

**IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

INTELLECTUAL VENTURES I LLC	§	
and	§	
INTELLECTUAL VENTURES II LLC,	§	Case No.: 6:23-cv-00292-ADA
	§	
Plaintiffs,	§	
	§	
v.	§	
	§	
ZEBRA TECHNOLOGIES	§	
CORPORATION,	§	
	§	
Defendant.	§	

**DEFENDANT ZEBRA TECHNOLOGIES CORPORATION’S THIRD
SUPPLEMENTAL INVALIDITY CONTENTIONS**

Pursuant to the Scheduling Order (Dkt. 26), Defendant Zebra Technologies Corporation (“Zebra”) provides these Third Supplemental Invalidity Contentions to Plaintiffs Intellectual Ventures I LLC and Intellectual Ventures II LLC (“IV”). Zebra contends that each of the patent claims asserted by IV is invalid under at least one or more of 35 U.S.C. §§ 101, 102, 103, and 112. These Third Supplemental Invalidity Contentions incorporate by reference Zebra’s Preliminary Invalidity Contentions served on December 19, 2023, Zebra’s First Supplemental Invalidity Contentions served on January 5, 2024, and Zebra’s Second Supplemental Invalidity Contentions served on March 1, 2024. These Third Supplemental Invalidity Contentions include newly discovered references charted against U.S. Patent No. 7,623,439, and which were not reasonably known to Zebra at the time it served its Preliminary Invalidity Contentions, First Supplemental Invalidity Contentions, or Second Supplemental Invalidity Contentions.

These Third Supplemental Invalidity Contentions are based on Zebra’s current knowledge of the asserted patents and prior art, along with its understanding of IV’s Disclosure of Amended First Supplemental Infringement Contentions, served on September 26, 2023 (“Infringement Contentions”). Zebra’s investigation of the prior art and its invalidity defenses is ongoing, and Zebra expressly reserves the right to supplement or otherwise amend these Third Supplemental Invalidity Contentions as the case proceeds, including as expressly permitted by the Scheduling Order (Dkt. 26) and the Court’s orders. These Third Supplemental Invalidity Contentions use the acronym “POSITA” to refer to a person having ordinary skill in the art to which the claimed inventions pertain.

I. GENERAL STATEMENTS AND RESERVATIONS

A. Asserted Claims

On September 26, 2023, IV served Zebra with IV’s Amended First Supplemental Infringement Contentions (“Infringement Contentions”), wherein IV alleges infringement of the following claims (collectively, “the Asserted Claims”) of U.S. Patent No. 7,623,439 (“the ’439 patent”), and U.S. Patent No. 7,646,835 (“the ’835 patent”) (collectively, “the Asserted Patents”):

	Asserted Patent	Asserted Claim(s)
A	’439 Patent	1-3, 7-11, 13-16, 18
B	’835 Patent	1-12, 17-20, 23

Zebra does not provide any Third Supplemental Invalidity Contentions regarding any claims not asserted against Zebra by IV. To the extent that IV is permitted to assert additional claims against Zebra in the future, Zebra reserves all rights to disclose new or supplemental invalidity contentions regarding such claims.

Moreover, IV’s Infringement Contentions are deficient in multiple respects and do not provide Zebra with sufficient information to understand the specific accused features and

components and the alleged factual and evidentiary bases for IV's allegations. IV has thus substantially prejudiced Zebra's ability to understand, for purposes of preparing these Third Supplemental Invalidity Contentions, what IV alleges to be the scope of the Asserted Claims. Additionally, while IV purports to accuse over one hundred products collectively across its Infringement Contentions, IV has, in fact, provided specific claim charts for only a limited number of products with respect to the Asserted Patents. For example, IV has only provided specific claim charts for, at most, two different products with respect to the '439 Patent, and likewise only provided specific claim charts for, at most, two different products with respect to the '835 Patent.

If IV modifies any assertion or contention in IV's Infringement Contentions or presents any new assertion or contention relevant to these Third Supplemental Invalidity Contentions, Zebra reserves the right to supplement or otherwise amend these Third Supplemental Invalidity Contentions. Zebra further reserves the right to supplement or otherwise amend these Third Supplemental Invalidity Contentions in the event that IV provides amended Infringement Contentions and to the extent the Court orders or allows IV to amend its Infringement Contentions.

B. Priority Dates of the Asserted Claims

In IV's Infringement Contentions, IV asserts that the Asserted Patents are entitled to the following priority dates:

	Asserted Patent	IV's Alleged Priority Date
A	'439 Patent	May 20, 2004
B	'835 Patent	November 17, 2003

It is IV's burden to show entitlement to its asserted priority dates, and Zebra asserts that IV has failed to meet that burden. For example, IV has failed to show that the '439 Patent is entitled to a priority date earlier than the filing of the applications that issued as the '439 Patent. In addition, IV has not identified the date of conception for any Asserted Patent nor produced any documents

evidencing the conception and reduction to practice for each claimed invention, as required by the Court's Standing Order Governing Proceedings – Patent Cases.

Nevertheless, Zebra has focused on prior art that predates the respective priority dates alleged by IV. Zebra reserves the right to amend its Third Supplemental Invalidity Contentions with additional prior art and/or with additional invalidity charts if IV changes its position and alleges any earlier or later priority dates, including based on any alleged dates of conception.

Nothing herein constitutes an admission concerning the priority date, conception date, or date of reduction to practice of any Asserted Claim.

C. Claim Construction

The Court has not yet construed the Asserted Claims. Zebra reserves the right to identify prior art or to supplement these Third Supplemental Invalidity Contentions because Zebra's position on invalidity of certain claims may depend on how those claims are construed by the Court. Zebra's Third Supplemental Invalidity Contentions are based, at least in part, on Zebra's present understanding of the Asserted Claims and/or its present understanding of the claim constructions IV appears to be using—based on IV's Infringement Contentions—whether or not Zebra agrees with such claim constructions.

To the extent that these Third Supplemental Invalidity Contentions reflect constructions of claim terms that may be consistent with or implicit in IV's Infringement Contentions, no inference is intended or should be drawn that Zebra agrees with such claim construction(s). Zebra takes no position on any matter of claim construction in these Third Supplemental Invalidity Contentions. Any statement herein describing or tending to describe any claim element is provided solely for the purpose of understanding the relevant prior art. Zebra expressly reserves the right to propose any claim construction it considers appropriate and/or to contest any claim construction it

considers inappropriate. Nothing contained in these Third Supplemental Invalidity Contentions, or any accompanying appendices should be understood or deemed to be an express or implied admission or contention with respect to the proper constructions of any terms in the Asserted Claims. The information provided shall not be deemed an admission regarding the scope of any claims or the proper construction of those claims or any terms contained therein. Zebra expressly reserves the right to take positions with respect to claim construction issues that are inconsistent with, or even contradictory to, claim construction positions expressed or implied in these Third Supplemental Invalidity Contentions. Moreover, nothing herein admits in any way that any of Zebra's accused products or services, or any of Zebra's other products or services, infringes any of the Asserted Claims.

D. Ongoing Discovery and Disclosures

Zebra provides these Third Supplemental Invalidity Contentions as provided for in the Scheduling Order (Dkt. 26). Discovery in this case is in its early stages, however, and Zebra's investigation, including Zebra's search for prior art, is ongoing. Zebra therefore reserves the right to further supplement or alter the positions taken and information disclosed in these Third Supplemental Invalidity Contentions including, without limitation, the prior art and grounds of invalidity set forth herein, to take into account information or defenses that may come to light as a result of these continuing efforts, including, but not limited to, positions that IV or expert witnesses may take concerning claim construction, infringement, and/or invalidity issues. Zebra also hereby incorporates by reference the testimony of any fact witnesses that are deposed, that provide declarations, or that otherwise testify in this lawsuit. Zebra also hereby incorporates by reference the forthcoming reports and testimony of Zebra's expert witnesses regarding invalidity of the patents.

Zebra bases these Third Supplemental Invalidity Contentions on its current knowledge and understanding of the Asserted Claims, IV's Infringement Contentions, the prior art, and other facts and information available as of the date of these contentions. Zebra has not yet completed its investigation, collection of information, discovery, or analysis relating to this action, and additional discovery may require Zebra to supplement or modify these contentions. For example, IV has not produced all of the information relevant to the Asserted Patents, and Zebra has not yet deposed the named inventors of the Asserted Patents, respectively, and/or other persons having potentially relevant information, but will engage in this and other such discovery consistent with this Court's Orders.

For example, Zebra may rely on IV's or any inventor's admissions concerning the scope of prior art relevant to the Asserted Patents; the patent prosecution histories for the Asserted Patents; any deposition testimony of the named inventors on the Asserted Patents; and the papers filed and any evidence submitted by IV in connection with this litigation. Zebra reserves the right to assert that one or more of Asserted Claims are invalid under 35 U.S.C. § 102(f) in the event that Zebra obtains evidence that the named inventors did not invent (either alone or in conjunction with others) the subject matter claimed in the Asserted Patents. Should Zebra obtain such evidence, it will provide the name(s) of the person(s) from whom and the circumstances under which the claimed invention or any part of it was derived.

Additionally, because third-party discovery is not yet complete, Zebra reserves the right to present additional items of prior art under 35 U.S.C. §§ 102(a), (b), (e), and/or (g), and/or § 103, located during the course of such discovery or further investigation, and to assert invalidity under 35 U.S.C. §§ 102(c), (d), or (f), to the extent that such discovery or investigation yields information forming the basis for such invalidity. For example, Zebra expects to issue subpoenas to, and receive

information from, third parties believed to have knowledge, documentation, and/or corroborating evidence concerning some of the prior art listed below and/or additional prior art. These third parties include, without limitation, the authors, inventors, vendors, or assignees of the references listed in these disclosures. Further, Zebra intends to take discovery on 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.

Prior art not included in these Third Supplemental Invalidity Contentions, whether known or not known to Zebra, may become relevant. In particular, Zebra is currently unaware of the extent, if any, to which IV will contend that limitations of the Asserted Claims are not disclosed in the prior art identified by Zebra. To the extent such an issue arises, Zebra reserves the right to identify other references that would render obvious the allegedly missing limitation(s) of the disclosed device or method. Further, because fact discovery has not yet opened and because Zebra has not yet completed its search for or analysis of relevant prior art, Zebra reserves the right to revise, amend, and/or supplement the information provided herein, including identifying, charting, and relying on additional references, should Zebra's further search and analysis yield additional information or references, consistent with the Federal Rules of Civil Procedure. IV also has a duty to produce to Zebra all relevant documents from other proceedings involving the Asserted Patents, including but not limited to all prior art, invalidity contentions, and expert reports on invalidity among other relevant items.

