

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

<i>In re</i> patent of Steve Shattil	§	Attorney Docket No.: 085697.027600
	§	
U.S. Patent No. 11,424,792	§	Customer No.: 67395
	§	
Issue Date: August 23, 2022	§	
	§	
Filing Date: February 23, 2021	§	
	§	
For: COORDINATED	§	
MULTIPOINT SYSTEMS	§	
	§	
	§	

**REQUEST FOR *EX PARTE* REEXAMINATION OF
U.S. PATENT NO. 11,424,792**

Mail Stop “*Ex Parte* Reexam”
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

Pursuant to 35 U.S.C. §§ 303-307, Samsung Electronics America, Inc. and Samsung Electronics Co., Ltd. (“Requesters”) request *ex parte* reexamination of claims 8, 9, and 10 (the “Challenged Claims”) of United States Patent No. 11,424,792 (the “’792 Patent,” Ex. 1001), which issued on August 23, 2022. *See* Ex. 1001 (’792 Pat.). On information and belief, the ’792 Patent is, based on USPTO records, currently assigned to GenghisComm Holdings, LLC. (“GenghisComm” or “Patent Owner”). The assignments for the ’792 Patent are recorded in the U.S.

Patent and Trademark Office at reel/frame 055774/0525, 059709/0683, and 059310/0087.

Patent Owner has engaged in a decades-long campaign of pursuing duplicative patents with hundreds of claims on substantially the same subject matter. By drafting claims directed to the 4G and 5G wireless standards well after those standards were adopted—and doing so in numerous patent applications that matured into patents—Patent Owner created a double patenting problem for the '792 Patent. Through its duplicative and multiplied patent filings, GenghisComm has improperly benefited from a patent term that was unjustly extended to the detriment of the public. Indeed, even if the Challenged Claims were patentable over the prior art, the '792 Patent should have been terminally disclaimed to a patent that expired in May of 2022. But that did not happen. Because of this oversight, the '792 Patent has enjoyed an improperly extended patent term.

Because the earlier-issued patents to which the '792 Patent should have been terminally disclaimed (or rejected over) has expired, GenghisComm is unable to cure its double patenting problem through a terminal disclaimer. *See Boehringer Ingelheim Int'l GMBH v. Barr Labs., Inc.*, 592 F.3d 1340, 1347 (Fed. Cir. 2010) (“By failing to terminally disclaim a later patent prior to the expiration of an earlier related patent, a patentee enjoys an unjustified advantage — a purported time extension of the right to exclude from the date of the expiration of the earlier patent. The patentee cannot undo this unjustified timewise extension by retroactively disclaiming the term of the later patent because it has already enjoyed rights that it seeks to disclaim.”). Therefore, reexamination should be ordered and claims 8, 9, and 10 of the '792 Patent should be canceled because they are unpatentable on obviousness-type double patenting grounds.

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Ex. 1001	U.S. Patent No. 11,424,792 to Shattil (“’792 Pat.”)
Ex. 1002	U.S. Patent No. 10,009,208 to Shattil (“’208 Pat.”)
Ex. 1003	U.S. Patent No. 10,230,559 to Shattil (“’559 Pat.”)
Ex. 1004	Kaiser, S. (1998). Multi-Carrier CDMA Mobile Radio Systems - Analysis and Optimization of Detection, Decoding, and Channel Estimation [Doctoral thesis, Institute of Communications and Navigation at the German Aerospace Center, Oberpfaffenhofen, Germany] (“Kaiser”)
Ex. 1005	U.S. Patent No. 6,609,010 to Dolle et al. (“Dolle”)
Ex. 1006	R1-02-1246, Proposed Baseline OFDM Systems for Study, Lucent Technologies, 3GPP TSG-RAN1 Meeting #28bis, Espoo, Finland, October 8-9, 2002 (“Lucent”)
Ex. 1007	File History of U.S. Patent Application No. 13/116,984 to Shattil (the “’984 FH”)
Ex. 1008	U.S. Patent No. 10,014,882 to Sen et al. (“’882 Pat.”)
Ex. 1009	File History of U.S. Patent Application No. 17/183,114 (the “’114 FH”)
Ex. 1010	File History of U.S. Patent Application No. 16/575,713 (the “’713 FH”)
Ex. 1011	File History of U.S. Patent Application No. 14/733,103 (the “’013 FH”)
Ex. 1012	File History of U.S. Patent Application No. 12/382,917 (the “’917 FH”)
Ex. 1013	File History of U.S. Patent Application No. 11/621,014 (the “’014 FH”)
Ex. 1014	Declaration of Harry Bims, Ph.D. (“Bims Decl.”)

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Ex. 1015	U.S. Patent Application Publication No. 2015/0256308 to Ma et al. (“Ma”)
Ex. 1016	U.S. Patent Application Publication No. 2008/0095121 of U.S. Patent Application No. 10/145,854 to Shattil (the “’854 Application”)
Ex. 1017	Complaint, <i>GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.</i> , 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (No. 1) (“Complaint”)
Ex. 1018	Exhibit 8 of Aug. 12, 2024 Infringement Contentions, as served in <i>GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.</i> , 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 8”)
Ex. 1019	Terminal Disclaimer entered on Apr. 4, 2018 in U.S. Patent Application No. 15/644,209 (the “’209 TD”)
Ex. 1020	U.S. Patent No. 9,800,448 to Shattil (“’448 Pat.”)
Ex. 1021	U.S. Patent No. 11,223,508 to Shattil (“’508 Pat.”)
Ex. 1022	Terminal Disclaimer entered on Nov. 29, 2018 in U.S. Patent Application No. 16/026,001 (“the ’001 TD”)
Ex. 1023	U.S. Patent No. 10,015,034 to Shattil (“’034 Pat.”)
Ex. 1024	U.S. Patent No. 10,038,584 to Shattil (“’584 Pat.”)
Ex. 1025	U.S. Patent No. 10,142,082 to Shattil (“’082 Pat.”)
Ex. 1026	Declaration of Sylvia Hall-Ellis, Ph.D. (“Hall-Ellis Decl.”)
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	<i>Inc.</i> , 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 6”)
Ex. 1031	Exhibit 4 of August 12, 2024 Infringement Contentions, as served in <i>GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.</i> , 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 4”)
Ex. 1032	Exhibit 6 of <i>Ex Parte</i> Reexamination Reply Brief, as in Reexamination No. 90/019,411 (filed June 6, 2024) (“Genghis Reply Br. Ex.”)
Ex. 1033	Exhibit 5 of <i>Ex Parte</i> Reexamination Reply Brief, as in Reexamination No. 90/019,411 (filed June 6, 2024) (“Shattil Decl.”)
Ex. 1034	Final Office Action in Reexamination No. 90/019,411 (entered August 21, 2024) (“411 Final OA”)
Ex. 1035	Angela Doufexi et al., <i>Design Considerations and Initial Physical Layer Performance Results for a Space Time Coded OFDM 4G Cellular Network</i> , IEEE PIMRC 2002 (2002) (“Doufexi”).
Ex. 1036	Excerpts from R. van Nee & R. Prasad, <i>OFDM Wireless Multimedia Communications</i> , Artech House (2000) (“Van Nee”).

I. OVERVIEW

This Request demonstrates that claims 8, 9, and 10 should not have issued because they are unpatentable on the grounds of obviousness-type double patenting over at least two other GenghisComm patents found among the thicket of divisionals, continuations, continuation-in-parts, and disclosures dating back to at least as early as 2001. Because of the thicket of redundant patent claims GenghisComm’s apparent strategy of swapping disclosures among different patent families relying on alleged incorporations by reference, the original Examiner overlooked certain earlier-issued patents when analyzing the double patenting issues. At least Challenged Claims 8, 9, and 10 should have been rejected based on the substantial new questions of patentability (SNQs) presented herein. Because the patents that form the basis of the double patenting grounds presented herein are expired, GenghisComm has obtained an improper and unfair extension of patent term, which may no longer be cured through the submission of retroactive disclaimers because it has already enjoyed the additional exclusivity it improperly obtained. *See Boehringer*, 592 F.3d at 1347.

II. STATEMENT CONCERNING PENDING MATTERS INVOLVING THE ’792 PATENT

The ’792 Patent is involved in the following pending litigation:

- *GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.*, 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024).

Requesters are unaware of any other litigation involving the ’792 Patent or any challenges currently or previously pending before the Patent Trial and Appeal Board. Requesters anticipate filing a request for *inter partes* review against certain claims of the ’792 Patent based on patents and printed publications and raising grounds under 35 U.S.C. §§ 102 and 103.

This Request is also being filed concurrently with another request for *ex parte* reexamination against another GenghisComm patent, U.S. Patent No. 11,252,005. This other Request for Reexamination raises issues double patenting SNQs as to certain claims of the '792 Patent.

Finally, Requesters are aware of a pending reexamination against a patent with a similar disclosure, similar claims, which is allegedly assigned to the same Patent Owner, and identifies the same inventor: U.S. Patent No. 10,200,227. *See Ex Parte* Reexamination Control No. 90/019,411 (filed Feb. 9, 2024).

III. EX PARTE REEXAMINATION FILING REQUIREMENTS

Pursuant to 37 C.F.R. § 1.510(b)(1), statements pointing out at least one substantial new question of patentability based on material, non-cumulative reference patents and printed publications for the Challenged Claims of the '792 patent are provided in Section VII of this Request.

Pursuant to 37 C.F.R. § 1.510(b)(2), reexamination of the Challenged Claims (14, 19, 35, 48, 51, 54, 57) of the '792 patent is requested, and a detailed explanation of the pertinence and manner of applying the cited references to the Challenged Claims is provided in Sections V and VI of this Request.

Pursuant to 37 C.F.R. § 1.510(b)(3), copies of every patent or printed publication relied upon or referred to in the statement pointing out each substantial new question of patentability or in the detailed explanation of the pertinence and manner of applying the cited references are provided as Exhibits 1001-1035 of this Request.

Pursuant to 37 C.F.R. § 1.510(b)(4), a copy of the '792 patent is provided as Exhibit 1001 of this Request.

Pursuant to 37 C.F.R. § 1.510(b)(5), the attached Certificate of Service indicates that a copy of this Request, in its entirety, has been served on Patent Owner

at the following address of record for Patent Owner, in accordance with 37 C.F.R. § 1.33(c):

GenghisComm Holdings, LLC
c/o 74284 - Steven J Shattil
P.O. Box 17355
Boulder, CO 80308-0355
UNITED STATES

Also submitted herewith is the fee set forth in 37 C.F.R. § 1.20(c)(1).

Pursuant to 37 C.F.R. § 1.510(b)(6), Requesters hereby certify that the statutory estoppel provisions of 35 U.S.C. § 315(e)(1) and 35 U.S.C. § 325(e)(1) do not prohibit Requesters from filing this *ex parte* patent reexamination request. Moreover, the Federal Circuit’s decision in *In re Vivint, Inc.*, 14 F.4th 1342 (Fed. Cir. 2021) does not apply to this Request should Patent Owner argue for a denial under 35 U.S.C. § 325(d). In *Vivint*, the requestor engaged in “serial” filings by submitting a reexam request after filing a series of IPR petitions, the last of which the Board deemed an “undesirable, incremental” attack on the Patent Owner and denied the petition. *Id.* at 1346. Yet, after that denial, the requestor filed a reexam request that ultimately resulted in cancellation of the challenged claims. On review, the Federal Circuit reversed the CRU’s decision ordering reexamination, finding that the request, which mirrored the denied IPR petition, was an abusive filing. The Federal Circuit reasoned that the reexam “copied, word-for-word, two grounds from the [denied petition], the very petition deemed ‘a case of undesirable, incremental petitioning.’” *Id.* at 1353.

In contrast, this Request involves no evidence of “serial” filing or harassment. It raises substantial new questions of patentability based on new information that the Office has not previously addressed. Indeed, the SNQs presented herein cannot be raised in *inter partes* review because they are not challenges under 35 U.S.C. § 102

or § 103. Therefore, unlike *Vivint*, this Request does not constitute “undesirable, incremental petitioning” and reexamination should not be denied under § 325(d).

IV. SUMMARY OF THE ’792 PATENT, ITS PROSECUTION HISTORY, AND PROBLEMS WITH THE DOMESTIC BENEFIT CLAIM; EFFECTIVE FILING DATE OF, AT BEST, JUNE 8, 2015

In this section, we first describe the disclosure of the ’792 Patent. Then we explain why the ’792 Patent is, at best, entitled to an effective filing date of June 8, 2015. We also discuss the prosecution history of the ’792 Patent and the applications that are included in the domestic benefit claim.

A. The Disclosure of the ’792 Patent

According to the abstract of the ’792 Patent, the patent purports to describe “[a] flexible channel bandwidth for mobile radio communications” that is provided “by provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications.” Ex. 1001 (’792 Pat.), Abstract. The “[f]ield” does not align with the abstract and instead says that the alleged invention relates “specifically to cooperative signal processing between wireless transceivers.” *Id.*, 1:22-24; *see also id.*, 3:3-8 (“Aspects of the disclosure describe cooperative-MIMO processing which comprise MIMO processing wherein the multiple input (MI) comprises downlink transmissions from multiple base transceiver stations and the multiple output (MO) comprises uplink transmissions to multiple base transceiver stations.”). Multiple transmitters can be selected to “ensure that a set of pre-coded transmissions is characterized by sufficient rank to allow a destination node to decode received signals.” *Id.*, 6:66-7:5.

Cooperative network coding can use “various types of linear network codes, including polyphase codes derived from a discrete Fourier transform” Ex. 1001 (’792 Pat.), 7:53-59. In the uplink, UEs can “produce a transmission signal with low

dynamic range (i.e., peak to average power). Thus, the UEs can employ CI coding on OFDM subcarriers to produce CI-OFDM (also known as single-carrier OFDM) signals.” *Id.*, 40:22-28. Symbol values may be “impressed onto the subcarriers,” *id.*, 40:29-31, and an IFFT can be used to do this, *id.*, 40:37-39.

According to certain examples, “transceiver operating characteristics can be adaptable,” as reflected in Figure 16 (below). Ex. 1001 (’792 Pat.), 42:40-42.

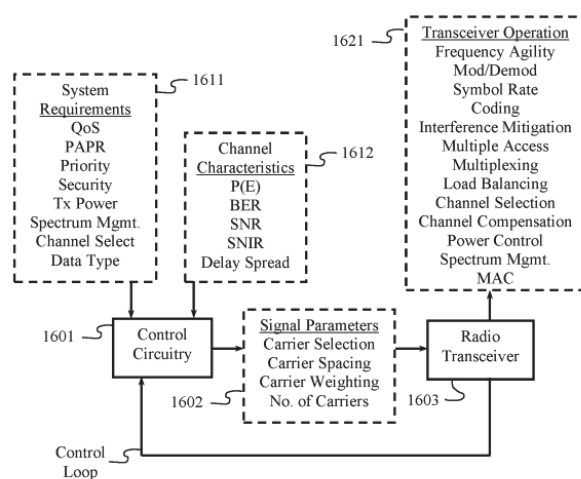


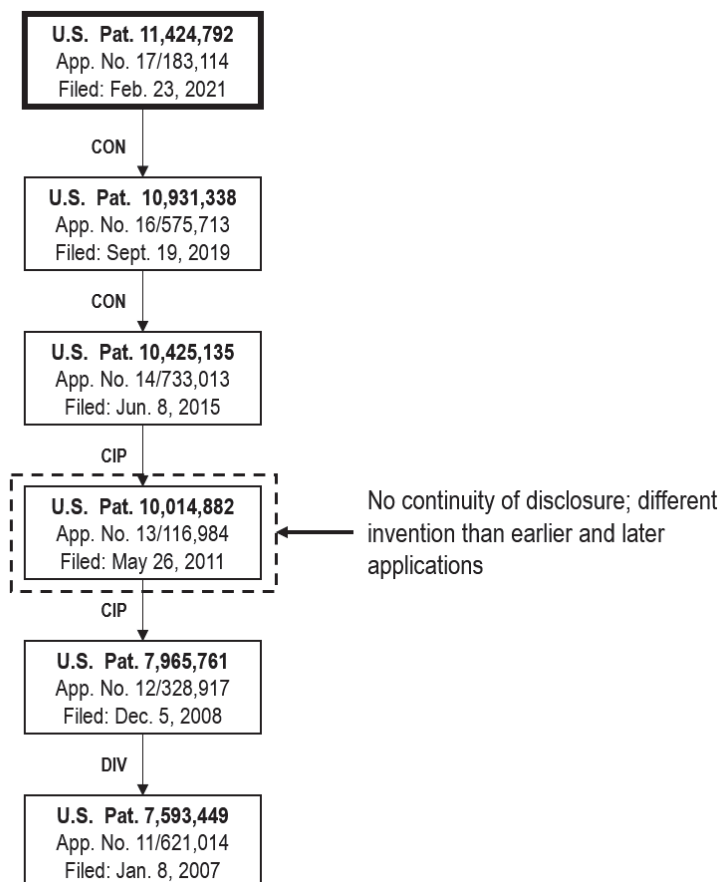
Figure 16

Control circuit 1601 receives “one or more system requirements 611” and then can “adapt one or more signal parameters 1602 employed by a radio transceiver 1603, such as radio transceivers employed by UEs, etc.” *Id.*, 42:45-48. For example, “the control circuitry 1601 may scale a transmitted bit rate by scaling the symbol duration, the number of subcarriers, the subcarrier spacing, and/or the number of bits per symbol per subcarrier.” *Id.*, 42:51-54.

B. The ’792 Patent Is, At Best, Entitled To An Effective Filing Date of June 8, 2015

While the ’792 Patent purports to claim the benefit of U.S. Patent Application No. 11/621,014, filed on January 8, 2007, it is not entitled to the benefit of that filing

date. This is because there is not continuity of disclosure of the claimed subject matter going back to that application. The following diagram illustrates the priority claim of the '792 Patent.



Specifically, U.S. Patent Application No. 13/116,984 names three people as inventors: Robi Sen, Steve Shattil,¹ and Ian Starnes. Ex. 1007 ('984 FH), p.465. The '984 Application is titled "Method and Apparatus for Fast Prototyping of Wireless Transceivers." *Id.* And, as originally filed, the first paragraph of the specification references (but does not incorporate by reference) U.S. Provisional Application No. 61/349,097, filed May 27, 2010. *Id.* No other applications, patents, or patent publications are referred to in the originally filed specification of the '984

¹ Mr. Shattil is both a named inventor and a patent agent registered to practice before the Office.

Application.²

Unlike the '792 Patent, the '984 Application “relates to rapid prototyping of electronic systems, and in particular, to systems and methods for assembling and configuring wireless transceiver components.” *Id.*, p.466. After describing perceived problems with the prior art, the '984 Application explains that “the present invention can solve” those problems “by providing an integrated hardware and software component architecture based on principles of Object Oriented Programming to allow system developers and end users to rapidly design, build, and test hardware in an iterative fashion, allowing for faster product life-cycles, greater innovation, and facilitating end-user and third-party development.” Ex. 1007 ('984 FH), p.467. The '984 Application includes no discussion of subcarrier spacings, provisioning subcarriers, or polyphase codes used to encode data symbols.

While irrelevant to the question of whether the disclosure of the '984 Application includes a disclosure of the subject matter now claimed in the '792 Patent claims, for the sake of completeness, Requesters note that during prosecution of the '984 Application, Mr. Shattil repeatedly attempted to amend the priority claim and was eventually successful. *See, e.g.*, Ex. 1007 ('984 FH), pp.296-316. Starting with a filing titled “Amendment And Petition for Unintentionally Delayed Priority Claim And Request for Corrected Filing Receipt,” Mr. Shattil sought a major change to the priority claim and represented that the delay “between the date the benefit claim was due [in 2011] and the date the benefit claim was filed [on February 13,

² A certificate of correction issued on July 14, 2020 in U.S. Patent No. 10,014,882. That certificate changed the first paragraph of the specification to include a priority claim through various applications back to U.S. Patent Application No. 10/131,163 (issued as U.S. Patent No. 7,430,257). *See* Ex. 1007 ('984 FH), p.46. None of the referenced applications were incorporated by reference. Nor could they have been without improperly introducing new matter. *See* 35 U.S.C. § 132(a) (“No amendments shall introduce new matter into the disclosure of the invention.”).

2015] was unintentional.” *Id.*, p.297; *see also id.*, p.304. The Application Data Sheet filed with the request to recognize a delayed priority claim indicated that the benefit claim reached back to U.S. Provisional Application No. 60/286,850 filed on April 26, 2001. *Id.*, p.314. That petition was ultimately dismissed because “application No. 12/328,917 is not a divisional of application No. 11/621,014, as specified in the ADS.” *Id.*, p.102.

On April 7, 2017, Mr. Shattil renewed the petition to correct the domestic benefit claim. This time instead of claiming that the ’917 Application was a divisional of the ’014 Application, the revised ADS indicated that the ’917 Application was a divisional of U.S. Patent Application No. 10/131,163. Ex. 1007 (’984 FH), p.91. The Office dismissed the Petition again. This time it was dismissed because while Applicant sought to claim the benefit U.S. Provisional Application 60/286,850 the intervening ’917 Application did not claim the benefit of the ’850 Provisional Application. *Id.*, pp.84-85.

The ’984 Application issued as U.S. Patent No. 10,014,882 without a corrected domestic benefit claim. Ex. 1008 (’882 Pat.), cover. About two years later, Mr. Shattil again tried to correct the benefit claim. After multiple petitions, declarations, and other submissions, the Office corrected the domestic benefit claim. Ex. 1007 (’984 FH), pp.2-55. None of these changes to the domestic benefit claim can cure a dispositive problem with the domestic benefit claim: the originally filed specification of the ’984 Application fails to describe the subject matter of the claims of the ’792 Patent.

Even with the amended priority claim, a priority claim standing alone is not an incorporation by reference. *See, e.g., In re De Seversky*, 474 F.2d 671, 674 (C.C.P.A. 1973) (“[T]he statement that an application is a continuation-in-part, or a continuation, or a division, or in part a continuation of another application is in a broad sense a ‘reference’ to the earlier application, but a mere reference to another

application, or patent, or publication is not an incorporation of anything therein into the application containing such reference for the purposes of the disclosure required by 35 U.S.C. § 112.”); MPEP § 608.01(p) (“Mere reference to another application, patent, or publication is not an incorporation of anything therein into the application containing such reference for the purpose of the disclosure required by 35 U.S.C. 112.”). The originally filed ’984 Application shows that there is no disclosure whatsoever of the OFDM systems, methods, and computer readable media claimed in the ’792 Patent. Patent Owner cannot point to anything incorporated by reference into the ’984 Application to provide written description for the ’792 Patent claims either.

Because the ’984 Application does not describe the subject matter recited in the ’792 Patent claims, there is a break in continuity of disclosure that renders the priority claim improper. In other words, because the ’984 Application does not support the claimed subject matter under 35 U.S.C. § 112(a), there is a break in the chain of earlier-filed applications. This breaks the domestic benefit chain to the ’984 Application because “continuity of disclosure must have been maintained through a chain of patents from the [earlier] patent leading up to the [later] patent.” *Zenon Envt’l, Inc. v. United States Filter Corp.*, 506 F.3d 1370, 1378 (Fed. Cir. 2007). Because continuity of disclosure was not maintained, the domestic benefit claim is legally flawed and improper. The earliest possible effective filing date of the ’792 Patent claims is the filing date of U.S. Patent Application No. 14/733,013 on **June 8, 2015**. Not only does this open up prior art to the ’792 Patent, it requires the ’792 Patent to be evaluated under post-AIA law.

C. The Prosecution History of the ’792 Patent

This section traces the prosecution history leading to the ’792 Patent back through the applications included in the claim for domestic benefit back to the filing

of U.S. Patent Application No. 11/621,014 filed on January 8, 2007. In discussing the prosecution history of the '984 Application, reference is made to the discussion in the preceding section regarding the flawed domestic benefit claim. *Supra* §IV.B.

1. U.S. Patent Application No. 17/183,114 (U.S. Patent No. 11,424,792)

The application for the '792 Patent was filed on February 23, 2021. Ex. 1009 ('114 FH), pp.49, 53-55. The specification included the following description of related applications:

This application is a Continuation of U.S. Pat. Appl. No. 16/575,713, filed on September 19, 2019, now U.S. Pat. No. 10,931,338, which is a Continuation of U.S. Pat. Appl. No. 14/733,013, filed June 8, 2015, now U.S. Pat. No. 10,425,135, which is a Continuation-in-Part of U.S. Pat. Appl. No. 13/116,984, filed May 26, 2011, now U.S. Pat. No. 10,014,882, which is a Continuation-in-Part of U.S. Pat. Appl. No. 12/328,917, filed December 5, 2008, now U.S. Pat. No. 7,965,761, which is a Divisional of U.S. patent application Ser. No. 11/6212,014 filed January 8, 2007, now U.S. Pat. No. 7,593,449, ***all of which are expressly incorporated by reference in their entirety.***

Ex. ('114 FH), p.97 (emphasis added). Insofar as this incorporation by reference is needed to support any claimed subject matter, it bears noting that it was not present in the '984 Application, *see supra* §IV.B, nor was it present in applications that the '984 Application was altered to refer to, *infra* §IV.C.4. Thus, it represents new matter added to the chain of applications on or after June 8, 2015.

On May 23, 2022 a First Office Action issued. The Office Action indicates that the application was “examined under the pre-AIA first to invent provisions.” Ex. 1009 ('114 FH), p.32. This was a mistake because of the break in the priority

chain discussed above. *Supra* §IV.B. The examiner also rejected the claims of the '114 Application on the grounds of obviousness-type double patenting over U.S. Patent No. 11,223,508. Ex. 1009 ('114 FH), pp.33-40. A terminal disclaimer was filed to terminally disclaim the term of any patent that was to issue based on the '114 Application to the term of U.S. Patent No. 11,223,508. *Id.*, pp.23-24. "No amendment was made" to the claims, *id.*, p.22, and they were allowed, *id.*, pp.11-14.

None of the double patenting references raised in this Request for Reexamination were applied in any rejection by the Office when it decided to issue the '792 Patent.

2. *U.S. Patent Application No. 16/575,713 (U.S. Patent No. 10,931,338)*

The immediate parent to the '792 Patent, U.S. Patent Application No. 16/575,713 (issued as U.S. Patent No. 10,931,338) was filed on September 19, 2019. Ex. 1010 ('713 FH), pp.76, 78-82. When compared to the '792 Patent, the '713 Application claimed the benefit of even earlier filed applications. This difference in priority claim between the '792 Patent and the '713 Application gives the '792 Patent a longer patent term under 35 U.S.C. § 154 than the patent issued on the '713 Application would have. This difference in part causes the double patenting issues raised in this Request. The '713 Application includes the following benefit claim:

This application is a Continuation of U.S. Pat. Appl. No. 14,733,013, filed June 8, 2015, now U.S. Pat. No. 10,425,135, which is a Continuation-in-Part of U.S. Pat. Appl. No. 13/116,984, filed May 26, 2011, now U.S. Pat. No. 10,014,882, which is a Continuation-in-Part of U.S. Pat. Appl. No. 12/328,917, filed December 5, 2008, now U.S. Pat. No. 7,965,761, which is a Divisional of U.S. patent application Ser. No.

11/621,014 filed January 8, 2007, now U.S. Pat. No. 7,593,449, which is a Divisional of U.S. patent application Ser. No. 10/131,163 filed Apr. 24, 2002, now U.S. Pat. No. 7,430,257, which claims priority to U.S. Provisional Application No. 60/286,850, filed Apr. 26, 2001, all of which are expressly incorporated by reference in their entireties.

Ex. 1010 ('713 FH), p.119 (emphasis added). Insofar as this incorporation by reference is needed to support any claimed subject matter, it bears repeating that it was not present in the '984 Application, *see supra* §IV.B., nor was it present in applications that the '984 Application was amended to claim priority to, *infra* §§ IV.C.5, IV.C.6. Thus, it represents new matter added to the chain of applications on or after June 8, 2015.

The claims of the '713 Application bear no meaningful resemblance to the claims of the '792 Patent. Ex. 1010 ('713 FH), pp.217-221. They relate to, for example, a “central processor” that includes “a cooperative Multiple-Input, Multiple-Output (MIMO) processor” that can select “a plurality of antennas residing on multiple ones of the plurality of geographically distributed base transceiver stations to receive transmission from each of the plurality of UEs,” among other things. *Id.*, p.217.

A first Office Action was mailed on September 16, 2020. Ex. 1010 ('713 FH), pp.35-67. The Examiner examined the claims under pre-AIA law. *Id.*, p.37. As explained above, *supra* § IV.B., this was an oversight. The Examiner rejected the '713 Application claims based on obviousness-type double patenting over the claims of the immediate parent patent to the '713 Application—U.S. Patent No. 10,425,135—alone or combined with a reference to Paulraj (U.S. Patent No. 6,351,499). *Id.*, pp.38-47. The Examiner also rejected certain claims as being obvious over Paulraj in view of U.S. Patent No. 5,809,426 to Radojevic et al. *Id.*,

pp.47-55. Other claims were rejected based on additional references in combination with Paulraj and Radojevic. *Id.*, pp.56-66.

The Applicant responded to the Office Action by contending that the prior art did not exploit multipath, Paulraj “teaches against” using multipath, and that the “claimed features are derived from an understanding that cannot be found in the combination of Paulraj and Radojevic,” thus cutting against the obviousness of the claims. *Id.*, pp.31-33. The ’713 Application was also terminally disclaimed to U.S. Patent No. 10,425,135. *Id.*, pp.14-15. The claims were then allowed. *Id.*, pp.8-11.

Because the claims of the ’713 Application bear no meaningful resemblance to the claims of the ’792 Patent none of the double patenting references raised in this Request for Reexamination were applied in any rejection by the Office in connection with the ’713 Application.

3. *U.S. Patent Application No. 14/733,013 (U.S. Patent No. 10,425,135)*

The second removed patent application in the ’792 Patent’s domestic benefit claim is U.S. Patent Application No. 14/733,013 (issued as U.S. Patent No. 10,425,135). The ’013 Application was filed on June 8, 2015. Ex. 1011 (’013 FH), pp.255, 257-260. The ’013 Application’s priority claim is very similar to the priority claim in its child application—the ’713 Application—discussed above. *Supra* § IV.B. Like that priority claim, it stretches back to U.S. Provisional Application No. 60/286,850 and includes a statement that the applications in the chain are incorporated by reference. Ex. 1011 (’013 FH), p.262.

The claims of the ’013 Application bear little resemblance to the claims of the ’792 Patent. *See generally* Ex. 1011 (’013 FH), pp.360-364. The ’013 Application claims include limitations such as a “central processor” that includes “a cooperative Multiple-Input, Multiple-Output (MIMO) processor configured for:” performing

various tasks including “selecting a plurality of antennas residing on multiple ones of the plurality of base transceiver stations to serve each of the plurality of UEs,” among other things. *Id.*, p.360.

