

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

EMPIRE TECHNOLOGY DEVELOPMENT
LLC,

Plaintiff,

v.

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

Defendants.

Civil Action No. 2:23-cv-00427-JRG

JURY TRIAL DEMANDED

**DEFENDANTS' PATENT LOCAL RULE 3-3
DISCLOSURE OF INVALIDITY CONTENTIONS
AND SUBJECT MATTER ELIGIBILITY CONTENTIONS**

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I. Introduction

Defendants Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., (collectively, “Defendants” or “Samsung”) make the following Patent Local Rule 3-3 Disclosure of Invalidity Contentions to Plaintiff Empire Technology Development LLC (“Plaintiff” or “Empire”) for Case No. 2:23-cv-00427-JRG.

Plaintiff has asserted U.S. Patent Nos. 8,798,120 (“the ’120 Patent”) and 8,565,331 (“the ’331 Patent”) (collectively, “the Asserted Patents” or “the Patents-in-Suit”) against Defendants. Complaint (E.D. Tex. 2:23-cv-00427, Dkt. 1). In Plaintiff’s Patent Local Rule 3-1 and 3-2 Disclosures (“Infringement Contentions”), served on January 4, 2024, Plaintiff has asserted the following claims against Defendants:

- Claims 25 and 29 of the ’120 Patent
- Claims 1, 5, 6, and 8 of the ’331 Patent

Defendants’ Invalidity Contentions address only those claims asserted in Plaintiff’s Infringement Contentions. Defendants submit these Invalidity Contentions without waiving any argument about the sufficiency or substance of Plaintiff’s Infringement Contentions.

Based on its investigation to date, Defendants hereby: (a) identify each item of prior art that anticipates each asserted claim or renders it obvious; (b) specify whether each such item of prior art anticipates each asserted claim and/or renders it obvious and, if a combination of items of prior art makes a claim obvious, identify each such combination and the motivation to combine such items; (c) submit a chart identifying where specifically in each item of prior art each element of each asserted claim is found, including for each element that is governed by 35 U.S.C. § 112 ¶ 6, the identity of the structure(s), act(s), or material(s) in each item of prior art that performs the claimed function; and (d) identify any grounds of invalidity of the asserted claims based on

indefiniteness under 35 U.S.C. § 112 ¶ 2 or enablement or written description under 35 U.S.C. § 112 ¶ 1.

In addition, pursuant to Patent Local Rule 3-4, and based on its investigation to date, Defendants have produced or are producing documents concurrently with these Invalidity Contentions.

II. Reservations

Defendants reserve the right to amend these Invalidity Contentions. The information and documents that Defendants produce are based on information available to date and are subject to further revision.

The information and documents that Defendants produce are based on Defendants' present understanding of Plaintiff's infringement theories as advanced by Plaintiff in its Infringement Contentions. Plaintiff's Infringement Contentions are deficient in numerous respects. For example, Plaintiff has failed to identify specifically where each element of each asserted claim is found within each accused instrumentality. Defendants have provided notice to Plaintiff of the deficiencies in its Infringement Contentions, including in multiple letters to Plaintiff sent January 19, 2024 and February 29, 2024. Plaintiff has failed to cure the deficiencies and has not undertaken reasonable efforts to put Defendants on notice of its theories of infringement. If Plaintiff attempts or is permitted to cure such deficiencies, amends its contentions, or provides additional information regarding its infringement theories, doing so may lead to further grounds for invalidity, and thus Defendants specifically reserve the right to amend or supplement its Invalidity Contentions.

Further, because discovery (including third party discovery) is at an early stage, Defendants reserve the right to amend or supplement these Invalidity Contentions. For example, Defendants have served subpoenas on multiple third parties (including Qualcomm Corp., Texas

Instruments, Inc., Intel Corp., Marvell Technology, Inc., MediaTek USA Inc., Broadcom Corp.) believed to have knowledge, documentation, and/or corroborating evidence relating to invalidity and/or prior art. Defendants also served a subpoena on the University of Texas at Austin, the prior assignee of the Asserted Patents. It is, therefore, likely that Defendants will discover additional prior art or additional information relating to known prior art, and Defendants reserve the right to supplement these contentions after becoming aware of additional prior art or information. Defendants further reserve the right to introduce and use such supplemental materials at trial.

Defendants' claim charts in Exhibits A-B cite particular teachings and disclosures of the prior art as applied to limitations of the asserted claims. However, persons having ordinary skill in the art may view an item of prior art generally in the context of other publications, literature, products, and understanding. Accordingly, the cited portions are only exemplary, and Defendants reserve the right to rely on uncited portions of the prior art references and on other publications and expert testimony as aids in understanding and interpreting the cited portions, as providing context thereto, and as additional evidence that a claim limitation is known or disclosed. Defendants reserve the right to establish what was known to a person having ordinary skill in the art through other publications, products, and/or testimony. Defendants also reserve the right to rely on uncited portions of the prior art references, other publications, and testimony to establish that a person of skill in the art would have been motivated to combine certain of the cited references so as to render the claims obvious. Citations to figures are inclusive of all discussion of those figures.

Defendants further reserve the right to argue that the asserted claims are invalid under 35 U.S.C. § 102(f) if discovery reveals that the named inventor of the Asserted Patents did not invent

the subject matter recited in the asserted claims. If Defendants assert invalidity under Section 102(f), Defendants will provide the name of the person(s) from whom, and the circumstances under which, the invention or any part of it was derived.

Defendants further intend to rely on inventor admissions concerning the scope of the asserted claims or of the prior art relevant to the asserted claims found in, *inter alia*, the patent prosecution history and/or reexamination history for the Asserted Patents and related patents and/or patent applications; any deposition testimony of a named inventor of the Asserted Patents; and the papers filed and any evidence submitted by Plaintiff in conjunction with this litigation. Defendants reserve the right to contend that the asserted claims are invalid for failure to name the correct inventor(s), and/or to contend that Plaintiff lacks standing to bring this litigation with respect to such patents.

Furthermore, nothing stated herein shall be treated as an admission or suggestion that Defendants agree with Plaintiff regarding the scope of any asserted claim or the claim constructions in its Infringement Contentions. To the extent that Defendants' Invalidity Contentions reflect claim constructions consistent with or suggested by Plaintiff's Infringement Contentions, no inference is intended nor should any be drawn that Defendants agree with Plaintiff's claim constructions. By applying any of Plaintiff's apparent claim constructions and interpretations, Defendants do not concede in any way that those constructions and interpretations are correct, but rather assert the fundamental principle that whatever infringes a claim if later in time anticipates if earlier in time. Defendants expressly reserve the right to propose alternative constructions to those that have been or may be advocated by Plaintiff.

Nor shall anything in these Invalidity Contentions be treated as an admission that Defendants' accused products meet any limitation of any asserted claim. Defendants deny that

it infringes any claim of the Asserted Patents. To the extent that any prior art contains a claim element that is the same as or similar to an accused product, inclusion of that prior art in Defendants' Invalidity Contentions shall not be deemed a waiver by Defendants of any claim construction or non-infringement position. Defendants expressly reserve the right to contest any claim construction asserted by Plaintiff and expressly reserve all non-infringement arguments.

In its Infringement Contentions, Plaintiff contends that the asserted claims of the Asserted Patents are entitled to the following priority and conception dates:¹

- The '120 Patent:
 - Claimed priority date: March 18, 2009
 - Claimed conception date: October 1, 2007
- The '331 Patent:
 - Claimed priority date: August 20, 2010
 - Claimed conception date: July 1, 2008

Defendants reserve the right to challenge Plaintiff's alleged priority dates or any alleged dates of conception or reduction to practice. Defendants further reserve the right to seek discovery regarding conception and reduction to practice, as appropriate, and to demonstrate earlier invention by other parties under 35 U.S.C. § 102(g), public use and/or the on-sale bar under 35 U.S.C. § 102(b), and/or applicants' failure to comply with 35 U.S.C. § 112. In addition, Defendants rely on Plaintiff's alleged priority dates in forming these Invalidity Contentions, and to the extent Plaintiff later argues, or it is determined that, any different priority date applies, Defendants reserve the right to amend these contentions accordingly.

¹ Plaintiff incorrectly refers to the claimed conception dates as the alleged "priority dates."

III. U.S. Patent No. 8,798,120 (“the ’120 Patent”)

A. Identification of Prior Art

In addition to the prior art cited on the face of the ’120 Patent and related patents, the admitted prior art in the specifications of the ’120 Patent and related patents, the prior art cited in any file histories, reexaminations, *inter partes* review proceedings, reissue proceedings, or other examination or post-grant proceedings of the ’120 Patent and related patents, and the prior art cited in any invalidity contentions or expert reports submitted in any action or proceedings involving the ’120 Patent or related patents, Defendants identify the following prior art that anticipates each asserted claim or renders it obvious.

1. Prior Art Patents

The following patents and patent publications are prior art to the asserted claims under at least pre-AIA 35 U.S.C. §§ 102(a), (b), (e), and/or (g) and/or pre-AIA 35 U.S.C. § 103. The identification of any patent or patent publication shall be deemed to include any counterpart patent or application filed, published, or issued anywhere in the world.

Patent or Publication Number	Country of Origin	Filing Date	Date of Issue or Publication
U.S. Pat. App. Pub. No. 2005/0289367 (“Clark”)	United States	June 29, 2004	December 29, 2005
U.S. Pat. App. Pub. No. 2009/0034639 (“Hwang”)	United States	July 31, 2008	February 5, 2009
U.S. Pat. App. Pub. No. 2007/0049239 (“Joung”)	United States	August 9, 2006	March 1, 2007
U.S. Patent No. 8,315,346 (“Kim”)	United States	March 16, 2007	November 20, 2012
U.S. Pat. App. Pub. No. 2006/0067263 (“Li”)	United States	September 30, 2004	March 30, 2006
U.S. Patent No. 7,596,378 (“Nizri”)	United States	September 30, 1999	September 29, 2009
U.S. Pat. App. Pub. No. 2008/0186918	United States	December 4, 2007	August 7, 2008

Patent or Publication Number	Country of Origin	Filing Date	Date of Issue or Publication
("Tinnakornsrisuphap")			
U.S. Patent No. 8,081,698 ("Xu-2007")	United States	June 28, 2007	December 20, 2011
U.S. Pat. App. Pub. No. 2010/0296591 ("Xu")	United States	June 9, 2009	November 25, 2010
U.S. Patent No. 7,020,110 ("Walton-2002")	United States	January 8, 2002	March 28, 2006
U.S. Pat. App. Pub. No. 2005/0250452 ("Walton")	United States	January 31, 2005	November 10, 2005

2. Prior Art Non-Patent Publications

The following non-patent publications are prior art to the asserted claims under at least pre-AIA 35 U.S.C. §§ 102(a), (b), (e), and/or (g) and/or pre-AIA 35 U.S.C. § 103.

Title	Author/Publisher	Date of Publication
<i>Modulation Optimization under Energy Constraints</i> ("Cui-2003")	Cui, et al., IEEE	June 2003
<i>Energy-Efficiency of MIMO and Cooperative MIMO Techniques in Sensor Networks</i> ("Cui-2004")	Cui, et al., IEEE Journal on Selected Areas in Communication	August 2004
<i>Energy-Constrained Modulation Optimization</i> ("Cui-2005")	Cui, et al., IEEE Transactions on Wireless Communications	September 2005
<i>Cross-Layer Energy and Delay Optimization in Small-Scale Sensor Networks</i> ("Cui-2007")	Cui, et al., IEEE Transactions on Wireless Communications	October 2007
<i>Virtual MIMO-based Cooperative Communications for Energy-constrained Wireless Sensor Networks</i> ("Jayaweera")	Jayaweera, IEEE Transactions on Wireless Communications	May 5, 2006
<i>A Network Selection Algorithm considering Power Consumption in Hybrid Wireless Networks</i> ("Joe")	Joe, et al., IEEE	2007
<i>Adaptive Mode Switching in the MIMO Broadcast Channel</i> ("Lee")	Lee, et al., IEEE Radio and Wireless Symposium	January 2008

Title	Author/Publisher	Date of Publication
<i>Adaptive Multi-antenna Power Control in Wireless Networks</i> (“Siam”)	Siam, et al., International Wireless Communications & Mobile Computing Conference, Association for Computer Machinery	July 3, 2006
<i>Performance of a UMTS Uplink MIMO Scheme</i> (“Tirola”)	Tirola, et al., IEEE 58 th Vehicular Technology Conference	October 6, 2003

3. Prior Art Systems

Defendants’ investigation into publicly available prior art systems that teach and/or render obvious each element of any asserted claims is ongoing. Fact discovery is at an early stage, and Defendants may require discovery from third parties regarding publicly available prior art systems. For example, Defendants served subpoenas directed to prior art on third parties Qualcomm Corp., Texas Instruments, Inc., Intel Corp., Marvell Technology, Inc., MediaTek USA Inc., and Broadcom Corp., which are believed to have relevant prior art products. Defendants reserve the right to amend its identification of prior art systems as Defendants become aware of the existence, functionality, and/or characteristics of prior art systems as a result of its investigation and forthcoming discovery. In addition to the prior art products, components, systems, and methods that may be identified as a result of discovery, Defendants also reserve the right to rely on the documents and publications identified in the corresponding claim charts as prior art publications.

B. Primary References

Defendants contend that the primary prior art references identified below and described in the charts attached as Exhibits A1 to A9, by themselves, anticipate the asserted claims of the ’120 Patent. To the extent that a primary reference is deemed not to anticipate a claim for failing to teach one or more limitations of that claim, Defendants contend that the claim would

nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art reference itself, as described in the attached charts. Defendants’ prior art charts (attached as Exhibits A1 thru A9) set forth the particular claims that are anticipated under 35 U.S.C. § 102 and/or rendered obvious under 35 U.S.C. § 103 by each item of prior art and identify where specifically in each item of prior art, each element of each asserted claim is found.

