

**Exhibit 7 to
Intellectual Ventures II LLC's
Preliminary Infringement Contentions**

**Infringement Claim Chart of
U.S. Patent No. 7,916,180 (the “180 Patent”)**

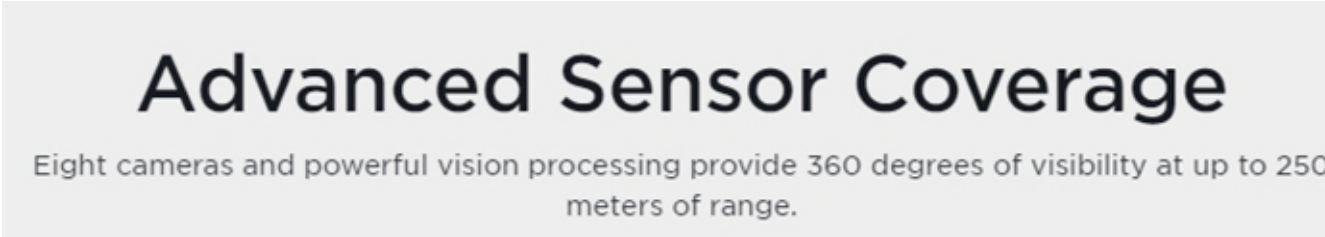
The Accused Instrumentalities include, without limitation, Tesla automotive vehicles (*e.g.*, Tesla Model X, S, 3, Y, Semi, Roadster Second Generation, and Cybertruck) that are equipped with Autopilot technology, and all past, current and future Tesla products that operate in the same or substantially similar manner as the specifically identified products and components, and all past, current, and future Tesla products that have the same or substantially similar features as the specifically identified products and components (“Count IX Automotive Vehicles” or “Tesla Automotive Vehicles”).

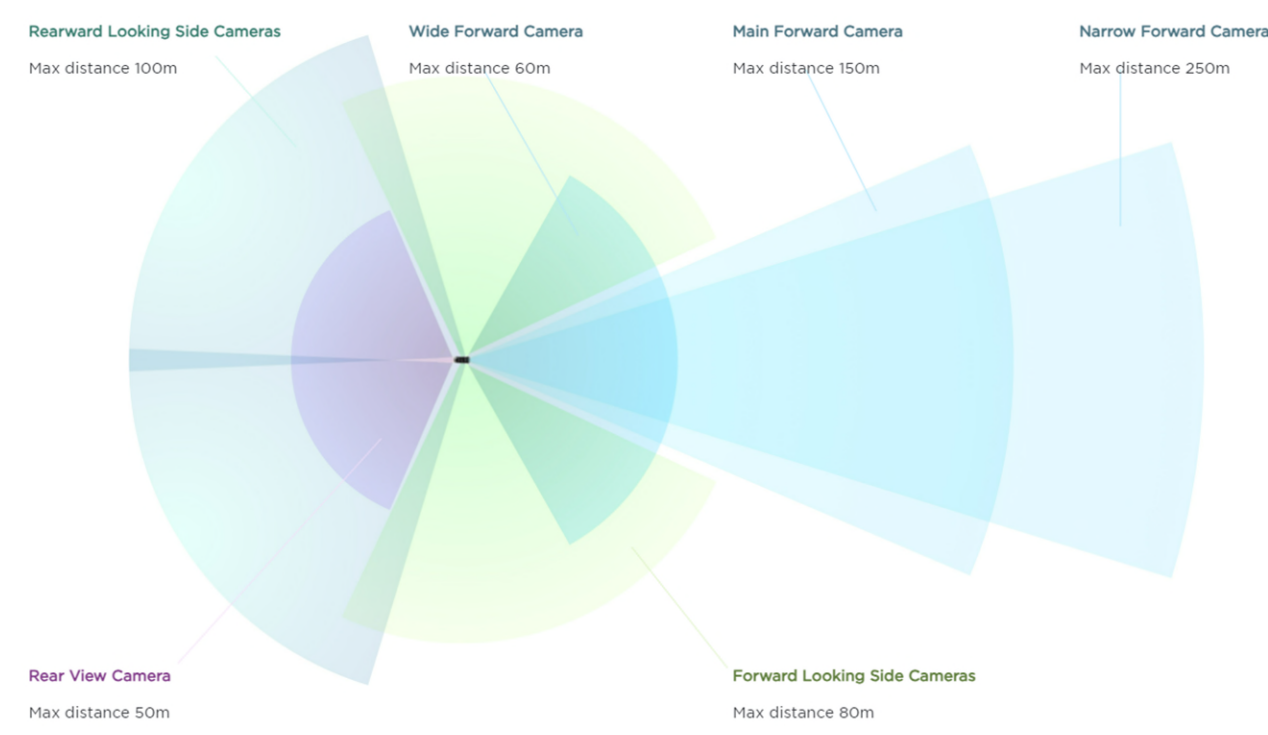
Plaintiff Intellectual Ventures II LLC, (“IV” or “Plaintiff”) does not intend this exemplary claim chart to be limiting, and IV reserves its rights to pursue other accused instrumentalities, patent claims, evidence, and infringement arguments in this case. Discovery has yet to begin and this case is still in its initial stages. Accordingly, IV reserves the right to amend and/or supplement these contentions to the full extent allowed by the Court, including but not limited to, incorporating additional information, claims, theories, and / or accused products.

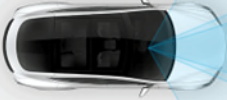
IV contends that Tesla, including Tesla’s employees, directly infringes each of the Asserted Claims, either literally or under the doctrine of equivalents. IV also contends that Tesla has indirectly infringed and continues to indirectly infringe by contributing to and actively inducing customers to use the Tesla vehicles and providing product manuals¹ that provide instructions regarding how to use Tesla vehicles in an infringing manner. Tesla also infringes via contributory infringement by providing replacement parts to Tesla vehicles and repair facilities by least making components that suitable for direct infringement that do not have any substantial non-infringing use.

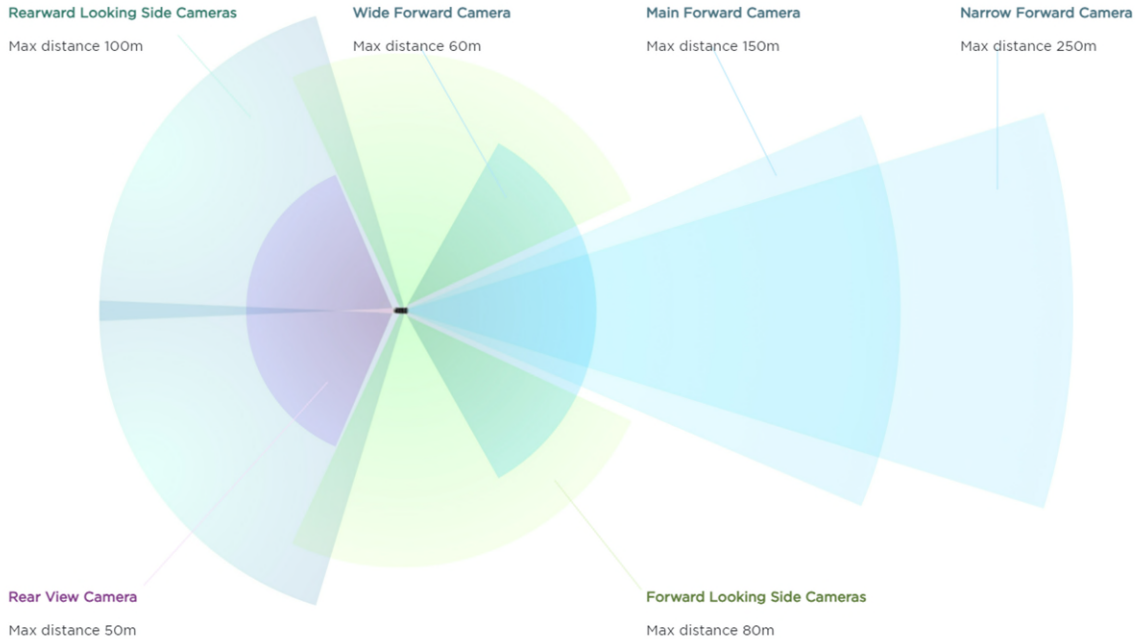
Tesla makes, uses, sells, offers for sale, and /or imports the Tesla Count IX Automobiles. For example, on information and belief, Tesla makes Tesla Count IX Automobiles, including at least in its Fremont, California; Lathrop, California; Grand Rapids, Michigan; Storey County, Nevada; Buffalo, New York; Brooklyn Park, Minnesota; Elgin, Illinois; and Austin, Texas manufacturing facilities. Further, Tesla sells and/or offers for sale the Tesla Count IX Automobiles in the United States through its sales centers.

