IN UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners,

v.

MAXELL, LTD.,
Patent Owner

Case: IPR2024-00906

U.S. Patent No. 11,445,241

DECLARATION OF BRUCE MCNAIR, M.E., EE

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and such willful false statements may jeopardize the validity of the patent which is under review in this proceeding.

Dated: March 26, 2025

Bruce McNair, M.E., EE

Maxell, Ltd.
Ex. 2017
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I. INTRODUCTION

1. My name is Bruce McNair, and I have prepared this declaration at the request of Maxell, Ltd. ("Maxell"). This declaration provides my opinions with respect to various aspects of the Petition filed by Petitioner relating to U.S. Patent No. 11,445,241 ("the '241 Patent").

2. Depending on new information learned including positions taken by Petitioner or Petitioner's expert, I reserve the rights to supplement my opinions included herein.

3. I am being compensated at my usual consulting rate of $650 per hour for my time reviewing materials and preparing this declaration. My opinions expressed here are my own. My compensation is not dependent on the outcome of this case and I have no other financial interest in this matter or the parties thereto.

4. In forming my opinions, I have relied on my knowledge and experience, as well as the documents and information referenced in this report.

II. BACKGROUND AND QUALIFICATIONS

5. A detailed description of my professional qualifications, including a listing of my specialties/expertise and professional activities, is contained in my curriculum vitae, a copy of which is attached as Appendix A. In what follows, I provide a short summary of my professional qualifications.

6. I have over 60 years of experience in the areas of electronic circuits and wireless communications systems and equipment, starting as an amateur radio operator in 1963 and including seven years as a GS-0855 Electronic Engineer working for the US Army Electronics Command, one year at ITT Defense Communications Division, 24 years as a Member of Technical Staff at AT&T/Bell Laboratories, 15 years as a full-time faculty member of the Electrical and Computer Engineering Department at Stevens Institute of Technology and seven years as an adjunct on-line faculty member at Stevens.

7. While I was working for the US Army Electronics Command at Fort Monmouth, NJ, I was responsible for research and development for the data transmission, electronic countercounter measures (ECCM), and cryptographic aspects of SINCGARS, the Single Channel Ground/Airborne Radio System. As part of this work, I built speech compression hardware and software, microprocessor-based systems, digital hardware and analog circuits to accomplish my research. In addition, as part of this work, I studied speech compression techniques to allow high-quality secure voice transmission at low data rates. I also investigated antenna tuner technologies for operation over a large fraction of the VHF spectrum.

8. While I was at ITT Defense Communications Division, I designed digital hardware for a satellite communications system used by the White House. I also designed hardware and software to realize the first hardware implementation of

a Linear Predictive Coder, a technology used extensively to this day for speech communications and speech recognition in virtually all communication today.

9. At AT&T Bell Labs, I worked on several projects involving public data networks, encryption, analog modems, network security and wireless systems. This included internal protocols and security for an X.25 pre-Internet public data network (Advanced Communications Service/Net-1000). I designed digital hardware and microprocessor-based systems to improve the operation of analog modems. I also initiated and led an IR&D (independent research and development) project to investigate and prototype a secure voice terminal based on newly evolving AT&T high-speed digital services. This involved analog and digital hardware design, microprocessor programming, and controlling systems through a signaling and control network. Part of this work involved interfacing with the analog telephone network, interfacing with audio input and output devices and digital speech and signal processing. I then led a group developing encryption add-ons for analog modems. I supervised a Bell Labs group investigating speech recognition and speaker verification. I led the Bell Labs Security Architecture Group, setting security and encryption standards for all AT&T products and services. This work led to several US patents.

10. From 1994 to 2002, my work at AT&T Bell Labs and AT&T Labs involved research into future wireless systems. I performed research into future

wireless systems, including modulation techniques and voice coding to maximize performance. This involved the design of digital and analog hardware, programming embedded systems, writing real-time digital signal processing (DSP) software and extensive testing of the system performance. In this role I studied, designed, and prototyped an OFDM communications system for application to wide-area cellular communications. This work led to several US Patents and IEEE publications.

11. Upon retirement from AT&T Labs in 2002, I founded a technology consulting company, Novidesic Communications, LLC. As part of this work, I have evaluated prototype MIMO appliques for Wi-Fi systems, have consulted with the US Government on signaling in cellular systems, and have consulted on intellectual property issues involving wireless, OFDM systems, and digital subscriber loop (DSL) systems, which use a technology called discrete multi-tone (DMT), a form of OFDM.

12. At Stevens Institute of Technology, I have taught undergraduate courses, including Electronic Circuits (EE359) dealing with analog and digital circuits. I was also responsible for the Capstone Senior Design Project in the Electrical and Computer Engineering Department. This project, a two-semester course required of all engineering seniors, requires the investigation, design, and prototyping of a complex electrical or computer system. Besides conducting the

course, I was also responsible for directly advising a significant fraction of the projects.

13. Among the Senior Design projects I have supervised, some have included student projects to investigate the use of OFDM and other wireless communications techniques.

14. I have taught graduate courses at Stevens (EE584 – Wireless System Security and CpE691 – Information Systems Security) which have heavy emphasis on the application of cryptography, including challenge-response systems and public-key cryptography. I also taught Physical Design of Wireless Systems (EE585) which deals with the detailed design of wireless systems such as cellular phones and other wireless communications equipment. I also have taught a graduate course, EE517, Digital and Computer Systems Architecture and undergraduate courses, CpE450, Architecture, Design and Implementation of Embedded Systems for Real-Time Applications and CpE-359 Switching Theory and Logical Design, involving microprocessor design and interfacing.

15. As part of the amateur radio hobby I have practiced since 1963, I have designed, implemented tested and operated various electronic devices involving analog, digital, RF and system control circuitry. I have also investigated the use of OFDM and other techniques used in modern commercial wireless systems for digital communications over amateur radio high-frequency (HF) dispersive channels.

III. UNDERSTANDING OF LEGAL STANDARDS

16. I am not a lawyer and am not offering any opinions regarding legal matters. However, I have been informed about legal standards of patent law, which I have used in developing my opinions expressed herein.

17. I understand that a patent may include two types of claims: independent claims and dependent claims. An independent claim stands alone and includes only the limitations it recites. A dependent claim can depend from an independent claim or another dependent claim and includes all the limitations that it recites in addition to all of the limitations recited in the claim or claims from which it depends.

A. Obviousness

18. I understand that a patent claim can be invalid under 35 U.S.C. § 103 if the claimed subject matter would have been "obvious" to a person of ordinary skill in the art as of the priority date of the patent based upon one or more prior art references. I understand that an obviousness analysis should consider each of the following so-called "*Graham* factors": (1) the scope and content of the prior art; (2) the differences between the claims and the prior art; (3) the level of ordinary skill in the pertinent art; and (4) secondary considerations, if any (such as unexpected results, commercial success, long felt but unsolved needs, failure of others, copying by others, licensing, and skepticism of experts).

19. I understand that a conclusion of obviousness may be based upon either a single prior art reference or a combination of prior art references, particularly if the combination of elements does no more than yield predictable results. However, I understand that merely demonstrating that each of the claim elements was, independently, known in the prior art does not prove that a patent composed of several claim elements is obvious.

20. Moreover, I understand that it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in a way the claimed new invention does.

21. I further understand that, to determine obviousness, courts look to the interrelated teachings of multiple patents or other prior art references, the effects of demands known to the design community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.

22. I also understand that, in determining whether a combination of prior art references renders a claim obvious, it may be helpful to consider whether there is some teaching, suggestion, or motivation to combine the references and a reasonable expectation of success in doing so. I understand, however, that the teaching, suggestion, or motivation to combine inquiry is not required and may not be relied upon in lieu of the obviousness analysis outlined above.

23. I understand that the following exemplary rationales may lead to a conclusion of obviousness: the combination of prior art elements according to known methods to yield predictable results; the substitution of one known element for another to obtain predictable results; and the use of known techniques to improve similar devices in the same way.

24. However, a claim is not obvious if the improvement is more than the predictable use of prior art elements according to their established functions. Similarly, a claim is not obvious if the application of a known technique is beyond the level of ordinary skill in the art.

25. Further, when the prior art teaches away from combining certain known elements, discovery of successful means of combining them is not obvious. I understand that similar subject matter may not be sufficient motivation for a person of skill in the art to combine references if the references have conflicting elements.

26. I understand that, in order to be used in an obviousness combination, a prior art reference must be "analogous." I understand that a prior art reference may be analogous if it is in the same field of endeavor as the other references with which it is combined, or if the reference is reasonably pertinent to solving the problems the inventors of the patent-at-issue sought to solve.

27. I understand that obviousness of a patent claim cannot properly be established through hindsight, and that elements from different prior art references,

or different embodiments of a single prior art reference, cannot be selected to create the claimed invention using the invention itself as a roadmap. I understand that the claimed invention as a whole must be compared to the prior art as a whole, and courts must avoid aggregating pieces of prior art through hindsight that would not have been combined absent the inventor's insight. I understand that prior art must be enabling.

28. I understand that obviousness is not established by simply combining previously known elements from the prior art. A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. An invention is unpatentable as obvious if the differences between the patented subject matter and the prior art would have been obvious at the time of invention to a person of ordinary skill in the art.

29. I understand that obviousness of a patent cannot properly be established by mere conclusory statements. Instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. When an expert opines that all the elements of a claim disparately exist in the prior art, the expert should provide the rationale to combine the disparate references. A reason for combining disparate prior art references is a critical component of an obviousness analysis. The obviousness analysis should be made explicit and needs to provide an articulated reasoning with some rational underpinning to identify the

reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.

30. I also understand that inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. This is another reason why merely pointing to the elements being known in the art in separate locations is not the end of the obviousness inquiry.

31. I understand that technical experts may testify to matters like the level of skill in the art at the time of the invention and what a skilled artisan might find obvious in light of the prior art without addressing objective indicia of non-obviousness. However, where an expert purports to testify not just to certain factual components underlying the obviousness inquiry, but to the ultimate question of obviousness, the expert must consider all factors relevant to that ultimate question, including all objective evidence of nonobviousness.

B. <u>Claim Construction</u>

32. I understand that the claim construction exercise begins with the language of the claims themselves, and that the general rule is that claim terms are given their plain and ordinary meaning to a person of ordinary skill in the art, in view of the specification of the patent, at the time of the invention. I also understand that

the intrinsic evidence (*i.e.*, the claims, the written description including the figures, and prosecution history) are the primary sources used in interpreting claim language.

33. I understand that if disputed claim language is clear on its face, the intrinsic evidence should be consulted to determine whether some deviation from the ordinary meaning of the claim language is warranted.

34. When the disputed claim language is not clear on its face, I understand that the intrinsic evidence should be used to resolve, if possible, any lack of clarity. I also understand that the specification is the best evidence of what the patentee intended the term to mean when there is no clear meaning of a claim term, and that the prosecution history may also shed light on the meaning of ambiguous terms. However, I understand that it is improper to import limitations from the specification into a patent claim through claim construction.

35. I have been informed that sometimes the ordinary meaning of claim language as understood by a person of ordinary skill in the art may be readily apparent even to lay persons. I understand that claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words.

C. <u>Public Accessibility</u>

36. I understand that for a printed publication to qualify as prior art, it must be publicly accessible.

37. I understand that a reference is considered publicly accessible if a person interested and ordinary skilled in the art, exercising reasonable diligence can locate it. I understand that whether a reference is publicly accessible depends on the specific facts of the case and is determined on a case-by-case basis.

38. I understand that when a reference is uploaded to a website, part of the inquiry on public accessibility can involve considering whether the reference is indexed or catalogued. I understand that whether a reference was indexed through search engines or could be found through search engines can also be part of the public accessibility inquiry.

D. <u>Inherency</u>

39. I understand that inherency requires inevitability. For example, to be inherent, a result must be inevitable from the operation disclosed. For a characteristic to be inherent, it must be inevitably present in the device. I understand that it is improper to establish inherency if it is only a possibility or a probability that a reference includes the alleged inherent feature. The fact that something may result from a given set of circumstances is not sufficient to establish inherency. Instead, an inherent feature must be necessarily present in the reference, not probably or possibly present in the reference.

40. I understand that inherency and obviousness are separate inquiries. I understand that what is inherent may not necessarily be known, and what is obvious cannot be predicated on what is unknown.

41. I understand that inherency is a question of fact.

42. I also understand that to turn to inherency, the reference must be silent as to the alleged inherent feature. If a reference discloses subject matter, principles of inherency cannot be used to ignore that explicit disclosure in favor of an alleged inherent disclosure that contradicts the explicit disclosure.

E. <u>Standard of Proof</u>

43. 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.

IV. METHODOLOGY AND MATERIALS CONSIDERED

44. I have relied upon my education, knowledge, and experience, as well as other materials discussed in this declaration in forming my opinions.

45. For this work, I have been asked to review the ’241 Patent including the specification and claims, the ’ 241 Patent’s prosecution history (file history). In developing my opinions related to the ’ 241 Patent, I have considered the materials cited herein, including those items itemized in the Exhibit Table below.

Exhibit[1]	Description
1001	Reserved
1002	Declaration of Chuck Creusere
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)
1007	Declaration of Nathaniel E Frank-White, records request processor at the Internet Archive
1008	US 2006/0258289 ("Dua")
1009	US 7,149,508 ("Herle")
1010	Nokia N93 User Guide ("N93")
1011	US 2006/0128332 ("van 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
1018	News article published on May 15, 2006, on www.mobiletracker.net
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")
1024	March 7, 2024, Infringement Contentions for the '590 Patent
1025	June 20, 2024, Maxell Claim Construction Brief
1026	July 10, 2024, Samsung Responsive Claim Construction Brief
1027	July 17, 2024, Maxell Reply Claim Construction Brief
1028	August 7, 2024, Maxell Markman Presentation
1029	August 8, 2024, Samsung Claim Construction Presentation
1030	August 12, 2024, Transcript of 8-7-24 Claim Construction Hearing
1031	Samsung-Maxell Tentative Constructions (2024-08-07)

[1] I understand that Petitioner has asked the Board to consider Exhibits 1032-1051 as supplemental information and that Maxell opposed inclusion of these exhibits. The Board has not yet ruled on the admissibility of such evidence.

1032	Archived Links
1033	Affidavit of Tanya Zeif
1034	Bhattarai Declaration
1035	Request for Affadavit
1036	September 25, 2024, Response from Justin Painter
1037	October 20, 2024, Possible Hacker E-mail in Response to Archives Request
1038	NPR Article about Hack
1039	October 22, 2024, Request Reminder
1040	November 6, 2024, Request Reminder
1041	November 19, 2024, Request Reminder
1042	December 13, 2024, Request Reminder
1043	December 23, 2024, Request Reminder (1)
1044	December 23, 2024, Request Reminder (2)
1045	December 23, 2024, Request to the Internet Archives for Affidavit
1046	December 27, 2024, Confirmation of Payment Email
1047	January 7, 2025, Correspondence
1048	January 7, 2025, Request Reminder
1049	January 10, 2025, Correspondence
1050	January 17, 2025, Request Reminder
1051	January 23, 2025, Correspondence
2001	1st Amended Docket Control Order from District Court Litigation
2002	Original Docket Control Order from District Court Litigation
2003	Maxell's Supplemental Preliminary Election of Asserted Claims
2004	Defendants' Preliminary Election of Prior Art
2005	U.S. Patent Publication No. US 2006/0203758 (Tee)
2006	U.S. Patent Publication No. US 2006/0135076 (Honkanen)
2007	Petitioners' invalidity contentions chart in District Court—Tee
2008	Petitioners' invalidity contentions chart in District Court—Honaken
2010	L2CAP-Based Prototype Media Streaming via Bluetooth Technology
2011	https://www.nytimes.com/2009/10/19/technology/companies/19nokia.html
2012	https://www.codeproject.com/Articles/9357/Symbian-OS-design-faults
2013	https://www.engadget.com/2010-10-21-nokia-refines-development-stategy-adopts-html5-in-qt-and-ends-s.html
2014	https://www.businessinsider.com/ios-5-over-the-air-updates-2011-7
2015	https://support.apple.com/en-us/102998
2016	Conference Transcript
2018	Claim Construction Order
2019	https://time.com/4837176/iphone-10th-anniversary/

2020	https://sites.suffolk.edu/jhtl/2014/09/30/nfc-technology-makes-first-appearance-in-apple-devices/
2021	https://www.nfcw.com/2010/12/07/35385/google-unveils-first-android-nfc-phone-but-nexus-s-is-limited-to-tag-reading-only-for-now/
2022	https://news.samsung.com/us/samsung-announces-launch-dates-for-groundbreaking-mobile-payment-service-samsung-pay/
2023	https://www.theregister.com/2008/08/13/iphone_not_very_3g/
2024	https://www.wsj.com/articles/SB118306134626851922
2025	https://blogs.windows.com/devices/2012/09/19/circuit-training-the-amazing-evolution-of-smartphone-processors/
2026	Essentials of Mobile Handset Design
2027	https://9to5mac.com/2012/06/02/new-iphone-to-debut-with-dual-band-40nm-bcm4334-broadcom-wifi-significant-power-savings-and-wifi-directios-airdrop/
2028	https://community.arubanetworks.com/browse/blogs/blogviewer?blogkey=5c9cb0f9-a77e-4f1f-95de-4aac6fa7b262
2029	SAM-MAX-00388464
2030	Creusere Deposition Transcript
2031	https://www.wired.com/2007/06/why-the-iphone-2/
2032	https://www.comms-express.com/infozone/article/802-11n/
2033	https://support.apple.com/en-us/102587
2034	https://www.ezurio.com/resources/blog/ota-over-the-air-updates-for-iot-devices
2035	https://www.theregister.com/2007/02/06/nokia_update_updated/
2036	Universal Mobile Telecommunications System

V. BACKGROUND OF THE TECHNOLOGY OF THE ’241 PATENT

A. <u>Background of the ’241 Patent</u>

46. The ’241 Patent has a priority date of November 28, 2007, issued on September 13, 2022 and is entitled, “Information Processing Apparatus and Information Processing Method.” The ’241 Patent is directed to multi circuit wireless communication and techniques to establish multiple wireless connections between a plurality of apparatuses and networks. EX1001 Abstract.

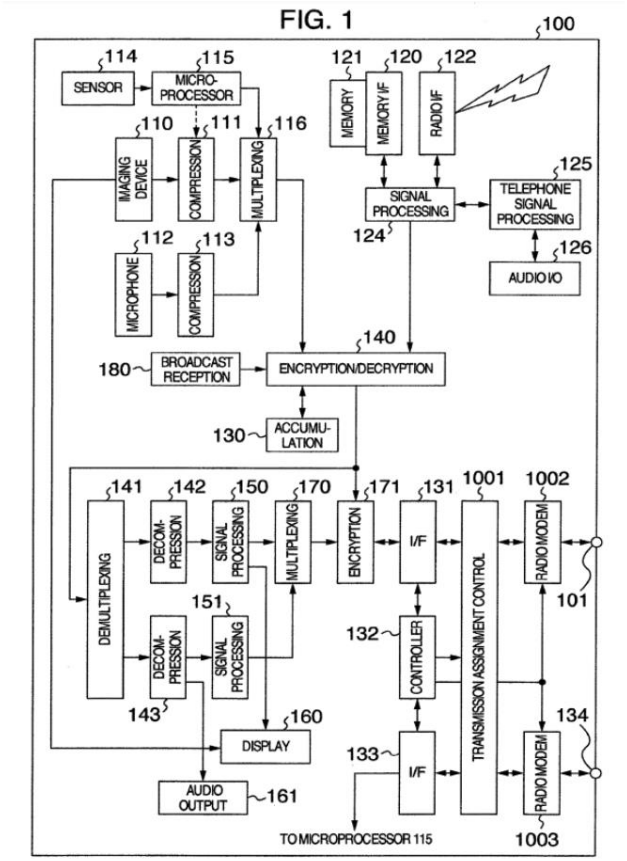
47. Specifically, the ’241 Patent discloses an embodiment where a display apparatus and/or video processing apparatus with a first radio communication unit that can communicate video information with an external video processing apparatus, a second radio communication unit that can connect by radio to the internet or a home network, and a controller, which together allow the display apparatus and/or video processing apparatus to display of high quality videos while also communicating with a network. EX1001 7:48-67.

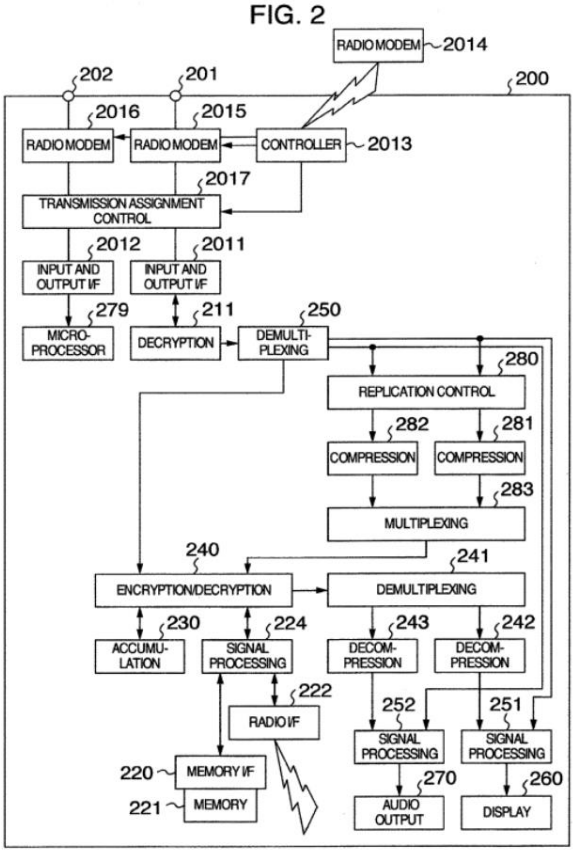
48. Prior to the inventions disclosed in the ’241 Patent, conventional display devices connected video processing apparatuses by establishing analog connections to transmit video and audio signals. EX1001 1:19-34. For example, they would use HDMI. As digital devices, such as a camera and cellular phone” became more common and sizes of circuitry became more compact, the inventors realized that there was a need for display devices to include multiple circuits to perform multiple functions. EX1001 1:41-67.

49. In view of these advances, the inventors came up with a solution to “provide a technique wherein while presenting on a display apparatus videos of high picture quality obtained from portable video processing apparatuses such as a camera and a cellular phone, it is possible to communicate with the internet and/or a home network.” EX1001 1:47-52. The inventors recognized that a solution to this problem would be to create and configure devices with “a first radio communication

unit capable of transmitting video information by radio to an external display apparatus" and "a second radio communication unit capable of connecting by radio to a network," along with other requisite components for providing the functionality that they described. EX1001 at 2:1-9. Part of the solution included, for example, providing a controller for "controlling assignment of connection by radio transmission for each of the first and second radio communication" circuits. EX1001 1:53-66.

50. Figures 1 and 2 of the '241 Patent disclose exemplary video processing apparatuses and display apparatuses (*e.g.*, cellular phones) that embody the invention of the '241 Patent:



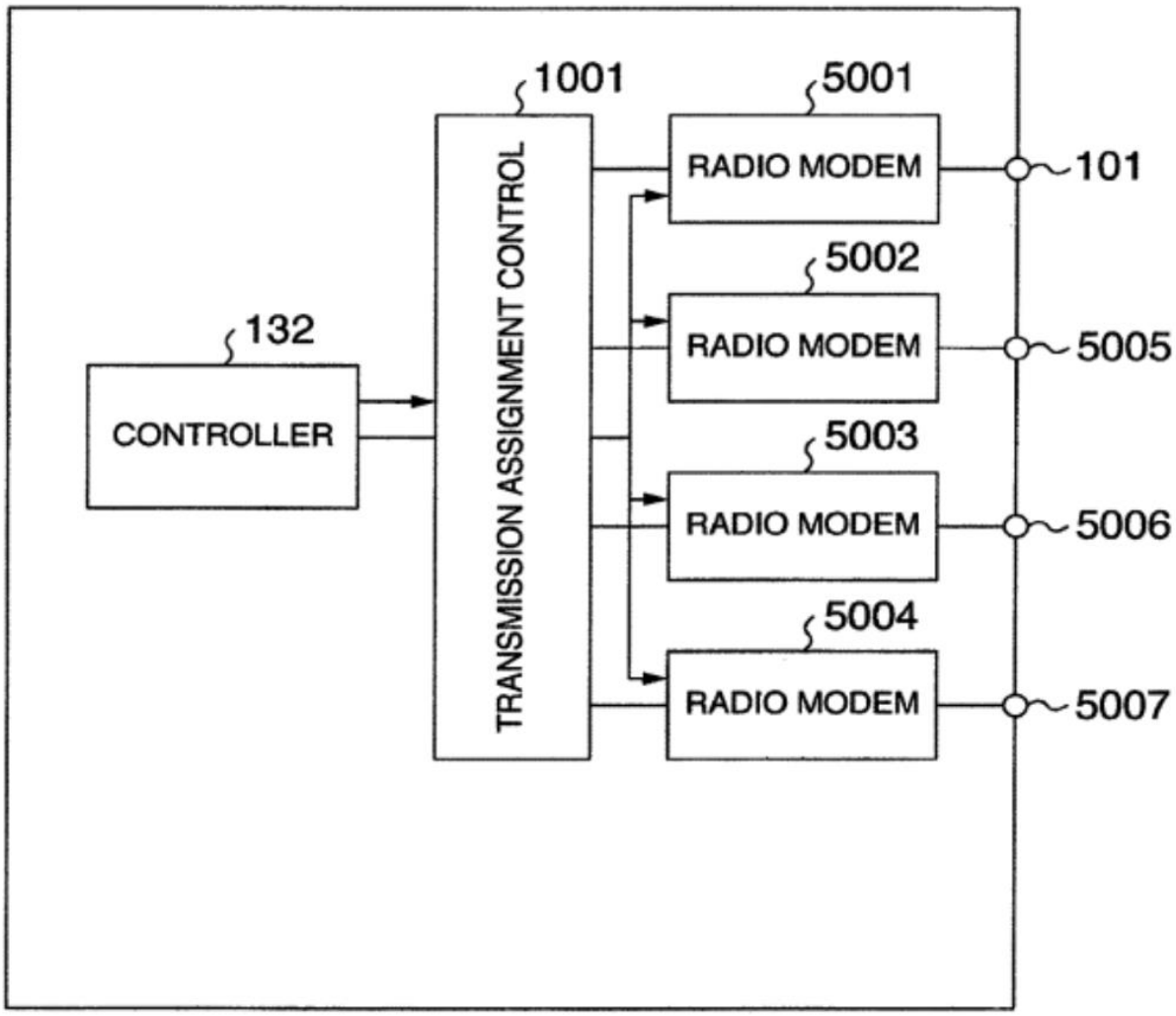


EX1001 Figs. 1 and 2.

51. Further, "[t]he frequency bands used for the transmission between the terminals 134 [in apparatus 100] and 202 [in apparatus 200] are limited to predetermined frequency bands. This increases the radio wave resource efficiency and prevents the problem of interference with other apparatuses." EX1001 3:38-42.

52. Figure 4 of the '241 Patent also discloses that such apparatuses (e.g., cellular phones) can include up to four radio communication circuits (radio modems 5001-5004) and a controller 132 that can "variably control the radio transmission assignment" to communication devices. EX1001 8:35-38. This facilitates communications "in a situation wherein the user issues an indication to transmit video information by radio via the modem 1002 to the display apparatus 200 while acquiring information from the Internet according to scheme 1." EX1001 8:38-43. For example, as show in Figure 4 below, the controller assigns connections to four different radio modems that have specific characteristics such as different transmission frequency bands and modulation schemes enabling multiple communications to occur without interference:

FIG. 4



EX1001 Fig. 4.

53. Moreover, as shown below in Figure 9, the ’241 Patent discloses different communication schemes for the video information transmission and connection to the internet:

FIG. 9

SCHEME	SCHEME 1	SCHEME 2
BANDWIDTH	6MHz	6MHz
CARRIER MODULATION SCHEME	64QAM	QPSK
CONVOLUTION CODE	3/4	2/3
GUARD INTERVAL	1/8	1/8
TRANSMISSION CAPACITY	17Mbps	5Mbps

EX1001 Fig. 9.

54. Hence, the ’241 Patent discloses a novel display apparatus and/or video processing apparatus which includes multiple radio communication circuits, where one of the circuits can be controlled to transfer video to another apparatus while a second circuit can be used to connect to the internet or home network.

55. The specifications of the’241 Patent disclose both the transmitting and receiving terminals. The ’241 Patent claims are directed to the transmitting terminal (*e.g.*, the ’241 Patent, claim 1 “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”).