Exhibit	Primary References
A1	U.S. Pat. App. Pub. No. 2005/0289367 (“Clark”)
A2	<i>Modulation Optimization under Energy Constraints</i> (“Cui-2003”)
A3	<i>Virtual MIMO-based Cooperative Communications for Energy-constrained Wireless Sensor Networks</i> (“Jayaweera”)
A4	U.S. Pat. App. Pub. No. 2006/0067263 (“Li”)
A5	<i>Adaptive Multi-antenna Power Control in Wireless Networks</i> (“Siam”)
A6	U.S. Pat. App. Pub. No. 2008/0186918 (“Tinnakornsriruphap”)
A7	U.S. Pat. App. Pub. No. 2005/0250452 (“Walton”)
A8	U.S. Pat. App. Pub. No. 2010/0296591 (“Xu”)
A9	U.S. Patent No. 8,081,698 (“Xu-2007”)

C. Secondary References

Exhibit A-A lists secondary prior art references and identifies, on a limitation-by-limitation basis, where specifically each secondary reference teaches the limitations of the asserted claims. To the extent that a primary reference is deemed, by itself, not to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention by the combination of the primary reference with one or more of the other primary references listed above and/or the references listed as disclosing those alleged missing limitations in Exhibit A-A.

D. Obvious Combinations

To the extent that a primary reference is deemed, by itself, not to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention by the combination of the primary reference with one or more other primary references and/or the knowledge of someone skilled in the art. For example, a person of ordinary skill in the art would have been motivated to combine any reference in Exhibits A1 to A9 with any other reference(s) in Exhibit A1 to A9. Such combinations would be achieved, for example, by merely combining the disclosures described in the respective claim charts for each reference.

Defendants also contend that any of the primary references (or combination of primary references) could be combined with any of the secondary references (or combination of secondary references) in Exhibit A-A to render obvious the asserted claims. Such combinations would be achieved by merely combining the disclosures described in the respective claim charts for each reference.

The obviousness combinations are provided in the alternative to Defendants' anticipation contentions and are not to be construed to suggest that any reference included in the combinations is not itself anticipatory.

1. Exemplary Combinations

Below are examples of prior art references that would have been combined by one of ordinary skill in the art at the time of the alleged invention. These combinations are merely examples. The asserted claims of the '120 Patent are rendered obvious by:

- Clark alone or in combination with one or more of Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Joung, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsisuphap, Walton, Walton-2002, Xu, and/or Xu-2007.

- Cui-2003 alone or in combination with one or more of Clark, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton, Walton-2002, Xu, and/or Xu-2007.
- Jayaweera alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Joe, Jounge, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton, Walton-2002, Xu, and/or Xu-2007.
- Li alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton, Walton-2002, Xu, and/or Xu-2007.
- Siam alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Li, Nizri, Tirola, Tinnakornsriruphap, Walton, Walton-2002, Xu, and/or Xu-2007.
- Tinnakornsriruphap alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Li, Nizri, Siam, Tirola, Walton, Walton-2002, Xu, and/or Xu-2007.
- Walton alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton-2002, Xu, and/or Xu-2007.
- Xu alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Jounge, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton, Walton-2002, and/or Xu-2007.

- Xu-2007 alone or in combination with one or more of Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Joung, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsrishupap, Walton, Walton-2002, and/or Xu.

2. Motivations to Combine

To the extent a finder of fact finds that a primary prior art reference does not disclose one or more limitations of an asserted claim, the asserted claim is nevertheless obvious because the alleged missing limitations contain nothing beyond ordinary improvements. In other words, the asserted claim combines known elements to achieve predictable results or chooses between clear alternatives known to those of skill in the art, particularly in view of the state of the art as reflected in the relevant prior art.

Moreover, as explained above, it would have been obvious to a person of skill in the art at the time of the alleged invention of the asserted claims to combine any primary reference with any combination of other primary references or secondary references so as to practice the asserted claims. To the extent that Plaintiff argues that any concept claimed in the asserted claims is not disclosed in a primary reference, it would, at a minimum, have been obvious to adapt the primary reference to include the concept or combine it with other primary references or secondary references that disclose the concept. Each concept described and claimed in the Asserted Patents was known to those of skill in the art as available design choices for wireless communication technologies.²

The Supreme Court has held that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*

² Each concept described and claimed in the ’120 Patent was known to those of skill in the art as available design choices for wireless communication technologies.

Int'l Co. v. Teleflex Inc., 550 U.S. 398, 416 (2007). “When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one.” *Id.* at 417. As the Supreme Court made clear, “[f]or the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *Id.*

To determine whether there is an apparent reason to combine the known elements in the fashion claimed by the patent at issue, a court can “look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art.” *Id.* at 418. For example, obviousness can be demonstrated by showing “there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent’s claims.” *Id.* at 420. “[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* Common sense also teaches that “familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *Id.*

However, the Supreme Court in *KSR* held that a claimed invention can be obvious even if there is no explicit teaching, suggestion, or motivation for combining the prior art to produce that invention. In summary, *KSR* holds that patents that are based on new combinations of elements or components already known in a technical field may be found to be obvious. *See, generally, KSR*, 550 U.S. 398. Specifically, the Court in *KSR* rejected a rigid application of the “teaching, suggestion, or motivation [to combine]” test. *Id.* at 418. “In determining whether the

subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. What matters is the objective reach of the claim.” *Id.* at 419. “Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* at 420. A key inquiry is whether the “improvement is more than the predictable use of prior art elements according to their established functions.” *Id.* at 417.

The rationale to combine or modify prior art references is significantly stronger when, as here, the references seek to solve the same problem, come from the same field, and correspond well to each other. *In re Inland Steel Co.*, 265 F.3d 1354, 1362 (Fed. Cir. 2001). The Federal Circuit has held that two references may be combined as invalidating art under similar circumstances, namely “[the prior art] focus[es] on the same problem that the ... patent addresses: enhancing the magnetic properties of ... steel. Moreover, both [prior art references] come from the same field Finally, the solutions to the identified problems found in the two references correspond well.” *Id.* at 1364 (concerning patents and prior art relating to improving the magnetic and electrical properties of steel).

In view of the Supreme Court’s *KSR* decision, the PTO issued a set of Examination Guidelines. Examination Guidelines for Determining Obviousness Under 35 U.S.C. §103 in view of the Supreme Court Decision in *KSR International Co. v. Teleflex, Inc.*, 72 Fed. Reg. 57526 (October 10, 2007). Those Guidelines summarized the *KSR* decision and identified various rationales for finding a claim obvious, including those based on other precedents. Those rationales include:

- (A) Combining prior art elements according to known methods to yield predictable results;
- (B) Simple substitution of one known element for another to obtain predictable results;

(C) Use of known technique to improve similar devices (methods, or products) in the same way;

(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

(E) “Obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;

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

Id. at 57529. The above rationales likewise apply in rendering obvious the asserted claims of the Asserted Patents.

The references disclosed herein, alone or in combination, contain an explicit and/or implicit teaching or motivation to combine them due to the following: (1) the knowledge generally available to a person of ordinary skill in the art; (2) the prior art references as understood by a person of ordinary skill in the art; (3) the nature of the problem to be solved; (4) the fact that each prior art reference addresses similar problems; and (5) the knowledge of those skilled in the art that the disclosed elements had been or could be used together.

As an example of those reasons and motivations to combine the references, Clark, Cui-2003, Cui-2004, Cui-2005, Cui-2007, Hwang, Jayaweera, Joe, Joung, Kim, Lee, Li, Nizri, Siam, Tirola, Tinnakornsriruphap, Walton, Walton-2002, Xu, and/or Xu-2007 generally relate to wireless communication technologies and, in particular, to transmission modes and/or energy consumption. *See* Ex. A1 to A9 and A-A. The references disclose similar components and techniques for selecting transmission modes and/or minimizing energy consumption. *Id.* The attached charts in Ex. A1 to A9 and A-A provide additional reasons and motivations to combine

the charted references.

Additionally, the primary and secondary references listed above are analogous art. They are all directed wireless communication technologies, including selecting transmission modes and/or minimizing energy consumption. *See, e.g.*, Clark at [0002] (“During some operations, some functional blocks may not be needed and it may be desirable to place these functional blocks in a standby mode to help reduce current consumption.”), Cui-2003 at p. 7 (“[A] short signaling header is transmitted to the receiver coded with a predefined system setup. Thus, an energy-minimizing adaptation is achieved.”), Cui-2005 at Abstract (“Wireless systems where the nodes operate on batteries so that energy consumption must be minimized while satisfying given throughput and delay requirements are considered. In this context, the best modulation strategy to minimize the total energy consumption required to send a given number of bits is analyzed.”), Cui-2007 at Abstract (“[W]e minimize the total network energy that includes both transmission and circuit energy consumptions, where we explore the tradeoff between the two energy elements.”), Hwang at Abstract (“An apparatus and method for supporting a plurality of MIMO modes in a wireless communication system are provided, in which a receiver selects one of the plurality of MIMO modes according to at least one of a received signal strength, a speed of the receiver, a correlation between a transmitter and the receiver, a presence or absence of channel quality information, a precoding index, and an antenna information, a rank, and a number of users.”), Jayaweera at 984 (“A closer look at the total energy and delay comparisons between cooperative MIMO and SISO communications was recently taken[.]The results showed that in some cases cooperative MIMO-based sensor networks may in fact lead to better energy optimization and smaller end-to-end delay Our analysis and numerical results suggest that with judicious choice of parameters at the system design level, proposed virtual MIMO-based

communication can provide significant energy and delay efficiencies in wireless sensor networks.”), Joe at Abstract (“[T]he proposed algorithm provides longer lifetime in the hybrid wireless network environment.”), Joung at Abstract (“A method of and apparatus for controlling power consumption in a wireless device that transmits and receives data to and from another wireless device based on a predetermined unit time.”), Kim at Abstract (“A method for transmitting/receiving feedback information in a multi-antenna system using a closed-loop scheme supporting multiple users, and a feedback system supporting the same. Multiple feedback protocol scenarios are predefined on the basis of communication environments affecting feedback information configurations.”), Lee at 714 (“[T]here is an inherent tradeoff between interference loss suffered by multi-user MIMO with the performance gains obtained by serving multiple users at once. This translates into a mode switching making single user transmissions better in some regimes and multi-user ones better in others. The key contribution of this paper is an analytical framework for determining this mode switching point, and to study the impact of correlation and number of antennas on this switching point.”), Li at [0019]-[0024] (“AP 110 operating in a MISO or a SISO operating mode may send a request over wireless shared media 160 to switch STA 120 and STA 150 to a SIMO or MIMO operating mode, if desired. STA 120 and STA 150 may acknowledge the request and may enable an operation of desired number of receivers and transmitters of the MIMO receivers-transmitters system When implemented as part of a station such as STA 120 and/or STA 150, node 200 may receive the request and switch MIMO system 230 from a SISO or MISO operating mode into a MIMO operating mode. This may be accomplished by enabling two or more receivers from MIMO system 230.”), Nizri at 3:34-49 (“While the MS is camped on a cell of one type (TDMA or CDMA), it monitors cells of both the same type and of the other type. The MS can reselect a cell of either type, as appropriate,

based on the signals received and on other predetermined criteria, such as network conditions and user preferences.”), Siam at Abstract (“[W]e dynamically adjust the ‘transmission mode’ and the transmission power on a per-packet basis so as to minimize the total energy consumption. By ‘transmission mode’ we mean one of the four possible transmit/receive antenna configurations: 1×1 (SISO), 2×1 (MISO), 1×2 (SIMO), and 2×2 (MIMO).”), Tirrola at p. 1 (“[U]plink (UL) performance was studied in the 3rd generation UMTS (Universal Mobile Telecommunications System) system assuming different SIMO/MIMO (Single/Multiple Input Multiple Output) approaches.”), Tinnakornsriruphap at [0046] (“[A]n operation mode of access terminal 250, a mode of operation that can include transmission in one of single-user single-input multiple-output (SIMO), single-user multiple-input multiple output (SU-MIMO) or multi-user MIMO (MU-MIMO)”), Walton at [0009] (“A controller selectively enables one or more transmitter units, as needed, for transmission The controller selectively enables one or more receiver units, as needed, for reception.”), Walton at [0053]-[0066] (“[W]ireless device 100 a may enable the desired number of receiver units via the control signals R_i for these receiver units Power controller 230 may provide the proper control signal to power source 258 and/or the circuit blocks to power down the various circuit blocks.”), Walton-2002 at 10:15-18 (“A scheduler can evaluate which specific combination of terminals provides the best system performance (e.g., the highest throughput) subject to any system constraints and requirements.”), Xu at [0058] (“To (re)schedule a terminal 220 in SIMO, SU-MIMO, or MU-MIMO mode of operation, access point 250 conveys a resource assignment 261 to the access terminal 220, with a data rate, a data rate offset, antenna subset selection for transmission, and antenna pattern selection.”), Xu-2007 at 6:64-7:18 (“System 200 can be employed in conjunction with various aspects described herein in order to switch between MIMO and SIMO transmission techniques.”).

