

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

**SAMSUNG ELECTRONICS CO., LTD. AND SAMSUNG ELECTRONICS
AMERICA, INC.**

Petitioner

v.

MAXELL, LTD.

Patent Owner

Inter Partes Review No.: IPR2024-00906

**DECLARATION OF DR. CHARLES D. CREUSERE IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,445,241**

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1005	File History of 10,129,590 (15/208,886)
1006	File History of the Reexamination of 10/129,590 (90/014,651)
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1008	US 2006/0258289 (“ Dua ”)
1009	US 7,149,508 (“ Herle ”)
1010	Nokia N93 User Guide (“ N93 ”)
1011	US 2006/0128332 (“ Rooyen ”)
1012	US 2006/0274704 (“ Desai ”)
1013	US 2004/0264600 (“ Kao ”)
1014	Bluetooth 2.0 + EDR (“ BT-Spec ”)
1015	3GPP TS 36.211 V0.2.1 (2006-11) Technical Specification (“ 3GPP-Spec ”)
1016	Jan 11, 2024, Infringement Contentions for ’241 Patent
1017	RM-55 (Nokia N93) SAR Compliance Test Report
1019	WO 00/48373 (“ Rinne ”)
1020	US 2005/0280471 (“ Matsushita ”)
1021	US 2007/0116292 (“ Kurita ”)
1022	Bluetooth Video Distribution Profile (“ VDP ”)
1023	US 2007/0275704 (“ Terai ”)

CHART OF CLAIMS
[1pre] A video processing apparatus, comprising:
[1a] a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band, the first radio communication circuit capable of transmitting video information by radio or receiving information by radio using the first transmission frequency band;
[1b] a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;
[1c] a third radio communication circuit capable of transmitting information and using a third transmission frequency band;
[1d] an imaging circuit capable of receiving video information and still picture information via an optical system;
[1e] a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;
[1f] an accumulation circuit capable of accumulating video information received by the imaging circuit; and
[1g] a controller controlling assignment of connection of each of the first, second, and third radio communication circuits,
[1h] wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio,
[1i] wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video,
[1j] wherein the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information while the second radio communication circuit connects to the internet or the home network, and
[1k] wherein one of the first, second, or third radio communication circuits receives a signal from the internet indicating that an update for an operating system of the video processing apparatus is available, and the video processing apparatus executes an update process such that an updated operating system of

CHART OF CLAIMS
the video processing apparatus is stored in the video processing apparatus after execution of the update process.
[4pre] The video processing apparatus according to claim 1, further comprising a radio interface capable of receiving video information by radio,
[4a] wherein the accumulation circuit accumulates the video information received via the radio interface, and
[4b] the first radio communication circuit is further capable of transmitting the accumulated video information.
5 The video processing apparatus of claim 1, further comprising a fourth radio communication circuit capable of transmitting information and using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits.
6 The video processing apparatus of claim 1, wherein the third transmission frequency band is different from the first and second transmission frequency bands.
8 The video processing apparatus of claim 1, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.
9 The video processing apparatus of claim 1, further comprising an input device capable of receiving a user's selection of content to be displayed on the video processing apparatus.
10 The video processing apparatus of claim 1, wherein one of the first, second, or third radio communication circuits receive a signal from the internet indicating that an update for an application of the video processing apparatus is available, and the video processing apparatus executes an application update process such that an updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process.
11 The video processing apparatus of claim 1, further comprising: a display for displaying a screen requesting user input, wherein the displayed screen prompts the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established, wherein in response to receiving the user input indicating allowance of the connection, the first radio communication circuit transmits the accumulated video information to the external device.

CHART OF CLAIMS	
12	The video processing apparatus of claim 1, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).
13	The video processing apparatus of claim 1, wherein the second radio communication circuit is controllable to change from the second modulation scheme to a different modulation scheme.
14	The video processing apparatus of claim 1, wherein the video processing apparatus comprises a cellular phone.
15	The video processing apparatus of claim 1, wherein the second and third radio communication circuits conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM).
16	The video processing apparatus of claim 1, wherein at least the first radio communication circuit and the third radio communication circuit are implemented as a combined circuit.
[17pre]	A method for video processing, comprising:
[17a]	receiving video information and still picture information via an optical system by an imaging circuit of a video processing apparatus;
[17b]	compressing the still picture information using a first type of compression method and the video information using a second type of compression method;
[17c]	accumulating video information received by the imaging circuit;
[17d]	implementing a first transmission scheme having a first modulation scheme and a first transmission frequency band;
[17e]	transmitting, using the first transmission frequency band, the video information to an external device by radio, via a first radio communication circuit;
[17f]	implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band;
[17g]	connecting, by radio, to an internet or a home network to transmit and receive information using the second transmission frequency band, via a second radio communication circuit;
[17h]	transmitting, via a third radio communication circuit, information using a third transmission frequency band;
[17i]	controlling, via a controller, assignment of connection of each of the first, second, and third radio communication circuits,
[17j]	wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, a connection is assigned to the first radio communication circuit for transmitting the video,

CHART OF CLAIMS
[17k] wherein the transmitting and connecting is controlled so that the first radio communication circuit transmits video information while the second radio communication circuit connects to the internet or the home network;
[17l] receiving, via one of the first, second, or third radio communication circuits a signal from the internet indicating that an update for an operating system is available; executing the update process; and storing an updated operating system after execution of the update process.
18 The method of claim 17, further comprising transmitting, via a fourth radio communication circuit, information using a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands.
19 The method of claim 17, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.
20 The method of claim 17, further comprising: receiving, via one of the first, second, or third radio communication circuits a signal from the internet indicating that an update for an application is available; executing the application update process; and storing an updated application after execution of the application update process.
21 The method of claim 17, further comprising: displaying a screen requesting user input, the displayed screen prompting the user for a user input that indicates whether the user allows a connection between the first radio communication circuit and the external device to be established; receiving a user input indicating allowance of the connection; transmitting, via the first radio communication circuit, the accumulated video information to the external device in response to receiving the user input indicating allowance.
22 The method of claim 17, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).
23 The method of claim 17, further comprising controlling the second radio communication circuit to change modulation scheme from the second modulation scheme to a different modulation scheme.
24 The method of claim 17, further comprising conducting demodulation through Orthogonal Frequency Division Multiplexing (OFDM) via the second and third radio communication circuits.
[25pre] A cellular phone, comprising:
[25a] a first radio communication circuit implementing a first transmission scheme having a first modulation scheme and first transmission frequency band, the first radio communication circuit capable of transmitting video information

CHART OF CLAIMS
by radio or receiving information by radio using the first transmission frequency band;
[25b] a second radio communication circuit implementing a second transmission scheme having a second modulation scheme different from the first modulation scheme and a second transmission frequency band different from the first transmission frequency band, the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band;
[25c] a third radio communication circuit capable of transmitting information using a third transmission frequency band;
[25d] a fourth radio communication circuit capable of transmitting information using a fourth transmission frequency band;
[25e] an imaging circuit capable of receiving video information and still picture information via an optical system;
[25f] a compression circuit compressing the still picture information using a first type of compression method and the video information using a second type of compression method;
[25g] a microphone receiving audio information corresponding to the video information received via the imaging circuit;
[25h] an accumulation circuit capable of accumulating video information received by the imaging circuit and audio information received by the microphone, wherein the first radio communication circuit can transmit video information accumulated in the accumulation circuit to an external device by radio;
[25i] a display displaying the video information received by the first radio communication circuit and displaying information received by the second radio communication circuit via the internet or home network;
[25j] a controller controlling assignment of connection of each of the first, second, third, and fourth radio communication circuits,
[25k] wherein when an indication from a user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video information,
[25l] wherein the controller controls each of the first and second radio communication circuit so that the first radio communication circuit transmits video information and the second radio communication circuit connects to the internet or the home network, and

CHART OF CLAIMS
[25m] wherein one of the first, second, or third radio communication circuits receives a signal from the internet indicating that an update for an operating system of the cellular phone is available, and the cellular phone executes an update process such that an updated operating system of the cellular phone is stored in the cellular phone after execution of the update process.
26 The cellular phone of claim 25, wherein one of the first, second, or third radio communication circuits receive a signal from the internet indicating that an update for an application of the cellular phone is available, and the cellular phone executes an application update process such that an updated application of the cellular phone is stored in the cellular phone after execution of the application update process.
27 The cellular phone of claim 25, wherein the first modulation scheme comprises shift keying modulation and the second modulation scheme comprises quadrature amplitude modulation (QAM).

I. INTRODUCTION

I, Charles D. Creusere, declare as follows:

1. My name is Charles D. Creusere. I have been asked by Petitioners Samsung Electronics Co. Ltd. and Samsung Electronics America, Inc. to provide my expert opinions in support of the above-identified petition for *inter partes* review of claims 1, 4-6, and 8-27 (“Challenged Claims”) of U.S. Patent No. 11,445,241 (“’241 patent,” EX1001), owned by Maxell, Ltd. (“PO”), pursuant to 35 U.S.C. §§311–19 and 37 C.F.R. §42.100..

2. I currently hold the opinions set forth in this declaration.

3. In summary, it is my opinion that the references cited below render obvious the Challenged Claims. My detailed opinions on the claims are set forth below.

4. I am being compensated for my time at the rate of \$450 per hour. This compensation is not contingent upon my performance, the outcome of this matter, or any issues involved in or related to this matter.

II. BACKGROUND AND QUALIFICATIONS

5. I received a Bachelor of Science degree in Electrical and Computer Engineering from the University of California at Davis in 1985. I received a Master of Science degree in Electrical and Computer Engineering from the University of California at Santa Barbara in 1990, and I received my Ph.D. in

Electrical and Computer Engineering, also from the University of California at Santa Barbara, in 1993.

6. I am currently a Full Professor in the Klipsch School of Electrical & Computer Engineering at New Mexico State University, and I hold the Frank Carden Endowed Chair in Telemetry and Telecommunications. I was an Assistant Professor at New Mexico State from January 2000 until I became an Associate Professor in 2004. I have been a Full Professor since August 2010. My research and teaching at New Mexico State have focused on digital signal processing and communications.

7. I have extensive experience in the technical areas of the '241 Patent, including more than 30 years of experience with analog and digital systems and, in particular, with digital signal processing and its application to communication, storage, and retrieval systems.

8. After receiving my B.S. from U. C. Davis in 1985, I went to work for the Naval Weapons Center, China Lake as a civilian Department of Defense (DoD) employee. From 1985 until the program was handed off to the contractor in 1989, I was the lead designer for the guidance electronics of the Laser Guided Training Round. My work on this project included analog and digital circuit design, embedded software design, and front-end systems integration and testing. In 1989, I was awarded a fellowship from the DoD to pursue graduate degrees at the

University of California, Santa Barbara. After returning to China Lake with my PhD in 1993, I continued to pursue practical engineering projects along with my more theoretical endeavors. The most encompassing of these projects involved developing efficient video compression and decompression algorithms for use with wireless communication channels. These algorithms were designed for real-time streaming in a manner that maximized bandwidth efficiency while ensuring that the quality of the most important information in the data stream was preserved. During my Master's program at UCSB I pursued a dual communications/digital signal processing coursework specialization and, as a result, took the following relevant graduate classes: ECE242 (Digital Coding of Analog Signals), ECE278 (Image Processing), ECE258 Digital Signal Processing, ECE148 (Real-Time Digital Signal Processing), ECE277B (Pattern Recognition), ECE243 (Digital Communication), ECE594C (Error Control Codes), and ECE205A (Information Theory). All of these classes have relevance to the patent in suit, but ECE242 (which is focused on data compression) and ECE243 are particularly pertinent here given that video compression and digital communication are both critical parts of any system designed to receive, stream, or store video data. In addition to the above, as part of my minor area of specialization in computer engineering, I took classes in linear and nonlinear programming, optimization theory, neural networks, and computational linear algebra. My Ph.D. research was focused on multimedia

data compression using multirate filter banks and wavelets, and I continued to do research in this area for the six years I spent working at the Naval Air Warfare Center in China Lake, CA after completing my dissertation. Some of the papers that I wrote which are relevant to the claimed invention of the '241 Patent and related art include:

- C.D. Creusere and A. Van Nevel, "ATR-directed image and video compression," Journal of Aircraft, Vol. 36, No. 4, pp. 626-31, July-August 1999.
- C.D. Creusere, "A new method of robust image compression based on the embedded zerotree wavelet algorithm," IEEE Trans. on Image Processing, Vol 6, No. 10, Oct. 1997, pp. 1436-1442.
- C.D. Creusere, "Fast embedded compression for video," IEEE Trans. On Image Processing, Vol. 8, No. 12, pp. 1811-16, December 1999.
- C.D. Creusere, "Motion compensated video compression with reduced complexity encoding for remote transmission," Signal Processing: Image Communications, Vol. 16, pp. 627-42, April 2000.

9. Since joining the faculty of New Mexico State University in 2000, I have taught numerous classes at both the graduate and undergraduate levels. These include EE497 (Digital Communications), EE585 (Telemetry Systems), EE573 (Signal Compression), EE596 (Image Processing), and EE586 (Information

Theory). In the course of teaching these various classes, I cover much of the signal processing that facilitates modern digital communication systems, including video transmission and processing.

10. A listing of the cases (including trials before the Patent Trial and Appeal Board) in which I have testified within the last four years is found following my CV in the attached Appendix A. I've also listed my publications and patents in Appendix A.

11. In addition to the experience and publications listed above, I have also received the following awards and distinctions that are relevant to the subject matter of this declaration. I am currently a Senior Area Editor for IEEE Transactions on Image Processing and have previously served as an Associate Editor for IEEE Transactions on Image Processing from 2010 through 2014. I have also served in this capacity from 2002 through 2005. From 2008-2013, I served as an Associate Editor for IEEE Transactions on Multimedia. I currently serve as deputy Editor-in-Chief for IEEE Transactions on Image Processing and as an Area Editor for IEEE Open Journal on Signal Processing.

12. In 2004, I served as the co-general chair for the IEEE Digital Signal Processing Workshop in Taos, New Mexico. In 2012 and 2014, I served as the co-technical chair for the Southwest Symposium on Image Analysis and Interpretation held in Santa Fe, New Mexico and San Diego, CA, respectively. In addition, I also

served as the technical chair for both the 2015 and the 2021 International Telemetering Conference held in Las Vegas, NV. I am also a member of the technical program committees for the IEEE International Conference on Image Processing, the IEEE International Conference on Acoustics, Speech, and Signal Processing, and the IEEE Data Compression Conference.

III. DOCUMENTS AND OTHER MATERIALS RELIED UPON

13. In forming the opinions set forth in this declaration, I have reviewed the documents in the following table:

Exhibit No.	Description
1001	U.S. Pat. No. 11,445,241 (“ the ’241 Patent ”)
1003	File History of 11,445,241 (17/568,166)
1004	U.S. Pat. No. 10,129,590 (with reexamination certificate)
1005	File History of 10,129,590 (15/208,886)
1006	File History of the Reexamination of 10/129,590 (90/014,651)
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1019	WO 00/48373 (“ Rinne ”)
1020	US 2005/0280471 (“ Matsushita ”)
1021	US 2007/0116292 (“ Kurita ”)

Exhibit No.	Description
1022	Bluetooth Video Distribution Profile (“VDP”)
1023	US 2007/0275704 (“Terai”)

14. Additionally, I have utilized my own experience and expertise, including regarding the knowledge and capabilities of a person of ordinary skill in the relevant art in the timeframe of the claimed priority date of the ’241 patent.

IV. STATUTORY GROUNDS FOR CHALLENGE

15. In this declaration, I offer opinions on the following grounds that are the basis for this IPR proceeding:

Ground	Claims	Stat. Basis	Prior Art
1	1, 4-6, 8-27	35 U.S.C. § 103	N93, Dua, Herle
2	1, 4-6, 8-27	35 U.S.C. § 103	N93, Dua, Herle, Rooyen, Desai, BT-Spec, 3GPP-SPEC, Kao
3	1, 4-6, 8-27	35 U.S.C. § 103	Dua, Herle
4	1, 4-6, 8-27	35 U.S.C. § 103	Dua, Herle, N93
5	1, 4-6, 8-27	35 U.S.C. § 103	Dua, Herle, N93, Rooyen, Desai, BT-Spec, 3GPP-SPEC, Kao

V. RELEVANT PATENT LAW AND LEGAL STANDARDS

A. Date of Invention

16. I have been asked to use the date of the filing of the earliest application to which priority is claimed (i.e., November 28, 2007) as the date of invention for purposes of my analysis.

B. Anticipation

17. I am informed and understand that a patent claim is invalid under 35 U.S.C. § 102 if a prior art disclosure teaches every element required by the claim, either expressly or inherently. The identical invention must be shown in as complete detail as is contained in the claim. When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art.

C. Obviousness

18. I am informed and understand that a patent claim is invalid under 35 U.S.C. § 103 if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person having ordinary skill in the art to which the subject matter pertains. Obviousness, as has been explained to me, is based on (i) the scope and content of the prior art, (ii) the differences between the prior art and the claim, (iii) the level of ordinary skill in the art, and (iv) any secondary indicia of non-obviousness (*e.g.*, “secondary considerations” such as commercial success in the marketplace of the claimed invention), to the extent that they exist.

