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Title: METHODS AND APPARATUS FOR RANDOM ACCESS
IN MULTI-CARRIER COMMUNICATION SYSTEMS

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DECLARATION OF DR. VALENTI

I declare that all statements made herein on 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.

By: Matthew C. Valenti

Matthew Valenti, Ph.D.

Date: Dec. 6, 2021

Contents

I.	QUALIFICATIONS AND BACKGROUND INFORMATION.....	9
II.	OVERVIEW OF CONCLUSIONS FORMED	16
III.	LEVEL OF ORDINARY SKILL IN THE ART	17
IV.	LEGAL STANDARDS	18
	A. Terminology.....	18
	B. Legal Standards.....	19
	1. Anticipation	19
	2. Obviousness	20
V.	THE '908 PATENT.....	24
	A. Overview of the '908 Patent	24
	B. Prosecution History of the '908 Patent.....	25
VI.	OVERVIEW AND COMBINATIONS OF PRIOR ART REFERENCES ..	27
	A. Ma (EX1005)	27
	B. TR (EX1006)	30
	C. Combination of Ma and TR ("Ma-TR").....	36
	D. Jung (EX1010).....	38
	E. Combination of Ma, TR, and Jung ("Ma-TR-Jung")	39
	F. Walton.....	40
	G. Combination of Walton and Jung ("Walton-Jung").....	42
VII.	MANNER IN WHICH THE PRIOR ART REFERENCES RENDER THE '908 CLAIMS UNPATENTABLE	44
	A. Ground-A1 - Claims 1-6, 8-16, 18-26, 28-30 are Obvious in view of Ma-TR.....	44
	<i>[1Pre/21Pre] A mobile station comprising,.....</i>	44
	<i>[11Pre] A method performed by a mobile station, the method comprising:</i>	44
	<i>[1a/11a] [a transmitter configured to: transmit]/transmitting, to a base station, a first uplink signal within a frequency band, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal</i>	45
	<i>[1b/11b] the first uplink signal ... utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols;.....</i>	48
	<i>[1c/11c] transmit/transmitting, to the base station, a random access signal followed by a guard period in only a portion of the frequency band, ...</i>	56

<i>[1d/11d] wherein the random access signal includes a sequence associated with the base station, ...</i>	<i>60</i>
<i>[1e/11e] wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols; and</i>	<i>61</i>
<i>[1f/11f] [a receiver configured to receive]/[receiving], from the base station, a response message.....</i>	<i>63</i>
<i>[21a] a first type of transmitter signal processing circuit configured to: generate a first uplink signal, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols; modulate the first uplink signal onto a first set of OFDM subcarriers;</i>	<i>65</i>
<i>[21b] a second type of transmitter signal processing circuit configured to generate an random access signal followed by a guard period, wherein the random access signal includes a sequence associated with a base station, wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols;.....</i>	<i>71</i>
<i>[21c] a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal;.....</i>	<i>74</i>
<i>[21d] a digital-to-analog (D/A) conversion circuit configured to convert the digital signal to an analog signal;</i>	<i>78</i>
<i>[21e] wherein the mobile station is configured to transmit, to the base station, the analog signal in a frequency band, wherein the random access signal occupies in a frequency domain only a portion of the frequency band;</i>	<i>81</i>
<i>[21f] wherein the mobile station is further configured to receive, from the base station, a second analog signal; and</i>	<i>82</i>
<i>[21g] wherein the mobile station further comprises: an analog-to-digital (A/D) conversion circuit configured to convert the second analog signal to a second digital signal; and</i>	<i>84</i>
<i>[21h] a receiver circuit configured to receive, based on the second digital signal, a response message.</i>	<i>87</i>
<i>[2a/12a/22a] [the receiver]/[the receiver circuit] is configured to determine/[determining] if the response message identifies the</i>	