56. The specification provides specific implementation details with respect to each claimed feature. For example, the specification of the ’241 Patent describes how the controller functions in response to an indication from the user:

> The controller 132 and the transmission rate assignment controller 1001 may variably control the radio transmission assignment to the modems 1002 and 1003 in response to an indication from the user. For example, in a situation wherein the user issues an indication to transmit video information by radio via the modem 1002 to the display apparatus 200 while acquiring information from the Internet according to scheme 1 of FIG. 9 by use of the modem 1003, the controller 132 outputs a control signal to the assignment controller 1001 such that the transmission scheme of the modem 1003 is changed from scheme 1 to scheme 2 of FIG. 9 and that of the modem 1002 is set to scheme 1 of FIG. 9 conduct communications. The transmission rate of the modem 1002 may be variably changed according to fineness or precision of the video information sent from the modem 1002 to the display apparatus 200. For example, if the fineness of the video information is altered from SD (640×480) to HD (1980×1080), the controller 132 instructs the assignment controller 1001 to heighten the transmission rate of the modem circuit 1002. It is preferable in the operation that the transmission rate of the modem 1003 is lowered in association with the variable control of the transmission rate of the modem 1002.

EX1001 8:35-57.

57. The specification of the ’241 Patent further discloses details on carrying out transmission of video information via a first radio communication circuit while simultaneously connecting to the Internet via second radio communication circuit. EX1001 2:32-37. This includes the controller controlling a transmission rate assignment control circuit and giving preference to particular circuits:

> The controller 132 controls the transmission rate assignment control circuit 1001 on the basis of time control information of the video signal to variably control the transmission rate of the radio modem circuit 1002. At the same time, the controller 132 variably controls the transmission rate of the radio modem circuit 1003 for radio communication with a network such as the Internet. According to the embodiment, in the assignment of the transmission rate to the demodulation circuits 1001 and 1002, the controller 132 gives preference to the demodulation circuit 1001. In other words, the transmission rate of the demodulation circuit 1001 is more than that of the modem circuit 1002. Hence, within the limited range of bands for the radio transmission, the modem 1002 can transmit video information without deteriorating the video quality of the video information having high picture quality.

EX1001 6:58-7:6.

B. <u>Level of Ordinary Skill in the Art</u>

58. I understand that claim construction and definiteness are examined through the eyes of a person of ordinary skill in the art (POSITA). I am informed

that the factors to be considered in determining the level of ordinary skill in the art are: (1) the education level of active workers in the field, (2) the type of problems encountered in the art, (3) prior art solutions to those problems, (4) the speed with which innovations are made; and (5) the sophistication of the technology in the art.

59. I have also been asked to assume that the relevant time period for determining the level of skill in the art for the ’241 Patent is its earliest claimed priority date, November 28, 2007.

60. In my opinion, at the time of the ’241 Patent, a POSITA would have a Bachelor of Science degree in Electrical Engineering, Computer Engineering, Computer Networking, or a related technical field, with at least one year of experience working in the field of wireless communications. More education (e.g., a Master’s degree) or work experience may compensate for a deficit in one of the relevant qualifications stated above.

61. As a result of my education and experience, I was at least a POSITA at the time of the invention of the ’241 Patent, and am still a person of at least ordinary skill in the art and have applied the perspective of a POSITA in my analysis. Before the priority dates of the subject patents, I recruited and supervised employees with the skill level and experience of a POSITA and taught students with this skill and experience level, as well.

C. Claims of the ’241 Patent At Issue

62. I understand that the following claims of the ’241 Patent are at issue:

’241 Patent Claim Element Number	Claim Text
[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

’241 Patent Claim Element Number	Claim Text
	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 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.
Claim 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.
Claim 6	The video processing apparatus of claim 1, wherein the third transmission frequency band is different from the first and second transmission frequency bands.
Claim 8	The video processing apparatus of claim 1, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.

’241 Patent Claim Element Number	Claim Text
Claim 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.
Claim 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.
Claim 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.
Claim 12	The video processing apparatus of claim 1, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).
Claim 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.
Claim 14	The video processing apparatus of claim 1, wherein the video processing apparatus comprises a cellular phone.
Claim 15	The video processing apparatus of claim 1, wherein the second and third radio communication circuits conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM).

’241 Patent Claim Element Number	Claim Text
Claim 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,

’241 Patent Claim Element Number	Claim Text
[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.
Claim 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.
Claim 19	The method of claim 17, wherein transmitting of the information by the third radio communication circuit comprises connecting to the internet.
Claim 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.
Claim 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.
Claim 22	The method of claim 17, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM).
Claim 23	The method of claim 17, further comprising controlling the second radio communication circuit to change modulation

’241 Patent Claim Element Number	Claim Text
	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 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]	[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

’241 Patent Claim Element Number	Claim Text
	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
[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.
Claim 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.

’241 Patent Claim Element Number	Claim Text
Claim 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).

VI. CLAIM CONSTRUCTION FOR THE ’241 PATENT

63. For any terms not specifically construed, I have applied the ordinary and customary meaning that these terms would have had to a person of ordinary skill in the art at the time of the invention (around late November 2007) in view of the patent’s specification. In order words, I have interpreted the remaining terms in accordance with the “plain and ordinary” meaning.

A. “circuit”

64. Petitioner states that “‘Circuit’ should be interpreted broadly as any circuitry.” Pet. 3. For the purposes of these proceedings, I agree that the Board does not need to construe the outer bounds of this term as part of these proceedings.

B. “video”

65. Petitioner states that “‘video’ should be interpreted broadly as any circuitry.” Pet. 4. For the purposes of these proceedings, I agree that the Board does not need to construe the outer bounds of this term as part of these proceedings.

C. “wherein . . . when an indication from [the/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"

66. I understand that Petitioners alleges that "The prior art discloses each of PO's interpretations, making construction unnecessary." Pet. 4-5. First, I disagree with Petitioner's characterization that PO asserted conflicting constructions during reexamination and Litigation. Next, since the filing of the Petition, the District Court found that this term should be given its "plain and ordinary meaning" and stated that the "language plainly requires the user to indicate two things: (1) to transmit video information, and (2) to use the first radio communication circuit in making that transmission." EX2018 at 23. Accordingly, for consistency with the concurrent litigation, I submit that this term should be given its plain and ordinary meaning.

VII. SUMMARY OF PETITIONERS' PROPOSED GROUNDS

1. The Petition raises five grounds of alleged obviousness based on the following eight references. U.S. Patent Publication No. 2006/0258289 ("Dua") (EX1008), U.S. Patent No. 7,149,508 ("Herle") (EX1009), Nokia N93 User Guide ("N93") (EX1010), U.S. Patent Publication No. 2006/0128332 ("van Rooyen") (EX1011), U.S. Patent Publication No. 2006/0274704 ("Desai") (EX1012), Bluetooth 2.0 + EDR Specification ("BT-Spec") (EX1014), 3GPP TS 36.211 Technical Specification Group Radio Access Network; Physical Channels and Modulation ("3GPP-Spec") (EX1015), and U.S. Patent Publication No. 2004/0264600 ("Kao") (EX1013). Pet. 1

Ground	’241 Patent Claim(s)	Type of Challenge	Primary Reference	Secondary Reference(s)
1	1, 4-5, 8-12, 14-25	§ 103	N93	(1) Dua (2) Herle
2	1, 4-5, 8-12, 14-25	§ 103	N93	(1) Dua (2) Herle (3) van Rooyen (4) Desai (5) BT-Spec (6) 3GPP-Spec (7) Kao
3	1, 4-5, 8-12, 14-25	§ 103	Dua	(1) Herle
4	1, 4-5, 8-12, 14-25	§ 103	Dua	(1) Herle (2) N93
5	1, 4-5, 8-12, 14-25	§ 103	Dua	(1) Herle (2) N93 (3) van Rooyen (4) Desai (5) BT-Spec (6) 3GPP-Spec (7) Kao

67. My opinions in this declaration are focused on the motivation to combine the references as well as what a POSITA would understand at the time with respect to those proposed combinations. My opinions are also focused on capabilities of Bluetooth at the relevant time. As such, I have not considered other issues for purposes of this declaration.

A. Dua

68. Dua, titled "Wireless Media System and Player and Method of Operation" was published November 16, 2006, based on a filing date of May 12, 2005. Dua discloses "A wireless media player and a related system and methodology are disclosed. One aspect of the wireless media player system pertains to a virtual connector system, apparatus, and method for the automatic establishment of wireless connectivity with other electronic devices. In one embodiment, the media player device employs the use of integrated Radio Frequency Identification ("RFID") technology to exchange communication settings, media capability, and other parameters with an external device that also has integrated RFID technology. EX1008 Abstract.

B. Herle

69. Herle, titled "System and Method for Delta-Based Over-the-Air Software Upgrades for a Wireless Mobile Station," was filed on February 5, 2003, and issued December 12, 2006. Herle discloses a mobile station capable of being upgraded based on receiving a delta file from a software upgrade server via a wireless network. The mobile station comprises: 1) a memory for storing an original image file and the delta file, wherein the delta file is suitable for upgrading the original image file; and 2) a controller for modifying the original image file

according to instructions stored in the delta file to thereby generate an upgraded image file. EX1009 Abstract.

C. <u>N93</u>

70. N93, titled "Nokia N93 User Guide," is a user guide for the Nokia N93 phone. N93 discloses various specifications and capabilities of the Nokia N93 phone, such as compliance with the Bluetooth Specification 2.0 and support of IEEE 802.11b/g standard features.

D. <u>Van Rooyen</u>

71. Van Rooyen, titled "Method and System for a Mobile Receiver Architecture for European Band Cellular and Broadcasting," was filed on December 13, 2004, and published on June 15, 2006. Van Rooyen is a preliminary working document that discusses a method and system for a mobile receiver architecture for European (EU) Band cellular and broadcasting in video processing systems. EX1011 Abstract.

E. <u>Desai</u>

72. Desai, titled "Method and Apparatus for Collaborative Coexistence Between Bluetooth and IEEE 802.11 G with Both Technologies Integrated onto a System-on-a-Chip (SOC) Device," was filed on March 23, 2006, and published on December 7, 2006. Desai discloses a method and apparatus for collaborative coexistence between Bluetooth and IEEE 802.11g with both technologies integrated onto a system-on-a-chip (SOC) device. EX1012 ¶ [0004].

F. BT-Spec

73. BT-Spec, titled The Specification of the Bluetooth System, covers the Bluetooth Specification for core package version 2.0 + EDR. EX1014 at 1.

G. 3GPP-Spec

74. 3GPP-Spec, titled 3GPP TS 36.211 v0.2.1 Generation Partnership Project; Technical Specification Group Radio Access Network; Physical Channels and Modulation, is a working document produced by the 3rd Generation Partnership Project and that has "not be subject to any approval process by the 3GPP Organizational Partners and shall not be implemented." EX1015 at 1, 5.

H. Kao

75. Kao, titled "Radio Receiver Supporting Multiple Modulation Formats with a Single Pair of ADCs," was filed on June 29, 2004, claims priority to Provisional Application No. 60/483,115, filed on June 30, 2003, and was published on December 7, 2006. Kao discusses a radio receiver that is capable of supporting multiple modulation formats with a single pair of analog to digital converters. EX1013 ¶ [0003].

VIII. PUBLIC ACCESSIBILITY OF REFERENCES

A. General

76. Petitioners and Dr. Creusere claim that the references were publicly available at least as of the date when they were "archived." EX1002 ¶¶50-58; Pet. 5-7. Petitioners and Dr. Creusere rely on an affidavit ("Wayback Affidavit") that

states that these references were purportedly archived using the Wayback Machine. But there is no evidence that the Wayback Machine was searchable by web address or URL and there is no evidence that a POSITA would know of the references' specific URLs (*e.g.*, http://nds1.nokia.com/phones/files/guides/Nokia_N93-1_UG_en.pdf). EX1007 ¶¶ 3, 7. There is also no evidence that the webpages were indexed through search engines or otherwise locatable by a search engine.

77. Instead, there is only speculation that the URLs associated with N93, BT-Spec, and 3GPP-Spec may have been momentarily available on a specific date at a specific time. There is no evidence that the URL was available for more than a moment in time to be able to be searched and located by a POSITA. The Wayback Affidavit explicitly states that each file is "preserved as it existed at a particular point in time" but not how long the files were available for. EX1007 ¶ 4.

B. N93

78. Additionally, the Bhattarai declaration notes that there was a link to the "Online copy of the N93 Manual (PDF)" on the Wikipedia website. EX1034. One of the key aspects of Wikipedia is that it allows anyone with internet access to create and edit articles. As an open-edit platform, Wikipedia allows users to create, edit, or delete articles at any time. Consequently, information may appear temporarily before being modified or removed by other editors. The dynamic nature of the site ensures that Wikipedia remains current, but it also means that some content may only be

accessible for a brief period. Therefore, there is no evidence provided that this link was up for a more than a moment of time for a POSITA to be able to locate the reference. Nor is there any evidence that it was publicly accessible prior to the critical date.

79. Also, there is no evidence showing which link was attached to the text "Online copy of the N93 Manual (PDF)" on the Wikipedia website." EX1032 at 5. While it is purported that the Wikipedia page linked to the URL http://nds1.nokia.com/phones/files/guides/Nokia_N93-1_UG_en.pdf (the "alleged N93 webpage"), there is no evidence of this through the submitted exhibits. In addition, an archived version of the alleged N93 webpage is submitted, but it was archived during a different time (April 23, 2007) than when the Wikipedia webpage was archived (October 15, 2007). Therefore, there is no evidence that the link available on the Wikipedia webpage led to the alleged N93 webpage as it is presented, because the dynamic nature of webpages means that the alleged N93 webpage could have changed content or been inoperable.

80. In another example of the dynamic nature of webpages, there is no evidence provided that the link actually led to the specific version of the Nokia N93 User Manual that is submitted as EX1010. There were multiple different versions of the user manual as shown by the submitted exhibits. EX1032 at 867, 999. For example, N93 reads "Issue 2," and a second version of the user guide provided by

Petitioners reads "Issue 1." A third version of the user guide provided by Petitioners reads "Issue 1," but is clearly different from the second version that also reads "Issue 1" and also includes a Spanish language portion. EX1032 at 867, 999, 1125. A comparison of these different manual reveals obvious differences: the second version of the user guide has text in green (EX1032 at 785) whereas N93 does not (EX1010), and there are a different number of pages in each version of the manual: N93 includes 131 pages, the second version includes 130 pages, and the third version includes 272 pages. EX1010 at 131; EX1032 at 996, 1270.

C. <u>3GPP-Spec</u>

81. Petitioners and Dr. Creusere also rely on a working document supposedly produced by the 3rd Generation Partnership Project. EX1015 at 1, 5. It is my opinion that this working document was **not** publicly accessible to a POSITA at the time of the invention.

82. First of all, I note that the document version is 0.2.1. The fact that it is a version 0 document means that (according to the Foreword on page 5 of the document) it has not even been presented to the Technical Specification Group ("TSG") for information (that would be a version 1.x.x), let alone approval (2.x.x) or is under change control (3.x.x or greater). EX1015 at 5. The document is very preliminary. The bottom of the cover page says "The present document has not been subject to any approval process by the 3GPP Organization Partners and **shall not be**

implemented. This Specification is for future development work within the 3GPP only. The Organization Partners accept no liability for any use of this Specification." EX1015 at 1.

83. Since this was a preliminary document at the time, a POSITA would need to know by other means that it existed to go looking for it. I saw no evidence that a POSITA would know of this document. Unless I was already familiar that this document existed and was looking specifically for the document, I probably would not be able to locate where it exactly was. Indeed, the evidence suggests that, if it was accessible at all, only those that created the document would know how to find it.

84. Typically, those working on such documents were senior researchers, fully engaged in developments in 3GPP and other standards. However, a POSITA based on the definition set forth by Dr. Creusere, would not have the inclination or skill to do the digging to find such a document. A POSITA in our case is an individual with a Bachelor of Science degree in Electrical Engineering, Computer Engineering, Computer Networking, or a related technical field, with at least one year of experience working in the field of wireless communications.

85. Without knowing of the document already, POSITA would not be able locate the 3GPP-Spec on the 3GPP FTP server. There is a zip file under the name of "36211-021.zip" which is not descriptive in a way that an interested party could find

it. The 3GPP-Spec is located in a zip file that is neither catalogued nor indexed. Thus, without knowing of the document already, the document lacks any other identifiers that would allow a POSITA to locate the document.

86. Additionally, I did not see evidence that the document was ever discussed or exhibited at a 3GPP meeting or anywhere else. Even if it was, I find it highly unlikely that a POSITA would turn to a very preliminary working document.

IX. GROUND 1: N93 IN VIEW OF DUA AND HERLE

A. No Motivation to Combine N93 and Dua and No Reasonable Expectation of Success in Doing So

1. State of Mobile Devices During Time of Invention

87. The capabilities of mobile devices during the time of the invention were very limited compared to today. Contemporary mobile devices are known as multi-function devices that have become ubiquitous in everyday life—work, entertainment, shopping, banking, socializing, etc. It is well-known that *today's* mobile devices are capable of capturing high quality photos and video, high-speed data transfer, seamless internet connectivity, video streaming, operating system updates, and fast video transfer capabilities. But mobile devices during the time of the invention did not have those same capabilities. EX2019 at 1.

88. Mobile devices during the time of the invention were known to be limited, resource-constrained devices. EX2019 at 1. Because the use of mobile devices today as indispensable for so many functions (connecting to the internet,

capturing video, transferring video information, etc.) is so normalized, the risk of hindsight bias is very high. Therefore, I discuss certain aspects of mobile devices during the time of the invention that would make it non-obvious to combine many of the claimed aspects of the invention in the way suggested by Petitioners and Dr. Creusere.

89. At a basic level, the claims describe a device with at least three (or four) radio communication circuits (*e.g.*, [1a]-[1c]), an imaging circuit capable of receiving video information via an optical system (*e.g.*, [1d]), a compression circuit (*e.g.*, [1e]), an input device (*e.g.*, [1f]), an accumulation circuit (*e.g.*, [1g]) a controller controlling assignment of connection of each of the first, second, and third radio communication circuits (*e.g.*, [1h]), ability to transmit video information to an external device by radio via the first radio communication circuit (*e.g.*, [1i]), an ability of the controller to control each of the first and second radio communication circuit in response to receiving an indication from the user (*e.g.*, [1j]), an ability of the controller to control 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 simultaneously (*e.g.*, [1k]), and an ability to update an operating system of the device.

90. These include many advanced capabilities that would have been non-obvious and beyond skill of a person of ordinary skill in the art to combine into one device. For example, the first iPhone, launched in June 2007, is considered by many to be a revolutionary device that fundamentally changed the operation of mobile devices into the multi-functional devices we know today. EX2019 at 1. However, the first iPhone lacked video recording capability, 3G capability, and over-the-air operating system update capability even though these technologies were known at the time on other devices. It was not until 2014, that Apple first added four radio communication circuits in their iPhone. EX2020 at 1. Similarly, it was not until 2010 that the first Android NFC phone was released. EX2021 at 1. Further, it was not until the launch of Galaxy S6 Edge+/Galaxy Note 5 on or around August 13, 2015—which included Samsung Pay and NFC with Bluetooth File Share, updates, etc.—that Samsung appeared to have first used the inventions of the ’241 Patent in its products, which is about 8 years after the priority date of the ’241 Patent. EX2022 at 1-5.

91. In view of the above facts, it is my opinion that the inventors of the ’241 Patent were well ahead of their time. They disclosed embodying inventions in cellular phones with numerous radio communication circuits, capability to capture videos, capability to share videos while accessing the Internet, capability to update operating system and applications, and numerous additional circuitry. Thus, the ’241

Patent discloses a novel display apparatus and/or video processing apparatus (*e.g.*, cellular phone) with multiple functionalities and circuitries working together to provide users with numerous smartphone functionalities that users are used to today but that were not found in the leading smartphones of that time.

92. Additionally, the primary purpose of a mobile device during the time of the invention was to provide calling and texting capabilities. EX2023 (Times Article). During the time of the invention, the mobile device was not the multi-functional device it is today. Instead, people primarily relied on separate devices for different functionalities, because it was difficult to combine multiple advanced features onto one device. The iPhone was one of the first devices that changed the way people thought about mobile devices. EX2019 at 1-2. For example, Steve Jobs introduced the iPhone as "An iPod, a phone, and an Internet communicator…There are not three separate devices. This is one device." EX2019 at 2.

93. Therefore, cellular capabilities were emphasized during the time, while other features were auxiliary. Implementing additional features onto mobile devices was difficult during the time of the invention. The claimed features, including transmitting video information, video recording capabilities, operating system update capabilities, ability to support multiple radio communication circuits, etc. were not the primary purpose of a mobile device. It was non-obvious to combine all the features onto one device because of technological limitations at the time. For

example, the iPhone itself made several tradeoffs in order to support its advanced functionality—it lacked video recording capabilities, 3G capabilities, and operating system update capabilities. Even when the 3G iPhone was launched in 2008, quality was such lackluster and "well below the level required by the WCDMA standard." EX2023 at 1. This indicates the complexities in integrating advanced features into a mobile device around the time of the invention. This also indicates the complexity in designing mobile devices to adhere to certain standards. Even though WCDMA standard had been established prior to the launch of the 3G iPhone, actually designing and building a cellular radio to operate as described by certain standards was difficult, particularly in view of integrating the cellular radio with other advanced features.

94. Mobile processors in 2007 were relatively slow (often single-core ARM11 chips around 300-400MHz) and had limited ability to multi-task. This constrained how many high-bandwidth features could run simultaneously. With only a few hundred MHz of processing power, running several wireless stacks and applications was very difficult. A mobile device's central processing unit (CPU) had to manage an operating system and the user interface. Running multiple apps or using multiple radio communication circuits simultaneously could quickly max out a CPU on a mobile device.

95. Next, power consumption was a critical concern in 2007 smartphones, as batteries often had limited capacity and the radios and processors consumed a lot of power comparatively. Combining multiple radio communication circuits, video capturing and processing capabilities, would impose difficult power requirements onto a device. For example, UMTS radio communication circuits drew significant power. Steve Jobs notes that 3G would have exacted too high a battery penalty at the time and that existing technology was not yet "mature" and stuck to 2G only for the original iPhone. EX2024 at 1, 6.

96. Memory was another limiting factor. Mobile devices in 2007 were constrained in RAM and internal storage which affected their ability to run multiple communication stacks and handle media data. Multiple processes (including background processes) are needed to run to support mobile device systems. If one application was open, it would be difficult to support another application (lessening ability to support "simultaneous" functionality).

97. Additionally, putting multiple radio communication circuits into one small device introduced significant interference and coexistence issues. Many of these technologies operated on nearby frequency bands, so without careful design, they could disrupt each other's signals. For example, Bluetooth and W-Fi could cause interference. Even when engineers employed techniques like frequency hopping and collision avoidance, the practical effect was apparent and made

simultaneous operations difficult. Manufactures had to add filters and complex scheduling algorithms to minimize collisions.

98. Further, in devices that included both GSM and UMTS, the device had further challenges and needed to prevent its own transmitters and receivers from interfering internally. Careful RF design was required, including separate antennas or antenna multiplexing, shielding, and good radio-frequency isolation to allow multiple radio communication circuits to occur simultaneously without one dropping.

99. To integrate multiple features on one device, such as GSM, UMTS, Bluetooth, and Wi-Fi, a mobile device would have to run several networking processes at once, e.g., a GSM/UMTS cellular stack (often running on a modem with its own real-time OS), a Bluetooth stack, and a Wi-Fi network stack—in addition to the main operating system. Depending on the feature set, mobile devices of this era would run two operating systems depending on the complexity of the device---a first operating system for the user applications, and a secondary real-time OS on the baseband chip that handled cellular radio functions.

100. Managing interoperability often meant firmware tuning for each combination of features. Devices with multiple radio communication technologies and advanced features (e.g., video taking and processing) often were unstable and there were many issues updating them. Software had to prioritize and manage radios.

Each protocol had its own firmware and APIs so combining them could lead to bugs and unexpected interactions.

101. Managing a device that operates at various frequencies, particularly simultaneously, makes meeting FCC Part 15 requirements challenging. It would not be obvious to a POSITA to just throw together various devices to provide the combined functions of multiple transceivers in one device and they would recognize that testing and experimentation would be required to meet the FCC tests.

102. It was not until 2008 that Qualcomm deliver the first System on a Chip (SoC) processor for mobile devices. EX2025 at 3. Because mobile devices are compact devices "most of the space is taken up by the battery, and the notion of spreading functionality between different chips would cause severe space constraints and bring battery life to its knees." EX2025 at 4.

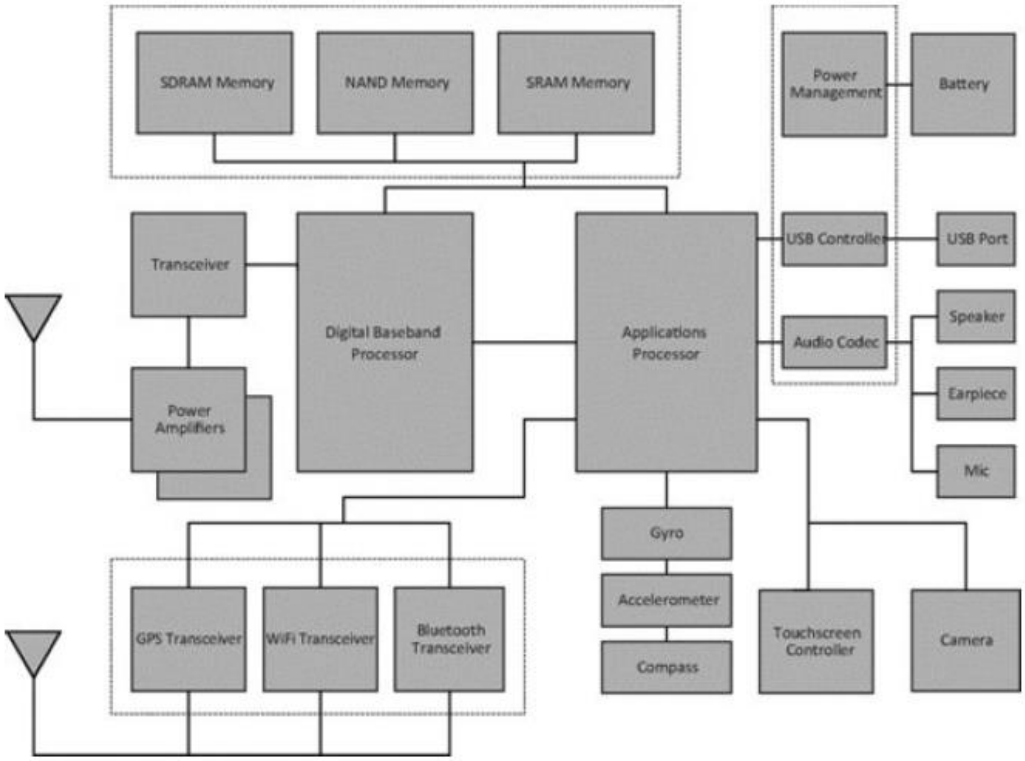
2. Use of a CPU Versus a Modem to Control Cellular Functions

103. Petitioners' and Dr. Creusere's rationale depends on the existence of using an operating system connected to a "CPU" that controls operation of Bluetooth, UMTS, and Wi-Fi/GSM. I disagree, because devices like the N93 during the time of the invention typically included two separate operating systems and separated processing related to cellular communications onto a modem. Petitioners and Dr. Creusere provide no evidence that that the device disclosed in N93 included processing that did not separate processing related to UMTS and GSM capabilities

from other processes onto a modem. In my opinion there is no clarity on whether the processing related to connecting to UMTS and GSM networks was separate from an application processor or CPU that ran the Symbian OS.

104. A sample hardware block diagram of a mobile handset is portrayed below.

Figure 3.2. Hardware block diagram of a mobile handset.



EX2026 at 95. As shown by the diagram, the application processor was linked to a Wi-Fi transceiver and Bluetooth transceiver, while the cellular transceiver ("transceiver" in the diagram) was controlled by a modem ("digital baseband processor" in the diagram).

105. “The digital baseband chipset is responsible for processing all of the communication with the cellular network, based on data signals sent to and received from the air interface via the radio chipset.” EX2026 at 96.

106. Petitioners, Dr. Creusere, and the cited references all fail to account for separate processing and fail to provide any explanation for how the CPU of Dua controls connection to GSM or UMTS networks via the network transceiver. N93 fails to disclose implementation details (as admitted by Petitioners and Dr. Creusere), and Dua simply does not include pertinent disclosures relevant to the modem of the N93 that would control assignment of the GSM and UMTS circuits. Dua fails to disclose any information about connecting to GSM versus UMTS networks in its block diagram, and cannot disclose or render obvious the CPU controlling assignment of the GSM and UMTS, particularly in light of a POSITA’s understanding of technology at the time of the invention.

107. The core functions of a cellular modem at the time of the invention included: providing precise timing framework to ensure data transmitted and received is acted upon at the correct point in time; providing an information flow framework to ensure different functional blocks could communicate correctly with each other; and providing a control framework that ensures processing modules can properly communicate with other subsystems (*e.g.*, radio and power management).

The modem included hardware and software implementations that is ***specific*** to the wireless standard that is supported.

