

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS INC.,

Petitioner,

v.

PANTECH WIRELESS, LLC

Patent Owner.

Case IPR2023-01270

U.S. Patent No. 10,869,247

**DECLARATION OF DANIEL VAN DER WEIDE
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,869,247**

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. QUALIFICATIONS	3
III. LEGAL UNDERSTANDING	5
A. My Understanding of Claim Construction	5
1. Means Plus Function Terms	7
B. My Understanding of Anticipation	8
C. My Understanding of Obviousness	9
D. My Understanding of the Doctrine of Equivalents	13
IV. BACKGROUND OF THE TECHNOLOGY	14
V. THE '247 PATENT	17
A. '247 Patent Overview	17
B. Prosecution History of the '247 Patent	18
VI. THE '247 PATENT PRIORITY DATE	19
VII. LEVEL OF ORDINARY SKILL IN THE ART	20
VIII. CLAIM CONSTRUCTION	22
A. Preambles	22
B. Means-Plus-Function	22
IX. GROUNDS OF UNPATENTABILITY	24
A. Ground 1: Lucent (Claims 1-2, 8, 11-12, 18)	26
1. Overview of Lucent	26
2. Invalidity of Claims 1-2, 8, 11-12, and 18 Over Lucent	29
(a) Element [1.pre]	29
(b) Element [1.a]	31
(c) Element [1.b]	33
(d) Element [1.c]	35

(e)	Element [1.d]	39
(f)	Element [1.e].....	43
(g)	Claim 2.....	49
(h)	Claim 8.....	52
(i)	Element [11.pre]	53
(j)	Element [11.a].....	54
(k)	Element [11.b]	54
(l)	Element [11.c].....	54
(m)	Claim 12.....	54
(n)	Claim 18.....	55
B.	Ground 2: Lucent in view of Liu (Claims 1-2, 8, 11-12, 18).....	55
C.	Grounds 3-4: Lucent (optionally in view of Liu) in further view of Das (Claims 9-10, 19-20).....	59
1.	Claims 9, 19	59
2.	Claims 10, 20	64
D.	Ground 5: Kuchibhotla in view of Liu (Claims 1-7, 11-17)	65
1.	Overview of Kuchibhotla.....	65
2.	Motivation to Apply Liu’s Teachings to Kuchibhotla.....	69
3.	Invalidity of Claims 1-7 and 11-17 Over Kuchibhotla in view of Liu	74
(a)	Element [1.pre]	74
(b)	Element [1.a].....	76
(c)	Element [1.b]	78
(d)	Element [1.c].....	80
(e)	Element [1.d]	82
(f)	Element [1.e].....	89
(g)	Claim 2.....	100
(h)	Claim 3.....	102
(i)	Claim 4.....	106
(j)	Claim 5.....	109
(k)	Claim 6.....	112
(l)	Claim 7.....	119
(m)	Element [11.pre]	121
(n)	Element [11.a].....	122
(o)	Element [11.b]	122
(p)	Element [11.c].....	122

	(q) Claim 12.....	122
	(r) Claim 13.....	122
	(s) Claim 14.....	122
	(t) Claim 15.....	122
	(u) Claim 16.....	123
	(v) Claim 17.....	123
E.	Ground 6: Kuchibhotla in view of Liu and Lucent (Claims 8, 18).....	123
	1. Motivation to Apply Lucent’s teachings to Kuchibhotla and Liu	123
	2. Invalidity of Claims 8 and 18 Over Kuchibhotla in view of Liu and Lucent.....	127
	(a) Claims 8, 18.....	127
F.	Ground 7: Kuchibhotla in view of Liu, Lucent, and Das (Claims 9-10, 19-20).....	129
	1. Claims 9, 19	129
	2. Claims 10, 20	130
G.	Grounds 8-14: Grounds 1-7 in further view of Rathonyi.....	131
X.	SECONDARY CONSIDERATIONS	137
XI.	CONCLUSION.....	137

I. INTRODUCTION

1. I have been retained by LG Electronics Inc. (I will refer to it as “LGE”) to provide my opinions on certain issues related to U.S. Patent No. 10,869,247 (the “’247 patent,” which I understand has been designated as Exhibit 1001) in connection with the above-captioned *inter partes* review (IPR) proceeding. I have been asked to provide my insights, analysis, and opinions regarding whether claims 1-20 of the ’247 patent (“Challenged Claims”) are obvious over the prior art references identified below.

2. I understand the ’247 patent is titled “Supporting uplink transmissions,” identifies as its named inventors Guodong Zhang, Sung-Hyuk Shin, Stephen E. Terry, James M. Miller, and Stephen G. Dick, and is currently owned by Pantech Wireless, LLC. I have considered the ’247 patent.

3. I understand that the file history of the ’247 patent has been designated as Exhibit 1002. I have considered this file history, and I will refer to it as the “’247 File History” or by its exhibit number.

4. I understand that the ’247 patent was filed as U.S. Patent Application 17/008,439 on August 31, 2020.

5. I have considered the prior art cited in my declaration, including:

- **R1-03-0285, *Signalling for H-ARQ Operation*, 3GPP TSG-WG1#31 (February 18-21, 2003) (“Lucent”).** I understand that a copy of this reference has been designated as Exhibit 1005.

- **U.S. Patent Application Publication No. 2004/0223507 to Kuchibhotla (“Kuchibhotla”)**, titled “ACK/NACK determination reliability for a communication device,” filed May 7, 2003, and published November 11, 2004. I understand that a copy of this reference has been designated as Exhibit 1006.
- **U.S. Patent Application Publication No. 2005/0048920 to Liu (“Liu”)**, titled “Method of control signaling in wireless communications,” filed August 26, 2003, and published March 3, 2005. I understand that a copy of this reference has been designated as Exhibit 1007.
- **U.S. Patent No. 6,359,877 to Rathonyi (“Rathonyi”)**, titled “Method and apparatus for minimizing overhead in a communication system,” filed July 21, 1998, and issued March 19, 2002. I understand that a copy of this reference has been designated as Exhibit 1008.
- **U.S. Patent Application Publication No. 2003/0076783 to Das (“Das”)**, titled “Adaptive hybrid retransmission method for wireless communications,” filed October 19, 2001, and published April 24, 2003. I understand that a copy of this reference has been designated as Exhibit 1009.

6. I understand that there is a pending district court litigation between Petitioner and Pantech (“LGE Litigation”) involving the ’247 patent.

7. I am being compensated by LGE at my standard hourly consulting rate of \$700 for my time on this matter. My compensation is not dependent on the outcome of this proceeding.

8. In forming my opinions, I relied on the documents cited in this declaration and the documents identified in the attached **Appendix B**. These documents comprise patents, file histories, printed publications, and other related

documents. As discussed below, each document is a type that experts in my field would have reasonably relied upon when forming their opinions. Further, experts in my field would have had access to each document either through the applicable patent offices and/or well-known libraries, conferences, or publications in the field. My opinions are also based upon my personal and professional experience.

9. In parallel with this declaration, I have prepared declarations for IPR2023-01269. I also understand that declarations are being prepared by other experts in IPR2023-01267, IPR2023-01268, IPR2023-01271, IPR2023-01272, and IPR2023-01273. Due to overlap in subject matter and prior art references and similarities in corresponding analyses, I understand that some parts of my declaration may bear superficial similarities to documents filed in these other IPRs, but all analysis and opinions presented herein are my own.

II. QUALIFICATIONS

10. I am qualified by education and experience to testify as an expert in the field of telecommunications. Attached as **Appendix A** to this declaration is a copy of my curriculum vitae detailing my education and experience. Additionally, the following overview of my background pertains to my qualifications for providing expert testimony in this matter.

11. I am a Full Professor in the Department of Electrical and Computer Engineering at the University of Wisconsin-Madison. I received my Bachelor of

Science Degree in Electrical Engineering from the University of Iowa in 1987; my Master of Science Degree in Electrical Engineering from Stanford University in 1990; and my Ph.D. degree in Electrical Engineering from Stanford in 1993. I teach several courses in my area of expertise, which includes high frequency electrical measurement and communications systems and advanced high-frequency circuit design and measurement. Specifically, I perform research on digital radio and communications systems ranging from RFID tags to lightwave transceivers, with emphasis on wireless and microwave technology. My first full-time employment upon graduation was as an engineer with Motorola Inc. International Cellular Subscriber division. The patents-in-suit refer generally to cell search and synchronization, which involve, among other techniques, sampling and coherent signal detection. I have built and published electronic circuits that have generated and measured the shortest pulses on record (480 fs @ 3.5V), and these results incorporate sampling and coherent signal detection. In addition, in 2007 I co-founded Optametra, a company developing and selling hardware and software for analysis of coherent communications in long-haul single mode optical fiber using many of the same techniques found in modern wireless communications, such as high-order modulation, forward error correction, and multicarrier transmission. Optametra sold its systems worldwide to many major telecommunications vendors and carriers—competing directly and successfully with Agilent Technologies (the

major telecom test and measurement vendor)—and was acquired by Tektronix in 2012. Before and during the timeframe relevant to the '247 patent's purported invention, I trained students in both analog and digital wireless communications techniques and standards, many of whom have been hired by Qualcomm, Google (formerly Motorola) and Skyworks. I am a Fellow of the IEEE.

12. I have previously testified as an expert witness in wireless telecommunications matters, as well as in matters related to adjacent wireless fields, such as RFID. Over the past two years, I've testified as an expert in more than twelve proceedings, and several of these were in wireless telecommunications, including written testimony on 3G standards in HTC Corp. v. Telefonaktiebolaget LM Ericsson Case No. 23844/FS Arbitration, International Chamber of Commerce. I currently serve on the Working Group for the IEEE P1765 Modulated Signal Measurement Uncertainty standards-setting body.

III. LEGAL UNDERSTANDING

A. My Understanding of Claim Construction

13. I have been informed that patent claims are construed from the viewpoint of a person of ordinary skill in the art of the patent at the time of the invention. I have been informed that patent claims generally should be interpreted consistent with their plain and ordinary meaning as understood by a person of ordinary skill in the art in the relevant time period (*i.e.*, at the time of the purported

invention, or the so called “effective filing date” of the patent application), after reviewing the patent claim language, the specification, and the prosecution history (*i.e.*, the intrinsic record).

14. I have further been informed that a person of ordinary skill in the art must read the claim terms in the context of the claim itself, as well as in the context of the entire patent specification. I understand that in the specification and prosecution history, the patentee may specifically define a claim term in a way that differs from the plain and ordinary meaning. I understand that the prosecution history of the patent is a record of the proceedings before the U.S. Patent and Trademark Office, and may contain explicit representations or definitions made during prosecution that affect the scope of the patent claims. I understand that an applicant may, during the course of prosecuting the patent application, limit the scope of the claims to overcome prior art or to overcome an examiner’s rejection, by clearly and unambiguously arguing to overcome or distinguish a prior art reference, or clearly and unambiguously disavowing claim coverage.

15. In interpreting the meaning of the claim language, I understand that a person of ordinary skill in the art may also consider “extrinsic” evidence, including expert testimony, inventor testimony, dictionaries, technical treatises, other patents, and scholarly publications. I understand this evidence is considered to ensure that a claim is construed in a way that is consistent with the understanding of those of

ordinary skill in the art at the time of the claimed invention. For example, this can be useful for a technical term whose meaning may differ from its ordinary English meaning. I understand that extrinsic evidence may not be relied on if it contradicts or varies the meaning of claim language provided by the intrinsic evidence, particularly if the applicant has explicitly defined a term in the intrinsic record.

1. Means Plus Function Terms

16. I have been informed and understand that certain claim terms can be means-plus-function terms. I understand that a “means-plus-function” term is one that is expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support of that function in the claim. I understand that a term is presumed not to be a means-plus-function term if it is not drafted using the term means. I also understand that a term that connotes sufficient structure to a person of ordinary skill in the art would not be a means-plus-function term.

17. I understand that for means-plus-function terms, the term is construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. My understanding of the doctrine of equivalents and equivalent structure is set forth below in Section III.D.

18. If a term is determined to be a means-plus-function claim, I understand that the disclosed structure in the specification is deemed to be corresponding

structure if the specification or prosecution history clearly links or associates that structure to the claimed function and the disclosure must be sufficient to achieve the claimed function.

B. My Understanding of Anticipation

19. I understand that a patent claim is invalid as “anticipated” if all of the limitations of the claim are present, either expressly or inherently, in a single previous device, or described, either expressly or inherently, in a single prior art publication or patent. I understand that, in the relevant time period, 35 U.S.C. § 102 stated that a person shall be entitled to a patent unless, among other bases:

- The invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent, or
- The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or
- The invention was described in—(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

20. I also understand that a prior art reference can disclose a claimed feature because the feature is expressly described or because the feature is inherent in the disclosure. I understand that something is inherent in a prior art reference if the missing descriptive matter must necessarily be present, not merely probably or possibly present, and it would be so recognized by a person of ordinary skill in the art as of the priority date of the patent. I understand that it is acceptable to examine evidence outside of the prior art reference (*i.e.*, extrinsic evidence) in determining whether a feature, while not expressly discussed in the reference, is necessarily present in it.

C. My Understanding of Obviousness

21. I understand that a claim may be invalid if the subject matter described by the claim as a whole would have been obvious to a hypothetical person of ordinary skill in the art in view of a prior art reference or in view of a combination of references at the time the claimed invention was made. Therefore, I understand that obviousness is determined from the perspective of a hypothetical person of ordinary skill in the art and that the asserted claims of the patent should be read from the point of view of such a person at the time the claimed invention was made. I further understand that a hypothetical person of ordinary skill in the art is assumed to know and to have all relevant prior art in the field of endeavor covered by the patent in suit.

22. I have been informed that there are two criteria for determining whether prior art is analogous and thus can be considered prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the patentee's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the patentee is involved. I have also been informed that the field of endeavor of a patent is not limited to the specific point of novelty, the narrowest possible conception of the field, or the particular focus within a given field. I have also been informed that a reference is reasonably pertinent if, even though it may be in a different field from that of the patentee's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to a patentee's attention in considering their problem.

23. I have also been advised that an analysis of whether a claimed invention would have been obvious should be considered in light of the scope and content of the prior art, the differences (if any) between the prior art and the claimed invention, and the level of ordinary skill in the pertinent art involved. I understand as well that a prior art reference should be viewed as a whole.

24. I have also been advised that in considering whether a claimed invention could be obvious over a combination of prior art references, I may assess whether there are apparent reasons to combine known elements in the prior art in the

manner claimed in view of interrelated teachings of multiple prior art references, the effects of demands known to the design community or present in the marketplace, and/or the background knowledge possessed by a person of ordinary skill in the art.

I understand that other principles may be relied on in evaluating whether a claimed invention would have been obvious, and that these principles include the following:

- A combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results;
- When a device or technology is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or in a different one, so that if a person of ordinary skill can implement a predictable variation, the variation is likely obvious;
- If a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond their skill;
- An explicit or implicit teaching, suggestion, or motivation to combine two prior art references to form the claimed combination may demonstrate obviousness, but proof of obviousness does not depend on or require showing a teaching, suggestion, or motivation to combine;
- Market demand, rather than scientific literature, can drive design trends and may show obviousness;
- In determining whether the subject matter of a patent claim would have been obvious, neither the particular motivation nor the avowed purpose of the named inventor controls whether the claim is obvious;

- One of the ways in which a patent's subject can be proved obvious is by noting that there existed at the time of invention a known problem for which there was an obvious solution encompassed by the patent's claims;
- Any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed;
- "Common sense" teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle;
- A person of ordinary skill in the art is also a person of ordinary creativity, and is not an automaton;
- A patent claim can be proved obvious by showing that the claimed combination of elements was "obvious to try," particularly when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions such that a person of ordinary skill in the art would have had good reason to pursue the known options within his or her technical grasp; and
- One should be cautious of using hindsight in evaluating whether a claimed invention would have been obvious.

25. I further understand that, in making a determination as to whether the claimed invention would have been obvious to a person of ordinary skill, the Board may consider certain objective factors if they are present, such as: commercial success of products practicing the claimed invention; long-felt but unsolved need; teaching away; unexpected results; copying; and praise by others in the field. These factors are generally referred to as "secondary considerations" or "objective indicia" of nonobviousness. I understand, however, that for such objective evidence to be

relevant to the obviousness of a claim, there must be a causal relationship (called a “nexus”) between the claim and the evidence and that this nexus must be based on a novel element of the claim rather than something in the prior art. I also understand that even when they are present, secondary considerations may be unable to overcome primary evidence of obviousness (such as motivation to combine with predictable results) that is sufficiently strong.

D. My Understanding of the Doctrine of Equivalents

26. I have been informed that there is a “doctrine of equivalents” in patent law that supports a finding of invalidity if a prior art element is equivalent to a claimed element, even if the prior art element is not identical to the claimed element. Equivalence may be established if the prior art element performs the identical function specified in the claim in substantially the same way and produces substantially the same result.

27. I also understand that insubstantial differences between a prior art element and a claimed element—as understood in light of its specification—will not preclude a finding of invalidity. For example, a difference in a number of parts in a prior art element and the corresponding element disclosed in the patent specification may be an insubstantial difference. Similarly, if a prior art element lacks several components of an overall structure corresponding to a claimed function, that difference may be insubstantial. And, potential advantages of a structure that do not

relate to a claimed function should not be considered in an equivalents determination.

28. I understand that the structures, materials, and acts to be considered equivalent or non-equivalent may be described in a patent's specification. A specification may therefore establish a narrow or broad range of equivalents, although an applicant also need not exhaustively describe the full range of equivalents.

IV. BACKGROUND OF THE TECHNOLOGY

29. As discussed in Section V below, the purported invention of the '247 patent is generally directed to implementing an error control technique for a wireless transmit/receive unit ("WTRU"), such as a mobile phone, to determine whether it needs to retransmit data to a base station when erroneous transmission occurs. In particular, the Challenged Claims recite a method for determining whether prior data blocks should be retransmitted, where the determination to retransmit is based on the uplink scheduling information received from the base station, rather than the receipt of a NACK.

30. At the time of the alleged invention of the '247 patent, error correction and control in transmissions between a WTRU and a base station were already performed via hybrid automatic repeat request (HARQ or H-ARQ) schemes in cellular networks. '247, 1:58-62; Kuchibhotla, ¶¶2, 23; Lucent, 1. For example, in

a typical HARQ system, to ensure that data is properly sent and received, the base station sends an acknowledgement message (“ACK”) or a negative acknowledgement message (“NACK”). ’247, 2:19-20; Kuchibhotla, ¶23. An ACK means the base station properly received the transmission. A NACK means the transmission is not properly received, thus signaling to the WTRU to retransmit that prior transmission. *Id.*

31. The ’247 patent particularly focuses on problems that may arise during a “H-ARQ operation” in connection with “handover,” where a WTRU is mobile and moves between cells that are serviced by different base stations in a cellular network. ’247, 2:4-22. For example, the ’247 patent discusses that, in hard handover, a WTRU loses access to the Node-B that controls the cell before the handover (*i.e.*, “source Node-B”) when it moves to a new cell serviced by another Node-B (*i.e.*, “target Node-B”). ’247, 2:4-12, 2:30-48. This raises the possibility of losing retransmissions if a WTRU retransmits previously NACKed data to the source Node-B while undergoing a hard handover. ’247, 2:30-34. Accordingly, the ’247 discusses prioritizing retransmissions of previously lost or “NACKed” data during handover before the WTRU fully transitions to a new target Node-B and loses access to the source Node-B. ’247, 7:41-44, 8:3-5. According to the ’247 patent, to efficiently retransmit the previously NACKed data, the source base station transmits to the WTRU an uplink (UL) scheduling message that identifies previously

NACKed data so that it can be retransmitted before the handover is completed. '247, 8:10-22. In particular, the UL scheduling message identifies the data to be retransmitted by “H-ARQ process identification for the H-ARQ process” corresponding to each previously NACKed transmission. '247, Abstract, 8:10-22. As such, the Challenged Claims require the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information rather than receipt of a “negative acknowledgement (NACK).” *See, e.g.,* '247, claims 1, 11. One of skill would have understood this as an implied NACK.

32. Based on my experience in the field, however, the claimed functionalities of the '247 patent were already known in the art prior to the '247 patent's priority date. For example, Kuchibhotla and Lucent each disclose a mobile device using a H-ARQ process for transmitting data blocks to a base station. Kuchibhotla, ¶23; Lucent 1. Kuchibhotla and Lucent also disclose determining whether to retransmit a previously sent data block to the base station based on scheduling information received from the base station and not based on receipt of a NACK. Kuchibhotla ¶¶62, 71 (determining whether to retransmit based on a “scheduling assignment message” and “ignoring...NACK”); Lucent 1, 4-5 (determining whether to retransmit based on whether the “New Data Indicator” field in a “schedule grant message” has changed). Furthermore, Lucent and Liu each disclose a H-ARQ process identification included in uplink scheduling information

to identify the H-ARQ process to which the scheduling information is directed. Lucent 1, 4-5 (using “H-ARQ channel” IDs included in schedule grant messages); Liu ¶¶25-33 (using “H-ARQ ID,” also called “H-ARQ channel ID” in downlink control channel frames).

33. As I discuss below, the Challenged Claims are anticipated and/or obvious over the prior art. Further, there were no technological barriers to combining these elements to form the claimed inventions and a person of ordinary skill in the art would have been motivated to combine these elements and would have understood that the combination would have yielded predictable results.

V. THE '247 PATENT

A. '247 Patent Overview

34. As I discuss in Section IV, the Challenged Claims are generally directed to having a WTRU determine whether to retransmit based on an uplink scheduling message received from the base station, instead of a NACK. In particular, the WTRU receives uplink scheduling information from a “source Node-B,” which serves two purposes: (1) to identify what data the WTRU needs to retransmit and (2) to communicate to the WTRU whether to retransmit. '247, 8:10-18. Regarding the first functionality, “source Node-B 210 uplink scheduler 225 may specify that the scheduled UL transmission is intended for the data blocks that were previously NACKed” by sending a H-ARQ process identification to the WTRU 205. '247,

8:10-18. Regarding the second functionality, the '247 discloses, “[b]y receiving the scheduling information from the source Node-B 210, the WTRU 205 knows that the schedule transmission is for the specific data associated with the HARQ process identification sent together with the scheduling information.” ’247, 8:18-22.

B. Prosecution History of the '247 Patent

35. In formulating my opinions, I considered the contents of the prosecution history of the '247 patent and its ancestors. *See* Exs. 1002 ('247 file history); Exs. 1012-1019 (ancestor file histories). The prosecution history shows that the Challenged Claims of the '247 patent were allowed without any substantive prosecution—the Examiner allowed all 20 claims with a one-paragraph statement citing to only one reference (US 2004/0109433), and in total cited only two references—US 2004/0109433 (Khan) and US 2002/0080719 (Parkvall). Ex. 1002, 93. Moreover, all of the originally-filed claims of the application that led to the '247 patent were allowed within less than three months following the application without receiving any rejections. Ex. 1002, 8-17, 93, 173.

36. I understand that the '247 patent is a continuation of a chain of 8 continuation applications, and all of those applications issued as a patent. *See* '247, 1-2 (“Related U.S. Application Data”). In my review of the earlier applications in the priority chain, I have seen substantive discussion of prior art only in two instances, which occurred during prosecution of related U.S. Patent Nos. 8,130,720

and 7,046,648, which issued from ancestor applications of the '247. However, those discussions were directed to different claim features that do not appear in or otherwise impact any of the Challenged Claims. In particular, the discussion during prosecution of U.S. Patent No. 8,130,720 was directed to limitations related to, e.g., a “CRC” check and “scheduling information including the maximum transmission power.” *See, e.g.*, Ex. 1013 at 195-97, 216-18, 228-30, 282-84, 291-94, 316-18, 392-94, 410-12, 441-43. The discussion during prosecution of U.S. Patent No. 7,046,648 was directed to limitations related to, e.g., “stor[ing] NACK data packets” and using “soft combining.” Ex. 1012 at 41-53, 71-73.

VI. THE '247 PATENT PRIORITY DATE

37. I understand the '247 patent was filed on August 31, 2020. I have not formulated any opinion about the correct priority date for the '247 patent. For purposes of this declaration, I was asked to assume, with respect to each of the prior art Grounds discussed in this declaration, that the '247 patent is entitled to the earliest claimed priority date of November 5, 2003. I have been instructed to consider the patent and the prior art from the perspective of a person having ordinary skill in the art as of November 5, 2003. My opinions set forth in this declaration would not change if the priority date for the '247 patent was determined to be later than November 5, 2003, because all of the prior art set forth in the grounds of unpatentability predate the earliest priority date of November 5, 2003.

VII. LEVEL OF ORDINARY SKILL IN THE ART

38. In rendering the opinions set forth in this declaration, I was asked to consider the patent claims and the prior art through the eyes of a person having ordinary skill in the art at the time of the alleged invention. I understand that the factors considered in determining the ordinary level of skill in a field of art include the level of education and experience of persons working in the field; the types of problems encountered in the field, the teachings of the prior art, and the sophistication of the technology at the time of the alleged invention. I understand that a person having ordinary skill in the art is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a person having ordinary skill in the art would also have knowledge from the teachings of the prior art, including the art cited below.

39. With respect to all of the Grounds, I have been asked to assume that the '247 patent is entitled to the priority date of November 5, 2003. Upon consideration of these factors, in my opinion, on or before this priority date, a person having ordinary skill in the art relating to the technology of the '247 patent would have had a bachelor's degree in electrical or computer engineering, computer science, or the equivalent thereof, and at least two years of experience with wireless communication systems. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.

40. I understand that Pantech's expert, Peter Rysavy, has offered an opinion in the LGE Litigation regarding the level of ordinary skill in the art required for another patent (U.S. Patent No. 9,854,545 or "'545 Patent") that is in a similar field of wireless communication as the '247 patent.¹ In particular, he opined that "at the time of the '545 Patent, a person of ordinary skill in the art would have a bachelor's degree in electrical engineering, or equivalent training, and approximately two years of experience working in the field of wireless networking." Ex. 1021, ¶30. This definition is consistent with the level of ordinary skill in the art I have proposed above for the '247 patent, and I have applied both definitions (both mine and Mr. Rysavy's) in my analysis in this declaration.

41. Well before November 5, 2003, my level of skill in the art was at least that of a person having ordinary skill. I am qualified to opine concerning what a person having ordinary skill in the art would have known and understood at the time of the '247 patent's purported invention. My analysis and conclusions herein are from the perspective of a person having ordinary skill in the art as of November 5, 2003.

¹ I am also submitting an expert declaration in support of an IPR challenging the '545 Patent (IPR2023-01269).

VIII. CLAIM CONSTRUCTION

42. I have been instructed that the Challenged Claims of the '247 patent are to be given their ordinary and customary meaning as understood by one of ordinary skill in the art at the time of the alleged invention in light of the specification and the prosecution history pertaining to the patent. I have followed these principles in my analysis set forth in this document.

43. I understand that the parties have not proposed any constructions for the '247 patent in the LGE Litigation.

A. Preambles

44. I understand the preamble of a claim may or may not be limiting. For purposes of this declaration, I have not been asked to formulate any opinion as to whether any claim preamble is limiting and have not formulated any such opinion. Instead, I have been instructed to consider whether the prior art discloses the preambles, to the extent they are limiting. To the extent they are limiting, they are disclosed by the prior art as discussed in Section IX.

B. Means-Plus-Function

45. For purposes of this declaration, I was asked to consider a means-plus-function construction of limitation [1.e] and whether that construction would affect my opinions. The construction I was instructed to consider is set forth below.

Limitation	Structure	Function
------------	-----------	----------

“the processor [] configured to cause the WTRU to: ...determine whether to retransmit...” (in [1.e])	processor in a WTRU (<i>see, e.g., '247, 3:25-28</i>) implementing an algorithm that, e.g., determines that the data block is scheduled for retransmission based on a received uplink scheduling information that includes a H-ARQ process identification associated with the data block to indicate that the data block was previously NACKed (<i>see, e.g., '247, 8:10-22</i>)	cause the WTRU to: determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station
--	--	--

46. I understand that in unrelated litigation involving the '247 patent, the district court issued a claim construction finding that the “processor” limitation in [1.e] is not means plus function. Ex. 1026, 55. Additionally, based on my review of the specification of the '247 patent and the Claims, at least limitations [1.c], [1.d], [2], and [10] are all performed by a transceiver. A person of ordinary skill in the art would have understood a transceiver to connote sufficient structure. *See, e.g., Rathonyi, 1:33-39, 15:64-66, Figure 1 (Grounds 8-14).* As such, I understand that these limitations should not be construed as means-plus-function terms.

47. I have not adopted the above constructions as my own, and I express no opinions as to whether those constructions should be adopted. Regardless, as set forth below in Section IX, limitation [1.e] is disclosed or rendered obvious by the

prior art cited herein even under these above constructions, literally and/or under the doctrine of equivalents by the processor in **Lucent's** UE (alone or in view of **Liu**) and **Kuchibhotla's** MS (in view of **Liu**), by performing substantially the same functions in substantially the same way to achieve substantially the same result.

IX. GROUNDS OF UNPATENTABILITY

48. In this section, I will explain why combinations of teachings from the following references render obvious each of the Challenged Claims. I have been instructed to assume that each of these references qualifies as prior art. I understand that Petitioner has retained Dr. Friedhelm Rodermund, an expert on 3GPP proceedings, to provide testimony regarding public accessibility of **Lucent**. See Declaration of Friedhelm Rodermund in Support of Petition for *Inter Partes* Review of U.S. Patent No. 10,869,247 (Ex. 1004, "Rodermund"). I have reviewed his declaration and agree with his analysis, which is incorporated into the table below.

Name	US Publication/ Title	Filed	Published/ Issued
Lucent	R1-03-0285, <i>Signalling for H-ARQ Operation</i>	N/A	By 2/21/2003 ²
Kuchibhotla	U.S. Patent Application	5/7/2003	11/11/2004

² See Rodermund, ¶¶61-77.

Name	US Publication/ Title	Filed	Published/ Issued
	Publication No. 2004/0223507		
Liu	U.S. Patent Application Publication No. 2005/0048920	8/26/2003	3/3/2005
Rathonyi	U.S. Patent No. 6,359,877	7/21/1998	3/19/2002
Das	U.S. Patent Application Publication No. 2003/0076783	10/19/2001	4/24/2003

49. As I explain above in Section IV, the methods of enhancing the reliability of the determination of ACK/NACK information in a H-ARQ process were well-known in the art. As I explain below, the Challenged Claims are invalid based upon the following prior art grounds:

50. **Ground 1:** Challenged Claims 1-2, 8, 11-12, 18 of the '247 patent are anticipated and rendered obvious by Lucent.

51. **Ground 2:** Challenged Claims 1-2, 8, 11-12, 18 of the '247 patent are rendered obvious by Lucent in view of Liu.

52. **Ground 3:** Challenged Claims 9-10, 19-20 of the '247 patent are rendered obvious by Lucent in view of Das.

53. **Ground 4:** Challenged Claims 9-10, 19-20 of the '247 patent are rendered obvious by Lucent in view of Liu and Das.

54. **Ground 5:** Challenged Claims 1-7, 11-17 of the '247 patent are rendered obvious by Kuchibhotla in view of Liu.

55. **Ground 6:** Challenged Claims 8, 18 of the '247 patent are rendered obvious by Kuchibhotla in view of Liu and Lucent.

56. **Ground 7:** Challenged Claims 9-10, 19-20 of the '247 patent and rendered obvious by Kuchibhotla in view of Liu, Lucent and Das.

57. **Grounds 8-14:** Challenged Claims of the '247 patent in the corresponding Grounds 1-7 are rendered obvious in further view of Rathonyi.

58. It is my opinion that the Challenged Claims of the '247 patent are unpatentable as explained below. I note that in this discussion, I may focus on the particular language in the specific claims, but it should be understood that my analysis applies to the corresponding elements of all Challenged Claims containing identical or substantially identical language.

A. Ground 1: Lucent (Claims 1-2, 8, 11-12, 18)

1. Overview of Lucent

59. **Lucent**, titled "Signalling for H-ARQ Operation," teaches signaling for scheduling transmissions from a "UE" to a "Node-B" in "asynchronous H-ARQ operation." Lucent, 1, Figures 1, 2. The UE transmits on a "H-ARQ channel," such

as “H-ARQ channel 0,” which is assigned to “a given H-ARQ process.” Lucent, 4-5, Figure 2.