For all these reasons, Zebra therefore reserves the right to further supplement or alter the positions taken and information disclosed in these Third Supplemental Invalidity Contentions including, without limitation, the prior art and grounds of invalidity set forth herein, to take into account information or defenses that may come to light as a result of these continuing efforts. Zebra further reserves the right to introduce and use such supplemental materials at trial.

E. Prior Art Identification and Citation

Herein, including in the Appendices hereto, Zebra identifies portions of prior art references that disclose one or more elements of the Asserted Claims. Although Zebra has identified at least one citation per element for each reference charted or otherwise discussed herein, each and every disclosure of the same element in said reference is not necessarily identified. In an effort to focus the issues, Zebra identifies only limited portions of the cited references. It should be recognized that a person of ordinary skill in the art would generally read a prior art reference as a whole and in the context of other publications, literature, and general knowledge in the field. To understand and interpret any specific statement or disclosure in a prior art reference, a person of ordinary skill in the art would rely upon other information including other publications and general scientific or engineering knowledge. Zebra therefore reserves the right to rely upon other portions of the prior art references not specifically cited herein, as well as on other publications and expert testimony to provide context and to aid understanding and interpretation of the identified portions. Zebra also reserves the right to rely upon other prior art references, other publications, and the testimony of experts to establish that the alleged inventions would have been obvious to a person of ordinary skill in the art, including on the basis of modifying or combining certain cited references. Zebra also reserves the right to rely upon any admissions relating to prior art in any Asserted Patent and/or their respective prosecution histories.

Additionally, where Zebra identifies a particular figure in a prior art reference, the identification should be understood to encompass the caption and description of the figure as well as any text relating to the figure in addition to the figure itself. Similarly, where an identified portion of text refers to a figure or other material, the identification should be understood to include the referenced figure or other material as well. As discovery progresses and the scope and focus of the liability issues become clearer, Zebra may rely on uncited portions of the prior art as well.

Zebra also reserves the right to rely on any system, public knowledge, or use embodying or otherwise incorporating any of the prior art disclosed herein, alone or in combination. Zebra further reserves the right to rely on any other documents or references describing any such system, knowledge, or use.

F. Other Reservation of Rights

Zebra reserves all rights to further supplement or modify these Third Supplemental Invalidity Contentions, including the prior art disclosed and stated grounds of invalidity, pursuant to the Court's local practices and the Scheduling Order in this matter. In addition, Zebra reserves the right to prove the invalidity of the Asserted Claims on bases other than those required to be disclosed in these Third Supplemental Invalidity Contentions. Zebra also expressly reserves the right to amend and/or supplement these Third Supplemental Invalidity Contentions should this case be transferred to another district where different local and/or patent rules are operative.

II. IDENTIFICATION OF PRIOR ART

Pursuant to the Scheduling Order (Dkt. 26), and in light of IV's Infringement Contentions, Zebra identifies the following prior art now known to Zebra that it contends anticipates one or more of the Asserted Claims under at least 35 U.S.C. §§ 102(a), (b), (e), and/or (g), either expressly or inherently as understood by a POSITA, and/or renders obvious under 35 U.S.C. § 103, either alone or in combination. At this time, Zebra contends that the following prior art references described below anticipate or render obvious, either alone or in combination, one or more of the Asserted Claims of the Asserted Patents. These prior art references also evidence the level of skill in the art and provide background information regarding the knowledge of a person of skill in the art. Zebra reserves the right to rely on these references to that end.

Zebra additionally incorporates by reference all prior art references cited on the face of each of the Asserted Patents, related patents, and all foreign counterparts. Zebra further

incorporates by reference all prior art references identified in the file histories of the same. Zebra reserves the right to rely upon foreign counterparts of the U.S. Patents identified in these Third Supplemental Invalidity Contentions, U.S. counterparts of foreign patents and foreign patent applications identified in these Third Supplemental Invalidity Contentions, U.S. and foreign patents and patent applications corresponding to articles and publications identified in these Third Supplemental Invalidity Contentions, and any systems, products, or prior inventions related to any references identified in these Third Supplemental Invalidity Contentions. Indeed, in these Third Supplemental Invalidity Contentions, any citation to a printed publication or other reference describing a prior art system should also be construed to include a reference to the prior art system itself.

A. Prior Art Patents and Publications

Subject to Zebra’s reservations of rights, Zebra identifies the following prior art patents and publications with respect to each Asserted Patent:

1. The ’439 Patent

Prior Art Reference	Effective Filing Date	Date of Issue or Publication
U.S. Pub. No. 2004/0004934 (“Zhu”)	July 3, 2002	January 8, 2004
U.S. Pub. No. 2003/0099304 (“Gore”)	November 28, 2001	May 29, 2003
U.S. Pub. No. 2002/0196731 (“Laroia ’731”)	June 19, 2001	December 26, 2002
U.S. Pub. No. 2002/0126706 (“Laroia ’706”)	March 9, 2001	September 12, 2002
U.S. Pub. No. 2005/0265275 (“Qualcomm 275”)	May 7, 2004	December 1, 2005
U.S. Patent No. 7,586,881 (“Broadcom”)	February 13, 2004	August 18, 2005
U.S. Patent No. 7,453,793 (“Qualcomm 793”)	April 10, 2003	November 18, 2008
U.S. Publication No. 2003/0095533 (“Samsung”)	November 10, 2001	May 22, 2003
“On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” (“Dammann”)	n/a	February 25, 2002
U.S. Patent No. 5,961,575 (“Hervin”)	February 26, 1996	October 5, 1999

Prior Art Reference	Effective Filing Date	Date of Issue or Publication
U.S. Publication No. 2002/0122499 (“Kannan”)	December 22, 2000	September 5, 2002
Admitted Prior Art of the ’439 Patent	n/a	n/a
802.11a Standard	n/a	1999
European Patent No. EP1573936 / International Application Publication No. WO 2005/041441 (“Bauch”)	September 30, 2003	July 26, 2006
U.S. Patent No. 6,842,487 (“Larsson ’487”)	September 22, 2000	January 11, 2005
U.S. Patent No. 7,082,159 (“Larsson ’159”)	November 29, 2000	July 25, 2006
U.S. Patent Application Publication No. 2004/0071222 (“Liang”)	June 7, 2001	April 15, 2004
Printed Publication Low Complex Standard Conformable Antenna Diversity Techniques for OFDM Systems and Its Application to the DVB-T System (“Dammann”)	n/a	January 2002

Zebra also identifies each of the prior art references identified in any other cases or proceedings involving the ’439 Patent, including, but not limited to:

- *Intellectual Ventures I LLC et al v. Lenovo Grp. Ltd.*, No. 6-23-cv-00307 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TP-Link Corp. Ltd.*, No. 6-23-cv-00308 (W.D. Tex.);
- *Intellectual Ventures I LLC v. TCL Electronics Holdings Ltd. et al*, No. 6-23-cv-00309 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. OnePlus Technology (Shenzen) Co., Ltd.*, No. 6-23-cv-00290 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TP-Link Corporation Ltd.*, No. 6-23-cv-00291 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TCL Electronics Holdings Ltd. f/k/a TCL Multimedia Technology Holdings, Ltd. et al*, No. 6-23-cv-00293 (W.D. Tex.);
- *Intellectual Ventures II LLC v. Lenovo Grp. Ltd.*, No. 6-23-cv-00068 (W.D. Tex.);

- *Intellectual Ventures I LLC et al v. Hewlett Packard Enter. Co.*, No. 1-22-cv-01350 (D. Del.).

Zebra’s investigation into prior art patents and publications is ongoing, and Zebra reserves the right to identify and rely on additional patents or publications that are identified through further investigation or discovery (which has not yet begun). Zebra additionally identifies and relies on patent or publication references that describe or are otherwise related to the prior art systems identified below. Zebra also reserves the right to supplement as further prior art is identified through investigation or discovery.

2. The ’835 Patent

Prior Art Reference	Effective Filing Date	Date of Issue or Publication
U.S. Patent No. 6,434,081 (“Johnson”)	May 12, 2000	August 13, 2002
U.S. Patent No. 6,735,709 (“Lee”)	November 9, 2000	May 11, 2004
U.S. Patent No. 6,691,214 (“Li”)	August 29, 2000	February 10, 2004
U.S. Patent No. 6,643,787 (“Zerbe”)	October 19, 1999	November 4, 2003
U.S. Patent No. 7,036,053 (“Zumkehr”)	December 19, 2002	April 25, 2006
U.S. Patent No. 6,463,392 (“Nygaard”)	August 16, 1999	October 8, 2002
U.S. Patent No. 6,889,357 (“Keeth”)	May 10, 2000	May 3, 2005
U.S. Pub. No. 2003/0112909 (“Best”)	June 25, 2001	June 19, 2003
U.S. Pub. No. 2003/0005250 (“Johnson ’250”)	June 28, 2001	January 2, 2003
Intel 82870DH DDR Memory Hub Datasheet (DMH) (“Intel DMH”)	n/a	August 2002
SLDRAM Consortium 4M x 18 SLDRAM Datasheet (“SLDRAM Consortium”)	n/a	September 22, 1997
Micron 512Mb: x4, x8, x16 DDR SDRAM Datasheet (“Micron DDR SDRAM”)	n/a	2000
U.S. Pub. No. 2003/0140208 (“LaBerge”)	January 22, 2002	July 24, 2003
KR Pub. No. 2002/0002658 (“Park”)	June 30, 2000	January 10, 2002

Zebra also identifies each of the prior art references identified in any other cases or proceedings involving the ’835 Patent, including, but not limited to:

- *Intellectual Ventures I LLC et al v. OnePlus Technology (Shenzen) Co., Ltd.*, No. 6-23-cv-00290 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. Lenovo Grp. Ltd.*, No. 6-23-cv-00307 (W.D. Tex.);
- *Intellectual Ventures II LLC v. Lenovo Grp. Ltd.*, No. 6-23-cv-00068 (W.D. Tex.).

Zebra’s investigation into prior art patents and publications is ongoing, and Zebra reserves the right to identify and rely on additional patents or publications that are identified through further investigation or discovery (which has not yet begun). Zebra additionally identifies and relies on patent or publication references that describe or are otherwise related to the prior art systems identified below. Zebra also reserves the right to supplement as further prior art is identified through investigation or discovery.