19. I further understand that obviousness may be demonstrated by showing that it would have been obvious to combine the teachings of more than

one item of prior art. In determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art, the following are examples of approaches and rationales that may be considered:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices (methods, or products) in the same way;
- Applying a known technique to a known device (method or product) ready for improvement to yield predictable results;
- Applying a technique or approach that would have been obvious to try (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to a person having ordinary skill in the art; and

- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

20. I further understand that an invention may be obvious if one of ordinary skill in the art, facing a wide range of needs created by developments in the field, would have seen an obvious benefit to the solutions tried by the applicant. When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, it may be obvious to a person of ordinary skill to try the known options. If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique would have been obvious.

21. I further understand that a person of ordinary skill in the art is a hypothetical person who is presumed to be aware of all of the relevant art at the time of the invention. The person of ordinary skill may be able to fit together the teachings of multiple patents and/or printed publications employing ordinary creativity and the common sense that familiar items may have uses in another context or beyond their primary purposes.

22. I also understand that when considering the obviousness of a patent claim, one should consider whether a teaching, suggestion, or motivation to combine the references exists so as to avoid impermissibly applying hindsight when combining or modifying the prior art. I understand this test should not be applied rigidly, but that the test can be important to avoid such hindsight.

23. I also understand that one of ordinary skill in the art must have a reasonable expectation of success in combining or modifying prior art references.

24. I also understand that all elements of a claim must be considered in an obviousness analysis.

D. Standard of Proof

25. I understand that the standard to prove unpatentability in an *inter partes* review proceeding is by a preponderance of the evidence, which means more likely than not.

VI. LEVEL OF ORDINARY SKILL IN THE ART

26. I have considered the level of ordinary skill in the art relevant to the '241 patent. I understand that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art.

27. After reviewing the '241 patent, the relevant portions of the prosecution history of the '241 patent, and cited references, it is my opinion that the relevant art of the '241 patent is in the field of wireless communications using multiple radios.

28. Based upon my knowledge of this field, I conclude that a person of ordinary skill in the art ("POSITA") at the time of the earliest filing date of the '241 patent (November 27, 2007), and for that matter, at all subsequent times through the present, would have had Bachelor degree in electrical engineering or equivalent with at least one year of experience in the field of wireless communications. Additional education or experience might substitute for the above requirements.

29. I am and was at the time of the earliest filing date at least a person of skill in the relevant art and I am able to provide insight and opinions into the understandings of such persons at all relevant times by virtue of my education, training and experience.

VII. THE '241 PATENT AND ITS PROSECUTION HISTORY

A. Overview of the '241 Patent

30. The '241 patent discloses a conventional multi radio, multimedia cellular phone of the type that was well known in the prior art by 2007. EX1001, Fig. 1. The '241 patent discloses conventional hardware (processor, memory,

radios, camera, microphone) for performing the conventional functions of that device, including capturing, compressing, storing, transmitting and receiving video and pictures by radio. *Id.*

31. It is my understanding that PO asserts that the '241 patent discloses novel ways of 1) transmitting video with one radio based on a user "indication" and connecting to a network with a second radio and 2) updating the software. As I discuss in more detail below, these functionalities were well known in the prior art prior to priority date of the '241 patent.

B. Overview of the File History

32. The '241 patent claims priority to 6 prior applications. EX1001, 1-2. I have found at least the following from the file history that is relevant for the reasons noted elsewhere in this declaration.

1. Prosecution of the reexamination of the '590 patent (90/014,651)

33. This reexamination is relevant because the '241 patent claims priority to the '590 patent and because the claims are extremely similar.

34. On January 12, 2021, a third-party requestor filed a request for reexamination of claims 1-10 (all claims) of U.S. Patent No. 10,129,590 ("590 patent") based on US2006/0203758 ("Tee") and US2006/0135076 ("Honkanen"). EX1006, 1005-1057 (request).

35. On February 10, 2021, reexamination was ordered and on July 14, 2021, all claims were rejected over Tee and/or Tee and Honkanen. EX1006, 296-317 (order), 161-228 (rejection).

36. On Sept. 14, 2021, PO amended the claims, added several new claims, and argued the amended and new claims were patentable over Tee and Honkanen. EX1006, 115-147 (amendment).

37. On Oct. 29, 2021, the examiner allowed all claims over Tee in view of a PHOSITA and Honkanen. EX1006, 12-40 (Notice of Intent to Issue Ex Parte Reexamination Certificate, 20-26).

38. On Nov. 15, 2021, the reexamination certificate issued. EX1004, certificate.

2. Prosecution of the 241 patent (17/568,166)

39. On Jan. 4, 2022, PO filed U.S. Appl. No. 17/568,166. EX1001, cover.

40. On March 16, 2022, all claims were allowed in a first office action allowance. EX1003, 58-70 (Notice of Allowance).

41. On Sept. 13, 2022, the '166 application issued as the '241 patent. EX1001, cover.

VIII. CLAIM CONSTRUCTION

42. In this section I list terms that require construction and I have applied those constructions in my subsequent analysis. For all other terms, I applied the plain and ordinary meaning that a POSITA would have for the terms.

A. “circuit”

43. “Circuit” should be interpreted broadly as any circuitry. For example, the “imaging circuit” limitation was introduced in an amendment in a priority application in 2018. EX1005, 82, 85 (March 9, 2018 Amendment, 2, 5). But the specification only discloses an “imaging device,” and does not explicitly disclose any “circuit” associated with that imaging device. EX1001, 3:58-59. The amendment that introduced “circuit” did so to replace “device” and “unit.” EX1005, 82-84 (March 9, 2018 Amendment, 2-4). PO asserted that the amendment did not introduce new matter. *Id.*, 87 (March 9, 2018 Amendment, 7).

44. A claimed circuit need not be separate from another claimed circuit. In fact, some dependent claims require multiple claimed circuits to be implemented as a “combined circuit.” EX1001, claim 16.

B. “video”

45. “Video” is not limited to video of any quality, resolution, size, or transfer rate (e.g., real time). The claims are not limited to the examples disclosed

in the specification. *See e.g.*, EX1001, 8:32-38 (disclosing exemplary bit rates and an example where the “user continuously views videos with high picture quality”).

C. “when an indication from a user indicates to transmit video information using the first radio communication circuit, the controller assigns a connection to the first radio communication circuit for transmitting the video”

46. The prior art discloses each of PO’s inconsistent interpretations of this phrase, making its construction unnecessary.

47. PO’s narrow interpretation: During reexamination of the ’590 patent, PO argued this limitation excludes the controller “automatically” selecting between multiple radios. Specifically, PO added this limitation via amendment to overcome a rejection over Tee and Honkanen. EX1006 117-128 (Sept. 14, 2021 Amendment, 3-14). PO argued that “Tee does not identify a particular transceiver for assignment of connection.” *Id.*, 129 (Sep. 14, 2021 Amendment, 15). For support, PO pointed to two passages of the specification where the user provides “an indication to use a particular modem for transmitting or receiving video.” *Id.*, 130 (Sep. 14, 2021 Amendment, 16). PO distinguished Tee’s disclosure as “automatically” assigning the connection to a radio to detect the target device. *Id.*, 137-140 (Sep. 14, 2021 Amendment, 23-26). PO argued “there is no reason why a PHOSITA would replace Tee’s solution of automatically assigning the connections with a system

that assigns the connections in response to a user indication.” *Id.*, 142 (Sep. 14, 2021 Amendment, 28).

48. PO’s broad interpretation: In the Litigation, PO argues this phrase encompasses the controller “automatically” selecting between multiple radios. EX1016, 289-293 (explicitly accusing the “Intelligent Wi-Fi” feature where Petitioners’ phones automatically choose between a Wi-Fi or cellular radio for communication, depending on operating conditions).

49. The prior art asserted herein renders the claims obvious under each of PO’s interpretations.

IX. PRIOR ART REFERENCES

A. EX1008 (“Dua”)

50. U.S. Patent Publication No. 2006/0258289 (“Dua”) was filed on May 12, 2005, and published on November 16, 2006. Dua is prior art to the ’241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b), 102(e).

B. EX1009 (“Herle”)

51. U.S. Patent No. 7,149,508 (“Herle”) was filed on February 5, 2003, and issued on December 12, 2006. Herle is prior art to the ’241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b), 102(e).

C. EX1010 (“N93”)

52. Nokia N93 User Guide (“N93”) was publicly available at least as of April 23, 2007. EX1007, 2. N93 is prior art to the ’241 patent under pre-AIA 35 U.S.C. § 102(a), 102(b).

D. EX1011 (“Rooyen”)

53. U.S. Patent Publication No. 2006/0128332 (“Rooyen”) was filed on December 13, 2004, and published on June 15, 2006. Rooyen is prior art to the ’241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b), 102(e).

E. EX1012 (“Desai”)

54. U.S. Patent Publication No. 2006/0274704 (“Desai”) was filed on March 23, 2006, and published on December 7, 2006. Desai is prior art to the ’241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b), 102(e).

F. EX1014 (“BT-Spec”)

55. The Specification of the Bluetooth System (“BT-Spec”) was publicly available at least on February 24, 2006. EX1007, 2. BT-Spec is prior art to the ’241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b).

G. EX1015 (“3GPP-SPEC”)

56. 3GPP TS 36.211 Technical Specification Group Radio Access Network; Physical Channels and Modulation (“3GPP-SPEC”) was publicly

available at least on January 7, 2007. EX1007, 2. 3GPP-SPEC is prior art to the '241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b).

H. EX1013 (“Kao”)

57. U.S. Patent Publication No. 2004/0264600 (“Kao”) was filed on June 29, 2004, and published on December 30, 2004. Kao is prior art to the '241 patent under pre-AIA 35 U.S.C. §§ 102(a), 102(b), 102(e).

I. Analogous Art

58. Each of Dua, Herle, N93, Rooyen, Desai, BT-Spec, 3GPP-SPEC and Kao is analogous art because each “relates to a technique to establish connections between a plurality of apparatuses and networks by radio.” EX1001, 1:23-25.

X. OVERVIEW OF THE GROUNDS

A. The Grounds

59. Ground 1 starts with N93’s multi-radio cellular phone, video transfer functionality, and “normal” user indications to assign radios. Dua teaches obvious hardware implementation details of a multi-radio cellular phone like N93 but more explicitly teaches “simultaneous” video transfers/connections, and an NFC radio. Herle teaches obvious over-the-air software update functionality for the cellular phones of each of N93 and Dua.

60. Ground 2 adds Rooyen (UMTS and GSM) and Desai (Bluetooth and Wi-Fi) as secondary references teaching that the standards-based radios disclosed in Dua and N93 may be implemented as separate or combined radio circuits.

61. Ground 2 also adds 3GPP-SPEC, BT-Spec, and Kao (802.11a/b/g) as secondary references teaching the modulation schemes and frequencies used by the standards-based radios disclosed in Dua, N93, Rooyen and Desai.

62. Ground 3 is based Dua and Herle, which teachings are incorporated by reference from Ground 1. Ground 3 starts with Dua's video transfer system and relies on Dua's "improved" user indications and Dua's reference to "normal" user indications to assign radios.

63. Ground 4 is based on the combination of Dua, N93 and Herle, which teachings are incorporated from Ground 1. Ground 4 uses N93 as a secondary reference teaching the implementation details of the "normal" user indications referenced in Dua.

64. Ground 5 adds Rooyen, Desai, 3GPP-SPEC, BT-Spec, and Kao as secondary references for the same reasons they are added in Ground 2.

B. Quick Reference for the Four Radios

65. N93 and Dua each discloses a number of standard short-range (e.g., Bluetooth and Wi-Fi) and cellular (e.g., UMTS and GSM) radios. Each of these radios could be mapped to each of the four claimed radios. Dua also discloses an

NFC radio, which could be mapped to each of the third and fourth radios. Each permutation of the mappings identified above are explicitly taught (or at least rendered obvious) by the Grounds. I refer to the following Mappings A and B in this declaration:

Mappings	1 st circuit	2 nd circuit	3 rd circuit	4 th circuit*
A: Claims 1, 4-6, 8-14, 17-23, 25-27	Bluetooth	UMTS	GSM	NFC
B: Claims 1, 4-5, 8-27	Bluetooth	UMTS	Wi-Fi	NFC or GSM

*Only five Challenged Claims require a fourth radio circuit. *See* EX1001, claims 5, 18, 25-27.

66. The characteristics of these standard radios would have been known to a POSITA because they were defined by the applicable standards:

Radio	Modulation Scheme	Frequency Band
Bluetooth	GFSK/ $\frac{\pi}{4}$ -DQPSK/8DPSK	2402-2480 MHz
UMTS	QAM/QPSK	2100 MHz
GSM	GMSK	800/1900 MHz
Wi-Fi	(a) – OFDM (QAM)	(a) 5000 MHz

	(b) – CCK/DSSS (g) – OFDM (QAM), CCK/DSSS (QPSK)	(b) 2400 MHz (g) 2400 MHz
NFC	ASK/PSK/QAM	13.56 MHz

EX1014, vol. 198-200 (Bluetooth); EX1015, 21-23 (UMTS); EX1020, [0004], [0052] (GSM); EX1013, Fig. 1, [0028], [0035] (Wi-Fi); EX1021, [0061], [0067] (NFC).

XI. GROUND 1: N93, DUA AND HERLE

A. Combination Rationale

67. N93 is a user manual for a multi-radio, multimedia cellular phone. N93 teaches Bluetooth, Wi-Fi, UMTS and GSM radios, user interfaces (display, buttons, camera, speaker, microphone), and multimedia capabilities (video/audio recording via microphone and camera, playback on display, transmission and receipt of video over each of the four radios). *See infra.* claim 1. N93 teaches the cellular phone contains memories and integrated circuits and runs an operating system and applications for performing the disclosed functionalities. *Id.* In short, N93 teaches a prior art smartphone.

68. The video transfer functionality disclosed by N93 includes real time video streaming and video transfer for storage and later playback. EX1010, 59-60

(video streaming over UMTS for a video call), 23-26 (Bluetooth video transfer for storage and later playback), 88-91 (UPnP over Wi-Fi, which a POSITA would have known included both streaming and transfer for storage and later playback). Additionally, N93 discloses the phone provides a modem connecting a PC to the Internet using simultaneous connections over Bluetooth to the PC and UMTS to the Internet. *Id.*, 83. This discloses to a POSITA (or at least renders obvious to a POSITA) that video could be streamed or transferred for storage and later playback over both radios, e.g., PC streaming video from the Internet or downloading a video file for later playback.

69. Dua also teaches a multi-radio, multimedia cellular phone. Dua teaches the same radios, user interfaces, and multimedia capabilities as N93. Dua expounds on N93's teaching that one radio can transmit/receive video while another radio connects to an internet or home network. Dua additionally teaches a) the internal hardware implementation details for a cellular phone like N93 and b) an NFC radio for improved user indications and other functionality. *See infra.* claim 1. It would have been obvious to a POSITA to combine the teachings of N93 with each of those teachings in Dua.

70. The video transfer functionality disclosed by Dua also includes real time video streaming and video transfer for storage and later playback. EX1008, [0190]-[0197] (real time video streaming for simultaneous relay over short and

long-range radios), [0205]-[0206] (video transfer for storage and later playback as a “stored” video).

Dua’s Implementation Details

71. It would have been obvious for a POSITA to combine N93’s teachings related to a cellular phone with Dua’s teachings of the internal hardware implementation details of such a phone. N93 is a user manual that states the phone includes integrated circuits but not describe them in detail. A POSITA would have been motivated to find such implementation details in the art and been led to Dua.

72. For example, N93 teaches that the phone includes integrated circuits and includes four radios, Bluetooth, Wi-Fi, UMTS and GSM radios, each of which can transmit and receive video. Dua teaches those radios can be implemented in short-range and long-range transceivers, i.e., the claimed radio communication circuits. N93 teaches the user, via the user interface and operating system, controls each radio to be assigned to perform its function. Dua teaches that the operating system runs on a CPU connected to each of the transceivers to control their assignment. N93 teaches that the phone includes a camera, microphone, memory and application programs for recording still images and video, compressing them using MPEG or JPEG and storing them in memory for immediate (e.g., video call) or later (e.g., file transfer) transmission. Dua teaches that the phone includes a camera with imaging sensors to capture the images, compression circuitry such as

a CODEC supporting MPEG and JPEG compression, microphone with audio codec, and memory. A POSITA would have had a reasonable expectation of success in implementing the features described in both of these references in the combination using the implementation details in Dua. Dua's details were known techniques that would yield predictable results as taught by Dua and involve only routing skill.

While

73. Some Challenged Claims require video transmissions over one radio “while” a second radio connects to an internet or home network. N93 teaches simultaneous data packet connections over its UMTS and GSM radios on the one hand, and its WiFi and Bluetooth radios on the other. For example, N93 teaches the phone can be used as a modem for a PC to connect the PC to the Internet by simultaneously using a Bluetooth connection to the PC and a UMTS or GSM connection to the Internet. EX1010, 83. And N93 explicitly teaches there can be a UMTS or GSM data packet connection and a simultaneous Wi-Fi connection. *Id.*, 18. N93 does state that the UI does not support certain options during a “voice call.” *Id.*, 24. N93 does not disclose any similar limitation related to simultaneous video transfers over Bluetooth and data connections over UMTS. Thus, a POSITA would have understood N93 to disclose simultaneous Bluetooth video transfers and data packet connections over UMTS.