60. **Lucent** discloses that the transmissions from the UE to the Node-B can be controlled via “Node-B controlled scheduling” or “autonomous” scheduling by the UE. Lucent, 1-2. In the Node-B controlled scheduling, **Lucent** teaches using a “schedule grant message transmitted by the Node-B” to schedule the UE’s “uplink transmission” to the Node-B. Lucent, 1. “The schedule grant message contains H-ARQ parameters, transport block size (TBS) indication, and modulation and coding scheme (MCS).” Lucent, 1.

61. As shown in the Figure 2 below, **Lucent** describes the H-ARQ parameters contained in the schedule grant message in an “(x, y)” tuple: in particular, as shown in the legend (annotated in red), where “x is the H-ARQ SAW channel,” and “y is the New Data Indicator” (NDI). Lucent, 4-5, Figure 2 (annotated).

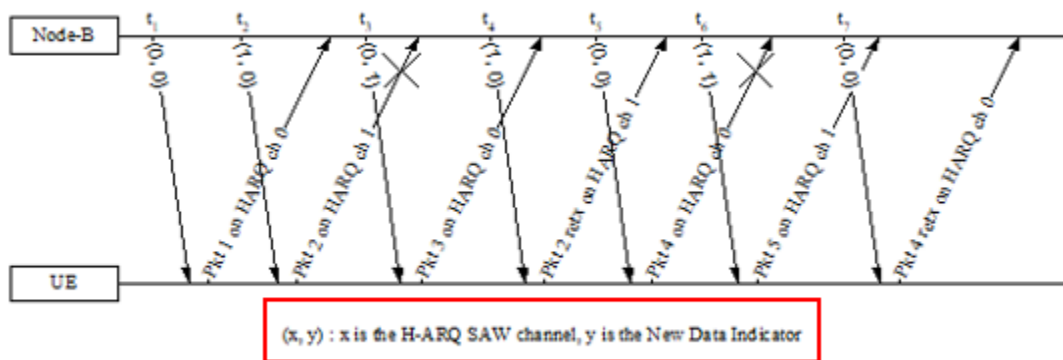


Figure 2. Implicit signalling of H-ARQ ACK/NACKs by Node-B

62. The NDI bit is used for “[i]mplicit signalling of H-ARQ ACK/NACKs by Node-B.” Lucent, 4-5, Figure 2. The NDI bit value can be 0 or 1. *Id.* Each time the UE receives a schedule grant message, it determines whether to “transmit[] a new packet” or “retransmit[]” the previous packet by comparing the NDI value included in the new schedule grant message with the NDI value included in the previously received schedule grant message. *Id.* If the two NDI values are different, the UE transmits a new packet. *Id.* If the two NDI values are the same, the UE retransmits the previous packet that it sent on the same H-ARQ channel. In other words, “if the New Data Indicator has not changed compared to the value in the previous received transmission of a given H-ARQ process, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous received transmission of a given H-ARQ process, it implies an ACK.” *Id.* The Node-B identifies which prior transmission to retransmit by using a H-ARQ channel identifier. *Id.* In particular, a schedule grant message with (0, y) tells whether the last transmission on the “H-ARQ channel 0” should be retransmitted, and a schedule grant message with (1, y) tells whether the last transmission on the “HARQ ch 1” should be retransmitted. *Id.*

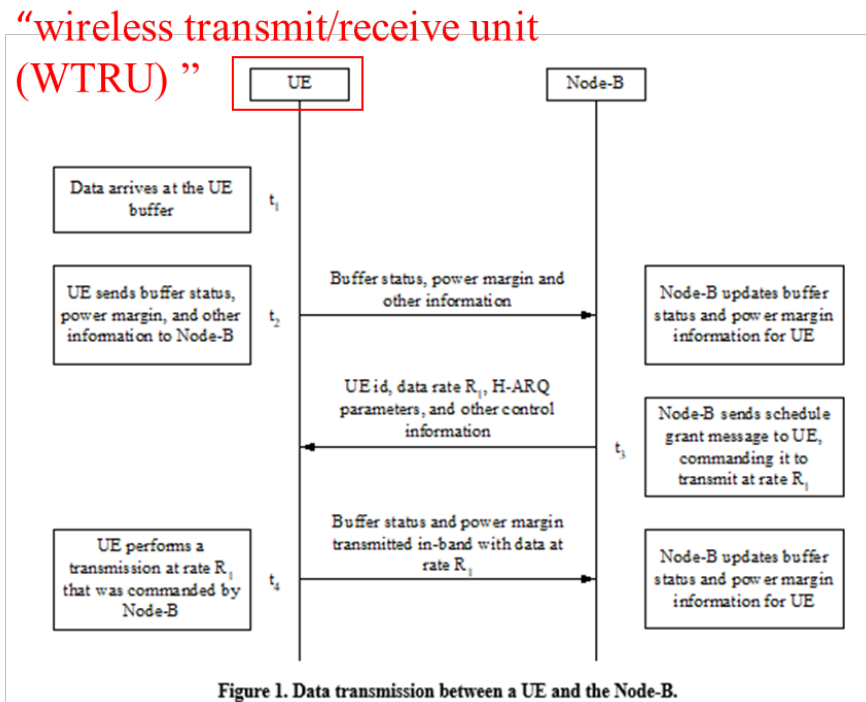
2. Invalidity of Claims 1-2, 8, 11-12, and 18 Over Lucent

(a) Element [1.pre]

63. Element [1.pre] recites “A wireless transmit/receive unit (WTRU) comprising.” This element is met by Lucent.

64. Lucent discloses a wireless transmit/receive unit (WTRU) (e.g., “UE” that transmits/receives information wirelessly to/from a Node-B). See e.g., Lucent (emphasis added):

- **Figure 1** (“Data transmission between a UE and the Node-B”)



- **Figure 2** (“Implicit signalling of H-ARQ ACK/NACKs by Node-B”)

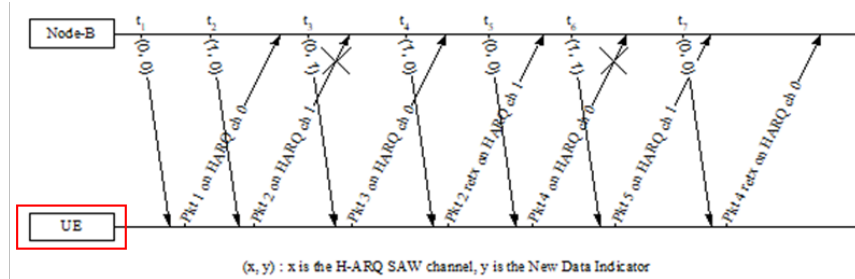


Figure 2. Implicit signalling of H-ARQ ACK/NACKs by Node-B

“wireless
transmit/receive
unit (WTRU) ”

- 1 (“§2.1 Node-B controlled scheduling[:] Here, *the UE’s uplink transmission is in response to a schedule grant message transmitted by the Node-B.*”)
- 3 (“An example of *data transmission between a UE and a Node-B* in this case is shown in Figure 1. In this example, we assume that *the mobile is already registered with the system* and is in the CELL_DCH state. A time t_1 , data shows up at the UE buffer. At time t_2 , *UE sends its buffer status and power margin information to the Node-B.... After receiving the buffer status and power margin information, the Node-B decides to schedule the mobile* and sends the scheduling grant at time t_3 . At time t_4 , *the UE transmits at the data rate commanded by the Node-B.*”)
- See also 4-5 (discussion of “UE” receiving and transmitting information to/from Node-B).

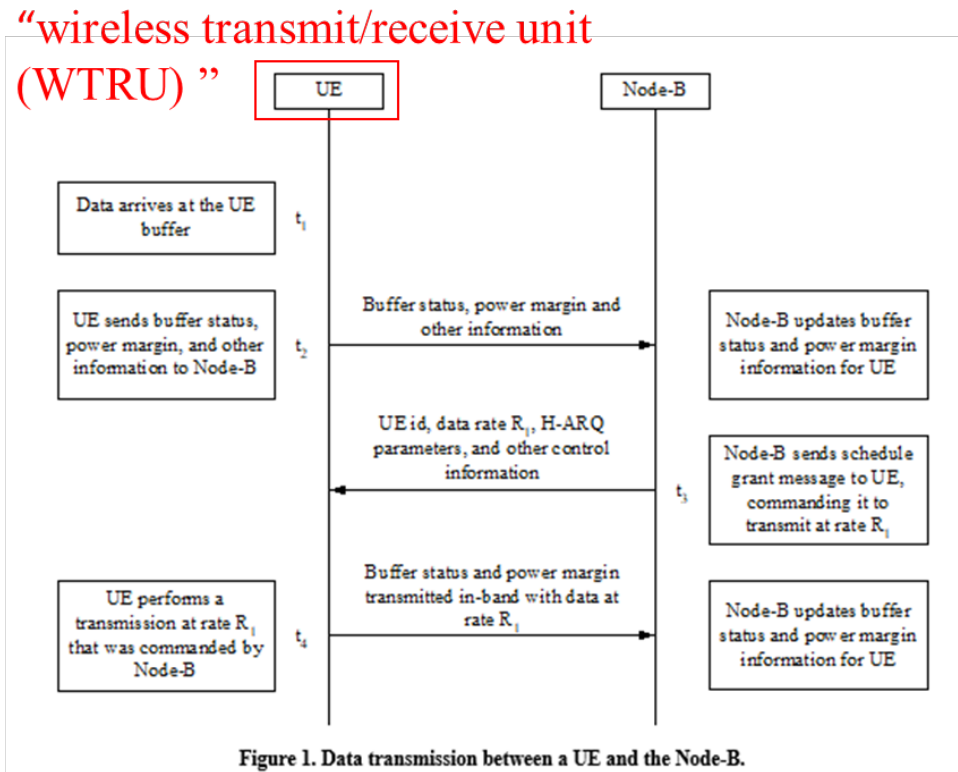
65. **Lucent** discloses a “UE” and a “Node-B” engaging in two-way “[d]ata transmission,” as depicted in Figures 1 and 2. Lucent, 1, 3-5, Figures 1-2. **Lucent** refers to UE also as “mobile.” Lucent, 3. For example, Lucent discloses, “the Node-B decides to schedule *the mobile* and sends the scheduling grant.” *Id.* A person of ordinary skill in the art would have understood the “mobile” as referring to a mobile device, which is a wireless transmit/receive unit (WTRU).

(b) Element [1.a]

66. Element [1.a] recites “**at least one transceiver.**” This element is met by Lucent.

67. Lucent **discloses at least one transceiver** (*e.g.*, transceiver of a “UE” or “mobile” for transmitting/receiving information to/from Node-B). *See e.g.*, Lucent (emphasis added):

- **Figure 1** (“Data transmission between a UE and the Node-B”)



- **Figure 2** (“Implicit signalling of H-ARQ ACK/NACKs by Node-B”)

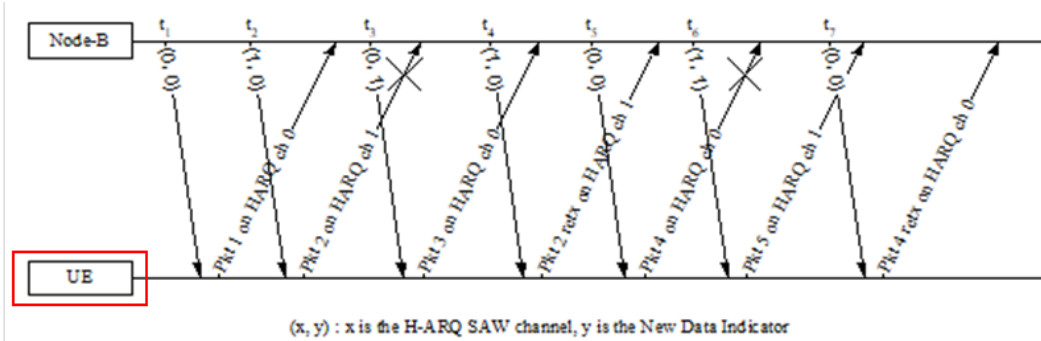


Figure 2. Implicit signalling of H-ARQ ACK/NACKs by Node-B

“wireless
transmit/receive
unit (WTRU) ”

- 1 (“§2.1 Node-B controlled scheduling[:] Here, the *UE’s* *uplink transmission is in response to a schedule grant message transmitted by the Node-B.*”)
- 3 (“An example of *data transmission between a UE and a Node-B* in this case is shown in Figure 1. In this example, we assume that *the mobile* is already registered with the system and is in the CELL_DCH state....After receiving the buffer status and power margin information, *the Node-B decides to schedule the mobile and sends the scheduling grant* at time t3. At time t4, *the UE transmits at the data rate commanded by the Node-B*”)
- *See also 4-5* (discussion of “UE” receiving and transmitting information to/from Node-B).

68. See my discussion for element [1.pre]. As I discuss in element [1.pre],

Lucent discloses a “UE,” also referred as “mobile,” that wirelessly transmits and receives information to and from a “Node-B.” *See* [1.pre]; Lucent 3. A person of ordinary skill in the art would have understood that **Lucent’s** “UE” or “mobile” includes a transceiver, which is a standard component in mobile devices used to communicate with the Node-B, where the receiver section of the transceiver receives

communication from the Node-B and the transmitter section of the transceiver transmits communication to the Node-B. At minimum, a person of ordinary skill in the art would have found it obvious to include at least one transceiver in the UE to implement such two-way communication with the Node-B as using transceivers in wireless communication devices were common practice at the time of the alleged invention. *See e.g.*, Rathonyi, 1:33-39, 15:64-66, Claim 9, Figure 1 (disclosing a mobile station communicating with a base station via its transceiver). Thus, **Lucent** discloses and renders obvious that its UE has at least one transceiver that performs these transmitting and receiving functionalities. *See also* discussion of [1.c]-[1.d] below.

(c) Element [1.b]

69. Element [1.b] recites “**a processor.**” This element is met by **Lucent**.

70. **Lucent** discloses **a processor** (*e.g.*, “UE[‘s]” processor that determines, *e.g.*, whether to “transmit[] a new packet” or “retransmit” a previous packet in a “H-ARQ process” depending on whether the “New Data Indicator (NDI)” sent in the “schedule grant message” from the Node-B has changed or remained the same; Figure 2). *See e.g.*, Lucent (emphasis added):

- **4-5** (“Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s) in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous received transmission of a given ***H-ARQ process***, it implies a

NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous received transmission of a given *H-ARQ process*, it implies an ACK... Figure 2 illustrates the method by means of an example. *At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response*, which is decoded correctly by the Node-B. *The schedule grant message sent by Node-B at time t_3 changes the NDI value for H-ARQ channel 0, which implicitly indicates to the UE that the first packet was received correctly. So, the UE transmits a new packet on H-ARQ channel in response*. Similarly, the second packet transmitted by the UE in response to the schedule grant message transmitted by the Node-B at time t_2 was received in error at the Node-B. The schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and H-ARQ channel as at time t_2 , which implicitly indicates to the UE that the second packet was received in error. In response, therefore, the UE retransmits the second packet.”)

71. See my discussion for elements [1.pre]. As I discuss in element [1.pre], **Lucent** discloses a UE that wirelessly communicates with a Node-B. See [1.pre]. **Lucent** further discloses that, in addition to wirelessly communicating with the Node-B, the UE performs other functions, including detecting a “New Data Indicator (NDI)” that UE receives in a “schedule grant message” and determining based on the NDI whether to “transmit[] a new packet” or “retransmit[]” a previous packet in a “H-ARQ process,” as I explain in more detail in elements [1.c]-[1.e]. See [1.c]-[1.e]; Lucent, 4-5. A person of ordinary skill in the art would have understood that the UE includes a processor in order to perform these functions. At minimum, a person of ordinary skill in the art would have found obvious to include a processor in the UE to perform these processes, as processors were standard, well-known

components that were used in wireless communication devices to process wireless communications, such as HARQ-based transmissions like those discussed in Lucent. *See e.g.*, Rathonyi, 1:33-39, 15:64-66, Claim 9, Figure 1 (disclosing a mobile station performing HARQ-based transmission control via its processor). Thus, **Lucent** discloses and renders obvious that its UE has a processor that processes HARQ-based communications to determine whether to retransmit data. *See also* discussion of [1.e] below.

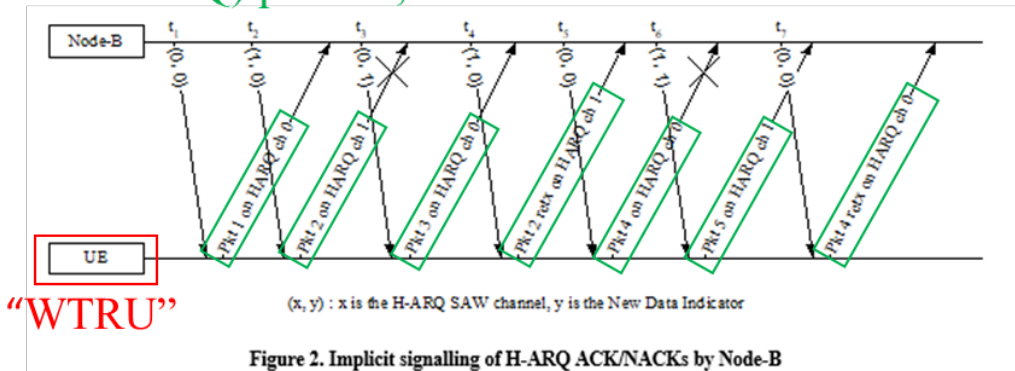
(d) Element [1.c]

72. Element [1.c] recites “**wherein the at least one transceiver and the processor are configured to cause the WTRU to: transmit, using a hybrid automatic repeat request (H-ARQ) process, a data block to a base station.**” This element is met by Lucent.

73. **Lucent discloses that the at least one transceiver (see [1.a]) and the processor (see [1.b]) are configured to cause the WTRU (see [1.pre]) to: transmit, using a hybrid automatic repeat request (H-ARQ) process, a data block to a base station (e.g., “UE transmits the first packet”/“data block” on “H-ARQ channel 0” identifying “a given H-ARQ process” “to the Node-B”).***See e.g.*, Lucent (emphasis added):

- **Figure 2** (“Implicit signalling of *H-ARQ* ACK/NACKs by Node-B”)

“transmit, using a hybrid automatic repeat request (H-ARQ) process, a data block to a base station”

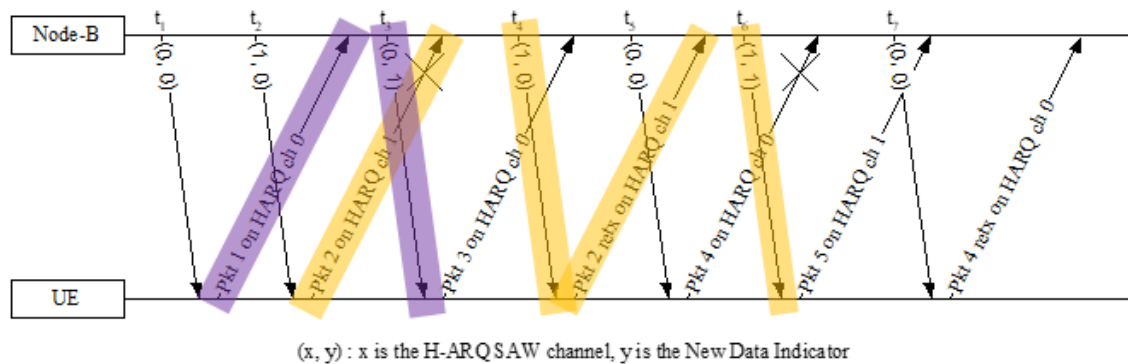


- 4-5 (“Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s) in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous *received transmission of a given H-ARQ process*, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous *received transmission of a given H-ARQ process*, it implies an ACK... Figure 2 illustrates the method by means of an example. *At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B.*”)
- 3 (“An example of data transmission between a UE and a Node-B in this case is shown in Figure 1 (“Data transmission between a UE and the Node-B”)...After receiving the buffer status and power margin information, the Node-B decides to schedule the mobile and sends the scheduling grant at time t_3 . At time t_4 , the UE transmits at the data rate commanded by the Node-B. Note that the buffer status and power margin information is carried in *each data block transmitted in response to a schedule grant received from the Node-B*. Therefore, when a UE sends data to the Node-B, buffer status and power margin information get updated as well.”)
- 1 (“Hybrid ARQ (H-ARQ) was one of the key technologies that led to the significant improvement that HSDPA provided over previous downlink transmission technologies, such as that in Rel ‘99. It can

be expected that ***H-ARQ*** will once again play an important role in uplink enhancements that are being studied now. [¶] ***Certain amount of signalling is necessary for H-ARQ operation. In this contribution, we discuss the signalling that is required for efficient H-ARQ operation.***”).

- ***See also*** 1-2 (§2.1), **Figure 1**.

74. See my discussion for elements [1.a]-[1.b]. **Lucent** also discloses “[a]n example of data transmission,” where “a UE sends data to the Node-B.” Lucent, 3. In this example, the UE “transmit[s]” to the Node-B “data block[s].” Lucent, 3. Lucent further discloses that transmissions of the data blocks (or “packet[s]”) from the UE to the Node-B are performed on specific “H-ARQ channel[s]” and according to “[i]mplicit signalling of H-ARQ ACK/NACK by Node-B.” Lucent, 4-5, Figure 2. As shown in Figure 2, each H-ARQ channel number identifies a single “H-ARQ process” at any given time, wherein each “given H-ARQ process” involves transmission, reception, and any retransmission of a data packet and the associated feedback signalling. *Id.* For example, “HARQ ch 0” identifies a H-ARQ process for transmitting and receiving a first packet (“Pkt 1”), as highlighted in purple in Figure 2 below. As another example, “HARQ ch 1” identifies a H-ARQ process for transmitting, receiving (unsuccessfully, as denoted by the “X”), and retransmitting a second packet (“Pkt 2”), as highlighted in yellow in Figure 2 below.



Lucent, Figure 2 (highlighted).

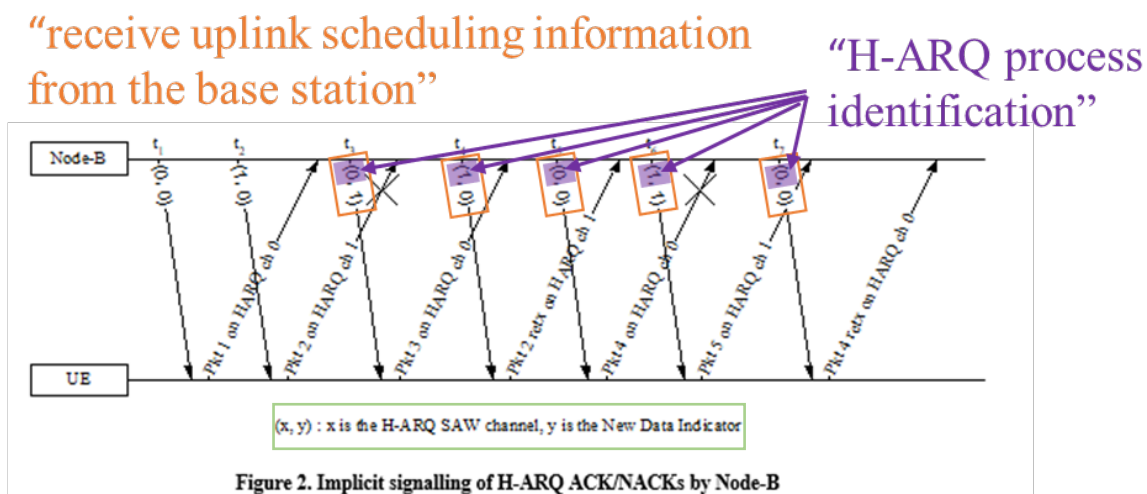
75. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Lucent's** UE includes at least a transceiver working with a processor, or at minimum would have found it obvious to use a transceiver working with a processor to transmit information to the Node-B. *See* [1.a]-[1.b]. In the example of the H-ARQ process for the second packet depicted above, a person of ordinary skill in the art would have understood, or at minimum found obvious, that the UE's transceiver transmits the second packet, receives a first feedback signalling, retransmits the second packet, and receives a second feedback signalling. Lucent, 3-5. As discussed in [1.a] above, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver working with the processor of the UE is configured to cause the UE to transmit data blocks to the Node-B using a H-ARQ process. Thus, **Lucent** discloses and renders obvious that its transceiver working with its processor is configured to cause the UE to transmit, using a H-ARQ process, a data block to the Node-B.

(e) Element [1.d]

76. Element [1.d] recites “receive uplink scheduling information from the base station, wherein the uplink scheduling information includes a H-ARQ process identification for the H-ARQ process.” This element is met by Lucent.

77. Lucent discloses that the at least one transceiver (see [1.a]) and the processor (see [1.b]) are configured to cause the WTRU (see [1.pre]) to receive uplink scheduling information from the base station (e.g., “UE” receives a “schedule grant message transmitted by the Node-B”), wherein the uplink scheduling information includes a H-ARQ process identification for the H-ARQ process (e.g., “The schedule grant message contains H-ARQ parameters,” including an “x” value identifying the H-ARQ process occurring on a “H-ARQ channel”). See e.g., Lucent (emphasis added):

- **Figure 2** (“Implicit signalling of H-ARQ ACK/NACKs by Node-B”)

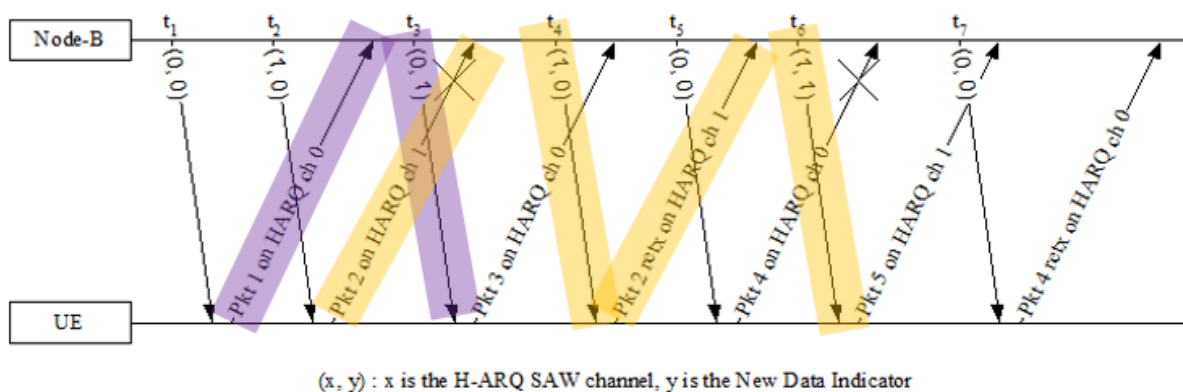


- **1** (“Here, the UE’s uplink transmission is in response to a schedule grant message transmitted by the Node-B. Therefore, there is a strict timing relationship between the transmission of the schedule grant message and the corresponding uplink data transmission....*The schedule grant message contains H-ARQ parameters*, transport block size (TBS) indication, and modulation and coding scheme (MCS).”)
- **4-5** (“Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s) in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous *received transmission of a given H-ARQ process*, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous *received transmission of a given H-ARQ process*, it implies an ACK... Figure2 illustrates the method by means of an example. *At time t_1 , Node-B schedules a transmission on H-ARQ channel 0*, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B. *The schedule grant message sent by Node-B at time t_3 changes the NDI value for H-ARQ channel 0, which implicitly indicates to the UE that the first packet was received correctly. So, the UE transmits a new packet on H-ARQ channel in response.* Similarly, the second packet transmitted by the UE in response to the schedule grant message transmitted by the Node-B at time t_2 was received in error at the Node-B. The schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and *H-ARQ channel* as at time t_2 , which implicitly indicates to the UE that the second packet was received in error. In response, therefore, the UE retransmits the second packet. The rest of figure is now self-explanatory.”)

78. See my discussion for elements [1.a]-[1.c]. **Lucent** also discloses, “the UE’s uplink transmission is in response to a schedule grant message transmitted by the Node-B.” **Lucent**, 1. In particular, “the UE transmits a new packet” or “retransmits” a previously sent packet based on “[t]he schedule grant message” that

it receives from the Node-B. Lucent, 4-5, Figure 2. “The schedule grant message contains H-ARQ parameters,” such as a “(x, y)” tuple, as shown in Figure 2, where “x is the H-ARQ SAW channel” (e.g., 0 or 1) and “y” is the “New Data Indicator” (NDI) (e.g., 0 or 1) indicating whether the UE is to transmit a new packet or retransmit a previously sent packet in its next transmission in a “given H-ARQ process.” Lucent, 1, 4-5, Figure 2.

79. As I previously discussed in [1.c], as shown in Figure 2, each “x” value, representing a H-ARQ channel “0” or “1,” identifies a distinct H-ARQ process at a given time and therefore is a H-ARQ process identification for its corresponding H-ARQ process. For example, as highlighted in Figure 2 below, “HARQ ch 0,” represented by $x=0$, identifies the H-ARQ process for “Pkt 1” (highlighted in purple). As another example, “HARQ ch 1,” represented by $x=1$, identifies the HARQ process for Pkt 2 (highlighted in yellow).



See Lucent, Figure 2 (highlighted). Indeed, a person of ordinary skill in the art would have understood that H-ARQ processes were commonly viewed as separate H-ARQ channels at the time of the invention. *See, e.g.* Ex. 1011 (Vayanos), ¶56 (“The eight HARQ processes may thus be viewed as eight ‘HARQ channels’ that may be used to transmit packets.”), ¶66 (“W-CDMA Release 5 allows for a number of re-ordering entities and a number of HARQ processes (or HARQ channels) to be operating concurrently.”); Liu, ¶¶26, 33, 38, Figure 5 (“HARQ Channel ID”/”H-ARQ ID” “identify[ing] a specific process in a hybrid automatic repeat request (HARQ) process”). As such, the “x” value in the (x, y) tuple of the schedule grant message is a H-ARQ process identification.

80. And at the very least, a person of ordinary skill in the art would have found it obvious to use the “x” value in **Lucent** as a H-ARQ process identification as a H-ARQ channel ID identifies a single H-ARQ process at a given time. *See, e.g.*, Vayanos, ¶¶56, ¶66; Liu, ¶¶26, 33, 38, Figure 5; Lucent, 4-5, Figure 2. Indeed, using H-ARQ channels IDs to also identify H-ARQ processes to keep track of H-ARQ processes would increase the channel utilization efficiency by transmitting multiple packets concurrently using multiple HARQ processes, thus enabling more efficient communications between the UE and the Node-B.

81. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Lucent’s** UE includes at least a transceiver working

with a processor, or at minimum would have found it obvious to use a transceiver working with a processor in Lucent's UE to receive information from the Node-B. *See* [1.a]-[1.b]. For example, a person of ordinary skill in the art would have understood, or at minimum found obvious, that the UE's transceiver receives the first schedule grant message, "(1, 0)" with respect to the H-ARQ process for Pkt 2 (highlighted in yellow in Figure 2 above) and the second schedule grant message, "(1, 1)." Lucent, 4-5, Figure 2. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver working with the processor of the UE is configured to cause the UE to receive the scheduling grant messages from the Node-B, which includes a H-ARQ process identification for the H-ARQ process. Thus, **Lucent** renders obvious and discloses that its UE includes a transceiver working together with the processor to cause the UE to receive the scheduling grant message including the H-ARQ process identification for the H-ARQ process from the Node-B.

(f) Element [1.e]

82. Element [1.e] recites **"determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from**

the base station.” This element is met by **Lucent** under at least Pantech’s interpretation.³

83. Under at least Pantech’s interpretation, **Lucent** discloses wherein **the at least one transceiver (see [1.a]) and the processor (see [1.b]) are configured to cause the WTRU (see [1.pre]) to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station (e.g., “the UE retransmits the second packet” “if the New Data Indicator” in the “schedule grant message” “has not changed compared to the value in the previous received transmission of a given H-ARQ process”).** See e.g., **Lucent** (emphasis added):

- **Figure 2 (“Implicit signalling of H-ARQ ACK/NACKs by Node-B”)**

³ In Pantech’s Infringement Contentions served on February 15, 2023 in the LGE Litigation, Pantech relies on functionality that is the same as **Lucent’s** for this limitation—namely, functionality involving a UE that determines whether to retransmit data based on a new data indicator rather than the receipt of an explicit NACK message. See Ex. 1022 at 17-26.

