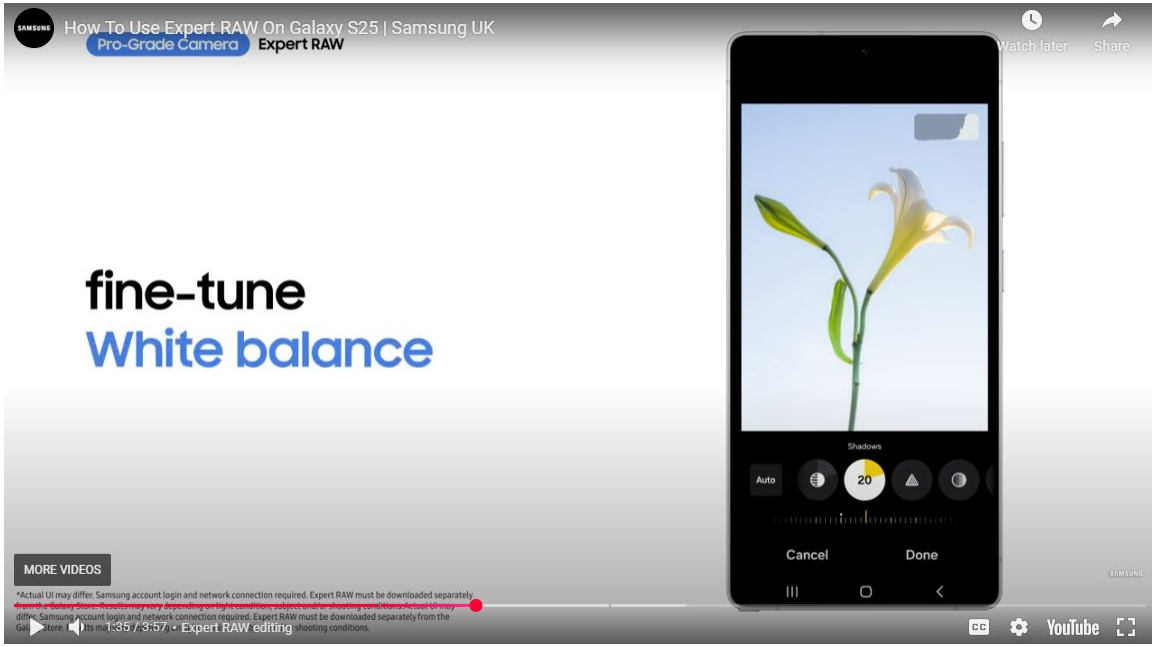
See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

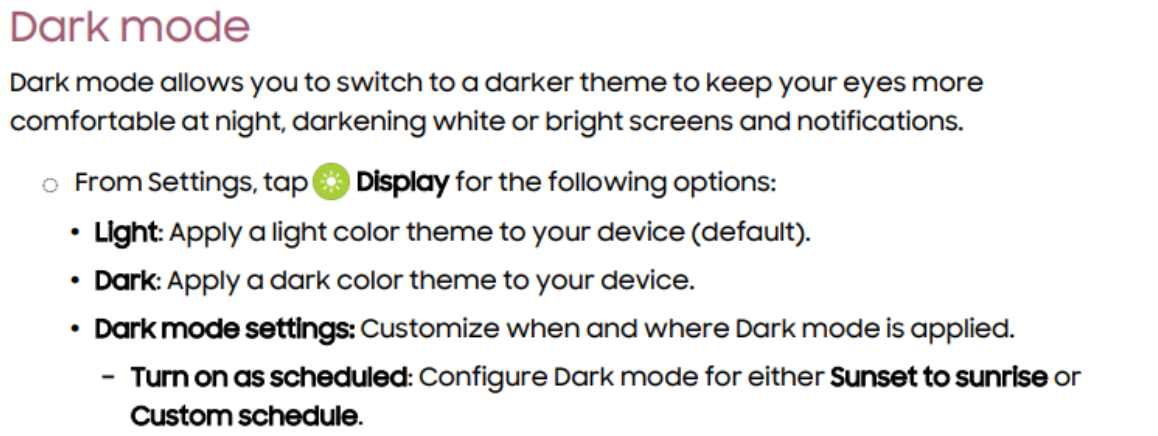
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products stop update of the data for correcting video signal of the background in scanner or equivalent camera mode. For example, upon information and belief the corrections applied to the scanned page are not applied to the colorful background: **Scan and edit documents on your Galaxy phone or tablet**  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/ Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a controller that controls the corrector to cause the corrector to not