74. To address any potential argument by PO that N93 does not sufficiently disclose or render obvious the “while” limitation, Dua explicitly teaches video transfers over a short-range (Bluetooth) radio and “simultaneous” connection to the Internet over a long-range radio (UMTS) to transfer video. For example, Dua teaches simultaneously transmitting video over the short-range transceiver while connected via a 3G (UMTS) radio to the internet to receive that same video via a SIP connection. EX1008, FIG. 10, [0190]-[0197]. Furthermore, Dua teaches receiving video over the short-range transceiver while simultaneously transmitting it over the network transceiver to a remote device. *Id.*, Fig. 1 (network transceiver 105, short-range transceiver 108, antenna 117), Fig. 10, [0190]-[0197] (simultaneous receiving and transmitting). A POSITA would have been motivated to support simultaneous video transfers in order to implement the use cases disclosed by Dua.

75. A POSITA would have had a reasonable expectation of success in supporting “simultaneous” communications over Bluetooth and UMTS radios in the combination. A POSITA would have known Bluetooth could stream video. *See* EX1014, 103, 1005 (video transfer via Bluetooth); EX1022, 8, 11-12 (Video Streaming Profile for Bluetooth); EX1023, [0008] [0014], [0108] (streaming video using Bluetooth). While the claims do not require any minimum transfer rate, Bluetooth’s transfer rate was similar to 3G (UMTS) transfer rates at the time,

which Dua teaches were sufficient. EX1014, 200 (transfer rate 1, 2, or 3 Mbps); EX1019, p. 6, ll. 6-8 (maximum data transfer capacity of 3G UMTS network is 2 Mbps).

76. Supporting simultaneous transfers would simply involve applying a known technique (simultaneous video transfers) to a known device ready for improvement (multi-radio cellular phone) to yield predictable results as taught by Dua. During reexamination 90/014,651, the examiner found, and PO did not dispute, that “simultaneously” performing these claimed functions was “well known” in the prior art. EX1006, 194-195 (Non-Final Office Action). A POSITA would have known radios like those in the Nokia N93 were capable of simultaneously transmitting in the unlicensed bands and cellular bands. EX1010, 2 (RM-55); EX1017, (RM-55 radios capable of simultaneous transmissions). A POSITA would have found obvious to support simultaneous operation of the radios so that the UMTS and GSM radios could connect to the Internet to receive messages (SMS, MMS, email) while using the Bluetooth radio to transfer video. Supporting simultaneous video transfers would have involved only routine skill.

77. Given there is no teaching in either of Dua or N93 that simultaneous data connections over the Bluetooth and UMTS radios should be prohibited, and because of the explicit teachings above that it should be supported, a POSITA

would have had no motivation to create a prohibition against simultaneous data connections in the combination.

NFC

78. It would have been obvious for a POSITA to combine N93's teachings related to a cellular phone with Dua's teaching that the cellular phone should include an NFC radio circuit. A POSITA would have been motivated to do so based on Dua's explicit teachings that it would enable Dua's "improved" user indication in any other similarly equipped devices (in addition to the "normal" user indications taught by N93 for other devices). A POSITA also would have been further motivated to add an NFC radio to support the functions of electronic wallets and keys. EX1008, [0054], [0089].

79. A POSITA would have had a reasonable expectation of success in including an NFC radio in the combination. NFC was a known industry standard radio and Dua explicitly teaches what is required to include it in the combination. Thus, supporting NFC in the combination would simply involve applying a known technique (NFC for Dua's "improved" techniques and electronic wallets and keys) to a known device ready for improvement (multi-radio cellular phone) to yield predictable results as taught by Dua. Supporting NFC in the combination would have involved only routine skill.

Over-The-Air Updates

80. It would have been obvious to combine each of N93 and Dua's teachings with Herle's teaching of an over-the-air ("OTA") update for software (operating system and applications) in a cellular phone. N93 discloses running a Symbian operating system and installed applications. EX1010, 2, 72, 98, 111, 114-116. Dua discloses its cellular phone runs an operating system and applications. EX1008, [0060] (operating system and applications), [0078] (same). N93 discloses updating or repairing an existing application. EX 1010, 115. Dua also teaches that software on its devices may be "updated" with new capabilities. EX1008, [0151], [0154]. But N93 and Dua do not explicitly describe the update process. Thus, a POSITA would have been motivated by N93 and Dua to find known software update processes for similar devices and would have been led to Herle.

81. Herle provides the express motivation to incorporate its OTA update process into cellular phones like N93 and Dua's to provide upgraded software, bug fixes, and newer versions. EX1009, 1:39-45. Herle explains OTA is an "important aspect" to remove the need for a customer to visit a service center. *Id.*, 1:24-38. Herle correctly notes that such updates were known in the computer industry in general, but that mobile devices have more limited resources and different hardware (like limited flash memory) that makes updating more difficult. *Id.*, 1:46-2:11. Herle teaches an improved OTA update process including notifying a mobile

device of the availability of an upgrade and a “delta file” that minimizes transmission and storage requirements. *Id.*, 2:32-3:67. A POSITA would have been motivated to implement Herle’s update process in the combination for each of those reasons.

82. Adding Herle’s update process would simply involve applying a known technique (OTA updates for cellular phones as taught by Herle) to a known device ready for improvement (cellular phone) to yield predictable results (cellular phone with OTA update capability). *KSR*, 550 U.S. at 416.

83. A POSITA would have had a reasonable expectation of success in making the combination. The smartphone described by N93 and Dua is precisely the type of cellular phone Herle teaches should be improved with its upgrade process. EX1009, Fig. 2; EX1008, Fig. 1. Dua discloses the same hardware components that Herle discloses as being required for its update process (e.g., radios, processor, memory). EX1008, Fig. 1. In addition, N93 and Dua disclose that the phones already have the capability of responding to OTA inquiries to provide their current software version information. EX1010, 115; EX1008, Fig. 7, [0141]. A POSITA would have just needed to implement the upgrade process in the manner taught by Herle. EX1009, Fig. 2 (262, 263, 264), Fig. 4. The modifications taught by Herle would have involved only routine skill.

B. Claim 1

1. [1pre]

84. The combination discloses or renders obvious “a video processing apparatus (multi-radio, multimedia cellular phone).”¹ EX1010, 10, 23-25 (record videos), 57-66 (cellular calls); EX1008, Fig. 1, [0057]-[0058] (cellular phone media player); *see also*, [1a]-[1k].

2. [1a]

85. The combination discloses or renders obvious “a first radio communication circuit implementing a first transmission scheme (Bluetooth) having a first modulation scheme ($\text{GFSK}/\frac{\pi}{4}$ -DQPSK/8DPSK) and a first transmission frequency band (2402-2480 MHz), the first radio communication circuit capable of transmitting video information (stored in Gallery) by radio or receiving information by radio (receiving video) using the first transmission frequency band (send or receive video over Bluetooth).” EX1010, 23-26

¹ The first sentence related to each limitation (or mapping) includes the language of the limitation at issue with parentheticals including exemplary arguments and evidence. This first sentence is to orient the reader and the parentheticals are just exemplary. I rely on all arguments and evidence provided with respect to a limitation (and any cross-referenced sections).

(send/receive via Bluetooth), 31-33 (same), 83-87 (same), 125 (circuits); EX1008, Figs. 1 (short-range transceiver 108 for Bluetooth), 7 (Bluetooth capability), 8B, 10, 18, [0059]-[0064] (circuits and hardware components for Bluetooth), [0137], [0156]-[0158] (wireless video transmission via Bluetooth), [0172], [0190]-[0192] (receiving video via Bluetooth), [0194], [0196], [0203].

86. N93 discloses that the cellular phone comprises electronic circuits and includes a Bluetooth radio communication circuit. EX1010, 10,14-16, 23-24, 33, 83-87, 125. N93 discloses using the Bluetooth radio to send and receive video and still images via Bluetooth video transfer. *Id.*, 23-26, 31-33, 83-87. N93 teaches the user can record still pictures and video (with audio) using the imaging circuit in the camera (along with the microphone), which is compressed and stored as a video file in the Gallery. *Id.*, 23-26; *see also* [1d]-[1f]. N93 discloses that the users can select a video clip or image in the Gallery and send it via Bluetooth and receive the same from another user. *Id.*, 23-26 (send/receive via Bluetooth), 31-33 (same), 83-87 (same), 88 (to PC); *see* [1g]-[1i], 11.

87. Dua also discloses the cellular phone comprises “integrated circuit chips and circuitry” including a short-range transceiver that comprises a Bluetooth radio communication circuit and provides additional implementation details. EX1008, Fig. 1 (transceiver 108), [0059]-[0062] (circuits and hardware components), [0062]-[0064] (combined circuit, short-range transceiver 108

supporting Bluetooth, Wi-Fi, etc.). Thus, transceiver 108 is a “combined circuit” that includes a Bluetooth radio circuit. *See* EX1001, Claim 16.

88. Dua also discloses the short-range transceiver sends and receives video using Bluetooth. EX1008, Fig. 7, [0062], [0137], [0156], [0196], [0203], [0206]-[0207]. Dua discloses video could be sent or received between media players using Bluetooth. *Id.*, [0172]. Dua also discloses that the video could be received from a local video camera using Bluetooth. *Id.*, Fig. 10, [0190]-[0192]. Dua discloses that the video could be converted and stored first or buffered while being converted and relayed. EX1008, Fig. 7, Fig. 8B (stored content 542), Fig. 18 (stored video 662), [0172] (converting), [0194] (buffering); 1[d]-1[f]. Dua discloses that the user can select previously recorded video to send via Bluetooth. EX1008, Fig. 8B (stored content 542), Fig. 18 (stored video 662); [1g]-[1i], 11.

89. N93 and Dua’s disclosure of Bluetooth inherently discloses to a POSITA the modulation scheme ($\text{GFSK}/\frac{\pi}{4}$ -DQPSK/8DPSK) and frequencies (2402-2480 MHz) required by the Bluetooth standard. EX1014, 198-200 ($\text{GFSK}/\frac{\pi}{4}$ -DQPSK/8DPSK), 195 (2402-2480 MHz excluding guard bands); EX1017, 4 (2402-2480 MHz). In the alternative, the Bluetooth modulation schemes and frequencies would have been obvious based on the knowledge of a POSITA as evidenced by those same references.

3. [1b]

90. The combination discloses or renders obvious “a second radio communication circuit implementing a second transmission scheme (UMTS) having a second modulation scheme (QPSK/QAM) different from the first modulation scheme (GFSK $\frac{\pi}{4}$ -DQPSK/8DPSK) and a second transmission frequency band (2100MHz) different from the first transmission frequency band (2402-2480 MHz), the second radio communication circuit capable of connecting by radio to an internet or a home network to transmit and receive information using the second transmission frequency band (Internet access through cellular network).” EX1010, 8 (“UMTS 2100 networks”), 15 (3G data packet connection), 61-64 (SIP and MMS); EX1008, Fig. 1 (network transceiver 105), [0059]-[0061] (circuits and hardware components), [0067] (Internet access through cellular network), [0068] (TCP/IP stack for IP-based networks), [0069] (3G cellular networks); *see* [1a] (Bluetooth using different bands/modulations).

91. N93 discloses the cellular phone includes electronics circuits and a UMTS radio communication circuit operating in the 2100 MHz band. EX1010, 8 (“UMTS 2100 networks”), 15, 59-62, 64, 92, 106, 110, 113, 125. The UMTS radio is a 3G radio that connects by radio to the Internet to transmit and receive information such as video calls, web browsing, e-mail, MMS, video clips, etc. EX1010, 15 (3G packet data connection, available, active, on hold), 59 (video

call), 60-61 (video calls and sharing video clips via SIP connections over UMTS), 64 (MMS over UMTS), 91-92 (connection manager), 106 (UMTS for MSS, Web browsing, e-mail, and “connect to the Internet), 113 (UMTS network mode).

92. Dua also discloses the cellular phone includes a UMTS transceiver by disclosing a 3G radio that is fully compliant with all worldwide 3GPP standards and provides additional implementation details. EX1008, [0069]. Dua discloses the transceiver interacts with the CPU 109 to implement the radio communication protocols in addition to higher level networking and application layer protocols (like TCP/IP, SIP, RTP, HTTP) to communicate over the radios and Internet. EX1008, [0066]-[0069]. Dua also discloses the UMTS radio connects by radio to the Internet to transmit and receive video using SIP connections. EX1008, [0068], [0140], [0183]-[0189].

93. Dua’s disclosure of a radio to support “all worldwide 3GPP and 3GPP2 standards” (EX1008, [0069]) inherently discloses to a POSITA a UMTS radio using the UMTS modulation schemes (QPSK, 16QAM, and 64QAM) and the frequency (2100 MHz), as required by those standards. EX1015, 2 (UMTS), 21 (QPSK), 21-22 (16QAM), 22-23 (64QAM), 15 (OFDM); EX1010, 8 (UMTS 2100 MHz); EX1011, [0010], [0019] (UMTS uses WCDMA at 2100 MHz). Dua’s disclosure of “fully compliant” radio also inherently discloses UMTS with TDD, such that information is transmitted and received on the same frequencies.

EX1015, 7 (TDD). In the alternative, the UMTS modulation schemes and frequencies would have been obvious based on the knowledge of a POSITA, as evidenced by those same references.

4. [1c]

94. The combination discloses or renders obvious “a third radio communication circuit (GSM or Wi-Fi) capable of transmitting information and using a third transmission frequency band (GSM: 900, 1800, 1900 MHz; Wi-Fi: 2.4GHz or 5Ghz).” EX1010, 8, 15-19, 30, 42-43, 53, 60, 78, 88-89, 91-92, 106-109, 112-113, 121, 125; EX1008, [0059]-[0061], [0066]-[0069], [0174].

Mapping A: GSM

95. N93 discloses the cellular phone includes a GSM radio (third radio circuit) to connect to the internet and is capable of transmitting information (SMS or data over GPRS and EDGE) using the 900, 1800 and 1900 MHz transmission frequency bands. EX1010, 7 (“EGSM 900/1800/1900”), 15 (GSM network, GPRS or EDGE packet data connection), 53 (GSM for texts), 91-92 (GSM data connections), 106-107(GSM data connections and access points, e.g., to connect to the internet), 113 (GSM network), 125 (electronic circuits).

96. Dua also discloses the cellular phone includes a GSM radio communication circuit in network transceiver 105 for interfacing with the cellular network and connecting to the Internet and provides additional implementation

details. EX1008, Fig. 1 (transceiver 105), [0059] (integrated circuit chips and circuitry) [0066] (GSM cellular network to access the Internet), [0067]-[0069]. A GSM radio is also disclosed based on Dua's teaching of full compliance with the worldwide standards. *Id.*, [0069].

97. N93 and Dua's disclosure of GSM radios inherently discloses to a POSITA the GSM frequency bands required by the relevant standards. EX1010, 8 (900, 1800, 1900); EX1011, Fig. 4a (412b), [0039]-[0040], [0080]-[0087] (GSM RFIC transceiver 900 and 1800 MHz). In the alternative, the GSM frequencies would have been obvious based on the knowledge of a POSITA, as evidenced by those same references.

Mapping B: Wi-Fi

98. N93 and Dua each disclose an additional "third radio communication circuit," including a Wi-Fi radio circuit in short range radio transceiver 108 (802.11b or g at 2.4GHz or 802.11a at 5GHz), which can transmit media and connect to the internet on their respective third transmission frequency band. EX1010, 18 (802.11b/g, e.g., to connect to the internet), 125; EX1008, [0062] (802.11a/b/g), [0066] (Internet access through Wi-Fi).

99. N93 and Dua's disclosure of the Wi-Fi radio communication circuits inherently discloses to a POSITA the frequency bands as defined by the relevant standards. EX1013, Fig. 1 (2.4 GHz, 5 GHz, both 802.11a and 802.11g use

OFDM). In the alternative, the Wi-Fi frequencies would have been obvious based on the knowledge of a POSITA, as evidenced by those same references.

5. [1d]

100. The combination discloses or renders obvious “an imaging circuit (camera with imaging sensors) capable of receiving video information and still picture information via an optical system (camera optics).” EX1010, 12, 23-29 125; EX1008, Fig. 1 (Camera 104), Fig. 3B, Fig. 7, [0061], [0085], [0165]-[0166], [0176], [0201].

101. N93 discloses the phone includes cameras for taking still images and video. EX1010, 23-25 (record videos), 25-29 (take pictures), 23 (two cameras), 125 (electronic circuits).

102. Dua also discloses the cellular phone includes a camera (Camera 104) to record videos and take still pictures and provides implementation details including lenses and filters and image sensors. EX1008, Fig. 1, Fig. 3B, [0061], [0085]. Dua discloses that Camera 104 includes imaging circuits such as a charged coupled device (CCD) sensor or complimentary oxide semiconductor (CMOS) sensor, which are imaging circuits. EX1008, Fig. 1, [0061]. Dua discloses Camera 104 can also include “optics (e.g., lenses, splitters, filters).” EX1008, [0061]. A POSITA would have understood from Dua’s teachings that the light passes through the optics and is sensed by the sensor, such that the sensor (imaging circuit)

receives the information via the optics (optical system). Dua discloses the information includes videos and still pictures. *Id.*, [0057] (“take pictures”), [0058] (“video conferencing,” “taking pictures”), [0142] (MPEG video and JPEG images), [0166].