A person of ordinary skill in the art would look to the primary and secondary references to improve or tailor the disclosure thereof to tailor to particular settings or particular factors. A person of ordinary skill in the art would understand the general trend and motivation to optimize the transmission mode selected and to optimize energy consumption, including in light of various transmission modes. A POSITA would have understood that doing so could increase device and/or system performance, including in terms of, for example, call quality, data transmission speed, data transmission performance, and battery lifetime. *See, e.g.*, Clark at [0002] (“During some operations, some functional blocks may not be needed and it may be desirable to place these functional blocks in a standby mode to help reduce current consumption.”), Cui-2003 at p. 7 (“[A] short signaling header is transmitted to the receiver coded with a predefined system setup. Thus, an energy-minimizing adaptation is achieved.”), Cui-2005 at Abstract (“Wireless systems where the nodes operate on batteries so that energy consumption must be minimized while satisfying given throughput and delay requirements are considered. In this context, the best modulation strategy to minimize the total energy consumption required to send a given number of bits is analyzed.”), Cui-2007 at Abstract (“[W]e minimize the total network energy that includes both transmission and circuit energy consumptions, where we explore the tradeoff between the two energy elements.”), Hwang at Abstract (“An apparatus and method for supporting a plurality of MIMO modes in a wireless communication system are provided, in which a receiver selects one of the plurality of MIMO modes according to at least one of a received signal strength, a speed of the receiver, a correlation between a transmitter and the receiver, a presence or absence of channel quality information, a precoding index, and an antenna information, a rank, and a number of users.”), Jayaweera at 984 (“A closer look at the total energy and delay comparisons between cooperative MIMO and SISO communications was recently

taken[.]The results showed that in some cases cooperative MIMO-based sensor networks may in fact lead to better energy optimization and smaller end-to-end delay Our analysis and numerical results suggest that with judicious choice of parameters at the system design level, proposed virtual MIMO-based communication can provide significant energy and delay efficiencies in wireless sensor networks.”), Joe at Abstract (“[T]he proposed algorithm provides longer lifetime in the hybrid wireless network environment.”), Joung at Abstract (“A method of and apparatus for controlling power consumption in a wireless device that transmits and receives data to and from another wireless device based on a predetermined unit time.”), Kim at Abstract (“A method for transmitting/receiving feedback information in a multi-antenna system using a closed-loop scheme supporting multiple users, and a feedback system supporting the same. Multiple feedback protocol scenarios are predefined on the basis of communication environments affecting feedback information configurations.”), Lee at 714 (“[T]here is an inherent tradeoff between interference loss suffered by multi-user MIMO with the performance gains obtained by serving multiple users at once. This translates into a mode switching making single user transmissions better in some regimes and multi-user ones better in others. The key contribution of this paper is an analytical framework for determining this mode switching point, and to study the impact of correlation and number of antennas on this switching point.”), Li at [0019]-[0024] (“AP 110 operating in a MISO or a SISO operating mode may send a request over wireless shared media 160 to switch STA 120 and STA 150 to a SIMO or MIMO operating mode, if desired. STA 120 and STA 150 may acknowledge the request and may enable an operation of desired number of receivers and transmitters of the MIMO receivers-transmitters system When implemented as part of a station such as STA 120 and/or STA 150, node 200 may receive the request and switch MIMO system 230 from a SISO or MISO operating mode into a MIMO

operating mode. This may be accomplished by enabling two or more receivers from MIMO system 230.”), Nizri at 3:34-49 (“While the MS is camped on a cell of one type (TDMA or CDMA), it monitors cells of both the same type and of the other type. The MS can reselect a cell of either type, as appropriate, based on the signals received and on other predetermined criteria, such as network conditions and user preferences.”), Siam at Abstract (“[W]e dynamically adjust the ‘transmission mode’ and the transmission power on a per-packet basis so as to minimize the total energy consumption. By ‘transmission mode’ we mean one of the four possible transmit/receive antenna configurations: 1×1 (SISO), 2×1 (MISO), 1×2 (SIMO), and 2×2 (MIMO).”), Tirola at p. 1 (“[U]plink (UL) performance was studied in the 3rd generation UMTS (Universal Mobile Telecommunications System) system assuming different SIMO/MIMO (Single/Multiple Input Multiple Output) approaches.”), Tinnakornsriruphap at [0046] (“[A]n operation mode of access terminal 250, a mode of operation that can include transmission in one of single-user single-input multiple-output (SIMO), single-user multiple-input multiple output (SU-MIMO) or multi-user MIMO (MU-MIMO)”), Walton at [0009] (“A controller selectively enables one or more transmitter units, as needed, for transmission The controller selectively enables one or more receiver units, as needed, for reception.”), Walton at [0053]-[0066] (“[W]ireless device 100 a may enable the desired number of receiver units via the control signals R_i for these receiver units Power controller 230 may provide the proper control signal to power source 258 and/or the circuit blocks to power down the various circuit blocks.”), Walton-2002 at 10:15-18 (“A scheduler can evaluate which specific combination of terminals provides the best system performance (e.g., the highest throughput) subject to any system constraints and requirements.”), Xu at [0058] (“To (re)schedule a terminal 220 in SIMO, SU-MIMO, or MU-MIMO mode of operation, access point 250 conveys a resource assignment 261 to the access

terminal 220, with a data rate, a data rate offset, antenna subset selection for transmission, and antenna pattern selection.”), Xu-2007 at 6:64-7:18 (“System 200 can be employed in conjunction with various aspects described herein in order to switch between MIMO and SIMO transmission techniques.”).

One of skill in the art would also have been motivated to combine the different publications and patents that were authored by employees of a given company or assigned to the same assignee and/or related to the same subject matter. Additionally, one of skill in the art would have been motivated to combine different references that were authored, developed, or invented by the same individual(s) related to the same subject matter. The common inventor/author/architect of the references demonstrate that they relate to continued work in a common field of effort and continued related developments in that field. One of skill in the art would, therefore, combine the references related to each individual. For example, a POSITA would have been motivated to combine at least Cui-2003, Cui-2004, Cui-2005, Cui-2007, and/or Siam, based solely on the fact that they have overlapping inventors/authors. Additionally, based on the teachings of the references and/or the knowledge of one of ordinary skill, one of skill in the art would have been motivated to combine different references from the same company. For example, a POSITA would have been motivated to combine at least Walton, Walton-2002, Xu, and/or Xu-2007, all of which are or were assigned to the same company: Qualcomm Inc. And, one of skill in the art would have been motivated to combine prior art systems or products with any related or applicable documentation or literature for that system, including for the reason that these materials are related.

In addition, below are additional motivations to combine prior art for particular claim limitations. The following discussion of specific claim limitations are merely examples and are not limiting.

For example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitations 25[a] (“a first antenna and a second antenna”) and/or 25[b] (“first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna; second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitations 25[a] and/or 25[b] in Exhibits A1 to A9 or Exhibit A-A. For example, several prior art references, including at least Jayaweera, Li, Siam, Tinnakornsriruphap, Walton, Xu, Xu-2007, Cui-2004, Hwang, Joung, Kim, Lee, Tirola,, and Walton-2002, explicitly describe or disclose “a first antenna and a second antenna.” *See, e.g.*, Jayaweera at 984, 986, 987; Li at Abstract, [0013], [0015], [0021]; Siam at Abstract, 875, 876, 877, 880; Tinnakornsriruphap at [0071]; Walton at Abstract, [0003], [0005]-[0008], [0016]; Xu at [0006]-[0008], [0010]; Xu-2007 at 12:1-22; Cui-2004 at 1089, 1093; Hwang at [0003], [0066]-[0068]; Joung at [0032]-[0043]; Kim at Abstract; Lee at 713, 714, Tirola at pp. 1, 2, 3, Fig. 1; Walton-2002 at 1:13-24, 4:7-15, Fig. 1. And several prior art references, including at least Clark, Li, Tinnakornsriruphap, Walton, Xu-2007, Cui-2004, Cui-2005, Cui-2007, Tirola, and Walton-2002, explicitly describe or disclose “first circuitry coupled to the first antenna and configured to process signals for transmission by the first antenna; second circuitry coupled to the second antenna and configured to process signals for transmission by the second antenna.” *See, e.g.*, Clark at [0042], Claim 35; Li at [0018], [0020], Tinnakornsriruphap at [0068], [0070]; Walton

at [0005]-[0008], [0016], [0024]-[0027]; Xu-2007 at 10:48-11:16, 13:20-43, Cui-2004 at Abstract, 1089; Cui-2005 at 2350; Cui-2007 at 3690; Tirola at pp. 1, 2, 3, Fig. 1; Walton-2002 at 42:28-39, 51:64-52:9, Fig. 8B.

A person skilled in the art would have understood the benefits of a multi-antenna system, would have recognized that configuring a mobile communication device to comprise multiple antennas and accompanying circuitry would provide benefits to the mobile communication device and in a mobile communication system, and would have been motivated to incorporate these features into mobile communication devices accordingly. *See, e.g.*, Clark at [0042] (“Wireless communication device 700 may include transceiver 706 to communicate wireless signals, and integrated circuitry 702 to communicate digital data signals 703 with the transceiver. In some embodiments, integrated circuitry 702 may provide digital data signals 703 to a transmitter portion of transceiver 706 for subsequent modulation and transmission over a communication channel. In some embodiments, a receiver portion of transceiver 706 may demodulate signals received over the communication channel and may provide associated digital signals 703 to integrated circuitry 702.”), Li at [0018] (“[Any] inefficient use of energy may be exacerbated by MIMO devices, since more than one antenna may be turned on for reception. The power consumed by low noise amplifiers and analog-to-digital converters may be multiplied by the number of antennas.”), Siam at Abstract (disclosing “MIMO-capable wireless LANs with two antennas per node” as “MIMO mode requires less RF transmission energy than the other three modes”), Tinnakornsriruphap at [0068] (“Each transceiver 722 receives and processes a respective symbol stream to provide one or more analog signals, and further conditions (e.g., amplifies, filters, and upconverts) the analog signals to provide a modulated signal suitable for transmission over the MIMO channel. NT modulated signals from transceivers 722A through

722T are then transmitted from NT antennas 724I through 724T, respectively. At receiver system 750, the transmitted modulated signals are received by NR antennas 752I through 752R and the received signal from each antenna 752 is provided to a respective transceiver (RCVR/TMTR) 754A through 754R. Each transceiver 754I-754R conditions (e.g., filters, amplifies, and downconverts) a respective received signal, digitizes the conditioned signal to provide samples, and further processes the samples to provide a corresponding “received” symbol stream.”), Tinnakornsriruphap at [0071] (“NT transmitters 724 I-724 T (also known as TX antennas) and NR receivers 752 I-752 R (also known as RX antennas) form a MIMO matrix channel”), Walton at [0006] (“[A] multi-antenna wireless device is equipped with multiple antennas that may be used for data transmission and/or reception. Each antenna may be associated with (1) transmit circuitry used to process a baseband output signal to generate a radio frequency (RF) output signal suitable for transmission via a wireless channel and (2) receive circuitry used to process an RF input signal to obtain a baseband input signal. The multi-antenna wireless device also typically has digital circuitry used to digitally process data for transmission and reception.”), Xu at [0007] (“MIMO systems can provide improved performance (e.g., higher throughput, greater capacity, or improved reliability, or any combination thereof) if the additional dimensionalities created by the multiple transmit and receive antennas are utilized”), Xu-2007 at 1:49-59 (“MIMO systems commonly employ multiple (N_T) transmit antennas and multiple (N_R) receive antennas for data transmission”), Cui-2004 at Abstract (“We first consider multi-input–multi-output (MIMO) systems[,] which have good spectral efficiency but also more circuitry that consumes energy. We then extend our energy-efficiency analysis of MIMO systems to individual single-antenna nodes that cooperate to form multiple-antenna transmitters or receivers. By transmitting and/or receiving information jointly, we show that tremendous energy saving is possible for

transmission distances larger than a given threshold[.] We also show that over some distance ranges, cooperative MIMO transmission and reception can simultaneously achieve both energy savings and delay reduction.”), Cui-2007 at 3690 (“[T]he total energy consumption (that includes both the average transmission energy and the circuit energy) ... can be approximated by ... the transmission energy and ... the total transceiver circuit processing energy.”), Hwang at [0003] (“A system with multiple transmit and receive antennas has recently attracted interest to increase the reliability or throughput of signal transmission and reception in wireless communication systems. Such a system is called a MIMO system.”), Tirola at p. 1 (“[T]he user equipment (UE) has a maximum of two transmit antennas.”), Walton-2002 at 1:13-24 (“A multiple-input multiple-output (MIMO) communication system employs multiple (NT) transmit antennas and multiple (NR) receive antennas for transmission of multiple independent data streams [E]ach of the terminals employs a sufficient number of antennas such that it can transmit and/or receive one or more data streams.”), Walton-2002 at 42:28-39 (“At each terminal scheduled for data transmission on the uplink, a data source 878 provides data to TX data processor 880, which codes, interleaves, and maps the data into modulation symbols. If multiple transmit antennas are used for uplink data transmission, TX MIMO processor 882 receives and further processes the modulation symbols to provide a stream of modulation symbol vectors for each antenna used for data transmission. Each symbol vector stream is then received and modulated by a respective modulator 854 and transmitted via an associated antenna 852.”). Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose

interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

As another example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitation 25[c] (“a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitation 25[c] in Exhibits A1 to A9 or Exhibit A-A. For example, several prior art references, including at least Clark, Cui-2003, Jayaweera, Li, Siam, Tinnakornsriruphap, Walton, Xu, Xu-2007, Cui-2004, and Walton-2002, explicitly describe or disclose “a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode wherein both the first and second antennas transmit data over a communications channel and a single-input multiple-output (SIMO) mode wherein only one of the first and second antennas transmit data over a communications channel.” *See, e.g.*, Clark at Abstract, [0002]-[0003]; Cui-2003 at p. 7; Jayaweera at 984, 986; Li at [0019], [0020], [0024]-[0026], [0050]; Siam at Abstract, 875-876; Tinnakornsriruphap at [0044], [0046]; Walton at [0009], [0022]-[0023], [0038]-[0043], [0053]-[0066]; Xu at [0003], [0015], [0044], [0058]; Xu-2007 at Abstract, 6:64-7:18, 7:48-56; Cui-2004 at Abstract, 1092, 1097; Walton-2002 at Abstract, 2:33-54, 10:15-18, 42:51-67, 43:16-21, Fig. 8B.