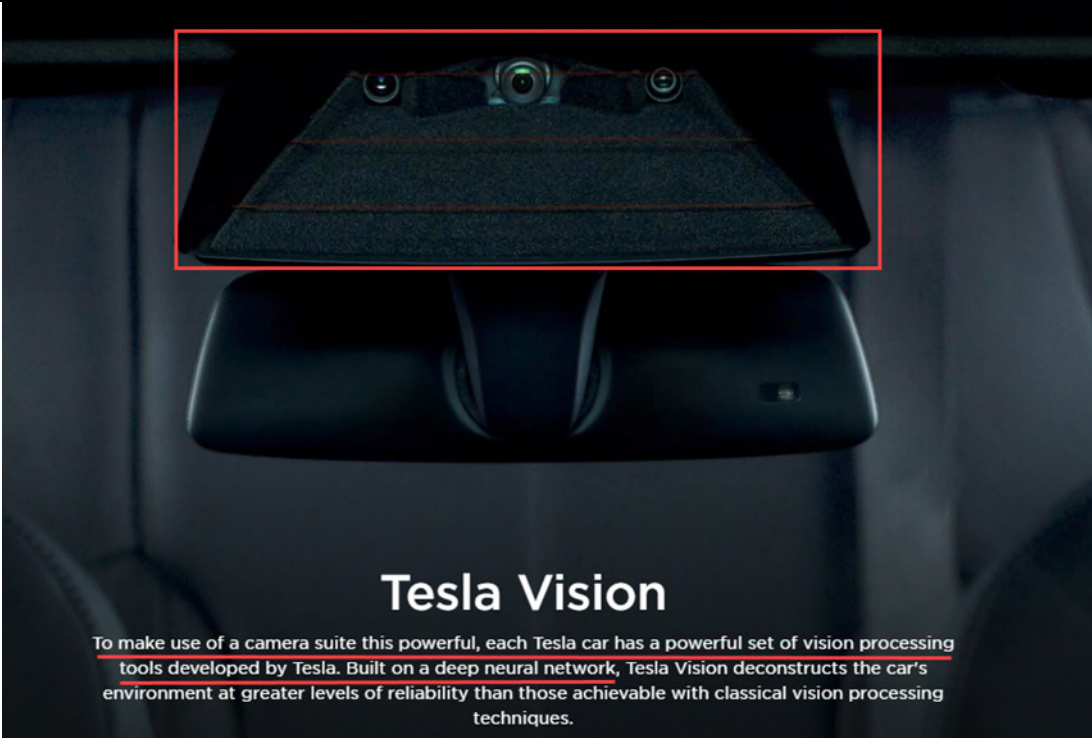
¹ See, for example, www.tesla.com/ownersmanual, www.tesla.com/support (last accessed on July 31, 2024).

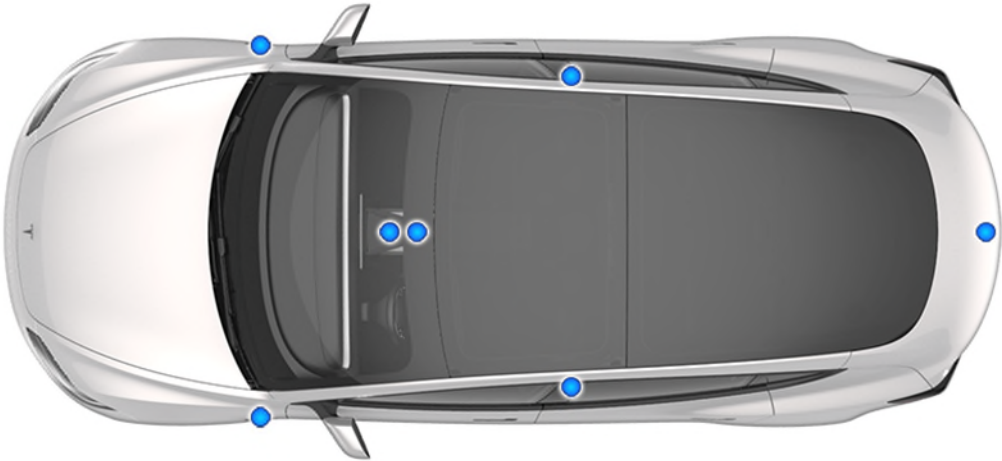
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
22. A method comprising:	<p>To the extent the preamble is limiting, on information and belief the Tesla Automotive Vehicles practice a method as recited in claim 22. For example, on information and belief, Tesla’s vehicle software includes the Driving Visualization feature, which uses multiple cameras with different fields of view (FOV).</p> <div>  <p>Model 3</p> <p>Design yours or get a trade-in estimate for your current vehicle.</p> <p>Custom Order</p> <p>Get an Estimate</p> </div> <p>Source: https://www.tesla.com/model3 (last accessed on April 10, 2024).</p> <div>  <p>Advanced Sensor Coverage</p> <p>Eight cameras and powerful vision processing provide 360 degrees of visibility at up to 250 meters of range.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

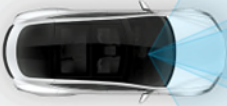
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>The diagram illustrates the camera configuration of a Tesla vehicle. It features six distinct camera fields of view, each represented by a colored sector radiating from a central point. The sectors are: a large light blue sector for the Main Forward Camera (150m), a smaller light blue sector for the Narrow Forward Camera (250m), a green sector for the Wide Forward Camera (60m), a purple sector for the Rearward Looking Side Cameras (100m), a light green sector for the Forward Looking Side Cameras (80m), and a small pink sector for the Rear View Camera (50m). Each sector is labeled with its name and maximum distance in meters.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

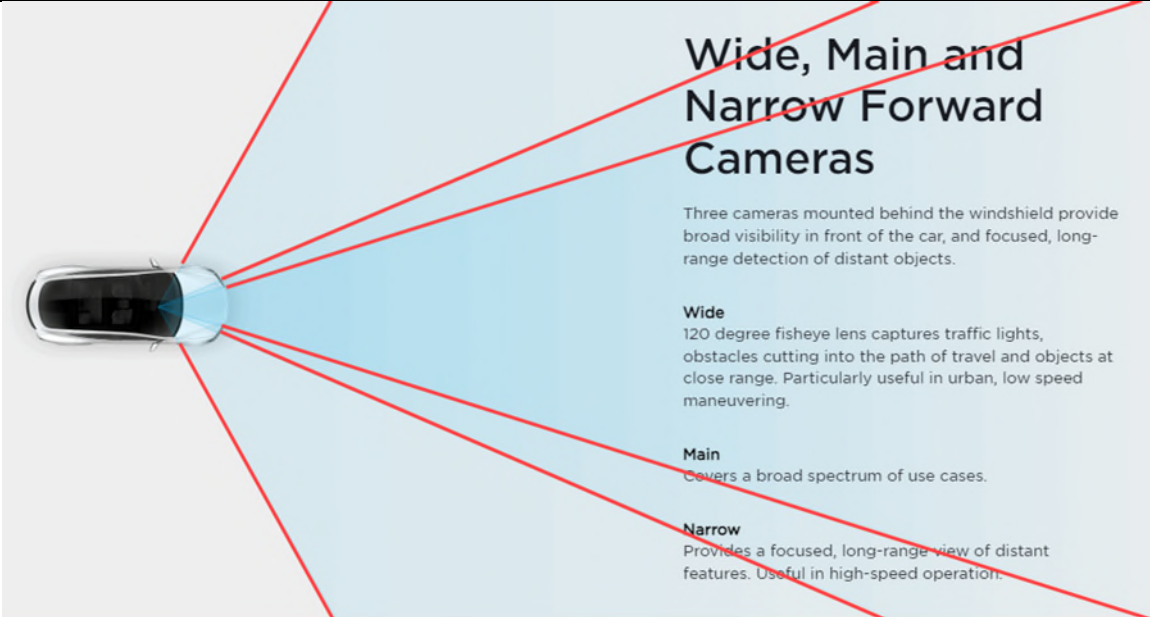
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<div>  <h3>Wide, Main and Narrow Forward Cameras</h3> <p><u>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</u></p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p> <div> <h3>Driving Visualization</h3> <p>Enjoy an improved 360 view around your car — a more dynamic interface recognizes and displays a wider variety of objects and lane lines. Since driving visualization is on the touchscreen in Model 3, you can also drag and pinch the display to temporarily adjust view angle and zoom. After a short period of inactivity, the visualization will return to the default position.</p> </div> <p>Source: https://www.tesla.com/support/software-version-10-0 (last accessed on April 10, 2024).</p>