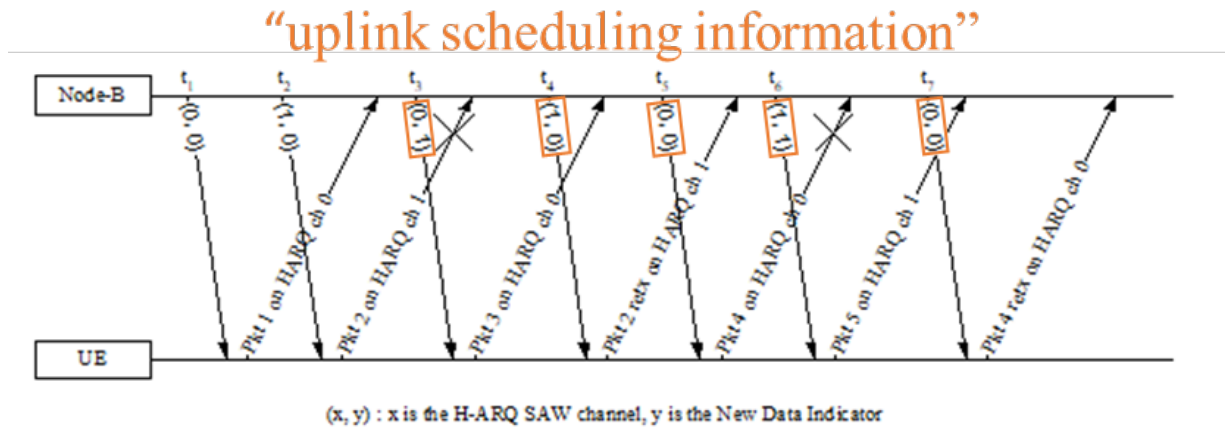


Figure 2. Implicit signalling of H-ARQ ACK/NACKs by Node-B

- 4-5 (“§3.1.3 Signalling of ACK/NACKs[:]
*Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s) in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous received transmission of a given H-ARQ process, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous received transmission of a given H-ARQ process, it implies an ACK...*Figure 2 illustrates the method by means of an example. At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B. *The schedule grant message sent by Node-B at time t_3 changes the NDI value for H-ARQ channel 0, which implicitly indicates to the UE that the first packet was received correctly. So, the UE transmits a new packet on H-ARQ channel in response.* Similarly, the second packet transmitted by the UE in response to the schedule grant message transmitted by the Node-B at time t_2 was received in error at the Node-B. *The schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and H-ARQ channel as at time t_2 , which implicitly indicates to the UE that the second packet was received in error. In response, therefore, the UE retransmits the second packet.*”)
- See also 1-2 (§2.1).

84. See my discussion for elements [1.a]-[1.d]. As I discuss in element [1.d], **Lucent** discloses that the UE receives a schedule grant message from the Node-B. *See* [1.d]. A schedule grant message includes “the New Data Indicator (NDI) bit(s),” where each NDI bit can take two values: 0 or 1. *Lucent* 4-5, Figure 2. **Lucent** discloses, “At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B.” *Id.* At times t_3 , t_5 , and t_7 , the Node-B sends more schedule grant messages to schedule the UE for following transmissions on H-ARQ channel 0. *Id.* Each time the UE receives a schedule grant message, it determines whether to “transmit[] a new packet” or “retransmit[]” the previous packet by comparing the NDI value included in the new schedule grant message with the NDI value included in the previously received schedule grant message. *Id.* If the two NDI values are different, the UE transmits a new packet. *Id.* If the two NDI values are the same, the UE retransmit the previous packet that it sent on the same H-ARQ channel. In other words, “if the New Data Indicator has not changed compared to the value in the previous received transmission of a given H-ARQ process, it implies a NACK.” *Lucent*, 4. Conversely, “if the New Data Indicator has changed compared to the value in the previous received transmission of a given H-ARQ process, it implies an ACK.” *Lucent*, 4-5; Fig. 2. Therefore, the UE in **Lucent** determines whether to retransmit a data block that it previously transmitted

based on the NDI value, not based on an explicit ACK or NACK indicator’. Thus, **Lucent** discloses and renders obvious that its UE includes a processor working together with the UE’s transceiver that is configured to cause the UE to determine whether to retransmit the data block based on the scheduling grant message and not based on whether the UE has received a NACK from the Node-B.

85. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Lucent’s** UE includes a processor working with a transceiver, or at minimum would have found it obvious to use a processor working with a transceiver in Lucent’s UE to perform HARQ-based processes. *See* [1.a]-[1.b]. For example, with respect to the H-ARQ process for Pkt 2 (highlighted in yellow in Figure 2 in [1.d]), a person of ordinary skill in the art would have understood, or at minimum found obvious, that the UE’s processor reads the first NDI included the first schedule grant message, determines to retransmit Pkt 2 based on the first NDI, reads the second NDI included the second schedule grant message, and determines not to retransmit Pkt 2) based on the second NDI. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious that the processor working with the transceiver of the UE is configured to cause the UE to determine whether to retransmit the data block (e.g., “Pkt 2” based on the received uplink information (e.g., “NDI”) and not based on whether the UE has received a NACK from the base station.

86. Based on a construction I was instructed to consider, which I have not adopted as my own, I have been asked whether the term “the processor [] configured to cause the WTRU to: ... determine whether to retransmit...” (in [1.e]) would be met if it was considered to be a means-plus-function limitation. As discussed in the Claim Construction Section above (§VIII.B), assuming this limitation is construed under means-plus-function, **the function includes** causing the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station, and **the corresponding structure includes** a processor in a WTRU (*see, e.g., '247, 3:25-28*) implementing an algorithm that, e.g., determines that the data block is scheduled for retransmission based on a received uplink scheduling information that includes a H-ARQ process identification associated with the data block to indicate that the data block was previously NACKed (*see, e.g., '247, 8:10-22*).

87. To the extent **Lucent** does not literally meet the function and corresponding structure for [1.e] as identified above in §VIII.B, this limitation is met by **Lucent** under the doctrine of equivalents under *Pantech's* interpretation⁴: for example, the processor in *Lucent's* “UE” performs the function of causing the

⁴ *See* n.3.

WTRU to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station (*see* my discussion of element [1.b], [1.d], and [1.e] above) in substantially the same way as the '247 patent (e.g., 8:10-22)—both utilize a “UE” to determine whether to retransmit a data block based on uplink scheduling information identifying information about a previous failed transmission, where the retransmission determination is not based on whether or not a NACK message was received by the WTRU (*see* my discussion of element [1.e] above)—to achieve substantially the same result—a determination is made as to whether to retransmit the data block (*see* my discussion of element [1.e] above).

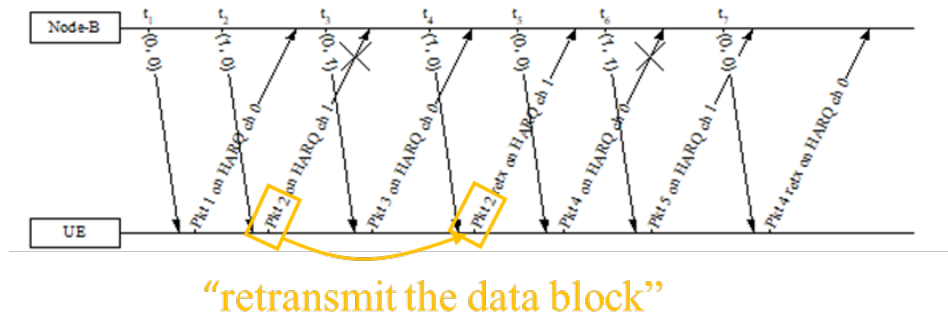
(g) Claim 2

88. Claim [2] recites “**The WTRU of claim 1, wherein the at least one transceiver and the processor are further configured to cause the WTRU to, in response to a determination to retransmit the data block, retransmit the data block.**” As discussed above, **Lucent** discloses and/or renders obvious claim 1. The element recited in claim 2 is further met by **Lucent**.

89. **Lucent** further discloses that the at least one transceiver (*see* [1.a]) and the processor (*see* [1.b]) are further configured to cause the WTRU (*see* [1.pre]) to, in response to a determination to retransmit the data block, retransmit the data block (e.g., “the UE retransmits the second packet” “if the New Data Indicator” in the

“schedule grant message” “has not changed compared to the value in the previous received transmission of a given H-ARQ process”). See e.g., Lucent (emphasis added):

• **Figure 2**



- **4-5** (“§3.1.3 Signalling of ACK/NACKs[:]
*Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s) in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous received transmission of a given H-ARQ process, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous received transmission of a given H-ARQ process, it implies an ACK...*Figure2 illustrates the method by means of an example. At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B. *The schedule grant message sent by Node-B at time t_3 changes the NDI value for H-ARQ channel 0, which implicitly indicates to the UE that the first packet was received correctly. So, the UE transmits a new packet on H-ARQ channel in response.* Similarly, the second packet transmitted by the UE in response to the schedule grant message transmitted by the Node-B at time t_2 was received in error at the Node-B. *The schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and H-ARQ channel as at time t_2 , which implicitly indicates to the UE that the*

second packet was received in error. In response, therefore, the UE retransmits the second packet.”)

- *See also 1-2 (§2.1).*

90. See my discussion for elements [1.a]-[1.e]. As I discuss in element [1.e], **Lucent** further discloses that the UE retransmits a packet if the NDI values are the same between the last two schedule grant messages that it receives on a H-ARQ channel. *See* [1.e]. For example, if “[t]he schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and H-ARQ channel as at time t_2 , which implicitly indicates to the UE that the second packet was received in error[,] . . . the UE retransmits the second packet.” *Lucent*, 4-5; Figure 2.

91. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Lucent’s** UE includes at least a transceiver and a processor, or at minimum would have found it obvious to use a transceiver and processor in *Lucent’s* UE to transmit/receive information to/from the Node-B, and perform HARQ-based processes, respectively. *See* [1.a]-[1.b]. For example, with respect to the H-ARQ process for Pkt 2 (highlighted in yellow in Figure 2 in [1.d]), a person of ordinary skill in the art would have understood, or at minimum found obvious, that: 1) the UE’s processor reads the first NDI included the first schedule grant message, determines to retransmit Pkt 2 based on the first NDI, and instructs the transceiver to perform the retransmission, and 2) the UE’s transceiver retransmits Pkt 2. As such, a person of ordinary skill in the art would have understood, and at

minimum found obvious, that the transceiver and the processor of **Lucent's** UE are configured to cause the UE to retransmit the old data block based upon a determination to retransmit, wherein the transceiver is configured to retransmit the data block whereas the processor is configured to determine whether or not to retransmit based on the NDI value and transfer the old data block to the transceiver for retransmission.

(h) Claim 8

92. Claim 8 recites **“The WTRU of claim 1, wherein the scheduling information indicates a modulation and coding scheme.”** As discussed above, **Lucent** discloses and/or renders obvious claim 1. The element recited in claim 8 is further met by **Lucent**.

93. **Lucent further discloses that the scheduling information indicates a modulation and coding scheme** (e.g., “schedule grant message contains...modulation and coding scheme (MCS)”). *See e.g.*, Lucent (emphasis added):

- 1 (§2.1) (“Here, *the UE's uplink transmission is in response to a schedule grant message transmitted by the Node-B*. Therefore, there is a strict timing relationship between the transmission of the schedule grant message and the corresponding uplink data transmission. The duration of the uplink transmission is a TTI. *The schedule grant message contains* H-ARQ parameters, transport block size (TBS) indication, and *modulation and coding scheme (MCS)...*”)
- *See also 2-3* (§3.1).

94. See my discussion for elements [1.pre]-[1.e]. As I discuss in [1.d], **Lucent** discloses that in scheduling its data transmissions to the Node-B, the UE uses schedule grant messages that it receives from the Node-B. See [1.d]. **Lucent** further discloses that “[t]he schedule grant message contains...modulation and coding scheme (MCS).” Lucent, 1.

(i) **Element [11.pre]**

95. Element [11.pre] recites “**A method comprising.**” This element is met by **Lucent**.

96. **Lucent discloses a method** (e.g., “method” of “[d]ownlink signalling of ACK/NACKs by the Node-B...implicitly by using the New Data Indicator (NDI) bit(s)”). See e.g., Lucent (emphasis added):

- **4-5 (“§3.1.3 Signalling of ACK/NACKs[:]** ***Downlink signalling of ACK/NACKs by the Node-B can be done implicitly by using the New Data Indicator (NDI) bit(s)*** in the case of Node-B controlled scheduling. Precisely, if the New Data Indicator has not changed compared to the value in the previous received transmission of a given H-ARQ process, it implies a NACK. Conversely, if the New Data Indicator has changed compared to the value in the previous received transmission of a given H-ARQ process, it implies an ACK... ***Figure 2 illustrates the method by means of an example.*** At time t_1 , Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0. The UE transmits the first packet in response, which is decoded correctly by the Node-B. The schedule grant message sent by Node-B at time t_3 changes the NDI value for H-ARQ channel 0, which implicitly indicates to the UE that the first packet was received correctly. So, the UE transmits a new packet on H-ARQ channel in response. Similarly, the second packet transmitted by the UE in response to the schedule grant message

transmitted by the Node-B at time t_2 was received in error at the Node-B. The schedule grant message transmitted by the Node-B to the UE at time t_4 uses the same values for NDI and H-ARQ channel as at time t_2 , which implicitly indicates to the UE that the second packet was received in error. In response, therefore, the UE retransmits the second packet. The rest of figure is now self-explanatory.”)

- **See also Figure 2.**

97. See my discussion for elements [1.c]-[1.e]. **Lucent** discloses a “method” of “[d]ownlink signalling of ACK/NACKs by the Node-B . . . implicitly by using the New Data Indicator (NDI) bit(s).” Lucent 4-5, Figure 2.

(j) Element [11.a]

98. Element [11.a] recites language that appears in elements [1.pre] and [1.c]. See my discussion for elements [1.pre] and [1.c].

(k) Element [11.b]

99. Element [11.b] recites language that appears in elements [1.pre] and [1.d]. See my discussion for elements [1.pre] and [1.d].

(l) Element [11.c]

100. Element [11.c] recites language that appears in elements [1.pre] and [1.e]. See my discussion for elements [1.pre] and [1.e].

(m) Claim 12

101. Claim 12 recites language that appears in claim 2, except that it depends on claim [11] instead of claim [1]. See my discussion for [2] and [11].

(n) Claim 18

102. Claim 18 recites language that appears in claim 8, except that it depends on claim [11] instead of claim [1]. See my discussion for [8] and [11].

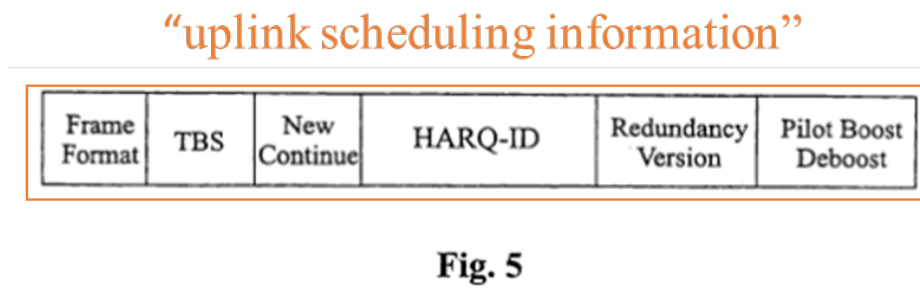
B. Ground 2: Lucent in view of Liu (Claims 1-2, 8, 11-12, 18)

103. As I discussed in Ground 1, **Lucent** discloses or at minimum renders obvious a “H-ARQ process identification for the H-ARQ process” (recited in [1.d] and [11.d]) in claims 1-2, 8, 11-12, and 18.

104. To the extent further disclosure is required to show a “H-ARQ process identification for the H-ARQ process,” **Liu** makes clear that a H-ARQ channel number functions as a H-ARQ process identification. **Liu discloses that uplink scheduling information includes a H-ARQ process identification for the H-ARQ process** (e.g., “downlink control channel” subframe “used in Node B scheduled mode” includes a “H-ARQ Channel ID”/“HARQ ID” that “identif[ies] a specific process in a hybrid automatic repeat request (HARQ) process”; Figure 5). **Liu, ¶¶25-33, Figure 5.**

105. **Liu** discloses a “downlink control channel,” which may be called “Enhanced Uplink-Shared Control Channel (EU-SCCH).” **Liu, ¶25.** An EU-SCCH frame is used in “Node B scheduled mode,” where remote terminals served by the Node B “monitor[]” the EU-SCCH to schedule their transmissions using information included in the EU-SCCH frame. **Liu, ¶¶25-33.** The EU-SCCH is transmitted from

a specific Node B to a remote terminal. *Id.* Liu depicts in Figure 5 below the format of a EU-SCCH frame in Figure 5. Liu, ¶45, Figure 5. In particular, Liu discloses that a EU-SCCH frame includes a “HARQ ID” that “identif[ies] a specific process in a hybrid automatic repeat request (HARQ) process.” Liu, ¶¶25-33, Figure 5. Furthermore, Liu refers to “HARQ ID” also as “HARQ channel ID,” indicating that the two terms are interchangeable. *See e.g.*, Liu ¶¶25-33 (“The following information may be carried over the EU-SCCH: MAC ID; **HARQ channel ID**. . . . As indicated above, the MAC ID indicates the remote terminal to which the message may be addressed. The **HARQ ID** may identify a specific process in a hybrid automatic repeat request (HARQ) process” (emphasis added)).



106. Like Lucent, **Liu** is analogous to and in the same field as the '247, which includes HARQ-based transmission control in wireless communication systems and is reasonably pertinent to the alleged problems identified in the '247—*e.g.*, implementing efficient transmissions for H-ARQ. '247, Abstract (“A method and a wireless transmit/receive unit (WTRU) supporting uplink transmissions. The method being used in a WTRU and comprising transmitting a data block to a base

station using a hybrid automatic repeat request (H-ARQ) process.”), 1:36-41, 2:13-48, 2:30-48, 2:52-62, 6:30-45, 6:58-61, 7:52-65, 8:10-22; Lucent, Title (“Signalling for H-ARQ Operation”), 1 (“Certain amount of signalling is necessary for H-ARQ operation. In this contribution, we discuss the signalling that is required for efficient H-ARQ operation.”); Liu, Abstract (“The present invention provides for efficient control signaling in a downlink control channel that specifies the following information: MAC ID, HARQ channel ID . . .”), ¶24 (“The HS-DPCCH carries uplink feedback signaling related to downlink HS-DSCH transmission. The HS-DSCH-related feedback signaling consists of Hybrid-ARQ Acknowledgement (HARQ-ACK) and Channel-Quality Indication (CQI).”); ¶33 (“Together, the HARQ ID and redundancy version may allow the base station to specify to the remote terminal the specific HARQ process and the specific retransmission that the base station wants the remote terminal to send.”).

107. To the extent further disclosure of a “H-ARQ process identification” does not identify a specific H-ARQ process, a person of ordinary skill in the art would have been motivated to additionally include **Liu’s** “HARQ ID” as one of the “H-ARQ parameters,” as **Lucent** teaches, in implementing **Lucent’s** schedule grant message such that it “identif[ies] a specific process in a hybrid automatic repeat request (HARQ) process.” Lucent, 1, Liu, ¶33. Including **Liu’s** HARQ ID in **Lucent’s** schedule grant message would advantageously allow a base station to more

precisely identify which H-ARQ process a desired retransmission corresponds to, for example, when a given H-ARQ channel between a UE and base station includes multiple H-ARQ processes. As such, modifying **Lucent's** schedule grant message to include Liu's H-ARQ ID would enable **Lucent's** existing system, which runs one H-ARQ process per H-ARQ channel at a given time, to accommodate multiple H-ARQ processes to occur in a H-ARQ channel in parallel.

108. A person of ordinary skill in the art would also have had a reasonable expectation of success in using **Lucent's** H-ARQ channel numbers as H-ARQ process identifications, as **Liu** teaches. **Liu** indeed uses the terms “H-ARQ ID,” which “may identify a specific process in a hybrid automatic repeat request (HARQ) process,” and “HARQ channel ID” interchangeably. *See e.g.*, Liu, ¶¶25-31 (“[T]he following information may be carried over the EU-SCCH: MAC ID; *HARQ channel ID*; Redundancy version; Transport Format; Transport Block Size; New/Continue data indicator; and Pilot boost/deboost.”) (emphasis added), ¶33 (“As indicated above, the MAC ID indicates the remote terminal to which the message may be addressed. *The HARQ ID* may identify a specific process in a hybrid automatic repeat request (HARQ) process; and the redundancy version specifies which of several retransmissions is of interest.”) (emphasis added). As such, using H-ARQ channel IDs in **Lucent** to identify H-ARQ processes would have been a

straightforward application of **Liu**'s teachings as it would not require any structural changes in **Lucent**'s schedule grant message.

C. Grounds 3-4: Lucent (optionally in view of Liu) in further view of Das (Claims 9-10, 19-20)

1. Claims 9, 19

109. Claims 9 and 19, depending from claims 1 and 11, respectively, recite “[The WTRU of claim 1/The method of claim 11,] wherein the transmitted data block has a first modulation and coding scheme (MCS) and the scheduling information indicates a second MCS, wherein the first MCS and the second MCS are different.” As I discuss in Grounds 1 and 2, claims 1 and 11 are disclosed or rendered obvious by **Lucent** (optionally in view of **Liu**).

110. **Das** discloses that the transmitted data block has a first modulation and coding scheme (MCS) and the retransmitted data block has a second MCS wherein the first MCS and the second MCS are different (*e.g.*, “different modulation, different coding, and different number of codes” used “for a retransmission than is used in the original transmission.”).

111. **Das** discloses using “different modulation, different coding, and different number of codes” “for a retransmission than is used in the original transmission” “based on the condition of the communication channel” in an “adaptive Hybrid ARQ scheme.” **Das**, ¶¶5, 9, 20, 23, claims 6-7. **Das** explains the adaptive H-ARQ scheme as follows:

As is well known, incremental redundancy (IR) transmission and soft combining (also referred to as Hybrid ARQ) are used to improve the efficiency of ARQ. For example, when a lost data frame is retransmitted, the receiving equipment may combine the multiple received copies of the frame to increase the likelihood of correct decoding. Alternately, the transmitter may transmit additional parity information instead of retransmitting another copy of the lost frame.

Das, ¶5. **Das** discloses that the IR methods disclosed by the prior art “requires variable length transmissions that lead to a more complex system in terms of implementation and control signaling transmission.” Das, ¶7. **Das** instead proposes an “adaptive Hybrid ARQ scheme using “a different modulation, different coding, and a different number of codes for a retransmission than is used in the original transmission, but still use fixed length frames in doing so.” Das, ¶9. “Consequently, the complexity and other problems associated with variable length transmissions are avoided. Keeping fixed length frames also ensures easy migration to future versions of third generation (3G) wireless systems.” *Id.*

112. **Das** also provides specific examples of changing modulation, coding rate, and number of codes based on the “changes in the quality of the communications channel.” Das, ¶¶19-23, claims 6-7. For example, “If user D’s original transmission 114 used quadrature phase shift keying (QPSK) over six (6) codes, then retransmission over three (3) codes using 16-QAM will provide the same coding rate since 16-QAM carries two times more bits per modulation symbol.” Das, ¶20. As another example, “the coding rate for user D’s retransmission 117 on

three (3) codes in frame 103 will be $2R$, where R is the coding rate for user D's first transmission 114 in frame 101 on six (6) codes.” *Id.* A person of ordinary skill in the art would have understood that using different modulation schemes or coding rate means using a different modulation and coding scheme (MCS).

113. As I discuss in Grounds 1 and 2 in connection with claim 8, **Lucent** (optionally in view of **Liu**) **discloses that the scheduling information includes a modulation and coding scheme.** **Lucent** discloses a “schedule grant message” that is used as scheduling information and includes modulation and coding scheme. *See* Sections IX.A, IX.B ([8]).

114. **Lucent** further discloses that “Node-B controlled scheduling” “allows for better noise rise management, resource utilization, and allows the Node-B to exploit multi-user diversity in the cell.” *Lucent*, 1. **Lucent** discusses the implications of the UE's selection of using a “lower MCS” or a “higher MCS” than the MCS value commanded by Node-B in Node-B scheduling. *Lucent*, 3. In particular, **Lucent** discloses that allowing the UE to select “a higher MCS . . . could affect the noise rise at the Node-B,” whereas “a lower MCS” may be preferable depending on “[t]he power margin available at the UE.” *Id.* Accordingly, **Lucent** discloses that, “[f]or efficient Node-B controlled scheduling . . . it is necessary for the UE to transmit power margin availability . . . frequently to the Node-B . . . for efficient MCS selection.” *Id.* As such, **Lucent** suggests that Node-B may change

the MCS included in the schedule grant message between UE's transmissions depending on the power margin availability of the UE.

115. A person of ordinary skill in the art would have been motivated to have the Node-B indicate in the scheduling information different modulation and coding scheme “for a retransmission than is used in the original transmission,” as **Das** teaches, in **Lucent's** Node-B controlled scheduling (optionally modified by **Liu**) to advantageously account for “changes in the quality of the communications channel.” **Das**, ¶¶9, 19-21. This would enable a more effective MCS scheme in **Lucent's** Node-B controlled scheduling (optionally modified by **Liu**), consistent with **Lucent's** motivations of better “noise rise management, resource utilization, and allow[ing] the Node-B to exploit multi-user diversity in the cell” in using Node-B scheduling. **Lucent**, 1. For example, as **Das** states, “there could be changes in the quality of the communications channel (e.g., better quality) that warrant less redundancy in the retransmission, such as the case with user D in which three (3) codes are allocated for retransmission 117 in frame 103 instead of the six (6) codes that were used in the original transmission 114.” **Das**, ¶19. **Das** discloses “by changing the number of codes on retransmission,” “a different coding rate can be obtained for retransmissions.” **Das**, ¶20. As such, using a lower code rate for retransmission would advantageously facilitate more efficient resource utilization. Moreover, a person of ordinary skill in the art would also have been motivated to

use a lower MCS for the retransmission if the original transmission was lost due to poor channel quality, caused, for example, by high noise level at the Node-B. Using a lower MCS for the retransmission will reduce chances of further errors because it is more robust, albeit with a lower information density.

116. Like Lucent and Liu, **Das** is analogous to and in the same field as the '247, which includes HARQ-based transmission control in wireless communication systems, and reasonably pertinent to the alleged problems identified in the '247—*e.g.*, implementing efficient transmissions for H-ARQ. *See* Section IX.B; Das, Abstract (“An adaptive incremental redundancy (*i.e.*, Hybrid ARQ) method is described for retransmitting information in a communication channel of a wireless communication system.”), ¶8 (“The shortcomings of the prior art are overcome according to the principles of the invention in an adaptive incremental redundancy (*i.e.*, Hybrid ARQ) method that avoids variable length transmissions (in time) by keeping fixed length frames (in time) and varying the number of codes to accurately match the desired redundancy.”), ¶9 (“[T]he adaptive Hybrid ARQ scheme according to the principles of the invention can use a different modulation, different coding, and a different number of codes for a retransmission than is used in the original transmission, but still use fixed length frames in doing so. Consequently, the complexity and other problems associated with variable length transmissions are

avoided. Keeping fixed length frames also ensures easy migration to future versions of third generation (3G) wireless systems.”).

117. A person of ordinary skill in the art would also have had a reasonable expectation of success in changing MCS in **Lucent’s** schedule grant message (optionally modified by **Liu**) based on the changes in the quality of the communication between the Node-B and the UE, as **Lucent** already suggests using a “lower MCS” may be preferable if the Node-B experiences a “noise rise” or the “power margin available at the UE” is reduced. **Lucent**, 3. Accordingly, **Lucent’s** Node-B may include a lower MCS in the schedule grant message for retransmission if, between the original transmission and the retransmission, Node-B experiences an increased noise level or receives from the UE a report of reduced power availability.

118. As such, **Lucent (optionally in view of Liu) in view of Das** renders obvious claims 9 and 19.

2. Claims 10, 20

119. Claims 10 and 20, depending from claims 9 and 19, respectively, further recite **“the at least one transceiver and the processor are further configured to cause the WTRU to, in response to the determination to retransmit the data block, retransmit the data block [see claim 2] using the second MCS [see claim 9]”** (Claim 10) and **“in response to a determination to retransmit the data block, retransmitting the data block [see claim 12] using**

the second MCS [see claim 19]” (Claim 20), respectively. As I discuss in Grounds 1-2, **Lucent** (optionally in view of **Liu**) discloses or renders obvious the claimed features recited in claims 2 and 12. *See* Sections IX.A, IX.B ([2], [12]).

120. For the same reasons that I discuss with respect to the claims 9 and 19 above (*see* Section IX.C.1), a person of ordinary skill in the art would have been motivated to apply **Das’s** teachings of using a different MCS for retransmission than for the original transmission to **Lucent’s** teachings (as optionally modified by **Liu**) of retransmission of a data block in response to a determination to retransmit the data block (as discussed for [2] and [12] in Grounds 1-2), such that **Lucent’s** UE (as optionally modified by **Liu’s** teachings) retransmits the data block using a second MCS that is different from the first MCS that is used to make the original transmission in response to a determination to retransmit the data block.

121. As such, **Lucent (optionally in view of Liu) in view of Das** renders obvious claims 10 and 20.

D. Ground 5: Kuchibhotla in view of Liu (Claims 1-7, 11-17)

1. Overview of Kuchibhotla

122. Kuchibhotla “provides a method to enhance the reliability of the determination of ACK/NACK information” communicated in a “HARQ” process “thereby resolving the issues of erroneous determination of an ACK as a NACK and

NACK as an ACK” by using a “supplementary indicator of message acceptability,” called a “new data expected” (NDE) indicator. Kuchibhotla, ¶¶40, 55, 60, 71.

123. **Kuchibhotla** discloses that “the error case of a NACK sent by the BTS being considered an ACK by the mobile can lead to disastrous conditions” because “the mobile would have flushed from it’s [sic] buffer the data packets as soon as an ACK is perceived and this data is lost forever in the case of streaming applications.” Kuchibhotla, ¶24. To mitigate such consequences, **Kuchibhotla** “requires that the mobile [station] not flush its buffer immediately on receiving the ACK/NACK indication from the [base transceiver station]” (BTS) and wait until “receiv[ing] a ‘[NDE]’ indicator” to “reliably determine that the BTS has in fact successfully received the previous packet.” Kuchibhotla, ¶62. The NDE indicator is sent “in a [scheduling assignment message (“SAM”)],” which is uplink scheduling information, “from the BTS” to a mobile station (MS). Kuchibhotla, ¶¶40, 55, 62, 5.

124. **Kuchibhotla** discloses that the NDE value is a more reliable indicator than an ACK/NACK transmission because “the NDE is sent in a SAM that has a CRC [cyclic redundancy check] check” (e.g., 12 bit “CRC” in SAM) and “the ACK/NACK channel does not have a CRC check.” Kuchibhotla, ¶¶62, 71, Figure 4. CRC provides further protection for potential erroneous determinations by the MS regarding whether the MS successfully received the SAM that the BTS sent.

See, e.g., Kuchibhotla, ¶¶48, 58-59, 62, Figure 4. For example, if the CRC check indicates that the SAM is properly received, and the NDE in the SAM is set to 0, the MS may decide that the NDE=0 is more reliable than any ACK indicator that it read with respect to the same transmission, and hence, ignore the ACK indicator. Kuchibhotla, ¶73.

125. **Kuchibhotla** discloses that the NDE is set to 1 if the BTS successfully receives a transmission from the MS and thus expects the MS to transmit new data in the next transmission. Kuchibhotla, ¶71. NDE is set to the 0 if the BTS does not successfully receive the previous transmission and thus expects retransmission of the previous data. *Id.* The NDE indicator is a particularly useful indicator of “message acceptability” when “the ACK/NACK and NDE disagree[.]” Kuchibhotla, Abstract, ¶¶55, 71, 73. For example, as highlighted in Figure 10 below, when “the MS has an error and misreads 614 the NACK” (red in the third row) “as an ACK” (green in the third row), “but correctly receives the NDE” (green in the fourth row), because the NDE has the additional CRC protection, “the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604.” Kuchibhotla, ¶73, Figure 10 (annotated below).