B. Prior Art Systems and Products

Zebra also contends that the Asserted Claims are invalid based on public knowledge and uses and/or offers for sale or sales of products and services that are prior art under 35 U.S.C. § 102(a) and/or (b); and/or prior inventions made in the United States by other inventors who had not abandoned, suppressed, or concealed them under 35 U.S.C. § 102(g), and that anticipate or render obvious under 35 U.S.C. § 103 the Asserted Claims.

For example, systems and products developed by chipset manufacturers such as, but not limited to, Micron, Zebra, Qualcomm, STMicroelectronics, Texas Instruments, Advanced Micro Devices, Hitachi, Samsung, IBM, and Intel may constitute prior art. However, fact discovery in this case does not open until April 10, 2024—the day after the claim construction hearing—and thus Zebra has not had the opportunity to conduct third-party discovery from companies and sources that may have relevant prior art. Zebra reserves the right to conduct such discovery and supplement its Third Supplemental Invalidity Contentions to include any prior art systems and

products that render the asserted claims invalid. Zebra may use physical samples, executable software, or source code as evidence of the relevant functionality of these prior art products or services. Zebra will make available for inspection any physical samples of products, systems, or software listed above, and/or any source code therefor, that it has in its possession or that becomes available in the future during discovery.

III. INVALIDITY UNDER 35 U.S.C. §§ 102 & 103

Each of the Asserted Claims is anticipated and/or rendered obvious by prior art. In particular, at this time, Zebra contends that at least each of the prior art references described and charted in the following Appendices anticipates or renders obvious, either alone or in combination, one or more of the Asserted Claims:

	Asserted Patent	Claim Chart Appendices
A	'439 Patent	A1–A14
B	'835 Patent	B1–B14

The accompanying Appendices, which are hereby incorporated by reference as if fully set forth herein, provide examples of prior art that discloses, either expressly or inherently, every limitation of the Asserted Claims and/or teachings, suggestions, motivations, and reasons through which a POSITA at the time of the alleged invention would have considered the limitations obvious in view of the state of the art at the time, the differences between the claimed invention and the state of the art, and the foreseeability from a technical perspective and/or marketing and/or natural and expected evolution of the art.

A. Anticipation

Zebra contends that the Asserted Claims of the Asserted Patents are invalid as anticipated under 35 U.S.C. § 102 in view of each of the prior art references charted in the following Appendices:

	Asserted Patent	Claim Chart Appendices
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A	'439 Patent	A1–A14
B	'835 Patent	B1–B14

The cited portions of prior art references identified in the attached claim charts are exemplary only and representative of the content and teaching of the prior art references, and should be understood in the context of the reference as a whole and as they would be understood by a person of ordinary skill in the art. To the extent any item of prior art cited above is deemed not to disclose, explicitly or inherently, any limitation of an Asserted Claim, Zebra reserves the right to argue that any difference between that prior art and the corresponding Asserted Claim would have been either inherent to the art, or obvious to a person of ordinary skill in the art, even if Zebra has not specifically denoted that the art is to be combined with the knowledge of a person of ordinary skill in the art.

B. Obviousness

Each anticipatory prior art reference disclosed in the preceding section, either alone or in combination with other prior art, also renders the Asserted Claims invalid as obvious, as demonstrated in the claim charts appended hereto. To the extent any limitation is deemed absent from the prior art listed above and in Appendices A1–A14 and B1–B14, these limitations would have been obvious to one skilled in the art at the time of the alleged invention, in view of the state of the art and knowledge of those skilled in the art under 35 U.S.C. § 103.

In addition, the references identified above render one or more Asserted Claims obvious when the references are read in combination with each other, and/or when read in view of the state of the art and knowledge of those skilled in the art. Each and every reference identified is also relevant to the state of the art at the time of the alleged invention. Any of the references disclosed above may be combined with one another to render obvious (and therefore invalid) each of the Asserted Claims. Zebra may rely upon a subset of the above identified references or all of the

references identified above, for purposes of obviousness depending on the Court's claim construction, positions taken by IV during this litigation, and further investigation and discovery. Indeed, as detailed further below, it would have been obvious to a person of skill in the art at the time of the respective alleged invention of the Asserted Claims to combine the various references cited herein so as to disclose the Asserted Claims.

Prior art references rendering the Asserted Claims obvious, alone or in combination with other references, are included in Appendices A1–A14 and B1–B14, which include exemplary claim charts for the Asserted Claims of each Asserted Patent, respectively, showing where in each reference or combinations of references each Asserted Claim may be found, and an explanation of why the prior art renders the Asserted Claim obvious.

Zebra also reserves the right to amend or supplement these contentions regarding anticipation or the obviousness of the Asserted Claims in view of further information from IV, information discovered during discovery, or a claim construction ruling by the Court. IV has not identified what elements or combinations it alleges were not known to one of ordinary skill in the art at the time. Therefore, for any claim limitation that IV alleges is not disclosed in a particular prior art reference, Zebra reserves the right to assert that any such limitation is either inherent in the disclosed reference or obvious to one of ordinary skill in the art at the time in light of the same, or that the limitation is disclosed in another of the references disclosed above and in combination would have rendered the asserted claim obvious.

Zebra intends to present expert evidence as well as intrinsic evidence demonstrating the motivation to combine the relied upon prior art references. This evidence will be presented in Zebra's expert reports in accordance with the procedural deadlines in this case. Zebra incorporates

by reference its forthcoming expert reports and any testimony of its experts presented according to the Court's schedule.

The motivation to combine or modify the above prior art is present, for example, in the references themselves, references cited on the face of the Asserted Patents, the knowledge, skill, or creativity of one of ordinary skill in the art, the prior art as a whole, and/or the nature of the problems allegedly addressed by the Asserted Patents. The law requires no showing of a specific motivation to combine or modify prior art references disclosed herein, as each combination or modification of art would have no unexpected results and at most would simply represent a known alternative to one of skill in the art. *See, e.g., KSR Int'l Co. v. Teleflex, Inc.*, 127 S.Ct. 1727, 1739-40 (2007) (rejecting the Federal Circuit's "rigid" application of the teaching, suggestion, or motivation to combine test, instead espousing an "expansive and flexible" approach). Notably, the Supreme Court held that a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton" and "in many cases, a person of ordinary skill in the art will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 1742. To a person of ordinary skill in the art, the Asserted Claims represent solutions that would have been obvious to try, with predictable results.

Nevertheless, should additional evidence of motivation to combine or modify be required to render the Asserted Claims obvious, Zebra contends that there was a motivation or reason to combine the references identified above. That motivation or reason was provided in the nature of the respective problems allegedly solved by the Asserted Patents, the teachings of the cited prior art itself, and/or the knowledge of a person of ordinary skill in the art. For example, the combinations identified above would have been combined or modified using: known methods to yield predictable results; common sense; known techniques in the same way; a simple substitution

of one known, equivalent element for another to obtain predictable results; and/or a teaching, suggestion, or motivation in the prior art generally. In addition, it would have been obvious to try combining or modifying the prior art references identified above because there were only a finite number of predictable solutions and/or because known work in one field of endeavor prompted variations based on predictable design incentives and/or market forces either in the same field or a different one. In addition, the combination of the prior art references would have been obvious because the combination represents known potential options with a reasonable expectation of success.

Additional evidence that there would have been a motivation or reason to combine or modify the prior art references above includes the interrelated teachings of multiple prior art references; the effects of demands known to the design community or present in the marketplace; the existence of a known problem for which there was an obvious solution encompassed by the Asserted Claims; the existence of a known need or problem in the field of the endeavor at the time of the alleged invention(s); and the background knowledge, skill, or creativity that would have been possessed by a person having ordinary skill in the art. Zebra may rely on uncited portions of the prior art references cited and produced, other publications and testimony, and the testimony of experts to establish that a person of ordinary skill in the art would have been motivated to modify or combine certain of the cited references so as to render the claims obvious. References identified by Zebra address the same technical issues and suggest very similar solutions to those issues discussed in the Asserted Patents and generally known at the time of the alleged invention(s) claimed in the Asserted Claims. Zebra reserves the right to supplement these Third Supplemental Invalidity Contentions with additional charts for any of the references listed above, and/or common knowledge and state of the art.

IV. INVALIDITY UNDER 35 U.S.C. § 112

Pursuant to the Court’s Order Governing Proceedings – Patent Cases, Zebra identifies the below grounds of invalidity under 35 U.S.C. § 112.

A. Legal Background Regarding the Indefiniteness, Enablement, And Written Description Requirements

Section 112, ¶ 2 includes a definiteness requirement: “[T]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.” 35 U.S.C. § 112, ¶ 2. “[A] patent is invalid for indefiniteness if its claims, read in light of the patent’s specification and prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2124 (2014).

The definiteness requirement requires that the claim set forth what the applicant regards as the invention, and do so with sufficient particularity and definiteness. *Allen Eng’g Corp. v. Bartell Indus.*, 299 F.3d 1336, 1348 (Fed. Cir. 2002). Where it would be apparent to one of skill in the art, based on the patent specification, that the “invention” set forth in a claim is not what the patent applicant regarded as the invention, the claim is invalid. *Id.*

35 U.S.C. § 112 further includes an enablement requirement: “The specification shall contain a written description . . . of 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, or with which it is most nearly connected, to make and use the same.” 35 U.S.C. § 112, ¶ 1. To satisfy the enablement requirement, the disclosure “must teach those skilled in the art how to make and use the full scope of the claimed invention without ‘undue experimentation.’” *Genentech, Inc. v. Novo Nordisk A/S*, 108 F.3d 1361, 1366 (Fed. Cir. 1997); *MagSil Corp. v. Hitachi Glob. Storage Techs., Inc.*, 687 F.3d 1377, 1381 (Fed. Cir. 2012); *Sitrick v. Dreamworks*,

LLC, 516 F.3d 993, 999 (Fed. Cir. 2008). If a specification teaches away from a substantial portion of the claim or does not enable the full scope of the claim, there is no enablement. *AK Steel Corp. v. Sollac*, 344 F.3d 1234 (Fed. Cir. 2003); *see also MagSil Corp.*, 687 F.3d at 1383-84 (Fed. Cir. 2012); *Amgen Inc. v. Sanofi*, 598 U.S. 594, 613-16 (2023).