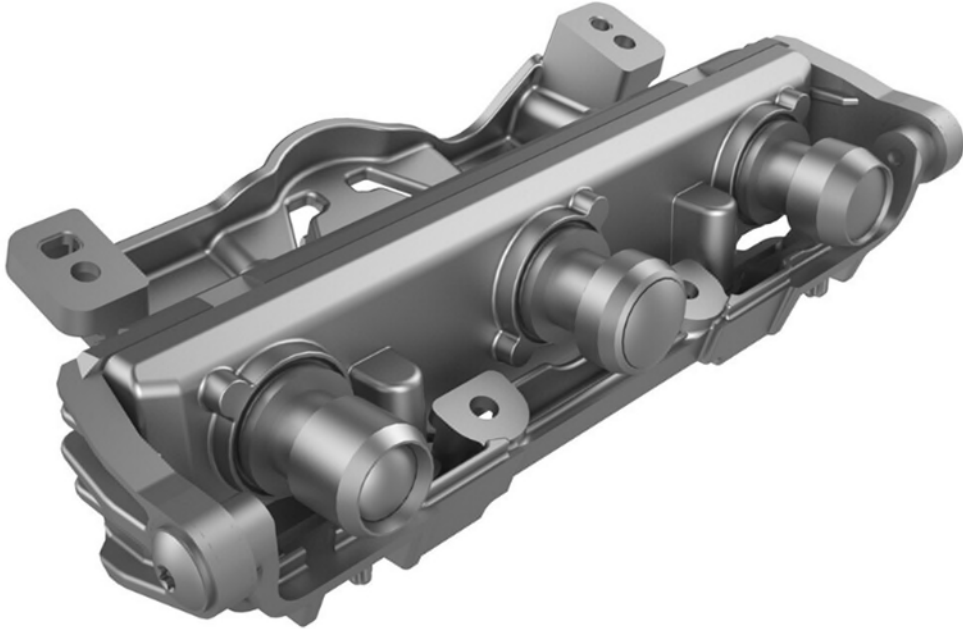
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
<p>22[a] configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene;</p>	<p>On information and belief, the Tesla Automotive Vehicles perform the step of configuring a first optics component relative to a first image sensor to form a first channel having a first field of view (FOV) that comprises a first angular width of a scene.</p> <p>For example, on information and belief, Tesla’s Driver Visualization uses a triple-camera assembly to input three channels of video images.</p>  <p>The diagram illustrates the camera layout of a Tesla vehicle. It shows a central point representing the vehicle's front, with several overlapping fields of view (FOV) represented by colored sectors and wedges. The labels and their corresponding maximum distances are as follows:</p> <ul style="list-style-type: none"> Rearward Looking Side Cameras: Max distance 100m (light blue sectors at the rear) Wide Forward Camera: Max distance 60m (light green wedge pointing forward) Main Forward Camera: Max distance 150m (light blue wedge pointing forward) Narrow Forward Camera: Max distance 250m (light blue wedge pointing forward, extending further than the main forward camera) Rear View Camera: Max distance 50m (purple sector at the rear) Forward Looking Side Cameras: Max distance 80m (light green wedges pointing forward) <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

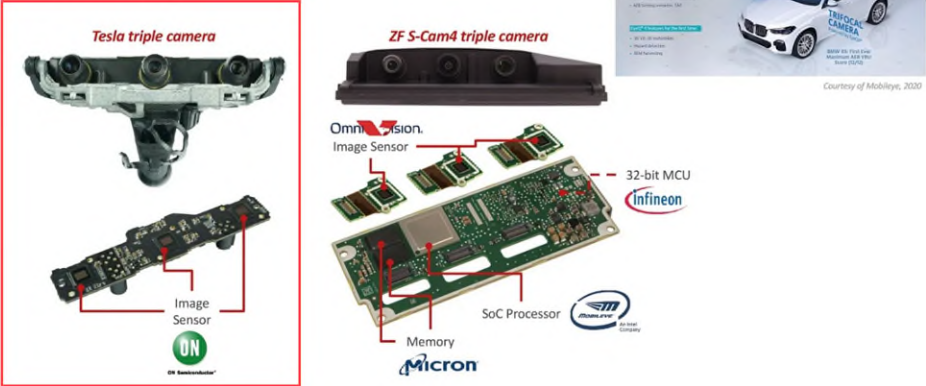
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>Tesla Vision</p> <p>To make use of a camera suite this powerful, each Tesla car has a powerful set of vision processing tools developed by Tesla. Built on a deep neural network, Tesla Vision deconstructs the car's environment at greater levels of reliability than those achievable with classical vision processing techniques.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p> <p>Autopilot uses the cameras on Model 3, which monitor the surrounding area and detect other vehicles, pedestrians, road markings, and obstacles such as barriers and curbs. There are cameras mounted on the front, rear, left, and right sides of Model 3 (see Cameras).</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Cameras</p> <p>Your Model 3 includes the following components that actively monitor the surrounding area:</p>  <p> <ul style="list-style-type: none"> • A camera is mounted above the rear license plate. • A camera is mounted in each door pillar. • Two cameras are mounted to the windshield above the rear view mirror. • A camera is mounted to each front fender. </p> <p>Model 3 is also equipped with high precision electronically-assisted braking and steering systems.</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<div>  <h2>Wide, Main and Narrow Forward Cameras</h2> <p><u>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</u></p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

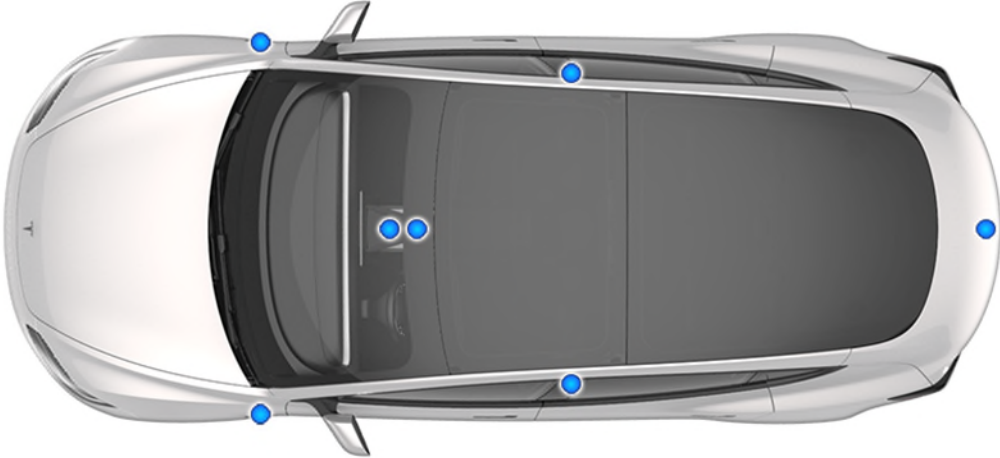
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>Wide, Main and Narrow Forward Cameras</p> <p>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

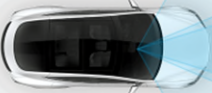
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>7. Remove the forward facing camera from the vehicle.</p> <p>Tip: Rotate the electrical connectors to the side to allow better grip of the forward facing camera.</p>  <p>Source: https://service.tesla.com/docs/Model3/ServiceManual/en-us/ (last accessed on April 10, 2024).</p> <p>The Triple Forward Camera of the Tesla Model 3 features three CMOS image sensors of the ON Semi AR0136A with 3.75 um Pixel size at 1280×960 1.2Mp resolution. It offers a front image capture system to 250 meters that are used by the Tesla Model 3 Driver Assist Autopilot Control Module Unit.</p> <p>Source: https://www.eetimes.com/a-tesla-model-3-tear-down-after-a-hardware-retrofit/4/ (last accessed on April 10, 2024).</p>