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	correct the video signal input to the input unit when the pattern portions are contained, each of these products include software, hardware, or a combination of the two that perform the equivalent function of controlling the corrected to correct video signal. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, controlling corrector) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, not correcting the video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate pattern detection and no correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[6.] The video processing apparatus according to claim 5, comprising: a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal, wherein when the no-picture area detector has detected that the pattern portions are no-picture areas, the characteristic point detector detects a level or distribution of at least one of luminance, hue and saturation of the video signal other than the no-picture areas.	Each of the Accused Samsung '645 Products includes a characteristic point detector which detects a level or distribution of at least one of luminance, hue and saturation of the video signal, wherein when the no-picture area detector has detected that the pattern portions are no-picture areas, the characteristic point detector detects a level or distribution of at least one of luminance, hue and saturation of the video signal other than the no-picture areas. For example, each of the Accused Samsung '645 Products includes an image sensor and/or associated processor(s) (e.g., ISP and/or DSP) that luminance, hue, and saturation levels, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime surroundings, flash lighting such that luminance/hue/saturation are detected of the no-picture area (e.g., object or person whose image is captured in front of a white background of the no picture area). As another example, the Samsung Galaxy S25 includes an ambient light sensor and/or associated processor(s) (e.g., ISP and/or DSP) that detect a color of light or lighting conditions in the surroundings, including, for example, cloudy outdoor lighting, sunny outdoor lighting, indoor incandescent lighting, indoor fluorescent lighting, or nighttime surroundings, flash lighting.

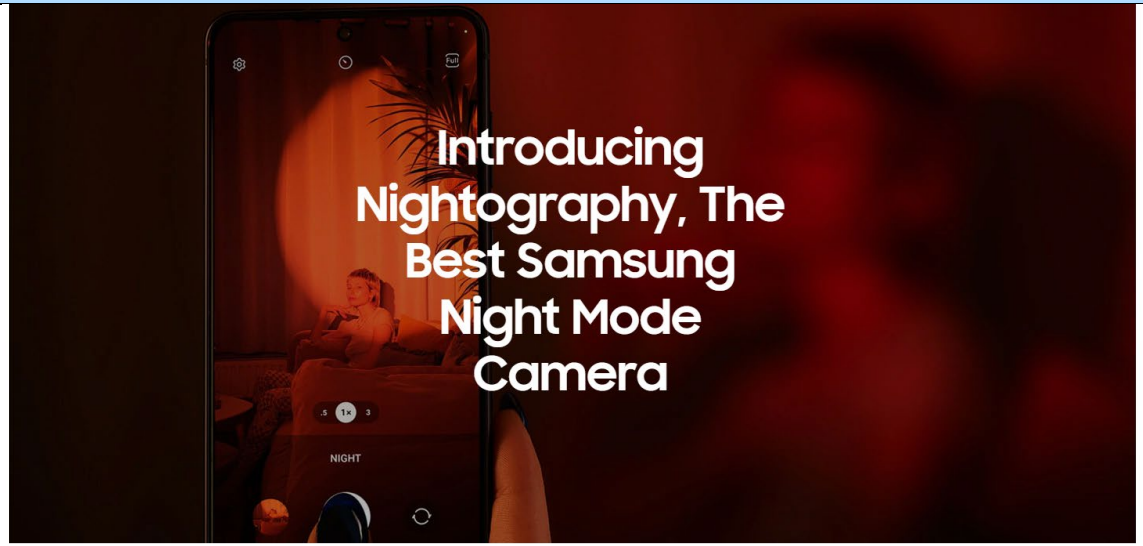
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Sensors Accelerometer, Barometer, Fingerprint Sensor, Gyro Sensor, Geomagnetic Sensor, Hall Sensor, Light Sensor, Proximity Sensor https://www.samsung.com/uk/smartphones/galaxy-s25/specs/ - **Pro**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while taking pictures. - **Pro video**: Manually adjust the ISO sensitivity, exposure value, white balance, and color tone while recording videos. Samsung Galaxy S25 User Manual at 43. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf) Adaptive color tone Adjust the colors and white balance based on ambient lighting conditions to make colors appear more natural in different environments. ○ From Settings, tap **Display** > **Adaptive color tone** and tap to enable this feature. *Id*. at 116.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 *Id*. at 117. 

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	https://www.samsung.com/us/support/answer/ANS10004601/  https://www.youtube.com/watch?v=QlOmlA8dc5w

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Samsung Galaxy S25 User Manual at 115. (https://downloadcenter.samsung.com/content/UM/202502/20250222040501249/SAM_S931_S936_S938_EN_UG_OS15_012425_FINAL_AC_02072025.pdf)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement



Don't let the fact that it's dark ruin your chance to capture unforgettable moments. Samsung Galaxy devices have an incredible range of camera modes - perfect for every occasion and when it comes to taking epic shots at night you have everything you need in Night Mode. Here we explore Nightography in all its illuminating glory and explain why Night mode is the best camera setting to choose for exceptional low light images.

What does Night Mode do?

Night Mode is a smartphone feature that enables you to take vivid, highly optimised photos, even in the dark. Meaning you can avoid taking washed out, blurry night images. Pictures look sharp due to the innovative AI multi-frame processing which combines 30 images into just one epic shot, optimising colour and detail in every pixel.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-night-mode-camera/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

What is low light photography?

Low light photography is all about capturing stunning images in conditions where natural or artificial light is minimal. Imagine photographing a beautiful sunset, a cityscape at night, or a candlelit dinner. The challenge lies in capturing the right details without the picture becoming too dark or grainy[1].

Enter the Galaxy S25 Ultra; designed to make low light photography an absolute joy. With its innovative Night Mode and Nightography features, this smartphone transforms night-time scenes into vivid and detailed photos. Night Mode intelligently combines multiple exposures, balancing the light and ensuring every part of the image is well-lit and clear.