35 U.S.C. § 112 further includes a written description requirement: “The specification shall contain a written description of the invention” 35 U.S.C. § 112, ¶ 1. “To satisfy the written description requirement, a patent 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.” *ICU Medical Inc. v. Alaris Medical Systems, Inc.*, 558 F.3d 1368, 1377 (Fed. Cir. 2009) (internal quotation marks and citations omitted); *see also Synthes USA, LLC v. Spinal Kinetics, Inc.*, 734 F.3d 1332, 1340 (Fed. Cir. 2013). “The test [for written description support] requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art. Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.” *Ariad Pharmaceuticals, Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010). The specification must describe the claimed invention in sufficient detail so that a POSITA can recognize what is claimed. The appearance of mere indistinct words in a specification or a claim, even an original claim, does not necessarily satisfy that requirement.” *University of Rochester v. G.D. Searle & Co.*, 358 F.3d 916, 923 (Fed. Cir. 2004) (internal quotation marks and citations omitted).

B. Invalidity Grounds Under 35 U.S.C. § 112

Based on IV’s Infringement Contentions, Zebra believes that one or more Asserted Claims are invalid for failure to comply with 35 U.S.C. § 112 for at least the following reasons: (1) the specifications of the Asserted Patents lack a written description of the alleged inventions one or more of the Asserted Claims in full, clear, concise, and exact terms as required by 35 U.S.C. § 112

¶ 1; (2) the specifications of the Asserted Patents do not enable one or more of the Asserted Claims as required by 35 U.S.C. § 112 ¶ 1; and/or (3) one or more of the Asserted Claims fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention. Zebra specifically reserves the right to amend and/or supplement these Third Supplemental Invalidity Contentions based on a failure to comply with the requirements of 35 U.S.C. § 112, including, for example, based on supplementation or amendments to IV's deficient First Supplemental Infringement Contentions.

One or more of the Asserted Claims fail to meet the written description requirement because the alleged inventions claimed therein are not sufficiently described in the specification of the Asserted Patents. Specifically, one or more of the Asserted Claims fail to meet the written description requirement for at least the terms identified below because, based on those terms, the specifications of the Asserted Patents do not adequately convey to those skilled in the art that the inventors had possession of the claimed subject matter as of the filing date. One or more of the Asserted Claims additionally fail to meet the enablement requirement because each specification of the Asserted Patents does not describe the manner and process of making and using the alleged inventions in the Asserted Claims to enable a person of skill in the art to make and use the full scope of the alleged invention without undue experimentation. Specifically, one or more of the Asserted Claims fail to meet the enablement requirement for at least the terms identified below because the specifications of the Asserted Patents do not describe the manner and process of making and using the alleged invention in the Asserted Claims. Additionally, based on Zebra's present understanding of the Asserted Claims and IV's apparent interpretation of these claims as reflected in its First Supplemental Infringement Contentions, one or more of the Asserted Claims fail to satisfy the requirements of § 112, ¶ 2 because the precise scope of at least the phrases listed

below (or terms contained therein) cannot be determined with reasonable certainty by a POSITA, even when reading the claims in light of the specification and prosecution history.

Zebra reserves the right to modify, amend, or supplement its contentions relating to 35 U.S.C. § 112 as the case progresses including, in particular, in view of any supplemental claim construction order entered by the Court in this matter.

1. Indefiniteness

Zebra contends that the following limitations of the Asserted Claims are indefinite under § under § 112, ¶ 2:¹

Asserted Patent	Claim Term/Limitation	Asserted Claim(s)
'835 Patent	“the valid operation range includes an optimal operation point for the integrated circuit device”	1, 7

2. Lack of Written Description

Zebra contends that the following limitations of the Asserted Claims lack sufficient written description under § 112, ¶ 1:

Asserted Patent	Claim Term/Limitation	Asserted Claim(s)
'835 Patent	“the valid operation range includes an optimal operation point for the integrated circuit device”	1, 7

3. Lack of Enablement

Zebra contends that the following limitations of the Asserted Claims lack enablement under § 112, ¶ 1:

Asserted Patent	Claim Term/Limitation	Asserted Claim(s)
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¹ Zebra also hereby incorporates by reference any additional term(s) or limitation(s) that Zebra identifies as and/or contends is indefinite under § 112, ¶ 2 at any point during the upcoming claim construction proceedings in this case.

'835 Patent	"the valid operation range includes an optimal operation point for the integrated circuit device"	1, 7
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V. INVALIDITY UNDER 35 U.S.C. § 101

To be patentable subject matter under § 101, a claim must be directed to one of four eligible subject matter categories: “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. “Claims that fall within one of the four subject matter categories may nevertheless be ineligible if they encompass laws of nature, physical phenomena, or abstract ideas.” *Diamond v. Chakrabarty*, 447 U.S. 303, 309 (1980). The Supreme Court established a two-step test for deciding the subject matter eligibility of claims under § 101. *Alice Corp. Pty. Ltd. v. CLS Bank Int’l*, 134 S. Ct. 2347, 2355 (2014). First, the claims must be analyzed to determine whether they are drawn to one of the statutory exceptions. *Id.* Claims that invoke generic computer components instead of reciting specific improvements in computer capabilities are abstract under this first step. *See Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327, 1335-36 (Fed. Cir. 2016). Second, the elements of the claims must be viewed both individually and as an ordered combination to see if there is an “inventive concept.” *Id.* The mere fact that a claim recites or implies that an abstract idea is implemented using a general-purpose computer does not supply an inventive concept necessary to satisfy § 101. *See Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1355 (Fed. Cir. 2016); *Alice*, 134 S. Ct. at 2357-59.

At present, including in view of current legal precedents regarding patent eligibility under 35 U.S.C. § 101, Zebra contends that the following Asserted Claims—at least as apparently

construed by IV in its Infringement Contentions—are directed to ineligible subject matter under 35 U.S.C. § 101 and applicable case law authority:²

Asserted Patent	Claims
'439 Patent	1-3, 7-11, 13-16, 18
'835 Patent	1-12, 17-20, 23

In compliance with the requirements of this Court's Standing Order Governing Proceedings (OGP) 4.3—Patent Cases, Section II, Paragraph 4, at present, including in view of current legal precedents regarding patent eligibility under 35 U.S.C. § 101, Zebra contends that the asserted claims of the '439 Patent are directed to the following abstract idea: generating and transmitting information in data packets. To the extent any claim elements of the independent or dependent asserted claims of the '439 Patent is not fully encompassed within the abstract idea, those elements are well-understood, routine, and/or conventional as demonstrated in the claim charts attached as Appendices A1-A14, which includes relevant 102/103 prior art. Zebra contends

² See, e.g., *Alice Corp. Pty. Ltd. v. CLS Bank Int'l*, 134 S. Ct. 2347 (2014); *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 132 S. Ct. 1289 (2012); *Trading Techs. Int'l, Inc. v. IBG, LLC*, 921 F.3d 1084 (Fed. Cir. 2019); *ChargePoint, Inc. v. SemaConnect, Inc.*, 920 F.3d 759 (Fed. Cir. 2019); *SAP America, Inc. v. InvestPic, LLC*, 898 F.3d 1161 (Fed. Cir. 2018); *Interval Licensing LLC v. AOL, Inc.*, 896 F.3d 1335 (Fed. Cir. 2018); *Aatrix Software, Inc. v. Green Shades Software, Inc.*, 882 F.3d 1121 (Fed. Cir. 2018); *Two-Way Media Ltd. v. Comcast Cable Commc'ns, LLC*, 874 F.3d 1329 (Fed. Cir. 2017), *cert. denied*, 139 S. Ct. 378 (2018); *Intellectual Ventures I LLC v. Capital One Fin. Corp.*, 850 F.3d 1332 (Fed. Cir. 2017); *Apple, Inc. v. Ameranth, Inc.*, 842 F.3d 1229 (Fed. Cir. 2016); *Affinity Labs of Texas, LLC v. DIRECTV, LLC*, 838 F.3d 1253 (Fed. Cir. 2016); *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350 (Fed. Cir. 2016); *Enfish, LLC v. Microsoft Corp.*, 822 F.3d 1327 (Fed. Cir. 2016); *Genetic Techs. Ltd. v. Merial L.L.C.*, 818 F.3d 1369 (Fed. Cir. 2016); *Intellectual Ventures I LLC v. Capital One Bank (USA)*, 792 F.3d 1363 (Fed. Cir. 2015); *Internet Patents Corp. v. Active Network, Inc.*, 790 F.3d 1343 (Fed. Cir. 2015); *OIP Techs., Inc. v. Amazon.com, Inc.*, 788 F.3d 1359 (Fed. Cir. 2015); *Content Extraction & Transmission LLC v. Wells Fargo Bank, Nat'l Ass'n*, 776 F.3d 1343 (Fed. Cir. 2014); *DDR Holdings, LLC v. Hotels.com, L.P.*, 773 F.3d 1245 (Fed. Cir. 2014); *buySAFE, Inc. v. Zebra, Inc.*, 765 F.3d 1350 (Fed. Cir. 2014); *Digitech Image Techs., LLC v. Elecs. for Imaging, Inc.*, 758 F.3d 1344 (Fed. Cir. 2014); *CyberSource Corp. v. Retail Decisions, Inc.*, 654 F.3d 1366 (Fed. Cir. 2011).

that the asserted claims of the '835 Patent are directed to the following abstract idea: calibrating the operation of a circuit. To the extent any claim element of the independent or dependent claims of the '835 Patent is not fully encompassed within the abstract idea, those elements are well-understood, routine, and/or conventional as demonstrated in the claim charts attached as Appendices B1-B14, which includes relevant 102/103 prior art. This identification is preliminary and Zebra reserves the right to supplement its contentions, including to modify the abstract idea to which the asserted claims are directed and provide additional evidence that the claimed concepts are well-understood, routine, and/or conventional.

VI. INVALIDITY CONTENTIONS AND ARGUMENT AND EVIDENCE FROM OTHER PROCEEDINGS INVOLVING THE ASSERTED PATENTS ARE HEREBY INCORPORATED BY REFERENCE

Zebra intends to rely, and does rely, on the invalidity contentions, findings, arguments, and/or any other relevant order or disclosure or argument from any other cases or proceedings involving any of the Asserted Patents, including for example:

- *Intellectual Ventures I LLC et al v. Lenovo Grp. Ltd.*, No. 6-23-cv-00307 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TP-Link Corp. Ltd.*, No. 6-23-cv-00308 (W.D. Tex.);
- *Intellectual Ventures I LLC v. TCL Electronics Holdings Ltd. et al*, No. 6-23-cv-00309 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. OnePlus Technology (Shenzen) Co., Ltd.*, No. 6-23-cv-00290 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TP-Link Corporation Ltd.*, No. 6-23-cv-00291 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. TCL Electronics Holdings Ltd. f/k/a TCL Multimedia Technology Holdings, Ltd. et al*, No. 6-23-cv-00293 (W.D. Tex.);

- *Intellectual Ventures II LLC v. Lenovo Grp. Ltd.*, No. 6-23-cv-00068 (W.D. Tex.);
- *Intellectual Ventures I LLC et al v. Hewlett Packard Enter. Co.*, No. 1-22-cv-01350 (D. Del.).