sequence associated with the base station in the random access signal; and, ...	88
[2b/12b/22b] on a condition that the response message identifies the sequence associated with the base station in the random access signal, [the transmitter]/[the first type of transmitter signal processing circuit is configured to transmit]/[transmitting] a second uplink signal.	89
[3/13/23] wherein the response message includes power adjustment information and wherein the second uplink signal is transmitted according to the power adjustment information.	90
[4/14/24] wherein the portion of the frequency band used for transmission of the random access signal does not include control channels.	94
[5/15/25] wherein the response message includes a mobile station identifier assigned to the mobile station.	95
[6/16/26] wherein the time duration of the combination of the random access signal and the guard period is greater than a time duration of at least two of the plurality of OFDM symbols.	96
[8/18/28] wherein the random access signal is a spread spectrum signal.	97
[9/19/29] [wherein: the receiver/the receiver circuit is further configured to receive]/further comprising: receiving] broadcast information from the base station, the broadcast information indicating at least one sequence associated with the base station for use in producing the random access signal.	97
[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.	99
[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.	99
[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.	99

B. Ground-A2 - Claims 10, 20, and 30 are Obvious in view of Ma-TR-Jung	101
<i>[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.</i>	101
<i>[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.</i>	101
<i>[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.</i>	101
C. Ground-B1 - Claims 1-6, 8-16, 18-26, 28-30 are anticipated or rendered obvious by Walton	102
<i>[1Pre/21Pre] A mobile station comprising,</i>	102
<i>[11Pre] A method performed by a mobile station, the method comprising:</i>	102
<i>[1a/11a] [a transmitter configured to: transmit]/transmitting, to a base station, a first uplink signal within a frequency band, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal</i>	104
<i>[1b/11b] the first uplink signal ... utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols;</i>	109
<i>[1c/11c] transmit/transmitting, to the base station, a random access signal followed by a guard period in only a portion of the frequency band,</i>	110
<i>[1d/11d] wherein the random access signal includes a sequence associated with the base station,</i>	114
<i>[1e/11e] wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols; and</i>	115
<i>[1f/11f] [a receiver configured to receive]]/[receiving], from the base station, a response message.</i>	117

<i>[21a] a first type of transmitter signal processing circuit configured to: generate a first uplink signal, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols; modulate the first uplink signal onto a first set of OFDM subcarriers;</i>	<i>119</i>
<i>[21b] a second type of transmitter signal processing circuit configured to generate an random access signal followed by a guard period, wherein the random access signal includes a sequence associated with a base station, wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols;.....</i>	<i>124</i>
<i>[21c] a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal;.....</i>	<i>127</i>
<i>[21d] a digital-to-analog (D/A) conversion circuit configured to convert the digital signal to an analog signal;</i>	<i>131</i>
<i>[21e] wherein the mobile station is configured to transmit, to the base station, the analog signal in a frequency band, wherein the random access signal occupies in a frequency domain only a portion of the frequency band;</i>	<i>133</i>
<i>[21f] wherein the mobile station is further configured to receive, from the base station, a second analog signal; and</i>	<i>134</i>
<i>[21g] wherein the mobile station further comprises: an analog-to- digital (A/D) conversion circuit configured to convert the second analog signal to a second digital signal; and</i>	<i>135</i>
<i>[21h] a receiver circuit configured to receive, based on the second digital signal, a response message.</i>	<i>136</i>
<i>[2a/12a/22a] [the receiver]/[the receiver circuit] is configured to determine/[determining] if the response message identifies the sequence associated with the base station in the random access signal; and, ...</i>	<i>137</i>
<i>[2b/12b/22b] on a condition that the response message identifies the sequence associated with the base station in the random access signal, [the transmitter]/[the first type of transmitter signal processing circuit is configured to transmit]/[transmitting] a second uplink signal.</i>	<i>140</i>