Nightography takes it a step further by leveraging advanced AI[2] and sensor technology to enhance low-light performance. This ensures that even in the darkest environments, your photos are bright, sharp, and full of detail. Whether you're capturing a starry night sky, a bustling cityscape, or a cosy, dimly lit moment, the Galaxy S25 Ultra makes low light photography effortless and exciting.

1. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.
2. Samsung account login is required for certain AI features.





What is astrophotography?

Astrophotography is the art of capturing the beauty of the night sky, and with the Galaxy S25 Ultra, it's never been easier. This advanced camera feature, is designed to capture the breath-taking beauty of the stars and planets by using long-exposure lenses, advanced AI[1] technology, and cutting-edge camera software. It even guides you through the process with on-screen prompts, making it simple to snap stunning photos at night[2].

The sophisticated Camera AI enhances night-time images by optimising colours and restoring the intricate details of the evening sky. With the Galaxy S25 Ultra's advanced camera capabilities, larger sensors, and improved low-light performance, you can capture the wonders of the stars and planets without needing specialist equipment. So, point your Galaxy S25 Ultra towards the sky, and let it show you the way!

1. Samsung account login is required for certain AI features.
2. Results may vary depending on shooting conditions including multiple subjects, being out of focus or moving subjects.

https://www.samsung.com/uk/mobile-phone-buying-guide/samsung-galaxy-s25-camera-specs-explained/

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, each of the Accused Samsung '645 Products supports the following color formats:

5.1.7. Video Codecs

- For acceptable quality of web video streaming and video-conference services, device implementations SHOULD use a hardware VP8 codec that meets the requirements.

If device implementations include a video decoder or encoder:

- [C-1-1] Video codecs MUST support output and input bytebuffer sizes that accommodate the largest feasible compressed and uncompressed frame as dictated by the standard and configuration but also not overallocate.
- [C-1-2] Video encoders and decoders MUST support YUV420 8:8:8 flexible color formats (`COLOR_FormatYUV420Flexible`) through `CodecCapabilities`.
- [C-1-3] Video encoders and decoders MUST support at least one of a planar or semiplanar YUV420 8:8:8 color format: `COLOR_FormatYUV420PackedPlanar` (equivalent to `COLOR_FormatYUV420Planar`) or `COLOR_FormatYUV420PackedSemiPlanar` (equivalent to `COLOR_FormatYUV420SemiPlanar`). They are STRONGLY RECOMMENDED to support both.
- [C-SR-1] Video encoders and decoders are STRONGLY RECOMMENDED to support at least one of a hardware optimized planar or semiplanar YUV420 8:8:8 color format (YV12, NV12, NV21 or equivalent vendor optimized format.)
- [C-1-5] Video decoders that support a high bit-depth format (9+ bits per channel) MUST support outputting an 8-bit equivalent format if requested by the application. This MUST be reflected by supporting an YUV420 8:8:8 color format via `android.media.MediaCodecInfo`.

If device implementations advertise HDR profile support through `Display.HdrCapabilities`, they:

- [C-2-1] MUST support HDR static metadata parsing and handling.

If device implementations advertise intra refresh support through `FEATURE_IntraRefresh` in the `MediaCodecInfo.CodecCapabilities` class, they:

- [C-3-1] MUST support the refresh periods in the range of 10 - 60 frames and accurately operate within 20% of configured refresh period.

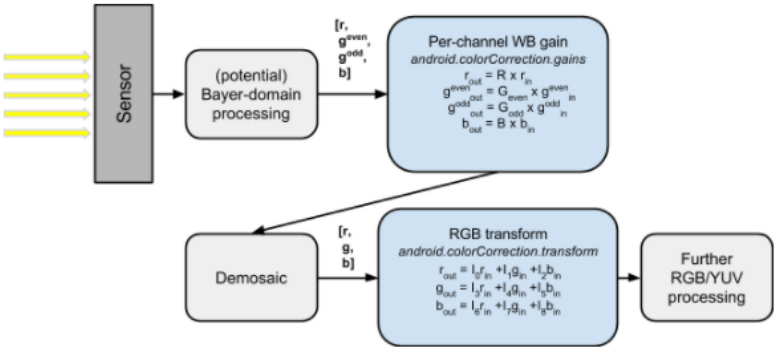
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

See https://source.android.com/docs/compatibility/15/android-15-cdd

5.1.8. Video Codecs List

Format/Codec	Details	File Types/Container Formats to be supported
H.263		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
H.264 AVC	See section 5.2 and 5.3 for details	• 3GPP (.3gp) • MPEG-4 (.mp4) • MPEG-2 TS (.ts, not seekable) • Matroska (.mkv, decode only)
H.265 HEVC	See section 5.3 for details	• MPEG-4 (.mp4) • Matroska (.mkv, decode only)
MPEG-2	Main Profile	• MPEG2-TS (.ts, not seekable) • MPEG-4 (.mp4, decode only) • Matroska (.mkv, decode only)
MPEG-4 SP		• 3GPP (.3gp) • MPEG-4 (.mp4) • Matroska (.mkv, decode only)
VP8	See section 5.2 and 5.3 for details	• WebM (.webm) • Matroska (.mkv)
VP9	See section 5.3 for details	• WebM (.webm) • Matroska (.mkv)