VII. ACCOMPANYING DOCUMENT PRODUCTIONS

Pursuant to the Court's Standing Order Governing Proceedings – Patent Cases, and in accordance with the Scheduling Order (Dkt. 26), Zebra is producing herewith, but under separate cover, a copy of each new prior art reference identified in Zebra's Third Supplemental Invalidity Contentions. Zebra reserves the right to continue to supplement this production as it obtains additional prior art references, documentation, and/or corroborating evidence concerning invalidity during the course of discovery.

Zebra has previously produced copies of technical documents sufficient to show the operation of the those accused products IV has provided specific claim charts for in its Infringement Contentions.

Dated: April 26, 2024

By: /s/ Michael T. Morlock
Michael T. Morlock

KILPATRICK TOWNSEND & STOCKTON LLP

Steve R. Borgman (Texas State Bar No. 02670300)
700 Louisiana Street, Suite 4300
Houston, Texas 77002
Telephone: 281-809-4081
Facsimile: 281-990-6826
Email: sborgman@kilpatricktownsend.com

Steven D. Moore (admitted in W.D. Tex.)
April E. Isaacson (admitted in W.D. Tex.)
Two Embarcadero Center
Suite 1900
San Francisco, CA 94111
Telephone: (415) 576-0200

Facsimile: (415) 576-0300
Email: smoores@kilpatricktownsend.com
Email: aisaacson@kilpatricktownsend.com

Michael T. Morlock (admitted pro hac vice)
Andrew N. Saul (admitted pro hac vice)
1100 Peachtree Street NE, Suite 2800
Atlanta, GA 30309
Telephone: (404) 815-6500
Facsimile: (404) 815-6555
Email: mmorlock@kilpatricktownsend.com
Email: asaul@kilpatricktownsend.com

**ATTORNEYS FOR DEFENDANT
ZEBRA TECHNOLOGIES CORPORATION**

CERTIFICATE OF SERVICE

I hereby certify that on April 26, 2024, the foregoing was served upon all counsel of record who have consented to electronic service.

By: /s/ Michael T. Morlock
Michael T. Morlock

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ‘439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ‘439 Patent, and the 802.11a Standard

The citations to portions of the above-referenced prior art, as well as any other reference, in this chart are exemplary only. For example, a citation that refers to or discusses a figure or figure item should be understood to also incorporate by reference that figure and any additional descriptions of that figure as if set forth fully therein. Zebra reserves the right to rely on the entirety of the references cited in this chart to show that the Asserted Claims of the ‘439 Patent are invalid. Zebra may rely upon uncited portions of the above-referenced prior art, other publications, and the testimony of experts or fact witnesses to provide context, and as aids to understanding and interpreting the portions that are cited herein. Zebra may also rely on uncited portions of the above-referenced prior art, other disclosed publications, and the testimony of experts to establish that a person of ordinary skill in the art would have been motivated to modify or combine certain of the cited references including the above-referenced prior art, so as to render the Asserted Claims of the ‘439 Patent obvious. Additionally, citations presented for one claim limitation are expressly incorporated by reference into all other limitations for that claim as well as all limitations of all claims on which that claim depends. Zebra also reserves the right to rely on additional citations or sources of evidence that also may be applicable, or that may become applicable in light of claim construction, changes in Plaintiff’s infringement contentions, and/or information obtained during discovery as the case progresses.

Zebra notes that Plaintiff appears in many instances to be pursuing overly broad constructions of various limitations of the Asserted Claims of the ‘439 Patent in an effort to piece together an infringement claim where none exists and to accuse a product that does not practice the claims. This claim chart takes into account Plaintiff’s overly broad construction of the claim limitations. Any assertion that a particular limitation is disclosed by a prior art reference or references may be based on Plaintiff’s apparent constructions and is not intended to be, and is not, an admission that such constructions are supportable or proper. Any assertion that a particular limitation is disclosed by a prior art reference or references also is not an admission that the claims are definite or otherwise satisfy 35 U.S.C. §112. And any assertion that the prior art discloses a claim preamble is not an admission that the preamble is limiting.

Zebra is investigating this prior art and have not yet completed discovery from third parties, who may have relevant information concerning the prior art. Therefore, Zebra reserves the right to supplement this chart after additional discovery is received. To the extent that any of the prior art discloses the same or similar functionality or feature(s) of any of the accused products, Zebra reserves the right to argue that said feature or functionality does not practice any limitation of any of the Asserted Claims of the ‘439 Patent, and to argue, in the alternative, that if said feature or functionality is found to practice any limitation of any of the Asserted Claims of the ‘439 Patent, then the prior art reference teaches the limitation and that the claim is not patentable. Finally, in addressing claim preambles herein, Zebra does not at this time take any position as to whether the preambles, or parts thereof, are limiting.

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ’439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
1	A method for transmitting orthogonal frequency division multiplexing (OFDM) signals comprising	Dammann discloses this limitation based on at least the following exemplary citations: In this paper, we show the equivalence of Space-Time block coding to multipath propagation with respect to Cyclic Delay Diversity for OFDM systems. Hence, we can apply existing Space-Time code design criteria and analyze methods for Space-Time code construction using Cyclic Delay Diversity OFDM systems in multipath propagation environments. Dammann at Abstract. Orthogonal frequency division multiplexing (OFDM) [2] is a suitable technique for broadband transmission in multipath fading environments and is implemented in new broadcast standards like terrestrial digital video broadcasting (DVB-T) [3] as well as wireless local area network (WLAN) standards [4] such as HIPERLAN/2 or IEEE 802.11a. Dammann at 1. Below we will briefly introduce the application of CDD to OFDM systems as described in detail in [8]. Fig. 1 shows the block diagram of an N-antenna OFDM transmitter with CDD. The OFDM modulated signal is transmitted over N antennas, whereas the particular signals only differ in an antenna specific cyclic shift.

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ‘439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ‘439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.1. The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TXantenna 1). Dammann at 2.2. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1a	generating a first OFDM packet for transmission including a guard interval portion and a symbol data portion each comprised of a plurality of samples;	Dammann discloses this limitation based on at least the following exemplary citations: Below we will briefly introduce the application of CDD to OFDM systems as described in detail in [8]. Fig. 1 shows the block diagram of an N-antenna OFDM transmitter with CDD. The OFDM

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		modulated signal is transmitted over N antennas, whereas the particular signals only differ in an antenna specific cyclic shift. After cyclic shifting, a cyclic prefix is inserted to avoid intersymbol interference and maintain subcarrier orthogonality for multipath channels. Dammann at 2.1. The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TXantenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when $T_{\text{Guard}} \geq \delta_{\text{max}} \quad (\geq \delta_1).$ T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1. Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain

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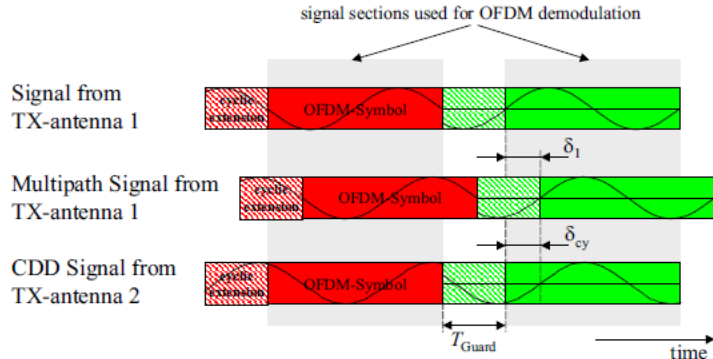
Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1. Dammann at 2.2.  Figure 2: Equivalence of CDD and multipath propagation for OFDM Dammann at Figure 2. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ’439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1b	cyclically advancing the first OFDM packet by shifting the samples in a first direction an amount less than a sample duration of the guard interval portion to generate a shifted version of the first OFDM packet for transmission in which at least a non-zero number of the samples from the symbol data portion of the first OFDM packet are shifted into the guard interval portion of the shifted version and a same non-zero number of samples from the guard interval portion of the first OFDM packet are shifted out of the guard interval portion of the shifted version;	Dammann and/or Hervin discloses this limitation based on at least the following exemplary citations: Below we will briefly introduce the application of CDD to OFDM systems as described in detail in [8]. Fig. 1 shows the block diagram of an N-antenna OFDM transmitter with CDD. The OFDM modulated signal is transmitted over N antennas, whereas the particular signals only differ in an antenna specific cyclic shift. After cyclic shifting, a cyclic prefix is inserted to avoid intersymbol interference and maintain subcarrier orthogonality for multipath channels. The functional block “UC” performs an upconversion of the signals from the baseband into RF-band. $\delta_{cy\ n}$, $n = 1, \dots, N-1$, denote cyclic shifts of the OFDM symbol in the time domain. Dammann at 2.1. The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		allows different OFDM symbols to be decoded without intersymbol interference when $T_{\text{Guard}} \geq \delta_{\text{max}} \quad (\geq \delta_1).$ T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1. Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1. Dammann at 2.2. If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range. Dammann at 2.2.