108. Cellular communications were limited during the time of the invention.

> [T]he term "3G" was used to create perception in the mind of the consumer that they would be able to browse the Internet from their mobile phone using a high-speed data connection, much as they would from their desktop PC. Although this was technically possible, the user experience was pretty poor, and much work was still required to understand how to deliver Internet-based services and content to a mobile successfully.

EX2026 at 32.

3. Introduction to N93 and Dua

109. It is my opinion that modifying N93 to include specific features of Dua or Herle would negate the original intent of N93, as such there would be no motivation to modify N93 with Dua or Herle's teachings.

110. N93 discloses a product manual for an advanced consumer phone that was carefully and purposely designed to include specific features, including specific form factor to mimic the form of a digital camcorder. EX1010 at 11-13; EX1018 at 1 ("[T]he N93 is a very advanced handset that Nokia is marketing more as a mobile computer than cell phone."). The Nokia N93 phone went through rigorous testing to meet consumer guidelines and was carefully designed to include specific features while excluding other features that were undesirable for the product. EX1018 at 1

(announcing Nokia N93 has been approved by the FCC); EX1017 at 1 (stating that the Nokia N93 meets requirements for SAR compliance). To this end, N93 discloses various warnings against any type of modification of the phone. For example, N93 includes statements such as:

- Use only batteries, chargers, and **enhancements** approved by Nokia for use with this particular model. The use of any other types may invalidate any approval or warranty, and may be **dangerous**." EX1010 at 9.

- "Use only approved **enhancements** and batteries. Do not connect incompatible products." EX1010 at 7.

- "Use only the supplied or an approved replacement antenna. **Unauthorized** antennas, **modifications**, or attachments could **damage the device** and may violate regulations governing radio services." EX1010 at 125.

111. On the other hand, Dua is directed to providing an "**automated methodology** by which two or more devices can establish wireless communication and make each other aware of device capabilities, available media types, communication protocols and other information specific to the devices." EX1008 ¶ [0012]. Dua states that as media devices gained more and more capability, there was a need to automatically establish a **secure** wireless connection to replace the insecure and time consuming user configuration methods. EX1008 ¶ [0010]. To solve this problem, Dua discusses integrating a media player with radio frequency

identification technology ("RFID"), that would allow initiation of this "automatic" information exchange between devices. EX1008 ¶¶ [0010], [0012].

112. Dua also notes that the invention helped address growing capabilities of media devices capable of storing and processing of large amounts of media content. EX1008 ¶ [0010]. For example, Dua discloses that "the media player 100 is a pocket sized device that allows a user to store a large collection of digital audio/music, video, images, presentations, animation, Internet content, and other types of media" and "[i]n accordance with the invention,…the media player 100 can automatically convert the media into a format that is supported by the stereo." EX1008 ¶¶ [0058], [0161].

113. A POSITA would not be motivated to combine the components from Dua's media player device with N93's advanced proprietary, closed-system device, because Dua and N93 required different hardware and software that would be difficult to integrate onto a mobile device. In addition, Dua's device and N93's device were directed to different use case scenarios. Dua's device was specifically directed to a wireless media player incorporating RFID technology to exchange communication settings with external devices that also had RFID technology. On the other hand, N93 was a specific consumer device directed to enabling specific functionality. There was not an obvious benefit or rationale to using Dua to improve N93, and improving an already advanced device with new capabilities that would

potentially interfere with previous functionalities. It would be beyond ordinary skill to combine specific features of N93 and specific features of Dua onto one device.

114. Mobile devices are resource-constrained. It would require more than ordinary skill to include Bluetooth, UMTS, GSM, Wi-Fi, and NFC capabilities onto one device. For example, given the limitations of the time, a POSITA would not find it obvious to combine all these alleged radio communication circuits because of the difficulty in designing and building an operable device that would support functionalities of all these alleged radio communication circuits. For example, a POSITA would need to consider managing interference between the different circuits, power sources to support the functioning of different circuits, power management for functioning of different circuits, software to support functioning of the different circuits, placement of the different circuits, size of components for the different circuits, and size of a device needed to support hardware of the different circuits, etc.

115. Combining multiple different systems can be quite challenging as each separate communications system has local oscillators and intermediate frequency stages that can cause internal interference with the others. In addition, each requires different clock signals and local oscillators that create sources of external interference that make it more difficult to meet FCC Part 15 requirements. 47 C.F.R. pt. 15 (2024). In general, a designer is highly motivated to reduce the number of

signal sources to an absolute minimum to avoid the problems of meeting FCC Part 15 requirements. FCC requirements are based on numerous health, safety, and technical rationales such as: reducing radio frequency emissions for health and safety of users, reducing interference to ensure mobile devices work properly on networks without causing harmful interference, and meeting technical standards to work with cellular networks. FCC Part 15 emissions may well be violated when integrating different radio communication technologies (such as simultaneous communication using one radio communication circuit and another radio communication circuit) onto one device. In addition, the SAR results for the N93 (EX1017) are for the **tested** configuration. Any modification would require new SAR testing, which would cause undue experimentation in combining various functions of different devices in the way described by the Petitioners and Dr. Creusere.

116. These safety and technical rationales exist outside business rationales because they drive designers to build mobile devices that do not harm users with excessive radiation, do not interfere with other critical communication systems, and work properly on available networks.

117. In my opinion, a POSITA would not be motivated to modify N93 with a radio circuit of Dua or any radio circuit because N93 **teaches away** from any such modification. In particular, making any addition or modification to the radio circuits

of N93 would require the changing/addition of an antenna. **But** N93 explicitly states that "**Unauthorized antennas**, **modifications**, or attachments could **damage the device** and may **violate** regulations governing radio services." EX1010 at 125 (emphasis added). Thus, a POSITA would not make any such modification to N93 because a POSITA would not want to damage the device or violate any regulations.

118. Indeed, N93 teaches away from **any** modification or enhancements without first seeking approval from Nokia because any such modifications "may be **dangerous**." EX1010 at 9. Nokia recognized that it was a challenge to meet the FCC SAR limits and changes could expose the user to unsafe (dangerous) RF radiation levels. This is particularly an issue since handsets are typically held next to the user's head where there is the greatest concern about RF emissions adversely affecting the brain. A POSITA would not be motivated to make dangerous modifications. Also, these modifications would frustrate the purpose of the device of Dua. In addition, Petitioners and Dr. Creusere never explain how a POSITA would be motivated to first obtain approval from Nokia to make the proposed modifications. Indeed, Nokia is highly unlikely to provide any such modifications in the first place because they had already designed a very specialized "computer" with specific design constraints, regulations, and marketing strategies in mind.

119. A POSITA would know that specific hardware components are needed to support different capabilities. For example, hardware that supports one Bluetooth

version or minimal interference with other communication capabilities cannot be assumed to support every other Bluetooth version as well. Different versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi cannot be substituted for each other without consideration for the actual hardware implementation of the different combinations. For example, N93 specifically discloses Bluetooth 2.0 and 802.11b/g capabilities and cannot be associated with modulation schemes and frequencies for different versions of Bluetooth and Wi-Fi. *See, e.g.*, Pet. at 8-9. It would not have been obvious to a POSITA to swap different versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi for one another with no consideration for the actual hardware implementation of these combinations.

120. A POSITA would not be motivated to combine different circuits, and further, combining different versions of the different circuits. Attempting to combine these different communication circuits onto one device, especially using references that do not even cite same versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi would require more than ordinary skill of a POSITA, and would therefore not be obvious to combine.

121. Dr. Creusere further alleges that "A POSITA would have had a reasonable expectation of success in implementing the features described in both of these references in the combination using Dua's implementation details. Dua's

details were known techniques that would yield predictable results as taught by Dua and involve only routine skill." EX1002 ¶72. I disagree.

122. N93 discloses specialized features that would not be obvious to implement using generic, unrelated diagrams. For example, N93 discloses multi-band cellular radio capabilities, (EX1010 at 8), as well as features based on these multi-band cellular radio capabilities, such as automatic selection between GSM and UMTS networks (EX1010 at 113).

123. Dua merely discloses a generic network transceiver "for interacting with a cellular network, such as a Global system Mobile (GSM) network)." EX1008 ¶ [0066]. Dua makes such fleeting references to its network transceiver that it fails to mention multi-band cellular capabilities, specify whether UMTS or CDMA technology is used, or give any further details on the network transceiver. EX1008 ¶¶ [0064], [0066], [0069]. Dua merely discloses a high level functional representation of a media player terminal interface with no actual details on the network transceiver itself.

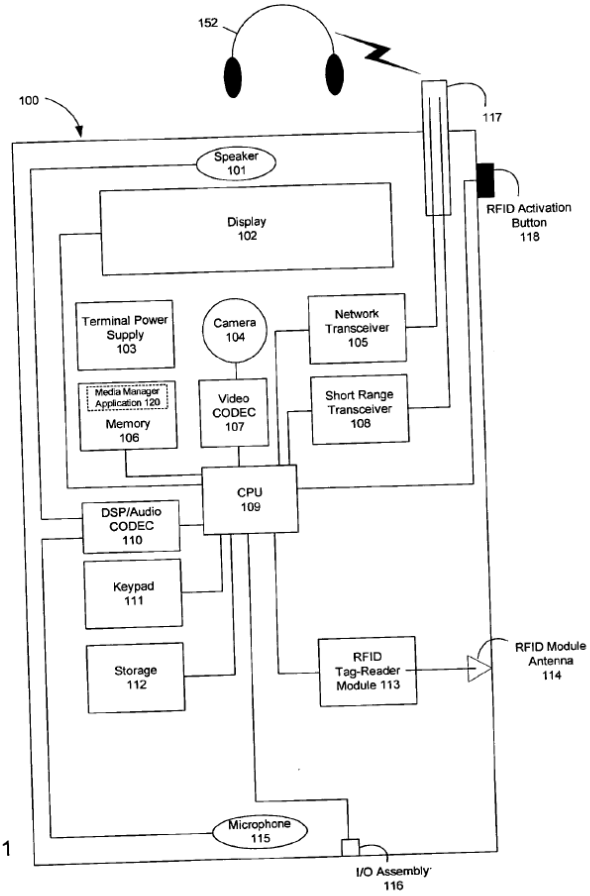


FIG. 1

EX1008 Fig. 1.

124. It would not be obvious to use Dua to disclose implementation details of N93, such as the hardware used to control multiple cellular radio capabilities when Dua fails to disclose any multi-band cellular radio capabilities at all. For example, the network transceiver may have its own processor or modem, instead of the CPU 109, to execute control to perform control over its actions. Therefore, a POSITA would not know a controller executes control of the short range transceiver and network transceiver of Dua.

125. Further, I disagree with Dr. Creusere that modifying Dua or N93 to add additional radio communication circuity would "involve only routine skill" and would have "a reasonable expectation of success." EX1002 ¶72. As explained above with respect to the guidance provided by N93 documentation, each device with radio communication circuity has to comply with certain regulations; undergoes rigorous testing to comply with such regulations; includes specific interfaces, transceivers, antennas, amplifiers, firmware and software to account for transmission and reception paths; and specific design constraints/requirements to avoid interference between such radio communication circuitry and their transmission and reception paths. This is why a market-leader of that time (Nokia) warns against modifications of such devices and explains that such modifications can be "dangerous," can "damage" the device, and can "violate regulations governing radio services." Thus, a POSITA would not be motivated to make any modifications to Dua or N93 because such modifications would not involve "routine skill" and would not have a reasonable expectation of success. To the contrary, a POSITA would follow the guidance of a market leader of that time (e.g., Nokia) and avoid making "dangerous" modifications that could "damage" the device and cause violation of "regulations governing radio services." Any modification/addition of circuitry to N93 or Dua, as proposed by Dr. Creusere, would require a significant redesign, retesting, and regulatory approval, which is well beyond routine skill because it would involve

coordination between numerous engineering teams (hardware design, firmware design, software design; hardware testing, firmware testing, software testing; regulatory testing) and legal team (regulatory submissions and approval). It seems to me that the requirement for Part 15 and SAR retesting to ensure FCC compliance is the definition of undue experimentation. Organizations that design cellular handsets expend considerable resources meeting these regulations.

126. Accordingly, in my opinion the modifications proposed to N93 or Dua by Petitioners and Dr. Creusere are not obvious.

4. It Is Non-Obvious to Use Dua's Teachings of Implementation Details to Disclose Implementation Details of N93

127. The Petition states that 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." Pet. 12. I disagree.

128. I first note that neither N93 nor Dua have enough "implementation details" to enable a POSITA to make or use a device that includes the claimed features of the invention. N93 is a high-level user manual and only advertises certain abilities of the N93 phone with no detail on how to actually implement them. Dua focuses on RFID capability, but includes no details on how to actually make a device that includes the **claimed** features, such as three or four radio communication circuits, video recording technology, and simultaneous functionality. Petitioners and Dr. Creusere even ***concede*** that N93 and Dua are too high level and fail to include

"lower-level implementation details." Pet. 51; EX1002 ¶ 199. Petitioners and Dr. Creusere further state that because N93 and Dua do ***not*** disclose these known implementation details, that "a POSITA would have been motivated to look for known implementations in the art and been led to [other references]." Pet. 51; EX1002 ¶ 199. Therefore, Dr. Creusere and Petitioners each note the deficiencies of N93 and Dua.

129. Petitioners and Dr. Creusere rely on a high level block diagram in Dua to disclose implementation details. Pet. 20. This block diagram is overly simplistic and fails to provide the details necessary to implement features related to cellular radios, particularly in a device like the N93. EX1008 Fig. 1.

130. For example, Dua includes no discussion of separate operating systems that were commonly used in mobile devices similar to the N93. Mobile devices in this era frequently ran two different operating systems—one that handled the user interface, and another operating system that managed cellular communications. This was due to the complexity of managing cellular communications at the time that necessitated separation from the rest of the operating system. Dua is directed to adding an NFC function and fails to disclose or render obvious details needed to enact specific features related to cellular radios, particularly in a device such as the N93. Therefore, Dua's block diagram and the rest of its disclosure fails to include any detail about the cellular network because it considers the "network transceiver"

as one module and fails to include any information on how the device would handle connections to GSM and UMTS networks. Petitioner and Dr. Creusere rely on an overly broad diagram to conclude that the CPU is controlling assignment of connection of multiple radio communication circuits, when there is no information on how the more granular operations of connecting specifically to a GSM or UMTS network is recited.

131. There is no evidence that would lead a POSITA to believe that a CPU managing assignment of connection to GSM or UMTS networks, rather than a different hardware component, such as a modem on the N93. On advanced mobile devices, modems were typically used separately from the CPU to control cellular functionality because the complicated timing requirements for radio protocols could not be handled by the main operating system. The modem on a mobile device needed to handle radio access, handovers, authentication, cellular data connections, low-level radio control, SIM card communication, etc. Additionally, the modem processor typically was optimized for handling tower handovers, timing synchronization, and decoding time signals, and needed to optimized to handle cellular specific issues.

132. Managing cellular radio communications during this time required a level of precision that could not be handled by the main processor. Additionally, cellular communication systems had to comply with strict regulatory and carrier

requirements. Separating the modem operating system into its own locked down system reduced the risk of user applications interfering with radio functions.

133. As another example, the modem often operated even when the mobile device was asleep. Separating it from the main operating system allows the modem processor to work and helped in maintaining battery life. It was also important to separate these processing because if handovers fail, it would prevent crashing of the entire device.

134. There is no disclosure in Dua or N93 that describes a process in which the CPU is able to control assignment of GSM and UMTS. Mobile devices similar to the N93 commonly had logic in the modem to decide which radio access technology to use at any given time. N93 fails to disclose "GSM ***only***" or "UMTS ***only***" as argued by Petitioners and Dr. Creusere. Pet. 65; EX1002 ¶246. N93 discloses network mode preferences, which means that "GSM" could indicate a preference for GSM networks, "UMTS" could indicate a preference for UMTS networks, while "Dual Mode" indicates no such preference. Because network selection was complicated, many manufacturers did not leave this level of control to the user.

135. As stated before, processing related to cellular communications was separated from other processing on mobile devices. N93 fails to disclose what algorithms were related to selection of "GSM" and "UMTS" networks and which

component processed these algorithms. Further, N93 also discloses processes in which the device rejected user selections because of lack of network availability. EX1010 at 113. This indicates, again, that the modem had control over assignment of connection, and not the CPU as alleged by Petitioners and Dr. Creusere.

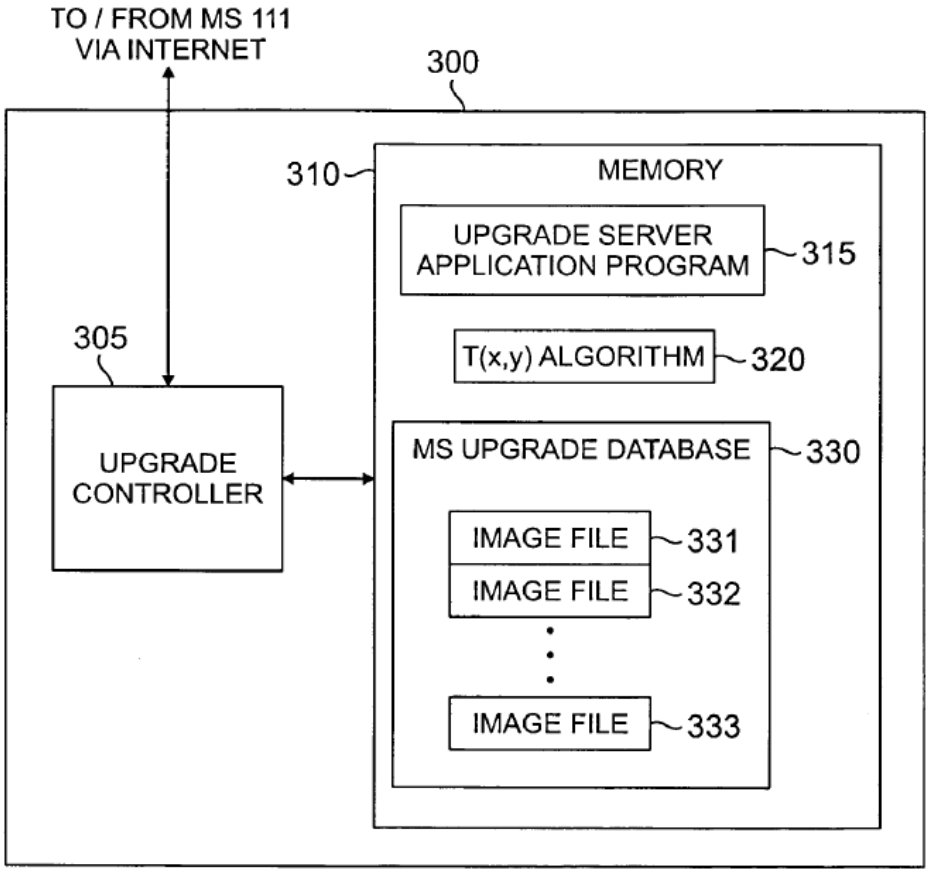
136. Dua also fails to disclose any selection mechanism between multiple cellular networks. EX1008 Fig. 1. Dua fails to disclose any specificity of cellular communications at all. Dua only discusses a network transceiver but fails to discuss operations of the network transceiver on a more granular level, such as the ability to connect to GSM versus UMTS networks. Dua's high level depiction of the CPU performing actions directed to one operating system therefore fails to disclose any actions directed to the other operating system on the modem, or any information on how cellular communications were controlled by any specific component.

B. No Motivation to Combine Herle with N93 or Dua and No Reasonable Expectation of Success in Doing So

137. Grounds 1-5 all rely on the purported combination of Herle with N93 and/or Dua. It is my opinion that Petitioners and Dr. Creusere have not shown by a preponderance of the evidence that Grounds 1-5 render the challenged claims unpatentable. A POSITA would not have been motivated to combine Herle with N93 or Dua at the time of the invention of the '241 Patent, and such a lack of motivation to combine is fatal to Grounds 1-5.

138. Neither N93 or Dua disclose any information regarding *operating system* updates. Instead, N93 only disclose application downloads using a "pull type system." *See* EX1010 at 115 ("You can use Nokia Application Installer in Nokia PC Suite to install an application to your device."). Dua only discloses updating media capabilities, RFID tags, and data stored in "device profile." EX1008 ¶ [0143] ("It should also be noted that devices such as media player 100 may periodically update their media processing capabilities to be able to handle additional formats."). Dua discloses that "the software can automatically update the RFID transmission information 450 stored in the RFID tag memory unit 322 with the latest information on the device's media capabilities." *Id.* ¶ [0151]. Additionally, "data stored in a device profile can periodically be updated over-the-air when the media player 100 establishes a communication session with the target device." *Id.* ¶ [0154].

139. Herle, on the other hand, discloses specific requirements to enable OTA delta updates, including the creation of an "upgrade server 300" with specific software, hardware, and network capabilities. EX1009 Fig. 3. Delta-based updates are updates that use a "delta file" which reflect only changes between "two versions of mobile station executable firmware," instead of a new image file entirely. EX1009 at 35:38-42.



EX1009 Fig. 3.

140. At a minimum, Herle requires provisioning of a specially designed server having an upgrade server application program 315, T(x,y) algorithm 320 to generate change files, an upgrade database 330, and an upgrade controller 305. *See id.* Next, Herle requires that each mobile station be equipped with a specially programed upgrade control program 262, which requires additional memory resources, and an algorithm program 263 to be able to handle a delta file. *See id.* Based on this, there was no motivation to combine N93 or Dua. There is no evidence that the operating systems in N93 and Dua could be updated at all. Therefore, it is

unclear why a POSITA would look to Herle to incorporate delta-based over-the-air updates for operating systems for two devices that do not support updates for operating systems. Herle's "express motivation" is "*improved* systems and methods for performing automatic software upgrades of wireless handsets and other types of mobile stations," in light of previous ineffective methods of updating software upgrades. *See* EX1009 2:3-28. Herle describes improving mobiles devices *already capable* of performing operating system upgrades either through previous methods of updating operating system, such as downloading and "install[ing] software upgrades for a personal computer (PC) via the Internet" or downloading new software based on partitioning the software into small modules. *See id.*

141. Beyond improper hindsight, there is no motivation to overhaul N93 or Dua's system to add the option of OTA operating system updates. For example, N93 was a consumer device from Nokia being sold worldwide. *See* EX1018. In order to have a uniform customer experience, Nokia would need to have servers all over the world to be able to support updates to its operating system. Adding such servers would increase the costs and require a significant infrastructure investment. In addition, given the high number of phones sold, the MS upgrade database 330 would need to have numerous verisons of "image files" 331-333 to be able to accurately generate delta files for a particular device that needs to be updated.

142. Further, N93 specifically instructs against downloading software that are not Symbian Signed or have passed the Java Verified™ testing, meaning Nokia was averse to having third-party servers host such upgrade programming. Further, Symbian was not an open source operating system until after 2009. *See* EX2011. Instead, it was a proprietary operating system with a very complex file structure and features. *See* EX2012 ("a large OS, containing hundreds of classes and thousands of member functions").

143. Thus, the servers would need to have large amounts of processing resources and memory just to be able to implement Herle's system and generate delta files. Petitioners and Dr. Creusere have also not explained whether the limited bandwidth of the UMTS/GSM systems of N93 and Dua will be able to handle receiving such delta files over cellular networks.

144. Similarly, significant computing resources would be needed on the devices of N93 and Dua to determine the differences between the received delta file and the existing operating system, compare them, then execute a process whereby the phone is reimaged with a completely new operating system. N93 specifically recites limited memory resources. *See* EX1010 at 22. There is no explanation by Petitioners and Dr. Creusere how N93 or Dua's limited memory and/or processor resources would handle such a significant reimaging of the operating system.

Additionally, Dua specifically calls over the air configurations "generally insecure." *See* EX1008 ¶ [0009].

145. Further, historical evidence shows it was not obvious to implement OTA operating system updates for specialized devices like N93 or Dua in light of systems like Herle. For example, development history of the Symbian operating system (the operating system of N93) refutes Petitioners' and Dr. Creusere's contentions that it would have been obvious to combine N93's teachings with Herle's teaching of OTA updates for operating system. EX2013.

146. Other specialized devices also had delays in implementing OTA operating system updates, even in light of delta-based update technology of Herle. For example, Apple's first major release of a mobile operating system, iOS 1.0, was announced in 2007, but Apple did not support OTA operating system updates until the release of iOS 5.0 in 2011. *See* EX2014; EX2015 ("Software updates available over the air without tethering."). This shows there were additional considerations for specialized systems to implement OTA operating system updates.

147. All of this evidence supports my opinion that adding OTA updates to the operating system of Herle into N93 or Dua was not a matter of routine skill. To the contrary, the state of the art at that time shows that updates to closed and proprietary operating systems were not supported at that time in view of memory constraints, network bandwidth concerns, and the desire of entities to limit access to

their proprietary operating systems. Indeed, this is confirmed by Herle's own disclosures because just to achieve OTA updates, Herle discloses a specialized system with significant investments in network infrastructure that requires specialized servers working in conjunction with specialized software on each device to accomplish this task. To accomplish Herle's disclosure, a system would need to be designed from the start to comply with all of Herle's requirements, which is not something that can be achieved retroactively in a proprietary and close-ended device like N93 or Dua. Petitioners and Dr. Creusere have never addressed this evidence and state of the art of implementing OTA updates in operating systems of proprietary systems, instead just providing a conclusory and hindsight driven analysis. In my opinion, such modifications are not obvious.

C. N93 and Dua Do Not Inherently Disclose Modulation Schemes and Frequencies

148. I disagree with Petitioners' and Dr. Creusere's assertion that N93 and Dua ***inherently*** disclose modulation schemes and frequencies associated with Bluetooth, UMTS, GSM, and Wi-Fi.

149. The mere fact that standards existed for certain communication protocols were available does ***not*** disclose or suggest actual hardware and/or software needed to implement the communication protocols, especially in view of integration with other components. It is not trivial to integrate different

communication circuits, wireless capabilities, and capabilities onto one devices without careful design considerations.

150. Standards essentially reflect an agreement by industry players that establishes specifications on how devices should communicate with other devices using a specific technology. There are multiple ways in which devices can be built to comply with standards. There are multiple optional and required parts of standards. EX1014 at 161-163. In addition, standards related to Bluetooth, UMTS, GSM, and Wi-Fi encompass a broad range of versions, types, etc. (*e.g.*, Bluetooth: Bluetooth 2.0, Bluetooth 2.0+EDR; Wi-Fi: 802.11a, 802.11b, 802.11g).

151. Because of this, just knowing that a device implements Bluetooth, UMTS, GSM, or Wi-Fi technologies cannot render obvious or make inherent any specific information such as modulation schemes and frequencies that the device implements. Instead, more specific information is needed, particularly because integration with other features (such as the claimed features) may limit what version, type, etc. of Bluetooth, UMTS, GSM, and Wi-Fi may be implemented in a particular device.

152. The exhibits provided by Petitioner demonstrate that different devices use different modulation schemes and frequencies for Bluetooth, UMTS, GSM, and Wi-Fi. For example, there are different frequency bands for GSM based on different references throughout the Petition. Pet. 10 (listing 800/1900 MHz for GSM

frequency bands); Pet. 24 (listing 900, 1800, 1900 MHz for GSM frequency band); Pet. 42 (listing 900 and 1800 MHz for GSM frequency band). If different devices use different combinations of 800, 900, 1800, and 1900 frequency bands (among other possible GSM frequency bands not cited), it is unclear how any one specific combination of these frequencies can be inherent from a general disclosure of Bluetooth, UMTS, GSM, and Wi-Fi. Instead, the modulation schemes and frequencies are dependent on specific hardware implementations and in consideration for other features and cannot be inherent or obvious.

153. A POSITA would know that specific hardware components are needed to support different capabilities. For example, hardware that supports one Bluetooth version or minimal interference with other communication capabilities cannot be assumed to support every other Bluetooth version as well. Different versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi cannot be substituted for each other without consideration for the actual hardware implementation of the different combinations. For example, N93 specifically discloses Bluetooth 2.0 and 802.11b/g capabilities and is therefore not associated with modulation schemes and frequencies for different versions of Bluetooth (such as Bluetooth 2.0+EDR) and Wi-Fi (such as 802.11a). EX1010 at 18. It would not have been obvious to a POSITA to swap different versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi for one another with no consideration for the actual hardware implementation of these combinations. A

POSITA would need to take into account many other considerations to contemplate integrating new versions of Bluetooth, UMTS, GSM, NFC, and Wi-Fi that would make it non-obvious to swap out for each other.

D. <u>N93 and Dua Are Non-Enabling</u>

154. Dua, N93, and Herle are not enabling prior art with respect to multiple claim limitations, such as the simultaneous limitation or control of multiple radio communication circuits.

1. N93 Is Non-Enabling

155. N93 is non-enabling with respect to the claim limitations. N93 is a user manual for a proprietary, closed-source device. At most, the user manual walks through certain features available on a device but gives no information on how to implement them. Petitioners and Dr. Creusere admit that N93 has no implementation details and uses this as motivation to combine N93 with Dua. Pet. 12.