Id.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	For example, the Accused Samsung '645 Products detects a color of light in the surroundings while performing color corrections: COLOR_CORRECTION_MODE Added in API level 21 `public static final Key<Integer> COLOR_CORRECTION_MODE` The mode control selects how the image data is converted from the sensor's native color into linear sRGB color. When auto-white balance (AWB) is enabled with `android.control.awbMode`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed. We define the expected processing pipeline below. For consistency across devices, this is always the case with TRANSFORM_MATRIX. When either FAST or HIGH_QUALITY is used, the camera device may do additional processing but `android.colorCorrection.gains` and `android.colorCorrection.transform` will still be provided by the camera device (in the results) and be roughly correct. Switching to TRANSFORM_MATRIX and using the data provided from FAST or HIGH_QUALITY will yield a picture with the same white point as what was produced by the camera device in the earlier frame. The expected processing pipeline is as follows:  https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_GAINS Added in API level 21 `public static final Key<RggbChannelVector> COLOR_CORRECTION_GAINS` Gains applying to Bayer raw color channels for white-balance. These per-channel gains are either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. The gains in the result metadata are the gains actually applied by the camera device to the current frame. The valid range of gains varies on different devices, but gains between [1.0, 3.0] are guaranteed not to be clipped. Even if a given device allows gains below 1.0, this is usually not recommended because this can create color artifacts. **Units**: Unitless gain factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_GAINS

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_TRANSFORM Added in API level 21 `public static final Key<ColorSpaceTransform> COLOR_CORRECTION_TRANSFORM` A color transform matrix to use to transform from sensor RGB color space to output linear sRGB color space. This matrix is either set by the camera device when the request `android.colorCorrection.mode` is not TRANSFORM_MATRIX, or directly by the application in the request when the `android.colorCorrection.mode` is TRANSFORM_MATRIX. In the latter case, the camera device may round the matrix to account for precision issues; the final rounded matrix should be reported back in this matrix result metadata. The transform should keep the magnitude of the output color values within `[0, 1.0]` (assuming input color values is within the normalized range `[0, 1.0]`), or clipping may occur. The valid range of each matrix element varies on different devices, but values within [-1.5, 3.0] are guaranteed not to be clipped. **Units**: Unitless scale factors **Optional** - The value for this key may be `null` on some devices. **Full capability** - Present on all camera devices that report being `HARDWARE_LEVEL_FULL` devices in the `android.info.supportedHardwareLevel` key https://developer.android.com/reference/android/hardware/camera2/CaptureRequest#COLOR_CORRECTION_TRANSFORM

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	CONTROL_AWB_MODE Added in API level 21 `public static final Key<Integer> CONTROL_AWB_MODE` Whether auto-white balance (AWB) is currently setting the color transform fields, and what its illumination target is. This control is only effective if `android.control.mode` is AUTO. When set to the AUTO mode, the camera device's auto-white balance routine is enabled, overriding the application's selected `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. Note that when `android.control.aeMode` is OFF, the behavior of AWB is device dependent. It is recommened to also set AWB mode to OFF or lock AWB by using `android.control.awbLock` before setting AE mode to OFF. When set to the OFF mode, the camera device's auto-white balance routine is disabled. The application manually controls the white balance by `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode`. When set to any other modes, the camera device's auto-white balance routine is disabled. The camera device uses each particular illumination target for white balance adjustment. The application's values for `android.colorCorrection.transform`, `android.colorCorrection.gains` and `android.colorCorrection.mode` are ignored. https://developer.android.com/reference/android/hardware/camera2/CaptureResult#CONTROL_AWB_MODE

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

CONTROL_AWB_MODE_DAYLIGHT

Added in API level 21

```
public static final int CONTROL_AWB_MODE_DAYLIGHT
```

The camera device's auto-white balance routine is disabled; the camera device uses daylight light as the assumed scene illumination for white balance.

While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant D65.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_DAYLIGHT

CONTROL_AWB_MODE_FLUORESCENT

Added in API level 21

```
public static final int CONTROL_AWB_MODE_FLUORESCENT
```

The camera device's auto-white balance routine is disabled; the camera device uses fluorescent light as the assumed scene illumination for white balance.

While the exact white balance transforms are up to the camera device, they will approximately match the CIE standard illuminant F2.