A first Office Action was mailed on October 20, 2016. *Id.*, pp.230-249. The Examiner explained that the ’013 Application would be examined under post-AIA law because, after a “review of the disclosures of the instant application and the parent application, . . . at least one claim presented or that have ever been presented in the instant application appears to be drawn to inventions having an effective filing date on or after March 16, 2013 as the claims fail to have support in the parent application.” *Id.*, p.232. The Examiner identified the requirement of a “cooperative Multiple-Input, Multiple-Output (MIMO) processor configured for coordinating transmissions of pre-coded signals from the plurality of antennas to exploit multipath in the RAN to coherently combine at each of the plurality of UEs.” *Id.* The Office Action states that this limitation “lacks support in the parent/provisional application and thus the effective filing date of at least on claim in the application appears to be 06/08/15.” *Id.* The Office Action then rejected the claims under §§ 112(b) and 103. *Id.*, pp.233-248.

Applicant responded to the Office Action in which Applicant disputed the Examiner’s determination that the ’013 Application was subject to post-AIA law. Ex. 1011 (’013 FH), pp.208-227. First, Applicant drew the Examiner’s attention to the priority claim and argued that “support for each and every feature of the claims in the instant application is supported by the set of disclosures to which priority is claimed (as explained below), and each application in the Domestic Priority data was filed before March 16, 2013.” *Id.*, p.216.

Applicant further disputed whether the references being applied by the Examiner was prior art:

With regard to the rejection of the above Claims under 35 U.S.C. 103,

Forenza is not a Prior-Art reference because the present application contains a proper priority chain which includes a claim of priority to U.S. patent application Ser. No. 10/131,163 (the ‘163 application), filed on April 24, 2002, which has an earlier filing date of Forenza (March 15, 2013) and the **earliest priority date** of Forenza (also March 15, 2013); and the specification of the ‘163 application presents adequate written description for the Claims in order to satisfy the statutory conditions of 35 U.S.C. Section 112.

Ex. 1011 (’013 FH), p.217 (bold in original). According to Mr. Shattil, “[t]he present application has the benefit of the earlier filing date of the ’163 application under 35 U.S.C. § 120, because it contains a specific reference to the ’163 application in accordance with 37 C.F.R. § 1.78(a), and the ’163 application satisfies the enablement and written description requirements of 35 U.S.C. 112, first paragraph.” *Id.*, p.217. According to Applicant, “[s]ince all the elements of Claim 1 are disclosed in Applicant’s prior ‘163 patent application, Claim 1 should have the priority benefit of the filing date of the ‘163 application.” *Id.*, p.218. Mr. Shattil then attempted to map the claims onto the disclosure found in U.S. Patent Application Publication No. 2007/0211786 (U.S. Patent Application No. 11/621,014), “which is identical to the ‘163 application, to guide the Office in its understanding of the claimed subject matter.” Ex. 1011 (’013 FH), p.219. Mr. Shattil made no effort to show how the claims of the ’013 Application were described in the immediate parent application—the ’984 Application. Nor did he address the requirement of continuity of disclosure.

Despite these failures, the examiner withdrew the section 112(b) rejections, maintained the obviousness rejections, and rejected Applicant’s argument that the claims should be examined under pre-AIA law and were entitled to the benefit of the ’163 Application. *Id.*, pp.186-203. The Examiner addressed the merits of Mr.

Shattil's arguments that Provisional Application No. 60/286,850 and U.S. Patent Application 10/131,163 and explained:

None of the applications that the applicant claims priority to, including Shattil '850 and Shattil '163, mention the word "MIMO" in their disclosures.

MIMO is not defined merely by multiple antennas and serving multiple subscriber units. Rather, MIMO is much more than simply sending the same signal from multiple antennas to a receiver, which has been well known in the art as 'antenna diversity' or 'transmit diversity' to improve SNR. Today, and at the time the application was filed, the most common meaning of MIMO, e.g. in LTE, is multiple inputs and multiple outputs to increase throughput by sending different data signals simultaneously from multiple antennas (collocated in a single base station) over the same radio channel and aggregating them at the receiver which may also have multiple antennas (e.g., [sic] 3GPP TS36.213 V9.3.0 (September 2010)

Thus, the disclosures in priority documents merely describe 'transmit diversity' to improve SNR, not MIMO as it is known today, and was known at the time the application was filed, specifically designed to increase throughput. Therefore the priority documents do not provide support for the use of the term "MIMO" in claim 1, and the application is therefore being handled as an AIA application.

Ex. 1011 ('013 FH), pp.202-203.

Applicant again responded. *Id.*, pp.173-184. Applicant argued that "the '163

application incorporates by reference patent application Ser. No. 09/718,851,³ entitled ‘Multiple Input, Multiple Output Carrier Interferometry Architecture,’ which specifically uses the word ‘MIMO’ (e.g., see Page 61.” *Id.*, p.181. Applicant further contended that “the ‘851 application describes spatial subchannels (e.g., Pages 61-64), a defining feature of MIMO that is also described throughout the ‘163 application” *Id.* Additionally, Mr. Shattil disputed the Examiner’s conclusion that the ‘163 Application failed to describe a technique for increasing throughput. *Id.*, pp.181-182 (“The ‘163 application precisely discloses what the Office defines as MIMO”). In conclusion, Mr. Shattil argued that:

In view of the above reasons, the claims of the present application are supported by the ‘163 application, and the priority date of the ‘163 application is sufficient to disqualify the relied-upon references in the 35 U.S.C. 103 rejections.

Furthermore, in view of the reasons discussed in Applicant’s letter dated 01/18/2017 and that the ‘850 application incorporates by reference the ‘851 application discussed above, at least the independent claims of the present application should be accorded the priority date of the ‘850 application.

Ex. 1011 (’013 FH), p.183. No effort was made to address continuity of disclosure or to show that the subject matter of the ’013 Application claims were supported by the ’984 Application. As explained above, they were not.

Even though no effort appears to have been undertaken to determine whether the intervening ’984 Application disclosed the subject matter that was being claimed in the ’013 Application, the Examiner explained that the claims would be examined

³ U.S. Patent Application No. 09/781,851 has not been made available to the public through Patent Center.

under pre-AIA law. *See* Ex. 1011 ('013 FH), p.139; *see also id.*, p.163 (“Applicant’s arguments with respect to priority and AIA/Pre-AIA designation are persuasive and the designation for the application has been changed from AIA to pre-AIA. Hence the previous rejections based on Forenza and Kim are withdrawn.”). And, the Examiner concluded that certain claims would be examined with an effective filing date of April 26, 2001 based on Provisional Application No. 60/286,850 and other claims would be examined based on a filing date of 04/24/2002 based on an effective filing date of April 24, 2002. *Id.* Various rejections under 35 U.S.C. §§ 112(b), (d), and 103 were made. *Id.*, pp.140-163. This was a mistake and contrary to law, as explained above.

A timely response to the Office Action was not received and the '013 Application went abandoned on February 28, 2018. A Notice of Abandonment was mailed on June 25, 2018. Ex. 1011 ('013 FH), pp.135-136. About six weeks later, Applicant filed a petition to revive the '013 Application, *id.*, pp.130-133, and the petition was granted, *id.*, p.129. In response to the rejections the claims were amended and arguments were presented. *Id.*, pp.115-126.

The Examiner disagreed with many of the arguments, and while the Office Action withdrew the section 112 rejections, the Examiner maintained the prior art rejections. *Id.*, pp.84-110. The action was made final. *Id.*, p.110. This led Applicant to amend the independent claims to require that “each of the plurality of UEs is served by a different plurality of antennas” and present an argument that this limitation distinguished the prior art. *Id.*, pp.73-82. The Examiner issued an Advisory Action, leading Applicant to file a Request for Continued Examination. *Id.*, pp.58-69.

In the next Office Action the Examiner applied new grounds of rejection, but continued to reject the claims largely based on the references that were being applied since the status of the application was incorrectly changed to be a pre-AIA

application. Ex. 1011 ('013 FH), pp.31-54. The Applicant again traversed the rejections and the claims were allowed. *Id.*, pp.7-21.

4. *U.S. Patent Application No. 13/116,984 (U.S. Patent No. 10,014,882)*

The '984 Application is summarized above in section IV.C.4. As already explained, the specification of the '984 Application as originally filed did not refer to the '850 Application, the '851 Application, the '163 Application and only claimed the benefit of a filing date of a 2010 provisional application. *Supra* § IV.C.4. The description found in the '984 Application does not support any of the claims of the '792 Patent; it has little, if anything, to do with the '792 Patent claims. *Id.* The '984 Application does not incorporate any materials by reference. And while the domestic benefit claim was changed after issuance, that change does not fix the continuity of disclosure issues as explained above. *Id.*

5. *U.S. Patent Application No. 12/328,917 (U.S. Patent No. 7,965,761)*

The '792 Patent claims the benefit of an earlier filing date through U.S. Patent Application No. 12/328,917, which issued as U.S. Patent No. 7,965,761. Ex. 1001 ('792 Pat.), cover. The '917 Application was filed on December 5, 2008 and included a preliminary amendment that changed the first paragraph of the specification to read as follows:

This application is a divisional application of U.S. Patent Application No. 11/621,014, filed January 8, 2007, which is a divisional application of U.S. Patent Application No. 10/131,163, filed April 24, 2002, which is a continuation-in-part application of U.S. Patent Application No. 09/022,950, filed February 12, 1998, now U.S. Patent No. 5,955,992.

Ex. 1012 ('917 FH), pp.148-155. The Application Data Sheet that was filed with the

'917 Application included the same domestic benefit claim. *Id.*, p.147. This domestic benefit claim does not incorporate by reference any earlier-filed applications.

The Examiner found only informalities in the application and issued an *Ex Parte Quayle* Action (after making a restriction and obtaining a provisional election by phone). *Id.*, pp.102-105. The Applicant addressed the formalities identified by the Examiner. Ex. 1012 ('917 FH), pp.86-91, 95-98.

In the Notice of Allowance the Examiner entered an Examiner's Amendment, which had been authorized by phone by Mr. Jeffrey Gluck on February 15, 2011.⁴ The Examiner's amendment led to a change in the priority claim and omitted the specific reference to U.S. Patent Application No. 11/621,014. *Id.*, p.77. The Examiner's Amendment read:

This application is a Divisional of U.S. Patent Application 10/131,163 filed April 24, 2002, which is now US Patent 7,430,257, which is a Continuation In Part of U.S. Patent Application 09/022,950, filed February 12, 1998, which is now U.S. Patent No. 5,955,992. This application is also a Continuation In Part of U.S. Provisional Application 60/286,850, filed April 26, 2001.

Id. The Examiner reminded the Applicant that "[s]hould the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312" before "payment of the issue fee." *Id.* The issue fee was paid without further comment by the Applicant. *Id.*, pp.68-69, 72. The '917 Application issued as

⁴ At all relevant times during the prosecution of the '917 Application the '917 Application was not owned or controlled by the current Patent Owner or Mr. Shattil. Mr. Shattil now claims to have regained control of the relevant patents and contends they have been assigned to Patent Owner. Requesters have seen no information that Mr. Shattil or Patent Owner were involved in the prosecution of the '917 Application before issuance.

U.S. Patent No. 7,965,761 and included the amended domestic benefit claim that the Applicant's representative had approved. Because of this intentional and applicant-approved amendment, the '917 Application lost copendency with its alleged immediate parent (the '163 Application) because the '163 Application issued in September 2008, and the '917 Application was filed months later in December 2008.

More than a half-decade after the issuance of the '917 Application as the '761 Patent, Mr. Shattil submitted a statement under 37 C.F.R. § 3.73(c) giving himself power of attorney on behalf of putative Patent Owner GenghisComm Holdings, LLC. Ex. 1012 ('917 FH), pp.59-60. Mr. Shattil sought a Certificate of Correction on March 20, 2018 and attributed the lack of copendency to a mistake by the Office (rather than a mistake by Applicant's representative who approved the amendment and failed to make any further amendment or object to the Examiner's Amendment before paying the issue fee). *Id.*, pp.49-50 (“[T]he Preliminary Amendment was evidently overlooked by the Patent Owner . . . Thus, the incorrect priority information was the fault of the Patent Office.”). Mr. Shattil further speculated that “counsel of record for a previous assignee” must have “overlooked” the priority claim on the issued patent. *Id.*, pp.49-50. Based on Mr. Shattil's suppositions and representations, the Certificate of Correction was approved, *id.*, p.37, and the Certificate issued on July 24, 2018, *id.*, p.35.

Nearly two more years passed before Mr. Shattil submitted a Petition for an Unintentionally Delayed Priority Claim. *See* Ex. 1012 ('917 FH), pp.28-29. Mr. Shattil claimed that despite knowing of the issues with the priority claim since 2018 when he filed for the Certificate of Correction, that “the entire delay between the date the benefit claim was due and the date the benefit claim was filed was unintentional.” *Id.* It is not clear to Requesters how Mr. Shattil could have made this representation because

- he was not the assignee or its representative when the Examiner's

Amendment was approved,

- he was not the assignee or its representative when the '917 Application issued, and
- almost *nine years* passed between the issuance of the '917 Application as the '761 Patent and the time Mr. Shattil filed the Petition for an Unintentionally Delayed Priority Claim; during this time Mr. Shattil has admitted (in a different patent application) that the owner of the '917 Application “was unresponsive to [Mr. Shattil],” that Mr. Shattil had to pursue “numerous schemes to discover the identity and contact the owner, including . . . probing for information from previous assignees . . . employing proxies to attempt to contact the owner, and so on.” Ex. 1007 ('984 FH), p.32.

The first Petition for an Unintentionally Delayed Priority Claim was dismissed because the Office concluded that the Petition (1) did not include the reference required by 35 U.S.C. § 120 and 37 C.F.R. § 1.78(d)(2) and (2) did not have a statement of unintentional delay. *Id.*, pp.26-27. A request was filed for reconsideration of the Petition, *id.*, pp.21-22, and this time the Petition was granted, *id.*, pp.6-7.

6. *U.S. Patent Application No. 11/621,014 (U.S. Patent No. 7,593,449)*

The earliest application in the domestic benefit chain for the Challenged Patent is U.S. Patent Application No. 11,621,014, filed on January 8, 2007. Ex. 1001 ('792 Pat.), cover. The '014 Application included the following domestic priority claim:

This application is [sic] Divisional of U.S. Patent Application 10/131,163 filed April 24, 2002 which is a Continuation In Part of U.S.

Patent Application 09/022,950, filed February 12, 1998, which is now U.S. Patent No. 5,955,992. This application is also a Continuation In Part of U.S. Provisional Application 60/286,850, filed April 26, 2001.

Ex. 1013 ('014 FH), p.84.

The Examiner issued a restriction requirement between five groups including “a receiver and transmitter system,” a “system for providing communication signals according to operating parameters,” “coder/decoder,” “transmitter and method for transmitting,” and “a filter.” *Id.*, pp.80-81. Applicant elected group I, claims 1-8 without traverse. *Id.*, p.73.

In the first Office Action on the merits, the Examiner rejected claims 1-8 as being anticipated by U.S. Patent No. 5,555,268 to Fattouche et al. Ex. 1013 ('014 FH), pp.65-68. In response to this Office Action, Applicant amended the claims to require the sub-space decoder to correlate at least one reference “carrier interferometry (CI) code with at least a subset of the plurality of sub-space values to decode at least one data symbol.” *Id.*, pp.47-57. Applicant contended that Fattouche lacked any disclosure or suggestion of CI coding. *Id.*, p.55. The claims were then allowed. *Id.*, pp.38-46.

V. EFFECTIVE FILING DATE AND POST-AIA STATUS

For the reasons explained above, *supra* § IV.B, the Challenged Claims are, at best, entitled to an effective filing date of June 8, 2015. Because this date post-dates the effective date of the first-inventor-to-file provisions of the AIA, this request should be evaluated under post-AIA law.

VI. STATEMENTS OF THE SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY

A. Double Patenting Can Be Raised in *Ex Parte* Reexamination

Unlike *inter partes* review which can only be used to present challenges under 35 U.S.C. §§102 or 103, *see* 35 U.S.C. §311(b), a substantial new question of patentability may be presented in *ex parte* reexamination based on double patenting. *See In re Londardo*, 119 F.3d 960 (Fed. Cir. 1997) (“[W]e conclude that the PTO was authorized during reexamination to consider the question of double patenting based upon the ’762 patent.”); M.P.E.P. §§ 804 (“A double patenting issue may raise a substantial new question of patentability of a claim of a patent, and thus can be addressed in a reexamination proceeding.”), 2258 (“Double patenting issues may also be considered during reexamination.”).

B. The One-Way Obviousness Test Applies To Evaluate The ’792 Double Patenting SNQs Presented In This Request.

“As a general rule, a one-way test applies to determine obviousness-type double patenting.” *In re Hubbell*, 709 F.3d 1140 1149 (Fed. Cir. 2013) (internal quotation marks omitted). The one-way test asks whether the claim at issue is obvious over the earlier reference patent claim. *Id.* “The two-way test is a narrow exception to the general rule of the one-way test, and it is only appropriate where (1) a second-filed application issues prior to a first-filed application, and (2) the PTO is solely responsible for the delay in the issuance of the first-filed application.” *In re Janssen Biotech, Inc.*, 880 F.3d 1315, 1325 (Fed. Cir. 2018) (internal quotation marks omitted); *see In re Berg*, 140 F.3d 1428, 1432 (Fed. Cir. 1998) (“Under the two-way test, the examiner also asks whether the patent claims are obvious over the application claims. If not, the application claims later may be allowed.”). Neither of these unusual circumstances are present here because GenghisComm is solely responsible for improperly extending the term of the ’792 Patent by omitting the priority claim that was found in earlier-filed applications in the same family.

C. A Terminal Disclaimer Cannot Retroactively Cure The Double

Patenting Issues Raised In This Request

Patent Owner may not submit a terminal disclaimer to obviate the double patenting SNQs raised herein because the '792 Patent has already enjoyed an improperly extended patent term. *See Boehringer*, 592 F.3d at 1347-1351; *see also* M.P.E.P. §§ 804.02(II) (“[A] terminal disclaimer filed after the expiration of the reference patent is not effective to obviate a nonstatutory double patenting rejection.”), 1490(VI)(A) (“A terminal disclaimer filed under 37 C.F.R. 1.321(c) or (d) after the expiration of the reference patent is not effective to obviate a nonstatutory double patenting rejection.”). The question presented in *Boehringer* was “whether a *retroactive* terminal disclaimer—i.e., a terminal disclaimer that is filed after the expiration date of an earlier commonly owned patent—is effective to overcome an obviousness-type double patenting” invalidity case. *Id.* at 1347 (emphasis original). The Federal Circuit concluded that “[b]y failing to terminally disclaim a later patent prior to the expiration of an earlier related patent, a patentee enjoys an unjustified advantage—a purported time extension of the right to exclude from the date of the expiration of the earlier patent.” *Id.* at 1348. “The patentee cannot undo this unjustified timewise extension by retroactively disclaiming the term of the later patent because it has *already* enjoyed the rights that it seeks to disclaim.” *Id.* (emphasis original). These principles apply here because the double patenting reference patents used in connection with the SNQs presented in this Request have already expired and Patent Owner has already improperly reaped the benefits of an extended patent term by failing to disclaim the term of the '792 patent before the term of the double patenting reference patent expired.

VII. DOUBLE PATENTING REFERENCES AND PRIOR ART STATUS OF PUBLICATIONS

A. U.S. Patent No. 10,009,208 (the “’208 Patent”) Is A Double Patenting Reference Against The ’792 Patent

The '208 Patent was filed on July 7, 2017 and claims the benefit of U.S. Patent Application Number 10/145,854 (“the '854 Application”), which was filed on May 14, 2002. Ex. 1002 ('208 Pat.), cover. The '208 Patent is terminally disclaimed to U.S. Patent No. 9,800,448 (the '448 Pat.), Ex. 1019 ('208 TD), p.1, which also claims the benefit of the filing date of '854 Application. Neither the '448 Patent or the '208 Patent received any patent term adjustment. Ex. 1002 ('208 Pat.), cover; Ex. 1020 ('448 Pat.), cover. Therefore, the '208 Patent expired May 14, 2022.

The term of the '792 Patent extends beyond the term of the '208 Patent. While the '792 Patent is terminally disclaimed to U.S. Patent No. 11,223,508, the '508 Patent expires on October 15, 2025. Ex. 1021 ('508 Pat.), cover. Thus, the '792 Patent is also set to expire on October 15, 2025.

Both the '792 Patent and the '208 Patent identify Steve Shattil as the sole inventor and therefore have the same inventive entity. *See* Ex. 1001 ('792 Pat.), cover; Ex. 1002 ('208 Pat.), cover. Because the '792 Patent and the '208 Patent have the same inventive entity, and because the '208 Patent expired on May 14, 2022, while the '792 Patent expires on October 15, 2025, the '792 Patent has enjoyed an improperly lengthened patent term of more than three years, which cannot be cured by the filing of a terminal disclaimer. *See supra* § VI.C. The '208 Patent is therefore a proper double patenting reference against the '792 Patent.

B. U.S. Patent No. 10,230,559 (the “'559 Patent”) is a Double Patenting Reference Against the '792 Patent

The '559 patent was filed on July 2, 2018 and claims the benefit of U.S. Patent Application Number 10/145,854 (“the '854 Application”), filed on May 14, 2002. Ex. 1003 ('559 Pat.), cover. The '559 Patent is terminally disclaimed to U.S. Patent No. 9,800,448 (the '448 Pat.), U.S. Patent No. 10,015,034, U.S. Patent No. 10,009,208, and U.S. Patent No. 10,038,584, each of which also claims the benefit

of the '854 Application's filing date. Ex. 1022 ('001 TD), p.1; Ex. 1020 ('448 Pat.), cover; Ex. 1023 ('034 Pat.), cover; Ex. 1002 ('208 Pat.), cover; Ex. 1024 ('584 Pat.), cover. The '559 Patent received no patent term adjustment. Ex. 1003 ('559 Pat.), cover. Therefore, the '559 Patent expired no later than May 14, 2022.

The term of the '792 Patent extends beyond the term of the '559 Patent. While the '792 Patent is terminally disclaimed to U.S. Patent No. 11,223,508, the '508 Patent expires on October 15, 2025. Ex. 1021 ('508 Pat.), cover. Thus, the '792 Patent is also set to expire on October 15, 2025.

Both the '792 Patent and the '559 Patent identify Steve Shattil as the sole inventor and therefore have the same inventive entity. *See* Ex. 1001 ('792 Pat.), cover; Ex. 1003 ('559 Pat.), cover. Because the '792 Patent and the '559 Patent have the same inventive entity, and because the '559 Patent expired on May 14, 2022 while the '792 Patent expires on October 15, 2025, the '792 Patent has enjoyed an improperly lengthened patent term of more than three years, which cannot be cured by the filing of a terminal disclaimer. *See supra* § VI.C. The '559 Patent is also therefore a proper double patenting reference against the '792 Patent.

**C. U.S. Patent Appl. Pub. No. 2015/0256308 To Ma et al. ("Ma") is
Prior Art To The '792 Patent At Least Under Post-AIA §
102(a)(2)**

Ma is only prior art if the effective filing date of the '792 Patent is after February 20, 2015. And it is. As explained above, the effective filing date of the '792 Patent is no earlier than June 8, 2015. *Supra* §§ IV.B, V. Because the effective filing date of the '792 Patent is after the effective filing date of Ma, Ma is prior art under post-AIA § 102(a)(2) because it was filed on February 20, 2015 and published on September 10, 2015. Ex. 1015 (Ma), cover.

Ma is analogous to the '792 Patent because it is in the same field of endeavor as the '792 Patent—namely, wireless communications networks, and especially

OFDM wireless communications networks and techniques. *See* Ex. 1001 (’792 Pat.), Abstract, 1:22-25; Ex. 1015 (Ma), ¶¶[0002], [0033].

D. Kaiser, S. (1998) Multi-Carrier CDMA Mobile Radio Systems - Analysis and Optimization of Detection, Decoding, and Channel Estimation [Doctoral thesis, Institute of Communications and Navigation at the German Aerospace Center, Oberpfaffenhofen, Germany] (“Kaiser”) is Prior Art to the ’792 Patent At Least Under Pre-AIA 35 U.S.C. § 102(b) or Post-AIA § 102(a)(1)

Kaiser’s status as prior art is provided under two alternative effective filing dates: (1) June 8, 2015 and (2) January 8, 2007.

Assuming An Effective Filing Date Of June 8, 2015. Kaiser is prior art under at least post-AIA § 102(a)(1) because it published in January of 1998. Ex. 1004 (Kaiser), p.1; Ex. 1026 (Hall-Ellis Decl.), ¶ 47.

Assuming an Effective Filing Date of Jan. 8, 2007. Alternatively, Kaiser-1997 is prior art under pre-AIA § 102(b)⁵ because it published in January of 1998. Ex. 1004 (Kaiser), p.1; Ex. 1026 (Hall-Ellis Decl.), ¶ 47.

Kaiser-1997 is analogous art to the ’792 Patent because it is the same field of endeavor as the ’792 Patent—namely wireless communications networks, and especially OFDM wireless communications networks and techniques. Ex. 1001 (’792 Pat.), Abstract, 1:22-25; Ex. 1004 (Kaiser), pp. 1-6.

E. U.S. Patent No. 6,609,010 to Dolle et al. (“Dolle”) is Prior Art to the ’792 Patent At Least Under Pre-AIA 35 U.S.C. § 102(b) or Post-AIA § 102(a)(1)

Dolle’s status as prior art is provided under two alternative effective filing dates: (1) June 8, 2015 and (2) January 8, 2007.

⁵ Requesters do not admit that the claims of the ’792 Patent are entitled to pre-AIA law under any scenario but instead presents this theory for completeness.

Assuming An Effective Filing Date Of June 8, 2015. Dolle is prior art under at least post-AIA § 102(a)(1) because it issued on August 19, 2003. Ex. 1005 (Dolle), cover.

Assuming an Effective Filing Date of January 8, 2007. Alternatively, Dolle is prior art under at least pre-AIA § 102(b) because it issued on August 19, 2003.

Dolle is analogous art to the '792 Patent because it is the same field of endeavor as the '792 Patent—namely wireless communications networks, and especially OFDM wireless communications networks and techniques. Ex. 1001 ('792 Pat.), Abstract, 1:22-25; Ex. 1005 (Dolle), 1:5-7; *see also id.*, 2:33-41.

F. R1-02-1246, Proposed Baseline OFDM Systems for Study (Oct. 08, 2002) (“Lucent”) is Prior Art to the '792 Patent At Least Under Pre-AIA 35 U.S.C. § 102(b) or Post-AIA § 102(a)(1)

Lucent's status as prior art is provided under two alternative effective filing dates: (1) June 8, 2015 and (2) January 8, 2007.

Assuming An Effective Filing Date Of June 8, 2015. Lucent is prior art under at least post-AIA § 102(a)(1) because it published on Oct. 8, 2002. Ex. 1006 (Lucent), p.1; Ex. 1028 (Bishop Decl.), ¶ 57.

Assuming an Effective Filing Date of January 8, 2007. Alternatively, Lucent is prior art under at least pre-AIA §§ 102(b) because it published on Oct. 8, 2002. Ex. 1006 (Lucent), p.1; Ex. 1028 (Bishop Decl.), ¶ 57.

Lucent is analogous art to the '792 Patent because it is the same field of endeavor as the '792 Patent—namely wireless communications networks, and especially OFDM wireless communications networks and techniques. Ex. 1001 ('792 Pat.), Abstract, 1:22-25; Ex. 1006 (Lucent), p.1; *see also id.*, pp. 2-5.

G. Angela Doufexi et al., *Design Considerations and Initial Physical Layer Performance Results for a Space Time Coded OFDM 4G Cellular Network*, IEEE PIMRC 2002 (2002) (“Doufexi”) is

Prior Art Under Pre-AIA 35 U.S.C. § 102(b) or Post-AIA § 102(a)(1)

Doufexi's status as prior art is provided under two alternative effective filing dates: (1) June 8, 2015 and (2) January 8, 2007.

Assuming An Effective Filing Date Of June 8, 2015. Doufexi is prior art under post-AIA § 102(a)(1) because it published in 2002. Ex. 1035 (Doufexi), p.1; Ex. 1026 (Hall-Ellis Decl.), ¶ 54.

Assuming an Effective Filing Date of January 8, 2007. Alternatively, Doufexi is prior art under pre-AIA § 102(b) because it was published in 2002. Ex. 1035 (Doufexi), p.1; Ex. 1026 (Hall-Ellis Decl.), ¶ 54.

Doufexi is analogous art to the '792 Patent because it is in the same field of endeavor as the '792 Patent—namely wireless communication networks, and especially OFDM wireless communication networks and techniques. Ex. 1001 ('792 Pat.), 1:22-25; Ex. 1035 (Doufexi), p.1.

VIII. SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY

A. Overview of the SNQs As to Claims 8, 9, and 10

This Request presents the following SNQs:

- **SNQ1:*** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 19 the '208 Patent in view of Ma;
- **SNQ2:** Claims 8 and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Dolle;
- **SNQ3:** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Lucent;
- **SNQ4:** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Doufexi;
- **SNQ5:** Claims 8, 9, and 10 are unpatentable for obviousness-type

- double patenting over claim 19 of the '208 Patent in view of Kaiser;
- **SNQ6:*** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Ma;
- **SNQ7:** Claims 8 and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Dolle;
- **SNQ8:** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Lucent; and
- **SNQ9:** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Doufexi; and
- **SNQ10:** Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Kaiser.

* Denotes an SNQ that applies only if the '792 Patent Challenged Claims are not entitled to the benefit of the earlier-claimed effective filing dates under 35 U.S.C. § 120.

B. Written Statements of Patent Owner Applicable to SNQs 1-10

Pursuant to 35 U.S.C. § 301(a)(2) and 37 C.F.R. § 1.501(a)(2), written statements made by a patent owner in proceedings before a federal court or the United States Patent and Trademark Office (USPTO) concerning the scope of any claim of the patent may be cited for inclusion in the official patent file. Such submissions are intended to ensure that the USPTO and the public are fully informed of positions taken by the patent owner regarding the scope of claims. As required by 35 U.S.C. § 301(c) and 37 C.F.R. § 1.501(a)(2), these submissions include accompanying documents, pleadings, or evidence from the relevant proceedings that address the written statements, provided in redacted form where necessary to exclude information subject to protective orders.

The following exhibits contain written statements of GenghisComm that are relevant to SNQs 1-10:

- **Ex. 1017:** Complaint, *GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.*, 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (No. 1) (“Complaint”).
- **Ex. 1018:** Exhibit 8 of August 12, 2024 Infringement Contentions, as served in *GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.*, 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 8”).
- **Ex. 1030:** Exhibit 6 of August 12, 2024 Infringement Contentions, as served in *GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.*, 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 6”).
- **Ex. 1031:** Exhibit 4 of August 12, 2024 Infringement Contentions, as served in *GenghisComm Holdings, LLC v. Samsung Electronics America, Inc.*, 2:24-cv-00242 (E.D. Tex.) (filed Apr. 12, 2024) (“ICs Ex. 4”).
- **Ex. 1032:** Exhibit 6 of *Ex Parte* Reexamination Reply Brief, as in Reexamination No. 90/019,411 (filed June 6, 2024) (“Genghis Reply Br. Ex.”).

These exhibits satisfy the formal requirements for presenting written statements of a patent owner under 35 U.S.C. § 301 and 37 C.F.R. § 1.501, ensuring that they are properly integrated into the official patent file and available for consideration in this reexamination proceeding.