[3/13/23] wherein the response message includes power adjustment information and wherein the second uplink signal is transmitted according to the power adjustment information.	142
[4/14/24] wherein the portion of the frequency band used for transmission of the random access signal does not include control channels.	142
[5/15/25] wherein the response message includes a mobile station identifier assigned to the mobile station.	146
[6/16/26] wherein the time duration of the combination of the random access signal and the guard period is greater than a time duration of at least two of the plurality of OFDM symbols.	146
[8/18/28] wherein the random access signal is a spread spectrum signal.	147
[9/19/29] [wherein: the receiver/the receiver circuit is further configured to receive]/further comprising: receiving] broadcast information from the base station, the broadcast information indicating at least one sequence associated with the base station for use in producing the random access signal.	148
[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.	151
[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.	151
[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.	151
D. Ground-B2 - Claims 10, 20 and 30 are obvious by Walton-Jung	155
[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.	155
[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to	

<i>parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.</i>	<i>155</i>
<i>[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.</i>	<i>155</i>

I. QUALIFICATIONS AND BACKGROUND INFORMATION

1. I am currently a Professor of Computer Science and Electrical Engineering at West Virginia University in Morgantown, West Virginia. I have over 25 years' experience in telecommunications and communication technology, with an emphasis on wireless and cellular networks. In particular, this experience includes physical-layer technology and issues related to cellular network call processing, along with current cellular standards including the 3GPP family of specifications related to LTE and UMTS. I have particular research and teaching interests in communication theory and statistical signal processing. My full qualifications and experience are set out in my *Curriculum Vitae* ("CV"), as EX1004.

2. I received a Bachelor of Science in Electrical Engineering from Virginia Polytechnic Institute and State University (Virginia Tech) in 1992 and a Master of Science in Electrical Engineering at Johns Hopkins University in 1995. I subsequently completed a Ph.D. in Electrical Engineering from Virginia Tech in 1999.

3. In 1992, I started as a full-time Electronics Engineer at the U.S Naval Research Laboratory (NRL) in Washington D.C after having served as an intern there during the summer of 1991. I subsequently was awarded a Bradley Fellowship by Virginia Tech's Bradley Department of Electrical and Computer Engineering from August, 1995 to July, 1999. The Fellowship allowed me to go

on leave from my position at NRL and pursue my Ph.D. full time. In addition to being supported by the Bradley Fellowship, I served as a Research Assistant and as an Instructor at Virginia Tech.

4. Upon receiving my Ph.D., in August, 1999, I joined the Lane Department of Computer Science and Electrical Engineering at West Virginia University initially as an Assistant Professor. I was promoted to Associate Professor with Tenure in August, 2005 and to Professor in August, 2010; a position I still hold today.

5. From July 1, 2019 through June 30, 2021, I served as the Department Chair, first as an Interim Chair (2019-2020) and then as the Raymond Lane Chair of the Lane Department (2020-2021).

6. Through my work in the engineering field, I have been recognized as a registered Professional Engineer since 2011.

7. In 2018, I was elevated by the IEEE to the rank of Fellow in recognition of my contributions to wireless communications technology. In 2000, 2001, and 2008, I won awards for Outstanding Researcher in the Statler College of Engineering and Mineral Resources at West Virginia University.

8. I have published 38 journal papers and technical magazine articles and over 100 conference papers in the telecommunications field, focusing on wireless technologies, including ten papers in the journal *IEEE Transactions on Wireless*

Communications. Many of these papers are on technologies used by 3G, 4G, and 5G wireless systems. My CV (EX1004) also contains a list of my publications.