6. [1e]

103. The combination discloses or renders obvious “a compression circuit (Video CODEC 107) compressing the still picture information using a first type of compression method (JPEG) and the video information using a second type of compression method (MPEG).” EX1010, 23, 35, 42 (JPEG), 2, 23 (MPEG-4), 125; EX1008, Fig. 1 (CODEC 107) Fig. 7, [0058], [0142]-[0143], [0172], [0198], [0205].

104. N93 renders obvious that the phone compresses the still pictures using one type (JPEG) and video using a different type (MPEG) of compression. EX1010, 23, 35, 42 (JPEG), 2, 23-25 (MPEG and video settings), 125 (electronic circuits). EX1010, 23, 35, 42 (JPEG), 2, 23 (MPEG-4), 125 (electronic circuits). N93 discloses a license under the MPEG-4 Visual Patent Portfolio License for information encoded in compliance with the MPEG-4 Visual Standard and for MPEG-4 videos. *Id.*, 2. N93 also discloses that the phone records video clips in the .mp4 file format. *Id.*, 23. A POSITA would have recognized the reference to MPEG as the well known standard for a type of video compression that differed

from JPEG. Based on N93's explicit disclosure of the MPEG-4 License directed to video encoding and further based on the specific disclosure of the standard .mp4 (MPEG-4 Part 14) file format, it will be obvious to a POSITA to implement MPEG-4 video encoding/compression on the .mp4 video clips.

105. Dua also discloses a camera (Camera 104) is connected to Video CODEC 107 supporting MPEG and JPEG compression and provides additional implementation details. EX1008, Figs. 1 (showing Video CODEC 107 connected to Camera 104), [0061]. Dua discloses the media player may convert the files into formats supported by the receiving device or storage in the media player. *Id.*, [0058], [0143], [0172], [0198], [0205], (convert for transmission or storage). Dua discloses the formats include digital formats MPEG and JPEG, which a POSITA would have known were the most common digital formats for video and still picture information. *Id.*, Fig. 7 (showing support for JPEG, MPEG), [0142]. It would have been obvious to a POSITA from the portions of Dua cited above that Video CODEC 107 would have been a compression circuit because that is the purpose of that component among the other circuits illustrated in Figure 1, and it is more efficient than software-based compression. It also would have been obvious to a POSITA that CPU 109 could have performed the described compression in software, albeit less efficiently, in which case CPU 109 would be a compression circuit.

7. [1f]

106. The combination discloses or renders obvious “an accumulation circuit (memory, hard drive) capable of accumulating video information received by the imaging circuit.” EX1010, 14, 20-22, 24-26, 30-33, 78-79; EX1008, Fig. 1 (memory 106, hard drive 112), [0059], [0194], [0198], [0205].

107. N93 discloses the phone includes accumulation circuits capable of storing video captured locally, or received over a radio, for later playback or transmission. EX1010, 14, 20-22, 25 (memory card, device memory), 24 (device memory or memory card saves videos), 30 (moving videos between device memory and memory card), 31 (saving a received video device memory or memory card), 32 (saving video to memory, default: device memory), 33 (transferring videos using memory card), 78-79 (playing video clips from device memory or memory card).

108. Dua also discloses the cellular phone comprises accumulation circuits (memory, hard drive) for storing video captured locally, or received over a radio, for later playback or transmission and provides additional implementation details. EX1008, Fig. 1 (memory 106, hard drive 112), [0059], [0166], [0198], [0205]-[0207]. Dua also discloses this limitation by disclosing buffering of video (live or previously stored) for purposes of flow control when transmitting and receiving. *Id.*, [0194] (buffering and flow control).

8. [1g]

109. The combination discloses or renders obvious “a controller (CPU 109) controlling assignment of connection of each of the first, second, and third radio communication circuits.” EX1010, 2, 98, 111, 114; EX1008, Fig. 1 (CPU 109), [0059], [0066].

110. N93 discloses the phone is a computing device running the Symbian operating system for presenting the user with options on the display and responding to the user’s input and selection of radios (UI) to transmit or receive video or connect to the internet or home network. EX1010, 2 (N93 uses Symbian OS), 98 (same), 111 (same), 114 (same).

111. N93 discloses the controller running the Symbian OS controls the UI and assignment of each of the Bluetooth UMTS, GSM, and Wi-Fi radios.

112. For Bluetooth, see below for [1i].

113. For UMTS and GSM, N93 discloses the operating system running on the controller has a user interface whereby the controller receives user indications to assign the UMTS or GSM radio to transmit or receive video as follows: (1) user exits the “Offline profile” (“Tools>Profiles”) to indicate to the controller to turn on the UMTS or GSM radio (EX1010, 101), (2) the user indicates the controller should assign only UMTS or only GSM using the “Network Mode” setting (*id.*, 113), (3) user indicates whether the controller should automatically search for and

select an available network, or whether it should be manual (*id.*), (4) user indicates the controller should define a packet data access point (*id.*, 107), and (5) user indicates whether the controller should connect “When available” or “When needed,” which will only connect when the user manually starts an application that requires it. *Id.*, 108-109.

114. A user can then indicate to the controller to assign a connection via the specified UMTS or GSM radio to transmit video by defining the specified network as an access point for multimedia messages (EX1010, 48, 53-54, 106), or e-mail (*id.*, 48, 54-55, 106) and then going into Gallery and selecting Send>Via Multimedia or Send>Via e-mail. *Id.*, 32-33.

115. Additionally, for the UMTS radio, N93 discloses the user can indicate to the controller to assign a connection via UMTS to transmit video by selecting “Options>Share video>Live” during a voice call which will cause the controller to assign a SIP connection over the UMTS radio. *Id.*, 61-62. The user can indicate the controller should assign a connection via UMTS to receive a video call as well. *Id.*, 62.

116. For Wi-Fi, N93 discloses the controller displays a prompt to the user to turn Wi-Fi scanning on to scan for a network, join the network, and create an IP or other connection to send or receive data over the Wi-Fi network, for example,

using home share to send or receive videos. *Id.*, 15, 17-19, 30-31, 53, 88-92, 106-109, 121.

117. Dua also discloses the phone is a computing device running an operating system and applications and provides additional implementation details including explicitly identifying microprocessor/CPU 109, which controls assignment of connection of each of Dua's radios. EX1008, Fig. 1 (showing CPU 109 with lines connecting each component). [0059], [0066]. Dua discloses CPU 109 runs the operating system and media player and receives the indications from the user via the user interface. *Id.*, [0059]-[0060].

118. Dua discloses CPU 109 controls each assignment of each connection of each of its radios. Dua discloses CPU 109 controls assignment of the radios because the CPU 109 implements the radio communication protocols with the transceivers and the higher-level networking and application layer protocols (like SIP, TCP/IP, SIP, RTP, HTTP) to communicate media over the radios and Internet. EX1008, [0066]-[0069]. Dua discloses CPU 109 controls assignment of the short-range radios (Bluetooth and Wi-Fi) to connect to a source or target based on profile information received via one of 1) the NFC radio, 2) from a user's selection of a stored profile, or 3) a user's manual configuration. *See* [1i]. Dua discloses CPU 109 controls assignment of the cellular radios (UMTS and GSM) based on the SIP protocol and target information stored in a buddy list for the buddy indicated by

the user. EX1008, [0066]-[0069], [0178]-[0185], [0192]-[0194]. Dua discloses the CPU 109 controls assignment of connection of the NFC radio based on the user pressing an activation button. *Id.*, Fig. 1 (118), [0070]-[0074], [0090], [0095]-[0098].

9. [1h]

119. The combination discloses or renders obvious “wherein the first radio communication circuit (Bluetooth) can transmit video information accumulated in the accumulation circuit to an external device by radio.” EX1010, 24, 31, 33, 83-86; EX1008, Fig. 8B, Fig. 18, [0166]-[0167], [0177], [0194], [0225]; *see* 1[a].

120. N93 discloses the Bluetooth circuit can transmit video information accumulated in memory (Gallery) to an external device by Bluetooth and receive video via Bluetooth and store same in the Gallery. EX1010, 24 (send/receive video using Bluetooth), 33 (same), 83-87 (same). N93 also discloses receiving video clips through Bluetooth connectivity and saving the video clips in the device memory. EX1010, 31.

121. Dua also discloses that Bluetooth can be used to transmit or receive video to and from an external device and provides additional implementation details. *See* [1a]. Dua discloses transmitting video previously saved in memory. EX1008, Fig. 8B (stored content 542), Fig. 18 (stored video 662), [0166]-[0167], [0177], [0225]. Dua also discloses transmitting video currently being captured or

received by another radio, dynamically converting it and buffering it for flow control prior to transmission. EXD1008, [0194]. Each satisfies this limitation.

10. [1i]

122. The combination discloses or renders obvious “wherein when an indication from a user (Bluetooth video transfer) indicates to transmit video information using the first radio communication circuit (e.g., Bluetooth) the controller assigns a connection to the first radio communication circuit for transmitting the video.” EX1010, 83-87; EX1008, Fig. 8A, Fig. 8B, [0009], [0160], [0147], [0196], [0215].

123. N93 discloses the operating system running on the controller (CPU 109 in the combination) has a user interface whereby the controller receives the claimed user indication and performs the claimed assignment for transmitting video as follows:

(1) user indicates to the controller to turn the Bluetooth radio on
“Connect>Bluetooth>On” (EX1010, 84-85, 87);

(2) user indicates to the controller to make the Bluetooth radio visible to other devices using “My phone’s visibility > Shown to all” (*id.*, 84-85);

(3) user indicates to the controller to assign a Bluetooth radio to detect a Bluetooth external device to send a video to by, for example, opening the Gallery application and selecting an item (video clip) to send using “Options>Send > Via

Bluetooth” (*id.*, 33 (send video from Gallery via Bluetooth), 83 (“video clip”), 85 (Gallery), 86 (send via Bluetooth)), the user can interrupt the search by selecting “Stop” (*id.*, 86);

(4) in response to a displayed prompt showing the detected Bluetooth external devices, the user indicates the particular device with which the user wants the controller to establish a connection to transfer the video (*id.*);

(5) in response, if previously paired (or once paired using the “Pair devices” process), the N93 establishes a connection with the indicated device, transmission of the video clip begins, and “Sending data” is displayed. *Id.*

124. For reception of video via Bluetooth, N93 additionally teaches a user is prompted and provides an indication to permit establishment of the connection to receive video. *Id.*, 87.

125. PO accuses this “normal” user indication technique for Bluetooth video transfer in the Litigation. EX1016, 63, 299-304.

126. Dua discloses that prior art “normal” techniques required the user to manually configure the radio for transmission. EX1008, [0009], [0123]-[0124]. A POSITA would have recognized the N93’s Bluetooth implementation as an example of such a “normal” technique.

127. It would have been obvious to a POSITA to include the “normal” technique disclosed in detail in N93 and mentioned in Dua in the combination to

support data exchanges with devices that did not support Dua's "improved" techniques.

11. [1j]

128. The combination discloses or renders obvious "wherein the controller (CPU) controls each of the first and second radio communication circuit so that the first radio communication circuit (e.g., Bluetooth) transmits video information while the second radio communication circuit (e.g., UMTS) connects to the internet or the home network." *See* [1a] (first radio), [1b] (second radio), 1[g] (controller), 1[h] (video), 1[i] (controller assigning first radio); EX1010, 18, 83; EX1008, Fig. 10, Fig. 11, [0190], [0195]-[0196], [0203].

129. N93 explicitly teaches the phone can be used as a modem for a PC by simultaneously using a Bluetooth connection to the PC and a UMTS connection to the Internet. *Id.*, 83. A PC can also be a target Bluetooth external device for video transfer. *Id.*, 86. N93 also explicitly teaches that there can be simultaneous Wi-Fi and UMTS data packet connections. *Id.*, 18. N93 does state that the Camera application does not support a Send option during a "voice call." *Id.*, 24. But N93 does not disclose any similar limitation related to data connections, which are explicitly supported as described above, or the Gallery application. N93 discloses Bluetooth can be used while running other applications. *Id.*, 84. Thus, a POSITA

would have understood N93 discloses simultaneous Bluetooth video transfers and data packet connections over UMTS.

130. Dua also discloses the controller controls the Bluetooth and UMTS radios (*see* [1g]-[1i]) so that video can be transmitted and received over the Bluetooth transceiver with local devices while the UMTS radio connects to the internet to transmit and receive the video with remote devices. EX1008, Fig. 10 and [0191]-[0200] (player 100A receiving video via Bluetooth and transmitting the video via UMTS to internet 730, player 100B receiving video via UMTS from internet 730 and transmitting the video via Bluetooth to television 751), Fig. 11 and [0201]-[0208] (media player 100B receiving video through internet 730 using cellular and transmitting the received video through Bluetooth to television 851). Dua explicitly teaches the video transmission/reception over the first radio (Bluetooth) can be “simultaneous” with the internet connection via the second radio (UMTS) for video transmission/reception. *Id.*, Figs. 8a-8b and [0155]-[0172] (illustrating and describing simultaneous transmissions for live and internet sources), Fig. 9 and [0173]-[0189] (“simultaneous” video transmissions), Fig. 16 and [0223] (live source), Fig. 17 and [0224] (internet source), [0014] (“simultaneous”), [0063] (“simultaneous”), [0176] (“simultaneously”), [0184] (“simultaneously”), [0192] (“simultaneously”). For example, Dua’s cellular phone receives an incoming media such as real-time video from a local source using

Bluetooth and/or a remote source over the Internet using UMTS and simultaneously transmits the real-time video to multiple target devices over the Internet. *Id.*, [0176], [0184]. Additionally, Dua's cellular phone receives the incoming media and simultaneously transmits the incoming media to a local target device via Bluetooth. *Id.*, [0155]-[0156].

131. It would have been obvious to a POSITA to support the simultaneous operation of these radios in the combination as claimed to support the Bluetooth video transfer functionality while the UMTS radio connects to the Internet to simultaneously send/receive the video being transferred. *See* Section VII.A (combination).

12. [1k]

132. The combination discloses or renders obvious "wherein one of the first, second, or third radio communication circuits (e.g., UMTS or GSM radios) receives a signal (notification message, list/notice of updates, delta file) from the internet indicating that an update for an operating system (cellphone's OS) of the video processing apparatus is available, and the video processing apparatus executes an update process (uses the delta file to create an updated OS image) such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process." EX1010, 2, 72, 98, 111, 114-116; EX1008, Fig. 7, [0058], [0060], [0141], [0143], [0151], [0154];

EX1009, Figs. 1-4, 1:14-3:30, 6:9-7:18, 7:25-36, 7:66, 8:3-38 (software update process).

133. N93 discloses its cellular phone running software, including an operating system and applications. EX1010, 2, 72, 98, 111, 114-116. N93 discloses its cellular radios (UMTS and GSM) are connected to the Internet. *See* [1b], [1c].

134. Dua also discloses its cellular phone running software, including an operating system and applications. EX1008, [0058], [0060]. Dua discloses that the software on the cellular phone can be updated but does not explicitly discuss how. *Id.*, [0141], [0143], [0151], [0154]. Dua discloses UMTS and GSM radios are connected to the Internet. *See* [1b], [1c].

135. Herle discloses a cellular phone running software and further discloses updating that software (OS and applications) over the air. EX1009, Fig. 2, 1:14-3:30 (OTA updates for OS and applications), 6:9-19 (OTA updates), 6:20-7:18 (phone components).

136. Herle discloses the update process can begin with the mobile station 111 receiving via its cellular radio a notification message from the Internet from the upgrade server 300. *Id.*, Fig. 1 (internet and wireless network 100), Fig. 2 (RF transceiver 210), Fig. 3 (“To/From MS 111 Via Internet”), Fig. 4 (405), 7:25-29, 8:13-18 (“a notification message from upgrade server 300”). This notification message “informs MS 111 that an upgrade is available.” *Id.*, 7:66. The MS 111

then provides the upgrade server with its software version. *Id.*, Fig. 4 (405, 410, 415), 8:3-11; 8:18-33. Additionally, the MS 111 may request a list of available upgrades, which list will then be provided by the upgrade server, or the upgrade server may simply tell the MS 111 the upgrade is available. *Id.*, 7:30-36. The upgrade server 300 uses that version information provided by the MS 111 to produce and send the correct delta file. *Id.*, Fig. 4 (405, 410, 415), 8:3-11; 8:18-33. The MS 111 then receives the delta file as an OTA download. *Id.*, Fig. 4 (420, 425), 8:11-12, 8:33-38. Each of the signal containing the notification message, the signal containing the list or upgrade notice, and the signal containing the delta file satisfies the claimed “signal” because each is received by a cellular radio for wireless network 100 in the MS 111, each is from the internet, and each indicates an upgrade is available. The notification message indicates an upgrade is available in general, the list or notice specifically indicates which upgrade is available for that device, and the delta file indicates the specific delta file upgrade that is available for that device.

137. The MS 111 then executes an update process by storing the delta file, verifying the delta file, executing a program to convert the original image into the new image file using the delta file, and then rebooting and executing the new image file. *Id.*, Fig. 4 (425, 430), 8:34-48. Thus, the updated software (OS or application) is stored in MS 111 after execution of the update process.

138. It would have been obvious to a POSITA to implement Herle's OTA upgrade process in the combination using the UMTS or GSM radios. *See* Section VII.A (combination).