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS)	NDE SENT (BTS)
0 (PREVIOUS PACKET)	ACK	ACK	0
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	NACK	ACK	0
1 (3 rd ATTEMPT)	ERROR: FLUSH ACK	ACK	0

FIG. 10

126. Conversely, when the MS “misreads 610 the ACK as a NACK, but correctly receives the NDE,” because the NDE is protected by the CRC, “the MS determines that the NDE=1 is more reliable 622, ignoring the misread NACK and preparing to send a new packet 600.” Kuchibhotla, ¶71, Figure 8. For example, annotated Figure 8 below shows an example of an “ACK” signal (green in the third row) that is erroneously received by the MS as a “NACK” (red in the third row), where the MS ignores the misread NACK upon receiving an NDE=1 indication (green in the fourth row). *Id.*

NDI (MS TFR)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS), t	NDE $t+t_0$
0 (PREVIOUS PACKET)	ACK	ACK	1
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	ACK	NACK	0
1 (3 rd ATTEMPT)	ACK (2 nd)	ACK	1

FIG. 8

2. Motivation to Apply Liu's Teachings to Kuchibhotla

127. As I explain in Section IX.D.1, **Kuchibhotla** teaches that the MS uses the NDE indicator in the scheduling assignment message (SAM) to determine whether a retransmission to the BTS is required. *See* §IX.D.1; Kuchibhotla ¶¶40-41, 60, 71, 73, Figures 8, 10. For example, **Kuchibhotla** teaches that the MS uses the NDE value in a SAM to determine whether to retransmit a prior data block that was NACKed by the BTS if the BS did not “properly receive” it. Kuchibhotla, ¶73. However, **Kuchibhotla** does not explicitly disclose how the MS is notified as to which data needs to be transmitted.

128. **Liu** discloses “a downlink control channel may be used in Node B scheduled mode” to transmit uplink scheduling information from a “specific Node B” to “remote terminal[]” servers. Liu, ¶25. **Liu** also discloses the frame format of

the downlink control channel. Liu, ¶¶25-33, Figure 5. In particular, similar to the NDE indicator in **Kuchibhotla**, a downlink frame includes a “new/continue data indication” that indicates whether “a new packet is to be sent.” *Id.* In addition, the downlink frame includes “HARQ channel ID” (which **Liu** also refers as “HARQ ID”) and “redundancy version.” *Id.* The “HARQ channel ID”/“HARQ ID” serves as a H-ARQ process identification because **Liu** discloses that the “HARQ ID...identif[ies] a specific process in a [HARQ] process.” Liu, ¶33. **Liu** also discloses that the “redundancy version specifies which of several retransmissions is of interest.” Liu, ¶33. Thus, “[t]ogether, the HARQ and redundancy version may allow the base station to specify to the remote terminal ... the specific retransmission that the base station wants the remote terminal to send.” *Id.*

129. A person of ordinary skill in the art would have been motivated to modify **Kuchibhotla**’s scheduling assignment message (SAM) to include at least a HARQ ID that identifies a specific HARQ process in addition to the NDE field, as **Liu** teaches, to distinguish SAMs and identify the packet transmission that each SAM corresponds to. Including a HARQ ID in the SAM would be particularly advantageous when there is a likelihood of confusion regarding the HARQ process to which a SAM is directed. For example, such a problem is more likely to arise in asynchronous H-ARQ, as **Kuchibhotla** contemplates. **Kuchibhotla**, ¶60. According to **Kuchibhotla**, it is unpredictable when, and even whether, the BTS will send a

SAM to the MS following an ACK/NACK message. Kuchibhotla, ¶¶60, 65. For example, **Kuchibhotla** discloses “[t]here is anti-correlation between SAM and ACK/NACK usage for asynchronous HARQ since typically non-contiguous frame scheduling is expected,” which means that there is no predefined delay between an ACK/NACK transmission and the corresponding SAM. *Id.* Further exacerbating this unpredictability, **Kuchibhotla** discloses that a SAM may not be sent at all. Kuchibhotla, ¶60 (“one does not want to send a larger SAM message if all that is needed is to send a simple ACK/NACK indication”), ¶65 (“the lack of receipt of the SAM message could also serve as an indication that the BTS did successfully receive the packet”). To address this unpredictability, **Kuchibhotla** teaches that the MS “await[s]” a SAM for a time period (“T1”) after it receives an ACK or NACK signal.. Kuchibhotla, ¶¶62, 65. If no SAM arrives, the MS makes a guess as to whether the prior transmission was successfully or unsuccessfully received. Kuchibhotla, ¶65 (“if a SAM was not already received and therefore no ‘new data expected’ indicator was received...either flush the data...or, if no SAM message was received...revert to an autonomous mode and send the packet again...the lack of receipt of the SAM message could also serve as an indication that the BTS did successfully receive the packet and be used as input in the determination process (if for time T1 no SAM was received)”). However, as illustrated in the example below, even if a SAM is received during the wait period, the MS will not be able to accurately determine which prior

transmission a SAM corresponds to if the SAM is received during a time when the MS is waiting on SAMs for two different transmissions (i.e., the waiting times for two different SAM arrivals overlap). Kuchibhotla, ¶¶60, 71.

- At T=0: MS sends a first transmission (tx1) to BTS.
- At T=1: MS sends a second transmission (tx2) to BTS.
- At T=2: MS receives an ACK or NACK signal for tx1, which triggers the waiting time T1 for receiving the corresponding SAM (SAM1). *See* Kuchibhotla, ¶65 (“the mobile . . . would await a further SAM message [for] a time T1”), ¶¶72-73.
- At T=3: MS receives an ACK or NACK signal for tx2, which triggers the waiting time T1 for receiving the corresponding SAM (SAM2). *See* Kuchibhotla, ¶65 (“the mobile . . . would await a further SAM message [for] a time T1”), ¶¶72-73.
- T=4: Before the waiting times for the two SAM arrivals corresponding to tx1 and tx2 expire, MS receives SAM1, which includes an NDE value intended for tx1. However, because “non-contiguous frame scheduling is expected” in **Kuchibhotla’s** “asynchronous HARQ,” MS is unable to ascertain whether the SAM corresponds to the tx1 or tx2. *See* Kuchibhotla ¶¶60, 65. Or, alternatively, if the MS interprets the SAM as corresponding to the “previous packet,” as taught by Kuchibhotla (¶62), the MS would incorrectly interpret SAM1 as corresponding to tx2, not tx1 for which SAM1 was intended.

130. Accordingly, a person of ordinary skill in the art would have been motivated to include a HARQ ID in **Kuchibhotla’s** SAM to advantageously avoid incorrect interpretations of SAMs by the MS, which is reasonably likely to occur in asynchronous H-ARQ, as illustrated above.

131. Like Kuchibhotla, **Liu** is analogous to and in the same field as the '247, which includes HARQ-based transmission control in wireless communication systems, and reasonably pertinent to the alleged problems identified in the '247—*e.g.*, implementing efficient transmissions for H-ARQ (*see* §IX.B). *See* Kuchibhotla, ¶25 (“[A] need exists for a new technique to enhance the reliability of the determination of ACK/NACK information, thereby resolving the issues of erroneous determination of an ACK as a NACK and NACK as an ACK.”), ¶41 (“The present invention allows more efficient implementation of an enhanced reverse link channel with adaptive modulation and coding (AMC), Hybrid ARQ (HARQ), and fast scheduling with reduced ARQ delay.”).

132. A person of ordinary skill in the art also would have had a reasonable expectation of success in applying **Liu’s** teachings of including a HARQ ID in uplink scheduling information to **Kuchibhotla’s** SAM. **Liu’s** downlink frame and **Kuchibhotla’s** SAM both manage transmissions of data packets from a mobile station to a base station as they both include indicators (“NDE” in Kuchibhotla and “new/continue data indication” in Liu) telling the mobile station to either transmit a new packet or retransmit an old packet. Kuchibhotla, ¶71; Liu, ¶33. First, it was well-known to use a H-ARQ IDs in SAMs at the time of the alleged invention. *See, e.g.*, Liu, ¶¶25-33, 36-44; Ex. 1010 (Khan) ¶20 (“[T]he forward scheduling control channel or forward uplink scheduling channel (F-USCH) providing the scheduling

and acknowledgement information for a mobile has the format shown in Table 1.”), ¶23 (“the HARQ feedback information consists of 2-bits (x, y). The first bit ‘x’ indicates whether the transmission is going to be for HARQ channel 0 or HARQ channel 1.”), ¶31 (“the methodology of the present invention is applicable to providing acknowledgement information for more than one HARQ channel, for more than one packet in a HARQ channel, or both. Also, the format of Table 1 can be further modified to associate a transmission format with each HARQ channel or with each packet”), ¶37, Table 1, Figure 7, Claim 3. Second, it was well-known to used HARQ channel IDs. Third, both **Kuchibhotla** and **Liu** teach that different HARQ channel IDs may be used for transmitting different data packets. **Kuchibhotla**, ¶¶51, 65; **Liu**, ¶33. As such, adding a HARQ channel ID as a HARQ process identifier in **Kuchibhotla**’s SAM would have been a straightforward application of a well-known technique for a purpose that is already envisioned by **Kuchibhotla**.

3. Invalidity of Claims 1-7 and 11-17 Over Kuchibhotla in view of Liu

(a) Element [1.pre]

133. Element [1.pre] recites “**A wireless transmit/receive unit (WTRU) comprising.**” This element is met by **Kuchibhotla**.

134. **Kuchibhotla** discloses a wireless transmit/receive unit (WTRU) (e.g., “mobile station (MS)” that wirelessly transmits information to a “[base

transceiver station]” (BTS) over a “reverse link” and wirelessly receives information from the BTS over a “forward link”). *See e.g., Kuchibhotla (emphasis added):*

- **Figure 5**

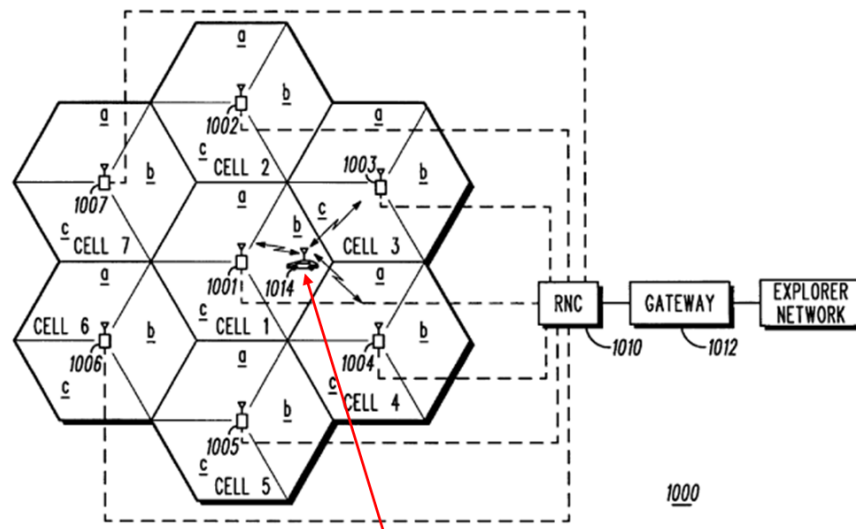


FIG. 5

“a wireless
transmit/receive
unit (WTRU)”

- ¶2 (“In a Universal Mobile Telecommunications System (UMTS) . . . *user equipment (UE) such as a mobile station (MS)* communicates with any one or more of a plurality of base station subsystems (BSSs) dispersed in a geographic region. *The mobile station is typically a cellular communication device.*”)
- ¶3 (“[T]he BSS communicates with the MS over a Forward Traffic Channel in a forward link and *the MS communicates with the BSS* over a Reverse Traffic Channel in a reverse link.”)
- ¶5 (“Typically, a BSS services a coverage area that is divided up into multiple sectors...each sector is serviced by one or more of multiple *base transceiver stations (BTSs)* included in the BSS”).
- ¶44 (“Referring now to FIGS. 3 and 5, communication *system 1000* further includes at least one mobile station (MS) 1014. MS 1014 may be any type of wireless user equipment (UE), such as a

cellular telephone, a portable telephone, a radiotelephone, or a wireless modem associated with data terminal equipment (DTE) such as a personal computer (PC) or a laptop computer. MS 1014 is serviced by multiple BTSs, that are included in an Active Set associated with the MS. *MS 1014 wirelessly communicates with each BTS in communication system 1000 via an air interface that includes a forward link (from the BTS to the MS) and a reverse link (from the MS to the BTS).* Each forward link includes multiple forward link control channels including an ACK/NACK channel, a paging channel, and traffic channel. Each reverse link includes multiple reverse link control channels, a paging channel, and a traffic channel.”)

135. **Kuchibhotla** discloses a “user equipment (UE) such as a mobile station (MS).” Kuchibhotla, ¶2. The MS is “typically a cellular communication device.” *Id.* The MS “wirelessly communicates” with each “base transceiver stations (BTSs)” in communication system 1000. Kuchibhotla, ¶¶43-44. The wireless communication between the MS and the BTS occurs “via an air interface that includes a forward link (from the BTS to the MS) and a reverse link (from the MS to the BTS).” *Id.* In particular, the MS transmits information to the BTS over the reverse link and receives information from the BS over the forward link. *Id.*

(b) Element [1.a]

136. Element [1.a] recites “**at least one transceiver.**” This element is met by Kuchibhotla.

137. **Kuchibhotla discloses at least one transceiver** (*e.g.*, transceiver of a MS 1014, which is a wireless transmit/receive unit, *see* [1.pre]).*See e.g.*, Kuchibhotla (emphasis added):

- **Figure 5**

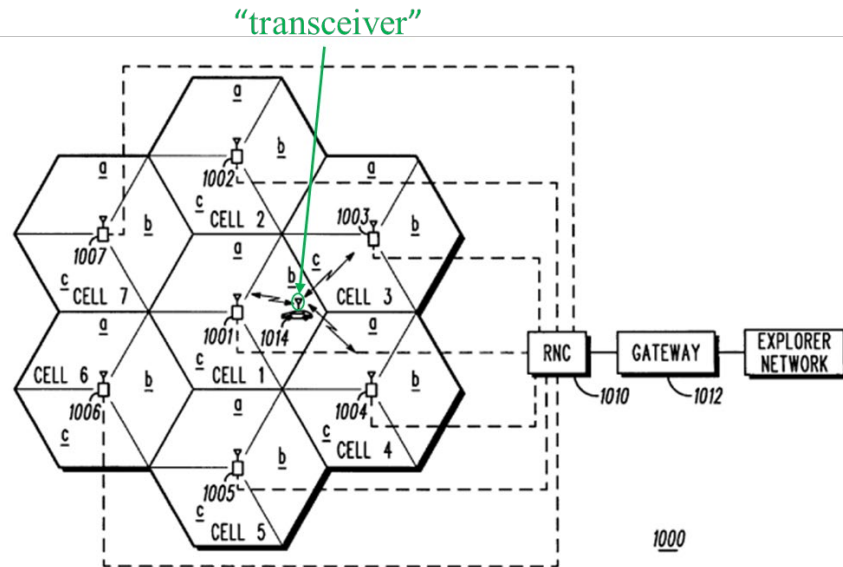


FIG. 5

- ¶44 (Referring now to FIGS. 3 and 5, communication *system 1000* further includes at least one mobile station (MS) 1014. MS 1014 may be any type of wireless user equipment (UE), such as a cellular telephone, a portable telephone, a radiotelephone, or a wireless modem associated with data terminal equipment (DTE) such as a personal computer (PC) or a laptop computer. MS 1014 is serviced by multiple BTSs, that are included in an Active Set associated with the MS. *MS 1014 wirelessly communicates with each BTS in communication system 1000 via an air interface that includes a forward link (from the BTS to the MS) and a reverse link (from the MS to the BTS).* Each forward link includes multiple forward link control channels including an ACK/NACK channel, a paging channel, and traffic channel. Each reverse link includes multiple reverse link control channels, a paging channel, and a traffic channel.)
- See also ¶5, Figure 13.

138. See my discussion for element [1.pre]. As I discuss in element [1.pre],

Kuchibhotla discloses “MS 1014,” which is a wireless transmit/receive unit that is

capable of communicating via an air interface that includes a forward link (from the BTS to the MS) and a reverse link (from the MS to the BTS). *See* [1.pre]; Kuchibhotla, ¶44. **Kuchibhotla** discloses, “MS 1014 may be any type of wireless user equipment (UE), such as a cellular telephone.” Kuchibhotla, ¶44. A person of ordinary skill in the art would have known that an MS, such as a cellular telephone, includes a transceiver, which is a standard component in mobile devices used to communicate with the BTS, where the receiver section of the transceiver receives communication from the BTS and the transmitter section of the transceiver transmits communication to the BTS. At minimum, a person of ordinary skill in the art would have found it obvious to include at least one transceiver in the MS to implement such two-way communication with the BTS as using transceivers in wireless communication devices were common practice at the time of the alleged invention. *See e.g.*, Rathonyi, 1:33-39, 15:64-66, Claim 9, Figure 1 (disclosing a mobile station communicating with a base station via its transceiver).

(c) Element [1.b]

139. Element [1.b] recites “**a processor.**” This element is met by **Kuchibhotla**.

140. **Kuchibhotla discloses a processor** (*e.g.*, processor of “MS” that makes “reliability” determinations of signals received from a BTS). *See e.g.*, Kuchibhotla (emphasis added):

- ¶44 (“Referring now to FIGS. 3 and 5, communication *system 1000* further includes at least one mobile station (MS) 1014. MS 1014 may be any type of wireless user equipment (UE), such as a cellular telephone, a portable telephone, a radiotelephone, or a wireless modem associated with data terminal equipment (DTE) such as a personal computer (PC) or a laptop computer. MS 1014 is serviced by multiple BTSs, that are included in an Active Set associated with the MS. *MS 1014 wirelessly communicates with each BTS in communication system 1000 via an air interface that includes a forward link (from the BTS to the MS) and a reverse link (from the MS to the BTS).* Each forward link includes multiple forward link control channels including an ACK/NACK channel, a paging channel, and traffic channel. Each reverse link includes multiple reverse link control channels, a paging channel, and a traffic channel.”)
- ¶71 (“...the MS has an error and misreads 610 the ACK as a NACK, but correctly receives the NDE. *The MS must then vote 620 on the reliability of the misread NACK or the NDE=1...*”)
- ¶73 (“...the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. *The MS must then vote 616 on the reliability of the misread ACK or the NDE=0...*”)
- See also ¶¶24, 41, 56, 68, 74, 77, Figure 13.

141. See my discussion for elements [1.pre]-[1.a]. As I discuss in elements [1.pre]-[1.a], **Kuchibhotla** discloses that the MS may be any type of wireless device that wirelessly communicates with each BTS in the communication system. See [1.pre]-[1.a]; Kuchibhotla, ¶44. Kuchibhotla further discloses that, in addition to wirelessly communicating with BTSs, the MS performs other functions, including interpreting a lack of response from a BTS as a NACK (Kuchibhotla, ¶24), choosing a scheduling assignment out of multiple scheduling assignments (Kuchibhotla, ¶41),

determining reliability of the ACK/NACK response received from a BTS by voting on the reliability of the misread NACK or the NDE=1 (Kuchibhotla, ¶¶56, 71, 74), and accumulating and flushing of data from its data buffer (Kuchibhotla, ¶¶68, 77). A person of ordinary skill in the art would have understood that the MS includes a processor in order to perform these functions. At minimum, a person of ordinary skill in the art would have found obvious to include a processor in the MS to perform these processes, as processors were standard, well-known components that were used in wireless communication devices to process wireless communications, such as HARQ-based transmissions like those discussed in **Kuchibhotla**.

(d) Element [1.c]

142. Element [1.c] recites **“wherein the at least one transceiver and the processor are configured to cause the WTRU to: transmit, using a hybrid automatic repeat request (H-ARQ) process, a data block to a base station.”** This element is met by **Kuchibhotla**.

143. **Kuchibhotla** discloses wherein the at least one transceiver (*see* [1.a]) and the processor (*see* [1.b]) are configured to cause the WTRU (e.g., “MS,” *see* [1.pre]) **to: transmit, using a hybrid automatic repeat request (H-ARQ) process, a data block to a base station** (e.g., “a data block transmitted” by “the source MS” to “an Active Set BTS” “on a specific Hybrid ARQ channel”). *See e.g., Kuchibhotla* (emphasis added):

- ¶41 (“In general, the present invention supports active set handoff and scheduling functions by allowing *a mobile station (MS) to provide HARQ ACK/NACK coding information to improve data throughput of an enhanced reverse link transmission to Active Set base transceiver stations (BTSs)*. The present invention allows more efficient implementation of an enhanced reverse link channel with adaptive modulation and coding (AMC), *Hybrid ARQ (HARQ)*, and fast scheduling with reduced ARQ delay.”)
- ¶51 (“...when *a data block transmitted on a specific Hybrid ARQ channel* has successfully been *decoded by an Active Set BTS*, the BTS acknowledges the successful decoding by *conveying an ACK to the source MS (e.g. MS 1014)*”)
- ¶53 (“[D]uring reverse link communications, *the MS 1114 transmits frames to a plurality of BTSs 301, 303, 304. The structure of the frames, includes:* (a) a flush bit which indicates to the BTS when to combine a current frame with a previously stored frame or to flush the current buffer; *(b) data*; (c) a cyclic redundancy check (CRC) bit which indicates whether a frame decoded successfully or not (i.e., whether the frame contained any errors); and (d) a tail bit for flushing the channel decoder memory. The information contained in the frame is referred to herein as soft information. *The BTSs can combine frames from multiple re-transmissions using an H-ARQ scheme.*”)
- ¶21 (“*The details for how to implement the various H-ARQ schemes are commonly known in the art* and therefore are not discussed herein.”)
- *See also* ¶¶6, 15, 17, 20, 22, 44, 53-54, 58, Figure 4.

144. See my discussion for elements [1.a]-[1.b]. Kuchibhotla also discloses that the MS transmits “frames to a plurality of BTSs.” Kuchibhotla, ¶53. The structure of these frames include “data.” *Id.* For example, during a soft handover, the MS sends its “data block” transmissions to an active set BTS on a specific

“Hybrid ARQ channel.” Kuchibhotla, ¶51. Based on these disclosures, a person of ordinary skill in the art would have understood that, by sending data blocks on a Hybrid ARQ channel, the MS uses a H-ARQ process to transmit a data block to the base station.

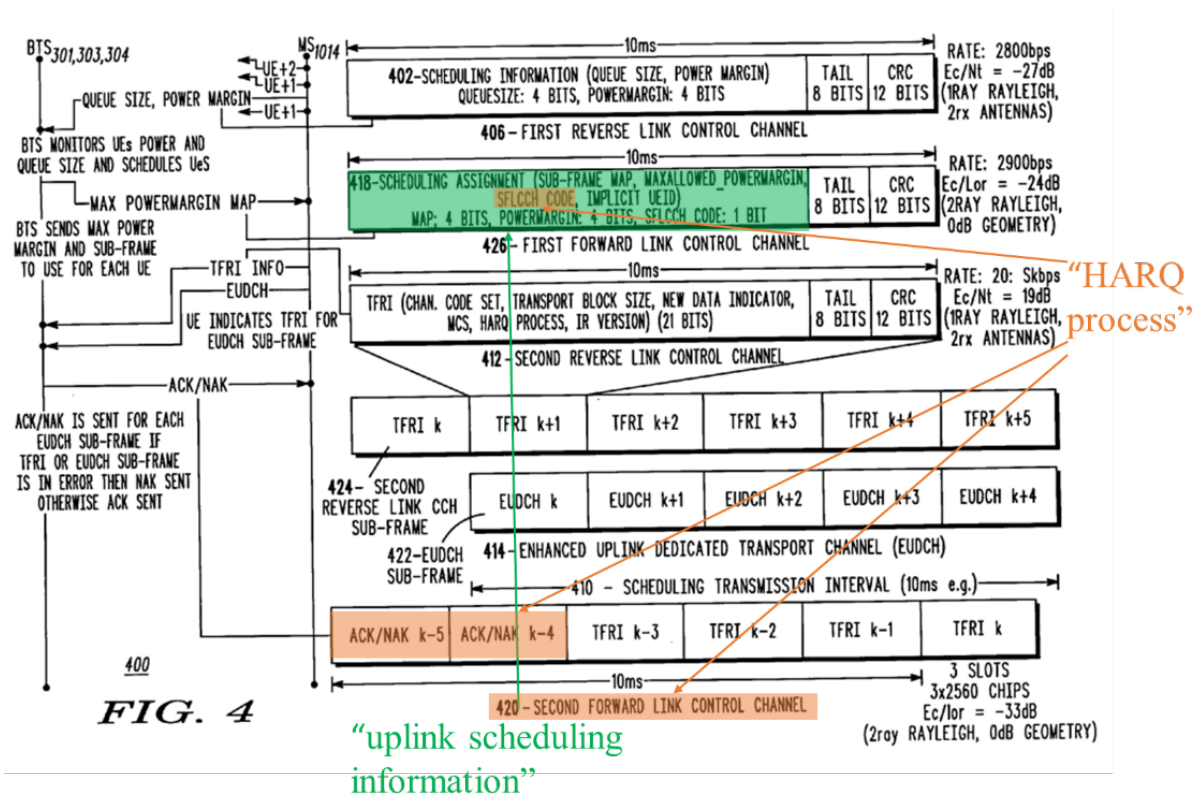
145. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Kuchibhotla’s** MS includes at least a transceiver working with a processor, or at minimum would have found it obvious to use a transceiver working with a processor in **Kuchibhotla’s** MS to transmit information to a BTS. *See* [1.a]-[1.b]. For example, in **Kuchibhotla’s** soft handover discussed above, a person of ordinary skill in the art would have understood, or at minimum found obvious, that the MS’s transceiver “transmits frames to a plurality of BTSs 301, 303, 304.” Kuchibhotla, ¶53. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver working with the processor of the MS is configured to cause the MS to transmit data blocks to a BTS using a H-ARQ process.

(e) Element [1.d]

146. Element [1.d] recites “**receive uplink scheduling information from the base station, wherein the uplink scheduling information includes a H-ARQ process identification for the H-ARQ process.**” This element is met by **Kuchibhotla** in view of **Liu**.

147. Kuchibhotla discloses wherein the at least one transceiver (see [1.a]) and the processor (see [1.b]) are configured to cause the WTRU (see [1.pre]) to receive uplink scheduling information from the base station (e.g., “a [SAM] from a BTS to a communication device (MS)”) for the H-ARQ process (e.g., “To enable uplink Hybrid ARQ an acknowledged/not acknowledged (ACK/NACK) feedback code channel can be used,” where “[t]he MS is told by a scheduling BTS which downlink code channel it should listen to for receiving ACK/NACK information”; Figure 4; see [1.c]). See e.g., Kuchibhotla (emphasis added):

• Figure 4



- ¶40 (“The present invention provides a method to enhance the reliability of the determination of ACK/NACK information, thereby resolving the issues of erroneous determination of an ACK as a NACK and NACK as an ACK both in and without soft handoff (SHO). This is achieved through a novel technique of using channel quality and “new data expected” indicators in *a scheduling assignment message from a BTS to a communication device (MS)*. This technique allows the set up of feedback information between the MS and active set BTSs such that a macro selection diversity benefit is obtained.)
- ¶48 (“Upon choosing an MS (e.g. MS 1014) to be scheduled, *each Active Set BTS 301, 303, 304 conveys a scheduling assignment 418 to the chosen MS, such as MS 1014, on a first forward link control channel 426*...The scheduling assignment 418 consists of the maximum allowed ‘power margin’ limit or target and a map of the allowed EUDCH sub-frame transmission intervals, such as a 2 ms sub-frame interval, for the next 10 ms transmission interval using a first forward link control channel 426.”)
- ¶58 (“*To enable uplink Hybrid ARQ an acknowledged/not acknowledged (ACK/NACK) feedback code channel can be used. The MS is told by a scheduling BTS which downlink code channel it should listen to for receiving ACK/NACK information.* Alternatively, the ACK/NACK information can be coded in the SAM from the BTS to the MS. In the explicit mode, *the BTSs in the active set sends dedicated scheduling assignment messages (SAM) to each mobile that describes a data transmission opportunity on the enhanced uplink channel*. The scheduling assignment can be sent over a 10 ms or a 2 ms long frame. Although other frame lengths are certainly possible, 10 ms and 2 ms frame lengths are more common in 3GPP.”)
- ¶73 (“*If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616 on the reliability of the misread ACK or the NDE=0.* Since the

NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, *the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter*, in the fourth row, the NDI bit is not flipped, and *old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS 610*. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.”)

- See also ¶¶52, 53.

148. See my discussion for elements [1.a]-[1.c]. **Kuchibhotla** also discloses that the MS receives from a BTS a “scheduling assignment message” (“SAM”) including scheduling information. Kuchibhotla, ¶¶40, 48, 58, Figure 4 (annotated above). For example, a SAM includes, among other parameters, “a map of the allowed EUDCH sub-frame transmission intervals, such as a 2 ms sub-frame interval.” Kuchibhotla, ¶48. “To enable uplink Hybrid HARQ[,] an acknowledged/not acknowledged (ACK/NACK) feedback code channel can be used.” Kuchibhotla, ¶58. In particular, the SAM also identifies to the MS “which downlink code channel it should listen to for receiving ACK/NACK information” for a given HARQ process. Kuchibhotla, ¶58.

149. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Kuchibhotla’s** MS includes at least a transceiver working with a processor, or at minimum would have found it obvious to use a transceiver working with a processor in **Kuchibhotla’s** MS to receive information

from a BTS. *See* [1.a]-[1.b]. For example, in **Kuchibhotla’s** “method to enhance the reliability of the determination of ACK/NACK information,” a person of ordinary skill in the art would have understood, or at minimum found obvious, that the MS’s transceiver receives a SAM from a BTS. Kuchibhotla, ¶40. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver working with the processor of the MS is configured to cause the MS to receive the SAM from the BTS.

150. **Liu** discloses that **uplink scheduling information includes a H-ARQ process identification for the H-ARQ process** (e.g., “downlink control channel” subframe “used in Node B scheduled mode” includes a “HARQ ID” that “may identify a specific process in a hybrid automatic repeat request (HARQ) process”; Figure 5).*See e.g.*, Liu (emphasis added):

- **Figure 5**

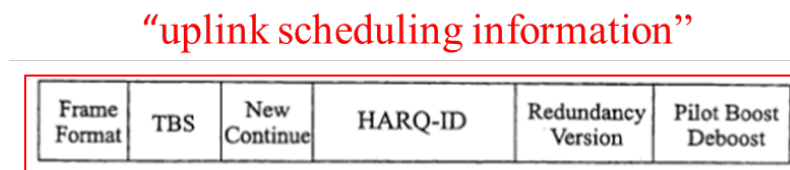


Fig. 5

- ¶18 (“**FIG. 5** is a representation of a downlink subframe of the present invention”)
- ¶25 (“In accordance with the present invention, *a downlink control channel may be used in Node B scheduled mode*. This channel can be monitored by multiple remote terminals served by the same node,

and *multiple such channel may be transmitted from a specific Node B*. This channel may be called Enhanced Uplink-Shared Control Channel (EU-SCCH). Advantageously, this channel may be a fixed rate channel with spreading factor 128, for example.”)

- ¶33 (“As indicated above, the MAC ID indicates the remote terminal to which the message may be addressed. *The HARQ ID may identify a specific process in a hybrid automatic repeat request (HARQ) process*; and the redundancy version specifies which of several retransmissions is of interest. Together, the *HARQ ID* and redundancy version *may allow the base station to specify to the remote terminal the specific HARQ process and the specific retransmission that the base station wants the remote terminal to send*. The *transport format specifies the correct channelization code to be used by the remote terminal in its transmission*. The transport block size specifies the size of the packet to be sent by the remote terminal. The *new/continue data indication if set to new indicates that a new packet is to be sent*. If set to continue it indicates that a previously transmitted packet is to be sent. The pilot boost/deboost signal controls the signal level of the pilot signal to be sent from the remote terminal to the base station.”)
- See also ¶¶26-32, 36-45.

151. **Liu** discloses a “downlink control channel” which may be called “Enhanced Uplink-Shared Control Channel (EU-SCCH).” **Liu**, ¶25. The EU-SCCH is transmitted from a specific Node B to a remote terminal. *Id.* **Liu** depicts the format of a EU-SCCH frame in Figure 5. **Liu**, ¶45, Figure 5. In particular, **Liu** discloses that a EU-SCCH frame includes a “HARQ ID” that “identif[ies] a specific process in a hybrid automatic repeat request (HARQ) process.” **Liu**, ¶¶25-33, Figure 5.