156. A user guide does not show the internal engineering of the device, such as circuit design, software development, antenna placement, and/or the like. N93 includes only very general mentions of "electronic circuits" and "circuit boards" in reference to providing care for the N93 device. EX1010 at 125. However, N93 does not disclose any details on firmware or hardware design. To "make" the devices described in N93, you would need at least schematics and board layouts to determine

how to integrate components of the device and how each component interfaces with each other.

157. On the other hand, the ’241 Patent describes numerous details on how to implement a controller in relation to four radio communication circuits, including with detailed diagrams and descriptions on how the controller controls assignment of each of the four radio communication circuits. For example, in describing how the controller functions in response to an indication from the user, the ’241 specification discloses:

> The controller 132 and the transmission rate assignment controller 1001 may variably control the radio transmission assignment to the modems 1002 and 1003 in response to an indication from the user. For example, in a situation wherein the user issues an indication to transmit video information by radio via the modem 1002 to the display apparatus 200 while acquiring information from the Internet according to scheme 1 of FIG. 9 by use of the modem 1003, the controller 132 outputs a control signal to the assignment controller 1001 such that the transmission scheme of the modem 1003 is changed from scheme 1 to scheme 2 of FIG. 9 and that of the modem 1002 is set to scheme 1 of FIG. 9 conduct communications. The transmission rate of the modem 1002 may be variably changed according to fineness or precision of the video information sent from the modem 1002 to the display apparatus 200. For example, if the fineness of the video information is altered from SD (640×480) to HD (1980×1080), the controller 132 instructs the assignment controller 1001 to heighten the transmission rate of the

> modem circuit 1002. It is preferable in the operation that the transmission rate of the modem 1003 is lowered in association with the variable control of the transmission rate of the modem 1002.

EX1001 8:35-57.

158. This enablement is completely missing from N93, which does not describe any "controller" and how it functions in relation to four radio communication circuits at all.

159. In addition, N93 fails to disclose any detail on how to implement simultaneous transmission of video information vua a first radio communication circuit while simultaneously connecting to the Internet via second radio communication circuit. On the other hand, the '241 Patent discloses how a controller controls a transmission rate assignment control circuit and gives preference to particular circuits to enable simultaneous transmission of video information via a first radio communication circuit while simultaneously connecting to the Internet via second radio communication circuit:

> The controller 132 controls the transmission rate assignment control circuit 1001 on the basis of time control information of the video signal to variably control the transmission rate of the radio modem circuit 1002. At the same time, the controller 132 variably controls the transmission rate of the radio modem circuit 1003 for radio communication with a network such as the Internet. According to the embodiment, in the assignment of the transmission rate to the

> demodulation circuits 1001 and 1002, the controller 132 gives preference to the demodulation circuit 1001. In other words, the transmission rate of the demodulation circuit 1001 is more than that of the modem circuit 1002. Hence, within the limited range of bands for the radio transmission, the modem 1002 can transmit video information without deteriorating the video quality of the video information having high picture quality.

EX1001 6:58-7:6. N93 is clearly missing the type of detail needed to enable the claimed features of the invention.

160. Further, designing and manufacturing mobile devices involves proprietary technology, including unique hardware and software designs to give companies an edge over competitors. Nokia, as a leading company of designing and manufacturing mobile devices, was highly motivated to keep many of their systems proprietary and would not enable others to make their proprietary mobile devices.

161. In addition, opening up hardware and software designs can expose security vulnerability to bad faith users. To protect mobile devices from being hacked, mobile device manufacturers could better control the security model of the mobile devices by keeping the information private.

162. Manufacturers also relied on offering unique proprietary features that competitors cannot easily replicate to differentiate their products in a market setting. Nokia would not enable competitors to easily copy their devices.

2. Dua Is Non-Enabling

163. Dua is also non-enabling in relation to the device. Dua is directed to the integration of "Radio Frequency Identification (RFID) to automatically setup and establish a wireless connection between at least one source device and one target device. EX1008 ¶ [0013]. Dua was written with breadth to account for as many types of media devices and wireless communication protocols as possible. However, Dua was only hypothetical or forward looking and fails to actually enable the execution of an invention with the supposed features of the claimed invention based on the Petitioners' and Dr. Creusere's mappings.

164. In particular, it is my opinion that Dua does not enable the making of a device with multiple radio communication circuits with specific controller functionality and simultaneous over multiple radio communication circuit functionality. While the '241 Patent discloses specific details on how to enable carrying out transmission of video information via a first radio communication circuit while simultaneously connecting to the Internet via second radio communication circuit, Dua lacks this detail. EX1001 8:35-57.

165. Petitioners and Dr. Creusere even admit that Dua is non-enabling and does not disclose the "lower-level implementation details" and a POSITA would not be motivated to look to Dua.

a) Dua does not enable a mobile device with dual-band Wi-Fi frequencies.

166. While Petitioners and Dr. Creusere state that Dua discloses that phones used a Wi-Fi radio on both 2.4GHz and 5GHz bands, this was non-obvious during the time of the invention of the ’241 Patent and Dua is not enabling in this regard. Instead, Dua tried to account for as many potential combinations of wireless communication technology and future developments but did not actually enable a mobile device that had the specific combinations alleged by Petitioners and Dr. Creusere. Instead, mobile devices that implemented Wi-Fi only implemented Wi-Fi using the 2.4 GHz band, as shown by the Nokia N93 User Guide. EX1010 at 18. This was due to the resource constraints of mobile devices during the time of the invention. Section IX.A.1. It was not until years after the time of the invention of the ’241 Patent that dual-band Wi-Fi was introduced in mobile devices. EX2027 at 1-3; EX2028 at 1.

b) Dua does not enable a mobile device that controls assignment to GSM and UMTS networks

167. Dua has only a high-level block diagram and does not account for the internal workings of a network transceiver.

168. Petitioners and Dr. Creusere cite a paragraph of Dua to state that “In accordance with a preferred embodiment of the invention, media player 100 is fully compliant with 3GPP and 3GPP2 Standards.” EX1002 ¶ 92; EX1008 ¶ [0069]. This paragraph of Dua only accounts for a media player being compliant with 3G

standards. This paragraph of Dua fails to account for a media player with the capability to connect to both 2G and 3G networks.

169. Because Dua does not disclose details of switching between 2G and 3G cellular networks, Dua does not disclose enabling details of how a controller would control assignment of connection to a 2G or 3G network. For example, Dua does not disclose the use of a modem that is used to control cellular functionality in a device. Instead, Dua only describes a network transceiver that is capable of interacting with a cellular network via an antenna. EX1008 ¶ [0066].

170. Thus, Dua does not account for managing control of connection to 2G and 3G networks and would not disclose the implementation details of controlling access to 2G and 3G networks.

E. <u>GSM and UMTS are not separate radio communication circuits</u>

171. In my opinion, GSM and UMTS are not separate radio communication circuits. Instead, they are multiple modes of "one radio communication circuit."

172. At the base of cellular communications, a mobile device transmits and receives information via connecting with **a** cellular network. While a mobile device may be able to connect to different cellular networks, the objective of a cellular radio in a mobile device is to establish connection to **a** cellular network.

173. For example, depending on its design, the cellular radio communication circuit could change modulation schemes to switch **between** certain types of cellular

networks, such as between the GSM networks and UMTS networks. But mobile devices are not designed to steadily maintain connections with **multiple** cellular networks (such as a GSM and UMTS network at the same time), and instead only maintain one active connection with a cellular network at the time. The functionality of cellular chipsets in mobile devices thus supports that a POSITA would consider the cellular radio communication circuit as **one** radio communication circuit because its function is to establish an active connection with **a** cellular network (either GSM or UMTS).

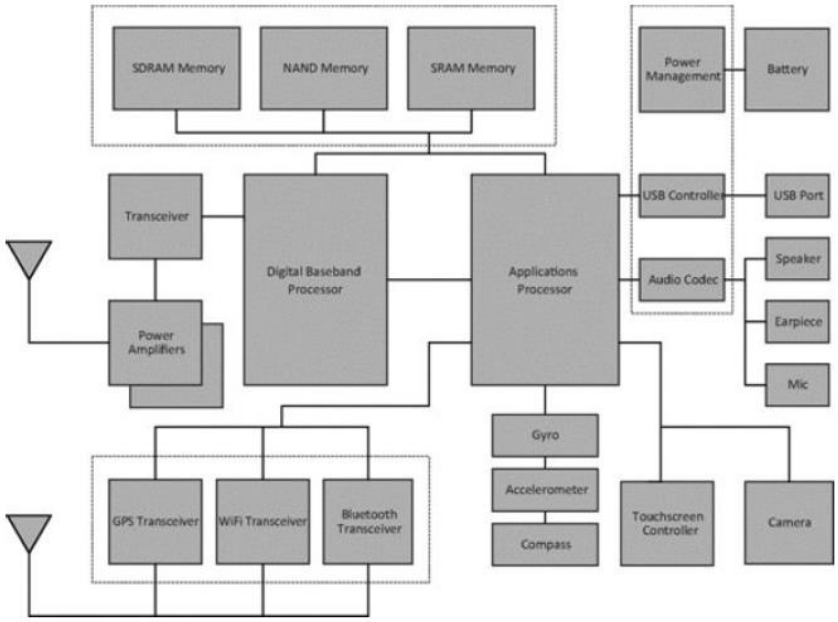
174. Dua also reflects this rationale as it places cellular functionality into one network transceiver and describes that the network transceiver is "for interacting with **a** cellular network." EX1008 ¶ [0066], Fig. 1. Although Dua does not show the use of a cellular modem to control the functionality of the transceiver, Dua reflects the idea that a POSITA would consider the cellular chipset as one radio communication circuit by placing all cellular functionality into a single "network transceiver." Fig. 1. N93 also describes functionality of switching between cellular networks. EX1010 at 113 ("Your device can automatically switch between the GSM and UMTS networks."). Kao, another cited reference, also reflects this understanding by a POSITA and states that "a cell phone needs to receive or transmit signals of only one standard at a time." EX1013 ¶ [0005].

175. This rationale is also in line with the ’241 claims, because the claims and specification contemplate a radio communication circuit that can change modulation schemes, such as how the cellular radio communication circuit changes modulation schemes to interact with a GSM network versus a UMTS network. EX1004 at 8:38-57.

176. Other documents reflect the consideration of the cellular chipset as one radio communication circuit:

> In a modern radio design, much of the radio functionality is contained within a single radio chipset. Depending on the target market for the resultant handset, **the radio chipset will contain support for many different radio standards and operating frequencies**. Current radio chipsets provide support for multiple air interfaces [(*e.g.*, UMTS ((850, 900, 1900, 2100 MHz), GSM ((850, 900, 1800, 1900 MHz))].

Figure 3.2. Hardware block diagram of a mobile handset.



EX2026 at 98. As seen by this figure, a POSITA would consider separate "Bluetooth," "Wi-Fi," and cellular transceivers, but do not further separate out the cellular transceiver into discrete radio communication circuits of "GSM" or "UMTS." EX2026 at 98.

177. Therefore, given the function of a cellular radio communication circuit to connect to a cellular network, a POSITA would not consider UMTS and GSM to be separate "radio communication circuits."

F. <u>N93 in view of Dua and Herle Fail to Disclose or Render Obvious Limitation [1a]</u>

178. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [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."

179. As a preface, I note that other claim limitations (*e.g.*, limitation [1b]) require other transmission schemes to have modulation schemes and frequency bands **different** from the first modulation scheme and first transmission frequency band. Other claim limitations require **specific** modulation schemes and frequencies (*e.g.*, claim 25 requires first modulation scheme to include shift keying modulation). Petitioners and Dr. Creusere also make assumptions based on transfer rates related to specific modulation schemes and frequencies. *See* Pet. 15; EX1002 ¶ 75. Therefore, it is vital to establish **correct** modulation scheme and transmission frequency band for any transmission scheme that is alleged by Petitioners and Dr. Creusere. It is **insufficient** to establish that transmission schemes are related to **any** modulation scheme or transmission frequency band—the transmission scheme must be mapped to the correct modulation scheme and transmission frequency band.

180. In relation to this limitation, I notice that Petitioners and Dr. Creusere state that "Bluetooth inherently discloses to a POSITA the modulation scheme (GFSK/$\frac{\pi}{4}$-DQPSK/8DPSK) and frequencies (2402-2480 MHz)." Pet. 21. I disagree with this statement for at least the following reasons: **(1)** a general statement of what a wireless technology is does not inherently disclose the specific modulation

schemes and frequencies that are used in a specific implementation of the wireless technology; **(2)** it is not obvious to change out one hardware implementation of a wireless technology for a different version of a wireless technology (and Petitioners and Dr. Creusere fail to provide any motivation to do so anyway); and **(3)** the N93 is not tied to Bluetooth 2.0 + EDR modulation schemes and frequencies.

181. **First**, an overly general statement of what a wireless technology is (*e.g.*, Bluetooth, UMTS, GSM, Wi-Fi, and/or NFC) does not inherently disclose the specific modulation schemes and frequencies that are used in a specific implementation of the wireless technology. In other words, the general labels of "Bluetooth," "UMTS," "GSM," "Wi-Fi" or "NFC" do not reveal any specific modulation schemes and frequencies that would be used in specific implementations of Bluetooth, UMTS, GSM, Wi-Fi, or NFC. Instead, each of Bluetooth, UMTS, GSM, Wi-Fi, and NFC is linked to a variety of different possible modulation schemes and frequencies that ***may*** be used depending on a specific implementation of it.

182. As a first example, if a POSITA only has the information that a device is "Bluetooth capable," a POSITA will not know which version or class of Bluetooth is actually used, and therefore cannot determine specific modulation schemes associated with the device. Section IX.C. Existing Bluetooth standards would only reveal **possibilities** for Bluetooth modulation schemes being used in a specific

implementation. As another example, a first device with Wi-Fi capabilities and a second device with Wi-Fi capabilities can have completely different modulation schemes and frequencies from each other (*e.g.*, using a component compliant with the 802.11a standard of Wi-Fi technology will use the OFDM modulation scheme and 5 GHz frequency band, while using a component compliant with the 802.11b standard of Wi-Fi technology will use the CCK/DSSS modulation scheme and 5GHz frequency band). EX1013 Fig. 1.

183. Therefore, there is no inherent disclosure of what modulation schemes and frequencies are possible in a specific embodiment of a Bluetooth capable device just from the mention of "Bluetooth."

184. **Second,** while I note Petitioners and Dr. Creusere provide no rationale to support this assertion, it is my opinion that it is not obvious to swap out different Bluetooth implementations for one another, particularly in light of a complex device that had multiple radio communication circuits, video processing functionality, and simultaneous functionality.[2] Different Bluetooth versions/capabilities were associated with different modulation schemes, and different modulation schemes required different requirements (*e.g.*, clocking requirements, power requirements, etc.) that would require more than ordinary skill to implement onto devices that were

[2] Specifically, this references the "simultaneous" functionality as described in the claim: "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 simultaneously."

already complex. Sections IX.A.1, IX.C. Integration of a specific Bluetooth component on a mobile device requires intricate design choices such as those related to printed circuit board limitations, radio frequency tuning, power supply requirements, and clocking requirements, particularly in light of the resource constraints of mobile devices during the time of the invention.

185. In other words, it is not obvious to swap out one Bluetooth embodiment out for another component, because design considerations need to be made for each specific implementation of a Bluetooth. Petitioners and Dr. Creusere only provide **possibilities** (and even fails to account for the full range of possibilities) for modulation schemes and frequencies for the Bluetooth component used in the N93 or Dua, and fails to set provide actual modulation schemes and frequencies that would be used in any specific implementation, particularly in view of the entire claim—which accounts for other complex features that would need to be accounted for. **Third**, N93 states that it does **not** use the Bluetooth 2.0+EDR modulation schemes or data rates cited by Petitioners and Dr. Creusere. The Bluetooth standard is also associated with multiple modulation schemes. Some of these modulation schemes **may** be present in a Bluetooth-enabled device, but are not necessarily present. For example, π/4-DQPSK and 8DPSK are modulation schemes associated with a specific type of Bluetooth—Bluetooth 2.0 + EDR. EX1014 at 41, 135. Devices that did not support Bluetooth 2.0 + EDR would not have these modulation

schemes. EX1014 at 48. For example, N93 specifies that it is not associated with EDR because it explicitly states that "this device is compliant with Specification 2.0." EX1010 at 84. Contemporaneous documents confirm that the Nokia N93 device was limited to Bluetooth 1.1 or 1.2 and would not have the transfer rates of Bluetooth 2.0+EDR. EX2029 at 1 ("Nokia phone is designed to meet Bluetooth Specifications 1.1 or 1.2"). The Bluetooth Specification for Version 2.0 + EDR states that "[i]f the full set required in Section 4.2 are not supported the '+EDR' configuration name shall not be used in product literature." EX1014 at 49. Therefore, N93 does not disclose a product compliant with the Bluetooth 2.0 + EDR modulation schemes recited by Petitioners and Dr. Creusere.[3]

186. Further, as stated above, there is no rationale for switching out the Bluetooth component in the N93 for any other Bluetooth component that would support other modulation schemes. There is also no consideration for the difficulty in redesigning a device that was compatible with one Bluetooth version for another—this is reflected by the fact that even when new Bluetooth standards were released, it would take many years for any hardware implementations to come to fruition, especially when integrating them with other features, such as the claimed features.

[3] This is relevant because Petitioners and Dr. Creusere rely on data rates that were not possible using Bluetooth 2.0 and only theoretically possible through Bluetooth 2.0+EDR.

G. N93 in view of Dua and Herle Fail to Disclose or Render Obvious Limitation [1b]

187. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [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."

188. For the reasons presented above in relation to Section IX.E, a POSITA would not consider "UMTS" as a radio communication circuit. Instead, UMTS is a type of network that a mobile device could connect to. A POSITA would consider a cellular radio communication circuit that is capable of connecting to a UMTS network, given the function of the cellular radio to establish and maintain a connection with a cellular network.

189. Also, for the reasons presented above in relation to Sections IX.C and IX.F, it is my opinion that the general disclosure of "UMTS" does not inherently disclose the specific modulation schemes and frequencies related with a specific implementation. Also, for the reasons presented in Section IX.C, it is not obvious to substitute one specific implementation (with one set of modulation schemes and frequencies) for another implementation (with a different set of modulation schemes

and frequencies) for another. Also, QAM modulation schemes were unavailable on the N93, nor would they have been obvious in light of Dua or Herle or the knowledge of a POSITA at the time of the invention.

190. N93 discloses capability to connect specifically to **UMTS** networks. Petitioners and Dr. Creusere fail to provide any evidence that N93 implemented any QAM modulation schemes. There is **no** disclosure of QAM modulation schemes in the SAR Report. EX1017. Specifically, the SAR Report for the N93 device only indicates GSMK, GFSK and 8PSK, none of which are associated with QAM modulation schemes. EX1017 at 4. Dua was written to be forward-looking and inclusive of different **possibilities** of wireless communication technologies but does not actually contemplate or enable the making of a device that would support multiple wireless communication technologies in combination with each other as alleged by Petitioners and Dr. Creusere. EX1008 ¶ [0069]; Sections IX.A.1, IX.D.2.

191. The mappings alleged in the Petition specifically map to **UMTS** networks. Pet. 9. The distinction was also made clear by Dr. Creusere, who stated that it is only "approximately correct" to refer to UMTS as 3G because there were many variations and standards as GSM within the 2G and 3G standards that were not GSM and UMTS. EX2030 13:7-16. Neither QAM nor OFDM were associated with UMTS networks. Pet. 8. The cited reference even state that QAM is a modulation scheme associated with a **different** technology from UMTS—HSDPA.

EX1011 ¶ [0010]. Petitioners and Dr. Creusere do not account for the implementation of other wireless communication technology (such as support for connecting to HSDPA networks) or account for integrating hardware components that support other wireless communication technology in combination with other claimed features. OFDM was also associated with LTE rather than UMTS and LTE is considered to be a different generation of cellular network than UMTS. EX2026 at 53.

192. General wireless standards do not disclose specific modulation schemes and frequencies that would be used in specific embodiments. Instead, as shown in the exhibits, modulation schemes and frequencies will depend based on the device. EX1017 at 4; EX1011 at Abstract. Further, general disclosure of standards do not disclose technology needed to implement the standard into a specific hardware implementation. Furthermore, it would take more than ordinary skill to implement such a modulation scheme into a device with the claimed features.

193. The design of the iPhone illustrates rejection of specific features, such as UMTS capabilities, even though it was released in 2007, after UMTS technology had been known and incorporated into other cellular devices. EX2031 at 2. This demonstrates the numerous tradeoffs that designers had to make to support advanced functionalities, particularly given the technical limitations of devices at the time of the invention. Section IX.A.1. This reflects that it would be beyond ordinary skill to

combine additional cellular network support in a mobile device that was resource constrained and already supported many features at the time.

H. N93 in view of Dua and Herle Fail to Disclose or Render Obvious Limitation [1c]

194. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [1c]: "a third radio communication circuit capable of transmitting information and using a third transmission frequency band."

195. For the reasons presented above in relation to Section IX.E, a POSITA would not consider "GSM" as a radio communication circuit. Instead, GSM is a type of network that a mobile device could connect to using a cellular radio communication circuit. A POSITA would consider a cellular radio communication circuit that is capable of connecting to a GSM network, given the function of the cellular radio to establish and maintain a connection with a cellular network.

196. Also, the Petition relies on the same rationale as limitations [1a] and [1b]—that the modulation schemes and frequencies would be inherent or obvious as to "GSM" and "Wi-Fi." I disagree. Pet. 24-25.

1. Mapping A (GSM)

197. For at least the same reasons provided in Sections IX.C, IX.F, and IX.G, I disagree with Petitioners' and Dr. Creusere's rationale that modulation schemes and frequencies for GSM would be obvious. As stated previously in Section IX.C,

general disclosure of "GSM" fails to inherently disclose or render obvious specific modulation schemes and frequencies of specific implementations.

2. Mapping B (Wi-Fi)

198. For at least the same reasons provided in Sections IX.C, IX.F, and IX.G, I disagree with Petitioners' and Dr. Creusere's rationale that modulation schemes and frequencies for Wi-Fi would be obvious. The general disclosure of "Wi-Fi" fails to disclose specific modulation schemes and frequencies of specific implementations. Next, N93 specifically discloses compliance with the 802.11(b/g) standard, and N93 also specifies the 2.4GHz band, not the 5GHz band. Dua also fails to disclose, render, obvious, or enable a device with Wi-Fi capabilities on the 2.4GHz and 5GHz bands. Section IX.D.2.a). Careful consideration needs to be given to integrate different types of modulation schemes and frequencies into a device with complex features (*e.g.*, managing interference with other radio communication circuits, etc.).

199. Also, it was not obvious to implement the 5GHz band (dual frequency Wi-Fi onto a mobile device during the time of the invention. Section IX.D.2.a). Mobile devices in 2007 that were already constrained with GSM and UMTS capabilities, Bluetooth, and 2.4GHz capabilities. Implementing 5GHz Wi-Fi would require different antennas, power management, and integrating a dual-band Wi-Fi

chip into a resource-constrained mobile device. This was not obvious during the time of the invention and beyond ordinary skill.

200. This is reflected by the fact that phones did **not** include dual-band Wi-Fi capabilities until years after the time of invention of the ’241 Patent. Wi-Fi 4, also known as IEEE 802.11n which introduced dual-band capability, was not introduced until 2009. EX2032 at 1. Before then, I am not aware of any implementation of dual-band Wi-Fi onto mobile devices, particularly mobile devices with multiple advanced capabilities that correspond to the claimed features of the ’241 Patent. Dr. Creusere is similarly unaware of any such device and did not analyze what capabilities “of all multimedia cell phones that were available in 2007” or “what their capabilities were in terms of their connection abilities.” EX2030 57:23-58:3.

201. Furthermore, the disadvantages of implementing 5GHz capability onto a mobile device would outweigh any advantages. If a mobile device already had 2.4 GHz Wi-Fi capability, there was minimal advantage to adding 5GHz capability, particularly given the disadvantages at the time. Therefore, there was no motivation to combine and construct such a device and Petitioners and Dr. Creusere does not provide any motivation for supporting additional frequencies. Pet. 25-26; EX1002 ¶ 99.

202. It is hindsight bias to consider mobile devices as powerful as they are now. While we are used to the improved computing power of mobile devices today,

mobile devices in 2007 were resource limited devices, and it was not obvious to provide all the functionalities in mobile devices, and it was beyond the level of ordinary skill to do so as well.

203. Petitioner does not cite Herle in relation to this limitation.

204. Therefore, Dua, N93, Herle, and the knowledge of a POSITA fail to disclose or render obvious including both Wi-Fi frequencies onto one mobile device.

I. N93 in view of Dua and Herle Fail to Disclose Limitation [1g]

205. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [1g]: "a controller controlling assignment of connection of each of the first, second, and third radio communication circuits."

1. N93

206. N93 fails to disclose or render obvious that the same controller controls assignment of connection of each of the first, second and third radio communication circuits, because (1) N93 fails to disclose a controller at all and how any alleged controller works in response to user indications; (2) a mobile device like the N93 would include a modem that controls UMTS and GSM connections and a separate component that controls Bluetooth connections; and (3) N93 is non-enabling concerning this limitation.

207. Petitioners and Dr. Creusere only provide evidence of N93 user indications in relation to this limitation. Pet. 29-31; EX1002 ¶¶110-116. N93

includes no information on how components such as a "controller" would respond to these user indications to perform any such actions like "controlling assignment of connection of each of the first, second, and third radio communication circuits."

208. N93 is a **user manual** for a closed-system, proprietary device. N93 hardly can be considered something that includes information on how to **make** the device it discloses. It does not include implementation details to make or understand the internal workings of how the device works. Petitioners and Dr. Creusere even note the lack of implementation details is the rationale Petitioners and Dr. Creusere use to turn to other references. EX1002 ¶ 71; Pet. 12. This illustrates the non-enabling nature of the N93 reference. Section IX.D.1.

209. In addition, there is no evidence that has been presented whether a mobile device such as the N93 prior to November 2007 had a CPU that handled controlling UMTS and GSM connections. As stated in Section IX.A.2, modems typically performed processing separately from other parts of the device. Because N93 includes only high level details on certain functionalities, N93 does not disclose the internal workings, such as modems or radio communication circuits, and how they work to control assignment of UMTS or GSM.

2. Dua

210. Dua also fails to disclose this feature because Dua: (1) does **not** account for the ability to connect to both GSM and UMTS networks, and (2) is non-enabling regarding this limitation.

211. Petitioner states that the CPU 109 is the "controller" of limitation [1g]. Petitioner relies heavily on Figure 1 of Dua to state that the CPU 109 controls assignment of connection of each of Dua's radios. Pet. 31; EX1002 ¶ 117. Figure 1 of Dua is reproduced below for reference.

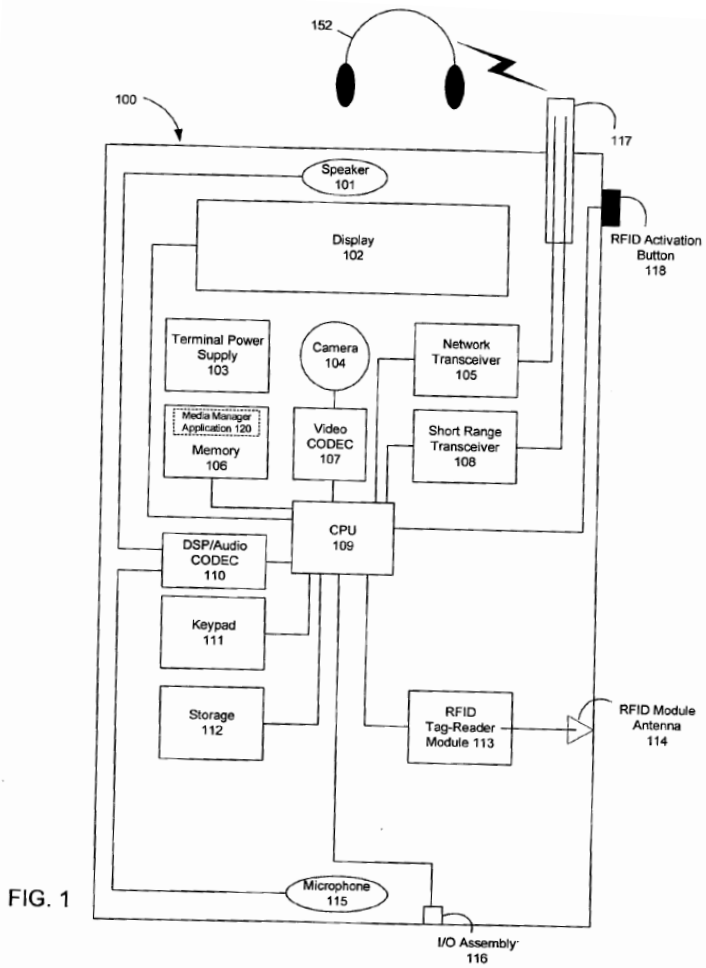


FIG. 1

212. Figure 1 of Dua is a high level functional representation of a media player terminal interface. EX1008 Fig. 1. While it may depict "lines connecting each component," this figure fails to describe actual processes executed by the CPU 109 in order to control assignment of Bluetooth, Wi-Fi, GSM/UMTS, or NFC functions. Figure 1 fails to disclose any detail on what processes are being executed by what component in relation to controlling assignment of particular circuits.