C. Claim 4

139. The combination discloses the claim 1 video processing apparatus (cellular phone) further comprises a radio interface capable of receiving video by radio (e.g., Bluetooth, UMTS, GSM, or Wi-Fi radio interfaces) wherein the accumulation circuit accumulates the video information received via the radio interface (stored in memory, hard drive, buffered for flow control and/or conversion) and the first radio communication circuit (Bluetooth) is further capable of transmitting the accumulated video information. *See* Claim 1. The radio interfaces are provided by the antennas, radio circuits and associated programming. *See* Claim 1 [a, b, g, i].

140. As shown in claim 1, in N93 the cellular phone can receive video over the Bluetooth or UMTS radio interfaces as a "video clip," store it in memory in the Gallery, and then transmit it over the first radio (Bluetooth). *See* Claim 1.

141. As shown for claim 1, in Dua the cellular phone can receive video over the UMTS radio interface as "Internet Content" and transmit it over the Bluetooth radio circuit in real time with local buffering and conversion.

EX1008,[0143], [0161], [0172], [0194]-[0197]. Dua discloses the cellular phone

can receive a video feed over Bluetooth or Wi-Fi and transmit it over UMTS in real time with local buffering and conversion. *Id.*, [0143], 0191]-[0192], [0194]. Dua also discloses the phone can store the entire video from any of those sources and then later transmit it over the first radio (Bluetooth) as “Stored Content.” *See* Claim 1.

D. Claim 5

142. The combination discloses or renders obvious the claim 1 video processing apparatus (cellular phone) further comprises “a fourth radio communication circuit (NFC or GSM) capable of transmitting information (interrogation signals, messages) and using a fourth transmission frequency band (13.56 MHz for NFC or 900/1800 MHz for GSM) that is different from the first, second, and third transmission frequency bands, wherein the controller controls assignment of connection of each of the first, second, third, and fourth radio communication circuits video processing apparatus (see [1g]).”

143. NFC: For mappings A and B/NFC, Dua discloses the cellular phone includes an NFC radio (transceiver 113). EX1008, Fig. 1, [0070]-[0074]. The NFC radio transmits on the 13.56 MHz frequency band which is different from the other bands. *Id.*, [0052]-[0055]; *see* [1a]-[1c] (other radios/bands). The NFC radio transmits several types of information. EX1008, [0070]-[0071] (interrogation signals, electronic payments, secure key access), [0129] (message components 451

outlined in FIG. 7). The CPU 109 controls assignment of all the radios, including the NFC radio. *See* [1g].

144. It would have been obvious to a POSITA to implement Dua's NFC radio in the combination. *See* Section VII.A (combination).

145. GSM: For Mapping B/GSM, N93 and Dua each discloses the cellular phone includes a GSM radio, which transmits information (e.g., video) on a band different from the other three bands. *See* [1c]. The CPU 109 controls assignment of all the radios, including the GSM radio. *See* [1g].

E. Claim 6

146. For Mapping A, the third transmission frequency band ([1c] (GSM)) is different from the first ([1a] (Bluetooth)) and second ([1b] (UMTS)) transmission frequency bands. *See* claim 1.

F. Claim 8

147. The transmitting of the information by the third radio (GSM or Wi-Fi) comprises connecting to the internet. *See* [1c].

G. Claim 9

148. N93 discloses the video processing apparatus (cellular phone) has an input device (EX1010, 10 (Keypad)), capable of receiving a user's selection of content to be displayed on the phone. *Id.*, 78-79 (pressing a key to play a selected video file).

149. Dua discloses the video processing apparatus (cellular phone) has an input device (EX1008, Fig. 1 (Keypad 111), [0061]), capable of receiving a user's selection of content to be displayed on the phone. *Id.*, [0078]-[0080] (selecting content to display).

H. Claim 10

150. *See* [1k] (Herle teaching software update for applications).

I. Claim 11

151. *See* [1i] (showing the N93 cell phone display displays a series of menu prompts requesting a user to turn on Bluetooth, discover a Bluetooth target device, and then indicate a Bluetooth connection should be established with a particular Bluetooth device to transfer a video, and in response to that indication transferring the video via Bluetooth to that device). This is the same user interface and Bluetooth video transfer functionality PO accuses in the Litigation of practicing this claim. EX1016, 467.

J. Claim 12

152. *See* [1b] (UMTS uses QAM).

K. Claim 13

153. *See* [1b] (UMTS uses QAM and QPSK). A POSITA would have understood that a UMTS connection, per the standard, is controllable to change schemes e.g., based on the available network and network conditions. For example,

in a noisy environment, a UMTS connection is controllable to use a more robust but lower bandwidth modulation scheme to mitigate the effects of the noise.

L. Claim 14

154. *See* [1pre] (each of N93 and Dua discloses a cellular phone).

M. Claim 15

155. *See* [1b], [1c] (Mapping B: UMTS and Wi-Fi (802.11a and 802.11g) use OFDM demodulation).

N. Claim 16

156. Dua discloses Bluetooth (first) and Wi-Fi (third) radio communication circuits are implemented as a combined circuit, short-range transceiver 108. *See* [1a], [1c] (Mapping B).

O. Claim 17

157. As shown above for claims 1, 5, 8, 10-13, 15, the combination discloses or renders obvious the claimed apparatus limitations and steps as they are claimed in method claims 17-24.

1. [17pre]

158. *See* [1pre].

2. [17a]

159. *See* [1d].

3. [17b]

160. *See* [1e].

4. [17c]

161. *See* [1f].

5. [17d]

162. *See* [1a].

6. [17e]

163. *See* [1a], [1h].

7. [17f]

164. *See* [1b].

8. [17g]

165. *See* [1b].

9. [17h]

166. *See* [1c].

10. [17i]

167. *See* [1g].

11. [17j]

168. *See* [1i].

12. [17k]

169. *See* [1j].

13. [17l]

170. *See* [1k].

P. Claim 18

171. *See* [5].

Q. Claim 19

172. *See* [8].

R. Claim 20

173. *See* [10].

S. Claim 21

174. *See* [11].

T. Claim 22

175. *See* [12].

U. Claim 23

176. *See* [13].

V. Claim 24

177. *See* [15].

W. Claim 25

1. [25pre]

178. *See* [1pre].

2. [25a]

179. *See* [1a].

3. [25b]

180. *See* [1b].

4. [25c]

181. *See* [1c].

5. [25d]

182. *See* [5].

6. [25e]

183. *See* [1d].

7. [25f]

184. *See* [1e].

8. [25g]

185. The combination discloses or renders obvious “a microphone receiving audio information corresponding to the video information received via the imaging circuit.”

186. N93 discloses microphone receives audio corresponding to the video being recorded on the camera. EX1010, 24, 34.

187. Dua also discloses a microphone receives audio corresponding to the video being recorded by the camera. EX1008, Fig. 1 (microphone 115), Fig. 3D (microphone 245), [0061], [0087], [0201] (video filming includes audio), [0203] (video feed includes both image and audio portions).

9. [25h]

188. *See* [1f] (accumulation circuit), [1a, 1h] (transmission to external device).

189. The combination also discloses or renders obvious an “accumulation circuit capable of accumulating...audio information received by the microphone.” *See* [25g]. N93 discloses the video includes that audio is sent along with the video via Bluetooth to the external device. EX1010, 24, 34. Dua’s disclosure of storing and buffering video information discloses to a POSITA that the stored or buffered video information that is transmitted to the external device via Bluetooth includes audio information. EX1008, [201] (video filming includes audio), [0203] (video feed includes both image and audio portions). And Dua explicitly discloses the video can be separated into audio and video during playback at the external device. *Id.*, [203].

10. [25i]

190. The combination discloses or renders obvious “a display displaying the video information received by the first radio communication circuit and displaying information received by the second radio communication circuit via the internet or home network.” *See* [1a] (receive video), [1b] (receive video), [9] (user selecting a video to be displayed); EX1010, 31 (display video clips received over Bluetooth or UMTS: e.g., MMS, e-mail), 62 (display live video received over UMTS) ; EX1008, Fig. 10 (displaying video from a local video camera 712), Fig. 17 (videos from the Internet), Fig. 20, [0191]-[0193], [0205], [228].

191. N93 discloses a display for displaying video received over the first radio communication circuit and stored and selected for playback. *See* [1a] (receive video using Bluetooth video transfer); [9] (user selecting a video to be displayed), EX1010, 31 (display video received via Bluetooth). N93 discloses displaying information (video) received by the second radio communication circuit via the internet (MMS or SIP video call via UMTS). *See* [1b] (receive video over UMTS); [9] (user selecting a video to be displayed), 31 (display video received over UMTS), 62 (same).

192. Dua also discloses that a media player can receive media content from local devices (short range radios like Wi-Fi or Bluetooth) or over the network (UMTS or GSM) and allows the user to view the content on the display. EX1008, [0205]. For example, Dua discloses that a media player can receive video information from a video camera via Bluetooth. *See* 1[a]. As another example, Dua discloses receiving Internet content via cellular radios. EX1008, Fig. 17; *see* 1[b]. Dua discloses that the display can play video received from any kind of source. EX1008, Fig. 20, [0228] (display playing a video being transmitted to a target device), Fig. 15, [0221] (video being transmitted includes live content received from a video camera via Bluetooth or Internet content received via cellular radios). A POSITA would have understood that Dua displays video information received using Bluetooth and also displays information received using cellular radio.

11. [25j]

193. *See* [1g] (controller for first three), [5] (controller for all four).

12. [25k]

194. *See* [1i].

13. [25l]

195. *See* [1j].

14. [25m]

196. *See* 1[k].

X. Claim 26

197. *See* [10].

Y. Claim 27

198. *See* 1[a] (Bluetooth shift keying modulation ($\text{GFSK}/\frac{\pi}{4}$ -

DQPSK/8DPSK)), 1[b] (UMTS uses QAM).

XII. GROUND 2: N93, DUA, HERLE, ROOYEN, DESAI, BT-SPEC, 3GPP-SPEC, AND KAO

A. Combination Rationale

The further combination with Rooyen and Desai.

199. It would have been obvious to combine the combination of Ground 1 with the further implementation details of Rooyen and Desai related to radio frequency integrated circuits. Dua and N93 disclose Bluetooth, Wi-Fi, GSM, and UMTS radios and Dua further discloses the radios are implemented as a short-

range transceiver 108 and a network transceiver 105. But neither reference explicitly discloses the lower-level implementation details regarding how those radios would be implemented. Thus, a POSITA would have been motivated to look for known implementations in the art and been led to Rooyen and Desai.

200. A POSITA would have been motivated to use the implementation details provided by Rooyen related to UMTS and GSM radio circuits in the combination. Rooyen explains how UMTS and GSM radio frequency integrated circuits (RFICs) can be implemented as separate or combined RFICs as the radio frequency front end (RFFE) of a transceiver like the network transceiver 105.

Rooyen even explains how to design the device to additionally support broadcast radios at the same time, like the broadcast radios disclosed in Dua. Thus, a POSITA would have been motivated to use Rooyen's implementations to support the functions that Dua teaches are desirable.

201. A POSITA would have been motivated to implement the Bluetooth and Wi-Fi radios in the combination as radio communication circuits in a combined circuit as taught by Desai to incorporate Desai's improved co-existence techniques. Desai explains that Wi-Fi and Bluetooth radios in handheld wireless devices can interfere with each other and prior art co-existence techniques were not optimal. EX1012, Fig. 1c (cell phone), [0007]-[0013]. Desai discloses implementing the radios in a single integrated circuit with an improved co-

existence technique that includes priority levels and a packet transfer scheduler (PTS). *Id.*, [0028]. Desai also expressly provides a motivation to combine so that some portions of the radio circuits can be implemented by “common logic, circuitry, and/or code.” *Id.*, [0048]. This provides the advantages of reduced power consumption and die size of the radio chip, which a POSITA would have recognized as important in the mobile phone of the combination. *Id.* A POSITA also would have been motivated to make the combination because, in a cellular phone like Dua and N93, it is advantageous to reduce the overall chip count to reduce the size of the circuit boards and simplify overall system design.

202. A POSITA would have had a reasonable expectation of success in making the combinations. Rooyen and Desai teach the implementation details to a POSITA, which are a matter of routine skill. These are standards-compliant radios, which were and remain well known to a POSITA, and widely implemented in the industry.

The further combination with BT-Spec, 3GPP-SPEC and Kao.

203. As explained for Ground 1, the combination inherently discloses the claimed modulation and transmission frequency limitations because they are required by the disclosed standards. Alternatively, they are rendered obvious by the knowledge of a POSITA. These references are provided as secondary references out of an abundance of caution to the extent the Board disagrees.

204. Dua and N93 disclose standard UMTS, GSM, Bluetooth and Wi-Fi radios as explained in Ground 1. The modulations and frequencies utilized by those radios are not all explicitly disclosed. Thus, a POSITA would have been interested in determining the appropriate modulations and frequencies in order to comply with the disclosed standards and enable communications with the intended standard-compliant devices. 3GPP-SPEC, BT-Spec, and Kao (802.11a/b/g) are secondary references that disclose the correct modulations and frequencies. *See* Section VI.B. (Quick Reference). A POSITA would have had a reasonable expectation of success in making the combination because these are each known standards implemented with standard technologies and are a matter of routine skill.

B. Overview and Incorporation from Ground 1

205. Ground 2 relies on the disclosures in BT-Spec, 3GPP-SPEC, and Kao as secondary reference for the relevant modulations and frequencies. The relevant disclosures are already included in Ground 1 as evidence of inherency and the knowledge of a POSITA. Thus, those citations are incorporated herein by reference and are not repeated below. Ground 2 also relies on Rooyen and Desai for “circuit” implementation details (including “combined circuit” for claim 16). The limitations impacted by those details are addressed below.

C. Claim 1

1. [1pre]

206. *See* Ground 1.

2. [1a]

207. *See* Ground 1.

208. It would have been obvious to a POSITA to implement the Bluetooth radio in the combination using a “first radio communication circuit” in view of Desai. Section VIII.A (combination). Desai discloses the Bluetooth radio can be implemented as a radio communication circuit within a combined integrated circuit with the Wi-Fi radio communication circuit. Desai discloses there is a Bluetooth radio circuit portion comprising logic, circuitry, and/or code. *Id.*, Figs. 2 (208), 3 (306), 7 (706), [0042], [0084]. Desai discloses there is a Wi-Fi radio circuit portion comprising logic, circuitry, and/or code. *Id.*, Figs. 2 (206), 3 (304), 7 (704), [0040]-[0041], [0046], [0083]. Desai discloses there can be common portions that can result in reduced power consumption and die size. *Id.*, [0048]. And Desai discloses there is additional prioritization and scheduling circuit to promote co-existence. *Id.*, [0044], [0049]-[0050].

3. [1b]

209. *See* Ground 1.

210. It would have been obvious to a POSITA to implement the UMTS radio as a “second radio communication circuit” in view of Rooyen. Section VIII.A (combination). Rooyen discloses a UMTS radio in a cellular phone like Dua and N93 can be implemented as a separate radio communication circuit (EX1011, Fig. 4a (412a), [0039]-[0040], [0080]-[0087] (UMTS RFIC transceiver 2100 MHz) or as a combined circuit with the GSM radio circuit (EX1011, Fig. 4b (413), [0040], [0088] (combined RFIC), each of which would have been obvious and each of which satisfies this limitation.

4. [1c]

211. *See* Ground 1.

212. Mapping A: It would have been obvious to a POSITA to implement the GSM radio in the combination as a “third radio communication circuit” in view of Rooyen. Section VIII.A (combination). Rooyen discloses a RF front end for the GSM radio can be implemented as a separate radio communication circuit (EX1011, Fig. 4a (412b), [0039]-[0040], [0080]-[0087] (GSM RFIC transceiver 900 and 1800 MHz) or as a combined circuit with the UMTS radio circuit (EX1011, Fig. 4b (413), [0040], [0088] (combined RFIC) each of which would have been obvious and each of which satisfies this limitation.

213. Mapping B: It would have been obvious to a POSITA to implement the Wi-Fi radio as a “third radio communication circuit” in view of Desai. Section

VIII.A (combination). Desai discloses the Wi-Fi radio (third radio) can be implemented as a radio communication circuit within a combined integrated circuit with the Bluetooth radio communication circuit (first radio). Desai discloses there is a Bluetooth radio circuit portion comprising logic, circuitry, and/or code. *Id.*, Figs. 2 (208), 3 (306), 7 (706), [0042], [0084]. Desai discloses there is a Wi-Fi radio circuit portion comprising logic, circuitry, and/or code. *Id.*, Figs. 2 (206), 3 (304), 7 (704), [0040]-[0041], [0046], [0083]. Desai discloses there can be common portions that can result in reduced power consumption and die size. *Id.*, [0048].

5. [1d]-[1k]

214. *See* Ground 1.

D. Claims 4-6, 8-15

215. *See* Ground 1.

E. Claim 16

216. *See* Ground 1. Additionally, in the combination, it would have been obvious to implement the Bluetooth (first) and Wi-Fi (third) radio communication circuits of transceiver 108 as a “combined circuit” as taught by Desai. *See* [1a], [1c], Section VIII.A (combination).

F. Claims 17-27

217. *See* Ground 1.

XIII. GROUND 3: DUA AND HERLE

A. Combination Rationale

218. It would have been obvious to combine the cellular phone of Dua with the over-the-air software (OS and application) functionality taught by Herle as shown above for Ground 1. *See* VII.A (combination).