9. I am active in the editorship of journal publications in the field of wireless communications. I have served in several roles for the journal *IEEE Transactions on Wireless Communications*, a premier journal on wireless communication technology, including as Associate Editor (2007-2011), Member of the Executive Editorial Committee (2014-2017), Chair of the Executive Editorial Committee (2016-2017), and member of the Steering Committee (2021-present). I have also acted as an Editor for several other journals, including *IEEE Transactions on Communications*, *IEEE Transactions on Vehicular Technology*, and *IEEE Wireless Communications Letters*. Since 2015, I have acted as Editor-in-Chief of *IEEE Communications Society Best Readings*, which is an online resource containing curated collections of papers on specific state-of-the-art technologies including *Network Localization and Navigation*, *Non-Orthogonal Multiple Access*, and *Device-to-Device Communications*.

10. I am active in the organization of the Technical Program for major conferences sponsored by the IEEE's Communication Society. I was Co-Chair of the Technical Program Committee (TPC) for the *2021 IEEE International Conference on Communications (ICC)*, a flagship conference on communication technology that typically receives over 2,000 paper submissions. I currently serve

as the Chair of the *IEEE GLOBECOM/ICC Technical Content (GITC)* committee, which is the technical steering committee for both *ICC* and *GLOBECOM*, the Communication Society's other flagship conference. I was the TPC Chair for the *2017 IEEE Military Communications Conference (MILCOM)*, which is the premier conference on military communications, and I have served on the steering committee for *MILCOM* as well. In addition to these high-level positions, I have served as the TPC chair for tracks or symposia within many other conferences, including other installments of *ICC*, *GLOBECOM*, and *MILCOM*.

11. I am responsible for the design and delivery of academic courses in communication technologies at the undergraduate and graduate level. I have taught courses on Digital Signal Processing, Communication Theory, and Wireless Networks at West Virginia University, and have been instrumental in developing and creating student study guides (workbooks) on the topics of Wireless Networking, Coding Theory, and Digital Signal Processing.

12. I run an active research program focused on the development and evaluation of advanced communication transmission technology, including physical-layer technologies such as error control coding, hybrid ARQ, frequency hopping, multi-antenna transmission, and modulation. I have secured external competitive funding from agencies including the National Science Foundation (NSF) and the Office of Naval Research (ONR) to support my work. My duties include the

mentoring of graduate students, many of whom have supported my research activities as research assistants. To date, I have supervised the research of 49 students successfully graduating with advanced degrees, 9 at the Ph.D. level and 40 at the M.S. level.

13. I have extensive experience in developing software for the simulation and implementation of various aspects of wireless communication systems, such as Turbo Codes and hybrid ARQ. My software is available to the public in a package called the Coded Modulation Library (CML).¹ The software contains simulations of error-control codes such as Turbo Codes and technologies such as hybrid ARQ. Various aspects of the LTE, UMTS, HSDPA, cdma2000, and DVB-S2 standards are implemented in this software. The code has been incorporated into several commercial products.

14. I previously have been retained as an expert witness in US Proceedings in the United States District Courts, the United States Patent and Trademark Office, and the ITC. This has included acting as an expert for major technology companies and wireless carriers in patent disputes and investigations involving telephone modems, mobile phone handsets, LTE, WCDMA/UMTS and other core wireless technologies.

¹ <https://github.com/wvu-wcrl/CML>

15. Based on my above-described near three decades of experience in communications technologies, and the acceptance of my publications and professional recognition by societies in my field, I believe that I am qualified to be an expert in wireless communication systems, communication networks, and signal processing.

16. I have been retained on behalf of Petitioner to offer technical opinions relating to U.S. Patent No. 10,833,908 (“the ’908 Patent”) and prior art references relating to its subject matter. I have reviewed the ’908 Patent, and relevant excerpts of the prosecution history of the ’908 Patent. Among various textbooks, documents, and publications, I have also reviewed the following prior art references:

Prior Art References	
EX1005	U.S. Patent Application Publication No. US20040001429 to Ma et al. (“Ma”)
EX1006	TR 101 146 V3.0 (“TR”)
EX1009	U.S. Patent Application Publication No. US20020159422 to Li et al. (“Li”)
EX1010	U.S. Patent Application Publication No. US20040114504A1 to Jung et al. (“Jung”)
EX1013	U.S. Patent Application Publication No. US20040082356 to Walton et al. (“Walton”)