152. **Liu** also discloses that a EU-SCCH frame is used in “Node B scheduled mode,” where remote terminals served by the Node B “monitor[]” the EU-SCCH to

schedule their transmissions using information included in the EU-SCCH frame. Liu, ¶¶25-33. For example, the EU-SCCH frame includes various type of information used for scheduling transmissions, such as a “transport format” that “specifies the correct channelization code to be used by the remote terminal in its transmission,” and “[t]he transport block size,” which “specifies the size of the packet to be sent by the remote terminal.” *Id.* As such, a person of ordinary skill in the art would have understood that an EU-SCCH frame that is sent from Node B to a remote terminal in “Node B scheduled mode” includes scheduling information for the remote terminal’s transmission.

153. As I discussed in more detail in §IX.D.2, a person of ordinary skill in the art would have been motivated to modify **Kuchibhotla’s** SAM, used in a “Hybrid ARQ” scheme, to include a “HARQ ID,” as **Liu** teaches, such that **Kuchibhotla’s** BTS uses the HARQ ID to identify to the MS “the specific HARQ process” corresponding to the retransmission that the base station wants the remote terminal to send, such as a prior transmission that was NACKed by the BTS because it was not “properly receive[d].” Kuchibhotla, ¶¶40, 48, 58, 73; Liu, ¶33; *see also* [1.e] below. By modifying **Kuchibhotla’s** SAM to include a HARQ ID, **Kuchibhotla in view of Liu** discloses uplink scheduling information that includes a H-ARQ process identification for the H-ARQ process that corresponds to a

previously NACKed data block that needs to be retransmitted to the BTS by the MS because it was not properly received.

(f) Element [1.e]

154. Element [1.e] recites **“determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station.”** This element is met by Kuchibhotla.

155. **Kuchibhotla discloses wherein the at least one transceiver and the processor** (*see* [1.a]-[1.b]) **are configured to cause the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information** (*e.g.*, “the mobile is required to read” an “[NDE] indicator [added] to the scheduling assignment message” “to determine if the BTS...is expecting new information or a retransmission of the previous transmission”; *see* Figures 8, 10) **and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station** (*e.g.*, “the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK [sent as NACK] and preparing to send the old packet 604”; *see* Figures 8, 10). *See e.g.*, Kuchibhotla (emphasis added):

- **Figure 8**

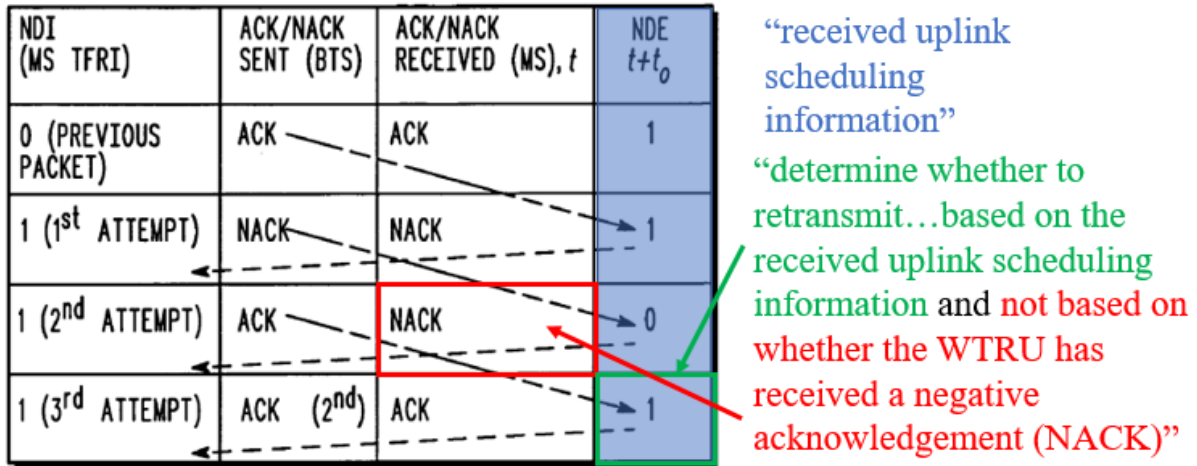


FIG. 8

- **Figure 10**

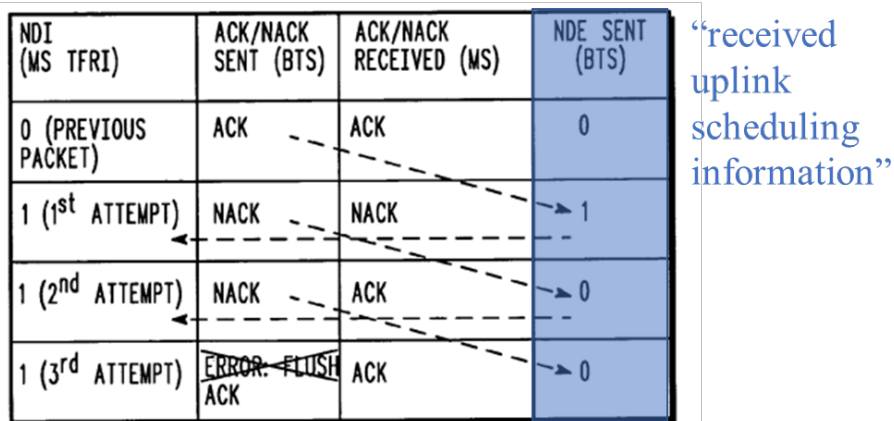


FIG. 10

- ¶40 (“The present invention provides *a method to enhance the reliability of the determination of ACK/NACK information*, thereby resolving the issues of erroneous determination of an ACK as a NACK and NACK as an ACK both in and without soft handoff (SHO). *This is achieved through a novel technique of using channel quality and “new data expected” indicators in a scheduling assignment message from a BTS to a communication device (MS).*”)

- ¶55 (“[T]he present invention provides a supplementary indicator of message acceptability that is used in conjunction with the ACK/NACK information. In a first embodiment, *the supplementary indicator is a New Data Expected (NDE) indicator that is sent in a subsequent scheduling assignment message (SAM) from the BTS*. In this embodiment, *following the reception of ACK/NACK information on the ACK/NACK channel, the MS does not flush data in its buffer until a NDE is received in a subsequent SAM*. By coupling the both the ACK/NACK information and the NDE indicator, the mobile is able *to make a more reliable conclusion regarding the success of the previous transmission.*”)
- ¶62 (“*The present invention requires that the mobile not flush its buffer immediately on receiving the ACK/NACK indication from the BTS*. The present invention further adds a one bit “new data expected” indicator to the scheduling assignment message sent on another code channel and the mobile is required to read this to determine if the BTS (that sent it the previous SAM message) is expecting new information or a retransmission of the previous transmission. *If the mobile receives a “new data expected” indicator in the scheduling assignment message it can reliably determine that the BTS has in fact successfully received the previous packet and it can then flush this packet from its buffer. The “new data expected” indicator is included in the scheduling assignment message and therefore has CRC protection, and hence the potential for falsing is low.* In addition, it should be noted that the memory requirement on the mobile is not increased due to having to store the (packet) transmission (it is not stored as soft bits) until reading of the scheduling assignment message. Note that *this mechanism is also useful in the case where the mobile receives an ACK from the BTS and interprets it as a NACK (a more probable erroneous condition).*”)
- ¶71 (“If the ACK/NACK and NDE disagreed, a voting procedure 616 would be used, as will be explained below...*In this case, the BTS properly receives 606 the retransmitted data and indicates this with an ACK 608 and the sending of and NDE of 1. However, the MS has an error and misreads 610 the ACK as a NACK, but correctly receives the NDE. The MS must then vote 620 on the reliability of the misread NACK or the NDE=1. Since the NDE is*

sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=1 is more reliable 622, ignoring the misread NACK and preparing to send a new packet 600.”)

- ¶73 (“*If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616 on the reliability of the misread ACK or the NDE=0. Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS 610. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.*”)
- See also ¶¶23-25, 67-69, 74-75, 78, Figures 7, 11, 12.

156. See my discussion for elements [1.a]-[1.d]. **Kuchibhotla** also discloses “a novel technique of using...’new data expected’ indicators in a scheduling assignment message from a BTS to a communication device (MS),” “to enhance the reliability of the determination of ACK/NACK information.” **Kuchibhotla**, ¶40. In particular, **Kuchibhotla** teaches using both a “New Data Expected (NDE) indicator” included in a SAM and the ACK/NACK information “to make a more reliable conclusion regarding the success of the previous transmission.” **Kuchibhotla**, ¶55. Below are the specific steps that **Kuchibhotla** teaches in applying this technique.

157. The MS receives an ACK/NACK indication but does not flush its buffer upon reading the ACK/NACK indication. Kuchibhotla, ¶68. Figure 8 is highlighted below to show an exemplary NACK indication that is erroneously received by the MS.

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS), t	NDE $t+t_0$
0 (PREVIOUS PACKET)	ACK	ACK	1
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	ACK	NACK	0
1 (3 rd ATTEMPT)	ACK (2 nd)	ACK	1

FIG. 8

158. The MS then receives a NDE indicator, with a value of 0 or 1, in the SAM to provide additional reliability for the ACK/NACK indication. Kuchibhotla, ¶¶71-73, Figures 8, 10. The NDE=0 means no new data is expected, and thus indicates that the previous transmission from the MS was not successfully received by the BTS. *Id.* The NDE=1 means new data is expected and indicates that the previous transmission from the MS was successfully received by the BTS. *Id.*

Figure 8 is highlighted below to show an exemplary NDE received by the MS following a NACK indication erroneously received by the MS.

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS), t	NDE $t+t_0$
0 (PREVIOUS PACKET)	ACK	ACK	1
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	ACK	NACK	0
1 (3 rd ATTEMPT)	ACK (2 nd)	ACK	1

FIG. 8

159. If the ACK/NACK indication and the NDE disagrees, as highlighted in red and green, respectively in Figure 8 below, the MS “vote...on the reliability” of the misread ACK/NACK or the NDE and determines that the NDE is “more reliable” because “the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check.” Kuchibhotla, ¶71. Consequently, the MS ignores the misread ACK/NACK. *Id.* For example, if the MS receives a NACK message and NDE=1 (as shown in Figure 8 below), the MS “determines that the NDE=1 is more reliable 622, ignoring the misread NACK and preparing to send a new packet 600.” *Id.* “Thereafter, in the fourth row, the NDI bit is flipped 602”

(unlike Figure 8 mistakenly showing that the NDI bit is not flipped in the fourth row), “and new data is sent 604 with the new NDI bit, which is properly received by the BTS 606 and MS 610.” *Id.* As such, the MS makes this retransmission decision based on the NDE=1 in the SAM, which is uplink scheduling information, not based on whether or not the MS received a NACK message (which was erroneously received). Kuchibhotla, ¶71, Figure 8.⁵

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS), t	NDE $t+t_0$
0 (PREVIOUS PACKET)	ACK	ACK	1
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	ACK	NACK	0
1 (3 rd ATTEMPT)	ACK (2 nd)	ACK	1

FIG. 8

⁵ Additionally, the retransmission decision made by **Kuchibhotla’s** MS based on the NDE indicator satisfies this limitation’s requirement to “determine whether to retransmit the data block...not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station” under Pantech’s interpretation because Pantech’s infringement contentions similarly rely on functionality where the UE bases its retransmission decision based on a new data indicator value. *See* n.3 (Ex. 1022, 17-26).

160. In another example where the NDE and ACK/NACK indication disagree, **Kuchibhotla** discloses that the MS correctly determines to retransmit a data block that was NACKed by the BTS based on the NDE value (set to 0) even though the NACK was erroneously received as an ACK. **Kuchibhotla**, ¶73, Figure 10. As shown in annotated Figure 10 below, “[if] the ACK/NACK and NDE disagreed,” the “BTS still does not properly receive 606 the retransmitted data” (after the MS’s “1st ATTEMPT” to retransmit data) and “indicates this with a NACK 612 and the sending of an[] NDE of 0.” *Id.* “However, the MS has an error and misreads 614 the NACK as an ACK” (which I denote by coloring the “ACK” in red in Figure 10 below), “but correctly receives the NDE.” *Id.* “Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and the MS 610.” *Id.* As such, the MS makes this retransmission decision based on the NDE=0 in the SAM, which is uplink scheduling information, not based on whether or not the MS received the NACK (it did not). **Kuchibhotla**, ¶73, Figure 10.

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS)	NDE SENT (BTS)
0 (PREVIOUS PACKET)	ACK	ACK	0
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	NACK	ACK	0
1 (3 rd ATTEMPT)	ERROR: FLUSH ACK	ACK	0

FIG. 10

161. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that **Kuchibhotla's** MS includes a processor working with a transceiver, or at minimum would have found it obvious to use a processor working with a transceiver in **Kuchibhotla's** MS to perform HARQ-based processes, respectively. *See* [1.a]-[1.b]. For example, a person of ordinary skill in the art would have understood, or at minimum found obvious, that in using the NDE “to *enhance* the reliability of the determination of ACK/NACK information,” the MS’s processor would process the SAM, identify the NDE value, and make the retransmission decision based on the NDE following a “reliability” voting. Kuchibhotla, ¶¶40 (emphasis added), 71, 73. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the processor working with the

transceiver of the MS is configured to cause the MS to determine whether to retransmit the old data block based on the NDE received in a SAM and not based on whether a NACK is received by the MS from the BTS.

162. Based on a construction I was instructed to consider, which I have not adopted as my own, I have been asked whether the term “the processor [] configured to cause the WTRU to: ... determine whether to retransmit...” (in [1.e]) would be met if it was considered to be a means-plus-function limitation. As discussed in the Claim Construction Section above (§VIII.B), assuming this limitation is construed under means-plus-function, **the function includes** causing the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station, and **the corresponding structure includes** a processor in a WTRU (*see, e.g., '247, 3:25-28*) implementing an algorithm that, *e.g.*, determines that the data block is scheduled for retransmission based on a received uplink scheduling information that includes a H-ARQ process identification associated with the data block to indicate that the data block was previously NACKed (*see, e.g., '247, 8:10-22*).

163. Even under such a construction, this limitation would be met by **Kuchibhotla in view of Liu**. A person having ordinary skill in the art would have understood Kuchibhotla to literally disclose a processor that meets this element. For

example, Kuchibhotla discloses a “mobile station” or “MS” that includes a processor (*see* [1.a]) that implements an algorithm that determines that the data block is scheduled for retransmission based on a received uplink scheduling information (e.g., “NDE” value included in “SAM”; *see* [1.e]) that includes a H-ARQ process identification associated with the data block to indicate that the data block was previously NACKed (*see* [1.d]). This processor performs the function of causing the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station (*see* my discussion of element [1.e] above).

164. To the extent **Kuchibhotla in view of Liu** does not literally meet the function and corresponding structure for [1.e] as identified above in §VIII.B, this limitation is met by **Kuchibhotla in view of Liu** under the doctrine of equivalents: for example, the processor in the mobile station rendered obvious by **Kuchibhotla in view of Liu** performs the function of causing the WTRU to determine whether to retransmit the data block based on the received uplink scheduling information and not based on whether the WTRU has received a negative acknowledgement (NACK) from the base station (*see* my discussion of elements [1.b], [1.d], and [1.e] above). This function is performed in substantially the same way as the ’247 patent (e.g., 8:10-22)—both utilize a mobile station to determine whether to retransmit a data

block based on uplink scheduling information identifying information about a prior failed transmission, where the retransmission determination is not based on whether a NACK was received by the WTRU (*see* my discussion of element [1.e] above)—to achieve substantially the same result—a determination is made as to whether to retransmit the data block (*see* my discussion of element [1.e] above).

(g) Claim 2

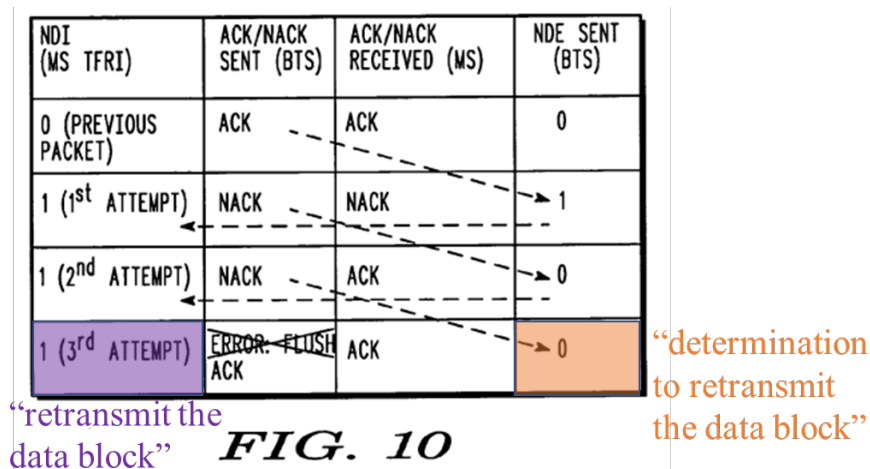
165. Claim [2] recites “The WTRU of claim 1, wherein the at least one transceiver and the processor are further configured to cause the WTRU to, in response to a determination to retransmit the data block, retransmit the data block.” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 2 is further met by **Kuchibhotla**.

166. **Kuchibhotla discloses wherein the at least one transceiver (*see* [1.a]) and the processor (*see* [1.b]) are further configured to cause the WTRU to, in response to a determination to retransmit the data block, retransmit the data block (*e.g.*, “the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter...old data is sent 604 with the same NDI bit”). *See e.g.*, Kuchibhotla (emphasis added):**

- ¶73 (*"If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616*

on the reliability of the misread ACK or the NDE=0. Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS 610. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.”)

• **Figure 10**



• **See also Figure 8.**

167. See my discussion for elements [1.a]-[1.e]. **Kuchibhotla** also discloses the MS retransmits the “old data” to the BTS upon making a retransmission decision based on the NDE, as I explain in element [1.e]. **Kuchibhotla**, ¶73, Figure 10; *see also* [1.e].

168. As I discuss in elements [1.a]-[1.c], and [1.e], a person of ordinary skill in the art would have understood that **Kuchibhotla in view of Liu** renders obvious

a MS that includes at least a transceiver working with a processor, or at minimum would have found it obvious to use a transceiver working with a processor to retransmit the data block to the Node-B (*see* [1.a], [1.c]) in response to the processor's determination to retransmit the data block (*see* [1.b], [1.e]). For example, a person of ordinary skill in the art would have understood, or at minimum found obvious, that after the MS's processor determines to retransmit an old data block, 1) the MS's transceiver retransmits the old data block to the BTS. Kuchibhotla, ¶73. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver (*see* [1.a]) working with the processor (*see* [1.b]) of the MS is configured to cause the MS to retransmit the old data block in response to the processor's determination to retransmit.

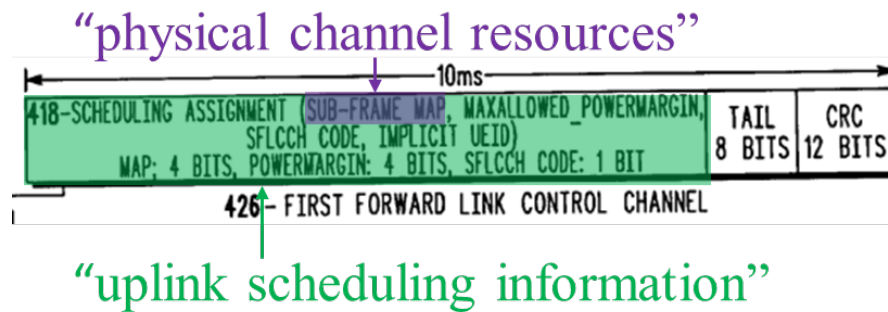
(h) Claim 3

169. **Claim [3] recites “The WTRU of claim 2, wherein the data block is retransmitted using physical channel resources included in the uplink scheduling information.”** As discussed above, **Kuchibhotla in view of Liu** renders obvious claims 1 and 2. The element recited in claim 3 is further met by **Kuchibhotla**.

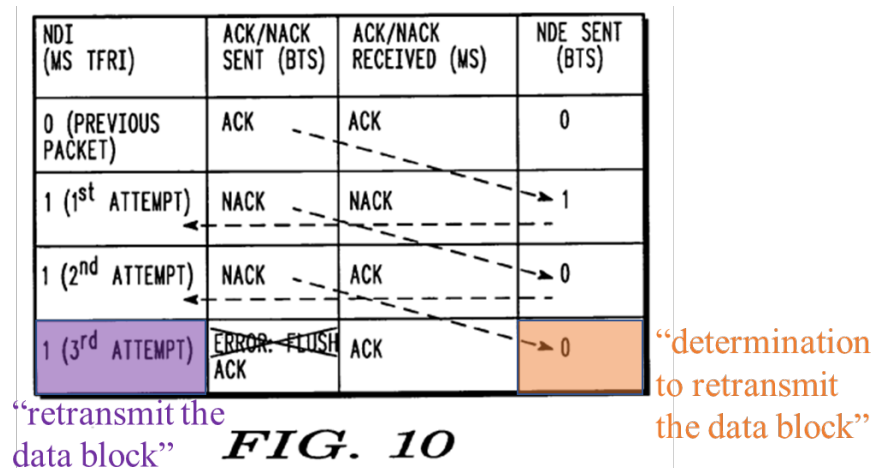
170. **Kuchibhotla discloses that the data block is retransmitted (*see* [2]) using physical channel resources included in the uplink scheduling information (*e.g.*, “SUB-FRAME MAP” included in the SAM “that describes a data transmission**

opportunity on the enhanced uplink channel”). See e.g., Kuchibhotla (emphasis added):

- **Figure 4** (excerpted)



- **Figure 10**



- ¶44 (“However, unlike communication system 100 of the prior art, *each reverse link of communication system 1000 further includes another traffic channel, an Enhanced Uplink Dedicated Transport Channel (EUDCH), that facilitates high speed data transport* by permitting a transmission of data that can be dynamically modulated and coded, and demodulated and decoded, on a sub-frame by sub-frame basis.”)
- ¶48 (“*The scheduling assignment 418 consists of the maximum allowed ‘power margin’ limit or target and a map of the allowed*

EUDCH sub-frame transmission intervals, such as a 2 ms sub-frame interval, for the next 10 ms transmission interval using a first forward link control channel 426.”)

- ¶58 (“In the explicit mode, *the BTSs in the active set sends dedicated scheduling assignment messages (SAM) to each mobile that describes a data transmission opportunity on the enhanced uplink channel*. The scheduling assignment can be sent over a 10 ms or a 2 ms long frame. Although other frame lengths are certainly possible, 10 ms and 2 ms frame lengths are more common in 3GPP.”)
- ¶55 (“[T]he present invention provides a supplementary indicator of message acceptability that is used in conjunction with the ACK/NACK information. In a first embodiment, *the supplementary indicator is a New Data Expected (NDE) indicator that is sent in a subsequent scheduling assignment message (SAM) from the BTS*. In this embodiment, *following the reception of ACK/NACK information on the ACK/NACK channel, the MS does not flush data in its buffer until a NDE is received in a subsequent SAM*. By coupling the both the ACK/NACK information and the NDE indicator, the mobile is able *to make a more reliable conclusion regarding the success of the previous transmission.*”)
- ¶62 (“*The present invention requires that the mobile not flush its buffer immediately on receiving the ACK/NACK indication from the BTS*. The present invention further adds a one bit “new data expected” indicator to the scheduling assignment message sent on another code channel and the mobile is required to read this to determine if the BTS (that sent it the previous SAM message) is expecting new information or a retransmission of the previous transmission. *If the mobile receives a “new data expected” indicator in the scheduling assignment message it can reliably determine that the BTS has in fact successfully received the previous packet and it can then flush this packet from its buffer. The “new data expected” indicator is included in the scheduling assignment message and therefore has CRC protection, and hence the potential for falsing is low.* In addition, it should be noted that the memory requirement on the mobile is not increased due to having to store the (packet) transmission (it is not stored as soft bits)

until reading of the scheduling assignment message. Note that *this mechanism is also useful in the case where the mobile receives an ACK from the BTS and interprets it as a NACK (a more probable erroneous condition).*”)

- ¶73 (“*If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616 on the reliability of the misread ACK or the NDE=0. Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS 610. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.*”)
- See also ¶¶17, 52.

171. See my discussion for elements [1.a]-[1.e] and claim [2]. As I discussed in element [1.e] and claim [2], **Kuchibhotla** discloses that the MS retransmits an old data block in response to the NDE=0 received within the corresponding SAM. See [1.e], [2].

172. **Kuchibhotla** discloses that a SAM also “describes a data transmission opportunity on the enhanced uplink channel” (“EUDCH”), which is a “reverse link” channel that “facilitates high speed data transport” from the MS to the BTS, including high speed retransmission of data packets. **Kuchibhotla**, ¶¶44, 58, Figure 4. A SAM includes “SUB-FRAME-MAP” (*i.e.*, “a map of the allowed EUDCH

sub-frame transmission intervals”). Kuchibhotla, ¶¶48, 58, Figure 4. In case of a retransmission, the SUB-FRAME-MAP specifies the time intervals in which retransmissions of the data blocks are made. *Id.* For example, the SUB-FRAME-MAP may specify “a 2 ms sub-frame interval for the next 10 ms transmission interval.” *Id.* The UE then retransmits within the specified 2 ms sub-frame interval. As such, the SUB-FRAME-MAP identifies the time intervals that are allocated to the MS for the retransmission. A person of ordinary skill in the art would have understood that physical channel resources include time and frequency domains, and that the MS in **Kuchibhotla** uses the allocated time intervals identified in the SUB-FRAME-MAP to retransmit data. Thus, the time intervals identified by **Kuchibhotla’s** SUB-FRAME-MAP constitute physical channel resources used for retransmission of a data block.

(i) Claim 4

173. Claim [4] recites “**The WTRU of claim 1, wherein the reception of the uplink scheduling information initiates retransmission of a negatively acknowledged (NACK’ed) data block.**” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 4 is further met by **Kuchibhotla**.

174. **Kuchibhotla discloses that the reception of the uplink scheduling information initiates retransmission of a negatively acknowledged (NACK’ed)**

data block (e.g., “preparing to send the old packet 604,” which “the BTS...does not properly receive 606...and indicates this with a NACK 612,” when “NDE=0” “is received in a subsequent SAM”).See e.g., Kuchibhotla (emphasis added):

• **Figure 10**

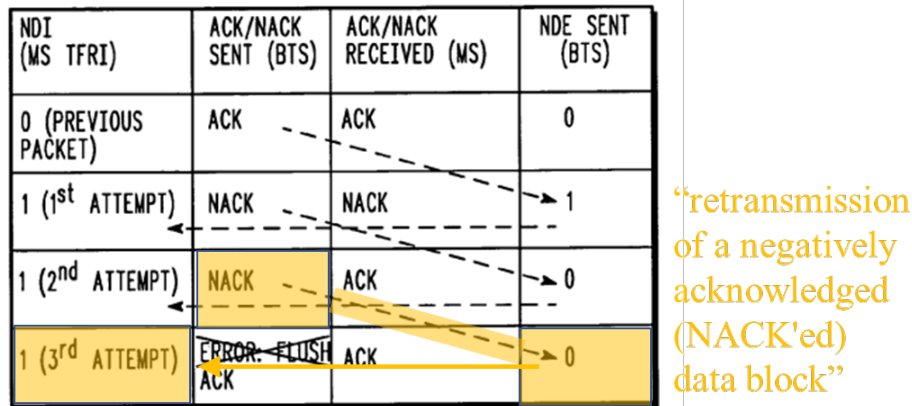


FIG. 10

- ¶55 (“[T]he present invention provides a supplementary indicator of message acceptability that is used in conjunction with the ACK/NACK information. In a first embodiment, *the supplementary indicator is a New Data Expected (NDE) indicator that is sent in a subsequent scheduling assignment message (SAM) from the BTS.* In this embodiment, *following the reception of ACK/NACK information on the ACK/NACK channel, the MS does not flush data in its buffer until a NDE is received in a subsequent SAM.* By coupling the both the ACK/NACK information and the NDE indicator, the mobile is able *to make a more reliable conclusion regarding the success of the previous transmission.*”)
- ¶62 (“*The present invention requires that the mobile not flush its buffer immediately on receiving the ACK/NACK indication from the BTS.* The present invention further adds a one bit “new data expected” indicator to the scheduling assignment message sent on another code channel and the mobile is required to read this to determine if the BTS (that sent it the previous SAM message) is expecting new information or a retransmission of the previous

transmission. If the mobile receives a “new data expected” indicator in the scheduling assignment message it can reliably determine that the BTS has in fact successfully received the previous packet and it can then flush this packet from its buffer. The “new data expected” indicator is included in the scheduling assignment message and therefore has CRC protection, and hence the potential for falsing is low. In addition, it should be noted that the memory requirement on the mobile is not increased due to having to store the (packet) transmission (it is not stored as soft bits) until reading of the scheduling assignment message. Note that *this mechanism is also useful in the case where the mobile receives an ACK from the BTS and interprets it as a NACK (a more probable erroneous condition).”)*

- ¶73 (“*If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616 on the reliability of the misread ACK or the NDE=0. Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS 610. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.*”)

175. See my discussion for elements [1.pre]-[1.e]. As I discuss in element [1.e], **Kuchibhotla** discloses that, when the MS receives “NDE=0” in a SAM, it initiates retransmission of the corresponding old packet despite receiving a “misread ACK” for the same data packet prior to receiving the SAM. See [1.e]. In doing so, the MS initiates retransmission of a negatively acknowledged (NACK’ed) data

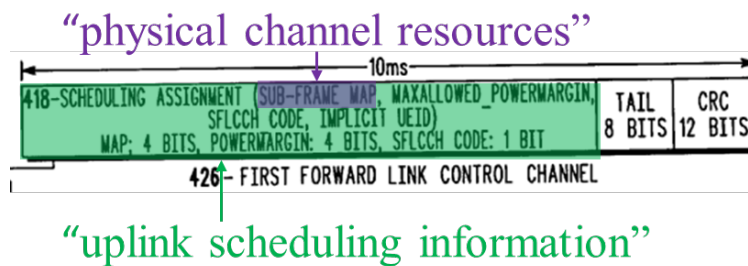
block, where the MS misreads a NACK indication sent by the BTS as an ACK indication, as shown in Figure 10 above. Kuchibhotla, ¶73, Figure 10.

(j) **Claim 5**

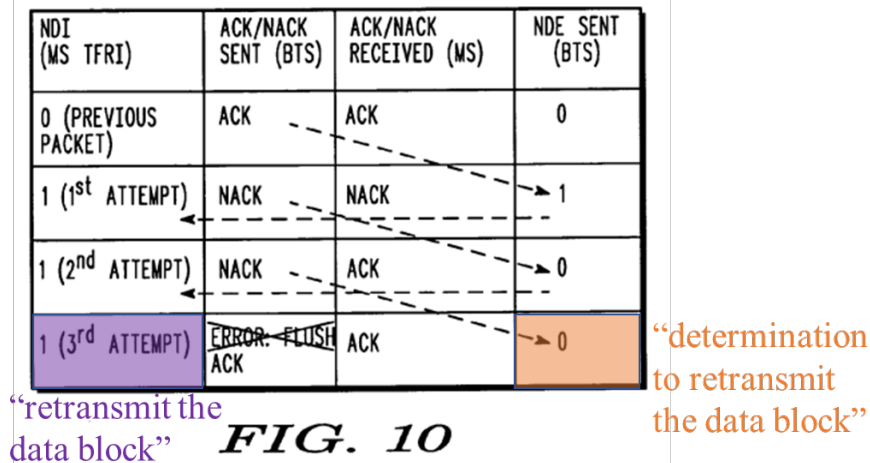
176. Claim [5] recites “**The WTRU of claim 1, wherein the uplink scheduling information includes physical channel resources.**” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 5 is further met by **Kuchibhotla**.