To comply with 37 C.F.R. § 1.501(a)(3), each written statement is identified with (i) the forum and proceeding in which the statement was filed, (ii) the specific papers and portions of the papers containing the statement, and (iii) an explanation of how the statement pertains to the scope of the claims of the patent. Additionally, per 37 C.F.R. § 1.501(b)(1), the pertinence and manner of applying these statements

to at least one claim of the patent are explained in detail.

1. *Characterizations of the equation recited in Claim 19 of the '208 Patent and Claim 1 of the '559 Patent*

Claim 19 of the '208 Patent and Claim 1 of the '559 Patent contain the following equation:

$$z(l \cdot M_{sc}^{\text{PUSCH}} + k) = \frac{1}{\sqrt{M_{sc}^{\text{PUSCH}}}} \sum_{i=0}^{M_{sc}^{\text{PUSCH}}-1} d(l \cdot M_{sc}^{\text{PUSCH}} + i) e^{-j \frac{2\pi i k}{M_{sc}^{\text{PUSCH}}}}$$

GenghisComm has characterized this equation in written statements, including:

- In the Complaint, GenghisComm states that:
 - the portion of the equation that is right of the equal sign is “a discrete Fourier transform” (Ex. 1017 (Complaint), ¶ 52),
 - the equation as a whole “is a complex-matrix multiply that spreads each data symbol across multiple subcarriers” (*Id.*),
 - the equation “utilizes an N-point discrete Fourier transform (DFT)” (*Id.*, ¶ 64),
 - the “equation corresponds to a DFT” (*Id.*, ¶ 98),
 - the equation “utilizes a discrete Fourier transform (DFT) to transform OFDM data symbols (N) into spread OFDM complex-valued data symbols” (*Id.*, ¶ 98),
 - the equation “us[es] a discrete Fourier transform to generate blocks of transform precoded complex-valued symbols” and is “a complex-matrix multiply that spreads the complex-valued symbols across multiple subcarriers” (*Id.*, ¶ 167),
 - “[o]ne property of the DFT used in [the equation] is that it is an orthogonal matrix” (*Id.*, ¶ 179),
 - with the equation “complex-valued symbols are transform precoded

- using a discrete Fourier transform (DFT) to generate blocks of transform precoded complex-valued symbols” (*Id.*, ¶ 244), and
- the equation “generates complex-valued data symbols by using the complex-valued codes of the discrete Fourier transform” (*Id.*, ¶ 247).
 - In Exhibit 6 to Patent Owner’s August 12, 2024 Infringement Contentions, Patent Owner states that:
 - “[a] DFT used for transform precoding includes an exponential term that corresponds to complex-valued codes that impart a cyclic shift to the encoded symbols and resulting waveforms” (Ex. 1030 (ICs Ex. 6), p.9).
 - In Exhibit 4 to Patent Owner’s August 12, 2024 Infringement Contentions, Patent Owner states that:
 - the equation “transform precod[es] [] data symbols using [a] DFT” and “generate[s] a block of transform precoded complex-valued symbols $z(0), \dots, z(M_{\text{symb}}-1)$,” which “are encoded data symbols” (Ex. 1031, p.5),
 - “[t]he portion of the DFT $e^{-j\frac{2\pi ik}{M_{SC}^{\text{PUSCH}}}}$ is used to define how data symbols are spread in the frequency domain, and correspond to complex-valued spreading codes” (*Id.*, p.5),
 - $d(l \cdot M_{SC}^{\text{PUSCH}} + i)$ represents “data symbols” (*Id.*, p.9),
 - $e^{-j\frac{2\pi ik}{M_{SC}^{\text{PUSCH}}}}$ represents “complex-valued codes” (*Id.*, p.9),
 - the equation “involves the use of a discrete Fourier transform,” “[t]he DFT itself represent[ing] a vector multiplication,” (*Id.*, p.14), and
 - “[t]he DFT [in the equation] can also be represented as a complex matrix multiplication where data symbols [] are multiplied by the matrix of complex-valued codes,” (*Id.*, p.14).

- In Exhibit 6 submitted in support of its Reply Brief in the currently pending '227 Ex Parte Reexamination proceedings, Patent Owner states that:
 - the equation “transform precod[es] [] data symbols using [a] DFT” and “generate[s] a block of transform precoded complex-valued symbols $z(0), \dots, z(M_{\text{symb}}-1)$,” which “are encoded data symbols” (Ex. 1032 (Genghis Reply Br. Ex.), p.3), and
 - “[t]he portion of the DFT $e^{-j\frac{2\pi ik}{M_{\text{PUSCH}}^{SC}}}$ is used to define how data symbols are spread in the frequency domain, and correspond to complex-valued spreading codes” (*Id.*).

2. *Characterizations of the equation recited in Claim 18 of the '208 Patent and Claim 6 of the '559 Patent*

Claim 18 of the '208 Patent and Claim 6 of the '559 Patent contain the following equation:

$$s_l(t) = \sum_{k=-\lceil N_{RB}^{UL} N_{SC}^{RB} / 2 \rceil}^{\lceil N_{RB}^{UL} N_{SC}^{RB} / 2 \rceil - 1} a_{k(-),l} e^{j2\pi(k+1/2)\Delta f(t - N_{CP,l}T_s)}$$

GenghisComm has characterized this equation in written statements, including:

- In the Complaint, GenghisComm states that:
 - the equation “utilizes an M-point inverse DFT” (Ex. 1017 (Complaint), ¶ 65),
 - the equation “utilizes an inverse fast Fourier transform to produce [a] time-continuous signal” (*Id.*, ¶ 73), and
 - the equation “utilizes an inverse DFT to generate a time-domain signal” (*Id.*, ¶ 169).
- In Exhibit 6 to Patent Owner’s August 12, 2024 Infringement Contentions,

Patent Owner states that:

- “[i]f multiple symbols are input to [a] IFFT at the same time, the output discrete-time signal is a sum (i.e., superposition) of the subcarrier frequencies modulated with their corresponding symbols[,] [t]he amplitudes of the various subcarrier frequencies at a given time will not be the same[, and] summing waveforms will result in either constructive or destructive interference” (Ex. 1030 (ICs Ex. 6), p.9).
- In Exhibit 8 to Patent Owner’s August 12, 2024 Infringement Contentions, Patent Owner states that:
 - “[t]he exponential used in the DFT employs polyphase codes,” (Ex. 1018 (ICs Ex. 8), p.7), and
 - “a resource grid of $N_{grid,x}^{size,u} N_{SC}^{RB}$ subcarriers . . . is defined” for “provision[ing] a consecutive series of OFDM subcarriers” (Ex. 1018 (*Id.*, p.8).
- In Exhibit 6 submitted in support of its Reply Brief in the currently pending ’227 Ex Parte Reexamination proceedings, Patent Owner states that:
 - the equation “perform[s] an M-point IDFT on [a] set of complex subcarrier amplitudes to generate a time-domain sequence to be transmitted into a wireless channel[, wherein] the time-domain sequence comprises a superposition of the OFDM subcarriers” (Ex. 1032 (Genghis Reply Br. Ex.), p.6),
 - a “superposition of [] OFDM subcarriers is represented by the summation ($\sum$) in the equation” (*Id.*),
 - the equation “uses an IFFT for transforming from the frequency-domain to the time-domain transformation” (*Id.*, p.7),
 - “[i]f multiple symbols are input to the IFFT at the same time, the output

discrete-time signal is a sum (i.e., superposition) of the subcarrier frequencies modulated with their corresponding symbols” (*Id.*), and

- the equation includes “an inverse DFT to produce the time-continuous signal $s_l(t)$ ” (*Id.*, p.11).

3. *Statements about “selecting one of a plurality of selectable subcarrier spacings”*

GenghisComm has interpreted “selectable subcarrier spacings” and “selecting one of a plurality of selectable subcarrier spacings” in written statements, including:

- In the Complaint, Patent Owner states that:
 - “subcarriers used in uplink or downlink communications are allowed to have different subcarriers spacings,” and different allowable subcarrier spacings are “selectable subcarrier spacings” (Ex. 1017 (Complaint), ¶¶ 295-296),
 - “variable subcarrier spacing[s]” equate to “selectable subcarrier spacings” (*Id.*, ¶¶ 333, 347),
 - “support [for] multiple OFDM numerologies” indicates “selectable subcarrier spacings” (*Id.*, ¶¶ 367),
 - receiving a remotely selected “[s]ubcarrier spacing configuration,” which indicates one possible subcarrier spacing among many, equates to selecting one of a plurality of selectable subcarrier spacings (*Id.*, ¶¶ 367, 412 (“ μ is the subcarrier spacing configuration . . . provided to the UE”).
- In Exhibit 6 to Patent Owner’s August 12, 2024 Infringement Contentions, Patent Owner states that:
 - multiple possible values for a parameter “ Δf ” that represent “[s]ubcarrier spacing” are “a plurality of selectable subcarrier spacings”

(Ex. 1030 (ICs Ex. 6), p.11).

C. Detailed Discussion of SNQs Based On Obviousness-Type Double Patenting Over the '208 Patent

As explained below, claims 8-10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19⁶ of the '208 Patent. The claims of the '792 Patent were not rejected for double patenting over the claims of the '208 Patent. And while a double patenting rejection based on U.S. Patent No. 11,223,508 was applied and overcome with a terminal disclaimer, the '208 Patent expired years before the '508 Patent will expire. The record does not indicate that the Office considered or evaluated whether obviousness-type double patenting existed as between the Challenged Claims and any claim of the '208 Patent, including but not limited to claim 19 of the '208 Patent. Claim 19 is a dependent claim that depends upon claim 18 of the '208 Patent. These claims provide:

18. A non-transitory computer-readable medium having computer executable program code stored thereon, the computer executable program code comprising:

program code to spread a plurality of data symbols with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT) to produce a plurality of spread symbols;

program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, for selecting a plurality of OFDM subcarriers

⁶ Claim 19 depends from claim 18 and thus includes all of the limitations of claim 18. All references to claim 19 refer to the limitations contained in both claims 18 and 19.

corresponding to at least one OFDM symbol interval; and

program code to generate an OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols, wherein the plurality of orthogonal spreading codes are selected to provide the superposition with a reduced peak-to-average-power ratio; and wherein the superposition comprises a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t , expressed by:

$$s_l(t) = \sum_{k=-\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}}^{\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)},$$

where N_{RB}^{UL} denotes a transmission bandwidth of the signal $s_l(t)$ and N_{SC}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL}N_{SC}^{RB}$ equals a total number of the OFDM subcarriers in the superposition, k is an index that indicates a range of a summation, $k^{(-)} = k + N_{RB}^{UL}N_{SC}^{RB}/2$, $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l , e is natural log, $j = \sqrt{-1}$, π is mathematical constant Pi, Δf denotes subcarrier frequency spacing, $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l ; wherein $a_{k,l}$ comprises a one of the plurality of code symbols corresponding to a k^{th} subcarrier in symbol period l .

19. The non-transitory computer-readable medium recited in claim 18, wherein one of the plurality of spread symbols is expressed by:

$$z(l \cdot M_{sc}^{\text{PUSCH}} + k) = \frac{1}{\sqrt{M_{sc}^{\text{PUSCH}}}} \sum_{i=0}^{M_{sc}^{\text{PUSCH}}-1} d(l \cdot M_{sc}^{\text{PUSCH}} + i) e^{-j \frac{2\pi i k}{M_{sc}^{\text{PUSCH}}}}$$

wherein M_{sc}^{PUSCH} is a DFT length corresponding to the plurality of orthogonal spreading codes, l is an index spanning 0 to a number of symbol intervals minus one, k is an index spanning zero to the DFT length M_{sc}^{PUSCH} minus one, i is an index spanning zero to the DFT length M_{sc}^{PUSCH} minus one, $d(i)$ is an i^{th} one of the plurality of data symbols, e is natural log, $j = \sqrt{-1}$, and π is mathematical constant Pi.

1. *SNQ1: Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Ma*

As explained below, claims, 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19 of the '208 Patent in view of Ma. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '208 Patent (or any claims including the equations expressed in the '208 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. Ma was not cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 19 of the '208 Patent in view of Ma presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies only if the effective filing date of the '792 Patent is determined to be after Ma's effective filing date. As explained above, the effective filing date of the '792 Patent is June 8, 2015. *E.g., supra* §§ IV.B, V.

The following claim charts show comparisons between claims 8, 9, and 10 of the '792 Patent and claim 19 of the '208 Patent and explain how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Ma:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
[8Pre] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is recited by or rendered obvious in view of claim 19 of the '208 Patent. Claim 19 of the '208 Patent recites a “computer-readable medium having computer executable program code thereon . . . responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.” A computer-readable medium, as a physical component of a computing system, is an apparatus. Ex. 1014 (Bims Decl.), ¶ 82. To the extent that claim 19 of the '208 Patent does not explicitly recite an apparatus for providing flexible channel bandwidth in mobile radio communications, a POSITA would have recognized that the computer-readable medium recited in claim 19 of the '208 Patent would need to be included in a mobile radio communications device to be functional. Ex. 1014 (Bims Decl.), ¶ 83. Indeed, including the computer readable medium in an apparatus for providing a flexible channel bandwidth would have merely combined known prior art elements (e.g., a memory with computer instructions stored on it with a processor and a transmitter for transmitting signals)

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	according to known methods to yield predictable results. Ex. 1014 (Bims Decl.), ¶ 96. Indeed, it was common by at least 2007 to use computer readable media to perform signal processing in mobile devices used to transmit signals over networks such as GSM networks, CDMA networks as reflected in various technologies such as 3G and 4G wireless communication networks. <i>Id.</i> At the very least, it would have been obvious to try to implement the computer-readable medium of claim 19 in an apparatus for providing flexible channel bandwidth because of the “compelling need in the broadband wireless industry in which network performance is not hard limited by the laws of physics [e.g., spectral efficiency].” Ex. 1001 ('792 Pat.), 2:60-63; Ex. 1014 (Bims Decl.), ¶ 97. Implementation of a computer-readable medium responsive to an assignment of spectrum resources within an apparatus for mobile communications would have been the predictable way to execute the code on the computer-readable medium and would have been expected to succeed as a solution well within the skill level of a POSITA. Ex. 1014 (Bims Decl.), ¶ 97. Thus, claim 19 of the '208 Patent recites or renders obvious: • an apparatus (<i>i.e., a computer-readable medium</i>) • for providing flexible channel bandwidth in mobile radio communications (<i>i.e., responsive to an assignment of spectrum resources for by a [OFDM] transmitter</i>). To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious the preamble of claim 8 of the '792 Patent, the preamble would have been obvious over claim 19 of the '208 Patent in view of Ma.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	Ma teaches an apparatus in discussing “a network device supporting wireless communications comprises at least one processor and a non-transitory computer readable storage medium storing programming for execution by the at least one processor.” Ex. 1015 (Ma) ¶ 9. Ma also mentions that these instructions are to “obtain a signal on frequency-time slots in a MAB region of a plurality of MAB regions partitioning a frequency and time plane of a carrier spectrum band” and to “defin[e] a sub-carrier spacing and a symbol duration for the frequency-time slots.” <i>Id.</i> Since the network device of Ma supports wireless communications and provides for partitioning frequency and time planes of a carrier spectrum band, it is an apparatus for providing flexible channel bandwidth in mobile radio communications. Ex. 1014 (Bims Decl.), ¶ 98. Thus, the transmitter in Ma is: • an apparatus (<i>i.e., network device</i>) • for providing flexible channel bandwidth (<i>i.e., partitioning frequency and time planes</i>) in mobile radio communications (<i>i.e., supporting wireless communication</i>). It would have been obvious to a POSITA to combine the transmitter of Ma with the computer-readable medium of claim 19 of the '208 Patent because such a combination would have allowed the computer readable medium of Claim 19 of the '208 Patent to be used for its intended purpose of processing signals for wireless communication and transmission over a wireless link thus yielding predictable results. Ex. 1014 (Bims Decl.), ¶ 99. As explained above, while claim 19 of the '208 Patent does not explicitly recite the term apparatus, Ma teaches an apparatus that includes a memory, processor, and transmitter, and therefore the prior art collectively includes each element

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	found in [8Pre]. Furthermore, in a combination of the transmitter of Ma and the computer-readable medium of claim 19 of the '208 Patent, both the transmitter and the computer-readable medium would have performed the same function as they would have separately. <i>Id.</i> Also, a POSITA would have recognized that the results of combining a computer-readable medium with an apparatus would be predictable, as computer-readable media are designed to be read by a computer (i.e., an apparatus). <i>Id.</i> Therefore, a POSITA would have reasonably expected to succeed in combining claim 19 and Ma. <i>Id.</i>
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent alone or in view of Ma. Claim 19 of the '208 Patent recites “program code responsive to an assignment of spectrum resources for use by a transmitter.” A POSITA would have recognized that (1) a transmitter would include a processor and (2) that program code, to be responsive to an assignment of spectrum resources, would need to be executed by at least one processor. Ex. 1014 (Bims Decl.), ¶ 100. A POSITA would have been motivated to execute the code with a processor due the motivation provided in claim 19 of the '208 Patent (i.e., that the program code is for use by a transmitter) and would have reasonably expected success as this modification—actually executing the program code with at least one processor—was well within the skill of a POSITA. <i>Id.</i> Thus, claim 19 renders obvious at least one processor (i.e., <i>program code responsive to an assignment of spectrum resources for use by a [OFDM] transmitter</i>). To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8A] of the '792

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Ma. Ma discloses at least one processor by stating that “a network device supporting wireless communications comprises at least one processor and a non-transitory computer readable storage medium storing programming for execution by the at least one processor.” Ex. 1015 (Ma) ¶ 9. Thus, claim 19 of the '208 Patent, whether alone or in view of Ma, teaches at least one processor (i.e., claim 19 of the '208 Patent recites <i>program code for use by a transmitter</i>, and Ma discusses a network device . . . comprises at least one processor). It would also have been obvious to a POSITA to combine Ma's with the computer-readable medium of claim 19 of the '208 Patent because such a combination would have allowed the computer-readable medium of claim 19 of the '208 Patent to provide its instructions for execution by the processor in the manner known to those of skill in the art to yield nothing more than predictable results (i.e., memory stores code that is executed by processors and has for many, many years). Ex. 1014 (Bims Decl.), ¶ 101. As shown above, while claim 19 of the '208 Patent does not explicitly use the word processor, Ma teaches a processor, and therefore the prior art collectively includes each element of limitation [8A]. Furthermore, in a combination of Ma's processor and the computer-readable medium of claim 19, both the processor and the computer-readable medium would have performed the same function as they would have separately (e.g., executing instructions and storing instructions). <i>Id.</i> Also, a POSITA would have recognized that the results of combining a computer-readable medium with a processor would be predictable, as the recited

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	program code on computer-readable media is programmed to be executed by a processor. <i>Id.</i>
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent alone or in view of Ma. Claim 19 of the '208 Patent recites “a non-transitory computer-readable medium having computer executable program code stored thereon . . . for use by a transmitter.” A POSITA would have recognized that a non-transitory computer-readable medium would need to be in communication with a processor to execute the claimed program code to perform any transmission of a signal as contemplated by claim 19 of the '208 Patent. Ex. 1014 (Bims Decl.), ¶ 83. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8B] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Ma. Ma discloses at least one processor by stating that “a network device supporting wireless communications comprises at least one processor and a non-transitory computer readable storage medium storing programming for execution by the at least one processor.” Ex. 1015 (Ma) ¶ 9. Thus, Ma and the '208 patent teach: • at least one non-transitory computer-readable memory (i.e., <i>a non-transitory computer-readable medium having computer executable program code stored thereon</i> of claim 19)

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	• in electronic communication with the at least one processor (i.e., <i>at least one processor</i> of Ma). It would also have been obvious to a POSITA to combine Ma's with the computer-readable medium of claim 19 of the '208 Patent because such a combination would have allowed the computer-readable medium of claim 19 of the '208 Patent to provide its instructions for execution by the processor in the manner known to those of skill in the art to yield nothing more than predictable results (i.e., memory stores code that is executed by processors and has for many, many years). Ex. 1014 (Bims Decl.), ¶ 103. As shown above, while claim 19 of the '208 Patent does not explicitly use the word processor, Ma teaches a processor, and therefore the prior art collectively includes each element of limitation [8A]. Furthermore, in a combination of Ma's processor and the computer-readable medium of claim 19, both the processor and the computer-readable medium would have performed the same function as they would have separately (e.g., executing instructions and storing instructions). <i>Id.</i> Also, a POSITA would have recognized that the results of combining a computer-readable medium with a processor would be predictable, as the recited program code on computer-readable media is programmed to be executed by a processor. <i>Id.</i>
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. Claim 19 of the '208 Patent recites the provisioning step of claim 8 of the '792 patent by reciting “program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, for selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.”

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	As recited in claim 11 of the '792 Patent, which depends from claim 8, “the provisioning [of claim 8] comprises receiving at least one of a system requirement and a channel characteristic, and the selecting is responsive to the at least one of the system requirement and the channel characteristic.” Because claim 11 depends from claim 8, the provisioning limitation [8C] in the '792 Patent covers receiving as recited in claim 11 of the '792 Patent because “[b]y definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.” <i>Littelfuse, Inc. v. Mersen USA EP Corp.</i>, 29 F.4d 1376, 1380 (Fed. Cir. 2022). In other words, an independent claim should be construed broadly enough to encompass what is recited in its dependent claim. <i>See Baxalta Inc. v. Genentech, Inc.</i>, 972 F.3d 1341, 1346 (Fed. Cir. 2020). Limitation [8C] of the '792 Patent thus encompasses receiving at least one of a system requirement and a channel characteristic, where the selecting (to provide for different symbol durations) is responsive to the received requirement and characteristic. Examples of the claimed system requirements and channel characteristics are shown in FIG. 16 of the '792 Patent.

Claim 8, '792 Patent

Claim 19 of the '208 Patent and Ma

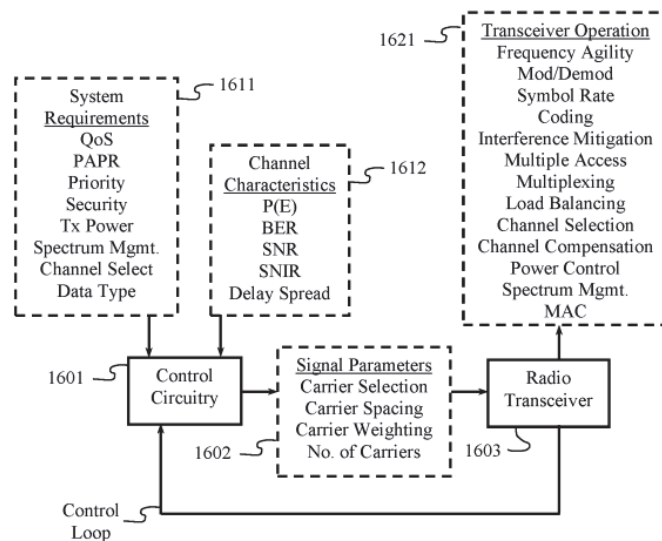


Figure 16

Ex. 1001 ('792 Pat.), FIG. 16

As shown in Figure 16, System Requirements 1611 include “Spectrum Mgmt.” Thus, the claimed provisioning a set of OFDM subcarriers encompasses receiving a spectrum management requirement.

Claim 19 of the '208 Patent recites receiving a spectrum management requirement by reciting “program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, for selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.” Ex. 1014 (Bims Decl.), ¶ 104.

Claim 19 of the '208 Patent therefore recites:

- **provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers (i.e.,**

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	<i>responsive to an assignment of spectrum resources . . . selecting a plurality of OFDM subcarriers)</i> • for mobile radio communications (i.e., <i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network</i>). Even if claim 19 of the '208 Patent could be read as not explicitly reciting limitation [8C] of the '792 Patent, it would have been obvious to a POSITA to include program code to receive and incorporate spectrum resource information for use by a transmitter as contemplated by and obvious over claim 19 of the '208 Patent because doing so was a known technique to improve a device similar to the apparatus of claim 8 of the '792 Patent. Ex. 1014 (Bims Decl.), ¶ 105. Both the transmitter of claim 19 of the '208 Patent and the apparatus of claim 8 of the '792 Patent were improved in the same way, especially when considering that claim 8 encompasses claim 11 of the '792 Patent. Claim 11 of the '792 Patent improves an apparatus executing instructions that are responsive to a received requirement and (2) to provide for selecting OFDM subcarriers. Claim 8 of the '792 Patent recites the same improvement to a transmitter by claiming code that is (1) responsive to an assignment of spectrum resources and (2) for performing a selection of subcarriers. <i>Id.</i> at ¶ 90. Furthermore, A POSITA would have applied the technique of receiving an assignment in claim 19 of the '208 Patent with predictable results. <i>Id.</i> Thus, claim 19 of the '208 Patent encompasses, or at least renders obvious, limitation [8C] of the '792 Patent.
[8D] encoding data symbols with polyphase codes derived from a	This limitation of claim 8 of the '792 Patent is recited in claim 19 of the '208 Patent.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
discrete Fourier transform to produce encoded data symbols; and	Claim 19 of the '208 Patent recites this limitation [8D] of the '792 Patent by reciting “program code to spread a plurality of data symbols with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT) to produce a plurality of spread symbols” and that “one of the plurality of spread symbols is expressed by: $z(l \cdot M_{sc}^{PUSCH} + k) = \frac{1}{\sqrt{M_{sc}^{PUSCH}}} \sum_{i=0}^{M_{sc}^{PUSCH}-1} d(l \cdot M_{sc}^{PUSCH} + i) e^{-j \frac{2\pi i k}{M_{sc}^{PUSCH}}}$ wherein M_{sc}^{PUSCH} is a DFT length corresponding to the plurality of orthogonal spreading codes.” A POSITA would recognize that claim 19 of the '208 Patent and claim 8 of the '792 Patent use similar terms where the wording is different. Ex. 1014 (Bims Decl.), ¶ 106. First, claim 8 of the '792 Patent uses the term “polyphase codes derived from a discrete Fourier transform” and claim 19 of the '208 Patent uses the term “complex-valued coefficients of a discrete Fourier transform.” Second, claim 8 of the '792 Patent uses “encoding data symbols” and claim 19 of the '208 Patent uses the phrase “spread a plurality of data symbols.” As to the first difference in terminology, Patent Owner admits that “[t]he exponential used in the DFT employs polyphase codes.” Ex. 1018 (ICs Ex. 8), p.7. In other words, the series recited in claim 19 of the '208 patent (i.e., $\sum_{i=0}^{M_{sc}^{PUSCH}-1} d(l \cdot M_{sc}^{PUSCH} + i) e^{-j \frac{2\pi i k}{M_{sc}^{PUSCH}}}$) represents a set of complex-valued coefficients that are multiplied by data values. This set is constrained such that each codeword in

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	the set is equal in length, and is a sequence of complex numbers, where neighboring complex numbers are equally spaced apart. In other words, the complex-valued coefficients in claim 19 are a class of polyphase codes. (Bims Decl.), ¶ 67. Thus, by referring to “complex-valued coefficients,” claim 19 of the '208 Patent claims “polyphase codes” as recited in claim 8 of the '792 Patent. <i>Id.</i> As to the second difference in terminology, the '208 Patent claims that the plurality of data symbols are spread, while the '792 Patent recites encoding data symbols. Both phrases are referring to an encoding process because encoding symbols, as claimed in the '792 Patent, spreads them. Ex. 1014 (Bims Decl.), ¶ 68. Furthermore, Patent Owner admitted that the function for $z(l \cdot M_{sc}^{PUSCH} + k)$ recited in claim 19 of the '208 Patent, which claim 19 recites as expressing one of the plurality of spread symbols, encodes complex-valued symbols across multiple subcarriers. For example, Patent Owner admits that this equation represents a “transform precoding step,” which “encodes data symbols . . . with polyphase codes using a DFT to generate encoded data symbols.” Ex. 1018 (ICs Ex. 8), p7. Furthermore, a POSITA would recognize the function $z(l \cdot M_{sc}^{PUSCH} + k)$ as multiplying data values with a set of complex-valued symbols that are formed from an alphabet of equally-spaced complex-valued symbols on the unit circle, for each of a plurality of subcarriers. Thus, the plurality of spread symbols recited in claim 19 of the '208 Patent are represented as a function that encodes data symbols with polyphase codes. Ex. 1014 (Bims Decl.), ¶ 69. Accordingly, claim 19 of the '208 Patent recites: • encoding data symbols (i.e., <i>spread[ing] a plurality of data symbols</i>)

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	• with polyphase codes derived from a discrete Fourier transform (i.e., <i>with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT)</i>) • to produce encoded data symbols (i.e., <i>to produce a plurality of spread symbols</i>). Thus, claim 19 of the '208 Patent recites limitation [8D] of claim 8 of the '792 Patent.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent alone or in view of Ma. Claim 19 of the '208 Patent recites limitation [8E] of claim 8 of the '792 Patent by claiming “program code to generate an OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols, wherein . . . the superposition comprises a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t, expressed by: $s_l(t) = \sum_{k=-\frac{N_{RB}^{UL}N_{sc}^{RB}}{2}}^{\frac{N_{RB}^{UL}N_{sc}^{RB}}{2}-1} a_{k(-),l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)},$ where . . . Δf denotes subcarrier frequency spacing, $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l.”

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	The following analysis breaks this element of claim 8 of the '792 Patent into three parts: (1) modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal, (2) that the superposition signal resembles a single-carrier signal, and (3) that the superposition signal has one of a plurality of different symbol durations. First, claim 19 of the '208 Patent recites modulating encoded data symbols on the OFDM subcarriers to produce a superposition signal. Claim 19 of the '208 Patent recites this limitation of claim 8 of the '792 Patent by reciting generating “an OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols.” By modulating spread symbols, claim 19 is modulating encoded symbols and is doing so to create a superposition signal. Ex. 1014 (Bims Decl.), ¶¶ 70, 107. Second, claim 19 of the '208 Patent claims that the superposition signal resembles a single-carrier signal. As admitted by Patent Owner, “[t]he transform precoding step [as it appears in claim 19 of the '208 Patent] spreads data symbols to cause the superposition of modulated subcarriers to mimic a single carrier.” Ex. 1017 (Complaint), ¶ 63. In other words, according to Patent Owner, “a sum (i.e., superposition) of the subcarrier frequencies modulated with their corresponding symbols . . . resembles a single carrier.” Ex. 1018 (ICs Ex. 8), p.8. Thus, by reciting that “the superposition comprises a time-continuous signal expressed by $s_l(t)$ [i.e., a sum of subcarrier frequencies modulated with their corresponding symbols],” claim 19 of the '208 Patent recites the “modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal” limitation of claim 8 of the '792 Patent. Ex. 1014 (Bims Decl.), ¶ 70.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	Third, claim 19 of the '208 Patent contemplates a superposition signal that has one of a plurality of different symbol durations because claim 19 recites “selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.” As a POSITA would recognize, a symbol interval represents the duration of a symbol. Ex. 1014 (Bims Decl.), ¶ 71. Thus, by selecting subcarriers that correspond to a plurality of OFDM intervals, and because these selected subcarriers are modulated by spread symbols to generate an OFDM signal that is a superposition of the plurality of OFDM subcarriers, claim 19 of the '208 Patent reads on “modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations,” as recited in claim 8 of the '792 Patent. <i>Id.</i> To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Ma. Ma discloses selectable symbol durations. For example, in a discussion of OFDM, Ma mentions that “flexible sub-carrier spacing and symbol duration allocation (e.g., corresponding to various MAB types) may be defined by various OFDM parameters (or frequency-time primitives), such as sub-carrier spacing, useful symbol length, cyclic prefix length, or combinations thereof.” Ex. 1015 (Ma), ¶ 31. FIG. 4 of Ma illustrates a plurality of durations:

Claim 8, '792 Patent

Claim 19 of the '208 Patent and Ma

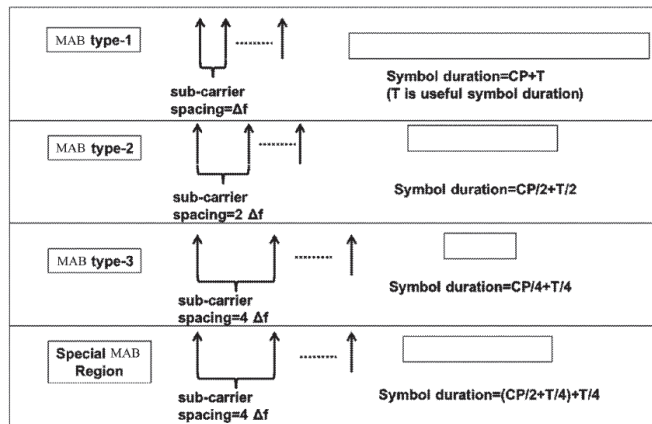


FIG. 4

Ma also explains that symbol duration is a selectable parameter: “[a]spects provided herein include variable OFDM frequency-time primitives that are dynamically selected to meet performance and efficiency demands” and “the flexible sub-carrier spacing and symbol duration allocation (e.g., corresponding to various MAB types) may be defined by various OFDM parameters (or frequency-time primitives), such as sub-carrier spacing, useful symbol length, cyclic prefix length, or combinations thereof.” Ex. 1015 (Ma) ¶ 25, 31.