213. Figure 1 of Dua also confirms that a POSITA would think of cellular functions as one radio communication circuit. Additionally, as stated above, a mobile device that could connect to either GSM or UMTS networks during the time of the invention is likely to have had a modem that handled controlling connections to UMTS and GSM networks. As stated in Section IX.A.2, modems typically performed processing separately from other parts of the device. Because Dua fails to address connecting to UMTS and GSM connections at all, Dua does not disclose the internal workings, such as how CPU 109, instead of the modem, would work to control connection to UMTS or GSM networks.

214. Accompanying descriptions of CPU 109 are no more illuminating. For example, cited paragraph [0060] of Dua states that "media player 100 includes a microprocessor 109 configured to execute instructions and to carry out various operations. In most instances, microprocessor 109 executes instructions under the control of an operating system or other software (e.g., media manager)." The vague

mention that "microprocessor 109 executes instructions under the control of an operating system" and that "[i]n most instances, microprocessor 109 executes instructions under the control of an operation system or other software" fails to disclose that microprocessor 109 actually executes instructions to control assignment of Bluetooth, Wi-Fi, GSM/UMTS, or NFC radios. In fact, it directly states the microprocessor only executes instructions under control of an operating system **in some instances**. This is not a statement regarding controlling of assignment and instead a very general statement about the microprocessor.

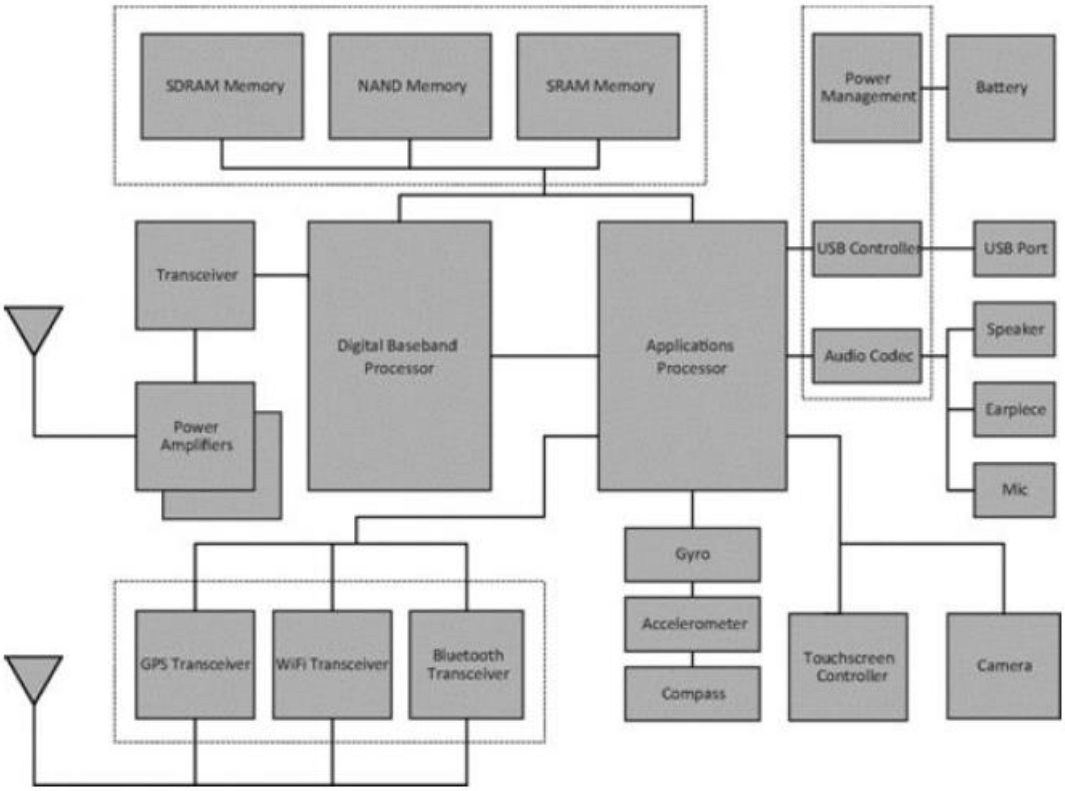
215. Additionally, Petitioners and Dr. Creusere also have not shown that CPU 109 controls assignment of connection of the cellular radios. Dua merely states that "CPU 109 is also connected to network transceiver 105 for interacting with a cellular network." EX1008 ¶ [0066]. But this general statement fails to discuss any details about processing done by the CPU to control assignment of connection of the cellular radio. The Petition makes the conclusory remark that "Dua discloses CPU 109 controls assignment of the cellular radios (UMTS, GSM) based on the SIP protocol and target information stored in a buddy list for the buddy indicated by the user." Pet. 32. But there is no actual language in Dua stating that the CPU executes code **in response** to such a user indication to control assignment of a cellular radio. The cited paragraphs, [0066]-[0069], [0178]-[0185], and [0192]-[0194] of Dua, fail

to even mention microprocessor/CPU 109 in relation to any of the actions being performed. Pet. 32; EX1008 ¶¶ [0066]-[0069], [0178]-[0185], [0192]-[0194].

216. It is my opinion that Dua discloses only general details and fails to disclose or render obvious information, such as actions executed by the CPU, that actually demonstrates that the CPU controls assignment of connection of each of the supposed first, second, and third radio communication circuits.

217. Furthermore, Petitioners and Dr. Creusere admits that Dua only discusses high level information and that a POSITA would turn elsewhere for more detailed information. EX1002 ¶ 199; Pet. 51. Dua is non-enabling with respect to this limitation and therefore fails to disclose or render obvious this limitation. Section IX.D.2.

218. No reference provided by Petitioner provides any actual description of a CPU controlling connection to Bluetooth, UMTS, and GSM/Wi-Fi. The references only show a portion of the system. On the other hand, other documents illustrate the use of different controllers that exercise control over Bluetooth versus UMTS connections, such as a modem or baseband processor, that "is responsible for processing all of the communication with the cellular network, based on data signals sent to and received from the air interface via the radio chipset." EX2026 at 240.



EX2026 Fig. 3.2 at 95.

219. Petitioner's references also confirm the idea that a separate component, such as a modem or baseband processor from a CPU that runs the main operating system, controls operation of cellular functionality rather than the CPU itself. EX1011 Fig. 3d (displaying "baseband processor" in relation to radio frequency front end). Petitioner provides no evidence that a CPU that would control assignment of Bluetooth, UMTS, and GSM/Wi-Fi connections, only separate parts of the process or parts that are too high-level to disclose the alleged functionality.

3. Combination

220. Dua cannot teach internal hardware implementation details of N93 for several reasons: (1) Dua does not address the capabilities of N93 and therefore could not address how to implement those details; and (2) Dua is non-enabling of the claimed features.

221. First, it is unclear how Dua could teach internal hardware implementation details of N93 when Dua fails to disclose or even discuss many of the capabilities, such as the ability to connect to GSM and UMTS networks, or settings related to "assignment of connection" that are alleged as present in N93. Since Dua fails to discuss these capabilities, it would follow that Dua fails to disclose or render obvious internal hardware implementation details of these capabilities. Further, contrary to the Petition's assertion, a POSITA would not be motivated to look to Dua for internal hardware implementation details of N93 because Dua fails to discuss these capabilities. Petitioners' and Dr. Creusere's explicit motivation for turning to Dua is that Dua would disclose the implementation details of N93. Pet. 12. However, because Dua does not disclose the same features and capabilities as N93, a POSITA would not turn to Dua for "implementation details."

222. Also, as described above in Section IX.D.2, Dua is non-enabling. This is admitted by the Petition itself and used as a motivation to turn to another reference in a different ground. Pet. 51. Dua simply is too high-level to disclose how a

controller controls assignment in response to specific user indications, particularly when it does not account for switching between GSM and UMTS networks or a modem at all.

J. N93 in view of Dua and Herle Fail to Disclose Limitation [1i]

223. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [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,."

224. This limitation is related to the same "controller" recited in limitation [1g], and therefore I incorporate by reference my opinions from Section IX.I here. For example, Petitioners and Dr. Creusere fail to prove that any controller is operating in response to user indications to control assignment of connection. N93 and Dua are much too high-level to disclose the internal workings when a user inputs a user indication. Further, Dua does not account for the user indications of N93 that deal with cellular radios that can connect to GSM and UMTS networks and therefore cannot disclose the specific implementation details of N93.

225. I also note that Dr. Creusere stated that "I haven't identified the exact point of assignment" and could not pinpoint where within these steps that assignment occurs. EX2030 28:14-15. He also discussed possibilities such as "the point at which

the processor determines which rate it's going to assign" but notably none of N93, Dua, or Herle discuss this feature.

226. Furthermore, Petitioners and Dr. Creusere also argue that a POSITA would be motivated to combine N93 and Dua. I disagree that a POSITA would be motivated to combine the two to include "normal user indications." Dua explicitly teaches against such "user configuration" and states that these normal user indications "make data exchange between the media devices **insecure** and **time consuming**" and that "[k]nown over-the-air techniques for configuration between two devices have also proven to be generally **insecure**." EX1008 ¶ [0009]. Therefore, N93 and Dua are directed to different goals, where Dua **teaches away** from manual user indications and instead teaches a method replacing normal user indications with automatic communication between devices.

227. Herle is not discussed at all in relation to this limitation.

228. Therefore, N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious this limitation.

K. <u>N93 in view of Dua and Herle Fail to Disclose Limitation [1j]</u>

229. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [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."

1. N93

230. Petitioners and Dr. Creusere rely on a set of different embodiments from N93 to disclose this combination:

a) "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." EX1002 ¶ 129; Pet. 36.

b) "A PC can be a target Bluetooth external device for video transfer." EX1002 ¶ 129; Pet. 36.

c) "N93 also explicitly teaches there can be simultaneous Wi-Fi and UMTS data packet connections." EX1002 ¶ 129; Pet. 36.

d) "N93 states that the Camera application does not support a Send option during a 'voice call'….But N93 does not disclose any similar limitation related to data connections, which are explicitly supported as described above, or the Gallery application." EX1002 ¶ 129; Pet. 36.

e) "N93 discloses Bluetooth can be used while running other applications." EX1002 ¶ 129; Pet. 36.

f) "Thus, a POSITA would have understood N93 discloses simultaneous Bluetooth video transfers and data packet connections over UMTS." EX1002 ¶ 129; Pet. 36.

231. None of these features alone discloses or renders obvious "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 simultaneously." If Petitioners and Dr. Creusere are asserting a combination of these different embodiments, they do not provide any indication of which features it proposes to combine or rationale to combine these different features of N93. I address each of these "features" in turn:

232. N93's discussion that the N93 can be used as a modem for a PC does not disclose or render obvious [1j] for several different reasons. First, there is no disclosure of transfer of video information in this portion of N93 at all. EX1010 at 83. There is nothing in N93 to show that it would support or enable the transfer of video information to the computer over a Bluetooth connection. Petitioners and Dr. Creusere do not even articulate a theory regarding the transfer of video information in relation to this limitation. In addition, the use of a mobile device as a modem indicates that the N93 device would first connect to the internet via the UMTS network, and any transfer of information using the mobile device as a modem would

occur **after** the connection is established, and using the N93 device as a pass through device. Based on this description, there is no transmission of video information over Bluetooth and while simultaneously connecting to the internet via the UMTS network.

233. Further, based on the technical capabilities at the time, it was not obvious for the Nokia N93 to support video transfer over Bluetooth while connecting to the Internet. These technical capabilities would render this supposed feature, particularly in combination with other alleged features, beyond ordinary skill or would require undue experimentation. At the alleged time of the Nokia N93's release (2006), mobile devices had limited hardware resources and were not optimized for true simultaneous communication across multiple wireless interfaces. Many UMTS and GPRS-capable mobile devices handled Bluetooth data and UMTS/GPRS traffic in a time-multiplexed fashion, meaning they switched between the two rather than running them simultaneously. Even when used as a modem, Bluetooth data transfers were typically paused or deprioritized when UMTS/GPRS was actively transmitting. In addition, as described above in relation to Section IX.F, N93 did not include Bluetooth 2.0+EDR data rates and did not have higher transfer rates than 1Mbps as alleged by Petitioners and Dr. Creusere, which would make this feature even more non-obvious. Pet. 15.

234. There is no evidence that the Symbian S60 software stack used in the N93 included an advanced networking stack capable of full-duplex operation across multiple wireless interfaces. If the N93 could connect a PC via Bluetooth and connect to UMTS/GPRS networks to fetch internet data, it likely did so in an alternating (not simultaneous) manner, meaning one connection had to wait while the other was active.

235. Prior to November 2007, RF coexistence between Bluetooth and UMTS/GPRS technologies was a major issue, as both technologies used adjacent frequency bands: UMTS (3G) operates at 1900/2100 MHz, while GSM/GPRS operates at 900/1800 MHz (depending on the region). Bluetooth operates in the 2.4 GHz ISM band, which would require the Bluetooth and UMTS transceivers to operate at nearby RF frequencies without interference.

236. Without sophisticated RF filtering, simultaneous use of UMTS and Bluetooth could cause significant interference, leading manufacturers to implement sequential transmission rather than true concurrency. If the N93 did not have dedicated RF isolation technology, and there is no evidence that it did, then when UMTS/GPRS was actively transmitting, Bluetooth performance would be degraded or temporarily suspended. If one service were transmitting while the other was attempting to receive, it is quite likely that the receiving system could be overloaded, preventing reception of weak signals.

237. Bluetooth tethering was severely constrained by low bandwidth and high latency at the time for the latest Bluetooth standard at the time (Bluetooth 2.0+ EDR): Bluetooth 2.0+ EDR maximum practical data rate was ~2 Mbps (theoretical max ~3 Mbps). As stated previously, the Nokia N93 device did not even support the higher data rates of Bluetooth 2.0+EDR. Section IX.F. Instead, evidence indicates that the Nokia N93 device actually was linked to Bluetooth 1.1, 1.2, or 2.0 and could not support the higher speeds linked to Bluetooth 2.0+EDR. EX1010 at 84; EX2029 at 1.

238. UMTS speeds in 2006 were typically around 384 Kbps (pre-HSDPA), while GPRS was much slower (~40-80 Kbps). Additionally, the Bluetooth PAN (Personal Area Network) profile was not optimized for high-speed, full-duplex data transfer.

239. Even if the N93 could theoretically act as a modem over Bluetooth, the connection would not have been true simultaneous operation—it would have been alternating or heavily constrained to the point that it could not support simultaneous video transfer over Bluetooth while connecting to the Internet via UMTS. There is evidence of no Nokia documentation from 2006 that states that the N93 was designed for full-duplex modem functionality over Bluetooth and UMTS/GPRS.

240. Industry practice at the time was to allow Bluetooth modem functionality via sequential data handling, not full parallel transmission. Many

mobile devices required the Bluetooth PAN connection to be paused or throttled while UMTS/GPRS was in use.

241. If Nokia itself did not market or document this functionality as a simultaneous feature, then it is unlikely that the N93 was designed or intended to operate that way.

242. Next, the fact that "A PC can be a target Bluetooth external device for video transfer" only describes an isolated action of transferring video information and does not disclose the simultaneous transfer of video information over Bluetooth while connecting to the internet using a cellular radio.

243. Dr. Creusere's statement that "N93 also explicitly teaches there can be simultaneous Wi-Fi and UMTS data packet connections" includes several problems. EX1002 ¶ 129. First, Dr. Creusere's citations do **not** support this assertion at all—page 18 does not show that there is simultaneous Wi-Fi and UMTS data packet connections. Next, this statement bears no relevance to the simultaneous transfer of video information via **Bluetooth** while connecting to the Internet using a cellular radio via the UMTS network.

244. I also disagree with Petitioners' and Dr. Creusere's statement that "N93 states that the Camera application does not support a Send option during a 'voice call'….But N93 does not disclose any similar limitation related to data connections, which are explicitly supported as described above, or the Gallery application."

EX1002 ¶¶133. Dr. Creusere asserts that because there is no specific restriction detailed in N93, that the option must have been possible. EX1002 ¶129.

245. This is quite circular, as Petitioners and Dr. Creusere are depending on the **absence** of information to **positively** disclose or render obvious a feature (simultaneous operations). This is essentially an alleged combination of different embodiments with no explanation or rationale on how to combine them except for the fact that there is nothing explicitly prohibiting it. But this cannot be enough. There is also nothing enabling or supporting simultaneous functionality of any of these actions. A POSITA would not expect a user manual to explicitly disclose prohibitions on every inoperable action on a device. Additionally, other contemporaneous evidence, such as the SAR report for the Nokia N93, indicate that there was no simultaneous use of Bluetooth to transmit video information while connecting to a UMTS network. EX1017 at 16. Further, the limited nature of mobile devices at the time would similarly suggest to a POSITA that these were not possible. Also, prior art must be enabling, but for the reasons listed above in Section IX.D.1, a user manual would not enable a POSITA to make this claimed feature (or any other claimed feature), and I do not understand how the absence of information would enable a POSITA to make such a device.

246. Petitioners and Dr. Creusere also state that "N93 discloses Bluetooth can be used while running other applications." Pet. 36. This is a mischaracterization

of N93. N93 only discusses that "Features using Bluetooth technology, or allowing such feature to run in the background while using other features, increase the demand on battery power and reduce the battery life." EX1010 at 84. Therefore, N93 does **not** disclose that features using Bluetooth technology can be used while running other **applications,** or specifies which features can be used while running Bluetooth in the background. There is no discussion of using Bluetooth while also using other wireless communication technology, in particular with the internet, such as using the cellular radio to connect to the Internet.

247. Lastly, Petitioners and Dr. Creusere state that "Thus, a POSITA would have understood N93 discloses simultaneous Bluetooth video transfers and data packet connections over UMTS." EX1002 ¶129. To support this contention, Dr. Creusere provides no supporting evidence. This cannot be enough to disclose or render obvious [1j]. The fact that there can be individual actions in the N93 fails to disclose or render obvious that these actions can occur simultaneously, especially in a resource-limited device. Further, none of these actions support simultaneous functionality and as stated previously, technical limitations and resource constraints of mobile devices at the time would not have rendered this simultaneous functionality obvious.

248. Therefore, N93 fails to disclose or render obvious this limitation, whether different features are taken alone or in combination.

2. Dua

249. It is further my opinion that Dua, alone or in combination with N93, does not disclose or render obvious limitation [1j]. Petitioners and Dr. Creusere cite Figures 8a-11 and accompanying descriptions of Dua to allege live video streaming over Bluetooth while simultaneously connecting to the internet to receive video data. EX1002 ¶ 130. These cited sections of Dua disclose varying actions of media player 100A and 100B in connecting with other devices. Figure 10 of Dua is reproduced below for reference.

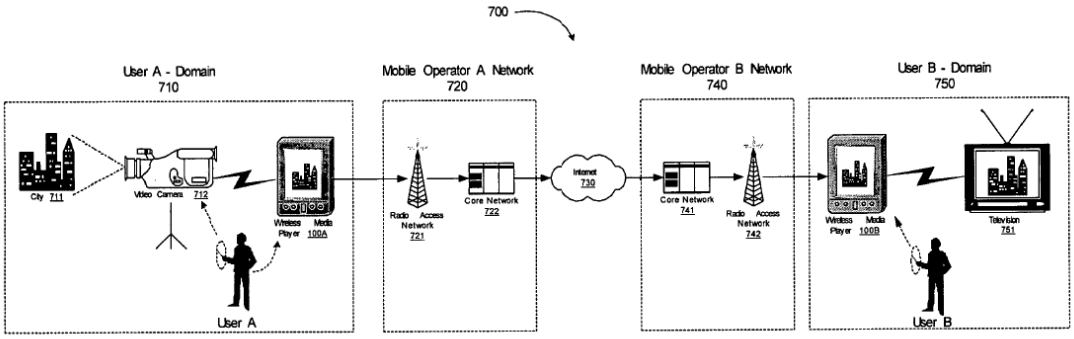


FIG. 10

EX1010 Fig. 10.

250. Based on these sections, the Petition alleges that Dua discloses "player 100A receiving video via Bluetooth and transmitting the video via UMTS to internet 730." Pet. 36-37. This is untrue.

251. First, Petitioners and Dr. Creusere fail to actually map these actions to a controller controlling each of the first and second radio communication circuits.

EX1002 ¶ 130; Pet. 36-37. Dua merely discloses a high level functional representation of a media player terminal interface with no actual details on the network transceiver itself. EX1008 Fig. 1. For example, Dua fails to provide any detail on how any alleged circuits within the network transceiver would work to control connection to GSM or UMTS networks. For example, Dua fails to account for a separate controller controlling assignment for Bluetooth and a separate modem controlling assignment of UMTS. Therefore, Dua fails to disclose actual details of a controller that executes control to perform any alleged actions such as how a CPU would control both Bluetooth and UMTS connections when processing of cellular connections was usually separated out into a modem. For example, as stated above, a POSITA would know that in many advanced mobile devices, a CPU or application processor controls assignment of the short range transceiver and a modem controls assignment of the network transceiver. There is nothing in Dua that discloses how operation to specific types of cellular networks would work.

252. Additionally, Petitioners and Dr. Creusere makes conclusory assumptions that video streaming is occurring over Bluetooth (instead of a different wireless protocol) without providing evidence from either reference to support its allegations. Figure 10 explicitly discusses a video **streaming** scenario as opposed to a video **file** transferring scenario. Video streaming is directed to real-time video display and play while transferring from another device. Conversely, in a video file

transfer scenario, the entire file must be transferred before a video can be played. This is an important distinction because these are two different methods of video delivery and it is my opinion that it was non-obvious and beyond ordinary skill to support video **streaming** over Bluetooth in devices such as the media player in Dua or mobile device of N93 during the time of the invention in light of the references cited by Petitioners and Dr. Creusere.

253. Petitioners and Dr. Creusere **only** provide evidence that Dua discloses video file transfer over Bluetooth but fails to provide evidence that Dua discloses video streaming over Bluetooth. Dua merely states that a video camera is "recording a city landscape 711 and simultaneously transmitting the video feed to the wireless media player 100A" and does not specify that the user is using Bluetooth to stream live video. EX1008 ¶[0192]. There is nothing in Dua that suggests that Bluetooth can be used to stream live video.

254. In fact, N93 and Dua explicitly exclude the Bluetooth profile—the Video Distribution Profile—that is needed to support streaming video over Bluetooth. EX1022 at 1, 8. N93 specifically excludes the Bluetooth profile that would support video streaming and only lists supported Bluetooth profiles such as "Basic Printing Profile, Generic Access Profile, Headset Profile, Hands-Free Profile." EX1010 at 84. Dua also only discusses the use of Bluetooth streaming in relation to **audio** streaming and lists examples of supported Bluetooth profiles as

"handsfree," and "handset" which are audio- (not video-) related features. EX1008 ¶ [0138]. Additionally, any time Dua explicitly discusses Bluetooth in relation to an example scenario, Dua only discusses Bluetooth in relation to scenarios involving audio streaming while not mentioned in any scenario involving video streaming. For example, Dua discloses a media player and a headset paired via Bluetooth, two media players that are paired to transmit music via Bluetooth, or a Bluetooth-enabled stereo. EX1008 ¶¶ [0126], [0128], [0159]. In contrast, when Dua discusses streaming video, Dua excludes Bluetooth and instead discusses an example of using a broadcast signal. EX1008 ¶ [0198]. Therefore, there is nothing in Dua that would suggest implementing Bluetooth **video** streaming or enable it.

255. It would not be obvious to implement video streaming over Bluetooth while simultaneously connecting to the Internet in light of N93 or Dua as proposed by Petitioner. N93 and Dua do not render obvious [1j] using the methodology proposed by Petitioner. A POSITA would not be motivated to specifically arrive at this combination of simultaneous communications specifically because Bluetooth circuity disclosed in Dua and N93 had various bandwidth limitations. For example, streaming video requires substantial data transfer rates and low latency. EX2010 at 225 ("Bluetooth wireless technology is a hot research topic….Unfortunately, It is not suitable for traditional media encoding and real time transition [] due to limited bandwidth[], high degree of error rates[,] and the time varying nature of radio link.").

256. The difficulty of implementing Bluetooth streaming would be beyond ordinary skill and would require undue experimentation, especially in consideration of implementing Bluetooth streaming in conjunction with the other claimed features, such as simultaneous connection with UMTS to connect to the Internet during the time of the invention. EX2010 at 225. Multiple sources have contemplated the difficulty in implementing streaming video over Bluetooth. EX2010 at 225.

257. The non-obviousness of implementing streaming video over Bluetooth is reflected by the fact that I am not aware of any products that during the time of the invention or even today, have implemented feature to enable streaming video over Bluetooth. While Dr. Creusere is insistent that *today's* technology implements Bluetooth video streaming, he was similarly unable to identify any products that successfully implemented Bluetooth video streaming:

Q. In your experience have you used a consumer device to stream video over Bluetooth?

A. Yes, I certainly have.

Q. Can you describe what that process looked like and what sort of device you used.

A. Well, I mean I've used -- if I -- if I share my screen on my Apple TV from my lap -- my -- my -- Mac -- MacBook laptop, then -- and used that to show a video from my computer, then I'm -- then I'm streaming video from one device to another one.

Q. And is that using Bluetooth?

A. Honestly, I'm not sure.

Q. Is there a process -- is there a product that you are sure of that has the capability to stream video over Bluetooth.

258. EX2030 56:7-21. Petitioners's and Dr. Creusere's viewpoints are based on a misunderstanding of video streaming technology. For example, Dr. Creusere also erroneously thought of streaming technology such as AirPlay as occurring over Bluetooth. EX2030 56:7-21. However, AirPlay uses screen mirroring or streaming over Wi-Fi, **not** Bluetooth. EX2033 at 1. When streaming video using AirPlay, Wi-Fi is used and not Bluetooth.

259. Additionally, to stream video over Bluetooth in N93 or Dua while simultaneously using UMTS circuit, video data must be heavily compressed to fit into Bluetooth's bandwidth. The compression required to transmit video over Bluetooth would tax the processing capabilities of the processor doing the video

compression possibly precluding real-time streaming. The Bluetooth circuitry of Dua and N93 also has higher latency than other wireless communication technologies, such as Wi-Fi, that would cause delays, synchronization issues, etc. with video streaming. Therefore, a POSITA would not be motivated to specifically arrive at the proposed combination of simultaneous communication specifically using Bluetooth for video streaming and UMTS for cellular communication, as such exchanges would come with its challenges. Media streaming over Bluetooth connection is a huge challenge. It would be beyond ordinary skill to include the feature of Bluetooth streaming while simultaneously connecting to the Internet via UMTS, particularly in combination with other claimed features.

260. Integrating video streaming over Bluetooth onto a cellular device with other communication hardware would create difficulties because of the limited resources, design constraints, health and safety concerns, regulatory compliance (which was the purpose of a mobile device), etc. A POSITA would use existing circuitry and solutions in N93 or Dua to stream video non-simultaneously and over a different wireless protocol (e.g., Wi-Fi) instead of specifically arriving at the claimed combination based on hindsight.

261. These problems are further exacerbated when suggesting that video streaming over Bluetooth occurred while simultaneously connecting to the Internet. As described above in relation to N93, mobile devices had limited hardware

resources and were not optimized for true simultaneous communication across multiple wireless interfaces.

262. As stated previously in relation to N93, early 3G and GPRS-capable phones handled Bluetooth data and UMTS/GPRS traffic in a time-multiplexed fashion, switching between the two in an alternating manner rather than running them simultaneously. Mobile devices during this time would switch between the two rather than running them simultaneously. For example, Bluetooth data transfers were typically paused or deprioritized when a cellular radio was actively transmitting to a UMTS network. Furthermore, the Bluetooth Personal Area Network (PAN) profile was not optimized for high-speed, full-duplex data transfer, resulting in alternating or constrained connections.

263. It would be nonobvious to implement an advanced networking stack capable of full-duplex operation across multiple wireless interfaces, as indicated by Petitioners and Dr. Creusere. RF coexistence between Bluetooth and UMTS/GPRS was a significant issue, as both used adjacent frequency bands.

3. Combination

264. After alleging that N93 and Dua each individually disclose element [1j], Petitioners and Dr. Creusere then depend on a "combination" of N93 and Dua to disclose this element. Pet. 13. Dr. Creusere relies on on circular reasoning to support these allegations. For example, Dr. Creusere states:

> 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.