B. Overview and Incorporation from Ground 1

219. Ground 3 differs from Ground 1 in two ways. First, Ground 3 relies on everything in Ground 1 except for the subject matter from N93. All non-N93 citations are incorporated herein by reference and not repeated below. Second, Ground 3 is based on Dua's "improved" user indications (indication of a radio using the NFC technique and indication of a radio through the use of a stored profile) and Dua's reference to "normal" user indications (manual radio configuration). Dua's indications were not addressed in depth in Ground 1 and, therefore, the limitations impacted by Dua's indications (1[i], 11, 17[j], 21, 25[k]) are addressed explicitly below.

C. Claim 1

1. [1pre]-1[h]

220. *See* Ground 1.

2. [1i]

221. The combination discloses or renders obvious "wherein when an indication from a user (user selection of NFC, stored profile, or prior art normal

configuration) indicates to transmit video information using the first radio communication circuit (e.g., Bluetooth) the controller assigns a connection to the first radio communication circuit for transmitting the video.” EX1008, Fig. 8A, Fig. 8B, [0009], [0160], [0147], [0196], [0215].

222. Dua discloses this limitation in at least three ways. First, Dua discloses receiving an indication from a user when a user presses the NFC activation button 118 while holding the device near a target device, which indicates the controller should assign a connection to the radio in the target device’s profile. EX1008, Fig. 8A (502-press RFID activation button), Fig. 8B (same), [0160], [0165], [0196]. The NFC radio then communicates with the device to obtain the target device profile. *Id.* That information is provided to the CPU 109. *Id.*, [0128], [0144]-[0155]. The CPU 109 then assigns connection of the relevant short-range radio (e.g., Bluetooth) and transmits the video. *Id.*, [0128];[0147], [0196].

223. Second, Dua discloses receiving an indication from a user when the user manually selects a previously stored target device profile, indicating the controller should assign a connection to the short-range radio in that target device profile. EX1008, Figs. 13-14, [0020], [0147], [0163], [0173], [0215]-[0220]. In the example illustrated in Fig.13, the user desires to transmit video to a target TV. If the user selects device profile entry 611, the CPU 109 will assign a connection to the radio in target TV 611’s stored profile (e.g., Bluetooth) causing a connection to

be made and the video to be transferred to TV 611. *Id.* If the user had instead indicated TV 612, the controller would not have assigned the connection to the Bluetooth radio for TV 611. *Id.*, [0215].

224. Dua's teachings regarding the first and second methods include the use-case where the target device supports only a single radio (e.g., Bluetooth), such that the user's indication (through the user's use of NFC or selection of a stored profile) is determinative of the radio to assign. EX1008, [0137]. In other words, Dua discloses support for the use case where the controller has no discretion to choose between radios, since the user's indication has dictated the radio that must be assigned by the controller. The intended radio would have been known and subjectively intended by the POSITA (and even a layperson). For example, a user that intends to use an external Bluetooth speaker to play audio intends for, and dictates that, the controller assign the Bluetooth radio to transfer the audio.

225. Dua does not disclose that the radio (e.g., Bluetooth) is explicitly displayed to the user, e.g., the word "Bluetooth" is not displayed on the screen in Figure 13. Thus, PO may attempt to argue Dua's improved indications are "implicit" indications by the user of the radio, and that the claims should be construed to require an "explicit" user indication. PO accuses "implicit" user indications in the Litigation. *See, e.g.*, EX1016, 264-267 (accusing the user

selecting “Quick Share” for “nearby” sharing, when the user does not explicitly indicate which radio to use for that “nearby” share).

226. Dua includes the additional teaching that some target devices and stored profiles can support multiple radios in a preferred order, in which case the user indication only indicates the device and the CPU 109 then automatically assigns a radio connection in the preferred order based on operating conditions. EX1008, [0137]. PO accuses such automatic selection in the Litigation, despite disclaiming it during the reexamination. *See, e.g.*, EX1016, 289-293 (accusing “Intelligent Wi-Fi” settings that automatically select a cellular or Wi-Fi radio without the user’s indication or knowledge).

227. Third, Dua discloses the prior art “normal” technique that required the user to manually configure the radio for transmission. EX1008, [0009], [0123]-[0124]. This “normal” technique requires the user to manually input the configuration commands through the user interface, which commands will be received by the CPU, and the CPU will then assign the radio connection as directed by the manually entered configuration settings to transmit the video. *Id.* A POSITA would have understood that a target device may not support Dua’s new and improved methods, requiring the user to manually enter the configuration using the “normal” technique. A POSITA would have understood that such manual configuration would require the user to “explicitly” indicate the radio.

3. [1j]-[1k]

228. *See* Ground 1.

D. Claims 4-6, 8-10

229. *See* Ground 1.

E. Claim 11

230. *See* [1i] (discussing Figs. 13-14 wherein a display screen prompts user to select a stored profile to indicate the user allows a connection to be established with TV 611 (not auto-detected or auto-connected), wherein in response to the user selecting the profile for TV 611, the Bluetooth connection is established and transmits the accumulated video to the TV 611).

F. Claims 12-16

231. *See* Ground 1.

G. Claim 17

1. [17pre]-[17i]

232. *See* Ground 1.

2. [17j]

233. *See* Ground 1 and Ground 3, [1i] (Dua's "improved" and "normal" indications).

3. [17k]-[17l]

234. *See* Ground 1.

H. Claims 18-20

235. *See* Ground 1.

I. Claim 21

236. *See* Ground 1 and Ground 3, 11 (Dua’s “improved” and “normal” indications).

J. Claims 22-24

237. *See* Ground 1.

K. Claim 25

1. [25pre]-[25j]

238. *See* Ground 1.

2. [25k]

239. *See* Ground 1 and Ground 3, [1i] (Dua’s “improved” and “normal” indications).

3. [25l]-[25m]

240. *See* Ground 1.

L. Claims 26-27

241. *See* Ground 1.

XIV. GROUND 4: DUA, HERLE, N93

A. Combination Rationale

242. It would have been obvious to a POSITA to further combine Dua-Herle with the additional implementation details and features taught by N93.

243. N93 is a user manual for a multi-radio, multimedia cellular phone, like the one disclosed in Dua. The N93 had Bluetooth, Wi-Fi, UMTS and GSM radios (like Dua), user interfaces (display, buttons, camera, speaker, microphone, like Dua), and provided multimedia capabilities (video/audio recording via microphone and camera, playback, transmission, and receipt), like Dua. In short, the N93 discloses a smartphone like Dua's.

244. It would have been obvious to a POSITA to combine Dua with the "normal" prior art method a controller assigning connections to transfer and receive video based on user indications as disclosed by N93. Dua discloses a method of setting up connections using NFC, which it describes as an improvement over the prior art, which require more manual effort by the user. EX1008, [0009]. Dua referred to such prior art techniques as, for example, the "normal Bluetooth" session set-up and discovery process. *Id.*, [0123]-[0124]. While Dua teaches its "improved" NFC method is preferred, a POSITA would have understood that not every target device would have an NFC chip or support Dua's improved method. Thus, a POSITA would have been motivated to retain support for the "normal" user indications as well. To the extent a POSITA did not already know of those "normal" indications, a POSITA would have been motivated to search in the art to find known implementations of such a normal process and been led to the N93.

245. N93 teaches the details of the “normal” user indications referred to by Dua, including the more detailed, explicit, indications by the user regarding the particular radio. For example, for Bluetooth video transfer, N93 teaches how the user manually turns the Bluetooth radio on, initiates a scan for devices, initiates a connection, conducts pairing as necessary, and eventually transfers video via Bluetooth. N93 teaches the corresponding manual, “normal” steps for UMTS, GSM, and Wi-Fi radios. EX1010, 61, 91-92, 106-107, (UMTS), 91-92, 106-107 (GSM), 17-19, 91-92, 106-109 (Wi-Fi). These steps include SIP connections over the cellular radios (like Dua) and UPnP connections over Wi-Fi (like Dua). EX1010, 61-62 (SIP), 88-91, 119 (UPnP); EX1008, [0068], [0140], [0180]-[0186], [0192]-[0194], [0202] (SIP), [0150] (UPnP).

246. N93 expressly teaches several additional motivations to implement the “normal” user configuration process in the combination. N93 teaches that power can be conserved if you allow the user to turn radios on/off or at least stop scanning for new networks. *Id.*, 85 (Bluetooth power savings), 121 (Wi-Fi power savings). N93 teaches these features are also desirable to prevent discovery by undesirable third party devices. EX1010, 85 (“Security tips”). N93 teaches that certain services often charge based on the amount of packet data. *Id.*, 65. A POSITA would have been motivated to include the N93’s functionality that permits the user to manually chose the radio connection to minimize data charges

(e.g., power and/or select only UMTS or GSM to avoid roaming onto the wrong operator, or use “Offline profile” to limit to Wi-Fi). While Dua’s improved connection teachings can be more efficient, a POSITA would have understood and been motivated to also support the functionality to “ask first” before assigning a particular radio connection.

247. A POSITA would have had a reasonable expectation of success in modifying Dua to support the “normal” prior art configuration process discussed in Dua and shown in detail in N93. N93 teaches the “normal” indications. Dua itself discloses this as the “normal” process, so by definition, it is well within the skill and knowledge of a POSITA.

248. Additionally, it would have been obvious to a POSITA to combine Dua with implementation details for the radios disclosed by N93. Dua and N93 disclose the same radios, but N93 provides additional implementation details that would have been obvious to include in the combination. For example, Dua states the cellular radios support GSM and all worldwide 3GPP and 3GPP2 standards. N93 discloses an example of including at least GSM at 1900 MHz with GPRS and EDGE, which would work, for example, on systems in the United States, and GSM at 800 and 900 MHz and UMTS at 2100 MHz, which would work, for example, on systems in Europe. It would have been obvious to include such implementation details as they are governed by the applicable standards.

249. A POSITA would have had a reasonable expectation of success in implementing the standard radios in the combination as taught by N93. These were the defined and fully described by international standards bodies, and as such, implementing them were well within the skill and knowledge of a POSITA.

250. Additionally, it would have been obvious to a POSITA to combine Dua with the Bluetooth video transfer and reception functionalities of N93. Dua discloses streaming video between devices (e.g., SIP over cellular, UPnP over Wi-Fi) and transferring video to a device for storage and later playback. EX1008, [0205]-[0206] (describing automatic storage of received videos for later playback). N93 also discloses streaming (e.g., SIP over cellular, UPnP over Wi-Fi) and transferring video to a device for storage and later playback (e.g., Bluetooth video transfer, MMS, e-mail). These are standard transfer protocols based, e.g., on Bluetooth Generic Object Exchange Profile, Object Push Profile, File Transfer Profile. EX1010, 84. Given that Dua explicitly supports Bluetooth and transfer for later playback, it would have been obvious to support standard types of video transfers disclosed in N93 as well.

251. A POSITA would have had a reasonable expectation of success in implementing the standard video transfer functions in the combination and as taught by N93. These were standard messaging functions (MMS, e-mail, Bluetooth

video transfer), and as such, implementing them were well within the skill and knowledge of a POSITA.

B. Overview and Incorporation from Ground 1

252. Ground 4 differs slightly from Ground 1 because it starts with Dua's "improved" user indications (incorporated from Ground 3) and additionally relies on N93's implementation details of "normal" user indications (incorporated from Ground 1) as a secondary reference.

C. Claim 1

1. [1pre]-[1h]

253. *See* Ground 1.

2. [1i]

254. *See* Ground 1 [1i]; Ground 3 [1i]. In the combination, in addition to Dua's "improved" user indications, it would have been obvious to a POSITA to implement N93's teachings regarding the "normal" user indications to transfer video using Dua's video transfers and N93's video transfers. *See* Section X.A (combination).

3. [1j]-[1k]

255. *See* Ground 1.

D. Claim 4-6, 8-10

256. *See* Ground 1.

E. Claim 11

257. *See* Ground 1, 1[a], 1[i], 11 (N93’s “normal” indications); *see* Ground 3, 1[a], 1[i], 11 (Dua’s improved indications).

F. Claims 12-20

258. *See* Ground 1.

G. Claim 21

259. *See* Ground 1, 1[a], 1[i], 11 (N93’s “normal” indications); *see* Ground 3, 1[a], 1[i], 11 (Dua’s improved indications).

H. Claims 22-27

260. *See* Ground 1.

XV. GROUND 5: DUA, HERLE, N93, ROOYEN, DESAI, BT-SPEC, 3GPP-SPEC, AND KAO

A. Combination Rationale

The further combination with Rooyen, Desai, BT-Spec, 3GPP-SPEC, and Kao.

261. It would have been obvious to combine the combination of Dua, Herle, and N93 with the further implementation details of Rooyen and Desai related to separate or combined radio frequency integrated circuits. *See* Section VIII.A (combination).

262. It would have been obvious to combine the combination with the further implementation details of BT-Spec, 3GPP-SPEC and Kao for the relevant aspects of the standard. *See* Section VIII.A (combination).

B. Overview and Incorporation from Grounds 1-4

263. Ground 5 relies on the order of combination of the references and evidence set forth in Grounds 3-4. The secondary references added in Ground 5 are relied on for the same reasons they are relied on in Ground 2, which is incorporated herein by reference. *See* Section VIII.B&C (overview and claims).

XVI. CONCLUSION

264. Claims 1, 4-6, 8-27 of the '241 patent are invalid for the reasons discussed above.

265. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both under Section 1001 of Title 18 of the United States Code.

May 16, 2024
Date


Dr. Charles D. Creusere

Appendix A

VITA

CHARLES D. CREUSERE

Klipsch School of Electrical & Computer Engineering

Mailing Address:

MSC 3-0

New Mexico State University

P.O. Box 30001

Las Cruces, NM 88003-8001

Phone: 575-646-3919

Fax: 575-646-1435

email: ccreuser@nmsu.edu

DISSERTATION TITLE

"Perfect Reconstruction Modulated Polyphase Filter Banks Using Reverse-Time Subfilters."

ACADEMIC TRAINING

- 1980-1985:** University of California at Davis, B.S. in Electrical and Computer Engineering.
- 1989-1990:** University of California at Santa Barbara, M.S. in Electrical and Computer Engineering.
- 1990-1993:** University of California at Santa Barbara, Ph.D. in Electrical and Computer Engineering.

PROFESSIONAL EXPERIENCE

2010-Present Holder of the Frank Carden Endowed Chair in Telemetry & Telecommunications and Full Professor. Current research interests include compressive sensing/sparse reconstruction for LIDAR and streaming sensor data as well as EEG brain analysis for audiovisual perceptual quality assessment and modeling.

October 2008 Selected for the International Foundation for Telemetry Endowed Professorship.

Jan. 2000-2008 Assistant/Associate professor in the Klipsch School of Electrical & Computer Engineering. My teaching areas include digital signal processing, image processing, pattern classification, and source coding (signal compression). I have done past research in areas of image, video, and audio compression as well as feature vector extraction for pattern classification. Currently, my research interests include distributed compression, polarimetric image processing for scene analysis, and nonstationary signal denoising.

1993-1999: Researcher & Team Leader, Naval Air Warfare Center, China Lake. My research efforts have focused on high speed image and video compression technologies which offer unique capabilities such as robustness to transmission errors and regional localization. My team (2 other people) and I have implemented a real-time (3 to 15 frames/second with 240x512 frames)

320C80-based system which uses a wavelet transform along with embedded coding techniques to compress a video input and stream it through the Internet via TCP/IP protocols. Our recent research focus has been to add more intelligence to the encoder so that the space-frequency information in the image that is most useful for image analysis is received with the highest fidelity. While most of my recent research has been in the area of embedded compression, I am still very much interested in other applications of time/space-frequency decompositions and of multirate digital signal processing concepts in general.

1999, Spring Quarter: Instructor at the University of California at Santa Barbara. Taught graduate class in Multirate Digital Signal Processing, ECE 258B.

1990-1993: Research Assistant, Department of Electrical and Computer Engineering, University of California, Santa Barbara. Worked under Prof. S.K. Mitra on subband coding and multirate filter bank theory. Also implemented real-time filter banks on a Motorola 56001 digital signal processor.

1992: Summer Employee, AT&T Bell labs, Murray Hill, NJ. Developed and simulated new methods of extremely low bit rate video coding for video telephone applications.

1985-1989: Design Engineer, Naval Weapons Center, China Lake. Designed, built, and tested the guidance electronics for the Laser Guided Training Round. This project included mixed analog and digital circuit design as well as the programming of an embedded DSP. Also developed software for an advanced video processor and studied ground target tracking.