A person skilled in the art would have understood the benefits of a controller receiving a control signal and selecting between MIMO and SIMO mode accordingly, would have recognized that configuring a mobile communication device to comprise a controller receiving a control signal and selecting between MIMO and SIMO mode accordingly would provide benefits to the mobile communication device and in a mobile communication system, and would have been motivated to incorporate these features into mobile communication devices accordingly. *See, e.g.,* Clark at [0002] (“During some operations, some functional blocks may not be needed and it may be desirable to place these functional blocks in a standby mode to help reduce current consumption.”), Cui-2003 at p. 7 (“[A] short signaling header is transmitted to the receiver coded with a predefined system setup. Thus, an energy-minimizing adaptation is achieved.”), Jayaweera at 984 (“A closer look at the total energy and delay comparisons between cooperative MIMO and SISO communications was recently taken[.]The results showed that in some cases cooperative MIMO-based sensor networks may in fact lead to better energy optimization and smaller end-to-end delay Our analysis and numerical results suggest that with judicious choice of parameters at the system design level, proposed virtual MIMO-based communication can provide significant energy and delay efficiencies in wireless sensor networks.”), Li at [0019]-[0024] (“AP 110 operating in a MISO or a SISO operating mode may send a request over wireless shared media 160 to switch STA 120 and STA 150 to a SIMO or MIMO operating mode, if desired. STA 120 and STA 150 may acknowledge the request and may enable an operation of desired number of receivers and transmitters of the MIMO receivers-transmitters system When implemented as part of a station such as STA 120 and/or STA 150, node 200 may receive the request and switch MIMO system 230 from a SISO or MISO operating mode into a MIMO operating mode. This may be accomplished by enabling two or more receivers from MIMO

system 230.”), Siam at Abstract (“[W]e dynamically adjust the ‘transmission mode’ and the transmission power on a per-packet basis so as to minimize the total energy consumption. By ‘transmission mode’ we mean one of the four possible transmit/receive antenna configurations: 1×1 (SISO), 2×1 (MISO), 1×2 (SIMO), and 2×2 (MIMO).”), Walton at [0009] (“A controller selectively enables one or more transmitter units, as needed, for transmission The controller selectively enables one or more receiver units, as needed, for reception.”), Tinnakornsriruphap at [0046] (“[A]n operation mode of access terminal 250, a mode of operation that can include transmission in one of single-user single-input multiple-output (SIMO), single-user multiple-input multiple output (SU-MIMO) or multi-user MIMO (MU-MIMO)”), Walton at [0053]-[0066] (“[W]ireless device 100 a may enable the desired number of receiver units via the control signals R_i for these receiver units Power controller 230 may provide the proper control signal to power source 258 and/or the circuit blocks to power down the various circuit blocks.”), Xu at [0058] (“To (re)schedule a terminal 220 in SIMO, SU-MIMO, or MU-MIMO mode of operation, access point 250 conveys a resource assignment 261 to the access terminal 220, with a data rate, a data rate offset, antenna subset selection for transmission, and antenna pattern selection.”), Xu-2007 at 6:64-7:18 (“System 200 can be employed in conjunction with various aspects described herein in order to switch between MIMO and SIMO transmission techniques.”), Cui-2004 at 1092 (“[T]he optimal strategy to minimize the total energy consumption is to operate on a multimode basis.”), Cui-2004 at 1097 (“[S]ince MIMO requires less transmission energy for the long-haul transmission, the total energy consumption will become smaller compared with MISO or SIMO when is large enough.”), Walton-2002 at 10:15-18 (“A scheduler can evaluate which specific combination of terminals provides the best system performance (e.g., the highest throughput) subject to any system constraints and requirements.”). Thus, a person of ordinary

skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

As another example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitation 25[d] (“wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitation 25[d] in Exhibits A1 to A9 or Exhibit A-A. For example, several prior art references, including at least Clark, Cui-2003, Jayaweera, Li, Siam, Tinnakornsriruphap, Walton, Xu, Xu-2007, Cui-2004, Cui-2005, Cui-2007, Joe, Joung, and Nizri, explicitly describe or disclose “wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry.” *See, e.g.*, Clark at Abstract, [0001], [0002]-[0003], [0016]; Cui-2003 at pp. 1, 2, 4; Jayaweera at 984, 985, 986, 987; Li at [0001], [0019], [0043]; Siam at Abstract, 875-876, 877; Tinnakornsriruphap at [0040], [0044]; Walton at [0005]-[0008], [0009], [0035]-[0037], [0053]-[0066], Xu at [0058], [0059]; Xu-2007 at 9:22-39, 15:5-15, 15:16-25; Cui-2004 at Abstract, 1089-1090, 1097; Cui-2005 at Abstract; Cui-2007 at 3688, 3689; Joe at Abstract, 1240, 1241; Joung at Abstract, [0092], [0098]-[0099]; Nizri at 3:34-49, 6:59-7:17, 14:30-55.

A person skilled in the art would have understood the benefits of a control signal for selecting between MIMO and SIMO mode based on a power consumption of the first and second circuitry, would have recognized that configuring a mobile communication device to comprise a

control signal for selecting between MIMO and SIMO mode based on a power consumption of the first and second circuitry would provide benefits to the mobile communication device and in a mobile communication system, and would have been motivated to incorporate these features into mobile communication devices accordingly. *See, e.g.*, Clark at [0002] (“During some operations, some functional blocks may not be needed and it may be desirable to place these functional blocks in a standby mode to help reduce current consumption.”), Cui-2003 at p. 1 (“[I]n order to find the optimal transmission scheme, the overall energy consumption including both transmission and circuit energy consumption needs to be considered.”), Jayaweera at 984 (“A closer look at the total energy and delay comparisons between cooperative MIMO and SISO communications was recently taken[.] The results showed that in some cases cooperative MIMO-based sensor networks may in fact lead to better energy optimization and smaller end-to-end delay.”), Li at [0019] (“AP 110, STA 120 and/or STA 150 may be initially set to operate in a SISO or a MISO operating mode, and may be subsequently switched to a MIMO operating mode In this manner, power consumption for STA 120 and STA 150 may be reduced, thereby extending the battery life for STA 120 and STA 150.”), Siam at Abstract (“[W]e dynamically adjust the ‘transmission mode’ and the transmission power on a per-packet basis so as to minimize the total energy consumption.”), Tinnakornsrisuphap at [0040] (“power control techniques provided herein...”), Walton at [0005]-[0008] (“The higher power consumption depletes the available battery resources more quickly, which then shortens both the standby time between battery recharges and the on time for active communication. There is therefore a need in the art for a multi-antenna wireless device that is power efficient.”), Xu at [0058]-[0059] (“To (re)schedule a terminal 220 in SIMO, SU-MIMO, or MU-MIMO mode of operation, access point 250 conveys a resource assignment 261 to the access terminal 220 ... Δ PSD 320 can be calculated

... based on power headroom of a power amplifier (PA) in the antenna employed to report CQI 239[;] [i]n addition, other factors such as projected battery lifetime...”), Xu-2007 at 9:22-39 (“the switching request is based on power headroom (PHR) data”), Cui-2004 at 1097 (“Since the MIMO structure involves more local energy consumption compared with the MISO or SIMO structure, the threshold distance above which MIMO becomes more energy-efficient is increased. However, since MIMO requires less transmission energy for the long-haul transmission, the total energy consumption will become smaller compared with MISO or SIMO when is large enough.”); Cui-2005 at Abstract (“[T]he best modulation strategy to minimize the total energy consumption required to send a given number of bits is analyzed.”), Cui-2007 at 3688 (“By modeling power consumption in the underlying circuits, optimal modulation schemes are derived to minimize the total energy consumption.”); Joe at Abstract (“[N]etwork selection algorithm considering power consumption in hybrid wireless networks for vertical handover”); Joung at [0092] (“a method of controlling power consumption in a portable wireless device”), Nizri at 3:34-49 (“The criteria and procedures for monitoring and reselection are preferably chosen so as to minimize power consumption by the MS.”). Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

As another example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitation 25[e] (“wherein the control signal is based, at least in part, on an idle power consumption of the mobile station”), it would have been obvious to a person of

ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitation 25[e] in Exhibits A1 to A9 or Exhibit A-A. For example, several prior art references, including at least Cui-2003, Li, Siam, Walton, Cui-2004, Cui-2005, Cui-2007, Joe, Joung, and Nizri, explicitly describe or disclose “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station.” *See, e.g.*, Cui-2003 at pp. 2, 4; Li at [0018], [0019]; Siam at 875-876, 877; Walton at Abstract, [0038]-[0043], [0044]-[0052], [0053]-[0066]; Cui-2004 at 1092, 1093; Cui-2005 at 2350, 2351; Cui-2007 at 3689, 3690; Joe at 1240; Joung at Abstract, [0028], [0051], [0058], [0076], [0097]; Nizri at 3:34-49, 12:3-4, 13:39-47, 14:30-55.

A person skilled in the art would have understood the benefits of a control signal for selecting between MIMO and SIMO mode based on an idle power consumption of the mobile station, would have recognized that configuring a mobile communication device to comprise a control signal for selecting between MIMO and SIMO mode based on an idle power consumption of the mobile station would provide benefits to the mobile communication device and in a mobile communication system, and would have been motivated to incorporate these features into mobile communication devices accordingly. *See, e.g.*, Cui-2003 at p. 2 (“Pon, Psp and Ptr are power consumption values for the active mode, the sleep mode, and the transient mode, respectively”), Li at [0018] (“For example, a station in idle mode waiting for incoming signals may consume approximately 60% of its battery energy.”), Siam at 875-876 (“Energy is one of the most critical resources of a wireless network. It can be conserved by controlling the transmission power of packets and/or by putting inactive nodes to sleep.”); Walton at Abstract (“In an idle state, the wireless device may enable only a subset (e.g., one) of the N receiver units and one or few processing units for signal detection and acquisition. For active communication, the wireless

device may enable Ntx transmitter units for data transmission and/or Nrx receiver units for data reception, where $1 \leq Ntx \leq N$ and $1 \leq Nrx \leq N$.”), Cui-2004 at 1093 (“our model can ... incorporate the energy consumption values in the sleep and transient modes when they are not negligible”), Cui-2005 at 2351 (“In the sleep mode, the power consumption is dominated by the leaking current I_l of the switching transistors[.] Since the leaking power consumption is usually much smaller than the power consumption in the active mode[.]it is neglected in the proposed model. Thus, $P_{sp} = 0$ is set. The analysis can be easily modified to incorporate $P_{sp} \neq 0$.”), Cui-2007 at 3690 (“In the sleep mode the power consumption is dominated by the leakage current of the switching transistors. Since for analog circuits the leakage power consumption is usually much smaller than the power consumption in the active mode, leakage power is neglected in the total energy consumption.”), Joe at 1240 (“We assume that input data of the vertical handover network selection algorithm can be received from networks and mobile itself. The input data list includes the followings ... Idle power consumption of NIC (Network Interface Card).”), Joung at [0076] (“ P^{PAidle} means power consumed when the portable wireless device 100 is in the idle mode.”), Nizri at 12:3-4 (“In order to reduce power consumption in idle mode, typically only one of the air interfaces is active at any given time.”). Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

As another example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitation 29[e] (“wherein the control signal is based, at least in part,

on a number of users of the communications system”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitation 29[e] in Exhibits A1 to A9 or Exhibit A-A. For example, several prior art references, including at least Siam, Tinnakornsriruphap, Walton, Xu, Cui-2007, Hwang, Joe, Joung, Kim, Lee, Tirola, and Walton-2002, explicitly describe or disclose “wherein the control signal is based, at least in part, on a number of users of the communications system.” *See, e.g.*, Siam at 878, 879, 890; Tinnakornsriruphap at [0046], [0071], [0074]-[0075]; Walton at [0017]-[0019], [0053]-[0066]; Xu at [0051]-[0057], [0055]; Cui-2007 at Abstract, 3690, 3691, 3692; Hwang at [0004]-[0007], [0049], [0065], [0066]; Joe at 1240; Joung at Abstract, [0028], [0098]-[0099]; Kim at 6:9-16, Claim 1; Lee at Abstract, 711, 713, 714; Tirola at pp. 2, 3, 4, Table IV, Figures 4(b) and 5; Walton-2002 at 30:31-46, 31:41-57, 31:58-65, 31:66-32:9.