EX1016	ETSI Special Mobile Group (SMG) Report of UMTS 30.06 v3.0.0 (SMG-Report) ²
EX1022	Excerpts from <i>Digital Signal Processing, Principles, Algorithms, and Applications</i> , Third Edition (Copyright@1996) (“Textbook”)

17. Counsel (Fish & Richardson) has informed me that I should consider these materials through the lens of one of ordinary skill in the art related to the '908 Patent at the time of the earliest possible priority date of the '908 Patent, and I have done so during my review of these materials. The '908 Patent claims the benefit of U.S. Provisional Patent Application No. 60/540,586, filed on Jan. 30, 2004, and of U.S. Provisional Patent Application No. 60/540,032, filed on Jan. 29, 2004. I have

² TR and SMG-Report are referred to in the alternative because they are technically identical in content, with different document formats (a single PDF document vs. zip file with a word document and separate annexes) and pagination (due to SMG-Report's ANNEXA4H's duplication of ANNEXA4 content, and some layout differences between ANNEXA4 of TR and ANNEXA4 of SMG-Report). *See generally* EX1006, EX1016. All citations will be to the former and not the latter.

been informed by Counsel to use Jan. 29, 2004 as the “Priority Date” in my analysis below.

18. I have no financial interest in the outcome of this proceeding. I am being compensated for my time spent as an expert on an hourly basis. My compensation is not dependent on the outcome of these proceedings or the content of my opinions.

19. In writing this declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of electrical engineering and wireless communication networks; my experience in teaching related subjects; and my experience in working with others involved in those fields. In addition, I have analyzed various publications and materials, in addition to other materials I cite in my declaration.

20. My opinions, as explained below, are based on my education, experience, and expertise in the fields relating to the '908 Patent. Unless otherwise stated, my testimony below refers to the knowledge of one of ordinary skill in the art as of the earliest possible priority date. Any figures that appear within this document have been prepared with the assistance of Counsel and reflect my understanding of the '908 Patent and the prior art discussed below.

II. OVERVIEW OF CONCLUSIONS FORMED

21. This declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions, based upon my knowledge and experience and my review of the prior art references listed above, I believe that:

- Claims 1-6, 8-16, 18-26, 28-30 are obvious over Ma in view of TR.
- Claims 10, 20, 30 are obvious over Ma in view of TR and Jung.
- Claims 1-6, 8-16, 18-26, 28-30 are Anticipated by/Obvious based on Walton.
- Claims 10, 20, 30 are obvious over Walton in view of Jung.

22. In support of these conclusions, I provide an overview of the references in Section VI and more detailed comments regarding the anticipation/obviousness of claims 1-6, 8-16, 18-26, and 28-30 (“**the Challenged Claims**”) of the '908 Patent in Section VII.

III. LEVEL OF ORDINARY SKILL IN THE ART

23. A person of ordinary skill in the art (POSITA) relating to, and at the time of, the Priority Date would have been someone with at least a Bachelor’s degree in an academic area emphasizing electrical engineering or a similar discipline, and at least two years of experience in the field working with, teaching, or researching wireless communication networks. Superior education could compensate for a deficiency in work experience, and *vice-versa*.

24. Based on my experience, I have an understanding of the capabilities of a person of ordinary skills in the art (POSITA). Indeed, I have taught, mentored, participated in organizations, and worked closely with many such persons over the course of my career. For example, from my industry consulting or conference interactions, I am familiar with what a POSITA would have known and found predictable in the art. From teaching and supervising my graduate students, I also have an understanding of the knowledge that a person with this academic experience possesses. Furthermore, I possess those capabilities myself.