177. **Kuchibhotla** discloses that the uplink scheduling information includes physical channel resources (*see* [3]). *See e.g.*, Kuchibhotla (emphasis added):

- **Figure 4 (excerpted)**



- **Figure 10**



- ¶44 (“However, unlike communication system 100 of the prior art, *each reverse link of communication system 1000 further includes another traffic channel, an Enhanced Uplink Dedicated Transport Channel (EUDCH), that facilitates high speed data transport* by permitting a transmission of data that can be dynamically modulated and coded, and demodulated and decoded, on a sub-frame by sub-frame basis.”)
- ¶48 (“*The scheduling assignment 418 consists of the maximum allowed ‘power margin’ limit or target and a map of the allowed EUDCH sub-frame transmission intervals*, such as a 2 ms sub-frame interval, for the next 10 ms transmission interval using a first forward link control channel 426.”)
- ¶58 (“In the explicit mode, *the BTSs in the active set sends dedicated scheduling assignment messages (SAM) to each mobile that describes a data transmission opportunity on the enhanced uplink channel*. The scheduling assignment can be sent over a 10 ms or a 2 ms long frame. Although other frame lengths are certainly possible, 10 ms and 2 ms frame lengths are more common in 3GPP.”)
- ¶55 (“[T]he present invention provides a supplementary indicator of message acceptability that is used in conjunction with the ACK/NACK information. In a first embodiment, *the supplementary indicator is a New Data Expected (NDE) indicator that is sent in a subsequent scheduling assignment message (SAM) from the*

BTS. In this embodiment, following the reception of ACK/NACK information on the ACK/NACK channel, the MS does not flush data in its buffer until a NDE is received in a subsequent SAM. By coupling the both the ACK/NACK information and the NDE indicator, the mobile is able to make a more reliable conclusion regarding the success of the previous transmission.”)

- ¶62 (“***The present invention requires that the mobile not flush its buffer immediately on receiving the ACK/NACK indication from the BTS. The present invention further adds a one bit “new data expected” indicator to the scheduling assignment message sent on another code channel and the mobile is required to read this to determine if the BTS (that sent it the previous SAM message) is expecting new information or a retransmission of the previous transmission. If the mobile receives a “new data expected” indicator in the scheduling assignment message it can reliably determine that the BTS has in fact successfully received the previous packet and it can then flush this packet from its buffer. The “new data expected” indicator is included in the scheduling assignment message and therefore has CRC protection, and hence the potential for falsing is low. In addition, it should be noted that the memory requirement on the mobile is not increased due to having to store the (packet) transmission (it is not stored as soft bits) until reading of the scheduling assignment message. Note that *this mechanism is also useful in the case where the mobile receives an ACK from the BTS and interprets it as a NACK (a more probable erroneous condition).**”)**
- ¶73 (“***If the ACK/NACK and NDE disagreed...In this case, the BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612 and the sending of and NDE of 0. However, the MS has an error and misreads 614 the NACK as an ACK, but correctly receives the NDE. The MS must then vote 616 on the reliability of the misread ACK or the NDE=0. Since the NDE is sent in a SAM that has a CRC check and the ACK/NACK channel does not have a CRC check, the MS determines that the NDE=0 is more reliable 618, ignoring the misread ACK and preparing to send the old packet 604. Thereafter, in the fourth row, the NDI bit is not flipped, and old data is sent 604 with the same NDI bit, which is now properly received by the BTS 606 and MS***

610. Therefore, the present invention provides a solution to the wasted resources and throughput and lost data that can presently occur when a MS misreads a BTS NACK as an ACK.”)

- See also ¶¶17, 52.

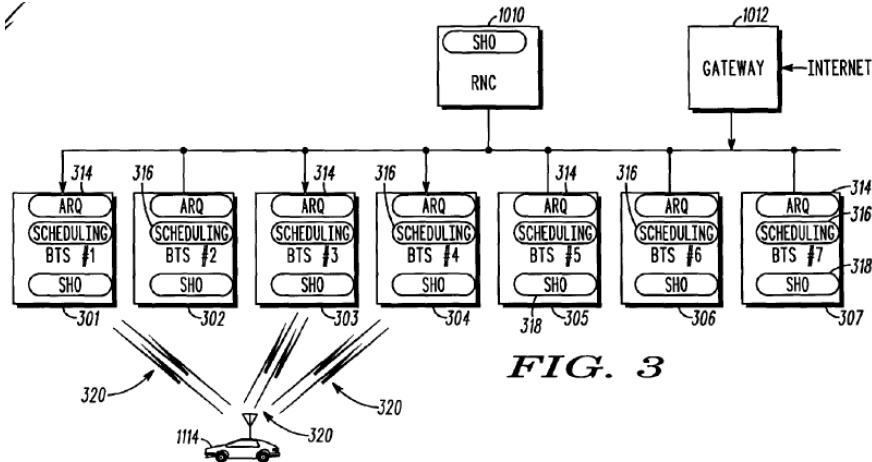
178. See my discussion for claims [1] and [3]. As I explain in claim [3], **Kuchibhotla** discloses that the MS receives uplink scheduling information (e.g., SAM) from a BTS, where the SAM includes physical channel resources. See [3].

(k) Claim 6

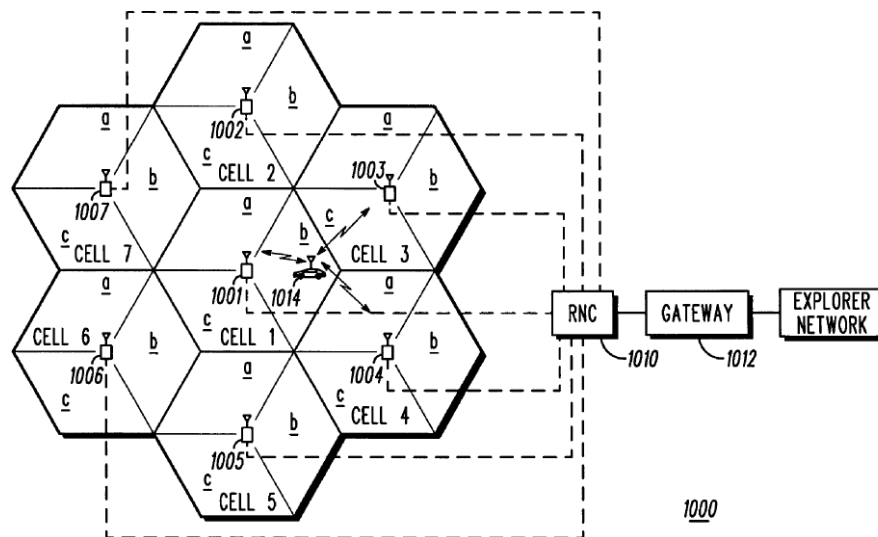
179. Claim [6] recites “**The WTRU of claim 1, wherein the uplink scheduling information is received from a primary cell and the WTRU transmits to the primary cell and at least one secondary cell.**” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 6 is further met by **Kuchibhotla**.

180. **Kuchibhotla discloses that the uplink scheduling information is received from a primary cell (e.g., cell serviced by a “scheduling BTS” that sends a “SAM”) and the WTRU transmits to the primary cell and at least one secondary cell (e.g. “MS is in soft handoff with a scheduling BTS” in a corresponding cell “and one or more non-scheduling BTSs” in their at least one corresponding cell, where “the non-scheduling BTS sends no SAM”).** See e.g., **Kuchibhotla** (emphasis added):

- **Figure 3**



• **Figure 5**



- ¶43 (“Similar to communication system 100, *communication system 1000 includes multiple cells* (seven shown). Each cell is divided into multiple sectors (three shown for each cell—sectors a, b, and c). *A base station subsystem (BSS) 1001-1007 located in each cell provides communications service to each mobile station located in that cell.* Each BSS 1001-1007 includes multiple base stations, also referred to herein as *base transceiver stations (BTSS) or Node-Bs, which wirelessly interface with the mobile stations located in the sectors of the cell serviced by the BSS.*”)

- ¶49 (“Referring back to FIG. 5, communication system 1000 includes a soft handoff (SHO) procedure by which MS 1014 can be handed off from a first air interface whose quality has degraded to another, higher quality air interface. For example, *as depicted in FIG. 5, MS 1014, which is serviced by a BTS servicing sector b of cell 1, is in a 3-way soft handoff with sector c of cell 3 and sector a of cell 4. The BTSs associated with the sectors concurrently servicing the MS, that is, the BTSs associated with sectors 1-b, 3-c, and 4-a, are the Active Set of the MS. In other words, MS 1014 is in soft handoff (SHO) with the BTSs 301, 303, and 304, associated with the sectors 1-b, 3-c, and 4-a servicing the MS, which BTSs are the Active Set of the MS.* As used herein, the terms ‘Active Set’ and ‘serving,’ such as an Active Set BTS and a serving BTS, are interchangeable and both refer to a BTS that is in an Active Set of an associated MS.”)
- ¶53 (“For example, as is known in the art, during reverse link communications, *the MS 1114 transmits frames to a plurality of BTSs 301, 303, 304.* The structure of the frames, includes: (a) a flush bit which indicates to the BTS when to combine a current frame with a previously stored frame or to flush the current buffer; (b) data; (c) a cyclic redundancy check (CRC) bit which indicates whether a frame decoded successfully or not (i.e., whether the frame contained any errors); and (d) a tail bit for flushing the channel decoder memory.”)
- ¶74 (“Referring to FIGS. 11 and 12, a present situation is shown where *an MS is in soft handoff with a scheduling BTS and one or more non-scheduling BTSs in its active set.* In this instance, a separate ACK/NACK code is used for the non-scheduling BTS(s), i.e. *the non-scheduling BTS sends no SAM.* This example is meant to show a scheduling BTS that sends a NACK (not acknowledged) indicating the data from the MS was not properly received, and the MS misreads this as an ACK. Further, a non-scheduling BTS can send a conflicting ACKINACK indication to the MS, which is also addressed in the present invention. In the first row, an MS has transmitted 1204 a previous packet (here with NDI=0), which the scheduling BTS has successfully received and sent 1208 an ACK on the ACK/NACK channel to the MS. *The scheduling BTS also sends and “new data expected” indication (NDE=1) in a SAM to*

the MS. The MS properly receives 1210 the ACK indication and confirming NDE. Therefore, the MS does not need to determine the reliability 1220, 1221 in this case....the present invention must consider whether any *non-scheduling BTS(s) may have properly received 1224 the packet.*”)

- *See also ¶¶11, 12, 14, 54, 56, 63, 66, 76, 78, Claims 16, 20, Figures 1, 2.*

181. See my discussion for elements [1.pre]-[1.e]. **Kuchibhotla** also discloses a “soft handoff” scenario between the MS and “a scheduling BTS and one or more non-scheduling BTSs in its active set.” Kuchibhotla, ¶¶49, 74. Though a MS transmits to all BTSs in its active set (Kuchibhotla, ¶¶43, 53), “scheduling BTS” sends “a SAM to the MS,” whereas a “non-scheduling BS sends no SAM” (Kuchibhotla, ¶74).

182. Furthermore, **Kuchibhotla** teaches that each BTS (whether scheduling or non-scheduling) is located in a cell. In particular, as shown in Figure 5 highlighted below, **Kuchibhotla’s** “[c]ommunication system 100 includes multiple cells (seven shown)” (with yellow borders in Figure 5 below), wherein each cell is divided into three sectors **a**, **b**, and **c** (highlighted in **red**, **blue**, and **green**, respectively in Figure 5 below). Kuchibhotla, ¶43. “A BSS 101-107 located in each cell provides communications service to each mobile station located in that cell.” Kuchibhotla, ¶11. “Each BSS 101-107 includes multiple BTSs, which BTSs wirelessly interface with the mobile stations located in the sectors of the cell serviced by the BSS.” *Id.*, Figures 1, 5.

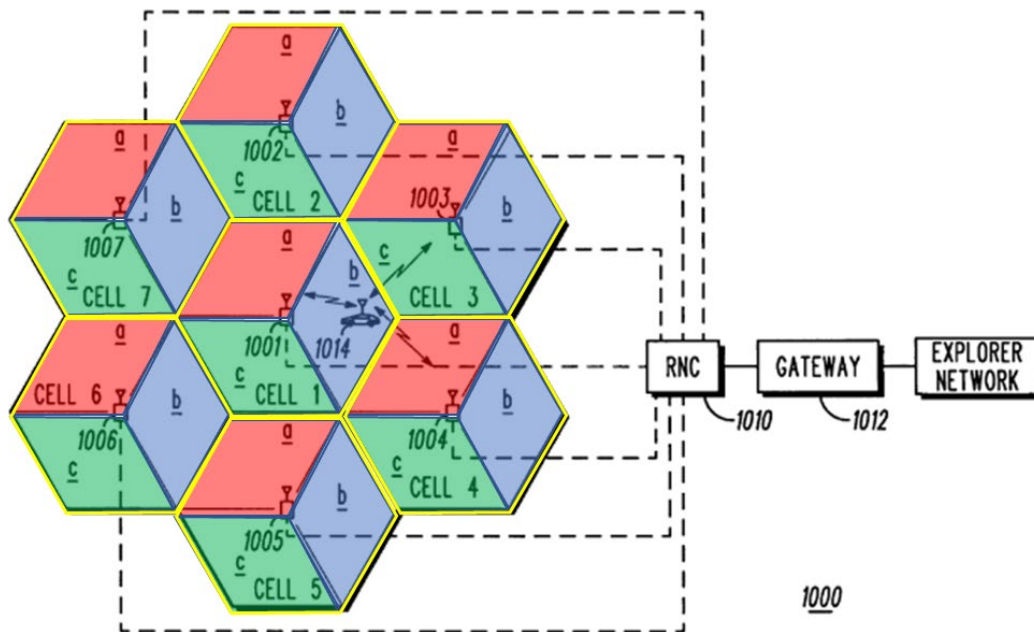


FIG. 5

183. **Kuchibhotla** describes a soft handoff where a MS communicates with three cells, one of which acts as a primary (scheduling) cell and the other two as secondary (non-scheduling) cells. Kuchibhotla, ¶¶12, 49, 74, Figure 5. A soft handoff occurs when a MS moves from one cell to another cell, which causes the BSS servicing the cell to change. Kuchibhotla, ¶12. During a soft handoff, the MS can be “handed off from a first communication link whose quality has degraded to another, higher quality communication link.” Kuchibhotla, ¶¶12, 49. For example, as depicted in Figure 5 highlighted below, “MS 114, which is serviced by a BTS servicing sector b of cell 1 [in blue], is in a 3-way soft handoff with sector c of cell 3 [in green] and sector a of cell 4 [in red].” Kuchibhotla, ¶¶12, 49, Figure 5 (annotated below).

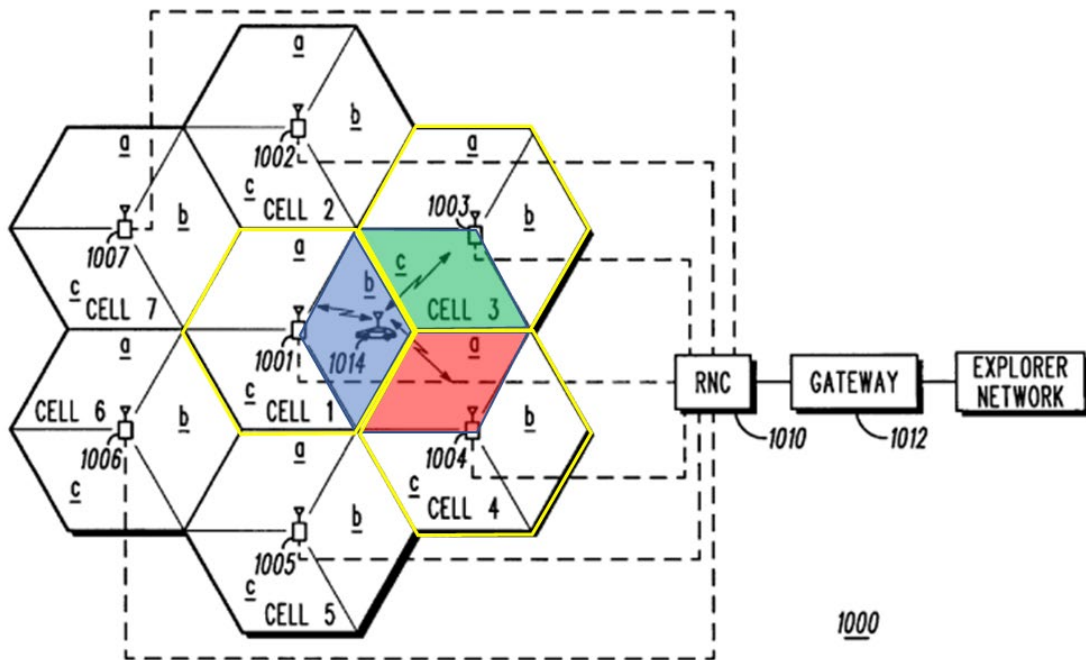
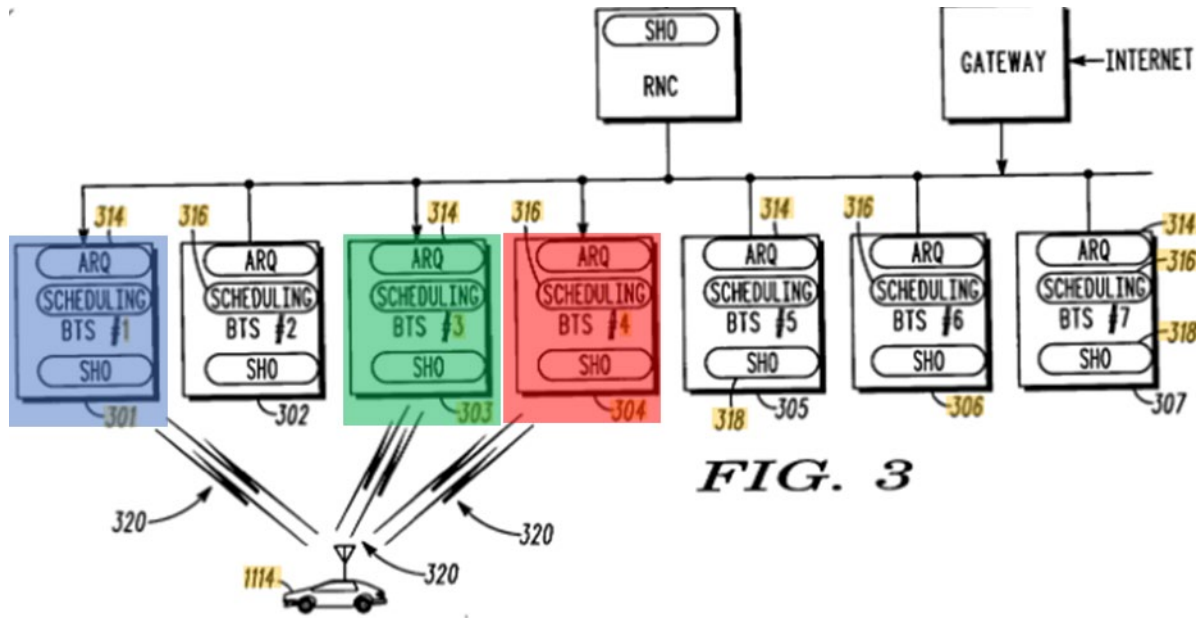


FIG. 5

“The BTSs associated with the sectors concurrently servicing the MS, that is, the BTSs associated with sectors **1-b**, **3-c**, and **4-a**, are known in the art as the “Active Set of the MS.” Kuchibhotla, ¶¶12, 49. “In other words, MS 1014 is in soft handoff (SHO) with the BTSs 301, 303, and 304, associated with the sectors 1-b, 3-c, and 4-a,” respectively, “servicing the MS, which BTSs are the Active Set of the MS.” Kuchibhotla, ¶49. Figure 3 (annotated below) shows the **BTSs 301 in blue**, **303 in green**, **304 in red**, highlighted consistently with the Figure 5 above.



Kuchibhotla further discloses that the active set of an MS consists of “a scheduling BTS and one or more non-scheduling BTSs.” *Kuchibhotla*, ¶74. Accordingly, one of the BTSs 301, 303, and 304 is a scheduling BTS and the others are non-scheduling BTSs. *Id.* ¶74, Figure 5. Because BTSs 301, 303, and 304 are each located in a different cell (as shown in Figure 5), **Kuchibhotla** teaches that one of the three BTS is a scheduling BTS (e.g., BTS 301) located in primary “cell 1,” and the other two BTSs are located in secondary cells 3 and 4 are non-scheduling BTSs located in secondary cells (e.g., BTS 303 in secondary “cell 3,” and BTS 304 in secondary “cell 4”). *Id.* ¶49. As such, **Kuchibhotla** discloses a primary cell and at least one secondary cell.

184. Because **Kuchibhotla** discloses that the MS receives a SAM only from the scheduling BTS, the MS receives the scheduling information included in the

SAM from the primary cell, where the scheduling BTS is located. Kuchibhotla, ¶74. **Kuchibhotla’s** further discloses that when soft handoff is performed, “each BTS . . . in the Active Set of the MS” receives a transmission from the MS. Kuchibhotla, ¶¶14, 53. Therefore, during the soft handoff managed by the BTSs 301, 303, and 304, the MS transmits to BTSs 301, 303, and 304, which are located in the primary cell and the two secondary cells. Kuchibhotla, ¶¶49, 74.

(I) Claim 7

185. Claim [7] recites “**The WTRU of claim 1, wherein the at least one transceiver and the processor are further configured to cause the WTRU to receive an ACK/NACK signal from the base station.**” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 7 is further met by **Kuchibhotla**.

186. **Kuchibhotla discloses that the at least one transceiver (see [1.a]) and the processor (see [1.b]) are further configured to cause the WTRU to, receive an ACK/NACK signal from the base station (e.g., “the BTS...sen[ds] an ACK [or NACK] on the ACK/NACK channel,” which “the MS properly receives” or “misreads”; Figure 10). See e.g., Kuchibhotla (emphasis added):**

- ¶73 (“[A]n MS has transmitted a previous packet, which *the BTS* has successfully received and *sent an ACK on the ACK/NACK channel to the MS.... [T]he MS properly receives the ACK indication.... [T]he data is not received by the BTS properly* 606, which *indicates this 612 as a NACK... [T]he MS also reads 614*

the NACK properly.... [T]he BTS still does not properly receive 606 the retransmitted data and indicates this with a NACK 612... [T]he MS has an error and misreads 614 the NACK as an ACK")

• **Figure 10**

NDI (MS TFRI)	ACK/NACK SENT (BTS)	ACK/NACK RECEIVED (MS)	NDE SENT (BTS)
0 (PREVIOUS PACKET)	ACK	ACK	0
1 (1 st ATTEMPT)	NACK	NACK	1
1 (2 nd ATTEMPT)	NACK	ACK	0
1 (3 rd ATTEMPT)	ERROR: FLUSH ACK	ACK	0

FIG. 10 “receive an ACK/NACK signal from the base station”

187. See my discussion for elements [1.pre]-[1.e]. Kuchibhotla also discloses that the MS “receives” “an ACK [or a NACK] on the ACK/NACK channel” from the BTS. Kuchibhotla, ¶73.

188. As I discuss in elements [1.a]-[1.b], a person of ordinary skill in the art would have understood that the MS rendered obvious by **Kuchibhotla in view of Liu** includes at least a transceiver working with a processor, or at minimum would have found it obvious to use a transceiver working with a processor in the MS to receive information from the Node-B. See [1.a]-[1.b]. For example, a person of ordinary skill in the art would have understood, or at minimum found obvious, that in receiving an ACK or NACK signal from the BTS as illustrated in Figure 10, the

MS's transceiver receives the ANC/NACK signal sent by the BTS. Kuchibhotla, ¶73, Figure 10. As such, a person of ordinary skill in the art would have understood, and at minimum found obvious, that the transceiver working with the processor of the MS is configured to cause the MS to receive an ACK/NACK signal from the BTS.

(m) Element [11.pre]

189. Element [11.pre] recites “A method comprising.” This element is met by **Kuchibhotla**.

190. **Kuchibhotla discloses a method** (e.g., “a method to enhance the reliability of the determination of ACK/NACK information”). See e.g., Kuchibhotla (emphasis added):

- ¶40 (“The present invention provides *a method to enhance the reliability of the determination of ACK/NACK information*, thereby resolving the issues of erroneous determination of an ACK as a NACK and NACK as an ACK both in and without soft handoff (SHO). *This is achieved through a novel technique of using channel quality and “new data expected” indicators in a scheduling assignment message from a BTS to a communication device (MS)*. This technique allows the set up of feedback information between the MS and active set BTSs such that a macro selection diversity benefit is obtained”)

191. See my discussion for elements [1.c]-[1.e]. **Kuchibhotla** discloses “a method to enhance the reliability of the determination of ACK/NACK information” by using the NDE indicators in a SAM sent from the BTS to the MS. Kuchibhotla, ¶40.

(n) Element [11.a]

192. Element [11.a] recites the same limitations as elements [1.pre] and [1.c]. See my discussion for elements [1.pre] and [1.c].

(o) Element [11.b]

193. Element [11.b] recites the same limitations as elements [1.pre] and [1.d]. See my discussion for elements [1.pre] and [1.d].

(p) Element [11.c]

194. Element [11.c] recites the same limitations as elements [1.pre] and [1.e]. See my discussion for elements [1.pre] and [1.e].

(q) Claim 12

195. Claim 12 recites the same limitations claim 2, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [2] and [11].

(r) Claim 13

196. Claim 13 recites the same limitations claim 3, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [3] and [11].

(s) Claim 14

197. Claim 14 recites the same limitations claim 4, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [4] and [11].

(t) Claim 15

198. Claim 15 recites the same limitations claim 5, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [5] and [11].

(u) Claim 16

199. Claim 16 recites the same limitations claim 6, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [6] and [11].

(v) Claim 17

200. Claim 17 recites the same limitations claim 7, except that it depends on claim [1] instead of claim [11]. See my discussion for claims [7] and [11].

E. Ground 6: Kuchibhotla in view of Liu and Lucent (Claims 8, 18)

1. Motivation to Apply Lucent's teachings to Kuchibhotla and Liu

201. **Kuchibhotla** discloses that a modulation and coding scheme (MCS) is included in a transmission from the MS to the BTS, but not included in the SAM sent from the BTS to the MS. Kuchibhotla, ¶52, Figure 4.

202. **Lucent** discloses including MCS in the uplink scheduling information (*i.e.*, “scheduling grant message”) that is sent by a base station (“Node-B”) to a user equipment (UE) as part of a “signalling” scheme “that is required for efficient HARQ operation.” Lucent, 1. Although Lucent discloses that MCS “can be set by either the [UE] or the [Node-B],” it also states that “allow[ing] the UE more flexibility in selecting the parameters . . . can result in significant overheads.” Lucent, 2. Accordingly, **Lucent** suggests that “[a]lternately, the UE should always follow the Node-B’s command, and use the parameters dictated by Node-B in the schedule grant message for uplink data transmission.” Lucent, 3. Under this

approach of “Node-B controlled scheduling,” “a schedule grant message transmitted by the Node-B . . . contains . . . modulation and coding scheme (MCS).” Lucent, 1.

203. Like Kuchibhotla and Liu, **Lucent** is analogous to and in the same field as the '247, which includes HARQ-based transmission control in wireless communication systems, and reasonably pertinent to the alleged problems identified in the '247—*e.g.*, implementing efficient transmissions for H-ARQ. '247, Abstract (“The method . . . comprising . . . receiving uplink scheduling information from the base station . . . and determining whether to retransmit the data block based on the received uplink scheduling information”), 1:36-41 (“the present invention is related to a method and apparatus for coordinating Node-Bs and supporting enhanced uplink (EU) transmissions during handover.”); Kuchibhotla, ¶25 (“a new technique to enhance the reliability of the determination of ACK/NACK information”), 58 (“Efficient layer 1 signaling is needed to enable fast explicit and autonomous scheduling with Hybrid ARQ at the BTS for enhanced uplink.”); Liu, Abstract (“The present invention provides for efficient control signaling in a downlink control channel”), ¶11 (“In view of the extensive amounts of control signaling in wireless communication systems such as UMTS, it may be desirable to provide efficient control signaling.”); Lucent, 1-2 (“Node-B controlled scheduling . . . Node-B controlled scheduling may be better suited for high data rate transmissions”), 4-5 (“Node-B schedules a transmission on H-ARQ channel 0, with NDI set equal to 0.

The UE transmits the first packet in response, which is decoded correctly by the Node-B.”).

204. As I explain above in this section, **Kuchibhotla** includes MCS in a transmission from the MS to the BTS. Kuchibhotla, ¶52, Figure 4. However, **Lucent** teaches that providing a user device (“MS” in **Kuchibhotla** and “UE” in **Lucent**) flexibility in selecting the parameters can result in significant overheads, and instead suggests a scheduling controlled by a base station (“BTS” in **Kuchibhotla** and “Node-B” in **Lucent**), where MCS is included in the scheduling information sent from the base station to the user device. Lucent, 2. A person of ordinary skill in the art would have been motivated to modify **Kuchibhotla** (including in combination of **Liu’s** teachings as discussed in Section IX.E.1 with these teachings from **Lucent** by including the MCS information in the SAM message that the BTS sends to the MS. This advantageously “allows for better noise rise management, resource utilization” and “exploit[ation] [of] multi-user diversity in the cell,” and “obviates the need for associated signalling” by the UE, “thereby reducing uplink overheads,” as **Lucent** discloses. Lucent, 3. Moreover, selection of MCS by the BTS prevents the MS from selecting a MCS value that is not feasible for the BTS’s operation, including, for example, selecting a high a MCS value “that could affect the noise rise” at the BTS. Lucent, 3.

205. Furthermore, a person of ordinary skill in the art would have at least found it obvious to include the MCS in **Kuchibhotla's** SAM (as modified by **Liu**) because there are a limited number of ways to choose and communicate an MCS value. As **Lucent** teaches, the MCS must be set either by the UE or the Node-B. **Lucent**, 2. As such, setting the MCS would be one of the two available options. Moreover, in **Kuchibhotla's** H-ARQ process, the only messaging that Node-B transmits to the UE is the ACK/NACK signaling and the SAM. **Kuchibhotla**, ¶58, Figure 4. Because ACK/NACK signaling solely consists of the ACK/NACK bits, a person of ordinary skill in the art would have found obvious to include the MCS in the SAM while having the Node-B set the MCS.

206. A person of ordinary skill in the art also would have had a reasonable expectation of success applying **Lucent's** teachings of including the MCS information in the scheduling information to **Kuchibhotla's** SAM (as modified by **Liu**). **Lucent** indeed discloses that the MCS can either be autonomously determined by the UE (as **Kuchibhotla** discloses), or “alternately,” selected by the Node-B. **Kuchibhotla**, ¶52, Figure 4; **Lucent**, 2-3. **Lucent** teaches including MCS in the scheduling grant message, which serves the same function as a SAM in **Kuchibhotla**—communicating scheduling information to the MS. **Lucent**, 2. As such, in view **Lucent's** solution of Node-B controlled scheduling, a person of

ordinary skill in the art would have reasonably expected to successfully modify **Kuchibhotla in view of Liu** to include MCS in the SAM.

2. Invalidity of Claims 8 and 18 Over Kuchibhotla in view of Liu and Lucent

(a) Claims 8, 18

207. Claim 8 recites “**The WTRU of claim 1, wherein the scheduling information indicates a modulation and coding scheme.**” As discussed above, **Kuchibhotla in view of Liu** renders obvious claim 1. The element recited in claim 8 is further met by **Kuchibhotla in view of Lucent**.

208. Lucent discloses that the scheduling information indicates a modulation and coding scheme (e.g., “The schedule grant message contains...modulation and coding scheme (MCS)” and is “transmitted by the Node-B” to the “UE”). See e.g., Lucent (emphasis added):

- **1** (“Here, *the UE’s uplink transmission is in response to a schedule grant message transmitted by the Node-B*. Therefore, there is a strict timing relationship between the transmission of the schedule grant message and the corresponding uplink data transmission. The duration of the uplink transmission is a TTI. *The schedule grant message contains* H-ARQ parameters, transport block size (TBS) indication, and *modulation and coding scheme (MCS)*.”)
- **1-2** (“**Node-B controlled scheduling**[:] Here, the UE’s uplink transmission is in response to a schedule grant message transmitted by the Node-B...*Node-B controlled scheduling has the following benefits: It allows for better noise rise management, resource utilization, and allows the Node-B to exploit multi-user diversity in the cell.... [¶] As a result, Node-B controlled scheduling may be better suited for high data rate transmissions.*”).