The application's values for `android.colorCorrection.transform` and `android.colorCorrection.gains` are ignored. For devices that support the MANUAL_POST_PROCESSING capability, the values used by the camera device for the transform and gains will be available in the capture result for this request.

https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_AWB_MODE_FLUORESCENT

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	As an additional example, the Accused Samsung '645 Products detect white attributes (e.g., based on scene classification or skin) and applies color temperature corrections by adjusting hue and saturation. For example, the "Camera" application includes a scene mode feature, which adjusts the camera settings based on detection of the type of scene including detecting white attributes in the scene. CONTROL_SCENE_MODE_FACE_PRIORITY Added in API lev `public static final int CONTROL_SCENE_MODE_FACE_PRIORITY` If face detection support exists, use face detection data for auto-focus, auto-white balance, and auto-exposure routines. If face detection statistics are disabled (i.e. `android.statistics.faceDetectMode` is set to OFF), this should still operate correctly (but will not return face detection statistics to the framework). Unlike the other scene modes, `android.control.aeMode`, `android.control.awbMode`, and `android.control.afMode` remain active when FACE_PRIORITY is set.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_FIREWORKS Added in API level 2
	
	`public static final int CONTROL_SCENE_MODE_FIREWORKS`
	
	Optimized for nighttime photos of fireworks.
	
	CONTROL_SCENE_MODE_HDR Added in API level 22
	
	`public static final int CONTROL_SCENE_MODE_HDR`
	
	Turn on a device-specific high dynamic range (HDR) mode.
	
	In this scene mode, the camera device captures images that keep a larger range of scene illumination levels visible in the final image. For example, when taking a picture of a object in front of a bright window, both the object and the scene through the window may be visible when using HDR mode, while in normal AUTO mode, one or the other may be poorly exposed. As a tradeoff, HDR mode generally takes much longer to capture a single image, has no user control, and may have other artifacts depending on the HDR method used.
	
	Therefore, HDR captures operate at a much slower rate than regular captures.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_LANDSCAPE Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_LANDSCAPE`
	
	Optimized for photos of distant macroscopic objects.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 4 (0x00000004)
	
	CONTROL_SCENE_MODE_NIGHT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT`
	
	Optimized for low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 5 (0x00000005)

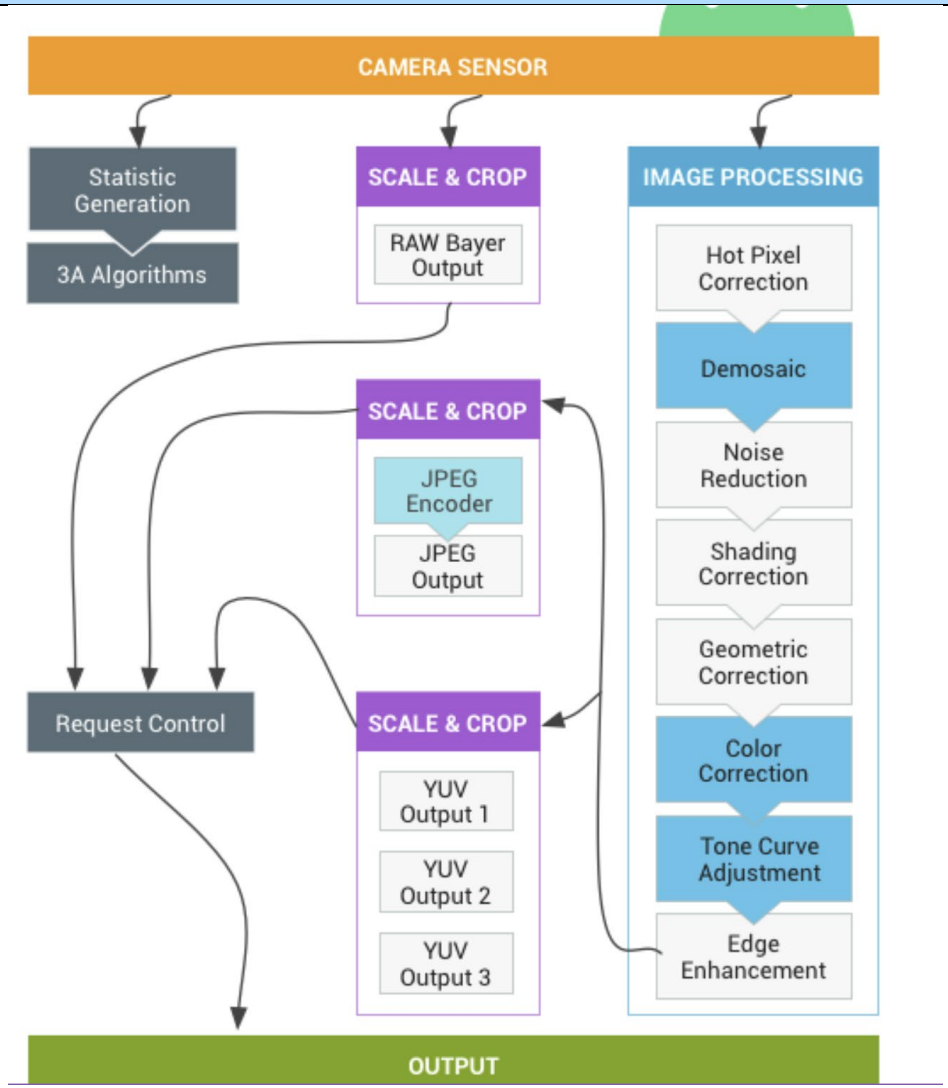
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_NIGHT_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_NIGHT_PORTRAIT`
	
	Optimized for still photos of people in low-light settings.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 6 (0x00000006)
	CONTROL_SCENE_MODE_PARTY Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PARTY`
	
	Optimized for dim, indoor settings with multiple moving people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 14 (0x0000000e)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

	CONTROL_SCENE_MODE_PORTRAIT Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_PORTRAIT`
	
	Optimized for still photos of people.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 3 (0x00000003)
	CONTROL_SCENE_MODE_SNOW Added in API level 21
	
	`public static final int CONTROL_SCENE_MODE_SNOW`
	
	Optimized for bright, outdoor settings containing snow.
	