IV. LEGAL STANDARDS

A. Terminology

25. I have been informed by Counsel and understand that the best indicator of claim meaning is its usage in the context of the patent specification as understood by one of ordinary skill. I further understand that the words of the claims should be given their plain meaning unless that meaning is inconsistent with the patent specification or the patent's history of examination before the Patent Office. Counsel has also informed me, and I understand that, the words of the claims should be interpreted as they would have been interpreted by one of ordinary skill at the time of the invention was made (not today). I have been informed by

Counsel that I should use Jan. 29, 2004 as the point in time for claim interpretation purposes with respect to this petition.

B. Legal Standards

26. I have been informed by Counsel and understand that documents and materials that qualify as prior art can render a patent claim unpatentable as being anticipated or obvious.

27. I am informed by Counsel and understand that all prior art references are to be looked at from the viewpoint of a person of ordinary skill in the art at the time of the invention, and that this viewpoint prevents one from using his or her own insight or hindsight in deciding whether a claim is anticipated or rendered obvious.

1. Anticipation

28. I understand that patents or printed publications that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

29. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

30. I understand that a prior art reference “anticipates” an asserted claim, and thus renders the claim invalid, if all limitations of the claim are disclosed in that prior art reference, either explicitly or inherently (i.e., necessarily present).

2. Obviousness

31. I understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a POSITA.

32. I have been informed by Counsel and understand that a claim is unpatentable for obviousness and that obviousness may be based upon a combination of prior art references. I am informed by Counsel and understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. However, I am informed by Counsel and understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.

33. I am informed by Counsel and understand that when a patented invention is a combination of known elements, a court determines whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue by considering the teachings of prior art references, the effects of demands known to people working in the field or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art.

34. I am informed by Counsel and understand that a patent claim composed of several limitations is not proved obvious merely by demonstrating that each of its limitations was independently known in the prior art. I am informed by Counsel and understand that identifying a reason those elements would be combined can be important because inventions in many instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known. I am informed by Counsel and understand that it is improper to use hindsight in an obviousness analysis, and that a patent's claims should not be used as a "roadmap."

35. I am informed by Counsel and understand that an obviousness inquiry requires consideration of the following factors: (1) the scope and content of the prior art, (2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called "secondary considerations" of non-obviousness, which include: (i) "long felt need" for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) "copying" of the claimed invention by others.

36. I have been informed by Counsel and understand that an obviousness evaluation can be based on a single reference or a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but that the nexus linking two or

more prior art references is sometimes simple common sense. I have been informed by Counsel and understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

37. I have been informed by Counsel and understand that if a technique has been used to improve one device, and a person of ordinary skill at the time of invention would have recognized that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

38. I have been informed by Counsel and understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I have been informed by Counsel and understand that a person of ordinary skill looking to overcome a problem will often be able to fit together the teachings of multiple prior art references. I have been informed by Counsel and understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill would have employed at the time of invention.

39. I have been informed by Counsel and understand that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill at the

time of invention, not just the patentee. Accordingly, I understand that 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.

40. I have been informed by Counsel and understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

41. I have been informed by Counsel and understand that there must be a relationship between any such secondary considerations and the invention, and that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

42. In sum, my understanding is that prior art teachings are properly combined where one of ordinary skill having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

43. I have been informed by Counsel and understand that in an *inter partes* review (IPR), “the petitioner shall have the burden of proving a proposition of

unpatentability,” including a proposition of obviousness, “by a preponderance of the evidence.” 35 U.S.C. § 316(e).

V. THE '908 PATENT

A. Overview of the '908 Patent

44. The '908 Patent's Specification describes a scenario in “a broadband wireless communication system” where “a spread spectrum signal is intentionally **overlapped**³ with an [orthogonal frequency division multiplexing (OFDM)] signal, in a time domain, a frequency domain, or both.” EX1001, Abstract. The '908 Patent purportedly provides “[m]ethods and techniques [that] are devised to ensure that the mutual interference between the **overlapped** signals is minimized to have insignificant impact on either signal and that both signals are detectable with expected performance by a receiver.” EX1001, Abstract.