Thus, claim 19 of the '208 Patent in view of Ma renders obvious:

- **modulating the encoded data symbols onto the OFDM subcarriers** (i.e., *generate an OFDM signal . . . modulated by the plurality of spread symbols*)
- **to produce a superposition signal that resembles a single-carrier signal** (i.e., *generate an OFDM signal comprising a superposition of the plurality of OFDM subcarriers*) **and**

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	• has one of a plurality of different symbol durations (i.e., <i>flexible sub-carrier spacing and symbol duration allocation</i> of Ma). It would have been obvious to a POSITA to use the symbol duration selection process discussed in Ma to select the symbol interval in claim 19 of the '208 Patent because doing so would use a known technique (i.e., Ma's symbol duration selection) to improve a similar system (i.e., a mobile communication system using an OFDM transmitter), thus allowing it to have the ability to provide a "flexible air interface[]" that can provide for "improved performance" in various deployment scenarios and under various channel conditions, Ex. 1015 (Ma), ¶[0003]; Ex. 1014 (Bims Decl.), ¶ 108. Claim 19 of the '208 Patent is directed to code "responsive to an assignment of spectrum resources for use by a transmitter," and both claim 19 and Ma relate to using transmitters in similar ways for mobile communications. <i>Id.</i> Thus, a POSITA would have applied the symbol duration selection of Ma to the transmitter of the '208 Patent with predictable results thus providing the benefit of flexibility in various deployment scenarios and adaptability to varying channel conditions. <i>Id.</i>; Ex. 1015 (Ma), ¶¶3, 23. Furthermore, a POSITA would have been motivated to combine Ma and the subject matter of claim 19 of the '208 Patent to provide this limitation of claim 8 of the '792 Patent because both Ma and the '208 Patent are seeking to improve network efficiency and reduce network latency. Ex. 1014 (Bims Decl.), ¶ 109. For example, Ma provides motivation to combine its symbol duration selection process with claim 19 of the '208 Patent in explaining the disadvantages of prior systems and the advantages of the systems discussed in Ma:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	Due to the fixed sub-carrier spacing and fixed OFDM symbol duration, conventional OFDM schemes may be unable to satisfy the spectrum efficiency and Quality of Service (QoS) requirements of next-generation networks . . . [and] [e]mbodiments of this disclosure provide methods for supporting variable sub-carrier spacing and symbol duration for transmitting OFDM symbols and associated cyclic prefixes. Ex. 1015 (Ma) ¶¶ 23, 24. Thus, a POSITA would have been motivated by to combine the flexible symbol duration of Ma with the selecting subcarriers corresponding to a symbol interval claimed in claim 19 of the '208 Patent because Ma teaches that its variable symbol duration addresses the issues of latency and efficiency of prior systems and to yield a more flexible system that could account for different channel conditions and deployment scenarios. Ex. 1014 (Bims Decl.), ¶ 109. A POSITA would have reasonably expected to succeed in making this combination because claim 19 of the '208 Patent already includes a variable for symbol duration, so dynamically selecting the value to be used as a variable symbol duration as discussed in Ma would have been straightforward. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent alone or in view of Ma. Claim 19 of the '208 Patent recites “program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, for selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval . . . wherein the superposition comprises a

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	time-continuous signal $s_l(t)$ in symbol interval l as a function of time t expressed by: $s_l(t) = \sum_{k=-[N_{RB}^{UL}N_{SC}^{RB}/2]}^{[N_{RB}^{UL}N_{SC}^{RB}/2]-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)}$ where . . . Δf denotes subcarrier frequency spacing, $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l.” Claim 19 of the '208 Patent contemplates a variable subcarrier frequency spacing because the expression for <i>the time-continuous signal $s_l(t)$</i> is based in part on Δf, which <i>denotes subcarrier frequency spacing</i> according to claim 19 of the '208 Patent. Because this is a variable, a POSITA would have found it obvious that it could change and be selected from a variety of options. Ex. 1014 (Bims Decl.), ¶ 72. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Ma. Ma teaches selecting one of a plurality of different selectable subcarrier spacings. For example, in a discussion of OFDM, Ma mentions that “[flexible sub-carrier spacing and symbol duration allocation (e.g., corresponding to various MAB types) may be defined by various OFDM parameters (or frequency-time primitives), such as sub-carrier spacing, useful symbol length, cyclic prefix length, or combinations thereof.” Ex. 1015 (Ma), ¶31.

Claim 8, '792 Patent

Claim 19 of the '208 Patent and Ma

FIG. 4 of Ma illustrates a plurality of sub-carrier spacings:

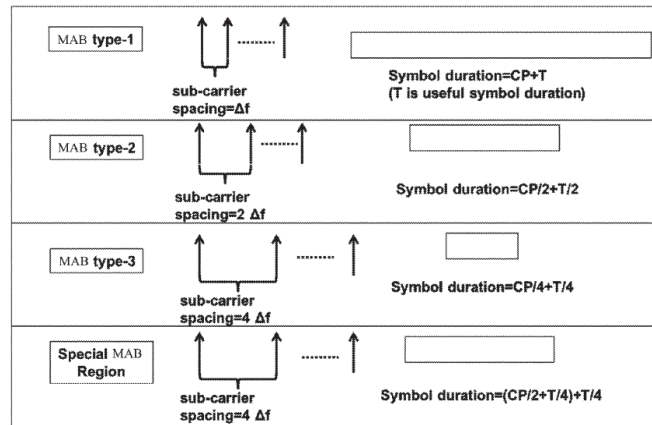


FIG. 4

Ma explains that subcarrier spacing can be selected: “[a]spects provided herein include variable OFDM frequency-time primitives that are dynamically selected to meet performance and efficiency demands” and “the flexible sub-carrier spacing and symbol duration allocation (e.g., corresponding to various MAB types) may be defined by various OFDM parameters (or frequency-time primitives), such as sub-carrier spacing, useful symbol length, cyclic prefix length, or combinations thereof.” Ex. 1015 (Ma) ¶¶ 25, 31.

An analysis of how Ma reads on this element of claim 8 of the '792 Patent can be broken down into three parts. First, in teaching that variable OFDM frequency-time primitives are dynamically selected and that sub-carrier spacing is a frequency-time primitive, Ma teaches dynamically selecting sub-carrier spacings. Ex. 1014 (Bims Decl.), ¶ 102. Second, by showing that that selectable subcarrier spacings can be chosen from the options shown in FIG. 4, Ma teaches selecting one of a plurality of different selectable subcarrier spacings. *Id.* And third, by showing that selection of a subcarrier-spacing from FIG. 4 can have an inverse impact

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	on symbol duration, Ma teaches that selecting a subcarrier spacing provides for one of the plurality of symbol durations shown in FIG. 4. <i>Id.</i> Thus, claim 19 of the '208 Patent in view of Ma renders obvious: • selecting one of a plurality of different selectable subcarrier spacings (i.e., <i>frequency-time primitives that are dynamically selected</i> in Ma, Δf in claim 19 of the '208 Patent) • to provide for the one of the plurality of different symbol durations (i.e., FIG. 4 of Ma shows that symbol duration changes as a function of sub-carrier spacing selection). A POSITA would have been motivated to combine Ma and the '208 Patent to provide this limitation of claim 8 of the '792 Patent because both Ma and the '208 Patent seek to improve network efficiency and reduce network latency. Ex. 1014 (Bims Decl.), ¶ 110. For example, Ma provides motivation to combine its subcarrier spacing selection process with claim 19 of the '208 Patent in explaining the disadvantages of prior systems and the advantages of the systems discussed in Ma: Due to the fixed sub-carrier spacing and fixed OFDM symbol duration, conventional OFDM schemes may be unable to satisfy the spectrum efficiency and Quality of Service (QoS) requirements of next-generation networks . . . [and] [e]mbodiments of this disclosure provide methods for supporting variable sub-carrier spacing and symbol duration for transmitting OFDM symbols and associated cyclic prefixes. Ex. 1015 (Ma) ¶¶23-24.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Ma
	Thus, a POSITA would have been motivated by to use the variable subcarrier spacing selection of Ma to select the subcarrier spacing recited in claim 19 of the '208 Patent because Ma teaches that its variable symbol duration (and thus subcarrier spacing) addresses the issues of latency and efficiency of prior systems and produces a system that is more flexible to accommodate changing channel conditions and deployment scenarios. Ex. 1014 (Bims Decl.), ¶ 112; Ex. 1015 (Ma), ¶¶3, 24. And a POSITA would have reasonably expected this combination to succeed because claim 19 of the '208 Patent already includes a variable for subcarrier space Δf , so dynamically selecting this subcarrier spacing as discussed in Ma would have been straightforward to a POSITA. <i>Id.</i>

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Ma
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Claim 9 of the '792 Patent is obvious over claim 19 of the '208 Patent in view of Ma. As explained above in connection with the discussion of claim 8 of the '792 Patent, claim 8 of the '792 patent does not explicitly mention using different selectable subcarrier spacings. However, it would have been obvious to implement Ma's techniques for using variable subcarrier spacings (and symbol durations) to increase the flexibility of the techniques recited in claim 19 of the '208 Patent to address different channel conditions and deployment scenarios. Because claim 19 of the '208 Patent does not recite selectable subcarrier spacings, it also does not explicitly

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Ma															
	claim that “at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two,” as recited in claim 9 of the '792 Patent. This limitation is taught by Ma. Ma teaches a plurality of different selectable subcarrier spacings where one of the subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two. For example, FIG. 4 of Ma illustrates four subcarrier spacing examples, with examples 2-4 being scaled by different scaling factors: <table><thead><tr><th>Label</th><th>sub-carrier spacing</th><th>Symbol duration</th></tr></thead><tbody><tr><td>MAB type-1</td><td>Δf</td><td>$CP+T$ (T is useful symbol duration)</td></tr><tr><td>MAB type-2</td><td>$2 \Delta f$</td><td>$CP/2+T/2$</td></tr><tr><td>MAB type-3</td><td>$4 \Delta f$</td><td>$CP/4+T/4$</td></tr><tr><td>Special MAB Region</td><td>$4 \Delta f$</td><td>$(CP/2+T/4)+T/4$</td></tr></tbody></table> FIG. 4 FIG. 4 of Ma shows three different sub-carrier spacings as Δf, $2 \Delta f$, and $4 \Delta f$. A POSITA would recognize this this notation shows that two of the subcarrier spacings are multiplied by a scaling factor that is a power of 2 (i.e., 2 and 4). Ex. 1014 (Bims Decl.), ¶ 113. Thus, the '208 Patent in view of Ma renders obvious:	Label	sub-carrier spacing	Symbol duration	MAB type-1	Δf	$CP+T$ (T is useful symbol duration)	MAB type-2	$2 \Delta f$	$CP/2+T/2$	MAB type-3	$4 \Delta f$	$CP/4+T/4$	Special MAB Region	$4 \Delta f$	$(CP/2+T/4)+T/4$
Label	sub-carrier spacing	Symbol duration														
MAB type-1	Δf	$CP+T$ (T is useful symbol duration)														
MAB type-2	$2 \Delta f$	$CP/2+T/2$														
MAB type-3	$4 \Delta f$	$CP/4+T/4$														
Special MAB Region	$4 \Delta f$	$(CP/2+T/4)+T/4$														

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Ma
	• at least one of the plurality of different selectable subcarrier spacings (i.e., Δf) • equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two (i.e., $2 \Delta f$ and $4 \Delta f$ as taught by Ma). Furthermore, a POSITA would have been motivated to combine Ma and the '208 Patent to provide this limitation of claim 9 of the '792 Patent because both Ma and the '208 Patent are seeking to improve network efficiency and reduce network latency. For example, Ma provides motivation to combine its subcarrier spacing selection process with claim 19 of the '208 Patent in explaining the disadvantages of prior systems and the advantages of the systems discussed in Ma: Due to the fixed sub-carrier spacing and fixed OFDM symbol duration, conventional OFDM schemes may be unable to satisfy the spectrum efficiency and Quality of Service (QoS) requirements of next-generation networks . . . [and] embodiments of this disclosure provide methods for supporting variable sub-carrier spacing and symbol duration for transmitting OFDM symbols and associated cyclic prefixes. Ex. 1015 (Ma) ¶¶23, 24. Thus, a POSITA would have been motivated by to combine the scaling factors for subcarrier spacings of Ma with the modulating claimed in claim 19 of the '208 Patent because Ma teaches that its variable symbol duration (and thus subcarrier spacing) addresses the issues of latency and efficiency of prior systems and produces a system that is more flexible to accommodate changing channel conditions

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Ma
	and deployment scenarios. Ex. 1014 (Bims Decl.), ¶ 105; Ex. 1015 (Ma), ¶¶3, 24. At the very least using a known technique for selecting different subcarrier spacings would have merely combined known elements (e.g., the expressions of claim 19 of the '208 Patent and the instructions for carrying them out) with a known subcarrier spacing that is a power of two (as in Ma, for example, Figure 4), to achieve predictable results (selectable subcarrier spacings in an OFDM system). Ex. 1014 (Bims Decl.), ¶ 114. Furthermore, a POSITA would have expected this combination to succeed as selecting one of a variety of options for Δf in claim 19 of the '208 patent would have been within the level of skill of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Ma
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 19 of the '208 Patent recites, or renders obvious, this limitation of claim 10 of the '792 Patent. Claim 19 of the '208 Patent recites this limitation of claim 10 of the '792 Patent by claiming that “the superposition comprises a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t, expressed by: $s_l(t) = \sum_{k=-\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}}^{\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)},$ where . . . $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l.” Thus, claim 19 of the '208 Patent recites that a cyclic prefix of length T_s, is added to superposition signal $s_l(t)$ as shown in

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Ma
	the equation representing $s_l(t)$. Ex. 1014 (Bims Decl.), ¶ 115. Thus, claim 19 recites adding a cyclic prefix to the superposition signal (i.e., $N_{CP,l}$ denotes <i>cyclic prefix length, a variable that shows a cyclic prefix is added to $s_l(t)$</i>).

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 19 of the '208 Patent in view of Ma. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Ma.

As explained in the charts above, any differences between claim 19 of the '208 Patent and claims 8, 9, and 10 of the '792 were obvious and plainly within the level of skill of a POSITA. Ex. 1014 (Bims Decl.), ¶¶ 82-89.

A POSITA would have found that integrating the instructions stored in memory for signal generation as recited in claim 19 of the '208 Patent into an apparatus for providing flexible channel bandwidth like the one of claim 8 of the '792 Patent would have been a predictable way to implement the “program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing network” because (1) claim 19 already indicates that such an implementation is the intended use of its program code and (2) the variable Δf for subcarrier spacing in $s_l(t)$ of claim 19 indicates that assignment of spectrum resources is intended to be flexible in the manner recited in claim 8 of the '792 Patent (i.e., by selecting one of a plurality of subcarrier spacings, which impact signal duration). *Id.* at ¶ 85. Indeed, selecting one of a variety of

different symbol durations in an OFDM device would have been one of a finite number of solutions to improve spectrum efficiency (the '208 Patent lists a handful of alternatives for improving efficiency, such as spectrum sharing, dynamic bandwidth exchange, and smart radio schemes). *See* Ex. 1002 ('208 Pat.), 1:52-56; *see also* Ex. 1014 (Bims Decl.), ¶ 87. Furthermore, a POSITA would have pursued implementing the instructions stored in memory for signal generation as recited in claim 19 of the '208 Patent to provide for the apparatus and selectable subcarrier spacing features of claim 8 of the '792 Patent with a reasonable expectation of success as such an implementation not require any changes to $s_l(t)$ because subcarrier spacing Δf is already a variable (and because implementation of $s_l(t)$ in an apparatus would have been well within the level of skill of a POSITA). Ex. 1014 (Bims Decl.), ¶¶ 83-85.

As explained in the charts above, claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Ma due to teachings, suggestions, and motivations provided by both Ma and claim 19 of the '208 Patent and due to the proposed combinations being the use of known techniques to improve similar devices. Furthermore, the proposed combinations of Ma and claim 19 of the '208 Patent combine prior art elements according to known methods with predictable results. The charts above show that between Ma and claim 19 of the '208 Patent, each element of claims 8, 9, and 10 of the '792 Patent are disclosed.

At the very least, it would have been obvious to a POSITA to try to (1) integrate the computer-readable medium of claim 19 of the '208 Patent into an apparatus that is for providing flexible channel bandwidth in mobile radio communications and that has at least one processor for executing instructions on the computer-readable medium, (2) create a single-carrier signal that provides for one of a plurality of different symbol durations in $s_l(t)$ by (3) selecting one of a plurality of different subcarrier spacings Δf for $s_l(t)$ as recited in claim 19 of the '208 Patent.

Id. at 84.

Furthermore, a POSITA would have been able to combine Ma and the subject matter of claim 19 of the '208 Patent using known methods (e.g., implementing signal processing of claim 19 of the '208 Patent in the apparatus of Ma and/or using Ma's subcarrier spacing selection and scaling factors to choose subcarrier spacings Δf for $s_l(t)$ in claim 19). Ex. 1014 (Bims Decl.), ¶ 84. And finally, the results of the proposed combinations of Ma and claim 19 of the '208 Patent would have been predictable to a POSITA as being straightforward and within the skill level of a POSITA. *Id.* at ¶ 86.

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Ma. Therefore, claim 19 of the '208 Patent in view of Ma presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent that was not considered during the original examination of the '792 Patent. Therefore, reexamination should be ordered, and the claims should be canceled.

2. *SNQ2: Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Dolle*

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19 of the '208 Patent in view of Dolle. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '208 Patent (or any claims including the equations expressed in the '208 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. Dolle was not even cited during prosecution of the '792 Patent and it does not appear on the face of the '729 Patent. Therefore, claim 19 of the '208 Patent in view of Dolle presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double

patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim chart shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 19 of the '208 Patent and explains how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Dolle:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8Pre] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Dolle. Dolle teaches an apparatus by teaching “a transceiver which can communicate wirelessly with another receiver 7 of a first system in a first transmission frequency band f_{c1} and which is furthermore capable of communicating wirelessly with a transceiver 9 of another system 2 on the basis of a transmission frequency band f_{c2} different to the first transmission frequency band f_{c1} of system 1. The transceiver thereby is part of a telecommunications device, such as a dualband cellular telephone.” Ex. 1005 (Dolle), 4:12-19; Ex. 1014 (Bims Decl.), ¶ 146. It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into the transceiver of Dolle due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network</i>”). A POSITA would have

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	had a reasonable expectation of success in making this combination because Dolle's transceiver is for a cellular telephone and implementing the functionality of the computer-readable medium of claim 19 of the '208 Patent into a cellular telephone would have been within the level of a POSITA as it had been common to do this in, for example, 2G, 3G, and even 4G technologies. <i>Id.</i> ¶ 147.
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent would have been obvious in view of claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8A] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Dolle. Dolle discloses or renders obvious at least one processor. For example, Dolle discloses a processor by teaching a control unit. More specifically, Dolle teaches “a control unit 8 is provided effecting the following control functions: control of the baseband block (e.g. modulation parameters, etc.), switch control between reception operation Rx and transmission operation Tx, switching between the first and the second transmission frequency band, operation of the local oscillator LO1 and LO2 synthesizers, respectively, selection of the bandwidth used in the transmission frequency bands, and selection of baseband parameters.” Ex. 1005 (Dolle), 4:66-5:13. Additionally, the “baseband block” would have been understood to be part of a baseband processor as known in the art, and the baseband block is used to “process the OFDM signals and/or symbols.” Ex. 1005 (Dolle), 6:55-56; Ex. 1014 (Bims Decl.), ¶ 149. It would have been obvious to a POSITA that the control unit and/or baseband processor of Dolle was or obviously would have been implemented with or as a processor. Ex. 1014 (Bims Decl.), ¶ 149.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	It would have been obvious to use Dolle's processor to execute computer executable program code of claim 19 of the '208 Patent medium of claim 19 of the '208 Patent due to a suggestion provided in claim 19 (i.e., that the computer readable medium is "<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network</i>") and a POSITA would have known that such a transmitter included a processor, as reflected by Dolle. <i>Id.</i> at ¶ 150. It would have also been obvious to use Dolle's processor to execute the program code of claim 19 of the '208 Patent Dolle's processor performs functions similar to the program code of claim 19 (i.e., selection of bandwidth and baseband parameters and processing OFDM signals and/or symbols). <i>Id.</i> A POSTIA would have had a reasonable expectation that this combination would succeed because the program code of claim 19 performs functions (e.g., selecting different selectable subcarrier spacings) comparable to those performed by the controller in Dolle (e.g., selection of parameters, such as subcarrier spacings) and selecting these criteria was predictable to a POSITA. <i>Id.</i>
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent would have been obvious in view of claim 19 of the '208 Patent. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8B] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Dolle. Dolle discloses or renders obvious at least one non-transitory computer-readable memory in electronic communication with at least once processor. For example, Dolle discloses that the control unit "is supplied at an input terminal 12 with DLC control data. DLC (data link control) corresponds to layer 2 and 3 of the OSI layer model for data communications. One sublayer of the data

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	link control thereby is the so-called MAC (media access control). The DLC control data input at the terminal 12 of the control unit 8 to drive the above cited control functions are particularly data from said MAC layer.” Ex. 1005 (Dolle), 5:20-25. The control unit would include memory to store the DLC control data and to use this data to drive the control functions. Additionally, the “baseband block” would have been understood to be part of a baseband processor as known in the art, and the baseband block is used to “process the OFDM signals and/or symbols.” Ex. 1005 (Dolle), 6:55-56; Ex. 1014 (Bims Decl.), ¶ 152. Thus, claim 19 of the '208 Patent in view of Dolle renders obvious: • at least one non-transitory computer-readable memory (<i>i.e., a non-transitory computer-readable medium as claimed in claim 19</i>) • in electronic communication with the at least one processor (<i>i.e., the controller of Dolle, and instructions stored in the at least one memory</i> (<i>i.e., computer-executable code stored on the non-transitory computer-readable medium</i>)). It would have been obvious to use Dolle’s processor in electronic communication with the computer executable program code of claim 19 of the '208 Patent due to a suggestion provided in claim 19 (<i>i.e., that the computer readable medium is “for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network,”</i> which would have led a POSITA to use a processor to process the instructions recited in claim 19 of the '208 Patent. Ex. 1014 (Bims Decl.), ¶ 153. A POSITA would have had a reasonable expectation of success in combining claim 19’s memory and instructions with Dolle’s processor(s) because the program code of

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	claim 19 performs functions comparable to those performed by the controller of Dolle and those of ordinary skill in the art were aware of how to implement memory with code alongside and with processors for executing that code. <i>Id.</i>
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious a signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Dolle. Dolle discloses an OFDM transmitter that implements variable subcarrier-spacing parameters, ΔF_1 and ΔF_2, and selects values for the variable subcarrier-spacing parameters that “satisfy the following equation: $\Delta F_1 / \Delta F_2 = k * 2^i,$ wherein k is a positive integer value and i is a negative or positive integer value including zero.” Ex. 1005 (Dolle), 3:28-38. Dolle states that “[t]his selection” of subcarrier

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	spacings “allows an effective implement[ation] of the baseband block [of a transceiver] to process [] OFDM signals and/or symbols.” <i>Id.</i>, 6:55-56. Dolle explains that its disclosed OFDM transceiver includes a “control unit” for “[selecting] baseband parameters” such as “subcarrier spacings: $\Delta F_1, \Delta F_2$.” <i>Id.</i>, 4:66-5:12, 6:2-6. Dolle makes clear that “the present invention is particularly concerned with the selection of the bandwidth parameters by the control unit.” <i>Id.</i>, 5:13-15. Dolle further provides example parameters including values for ΔF_1 and ΔF_2 equal to 312.5 kHz and 625 kHz, respectively. <i>Id.</i>, FIG. 1, 6:59-7:13. As a POSITA would recognize that to maintain orthogonality, subcarrier spacing will have an inverse relationship with symbol duration. Ex. 1014 (Bims Decl.), ¶ 158. Thus, by teaching selecting one of a plurality of values for subcarrier spacings, Dolle is also teaching setting one of a plurality of different symbol durations. <i>Id.</i> In summary, claim 19 of the '208 Patent in view of Dolle renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition) • to produce a superposition signal (i.e., a superposition of the plurality of OFDM

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	<i>subcarriers modulated by the plurality of spread symbols)</i> • that resembles a single-carrier signal (i.e., wherein the superposition comprises a time-continuous signal $s_l(t)$) • and has one of a plurality of different symbol durations (i.e., the superposition signal $s(t)$ has a symbol interval l as a function of time t, which could be one of a plurality of durations as suggested by Dolle). It would have been obvious to a POSITA to combine the “OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbol” of claim 19 of the '208 Patent with Dolle’s teaching of using different subcarrier spacings (and thus different symbol durations) because in Dolle, “a solution is proposed for an OFDM system transmitting a dual frequency band and providing interoperability with a coexisting OFDM system,” such as the coexisting OFDM system of claim 19. Ex. 1005 (Dolle), 5:58-6:2; Ex. 1014 (Bims Decl.), ¶ 159. Dolle also indicates that “[t]he above selection of the ratios n/m is particularly advantageous for the effective implementation of the FFT algorithm generating the OFDM symbols.” Ex. 1005 (Dolle), 6:32-34. Thus, a POSITA would have recognized the advantage of—and would reasonably expected success in—using Dolle’s selection of ratios (i.e., which is selecting one from a variety of subcarrier spacings and results in one of a variety of symbol durations) within the algorithms and techniques of claim 19 of the '208 Patent (including the FFT algorithm). Ex. 1014 (Bims Decl.), ¶ 159.
[8F] wherein provisioning	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i>

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	§ VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Dolle. Dolle discloses an OFDM transmitter that implements variable subcarrier-spacing parameters, ΔF_1 and ΔF_2, and selects values for the variable subcarrier-spacing parameters that “satisfy the following equation: $\Delta F_1 / \Delta F_2 = k * 2^i,$ wherein k is a positive integer value and i is a negative or positive integer value including zero.” Ex. 1005 (Dolle), 3:28-38. Dolle states that “[t]his selection” of subcarrier spacings “allows an effective implement[ation] of the baseband block [of a transceiver] to process [] OFDM signals and/or symbols.” <i>Id.</i>, 6:55-56. Dolle explains that its disclosed OFDM transceiver includes a “control unit” for “[selecting] baseband parameters” such as “subcarrier spacings: $\Delta F_1, \Delta F_2$.” <i>Id.</i>, 4:66-5:12, 6:2-6. Dolle makes clear that “the present invention is particularly concerned with the selection of the bandwidth parameters by the control unit.” <i>Id.</i>, 5:13-15. Dolle further provides example parameters including values for ΔF_1 and ΔF_2 equal to 312.5 kHz and 625 kHz, respectively. <i>Id.</i>, FIG. 1, 6:59-7:13. Thus, Dolle teaches that selection of subcarrier spacing allows effective implementation of a baseband, where subcarrier spacings can be selected to satisfy the equation $\Delta F_1 / \Delta F_2 = k * 2^i$. As a POSITA would have recognized, choosing subcarrier spacings to satisfy this equation would involve selecting one or two of a plurality of subcarrier spacings. Ex. 1014 (Bims Decl.), ¶ 162.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Dolle
	In summary, claim 19 of the '792 Patent, whether alone or in combination with Dolle, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing, and Dolle teaching selecting subcarrier spacings) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l). It would have been obvious to a POSITA to combine the “OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbol” of claim 19 of the '208 Patent with Dolle’s teaching of different subcarrier spacings because in Dolle, “a solution is proposed for an OFDM system transmitting a dual frequency band and providing interoperability with a coexisting OFDM system,” such as the coexisting OFDM system of claim 19. Ex. 1005 (Dolle), 5:58-6:2; Ex. 1014 (Bims Decl.), ¶ 163. Dolle also indicates that “[t]he above selection of the ratios n/m is particularly advantageous for the effective implementation of the FFT algorithm generating the OFDM symbols.” Ex. 1005 (Dolle), 6:32-34. Thus, a POSITA would recognize the advantage of—and would reasonably expected success in—using Dolle’s selection of ratios (i.e., which is selecting one from a variety of subcarrier spacings and results in one of a variety of symbol durations) within FFT algorithm of claim 19 of the '208 Patent. Ex. 1014 (Bims Decl.), ¶ 163.