FUNDED RESEARCH

- (2000) Office of Naval Research, *Compression of Digital Elevation Maps Using Non-linear Wavelets*, 2000-2003, \$94K
- (2001) Sandia National Labs, *Intelligent Compression for Remote Sensing*, 2001-2003, \$70K.
- (2002) National Science Foundation (Early Career Grant), *Efficient Audio Compression with Perceptually Embedded Scalability*, 2002-2007, \$350K.
- (2004) National Geospatial-Intelligence Agency, *Passive Polarimetric Imagery Classification Study*, 2004-2006, \$160K (joint with Dr. David Voelz).
- (2005) Los Alamos National Laboratories, *Signal Detection via Adapted Filter Banks and Geometric Dimensionality Reduction*, 2005-2006, \$15K (unburdened).
- (2006) Los Alamos National Laboratories, *Signal Detection via Adapted Filter Banks and Geometric Dimensionality Reduction*, 2006-2007, \$50K (unburdened).
- (2006) National Geospatial-Intelligence Agency, *Exploiting Polarization in Imaging Systems*, 2006-2009, \$304K (joint with Dr. David Voelz).
- (2006) Army Research Office, *Distributed Source Coding Using Bitstream-based Detection and Classification*, 2006-2009, \$326K.
- (2006) DARPA (Subcontract from LANL), *ADAM Project*, 2006-2007, \$104K (joint with Dr. Joe Lakey and Dr. Jaime Ramirez)

- (2009) NMSU IRG, *Perceptual audio quality evaluation by direct measurement of human brain responses*, 2009-2010, \$39K (joint with Dr. Jim Kroger, Psychology)
- (2011) National Science Foundation, *CIF:Medium:Assessment and modeling of temporal variation in perceived audio and video quality using direct brainwave measurement*, 2011-2015, \$917K (lead PI with Dr. Jim Kroger and Dr. Joerg Kliewer as co-PIs)
- (2011) NASA EPSCOR, *Proximity Operations for Near Earth Asteroid Exploration*, 2011-2014, \$750K (co-PI, with Dr. Eric Butcher (lead), others)
- (2012) National Geospatial Intelligence Agency (NGA), *Pulse Complexity Based LIDAR Scene Modeling for Sparse Reconstruction and Super-Resolution*, 2012-2013 (plus 3 1 year options), \$150K (\$75K/option year), co-PI Dr. David Voelz.
- (2018) Airforce Research Lab (AFRL), *Software Radio Design in LabView FPGA*, 2018-2019, \$140K.

PATENTS

- Patent titled "Parallel digital image compression system which exploits zerotree redundancies in wavelet coefficients," Patent Number 6,148,111.
- Patent titled "Efficient embedded image and video compression using lifted wavelets," Number: 6,466,698, granted October 15, 2002.

OTHER DISTINCTIONS

- Awarded the International Foundation for Telemetering Professorship, October 2008.
- Received an educational fellowship from the Department of Defense, 1989-1992.
- Certificate of Merit for the outstanding technical paper awarded at the AIAA Missile Sciences Conference for the paper "Automatic target recognition directed image compression," Nov. 1998.
- Patent (classified) "Notice of Allowability" titled, "Microcontroller-Based Laser Pulse Decoder," granted October 7, 1991.
- Associate editor for IEEE Trans. on Image Processing, 2002-2005, 2010-2014
- Associate editor for IEEE Trans. on Multimedia, 2008-2013.
- Guest Editor, "Issue on Advances in Hyperspectral Data Processing and Analysis", IEEE Journal of Selected Topics in Signal Processing, Vol. 5, Numbers: 5 & 6, August-September 2015,
- Co-general chair, IEEE Digital Signal Processing Workshop, August 2004, Taos, NM.
- Co-technical chair for the 2012 and 2014 Southwest Symposium on Image Analysis and Interpretation.
- Student Paper Contest Chair, 40th Asilomar Conf. on Signals, Systems, and Computers, October 2006.

- Organized special session entitled "Applications of Multirate DSP" at the 40th Asilomar Conf. on Signals, Systems, and Computers, October 2006.
- Member of technical program committees for the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), the IEEE International Conference on Image Processing (ICIP), and the IEEE Data Compression Conference (DCC).
- Senior Area Editor, IEEE Transactions on Image Processing, March 2016 to May 2022.
- Area Editor for IEEE Access, June 2022-Present.
- Deputy Editor-in-Chief, IEEE Transactions on Image processing, May 2023-present.

CONSULTING ACTIVITIES

- Video compression systems (technology consultant), Abba Tech, Albuquerque, NM, 2000.
- Expert witness in laser rangefinding technology, Asia Optical Inc. (through NY law firm of Osterlenk, Faber, Gerb & Soffen), Case: LTI versus Nikon/AOI, July 2001-2003. Case went to trial/ testified in court.
- Technical expert for defense; Case: Real-Time v. AT&T (byte.mobile), 2011-2012, case settled June 2012.
- Technical expert for defense; Case: Princeton Digital v. Dell, 2014-2015, case dismissed June 2015.
- Technical expert for defense; Noninfringement & IPR (6,597,812), Real-time v. SAP, 1/2016-6/2016.
- Technical expert for defense; IPRs (7,378,992 & 8,643,513), Real-time v. Riverbed, et al., 2/2016-2017
- Technical expert for defense; IPRs (7,415,530, 9,116,908, 7,161,506, & 9,054,728), Real-time v. Dell, et al., 2/2016-2017
- Technical expert for defense; Noninfringement, Real-time v. HP Enterprises, 4/2016-2018.
- Technical expert for defense; IPR (7,358,867, 7,161,506, & 9,054,728), Real-time v. Teradata 11/2016-2017
- Technical expert for defense; IPRs (7,415,530, 8,643,513 & 7,378,992), Real-time v. Veritas 12/2016-2017.
- Technical expert for defense; IPRs (7,075,917 & 6,304,612), UNILOC v. Apple 9/2018-2019.
- Technical expert for defense; IPR (7,558,730), Advanced Voice Recognition Systems v. Apple 7/2019-2020.
- Technical expert for defense; District Court; Noninfringement, Realtime Adaptive Systems v. YouTube/Google, 2018-2020.
- Technical expert for defense; ITC case; Nokia v. Lenovo, Oct. 2020-2021.
- Technical expert for defense; IPR (10,176,848), Maxell v. Apple, 2019-2021.

- Technical expert for plaintiff (rebutting invalidity); East Texas District Court; USAA v. PNC Bank, 2021-present. Deposed in Case 1 and Case 2; Attended trial in May 2022 for Case 1 and September 2022 for Case 2 but was not called to testify (USAA won on all counts, patents upheld as valid); I have also opined as an expert in 3 related IPRs (deposed in one of those cases, so far).
- Technical expert for defense; District Court; Gesture Tech Partners v. Apple/Lenovo&Motorola, 2021.

JOURNAL PUBLICATIONS

1. **C.D. Creusere and S.K. Mitra**, "A simple method for designing high-quality prototype filters for M-band pseudo-QMF banks," *IEEE Trans. on Signal Processing*, Vol. 43, No. 4, April 1995, pp. 1005-1007.
2. **C.D. Creusere and S.K. Mitra**, "Efficient audio coding using perfect reconstruction noncausal IIR filter banks," *IEEE Trans. on Speech and Audio Processing*, Vol. 4, No. 2, March 1996, pp. 115-123.
3. **C.D. Creusere and S.K. Mitra**, "Image coding using wavelets based on perfect reconstruction IIR filter banks," *IEEE Trans. on Circuits and Systems for Video Technology*, Vol. 6, No. 5, Oct. 1996, pp. 447-458.
4. **C.D. Creusere**, "A new method of robust image compression based on the embedded zerotree wavelet algorithm," *IEEE Trans. on Image Processing*, Vol. 6, No. 10, Oct. 1997, pp. 1436-1442.
5. **C.D. Creusere and A. Van Nevel**, "ATR-directed image and video compression," *Journal of Aircraft*, Vol. 36, No. 4, pp. 626-31, July-August 1999.
6. **C.D. Creusere**, "Fast embedded compression for video," *IEEE Trans. on Image Processing*, Vol. 8, No. 12, pp. 1811-16, December 1999.
7. **C.D. Creusere**, "Motion compensated video compression with reduced complexity encoding for remote transmission," *Signal Processing: Image Communications*, Vol. 16, pp. 627-42, April 2000.
8. **C.D. Creusere**, "Understanding perceptual distortion in MPEG scalable audio coding," *IEEE Trans. on Speech and Audio Processing*, Vol. 13, No. 3, pp. 422-431, May 2005.
9. **L. E. Boucheron and C.D. Creusere**, "Lossless wavelet-based compression of digital elevation maps for fast and efficient search and retrieval," *IEEE Trans. on Geoscience and Remote Sensing*, Vol. 43, No. 5, pp. 1210-1214, May 2005.
10. **V. Thilak, D. Voelz, and C.D. Creusere**, "Polarization-based index of refraction and reflection angle estimation for remote sensing applications," *Applied Optics*, Vol. 46, Bo. 30, pp. 7427-7536, Oct. 2007.
11. **C.D. Creusere, K. Kallakuri, and R. Vanam**, "An Objective Metric of Human Subjective Audio Quality Optimized for a Wide Range of Audio Fidelities," *Audio, Speech, and Language Processing, IEEE Transactions on [see also Speech and Audio Processing, IEEE Transactions on]*, vol.16, no.1, pp.129-136, Jan. 2008
12. **S. Kandadai and C.D. Creusere**, "Scalable Audio Compression at Low Bitrates," *Audio, Speech, and Language Processing, IEEE Transactions on [see also Speech and Audio Processing, IEEE Transactions on]*, vol.16, no.5, pp.969-979, July 2008
13. **S. Kandadai and C.D. Creusere**, "Reverse engineering and repartitioning vector quantizers using training set synthesis," *Signal Processing*, August 2008.
14. **V. Thilak, C.D. Creusere, and D. Voelz**, "Passive Polarimetric Imagery-Based Material Classification Robust to Illumination Source Position and Viewpoint," *Image Processing, IEEE Transactions on*, vol.20, no.1, pp.288-292, Jan. 2011.
15. **C.D. Creusere and J. Hardin**, "Assessing the Quality of Audio Containing Temporally Varying Distortions," *Audio, Speech, and Language Processing, IEEE Transactions on*, vol.19, no.4, pp.711-720, May 2011.

16. **Castorena, J.; Creusere, C.D.**, "The Restricted Isometry Property for Banded Random Matrices," *Signal Processing, IEEE Transactions on* , vol.62, no.19, pp.5073-5084, Oct.1, 2014 doi: 10.1109/TSP.2014.2345350.
17. **Castorena, J.; Creusere, C.D.**, "Sampling of Time-Resolved Full-Waveform LIDAR Signals at Sub-Nyquist Rates," *Geoscience and Remote Sensing, IEEE Transactions on* , vol.53, no.7, pp.3791-3802, July 2015. doi: 10.1109/TGRS.2014.2383839.

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1. **H. Babic, S.K. Mitra, C.D. Creusere, and A. Das**, "Perfect reconstruction recursive QMF banks for image subband coding," *Proc. Asilomar Conf. Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 1991, pp. 746-750.
2. **S.K. Mitra, C.D. Creusere, and H. Babic**, "A novel implementation of perfect reconstruction QMF banks using IIR filters," *Proc. IEEE Int. Symposium on Circuits and Systems*, San Diego, CA, May 1992, pp. 2312-2315.
3. **S.K. Mitra, C.D. Creusere, and H. Babic**, "Design of transmultiplexers using IIR filter banks," *Signal Processing VI: Theories and Applications*, Elsevier Science Publishers, 1992, pp. 223-226.
4. **C.D. Creusere and S.K. Mitra**, "Efficient image scrambling using polyphase filter banks," *Proc. International Conference on Image Processing*, Austin, TX, Nov. 1994, pp. 81-85.
5. **C.D. Creusere and G. Hewer**, "Wavelet-based nearest neighbor pattern classification using scale sequential matching," *Proc. Asilomar Conf. Signals, Systems and Computers*, Pacific Grove, CA, Nov. 1994, pp. 1123-1127.
6. **C.D. Creusere**, "Embedded zerotree image coding using low complexity IIR filter banks," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, Detroit, MI, May 1995, pp. 2213-16.
7. **C.D. Creusere and Gary Hewer**, "Digital video compression for weapons control and bomb damage indication," *AGARD Conference Proceedings 576*, Chapter 16, Sept. 1995.
8. **C.D. Creusere**, "Image coding using parallel implementations of the embedded zerotree wavelet algorithm," *Proc. of the Digital Video Compression Conference (Algorithms and Technologies 1996)*, San Jose, CA, Jan. 28-Feb. 2, 1996, pp. 82-93.
9. **C.D. Creusere**, "A family of image compression algorithms which are robust to transmission errors," *Proceedings of the SPIE*, Vol. 2825, Denver, CO, August, 1996, pp. 890-900.
10. **C.D. Creusere**, "Perfect reconstruction time-varying IIR filter banks," *Conf. Rec. Asilomar Conf. Signals, Systems, and Computers*, Pacific Grove, CA, Nov. 1996, pp. 1319-23.
11. **C.D. Creusere**, "Out-of-loop motion compensation for reduced complexity video encoding," *Proc. of the Data Compression Conf.* (pp. 428) & *Data Compression Industry Workshop* (pp.28-37), March 1997, Snowbird, UT.
12. **C.D. Creusere**, "Periodic pan compensation for reduced complexity video compression," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, Vol IV, pp. 2889-92, April 1997, Munich, Germany.
13. **C.D. Creusere**, "A new approach to global motion compensation which reduces video encoding complexity," *Proc. Int. Conf. on Image Processing*, Vol. III, pp. 634-7, October 1997, Santa Barbara, CA.
14. **C.D. Creusere**, "Spatially partitioned lossless image compression in an embedded framework," *Conf. Rec. 31st Asilomar Conf. on Signals, Systems, and Computers*, Nov. 1997, Pacific Grove, CA.
15. **C.D. Creusere**, "Adaptive embedding for reduced complexity image and video compression," *Proc.*

- of the SPIE, Vol 3309 (Visual Communications and Image Processing), pp. 48-57, Jan. 1998, San Jose, CA.
16. **C.D. Creusere**, "Successive coefficient refinement for embedded lossless image compression," *Proc. of the Data Compression Conf.*, pp. 539, March 1998, Snowbird, UT.
 17. **C.D. Creusere**, "Subband coding of speech and audio," *Proc. of the European Signal Processing Conf.* (invited paper), Sept. 1998, Isle of Rhodes, Greece.
 18. **C.D. Creusere**, "Fast embedded video compression using cache-based processing," *Proc. of the European Signal Processing Conf.*, Sept. 1998, Isle of Rhodes, Greece.
 19. **C.D. Creusere**, "Successive coefficient refinement for embedded lossless image compression," *Proc. Int. Conf. on Image Processing*, Oct. 1998, Chicago, IL.
 20. **C.D. Creusere** and A. Van Nevel, "Autonomous target recognition directed image compression," *Proc. of the AIAA*, Nov. 1998.
 21. **C.D. Creusere**, "Improved successive refinement for wavelet-based embedded image compression," *Proc. of the SPIE*, Denver, CO, July 1999.
 22. A. Van Nevel and **C.D. Creusere**, "Intelligent Bandwidth Compression," *Proc. of the SPIE*, Denver, CO, July 1999.
 23. **C.D. Creusere**, "Optimal refinement/significance map tradeoffs in SPIHT-based image compression," *Conf. Rec., 34th Asilomar Conf. on Signals, Systems, & Computers*, pp. 1026-30, Oct. 2000.
 24. **C.D. Creusere**, "Compression of digital elevation maps using nonlinear wavelets," *Proc. Int. Conf. on Image Processing*, pp. 824-7, October 2001.
 25. **C.D. Creusere and G. Dahman**, "Object detection and localization in compressed video," *Conf. Rec. 35th Asilomar Conf. on Signals, Systems, and Computers*, Nov. 2001, Pacific Grove, CA.
 26. **C.D. Creusere**, "An analysis of perceptual artifacts in MPEG scalable audio coding," *Proceedings of the Data Compression Conference*, pp. 152-161, April 2002, Snowbird, UT.
 27. **C.D. Creusere and N. Tolk**, "Combining wavelets and GLICBAWLS to achieve resolution-progressive lossless compression," *Proc. of the International Conference on Image Processing*, pp. III-229-32, October 2002.
 28. **L. Boucheron and C.D. Creusere**, "Compression of digital elevation maps for fast and efficient search and retrieval," *Proc. of the International Conference on Image Processing*, pp. 629-32, September 2003.
 29. **S. Kandadai and C.D. Creusere**, "An experimental study of object detection in the wavelet domain," *Conf. Rec. 37th Asilomar Conf. on Signals, Systems, and Computers*, pp. 1620-4, Nov. 2003, Pacific Grove, CA.
 30. **C.D. Creusere**, "Quantifying perceptual distortion in scalably compressed MPEG audio," *Conf. Rec. 37th Asilomar Conf. on Signals, Systems, and Computers*, pp. 265-9, Nov. 2003, Pacific Grove, CA.
 31. **C.D. Creusere and L. Zhou**, "Spatial object detection and classification in JPEG bitstreams," *Proceedings 11th Digital Signal Processing Workshop*, pp. 115-9, August 2004, Taos Ski Valley, NM.
 32. **L. Zhou and C.D. Creusere**, "Spatial object detection in JPEG bitstreams," *Proceedings European Conference on Signal Processing*, pp. 949-52, September 2004, Vienna, Austria.
 33. **V. Thilak and C.D. Creusere**, "Tracking of extended size targets in H.264 compressed video using the probabilistic data association filter," *Proceedings European Conference on Signal Processing*, pp. 281-4, September 2004, Vienna, Austria.
 34. **S. Kandadai and C.D. Creusere**, "Reverse engineering vector quantizers by training set synthesis," *Proceedings European Conference on Signal Processing*, pp. 789-92, September 2004, Vienna, Austria.