45. However, the claims of the '908 Patent does not require the OFDM signal and the spread spectrum signal to be “**overlapped**,” but simply recite transmitting “*a first uplink signal*” that is an OFDM signal (the claimed) and transmitting “*a random access signal*” that “*includes a sequence*”). See e.g., claim 1 of the '908 Patent that recites:

³ Bold represents added emphasis, unless otherwise specified.

*1. A mobile station comprising:
a transmitter configured to:
transmit, to a base station, a first uplink signal within a
frequency band, wherein the first uplink signal is an orthogonal
frequency division multiplexing (OFDM) signal and utilizes a frame
format comprising a plurality of timeslots, each timeslot comprising a
plurality of OFDM symbols;
transmit, to the base station, a random access signal followed
by a guard period in only a portion of the frequency band, wherein the
random access signal includes a sequence associated with the base
station, wherein a time duration of a combination of the random
access signal and the guard period is greater than a time duration of
at least one of the plurality of OFDM symbols; and
a receiver configured to receive, from the base station, a
response message.*

46. As I explain below in Sections VI and VII, the broadly drafted Challenged Claims of the '908 Patent merely recite features that had been known and/or implemented in the art before the Critical Date of the '908 Patent.

B. Prosecution History of the '908 Patent

47. The '908 Patent issued from U.S. Patent Application No. US16/902,740 ("the '740 application"), which was filed on 2020-06-16 and a continuation of U.S. patent application Ser. No. 15/953,950, filed Apr. 16, 2018, which is continuation of U.S. patent application Ser. No. 14/321,615, filed Jul. 1, 2014, which issued on

Apr. 17, 2018 as U.S. Pat. No. 9,948,488, which is a continuation application of U.S. patent application Ser. No. 13/861,942, filed Apr. 12, 2013, which issued on Jul. 1, 2014 as U.S. Pat. No. 8,767,522, which is a continuation application of U.S. patent application Ser. No. 13/347,644, filed Jan. 10, 2012, which issued on Apr. 23, 2013 as U.S. Pat. No. 8,428,009, which is a continuation application of U.S. patent application Ser. No. 12/975,226, filed Dec. 21, 2010, which issued on Jan. 10, 2012 as U.S. Pat. No. 8,094,611, all of which are incorporated herein by reference. U.S. patent application Ser. No. 12/975,226 is a continuation application of U.S. patent application Ser. No. 10/583,229, filed Aug. 27, 2008, which issued on Jan. 4, 2011 as U.S. Pat. No. 7,864,725, which is the National Stage Application of International Application No. PCT/US2005/003518, filed Jan. 27, 2005, which claims the benefit of U.S. Provisional Patent Application No. 60/540,586, filed on Jan. 30, 2004, and of U.S. Provisional Patent Application No. 60/540,032, filed on Jan. 29, 2004. EX1001, cover.

48. The '908 Patent issued without receiving any prior art rejection. *See generally* EX1002. A Non-Final Office Action raised 35 USC §112 rejections, especially to "Claims 1, 11 and 21 limitations, directed to 'the initial random access signal includes a sequence associated with the base station and a time duration of the initial random access signal and a guard period is greater than a time duration of at least one of the plurality of the OFDM symbols' are not

supported by the disclosure, as filed, and are identified as NEW MATTER.”

EX1002, 142.

49. No reason for allowance was given during the prosecution of the '908 Patent. EX1002, 190. Examiner allowed the '908 Patent with an interview summary noting that “Applicant indicated the particulars of Fig. 5, which show the relative durations of the OFDM symbols and the guard period, as the support for the claim 1 limitations,” “which were rejected in the Office action as NEW MATTER.” EX1002, 191.

50. To the extent such claim 1 limitations, i.e., “*wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols*” were deemed as inventive, these claim 1 limitations, as well as other features of the Challenged Claims, were known and rendered obvious by prior art references, as I explain below in Sections VI and VII.