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Dolle																												
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Claim 9 of the '792 Patent is obvious over claim 19 of the '792 Patent in view of Dolle. Dolle teaches one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two. For example, Dolle shows two alternative systems, 2a and 2b: <table><tr><th colspan="4">-continued</th></tr><tr><th></th><th>System 1</th><th>System 2a</th><th>System 2b</th></tr><tr><td>bandwidth</td><td></td><td></td><td></td></tr><tr><td>Channel spacing</td><td>20 MHz</td><td>160 MHz</td><td>160 MHz</td></tr><tr><td>Total number of subcarriers</td><td>64</td><td>512</td><td>256</td></tr><tr><td>Subcarrier spacing</td><td>312.5 kHz</td><td>312.5 kHz</td><td>625 kHz</td></tr><tr><td>Guard band between channels</td><td>4 MHz</td><td>32 MHz</td><td>32 MHz</td></tr></table> Ex. 1005 (Dolle), 7:1-10. As shown in the table above from Dolle, the subcarrier spacing of system 2a is 312.5 kHz and the subcarrier spacing of system 2b is 625 kHz. 312.5 kHz multiplied by a factor that is a power of two (i.e., 2¹, which is 2) is 625 kHz. Thus, the '792 Patent in view of Dolle renders obvious: • at least one of the plurality of different selectable subcarrier spacings (i.e., 625 kHz) • equals at least one other of the plurality of different selectable subcarrier spacings (i.e., 312.5 kHz) • multiplied by a scaling factor that is a power of two (i.e., 2).	-continued					System 1	System 2a	System 2b	bandwidth				Channel spacing	20 MHz	160 MHz	160 MHz	Total number of subcarriers	64	512	256	Subcarrier spacing	312.5 kHz	312.5 kHz	625 kHz	Guard band between channels	4 MHz	32 MHz	32 MHz
-continued																													
	System 1	System 2a	System 2b																										
bandwidth																													
Channel spacing	20 MHz	160 MHz	160 MHz																										
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Subcarrier spacing	312.5 kHz	312.5 kHz	625 kHz																										
Guard band between channels	4 MHz	32 MHz	32 MHz																										

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Dolle
	It would have been obvious to a POSITA to combine the “OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbol” of claim 19 of the '208 Patent with Dolle’s signal that has a number of different symbol durations, at least one of which is multiplied by a scaling factor that is a power of two of another, because Dolle system is “is proposed for an OFDM system transmitting a dual frequency band and providing interoperability with a coexisting OFDM system,” such as the coexisting OFDM system of claim 19. Ex. 1014 (Bims Decl.), ¶ 167. Dolle also indicates that “[t]he above selection of the ratios n/m is particularly advantageous for the effective implementation of the FFT algorithm generating the OFDM symbols.” Ex. 1005 (Dolle), 7:1-10. Thus, a POSITA would recognize the advantage of—and would reasonably expect success in—using Dolle’s subcarrier spacings within the FFT algorithm of claim 19 of the '208 Patent. Ex. 1014 (Bims Decl.), ¶ 167.

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Dolle
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 19 of the '208 Patent recites this limitation of claim 10 of the '792 Patent. <i>Supra</i> § VII.C.1.

As explained in the charts above, claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Dolle. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Dolle.

As explained in the charts above, any differences between claim 19 of the '208 Patent and claims 8 and 10 of the '792 were obvious and plainly within the level of skill of a POSITA.

Claim 19 of the '208 Patent in view of Dolle merely combines prior art elements according to known methods to yield predictable results. The charts above show that between Dolle and the claim 19 of '208 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have been motivated to combine claim 19 of the '208 Patent with Dolle because it would have used known methods including implementing signal processing of claim 19 of the '208 Patent in the transceiver using the processor of Dolle and using the alternative subcarrier spacing selection of Dolle to choose subcarrier spacings Δf for $s_l(t)$ in claim 19. Ex. 1014 (Bims Decl.), ¶ 143. This would have provided the benefits observed by Dolle including providing for a dual band transmission that is “well adapted for a transmission according to OFDM techniques.” Ex. 1005 (Dolle), 2:34-44. The results of the proposed combinations of Dolle and claim 19 of the '208 Patent would have been predictable to a POSITA because selecting different subcarrier spacings and using a processor to execute instructions was a common technique that had been known to those of ordinary skill in the art with predictable consequences. *Id.*

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Dolle. Therefore, claim 19 of the '208 Patent in view of Dolle

presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered and the Challenged Claims should be canceled.

3. SNQ 3: Claims 8, 9, and 10 are unpatentable over claim 19 of the '208 Patent in view of Lucent;

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19 of the '208 Patent alone or in view of Lucent. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '208 Patent (or any claims including the equations expressed in the '208 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. Lucent was not cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 19 of the '208 Patent in view of Lucent presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 19 of the '208 Patent and explains how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Lucent.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 patent, it is obvious over claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8Pre] of claim 8 of the '792 Patent, this limitation would have been

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	obvious over claim 19 of the '208 Patent in view of Lucent. Lucent teaches a proposed “baseline system with multiple configurations suitable for different channel conditions.” Ex. 1006 (Lucent) p.4. Thus, the '792 Patent, both alone and in view of Lucent renders obvious: • an apparatus (i.e., <i>baseline</i> system) • for providing flexible channel bandwidth in mobile radio communications (i.e., <i>suitable for different channel conditions</i>). It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into the proposed system of Lucent due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 172. There would be a reasonable expectation that this combination would succeed because combining the proposed system of Lucent with the computer-readable medium of claim 19 of the '208 Patent would have been a straightforward assembly of computer components within the level of a POSITA. <i>Id.</i>
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent would have been obvious in view of claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8A] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Lucent.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	Lucent discloses or renders obvious at least one processor. For example, Lucent teaches a proposed “baseline system with multiple configurations suitable for different channel conditions.” Ex. 1006 (Lucent) p.4. A POSITA would have recognized that this baseline system would include a processor. Ex. 1014 (Bims Decl.), ¶ 173. Thus, Lucent discloses or render obvious at least one processor (i.e., included as part of the <i>baseline system</i>). It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into the proposed system of Lucent due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 174. There would be a reasonable expectation that this combination would succeed because combining the proposed system of Lucent with the computer-readable medium of claim 19 of the '208 Patent would have been a straightforward assembly of computing components within the level of a POSITA. <i>Id.</i>
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8B] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Lucent. Lucent discloses or renders obvious at least one non-transitory computer-readable memory in electronic communication with at least once processor. For example, Lucent teaches a proposed “baseline system with multiple configurations suitable for different channel conditions.”

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	Ex. 1006 (Lucent), p4. A POSITA would have recognized that this baseline system would include memory in electronic communication with a processor. Ex. 1014 (Bims Decl.), ¶ 176. Thus, Lucent teaches at least one non-transitory computer-readable memory in electronic communication with at least one processor (i.e., <i>the baseline system</i>). Thus, claim 19 of the '208 Patent in view of Lucent renders obvious • at least one non-transitory computer-readable memory (i.e., <i>a non-transitory computer-readable medium as claimed in claim 19 of the '208 Pat.</i>) • in electronic communication with the at least one processor (i.e., <i>the transmitter of claim 19 of the '208 patent and the baseline system of Lucent</i>) • and instructions stored in the at least one memory (i.e., <i>computer-executable code stored on the non-transitory computer-readable medium of claim 19 of the '208 Pat.</i>). It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into the baseline system of Lucent due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 168. There would be a reasonable expectation that this combination would succeed because combining the baseline system of Lucent with the computer-readable medium of claim 19 of the '208 Patent would have been a straightforward combination of computing components within the level of a POSITA. <i>Id.</i>

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8E] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Lucent. Lucent teaches subcarriers with a plurality of different symbol durations. For example, Lucent states that “we can choose the OFDM symbol duration up to 805.5 usec as long as it does not violate the coherence bandwidth dictated by Table 2.” Ex. 1006 (Lucent), p.2. Lucent also shows a list of options for symbol durations in Table 3:

Claim 8, '792 Patent

Claim 19 of the '208 Patent and Lucent

No. Sym/TS	OFDM Symbol period ($T_s + T_p$)	No of tones w/ 5% time overhead	No. of FFT points	No of tones w/ 10% time overhead	No. of FFT points	No of tones w/ 15% time overhead	No. of FFT points
1	667 usec	3166	4096	3000	4096	2833	4096
2	333 usec	1583	2048	1500	2048	1416	2048
3	222 usec	1055	2048	1000	1024	944	1024
4	167 usec	791	1024	750	1024	708	1024
5	133 usec	644	1024	600	1024	566	1024

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6	111 usec	527	1024	500	512	472	512
7	95.2 usec	452	512	428	512	404	512
8	83.3 usec	395	512	375	512	354	512
9	74.1 usec	351	512	333	512	314	512
10	66.7 usec	316	512	300	512	283	512
11	60.6 usec	287	512	272	512	257	512
12	55.6 usec	263	512	250	256	236	256
13	51.3 usec	243	256	230	256	217	256
14	47.6 usec	226	256	214	256	202	256
15	44.4 usec	211	256	200	256	188	256
16	41.7 usec	197	256	187	256	177	256

Table 3. Number of Symbols per Time slot vs. Number of possible sub-carriers over 5MHz bandwidth vs. Number of FFT points needed

Id. at p.3.

Thus, Lucent teaches an OFDM signal that has one of a plurality of different symbol durations.

In summary, claim 19 of the '208 Patent, both alone and in view of Lucent, renders obvious:

- **modulating the encoded data symbols** (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l)
- **onto the OFDM subcarriers** (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition)

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	• to produce a superposition signal (i.e., <i>a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols</i>) • that resembles a single-carrier signal (i.e., <i>wherein the superposition comprises a time-continuous signal $s_l(t)$</i>) • and has one of a plurality of different symbol durations (i.e., the superposition signal $s(t)$ has a symbol interval in claim 19 of the '208 Patent, which could represent one of the plurality of durations listed in Table 3 of Lucent). Lucent focuses on the need for a plurality of symbol durations by stating that, “assuming the nominal UE speed is less than 120 km/hr, we can choose the OFDM symbol duration up to 805.5 usec as long as it does not violate the coherence bandwidth dictated by Table 2.” Ex. 1006 (Lucent), p.1. Lucent recommends “(1) [t]o allow shorter symbol durations when the multipath is less severe, this would result in wider subcarrier spacing which would make the system more immune to frequency offset [or] (2) [t]o use shorter symbol duration which makes the system less susceptible to high Doppler and hence reduces the ICI.” <i>Id.</i>, p.5. In view of Lucent’s teachings, a POSITA would have found it obvious to include instructions for modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations as recited in claim 19 of the '208 Patent for the reasons that follow. Lucent describes a plurality of symbol durations and focuses on the impact of different symbol

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	durations. Ex. 1014 (Bims Decl.), ¶ 185. A POSITA would have been motivated to include instructions for selecting one of a plurality of symbol durations based on Lucent to accommodate “for different channel conditions,” and allow for “shorter symbol durations when multi-path is less severe,” thus permitting wider-subcarrier spacings to “make the system more immune to frequency offset.” Ex. 1006 (Lucent), p.5; Ex. 1014 (Bims Decl.), ¶ 185. Thus, Lucent provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '792 Patent to provide for one of a plurality of different symbol duration. Ex. 1014 (Bims Decl.), ¶ 185. A POSITA would have reasonably expected success in combining Lucent’s plurality of different symbol durations with claim 19 of the '208 Patent because Lucent was intended for use in connection with multi-carrier OFDM systems, such as the apparatus recited in claim 19 of the '208 Patent. <i>Id.</i> Moreover, providing for one of a plurality of symbol durations would have been simple to implement in the context of the subject matter recited in claim 19 of the '208 Patent. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Lucent. Lucent teaches that “[t]he sub-carrier spacing should be large enough to provide robustness against frequency offset and phase noise, but it also has to be small enough

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent																																																
	such that each sub-carrier experiences flat fading. Normally, the tone (or sub-carrier) spacing can be selected by first fixing a maximum delay spread from all possible channel conditions, calculating the coherence bandwidth and then using it as an upper bound for the sub-carrier spacing.” Ex. 1006 (Lucent), p.2. Lucent also shows a list of options for symbol durations in Table 4: <table><tr><th>System Parameters</th><th>Configuration 1</th><th>Configuration 2</th><th>Configuration 3</th></tr><tr><td>Suitable deployment environment</td><td>Indoor, Pedestrian A</td><td>Vehicular A</td><td>Pedestrian B</td></tr><tr><td>Symbol per 0.67 msec time slot</td><td>12</td><td>6</td><td>3</td></tr><tr><td>Number of FFT points</td><td>256</td><td>512</td><td>1024</td></tr><tr><td>Number of sub-carriers</td><td>256</td><td>512</td><td>1024</td></tr><tr><td>OFDM Symbol period (usec)</td><td>55.6</td><td>111</td><td>222</td></tr><tr><td>Sub-carrier spacing (kHz)</td><td>19.2</td><td>9.6</td><td>4.8</td></tr><tr><td>Guard band on each side of the 5MHz band (kHz)</td><td>42.4</td><td>42.4</td><td>42.4</td></tr><tr><td>Sampling period (usec)</td><td>0.20345025</td><td>0.20345025</td><td>0.20345025</td></tr><tr><td>Guard time $T_g = T_{prefix} + T_{postfix}$ (samples/usec)</td><td>17/3.46</td><td>34/6.92</td><td>68/13.8</td></tr><tr><td>Cyclic prefix length (samples/usec)</td><td>5/1.017252604</td><td>16/3.255204</td><td>50/10.17252604</td></tr><tr><td>Power amplifier ramp-up and ramp-down period (samples)</td><td>6 samples each</td><td>9 samples each</td><td>9 samples each</td></tr></table> Table 4. Parameters for baseline OFDM systems Ex. 1006 (Lucent), p.5. Thus, Lucent teaches an OFDM signal that has one of a plurality of different selectable sub-carrier spacings for difference environments (e.g., configuration 1 with 19.2 kHz, configuration 2 with 9.6 kHz, and configuration 3 with 4.8kHz). In summary, claim 19 of the '208 Patent, both alone and in combination with Lucent, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier	System Parameters	Configuration 1	Configuration 2	Configuration 3	Suitable deployment environment	Indoor, Pedestrian A	Vehicular A	Pedestrian B	Symbol per 0.67 msec time slot	12	6	3	Number of FFT points	256	512	1024	Number of sub-carriers	256	512	1024	OFDM Symbol period (usec)	55.6	111	222	Sub-carrier spacing (kHz)	19.2	9.6	4.8	Guard band on each side of the 5MHz band (kHz)	42.4	42.4	42.4	Sampling period (usec)	0.20345025	0.20345025	0.20345025	Guard time $T_g = T_{prefix} + T_{postfix}$ (samples/usec)	17/3.46	34/6.92	68/13.8	Cyclic prefix length (samples/usec)	5/1.017252604	16/3.255204	50/10.17252604	Power amplifier ramp-up and ramp-down period (samples)	6 samples each	9 samples each	9 samples each
System Parameters	Configuration 1	Configuration 2	Configuration 3																																														
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Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l). Lucent focuses on the need for a plurality of subcarrier spacings by stating that, “[i]n order to design [a] OFDM system properly, . . . the sub-carrier spacing should be less than the coherence bandwidth.” Ex. 1006 (Lucent), p.1. Lucent further explains that “[t]he sub-carrier spacing should be large enough to provide robustness against frequency offset and phase noise, but it also has to be small enough such that each sub-carrier experiences flat fading. Normally, the tone (or sub-carrier) spacing can be selected by first fixing a maximum delay spread from all possible channel conditions, calculating the coherence bandwidth and then using it as an upper bound for the sub-carrier spacing.” Ex. 1006 (Lucent), p.2. Lucent further explains that “[t]he smaller the number of sub-carriers is, the wider the subcarrier spacing becomes which leads to robustness against frequency offset and phase noise.” <i>Id.</i>, p.3. Lucent recommends having “a baseline system with multiple configurations suitable for different channel conditions,” and this includes allowing “shorter symbol durations when the multipath is less severe, this would result in wider sub-carrier spacing which would make the system more immune to frequency offset.” <i>Id.</i>, p.5. In view of Lucent’s teachings, a POSITA would have found it obvious to include instructions for selecting one of a plurality of selectable subcarrier spacings as recited in claim 19 of the '208 Patent for the reasons that follow. Lucent describes a plurality of selectable subcarrier

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Lucent
	frequency spacing configurations and focuses on subcarrier spacings as a key selection criteria. Ex. 1014 (Bims Decl.), ¶ 186. A POSITA would have been motivated to include instructions for selecting one of a plurality of selectable subcarrier spacings based on Lucent because selection of a subcarrier spacing from a plurality of selectable subcarrier spacings would have permitted adjustments to be made to the resulting communications to accommodate “for different channel conditions,” and allow for “shorter symbol durations when multi-path is less severe,” thus permitting wider-subcarrier spacings to “make the system more immune to frequency offset.” Ex. 1006 (Lucent), p.5; Ex. 1014 (Bims Decl.), ¶ 186. Thus, Lucent provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '792 Patent to provide for instructions for selecting one of a plurality of selectable subcarrier spacings. Ex. 1014 (Bims Decl.), ¶ 187. A POSITA would have reasonably expected success in combining Lucent’s selectable subcarrier spacings with claim 19 of the '208 Patent because Lucent was intended for use in connection with multi-carrier OFDM systems, such as the apparatus recited in claim 19 of the '208 Patent. <i>Id.</i> Moreover, instructions for selecting one from a plurality of selectable subcarrier spacings would have been simple to implement in the context of the subject matter recited in claim 19 of the '208 Patent, which already recites the subcarrier frequency spacing as a variable “Δf.” <i>Id.</i>

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Lucent
[9] The apparatus of claim 8, wherein at least one of the plurality of different	Claim 9 of the '792 Patent is obvious over claim 19 of the '208 Patent in view of Lucent.

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Lucent																																																
selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Lucent teaches multiple subcarrier spacings where at least one of the spacings is a factor of two of another spacing. For example, Lucent shows a list of options for subcarrier spacings in Table 4: <table><tr><th>System Parameters</th><th>Configuration 1</th><th>Configuration 2</th><th>Configuration 3</th></tr><tr><td>Suitable deployment environment</td><td>Indoor, Pedestrian A</td><td>Vehicular A</td><td>Pedestrian B</td></tr><tr><td>Symbol per 0.67 msec time slot</td><td>12</td><td>6</td><td>3</td></tr><tr><td>Number of FFT points</td><td>256</td><td>512</td><td>1024</td></tr><tr><td>Number of sub-carriers</td><td>256</td><td>512</td><td>1024</td></tr><tr><td>OFDM Symbol period (usec)</td><td>55.6</td><td>111</td><td>222</td></tr><tr><td>Sub-carrier spacing (kHz)</td><td>19.2</td><td>9.6</td><td>4.8</td></tr><tr><td>Guard band on each side of the 5MHz band (kHz)</td><td>42.4</td><td>42.4</td><td>42.4</td></tr><tr><td>Sampling period (usec)</td><td>0.20345025</td><td>0.20345025</td><td>0.20345025</td></tr><tr><td>Guard time $T_g = T_{prefix} + T_{postfix}$ (samples/usec)</td><td>17/3.46</td><td>34/6.92</td><td>68/13.8</td></tr><tr><td>Cyclic prefix length (samples/usec)</td><td>5/1.017252604</td><td>16/3.255204</td><td>50/10.17252604</td></tr><tr><td>Power amplifier ramp-up and ramp-down period (samples)</td><td>6 samples each</td><td>9 samples each</td><td>9 samples each</td></tr></table> Table 4. Parameters for baseline OFDM systems Ex. 1006 (Lucent), p.5. Table 4 shows three different configurations with three different subcarriers spacings, 19.2 (Configuration 1), 9.6 (Configuration 2), and 4.8 (Configuration 3). Two to the first power is two, and two to the second power is four. Thus, both two and four are scaling factors that are powers of two. The subcarrier spacing of Configuration 1 is 19.2khz, which is 2x the subcarrier spacing of Configuration 2 (9.6kHz) and 4x the subcarrier spacing of Configuration 3 (4.8kHz). Thus, the '208 Patent in view of Lucent renders obvious different OFDM configurations: • wherein at least one of the plurality of different selectable subcarrier spacings (i.e., Configuration 1 with 19.2 kHz, Configuration 2 with 9.6 kHz, and Configuration 3 with 4.8 kHz)	System Parameters	Configuration 1	Configuration 2	Configuration 3	Suitable deployment environment	Indoor, Pedestrian A	Vehicular A	Pedestrian B	Symbol per 0.67 msec time slot	12	6	3	Number of FFT points	256	512	1024	Number of sub-carriers	256	512	1024	OFDM Symbol period (usec)	55.6	111	222	Sub-carrier spacing (kHz)	19.2	9.6	4.8	Guard band on each side of the 5MHz band (kHz)	42.4	42.4	42.4	Sampling period (usec)	0.20345025	0.20345025	0.20345025	Guard time $T_g = T_{prefix} + T_{postfix}$ (samples/usec)	17/3.46	34/6.92	68/13.8	Cyclic prefix length (samples/usec)	5/1.017252604	16/3.255204	50/10.17252604	Power amplifier ramp-up and ramp-down period (samples)	6 samples each	9 samples each	9 samples each
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Claim 9, '792 Patent	Claim 19 of the '208 Patent and Lucent
	• equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two (i.e., <i>Configuration 1, which equal to Configuraiton 2 multiplied by two or Configuration 3, which is equal to Configuration 1 multiplied by four</i>). It would have been obvious to implement the subcarrier spacing configurations of Lucent for use as the subcarrier spacings in claim 19 of the '208 Patent because it would be use of a known technique (i.e., configuring a subcarrier spacing as a factor of two of another subcarrier spacing) to improve similar devices (i.e., the computer-readable medium of claim 19 of the '208 Patent and the baseline system of Lucent) in the same way. Ex. 1014 (Bims Decl.), ¶ 179. There would be a reasonable expectation that this combination would succeed because of the similarity of how both references deal with subcarrier spacings and because combining the proposed system of Lucent with the computer-readable medium of claim 19 of the '208 Patent would have been within the level of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Lucent
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a	Claim 19 of the '208 Patent recites this limitation of claim 10 of the '792 Patent. <i>Supra</i> § VII.C.1.

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Lucent
cyclic prefix to the superposition signal.	

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 19 of the '208 Patent in view of Lucent. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Lucent.

As explained in the charts above, any differences between claim 19 of the '208 Patent and claims 8, 9, and 10 of the '792 were obvious and plainly within the level of skill of a POSITA.

A POSITA would have found that integrating the instructions stored in memory for signal generation as recited in claim 19 of the '208 Patent into an apparatus for providing flexible channel schemes for handling different deployment scenarios and use cases as described in Lucent would have merely used known techniques for their intended purposes to achieve only predictable results. The charts above show that between Lucent and claim 19 of the '208 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have found it obvious to combine claim 19 of the '208 Patent and Lucent because doing so would have had beneficial results including increased system flexibility and would have merely used known methods (e.g., implementing signal processing of claim 19 of the '208 Patent in the system of Lucent and/or using the subcarrier spacing selection based on channel characteristics of Lucent to choose subcarrier spacings Δf for $s_l(t)$ in claim 19) to achieve these results. Ex. 1014 (Bims Decl.), ¶ 169. The results of the proposed combination of Lucent and claim 19 of the '208 Patent would have been predictable to a POSITA because it was merely a

combination of known, predictable techniques and doing so was within the skill level of a POSITA. *Id.*

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable as being obvious over claim 19 of the '208 Patent in view of Lucent. Therefore, claim 19 of the '208 Patent in view of Lucent presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered and the claims should be canceled.

4. SNQ 4: Claims 8, 9, and 10 are unpatentable over claim 19 of the '208 Patent in view of Doufexi;

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19 of the '208 Patent alone or in view of Doufexi. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '208 Patent (or any claims including the equations expressed in the '208 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. Doufexi was not cited during prosecution of the '792 Patent and it does not appear on the face of the '792 Patent. Therefore, claim 19 of the '208 Patent in view of Doufexi presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 19 of the '208 Patent and explains how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Doufexi.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 patent, it is obvious over claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8Pre] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi teaches “key design considerations and link parameters for a 4G OFDM system are identified and initial physical layer performance results are presented for a number of transmission modes and channel scenarios.” Ex. 1035 (Doufexi), p.1. Thus, the '792 Patent, both alone and in view of Doufexi renders obvious: • an apparatus (i.e., <i>4G OFDM system in Doufexi</i>) • for providing flexible channel bandwidth in mobile radio communications (i.e., <i>for a number of transmission modes and channel scenarios</i>). It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into the proposed system of Doufexi due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 198. There would have been a reasonable expectation that this

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	combination would be successful because combining the proposed system of Doufexi with the computer-readable medium of claim 19 of the '208 Patent would have been within the level of skill possessed by a POSITA because the computer readable medium of claim 19 is intended to be used in an OFDM communication system such as that disclosed by Doufexi and implementing it as such would have required only routine skill. <i>Id.</i>
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent would have been obvious in view of claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8A] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi renders obvious at least one processor. For example, Doufexi teaches that “[t]he symbol duration may be increased by employing a larger FFT in the modulation process.” Ex. 1035 (Doufexi) p.2. A POSITA would have recognized that performing modulation process would have required a processor. Ex. 1014 (Bims Decl.), ¶ 199. Thus, Doufexi suggests at least one processor (i.e., <i>for performing the modulation process</i>). Moreover, instructions such as those recited in claim 19 of the '208 Patent are conventionally executed by a processor. Without a processor, such instructions are useless. It would have been obvious to integrate the computer-readable medium of claim 19 of the

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	'208 Patent into the proposed system of Doufexi due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 200. Moreover, a POSITA would have combined the claim 19 computer-readable medium with a processor because a processor would have been needed to execute the instructions stored on claim 19’s computer-readable medium. A POSITA would have had a reasonable expectation of success in making the claimed combination because the computer readable medium of claim 19 is intended to be used in an OFDM communication system and includes instructions that are intended to be executed by a processor; implementing the claimed computer-readable medium with a processor was nothing more than routine skill. <i>Id.</i>
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8B] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi discloses or renders obvious at least one non-transitory computer-readable memory in electronic communication with at least once processor. For example, Doufexi teaches “key design considerations and link parameters for a 4G OFDM system are identified and initial physical layer performance results are presented

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	for a number of transmission modes and channel scenarios.” Ex. 1035 (Doufexi), p.1. A POSITA would have recognized that the 4G OFDM system would include memory that stores the transmission modes and that is in electronic communication with a processor. Ex. 1014 (Bims Decl.), ¶ 202. Thus, Doufexi teaches at least one non-transitory computer-readable memory in electronic communication with at least one processor (i.e., <i>the 4G OFDM system</i>). Thus, claim 19 of the '208 Patent in view of Doufexi renders obvious • at least one non-transitory computer-readable memory (<i>i.e., a non-transitory computer-readable medium as claimed in claim 19 of the '208 Pat.</i>) • in electronic communication with the at least one processor (<i>i.e., the transmitter of claim 19 of the '208 patent and the OFDM system of Doufexi</i>) • and instructions stored in the at least one memory (<i>i.e., computer-executable code stored on the non-transitory computer-readable medium of claim 19 of the '208 Pat.</i>). It would have been obvious to integrate the computer-readable medium of claim 19 of the '208 Patent into Doufexi's system due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 203. A POSITA would have had a

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	reasonable expectation that this combination would succeed because combining the baseline system of Doufexi with the computer-readable medium of claim 19 of the '208 Patent would have merely combined the computer readable medium of claim 19 of the '208 Patent with an OFDM transmission system as suggested by the claim itself, thus making such a combination been within the level of skill possessed by a POSITA. <i>Id.</i>
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8E] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi discloses a “4G OFDM system” and proposes OFDM as “a leading candidate for a 4G cellular communications standard.” Ex. 1035 (Doufexi), p.1. Doufexi further “identifies and describes the key link parameters of OFDM for a potential 4G cellular standard,” which include

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	“Δf” denoting “sub-carrier spacing.” <i>Id.</i>, p.1, table 2. Doufexi explains that, “[s]ince 4G systems will be deployed in a wide range of environments, <i>a fixed set of parameters is not capable of achieving high performance in all cases.</i>” <i>Id.</i>, p.1 (emphasis added). Doufexi suggests that “[a] system capable of dynamically adapting one or more of the above parameters <i>may offer superior performance</i>” and provides a set of selectable values for dynamically adaptable OFDM parameters. <i>Id.</i> (emphasis added). For example, Doufexi provides a set of selectable values (16kHz and 8 kHz) for Δf and for symbol duration (62.5 μs and 125 μs). <i>Id.</i>, table 2. In summary, claim 19 of the '208 Patent, both alone and in view of Doufexi, renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition) • to produce a superposition signal (i.e., a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols) that resembles a single-carrier signal (i.e., wherein the superposition comprises a time-continuous signal $s_l(t)$)

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	• and has one of a plurality of different symbol durations (i.e., <i>the superposition signal $s(t)$ has a symbol interval, which could have one of the plurality of durations of Doufexi</i>). In view of Doufexi's teachings, a POSITA would have found it obvious to produce a superposition signal with one of a plurality of symbol durations for the reasons that follow. Doufexi describes a plurality of symbol duration configurations and focuses on symbol duration as a key OFDM parameter. Ex. 1014 (Bims Decl.), ¶ 208. A POSITA would have been motivated to produce a superposition signal with one of a plurality of symbol durations based on Doufexi because such selection would enable the OFDM apparatus recited in claim 19 of the '208 Patent to operate effectively across a wide range of environments, and Doufexi indicates that a fixed set of OFDM parameters would not achieve high performance in all cases. Doufexi, p.1; Ex. 1014 (Bims Decl.), ¶ 208. Thus, Doufexi provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '208 Patent to produce a superposition signal with one of a plurality of symbol durations. Ex. 1014 (Bims Decl.), ¶ 209. A POSITA would have recognized that applying Doufexi's teaching various symbol durations to the system of claim 19 would have predictably enhanced adaptability and performance across different deployment environments, thus yielding an improved system. <i>Id.</i>, ¶ 188.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi discloses a “4G OFDM system” and proposes OFDM as “a leading candidate for a 4G cellular communications standard.” Ex. 1035 (Doufexi), p.1. Doufexi further “identifies and describes the key link parameters of OFDM for a potential 4G cellular standard,” which include “Δf” denoting “sub-carrier spacing.” <i>Id.</i>, p.1, table 2. Doufexi explains that, “[s]ince 4G systems will be deployed in a wide range of environments, a fixed set of parameters is not capable of achieving high performance in all cases.” <i>Id.</i>, p.1. Doufexi suggests that “[a] system capable of dynamically adapting one or more of the above parameters may offer superior performance” and provides a set of selectable values for dynamically adaptable OFDM parameters. <i>Id.</i> For example, Doufexi provides a set of selectable values (16kHz and 8 kHz) for Δf and for symbol duration (62.5 μs and 125 μs). <i>Id.</i>, table 2. In summary, claim 19 of the '792 Patent, both alone and in combination with Doufexi, renders obvious:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	• wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l, which could have one of the plurality of different symbol durations of Doufexi). In view of Doufexi's teachings, a POSITA would have found it obvious to include instructions for selecting one of a plurality of selectable subcarrier spacings as recited in claim 19 of the '208 Patent for the reasons that follow. Doufexi describes a plurality of selectable subcarrier frequency spacing configurations and focuses on subcarrier spacings as a key dynamically adaptable OFDM parameter. Ex. 1014 (Bims Decl.), ¶ 212. A POSITA would have been motivated to include instructions for selecting one of a plurality of selectable subcarrier spacings based on Doufexi because such selection would enable the OFDM apparatus recited in claim 19 of the '792 Patent to operate effectively across a wide range of environments, and Doufexi indicates that a fixed set of OFDM parameters would not achieve high performance in all cases. Doufexi, p.1; Ex. 1014 (Bims Decl.), ¶ 212. Thus, Doufexi provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '208 Patent to provide for

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	instructions for selecting one of a plurality of selectable subcarrier spacings. Ex. 1014 (Bims Decl.), ¶ 213. A POSITA would have recognized that applying Doufexi's teaching of selectable subcarrier spacings to the system of claim 19 of the '208 Patent would have predictably enhanced adaptability and performance across different deployment environments, thus yielding an improved system. <i>Id.</i>