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ’439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Figure 2: Equivalence of CDD and multipath propagation for OFDM Dammann at Figure 2. Digital circuitry for performing arithmetic operations such as shift and/or rotate operations have long been known in the art. In a shift operation, data stored in a storage device, commonly referred to as a shift register, is moved relative to the boundaries of the device. An arithmetic shift right effects a divide by 2 operation while an arithmetic shift left effects a multiply by 2 operation. In a circular shift operation, also known as a rotate, the rightmost and leftmost positions in the shift register are treated as being adjacent during the shift. A rotate operation may be a rotate left (or "ROL") operation in which all of the bits of an operand are shifted left by one or more positions and the most significant bits are shifted around to become

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

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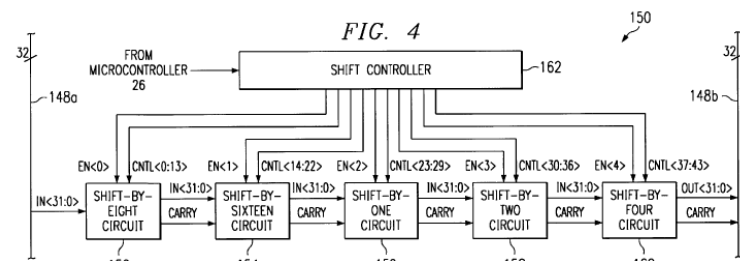
Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		the least significant bits or a rotate right (or "ROR") operation in which all of the bits of the operand shifted right by one or more positions and the least significant bits are shifted around to become the most significant bits. Hervin at 1:13-30.  Hervin at Fig. 4. The five stages of the illustrated combined shift and rotate unit 150 are coupled together, in series, between the 32-bit buses 148a-b. Each shift circuit 152 through 160 is configured to perform either a shift left, shift right, rotate left or rotate right operation, of the specified size, i.e., 8-bit, 16-bit, 1-bit, 2-bit and 4-bit, on a 32-bit, double word sized operand input thereto. In a shift left or shift right operation, the contents of the leftmost bit (bit 31) or rightmost bit (bit 0) is respectively shifted out of the operand while in a rotate left or rotate right operation, the contents of the leftmost bit or rightmost

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		bit is placed in the rightmost bit or leftmost bit, respectively. As will be more fully described below, the shift-by-eight circuit 152 and the shift-by-sixteen circuit 154 are also configured to perform selected pre-processing operations on byte sized (8-bit) and word sized (16-bit) operands input thereto. Hervin at 8:5-20. The shift-by-eight circuit 152 is coupled to the shift controller 162 by an enable input EN 0! and control inputs CNTL 0:13!. EN 0! instructs the shift-by-eight circuit 152 to either pass the input operand to the shift-by-sixteen circuit 154 or perform either a shift or pre-processing operation on the input operand. If enabled, CNTL 0:13! instructs the shift-by-eight circuit 152 as to which shift or preprocessing operation is to be performed on the input operand. The shift-by-eight circuit 152 performs pre-processing operations on 8-bit input operands by smearing, the contents of bits 0-7 in bits 7-15. The shift-by-eight circuit 152 may also be selectively enabled to perform 8-bit shift/rotate operations, for example, shift left, shift right, rotate left and rotate right on 32-bit input operands received from the bus 148a. Hervin at 8:51-65.

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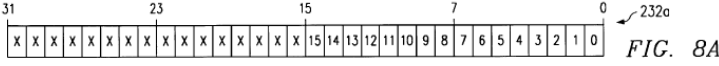
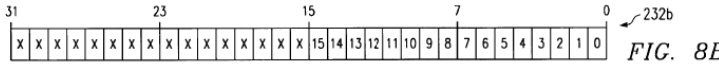
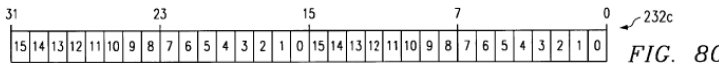
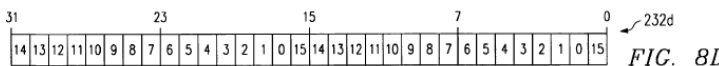
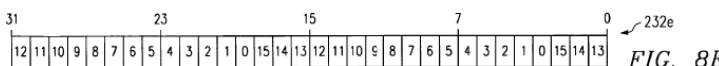
Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		 FIG. 8A  FIG. 8B  FIG. 8C  FIG. 8D  FIG. 8E Hervin at Fig. 8. Referring next to FIGS. 8A-E, a 3-bit rotate left operation performed on a 16-bit operand will now be described in greater detail. As previously discussed, a 16-bit operand occupies the rightmost word (bytes 0-1) of the register 164. Thus, as shown in FIG. 8A, the contents of the 16-bit operand 232a input the shift-by-eight circuit 152 is held in bits 0-15 while bits 16-31 are "don't cares". The operand 232a passes through the shift-by-eight circuit 152 without pre-processing. Thus, as illustrated in FIG. 8B, the operand 232b output the shift-by-eight circuit 152 remains unchanged. The operand 232b is propagated to the shift-by-sixteen circuit 154 where the contents of bits 0-15 are smeared into bits 16-31 to produce the

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		operand 232c illustrated in FIG. 8C. The operand 232c is then propagated to the shift-by-one circuit 156. As the shift operation being performed is a 3-bit rotate left operation, the shift-by-one circuit 156 shifts the contents of bits 0-30 one bit to the left and places the contents of bit 31 into bit 0, thereby producing the operand 232d illustrated in FIG. 8D. The operand 232d is then propagated to the shift-by-two circuit 158. Again, as the shift operation being performed is a 3-bit rotate left operation, the shift-by-two circuit 158 shifts the contents of bits 0-29 two bits to the left and places the contents of bits 30-31 into bits 0-1, thereby producing the operand 232e illustrated in FIG. 8E. As no further shift or rotate operations are necessary, operand 232e passes through the shift-by-four circuit 160 and is placed on the bus 148b for transport to the register file 24 where bits 16-31 are discarded. As may be seen, bits 0-15 of the result placed on the bus 148b is a 3-bit rotate left operation performed on an 16-bit operand. In this manner, a 3-bit rotate operation is performed on a word sized operand using only the same interconnect between bits 0 and 31 needed for performing rotate operations on byte sized operands and without need for either an interconnection between bits 0 and 15 or for a separate conditioning unit to pre-process the word sized operand. Hervin at 11:41-27. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
1c	substantially simultaneously transmitting the first OFDM packet and the shifted version of the OFDM packet;	Dammann discloses this limitation based on at least the following exemplary citations: The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TXantenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when $T_{\text{Guard}} \geq \delta_{\text{max}} \quad (\geq \delta_1).$ T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1. Now we transmit a 2nd CDD OFDM time signal from

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1. Dammann at 2.2. Figure 2: Equivalence of CDD and multipath propagation for OFDM Dammann at Figure 2. If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range. Dammann at 2.2. In this paper we have presented a system model which uses multiple antennas to transmit cyclic delayed copies of an OFDM symbol. We term this technique Cyclic Delay Diversity (CDD). Furthermore, we extend the transmission model to include multipath components, and derive a condition on the antenna delays which insure that multipath and antenna delay components have equivalent descriptions from the receiver point of view. Dammann at 4. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
2	The method of claim 1, further comprising cyclically advancing the	Dammann discloses this limitation based on at least the following exemplary citations:

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OFDM packet for a duration of less than approximately 800 nanosecs.

2.2 Equivalence of multipath propagation and CDD

The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when

$$T_{Guard} \geq \delta_{max} \quad (\geq \delta_1).$$

T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .

Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1.

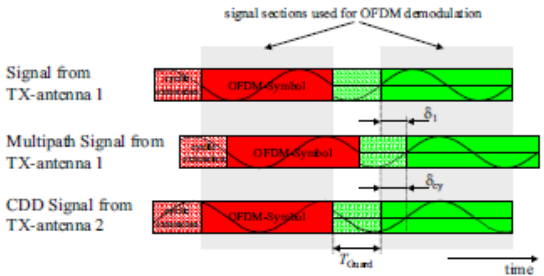


Figure 2: Equivalence of CDD and multipath propagation for OFDM

If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.2. Additionally, Guard intervals were commonly known to be 800 nanoseconds long as described by the 802.11a standard published prior to the ’439 Patent and in the Admitted Prior Art of the ’439 Patent. Kannan discloses this limitation based on at least the following exemplary citations: Typically, the appending of a cyclic prefix comprises an appending of the last T_g seconds of each OFDM symbol as a prefix to itself. Preferably T_g is a preassigned length of 16 taps, or 0.8 μs; however, those of ordinary skill in the art realize that the preassigned length of the cyclic prefix is up to the designer of the system as the designer weighs the greater protection afforded by a longer cyclic prefix against the inefficiency of a longer prefix. Kannan at [0040]. Preferably, composite communication channel 400 appears to be a communication channel with a multipath delay of, at most, a length of the cyclic prefix (i.e., 16 taps, wherein each tap corresponds to a sampling of a signal, and at a sampling rate of 20 MHz 16 taps corresponds to a delay of 0.8 μs), although, in the alternative, the design of composite communication channel 400 may be oriented to any tolerable multipath delay.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Kannan at [0044]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
3	The method of claim 1, further comprising cyclically advancing the OFDM packet for a duration of less than one half of the sample duration of the guard interval portion.	Dammann discloses this limitation based on at least the following exemplary citations:

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The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when

$$T_{Guard} \geq \delta_{max} \quad (\geq \delta_1).$$

T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .

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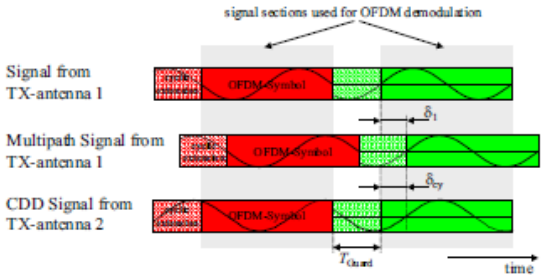


Figure 2: Equivalence of CDD and multipath propagation for OFDM

If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.2. Additionally, it was commonly known to select a cyclic shift duration that was less than one half of the sample duration of the guard interval as described in the Admitted Prior Art of the ‘439 patent (e.g., ‘439 patent at FIG. 5 and 3:50-4:4). <i>See</i> Claim 1(b). To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
7	The method of claim 1, further comprising transmitting the first OFDM packet from a multiple-antenna transmitter device.	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, element 1[c]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8	A signal transmitting system for transmitting orthogonal frequency division multiplexing (OFDM) signals comprising:	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, claim 1, preamble. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8a	a first transmit processor for generating a first OFDM packet for transmission including a guard interval portion and a symbol data	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, element 1[a].

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
	portion each compromised of a plurality of samples;	Kannan discloses this limitation based on at least the following exemplary citations: Kannan describes a similar OFDM system that explicitly teaches a processor for generating an OFDM packet for transmission. 200 FIG. 2 Kannan at FIG. 2.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		FIG. 5 Kannan at FIG. 5. As those skilled in the art are aware, the various functions of signal processing unit 308 as described herein may be implemented in hardware circuitry, such as a programmable logic array (PLA) or an

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		application specific integrated circuit (ASIC). Alternatively, as those skilled in the art are further aware, the functions of one or more of blocks 204-214, 224-234, and 250-254 may be implemented in signal processing unit 308 by software executed by a processor, such as a microprocessor or a digital signal processor (DSP), that executes instructions and programs that are stored in an associated memory. Kannan at [0026]. FIG. 5 is a block diagram of a communication system 500 in accordance with another embodiment, a “multiple antenna” embodiment, of the present invention. Kannan at [0063]. Although communication system 500 is shown including one antenna on transmit side 560 and two antennas on receive side 562, those who are of ordinary skill in the art realize that communication system 500 may have one or multiple antennas on transmit side 560, or at the transmitting communication device, and may have any number of antennas on receive side 562, or at the receiving communication device, and that the description provided below may be extended to any such communication system or communication device.