35. **V. Thilak, J. Saini, D. G. Voelz, C. D. Creusere** , "Pattern recognition for passive polarimetric data using nonparametric classifiers," *Proc. of the SPIE Vol. 5888*, p. 337-344, Polarization Science and Remote Sensing II; Joseph A. Shaw, J. Scott Tyo; Eds.
36. **R. Vanam and C.D. Creusere**, "Evaluating low bitrate scalable audio quality using advanced version of PEAQ and energy equalization approach ," *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing*, Vol. III, pp. 189-92, March 2005.
37. **S. Kandadai and C.D. Creusere**, "Reverse engineering vector quantizers for repartitioned signal spaces," *Proc. 39th Asilomar Conference on Signals, Systems, and Computers*, pp. 1208-12, Pacific Grove, CA, Nov. 2005.
38. **R. Vanam and C.D. Creusere**, "Scalable perceptual metric for evaluating audio quality," *Proc. 39th Asilomar Conference on Signals, Systems, and Computers*, pp. 319-23, Pacific Grove, CA, Nov. 2005.
39. **S. Kandadai and C.D. Creusere**, "Perceptually-weighted audio coding that scales to extremely low bitrates," *Proc. IEEE Data Compression Conference*, pp. 382-391, Snowbird, UT, March 2006.
40. **V. Thilak, D. Voelz, C. Creusere, S. Damarla**, "Estimating the refractive index and reflected zenith angle of a target using multiple polarization measurements," *Proc. SPIE Vol. 6240, 624004*, Polarization: Measurement, Analysis, and Remote Sensing VII; Dennis H. Goldstein, David B. Chenault; Eds., May 2006.
41. **V.M. Prasad and C.D. Creusere**, "Analyzing reversible lapped transformations using Reng probing," *Proc. 40th Asilomar Conference on Signals, Systems, and Computers*, pp. 873-877, Oct. 2006.
42. **N. Balachandran and C.D. Creusere**, "Chirp classification using hidden Markov models," *Proc. 40th Asilomar Conference on Signals, Systems, and Computers*, pp. 545-549, Oct. 2006.
43. **V. Thilak and C.D. Creusere**, "Estimating the complex index of refraction and view angle of an object using multiple polarization measurements," *Proc. 40th Asilomar Conference on Signals, Systems, and Computers*, pp. 1067-1071, Oct. 2006.
44. **V. Thilak, C.D. Creusere, and D.G. Voelz**, "Material classification using passive polarimetric imagery," *Proc. IEEE Int. Conf. on Image Proc.*, Vol. 4, pp. IV-121-124, Sept., 2007.
45. **A. Pamba, V. Thilak, D. G. Voelz, C. D. Creusere** "Estimation of incidence and reflection angles from passive polarimetric imagery: extension to out-of-plane scattering," *Proc. SPIE Vol 6682, 66820O*, Polarization Science and Remote Sensing III, Joseph A. Shaw; J. Scott Tyo, Editors, September 2007.
46. **V. Thilak, D. G. Voelz, C. D. Creusere**, "Image segmentation from multi-look passive polarimetric imagery, *Proc. SPIE 6682, 668206*, Polarization Science and Remote Sensing III, Joseph A. Shaw; J. Scott Tyo, Editors, October 2007.
47. **S. Kandadai and C.D. Creusere**, "Optimal Bit Layering for Scalable Audio Compression Using Objective Audio Quality Metrics," *Signals, Systems and Computers, 2007. ACSSC 2007. Conference Record of the Forty-First Asilomar Conference on* , pp.560-564, 4-7 Nov. 2007.
48. **C.D. Creusere and I. Mecimore**, "Bitstream-based overlap analysis for multi-view distributed video coding," *Proc. IEEE Southwest Symposium on Image Analysis and Interpretation*, pp. 93-96, March 2008.
49. **V. Thilak, C.D. Creusere, and D.G. Voelz**, "Passive Polarimetric Imagery Based Material Classification For Remote Sensing Applications," *Proc. IEEE Southwest Symposium on Image Analysis and Interpretation*, pp. 153-156 March 2008.
50. **V. Thilak, Q. Wang, D. G. Voelz, C. D. Creusere**, "Estimation of target geometry from Mueller matrix imagery," *Proc. SPIE 6972*, March 2008.
51. **C.D. Creusere and I. Mecimore**, "Bitstream-based correlation detector for multi-view distributed video coding applications," *Proc. Int. Conf. on Acoustics, Speech, and Signal Processing*, pp. 1001-1004, April 2008, Las Vegas, NV.

52. **S. Kandadai, J. Hardin, and C.D. Creusere**, "Audio quality assessment using the mean structural similarity measure," *Proc. Int. Conf. on Accoustics, Speech, and Signal Processing*, pp. 221-224, April 2008, Las Vegas, NV.
53. **S. Matta and C.D. Creusere**, "Efficient correlation extraction for distributed audio coding," *Signals, Systems and Computers, 2008 42nd Asilomar Conference on*, vol., no., pp.1272-1276, 26-29 Oct. 2008.
54. **J.C. Hardin and C.D. Creusere**, "Objective analysis of temporally varying audio quality metrics," *Signals, Systems and Computers, 2008 42nd Asilomar Conference on*, vol., no., pp.1245-1249, 26-29 Oct. 2008.
55. **S. Matta and C.D. Creusere**, "Distributed audio coding with efficient source correlation extraction," *Proceedings 13th Digital Signal Processing Workshop*, pp. 16-20, January 2009, Marco Island, FL.
56. **I. Mecimore and C.D. Creusere**, "Unsupervised bitstream based segmentation of images," *Proceedings 13th Digital Signal Processing Workshop*, pp. 642-647, January 2009, Marco Island, FL.
57. **Q. Wang, C.D. Creusere, V. Thilak, and D.G. Voeltz**, "Active polarimetric imaging for estimation of scene geometry," *Proceedings 13th Digital Signal Processing Workshop*, pp. 659-663, January 2009, Marco Island, FL.
58. **J.C. Hardin and C.D. Creusere**, "A temporally varying objective audio quality metric," *Proceedings 13th Digital Signal Processing Workshop*, pp. 21-25, January 2009, Marco Island, FL.
59. **I. Mecimore, W. Fahrenkrog, and C.D. Creusere**, "On bitstream based edge detection techniques," *ITEA Conference*, January 2009, El Paso, TX (best graduate student paper award).
60. **Mecimore, Ivan; Creusere, Charles D.**, "Low complexity multi-view distributed video coding based on JPEG," *Image Analysis & Interpretation (SSIAI), 2010 IEEE Southwest Symposium on*, vol., no., pp.165-168, 23-25 May 2010.
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62. **Castorena, J.; Creusere, C.D.; Voelz, D.**, "Modeling lidar scene sparsity using compressive sensing," *Geoscience and Remote Sensing Symposium (IGARSS), 2010 IEEE International*, vol., no., pp.2186-2189, 25-30 July 2010.
63. **Castorena, J.; Creusere, C.D.; Voelz, D.**, "Using finite moment rate of innovation for LIDAR waveform complexity estimation," *Signals, Systems and Computers (ASILOMAR), 2010 Conference Record of the Forty Fourth Asilomar Conference on*, vol., no., pp.608-612, 7-10 Nov. 2010.
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66. **Davis, P; Creusere, C.**, "Quantifying the gains of compressive sensing for telemetering application," *Proc. International Telemetering Conference*, Las Vegas, NV, October 2011.
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73. **Charles D. Creusere ; Juan Castorena,** "A unified framework for 3rd generation lidar pulse processing based on finite rate of innovations," *Proc. SPIE 8858, Wavelets and Sparsity XV*, 88580T (September 26, 2013); doi:10.1117/12.2022447.

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75. **Castorena, J.E.; Creusere, C.;** "Full-waveform LIDAR recovery at sub-Nyquist rates," *Proc. International Telemetering Conference*, Las Vegas, NV, October 2013.

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83. **Newtson, Kathy; Creusere, Charles D.;** "Histogram oriented gradients and map seeking circuits pattern recognition with compressed imagery," *Proc. Southwest Symposium on Image Analysis and Interpretation*, Santa Fe, NM, March 2016.

84. **Davis, Philip; Creusere, Charles D.; Kroger, Jim,** " Assessing Cross Frequency Coupling in EEG Collected from Subjects Viewing Video using a Modified Metric ," *Proc. Southwest Symposium on Image Analysis and Interpretation*, Santa Fe, NM, March 2016.

85. **Davis, Philip; Creusere, Charles D.; Kroger, Jim,** "The Effect of Perceptual Video Quality on EEG Power Distribution," *Proceedings International Conference on Image Processing, 2016 IEEE*,

Phoenix, AZ, September 2016.

86. **Creusere, Charles D.; Castorena, J.; Dragulin, I.; Voelz, D.**, "Quantifying the Accuracy of FRI based LIDAR Waveform Analysis," *Proceedings International Conference on Image Processing, 2016 IEEE*, Phoenix, AZ, September 2016.

87. **Kathy A. Newton, Charles D. Creusere**, "Compressed imagery detection rate through map seeking circuit, and histogram of oriented gradient pattern recognition", Proc. SPIE 10203, Pattern Recognition and Tracking XXVIII, 102030F (1 May 2017); doi:10.1117/12.2262919; <https://doi.org/10.1117/12.2262919>

88. **Erandi Wijerathna, Charles D. Creusere, David Voelz, Juan Castorena**, "Polarimetric LIDAR with FRI sampling for target characterization", Proc. SPIE 10407, Polarization Science and Remote Sensing VIII, 104070R (7 September 2017); doi: 10.1117/12.2272587; <https://doi.org/10.1117/12.2272587>

89. **Andrew J. Phillips, Charles D. Creusere**, "The effects of lossy EEG compression on ERP analysis," *International Telemetry Conference Proceedings*, November 2018, <http://hdl.handle.net/10150/631654>.

90. **Andrew J. Phillips, Charles D. Creusere**, "The effects of lossy frequency-domain EEG compression on cross-frequency coupling analysis," *International Telemetry Conference Proceedings*, October 2019.

91. **Sergio Lara, Charles D. Creusere**, "Software Defined Radio for Carrier and Symbol Timing Extraction," *International Telemetry Conference Proceedings*, October 2021.

92. **Sergio Lara, Charles D. Creusere**, "LabView for Software Defined Radio Development," *International Telemetry Conference Proceedings*, October 2021.

93. **Ayatollah Elsayed, Charles D. Creusere**, "The Feedback Dynamics of Brain-Computer Interfaces in a Distributed Processing Environment," *Proceedings of HICSS-55*, January 2022; <http://hdl.handle.net/10125/79821>.

94. **Joshua Tellez, Charles D. Creusere**, "Evaluation of JPEG-2000 Image Compression as Applied to Electroencephalography," *International Telemetry Conference Proceedings*, Glendale, AZ, October 2022, <https://repository.arizona.edu/handle/10150/666964>.

PRESENTATIONS & OTHER PUBLICATIONS

1. **C.D. Creusere**, "Generic Tracking Laboratory Study," *NWC Technical Paper 7018*, Nov. 1989, Naval Weapons Center, China Lake, CA.
2. **C.D. Creusere**, "Robust image coding using the embedded zerotree wavelet algorithm," presented at the Digital Compression Conference, Snowbird, UT, April 1996.
3. **C.D. Creusere**, "Creating a compressed and embedded image representation which is robust to transmission errors," presented at the Office of Naval Research Workshop on Error Resilient Compression, San Diego, CA, February, 1996.
4. **C.D. Creusere**, "Data Compression Project Final Report," NAWCWD Technical Paper, TP 8442.
5. **C.D. Creusere**, "Applications of multirate digital signal processing to communications systems," NATO/RTA lecture series 216 on *Applications of Mathematical Signal Processing Techniques to Mission Systems*, presented in Paris, France; Cologne, Germany; and Monterey, CA, November 1999.
6. **C.D. Creusere**, "Object detection and recognition in compressed video," invited presentation

and white paper for the Motion Imagery Workshop, sponsored by the National Imagery and Mapping Agency (NIMA) and the National Science Foundation (NSF).

7. **C.D. Creusere**, "Application specific compression: digital elevation map browsing, video surveillance, and scalable audio," invited seminar at the University of Arizona, Tucson, AZ, March 2003.

8. **C.D. Creusere**, "Compressing Digital Elevation Maps for Efficient Search and Retrieval," presented at the Office of Naval Research Workshop on Image Processing, Minneapolis, MN, May 2003.

Total Number of depositions: 15
Testified in Federal Court: 1 (in 2003)
Participated in Federal Court proceedings: 3
Hired for ITC cases: 3 (never deposed or testified)

- Technical expert for defense (Evaluated expired PD patent and wrote Dec. demonstrating Dell could not have infringed, case was dropped); Case: Princeton Digital v. Dell, 2014-2015, case dismissed June 2015, **no deposition**.
-> **A company named Princeton Digital was threatening to sue Dell over possible infringement on an expired patent related to JPEG image compression. I did some analysis to show that PD COULD have easily determined prior to patent expiration whether or not Dell actually infringed.**
- Technical expert for defense; Noninfringement & IPR (6,597,812), Real-time v. SAP/HP Enterprises, 1/2016-6/2016, **2 depositions (IPR)**. -> **the patents in suit were related to lossless compression technology. Patent in IPR suit dealt with combined run-length coding and dictionary-based coding.**
- Technical expert for defense; IPRs (7,378,992 & 7,415,513), Real-time v. Riverbed (and others), 2/2016-present, **1 deposition**. -> **The patents in suit were related to lossless compression technology with the specific being to provide content dependent and independent compression**
- Technical expert for defense; IPRs (8,643,530, 7,378,992, 7,161,506, & 9,054,728), Real-time v.
- Dell (and others), 2/2016-7/2018, **2 depositions**. -> **All of the patents in suit were related to lossless data compression. One set dealt with "accelerated data storage and retrieval" while the other was related to adaptive content dependent/independent compression**
- Technical expert for defense; Noninfringement, Real-time v. HP Enterprises, 4/2016-10/2018, **not deposed, settled before deposition**. -> **Dealt with noninfringement for patents listed for the IPRs above.**
- Technical expert for defense; IPR (7,358,867, 7,161,506, & 9,054,728), Real-time v. Teradata
- 11/2016-8/2018, **1 deposition**. -> **Patents dealt with lossless compression. Specifically, patents claimed that different encoding schemes would be selected for each of a plurality of data blocks based on some criterion. Specific to one of these patents, the encoder could also choose NOT to encode a block if that was desirable.**
- Technical expert for defense; IPRs (8,643,513 & 7,378,992), Real-time v. Veritas 12/2016-2018, **no additional deposition -> Duplicate of Dell IPR above**
- Technical expert for defense; IPRs (7,151,916; 7,075,917; 6,304,612) , Uniloc LLC v. Apple, 2018-2019, **not deposed**. -> **Patents dealt with aspects of communications systems, including tail-biting convolutional coding and ARQ systems for error correction**
- Technical expert for defense; Noninfringement, Realtime Adaptive Systems v. YouTube/Google, 2018-2019, **1 deposition, settled before trial**.
- Technical expert for defense; IPR (7,558,730), AVRS v. Apple, 2019-2020, **2 depositions**. -> **dealt with an internet-based voice transcription service.**
- Technical expert for defense; IPR (10,129,590), Maxell v. Apple, 2019-2020, Oct. 2020-2021. -> **Dealt with video compression. Specifically, a methodology for capturing video from a device and transmitting it wirelessly to at least two other devices (one through the internet) where one device has a higher priority than the other. Settled before deposition.**
- Technical expert for defense; U.S. ITC case; Nokia v. Lenovo, Oct. 2020-March 2021 -> **Patents related to H.264 video compression. Hired as a testifying expert witness but**

ultimately have provided primarily technical analysis of opposing expert witness report. ***No deposition.***

- Technical expert for defense; IPR (10,176,848) , Maxell v. Apple, 2019-2020, Dec. 2020-2021. -> **Deals with video compression. Specifically, a methodology for identifying a person of interest in recorded digital video. Settled before deposition.**
- Technical expert for defense; Claims construction, Gesture Tech v. Apple/Lenovo/Motorola, 11/2021-12/2021, 8/2023. ***No depositions.***
- Technical expert for plaintiff; USAA v. PNC Bank; October 2021-January 2023; Expert Arguing against invalidity in two U.S. District Court cases (2:20-cv-00319-JRG and 2:21-cv-00246-JRG) and 4 IPRs (IPR2022-00075, IPR2022-00076, IPR2021-01073, and IPR2021-01070). **All patents dealt with mobile remote check deposit. Deposed 4 times and attended both trials but did not testify.**
- Technical expert for the defense; US ITC case; VideoLabs, Inc. v. HP Inc; August 2023 scheduled; ***Patents invalidated by IPRs prior to start of ITC case.***
- Technical expert for defense; Federal District Court; Gesture Partners v. Lenovo/Motorola, December 2023-present. **Wrote invalidity and noninfringement reports (source code and device analysis), Deposed April 2024. USP 8,878,949 dealt with optical-based gesture recognition.**
- Technical expert for defense; IPRs; Nokia v. Amazon; USP 10,536,714, USP 8,077,991; 2024-present; **Depositions pending institution.**
- Technical expert for defense; IPRs; Maxell v. Samsung; USP 11,445,241; 2024-present; **Depositions pending institution.**
- Technical expert for the defense; Federal District Court/ITC; Nokia v. HP Inc; 2024-present; **Case pending.**