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Doufexi																														
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Claim 9 of the '792 Patent is obvious over claim 19 of the '208 Patent in view of Doufexi. Doufexi teaches multiple subcarrier spacings where at least one of the spacings is a factor of two of another spacing. For example, Doufexi shows a list of options for subcarrier spacings in Table 2: <table><caption>Table 2. OFDM Parameters for 4G.</caption><tr><th>Parameter</th><th>Value 1</th><th>Value 2</th></tr><tr><td>Operating Frequency</td><td>2GHz</td><td>2GHz</td></tr><tr><td>Bandwidth (<i>B</i>)</td><td>4096 kHz</td><td>4096 kHz</td></tr><tr><td>Useful Symbol Duration (<i>T_u</i>)</td><td>62.5 μs</td><td>125 μs</td></tr><tr><td>Guard Interval Duration (<i>T_g</i>)</td><td>15.625 μs (<i>T_u/4</i>)</td><td>31.25 μs (<i>T_u/4</i>)</td></tr><tr><td>Total Symbol Duration (<i>T_{symbol}</i>)</td><td>78.125 μs (with <i>GI = T_u/4</i>)</td><td>156.25 μs (with <i>GI = T_u/4</i>)</td></tr><tr><td>Inner Channel Coding</td><td>Punctured 1/2 rate convolution code, Constraint length 7, {133, 171}_{octal}</td><td>Punctured 1/2 rate convolution code, Constraint length 7, {133, 171}_{octal}</td></tr><tr><td>FFT Size</td><td>256</td><td>512</td></tr><tr><td>Number of data sub-carriers (<i>N_D</i>)</td><td>216</td><td>432</td></tr><tr><td>Sub-carrier spacing (<i>Δf</i>)</td><td>16 kHz</td><td>8 kHz</td></tr></table> Ex. 1035 (Doufexi), p.2. Table 2 shows two different values for subcarriers spacings, 16kHz (Value 1) and 8 kHz (Value 2). Two to the first power is two. Thus, two is a scaling factor that is a power of two. The subcarrier spacing of Value 1 is 16khz, which is 2x the subcarrier spacing of Value 2 (8kHz). Thus, the '208 Patent in view of Doufexi renders obvious different OFDM configurations:	Parameter	Value 1	Value 2	Operating Frequency	2GHz	2GHz	Bandwidth (<i>B</i>)	4096 kHz	4096 kHz	Useful Symbol Duration (<i>T_u</i>)	62.5 μs	125 μs	Guard Interval Duration (<i>T_g</i>)	15.625 μs (<i>T_u/4</i>)	31.25 μs (<i>T_u/4</i>)	Total Symbol Duration (<i>T_{symbol}</i>)	78.125 μs (with <i>GI = T_u/4</i>)	156.25 μs (with <i>GI = T_u/4</i>)	Inner Channel Coding	Punctured 1/2 rate convolution code, Constraint length 7, {133, 171} _{octal}	Punctured 1/2 rate convolution code, Constraint length 7, {133, 171} _{octal}	FFT Size	256	512	Number of data sub-carriers (<i>N_D</i>)	216	432	Sub-carrier spacing (<i>Δf</i>)	16 kHz	8 kHz
Parameter	Value 1	Value 2																													
Operating Frequency	2GHz	2GHz																													
Bandwidth (<i>B</i>)	4096 kHz	4096 kHz																													
Useful Symbol Duration (<i>T_u</i>)	62.5 μs	125 μs																													
Guard Interval Duration (<i>T_g</i>)	15.625 μs (<i>T_u/4</i>)	31.25 μs (<i>T_u/4</i>)																													
Total Symbol Duration (<i>T_{symbol}</i>)	78.125 μs (with <i>GI = T_u/4</i>)	156.25 μs (with <i>GI = T_u/4</i>)																													
Inner Channel Coding	Punctured 1/2 rate convolution code, Constraint length 7, {133, 171} _{octal}	Punctured 1/2 rate convolution code, Constraint length 7, {133, 171} _{octal}																													
FFT Size	256	512																													
Number of data sub-carriers (<i>N_D</i>)	216	432																													
Sub-carrier spacing (<i>Δf</i>)	16 kHz	8 kHz																													

Claim 9, '792 Patent	Claim 19 of the '208 Patent and Doufexi
	• wherein at least one of the plurality of different selectable subcarrier spacings (i.e., <i>Value 1</i> with 16 kHz and <i>Value 2</i> with 8 kHz) • equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two (i.e., <i>Configuration 1</i>, which equal to <i>Configuration 2</i> multiplied by two or <i>Configuration 3</i>, which is equal to <i>Configuration 1</i> multiplied by four). It would have been obvious to implement the subcarrier spacing configurations of Doufexi for use as the subcarrier spacings in claim 19 of the '208 Patent because it would be use of a known technique (i.e., configuring a subcarrier spacing as a factor of two of another subcarrier spacing) to improve similar devices (i.e., the computer-readable medium of claim 19 of the '208 Patent and the OFDM system of Doufexi) in the same way. Ex. 1014 (Bims Decl.), ¶ 216. There would be a reasonable expectation that this combination would succeed because of the similarity of how both references deal with subcarrier spacings and because combining the proposed system of Doufexi with the computer-readable medium of claim 19 of the '208 Patent would have been within the level of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Doufexi
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-	Claim 19 of the '208 Patent recites this limitation of claim 10 of the '792 Patent. <i>Supra</i> § VII.C.1.

Claim 10, '792 Patent	Claim 19 of the '208 Patent and Doufexi
readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 19 of the '208 Patent in view of Doufexi. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Doufexi.

As explained in the charts above, any differences between claim 19 of the '208 Patent and claims 8 and 10 of the '792 were obvious and plainly within the level of skill of a POSITA.

The combination of claim 19 of the '208 Patent and Doufexi merely would have used known techniques to improve similar devices. Furthermore, the proposed combinations of Doufexi and the claim 19 of the '208 Patent combine prior art elements according to known methods with predictable results. The charts above show that between Doufexi and claim 19 of the '208 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have been motivated to combine claim 19 of the '208 Patent with Doufexi because (1) claim 19 of the '208 Patent suggests that it is to be used in an OFDM transmission system, (2) Doufexi discloses an OFDM transmission system that was useful for 4G communications, and (3) Doufexi explains that providing variable parameters including symbol duration and subcarrier spacing will allow for a more useful OFDM communication system that can address more use cases. Thus, the

combination of claim 19 of the '208 Patent would merely have used known methods (e.g., implementing signal processing of claim 19 of the '208 Patent in the OFDM system of Doufexi and/or using the subcarrier spacing selection based on OFDM Parameters of Doufexi to choose subcarrier spacings Δf for $s_l(t)$ in claim 19) to achieve predictable results. Ex. 1014 (Bims Decl.), ¶ 194. And finally, the results of the proposed combination of Doufexi and claim 19 of the '208 Patent would have been predictable to a POSITA because the impact of changing subcarrier spacing and symbol duration were known and doing so was within the skill level of a POSITA. *Id.*

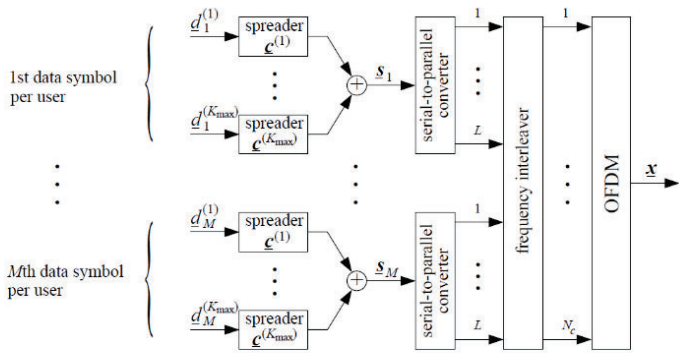
Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable as being obvious over claim 19 of the '208 Patent in view of Doufexi. Therefore, claim 19 of the '208 Patent in view of Doufexi presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered, and the claims should be canceled.

5. SNQ5: Claims 8 and 10 are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Kaiser

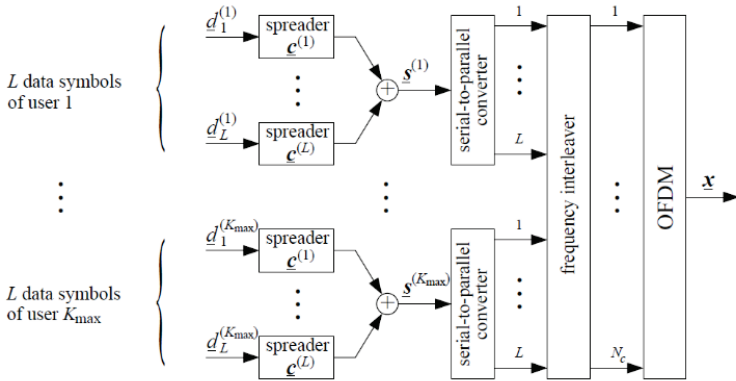
As explained below, claims 8 and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 19 of the '208 Patent alone or in view of Kaiser. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '208 Patent (or any claims including the equations expressed in the '208 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. Kaiser was not cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 19 of the '208 Patent in view of Kaiser presents a SNQ as to whether claims 8 and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

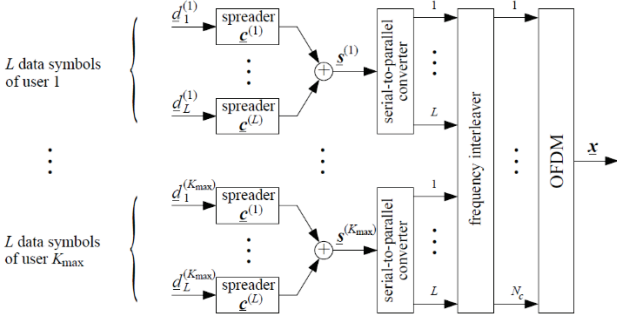
This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8 and 10 of the '792 Patent and claim 19 of the '208 Patent and explains how claims 8 and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Kaiser:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
[8Pre] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 patent, it is obvious over claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8Pre] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser teaches an apparatus (i.e., an MC-CDMA transmitter):  Figure 3.8: <i>M</i>-Modification: MC-CDMA transmitter with simultaneous transmission of <i>M</i> data symbols per user and OFDM symbol; BS with $K_{\max} = L$ active users and $N_c = ML$ subcarriers Ex. 1004 (Kaiser), p.42. Kaiser also states that “the performance of the MC-CDMA reference system presented in this section is applicable to

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	any MC-CDMA system with an arbitrary transmission bandwidth.” <i>Id.</i> at p.56. Thus, the transmitter in Kaiser is: • an apparatus (i.e., <i>a transmitter</i>) for providing flexible channel bandwidth (i.e. <i>arbitrary transmission bandwidth</i>) • in mobile radio communications (i.e., <i>a MC-CDMA reference system</i>) Ex. 1014 (Bims Decl.), ¶ 123. It would have been obvious to a POSITA to integrate the computer-readable medium of claim 19 of the '208 Patent into the system of Kaiser due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.” Ex. 1014 (Bims Decl.), ¶ 124. There would have been a reasonable expectation that this combination would succeed because the transmitter shown in FIG. 3.8 of Kaiser uses OFDM (i.e., MC-CDMA transmitter with simultaneous transmission of M data symbols per user and OFDM symbol) and implementing the functionality of the computer-readable medium of claim 19 of the '208 Patent into a transmitter would have been within the level of a skill of a POSITA. <i>Id.</i>
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, render obvious limitation [8A] of the '792 Patent, this limitation of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser discloses using a processor in a mobile communications apparatus. For example, Kaiser discloses

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	spreaders that are part of a transmitter:  Figure B.1: Principle of SS-MC-MA illustrated for the transmitter in the downlink to enable a comparison with MC-CDMA shown in Fig. 3.8 Ex. 1004 (Kaiser), p.130. A POSITA would have understood that the spreaders illustrated in Kaiser’s Figure B.1 represent functionality that would be performed by a processor of the “transmitter in the downlink.” Ex. 1014 (Bims Decl.), ¶ 126. Thus, Kaiser teaches at least one processor (<i>i.e., spreader or transmitter</i>). It would have been obvious to use the spreader or transmitter of Kaiser implemented in or as a processor to execute computer executable program code of claim 19 of the '208 Patent, which is stored in a computer-readable medium of claim 19 of the '208 Patent at least because claim 19 of the '208 Patent is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 129. A POSITA would have had a reasonable expectation of succeeding in making the claimed combination because the program code of claim 19 of the '208 Patent performs functions comparable to those performed by the spreader in the transmitter of Kaiser. <i>Id.</i>
[8B] at least one non-transitory computer-readable	This limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1.

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	To the extent that claim 19 of the '208 Patent does not, by itself, render obvious limitation [8B], this limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser discloses or renders obvious at least one non-transitory computer-readable memory in electronic communication with at least once processor. For example, Kaiser discloses spreaders that are part of a transmitter:  Figure B.1: Principle of SS-MC-MA illustrated for the transmitter in the downlink to enable a comparison with MC-CDMA shown in Fig. 3.8 Ex. 1004 (Kaiser), p.130. A POSITA would understand that the spreaders illustrated in Figure B.1 either represent processors or represent functionality that would be performed by a processor in electronic communication with memory. Ex. 1014 (Bims Decl.), ¶ 129. Thus, claim 19 of the '208 Patent, whether alone or in view of Kaiser, renders obvious: • at least one non-transitory computer-readable memory (i.e., <i>a non-transitory computer-readable medium</i> as claimed in claim 19 of the '792 Patent) • in electronic communication with the at least one processor (i.e., the <i>spreaders</i> shown in B.1 of Kaiser),

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	• and instructions stored in the at least one memory (i.e., <i>computer-executable code stored on the non-transitory computer-readable medium</i>). It would have been obvious to use the spreader or transmitter implemented in a processor of Kaiser in electronic communication with the computer executable program code of claim 19 of the '208 Patent due to a suggestion provided in claim 19 (i.e., that the computer readable medium is “<i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network.</i>” Ex. 1014 (Bims Decl.), ¶ 130. A POSITA would have had a reasonable expectation of success in arriving at the combination because the program code of claim 19 of the '208 patent performs functions comparable to those performed by the spreader in the transmitter of Kaiser. <i>Id.</i>
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	Claim 19 of the '208 Patent recites or renders obvious this limitation of the '792 Patent. <i>Supra</i> § VII.C.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	Claim 19 of the '208 Patent recites or renders obvious this limitation of the '792 Patent. <i>Supra</i> § VII.C.1. Claim 19 of the '208 Patent recites this limitation [8D] of the '792 Patent by reciting “program code to spread a plurality of data symbols with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT) to produce a plurality of spread symbols” and that “one of the plurality of spread symbols is expressed by:

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	$z(l \cdot M_{sc}^{PUSCH} + k) = \frac{1}{\sqrt{M_{sc}^{PUSCH}}} \sum_{i=0}^{M_{sc}^{PUSCH}-1} d(l \cdot M_{sc}^{PUSCH} + i) e^{-j \frac{2\pi i k}{M_{sc}^{PUSCH}}}$ wherein M_{sc}^{PUSCH} is a DFT length corresponding to the plurality of orthogonal spreading codes.” A POSITA would recognize that claim 19 of the '208 Patent and claim 8 of the '792 Patent use similar terms where the wording is different. Ex. 1014 (Bims Decl.), ¶ 106. First, claim 8 of the '792 Patent uses the term “polyphase codes derived from a discrete Fourier transform” and claim 19 of the '208 Patent uses the term “complex-valued coefficients of a discrete Fourier transform.” Second, claim 8 of the '792 Patent uses “encoding data symbols” and claim 19 of the '208 Patent uses the phrase “spread a plurality of data symbols.” As to the first difference in terminology, Patent Owner admits that “[t]he exponential used in the DFT employs polyphase codes.” Ex. 1018 (ICs Ex. 8), p.7. In other words, the series recited in claim 19 of the '208 patent (i.e., $\sum_{i=0}^{M_{sc}^{PUSCH}-1} d(l \cdot M_{sc}^{PUSCH} + i) e^{-j \frac{2\pi i k}{M_{sc}^{PUSCH}}}$) represents a set of complex-valued coefficients that are multiplied by data values. This set is constrained such that each codeword in the set is equal in length, and is a sequence of complex numbers, where neighboring complex numbers are equally spaced apart. In other words, the complex-valued coefficients in claim 19 are a class of polyphase codes. (Bims Decl.), ¶ 67. Thus, by referring to “complex-valued coefficients,” claim 19 of the '208 Patent claims “polyphase codes” as recited in claim 8 of the '792 Patent. <i>Id.</i>

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	As to the second difference in terminology, the '208 Patent claims that the plurality of data symbols are spread, while the '792 Patent recites encoding data symbols. Both phrases are referring to an encoding process because encoding symbols, as claimed in the '792 Patent, spreads them. Ex. 1014 (Bims Decl.), ¶ 68. Furthermore, Patent Owner admitted that the function for $z(l \cdot M_{sc}^{PUSCH} + k)$ recited in claim 19 of the '208 Patent, which claim 19 recites as expressing one of the plurality of spread symbols, encodes complex-valued symbols across multiple subcarriers. For example, Patent Owner admits that this equation represents a “transform precoding step,” which “encodes data symbols . . . with polyphase codes using a DFT to generate encoded data symbols.” Ex. 1018 (ICs Ex. 8), p7. Furthermore, a POSITA would recognize the function $z(l \cdot M_{sc}^{PUSCH} + k)$ as multiplying data values with a set of complex-valued symbols that are formed from an alphabet of equally-spaced complex-valued symbols on the unit circle, for each of a plurality of subcarriers. Thus, the plurality of spread symbols recited in claim 19 of the '208 Patent are represented as a function that encodes data symbols with polyphase codes. Ex. 1014 (Bims Decl.), ¶ 69. Accordingly, claim 19 of the '208 Patent recites: • encoding data symbols (i.e., <i>spread[ing] a plurality of data symbols</i>) • with polyphase codes derived from a discrete Fourier transform (i.e., <i>with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT)</i>) • to produce encoded data symbols (i.e., <i>to produce a plurality of spread symbols</i>).

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	Thus, claim 19 of the '208 Patent recites limitation [8D] of claim 8 of the '792 Patent.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	Claim 19 of the '208 Patent recites or renders obvious this limitation of the '792 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious limitation [8E] of claim 8 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser teaches a plurality of different symbol durations. For example, Kaiser explains that “the OFDM symbol duration should be smaller than the coherence time $(\Delta t)_c$ of the channel, cf. (2.13), and the subcarrier spacing should be smaller than the coherence bandwidth $(\Delta f)_c$ of the channel, cf. (2.9).” Ex. 1004 (Kaiser), p.31. Selecting symbol duration to be smaller than coherence time indicates that a selection is being made between at least two durations (e.g., a duration that is smaller than coherence time and a duration that is larger than coherence time). Ex. 1014 (Bims Decl.), ¶ 133. Thus, by teaching that symbol duration should be smaller than coherence time, Kaiser teaches that the resulting carrier has one of a plurality of different symbol durations. <i>Id.</i> It would have been obvious to a POSITA to use the symbol duration selection process discussed in Kaiser to select the symbol duration for symbol in claim 19 of the '208 Patent because doing so is a use of a known technique (i.e., producing a signal with one of a plurality of different durations) to improve a similar system (i.e., a transmitter). <i>Id.</i> at ¶ 125. In Kaiser, “The assigned MC-CDMA transmitter . . . is introduced in Fig. 3.8 to distinguish the M simultaneously transmitted data symbols.” Ex. 1004 (Kaiser), p.42. This transmitter in Kaiser is similar to the

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	transmitter that uses the assignment of spectrum resources in claim 19 of the '208 Patent (i.e., claim 19 recites code “responsive to an assignment of spectrum resources for use <i>by a transmitter</i>”). Furthermore, using the symbol duration selection process of Kaiser to improve the transmitter of claim 19 of the '208 Patent would have been within the skill of a POSITA. Ex. 1014 (Bims Decl.), ¶ 134. Thus, a POSITA would have found it obvious to apply the symbol duration selection of Kaiser to the transmitter of the '208 Patent and the resulting combination would have yielded only predictable results. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser teaches selecting one of a plurality of different selectable subcarrier spacings. For example, Kaiser explains that “orthogonality between the signals is obtained by <i>choosing a subcarrier spacing</i> equal to the reciprocal of the symbol duration per subcarrier T_s, known as orthogonal frequency division multiplexing (OFDM).” Ex. 1004 (Kaiser), pp.5-6 (emphasis added). Choosing a subcarrier spacing requires that there be more than one subcarrier spacing to choose from and that the subcarrier spacing be choosable (i.e., selectable). Ex. 1014 (Bims Decl.), ¶ 136. Thus, by teaching “choosing a subcarrier spacing,” Kaiser teaches “selecting one of a plurality of different selectable subcarrier spacings.” <i>Id.</i> Kaiser also discusses selection of subcarrier spacing by

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	teaching that subcarrier spacing should be chosen based on other channel characteristics. For example, Kaiser teaches that “the OFDM symbol duration should be smaller than the coherence time $(\Delta t)_c$ of the channel, cf. (2.13), and the subcarrier spacing should be smaller than the coherence bandwidth $(\Delta f)_c$ of the channel, cf. (2.9).” Ex. 1004 (Kaiser), p.97. Selecting subcarrier spacing to be smaller than coherence bandwidth indicates that selection is being made between at least two spacings (e.g., a spacing that is smaller than coherence bandwidth and a spacing that is equal to or larger than coherence bandwidth). Ex. 1014 (Bims Decl.), ¶ 137. Thus, by teaching that subcarrier spacing should be smaller than coherence bandwidth, Kaiser teaches selecting one of a plurality of different selectable subcarrier spacings. In summary, claim 19 of the '792 Patent, whether alone or in combination with Kaiser, teaches: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., <i>in calculating $s_l(t)$, Δf denotes subcarrier frequency spacing</i>) • to provide for the one of the plurality of different symbol durations (i.e., <i>in calculating $s_l(t)a_{k,l}$ is a value modulated onto a k^{th} subcarrier with a spacing Δf</i>). It would have been obvious to a POSITA to use the subcarrier spacing selection process discussed in Kaiser to select the subcarrier spacing for the variable Δf in claim 19 of the '208 Patent because doing so would have used a known technique (i.e., subcarrier spacing selection) to improve a similar system (i.e., a transmitter). Ex. 1014 (Bims Decl.), ¶ 138. In Kaiser, “The assigned MC-CDMA transmitter . . . is introduced in Fig. 3.8 to distinguish the M simultaneously transmitted data symbols” where “the tighter subcarrier spacing enables one to guarantee flat

Claim 8, '792 Patent	Claim 19 of the '208 Patent and Kaiser
	fading per subchannel in propagation scenarios with decreased coherence bandwidth.” Ex. 1004 (Kaiser), p.42. This transmitter in Kaiser, for which tighter subcarrier spacings are selected, is related to the transmitter that uses the assignment of spectrum resources in claim 19 of the '208 Patent (i.e., claim 19 recites code “responsive to an assignment of spectrum resources for use <i>by a transmitter</i>”). And as a POSITA would have known, not only did spectrum resources need to be assigned, but maintaining orthogonality involved a particular subcarrier spacing (i.e., “the carriers are linearly independent (i.e., orthogonal) if the carrier spacing is a multiple of $1/T$”). Ex. 1036 (Van Nee), p.22; Ex. 1014 (Bims Decl.), ¶ 138. Furthermore, using the symbol duration selection process of Kaiser to improve the transmitter of claim 19 of the '208 Patent to provide flat fading per subchannel in propagation scenarios would have been within the skill of a POSITA. Ex. 1014 (Bims Decl.), ¶ 138. Thus, a POSITA would have applied the symbol duration selection of Kaiser to the transmitter of the '208 Patent with predictable results. <i>Id.</i>

Claim 10, '792 Patent	Claim 19 of the '792 Patent in view of Kaiser
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one	Claim 10 of the '792 Patent is recited in or rendered obvious by claim 19 of the '208 Patent. <i>Supra</i> § VII.C.1. To the extent that claim 19 of the '208 Patent does not, by itself, recite or render obvious claim 10 of the '792 Patent, this limitation would have been obvious over claim 19 of the '208 Patent in view of Kaiser. Kaiser discloses instructions for adding a cyclic prefix to the superposition signal. For example, as shown in Fig. 3.2 of Kaiser (reproduced below), Kaiser discloses that “OFDM with guard interval is applied in SS-MC-MA systems in the same

Claim 10, '792 Patent

processor for adding a cyclic prefix to the superposition signal.

Claim 19 of the '792 Patent in view of Kaiser

way as in MC-CDMA systems, cf. Section 3.1.1. In order to perform coherent data detection at the receiver and to guarantee robust time and frequency synchronization, pilot symbols are multiplexed in the transmitted data.” Ex. 1004 (Kaiser), p.133.

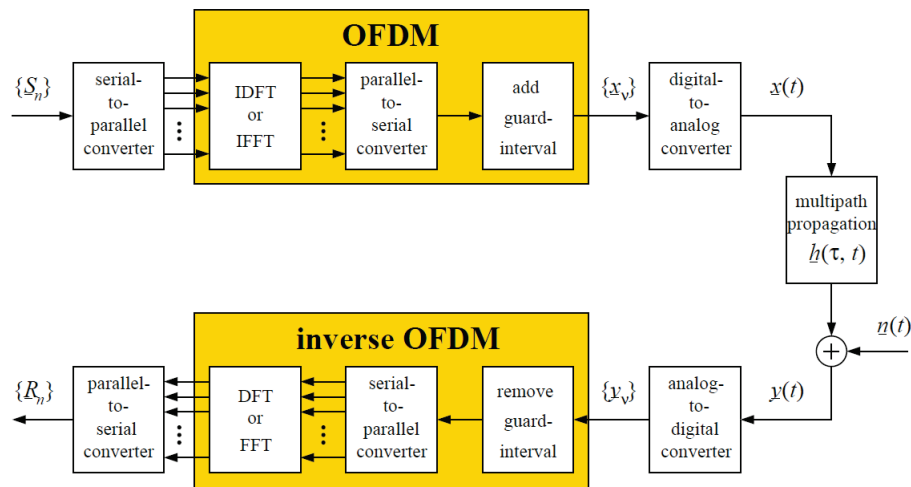


Figure 3.2: MC transmission system with OFDM

Id. at p.32.

Kaiser also notes that “[t]he guard interval is a cyclic prefix added to each OFDM symbol which is obtained by extending the duration of an OFDM symbol to

$$T'_s = T_g + T_s."$$

Id. at p.33.

As shown in equation 3.8, Fig. 3.2, and the corresponding text, Kaiser teaches adding a cyclic prefix to an OFDM signal.

Thus, claim 19 of the '208 Patent, whether alone or in combination with Kaiser recites or renders obvious:

- **instructions stored in the at least one non-transitory computer-readable memory** (i.e., *program code responsive to an assignment of spectrum resources*)

Claim 10, '792 Patent	Claim 19 of the '792 Patent in view of Kaiser
	• the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal (i.e., <i>the guard interval is a cyclic prefix added to each OFDM symbol</i>). Ex. 1014 (Bims Decl.), ¶ 140. It would have been obvious to a POSITA to combine adding a cyclic prefix as discussed in Kaiser to claim 19 of the '208 Patent because doing so is a use of a known technique (i.e., the cyclic prefix is a variable in claim 19 of the '208 Pat.) to improve a similar system (i.e., non-transitory computer-readable medium of claim 19 of the '208 Patent, which include the cyclic prefix variable $N_{CP,1}$ in its calculation of a superposition signal). <i>Id.</i> at ¶ 141. Adding a cyclic prefix as discussed in Kaiser to OFDM symbols recited in claim 19 would have been within the skill of a POSITA, as the equation for $s_l(t)$ already include a cyclic prefix variable. Thus, a POSITA would have combined Kaiser and claim 19 of the '792 Patent predictable results since both discuss using cyclic prefixes in a similar manner. <i>Id.</i>

As shown in the charts above, claims 8 and 10 of the '792 Patent would have been obvious over claim 19 of the '208 Patent in view of Kaiser. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8 and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '208 Patent in view of Kaiser.

The combination of claim 19 of the '208 Patent with Kaiser reflects the use of known techniques according to known methods to achieve predictable results. The charts above show that between Kaiser and claim 19 of the '208 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have been motivated to combine Kaiser and claim 19 of the '208 Patent because

doing so would have merely used known signal processing techniques as recited in claim 19 of the '208 Patent with other known techniques for selecting certain parameters (e.g., the variable for subcarrier spacing) and implementing the instructions using known methods (e.g., using a processor to execute instructions stored in memory to perform things like spreading and modulation). Ex. 1014 (Bims Decl.), ¶ 119. And finally, the results of the proposed combinations of Kaiser and claim 19 of the '208 Patent would have been predictable to a POSITA because the techniques are straightforward implementations of the principles stated in the prior art and within the skill level of a POSITA. *Id.* at ¶ 120.

Based on the foregoing, claims 8 and 10 of the '792 Patent are unpatentable for obviousness-type double patenting over claim 19 of the '208 Patent in view of Kaiser. Therefore, claim 19 of the '208 Patent in view of Kaiser presents a SNQ as to the patentability of claims 8 and 10 of the '792 Patent, reexamination should be ordered, and the claims should be canceled.

D. Detailed Discussion of SNQs Based On Obviousness-Type Double Patenting Over the '559 Patent

As explained below, claims 8-10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 6⁷ of the '559 Patent. The claims of the '792 Patent were not rejected for double patenting over the claims of the '559 Patent. And while a double patent rejection based on U.S. Patent No. 11,224,508 was applied and overcome with a terminal disclaimer, the '559 Patent expired years before the '508 Patent will expire. The record does not indicate that the Office considered or evaluated whether obviousness-type double patenting existed as between the Challenged Claims and any claim of the '559 Patent, including but not

⁷ Claim 6 depends from claim 1 and thus includes all of the limitations of claim 1. All references to claim 6 refer to the limitations contained in both claims 1 and 6.

limited to claim 6 of the '559 Patent. Claim 6 is a dependent claim that depends upon claim 1 of the '559 Patent. These claims provide:

1. An apparatus, comprising:

a processor; and

a non-transitory computer-readable memory communicatively coupled to the processor, the memory including a set of instructions stored thereon and executable by the processor for:

spreading a plurality of data symbols with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT) to produce a plurality of spread symbols;

responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval; and

generating an OFDM signal comprising a superposition of the plurality of OFDM subcarriers, each modulated by one of the plurality of spread symbols, wherein the plurality of orthogonal spreading codes are selected to provide the superposition with a reduced peak-to-average-power ratio; wherein at least one of the plurality of spread symbols is expressed by:

$$z(l \cdot M_{sc}^{\text{PUSCH}} + k) = \frac{1}{\sqrt{M_{sc}^{\text{PUSCH}}}} \sum_{i=0}^{M_{sc}^{\text{PUSCH}}-1} d(l \cdot M_{sc}^{\text{PUSCH}} + i) e^{-j \frac{2\pi i k}{M_{sc}^{\text{PUSCH}}}}$$

wherein M_{sc}^{PUSCH} is a DFT length corresponding to the plurality of orthogonal spreading codes, l is an index spanning 0 to a number of

symbol intervals minus one, k is an index spanning zero to the DFT length M_{sc}^{PUSCH} minus one, i is an index spanning zero to the DFT length M_{sc}^{PUSCH} minus one, $d(i)$ is an i^{th} one of the plurality of data symbols, e is natural log, $j = \sqrt{-1}$, and π is mathematical constant Pi.