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Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ’439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Kannan at [0064]. Signal processing unit 612 preferably performs functions of each of blocks 504-514, 524-534, 550-555, and 558 as described below with respect to FIG. 5, which functions are performed by either a transmitting communication device or a receiving communication device, whichever is appropriate. Similar to signal processing unit 308, the various functions of signal processing unit 612 as described herein may be implemented in hardware, software, or a combination of hardware and software. Kannan at [0065]. The operation of transmit side 560 of communication system 500 is similar to the operation of transmit side 260 of communication system 200. An encoder 504 receives user information, preferably in a binary form, from a data source 502, such as data source 614. Encoder 504 applies an error correcting code to the user information and outputs a bit stream. The bit stream is routed to a symbol mapper 506 that is coupled to encoder 504. Symbol mapper 506 groups the bit stream into multiple groups of bits and maps each group of bits to a corresponding symbol to produce a symbol stream. Symbol mapper 506 then routes the symbol stream to a S/P converter 508 coupled to the symbol mapper. S/P converter 508 converts the symbol stream from a serial form to a parallel form, producing N parallel symbols where N is the number of subcarriers contained in

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		a frequency bandwidth allocated to a communication session. Alternatively, when fewer than the N subcarriers are modulated by orthogonal modulator 210, S/P converter 208 produces a quantity of parallel symbols corresponding to a quantity of subcarriers modulated by the orthogonal modulator. S/P converter 508 then applies the N parallel symbols to an orthogonal modulator 510 coupled to the S/P converter. Orthogonal modulator 510 modulates each subcarrier of N orthogonal subcarriers by a symbol of the N parallel symbols and conveys the modulated subcarriers to a subcarrier suppression block 550. Kannan at [0066]. Subcarrier suppression block 550, or alternatively orthogonal modulator 510 when subcarrier suppression block 550 is included in the orthogonal modulator, then conveys the suppressed and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a P/S converter 512. P/S converter 512 converts the subcarriers received from subcarrier suppression block 550, or alternatively from orthogonal modulator 510, from a parallel form to a serial form to produce an output signal 513. P/S converter 512 conveys output signal 513 to a C/P adder 514 that appends a guard band interval, or cyclic prefix, to signal 513 to produce output signal 515. C/P adder 514 conveys output signal 515 to an upconverter 516 that upconverts output signal 515 from a baseband frequency to a transmit frequency. The upconverted signal is conveyed to power amplifier (PA) 518 that amplifies the signal and

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		transmits the amplified signal via one or more antennas (one shown) and a communication channel 540. Kannan at [0069]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8b	OFDM packet by shifting the samples in a first direction an amount less than a sample duration of the guard interval portion to generate a shifted version of the first OFDM packet for transmission in which at least a non-zero number of the samples from the symbol data portion of the first OFDM packet are shifted into the guard interval portion of the shifted version and a same	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, element 1[b]. Kannan describes a similar OFDM system that explicitly teaches a processor for performing the functions required by a transmitter in an OFDM system. See Claim 8(a). To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ’439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
	non-zero number of samples from the guard interval portion of the first OFDM packet are shifted out of the guard interval portion of the shifted version;	Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8c	a plurality of radio transmitters for converting the OFDM packet and the shifted version of the OFDM packet to corresponding radio signals;	Dammann discloses this limitation based on at least the following exemplary citations:

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2.2 Equivalence of multipath propagation and CDD

The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when

$$T_{Guard} \geq \delta_{max} \quad (\geq \delta_1).$$

T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .

Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1.

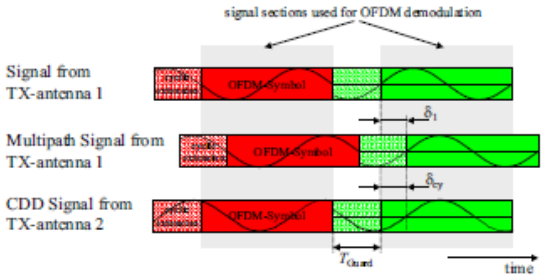


Figure 2: Equivalence of CDD and multipath propagation for OFDM

If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.2. In this paper we have presented a system model which uses multiple antennas to transmit cyclic delayed copies of an OFDM symbol. We term this technique Cyclic Delay Diversity (CDD). Furthermore, we extend the transmission model to include multipath components, and derive a condition on the antenna delays which insure that multipath and antenna delay components have equivalent descriptions from the receiver point of view. Dammann at 4. The functional block “UC” performs an upconversion of the signals from the baseband into RF-band. Dammann at 2.1. Kannan discloses this limitation based on at least the following exemplary citations: OFDM is a wideband modulation scheme that divides a frequency bandwidth allocated for a communication session into multiple narrower frequency sub-bands. Each sub-band includes a radio frequency (RF) subcarrier, wherein each subcarrier is mathematically orthogonal to the RF subcarrier included in each of

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		the other subchannels. The orthogonality of the subcarriers allows their individual spectra to overlap without causing interference with the other carriers (i.e., intercarrier interference). The division of a frequency bandwidth into multiple orthogonal sub-bands allows for a modulation scheme capable of a high data rate and very efficient bandwidth usage. Kannan at [0003].

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		FIG. 5 Kannan at FIG. 5. Subcarrier suppression block 550, or alternatively orthogonal modulator 510 when subcarrier suppression block 550 is included in the orthogonal modulator, then conveys the suppressed and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a P/S converter 512. P/S converter 512 converts the subcarriers received from subcarrier suppression block

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		550, or alternatively from orthogonal modulator 510, from a parallel form to a serial form to produce an output signal 513. P/S converter 512 conveys output signal 513 to a C/P adder 514 that appends a guard band interval, or cyclic prefix, to signal 513 to produce output signal 515. C/P adder 514 conveys output signal 515 to an upconverter 516 that upconverts output signal 515 from a baseband frequency to a transmit frequency. The upconverted signal is conveyed to power amplifier (PA) 518 that amplifies the signal and transmits the amplified signal via one or more antennas (one shown) and a communication channel 540. Kannan at [0069]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8d	a plurality of radio antennas correspondingly coupled to the	Dammann and Kannan disclose this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, element 8[c].

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
	plurality of radio transmitters for transmitting the radio signals;	To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
8e	wherein the first transmit processor and the second transmit processor are configured to substantially simultaneously cause the transmission of the first OFDM packet and the shifted version of the OFDM packet via corresponding transmitters and antenna.	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.,</i> element 1[c]. Kannan additionally teaches one or more antennas transmitting one or more transmit (e.g., radio) frequency signals from one or more transmitters. <i>See</i> Claim 8(c). To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
9	The system of claim 8, wherein each of the first and second transmit processors includes a cyclic extension module for performing cyclical advancements.	Dammann discloses this limitation based on at least the following exemplary citations:

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2.2 Equivalence of multipath propagation and CDD

The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when

$$T_{Guard} \geq \delta_{max} \quad (\geq \delta_1).$$

T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .

Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1.

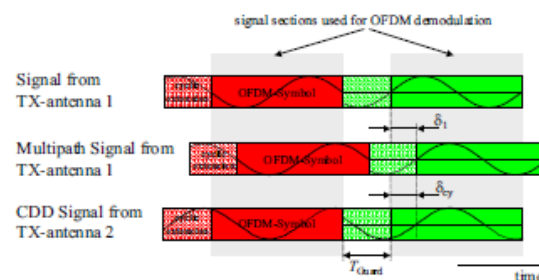


Figure 2: Equivalence of CDD and multipath propagation for OFDM

If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.2. Kannan additionally teaches a transmit processor that includes a cyclic prefix module (e.g., C/P adder 514). When applied to Dammann’s system that includes a cyclic shift, it would be obvious to provide a module and/or modify an already existing module in Kannan’s transmit processor to perform the function of a cyclic shift. FIG. 5

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Kannan at FIG. 5. Subcarrier suppression block 550, or alternatively orthogonal modulator 510 when subcarrier suppression block 550 is included in the orthogonal modulator, then conveys the suppressed and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a P/S converter 512. P/S converter 512 converts the subcarriers received from subcarrier suppression block 550, or alternatively from orthogonal modulator 510, from a parallel form to a serial form to produce an output signal 513. P/S converter 512 conveys output signal 513 to a C/P adder 514 that appends a guard band interval, or cyclic prefix, to signal 513 to produce output signal 515. C/P adder 514 conveys output signal 515 to an upconverter 516 that upconverts output signal 515 from a baseband frequency to a transmit frequency. The upconverted signal is conveyed to power amplifier (PA) 518 that amplifies the signal and transmits the amplified signal via one or more antennas (one shown) and a communication channel 540. Kannan at [0069]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
10	The system of claim 9, wherein each of the cyclic extension modules is configured to cyclically advance the OFDM packet for a duration of less than one half of sample duration of the guard interval.	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g., claim 3.</i> Additionally, it was commonly known to select a cyclic shift duration that was less than one half of the sample duration of the guard interval as described in the Admitted Prior Art of the ’439 patent (e.g., ’439 patent at FIG. 5 and 3:50-4:4). As explained in Claim 9, Dammann in view of Hervin and/or Kannan teaches each of the cyclic extension modules is configured to cyclically shift the OFDM packet. <i>See Claim 1(b) and 9.</i> To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
11	The system of claim 9, wherein each of the cyclic extension modules is configure to cyclically advance the OFDM packet for a duration of less than approximately 800 nanoseconds.	Dammann discloses this limitation based on at least the following exemplary citations: <i>See, e.g.</i>, claim 2. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
13	The system of claim 8, wherein each of the plurality of transmit processors further includes an Inverse Fast Fourier (IFFT) module for generating OFDM symbols from incoming data.	Dammann discloses this limitation based on at least the following exemplary citations: Orthogonal frequency division multiplexing (OFDM) [2] is a suitable technique for broadband transmission in multipath fading environments and is implemented in new broadcast standards like terrestrial digital video broadcasting (DVB-T) [3] as well as wireless local area network (WLAN) standards [4] such as HIPERLAN/2 or IEEE 802.11a.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 1. Kannan additionally teaches an IFFT module (e.g., IFFT/orthogonal modulator 510) included in each transmit processor configured to generate the OFDM symbols. FIG. 5

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Kannan at FIG. 5. The operation of transmit side 560 of communication system 500 is similar to the operation of transmit side 260 of communication system 200. An encoder 504 receives user information, preferably in a binary form, from a data source 502, such as data source 614. Encoder 504 applies an error correcting code to the user information and outputs a bit stream. The bit stream is routed to a symbol mapper 506 that is coupled to encoder 504. Symbol mapper 506 groups the bit stream into multiple groups of bits and maps each group of bits to a corresponding symbol to produce a symbol stream. Symbol mapper 506 then routes the symbol stream to a S/P converter 508 coupled to the symbol mapper. S/P converter 508 converts the symbol stream from a serial form to a parallel form, producing N parallel symbols where N is the number of subcarriers contained in a frequency bandwidth allocated to a communication session. Alternatively, when fewer than the N subcarriers are modulated by orthogonal modulator 210, S/P converter 208 produces a quantity of parallel symbols corresponding to a quantity of subcarriers modulated by the orthogonal modulator. S/P converter 508 then applies the N parallel symbols to an orthogonal modulator 510 coupled to the S/P converter. Orthogonal modulator 510 modulates each subcarrier of N orthogonal subcarriers by a symbol of the N parallel symbols and conveys the modulated subcarriers to a subcarrier suppression block 550.