EX1002 ¶77. Here, the Petition relies on the **absence** of prohibiting a feature to support a positive disclosure of the feature. This type of circular reasoning cannot be enough to establish a finding of obviousness. In addition, the absence of information cannot enable such a device to be made. As stated above, neither N93 nor Dua disclose or render obvious simultaneous technology. Further, given technological limitations at the time, Petitioners' and Dr. Creusere's arguments of what was possible during the time of the invention were not technically possible, beyond the level of ordinary skill, and/or not enabled by the prior art.

L. <u>N93 in view of Dua and Herle Fail to Disclose Limitation [1k]</u>

265. It is my opinion that N93 in view of Dua and Herle fails to disclose or render obvious limitation [1k]: "wherein the second or third radio communication circuits receive 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 the video processing apparatus is stored in the video processing apparatus after execution of the update process."

266. At the time of the ’241 Patent, it would not have been obvious to a POSITA to combine N93 with Dua and Herle. Petitioner’s statement as to why N93, Dua, and Herle should be combined is conclusory and unsupported by sufficient evidence and analysis.

267. Claim element [1k] requires at least: (a) receiving a signal from the internet indicating that an update for an operating system of the video processing apparatus is available; (b) executing an update process such that an updated operating system of the video processing apparatus is stored in the video processing apparatus after execution of the update process; and (c) executing the update process by the video processing apparatus itself. N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim limitation [1k].

1. N93

268. N93 fails to disclose or render obvious this limitation and further, Petitioners and Dr. Creusere fails to provide any evidence or arguments to the contrary. Petitioners and Dr. Creusere only present evidence that N93 discloses application downloads. EX1002 ¶ 132; Pet. 38. Regarding this application downloads, N93 discusses updating applications using a “pull type system.” EX1010 at 115. Therefore, N93 only discloses pulling updates, does not disclose “receiving a signal from the internet indicating that an update” is available), and only discusses these updates in relation to *applications* and not its operating system.

269. N93 also states that "After you install applications to a compatible memory card, installation files (.sis) remain in the device memory. The files may use **large amounts of memory** and prevent you from storing other files." EX1010 at 22. N93 thus discusses a very limited storage available. N93 also states "Only install and use applications and other software from trusted sources, such as applications that are Symbian Signed or have passed the Java VerifiedTM testing." EX1010 at 72. Thus, N93 discusses security concerns with installations and software changes.

270. In addition, N93 specifically discloses a system that involves the use of tethering to a computer and using "Nokia PC Suite" to install files. EX1010 at 115. Tethered updates provided many advantages versus OTA updates during the time of the invention. For example, tethered updates allowed for greater control, reliability and offline capability. EX2034 at 2. This was particularly advantageous during the time of the invention of the '241 Patent, because cellular networks were not as reliable as they are known to be today:

> In the early 2000s the term "3G" was used to create perception in the mind of the consumer that they would be able to browse the Internet from their mobile phone using a high-speed data connection, much as they would from their desktop PC. Although this was technically possible, the user experience was pretty poor, and **much work was still required to understand how to deliver Internet-based services and content to a mobile successfully**.

EX2026 at 32. If there were issues with wireless connectivity with the network (and there were many during the time of the invention of the ’241 Patent), it would interrupt the update and possibly render the device inoperable, weighing against implementation of OTA operating system updates. EX2034 at 2.

271. In addition, there are many complexities with implementing OTA operating system updates with a device that is complex and includes advanced features (such as the claimed features). For example, the N93 itself, because it included many advanced features, was known to be an inherently instable device, and there were many difficulties in implementing updating capabilities in the N93. EX2035 at 1. Because of the inherent instability of such a handset, a POSITA would not be motivated to implement over-the-air operating system updates in such a device because of the various disadvantages.

272. Dr. Creusere did not “evaluate[] the relatives strengths and weaknesses specifically of using a delta-based update process versus using some other non-delta-based update process.” EX2030 63:21-64:1. However, it is important to weigh both the advantages and disadvantages when considering whether it was obvious to combine certain features.

273. Instead, development history reflects that it was non-obvious for various reasons to implement OTA operating system updates in particular devices like the N93. For example, the Android operating system did not implement OTA

operating system updates until 2009 and Apple did not implement OTA operating system updates until 2011. EX2034 at 1.

274. Further, N93 fails to support any evidence of updating an **operating system**. A single application can easily be terminated and replaced during an update with minimal impact on the overall device operation, other than the application not being available. Applications are relatively small in the grand scheme of things, so they can be transferred and replaced. The operating system is the life blood of the system and if it stops, the entire system is useless. It is also relatively large, so even if the update itself is small, for safety, one must be able to transfer a significant amount of information reliably and switch to the updated code safely lest the system be in a state from which recovery is impossible without some external operation, *e.g.*, taking a non-working phone to the store or service center.

2. Dua

275. Dua also fails to disclose [1k] and Petitioners and Dr. Creusere fail to provide any evidence or arguments to the contrary. Petitioners and Dr. Creusere merely assert that Dua's "devices may be 'updated' with new [media processing] capabilities" but this does not disclose actual operating system updates. Pet. 17; EX1002 ¶ 80. Instead, Dua only discloses updating media capabilities, RFID tags, and data stored in "device profile." EX1008 ¶¶[0143], [0151], [0154]. Dua is silent regarding receiving any indication that an update for an operating system is available

over the internet or updating the **operating system** at all. Furthermore, Dua even discloses that "[k]nown over-the-air techniques for configuration between two devices have also proven to be generally **insecure**." *Id.* ¶[0009]. Therefore, Dua teaches against using over-the-air techniques for transferring information, such as transferring information for operating system updates.

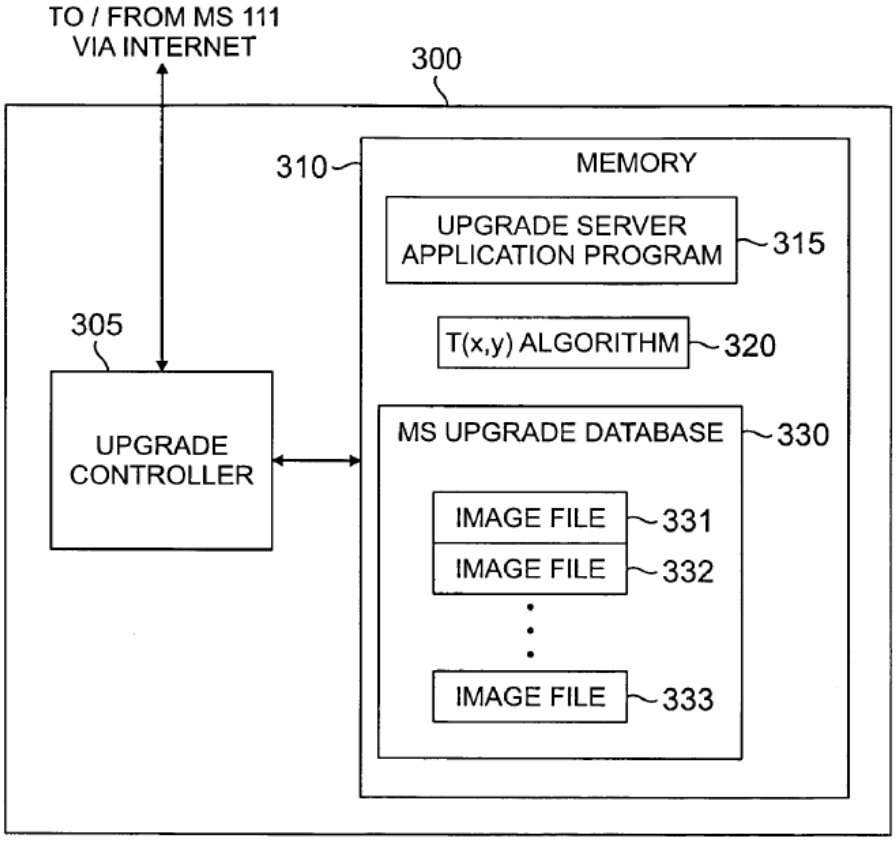
276. Based on this, Petitioners and Dr. Creusere fail to establish that it would have been obvious to combine N93, Dua, and Herle. Petitioners and Dr. Creusere fail to align the rationale towards actual claim limitations, which are directed to updates to an **operating system**. Pet. 17. There is no disclosure or any suggestion in N93 or Dua of **updating an operating system**. Instead, they both emphasize a "secure" environment and teach away from over-the-air operating system updates. EX1008 ¶[0009]; EX1010 at 72. As stated previously, it was more difficult and beyond ordinary skill to implement operating system updates for advanced devices such as the devices in N93 or Dua that included the capabilities alleged by Petitioner.

277. Similarly, as stated above with respect to N93, it would not have been obvious to implement OTA operating system updates in a system such as Dua which includes multimedia processing capabilities. The unstable nature of cellular networks, in combination with the unstable nature of specialized mobile devices such as the N93 device or the device discussed in Dua, would make implementing

OTA operating system updates non-obvious, for example, because it was beyond ordinary skill to implement.

3. Combination of N93, Dua, and Herle

278. Petitioners and Dr. Creusere only allege that N93 and Dua disclose "updating or repairing an existing application" or that Dua's "devices may be 'updated' with new [media processing] capabilities." Pet. 17-18. There is no evidence regarding whether the operating systems in N93 and Dua could be updated at all. In particular, Herle discusses a device that is much less complex than the devices in N93 and Dua. In this case, "it is unclear why a POSITA would look to Herle to incorporate delta-based over-the-air updates for operating systems for two devices that *do not support updates for operating systems*…Herle describes improving mobiles devices *already capable* of performing operating system upgrades." EX2009 ¶78. Herle also discloses "specific requirements to enable OTA delta updates, including the creation of an 'upgrade server 300' with specific software, hardware, and network capabilities. EX2009 ¶76; *see* EX1009 Fig. 3.



EX1009 Fig. 3. "At a minimum, Herle requires provisioning of a specially designed server having an upgrade server application program 315, T(x,y) algorithm 320 to generate change files, an upgrade database 330, and an upgrade controller 305….Next, Herle requires that each mobile station be equipped with a specially programed upgrade control program 262, which requires additional memory resources, and an algorithm program 263 to be able to handle a delta file." EX2009 ¶77.

279. There was no motivation to change the updating process on devices such as the device in N93 or Dua. Nokia already discusses a methodology using the

Nokia PC Suite to install files. EX1010 at 115. While delta-based updates had been known for years, Nokia explicitly chose use of a different system of updates that included the use of specialized software on a PC. In my opinion, the advanced feature set of the N93 device or device in Dua, made the device more difficult to update, and it was preferred to update devices using a wired connection, if possible, due to the limitations of cellular networks at the time.

280. A POSITA would have understood in November 2007 the disadvantages greatly outweigh the advantages in implementing over-the-air operating system updates on a device like the device discussed in N93 or Dua. For example, OTA updates are generally more insecure and susceptible to failure. Cellular networks during the time of the invention were not as robust as cellular networks today, and were prone to disruption. Such network instability could lead to an interrupted update, which, in turn, could corrupt a device without an easy recovery path. In addition, wireless connections are known to be less secure.

281. On the other hand, updating a mobile device through the use of a computer allowed for a system where the computer could back up important files and provide more recovery than OTA updates. Additionally, wired connections are generally known to be more stable than wireless connections. It was unlikely that a wired connection would be disrupted and interrupt an update, therefore lessening the risk of device corruption due to a connection disruption.

282. Weighing these advantages and disadvantages led many POSITAs to not implement over-the-air updates. It also was beyond ordinary skill to implement such updates in November 2007. This is apparent through the design of the N93 device itself, which did not implement over-the-air operating system updates. This is also reflected by the development history of devices such as the iPhone, which did not implement OTA updates until 2011, around four years after the release of the original iPhone, despite the fact that other systems implemented delta-based updates. Because over-the-air connections are considered to have more security risks, it took Apple additional time to provide a secure methodology of implementing OTA operating system updates.

283. Additionally, or alternatively, it would take more than ordinary skill to implement an over-the-air operating system update on a device such as the N93 based on N93, Dua, and Herle, as suggested by Petitioners and Dr. Creusere. As stated, even the tethered method of updating caused issues in the handset and many people faced difficulties in updating the N93 device. As described above, the N93 had many advanced features that made it "inherently unstable." EX2035 at 1. This indicates that the advanced features of the N93 created greater complexities with implementing operating system updates than with a simpler device. For example, updating one part of a system can cause failures in others if dependencies are not managed correctly.

284. Further, introducing over-the-air updates would introduce even more processing requirements on a device that was already at capacity due to a multitude of advanced features. As taught by Herle, a mobile device would need to be able to download the file and implement a process to update the operating system without the extra power or storage of a computer. During this time, storage and processing power were limited. It is likely that developers would wait until devices were more capable and could handle updates independently and securely.

285. Beyond improper hindsight, there is no motivation to overhaul N93 or Dua's system to add the option of OTA updates. For example, N93 was a consumer device from Nokia being sold worldwide….In order to have a uniform customer experience, Nokia would need to have servers all over the world to be able to support updates to its operating system. Adding such servers would increase the costs and require a significant infrastructure investment. In addition, given the high number of phones sold, the MS upgrade database 330 would need to have numerous verisons of 'image files' 331-333 to be able to accurately generate delta files for a particular device that needs to be updated." EX2009 ¶78.

286. N93 specifically instructs against downloading software that are not Symbian Signed or have passed the Java Verified™ testing, meaning Nokia was averse to having third-party servers host such upgrade programming. Further, Symbian was not an open source operating system until after 2009….Instead, it was

a proprietary operating system with a very complex file structure and features. *See* EX2011; EX2012 ("a large OS, containing hundreds of classes and thousands of member functions").

287. Servers would need "large amounts of processing resources and memory just to be able to implement Herle's system and generate delta files. Due to the limited bandwidth of the UMTS/GSM networks during the time of the invention, it would be nonobvious to handle receiving such delta files over cellular networks.

288. Similarly, significant computing resources would be needed on the devices of N93 and Dua to determine the differences between the received delta file and the existing operating system, compare them, then execute a process whereby the phone is reimaged with a completely new operating system. N93 specifically recites limited memory resources. The limited memory and/or processor resources would not motivate a POSITA to handle such a significant reimaging of the operating system. Additionally, Petitioners and Dr. Creusere fail to reconcile the fact that Dua specifically calls over the air configurations "generally insecure." EX1008 ¶[0009].

289. Further, historical evidence shows it was not obvious to implement OTA operating system updates for specialized devices like N93 or Dua in light of systems like Herle. For example, development history of the Symbian operating system (the operating system of N93) refutes Petitioners and Dr. Creusere's

contention that it would have been obvious to combine N93's teachings with Herle's teaching of OTA updates for operating system. EX2013.

290. Specialized devices like the N93 also had delays in implementing OTA operating system updates, even in light of delta-based update technology of Herle. For example, as stated previously, Apple did not support OTA operating system updates until the release of iOS 5.0 in 2011. EX2009 ¶83; EX2014; EX2015. The complexities and disadvantages, such as the difficulty in implementing OTA updates in complex devices like the N93 and the insecure and unstable nature of OTA updates would have made it non-obvious to implement OTA updates. Additionally, there would be no reasonable expectation of success during the time of the invention, which is reflected by the development history of mobile phones and when they implemented OTA updates.

291. Therefore, a POSITA would not find implementing OTA updates to operating system of Herle into N93 or Dua to be a matter of routine skill. EX2009 ¶84. To the contrary, the state of the art at that time shows that updates to closed and proprietary operating systems were not supported at that time in view of memory constraints, network bandwidth concerns, and the desire of entities to limit access to their proprietary operating systems.

292. This is confirmed by Herle's own disclosures because just to achieve OTA updates, Herle discloses a specialized system with significant investments in

network infrastructure that requires specialized servers working in conjunction with specialized software on each device to accomplish this task. To accomplish Herle's disclosure, a system would need to be designed from the start to comply with all of Herle's requirements, which is not something that can be achieved retroactively in a proprietary and close-ended device like N93 or Dua. Petitioners and Dr. Creusere fail to address this evidence or the state of the art of implementing OTA updates in operating systems of proprietary systems, instead just providing a conclusory and hindsight driven analysis.

293. Therefore, a POSITA would not have considered it obvious to combine N93, Dua, and Herle.

M. N93 in view of Dua and Herle Fail to Disclose Claim 4

294. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 4. Claim 4 depends from claim 1. Therefore, claim 4 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

295. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

N. N93 in view of Dua and Herle Fail to Disclose Claim 5

296. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 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. Claim 5 depends from claim 1. Therefore, claim 5 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

297. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

298. Further, I add some additional opinions. Claim 11 recites a fourth radio communication circuit, including a fourth transmission frequency band that is different from the first, second, and third transmission frequency bands, and a controller that controls assignment of connection of each of the first, second, third, and fourth radio communication circuits.

1. NFC

299. The specific combination of capabilities in one mobile device during the time of the invention was non-obvious according to Petitioner's mappings: Bluetooth + UMTS + GSM + NFC (Mapping A), or Bluetooth + UMTS + Wi-Fi + NFC (Mapping B).

300. The specific combination of capabilities in one mobile device during the time of the invention was non-obvious according to the mappings: Bluetooth + UMTS + GSM + NFC (Mapping A), or Bluetooth + UMTS + Wi-Fi + NFC (Mapping B).

301. Dua does not disclose or render obvious a device with all these capabilities. Dua was drafted to be as applicable as possible to potential combinations and forward-looking with potential technologies but does not actually enable a device with the specific combination of technologies alleged by Petitioners and Dr. Creusere at the time of invention. Section IX.D. This is supported by the development history. It was not until years after November 2007 that manufacturers released products with four radio communication circuits that included NFC support. Section IX.D. If a mobile device did include NFC, it did not include the specific combination of other capabilities argued by Petitioners and Dr. Creusere, such as Wi-Fi capability or the ability to connect to UMTS networks.

302. In addition, for the reasons set forth above in relation to limitation [1g], the N93-Dua-Herle combination fails to disclose or render obvious that a controller controls assignment of all four circuits. Section IX.I.

2. GSM

303. The specific combination of capabilities in one mobile device during the time of the invention was non-obvious according to the Petition's mappings: Bluetooth + UMTS + Wi-Fi + GSM (Mapping B).

304. For the reasons set forth above in relation to limitation [1g], N93-Dua-Herle combination fails to disclose or render obvious that a controller controls assignment of all four circuits. Section IX.I. For example, a modem would typically be used to control assignment of connection to GSM and UMTS networks. Further, a POSITA would not consider GSM and UMTS as two "radio communication circuits." Instead, a POSITA would consider GSM and UMTS to be different modes of one cellular chipset. Section IX.E.

305. Therefore, N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 5.

O. <u>N93 in view of Dua and Herle Fail to Disclose Claim 6</u>

306. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 6: The video processing apparatus of claim 1, wherein the third transmission frequency band is

different from the first and second transmission frequency bands. Claim 6 depends from claim 1. Therefore, claim 8 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

307. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

308. Additionally, I note that Petitioner has only set forth rationale regarding one specific mapping: Mapping A. Pet. 43. Therefore, Petitioner has conceded that Mapping B does not disclose or render obvious claim 6.

P. N93 in view of Dua and Herle Fail to Disclose Claim 8

309. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 8. Claim 8 depends from claim 1. Therefore, claim 8 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

310. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

Q. N93 in view of Dua and Herle Fail to Disclose Claim 9

311. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 9. Claim 9 depends from claim 1. Therefore, claim 9 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

312. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

R. N93 in view of Dua and Herle Fail to Disclose Claim 10

313. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 10. Claim 10 depends from claim 1. Therefore, claim 10 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

314. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

315. Further, I note that claim 16 discusses an **application** update instead of an operating system update. However, Petitioner cites the same rationale as

limitation [1k]. Pet. 44. Petitioner's rationale is insufficient for the reasons set forth above in relation to limitation [1k] and also for the additional reasons below. Section IX.L.

316. Similarly to claim element [1.k], claim 10 requires at least: (a) receiving a signal from the internet indicating that an update for an application is available; (b) executing an update process such that an updated application is stored in the video processing apparatus after execution; and (c) executing the update process by the video processing apparatus itself.

317. N93 fails to disclose all of these parts and the Petition fails to provide any evidence or arguments to the contrary. For example, N93 fails to disclose (a) because N93 only discloses "install[ing] a file that contains an update or repair to an existing application" via using the Nokia Application Installer on a PC. EX1010 at 115. Therefore, N93 only discloses pulling a file with an update to an application rather than receiving a signal from the internet indicating that an update is available. N93 also fails to disclose (c) because N93 discloses that installation is executed by another device ("You can use Nokia Application Installer in Nokia PC Suite to install an application to your device") and fails to disclose that the N93 device is executing the application update process itself. EX1010 at 115.

318. Dua similarly fails. Petitioners and Dr. Creusere merely assert that Dua's "devices may be 'updated' with new [media processing] capabilities." Pet. 17;

EX1002 ¶ 80. Dua fails to disclose (a) because Dua is silent regarding receiving any indication over the internet about an application update. Dua also fails to disclose (b) and (c) because Dua fails to disclose any details about the application update process, such as whether the updated application of the video processing apparatus is stored in the video processing apparatus after execution of the application update process or whether the multimedia player executes the application update process itself. *See, e.g.*, EX1008 ¶¶[0143], [0151], [0154]. Similarly, Dua does not disclose that the media device of Dua is executing an update process versus using another device to flash Dua, rather than the media device of Dua executing an update process itself.

319. Next, as stated above in relation to Sections IX.B and IX.L, it was non-obvious to implement application updates by combining N93, Dua, and Herle. I that N93, Dua, and Herle could not be combined based on the difficult nature implementing updates in complex devices such as in N93 and Dua.

S. <u>N93 in view of Dua and Herle Fail to Disclose Claim 11</u>

320. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 11.

321. Claim 11 depends from claim 1. Therefore, claim 11 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

T. N93 in view of Dua and Herle Fail to Disclose Claim 12

322. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 12: "The video processing apparatus of claim 1, wherein the second modulation scheme comprises quadrature amplitude modulation (QAM)." Claim 12 depends from claim 1. Therefore, claim 12 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

323. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

324. Additionally, N93, Dua, and Herle fail to disclose or render obvious that a mobile device with all the claimed capabilities would use a QAM modulation scheme.

325. As stated above in relation to limitation [1b], Petitioners and Dr. Creusere assert a mapping that applies specifically to **UMTS** networks. Pet. 8; Section IX.G. The references cited in the Petition and by Dr. Creusere confirm that QAM is a modulation scheme associated with a **different** technology from UMTS—HSDPA. EX1011 ¶ [0010]. Dr. Creusere and Petitioners do not account for or assert even argument that involves the modification or combination based on implementing

other wireless communication technology (such as support for HSDPA) or account for integrating hardware components that support other wireless communication technology in combination with other claimed features.

326. Additionally, N93 discusses an ability to connect to UMTS networks, but does **not** discuss HSPA capability. The SAR report further supports that N93 did not have HSPA capability. As stated in Sections IX.C, IX.G, and IX.H, just because a modulation scheme was possible does not mean that a specific device would be capable of implementing the modulation scheme, particularly in combination with a plethora of other features due to the limited nature of mobile devices during the time of the invention.

327. Dua also does not disclose HSPA capability, Dua only discloses that in a **preferred** embodiment, a multimedia device would be compliant with all 3GPP and 3GPP2 standards. EX1008 ¶ [0069]. Again, Dua was forward looking and attempted to account for different possibilities of technologies that may arise in the future, but failed to enable actual implementation of a device with that technology, particularly in integration with other features. Also, these other standards include different networks than the UMTS capabilities alleged by Dr. Creusere. EX1011 ¶ [0010].

328. Petitioners and Dr. Creusere do not allege a combination of implementing updated technology, such as a cellular modem capable of HSPA.

EX1002 ¶ 152; Pet. 44. Therefore, QAM would not be obvious in light of N93, Dua, and Herle, as alleged by Petitioners and Dr. Creusere.

U. N93 in view of Dua and Herle Fail to Disclose Claim 13

329. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 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." Claim 13 depends from claim 1. Therefore, claim 13 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

330. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

331. Further, as described above in relation to Section IX.T (claim 13), N93, Dua, and Herle do not render obvious use of the QAM modulation scheme. Therefore, a POSITA would find it obvious to change schemes between QAM and QPSK using a mobile device based on N93, Dua, and Herle's teachings, because there is no QAM modulation scheme disclosed in the first place. I note that Petitioner and Dr. Creusere do not support this contention with any evidence. Pet. 44.

V. N93 in view of Dua and Herle Fail to Disclose Claim 14

332. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 14. Claim 14 depends from claim 1. Therefore, claim 14 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

333. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

W. N93 in view of Dua and Herle Fail to Disclose Claim 15

334. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 15: "The video processing apparatus of claim 1, wherein the second and third radio communication circuits conduct demodulation through Orthogonal Frequency Division Multiplexing (OFDM)." Claim 15 depends from claim 1. Therefore, claim 15 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

335. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

336. I also note that Petitioners and Dr. Creusere that N93, Dua, and Herle do not disclose or render obvious via its Mapping A theory and only provides rationale in relation to its Mapping B theory. Pet. 45. I further note Petitioners have failed to map UMTS to OFDM previously and excludes OFDM as a modulation scheme for UMTS, but then asserts the theory in relation to this dependent claim. Pet. 9-10.

337. I further note that it would not be obvious to use OFDM demodulation during the time of the invention. OFDM is associated with LTE, a standard that was not finalized until late 2008. The first LTE base stations was not launched until later, and phones implementing LTE capable technology were not released until after 2010. EX2026 at 56. There was no motivation to create mobile devices for a standard that was not yet finalized and only based on modulation schemes disclosed in a very preliminary working document during the time of the invention during the time of the invention. Adding LTE functionality would require hardware and would not be obvious and require more than ordinary skill to implement. For example, this would include adding additional components to support the OFDM modulation scheme to the N93 device or device in Dua, only to be **unable** to actually use the functionality, since there were no base stations and LTE networks launched that would support communication on the OFDM modulation scheme. Further, based on the document provided by Petitioners and Dr. Creusere, there would have been no motivation to

combine because there was no clarity on whether this modulation scheme would actually be adopted into the standard, since it was a very preliminary working document.

338. Additionally, as noted above in relation to Section IX.G, Petitioners and Dr. Creusere explicitly map the second radio communication circuit to UMTS, not LTE. Pet. 9-10; EX1002 ¶ 66. Dr. Creusere explicitly noted the distinction in his deposition, stating that UMTS does not refer to all 3G capabilities because "[t]here were many variations as the standard progressed from, say, GSM, which is often thought of as 2G to UMTS, which is often thought of as 3G." EX2030 at 13:7-16. Further, LTE is thought of as 4G or otherwise a different "generation" than 3G. EX2026 at 53. He therefore distinguishes GSM and UMTS from other enhancements made, such as EDGE, and also other technologies, such as LTE. None of N93, Dua, and Herle disclose or render obvious LTE technology. N93 explicitly only discusses connection to GSM and UMTS networks, while Dua does not contemplate LTE capabilities or OFDM modulation schemes because it only refers to 3G standards and does not enable the implementation of such changes. Herle is completely silent regarding LTE.

339. UMTS and LTE are completely different radio access technologies (*e.g.*, OFDM in downlink + SC-FDMA in uplink for LTE versus DS-CDMA for UMTS/W-CDMA), with different frame structures, slot structures, and signal

processing. Based on the references cited by the Petitioners and Dr. Creusere, it would be non-obvious to add OFDM mapper and/or OFDM signal generation from LTE into a UMTS device, *e.g.*, a device that complies with TS 25.211. There is no enablement from any of the references on how to implement such features.

340. A POSITA would have no expectation of success of combining the UMTS system of N93 with the OFDM modulation scheme disclosed in TS 36.211. The following diagrams show the different frame structures, slot structures, and signal processing needed for UMTS and other systems versus LTE. A POSITA would have no expectation of success of combining the UMTS system of N93 with the OFDM modulation scheme disclosed in TS 36.211. The following diagrams show the different frame structures, slot structures, and signal processing needed for UMTS and other systems versus LTE:

4.1 Generic frame structure

The generic frame structure is applicable to both FDD and TDD transmissions. Each radio frame is $T_f = 307200 \times T_s = 10\,\text{ms}$ long and consists of 20 slots of length $T_{slot} = 15360 \times T_s = 0.5\,\text{ms}$, numbered from 0 to 19. A subframe is defined as two consecutive slots where subframe i consists of slots $2i$ and $2i+1$.

For FDD, 10 subframes are available for downlink transmission and 10 subframes are available for uplink transmissions in each 10 ms interval. Uplink and downlink transmissions are separated in the frequency domain.

For TDD, a subframe is either allocated to downlink or uplink transmission. The first subframe in a radio frame is always allocated for downlink transmission.