6. The apparatus recited in claim 1, wherein the superposition comprises a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t , expressed by:

$$s_l(t) = \sum_{k=-[N_{RB}^{UL}N_{SC}^{RB}/2]}^{[N_{RB}^{UL}N_{SC}^{RB}/2]-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)}$$

where N_{RB}^{UL} denotes a transmission bandwidth of the signal $s_l(t)$ and N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL}N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition, k is an index that indicates a range of a summation, $k^{(-)} = k + N_{RB}^{UL}N_{sc}^{RB}/2$, $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l , e is natural log, $j = \sqrt{-1}$, π is mathematical constant Pi, Δf denotes subcarrier frequency spacing, $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l ; wherein $a_{k,l}$ comprises a one of the plurality of code symbols corresponding to a k^{th} subcarrier in symbol period l .

Ex. 1003 ('559 Pat.), 52:24-59, 53:10-29.

1. *SNQ6: Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Ma*

As explained below, claims, 8, 9, and 10 of the '792 Patent are unpatentable

based on obviousness-type double patenting over claim 6 of the '559 Patent alone or in view of Ma. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '559 Patent (or any claims including the equations expressed in the '559 Patent claims) for obviousness-type double patenting. *Supra* § VII.C. And Ma was not even cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 6 of the '559 Patent in view of Ma presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent is unpatentable for obviousness-type double patenting.

This SNQ applies only if the effective filing date is determined to be after Ma's effective filing date. As explained above, the effective filing date of the '792 Patent is June 8, 2015. *See supra* §§ IV.B, V.

The following claim chart shows comparisons between claims 8, 9, and 10 of the '792 Patent and claim 6 of the '559 Patent and explain how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Ma.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is explicitly claimed in claim 6 of the '559 Patent, which recites “[a]n apparatus.” Ex. 1003 ('559 Pat.), 52:24. The remainder of the limitations of claim 6 of the '559 Patent show that the claimed apparatus is for communication in a wireless communication network because it recites concepts like generating “an OFDM signal comprising a superposition of the plurality of OFDM subcarriers,” and a “transmitter in an orthogonal frequency division multiplexing (OFDM) network” Ex. 1003 ('559 Pat.), 52:34-40.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	Therefore, this limitation of claim 6 of the '559 Patent reads on preamble [8Pre] of the '792 Patent. Ex. 1014 (Bims Decl.), ¶ 224.
[8A] at least one processor; and	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. Claim 6 of the '559 Patent recites “<i>a processor.</i>” Ex. 1003 ('559 Pat.), 52:25. Claim 6 of the '559 Patent thus recites the at least one processor of claim 8 of the '792 Patent.
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. Claim 6 of the '559 Patent recites “a non-transitory computer-readable memory communicatively coupled to the processor, the memory including a set of instructions stored thereon and executable by the processor.” Ex. 1003 ('559 Pat.), 52:26-29. Claim 6 of the '559 Patent therefore claims: • at least one non-transitory computer-readable memory (i.e., “<i>a non-transitory computer-readable memory</i>”) • in electronic communication with the at least one processor (i.e., “<i>communicatively coupled to the processor</i>”), • and instructions stored in the at least one memory, the instructions executable by the at least one processor (i.e., “<i>the memory including a set of instructions stored thereon and executable by the processor</i>”). Therefore, while not verbatim identical, this limitation of

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	claim 6 of the '559 Patent anticipates limitation [8B] of the '792 Patent.
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 6 of the '559 Patent. Claim 6 of the '559 Patent recites the provisioning step of claim 8 of the '792 patent by reciting, “responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.” Ex. 1003 ('559 Pat.), 52:34-38. As recited in claim 11 of the '792 Patent, which depends from claim 8, “the provisioning [of claim 8] comprises receiving at least one of a system requirement and a channel characteristic, and the selecting is responsive to the at least one of the system requirement and the channel characteristic.” Because claim 11 depends from claim 8, the provisioning limitation [8C] in the '792 Patent covers receiving as recited in claim 11 of the '792 Patent because “[b]y definition, an independent claim is broader than a claim that depends from it, so if a dependent claim reads on a particular embodiment of the claimed invention, the corresponding independent claim must cover that embodiment as well.” <i>Littelfuse, Inc. v. Mersen USA EP Corp.</i>, 29 F.4d 1376, 1380 (Fed. Cir. 2022). In other words, an independent claim should be construed broadly enough to encompass what is recited in its dependent claim. <i>See Baxalta Inc. v. Genentech, Inc.</i>, 972 F.3d 1341, 1346 (Fed. Cir. 2020). Limitation [8C] of the '792 Patent thus encompasses receiving at least one of a system requirement and a channel characteristic, where the selecting (to provide for different symbol durations) is responsive to the received requirement

Claim 8, '792 Patent

Claim 6 of the '559 Patent and Ma

and characteristic. Examples of the claimed system requirements and channel characteristics are shown in FIG. 16 of the '792 Patent.

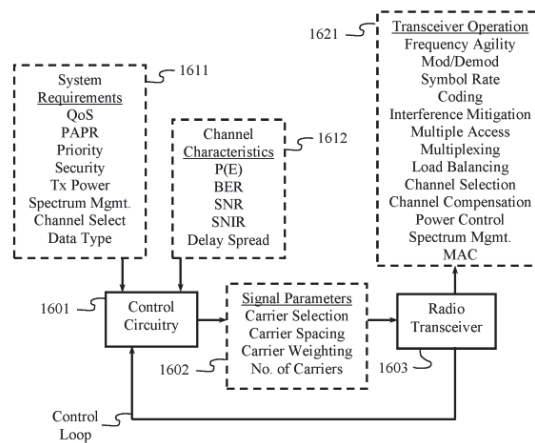


Figure 16

Ex. 1001 ('792 Pat.), FIG. 16

As shown in Figure 16, System Requirements 1611 include “Spectrum Mgmt.” Thus, the claimed provisioning a set of OFDM subcarriers encompasses receiving a spectrum management requirement.

Claim 6 of the '559 Patent recites receiving at least one of a system requirement and channel characteristic that are used to select one of a plurality of different selectable subcarrier spacings by reciting “responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network, selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.”

As a POSITA would recognize, the assignment of spectrum resources recited in claim 6 of the '559 Patent reads on a system requirement of claim 8 of the '792 Patent (i.e., the

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	Spectrum Mgmt. shown in Figure 16 of the '792 Pat.). Ex. 1014 (Bims Decl.), ¶ 228. Thus, the selection of subcarriers recited in claim 6 of the '559 Patent includes receiving at least one of a system requirement and channel characteristic (i.e., is responsive to an assignment of spectrum resources). Therefore, claim 6 of the '559 Patent recites: • provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers (i.e., <i>responsive to an assignment of spectrum resources . . . selecting a plurality of OFDM subcarriers</i>) • for mobile radio communications (i.e., <i>for use by a transmitter in an orthogonal frequency division multiplexing (OFDM) network</i>). Even if claim 6 of the '559 Patent could be read as not explicitly reciting limitation [8C] of the '792 Patent, it would have been obvious to a POSITA to include program code to receive and incorporate spectrum resource information for use by a transmitter as contemplated by and obvious over claim 6 of the '559 Patent because doing so was a known technique to improve a device similar to the apparatus of claim 8 of the '792 Patent. Ex. 1014 (Bims Decl.), ¶ 228. Both the transmitter of claim 6 of the '559 Patent and the apparatus of claim 8 of the '792 Patent were improved in the same way, especially when considering that claim 8 encompasses claim 11 of the '792 Patent. Claim 11 of the '792 Patent improves an apparatus executing instructions that are responsive to a received requirement and (2) to provide for selecting OFDM subcarriers. Claim 8 of the '792 Patent recites the same improvement to a transmitter by claiming code that is (1) responsive to an assignment of spectrum resources and (2) for performing a selection of subcarriers. <i>Id.</i> at ¶ 90. Furthermore, A POSITA would have applied the technique of receiving an

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	assignment in claim 6 of the '559 Patent with predictable results. <i>Id.</i> Thus, claim 6 of the '559 Patent encompasses limitation [8C] of the '792 patent.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. Claim 6 of the '559 Patent recites “spreading a plurality of data symbols with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT) to produce a plurality of spread symbols . . . wherein at least one of the plurality of spread symbols is expressed by: $z(l \cdot M_{SC}^{PUSCH} + k) = \frac{1}{\sqrt{M_{SC}^{PUSCH}}} \sum_{i=0}^{M_{SC}^{PUSCH}-1} d(l \cdot M_{SC}^{PUSCH} + i) e^{-j \frac{2\pi i k}{M_{SC}^{PUSCH}}}$ wherein M_{SC}^{PUSCH} is a DFT length corresponding to the plurality of orthogonal spreading codes.” Ex. 1003 ('559 Pat.), 52:30-33, 52:44-59. A POSITA would recognize that claim 6 of the '559 Patent and claim 8 of the '792 Patent use interchangeable terms where the wording is different. Ex. 1014 (Bims Decl.), ¶ 229. First, claim 8 of the '792 Patent uses the term “polyphase codes derived from a discrete Fourier transform” and claim 6 of the '559 Patent uses the term “complex-valued coefficients of a discrete Fourier transform.” Second, claim 8 of the '792 Patent uses “encoding data symbols” and claim 6 of the '559 Patent uses the phrase “spreading a plurality of data symbols.” As to the first difference in terminology, Patent Owner admits that “[t]he exponential used in the DFT employs polyphase codes.” Ex. 1018 (ICs Ex. 8), p.7. In other words,

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	the exponential recited in claim 6 of the '559 Patent (i.e., $e^{-j\frac{2\pi ik}{M_{sc}^{PUSCH}}}$) represents a complex-valued coefficient that are multiplied by data values. This set is constrained such that each codeword in the set is equal in length, and is a sequence of complex numbers, where neighboring complex numbers are equally spaced apart. In other words, the complex-valued coefficients in claim 19 are a class of polyphase codes. (Bims Decl.), ¶ 67. Thus, by referring to “complex-valued coefficients,” claim 6 of the '559 Patent claims “polyphase codes” as recited in claim 8 of the '792 Patent. <i>Id.</i> As to the second difference in terminology, the '559 Patent claims that the plurality of data symbols are spread, while the '792 Patent recites encoding data symbols. Both phrases are referring to an encoding process because encoding symbols, as claimed in the '792 Patent, spreads them. <i>Id.</i> at 68. Patent Owner admitted that the following equation recited in claim 19 of the '559 Patent, which the '559 patent recites as expressing one of the plurality of spread symbols, encodes complex-valued symbols across multiple subcarriers by encoding. $z(l \cdot M_{sc}^{PUSCH} + k) = \frac{1}{\sqrt{M_{sc}^{PUSCH}}} \sum_{i=0}^{M_{sc}^{PUSCH}-1} d(l \cdot M_{sc}^{PUSCH} + i) e^{-j\frac{2\pi ik}{M_{sc}^{PUSCH}}}$ For example, Patent Owner admits that this equation represents a “transform precoding step,” which “encodes data symbols . . . with polyphase codes using a DFT to generate encoded data symbols.” Ex. 1018 (ICs Ex. 8), p7. Thus, the plurality of spread symbols recited in claim 6 of the '559 Patent are represented as a function that encodes data symbols with polyphase codes.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	Accordingly, claim 6 of the '559 Patent encompasses: • encoding data symbols (i.e., <i>spread[ing] a plurality of data symbols</i>) • with polyphase codes derived from a discrete Fourier transform (i.e., <i>with a plurality of orthogonal spreading codes comprising complex-valued coefficients of a discrete Fourier transform (DFT)</i>) • to produce encoded data symbols (i.e., <i>to produce a plurality of spread symbols</i>). Thus, this limitation of claim 6 of the '559 Patent recites limitation [8D] of the '792 Patent.
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent alone or in view of Ma. Claim 6 of the '559 Patent recites this feature of claim 8 of the '792 Patent by claiming that “generating an OFDM signal comprising a superposition of the plurality of OFDM subcarriers, each modulated by one of the plurality of spread symbols, wherein the plurality of orthogonal spreading codes are selected to provide the superposition with a reduced peak-to-average-power ratio . . . wherein the superposition comprises a time-continuous signal $s_1(t)$ in symbol interval l as a function of time t, expressed by: $s_1(t) = \sum_{k=-\frac{N_{RB}^{UL}N_{sc}^{RB}}{2}}^{\frac{N_{RB}^{UL}N_{sc}^{RB}}{2}-1} a_{k(-),l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)},$

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	where N_{RB}^{UL} denotes a transmission bandwidth of the signal $s_1(t)$ and N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL}N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition, k is an index that indicates a range of a summation, $k^{(-)} = k + N_{RB}^{UL}N_{sc}^{RB}/2$, $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l, e is natural log, $j = \sqrt{-1}$, π is mathematical constant Pi, Δf denotes subcarrier frequency spacing, $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l; wherein $a_{k,l}$ comprises a one of the plurality of code symbols corresponding to a k^{th} subcarrier in symbol period l.” The following analysis breaks this element of claim 8 of the '792 Patent into three parts: (1) modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal, (2) that the superposition signal resembles a single-carrier signal, and (3) that the superposition signal has one of a plurality of different symbol durations. First, claim 6 of the '559 Patent teaches modulating encoded data symbols on the OFDM subcarriers to produce a superposition signal. Claim 6 of the '559 Patent recites this limitation of claim 8 of the '792 Patent by reciting generating “an OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols.” By modulating spread symbols, claim 19 is modulating encoded symbols and is

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	doing to create a superposition signal. Ex. 1014 (Bims Decl.), ¶ 230. Second, claim 6 of the '559 Patent claims that the superposition signal resembles a single-carrier signal. As admitted by Patent Owner, “[t]he transform precoding step [as it appears in claim 6 of the '559 Patent] spreads data symbols to cause the superposition of modulated subcarriers to mimic a single carrier.” Ex. 1017 (Complaint), ¶63. In other words, according to Patent Owner, “a sum (i.e., superposition) of the subcarrier frequencies modulated with their corresponding symbols . . . resembles a single carrier.” Ex. 1018 (ICs Ex. 8), p8. Thus, by reciting that “the superposition comprises a time-continuous signal expressed by $s_l(t)$ [i.e., a sum of subcarrier frequencies modulated with their corresponding signals]”, claim 6 of the '559 Patent recites the “modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal” limitation in claim 8 of the '792 Patent. Ex. 1014 (Bims Decl.), ¶ 230. This is interpretation is confirmed by an explanation in the '854 Application, which the '559 Patent incorporates by reference: “[w]eights applied to the carriers shape the carrier superpositions, thus, allowing CI signals to appear as single-carrier waveforms, such as Time Division Multiple Access (TDMA) or DS-CDMA signals.” Ex. 1016, (the '854 Application), ¶8. In claim 6 of the '559 Patent, $s_l(t)$ is a superposition signal in which “$a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l.” In other words, $a_{k,l}$ is a weight that shapes the superposition $s_l(t)$, allowing $s_l(t)$ to appear as a single-carrier waveform. Ex. 1014 (Bims Decl.), ¶ 230. Third, claim 6 of the '559 Patent contemplates a superposition signal that has one of a plurality of different

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	symbol durations because claim 19 recites “selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval.” As a POSITA would recognize, a Claim 6 of the '559 Patent therefore claims symbol interval represents the duration of a symbol. Ex. 1014 (Bims Decl.), ¶ 71. Thus, by selecting subcarriers that correspond to a plurality of OFDM intervals, and because these selected subcarriers are modulated by spread symbols to generate an OFDM signal that is a superposition of the plurality of OFDM subcarriers, claim 6 of the '559 Patent reads on “modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations,” as recited in claim 8 of the '792 Patent. <i>Id.</i> To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Ma. Ma discloses a signal with one of a plurality of different symbol durations. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent, in view of Ma, renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition)

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	• to produce a superposition signal (i.e., <i>a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols</i>) • that resembles a single-carrier signal (i.e., <i>wherein the superposition comprises a time-continuous signal $s_l(t)$</i>) • and has one of a plurality of different symbol durations (i.e., <i>the superposition signal $s(t)$ has a symbol interval l as a function of time t</i>). It would have been obvious to a POSITA to use the symbol duration selection process discussed in Ma to select the symbol interval in claim 6 of the '559 Patent because doing so would use a known technique (i.e., Ma's symbol duration selection) to improve a similar system (i.e., a mobile communication system using an OFDM transmitter), thus allowing it to have the ability to provide a "flexible air interface[]" that can provide for "improved performance" in various deployment scenarios and under various channel conditions. Ex. 1015 (Ma), ¶[0003]; Ex. 1014 (Bims Decl.), ¶ 230. Claim 6 of the '559 Patent is directed to code "responsive to an assignment of spectrum resources for use by a transmitter," and both claim 6 of the '559 Patent and Ma relate to using transmitters in similar ways for mobile communications. Ex. 1014 (Bims Decl.), ¶ 230. Thus, a POSITA would have applied the symbol duration selection of Ma to the transmitter of claim 6 of the '559 Patent with predictable results thus providing the benefit of flexibility in various deployment scenarios and adaptability to varying channel conditions. <i>Id.</i> Furthermore, a POSITA would have been motivated to combine Ma and the subject matter of the claim 6 of the '559 Patent to provide this limitation of claim 8 of the '792 Patent

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	because both Ma and claim 6 of the '559 Patent are seeking to improve network efficiency and reduce network latency. Ex. 1014 (Bims Decl.), ¶ 231. For example, Ma provides motivation to combine its symbol duration selection process with claim 6 of the '559 Patent in explaining the disadvantages of prior systems and the advantages of the systems discussed in Ma: Due to the fixed sub-carrier spacing and fixed OFDM symbol duration, conventional OFDM schemes may be unable to satisfy the spectrum efficiency and Quality of Service (QoS) requirements of next-generation networks . . . [and] [e]mbodiments of this disclosure provide methods for supporting variable sub-carrier spacing and symbol duration for transmitting OFDM symbols and associated cyclic prefixes. Ex. 1015 (Ma) ¶¶ 23, 24. Thus, a POSITA would have been motivated by to combine the flexible symbol duration of Ma with the selecting subcarriers corresponding to a symbol interval claimed in claim 6 of the '559 Patent because Ma teaches that its variable symbol duration addresses the issues of latency and efficiency of prior systems and to yield a more flexible system that could account for different channel conditions and deployment scenarios. Ex. 1014 (Bims Decl.), ¶ 231. A POSITA would have reasonably expected to succeed in making this combination because claim 6 of the '559 Patent already includes a variable for symbol duration, so dynamically selecting the value to be used as a variable symbol duration as discussed in Ma would have been straightforward. <i>Id.</i>
[8F] wherein provisioning comprises selecting	This limitation of claim '8 of the '792 Patent is recited in or rendered obvious by claim 6 of the '559 Patent alone or in view of Ma.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	For example, claim 6 of the '559 Patent recites “selecting a plurality of OFDM subcarriers corresponding to at least one OFDM symbol interval” and “generating . . . a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t expressed by: $s_l(t) = \sum_{k=-[N_{RB}^{UL}N_{SC}^{RB}/2]}^{[N_{RB}^{UL}N_{SC}^{RB}/2]-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)}$ where . . . Δf denotes subcarrier frequency spacing.” Claim 6 of the '559 Patent claims variable parameters, including variable subcarrier frequency spacings, as the expression for the “<i>time-continuous signal $s_l(t)$</i>” is defined in part by variable parameters such as “Δf,” which “<i>denotes subcarrier frequency spacing.</i>” A POSITA would have understood that the use of variable parameters in the expression for the “<i>time-continuous signal $s_l(t)$</i>” indicates that each parameter, including “Δf,” could have any one of a plurality of different values. Specifically, a POSITA would have understood that “Δf,” which “<i>denotes subcarrier frequency spacings,</i>” could correspond to one of a plurality of possible subcarrier spacings and that one of a plurality of possible subcarrier spacings would need to be selectable and select[ed] in order to generate the “<i>time-continuous signal $s_l(t)$</i>.” Ex. 1014 (Bims Decl.), ¶ 232. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Ma. Ma teaches selecting one of a plurality of different

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Ma
	selectable subcarrier spacings. <i>Supra</i> ¶ VII.C.1. Thus, claim 6 of the '559 Patent, whether alone or in combination with Ma, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l as recited in claim 6 of the '559 patent, using the flexible subcarrier spacing options illustrated in FIG. 4 of Ma). It would have been obvious to a POSITA to use the flexible symbol durations discussed in Ma to select the symbol duration for the variable Δf in claim 19 of the '559 Patent because Ma provides motivation for doing so. For example, Ma predicts that “next generation wireless communication protocols will likely include air interfaces that support waveform adaptation to allow the most suitable waveform to be dynamically selected based on various criteria, such as channel conditions, traffic types, transmission mode, user equipment (UE) capabilities, or other factors.” Ex. 1015 (Ma), ¶3. A POSITA would have reasonably expected this combination to succeed given the similarities between Ma’s desire to support waveform adaptation and the flexibility that the variable Δf provides for subcarrier spacing in the '559 Patent. Ex. 1014 (Bims Decl.), ¶ 233.

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Ma
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	This feature of claim 9 of the '792 Patent is obvious in over claim 6 of the '559 Patent in view of Ma. As explained above in connection with the discussion of claim 8 of the '792 Patent, claim 8 of the '792 patent does not explicitly mention using different selectable subcarrier spacings. However, it would have been obvious to implement Ma's techniques for using variable subcarrier spacings (and symbol durations) to increase the flexibility of the techniques recited in claim 6 of the '559 Patent to address different channel conditions and deployment scenarios. Because claim 6 of the '559 Patent does not recite selectable subcarrier spacings, it also does not explicitly claim that "at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two," as recited in claim 9 of the '792 Patent. This limitation is taught by Ma. Ma teaches selecting a plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two. <i>Supra</i> § VII.C.1. Thus, the '559 Patent in view of Ma renders obvious: • at least one of the plurality of different selectable subcarrier spacings (i.e., Δf) • equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two (i.e., $2 \Delta f$ and $4 \Delta f$ as taught by Ma). Furthermore, a POSITA would have been motivated to combine Ma and the '559 Patent to provide this

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Ma
	limitation of claim 9 of the '792 Patent because both Ma and the '559 Patent are seeking to improve network efficiency and reduce network latency. Ex. 1014 (Bims Decl.), ¶ 235. For example, Ma provides motivation to combine its subcarrier spacing selection process with claim 6 of the '559 Patent in explaining the disadvantages of prior systems and the advantages of the systems discussed in Ma: Due to the fixed sub-carrier spacing and fixed OFDM symbol duration, conventional OFDM schemes may be unable to satisfy the spectrum efficiency and Quality of Service (QoS) requirements of next-generation networks, which will likely need to support much higher mobility, lower latency and overhead, more channel types, more deployment environments, and more transmission schemes . . . rmbodyments of this disclosure provide methods for supporting variable sub-carrier spacing and symbol duration for transmitting OFDM symbols and associated cyclic prefixes. Ex. 1015 (Ma) ¶¶ 23, 24. Thus, a POSITA would have been motivated by to combine the scaling factors for subcarrier spacings of Ma with the modulating claimed in claim 6 of the '559 Patent because Ma teaches that its variable symbol duration (and thus subcarrier spacing) addresses the issues of latency and efficiency of prior systems and produces a system that is more flexible to accommodate changing conditions and deployment scenarios. Ex. 1014 (Bims Decl.), ¶ 235; Ex. 1015 (Ma) ¶¶ 3, 24. At the very least, using a known technique for selecting different subcarrier spacings would have merely combined known elements (e.g., the expressions of claim 6 of the '559 Patent and the instructions for carrying them out) with a known subcarrier spacing that is a power of two (as

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Ma
	in Ma, for example, Figure 4), to achieve predictable results (i.e., selectable subcarrier spacings in an OFDM system). Ex. 1014 (Bims Decl.), ¶ 235. Furthermore, a POSITA would have expected this combination to succeed as selecting one of a variety of options for Δf in claim 6 of the '559 patent would have been within the level of skill of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 19 of the '850 Patent and Ma
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 6 of the '559 Patent recites this limitation of claim 10 of the '792 Patent. Claim 6 of the '559 Patent recites this limitation of claim 10 of the '792 Patent wherein the superposition comprises a time-continuous signal $s_l(t)$ in symbol interval l as a function of time t, expressed by: $s_l(t) = \sum_{k=-\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}}^{\frac{N_{RB}^{UL}N_{SC}^{RB}}{2}-1} a_{k^{(-)},l} e^{j2\pi(k+1/2)\Delta f(t-N_{CP,l}T_s)},$ where . . . $N_{CP,l}$ denotes cyclic prefix length in number of time units T_s for symbol interval l.” Thus, claim 6 of the '559 Patent recites that a cyclic prefix of length T_s is added to superposition signal $s_l(t)$ as shown in the equation representing $s_l(t)$.

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 6 of the '559 Patent in view of Ma. While the charts provide clear reasoning with respect to obviousness, the following analysis provides

additional rationales as to why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Ma.

As explained in the charts above, any differences between claim 6 of the '559 Patent and claims 8, 9, and 10 of the '792 were obvious and plainly within the level of skill of a POSITA. Ex. 1014 (Bims Decl.), ¶ 218.

A POSITA would have found that integrating the instructions stored in memory for signal generation as recited in claim 6 of the '559 Patent into an apparatus for providing flexible channel bandwidth like the one of claim 8 of the '792 Patent would have been a predictable way to implement the “program code responsive to an assignment of spectrum resources for use by a transmitter in an orthogonal frequency division multiplexing network” because (1) claim 19 already indicates that such an implementation is the intended use of its program code and (2) the variable Δf for subcarrier spacing in $s_l(t)$ of claim 6 of the '559 Patent indicates that assignment of spectrum resources is intended to be flexible in the manner recited in claim 8 of the '792 Patent (i.e., by selecting one of a plurality of subcarrier spacings, which impacts signal duration). Ex. 1014 (Bims Decl.), ¶ 219. Indeed, selecting one of a variety of different symbol durations in an OFDM device would have been one of a finite number of solutions to improve spectrum efficiency (the '559 Patent lists a handful of alternatives for improving efficiency, such spectrum sharing, dynamic bandwidth exchange, and smart radio schemes). See Ex. 1003 ('559 Pat.), 1:45-52. Furthermore, a POSITA would have pursued implementing instructions stored in memory for signal generation as recited in claim 6 of the '559 Patent to provide for the selectable subcarrier spacing features of claim 8 of the '792 Patent with a reasonable expectation of success as such an implementation not require any changes to $s_l(t)$ as subcarrier spacing Δf is already a variable and implementation $s_l(t)$ in an apparatus would have been well within the skill of a POSITA. Ex. 1014 (Bims Decl.), ¶ 220.

As explained in the charts above, claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Ma due to teachings, suggestions, and motivations provided by both Ma and the '559 Patent and due to the proposed combinations being the use of known techniques to improve similar devices. Furthermore, the proposed combinations of Ma and claim 6 of the '559 Patent combine prior art elements according to known methods with predictable results. The charts above show that between Ma and claim 6 of the '559 Patent, each element of claims 8, 9, and 10 of the '792 Patent are disclosed.

At the very least, it would have been obvious to a POSITA to try to (1) integrate the computer-readable medium of claim 6 of the '559 Patent into an apparatus that is for providing flexible channel bandwidth in mobile radio communications and that has at least one processor for executing instructions on the computer-readable medium, (2) create a single-carrier signal that provides for one of a plurality of different symbol durations in $s_l(t)$ by (3) selecting one of a plurality of different subcarrier spacings Δf for $s_l(t)$ as recited in claim 6 of the '559 Patent. *Id.* at 70, 71.

Furthermore, a POSITA would have been able to combine Ma and the subject matter of claim 6 of the '559 Patent using known methods (e.g., using Ma's subcarrier spacing selection and scaling factors to choose subcarrier spacings Δf for $s_l(t)$ in claim 6 of the '559 Pat.). Ex. 1014 (Bims Decl.), ¶ 222. And finally, the results of the proposed combinations of Ma and claim 6 of the '559 Patent would have been predictable to a POSITA as being straightforward, simple, and within the skill level of a POSITA. *Id.*

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Ma. Therefore, claim 6 of the '559 Patent in view of Ma presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent that

was not considered during the original examination of the '792 Patent. Therefore, reexamination should be ordered, and the claims should be canceled.

2. *SNQ7: Claims 8, 9, and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Dolle*

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 6 of the '559 Patent in view of Dolle. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over the claims of the '559 Patent (or any claims including the equations expressed in the '559 Patent claims) for obviousness-type double patenting. *Supra* §VII.C. Dolle was not cited during prosecution of the '792 Patent and does not appear on the face of the '729 Patent. Therefore, claim 6 of the '559 Patent in view of Dolle presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 6 of the '559 Patent and explain how claims 8, 9 and 10 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Dolle:

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
[8A] at least one processor; and	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.Claim 6 of the '559 Patent recites “a processor.” Ex. 1003 ('559 Pat.), 52:25. Claim 6 of the '559 Patent thus recites the at least one processor of claim 8 of the '792 Patent.
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8B of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in or rendered obvious by claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Dolle. Dolle discloses an OFDM transmitter that implements variable subcarrier-spacing parameters. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent in view of Dolle renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition) • to produce a superposition signal (i.e., a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols) • that resembles a single-carrier signal (i.e., wherein the superposition comprises a time-continuous signal $s_l(t)$) • and has one of a plurality of different symbol durations (i.e., the superposition signal $s(t)$ has a symbol interval l as a function of time t).

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
	It would have been obvious to a POSITA to combine the “OFDM signal comprising a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbol” of claim 6 of the '559 Patent with Dolle’s teaching of using different subcarrier spacings (and thus different symbol durations) because in Dolle, “a solution is proposed for an OFDM system transmitting a dual frequency band and providing interoperability with a coexisting OFDM system,” such as the coexisting OFDM system of claim 19. Ex. 1005 (Dolle), 5:58-6:2; Ex. 1014 (Bims Decl.), ¶ 259. Dolle also indicates that “[t]he above selection of the ratios n/m is particularly advantageous for the effective implementation of the FFT algorithm generating the OFDM symbols.” Ex. 1005 (Dolle), 6:32-34. Thus, a POSITA would have recognized the advantage of—and would reasonably expected success in—using Dolle’s selection of ratios (i.e., which is selecting one from a variety of subcarrier spacings and results in one of a variety of symbol durations) within the algorithms and techniques of claim 6 of the '559 Patent (including the FFT algorithm). Ex. 1014 (Bims Decl.), ¶ 259.
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim '8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Dolle. Dolle discloses an OFDM transmitter that implements variable subcarrier-spacing parameters. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent, both alone or in combination with Dolle, renders obvious:

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
	• wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l). In view of Dolle's teachings, a POSITA would have found it obvious to include instructions for selecting one of a plurality of selectable subcarrier spacings as recited in claim 8 of the '792 Patent for the variable "Δf" as recited in claim 6 of the '559 Patent for the reasons that follow. Ex. 1014 (Bims Decl.), ¶¶ 261. A POSITA would have been motivated to include instructions for selecting one of a plurality of selectable subcarrier spacings based on the equation found in Dolle because doing so would "[allow] an effective implement[ion] of the baseband block to process the OFDM signals and/or symbols." Ex. 1005 (Dolle), 6:55-56; Ex. 1014 (Bims Decl.), ¶ 261. Thus, the combination of claim 6 of the '559 Patent with the variable "Δf," but without subcarrier-spacing selection criteria, and the subcarrier-spacing selection criteria disclosed in Dolle (i.e., the equation $\Delta F_1 / \Delta F_2 = k * 2^i$) would have been the use of a known technique (Dolle's subcarrier-spacing selection criteria) to improve a similar device (i.e., an apparatus within the scope of claim 6 of the '559 Patent implementing a variable "Δf") in the same way. Ex. 1014 (Bims Decl.), ¶ 262. Additionally, Dolle provides an express motivation to the POSITA to provide for a selectable subcarrier spacing and selecting one of a plurality of selectable subcarrier spacings. <i>Id.</i> A POSITA would have reasonably expected success in combining Dolle's selections of one of a plurality of selectable subcarrier spacings with an implementation covered by claim 6 of the

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Dolle
	'559 Patent because the techniques disclosed in Dolle are “particularly well adapted for [transmissions] according to OFDM techniques” and claim 6 recites use of OFDM techniques including use of a variable parameter for indicating subcarrier spacing. Ex. 1005 (Dolle), 2:40-41; Ex. 1014 (Bims Decl.), ¶ 262.