- **2** (“Autonomous Rate Selection by UE[:] The signalling done by the UE depends on whether or not the UE is allowed to override the parameters signalled by the Node-B. *In the case, where the UE is allowed to override Node-B’s commands (as in [2]), it will have to necessarily signal* transport block size (TBS) indication, and *modulation and coding scheme (MCS).... [¶]* Although this allows the UE more flexibility in selecting the parameters for its transmission based on the available resources at the UE, *it can result in significant overheads.*”)
- **3** (“Rate Selection by Node-B[:] “Alternately, *the UE should always follow the Node-B’s command, and use the parameters dictated by Node-B in the schedule grant message for uplink data transmission. Clearly, this method of operation obviates the need for the associated signalling, thereby reducing uplink overheads.* However, it does reduce the flexibility at the UE in selecting the parameters for uplink data transmission. This flexibility may be beneficial in the following cases:
 - The power margin available at the UE is not sufficient to support the data rate commanded by the Node-B for the given TBS, so that a lower MCS or smaller TBS is preferable. Note that the UE cannot be allowed to select a higher MCS as that could affect the noise rise at the Node-B.
 - The buffer contents at the UE can be transmitted more efficiently using a lower MCS.”).

209. **Lucent** discloses “a schedule grant message transmitted by the Node-B.” **Lucent**, 1. In response to the scheduling grant message, the UE performs the “uplink transmission.” *Id.* **Lucent** also discloses that the schedule grant message contains “modulation and coding scheme (MCS).” *Id.* As I discuss in more detail in Section IX.E.1, a person of ordinary skill in the art would have been motivated to modify **Kuchibhotla’s** SAM (as further modified by **Liu**), as **Lucent** teaches, such

that the SAM includes modulation and coding scheme, like **Lucent's** schedule grant message does.

210. **Claim 18 recites the same limitations claim 8, except that it depends from claim [11] instead of claim [1].** Thus, in view of the above, claims 8 and 18 are rendered obvious by **Kuchibhotla in view of Liu and Lucent**.

F. Ground 7: Kuchibhotla in view of Liu, Lucent, and Das (Claims 9-10, 19-20)

1. Claims 9, 19

211. Claims 9 and 19, depending from claims 1 and 11, respectively, recite “[The WTRU of claim 1/The method of claim 11,] wherein the transmitted data block has a first modulation and coding scheme (MCS) and the scheduling information indicates a second MCS, wherein the first MCS and the second MCS are different.” As I discuss above, **Kuchibhotla in view of Liu** renders obvious claims 1 and 11. And as I further discuss in Ground 6 in connection with claims 8 and 18, **Kuchibhotla in view of Liu and Lucent** renders obvious that the scheduling information indicates a modulation and coding scheme (MCS). *See* Section IX.E.2.

212. As I discuss in Section IX.C (Grounds 3-4 based on **Lucent** and optionally in view of **Liu**), **Das** discloses that the transmitted data block has a first modulation and coding scheme (MCS) and the retransmitted data block has a second MCS wherein the first MCS and the second MCS are different, as recited by claims

9 and 19. *See* Section IX.C. As I discuss in Section IX.C, a person of ordinary skill in the art would have found obvious to further apply **Das's** teachings of using different MCS values for retransmission than used in the original transmission in implementing **Lucent's** Node-B controlled modulation and coding scheme. *See* Section IX.C. For the same reasons that I discuss in Section IX.C, a person of ordinary skill in the art would have been motivated to apply **Das's** teachings in implementing **Kuchibhotla's** SAM (as modified by **Liu's** and **Lucent's** teachings) to advantageously enable **Kuchibhotla** system to provide a more effective MCS scheme that is tailored to “the condition of the communication channel,” as **Das** teaches. *See* Lucent, 1-3; Das, ¶¶5, 9, 20, 23, claims 6-7; *see* Section IX.C.

213. Like Kuchibhotla, Lucent, and Liu, **Das** is analogous prior art and in the same field as the '247. *See* Sections IX.C (Grounds 3-4), IX.D.2 (Ground 5), IX.E.1 (Ground 6).

214. As such, **Kuchibhotla in view of Liu, Lucent, and Das** renders obvious claims 9 and 19.

2. Claims 10, 20

215. Claims 10 and 20, depending from claim 9 and 19 respectively further recite “**the at least one transceiver and the processor are further configured to cause the WTRU to, in response to the determination to retransmit the data block, retransmit the data block [see claim 2] using the second MCS [see claim**

9]” (Claim 10) and “in response to a determination to retransmit the data block, retransmitting the data block [see claim 12] using the second MCS [see claim 19]” (Claim 20), respectively. As I discuss for [2] and [12] in Ground 5, **Kuchibhotla (in view of Liu)** discloses the claimed features recited in claims 2 and 12. In addition, a person of ordinary skill in the art would have been motivated to implement **Kuchibhotla’s** teachings (as modified by **Liu**) of retransmitting the data block in response to a determination to retransmit the data block, as I discuss for [2], [12] in Ground 5, by using **Das’s** teachings of using a different MCS for retransmission than for the original transmission for the same reasons that I discuss above with respect to claims [9] and [19] such that **Kuchibhotla’s** WTRU (as modified by **Liu’s** and **Lucent’s** teachings (as I discuss in Grounds 5, 8)) retransmits the data block using a second MCS that is different from the first MCS that is used to make the original transmission in response to a determination to retransmit the data block.

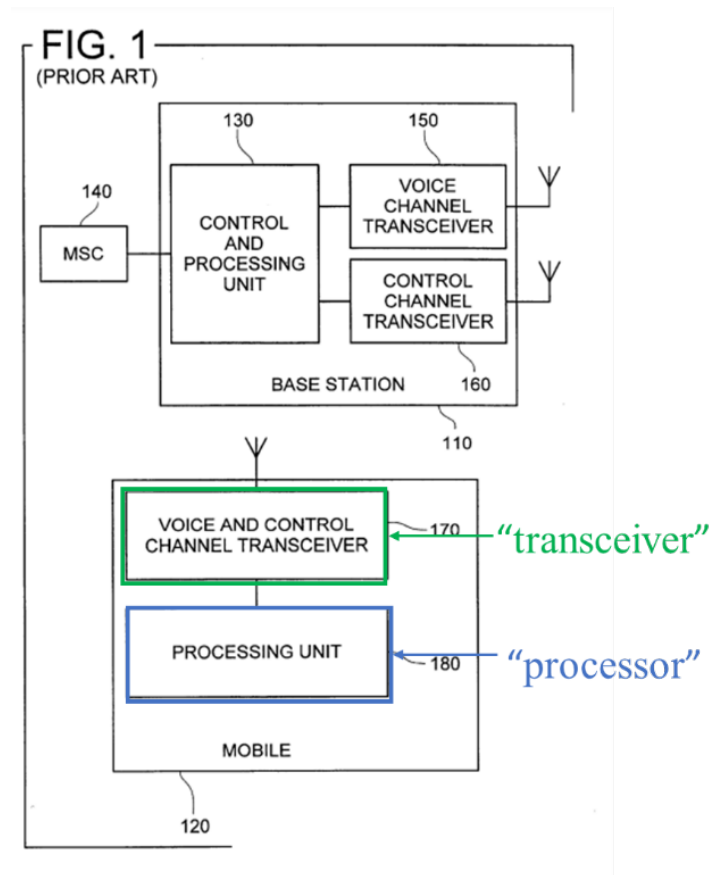
216. As such, **Kuchibhotla in view of Liu, Lucent, and Das** renders obvious claims 10 and 20.

G. Grounds 8-14: Grounds 1-7 in further view of Rathonyi

217. As I discuss in Grounds 1 and 5, **Lucent** and **Kuchibhotla** each discloses, or at the very least renders obvious, the recited “transceiver” and “processor” components in [1.a] and [1.b] for Grounds 1-7. *See* Sections IX.A.2

(Ground 1, [1a], [1.b]), IX.D.3 (Ground 5, [1.a], [1.b]). To the extent further disclosure is required, **Rathonyi** (Ex. 1008) additionally discloses user equipment that includes transceiver and processor components to transmit/receive and process HARQ-based wireless communications.

218. **Rathonyi** discloses “a method and apparatus for minimizing overhead in packet re-transmission” in a “cellular radiotelephone system.” Rathonyi, 1:6-13. The cellular radiotelephone system includes “an exemplary base station 110 and a mobile station 120.” *Id.* The mobile station 120 includes a “transceiver 170” and a “processing unit 180,” as shown in Figure 1 below. Rathonyi, 1:33-39, Figure 1.



219. Like Lucent, Kuchibhotla, Liu, and Das, **Rathonyi** is analogous to and in the same field as the '247, which includes HARQ-based transmission control in wireless communication systems, and reasonably pertinent to the alleged problems identified in the '247—*e.g.*, implementing efficient transmissions for H-ARQ. Rathonyi, 1:6-10 (“this invention relates to a method and apparatus for minimizing overhead in packet re-transmission in a communication system”), 6:28-40 (“It is still a further object of the present invention to support Type II hybrid ARQ and soft combining in variable rate packet re-transmission.”); *see* Sections IX.A-IX.F (Grounds 1-7).

220. A person of ordinary skill in the art would have been motivated to implement **Kuchibhotla’s** mobile station (**in view of Liu**) or **Lucent’s** UE (**optionally in view of Liu**) to include a transceiver, as taught in **Rathonyi**, “to allow [the] mobile station to communicate with the base stations.” Rathonyi, 1:33-39 (“The mobile station 120 receives the information broadcast on a control channel at its voice and control channel transceiver 170.”), 2:41-42 (“Packets are then transmitted by the BTS 18 over the air interface to a remote station 21.”), 3:16-21 (“In cellular radio systems, an air interface protocol is required in order to allow a mobile station to communicate with the base stations and a mobile switching center (MSC). The air interface protocol is used to initiate and to receive cellular telephone calls.”). For example, by including a transceiver in **Kuchibhotla (in view of Liu)**,

as **Rathonyi** teaches, the MS can use the transceiver to receive a scheduling assignment messages (SAM) from a BTS and send data blocks to the BTS in response to the SAM. *See e.g.*, Section IX.D.3 (Ground 5, [1.c] and [1.d]). Similarly, by including a transceiver in **Lucent (optionally in view of Liu)**, as **Rathonyi** teaches, the UE can use the transceiver to receive a schedule grant message from the Node-B and send data blocks to the Node-B in response to the schedule grant message. *See e.g.*, Section IX.A.2 (Ground 1, [1.c] and [1.d]).

221. Further, a person of ordinary skill in the art would have been motivated to implement **Kuchibhotla's** mobile station (**in view of Liu**) or **Lucent's** UE (**optionally in view of Liu**) to include a processor, as taught in **Rathonyi**, to “evaluate[] the received control channel information,” such as scheduling information. **Rathonyi**, 1:33-39 (“[T]he processing unit 180 evaluates the received control channel information.”), 3:16-21 (“In cellular radio systems, an air interface protocol is required in order to allow a mobile station to communicate with the base stations and a mobile switching center (MSC). The air interface protocol is used to initiate and to receive cellular telephone calls.”), 11:18-20 (“[A] processor evaluates whether or not the current packet size is the best suited for the current channel conditions.”). For example, by including a processor in **Kuchibhotla (in view of Liu)**, as **Rathonyi** teaches, the MS can evaluate the SAM that it receives to determine whether to retransmit an old data block, and upon determining to

retransmit, prepare the old data block for retransmission. *See e.g.*, Section IX.D.3 (Ground 5, [1.e] and [2]). Similarly, by including a processor in **Lucent (optionally in view of Liu)**, as **Rathonyi** teaches, the UE can evaluate the schedule grant message that it receives to determine whether to retransmit an old data block, and upon determining to retransmit, prepare the old data block for retransmission. *See e.g.*, Section IX.A.2 (Ground 1, [1.e] and [2]). Using processors to perform these H-ARQ-related tasks advantageously leads to faster response times by the mobile station and allows handling multiple H-ARQ processes sent by different base stations in parallel.

222. A person of ordinary skill in the art would have had a reasonable expectation of success using **Rathonyi's** transceiver and processor in implementing: 1) **Kuchibhotla's** MS in view of **Liu** (*see* Ground 5) and in further view of **Lucent** (*see* Ground 6) and **Das** (*see* Ground 7), and 2) **Lucent's** UE optionally in view of **Liu** (*see* Grounds 1-2) and in further view of **Das** (*see* Grounds 3-4), because transceivers and processors were standard components at the time of the alleged invention for user equipments, such as **Rathonyi's** mobile station 120, to transmit, receive, and process information. Rathonyi, 1:33-39 (“The mobile station 120 receives the information broadcast on a control channel at its voice and control channel transceiver 170. Then, the processing unit 180 evaluates the received control channel information.”), Figure 1.

223. Accordingly, each of the Challenged Claims is further rendered obvious for the reasons set forth for Grounds 1-7, as further modified with **Rathonyi's** teachings of a transceiver and a processor.

224. Based on constructions I was instructed to consider, which I have not adopted as my own, I have been asked to consider whether the terms identified in the Claim Construction Section above (§VIII.B) for [1.e] would be met if they were considered to be a means-plus-function limitations. *See* functions and corresponding structures identified in §VIII.B. Even under such constructions, these limitations would be rendered obvious by Grounds 1-2, and 5 in view of **Rathonyi**. A person having ordinary skill in the art would have understood that Grounds 1-2, and 5 in view of **Rathonyi** render obvious a processor that literally meets limitation [1.e]. *See* my discussion of [1.e] in Grounds 1, 2, and 5.

225. To the extent Grounds 1-2, and 5 in view of **Rathonyi** do not literally meet limitation [1.e] under means-plus-function construction, they are met by Grounds 1-2, and 5 in view of **Rathonyi** under the doctrine of equivalents: for example, the resulting system from applying **Rathonyi's** teachings to Grounds 1-2, and 5 (as discussed above) and the '247 patent both disclose a mobile station that performs the claimed functions for [1.e] in substantially the same way to achieve the same result, as discussed above. *See* my discussion of [1.e] in Grounds 1, 2, and 5.

X. SECONDARY CONSIDERATIONS

226. I have seen no evidence in the '247 patent's prosecution history or elsewhere supporting any secondary considerations arguments, or evidence of nexus to any of Challenged Claims. *See generally* '247 FH. Indeed, per my discussion of the prior art referenced herein, any purported solutions to problems or unexpected results in the '247 patent were already well known. To the extent Pantech asserts the existence of any secondary considerations in its responses, I reserve my right to address any such evidence.

XI. CONCLUSION

227. In summary, I have concluded that the Challenged Claims are anticipated and/or rendered obvious over the prior art references as discussed above. Specifically, in my opinion, for at least the reasons above, the Challenged Claims of the '247 patent are disclosed and rendered obvious as follows.

Ground	Claims	Anticipation or Obviousness	Prior Art References
1	1-2, 8, 11-12, 18	Anticipated and Obvious	Lucent
2	1-2, 8, 11-12, 18	Obvious	Lucent in view of Liu
3	9-10, 19-20	Obvious	Lucent in view of Das
4	9-10, 19-20	Obvious	Lucent and Liu in view of Das
5	1-7, 11-17	Obvious	Kuchibhotla in view of Liu
6	8, 18	Obvious	Kuchibhotla and Liu in view of Lucent

Ground	Claims	Anticipation or Obviousness	Prior Art References
7	9-10, 19-20	Obvious	Kuchibhotla and Liu, in view of Lucent, and in further view of Das
8-14	See above for corresponding Grounds 1-7	Obvious	Grounds 1-7 in further view of Rathonyi

228. To the extent it is argued that any further disclosure is required for an element in the Challenged Claims that I have identified as being disclosed, a person of ordinary skill in the art would certainly have found that element obvious to include based on the sample explicit disclosure or inherent disclosures and analysis I have identified above.

229. I reserve the right to supplement my opinions in the future to respond to any arguments that Patent Owner or its expert(s) may raise and to take into account new information as it becomes available to me.

230. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

231. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Executed this 10th day of August 2023, in Madison, WI.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Daniel van der Weide', is written over a horizontal line.

Daniel van der Weide, Ph.D.

APPENDIX A

DANIEL W. VAN DER WEIDE

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<https://scholar.google.com/citations?user=Cy2A2foAAAAJ&hl=en&oi=sra>

ACADEMIC EXPERIENCE

- PROFESSOR
ELECTRICAL AND COMPUTER
ENGINEERING (COURTESY
APPOINTMENTS IN
RADIOLOGY, BIOMEDICAL
ENGINEERING AND
MATERIALS SCIENCE) MICROFABRICATED HIGH-FREQUENCY
ELECTROMAGNETIC SENSORS; localized broadband
spectroscopy and microscopy, low-dimensional
devices and circuits using multifunctional scanning
probes; THz spectroscopy with nonlinear
transmission lines; instruments for wireless
communications. Contactless sensors. May 2004–
Present
(Associate
September 1999–
May 2004)
- UNIVERSITY OF WISCONSIN-
MADISON
- ASSOCIATE PROFESSOR
ELECTRICAL AND COMPUTER
ENGINEERING May 1998–
August 1999
(Assistant
September 1995–
May 1998)
- UNIVERSITY OF DELAWARE
- POST-DOCTORAL
RESEARCHER
ABTEILUNG VON KLITZING August 1993–
August 1995
- MAX-PLANCK-INSTITUT FÜR
FESTKÖRPERFORSCHUNG CONTACTLESS HIGH-FREQUENCY
SPECTROSCOPY OF LOW-DIMENSIONAL
ELECTRON SYSTEMS; achieved current record
(480 fs, 3.5 V) nonlinear transmission lines
Primary collaborators: F. Keilmann and R. Blick
- DOCTOR OF PHILOSOPHY
MASTER OF SCIENCE
ELECTRICAL ENGINEERING September 1988–
December 1992
- STANFORD UNIVERSITY Dissertation: “All-electronic Generation and
Detection of Terahertz Radiation with
Subpicosecond Pulses.” Attained the first sub-ps
and record 880 fs electrical pulses with GaAs
nonlinear transmission lines; used these pulses for
free-space signal generation and detection from
6 GHz–3 THz
Advisor: D. M. Bloom
- BACHELOR OF SCIENCE
ELECTRICAL ENGINEERING
MINOR IN LATIN August 1981–
May 1987
- UNIVERSITY OF IOWA Collegiate Scholar Award, 1987
Dean’s Scholarship, 1982–86
University Scholarship, 1981–86
Member, Tau Beta Pi, Eta Kappa Nu
President, IEEE Student Chapter, 1986

RECOGNITION

- FELLOW, IEEE, SENIOR MEMBER OPTICA (OSA), MEMBER APS, MRS

• VILAS ASSOCIATE	UNIVERSITY OF WISCONSIN	\$86,400	2002-04
• ALEXANDER VON HUMBOLDT FELLOWSHIP	“Localized microwave excitation of low-dimensional electronic devices” (J.P. Kotthaus, Munich)		1999–2000 (postponed)
• PECASE AWARD NATIONAL SCIENCE FOUNDATION	“Pioneering research on nanoscale-dimension electronic circuits and development of a web-based virtual laboratory that provides student access to advanced scientific instrumentation”	\$510,000 (incorporates NSF CAREER Award; one of two engineers in NSF ECS Division selected)	June 1998– May 2003
• YOUNG INVESTIGATOR PROGRAM AWARD OFFICE OF NAVAL RESEARCH	“Coherent signal generation with integrated circuits for wideband 100 GHz network measurements”	\$327,394	May 1998– June 2002
• INNOVATION/TECHNICAL ACHIEVEMENT AWARD DARPA ULTRA PROGRAM	“Significant Technical Achievement by an Individual Performer”	(one of two individual awardees)	October 1997
• UNIVERSITY RESEARCH AWARD FORD MOTOR COMPANY	“All-Electronic Terahertz Spectroscopy for On-Board Exhaust-Gas Monitoring”	\$150,000 (award rate < 4%)	April 1996– March 1999
• ANNUAL MEETING INVITED WORKSHOP SPEAKER OPTICAL SOCIETY OF AMERICA	“Presenting Scientific Information on the World-Wide Web”	\$2,000	October 1996

INSTITUTIONAL RECOGNITION

• DEAN’S MERIT INCREASE + PROVOST’S SPECIAL MERIT INCREASE UNIVERSITY OF DELAWARE	“Extraordinarily high level of performance as an engineering faculty member”		June 1996, June 1997, June 1998
• FELLOW NATIONAL SCIENCE FOUNDATION	Institute for Transforming Undergraduate Education, University of Delaware		May 1997– April 1998
• FELLOW UNIVERSITY OF DELAWARE	Center for Teaching Effectiveness		May 1996– April 1997

OUTSTANDING EDITORIAL ACHIEVEMENT AWARDS	“A YIG-Tuned Nonlinear Transmission Line Multiplier” and two other papers	March 1992– February 1993
WATKINS-JOHNSON COMPANY		

CURRENT AND RECENT SPONSORED RESEARCH

SOLE PRINCIPAL INVESTIGATOR UNLESS OTHERWISE NOTED

RESEARCH GRANT	SBIR: Treatment of Onychomycosis Utilizing Targeted, Controlled High-Frequency Energy (Scientific PI)	\$233,750	February 2021– January 2023 Phase II extension proposal January 2023– December 2025
RESEARCH GRANT	Self-winding Helices as Slow-wave Structures for mm and sub-mm Traveling Wave Tubes (co-PI with Francesca Cavallo (UNM) and Max Lagally (UW))	\$856,319 \$1,700,000	April 2019– March 2022 Phase II extension proposal August 2022– July 2025
RESEARCH GRANT	WiMi: A Reconfigurable Platform for Millimeter-Wave Wireless Networking and Sensing (Xinyu Zhang, Parameswaran Ramanathan and Daniel van der Weide)	\$899,279	October 2015– June 2019
RESEARCH GRANT	STTR Phase I: Near-field fiber laser comb spectroscopy (NFLCS) (with Polaronyx)	\$100,000	October 2009– June 2010
RESEARCH GRANT	Complex modulation and coherent detection for enhanced near-field far-infrared spectroscopy	\$285,000	May 2008– August 2010
RESEARCH GRANT	Comb spectrometer development	\$206,325	March 2007– November 2008
RESEARCH GRANT	RFID Partnership for Innovation in Wisconsin’s Packaging and Printing Industry Cluster (Raj Veermani, PI and Marc Anderson, co-PI)	\$600,000	January 2008– December 2009
RESEARCH GRANT	SCANNING PROBE MICROSCOPY FOR NEAR-FIELD MICROWAVE ANALYSIS	\$40,000	June 2006– May 2007
AGILENT TECHNOLOGIES INC.			

• RESEARCH GRANT NIH R01	MICROWAVE TUMOR ABLATION (F.T. Lee, Jr., PI)	\$1,087,500	May 2006– April 2010
• RESEARCH GRANT NIH R01	ULTRAWIDEBAND MICROWAVE DETECTION OF BREAST CANCER (Susan Hagness, PI, Barry Van Veen, co- PI)		April 2005– March 2010
• EQUIPMENT GRANT ONR DURIP	METAL-ORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD)CRYSTAL-GROWTH SYSTEM (with Dan Botez)	\$198,450	May 2005– April 2006
• AIR FORCE OFFICE OF SCIENTIFIC RESEARCH	“Microfabricated Traveling Wave Tubes for High Power Millimeter- Wave and THz-regime Radiation Sources” (PI: J.H. Booske Co-PIs: H. Jiang, D. van der Weide)	\$149,970	March 2005– February 2006
• RESEARCH GRANT NIH STTR	Noncontact membrane protein probe (with Prairie Technologies)	\$600,000	May 2005– April 2008
• RESEARCH GRANT AFOSR	MURI: “Nanoprobe Tools for Molecular Spectroscopy and Control” (PI with co-PI’s Robert Blick (UW) and Dennis Prather, University of Delaware)	\$5,661,700	August 2003– July 2008
• RESEARCH GRANT ARO Breast Cancer Imaging Research Program (BCIRP)	“Compact low-cost microwave reflectometer for breast cancer detection” (PI with co-PI’s Susan Hagness and Barry Van Veen)	\$478,959	February 2004– January 2007
• RESEARCH GRANT NIH R-21	“Microcatheter microwave ablation for cancer treatment” with Fred Lee, Jr. MD	\$436,500	May 2004– April 2006
• RESEARCH GRANT DARPA	“Single-Receptor Interfaces for Real-Time Kinetics” (PI with co- PI Robert Blick)	\$650,000	July 2003– December 2004
• RESEARCH GRANT AFOSR	DURIP: “Device Measurement and Modeling System for Electronic Terahertz Sensing”	\$290,000	May 2003– December 2003
• RESEARCH GIFT AGILENT TECHNOLOGIES	“Near field microwave probing”	\$20,000	January 2003
• RESEARCH GRANT NSF NIRT	“Nanotubes and nanowires as biological sensors and actuators,” with R. Hamers (PI) and L. Smith	\$1,748,936	July 2002–June 2006
• RESEARCH GRANT ARO	“Space-time microwave imaging for early-stage breast cancer detection” with S. Hagness (PI) and B. Van Veen	\$424,701	March 2002– March 2005
• RESEARCH GRANT	“Biomolecular interaction sensing with sub-terahertz fields”	\$533,227	May 2002–

ARO			April 2005
• RESEARCH GRANT AFOSR	“Electronic terahertz spectroscopic imaging of explosives and weapons”	\$497,102	July 2002–June 2005
• RESEARCH GRANT AFOSR/DARPA	“Broadband High-Gain Antennas for Terahertz Systems”	\$99,000	July 2003–June 2004
• RESEARCH GRANT DARPA	“MOSAIC: Atomic resolution magnetic resonance force microscope imaging using very high frequency cantilevers,” with M. Roukes, Caltech (PI), et al.	\$348,414 (UW share)	May 2002–April 2004
• RESEARCH GRANT NIH R-21	“Space-time microwave imaging for breast cancer detection” with S. Hagness (PI) and B. Van Veen	\$145,500	June 2002–March 2003
• SUPPORT GRANT UNIVERSITY OF WISCONSIN	“Nanotechnology Cluster Conference” with M. Eriksson, C.-B. Eom, and R. Carpick	\$20,000	July 2002–June 2003
• RESEARCH GRANT NIH STTR	“Noncontact membrane protein probe” with Prairie Technologies, LLC	\$244,000 \$1,200,000	Phase I May 2002–April 2004 Phase II April 2005–March 2009
• RESEARCH GRANT DARPA/NRO	“Wideband optical arbitrary waveforms using Fourier and wavelet composition”	\$982,815	December 2001–November 2004
• RESEARCH GRANT NSF NIRT	“Complex epitaxial magnetic oxide heterostructures for nanoscale spin devices,” with C.-B. Eom (PI), et al.	\$1,550,000	July 2002–June 2006
• RESEARCH GRANT ARO	“Solid state quantum computing using nanostructured logic gates,” PI with Mark Eriksson, Bob Joynt and Max Lagally	\$1,199,000	May 2001–April 2005
• RESEARCH GRANT ANALEX CORP.	“Computational tools for optimized design of advanced traveling wave tubes,” with John Booske (PI)	\$130,000	January 2001–December 2002
• RESEARCH GRANT DARPA	“Sonic MEMS,” with Amit Lal (PI), et al.	\$1,700,000	September 2000–August 2003
• RESEARCH GRANT ONR MURI	“Stochastic chemical sensing with engineered channel proteins” with Hagan Bayley: Texas A&M; Daniel Kahne: Princeton; Reza Ghadiri: Scripps; Leslie Loew:	\$1,196,515 \$6,543,734 total	May 1999–October 2004

• RESEARCH GRANT AFOSR STTR	University of Connecticut “Terahertz traveling wave tubes: a breakthrough innovation in coherent radiation sources,” with John Booske (PI)	\$600,000	March 2001– February 2002
• RESEARCH GRANT ONR	“Nanoscience of microwave-based integrated biological sensors,” with Bob Hamers (PI) and Lloyd Smith	\$800,000	May 2001– December 2001
• RESEARCH GRANT NSF SGER	“Measurement based channel modeling for coherent terahertz communications” with B. Van Veen (PI) and A. Sayeed	\$60,000	August 2001– July 2002
• SMALL GRANT FOR EXPLORATORY RESEARCH NSF	“Scanning near-field microscopy for non-contact imaging of ion channel dynamics in the DC–THz regime,” co-PI: Prof. Phillip Haydon, Iowa State University	\$45,000	July 1998– June 1999
• RESEARCH GRANT DARPA INFORMATION TECHNOLOGY OFFICE ULTRASCALE COMPUTING	“Nanoscale field localization for manipulation and probing of computationally interesting biomolecules”	\$763,116	September 1998– August 2003
• RESEARCH GRANT FEDERAL AVIATION ADMINISTRATION	“Terahertz spectroscopic reflection imaging to detect explosives and weapons on personnel”	\$80,000 (pilot study) \$605,218 (follow-on)	March 1997– January 2001
• “THE CENTER FOR NANOMACHINED SURFACES,” A DELAWARE ADVANCED TECHNOLOGY CENTER STATE OF DELAWARE	CENTER DIRECTOR, with Rodel, Dupont Photomask, CFM Technologies, and Delaware Diamond Knives as industrial partners; Mark Barteau (Chem E) and Mary Wirth (Chemistry)	\$6,753,897 (State portion is \$2.88MM; balance from industry)	August 1997– August 1999
• RESEARCH GRANT UNIVERSITY OF DELAWARE RESEARCH FOUNDATION	“Localized FIR spectroscopy with scanning probes”	\$30,000	June 1997– May 1998
• RESEARCH GRANT W. L. GORE & ASSOCIATES AND DEL. RESEARCH PARTNERSHIP	“High-frequency field scanning for smart shielding” and “Gigabit optoelectronic communications”	\$210,223	October 1996– September 1999
• USER’S GRANT NSF NNUN	“Multifunctional scanning probes”	\$5,000	August 1996– July 1997
• RESEARCH GRANT	“Microfabricating a nanoscilloscope”	\$499,717	July 1996– June 1999

DARPA ELECTRONICS
TECHNOLOGY OFFICE ULTRA
ELECTRONICS

- RESEARCH GRANT
OFFICE OF NAVAL RESEARCH “Probing local device fields using AC scanning force microscopy” \$441,855 July 1996–June 1999
 - ENGINEERING RESEARCH
EQUIPMENT GRANT “Reactive ion etcher and annealer” Co-PI with P. Berger, J. Olowolafe, and J. Kolodzey \$100,000 August 1996–July 1997
- NATIONAL SCIENCE
FOUNDATION

RESEARCH SUPERVISION

POST-DOCTORAL AND AFFILIATED RESEARCHERS

Matt Dwyer	Electronic THz systems	January 2016– January 2020
Marcos Martinez	Advanced Sensing with Chipless RFID	January 2016– August 2021
Chiya Saeidi	Field simulations for contactless measurements	January 2015– May 2018
Alexander Kozyrev	Nonlinear transmission lines for high power generation	January 2003– May 2015
John Grade	OptoMEMS and contactless sensors/applicators	February 2004– Present
Charles Paulson	Scanning near-field microscopy of biomolecules and cells	January 2003– February 2006
Yaqiang Wang	Microfabricated near-field electromagnetic antennas	September 2003– January 2006
Il-Seok (Sunny) Son	BioMEMS	October 2003– August 2004
George Kumar (Joint with Robert Blick)	Single-molecule biophysics	July 2003–August 2004
Kelvin Fu	Microfabricated circuits and mechanical structures for integrated optics	June 2003– December 2004
Bjoern Rosner	Near-field probes, scanning spin microscopy	June 2002– December 2002
Bhagwati Prasad	Electromagnetic spectroscopy of biomolecules and cells	March 2000– February 2001
Moises Cywiak	Interferometric near-field measurement of quartz surface properties	September 1998– September 1999
Janusz Murakowski	Detection of gas species using THz spectroscopy	May 1998– September 1999
Pavel Neuzil	Microfabrication of multifunctional scanning probes	April 1996– September 1999
Vivek Agrawal	Localized and far-field microwave spectroscopy	June 1996– December 1999

GRADUATE (CURRENT)

Name	Degree	Topic	Expected Grad. Date
Yu Huang	Ph.D.	High-frequency field measurement	2025
Tingyou Guo	Ph.D.	Helices in	2025
Yuchen Gu	Ph.D.	Using high frequencies in medical imaging	2023
Atul Bhadkhamkar	Ph.D.	Optical sources for broadband spectroscopy	2023

GRADUATE (PAST)

Matt Fayyad	M.S.	Transduction of biological signals with microwaves	2022
M.R. Naeini	Ph.D.	3D Printed Highly Integrated Microwave Components for Arrays and Sensing	2021
Aaron Day	M.S.	Timing stabilization for coherent measurements	2019
Matt Dwyer	Ph.D.	Electronic THz systems in wide bandgap semiconductors	2017
Marcos Martinez	Ph.D.	Advanced Sensing with Chipless RFID	2016
Pushkar Kulkarni	Ph.D.	RF sensing circuits for medical diagnostics	2016
Madhav Venkateswaran	Ph.D.	MRI coils and RF-powered medical diagnostics	2016
Babita Yadav	M.S.	Design of Active Filter using Substrate Integrated Waveguide	2016
Vincent Chen	Ph.D.	RFID antennas	2012
Chiya Saeidi	Ph.D.	Engineering plasmonic metasurfaces to manipulate optical waves	2015
Paul Laeseke (joint with Fred Lee, Radiology)	M.D./ Ph.D.	Interstitial tumor ablation with microwaves	2009
Min Zhao (joint with Susan Hagness)	Ph.D.	Receivers for breast cancer detection	2009
Hai Huang	M.S.	Broadband antennas and interfaces	2009
Anuj Dron (joint with Susan Hagness)	M.S.	Broadband antennas for biospectroscopy	2006
Chao Qin	Ph.D.	Meta-material nearfield antennas	2007
Sung-Jin Ho	Ph.D.	Ultra-high-speed transistors	2006
Abdi Karbassi	Ph.D.	Near field probing techniques	2006
Min-Ki Choi	Ph.D.	Terahertz spectroscopy	2006
Hongjoon Kim	Ph.D.	Left-handed nonlinear transmission lines	2006
Modhurin Banerjee (joint with Tom Grist, Radiology)	M.S.	Medical imaging with microfabricated magnetic mixers	2007
Jake Shea (joint with Susan Hagness)	M.S.	Antennas for cancer detection	2007
Chih-Chuan Yen	M.S.	RFID antennas	2006
Kae-Oh Sun	Ph.D.	Compact microwave filters and wave control circuits	2006

Chris Brace (joint with Fred T. Lee, Jr, Radiology)	Ph.D.	Ablation of tumors with localized microwaves	2005
Kimberly Taylor, Biophysics	Ph.D.	Protein spectroscopy with microwaves	2005
Jim Truitt (joint with Mark Eriksson, Physics)	Ph.D.	Localized ESR, nanoscale quantum gates and quantum computation	2004
John Peck (joint with Robert Hamers, Chemistry)	Ph.D.	Biomolecule spectroscopy and near-zone antennas	2003
Douglas Lagally	M.S.	Near-field magnetic antennas	2005
Luke Palmer (joint with Susan Hagness, ECE)	M.S.	Antennas for breast cancer detection	2004
Rashmi Pathak (joint with Peter Timbie, Physics)	M.S.	Arrays of antenna-coupled microbolometers	2005
Jill Pamperin	M.S.	Metamaterial antennas	2005
Guoqing Ning (joint with Robert Blick, and Rob Carpick)	M.S.	BioMEMS and near-field scanning probes	2005
Greg Meyer		Project assistant for integration of research and teaching	2003-04
Daniel Imaizumi		Electrophysiology/microscopy of nerve cells	2001-02
Hui Liu	M.S.	Electromagnetic spectroscopy of biomolecules and cells	2001
XiaoQing Wang		Integrated terahertz electronic circuits	1998-99
Prayoot Akkaraekthalin	Ph.D.	Integrated frequency translation for low-cost, high-performance network analysis	1998
Jon Bergey	M.S.	Scanning field measurements and instrumentation	1999
Toralf Bork	M.S.	Measurement system for electromagnetic near-zone fields (thesis completed with Technical Univ. of Chemnitz-Zwickau)	1999
Tom Clupper	M.S.	Nonlinear device measurements and modeling	1999
Rob March	M.S.	Web-based remote-access instrumentation and high-frequency CMOS device and circuit models	1999
Alexander Ukhanov		Scale-model broadband antenna measurements	1996-97

TEACHING EXPERIENCE

ECE 230, CIRCUIT ANALYSIS, University of Wisconsin-Madison. Fall 2018, 2021 Spring 2019, 2020, Fall 2021, Spring 2022, Fall 2023. Core undergraduate circuit analysis course, based on Alexander & Sadiku and flipped-classroom approach.