A person skilled in the art would have understood the benefits of a control signal for selecting between MIMO and SIMO mode based on a number of users of the communications system, would have recognized that configuring a mobile communication device to comprise a control signal for selecting between MIMO and SIMO mode based on a number of users of the communications system would provide benefits to the mobile communication device and in a mobile communication system, and would have been motivated to incorporate these features into mobile communication devices accordingly. *See, e.g.*, Siam at 879-890 (“When the circuit power is assumed to be zero ($\alpha = 0$), routes with large number of hops exist. When we have non-zero circuit power ($\alpha = 0.01$), the average number of hops across all routes is reduced to balance the extra circuit power in the relay nodes. Note that the throughput performance of E-BASIC with PAR is degraded as a price of saving energy.”), Tinnakornsriruphap at [0074] (“Intra-cell interference can be present due to the plurality of users present in the cell serviced by the base

station 710. Such interference can affect CQI values reported by each of terminals 750, 750, and 750s.”), Walton at [0017]-[0019] (“For data transmission, a transmit (TX) data processor 114 receives traffic data from a data source 112, processes (e.g., encodes, interleaves, and symbol maps) the traffic data and control data from a controller 140.”), Xu at [0055] (“It should be appreciated that a resulting PSD level is to be reduced according to the number of scheduled MIMO streams, in order to maintain the same total transmitted power from terminal 220. As an example, in a case in which two streams are scheduled (through scheduler 258), a Δ PSD is effectively reduced by half for each of the antennas involved in transmission of data.”), Cui-2007 at 3692 (“[T]he optimal time slot for each link to minimize the total energy is proportional to the relative magnitude of traffic load W_{ij} , which is intuitively correct.”), Hwang at [0004]-[0007] (“However, as the number of receivers increases, feedback information also increases. As a result, resource efficiency decreases in the unified MIMO system. Accordingly, there exists a need for a technique for reducing the amount of feedback information in the unified MIMO system. There is also a need for a technique for selecting an optimal MIMO mode from among a plurality of MIMO modes, taking into account the environment of a receiver in the unified MIMO system.”), Joe at 1240 (“The proposed algorithm prevents unnecessary handovers by using current battery level, traffic class, power consumption of each network interface card of mobile station and selects an optimal network by user preference.”), Joung at Abstract (“A method of and apparatus for controlling power consumption in a wireless device that transmits and receives data to and from another wireless device based on a predetermined unit time, includes receiving at least one data frame from the other wireless device within the range of a maximum reception mode time, transmitting at least one data to the other wireless device at an adjusted transmission rate according to traffic requirements or status information of the portable wireless device, and

switching a current mode of the portable wireless device to a doze mode for a remaining time of the unit time.”), Kim at 6:9-16 (“[A] receiver selects at least one operating mode between MU-MIMO mode supporting multiple users and SU-MIMO mode supporting a single user, on the basis of the number of users. The operating mode is selected on the basis of a temporarily stored active user set in a cell.”), Lee at 713 (“[W]e determine the mode switching point by ... the number of users.”), Tirola at p. 2 (“When studying the UL performance of different transmission schemes, the UL load factor, denoted as η plays an important role. The UL load factor is calculated [based on] i [,] the ratio of other cell to own cell interference, J [,] the number of users[,] and E_c/N_0 [,] the chip energy per total noise power density.”), Walton-2002 at 30:31-46 (“The SNRs from the active terminals may be evaluated by the scheduler to determine which terminal(s) to transmit data to and when.”). Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

IV. U.S. Patent No. 8,565,331 (“the ’331 Patent”)

A. Identification of Prior Art

In addition to the prior art cited on the face of the ’331 Patent and related patents, the admitted prior art in the specifications of the ’331 Patent and related patents, the prior art cited in any file histories, reexaminations, *inter partes* review proceedings, reissue proceedings, or other examination or post-grant proceedings of the ’331 Patent and related patents, and the prior art cited in any invalidity contentions or expert reports submitted in any action or proceedings

involving the '331 Patent or related patents, Defendants identify the following prior art that anticipates each asserted claim or renders it obvious.

1. Prior Art Patents

The following patents and patent publications are prior art to the asserted claims under at least pre-AIA 35 U.S.C. §§ 102(a), (b), (e), and/or (g) and/or pre-AIA 35 U.S.C. § 103. The identification of any patent or patent publication shall be deemed to include any counterpart patent or application filed, published, or issued anywhere in the world.

Patent or Publication Number	Country of Origin	Filing Date	Date of Issue or Publication
U.S. Patent Application Pub. No. 2008/0222482 (“Ban”)	United States	February 21, 2008	September 11, 2008
U.S. Patent Application Pub. No. 2005/0276360 (“Fujii”)	United States	April 15, 2005	December 15, 2005
U.S. Patent Application Pub. No. 2005/0176436 (“Mantravadi”)	United States	February 5, 2004	August 11, 2005
U.S. Patent Application Pub. No. 2006/0203932 (“Palanki”)	United States	July 5, 2005	September 14, 2006
U.S. Patent Application Pub. No. 2008/0032630 (“Kim”)	United States	March 17, 2007	February 7, 2008
U.S. Patent No. 7,577,085 (“Narasimhan”)	United States	July 5, 2002	August 18, 2009
International Publication No. WO 2005/088882 (“Ma”)	World Intellectual Property Organization	March 15, 2005	September 22, 2005
U.S. Patent Application Publication No. 2008/0192842 (“Fei”)	United States	October 29, 2004	August 14, 2008
U.S. Patent No. 7,486,726 (“Alexander”)	United States	July 23, 2004	December 30, 2004
European Patent Application No. EP 2 114 029 (“Haustein”)	European Patent Office	April 28, 2008	November 4, 2009
U.S. Patent Application Publication No. 2006/0050770 (“Wallace”)	United States	January 24, 2005	March 9, 2006

Patent or Publication Number	Country of Origin	Filing Date	Date of Issue or Publication
U.S. Patent Application Publication No. 2007/0110179 ("Alamouti")	United States	September 28, 2006	May 17, 2007
U.S. Patent No. 7,418,042 ("Choi")	United States	September 17, 2003	November 3, 2005
U.S. Patent Application Publication No. 2002/0003774 ("Wang")	United States	July 3, 2001	January 10, 2002
U.S. Patent Application Publication No. 2006/078075 ("Stamoulis")	United States	October 11, 2005	April 13, 2006
U.S. Patent No. 7,729,443 ("Fukuoka")	United States	June 26, 2007	June 1, 2010
U.S. Patent Application Publication No. 2009/0005101 ("Matsumoto")	United States	June 26, 2007	January 1, 2009
U.S. Patent No. 6,940,914 ("Lo")	United States	June 11, 2001	September 6, 2005

2. Prior Art Non-Patent Publications

The following non-patent publications are prior art to the asserted claims under at least pre-AIA 35 U.S.C. §§ 102(a), (b), (e), and/or (g) and/or pre-AIA 35 U.S.C. § 103.

Title	Author/Publisher	Date of Publication
<i>Joint Pilot-Aided and Blind Decision-Directed Channel Estimation for MIMO-OFDM System</i> ("Tang")	Ling Tang & Mosa Ali Abu-Rgheff,	December 4, 2007

3. Prior Art Systems

Defendants' investigation into publicly available prior art systems that teach and/or render obvious each element of any asserted claims is ongoing. Fact discovery is at an early

stage, and Defendants may require discovery from third parties regarding publicly available prior art systems. For example, Defendants served subpoenas directed to prior art on third parties Qualcomm Corp., Texas Instruments, Inc., Intel Corp., Marvell Technology, Inc., MediaTek USA Inc., and Broadcom Corp., which are believed to have relevant prior art products. Defendants reserve the right to amend its identification of prior art systems as Defendants become aware of the existence, functionality, and/or characteristics of prior art systems as a result of its investigation and forthcoming discovery. In addition to the prior art products, components, systems, and methods that may be identified as a result of discovery, Defendants also reserve the right to rely on the documents and publications identified in the corresponding claim charts as prior art publications.

B. Primary References

Defendants contend that the primary prior art references identified below and described in the charts attached as Exhibits B1 to B11, by themselves, anticipate the asserted claims of the '331 Patent. To the extent that a primary reference is deemed not to anticipate a claim for failing to teach one or more limitations of that claim, Defendants contend that the claim would nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art reference itself, as described in the attached charts. Defendants' prior art charts (attached as Exhibits B1 thru B11) set forth the particular claims that are anticipated under 35 U.S.C. § 102 and/or rendered obvious under 35 U.S.C. § 103 by each item of prior art and identify where specifically in each item of prior art, each element of each asserted claim is found.

Exhibit	Primary References
B1	U.S. Patent Application Pub. No. 2008/0222482 ("Ban")
B2	U.S. Patent Application Pub. No. 2005/0276360 ("Fujii")

Exhibit	Primary References
B3	U.S. Patent Application Pub. No. 2005/0176436 (“Mantravadi”)
B4	U.S. Patent Application Pub. No. 2006/0203932 (“Palanki”)
B5	U.S. Patent Application Pub. No. 2008/0032630 (“Kim”)
B6	U.S. Patent No. 7,577,085 (“Narasimhan”)
B7	International Publication No. WO 2005/088882 (“Ma”)
B8	U.S. Patent Application Publication No. 2008/0192842 (“Fei”)
B9	U.S. Patent No. 7,486,726 (“Alexander”)
B10	European Patent Application No. EP 2 114 029 (“Haustein”)
B11	<i>Joint Pilot-Aided and Blind Decision-Directed Channel Estimation for MIMO-OFDM System</i> (“Tang”)

C. Secondary References

Exhibit B-A lists secondary prior art references and identifies, on a limitation-by-limitation basis, where specifically each secondary reference teaches the limitations of the asserted claims. To the extent that a primary reference is deemed, by itself, not to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention by the combination of the primary reference with one or more of the other primary references listed above and/or the references listed as disclosing those alleged missing limitations in Exhibit B-A.

D. Obvious Combinations

To the extent that a primary reference is deemed, by itself, not to anticipate or render obvious a claim for failing to teach one or more limitations, the claim would nonetheless have been obvious to a person of ordinary skill in the art at the time of the invention by the combination of the primary reference with one or more other primary references and/or the knowledge of

someone skilled in the art. For example, a person of ordinary skill in the art would have been motivated to combine any reference in Exhibits B1 to B11 with any other reference(s) in Exhibit B1 to B11. Such combinations would be achieved, for example, by merely combining the disclosures described in the respective claim charts for each reference.

Defendants also contend that any of the primary references (or combination of primary references) could be combined with any of the secondary references (or combination of secondary references) in Exhibit B-A to render obvious the asserted claims. Such combinations would be achieved by merely combining the disclosures described in the respective claim charts for each reference.

The obviousness combinations are provided in the alternative to Defendants' anticipation contentions and are not to be construed to suggest that any reference included in the combinations is not itself anticipatory.

1. Exemplary Combinations

Below are examples of prior art references that would have been combined by one of ordinary skill in the art at the time of the alleged invention. These combinations are merely examples. The asserted claims of the '331 Patent are rendered obvious by:

- Ban alone or in combination with one or more of Alamouti, Wang, Wallace, Mantravadi, Kim, Fei, Tang, Haustein, and/or Ma.
- Fujii alone or in combination with one or more of Alamouti, Wang, Wallace, Mantravadi, Kim, Fei, Tang, Haustein, and/or Ma.
- Mantravadi alone or in combination with one or more of Ban, Palanki, Wallace, Stamoulis, Kim, Narasimham, Fei, Tang, Haustein, Fukuoka, Matsumoto, and/or Ma.

- Palanki alone or in combination with one or more of Alamouti, Wang, Wallace, Mantravadi, Kim, Fei, Tang, Haustein, and/or Ma.
- Kim alone or in combination with one or more of Choi, Palanki, Ban, Mantravadi, Stamoulis, Kim, Fujii, Lo, Fei, Tang, and/or Haustein.
- Narasimhan alone or in combination with one or more of Choi, Palanki, Ban, Mantravadi, Stamoulis, Kim, Fujii, Lo, Fei, Tang, and/or Haustein.
- Ma alone or in combination with one or more of Choi, Palanki, Ban, Mantravadi, Stamoulis, Kim, Fujii, Lo, Fei, Tang, and/or Haustein.
- Fei alone or in combination with one or more of Alamouti, Wang, Wallace, Mantravadi, Kim, Tang, Haustein, and/or Ma.
- Alexander alone or in combination with one or more of Alamouti, Wang, Wallace, Mantravadi, Kim, Fei, Tang, Haustein, and/or Ma.
- Haustein alone or in combination with one or more of Choi, Palanki, Ban, Mantravadi, Stamoulis, Kim, Fujii, Lo, Fei, and/or Tang.
- Tang alone or in combination with one or more of Choi, Palanki, Ban, Mantravadi, Stamoulis, Kim, Fujii, Lo, Fei, and/or Haustein.

2. Motivations to Combine

To the extent a finder of fact finds that a primary prior art reference does not disclose one or more limitations of an asserted claim, the asserted claim is nevertheless obvious because the alleged missing limitations contain nothing beyond ordinary improvements. In other words, the asserted claim combines known elements to achieve predictable results or chooses between clear alternatives known to those of skill in the art, particularly in view of the state of the art as reflected in the relevant prior art.

Moreover, as explained above, it would have been obvious to a person of skill in the art at the time of the alleged invention of the asserted claims to combine any primary reference with any combination of other primary references or secondary references so as to practice the asserted claims. To the extent that Plaintiff argues that any concept claimed in the asserted claims is not disclosed in a primary reference, it would, at a minimum, have been obvious to adapt the primary reference to include the concept or combine it with other primary references or secondary references that disclose the concept. Each concept described and claimed in the Asserted Patents was known to those of skill in the art as available design choices for wireless communication technologies.³

The Supreme Court has held that “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). “When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one.” *Id.* at 417. As the Supreme Court made clear, “[f]or the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.” *Id.*

To determine whether there is an apparent reason to combine the known elements in the fashion claimed by the patent at issue, a court can “look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art.” *Id.* at

³ Each concept described and claimed in the ’331 Patent was known to those of skill in the art as available design choices for wireless communication technologies.

418. For example, obviousness can be demonstrated by showing “there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent’s claims.” *Id.* at 420. “[A]ny need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* Common sense also teaches that “familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle.” *Id.*

However, the Supreme Court in *KSR* held that a claimed invention can be obvious even if there is no explicit teaching, suggestion, or motivation for combining the prior art to produce that invention. In summary, *KSR* holds that patents that are based on new combinations of elements or components already known in a technical field may be found to be obvious. *See, generally, KSR*, 550 U.S. 398. Specifically, the Court in *KSR* rejected a rigid application of the “teaching, suggestion, or motivation [to combine]” test. *Id.* at 418. “In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. What matters is the objective reach of the claim.” *Id.* at 419. “Under the correct analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *Id.* at 420. A key inquiry is whether the “improvement is more than the predictable use of prior art elements according to their established functions.” *Id.* at 417.

The rationale to combine or modify prior art references is significantly stronger when, as here, the references seek to solve the same problem, come from the same field, and correspond well to each other. *In re Inland Steel Co.*, 265 F.3d 1354, 1362 (Fed. Cir. 2001). The Federal Circuit has held that two references may be combined as invalidating art under similar

circumstances, namely “[the prior art] focus[es] on the same problem that the ... patent addresses: enhancing the magnetic properties of ... steel. Moreover, both [prior art references] come from the same field Finally, the solutions to the identified problems found in the two references correspond well.” *Id.* at 1364 (concerning patents and prior art relating to improving the magnetic and electrical properties of steel).