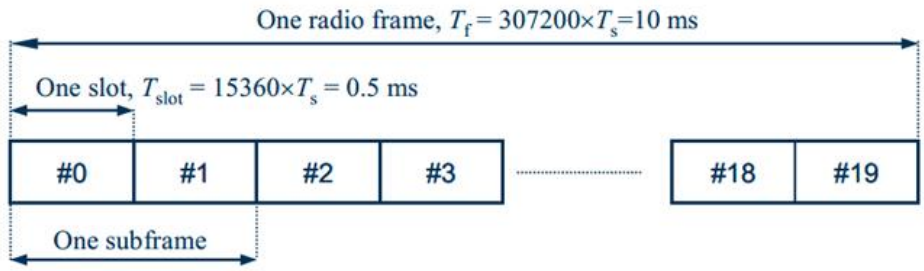


Figure 1: Generic frame structure.

EX2036 at 7 (frame structure for LTE, each frame of 10ms has 20 slots of 0.5ms each).

The following general steps can be identified for downlink transmission on a physical channel:

- scrambling
- modulation of scrambled bits to generate complex-valued modulation symbols
- mapping of complex-valued modulation symbols to resource elements
- generation of complex-valued time-domain OFDM signal for each layer

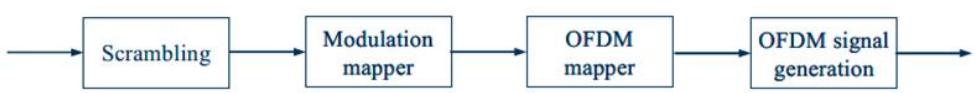


Figure 3: Overview of downlink signal generation.

EX1015 at 8 (LTE downlink transmission is OFDM).

The following general steps can be identified for uplink transmission on a physical channel:

- scrambling
- modulation of scrambled bits to generate complex-valued modulation symbols
- mapping of complex-valued modulation symbols to resource elements
- generation of complex-valued time-domain SC-FDMA signal for each layer

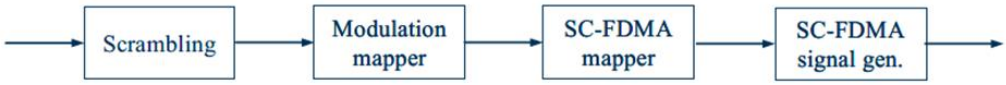


Figure 9: Overview of uplink signal generation.

EX1015 at 16 (LTE uplink transmission is SC-FDMA).

4.2.1 Multiple Access

The access scheme is Direct-Sequence Code Division Multiple Access (DS-CDMA) with information either spread over approximately 5 MHz (FDD and 3.84 Mcps TDD) bandwidth, thus also often denoted as Wideband CDMA (WCDMA) due that nature, 10MHz (7.68 Mcps TDD) bandwidth, or 1.6MHz (1.28Mcps TDD), thus also often denoted as Narrowband CDMA. UTRA has two modes, FDD (Frequency Division Duplex) & TDD (Time Division Duplex), for operating with paired and unpaired bands respectively. The possibility to operate in either FDD or TDD mode allows for efficient utilisation of the available spectrum according to the frequency allocation in different regions. FDD and TDD modes are defined as follows:

FDD: A duplex method whereby uplink and downlink transmissions use two separated radio frequencies. In the FDD, each uplink and downlink uses the different frequency band. A pair of frequency bands which have specified separation shall be assigned for the system.

TDD: A duplex method whereby uplink and downlink transmissions are carried over same radio frequency by using synchronised time intervals. In the TDD, time slots in a physical channel are divided into transmission and reception part. Information on uplink and downlink are transmitted reciprocally.

UTRA TDD has three options, the 3.84Mcps option and the 1.28Mcps option, the 7.68Mcps TDD option. In UTRA TDD there is TDMA component in the multiple access in addition to DS-CDMA. Thus the multiple access has been also often denoted as TDMA/CDMA due to the added TDMA nature.

EX2037 at 8 (UMTS/W-CDMA uses DS-CDMA in both uplink and downlink).

5 Physical channels and physical signals

Physical channels are defined by a specific carrier frequency, scrambling code, channelization code (optional), time start & stop (giving a duration) and, on the uplink, relative phase (0 or $\pi/2$). The downlink E-HICH and E-RGCH are each further defined by a specific orthogonal signature sequence. Scrambling and channelization codes are specified in [4]. Time durations are defined by start and stop instants, measured in integer multiples of chips. Suitable multiples of chips also used in specification are:

Radio frame:	A radio frame is a processing duration which consists of 15 slots. The length of a radio frame corresponds to 38400 chips.
Slot:	A slot is a duration which consists of fields containing bits. The length of a slot corresponds to 2560 chips.
Sub-frame:	A sub-frame is the basic time interval for E-DCH and HS-DSCH transmission and E-DCH and HS-DSCH-related signalling at the physical layer. The length of a sub-frame corresponds to 3 slots (7680 chips).

EX2036 at 9 (TS 25.211 at 9, frame structure for UMTS, frame of 15 slots).

5.2.1.1 DPCCH and DPDCH

The uplink DPDCH is used to carry the DCH transport channel. There may be zero, one, or several uplink DPDCHs on each radio link.

The uplink DPCCH is used to carry control information generated at Layer 1. The Layer 1 control information consists of known pilot bits to support channel estimation for coherent detection, transmit power-control (TPC) commands, feedback information (FBI), and an optional transport-format combination indicator (TFCI). The transport-format combination indicator informs the receiver about the instantaneous transport format combination of the transport channels mapped to the simultaneously transmitted uplink DPDCH radio frame. There is one and only one uplink DPCCH on each radio link.

Figure 1 shows the frame structure of the uplink DPDCH and the uplink DPCCH. Each radio frame of length 10 ms is split into 5 subframes, each of 3 slots, each of length T_{slot} = 2560 chips, corresponding to one power-control period. The DPDCH and DPCCH are always frame aligned with each other.

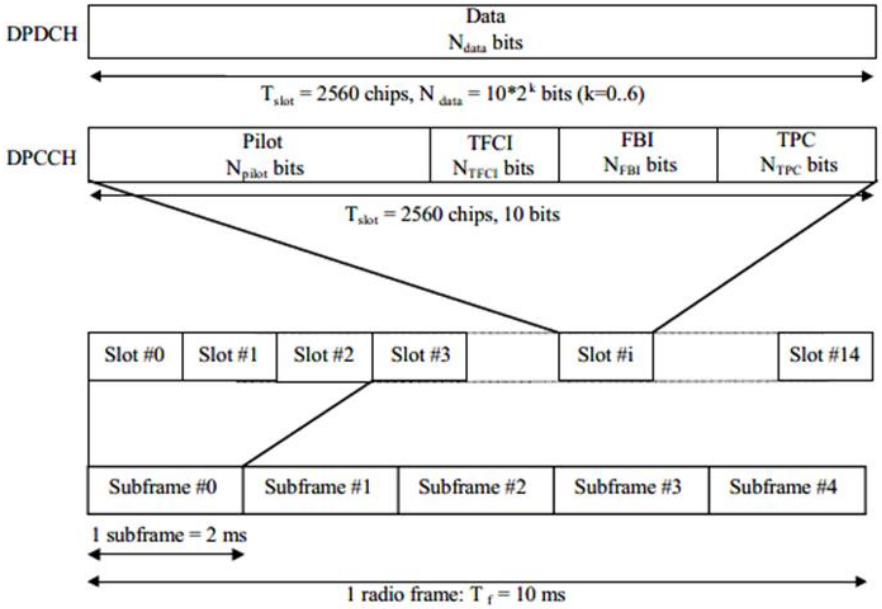


Figure 1: Frame structure for uplink DPDCH/DPCCH

EX2036 at 10 (frame structure for UMTS, each frame of 10ms with 15 slots).

5.2.1.3 E-DPCCH and E-DPDCH

The E-DPDCH is used to carry the E-DCH transport channel. There may be zero, one, or several E-DPDCH on each radio link.

The E-DPCCH is a physical channel used to transmit control information associated with the E-DCH. There is at most one E-DPCCH on each radio link.

E-DPDCH and E-DPCCH are always transmitted simultaneously, except for the case that E-DPDCH but not E-DPCCH is DTXed due to power scaling as described in [5] section 5.1.2.6. E-DPCCH shall not be transmitted in a slot unless DPCCH is also transmitted in the same slot.

Figure 2B shows the E-DPDCH and E-DPCCH (sub)frame structure. Each radio frame is divided in 5 subframes, each of length 2 ms; the first subframe starts at the start of each radio frame and the 5th subframe ends at the end of each radio frame.

An E-DPDCH may use BPSK or 4PAM modulation symbols. In figure 2B, M is the number of bits per modulation symbol i.e. M=1 for BPSK and M=2 for 4PAM.

The E-DPDCH slot formats, corresponding rates and number of bits are specified in Table 5B. The E-DPCCH slot format is listed in Table 5C.

EX2036 at 13.

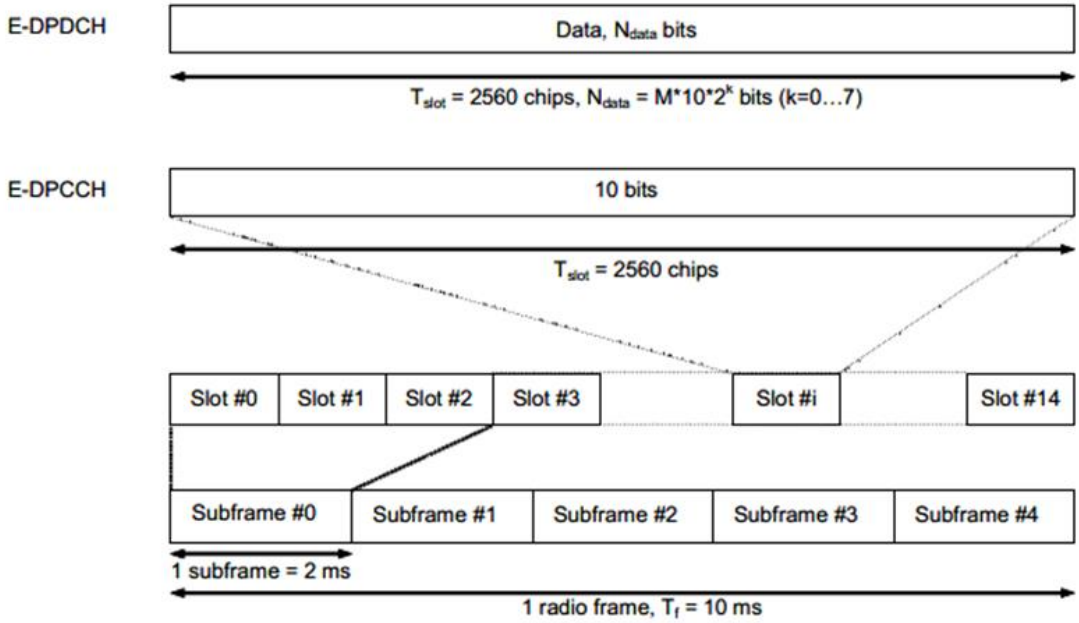


Figure 2B: E-DPDCH frame structure

EX2036 at 14 (frame structure for UMTS, for downlink).

341. Therefore, N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 15.

X. N93 in view of Dua and Herle Fail to Disclose Claim 16

342. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 16. Claim 16 depends from claim 1. Therefore, claim 16 is non-obvious in view of N93, Dua, and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

343. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections IX.A-IX.L.

Y. N93 in view of Dua and Herle Fail to Disclose Claims 17-24

344. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 17-24.

345. In relation to this claim, Petitioner incorporates its rationale in relation to claims 1, 5, 8, 10-13, and 15. As such, I incorporate by reference my opinions regarding claim 1, 5, 8, 10-13, and 15 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claims 1, 5, 8, 10-13, and 15. Sections IX.A-IX.L (overall ground and claim 1), IX.N (claim 5), IX.P (claim 8), IX.R-IX.U (claims 10-13), IX.W (claim 15).

Z. N93 in view of Dua and Herle Fail to Disclose Claim 25

346. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 25.

347. In relation to this claim, Petitioners and Dr. Creusere incorporate its rationale in relation to other claims 1 and 5. Pet. 47-50. Therefore, for at least the same reasons set forth above in relation to claims 1 and 5, N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 25.

348. For [25a], see [1a]. Section IX.F.

349. For [25b], see [1b]. Section IX.G.

350. For [25c], see [1c]. Section IX.H.

351. For [25d], see Claim 5. Section IX.N.

352. For [25j], see [1g] and Claim 5. Sections IX.I, IX.N.

353. For [25k], see [1i]. Section IX.JIX.K.

354. For [25l], see [1j]. Section IX.K.

355. For [25m], see [1k]. Section IX.L.

AA. N93 in view of Dua and Herle Fail to Disclose Claim 25

356. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 26.

357. In relation to this claim, Petitioner incorporates its rationale in relation to claim 10. Pet. 51; EX1002 ¶ 197. As such, I incorporate by reference my opinions regarding claim 10 that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 10. Section IX.R.

BB. N93 in view of Dua and Herle Fail to Disclose Claim 27

358. It is my opinion that N93, Dua, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 27.

359. In relation to this claim, Petitioners and Dr. Creusere incorporate rationale in relation to claim limitations [1a] and [1b]. Pet. 51; EX1002 ¶ 198. As such, I incorporate by reference my opinions regarding claim limitations [1a], [1b], and additionally claim 12, that demonstrates N93, Dua, and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 10. Sections IX.F (limitation [1a]), IX.G (limitation [1b]), IX.T (claim 12).

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

A. Combination Rationale

1. It Was Non-Obvious to Combine Van Rooyen and Desai

360. Petitioners and Dr. Creusere argue that because N93 and Dua do not disclose implementation details, a POSITA would be motivated to use van Rooyen's and Desai's implementation details and have a reasonable expectation of success in making the combinations. I disagree.

361. It would be beyond ordinary skill to implement the claimed invention based on the references cited in the Petition. Even the cited references describe the complexities in combining ***even just two*** radio communication circuits. EX1012 ¶¶ [0007]-[0008]. The references also describe the difficulty in supporting different communication technologies with European band cellular technologies, stating that supporting additional communication technologies "may prove a difficult task in the design and implementation of radio frequency front ends (RFFE) for mobile terminals because of the range of frequencies and/or data rates that need to be supported." EX1011 ¶ [0017]. The combination suggested by the Petition and Dr. Creusere includes combining multiple different radio communication circuits and capabilities of multiple devices past what was of ordinary skill during the time of the invention. Combining N93 and Dua with van Rooyen and Desai would still not make it obvious because it was beyond ordinary skill to build a device in the way suggested by Petitioners and Dr. Creusere.

362. Further, van Rooyen describes implementation of mobile **receiver** architecture for European (EU) band cellular and **broadcasting**. EX1011 ¶ [0005]. Thus, van Rooyen focuses on **receivers** and integration of receivers capable of receiving **broadcasting** channels in a cellular device. EX1011 at Abstract. Van Rooyen discusses the complexities in integrating multiple wireless technologies and specifically addresses a system for implementing broadcasting features into a mobile

terminal. Van Rooyen is silent regarding implementing Bluetooth communication or other claimed features, such as one controller controlling assignment of Bluetooth, UMTS, Wi-Fi/GSM connections or simultaneous communication using two different radio communication circuits. Van Rooyen does not account for the complexities in implementing all these features. Having multiple receivers does not address the issue of SAR limits or transmitting into multiple nearby antennas or the intermodulation distortion that would occur with multiple transmitters.

363. While Petitioners and Dr. Creusere state that a POSITA would be motivated to turn to Desai to implement the Bluetooth and Wi-Fi in a combined integrated circuit, a POSITA would not be motivated to turn to Desai in relation to the claimed features. Desai addresses coexistence of two (not four) transceivers in a single frequency range (2.4 GHz). EX1012 ¶ [0004]. Desai is not relevant to a device that operates on anything other than 2.4 GHz frequencies. Desai is explicitly directed to "collaborative coexistence between Bluetooth and IEEE 802.11g with both technologies integrated onto a SOC device." EX1012 at Abstract. Desai focuses on scheduling transmission of WLAN and Bluetooth signals and not on implementation of "radio communication circuits," or controlling assignment of "radio communication circuits." EX1012 at Abstract.

364. The combination of van Rooyen and Desai do not disclose or render obvious how to combine the two systems together to result in the invention. Both

references discuss the difficulty in integrating specific wireless communication technologies and do not account for integration with each other, especially in relation to a controller that controls assignment in relation to the specific wireless communication technologies.

365. Furthermore, van Rooyen teaches against Dr. Creusere's discussion of a CPU to control assignment of the cellular radios. Instead, van Rooyen discloses the use of a separate processor, a **baseband** processor, to control operations related to connecting to cellular networks. EX1011 Fig. 3d.

2. It Was Non-Obvious to Combine Kao

366. A POSITA would also not be motivated to turn to Kao to make the device alleged by Petitioners and Dr. Creusere. Kao is specifically directed to a radio receiver that is capable of supporting multiple modulation formats with a single pair of analog to digital converters ("ADCs"). Worse than van Rooyen, Kao makes no mention of the design of a transmitter. It describes a method of sharing ADCs to receive multiple signal formats from some transmitters external to Kao's invention.

367. In addition, Kao explicitly teaches against the claimed invention and simultaneous functionality, because it states that "in a user terminal supporting multiple standards or multi-mode standards, only one signal modulation format needs to be handled at one time." EX1013 ¶ [0012]. Kao explicitly teaches a way to reduce "power consumption of the baseband processing modules other than the one

that is receiving or transmitting signals, since there is always only one signal modulation format processed at one time." EX1013 ¶ [0029].

368. Kao also teaches against the combination alleged by Petitioners and Dr. Creusere in relation to the use of one controller to control three or four radio communication circuits, because it discusses that prior art disclosed that processing for a "mobile phone supporting both GSM-1800 and FDD WDCMA standards" occurs in two respective modules. EX1013 ¶¶ [0010], [0011], Figs. 2, 3. This reflects that one controller does not control any alleged Bluetooth, UMTS, GSM/Wi-Fi circuits because these alleged circuits are controlled separately by different modules.

369. Kao also teaches against the claimed invention because it discloses the use of one radio communication circuit to handle multiple modulation schemes instead of having multiple different radio communication circuits.

3. BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Suggest the Modulation Schemes and Transmission Frequencies of N93, Dua, Van Rooyen, or Desai

370. After contending that the N93-Dua-Herle combination of Ground 1 discloses the challenged claims, the Petition then states for Ground 2 that: "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." Petitioners present these references [BT-Spec, 3GPP-Spec, and Kao] as secondary references out of an abundance of caution ***to the extent*** the Board disagrees. Pet. 53.

371. I disagree that combination with the standards discloses or renders obvious the claimed invention. First, as explained above, 3GPP-Spec was not publicly accessible to a POSITA at the time of the invention. Because 3GPP-Spec was not publicly accessible to a POSITA at the time of the invention, it could not disclose the "modulation schemes" of "transmission frequency limitations" as alleged by Dr. Creusere.

372. Within each of the broad categories of UMTS, GSM, Bluetooth, and Wi-Fi technologies, there are ***multiple*** different standards. Standards include both required and optional features. Additionally, standards are directed to requirements for compliance with just the one standard. As set forth in Sections IX.A.4, general knowledge of a standard will not disclose the specific frequencies and modulation schemes used for a specific hardware implementation of UMTS, GSM, Bluetooth, or Wi-Fi.

373. Standards also do not disclose how to make a device compliant with the standards, particularly a device that must be compliant with multiple different standards while including the other alleged features.

374. Further, the combination would require combining different types of hardware compliant with different standards with no rationale articulated for combining each standard. For example, BT-Spec is directed to disclosing the Bluetooth Specification 2.0+EDR. The frequencies and modulation schemes are relevant to hardware implementations that are compatible specifically with Bluetooth Specification 2.0+EDR. But N93 did not implement Bluetooth 2.0+EDR. Instead, Nokia stated that N93 used Bluetooth 1.1 or 1.2. EX2029 at 1. It is not trivial to update just one component of a mobile device. Even updating firmware caused many issues in a phone with Bluetooth, Wi-Fi, UMTS, and GSM capabilities. EX2035 at 1. Further implementing a new hardware would cause complete redesign of the mobile design and frustrate the original intent of the N93.

375. In addition, as the Petition only "present[s] these references as secondary references out of an abundance of caution," the Petition is silent as to the deficiencies of N93 and Dua—indeed, Petitioners and Dr. Creusere argue "the combination" of Ground 1 inherently discloses the matter for which it uses the remaining references of Grounds 2 and 5. There is, therefore, no indication in the Petition that Dua or N93 has any deficiencies related to these elements. It is thus unclear why a person of ordinary skill would turn to BT-Spec, 3GPP-Spec, and Kao for the teaching of an element that, according to Dr. Petitioners and Creusere, is

already taught by Dua and N93. For this reason, the N93-Dua-Herle-van Rooyen-Desai-BT-Spec-3GPP-Spec- Kao combination fails.

376. Petitioners and Dr. Creusere also claim that 3GPP-Spec can be used to disclose the relevant worldwide 3GPP and 3GPP2 modulation schemes and frequencies of Dua. *See* Pet. at 53-54; *see also* EX1008 ¶[0069]. It is unclear how Dua, which was filed on May 12, 2005, would have relied on the modulation schemes and frequencies of 3GPP-Spec, which Petitioners and Dr. Creusere purportedly date at 1/7/2007, over a year *after* the filing date of Dua. Pet. 5; EX1008; EX1015. Even if Dua could support 3GPP and 3GPP2 standards during the time that it was filed, Petitioners and Dr. Creusere offer no evidence, or even argument, that the hardware of Dua could support *new* 3GPP and 3GPP2 standards. Additionally, the fact that Dua describes compliance with 3GPP and 3GPP2 standards fails to disclose specific modulation schemes and frequencies (or even whether to use 3GPP or 3GPP2 technology) that would be implemented in a specific hardware implementation.

377. Furthermore, the 3GPP-Spec cited by Petitioners and Dr. Creusere is an unapproved document that includes an explicit statement *against* implementation. EX1015 at 1 ("The present document has not been subject to any approval process by the 3GPP Organizational Partners and **shall not be implemented**."). As noted

earlier, this was a very preliminary working document that a POSITA would not turn to in order to implement the invention. Section VIII.C.

378. Further, the Petition is unclear about what is being used from BT-Spec, 3GPP-Spec, or Kao in relation with its Ground 2 arguments. While Petitioners and Dr. Creusere purport to use BT-Spec, 3GPP-Spec, and Kao as "secondary references for the relevant modulations and frequencies," Petitioners and Dr. Creusere also rely on Ground 1 references and van Rooyen to disclose frequencies as well." Pet. 54-54. It is unclear how and when Petitioners and Dr. Creusere is purporting to bring in BT-Spec, 3GPP-Spec, and Kao when Petitioners and Dr. Creusere rely on other references to disclose the same claim features.

B. N93, Dua, Herle, Van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Render Obvious Claim Elements [1d]-[1k]

379. N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claim elements [1d]-[1k]. In relation to these elements, Petitioners and Dr. Creusere cite to Ground 1 rationale. Pet. 57.

380. Therefore, for at least the same reasons provided for Ground 1, N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claim elements [1d]-[1k]. Sections IX.A-IX.E, IX.I-IX.L.

C. N93, Dua, Herle, Van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Render Obvious Claims 4-6, 8-15

381. N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-15. In relation to these elements, Petitioner cites to Ground 1 rationale. Pet. 57.

382. Therefore, for at least the same reasons provided for Ground 1, N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-15. Section IX.

D. N93, Dua, Herle, Van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Render Obvious Claim 16

383. N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 16. In relation to these elements, Petitioner cites to Ground 1.

384. Therefore, for at least the same reasons provided for Ground 1, N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 22. Section IX.

385. In addition, claim 16 depends from claim 1. Therefore, claim 16 is not disclosed or rendered obvious by N93, Dua, Herle, van Rooyen, Desai, BT-Spec,

3GPP-Spec, and Kao, whether taken alone or in reasonable combination, for at least the same reasons provided above in relation to claim 1. Section X.B.

E. N93, Dua, Herle, Van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Render Obvious Claims 17-27

386. N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 17-27. In relation to these elements, Petitioner cites to Ground 1 rationale. Pet. 57.

387. Therefore, for at least the same reasons provided for Ground 1, N93, Dua, Herle, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 17-27. Section IX.

XI. GROUND 3: DUA AND HERLE

A. Combination Rationale

388. For the same reasons asserted above in relation to Ground 1, which address the combination of N93, Dua, and Herle, a POSITA would not combine Dua and Herle. Sections IX.B, IX.L.

B. Dua and N93 Fail to Disclose or Render Obvious Claim Limitations [1pre]-[1h], [1j]-[1k]

389. Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim limitations [1pre]-[1h] and [1j]-[1k]. In relation to these limitations, Petitioner just cites back to Ground 1 and relies on the same

rationale applied in Ground 1. Pet. 58. Therefore, for at least the same reasons provided for Ground 1, Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim elements [1pre]-[1h] and [1j]-[1k]. Section IX.

C. Dua and N93 Fail to Disclose or Render Obvious Claim Limitations [1i]

390. Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim limitation [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."

391. As stated above in relation to limitation [1j] for Ground 1, I disagree that a POSITA would be motivated to combine the two to include "normal user indications." Dua explicitly teaches against such "user configuration" and states that these normal user indications "make data exchange between the media devices **insecure** and **time consuming**" and that "[k]nown over-the-air techniques for configuration between two devices have also proven to be generally **insecure**." EX1008 ¶ [0009]. Therefore, Dua **teaches away** from manual user indications and instead teaches a method replacing normal user indications with automatic communication between devices.

D. Dua and Herle Fail to Disclose or Render Obvious Claims 4-6, 8-10

392. Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-10. Pet. 61; EX1002 ¶ 229. In relation to most of these claims, Petitioner just cites back to Ground 1. Therefore, for at least the same reasons provided for Ground 1, Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-10. Section IX.

E. N93 in view of Dua and Herle Fail to Disclose Claim 11

393. It is my opinion that Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 11. Claim 11 depends from claim 1. Therefore, claim 11 is non-obvious in view of Dua and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

394. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates Dua and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections XI.B-XI.C.

F. N93 in view of Dua and Herle Fail to Disclose Claims 12-16

395. It is my opinion that Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 12-16. Claims 12-16 depend from claim 1. Therefore, claims 12-16 are non-obvious in view of Dua

and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1.

396. As such, I incorporate by reference my opinions regarding claim 1 that demonstrates Dua and Herle, whether taken alone or in reasonable combination, do not disclose or render obvious claim 1. Sections XI.B-XI.C.

397. Additionally, Petitioner depends on rationale from Ground 1 in relation to this limitation. Pet. 62. Therefore, for at least the same reasons provided for Ground 1, Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 12-16. Section IX.

G. N93 in view of Dua and Herle Fail to Disclose Claim 17-27

398. It is my opinion that Dua and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim 17. In relation to these claims, Petitioner cites rationales related to claim 1 (for Ground 3) and also Ground 1. Pet. 62-63. Therefore, claim 17 is non-obvious in view of Dua and Herle, whether taken alone or in reasonable combination, for at least the same reasons asserted above in relation to claim 1 and in relation to Ground 1. Sections IX, XI.B-XI.C.

XII. GROUND 4: DUA, HERLE, AND N93

A. Combination Rationale

399. For the same reasons asserted above in relation to Ground 1, which combines the same references, a POSITA would combine not Dua, N93, and Herle. Sections IX.A-IX.B.

B. Dua, Herle, and N93 Fail to Disclose or Render Obvious Claim Limitations [1pre]-[1h], [1j]-[1k]

400. Dua, Herle, and N93, whether taken alone or in reasonable combination, fail to disclose or render obvious claim limitations [1pre]-[1h] and [1j]-[1k]. In relation to these limitations, Petitioner just cites back to Ground 1 and relies on the same rationale applied in Ground 1. Therefore, for at least the same reasons provided for Ground 1, Dua, Herle, and N93, whether taken alone or in reasonable combination, fail to disclose or render obvious claim elements [1pre]-[1h] and [1j]-[1k]. Section IX.

C. Dua, Herle, and N93 Fail to Disclose or Render Obvious Claim Limitation [1j]

401. Dua, N93, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claim limitation [1i]. In relation to this limitation, Petitioner cites back to Ground 1, Ground 3, and states that 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. I address that it would not

have been obvious to combine Dua's teachings and N93's teachings in Section IX.J. Therefore, I incorporate here by reference my opinions stated in Section IX.J.

D. Dua, Herle, and N93 Fail to Disclose or Render Obvious Claims 4-6, 8-27

402. Dua, N93, and Herle, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-27. In relation to these claims, Petitioner just cites back to Ground 1 and sometimes Ground 3. Therefore, for at least the same reasons provided for Grounds 1 and 3, Dua, Herle, and N93, whether taken alone or in reasonable combination, fail to disclose or render obvious claims 4-6, 8-27. Sections IX, XI.

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

A. Combination Rationale

403. For the same reasons asserted above in relation to Grounds 1 and 2, which combines the same references, a POSITA would not combine Dua, Herle, N93, Van Rooyen, Desai, BT-Spec, 3Gpp-Spec, and Kao. Sections IX.A-IX.B, X.A.