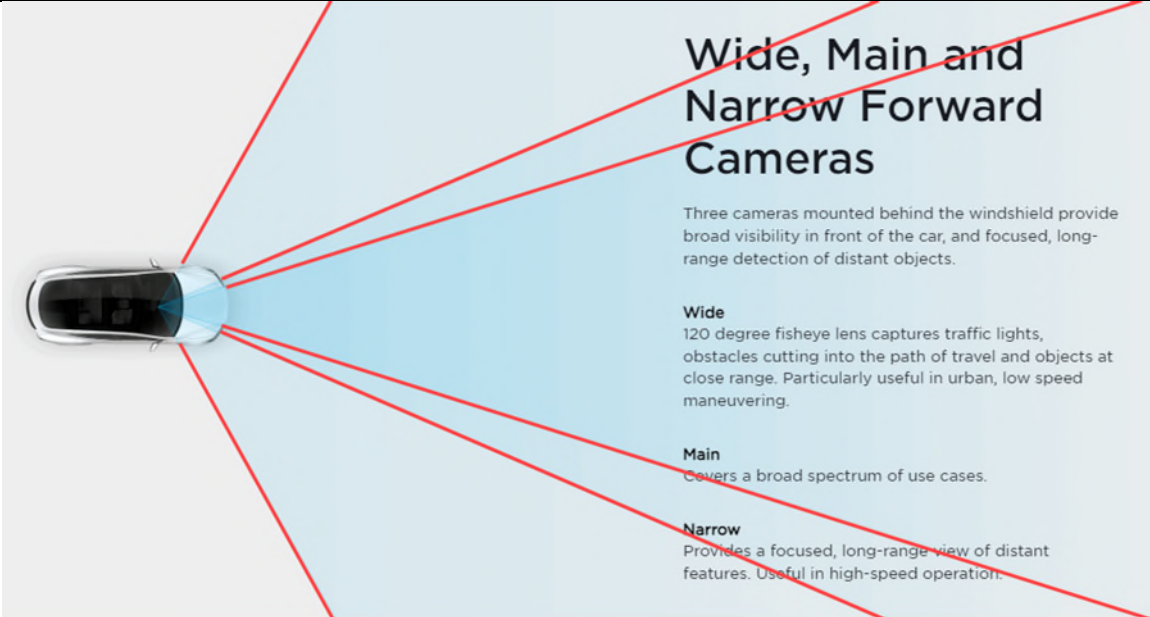
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Forward cameras</p> <p>For forward vision, Tesla has developed a tri-camera module with three On Semiconductor image sensors. Model 3 also uses two forward-looking side cameras, two rear-peering side cameras and a rear-view camera.</p> <p>Source: https://www.eetasia.com/teslas-hardware-retrofits-for-model-3/ (last accessed on April 10, 2024).</p> <p>Tesla Model 3 – Forward cameras : comparison with other forward Tri-Cam</p> <p>(Source: Automotive Teardown Track, System Plus Consulting, 2020)</p> <div> <p>☐ ZF S-Cam4 Tri-Cam with Mobileye EyeQ4 in BMW X5</p> <ul style="list-style-type: none"> ▪ ZF Tri-Cam cost: \$165 ▪ Tesla Tri-Cam cost: \$65  <p>The image shows a comparison of two tri-camera modules. On the left, the 'Tesla triple camera' is shown, which is a black, rectangular module with three lenses. Below it, the internal components are shown, including an 'Image Sensor' and a '32-bit MCU' (Infineon). On the right, the 'ZF S-Cam4 triple camera' is shown, which is a black, rectangular module with three lenses. Below it, the internal components are shown, including an 'Image Sensor', a '32-bit MCU' (Infineon), a 'SoC Processor' (NXP), and 'Memory' (Micron). A small inset image shows a white car with the text 'Leading the Way With High-end ADAS Features' and 'Launched in 2019 with 25 ADAS features'.</p> </div> <p>Source: https://www.eetimes.com/a-tesla-model-3-tear-down-after-a-hardware-retrofit/4/ (last accessed on April 10, 2024).</p>

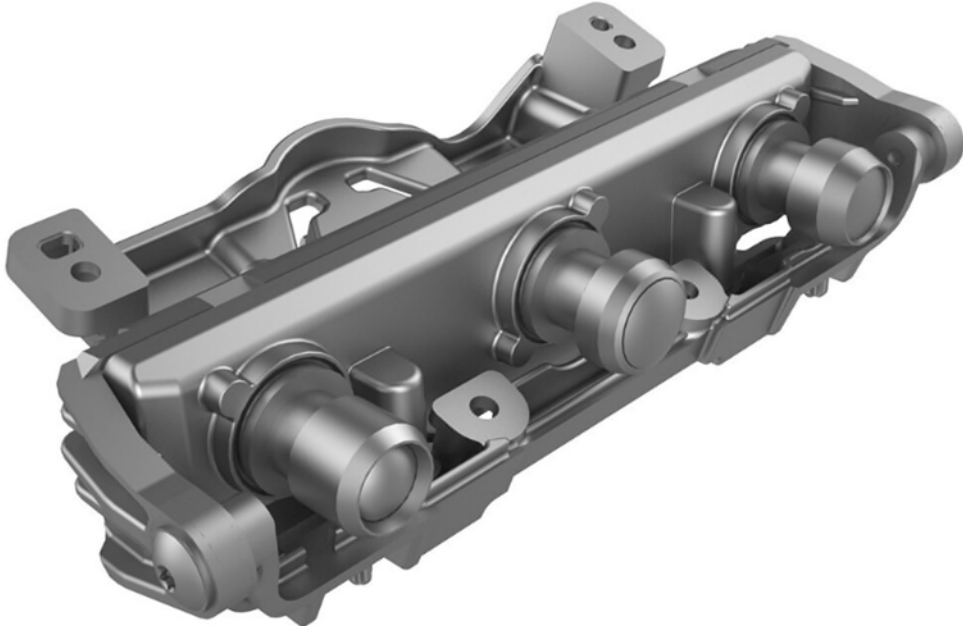
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>On information and belief, image frames from each camera channel are processed by the Tesla FSD Computer.</p> <div>  </div> <p>visions including sensors</p> <p>The FSD SoC, as shown in Figure 2(b), provides general-purpose CPU cores that run most of the autopilot algorithms. Every few milliseconds, new input frames are received through a dedicated image signal processor where they get pre-processed before being stored in the DRAM. Once new frames are available in the main memory, the CPUs instruct the NNA accelerators to start processing them. The accelerators control the data and parameters streaming into their local SRAM, as well as the results streaming back to the DRAM. Once the corresponding result frames have been sent out to the DRAM, the accelerators trigger an interrupt back to the CPU complex. The GPU is available for any postprocessing tasks that might require algorithms not supported by the NNA accelerators.</p> <p>Source: E. Talpes et al., “Compute Solution for Tesla’s Full Self-Driving Computer,” IEEE Computer Society (March/April 2020) at 26.</p>

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	<div> <p>Figure 2(a) is a die photograph of the FSD chip showing various functional blocks. A yellow box highlights the 'ISP+ Video Enc' block, a green box highlights the 'GPU x1' block, a red box highlights the 'NNA x2' block, and a blue box highlights the 'CPU x12' block. A purple box in the top right corner is labeled 'Safety & Security'.</p> <p>Figure 2(b) is a SoC block diagram showing the system architecture. On the left, 'Cameras in' feed into an 'ISP'. The 'ISP' is connected to an 'Interconnect controller' and a 'GPU'. The 'Interconnect controller' is also connected to a 'DRAM controller' and an 'NOC controller'. The 'NOC controller' is connected to four '4x CPU' units, each with an 'L2 Cache'. Below the CPUs are two '32MB SRAM' blocks, each containing an 'NNA' (NNA #1 and NNA #2) and a 'DMA' block. A 'Security' block is also shown. Arrows indicate 'Non coherent traffic' (orange) and 'Coherent traffic' (blue).</p> </div> <p>Figure 2. (a) FSD chip die photo with major blocks. (b) SoC block diagram.</p> <p>Source: E. Talpes et al., “Compute Solution for Tesla’s Full Self-Driving Computer,” IEEE Computer Society (March/April 2020) at Fig. 2.</p>
<p>22[b] configuring a second optics component relative to a second image sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different;</p>	<p>On information and belief, the Tesla Automotive Vehicles perform the step of configuring a second optics component relative to a second image sensor to form a second channel having a second FOV that comprises a second angular width of the scene, wherein the first and second angular widths are different.</p> <p>Autopilot uses the cameras on Model 3, which monitor the surrounding area and detect other vehicles, pedestrians, road markings, and obstacles such as barriers and curbs. There are cameras mounted on the front, rear, left, and right sides of Model 3 (see Cameras).</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

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	<p>Cameras</p> <p>Your Model 3 includes the following components that actively monitor the surrounding area:</p>  <p> <ul style="list-style-type: none"> • A camera is mounted above the rear license plate. • A camera is mounted in each door pillar. • Two cameras are mounted to the windshield above the rear view mirror. • A camera is mounted to each front fender. </p> <p>Model 3 is also equipped with high precision electronically-assisted braking and steering systems.</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

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	<div>  <h3>Wide, Main and Narrow Forward Cameras</h3> <p><u>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</u></p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

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	 <p>Wide, Main and Narrow Forward Cameras</p> <p>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

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	<p>7. Remove the forward facing camera from the vehicle.</p> <p>Tip: Rotate the electrical connectors to the side to allow better grip of the forward facing camera.</p>  <p>Source: https://service.tesla.com/docs/Model3/ServiceManual/en-us/ (last accessed on April 10, 2024).</p> <p>The Triple Forward Camera of the Tesla Model 3 features three CMOS image sensors of the ON Semi AR0136A with 3.75 um Pixel size at 1280×960 1.2Mp resolution. It offers a front image capture system to 250 meters that are used by the Tesla Model 3 Driver Assist Autopilot Control Module Unit.</p> <p>Source: https://www.eetimes.com/a-tesla-model-3-tear-down-after-a-hardware-retrofit/4/ (last accessed on April 10, 2024).</p>