In view of the Supreme Court’s *KSR* decision, the PTO issued a set of Examination Guidelines. Examination Guidelines for Determining Obviousness Under 35 U.S.C. §103 in view of the Supreme Court Decision in *KSR International Co. v. Teleflex, Inc.*, 72 Fed. Reg. 57526 (October 10, 2007). Those Guidelines summarized the *KSR* decision and identified various rationales for finding a claim obvious, including those based on other precedents. Those rationales include:

- (A) Combining prior art elements according to known methods to yield predictable results;

- (B) Simple substitution of one known element for another to obtain predictable results;

- (C) Use of known technique to improve similar devices (methods, or products) in the same way;

- (D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

- (E) “Obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

- (F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to one of ordinary skill in the art;

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

Id. at 57529. The above rationales likewise apply in rendering obvious the asserted claims of the Asserted Patents.

The references disclosed herein, alone or in combination, contain an explicit and/or implicit teaching or motivation to combine them due to the following: (1) the knowledge generally available to a person of ordinary skill in the art; (2) the prior art references as understood by a person of ordinary skill in the art; (3) the nature of the problem to be solved; (4) the fact that each prior art reference addresses similar problems; and (5) the knowledge of those skilled in the art that the disclosed elements had been or could be used together.

Additionally, the primary and secondary references listed above are analogous art. They are all directed wireless communication technologies, including receiving and decoding data. *See, e.g.*, Ban ¶ [0147] (“First, the above described data symbols in the preceding data block are demodulated and data symbols in the data block are handled as known data using the demodulation result. In this way, since all the pilot symbols and data symbols in the data block can be regarded as known data, the channel can be estimated using the entire data block.”); Fujii ¶ [0040] (“A general object of the present invention is to provide a receiver, a transmitter, a radio communication system and a channel estimation method which can improve channel estimation accuracy while reducing the amount of calculation.”); Mantravadi ¶ [0006] (“The receiver also estimates the response of the wireless channel and uses the channel estimate for three processing steps—to detect for the base stream, to estimate the interference due to the base stream, and to detect for the enhancement stream.”); Palanki ¶ [0109] (“For the data-aided channel estimation technique, the received data symbols are used along with the received pilot symbols for channel estimation.”); Kim at Abstract (“Techniques for efficiently deriving uplink channel estimates without consuming much additional uplink resources are described.”); Narasimham at Abstract (“Method, apparatus, and data packet format to implement transmit diversity in a multicarrier environment is disclosed.”); Ma at 26:10-12 (“Once again, the TPS data, if reliably encoded and

reliably decoded at the receiver can be used as further pilot locations for the purposes of channel estimation.”); Fei at Abstract (“The invention relates to channel estimation in a receiver.”); Alexander at Abstract (“The present invention relates to improved multiple access communications. In one form, the invention relates to an improved signal processing method and apparatus for an iterative method of determining the reception of a signal in a multi user packet based wireless OFDM (Orthogonal Frequency Division Multiplexing) communication system.”); Haustein at Abstract (“A method of transmitting data in a communication network is provided”); Tang at Abstract (“The proposed scheme utilizes the initial estimated channel obtained by the conventional channel estimation to detect the transmitted data symbol in the middle sub-carrier between any two adjacent pilot sub-carriers. Then these symbols are regarded as the ‘extra pilot symbols’ and are applied to estimate the channel on the whole frequency band.”); Wallace ¶ [0010] (“A receiving entity obtains received symbols for the data transmission sent by the transmitting entity. The receiving entity derives an effective channel response matrix, e.g., based on received pilot symbols.”); Alamouti ¶ [0020] (“The estimates developed by channel estimator 22 can be obtained by sending a known training signal that channel estimator 22 recovers, and based on the recovered signal the channel estimates are computed. This is a well known approach.”); Wang ¶ [0004] (“The channel estimation in the receiving device is usually performed on the basis of pilot symbols transmitted from the transmitting device. The receiving device performs a channel estimation by comparing received pilot symbols with an expected pilot symbol to measure the channel response and to tune the receiving device to the best transmission channel, i.e. the transmitting antenna to which the better connection exists.”); Stamoulis ¶ [0022] (“Demodulator 160 provides received pilot symbols to a channel processor 170 and provides received data symbols to a data detector 172. Channel processor 170 derives channel estimates

for the wireless channel between transmitter 110 and receiver 150 and estimates of noise and estimation errors based on the received pilot symbols.”); Fukuoka 1:43-47 (“Herein, FIG. 1 shows an example of a typical aspect of channel estimation errors occurring in arranged locations of data symbols when a channel estimation value estimated based on the amplitude and phase of a received pilot symbol is used”); Lo Abstract (“The method comprises receiving a block of ‘n’ transmitted symbols, the symbols including pilot symbols and ‘d’ data symbols, estimating a channel using the pilot symbols to create a channel estimate.”)

A person of ordinary skill in the art would look to the primary and secondary references to improve or tailor the disclosure thereof to tailor to particular conditions or particular factors. A person of ordinary skill in the art would understand the general trend and motivation to optimize the decoding of data, including providing more accurate channel estimation. A POSITA would have understood that doing so could increase device and/or system performance, including in terms of, for example, call quality, data transmission speed, and data transmission performance. *See, e.g.*, Ban ¶ [0153] (“As described above, using the single carrier transmitter according to the embodiment of the present invention makes it possible to substantially extend the length of cyclic prefix without changing the length of the data block and the length of the cyclic prefix added at the CP addition unit. Furthermore, by using the single carrier receiver according to the embodiment of the present invention and combining the same data symbols transmitted in a plurality of data blocks from the single carrier transmitter according to the embodiment of the present invention, it is possible to realize data demodulation with loss due to substantial extension of the cyclic prefix length (CP length) suppressed to a minimum.”); Fujii ¶ [0040] (“A general object of the present invention is to provide a receiver, a transmitter, a radio communication system and a channel estimation method which can improve channel estimation

accuracy while reducing the amount of calculation.”); Mantravadi ¶ [0006] (“The quality of the channel estimate directly impacts system performance. Thus, techniques that can provide a high quality channel estimate are highly desirable.”); Palanki ¶ [0009] (“Pilot transmission techniques that can avoid high PAPR and channel estimation techniques are described herein.”); Kim at Abstract (“Techniques for efficiently deriving uplink channel estimates without consuming much additional uplink resources are described.”); Narasimham at 2:18-21 (“To address these perceived and related shortcomings, the present invention is directed to a method, apparatus, and data packet suitable for implementing transmit diversity in a multi-carrier environment.”); Ma at 26:10-12 (“Once again, the TPS data, if reliably encoded and reliably decoded at the receiver can be used as further pilot locations for the purposes of channel estimation.”); Fei ¶ [0001] (“The present invention generally relates to radio communications systems, and in particular to improved channel estimation in such systems.”); Alexander at Abstract (“The present invention relates to improved multiple access communications. In one form, the invention relates to an improved signal processing method and apparatus for an iterative method of determining the reception of a signal in a multi user packet based wireless OFDM (Orthogonal Frequency Division Multiplexing) communication system.”); Haustein ¶ [0006] (“Thus, there may be a need for a method of and a device for transmitting data in a communication network which provides an improved performance.”); Tang at Abstract (“In this paper a joint pilot-aided and blind decision-directed channel estimation (PA-DDCE) scheme is proposed to achieve a good tradeoff between the pilots overhead and the system performance.”); Wallace ¶ [0008] (“There is therefore a need in the art for techniques to process data for transmit diversity in a multi-antenna communication system.”); Alamouti ¶ [0002] (“This invention relates to wireless communication and, more particularly, to techniques for effective wireless communication in the

presence of fading and other degradations.”); Wang ¶ [0006] (“The object of the present invention is now to propose a transmitting device and a receiving device for a wireless OFDM communication system with space time transmit diversity as well as a channel estimation method for such a communication system, which allow a simple and effective channel estimation to be performed.”); Stamoulis ¶ [0098] (“The techniques described herein can calculate LLRS in a manner to account for noise and estimation errors due to zeroed-out pilot subbands, which may improve performance.”); Fukuoka 2:1-5 (“It is therefore an object of the present invention to provide a radio communication method and a radio communication apparatus achieving reliably diversity gain when the same data symbols are subjected to symbol combining in a Repetition-type radio communication method.”); Lo at 3:52-54 (“The present invention addresses the deficiencies of the prior art by increasing the accuracy and efficiency of channel estimation in several respects.”).

As an example of those reasons and motivations to combine the references, Ban, Fujii, Mantravadi, Palanki, Kim, Narasimhan, Ma, Fei, Alexander, Haustein, Tang, Wallace, Alamouti, Choi, Wang, Stamoulis, Fukuoka, Matsumoto, and Lo generally relate to transmitting data over a channel, and estimating a channel matrix as part of decoding the data. *See* Ex. B1 to B11 and B-A. The references disclose similar components and techniques for transmitting and receiving data over a channel, and estimating that channel in connection with decoding the received data. *Id.* The attached charts in Ex. B1 to B11 and B-A provide additional reasons and motivations to combine the charted references.

One of skill in the art would also have been motivated to combine the different publications and patents that were authored by employees of a given company or assigned to the same assignee and/or related to the same subject matter. Additionally, one of skill in the art

would have been motivated to combine different references that were authored, developed, or invented by the same individual(s) related to the same subject matter. The common inventor/author/architect of the references demonstrate that they relate to continued work in a common field of effort and continued related developments in that field. One of skill in the art would, therefore, combine the references related to each individual. For example, a POSITA would have been motivated to combine at least Palanki and Mantravadi, based solely on the fact that they have overlapping inventors/authors. Additionally, based on the teachings of the references and/or the knowledge of one of ordinary skill, one of skill in the art would have been motivated to combine different references from the same company. For example, a POSITA would have been motivated to combine at least Palanki, Wallace, and Mantravadi, Stamoulis, and Kim, all of which are or were assigned to the same company: Qualcomm Inc. And, one of skill in the art would have been motivated to combine prior art systems or products with any related or applicable documentation or literature for that system, including for the reason that these materials are related.

In addition, below are additional motivations to combine prior art for particular claim limitations. The following discussion of specific claim limitations are merely examples and are not limiting.

For example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitations 1[a] and/or 1[b] (“receiving a pilot symbol over the communications channel” and “estimating a channel matrix of the communications channel based, at least in part, on the pilot symbol”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitations 1[a] and 1[b] in Exhibits B1 to B11 or Exhibit B-A. For example,

numerous prior art references explicitly describes or implicitly suggests receiving and estimating a channel matrix of the communications channel based, at least in part, on a pilot symbol. *See, e.g.,* Wallace ¶ [0010] (“A receiving entity obtains received symbols for the data transmission sent by the transmitting entity. The receiving entity derives an effective channel response matrix, e.g., based on received pilot symbols.”); Alamouti ¶ [0020] (“The estimates developed by channel estimator 22 can be obtained by sending a known training signal that channel estimator 22 recovers, and based on the recovered signal the channel estimates are computed. This is a well known approach.”); Wang ¶ [0004] (“The channel estimation in the receiving device is usually performed on the basis of pilot symbols transmitted from the transmitting device. The receiving device performs a channel estimation by comparing received pilot symbols with an expected pilot symbol to measure the channel response and to tune the receiving device to the best transmission channel, i.e. the transmitting antenna to which the better connection exists.”); Stamoulis ¶ [0022] (“Demodulator 160 provides received pilot symbols to a channel processor 170 and provides received data symbols to a data detector 172. Channel processor 170 derives channel estimates for the wireless channel between transmitter 110 and receiver 150 and estimates of noise and estimation errors based on the received pilot symbols.”); Fukuoka 1:43-47 (“Herein, FIG. 1 shows an example of a typical aspect of channel estimation errors occurring in arranged locations of data symbols when a channel estimation value estimated based on the amplitude and phase of a received pilot symbol is used”); Lo Abstract (“The method comprises receiving a block of ‘n’ transmitted symbols, the symbols including pilot symbols and ‘d’ data symbols, estimating a channel using the pilot symbols to create a channel estimate.”). It would have been obvious to combine any primary reference with any of Wallace, Alamouti, Wang, Stamoulis, Fukuoka, Matsumoto, or Lo to satisfy limitations 1[a] and/or 1[b].

A person skilled in the art would have recognized that receiving pilot symbols and using them to estimate a channel matrix was a “well known approach” to estimate impacts of the channel on the transmitted data and more accurately decode the data. *See, e.g.*, Alamouti ¶ [0020]. Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations.

For example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitations 1[c] and/or 1[d] (“receiving replicated data from multiple data streams transmitted over the communications channel” and “decoding the replicated data using the estimated channel matrix”) or dependent claim 5 (“wherein the replicated data includes same data symbols in multiple data streams”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the primary reference with any of the prior art that discloses limitations 1[c] and 1[d], as well as dependent claim 5, in Exhibits B1 to B11 or Exhibit B-A.