B. Dua, Herle, N93, Van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao Fail to Disclose or Render Obvious Claims 1, 4-5, 8-12, 14-25

404. In relation to these claims, Petitioner just states that "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." Pet. 69.

405. Therefore, for the same reasons asserted above in relation to Grounds 1-4, Dua, Herle, N93, van Rooyen, Desai, BT-Spec, 3GPP-Spec, and Kao, whether taken alone or in reasonable combination, fail to disclose or render obvious the challenged claims. Sections IX-XII.

XIV. CONCLUSION

406. In addition to the opinions and evidence expressed herein, I reserve the right to rebut any arguments made or evidence presented in response to this report. I also reserve the right to supplement this report based on further investigation or analysis. I also plan to use graphic exhibits and/or demonstratives to help illustrate the facts and opinions I have expressed herein.

APPENDIX A

Bruce McNair

1 Iron Hill Drive
Holmdel, NJ 07733
bmcnair@novidesic.com
1-732-371-5026

Career Summary

- Sixty years engineering research, design, development, systems engineering experience in communications systems (including extensive background in wireless communications and system/network security)
- Twenty four years as a well-rated member of one of world's most highly respected R&D organizations, recognized for breadth, depth and practicality of expertise
- Extensive experience teaching technical short courses for premiere educational programs over a fourteen year period
- Full time university educator for fifteen years with experience teaching a broad set of courses focusing on practical engineering approach
- On-line university educator for twenty years teaching well-attended graduate courses in wireless and security technologies

Research interests

- High speed wireless data networking
- System/network security
- Geolocation technology
- Real-time digital signal processing
- Software-Defined Radio technology
- Broadband Powerline (BPL) technology

Present Organizations

- Stevens Institute of Technology,
- Novidesic Communications, LLC

Job Titles

- Distinguished Service Professor of Electrical and Computer Engineering
- Founder, Chief Technology Officer

Education

- M.E., E.E., Stevens Institute of Technology, 1974
- B.E. (with Honor), Stevens Institute of Technology, 1971
- Completed qualifiers and course work for PhD in Computer Science at Stevens

Relevant Experience

January 2003 – present – on-line teaching professor – Electrical and Computer Engineering, Stevens Institute of Technology, Hoboken, NJ;
Teach several well-enrolled on-line graduate courses in wireless security, information systems security and physical design of wireless communications systems.

August 2002 – December 2017 (retired) – Distinguished Service Professor of Electrical and Computer Engineering, Program Director, Computer Engineering graduate program, Stevens Institute of Technology, Hoboken, NJ;
Design and manage the Senior Design Project, a two-semester program that forms a substantial portion of the senior year in the engineering program. This project comprises a large fraction of the seniors' efforts and serves to provide real-world engineering design experiences for the student. Teach a large number of well-enrolled graduate and undergraduate core and elective courses. Conduct research in wireless systems, geolocation services, and broadband powerline (BPL) systems, particularly security needs and solutions. Member of Stevens Intellectual Property Review Board, Stevens Honor Board Advisory Council, Stevens' Schaeffer School of Engineering and Science Promotion and Tenure Committee, and the Senior Design Coordinator Committee.

February 2002 – present – CTO, Novidesic Communications, LLC, Holmdel, NJ;
Founded a technical consulting company, providing expert witness support and testimony, telecommunications, wireless networking, security, software, computing, product evaluation, proof-of-concept prototyping, and web site design guidance to individuals and small businesses. Clients include health care facilities, patent attorneys, major telecommunications providers, venture capitalists, major component manufacturing company, start-up hardware and concept development companies. Supported technology needs of small local business leading to Phase I and Phase II SBIR funding in the area of RFID with patented technology. Provide IP portfolio evaluation. Expert witness in patent litigation with experience testifying at deposition and trial as well as preparing USPTO IPR declarations.

August 2011 – February 2012 – Part-time consultant, Lockheed-Martin, Moorestown, NJ;
Support development of advanced radar systems and interactions with other wireless systems.

2010 – 2015 (part-time, on an as-needed basis) – Senior Systems Engineer consultant, AT&T Government Solutions, Columbia, MD;
Support AT&T's projects with the US Government customers on defense and intelligence-related systems, drawing on previous knowledge and experience in signal processing, wireless systems, telephone and computer networks, and secure system design.

Relevant Experience (continued)

May 1994 to February 2002 (retired) -- Wireless Systems Research Department, AT&T Bell Labs/ AT&T Labs - Research, Holmdel/Red Bank/Middletown, NJ
Member of Technical Staff/Research Staff Member/Principal Technical Staff Member/Technology Consultant; Investigating high-speed, high-mobility wireless data communications systems for untethered access to high speed global networks. Proposed and investigated IEEE 802.11(a & b) physical and MAC layer extensions to outdoor, high mobility environment. Efforts involved system architecture, system control, real-time DSP programming in C, high-speed hardware design, RF design, analog, RF interfacing, Matlab/SIMULINK simulation and experimental investigations. Responsible for complete design, implementation and characterization of a multiple TMS320C40-based 384 kb/s OFDM transmission system and definition/design of advanced signal processing platforms. Recent research extended results to 5-40 Mb/s with TMS320C62/FPGA-based platform and incorporated 802.11a and DVB-T technology. Previous research involved speech quality/data rate enhancements to IS-136, the North American TDMA cellular standard.

November 1987 to April 1994 -- Security and System Reliability Architecture Group, AT&T Bell Labs, Holmdel, NJ
Technical Manager; Created, staffed, and led a group of security, systems reliability and fraud control experts to assess security/quality of products, services, operations systems, communications networks, operating systems, and work centers and to recommend, specify, and prototype cost effective improvements. Created corporate process to build security into the development process. Transformed small (2 person) corporate-funded activity into well-staffed (multi million dollar), successful business unit supported program. Served as security technologies subject matter expert for AT&T Corporate Security and other (AT&T and outside) organizations

May 1982 to October 1987 -- various AT&T Bell Labs organizations, MTS - Supervisor; System Design, Exploratory Development, Applied Research, and Final Product Development of secure voice terminals, modems, speech recognition and speaker verification systems, security chips, encryption devices, and network management systems

June 1978 to April 1982 -- various AT&T Bell Labs organizations, Member of Technical Staff, System design, digital hardware design and simulation of wide area (X.25) data communications networks and high-speed data transmission techniques for voiceband modems. Led $1M IR&D secure voice terminal initiative, ultimately resulting in promotion to MTS-Supervisor and laying groundwork for AT&T's breakthrough success in NSA’s STU-3 program.

Relevant Experience (continued)

June 1971 to February 1973, January 1974 to June 1978 -- U.S Army Communications R&D Command, Fort Monmouth, NJ. GS-7, 9, 11 & 12 Electronic Engineer (GS-0855)
Development of tactical military radio communications equipment, specializing in modulation, data transmission, communications security and electronic warfare (frequency hopping and direct sequence spread spectrum) for the SINCGARS VHF-FM radio system.

March 1973 to December 1973 -- ITT Defense Communications Division, Nutley, NJ.
Junior Member of Technical Staff; Designed, developed and tested software and digital hardware for portable satellite terminals for use by White House and the world's first hardware implementation of a 2400 bps Linear Predictive Coder (LPC) secure speech transmission system.

Patents, Presentations and Publications

Twenty six U.S. patents and nineteen international patents granted (several pending) in areas such as data transmission, cryptographic techniques, speech processing, video processing, security systems, user authentication, fraud control, synchronization, dynamic channel assignment, localization techniques, hazardous voltage detection, RFID, biomedical applications, vibration energy harvesting, solar energy harvesting for portable devices, etc.

Presented numerous well-rated short courses in Digital Communications, Digital Telephony, Digital Signal Processing, and Wireless Communications, & Security. Course sponsors included: Bell Labs In-hours Continuing Education Program, George Washington University, University of Maryland, UCLA Extension, Johns Hopkins University – Organizational Effectiveness Institute, Berlin (Germany) Continuing Engineering Education Program, Monmouth University, and the Fort Monmouth Education Center.

Several papers presented at IEEE Vehicular Technology and other Conferences and published in AT&T Technical Journal, IEEE Transactions on Wireless Communications, and IEEE Communications Magazine on various topics in wireless systems and security.

Skills

System/network architecture, communications system design, digital hardware design, RF design, signal processing, real-time DSP programming, software design and coding, proof-of-concept prototyping, designing and conducting laboratory research experiments, OFDM, TDMA/IS-136, FPGA, encryption, computer network security, threat assessment, data communications protocols, computer architecture, digital and analog video systems, system & link-level simulation, UNIX/Linux, Windows, C/C++, Matlab/Simulink, MathCad, PASCAL, Algol, SNOBOL, Verilog, VHDL, FORTRAN. Recruitment, development and management of highly effective technical staff. Highly effective technical presentations and training sessions to any level audience. Well-developed technical writing skills. Preparation, deposition, and testifying regarding expert report for patent infringement/non-infringement/validity/invalidity and other litigation matters. Assist in claim construction and prior art research for patent litigation.

Other information

U.S Citizen. Held Top Secret - Sensitive Compartmented Information (TS/SCI) clearance with full scope polygraph until October 2015.

Selected as one of twenty-six finalists among 490 entrants in the 2014 Bell Labs Prize competition for proposal “High-precision, low-cost, low-power indoor geolocation techniques.”

Stevens Institute of Technology, Henry Morton Distinguished Teaching Professor, 2013-2014.

Named to New Jersey Inventors Hall of Fame, Inventor of the Year (2012) for “Patented/Innovative Research and Entrepreneurial Leadership Related to: Groundbreaking modem development and next generation wireless data communications systems”

Mentored two AT&T Labs Fellowship Program (ALFP) participants, three students in the MentorNet program, 5 Bell Labs Early Career Advisory Program (ECAP) participants, numerous summer students (graduate and undergraduate), several new employees, and all of the staff in groups I have managed.

Advised a significant fraction of ECE Senior Design groups, numerous graduate students; participation in thesis committees of several Stevens PhD students in various departments, including Physics, Computer Science, Mechanical Engineering, and ECE. Consult with non-ECE students on ECE aspects of their Senior Design projects

Mentor summer students at Stevens in NSF-funded Research Experience for Undergraduates (co-PI).

Stevens Institute of Technology, Schaefer School of Engineering, Undergraduate Teaching Award, December 2006.

Life Senior Member, Institute of Electrical and Electronic Engineers - Member of Communications, Signal Processing, Computer and Education Societies

Member, American Society for Engineering Education

Secretary, IEEE Communications Society Communications Security Committee

Identified by Rutberg & Co. Investment Bankers (San Francisco) as member of a group of 213 “Top Wireless Influencers: 2002”

Member of the Council of Communications Advisors

Amateur radio operator licensed since 1963, Amateur Extra Class since 1970

Contact Information

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US Patents

- “Liquid Crystal Display using the photovoltaic behavior of LED backlights as a source of electrical energy.” US Patent #10,310,326, June 4, 2019.
- “Method and apparatus for locating and distinguishing blood vessel.” US Patent #8,764,663, July 1, 2014.
- “Secure IP access protocol framework and supporting network architecture,” US Patent #8,046,577, October 25, 2011.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #7,990,839, August 2, 2011.
- “Simulcasting OFDM system having mobile station location identification,” US Patent 7,962,162, June 14, 2011.
- “RFID Devices for Verification of Correctness, Reliability, Functionality and Security,” US Patent 7,712,674, May 11, 2010.
- ““Dynamic Channel Assignment,” US Patent 7,457,259, November 25, 2008.
- ““RFIDs Embedded into Semiconductors,” US Patent 7,348,887, March 25, 2008.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #7,310,302, December 18, 2007.
- “Mobile Device Having Network Interface Selection,” US Patent #7,180,876, February 20, 2007.
- "Dynamic Channel Assignment," US Patent #6,954,465, October 11, 2005.
- “Method for Estimating Time and Frequency Offset in OFDM Systems,” US Patent #6,891,792, May 10, 2005.
- "Security System Providing Lockout for Invalid Access Attempts," US Patent #5,559,505, September 24, 1996.
- "Telecommunications Fraud Detection Scheme," US Patent #5,504,810, April 2, 1996.
- "Authenticator Card and System," US Patent #5,450,491, September 12, 1995.
- "Secure Telecommunications," US Patent #5,392,357, February 21, 1995.
- "Data Message Storage and Pickup Service,” US Patent #5,392,336, February 21, 1995.
- "System and Method for Granting Access to a Resource," US Patent #5,375,244, December 20, 1994.
- "Secure Teleconferencing," US Patent #5,353,351, October 4, 1994.
- "Method and Apparatus for Processor Based Encryption," US Patent #5,278,905, January 11, 1994.
- "Centralized Security Control System," US Patent # 5,276,444, January 4, 1994.
- "Technique for Voice Based Security System," US Patent #5,265,191, November 23, 1993.

US Patents (continued)

- "Video Scrambling System", US Patent # 5,206,906, April 27, 1993.
- "Cryptographic Transmission System," US Patent #4,642,424, February 10, 1987.
- "Processing of Encrypted Voice Signals," US Patent #4,608,455, August 26, 1986.
- "Control of Coefficient Drift for Fractionally Spaced Equalizers," US Patent #4,376,308, March 8, 1983

Several other published and unpublished US patents pending

International Patents

- “Voltage-controlled apparatus for battery-powered electronic devices,” EP Patent #0568237 B1, January 23, 2002.
- “A Dynamic Channel Assignment,” EP Patent #1,137,299, September 26, 2001.
- “Data Message Storage and Pickup Service,” EP Patent #0626776 B1, April 7, 1999.
- “Data Message Storage and Pickup,” Canadian Patent #CA-2119227A1, February 24, 1998.
- “Centralized Security Control System,” Canadian Patent #CA-2078077, January 27, 1998.
- “Improved centralized security control system and method,” EP Patent #0534679. August 12, 1997.
- “Authenticator Card with Changing Bar Code Pattern,” EP Patent #0,715,789, June 12, 1996.
- “Technique for voice-based security systems,” Canadian Patent #CA-2072172, April 30, 1996.
- “Method and apparatus for user identification and verification of data packets in a wireless communications network,” EP Patent #0,689,316, December 27, 1995.
- “Central Difference Control System,” Japanese Patent #1995-131526, May 19, 1995.
- “Authenticator Card with Changing Bar Code Pattern,” WO Patent #1995/006371, March 2, 1995.
- “Method for safety system of voice base and device therefore,” Japanese Patent #1995-049696, February 21, 1995.
- “Data message storage and pick up service, EP Patent #0,626,776, November 30, 1994.
- “Method for safety system of voice base and device therefore,” Japanese Patent #1995-049696, February 21, 1995.
- “Data message storage and pick up service, EP Patent #0,626,776, November 30, 1994.
- “Apparatus for battery type electronic device,” Japanese Patent #1994-138983, May 20, 1994.
- “Method and system for making communication via exchange network available, method for providing,” Japanese Patent #1994-085811, March 25, 1994.

International Patent (continued)

- Voltage-controlled apparatus for battery-powered electronic devices," EP Patent #0,568,237, November 3, 1993
- "Security node in switched telecommunication network", EP Patent #0,553,553, August 4,1993.
- "Improved centralized security control system and method," EP Patent 0,534,679, March 31, 1993.
- "An improved technique for voice-based security systems," EP Patent #0,533,396, March 24, 1993.
- "Cryptographic Transmission System," Canadian Patent #CA-1223932, July 7, 1987.

Several other published and non-published applications pending.

Journal Publications

- Leung,K., Clark,M.V., McNair,B., Kostic,Z., Cimini,L.J., Winters,J.H., "Outdoor IEEE 802.11 Cellular Networks: Radio and MAC Design and Their Performance", *IEEE Transactions on Vehicular Technology*, Vol. 56, No. 5, pp. 2673-2684, September 2007.
- Chuang, J., Cimini, L., Li, G., Lin, L., McNair, B., Sollenberger, N., Suzuki, M., Zhao, H., "High Speed wireless data access based on combining EDGE with wideband OFDM," *IEEE Communication Magazine*, November, 1999.
- D'Angelo, D.M., McNair, B., Wilkes, J.E., "Security in Electronic Messaging Systems," *AT&T Technical Journal*, Volume 73, Number 3, 1994.

Research awards

- "Standalone/Networked Compact, Low Power, Image-fused Multi-Spectrum Sensor System for Target Acquisition, Tracking and Fire Control," ARDEC, $2365000, co-PI with Victor Lawrence, Hong Man. AY2008-2009
- NSF: "REU Site: Integrated Software Radio and Radio Frequency Test Bed for Wireless Research in Dynamic Spectrum Access"; $296,754; NSF; Co-PI with Yu-Dong Yao. AY2004-2005
- AT&T Labs-Research Equipment donation of $900k DSP systems and wireless test equipment. AY2003-2004
- AT&T Labs-Research - $60k grant for "Investigation of Broadband Powerline technology" AY2003-2004

Masters theses supervised

- Xiongwei Xu, "The synchronization of IEEE 802.11A System", May 2014.
- Abdurazak Fathalla, "Security of Cloud Computing," May 2011.
- Tejas Marathe, "Comprehensive Performance Criteria for Wi-Fi Location Systems," December 2008.

Masters theses supervised (continued)

- Milin Patel, “Network Performance Enhancement using QoS, TCP Optimization, Application Acceleration and Dynamic Resource Allocation Techniques,” January 2008.
- Leo Gerard Raj, “Security in 4G Wireless Systems,” May 2005.

PhD committees

- Chao Tian, “Realization of Pure AM/FM Modulation via Combined Optical and Electrical Injection of Carriers in DFB Laser,” Stevens Institute of Technology, Physics Department, March 2015.
- Tao Yang, “All-optical frequency modulation of quantum cascade laser and its application on infrared spectroscopy,” Stevens Institute of Technology, Physics Department, May 2014.
- Fangming He, “Physical Security in Wireless Communications,” Stevens Institute of Technology, Electrical and Computer Engineering Department, May, 2012.
- Vinod Challa, “Vibration Energy Harvesting for Low Power and Wireless Applications,” Stevens Institute of Technology, Mechanical Engineering Department, May, 2011.
- Brian Borowski, “Application of Channel Estimation to Underwater Acoustic Communication,” Stevens Institute of Technology, Computer Science Department, June, 2010.
- Gang Chen, "All-Optical Modulation of Quantum Structure/Devices," Stevens Institute of Technology, Physics Department, May 2010.

Conference Papers

- He, F., Man, H., Kivanc, D., McNair, B., “EPSON: Enhanced Physical Security in OFDM Networks,” Proc. ICC 2009, Dresden, Germany, June 2009.
- Patel, S.; Cimini Jr, L.J.; McNair, B., “Comparison of frequency offset estimation techniques for burst OFDM,” *Proc. IEEE Vehicular Technology Conference VTC2002*, Birmingham, AL, May, 2002.
- Cimini, L., Leung, K., McNair, B., Winters, J. "Outdoor IEEE 802.11b Cellular Networks: MAC Protocol Design and Performance," *Proc. ICC 2002*, New York, NY, April 2002
- Clark, M., Leung, K., McNair, B., Kostic, Z., "Outdoor IEEE 802.11b Cellular Networks: Radio Link Performance", *Proc. ICC 2002*, New York, NY, April 2002.
- McNair, B., “Software Radio – the Commercial Perspective,” *Proc. IEEE Sarnoff Symposium*, Princeton, NJ, March 2002.
- Zou, H., Daneshard, B., McNair, B., "An Integrated OFDM Receiver for High-Speed Mobile Data Communications," *Proc. IEEE Globecom 2001*, San Antonio, TX, Oct. 2001.
- McNair, B., "Future Directions for Wireless Communications," *Supercomm2001*, Atlanta, GA, June, 2001

Conference Papers (continued)

- Cimini, L., McNair, B, "OFDM for High Data Rate, High-Mobility, Wide-Area Wireless Communications," *Proc. IEEE Sarnoff Symposium*, Princeton, NJ, March, 2001.
- Cimini, L., McNair, B, Sollenberger, N., "Implementation of an Experimental 384 kb/s Radio Link for High-Speed Internet Access," *Proc. IEEE Vehicular Technology Conference VTC2000*, Boston, MA, September, 2000.
- Cimini, L., McNair, B, Sollenberger, N., "Performance of an Experimental 384 kb/s 1900 MHz Radio Link In a Wide-Area High-Mobility Environment," *Proc. IEEE Vehicular Technology Conference VTC2000*, Boston, MA, September, 2000.
- Takamura, K.; Kunihiro, T.; Yamaura, T.; Fujita, E.; Anderson, G.; Chibane, C.; Feinberg, P.; Sollenberger, N.; McNair, B.; Mielcarek, E., "Field trial results of a band hopping OFDM system,' *Proc. IEEE Vehicular Technology Conference VTC99-Fall*, 1999. Amsterdam, the Netherlands, September 1999.
- McNair, B., Cimini, L., Sollenberger, N., "A Robust Timing and Frequency Offset Estimation Scheme for Orthogonal Frequency Division Multiplexing (OFDM) Systems," *Proc. IEEE Vehicular Technology Conference, VTC99*, Houston, TX, May 1999.
- McNair, B., Gupta, S., Kostic, Z., Sollenberger, N., "Experimental Results for Extensions to the IS-136 TDM Standard Based on Higher Level Modulation, Coherent Detection, and Equal Gain Antenna Combining," *Proc. IEEE Vehicular Technology Conference, VTC99*, Houston, TX, May 1999.
- Kostic, Z., McNair, B., Sollenberger N., "Experimental Performance Results of an Indoor Wireless Extension of IS-136 Based on pi/8 D8PSK, Coded Modulation, and Antenna Diversity," *Proc. IEEE Vehicular Technology Conference, VTC98*, Ottawa, Canada, May 1998.
- McNair, B., "The Effectiveness of Preselection Diversity for Indoor Wireless Systems," Proc. Int. Conf. on Universal Personal Communications, San Diego, CA, Oct. 1997.

Invited talks

- "Adventures in On-Line Education," Tsinghua University Webinar: Showcasing Online Course Designs, Online Teaching Guidance Expert Group, International Center for Engineering Educations (ICEE) – The United Nations Educational, Scientific and Cultural Organization (UNESCO), April 27, 2020.
- "Providing Structure, Motivation and Process in Security Education," Stevens/NIKSUN Workshop on Innovations in Cyber Security Research, Education and Training, Hoboken, NJ, March 2015
- "Wireless Security Panel," IEEE/AFCEA Fort Monmouth Annual Information Technology Forum and Expo, April 2005.

Invited talks (continued)

- "Of What Use is Wireless Multimedia Without Security," "What's Next in Multimedia Panel," 14th Annual Wireless and Optical Communications Conference, April 2005.
- "Is Wireless Security an Oxymoron?" IEEE Princeton/Central NJ Communications and Consumer Electronics and Computer Science Chapters, December, 2003.

Other Publications

- McNair, B., "Automatic Repeater Offsets," *73 Magazine,* November 1978, pp. 82-86.
- McNair, B, Williman, G., "Digital Keyboard Entry System," *Ham Radio,* Volume 11, Number 9, September, 1978, pp. 92-97.
- McNair, B., "A Digital Display for Amateur Radio Communications Equipment," *Ham Radio,* Volume 9, Number 9, September 1976, pp. 16-25.
- MIL-STD-188-114, "Electrical Characteristics of Digital Interface Circuits," Department of Defense Interface Standard, 24 March 1976

- Graduate:
  - EE/CpE-517 - Digital and Computer Systems Architecture (on-campus)
  - EE/TM/NIS-584 – Wireless System Security (on-campus and on-line)
  - EE-585/PEP-685/MT-685 – Physical Design of Wireless Communications (on-campus and on-line)
  - NiS/CpE-691 – Information Systems Security (on-campus and on-line)
  - EE/CpE-810A - Special Topics in EE/CpE - Digital and Computer Systems Architecture (on-campus)

- Undergraduate (on-campus):
  - E-232 – Design IV
  - BME-322 – Biomedical Design VI
  - EE/CpE-322 – ECE Design VI
  - EE/CpE-345 – Modeling and Simulation
  - CpE-358/CS-381 –Switching Theory and Logical Design
  - EE-359 – Electronic Circuits
  - EE/CpE-423; EE/CpE-424 – Senior Design
  - CpE-450 – Real-time Embedded Systems

Short Courses

- “Electronics and Computers,” preparation course for Fundamentals of Engineering/Professional Engineering license
  Stevens Institute of Technology
- "Digital Signal Processing - Principles, Architecture, and System Applications"
  - *Organizational Effectiveness Institute (originally Johns Hopkins University's continuing education program)*,
- "Wireless Digital Communications Systems: Components, Specifications, Test and Evaluation"
  - *Organizational Effectiveness Institute*
- "Security in Digital Communications Networks"
  - *Bell Labs Architecture Area Adopt a University Program: Grambling State University*
  - *Monmouth University*
- “Digital Telephony"
  - *Monmouth University*
  - *Fort Monmouth Education Center*
  - *Berlin (F.R.G.) Continuing Engineering Education Program*
- "Digital Communications & Applications"
  - *University of Maryland*
  - *Fort Monmouth Education Center*
  - *UCLA Extension University*
- "Digital Communications," presented with Allen Gersho, N.S. Jayant and David Falconer.
  - *George Washington University*
- "Data Communications for the System Designer"
  - *Bell Labs In-Hours Continuing Education Program*

Expert witness, patent consulting experience

- Authentication technology
- Bluetooth, WiFi, ZigBee, and other local/personal area wireless networking
- Cellular systems
- Communications networking
- Digital clock control for power management in SoCs
- Digital Rights Management
- Digital Subscriber Loop (DSL) technology
- Electronic technology
- Embedded systems
- Emergency alerting systems
- Geolocation technology
- Industrial process control software
- Localization services
- Messaging systems
- Multifactor Authentication
- Peer-to-peer and client-server networks
- Secure voice communications
- Signal processing
- Smart cards and magnetic stripe cards for payment systems
- Software/firmware code analysis (C, VHDL)
- Software trade secrets
- Television and television tuner technology
- Trusted systems
- User and system authentication technology
- Video messaging
- Video scrambling and pay-per-view systems
- Voice processing and voice response systems
- Wireless communications and networking – particularly PHY and MAC layers

Law firms supported

- Alston-Bird, New York, NY and Charlotte, NC (Ross Barton, Kirk Bradley, Darlena Subashi, Karlee Wroblewski)
- Baker & McKenzie, Dallas, TX (William McSpadden)
- Bradley, Birmingham, AL (Paul Sykes, Benn Wilson, Jake Gipson)
- Bragalone-Conroy, Dallas, TX (Nick Kliewer, Daniel Olejko, Stephanie Wood)
- Cantor-Colburn, Hartford, CT (Steve Coyle)
- Carella-Byrne (Donald Ecklund)
- Clark-Hill, Pittsburgh, PA, (J. Alexander Hershey)
- Desmarias, New York, NY (Kerri-Ann Leembeck)
- DLA Piper, Austin, TX, San Francisco, CA and San Diego, CA (Brian Erickson, Gerald Sekimura, Kevin Hamilton)
- Fox Rothschild, Lawrenceville, NJ (Gerard Norton)
- Gibbons-Deldeo, Newark, NJ (Michael Cukor, Sheila McShane, Vin McGeary, Erich Falke, Chris Strate)
- Goodwin-Proctor, New York, NY and Washington, DC. (Mark Abate, Calvin Wingfield)
- Greenberg-Traurig, McLean, VA (Andrew Sommer)
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- Latimer, LLP, Oakhurst, NJ (Brian Latimer)
- Merchant-Gould, Atlanta, GA (George Jenson)
- Morrison-Foerster, San Diego, CA (Christian Andreau-von Eaw)
- Oblon Spivak, Arlington, VA (Robert Mattson, Scott McKeown)
- Orrick, Herrington and Sutcliffe, Silicon Valley (Jason Angell)
- Quattlebaum, Grooms, Tull & Burrow, Little Rock, AR (Steve Quattlebaum)
- Quinn-Emanuel, New York, NY (Marc Kaplan)
- Ropes & Gray, Washington, DC, (Scott McKeown, Victor Cheung)
- Sabety & Associates (Ted Sabety)
- Sidley Austin, Chicago, IL, Washington, D.C. (Doug Lewis, Rick Cederoth, Mike Franzinger)
- Steptoe & Johnson, Washington, D.C. (Kate Cappaert, Brian Johnson)
- Carr & Waddoups, Salt Lake City, UT (Trent Waddoups)
- Unified Patents, Washington, DC (Michelle Callaghan/Aspen, Ashraf Fawzy, Jung Hahm, Roshan Mansinghani, Jessica Marks, Jordan Rossen, David Seastrunck)
- Wilson, Sonsini, Goodrich & Rosati, Palo Alto, CA, Seattle, WA (Matthew Argenti, Quincy Lu)
- White Case, Washington, DC, New York, NY (David Tennant, Grace Wang)
- Wisser and Weinstein, West Hartford, CT (Kerry Wisser)
- Woodcock and Washburn, Philadelphia, PA (Michael Bonella)