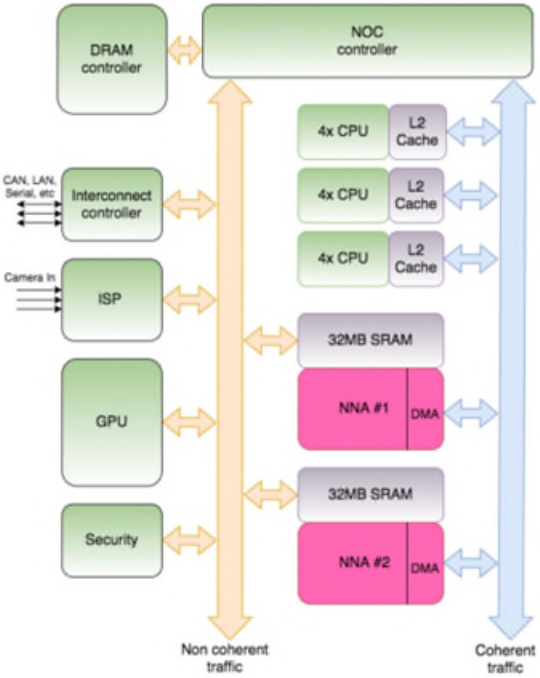
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	<p>Forward cameras For forward vision, Tesla has developed a tri-camera module with three On Semiconductor image sensors. Model 3 also uses two forward-looking side cameras, two rear-peering side cameras and a rear-view camera.</p> <p>Source: https://www.eetasia.com/teslas-hardware-retrofits-for-model-3/ (last accessed on April 10, 2024).</p>
<p>22[c] independently controlling simultaneous data acquisition with each of the first and second channels during a frame; and</p>	<p>On information and belief, the Tesla Automotive Vehicles perform the step of independently controlling simultaneous data acquisition with each of the first and second channels during a frame.</p> <p>For example, on information and belief, each image sensor in the Tesla Autopilot independently and simultaneously controls the data acquisition of each camera channel. For example, the Auto Exposure Control controls the integration time of each image sensor independently.</p> <p>The Triple Forward Camera of the Tesla Model 3 features three CMOS image sensors of the ON Semi AR0136A with 3.75 um Pixel size at 1280×960 1.2Mp resolution. It offers a front image capture system to 250 meters that are used by the Tesla Model 3 Driver Assist Autopilot Control Module Unit.</p> <p>Source: https://www.eetimes.com/a-tesla-model-3-tear-down-after-a-hardware-retrofit/4/ (last accessed on April 10, 2024).</p> <p>Forward cameras For forward vision, Tesla has developed a tri-camera module with three On Semiconductor image sensors. Model 3 also uses two forward-looking side cameras, two rear-peering side cameras and a rear-view camera.</p>

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	<p>Source: https://www.eetasia.com/teslas-hardware-retrofits-for-model-3/ (last accessed on April 10, 2024).</p> <p>Overview</p> <hr/> <div> <p>The AR0132AT is a 1/3-inch CMOS digital image sensor with an active-pixel array of 1280H x 960V. It captures images in either linear or high dynamic range modes, with a rolling-shutter readout. It includes sophisticated camera functions such as auto exposure control, windowing, and both video and single frame modes. It is designed for both low light and high dynamic range scene performance. It is programmable through a simple two-wire serial interface. The AR0132AT produces extraordinarily clear, sharp digital pictures, and its ability to capture both continuous video and single frames makes it the perfect choice for a wide range of applications, including surveillance and HD video. This sensor is compatible with ON Semiconductor's automotive image co-processors which provides megapixel HDR image processing.</p> </div> <div> <div>> Applications</div> <div>> End Products</div> <div>> Features</div> </div> <div> <div>Material Composition</div> <div>Product Change Notification</div> </div> <p>Source: https://www.onsemi.com/products/sensors/image-sensors/AR0132AT (last accessed on April 10, 2024).</p> <p>Overview</p> <hr/> <div> <p>* PRELIMINARY INFO* ON Semiconductor's AR0136AT 1/3-inch CMOS digital image sensor with an active-pixel array of 1280H x 960V. It captures images in either linear or high dynamic range modes, with a rolling-shutter readout. It includes sophisticated camera functions such as auto exposure control, windowing, and both video and single frame modes. It is designed for both low light and high dynamic range scene performance. It is programmable through a simple two-wire serial interface. The AR0136AT produces extraordinarily clear, sharp digital pictures, and its ability to capture both continuous video and single frames makes it the perfect choice for a wide range of applications, including surveillance and HD video. This sensor is compatible with ON Semiconductor's automotive image co-processors which provides megapixel HDR image processing. Engineering Samples available in Q3 2015.</p> </div> <div> <div>> Applications</div> <div>> Features</div> </div> <div> <div>Material Composition</div> <div>Product Change Notification</div> </div> <div> <div>Product Overview</div> </div>

Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Source: https://www.onsemi.com/products/sensors/image-sensors/AR0136AT (last accessed on April 10, 2024).</p> <p>New AR0136 image sensor</p> <p>Our test of the new Onsemi Rolling Shutter Sensor, the AR0136 as successor of the AR0132, has shown an improved fit for the automotive, security and surveillance industries. Thanks to the backside-illuminated (BSI) production technology, the performance of the AR0136 sensor has been improved compared to the AR0132, and the sensor demonstrates, improved quantum efficiency of red pixels.</p> <p>Our test of the new Onsemi Rolling Shutter Sensor, the AR0136 as successor of the AR0132, has shown an improved fit for the automotive, security and surveillance industries. Thanks to the backside-illuminated (BSI) production technology, the performance of the AR0136 sensor has been improved compared to the AR0132, and the sensor demonstrates, improved quantum efficiency of red pixels.</p> <p>Source: https://www.framos.com/en/news/why-the-new-ar0136-image-sensor-performs-better-in-automotive-and-security-than-its-predecessor (last accessed on April 10, 2024).</p> <p>All but the rear camera is the same Aptina AR0132 camera (Aptina is now On Semiconductor). It is a 1/3 inch CMOS 1.2M device, capable of 720p at 60 fps. Tesla appears to be using a visual field of 1280 x 960 at 30 fps. An additional 4 vertical rows of camera (not visual) data make each frame 1280 x 964.</p> <p>Source: https://teslatap.com/undocumented/ (last accessed on April 10, 2024).</p>
22[d] combining data received during the frame from one or more of the first and second channels to provide an image.	<p>On information and belief, the Tesla Automotive Vehicles perform the step of combining data received during the frame from one or more of the first and second channels to provide an image.</p> <p>For example, on information and belief, Tesla’s Birds Eye View combines the image frames of multiple different cameras to provide a 3D video. The video is used for labeling, object detection and control, and for Driver Visualization.</p>

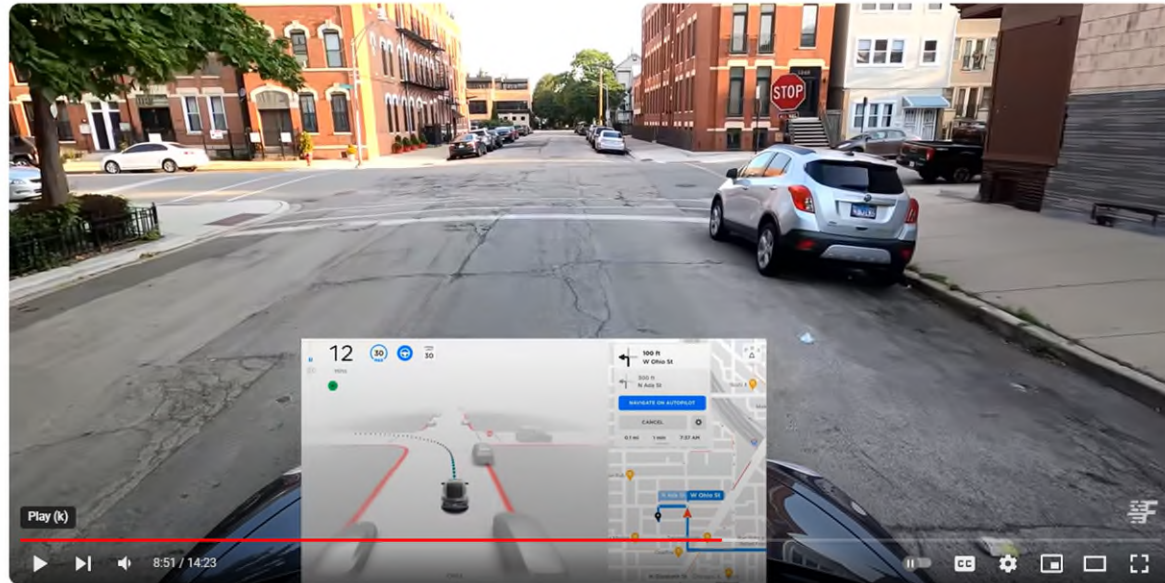
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>"So we had to do a fundamental rewrite of the entire autopilot software stack, and all of the labeling software as well. We are now labeling in 3D video."</p> <p>"This is hugely different from previous times. we were labeling a bunch of single images from the 8 cameras. They will be labeled at different times by different people and some of the labels you literally can't tell what it is you are labeling. This caused a lot of errors."</p> <p>"Now, with our new labeling tools, we label entire video segments. So you basically get a surround video of the thing to label -- Surround video and with time. It is now taking all cameras simultaneously and looking at how the images change over time"</p> <p>Source: https://www.torquenews.com/11826/vector-space-birds-eye-view-coming-tesla-cars-full-self-driving (last accessed on April 10, 2024).</p> <p>On information and belief, data is received from all cameras during the frame and then an image is rendered in 3D and presented to the driver. As part of this process, the frames from multiple cameras are combined with the Multi-Camera Fusion function and then transformed to 3D Vector Space.</p>

Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<div> </div> <p>visions including sensors</p> <p>The FSD SoC, as shown in Figure 2(b), provides general-purpose CPU cores that run most of the autopilot algorithms.</p> <p>Every few milliseconds, new input frames are received through a dedicated image signal processor where they get pre-processed before being stored in the DRAM.</p> <p>Once new frames are available in the main memory, the CPUs instruct the NNA accelerators to start processing them. The accelerators control the data and parameters streaming into their local SRAM, as well as the results streaming back to the DRAM. Once the corresponding result frames have been sent out to the DRAM, the accelerators trigger an interrupt back to the CPU complex. The GPU is available for any postprocessing tasks that might require algorithms not supported by the NNA accelerators.</p> <p>Source: E. Talpes et al., “Compute Solution for Tesla’s Full Self-Driving Computer,” IEEE Computer Society (March/April 2020) at 26.</p>

Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>The diagram illustrates the architecture of Tesla's Full Self-Driving Computer. It features a central vertical bus system. On the left, components including a DRAM controller, Interconnect controller (connected to CAN, LAN, Serial, etc.), ISP (receiving Camera In), GPU, and Security are connected to the bus via orange double-headed arrows. On the right, components include a NOC controller, three sets of 4x CPU with L2 Cache, two 32MB SRAM blocks, and two NNA (Neural Network Accelerator) blocks, each with a DMA. These are connected via blue double-headed arrows. A large orange arrow labeled 'Non coherent traffic' points downwards, and a large blue arrow labeled 'Coherent traffic' points upwards, indicating the direction of data flow between the components.</p> <p>Source: E. Talpes et al., “Compute Solution for Tesla’s Full Self-Driving Computer,” IEEE Computer Society (March/April 2020) at Fig. 2.</p>

Claim 22

Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180



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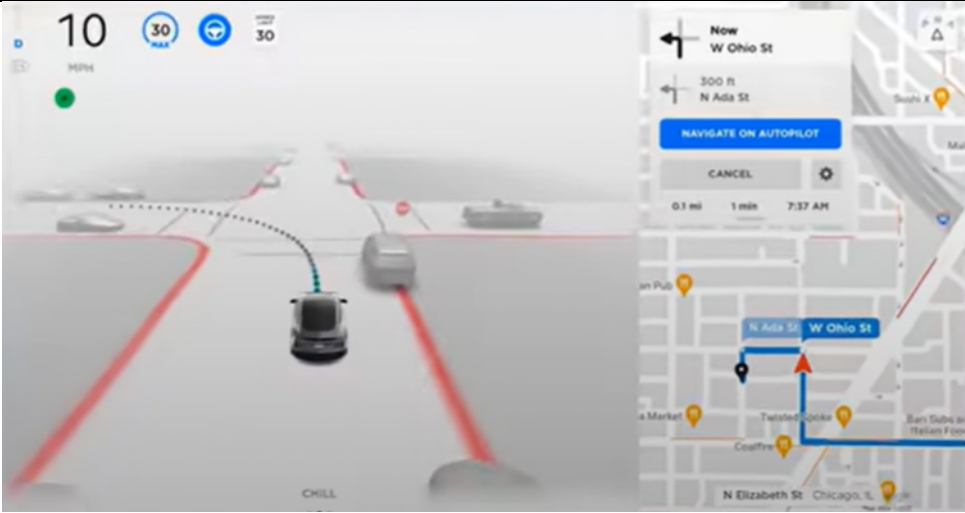


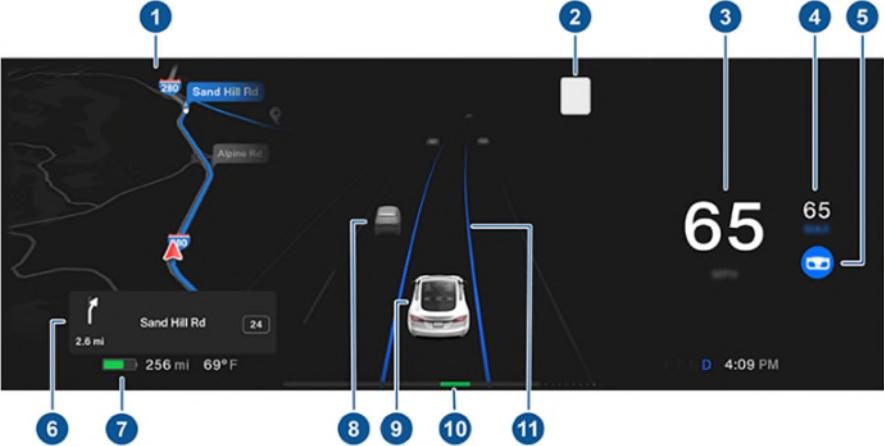
36K views 2 years ago

We are testing FSD Beta 10.0 in the streets of Chicago. I'll be driving around and give my impressions in comparison with other versions. Enjoy!

Get 1,000 Miles/1,500 Kms of free Supercharging when you purchase a new Tesla! Click this link before placing your order: ...more

Source: <https://www.youtube.com/watch?v=Fmj5MkyUD08> at 8:51 (last accessed on April 8, 2024).

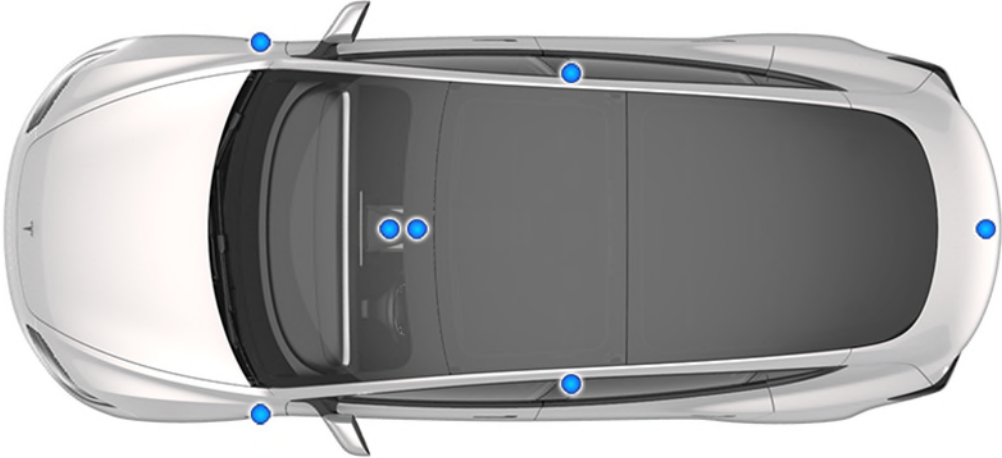
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>The image is a screenshot of the Tesla Full Self-Driving Beta interface. On the left, a 3D vector-space visualization shows the vehicle's current position and its predicted path (indicated by a red line) through a simulated environment. The vehicle is a dark-colored sedan. The environment includes other vehicles and road markings. On the right, a navigation map shows the current route (blue line) and the destination (red arrow). The map includes street names like 'W Ohio St' and 'N Ada St'. A 'NAVIGATE ON AUTOPILOT' button is visible on the map. The top of the screen displays speed limits (10, 30, 30) and a 'CHILL' status indicator.</p> <p>Source: https://www.youtube.com/watch?v=Fmj5MkyUD08 at 8:51 (last accessed on April 8, 2024).</p> <p>Tesla is currently testing its Full Self Driving Beta software in the wild utilizing the 2000 or so Tesla owners in the EV maker's Early Access Program. In these vehicles, Tesla has implemented a new autopilot visualization where the vehicle's view of the surrounding is converted to a dot map in vector space and gets rendered in 3D with spectacular visuals.</p> <p>Source: https://www.torquenews.com/11826/elon-musk-confirms-vector-space-birds-eye-view-coming-all-tesla-vehicles-next-month#google_vignette (last accessed on April 10, 2024).</p>

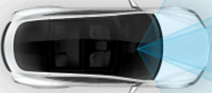
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Instrument Panel - Driving</p> <p>When Model S is driving (or ready to drive), the instrument panel shows your current driving status and a real-time visualization of the road as detected by the Autopilot components. The visualization automatically zooms in and out based on the detected road type.</p>  <p>Source: https://www.tesla.com/ownersmanual/models/en_us/ (last accessed on April 10, 2024).</p>