For example, numerous prior art references disclose receiving and decoding replicated data from multiple streams. *See, e.g.*, Palanki ¶ [0105] (“The sequence of K equalized data symbols from equation (24) contains S copies of the transmitted data symbols.”), Ban ¶ [0139] (“An eighth received data symbol A8 of the received data block A and a sixth received data symbol A8’ of the received data block B correspond to the same transmission data symbol (a8 in FIG. 2(A))”), Fei ¶ [0058] (“In the CC scheme, the retransmitted data block is based on identical bits as a previous (original) data block. In the IR scheme, each data block is encoded with

redundancy and punctured into a number of versions, often referred to as sub-blocks for transmission to the receiver.”), Haustein at Abstract (“initiating a retransmission of the data packet comprising a third plurality of pilot signals, wherein some of the pilot signals of the third plurality of pilot signals are formed by converted payload data of the second plurality of payload data”), Tang at Abstract (“The proposed scheme utilizes the initial estimated channel obtained by the conventional channel estimation to detect the transmitted data symbol in the middle sub-carrier between any two adjacent pilot sub-carriers. Then these symbols are regarded as the ‘extra pilot symbols’ and are applied to estimate the channel on the whole frequency band.”), Wallace ¶ [0009] (“In an embodiment, a transmitting entity processes one or more (N_D) data symbol streams and generates multiple (N_C) coded symbol streams. Each data symbol stream may be sent as a single coded symbol stream or as two coded symbol streams using, e.g., space-time transmit diversity (STTD), space-frequency transmit diversity (SFTD), or orthogonal transmit diversity (OTD).”), Alamouti ¶ [0010] (“Space diversity is effected by redundantly transmitting over a plurality of antennas; time diversity is effected by redundantly transmitting at different times; and frequency diversity is effected by redundantly transmitting at different frequencies.”), Choi 2:38-40 (“The receiver combines each of the signals that correspond to the repetition coded values and then uses the combined signal to recover the values.”), Wang ¶ [0023] (“Further, the base station 1 comprises a encoding means 3 for encoding a data stream on the basis of a space time transmit diversity (STTD) scheme and outputting a first and a second STTD encoded data stream to a multiplexer 4. The first STTD encoded data stream is to be transmitted via the first antenna 5 and the second STTD encoded data stream is to be transmitted via the second antenna 6.”), Stamoulis ¶ [0027] (“The last C samples in the sequence are copied to the start of the sequence to form an OFDM symbol that contains $K+C$ samples.”), Fukuoka 1:15-20

(“Conventionally, a Repetition type radio communication method has been known where a transmitting-side radio communication apparatus transmits a radio signal including a plurality of same data symbols, and a receiving-side radio communication apparatus combines symbols of the same data symbols included in the received radio signal and obtains diversity gain.”), Matsumoto ¶ [0048] (“With repetition OFDM, ‘repetition symbols’ (referring to data symbols obtained by duplicating a data symbol) in a radio frame are combined at the receiving side, and, as a result, the SNR after combining improves.”). A person skilled in the art would have recognized that these and other schemes could be implemented in the other data transmission schemes to improve the receipt and decoding of the data.

Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations. It would have been obvious to combine any primary reference with any of Palanki, Ban, Fei, Haustein, Tang, Wallace, Alamouti, Choi, Wang, Stamoulis, Fukuoka, and Matsumoto to satisfy limitations 1[c] and/or 1[d], as well as dependent claim 5.

For example, to the extent that any primary reference is deemed not to anticipate a claim for failing to teach limitations 1[e] and/or 1[f] (“generating an updated estimate of the channel matrix based, at least in part, on the replicated data” and “decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix”), it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine

the primary reference with any of the prior art that discloses limitations 1[e] and 1[f] in Exhibits B1 to B11 or Exhibit B-A.

For example, several prior art references disclose generating an updated estimate of a channel matrix based on replicated data and decoding subsequently received signals using the updated estimate. *See, e.g.*, Palanki ¶ [0109] (“A second channel estimate is then derived based on the received data symbols and the data symbol estimates.”), Ban ¶ [0147] (“First, the above described data symbols in the preceding data block are demodulated and data symbols in the data block are handled as known data using the demodulation result. In this way, since all the pilot symbols and data symbols in the data block can be regarded as known data, the channel can be estimated using the entire data block”), Fei ¶ [0109] (“[T]he resulting combined reference information is input to the channel estimator of the receiver and is used in a refined channel response estimation for the second block.”), Mantravadi ¶ [0009] (“A second (data-directed or decision-directed) channel estimate is derived based on the remodulated symbols. The first and second channel estimates are then combined to obtain a third (enhanced) channel estimate having higher quality.”), Fujii ¶ [0077] (“In the succeeding estimation process, each of the channel estimators 102-1, ... , 102-M uses the estimated transmit symbols $s_1 \sim s_N$ instead of the pilot signals, to estimate a channel more accurately.”), Stamoulis at Abstract (“Data detection is performed on the received data symbols with the channel estimates to obtain data symbol estimates. Estimates of noise and estimation errors due to the zeroed-out pilot sub bands are derived. LLRs are then computed based on the data symbol estimates, the channel estimates, and the estimates of the noise and estimation errors. The LLRs are deinterleaved and decoded to obtain decoded data.”), Lo 4:16-18 (“The symbol compensator compensates the group of ‘m’ strongest symbols using the initial estimate and re-estimates the channel using the compensated

symbols and pilot symbols.”). Based on any of these references, it would have been obvious to a person of ordinary skill to generate an updated estimate of the channel matrix using replicated data for decoding subsequent received data.

A person skilled in the art would have recognized that that use of data in channel estimation was well known and routine. Thus, a person of ordinary skill in the art would have been motivated to modify any of the primary references to include this feature. A person of ordinary skill in the art would also have had a reasonable expectation of success. A person of ordinary skill in the art would have understood that these references disclose interrelated teachings based on routine technologies and would have been amenable to various well-understood and predictable combinations. It would have been obvious to combine any primary reference with any of Palanki, Ban, Mantravadi, Fei, Fujii, Stamoulis, and Lo to satisfy limitations 1[e] and 1[f].

V. Invalidity Contentions Under 35 U.S.C. § 112

Defendants include below the grounds on which Defendants contend the asserted claims are invalid for failure to meet the requirements of the first two paragraphs of 35 U.S.C. § 112.

Plaintiff has not yet provided a claim construction for many of the terms and phrases that Defendants anticipate will be in dispute. Defendants, therefore, cannot provide a complete list of its § 112 defenses because Defendants do not know whether Plaintiff will proffer a construction for certain terms and phrases that is broader than, or inconsistent with, the construction that would be supportable by the disclosure set forth in the specification.

To the extent the following contentions reflect constructions of claim limitations consistent with or implicit in Plaintiff’s Infringement Contentions, no inference is intended nor should any be drawn that Defendants agree with Plaintiff’s claim constructions, and Defendants expressly reserve the right to contest such claim constructions. Defendants offer these

contentions in response to Plaintiff's Infringement Contentions and without prejudice to any position it may ultimately take as to any claim construction issues.

Accordingly, Defendants reserve the right to amend or supplement these § 112 Invalidity Contentions as discovery progresses.

A. Indefiniteness Under 35 U.S.C. § 112, ¶ 2

35 U.S.C. § 112, ¶ 2 requires that a patent claim “particularly point[] out and distinctly claim[] the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. Claim terms that fail to inform those skilled in the art “with reasonable certainty ... about the scope of the invention” fail the definiteness requirement of 35 U.S.C. § 112, ¶ 2. *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014).

Each of the asserted claims are invalid as indefinite under 35 U.S.C. § 112 because they fail to particularly point out and distinctly claim the subject matter which the applicant regards as his invention. In particular, the following limitations, read in light of the intrinsic evidence, fail to inform those skilled in the art with reasonable certainty about the scope of the claimed inventions:

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- Claims 25 and 29: “[first/second] circuitry coupled to the [first/second] antenna and configured to process signals for transmission by the [first/second] antenna”
- Claims 25 and 29: “a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode ... and a single-input multiple-output (SIMO) mode...”

- Claims 25 and 29: “wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry”
- Claim 25: “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station”
- Claim 29: “wherein the control signal is based, at least in part, on a number of users of the communications system”

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- Claim 1: “receiving replicated data from multiple data streams transmitted over the communications channel”
- Claim 1: “decoding the replicated data using the estimated channel matrix”
- Claim 1: “generating an updated estimate of the channel matrix based, at least in part, on the replicated data”
- Claim 1: “decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix”
- Claim 5: “wherein the replicated data includes same data symbols in multiple data streams.”
- Claim 6: “a receiver configured to receive signals over a communications channel, wherein the signals are based at least in part on first and second data streams transmitted over a communications channel, wherein the second data stream includes at least one data symbol replicated from the first data stream”
- Claim 6: “a decoder coupled to the receiver and the channel estimator, wherein the decoder is configured to receive the received signals and decode the at least one data symbol replicated from the first data stream”

- Claim 6: “a channel estimator coupled to the decoder and the receiver, wherein the channel estimator is configured to receive the received signals and the decoded at least one data symbol, wherein the channel estimator is configured to estimate a channel matrix of the communications channel based, at least in part, on the decoded at least one data symbol”
- Claim 6: “wherein the decoder is further configured to decode subsequent received signals based, at least in part, on the estimate of the channel matrix.”

B. Lack of Enablement/Lack of Written Description Under 35 U.S.C. § 112, ¶ 1

The asserted claims of the Patents-In-Suit are further invalid under 35 U.S.C. § 112, ¶ 1 because the specifications do not contain an adequate written description of the subject matter of these claims and would not enable one of skill in the relevant art to make and use the alleged invention.

For a claim to be valid, the specification must contain a written description of the invention. 35 U.S.C. § 112, ¶ 1. To fulfill the written description requirement, it “must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed.” *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (citation and internal quotation marks omitted). “[T]he applicant must ‘convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention,’ and demonstrate that by disclosure in the specification of the patent.” *Carnegie Mellon Univ. v. Hoffmann-La Roche Inc.*, 541 F.3d 1115, 1122 (Fed. Cir. 2008) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64 (Fed. Cir. 1991)).

The specification must also describe “the manner and process of making and using [the invention], in such full, clear, concise, and exact terms as to enable any person skilled in the art

to which it pertains ... to make and use the” invention. *Ariad*, 598 F.3d at 1343; *see also* 35 U.S.C. § 112 ¶ 1. “The enablement requirement is satisfied when one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation.” *AK Steel Corp. v. Sollac & Ugine*, 344 F.3d 1234, 1244 (Fed. Cir. 2003) (citation omitted). “[T]he scope of the claims must be less than or equal to the scope of the enablement.” *Nat’l Recovery Tech., Inc. v. Magnetic Separation Sys., Inc.*, 166 F.3d 1190, 1196 (Fed. Cir. 1999).

Each of the asserted claims below are invalid because the specifications fail to provide written description and/or an enabling disclosure of at least the following limitations:

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- Claims 25 and 29: “[first/second] circuitry coupled to the [first/second] antenna and configured to process signals for transmission by the [first/second] antenna”
- Claims 25 and 29: “a controller coupled to the first and second circuitry, wherein the controller is configured to receive a control signal and, in accordance with the control signal, to select between a multiple-input multiple-output (MIMO) mode ... and a single-input multiple-output (SIMO) mode...”
- Claims 25 and 29: “wherein the control signal is based, at least in part, on a power consumption of the first and second circuitry”
- Claim 25: “wherein the control signal is based, at least in part, on an idle power consumption of the mobile station”
- Claim 29: “wherein the control signal is based, at least in part, on a number of users of the communications system”

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- Claim 1: “receiving replicated data from multiple data streams transmitted over the communications channel”
- Claim 1: “decoding the replicated data using the estimated channel matrix”
- Claim 1: “generating an updated estimate of the channel matrix based, at least in part, on the replicated data”
- Claim 1: “decoding subsequently received signals over the communications channel using the updated estimate of the channel matrix”
- Claim 5: “wherein the replicated data includes same data symbols in multiple data streams.”
- Claim 6: “a receiver configured to receive signals over a communications channel, wherein the signals are based at least in part on first and second data streams transmitted over a communications channel, wherein the second data stream includes at least one data symbol replicated from the first data stream”
- Claim 6: “a decoder coupled to the receiver and the channel estimator, wherein the decoder is configured to receive the received signals and decode the at least one data symbol replicated from the first data stream”
- Claim 6: “a channel estimator coupled to the decoder and the receiver, wherein the channel estimator is configured to receive the received signals and the decoded at least one data symbol, wherein the channel estimator is configured to estimate a channel matrix of the communications channel based, at least in part, on the decoded at least one data symbol”
- Claim 6: “wherein the decoder is further configured to decode subsequent received signals based, at least in part, on the estimate of the channel matrix.”