	See also:
	
	`CaptureRequest.CONTROL_SCENE_MODE`
	
	Constant Value: 9 (0x00000009)

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	COLOR_CORRECTION_MODE Added in API level 21 `public static final Key<Integer> COLOR_CORRECTION_MODE` The mode control selects how the image data is converted from the sensor's native color into linear sRGB color. When auto-white balance (AWB) is enabled with `CaptureRequest#CONTROL_AWB_MODE`, this control is overridden by the AWB routine. When AWB is disabled, the application controls how the color mapping is performed. *See* https://developer.android.com/reference/android/hardware/camera2/CameraMetadata#CONTROL_SCENE_MODE_FACE_PRIORITY The HAL and camera subsystem The camera subsystem includes the implementations for components in the camera pipeline such as the 3A algorithm and processing controls. The camera HAL provides interfaces for you to implement your versions of these components. To maintain cross-platform compatibility between multiple device manufacturers and Image Signal Processor (ISP, or camera sensor) vendors, the camera pipeline model is virtual and does not directly correspond to any real ISP. However, it is similar enough to real processing pipelines so that you can map it to your hardware efficiently. In addition, it is abstract enough to allow for multiple different algorithms and orders of operation without compromising either quality, efficiency, or cross-device compatibility.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement

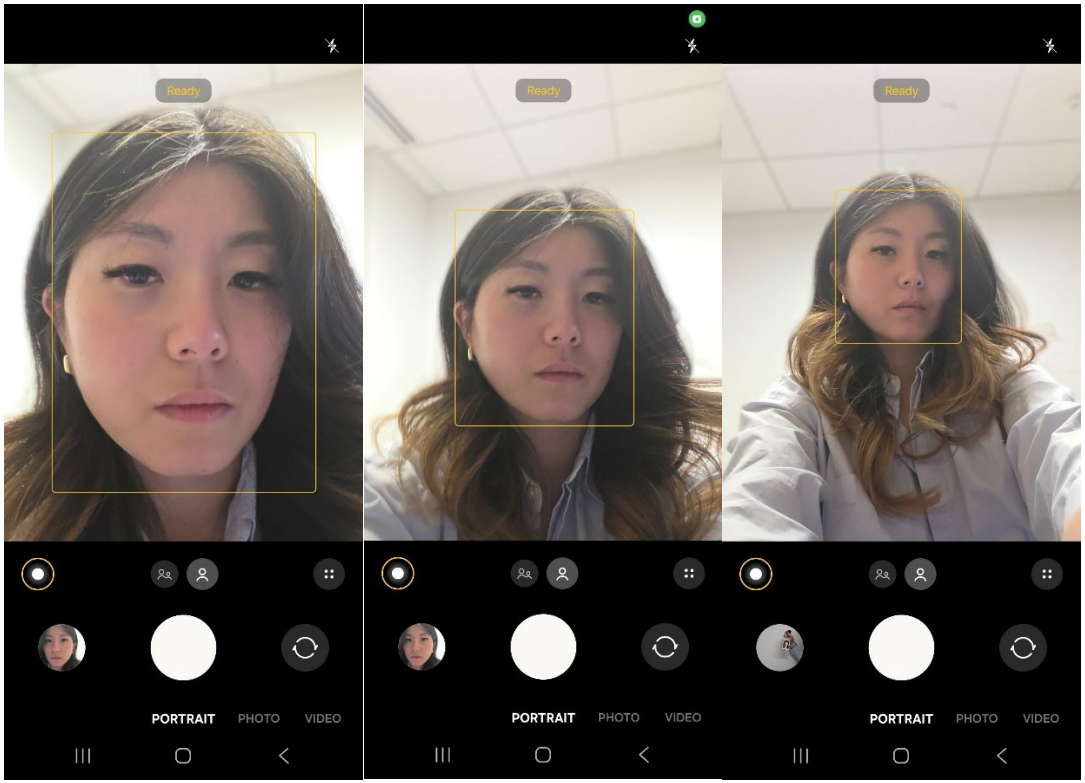
Parameter	State	Properties controlled
android.control.aeMode	OFF	None
	ON	android.sensor.exposureTime android.sensor.frameDuration android.sensor.sensitivity android.lens.aperture (if supported) android.lens.filterDensity (if supported)
	ON_AUTO_FLASH	Everything is ON, plus android.flash.firingPower, android.flash.firingTime, and android.flash.mode
	ON_ALWAYS_FLASH	Same as ON_AUTO_FLASH
	ON_AUTO_FLASH_RED_EYE	Same as ON_AUTO_FLASH
android.control.awbMode	OFF	None
	WHITE_BALANCE_*	android.colorCorrection.transform. Platform-specific adjustments if android.colorCorrection.mode is FAST or HIGH_QUALITY.