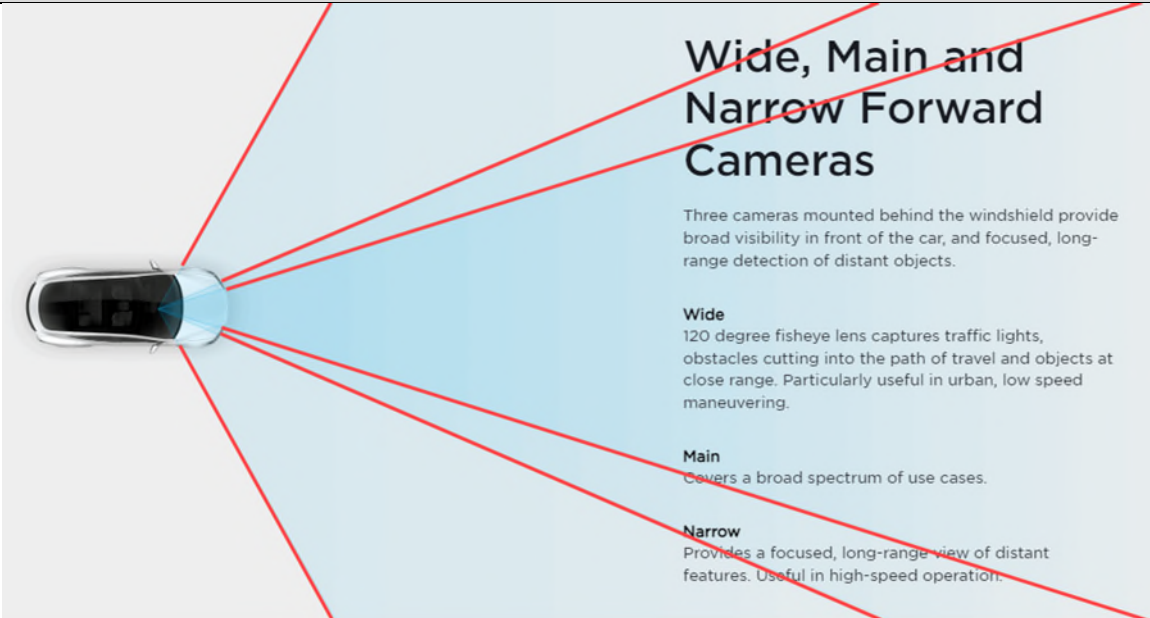
Claim 22	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>1. The instrument panel displays your location on a map, a wiper menu, Auto Shift out of Park instructions, etc. When a navigation route is active, the upcoming portion of the route displays.</p> <p>2. The speed limit (if available) that is currently being detected by Speed Assist (see Speed Assist).</p> <p>3. Current driving speed.</p> <p>4. The currently set cruising speed. When Traffic-Aware Cruise Control is available but you haven't set a cruising speed by engaging Traffic-Aware Cruise Control or Autosteer, the icon is gray (see Autopilot Features).</p> <p>5. Autosteer is actively steering Model S. When Autosteer is available but you haven't activated it, the icon is gray (see Autosteer).</p> <p>6. When navigating, upcoming instructions in the navigation route appear here.</p> <p>7. Total estimated driving distance (or energy) available. Instead of driving distance, you can display the percentage of battery energy remaining (touch Controls > Display > Energy Display).</p> <div> <p>Note</p> <p>When anticipating when you need to charge, use estimates as a general guideline only.</p> </div> <p>8. Surrounding road users are shown in their corresponding locations.</p> <div> <p>Warning</p> <p>Although the instrument panel shows surrounding traffic, some vehicles may not be displayed. Never rely on the instrument panel to determine if a vehicle is present (for example, in your blind spot). Always use your mirrors and perform shoulder checks.</p> </div> <p>9. Your Model S.</p> <p>10. The power meter displays real-time power usage. During acceleration, the bar fills to the right to represent power being used. During deceleration (when Model S is moving and you release your foot from the accelerator pedal), the bar fills to the left with a green color to represent power being fed back to the Battery by regenerative braking (see Regenerative Braking).</p> <p>11. When Autosteer is active and detects the driving lane, it is highlighted in blue (see Autopilot Features). Depending on the current driving scenario, you may see neighboring lanes.</p> <p>Source: https://www.tesla.com/ownersmanual/models/en_us/ (last accessed on April 10, 2024).</p>

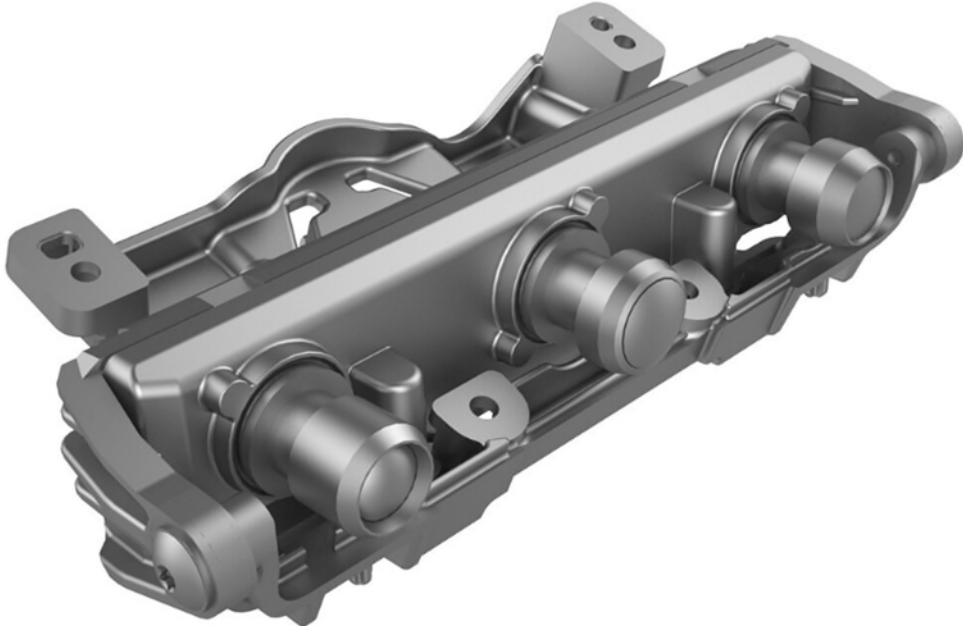
Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
28. The method of claim 22, comprising configuring a third optics component relative to a third image sensor to form a third channel having a third FOV,	<p>On information and belief, the Tesla Automotive Vehicles perform the step of configuring a third optics component relative to a third image sensor to form a third channel having a third FOV, wherein the third FOV is different from one or more of the first FOV and the second FOV.</p> <p>See Claim 22.</p>

Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
<p>wherein the third FOV is different from one or more of the first FOV and the second FOV.</p>	<p>For example, on information and belief the accused products use a third image sensor in accordance with the claim in using autopilot and/or in using cameras:</p> <p>Autopilot uses the cameras on Model 3, which monitor the surrounding area and detect other vehicles, pedestrians, road markings, and obstacles such as barriers and curbs. There are cameras mounted on the front, rear, left, and right sides of Model 3 (see <u>Cameras</u>).</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

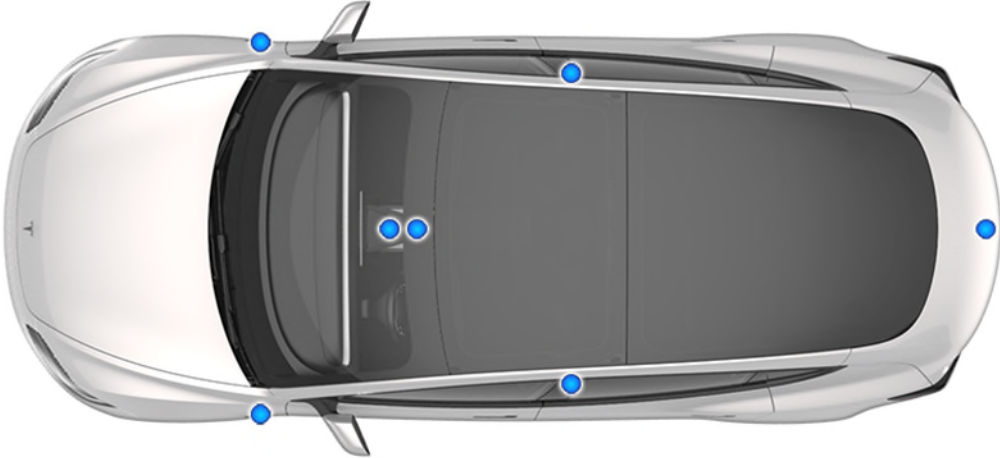
Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Cameras</p> <p>Your Model 3 includes the following components that actively monitor the surrounding area:</p>  <p> <ul style="list-style-type: none"> • A camera is mounted above the rear license plate. • A camera is mounted in each door pillar. • Two cameras are mounted to the windshield above the rear view mirror. • A camera is mounted to each front fender. </p> <p>Model 3 is also equipped with high precision electronically-assisted braking and steering systems.</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