ECE 270, 271, CIRCUIT LABORATORY, University of Wisconsin-Madison. Fall 2020, Spring 2021. Core undergraduate circuit laboratory courses taught using online methods.

ECE 340, ELECTRONIC CIRCUITS I, University of Wisconsin-Madison. Fall 2011, 2014, 2016-20. Core undergraduate transistor circuits course, based on Sedra & Smith and interactive quizzing.

ECE 342, ELECTRONIC CIRCUITS II, University of Wisconsin-Madison. Spring 2014. Follow-on advanced circuits course with emphasis on R.D. Middlebrook's analysis techniques and Sedra & Smith.

ECE 447, APPLIED COMMUNICATIONS SYSTEMS, University of Wisconsin-Madison. Spring 2000, Fall 2000, 2001, 2002, 2008-19, 2021, 2023 (supervised teaching by M. Martinez Fall 2018, 2020). Developed and taught advanced time- and frequency-domain analysis and design graduate level course. This course draws on electromagnetic theory for transmission lines, device physics for linear and nonlinear circuit models, time- and frequency-domain measurements, and CAD software. Final project is an ADS simulation.

ECE 547, ADVANCED COMMUNICATIONS CIRCUIT DESIGN, University of Wisconsin-Madison. Spring 2001, 2003, 2005, 2007, 2009-22 Developed and taught advanced communications circuits course, with emphasis on PLL's, transceiver architecture, IC concepts, PCM, and components; introduced laboratory and component projects for 2.4 GHz transceiver system.

ECE 420, ELECTROMAGNETIC WAVE TRANSMISSION. Fall 2008-09; SPRING 2012-13, (supervised teaching by M. Martinez Fall 2018).

ECE 601, BUSINESS FOR ENGINEERS, University of Wisconsin-Madison. Fall 2002-05. Developed and taught popular business course for primarily seniors in all engineering departments. Course features significant business planning, accounting and case analysis.

ECE 545, ADVANCED COMMUNICATIONS ENGINEERING LABORATORY, University of Wisconsin-Madison. Spring 2002, 2006, 2010, 2014, 2021. Developed and taught laboratory course on microwave and communications circuits measurements. Covered slotted-line measurements, scalar and vector network analyzers, time-domain reflectometers, transistor amplifier design and construction, mixers, couplers, filters and computer-aided design.

SELECTED FOR NSF NEW CENTURY SCHOLARS WORKSHOP, Stanford University. Summer 1998.

ELEG467/667, HIGH-SPEED/MICROWAVE INTEGRATED CIRCUITS, University of Delaware. Spring 1995–99. Developed and taught advanced time- and frequency-domain analysis and design graduate level course. This course draws on electromagnetic theory for transmission lines, device physics for linear and nonlinear circuit models, time- and frequency-domain measurements, and CAD software (e.g., HSPICE, Libra, and Sonnet Software's *em*) for a comprehensive introduction to time- and frequency-domain IC concepts in the picosecond/GHz realm. The course features an industrially relevant final project.

ELEG661, MATERIALS & DEVICES SEMINAR, University of Delaware. Spring 1996–97. Graduate seminar with invited speakers.

SCANNING PROBE MICROSCOPY FOR MATERIALS CHARACTERIZATION, University of Delaware. Spring 1996–97. Highly ranked Engineering Outreach short course with industrial and academic participants.

ELEG312, ADVANCED ELECTRONIC CIRCUITS, University of Delaware. Autumn 1995–98. Junior-level core circuits course covering Sedra & Smith Chapters 5–8 (FETs through feedback). *Nominated by students for a University Teaching Award for 1996–97 and 1997–98 semesters.*

EE139, DESIGN PROJECT, Assistant to Professor David M. Bloom, Stanford University. Spring 1991–92. Discussed and assisted with electronic projects for seniors in EE.

EE392L, BUSINESS MANAGEMENT FOR ELECTRICAL ENGINEERS, Assistant to Consulting Professor Robert Maxfield, Stanford University. Spring 1990–91. Managed all grading, held discussions and lectured on entrepreneurship for 60 students.

IE273, ENTREPRENEURSHIP IN HIGH TECHNOLOGY, Assistant to Lecturer Charles Banfe, Stanford University. Autumn 1990–91. Selected students, managed all grading, held discussions and lectured on entrepreneurship for 60 students; awarded a departmental certificate of recognition for this work.

EE246, MICROWAVE CIRCUIT DESIGN, Assistant to Professor Bertram A. Auld, Stanford University. Winter 1989–90. Managed all grading, held discussions and lectured on microstrip resonators and computer-aided design.

PROFESSIONAL ACTIVITIES AND SERVICE

- Work featured in US News & World Report
<http://www.vdwdesign.com/projects/THz/briefings/usnews-thz-aug2003.jpg> (scanned copy of article)
- Work featured in “Battling Bioterror” by Noah Shachtman
<http://www.techcentralstation.com/1051/defensewrapper.jsp?PID=1051-350&CID=1051-112202A>
- Work featured in Laser Focus World, April 2003 article on THz imaging
http://lfw.pennnet.com/Articles/Article_Display.cfm?Section=ARCHI&Subsection=Display&ARTICLE_ID=174912&KEYWORD=weide&p=12
- “Terahertz imaging: T-ray specs” *Nature* **424**, 721 - 722 (14 Aug 2003) News Feature
http://www.vdwdesign.com/projects/THz/briefings/Nature_THz_424721a_r.pdf
- Cover issue of Optical Society of America’s Optics and Photonics News, April 2003
http://www.vdwdesign.com/projects/THz/briefings/opn_thz_2003.pdf
- Organized and lead a FIAP focus session on “Biosensors & physics for high-throughput drug screening” at the APS March Meeting, 2003
- NSF annual site review team for Cornell Nanobiotechnology Center, September 2002
- NSF Panel Review, June 2002
- Coordinating Bionanofab Facility proposal
- Authored (with D. Beebe) “Keck Center for Engineered Cellular Scale Exploration” proposal
- Ph.D. thesis review for Singapore
- Mid-term review for faculty member at Rice University
- Advised MEPP program student Nicholas Thompson (2002)
- Advisor to cluster hire in Chemical Genomics
- Member of the SURE/REU research projects team
- Army Research Office proposal review, “Biological sensing with terahertz circular dichroism spectroscopy”
- Organized and Chaired Invited Special Topic Session, “THz Contrast Mechanisms in Chemical and Biological Systems,” at 9th International Conference on Terahertz Electronics, Charlottesville VA, Oct 15-16, 2001.
- Co-organized UW-Madison/Promega Symposium on Biological Imaging: Solving Biological Problems with Imaging Technology, May 25, 2001
- Co-organized UW-Madison Interdisciplinary Workshop: Emerging Techniques in Screening and Imaging Science, October 19, 2000; organizing follow-on conference on high-throughput screening for DNA, proteins and therapeutic discovery for Fall 2001
- NSF PFET Review Panel, June 1997, March 1998

- Head, NSF SBIR Phase I Review Panel, October 1995
- NSF mail reviews, December 1995–Present
- Swiss NSF mail reviews, May 1997–Present
- Ireland NSF mail reviews, 2001
- Journal Reviewer, *IEEE Nano*, *Optics Comm.*, *Macromolecules*, *Appl. Phys. Lett.*, *Proc. IEEE*, *IEEE Trans. Microwave Theory Tech.*, *IEEE Electron Dev. Lett.*, *Rev. Sci. Instrum.*
- Textbook Reviewer, *Microelectronic Circuits*, Sedra & Smith, 4th Ed., 1996; *Microwave and RF Design of Wireless Systems*, Pozar, 2001
- Member, OSA Emerging Technology Committee, 1997–2010

UNIVERSITY ACTIVITIES AND SERVICE

- Faculty Senate, 2016-present
- University Conflict of Interest Committee, 2007-15
- Representing the College of Engineering on the Faculty Advisory Council for the Kauffman/VIEW (“Values in Entrepreneurship at Wisconsin”) Campus Initiative; presented at a site visit “Discussions of Wisconsin cross-campus and entrepreneurial activities” (October 7, 2003, School of Business)
- 2003 “Conversations in Science” series, hosted by Prof. Bassam Shakashiri (October 2, 2003, Edgewood High School, Madison)
- Visited a University of Wisconsin preschool class and demonstrated separation of mixed dyes using an agar gel matrix to demonstrate a visible aspect of nanotechnology (May 2003)
- Co-chair and organizer of “NanoExpo ’03,” a one-and-a-half-day symposium emphasizing the emerging role of nanotechnology in our lives during the next 10 years. The conference was held May 30 and 31, 2003, in Madison. Conference website <http://nano.engr.wisc.edu> and report <http://www.engr.wisc.edu/news/headlines/2003/Jun02.html>
- Helped produce a 6-minute video short on nanotechnology at Wisconsin (May 2003)
- Hosted and co-organized a Materials Science Program Open House. This event brought together faculty of materials science and physics from regional four-year schools to introduce them to the nanoscience work going on at the University of Wisconsin (May 2003)
- Invited affiliate of the Genome Center of Wisconsin (2003)
- Initiated the UW response to NSF renewal for National Nanofabrication User’s Network (NNUN)
- Co-organized and co-hosted “NanoExpo ’03,” a one-and-a-half-day symposium emphasizing the emerging role of nanotechnology in our lives during the next 10 years. The conference was held May 30 and 31, 2003, in Madison, Wisconsin. This conference, with local, regional, and national speakers, drew industry professionals interested in new opportunities and trends in nanotechnology, academic researchers who wished to learn about the latest nanotechnology applications, teachers at all levels who wished to exchange ideas for nano education and outreach programs, and members of the public curious about nanotechnology.
- Demonstrated wireless and optical communications to kindergarten class at Thoreau Elementary School, Madison WI for NSF 50th Anniversary Service Program, Jan 2001
- Graduate admissions committee, 2000–2016
- Curriculum committee, 2001–present

- MATHCOUNTS Day 1997: Organized and conducted demonstrations and tours of Electrical Engineering for 400 middle-school students, Jan 16, 1997
- MATHCOUNTS Day 1996: Organized and conducted demonstrations and tours of Electrical Engineering for 250 middle-school students, Jan 18, 1996
- Dupont Explorer Scouts Tour (with D. Vengroff): Organized and conducted laboratory demonstrations and tours of Electrical Engineering for 35 high-school students and parents/advisors, Feb 10, 1997

MULTIDISCIPLINARY ACTIVITIES IN TEACHING, RESEARCH AND SERVICE

- Appointments in Radiology, Biomedical Engineering and Materials Science
- Trainer (member) of UW Biophysics Degree Program, an interdisciplinary program offering the Ph.D. degree—advised Kimberly Taylor in this program.
- Two of the professionals in my laboratory (Steve Limbach and Alan Betterman) have degrees in biology
- Ongoing collaboration with Phil Haydon (Neuroscience, Tufts University) on local probing of protein activity in cells
- Initiated a collaboration with Homme Hellinga (Biochemistry, Duke University) on nanopore sequencing of nucleic acids
- Collaborations and student exchanges with Ed Chapman (Physiology), Gerard Marriott (Physiology), Matt Jones (Physiology), Fred Blattner (Genetics), Jo Handelsmann (Plant Pathology), Robert Goodman (Plant Pathology) [wrote two NIH proposals with the last three people]
- Collaboration with Bob Hamers and Lloyd Smith (Chemistry), joint proposals written and funded; John Peck (my graduate student) now funded in Chemistry; regular group meetings and joint publications
- Collaboration with Ron Raines (Biochemistry) in protein stretching with scanning force microscopes as well as studying transport of cationic peptides across lipid bilayers using electrophysiology

PROFESSIONAL EXPERIENCE

START-UPS

- Founder and Business Development, AntenneX, B.V. (millimeter-wave antenna measurements)
- Founder and Board Member, Elucet Medical, Inc. (wireless surgical navigation)
- Founder, Accure Medical, LLC (RF treatment for finger- and toenail infection)
- Founder, ThroughPuter, LLC (Platform-as-a-Service authentication)
- Founder, President, vdW Design, LLC (Incubator, SBIR awardee)
- Founder, Board Member, Advisor, Micrablate, LLC, now NeuWave Medical, Inc. (Microwave percutaneous ablation devices; acquired by Johnson & Johnson 2016)
- Founder, President, NFI, LLC (Near-field imaging for skin cancer)
- Founder, President, Tera-X, LLC (Ultrawideband antennas, imaging radar, SBIR awardee)
- Founder, VP of Engineering, Optametra, LLC (Coherent lightwave signal analyzers; acquired by Tektronix 2011)

MICROWAVE DEVICE RESEARCH AND DEVELOPMENT, Advanced Development Department, Watkins-Johnson Company, Palo Alto, California. June 1988–July 1993. Designed and built several broadband YIG-tuned microwave oscillators; published the lowest-reported phase noise for an oscillator

with a magnetostatic-wave resonator; developed and published division-wide computer-aided circuit design capabilities with Unix workstations, including nonlinear device and circuit modeling, and electromagnetic simulations; taught seminars on microwave oscillator theory, circuit simulation and MESFET analysis.

CELLULAR TELEPHONE ENGINEERING, International Cellular Subscriber Division, Motorola, Inc., Schaumburg, Illinois. August 1987–April 1988. Designed and developed a fixed-subscriber unit for remote cellular telephone installations; investigated field quality and cellular coverage in Hong Kong and Thailand; wrote a database application to track international cellular subscriber field failure types for feedback to design and production; worked with Division Management to implement Motorola’s “Six-Sigma” quality program for international cellular telephones.

INTERACTIVE SPEECH AND WRITING THERAPY, sola mente, Inc., Iowa City, Iowa. August 1985–August 1987. Started and ran a university-incubated company to design and build combined speech- and handwriting-recognition device for therapeutic and language-acquisition applications.

MICROWAVE RESONATOR RESEARCH AND DEVELOPMENT, Signal Analysis Division, Hewlett-Packard Company, Santa Rosa, California. May 1985–August 1985. Studied, measured, and reported on new magnetostatic-wave signal processing devices; improved resonator characterization by automating the HP8510A network analyzer. Taught a noontime course entitled “Latin at Lunch.”

DYE LASER CONTROL ENGINEERING, Laser Isotope Separation Division, Lawrence-Livermore National Laboratory, Livermore, California. May 1984–August 1984. Observed, documented, and improved dye laser temperature control system for precise uranium isotope enrichment.

AUTOMATIC TEST EQUIPMENT ENGINEERING, Production Automation, Division of EWA, Inc., Santa Clara, California. May 1983–December 1983. Assisted in design, construction, and testing of production ATE for Apple Computer, Western Electric, and Comdial. Made engineering drawings, specified components, and wrote spreadsheets to assist in bidding.

JOURNAL PUBLICATIONS

CURRENT

1. D. C. Gold, A. S. Bhadkamkar, S. Carpenter, L. T. Hogan, M. Dwyer, M. Beede, R. H. Goldsmith, D. van der Weide, and D. D. Yavuz, “High-power near-CW Raman lasing in mm-sized glass disks,” *Opt. Lett.* 47, 4171-4174 (2022)
2. Marcos Martínez Argudo, Shiva Hajitabarmarznaki, Divya J. Prakash, Matthew M. Dwyer, Max G. Lagally, Daniel W. van der Weide, and Francesca Cavallo, “Amplification of THz waves by beam-wave interaction in self-assembled helical slow-wave structures with single and double chirality”, *AIP Advances* 12, 085121 (2022)
3. Divya J. Prakash, Matthew M. Dwyer, Marcos Martínez Argudo, Mengistie L. Debasu, Hassan Dibaji, Max G. Lagally, Daniel W. van der Weide, and Francesca Cavallo, “Self-Winding Helices as Slow-Wave Structures for Sub-Millimeter Traveling-Wave Tubes,” *ACS Nano* 15 (1), 1229-1239 (2021)
4. A. M. Day, M. M. Dwyer and D. W. van der Weide, “Phase Perturbation as a Measurement Metric: A Novel Noncontact In-Line Production Measurement Through an All-Electronic Millimeter-Wave System Tracking Millidegree Perturbations in Phase,” *IEEE Microwave Magazine*, vol. 22, no. 1, pp. 79-85 (2021)
5. M. Ranjbar Naeini, M. Mirmozafari and D. van der Weide, “Monolithic 3-D-Printing of an Integrated Marchand Balun with a Dipole Antenna,” in *IEEE Transactions on Components, Packaging and Manufacturing Technology*. vol. 10, no. 4, pp. 654-658 (2020)

6. Mohammadreza Ranjbar Naeini and Daniel van der Weide, "Cascaded 3D-Printed X-band Components for Subsystems," *IEEE Microwave and Wireless Components Letters* 29 (5), 333 (2019)
7. C. Saeidi and D. van der Weide, "Nanoscale nonlinear circuit elements at optical frequencies," *IEEE Trans. Nanotech.*, 17 (3), 611 (2018)
8. Atul Bhadkamkar, Matthew Dwyer, and Daniel van der Weide, "Analysis of half-tapered fiber coupling for microresonators," *Opt. Express* 25, 32841-32852 (2017)
9. M. Martinez and D. van der Weide, "Compact single-layer depolarizing chipless RFID tag," *Microw. Opt. Technol. Lett.*, 58, 1897-1900 (2016)
10. P.B. Kulkarni and D. van der Weide, "Wideband circularly polarized SIW cavity-backed slot antenna with sequential rotation feeding," *Microw. Opt. Technol. Lett.*, 58: 2566-2570 (2016)
11. C. Saeidi and D. van der Weide, "A figure of merit for focusing metasurfaces," *Applied Physics Letters*, 106 (11), 113110 (2015)
12. C. Saeidi and D. van der Weide, "Wideband plasmonic focusing metasurfaces," *Applied Physics Letters*, 105 (5), 053107 (2014)
13. C. Saeidi and D. van der Weide, "Bandwidth-tunable optical filters with nanoparticle arrays," *Optics Express*, vol. 22, pp. 12499-12504 (2014)
14. C. Saeidi and D. van der Weide, "Nanoparticle array based optical frequency selective surfaces: theory and design: errata," *Optics Express*, vol. 21, pp. 24119-24119 (2013)
15. C. Saeidi and D. van der Weide, "Nanoparticle array based optical frequency selective surfaces: theory and design," *Optics Express* vol. 21, pp. 16170-16180 (2013)
16. C. Saeidi and D. van der Weide, "Synthesizing metasurfaces with nanodisks," *Applied Physics Letters* vol. 103, pp. 183101, Oct 2013.
17. C. Saeidi and D. van der Weide, "Periodic Substrate Structure Suppresses Spurious Response in Coupled Line Filters," *Microwave and Optical Technology Letters*, vol. 54, pp. 2175-2178, Sep 2012.
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BOOK SECTIONS

1. I. V. Shadrivov, M. Lapine, Y. S. Kivshar, A. Kozyrev, and D. van der Weide, "Nonlinear and Tunable Left-Handed Transmission Lines," in *Nonlinear, Tunable and Active Metamaterials*. vol. 200, ed: Springer International Publishing, 2015, pp. 89-103.

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CONFERENCE PRESENTATIONS

PAPERS AWARDED PRIZES

1. A. Day, M. Dwyer, D. van der Weide, "Millimeter-wave thickness-deviation measurement system," in 2020 IEEE Radio and Wireless Symposium (RWS) 2020, *First Prize Student Paper Competition*.
2. C.L. Brace, P. Laeseke, L.A. Sampson, T.M. Frey, D.W. van der Weide and F.T. Lee. "Principles of microwave ablation," RSNA 2005, *Educational Exhibit Certificate of Merit*.
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4. D.W. van der Weide, "A YIG-tuned nonlinear transmission line multiplier," at IEEE MTT-S International Microwave Symposium, Atlanta GA, 1993. *Student paper contest award*.
5. D.W. van der Weide, "Thin-film YIG oscillators with low phase noise and high spectral purity," at IEEE MTT-S International Microwave Symposium, Albuquerque NM, 1992. *Student paper contest award*.

INVITED

1. D.W. van der Weide, "Ohm vs. Maxwell: Using electromagnetic fields as treatment modalities" Plenary invited speaker, European Computer Assisted Liver Surgery Society annual meeting, Oct. 17-19, 2019, Bern, Switzerland.

2. A. B. Kozyrev and D.W. van der Weide, "Prospects for Nonlinear Left-Handed Transmission Lines" invited presentation at Metamaterials 2007: The First International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Rome, Italy, October 22-26, 2007.
3. D.W. van der Weide, John Grade, Min Ki Choi, and Alan Bettermann, "THz Spectroscopic Detection with Electronic Techniques," presented at NATO Advanced Research Workshop: Terahertz Frequency Detection and Identification of Materials and Objects, Spiez, Switzerland, 2006.
4. D.W. van der Weide and John Grade, "THz Antennas with Broadband Gain," presented at NATO Advanced Research Workshop: Terahertz Frequency Detection and Identification of Materials and Objects, Spiez, Switzerland, 2006.
5. D.W. van der Weide, "Materials contrast for electronic terahertz imaging," Spring MRS Meeting, San Francisco, CA, April 2006.
6. A. B. Kozyrev, H. Kim, A. Karbassi and D. W. van der Weide, "Higher Harmonic Generation and Parametric Instabilities in Left-Handed Nonlinear Transmission Lines", 2005 IEEE AP-S Int. Symposium and USNC/URSI National Radio Science Meeting, 3-8 July 2005, vol. 2B, pp. 209-212 (2005).
7. Interviewed about use of terahertz technology for counter-terrorism in a 30 minute show "Connect" on BBC Radio 4 by Julian Mayers, November, 2005.
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- D.W. van der Weide, "Making RFID Mainstream," Wisconsin Technology Network, September 2005.
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- K. Taylor and D.W. van der Weide, "Microwave sensing of protein conformation and binding," Biophysical Society Annual Meeting, San Antonio TX, 2003.
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- D.W. van der Weide, "Short pulse generation and measurement approaches for spectroscopy and (bio)sensing," Invited seminar, Agilent Laboratories, Palo Alto, CA, May 2002.
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- D.W. van der Weide, "Terahertz Interactions with Molecules, both Real and Artificial," Physical Chemistry Seminar, University of Wisconsin-Madison, October 3, 2000.

SELECTED PATENTS

(use [\(Dan*\) inventor:\(van der Weide,\)](#) - [Google Patents](#) for a more complete list >80 total)

	PAT. NO.	Title
17	7,768,458	Systems, methods and devices for improved imaging
16	7,725,151	Apparatus and method for near-field imaging of tissue
15	7,691,298	Plastic cantilevers for force microscopy
14	7,467,015	Segmented catheter for tissue ablation
13	7,368,305	High aspect ratio micromechanical probe tips and methods of fabrication
12	7,345,610	High speed digital-to-analog converter
11	7,244,254	Air-core microwave ablation antennas
10	7,183,055	Direct radio-frequency detection of nucleotide hybridization at microelectrodes
9	7,179,587	Method and apparatus for high frequency interfacing to biochemical membranes
8	7,146,282	Mechanical force detection of magnetic fields using heterodyne demodulation
7	7,135,917	Left-handed nonlinear transmission line media
6	6,845,655	Heterodyne feedback system for scanning force microscopy and the like
5	6,801,029	Microwave dielectric spectroscopy method and apparatus
4	6,649,402	Microfabricated microbial growth assay method and apparatus
3	6,597,010	Solid-state quantum dot devices and quantum computing using nanostructured logic gates
2	5,936,237	Combined topography and electromagnetic field scanning probe microscope
1	5,748,309	Coherent periodically pulsed radiation spectrometer

APPENDIX B

Appendix B

List of Materials Considered

Exhibit	Description
1001	U.S. Patent No. 10,869,247 (“’247”)
1002	File History of U.S. Application No. 17/008,439 (“’247 FH)
1004	Declaration of Friedhelm Rodermund in Support of Petition for <i>Inter Partes</i> Review of U.S. Patent No. 10,869,247 (“Rodermund”)
1005	R1-03-0285, <i>Signalling for H-ARQ Operation</i> (“Lucent”)
1006	U.S. Patent Application Publication No. 2004/0223507 (“Kuchibhotla”)
1007	U.S. Patent Application Publication No. 2005/0048920 (“Liu”)
1008	U.S. Patent No. 6,359,877 (“Rathonyi”)
1009	U.S. Patent Application Publication No. 2003/0076783 (“Das”)
1010	U.S. Patent Application Publication No. 2004/109433 (“Khan”)
1011	U.S. Patent Application Publication No. 2003/210669 (“Vayanos”)
1012	File History of U.S. Application No. 10/962,720
1013	File History of U.S. Application No. 11/434,330
1014	File History of U.S. Application No. 13/308,950
1015	File History of U.S. Application No. 13/908,242
1016	File History of U.S. Application No. 14/869,313
1017	File History of U.S. Application No. 15/699,418
1018	File History of U.S. Application No. 16/283,407

Exhibit	Description
1019	File History of U.S. Application No. 16/545,398
1020	Joint Claim Construction and Prehearing Statement, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas), Dkt. No. 118.
1021	Claim Construction Expert Report of Peter Rysavy Concerning U.S. Patent No. 9,854,545, <i>Pantech Corp. et al. v. LG Electronics Inc. et al.</i> , Case 5:22-cv-00113-RWS-JBB (E.D. Texas) (June 23, 2023).
1022	Pantech's Preliminary Infringement Contentions of U.S. Patent No. 10,869,247
1026	Claim Construction Memorandum Opinion and Order, <i>Pantech Corp. v. OnePlus Tech. (Shenzhen) Co., Ltd.</i> , No. 22-cv-00069-RWS-JBB, Dkt. No. 51 (E.D. Tex. Aug. 8, 2023)
1051	Webpage, available at https://archive.org/legal/affidavit.php
1052	Internet Archive Capture, available at https://web.archive.org/web/20020126155238/http://www.3gpp.org:80/TB/home.htm
1053	Internet Archive Capture, available at https://web.archive.org/web/20021201115542/http://www.3gpp.org/
1054	Internet Archive Capture, available at https://web.archive.org/web/20021225100542/http://www.3gpp.org/TB/RAN/RAN1/RAN1.htm
1055	Internet Archive Capture, available at https://web.archive.org/web/20021225085437/http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/
1056	Internet Archive Capture, available at https://web.archive.org/web/20030310074828/http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/

Exhibit	Description
1057	Excel file “work_plan_3gpp_020926.xls,” retrieved from https://web.archive.org/web/20060625054352/http://www.3gpp.org/ftp/Information/WORK_PLAN/older_versions/work_plan_3gpp_020926.zip
1058	Internet Archive Capture, available at https://web.archive.org/web/20051103081215/http://list.3gpp.org/scripts/wa.exe?SUBED1=3gpp_tsg_ran_wg1&A=1
1059	Webpage, available at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/Docs/Zips
1060	R1-03-0285, retrieved from https://list.etsi.org/scripts/wa.exe?A3=ind0302&L=3GPP_TSG_RAN_WG1&E=base64&P=13236608&B=-----090504090304090107000407&T=application%2Fzip;%20name=%22R1-03-0285-signaling%20for%20HARQ.zip%22&N=R1-03-0285-signaling%20for%20HARQ.zip&X=OD369BF41AE3BADE7C1&Y=friedhelm.rodermund%40iotecc.com (R1-03-0285-signaling for HARQ.doc in R1-03-0285-signaling for HARQ.zip)
1061	Webpage, available at https://list.etsi.org/scripts/wa.exe?A2=3GPP_TSG_RAN_WG1;db5ce98d.0302&S=
1062	Internet Archive Capture, available at https://web.archive.org/web/20021129231250/http://list.etsi.org/
1063	Internet Archive Capture, available at https://web.archive.org/web/20030326234439/http://list.etsi.org/
1064	Internet Archive Capture, available at https://web.archive.org/web/20030926220033/http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/Docs/Zips/

Exhibit	Description
1065	R1-03-0285, retrieved from http://3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/docs/ZIPS/R1-030285.zip (R1-03-0285-signaling for HARQ.doc in R1-030285.zip)
1066	Tdoc R1-030396, retrieved from https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/Report/R1-030396.zip (R1-030396_minutes_31.doc in R1-030396.zip)
1067	Webpage, available at https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_31/Report
1068	Internet Archive Capture, available at https://web.archive.org/web/20030626230505/http://www.3gpp.org:80/ftp/tsg_ran/WG1_RL1/
1069	Excel file “R1_Index(2003).xls,” retrieved from https://web.archive.org/web/20070213231840/http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/R1_Index(2003).zip
1070	Internet Archive Capture, available at https://web.archive.org/web/20030114054451/http://www.3gpp.org:80/tb/home.htm