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Conference Paper “On the Equivalence of Space-Time Block Coding with Multipath Propagation and/or Cyclic Delay Diversity in OFDM” to Dammann et al. (“Dammann”), U.S. Patent No. 5,961,575 to Hervin et al. (“Hervin”), U.S. Publication No. 2002/0122499 to Kannan et al. (“Kannan”), the Admitted Prior Art of the ‘439 Patent, and the 802.11a Standard

Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Kannan at [0066]. Subcarrier suppression block 550, or alternatively orthogonal modulator 510 when subcarrier suppression block 550 is included in the orthogonal modulator, then conveys the suppressed and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a P/S converter 512. P/S converter 512 converts the subcarriers received from subcarrier suppression block 550, or alternatively from orthogonal modulator 510, from a parallel form to a serial form to produce an output signal 513. P/S converter 512 conveys output signal 513 to a C/P adder 514 that appends a guard band interval, or cyclic prefix, to signal 513 to produce output signal 515. C/P adder 514 conveys output signal 515 to an upconverter 516 that upconverts output signal 515 from a baseband frequency to a transmit frequency. The upconverted signal is conveyed to power amplifier (PA) 518 that amplifies the signal and transmits the amplified signal via one or more antennas (one shown) and a communication channel 540. Kannan at [0069]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person

Exhibit A9 – Invalidity Claim Chart for U.S. Patent No. 7,623,439 (“the ’439 Patent”):

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results.
14	The system of claim 8, wherein the first and second transmit processors perform the cyclical advancements on baseband signals.	Dammann discloses this limitation based on at least the following exemplary citations:

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2.1 Introduction to Cyclic Delay Diversity for OFDM

Below we will briefly introduce the application of CDD to OFDM systems as described in detail in [8]. Fig. 1 shows the block diagram of an N -antenna OFDM transmitter with CDD. The OFDM modulated signal is transmitted over N antennas, whereas the particular signals only differ in an antenna specific cyclic shift. After cyclic shifting, a cyclic prefix is inserted to avoid inter-symbol interference and maintain subcarrier orthogonality for multipath channels. The functional block “UC” performs an upconversion of the signals from the base-band into RF-band. $\delta_{cy\ n}, n = 1, \dots, N - 1$, denote cyclic shifts of the OFDM symbol in the time domain.

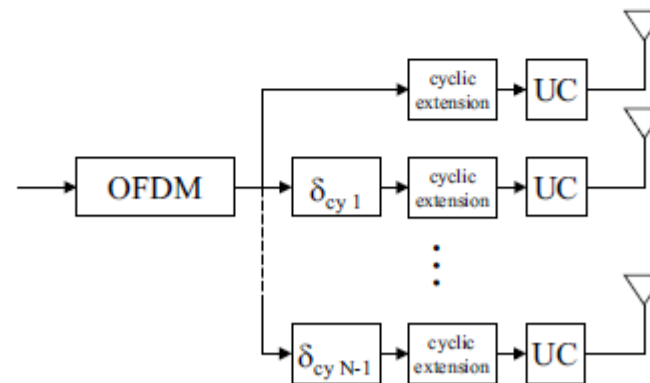


Figure 1: Application of CDD to an OFDM transmitter

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.1. Kannan additionally teaches the transmit processors performing the functions of the transmitters on baseband signals prior to upconverting to a radio signal. FIG. 5 Kannan at FIG. 5. Subcarrier suppression block 550, or alternatively orthogonal modulator 510 when subcarrier suppression block 550 is included

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		in the orthogonal modulator, then conveys the suppressed and the non-suppressed subcarriers, or alternatively only the non-suppressed subcarriers, to a P/S converter 512. P/S converter 512 converts the subcarriers received from subcarrier suppression block 550, or alternatively from orthogonal modulator 510, from a parallel form to a serial form to produce an output signal 513. P/S converter 512 conveys output signal 513 to a C/P adder 514 that appends a guard band interval, or cyclic prefix, to signal 513 to produce output signal 515. C/P adder 514 conveys output signal 515 to an upconverter 516 that upconverts output signal 515 from a baseband frequency to a transmit frequency. The upconverted signal is conveyed to power amplifier (PA) 518 that amplifies the signal and transmits the amplified signal via one or more antennas (one shown) and a communication channel 540. Kannan at [0069]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results
15	The system of claim 8, wherein the first and second transmit processors include application specific integrated circuits (ASICs).	Dammann discloses this limitation based on at least the following exemplary citations:

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2.2 Equivalence of multipath propagation and CDD

The equivalence between multipath propagation and CDD is illustrated in Fig. 2. We assume that an OFDM time signal with cyclic extension – as commonly used for OFDM systems – is transmitted from antenna 1 (TX-antenna 1). The cyclic extension allows different OFDM symbols to be decoded without intersymbol interference when

$$T_{\text{Guard}} \geq \delta_{\text{max}} \quad (\geq \delta_1).$$

T_{Guard} is the period of the cyclic extension, and δ_{max} is the maximum multi-path delay of the channel. For clarity, one carrier is drawn as a sine wave with a different phase per OFDM symbol in Fig. 2. We observe that we may receive the OFDM time signal from TX-antenna 1 superimposed with a multi-path signal from antenna 1 delayed by δ_1 .

Now we transmit a 2nd CDD OFDM time signal from TX-antenna 2. As can be seen from Fig. 2, the OFDM time domain symbols, transmitted from TX-antenna 2, are built by a cyclic shift δ_{cy} of the respective OFDM time domain symbols at TX-antenna 1.

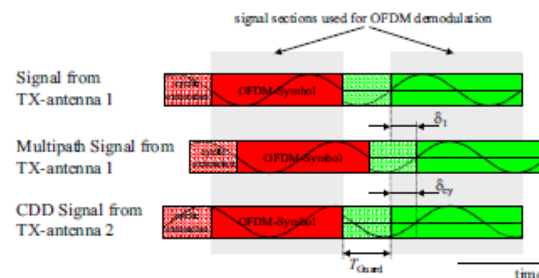


Figure 2: Equivalence of CDD and multipath propagation for OFDM

If we now compare the signal sections which are used for OFDM demodulation, one can see that a cyclic delay δ_{cy} behaves exactly like a multipath channel delay δ_1 based on the channel model. So an arbitrary OFDM receiver cannot distinguish between multipath propagation and CDD within this signal range.

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		Dammann at 2.2. Kannan discloses this limitation based on at least the following exemplary citations: As those skilled in the art are aware, the various functions of signal processing unit 308 as described herein may be implemented in hardware circuitry, such as a programmable logic array (PLA) or an application specific integrated circuit (ASIC). Alternatively, as those skilled in the art are further aware, the functions of one or more of blocks 204-214, 224-234, and 250-254 may be implemented in signal processing unit 308 by software executed by a processor, such as a microprocessor or a digital signal processor (DSP), that executes instructions and programs that are stored in an associated memory. Kannan at [0026]. FIG. 5 is a block diagram of a communication system 500 in accordance with another embodiment, a “multiple antenna” embodiment, of the present invention. Kannan at [0063]. Signal processing unit 612 preferably performs functions of each of blocks 504-514, 524-534, 550-555, and 558 as described below with

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
		respect to FIG. 5, which functions are performed by either a transmitting communication device or a receiving communication device, whichever is appropriate. Similar to signal processing unit 308, the various functions of signal processing unit 612 as described herein may be implemented in hardware, software, or a combination of hardware and software. Kannan at [0065]. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ‘439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results
16	The system of claim 8, wherein the transmitter is an 802.11 compliant device.	Dammann discloses this limitation based on at least the following exemplary citations:

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		Orthogonal frequency division multiplexing (OFDM) [2] is a suitable technique for broadband transmission in multipath fading environments and is implemented in new broadcast standards like terrestrial digital video broadcasting (DVB-T) [3] as well as wireless local area network (WLAN) standards [4] such as HIPERLAN/2 or IEEE 802.11a. Dammann at 1. Additionally, it was well understood and obvious OFDM systems would adhere to the 802.11 standard as the standard had existed long before the ’439 patent. To the extent it is found that the above-referenced prior art does not disclose this limitation, it would have been obvious to modify the above-referenced prior art to meet this limitation, based on the knowledge of a person of ordinary skill in the art and/or the teachings other prior art references identified in Defendants’ Preliminary Invalidity Contentions, including, but not limited to, the corresponding sections of charts for other prior art for the ’439 Patent. A person of ordinary skill in the art would have been motivated to combine the above-referenced prior art with any of such other prior art references with a reasonable expectation of success, at least because each of these references contains familiar elements within the same field of endeavor to address the same known problems, according to known methods which would yield predictable results

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Claims	U.S. Patent No. 7,623,439	Exemplary Evidence in Prior Art
18	The system of claim 8, wherein the first and second transmit processors include firmware stored in a memory device and executed by a suitable instruction execution system.	Dammann discloses this limitation based on at least the following exemplary citations:

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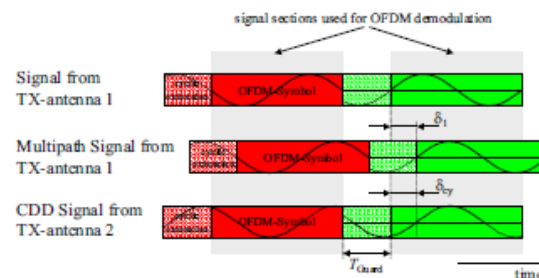


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