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Dolle
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	This element of claim 9 of the '792 Patent is obvious over claim 6 of the '559 Patent in view of Dolle. Dolle teaches one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent in view of Dolle renders obvious: • at least one of the plurality of different selectable subcarrier spacings (i.e., 625 kHz) • equals at least one other of the plurality of different selectable subcarrier spacings (i.e., 312.5 kHz) • multiplied by a scaling factor that is a power of two (i.e., 2). Thus, claim 9 of the '792 Patent is obvious over claim 6 of the '559 Patent in view of Dolle. It would have been obvious to a POSITA to combine the “OFDM signal comprising a superposition of the plurality

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Dolle
	of OFDM subcarriers modulated by the plurality of spread symbol” of claim 6 of the '559 Patent with Dolle’s signal that has a number of different symbol durations, at least one of which is multiplied by a scaling factor that it a power of two of another, because Dolle system is “is proposed for an OFDM system transmitting a dual frequency band and providing interoperability with a coexisting OFDM system,” such as the coexisting OFDM system of claim 19. Ex. 1014 (Bims Decl.), ¶ 263. Dolle also indicates that “[t]he above selection of the ratios n/m is particularly advantageous for the effective implementation of the FFT algorithm generating the OFDM symbols.” Ex. 1005 (Dolle), 7:1-10. Thus, a POSITA would recognize the advantage of—and would reasonably expect success in—using Dolle’s subcarrier spacings within the FFT algorithm of claim 6 of the '559 Patent. Ex. 1014 (Bims Decl.), ¶ 264.

Claim 10, '792 Patent	Claim 6 of the '559 and Dolle
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 10 of the '792 Patent is recited in, or rendered obvious by, claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

As explained in the charts above, claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Dolle.

While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Dolle.

As explained in the charts above, any differences between claim 6 of the '559 Patent and claims 8 and 10 of the '792 were obvious and plainly within the level of skill of a POSITA.

Claim 6 of the '559 Patent in view of Dolle merely combines prior art elements according to known methods to yield predictable results. The charts above show that between Dolle and the claim 6 of '559 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have been motivated to combine claim 6 of the '559 Patent with Dolle because it would have used known methods including implementing signal processing of claim 6 of the '559 Patent in the transceiver using the processor of Dolle and using the alternative subcarrier spacing selection of Dolle to choose subcarrier spacings Δf for $s_l(t)$ in claim 6 of the '559 Patent. Ex. 1014 (Bims Decl.), ¶ 151. This would have provided the benefits observed by Dolle including providing for a dual band transmission that is “well adapted for a transmission according to OFDM techniques.” Ex. 1005 (Dolle), 2:34-44. The results of the proposed combinations of Dolle and claim 6 of the '559 Patent would have been predictable to a POSITA because selecting different subcarrier spacings and using a processor to execute instructions was a common technique that had been known to those of ordinary skill in the art with predictable consequences. Ex. 1014 (Bims Decl.), ¶ 151

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Dolle. Therefore, claim 6 of the '559 Patent in view of Dolle presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered and the Challenged Claims should be canceled.

3. *SNQ8: Claims 8, 9, and 10 are unpatentable over claim 6 of the '559 Patent in view of Lucent*

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 6 of the '559 Patent alone or in view of Lucent. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '559 Patent (or any claims including the equations expressed in the '559 Patent claims) for obviousness-type double patenting. *Supra* § VII.D. Lucent was not cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 6 of the '559 Patent in view of Lucent presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 6 of the '559 Patent and explains how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Lucent.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8A] at least one processor; and	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
	Claim 6 of the '559 Patent recites “ <i>a processor.</i> ” Ex. 1003 ('559 Pat.), 52:25. Claim 6 of the '559 Patent thus recites the at least one processor of claim 8 of the '792 Patent.
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Lucent. Lucent teaches an OFDM signal that has one of a plurality of different symbol durations. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent in view of Lucent renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition) • to produce a superposition signal (i.e., a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols) • that resembles a single-carrier signal (i.e., wherein the superposition comprises a time-continuous signal $s_l(t)$) • and has one of a plurality of different symbol durations (i.e., the superposition signal $s(t)$ has a symbol interval l as a function of time t).

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
	Lucent focuses on the need for a plurality of symbol durations by stating that, “assuming the nominal UE speed is less than 120 km/hr, we can choose the OFDM symbol duration up to 805.5 usec as long as it does not violate the coherence bandwidth dictated by Table 2.” Ex. 1006 (Lucent), p.1. Lucent recommends “(1) [t]o allow shorter symbol durations when the multipath is less severe, this would result in wider subcarrier spacing which would make the system more immune to frequency offset [or] (2) [t]o use shorter symbol duration which makes the system less susceptible to high Doppler and hence reduces the ICI.” <i>Id.</i>, p.5. In view of Lucent’s teachings, a POSITA would have found it obvious to include instructions for modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations as recited in claim 6 of the '559 Patent for the reasons that follow. Lucent describes a plurality of symbol durations and focuses on the impact of different symbol durations. Ex. 1014 (Bims Decl.), ¶ 275. A POSITA would have been motivated to include instructions for selecting one of a plurality of symbol durations based on Lucent to accommodate “for different channel conditions,” and allow for “shorter symbol durations when multi-path is less severe,” thus permitting wider-subcarrier spacings to “make the system more immune to frequency offset.” Ex. 1006 (Lucent), p.5; Ex. 1014 (Bims Decl.), ¶ 275. Thus, Lucent provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '792 Patent to provide for one of a plurality of different symbol duration. Ex. 1014 (Bims Decl.), ¶ 276. A POSITA would have reasonably expected success in combining Lucent’s plurality of different symbol durations with claim 6 of the '559 Patent because Lucent was intended for use in

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
	connection with multi-carrier OFDM systems, such as the apparatus recited in claim 6 of the '559 Patent. <i>Id.</i> Moreover, providing for one of a plurality of symbol durations would have been simple to implement in the context of the subject matter recited in claim 6 of the '559 Patent. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim '8 of the '792 Patent is obvious over claim 6 of the '559 Patent in view of Lucent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Lucent. Lucent teaches an OFDM signal that has one of a plurality of different selectable sub-carrier spacings. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent, whether alone or in combination with Lucent, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l). Lucent focuses on the need for a plurality of subcarrier spacings by stating that, “[i]n order to design [a] OFDM system properly, . . . the sub-carrier spacing should be less than the coherence bandwidth.” Ex. 1006 (Lucent), p.1. Lucent further explains that “[t]he sub-carrier spacing should be large enough to provide robustness against

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
	frequency offset and phase noise, but it also has to be small enough such that each sub-carrier experiences flat fading. Normally, the tone (or sub-carrier) spacing can be selected by first fixing a maximum delay spread from all possible channel conditions, calculating the coherence bandwidth and then using it as an upper bound for the sub-carrier spacing.” Ex. 1006 (Lucent), p.2. Lucent further explains that “[t]he smaller the number of sub-carriers is, the wider the subcarrier spacing becomes which leads to robustness against frequency offset and phase noise.” <i>Id.</i>, p.3. Lucent recommends having “a baseline system with multiple configurations suitable for different channel conditions,” and this includes allowing “shorter symbol durations when the multipath is less severe, this would result in wider sub-carrier spacing which would make the system more immune to frequency offset.” <i>Id.</i>, p.5. In view of Lucent’s teachings, a POSITA would have found it obvious to include instructions for selecting one of a plurality of selectable subcarrier spacings as recited in claim 6 of the '559 Patent for the reasons that follow. Lucent describes a plurality of selectable subcarrier frequency spacing configurations and focuses on subcarrier spacings as a key selection criteria. Ex. 1014 (Bims Decl.), ¶ 278. A POSITA would have been motivated to include instructions for selecting one of a plurality of selectable subcarrier spacings based on Lucent because selection of a subcarrier spacing from a plurality of selectable subcarrier spacings would have permitted adjustments to be made to the resulting communications to accommodate “for different channel conditions,” and allow for “shorter symbol durations when multi-path is less severe,” thus permitting wider-subcarrier spacings to “make the system more immune to frequency offset.” Ex. 1006 (Lucent), p.5; Ex. 1014 (Bims Decl.), ¶ 278.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Lucent
	Thus, Lucent provides an express motivation to the POSITA to modify the subject matter recited in claim 19 of the '792 Patent to provide for instructions for selecting one of a plurality of selectable subcarrier spacings. Ex. 1014 (Bims Decl.), ¶ 279. A POSITA would have reasonably expected success in combining Lucent's selectable subcarrier spacings with claim 6 of the '559 Patent because Lucent was intended for use in connection with multi-carrier OFDM systems, such as the apparatus recited in claim 6 of the '559 Patent. <i>Id.</i> Moreover, instructions for selecting one from a plurality of selectable subcarrier spacings would have been simple to implement in the context of the subject matter recited in claim 6 of the '559 Patent, which already recites the subcarrier frequency spacing as a variable "Δf." <i>Id.</i>

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Lucent
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Claim 9 of the '792 Patent is obvious over claim 6 of the '559 patent in view of Lucent. Lucent teaches different OFDM configurations wherein at least one of the plurality of different selectable subcarrier spacings. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent in view of Lucent renders obvious: • at least one of the plurality of different selectable subcarrier spacings (i.e., 625 kHz) • equals at least one other of the plurality of different selectable subcarrier spacings (i.e., 312.5 kHz) • multiplied by a scaling factor that is a power of two (i.e., 2).

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Lucent
	It would have been obvious to implement the subcarrier configurations of Lucent for use as the subcarrier spacings in claim 6 of the '559 Patent into the proposed system of Lucent because it would be use of a known technique (i.e., configuring a subcarrier spacing as a factor of two of another subcarrier spacing) to improve similar devices (i.e., the apparatus of the '559 Patent and the baseline system of Lucent) in the same way. Ex. 1014 (Bims Decl.), ¶ 281. There would be a reasonable expectation that this combination would succeed because of the similarity of how both references deal with subcarrier spacings and because combining the proposed system of Lucent with the computer-readable medium of claim 6 of the '559 Patent would have been within the level of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 6 of the '559 Patent and Lucent
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 6 of the '559 Patent recites this limitation of claim 10 of the '792 Patent. <i>Supra</i> § VII.D.1.

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 6 of the '559 Patent in view of Lucent. While the charts provide clear reasoning with respect to obviousness, the following provides

additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Lucent.

As explained in the charts above, any differences between claim 6 of the '559 Patent and claims 8, 9, and 10 of the '792 were obvious and plainly within the level of skill of a POSITA.

A POSITA would have found that integrating the instructions stored in memory for signal generation as recited in claim 6 of the '559 Patent into an apparatus for providing flexible channel schemes for handling different deployment scenarios and use cases as described in Lucent would have merely used known techniques for their intended purposes to achieve only predictable results. The charts above show that between Lucent and claim 6 of the '559 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have found it obvious to combine claim 6 of the '559 Patent and Lucent because doing so would have had beneficial results including increased system flexibility and would have merely used known methods (e.g., implementing signal processing of claim 6 of the '559 Patent in the system of Lucent and/or using the subcarrier spacing selection based on channel characteristics of Lucent to choose subcarrier spacings Δf for $s_l(t)$ in claim 19) to achieve these results. Ex. 1014 (Bims Decl.), ¶ 266. The results of the proposed combination of Lucent and claim 6 of the '559 Patent would have been predictable to a POSITA because it was merely a combination of known, predictable techniques and doing so was within the skill level of a POSITA. *Id.*

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent are unpatentable as being obvious over claim 6 of the '559 Patent in view of Lucent. Therefore, claim 6 of the '559 Patent in view of Lucent presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered and the claims should be canceled.

4. *SNQ9: Claims 8, 9, and 10 are unpatentable over claim 6 of the '559 Patent in view of Doufexi*

As explained below, claims 8, 9, and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 6 of the '559 Patent alone or in view of Doufexi. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '559 Patent (or any claims including the equations expressed in the '559 Patent claims) for obviousness-type double patenting. *Supra* § VII.D. Doufexi was not cited during prosecution of the '792 Patent and it does not appear on the face of the '792 Patent. Therefore, claim 6 of the '559 Patent in view of Doufexi presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent is unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8, 9, and 10 of the '792 Patent and claim 6 of the '559 Patent and explains how claims 8, 9, and 10 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Doufexi.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8A] at least one processor; and	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
	Claim 6 of the '559 Patent recites “ <i>a processor.</i> ” Ex. 1003 ('559 Pat.), 52:25. Claim 6 of the '559 Patent thus recites the at least one processor of claim 8 of the '792 Patent.
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
[8E] modulating the encoded data symbols onto the OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Doufexi. Doufexi teaches an OFDM signal that has one of a plurality of different symbol durations. <i>Supra</i> § VII.C.5. Thus, claim 6 of the '559 Patent in view of Doufexi renders obvious: • modulating the encoded data symbols (i.e., $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l) • onto the OFDM subcarriers (i.e., N_{sc}^{RB} denotes a number of OFDM subcarriers per unit of transmission bandwidth such that $N_{RB}^{UL} N_{sc}^{RB}$ equals a total number of the OFDM subcarriers in the superposition) • to produce a superposition signal (i.e., a superposition of the plurality of OFDM subcarriers modulated by the plurality of spread symbols) • that resembles a single-carrier signal (i.e., wherein the superposition comprises a time-continuous signal $s_l(t)$) • and has one of a plurality of different symbol durations (i.e., the superposition signal $s(t)$ has a symbol interval l as a function of time t).

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
	In view of Doufexi's teachings, a POSITA would have found it obvious to produce a superposition signal with one of a plurality of durations for the reasons that follow. Doufexi describes a plurality of symbol duration configurations and focuses on symbol duration as a key OFDM parameter. Ex. 1014 (Bims Decl.), ¶ 292. A POSITA would have been motivated to produce a superposition signal with one of a plurality of symbol durations based on Doufexi because such selection would enable the OFDM apparatus recited in claim 6 of the '559 Patent to operate effectively across a wide range of environments, and Doufexi indicates that a fixed set of OFDM parameters would not achieve high performance in all cases. Doufexi, p.1; Ex. 1014 (Bims Decl.), ¶ 293. Thus, Doufexi provides an express motivation to the POSITA to modify the subject matter recited in claim 5 of the '559 Patent to produce a superposition signal with one of a plurality of symbol durations. Ex. 1014 (Bims Decl.), ¶ 293. A POSITA would have recognized that applying Doufexi's teaching various symbol durations to the system of claim 5 of the '559 would have predictably enhanced adaptability and performance across different deployment environments, thus yielding an improved system. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim '8 of the '792 Patent is obvious over claim 6 of the '559 Patent in view of Doufexi. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Doufexi. Doufexi teaches an OFDM signal that has one of a plurality

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
	of different selectable sub-carrier spacings. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent, whether alone or in combination with Doufexi, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing) • to provide for the one of the plurality of different symbol durations (i.e., in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l). In view of Doufexi's teachings, a POSITA would have found it obvious to include instructions for selecting one of a plurality of selectable subcarrier spacings as recited in claim 6 of the '559 Patent for the reasons that follow. Doufexi describes a plurality of selectable subcarrier frequency spacing configurations and focuses on subcarrier spacings as a key dynamically adaptable OFDM parameter. Ex. 1014 (Bims Decl.), ¶ 296. A POSITA would have been motivated to include instructions for selecting one of a plurality of selectable subcarrier spacings based on Doufexi because such selection would enable the OFDM apparatus recited in claim 6 of the '559 Patent to operate effectively across a wide range of environments, and Doufexi indicates that a fixed set of OFDM parameters would not achieve high performance in all cases. Doufexi, p.1; Ex. 1014 (Bims Decl.), ¶ 296. Thus, Doufexi provides an express motivation to the POSITA to modify the subject matter recited in claim 6 of the '559 Patent to provide for instructions for selecting one of a plurality of selectable subcarrier spacings. Ex. 1014 (Bims Decl.), ¶ 297. A POSITA would have recognized that

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Doufexi
	applying Doufexi's teaching of selectable subcarrier spacings to the system of claim 6 of the '559 Patent would have predictably enhanced adaptability and performance across different deployment environments, thus yielding an improved system. <i>Id.</i>

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Doufexi
[9] The apparatus of claim 8, wherein at least one of the plurality of different selectable subcarrier spacings equals at least one other of the plurality of different selectable subcarrier spacings multiplied by a scaling factor that is a power of two.	Claim 9 of the '792 Patent is obvious over claim 6 of the '559 patent in view of Lucent. Doufexi teaches different OFDM configurations wherein at least one of the plurality of different selectable subcarrier spacings. <i>Supra</i> § VII.C.5. Thus, claim 6 of the '559 Patent in view of Lucent renders obvious: • at least one of the plurality of different selectable subcarrier spacings (i.e., 16 kHz) • equals at least one other of the plurality of different selectable subcarrier spacings (i.e., 8 kHz) • multiplied by a scaling factor that is a power of two (i.e., 2). It would have been obvious to implement the subcarrier configurations of Lucent for use as the subcarrier spacings in claim 6 of the '559 Patent into the proposed system of Lucent because it would be use of a known technique (i.e., configuring a subcarrier spacing as a factor of two of another subcarrier spacing) to improve similar devices (i.e., the apparatus of the '559 Patent and the baseline system of Lucent)

Claim 9, '792 Patent	Claim 6 of the '559 Patent and Doufexi
	in the same way. Ex. 1014 (Bims Decl.), ¶ 299. There would be a reasonable expectation that this combination would succeed because of the similarity of how both references deal with subcarrier spacings and because combining the proposed system of Lucent with the computer-readable medium of claim 6 of the '559 Patent would have been within the level of a POSITA. <i>Id.</i>

Claim 10, '792 Patent	Claim 6 of the '559 Patent and Lucent
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 6 of the '559 Patent recites this limitation of claim 10 of the '792 Patent. <i>Supra</i> § VII.D.1.

As shown in the charts above, claims 8, 9, and 10 of the '792 Patent are rendered obvious over claim 6 of the '559 Patent in view of Doufexi. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8, 9, and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Doufexi.

As explained in the charts above, any differences between claim 6 of the '559 Patent and claims 8 and 10 of the '792 were obvious and plainly within the level of

skill of a POSITA.

The combination of claim 6 of the '559 Patent and Doufexi merely would have used known techniques to improve similar devices. Furthermore, the proposed combinations of Doufexi and the claim 6 of the '559 Patent combine prior art elements according to known methods with predictable results. The charts above show that between Doufexi and claim 6 of the '559 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would have been motivated to combine claim 6 of the '559 Patent with Doufexi because (1) claim 6 of the '559 Patent suggests that it is to be used in an OFDM transmission system, (2) Doufexi discloses an OFDM transmission system that was useful for 4G communications, and (3) Doufexi explains that providing variable parameters including symbol duration and subcarrier spacing will allow for a more useful OFDM communication system that can address more use cases. Thus, the combination of claim 6 of the '559 Patent would merely have used known methods (e.g., implementing signal processing of claim 6 of the '559 Patent in the OFDM system of Doufexi and/or using the subcarrier spacing selection based on OFDM Parameters of Doufexi to choose subcarrier spacings Δf for $s_l(t)$ in claim 6 of the '559 Patent) to achieve predictable results. Ex. 1014 (Bims Decl.), ¶ 284. And finally, the results of the proposed combination of Doufexi and claim 6 of the '559 Patent would have been predictable to a POSITA because the impact of changing subcarrier spacing and symbol duration were known and doing so was within the skill level of a POSITA. *Id.*

Based on the foregoing, the subject matter of claims 8, 9, and 10 of the '792 Patent is unpatentable as being obvious over claim 6 of the '559 Patent in view of Doufexi. Therefore, claim 6 of the '559 Patent in view of Doufexi presents a SNQ as to the patentability of claims 8, 9, and 10 of the '792 Patent. Reexamination should be ordered, and the claims should be canceled.

5. *SNQ10: Claims 8 and 10 are unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Kaiser*

As explained below, claims 8 and 10 of the '792 Patent are unpatentable based on obviousness-type double patenting over claim 6 of the '559 Patent alone or in view of Kaiser. As set forth above, the prosecution history does not show that the Office considered rejecting the claims of the '792 Patent over those of the '559 Patent (or any claims including the equations expressed in the '559 Patent claims) for obviousness-type double patenting. *Supra* § VII.D. Kaiser was not cited during prosecution of the '792 Patent and does not appear on the face of the '792 Patent. Therefore, claim 6 of the '559 Patent in view of Kaiser presents a SNQ as to whether claims 8, 9, and 10 of the '792 Patent are unpatentable for obviousness-type double patenting.

This SNQ applies regardless of the effective filing date of these claims.

The following claim charts shows a comparison between claims 8 and 10 of the '792 Patent and claim 6 of the '559 Patent and explain how claims 8 and 10 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Kaiser:

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Kaiser
[8PRE] An apparatus for providing flexible channel bandwidth in mobile radio communications, comprising:	To the extent that the preamble is a limitation of claim 8 of the '792 Patent, it is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8A] at least one processor; and	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Kaiser
[8B] at least one non-transitory computer-readable memory in electronic communication with the at least one processor, and instructions stored in the at least one memory, the instructions executable by the at least one processor for:	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8C] provisioning a set of Orthogonal Frequency Division Multiplexing (OFDM) subcarriers for mobile radio communications;	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8D] encoding data symbols with polyphase codes derived from a discrete Fourier transform to produce encoded data symbols; and	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.
[8E] modulating the encoded data symbols onto the	This limitation of claim 8 of the '792 Patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1.

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Kaiser
OFDM subcarriers to produce a superposition signal that resembles a single-carrier signal and has one of a plurality of different symbol durations;	To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious a superposition signal with one of a plurality of different symbol durations, this limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Kaiser. Kaiser teaches a plurality of different symbol durations. <i>Supra</i> § VII.C.1. It would have been obvious to a POSITA to use produce a superposition signal of claim 6 of the '559 patent that has one of the plurality of symbol durations from Kaiser because doing so is a use of a known technique (i.e., creating a signal with one a plurality of symbol durations) to improve a similar system (i.e., a mobile communication system such as a transmitter). Ex. 1014 (Bims Decl.), ¶ 247. Kaiser teaches that “[t]he generation of an MC spread spectrum signal is illustrated in Fig. 3.6 and is application on the transmitter side in both the up- and down-link.” Ex. 1004 (Kaiser), p.39. Similarly, claim 6 of the '559 Patent is directed to code “responsive to an assignment of spectrum resources for use by a transmitter”, and both references discuss using transmitters in similar ways for mobile communications. Ex. 1014 (Bims Decl.), ¶ 247. Thus, a POSITA would have found it obvious to apply the symbol duration selection of Kaiser to the transmitter of claim 6 of the '559 Patent and the resulting combination would have yielded only predictable results. <i>Id.</i>
[8F] wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings, to provide for the one of the plurality of different symbol durations.	This limitation of claim 8 of the '792 patent is recited in claim 6 of the '559 Patent. <i>Supra</i> § VII.D.1. To the extent that claim 6 of the '559 Patent does not, by itself, claim or render obvious selecting one of a plurality of different selectable subcarrier spacings, this claim limitation of claim 8 of the '792 Patent would have been obvious over claim 6 of the '559 Patent in view of Kaiser. Kaiser teaches selecting one of a plurality of different

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Kaiser
	selectable subcarrier spacings. <i>Supra</i> § VII.C.1. Kaiser also discusses selection of subcarrier spacing by teaching that subcarrier spacing should be chosen based on other channel characteristics. <i>Supra</i> § VII.C.1. Thus, claim 6 of the '559 Patent, whether alone or in combination with Kaiser, renders obvious: • wherein provisioning comprises selecting one of a plurality of different selectable subcarrier spacings (i.e., <i>in calculating $s_l(t)$ Δf denotes subcarrier frequency spacing</i>) • to provide for the one of the plurality of different symbol durations (i.e., <i>in calculating $s_l(t)$ $a_{k,l}$ is a value modulated onto a k^{th} subcarrier in symbol period l</i>). It would have been obvious to a POSITA to use the subcarrier spacing selection process discussed in Kaiser to select the subcarrier spacing for the variable Δf in claim 6 of the '559 Patent because doing so would have used a known technique (i.e., subcarrier spacing selection) to improve a similar system (i.e., the transmitters in claim 6 of the '559 Patent and in Kaiser). Ex. 1014 (Bims Decl.), ¶ 238. In Kaiser, “The assigned MC-CDMA transmitter . . . is introduced in Fig. 3.8 to distinguish the M simultaneously transmitted data symbols” where “the tighter subcarrier spacing enables one to guarantee flat fading per subchannel in propagation scenarios with decreased coherence bandwidth.” Ex. 1004 (Kaiser), 42. This transmitter in Kaiser, for which tighter subcarrier spacings are selected, is related to the transmitter that uses the assignment of spectrum resources in claim 6 of the '559 Patent (i.e., claim 19 recites code “responsive to an assignment of spectrum resources for use <i>by a transmitter</i>”). This assignment of spectrum resources, such as carrier frequencies, would involve selecting particular spacings to maintain

Claim 8, '792 Patent	Claim 6 of the '559 Patent and Kaiser
	orthogonality as “the carriers are independent (i.e., orthogonal) if the carrier spacings is a multiple of $1/T$.” Ex. 1036 (Van Nee), p.22; 1014 (Bims Decl.), ¶ 249. Thus, a POSITA would have applied the subcarrier spacing selection of Kaiser to the transmitter of claim 6 of the '559 Patent with predictable results. Ex. 1014 (Bims Decl.), ¶ 249.

Claim 10, '792 Patent	Claim 6 of the '559 Patent and Kaiser
[10] The apparatus of claim 8, further comprising instructions stored in the at least one non-transitory computer-readable memory, the instructions executable by the at least one processor for adding a cyclic prefix to the superposition signal.	Claim 6 of the '559 Patent recites or renders obvious claim 10 of the '792 Patent. <i>Supra</i> § VII.D.1.

As shown in the charts above, claims 8 and 10 of the '792 Patent would have been obvious to a POSITA over claim 19 of the '559 Patent in view of Kaiser. While the charts provide clear reasoning with respect to obviousness, the following provides additional rationales for why claims 8 and 10 of the '792 Patent would have been obvious to a POSITA over claim 6 of the '559 Patent in view of Kaiser.

The combination of claim 6 of the '559 Patent with Kaiser reflects the use of known techniques according to known methods to achieve predictable results. The charts above show that between Kaiser and claim 6 of the '559 Patent, each element of claims 8 and 10 of the '792 Patent are disclosed. Furthermore, a POSITA would

have been motivated to combine Kaiser and claim 6 of the '559 Patent because doing so would have merely used known signal processing techniques as recited in claim 6 of the '559 Patent with other known techniques for selecting certain parameters (e.g., the variable for subcarrier spacing) and implementing instructions using known methods (e.g., using a processor to execute instructions stored in memory to perform things like spreading and modulation). Ex. 1014 (Bims Decl.), ¶ 239. And finally, the results of the proposed combinations of Kaiser and claim 6 of the '559 Patent would have been predictable to a POSITA because the techniques are straightforward implementations of the principles state in the prior art and are within the skill level of a POSITA. *Id.*

Based on the foregoing, the subject matter of claims 8 and 10 of the '792 Patent is unpatentable for obviousness-type double patenting over claim 6 of the '559 Patent in view of Kaiser. Therefore, claim 6 of the '559 Patent in view of Kaiser presents a SNQ as to the patentability of claims 8 and 10 of the '792 Patent, reexamination should be ordered, and the claims should be canceled.

IX. SECONDARY CONSIDERATIONS DO NOT WARRANT A CONCLUSION OF PATENTABILITY

Secondary considerations do not demonstrate nonobviousness. During a re-examination proceeding (90/019,411, the "'411 EPR") regarding U.S. Patent No. 10,200,227, Patent Owner argued that the '227 Patent claims are non-obvious because of alleged (1) commercial success, (2) long felt but unsolved need, and (3) failure of others. Ex. 1032 (Genghis Reply Br.), ¶¶ 42-47; Ex. 1033 (Shattil Decl.), ¶¶ 10-33. The patentee's secondary indicia arguments did not withstand scrutiny during that re-examination proceeding. Ex. 1034 ('411 Final OA), pp.10-12. Secondary considerations cannot withstand scrutiny in this proceeding either.

First, even if the alleged secondary considerations were relevant to nonobviousness of the claims of the '227 Patent over the prior art at issue in the '411 EPR, the claims of the double patenting reference patent(s) at issue in this proceeding provide the same benefits by, for example, employing DFT spreading and modulation to produce a single carrier OFDM signal. Second, as found in the '411 EPR, the alleged evidence of secondary considerations does not have sufficient nexus to the claimed subject matter. Third, Requesters are unaware of evidence that objective indicia demonstrate that any difference between the subject matter of the obviousness-type double patenting reference claims and the Challenged Claims would have been nonobvious.

X. CONCLUSION

Reexamination and cancellation of claims 8, 9, and 10 of the '792 Patent is respectfully requested. The Commissioner is hereby authorized to charge Deposit Account 502638 under Docket No. 085697.027600 the *Ex Parte* Reexamination fee of \$13,545 under 37 C.F.R. § 1.20(c)(1). Requesters believe no other fee is due with this submission, however, the Commissioner is hereby authorized to charge any fee deficiency or credit any over-payment to Deposit Account 502638.

Please direct all correspondence in this matter to the undersigned.

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Respectfully submitted,

By: /Andrew R. Sommer/

Andrew R. Sommer

Reg. No. 53,932

GREENBERG TRAURIG, LLP

1750 Tysons Boulevard

McLean, VA 22102

Tel: (703) 749-1370

Bryan K. Hanks

Reg. No. 52,991

GREENBERG TRAURIG, LLP

2375 E Camelback Rd, Suite 800

Phoenix, AZ 85016

Tel: (801) 478-6941

Jared K. Lee

Reg. No. 72,786

GREENBERG TRAURIG, LLP

222 S Main St., Suite 1730

Salt Lake City, UT 84101

Tel: (801) 478-6948

Counsel for Requesters