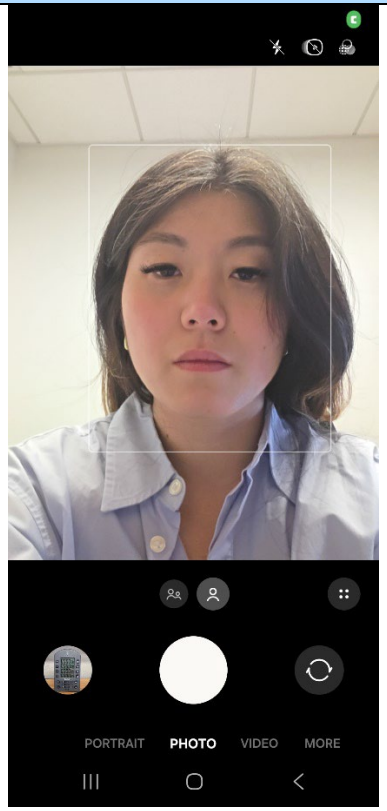
The controls in the Image Processing block in Figure 2 all operate on a similar principle, and generally each block has three modes:

- OFF: This processing block is disabled. The demosaic, color correction, and tone curve adjustment blocks cannot be disabled.
- FAST: In this mode, the processing block may not slow down the output frame rate compared to OFF mode, but should otherwise produce the best-quality output it can given that restriction. Typically, this would be used for preview or video recording modes, or burst capture for still images. On some devices, this may be equivalent to OFF mode (no processing can be done without slowing down the frame rate), and on some devices, this may be equivalent to HIGH_QUALITY mode (best quality still does not slow down frame rate).
- HIGH_QUALITY: In this mode, the processing block should produce the best quality result possible, slowing down the output frame rate as needed. Typically, this would be used for high-quality still capture. Some blocks include a manual control which can be optionally selected instead of FAST or HIGH_QUALITY. For example, the color correction block supports a color transform matrix, while the tone curve adjustment supports an arbitrary global tone mapping curve.

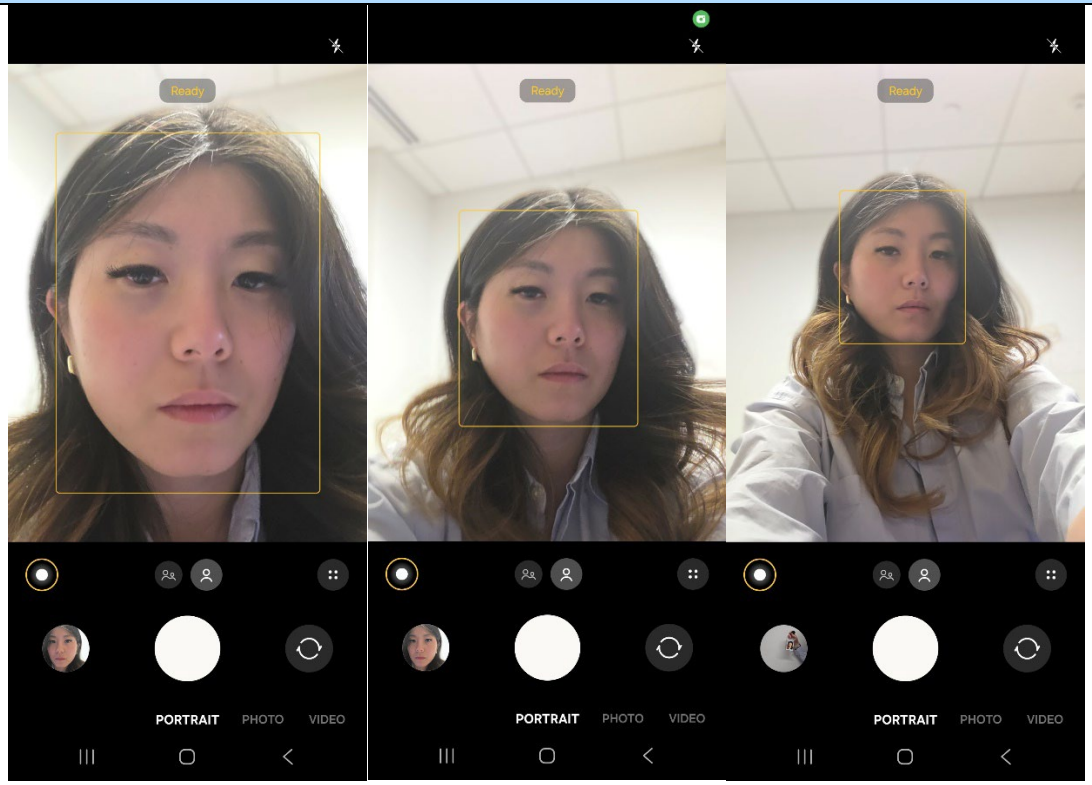
See, also: https://source.android.com/devices/camera/camera3_requests_hal#interaction