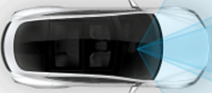
Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<div>  <h3>Wide, Main and Narrow Forward Cameras</h3> <p><u>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</u></p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

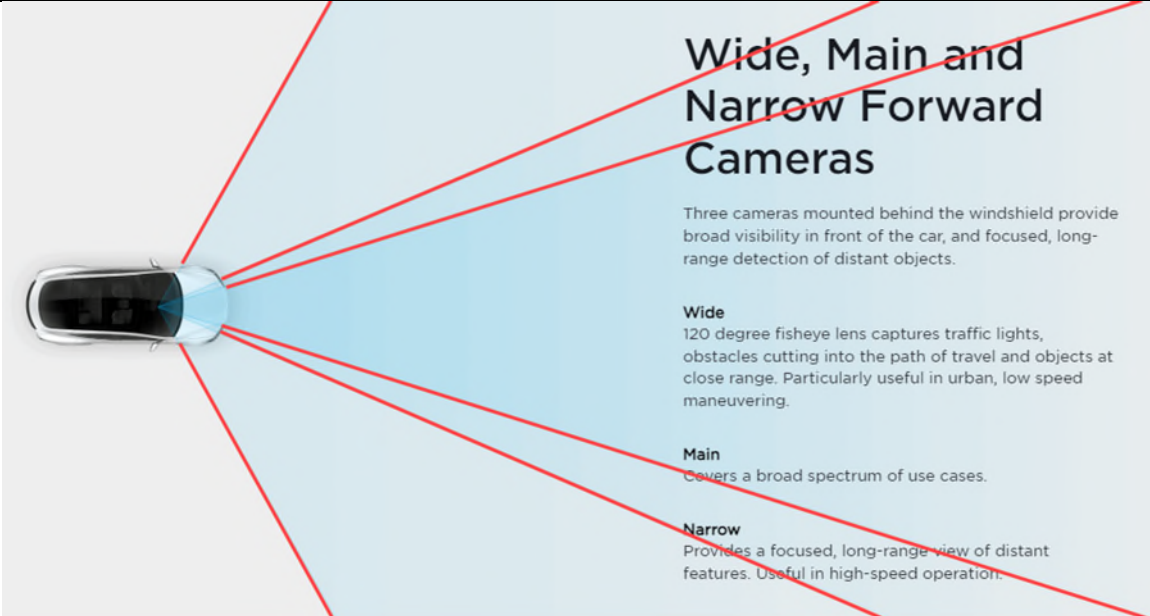
Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>Wide, Main and Narrow Forward Cameras</p> <p>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

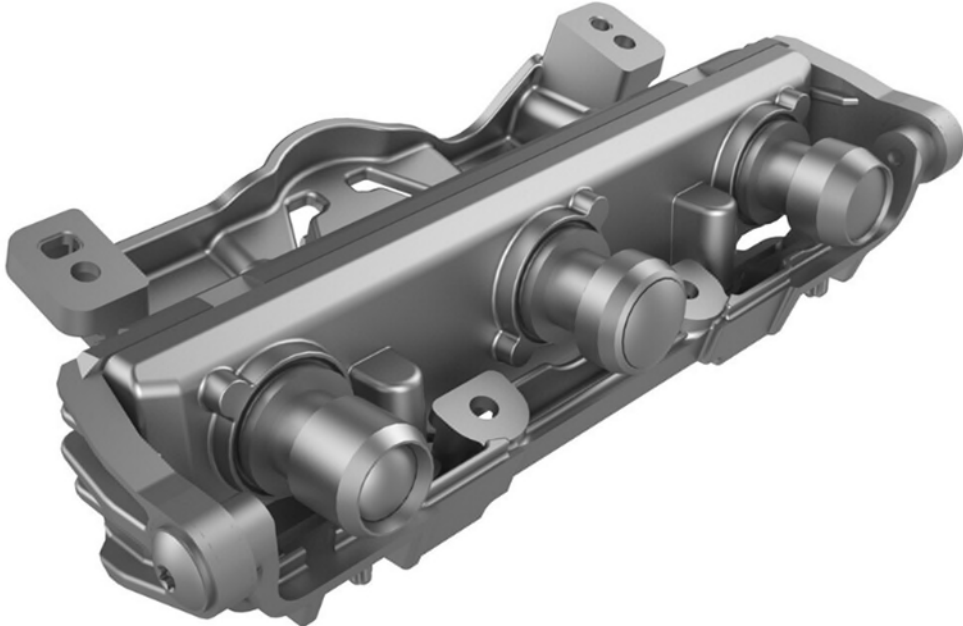
Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>7. Remove the forward facing camera from the vehicle.</p> <p>Tip: Rotate the electrical connectors to the side to allow better grip of the forward facing camera.</p>  <p>Source: https://service.tesla.com/docs/Model3/ServiceManual/en-us/ (last accessed on April 10, 2024).</p> <p>The Triple Forward Camera of the Tesla Model 3 features three CMOS image sensors of the ON Semi AR0136A with 3.75 um Pixel size at 1280×960 1.2Mp resolution. It offers a front image capture system to 250 meters that are used by the Tesla Model 3 Driver Assist Autopilot Control Module Unit.</p> <p>Source: https://www.eetimes.com/a-tesla-model-3-tear-down-after-a-hardware-retrofit/4/ (last accessed on April 10, 2024).</p>

Claim 28	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Forward cameras</p> <p>For forward vision, Tesla has developed a tri-camera module with three On Semiconductor image sensors. Model 3 also uses two forward-looking side cameras, two rear-peering side cameras and a rear-view camera.</p> <p>Source: https://www.eetasia.com/teslas-hardware-retrofits-for-model-3/ (last accessed on April 10, 2024).</p>
Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
<p>30. The method of claim 28, comprising configuring a fourth optics component relative to a fourth image sensor to form a fourth channel having a fourth FOV, wherein the fourth FOV is different from one or more of the first FOV, the second FOV and the third FOV.</p>	<p>On information and belief, the Tesla Automotive Vehicles perform the step of configuring a fourth optics component relative to a fourth image sensor to form a fourth channel having a fourth FOV, wherein the fourth FOV is different from one or more of the first FOV, the second FOV and the third FOV.</p> <p>See Claim 22.</p> <p>For example, on information and belief the accused products use a fourth image sensor in accordance with the claim in using autopilot and/or in using cameras:</p> <p>Autopilot uses the cameras on Model 3, which monitor the surrounding area and detect other vehicles, pedestrians, road markings, and obstacles such as barriers and curbs. There are cameras mounted on the front, rear, left, and right sides of Model 3 (see <u>Cameras</u>).</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p> <p>For example, on information and belief, the accused products use four cameras.</p>

Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Cameras</p> <p>Your Model 3 includes the following components that actively monitor the surrounding area:</p>  <p> <ul style="list-style-type: none"> • A camera is mounted above the rear license plate. • A camera is mounted in each door pillar. • Two cameras are mounted to the windshield above the rear view mirror. • A camera is mounted to each front fender. </p> <p>Model 3 is also equipped with high precision electronically-assisted braking and steering systems.</p> <p>Source: https://www.tesla.com/sites/default/files/model_3_owners_manual_north_america_en.pdf (last accessed on April 10, 2024).</p>

Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<div>  <h3>Wide, Main and Narrow Forward Cameras</h3> <p><u>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</u></p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> </div> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	 <p>Wide, Main and Narrow Forward Cameras</p> <p>Three cameras mounted behind the windshield provide broad visibility in front of the car, and focused, long-range detection of distant objects.</p> <p>Wide 120 degree fisheye lens captures traffic lights, obstacles cutting into the path of travel and objects at close range. Particularly useful in urban, low speed maneuvering.</p> <p>Main Covers a broad spectrum of use cases.</p> <p>Narrow Provides a focused, long-range view of distant features. Useful in high-speed operation.</p> <p>Source: https://www.tesla.com/autopilot (last accessed on April 10, 2024).</p>

Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
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Claim 30	Example Evidence of Tesla Automotive Vehicles – U.S. Patent No. 7,916,180
	<p>Forward cameras</p> <p>For forward vision, Tesla has developed a tri-camera module with three On Semiconductor image sensors. Model 3 also uses two forward-looking side cameras, two rear-peering side cameras and a rear-view camera.</p> <p>Source: https://www.eetasia.com/teslas-hardware-retrofits-for-model-3/ (last accessed on April 10, 2024).</p>