VI. Subject Matter Ineligibility

Pursuant to the Court's Docket Control Order and the Court's Standing Order Regarding Subject Matter Eligibility Contentions Applicable to All Patent Infringement Cases Assigned to Chief District Judge Rodney Gilstrap ("Order Regarding Eligibility"), Defendants provide the following disclosure:

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In addition to the preceding invalidity contentions, Defendants further contend that each of the asserted claims of the '120 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The '120 Patent's asserted claims are invalid under 35 U.S.C. § 101 for failure to recite patent-eligible subject matter. Specifically, all asserted claims of the '120 patent are fatally abstract under the U.S. Supreme Court's decision in *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208 (2014) and progeny. The abstract ideas presented in the claims are generally directed to the abstract concept of selecting transmission mode to optimize power consumption. Under Alice Step 1, those ideas are abstract, as they relate to a fundamental long prevalent practice of selecting transmission mode to optimize power consumption. *See Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1314 (Fed. Cir. 2016); *Silver State Intellectual Techs. v. Facebook Inc.*, 2018 WL 1729444, at *4-*5 (N.D. Cal. 2018); *VeriPath, Inc. v. Didomi*, 2020 WL 1503687, at *3-*4 (S.D.N.Y. 2020); *Kaleasy Tech LLC v. Slack Techs., Inc.*, 2020 WL 4260605, at *4-*6 (D. Del. 2020); *Grecia v. Bank of New York Mellon Corp.*, 2020 WL 1979276, at *4-*9 (S.D.N.Y. 2020); *Tele-Publishing, Inc. v. Facebook, Inc.*, 2017 WL 1959218, at *5-*10 (D. Mass. 2017); *Atos, LLC v. Allstate Ins. Co.*, 2021 WL 6063963, at *9-*12 (N.D. Ill. 2021); *ChargePoint, Inc. v. SemaConnect, Inc.*, 2018 WL 1471685, at *8-*11 (D. Md. 2018), *aff'd*, 920 F.3d 759, 768-75 (Fed. Cir. 2019); *UbiComm, LLC v. Zappos IP, Inc.*, 2013 WL 6019203, at *3-*6 (D. Del. 2013); *Ericsson Inc. v. TCL Commc'n Tech. Holdings Ltd.*, 955 F.3d 1317, 1326-31

(Fed. Cir. 2020); *Broadcom Corp. v. Netflix Inc.*, 2022 WL 1105073, at *4–*6 (N.D. Cal. 2022); *CG Tech. Dev., LLC v. Fanduel, Inc.*, 2020 WL 1064863, at *3–*5 (D. Del. 2020); *CardioNet, LLC v. Scottcare Corp.*, 2019 WL 3072702, at *7–*10, *19–*21 (E.D. Pa. 2019); *RingCentral, Inc. v. Dialpad, Inc.*, 2019 WL 1102986, at *3–*6 (N.D. Cal. 2019); *Umbanet, Inc. v. Epsilon Data Mgmt., LLC*, 2017 WL 1398274, at *4–*5 (E.D. Tex. 2017); *Protegrity USA, Inc. v. Netskope, Inc.*, 2015 WL 6126599, at *6–*8 (N.D. Cal. 2015); *Mantissa Corp. v. Ondot Sys., Inc.*, 2017 WL 3437773, at *7–*19 (S.D. Tex. 2017); *Beteiro, LLC v. BetMGM, LLC*, 2022 WL 4092946, at *6–*10 (D.N.J. 2022); *Mira Advanced Tech. Sys., Inc. v. Google LLC*, 2022 WL 3925235, at *4–*6 (S.D.N.Y. 2022); *Liquet Techs., Inc. v. Tile, Inc.*, 2021 WL 4198521, at *4–*7 (N.D. Cal. 2021); *RDPA, LLC v. Geopath, Inc.*, 2021 WL 2440700, at *12–*17 (S.D.N.Y. 2021); *B# on Demand LLC v. Spotify Tech. S.A.*, 2020 WL 5369185, at *8–*14 (D. Del. 2020); *ClearDoc, Inc. v. RiversideFM, Inc.*, 2022 WL 3355960, at *3–*5 (D. Del. 2022); *DigiMedia Tech, LLC v. ViacomCBS Inc.*, 2022 WL 836788 at *5–*8 (S.D.N.Y. 2022). A claim is drawn to an abstract idea when “humans have always performed [the claimed] functions.” *Content Extraction & Transmission LLC v. Wells Fargo Bank, NA*, 776 F.3d 1343, 1347 (Fed. Cir. 2014). Limiting the invention to a particular technological environment, e.g., generic computer hardware, “do[es] not render an otherwise abstract concept any less abstract.” *Intellectual Ventures I LLC v. Capital One Fin. Corp.*, 850 F.3d 1332, 1340 (Fed Cir. 2017). Furthermore, because the patent relates to transmission of information, it is likewise abstract, as “information is ... an intangible.” *Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 6290, 6293 (Fed. Cir. 2016).

Moreover, under Alice Step 2, the ’120 Patent does not contain any inventive concept. The ’120 Patent’s asserted claims employ well-known components (e.g., a “mobile station,” a

“communication system,” an “antenna,” “circuitry,” and a “controller”) or functionality (e.g., “process,” “receive,” and “select”), as reflected in Defendants’ invalidity contentions under 35 U.S.C. §§ 102-103, which is not enough to impart patent-eligibility to an abstract idea. *See, e.g., Alice*, 573 U.S. at 225 (holding that limitations describing “‘well-understood, routine, conventional activit[ies]’ previously known to the industry” were insufficient to supply an inventive concept (quoting *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 73 (2012))).

Further details regarding Defendants’ contentions that the asserted claims of the ’120 Patent do not qualify as patent-eligible subject matter are contained in Exhibit A-B (chart of patent ineligibility). Specifically, pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit A-B contains a chart identifying each exception to eligibility to which each asserted claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit A-B, each asserted claim of the ’120 Patent is directed to an abstract idea and therefore is not directed to patent eligible subject matter. Exhibit A-B also identifies claim 25 as representative of the other asserted claims for purposes of the eligibility inquiry. In addition, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit A-B, which references and incorporates information from Exhibits A1 to A9, read in conjunction with the preceding paragraphs herein, provides: (i) a description of how each element of each asserted claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the asserted claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the '120 Patent, the relevant industry was well-developed. Computing devices and mobile communication devices (or “mobile stations”), including with antenna(s), circuitry, and controller(s), and including processing, receiving, and selecting functionality, had been in use for several decades, and all individual elements disclosed and recited in the '120 Patent were conventional, routine, and well known in the wireless communication industry. *See generally* Exhibits A1 to A9. By way of example, mobile stations for use in a communications system were well-known. *See, e.g.,* Exhibits A1 to A9 at Element 25[pre]. Moreover, these known mobile stations frequently included antenna(s), circuitry, and controller(s). *See, e.g.,* Exhibits A1 to A9 at Elements 25[a]-25[c]. Indeed, none of these concepts were new or merely on the verge of development as of the alleged priority date of the '120 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The '120 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

'331 Patent

In addition to the preceding invalidity contentions, Defendants further contend that each of the asserted claims of the '331 Patent is drawn to subject matter that is not patentable under 35 U.S.C. § 101. The '331 Patent's asserted claims are invalid under 35 U.S.C. § 101 for failure to recite patent-eligible subject matter. Specifically, all asserted claims of the '331 Patent are fatally abstract under the Supreme Court's decision in *Alice Corp. v. CLS Bank Int'l*, 573 U.S. 208 (2014) and progeny. The abstract ideas presented in the claims are generally directed to the abstract concept of receiving and decoding data. Under Alice Step 1, those ideas are abstract, as

they relate to a fundamental long prevalent practice of receiving and decoding data. *See Intellectual Ventures I LLC v. Symantec Corp.*, 838 F.3d 1307, 1314 (Fed. Cir. 2016); *UbiComm, LLC v. Zappos IP, Inc.*, 2013 WL 6019203, at *3-*6 (D. Del. 2013); *Atos, LLC v. Allstate Ins. Co.*, 2021 WL 6063963, at *9-*12 (N.D. Ill. 2021); *ChargePoint, Inc. v. SemaConnect, Inc.*, 2018 WL 1471685, at *8-*11 (D. Md. 2018), *aff'd*, 920 F.3d 759, 768-75 (Fed. Cir. 2019); *Ericsson Inc. v. TCL Commc'n Tech. Holdings Ltd.*, 955 F.3d 1317, 1326-31 (Fed. Cir. 2020); *Broadcom Corp. v. Netflix Inc.*, 2022 WL 1105073, at *4-*6 (N.D. Cal. 2022); *Silver State Intellectual Techs. v. Facebook Inc.*, 2018 WL 1729444, at *4-*5 (N.D. Cal. 2018); *VeriPath, Inc. v. Didomi*, 2020 WL 1503687, at *3-*4 (S.D.N.Y. 2020); *Kaleasy Tech LLC v. Slack Techs., Inc.*, 2020 WL 4260605, at *4-*6 (D. Del. 2020); *Grecia v. Bank of New York Mellon Corp.*, 2020 WL 1979276, at *4-*9 (S.D.N.Y. 2020); *Tele-Publishing, Inc. v. Facebook, Inc.*, 2017 WL 1959218, at *5-*10 (D. Mass. 2017); *CG Tech. Dev., LLC v. Fanduel, Inc.*, 2020 WL 1064863, at *3-*5 (D. Del. 2020); *CardioNet, LLC v. Scottcare Corp.*, 2019 WL 3072702, at *7-*10, *19-*21 (E.D. Pa. 2019); *RingCentral, Inc. v. Dialpad, Inc.*, 2019 WL 1102986, at *3-*6 (N.D. Cal. 2019); *Umbanet, Inc. v. Epsilon Data Mgmt., LLC*, 2017 WL 1398274, at *4-*5 (E.D. Tex. 2017); *Protegrity USA, Inc. v. Netskope, Inc.*, 2015 WL 6126599, at *6-*8 (N.D. Cal. 2015); *Mantissa Corp. v. Ondot Sys., Inc.*, 2017 WL 3437773, at *7-*19 (S.D. Tex. 2017); *Beteiro, LLC v. BetMGM, LLC*, 2022 WL 4092946, at *6-*10 (D.N.J. 2022); *Mira Advanced Tech. Sys., Inc. v. Google LLC*, 2022 WL 3925235, at *4-*6 (S.D.N.Y. 2022); *Linquet Techs., Inc. v. Tile, Inc.*, 2021 WL 4198521, at *4-*7 (N.D. Cal. 2021); *RDPA, LLC v. Geopath, Inc.*, 2021 WL 2440700, at *12-*17 (S.D.N.Y. 2021); *B#on Demand LLC v. Spotify Tech. S.A.*, 2020 WL 5369185, at *8-*14 (D. Del. 2020); *ClearDoc, Inc. v. RiversideFM, Inc.*, 2022 WL 3355960, at *3-*5 (D. Del. 2022); *DigiMedia Tech, LLC v. ViacomCBS Inc.*, 2022 WL 836788 at *5-*8 (S.D.N.Y. 2022).

A claim is drawn to an abstract idea when “humans have always performed [the claimed] functions.” *Content Extraction & Transmission LLC v. Wells Fargo Bank, NA*, 776 F.3d 1343, 1347 (Fed. Cir. 2014). Limiting the invention to a particular technological environment, *e.g.* a generic mobile platform, “do[es] not render an otherwise abstract concept any less abstract.” *Intellectual Ventures I LLC v. Capital One Fin. Corp.*, 850 F.3d 1332, 1340 (Fed Cir. 2017). Furthermore, because the patent relates to transmission of information, it is likewise abstract, as “information is ... an intangible.” *Electric Power Group, LLC v. Alstom S.A.*, 830 F.3d 6290, 6293 (Fed. Cir. 2016).

Moreover, under Alice Step 2, the ’331 Patent does not contain any inventive concept. The ’331 Patent’s asserted claims employ well-known components (*e.g.*, “a communication device,” “a receiver,” “a decoder,” and “a channel estimator”), as reflected in Defendants’ invalidity contentions under 35 U.S.C. §§ 102-103, which is not enough to impart patent-eligibility to an abstract idea. *See, e.g., Alice*, 573 U.S. at 225 (holding that limitations describing “‘well-understood, routine, conventional activit[ies]’ previously known to the industry” were insufficient to supply an inventive concept (quoting *Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. 66, 73 (2012))).

Further details regarding Defendants’ contentions that the asserted claims of the ’331 Patent do not qualify as patent-eligible subject matter are contained in Exhibit B-B (chart of patent ineligibility). Specifically, pursuant to section (a)(1) of the Order Regarding Eligibility, Exhibit B-B contains a chart identifying each exception to eligibility to which each asserted claim is directed and the factual and legal basis therefor. For avoidance of doubt, and as set forth above and in Exhibit B-B, each asserted claim of the ’331 Patent is directed to an abstract idea and therefore is not directed to patent eligible subject matter. Exhibit B-B also identifies claim

6 as representative of the other asserted claims for purposes of the eligibility inquiry. In addition, pursuant to section (a)(2)(B) and (a)(3) of the Order regarding Eligibility, Exhibit B-B which references and incorporates information from Exhibits B1 through B11, read in conjunction with the preceding paragraphs herein, provides: (i) a description of how each element of each asserted claim, both individually and in combination with the other elements of that claim, was well understood, routine, and/or conventional in the relevant industry at the relevant time and (ii) an identification of the factual or legal basis for how the asserted claims are otherwise ineligible for patent protection.

Finally, pursuant to section (a)(2)(A) of the Order Regarding Eligibility, Defendants provide the following description of the relevant industry at the relevant time. As of the alleged priority date for the '331 Patent, the relevant industry was well-developed. Mobile platforms in general had been in use for several decades, including mobile platforms performing channel estimation using both pilot symbols and data, and all individual elements disclosed and recited in the '331 Patent were conventional, routine, and well known in the mobile communication industry. *See generally* *See, e.g.*, Exhibits B1 to B11 and B-A at Elements 1[pre], 6[pre]. By way of example, mobile platforms with receivers that included a decoder and channel estimator were well-known. *See, e.g.*, Exhibits B1 to B11 and B-A at Elements 1[a]-1[f]. Indeed, none of these concepts were new or merely on the verge of development as of the alleged priority date of the '331 Patent. Instead, these concepts had been known for years and were the subject of many published articles and/or patents from around the world. The '331 Patent contributed nothing beyond what was already conventional, routine, well-known technology as of the relevant time period.

VII. Document Production

Pursuant to Patent Local Rule 3-4, Defendants are concurrently producing the prior art identified in these Invalidity Contentions, but Defendants are not required to produce the prior art in the file history of the Asserted Patents.

In addition, based on its investigations to date, and to the extent not already produced, Defendants are concurrently producing source code, specifications, schematics, flow charts, artwork, formulas, or other documentation sufficient to show the operation of any aspects or elements of the Accused Instrumentalities identified by Plaintiff in its P. R. 3-1(c) chart.

Defendants reserve the right to supplement these productions with additional documentation, in accordance with the Federal Rules of Civil Procedure, the Local Rules, the Court's orders and other applicable rules and statutes.

Dated: March 29, 2024

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to the Federal Rules of Civil Procedure, I hereby certify that, on March 29, 2024, all counsel of record who have appeared in this case are being served with a copy of the foregoing via the electronic mail.

/s/ Brian A. Treggs
Brian A. Treggs
Case Manager
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