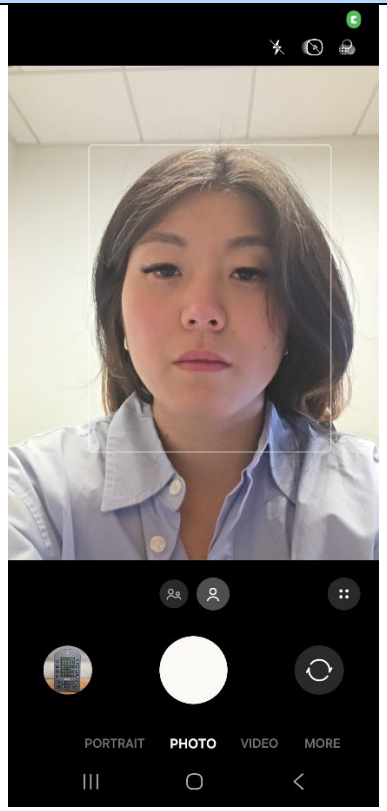
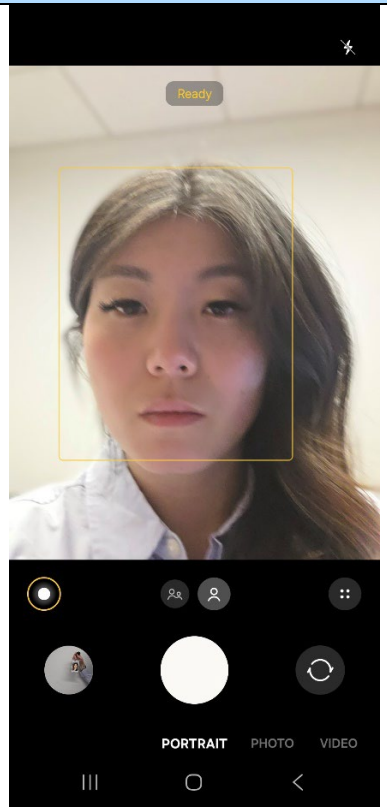
U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Doctrine of Equivalents To the extent Samsung argues that the above-identified structure do not literally infringe this claim element, this limitation is infringed under the doctrine of equivalents because the Accused Samsung '645 Products contain one or more components and/or software, or combination thereof, that perform substantially the same function in substantially the same way to obtain the same result. By way of example, to the extent that Samsung argues that the Accused Samsung '645 Products do not have a characteristic point detector that detects a level or distribution of at least one of luminance, hue and saturation of the video signal, each of these products include software, hardware, or a combination of the two that perform the equivalent function of detecting a level or distribution of luminance, hue, or saturation. Using this software, hardware, or combination of the two, these products perform substantially the same function (for example, detecting levels or distribution and performing corrections accordingly) in substantially the same way (e.g., sending instructions and/or performing image processing). The performance of this function achieves substantially the same result, for example, not correcting the video signal. For example, the Accused Samsung '645 Products include image sensors, ISP, DSP, GPU, and/or CPU that execute source code to perform image processing of video signal. These components and/or software operate together and function in substantially the same way to facilitate luminance/hue/saturation level/distribution detection and correction. That this functionality may be divided across several components (including software and/or hardware, *e.g.*, one or more processors) does not preclude these components from collectively functioning as a controller.
[7.] The video processing apparatus according to claim 5, wherein the pattern portions are portions added to left and right of the contents or	Each of the Accused Samsung '645 Products includes a video processing apparatus, wherein the pattern portions are portions added to left and right of the contents or above and below the contents and displayed. For example, the pattern portions can correspond to the white background and/or black background, wallpaper areas, and/or no-picture areas when a person is standing in front or

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
above and below the contents and displayed.	an object is placed in front of a wall or snow such that the picture area is the person or object in the foreground and the pattern portion is the background. As an additional example, the pattern portion can be the white page in a picture of the text in scanning mode.  Demonstration of face detection, with the bounding box shown identifying the face at three different sizes

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/
[8.] The video processing apparatus according to claim 5, wherein the no-picture areas have a black color or a white color.	Each of the Accused Samsung '645 Products includes a video processing apparatus, wherein the no-picture areas have a black color or a white color. For example, the pattern portions can correspond to the white background and/or black background when a person is standing in front or an object is placed in front of a wall or snow such that the picture area is the person or object in the foreground and the pattern portion is the background. As an additional example, the pattern portion can be the white page in a picture of the text in scanning mode.

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	 Demonstration of face detection, with the bounding box shown identifying the face at three different sizes

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	  Demonstrating difference between the "Photo" mode and the "Portrait" mode. As an additional example, the Accused Samsung '645 Products include a scanner or equivalent camera mode where the detector detects whether a pattern portion is contained in the video signal input to the input unit (e.g., black text and white page or white/black background on which the paper is placed).

U.S. Patent No. 7,952,645	Exemplary Evidence of Infringement
	Scan and edit documents on your Galaxy phone or tablet  If you need to bring an important document with you but don't want to carry a heavy book or stack of files, you can scan and save the document using your Galaxy phone or tablet. Your device will create an exact replica of the document, so you'll always have access to it in your Gallery app when you need to view it. Your document can also be edited using the Samsung Notes app and exported as a PDF. *See* https://www.samsung.com/us/support/answer/ANS00092489/