VI. OVERVIEW AND COMBINATIONS OF PRIOR ART REFERENCES

A. Ma (EX1005)⁴

⁴ General descriptions provided for the references and combinations discussed in Section VI are incorporated into each subsection addressing/applying those

51. Similar to the '908 Patent, Ma is directed to a multi-carrier wireless network, specifically, an Orthogonal Frequency Division Modulation (OFDM) network.

EX1005, Abstract. Ma discloses “an uplink **air interface** used in a **wireless communication network**” that includes “two different **OFDMA** modes [i.e.,] Mode-1 and Mode-2” that share “a common wireless channel ... within an overall OFDM band.” EX1005, 0002, 0124. The first mode, “Mode-1[,] is used to provide low rate circuit oriented connectivity for multiple users simultaneously preferably using orthogonal code separation,” EX1005, 0124. The second mode, “Mode-2[,] is used to provide higher rate bursty packet connectivity.” *Id.* “**Mode-1 supports** the provision of **user dedicated channels with fixed data** rate to support real-time service, uplink signalling and simple messaging.” EX1005, 0143. **Mode-2**, on the other hand, “**supports** the transmission of **high speed data bursts.**” *Id.*

52. Similar to the '908 Patent, in addition to the OFDM-based “*uplink signals*”, Ma also discloses the claimed “*random access signal*” through the use of “a **Random Access Channel (RACH)** for UE’s new to a particular wireless network to access the system.” EX1005, 0205. Ma discloses that “**the RACH is transmitted simultaneously** both in time and frequency **with the transmission of the other Mode-1 signals by other users.**” EX1005, 0205.

references, as are the discussions of combinations.

53. Ma discloses an example random access “procedure for UE to initiate a connection with access network” through use of the RACH:

1) After power on, UE synchronizes to the base station for timing and frequency and at the same time **selects the serving base station**, for example through the detection of a downlink preamble.

2) UE listens to a DL [downlink] signaling channel for the information identifying the **RACH PN [pseudo-noise] codes to be used in that cell/sector**.

3) UE measures the DL long term C/I [Carrier to Interference].

4) UE **sends RACH code** chosen randomly from serving base station's code set **via an ALOHA RACH channel**. The transmit power is determined inversely proportional to the DL long term C/I measurement.

5) If the **base station detects the RACH code successfully it measures the time offset of that UE** and then sends the initial dedicated uplink access channel grant, together with the RACH code index as well as **the time offset information**. The UE then detects such signature to identify access grant through DL signaling channel.

6) UE **adjusts its timing** and sends back its ID, its CQI report information, and uplink traffic load request if it wants to start uplink data transmission, for example via an initial dedicated uplink signalling channel, one of the parallel low delay circuitry data channels discussed previously.

7) Base station schedules the uplink multi-user accesses based on the measured uplink channel condition from Mode-1 pilot, and the traffic requirements reported from different active UEs.

8) The channel resource assignment and the coding/modulation primitives for different UE are signaled via DL signaling channel.

EX1005, 0234-0242.

54. Similar to the '908 Patent, Ma also discloses overlaying an “access channel” (e.g., RACH that includes a spread spectrum signal (e.g., a “RACH signature [with a] spreading factor”)) “over the low rate mode [OFDM] transmissions of other users” (i.e., an OFDM signal). EX1005, Abstract, 0197. EX1001, Abstract. For example, Ma discloses that “**the RACH is transmitted simultaneously** both in time and frequency **with the transmission of the other Mode-1 signals by other users.**” EX1005, 0206.

B. TR (EX1006)

55. TR is a technical report that “describes the detailed evaluation work towards the definition of the Universal Mobile Telecommunications System UMTS Terrestrial Radio Access (UTRA).” EX1006, 5. It provides “technical proposals for radio access technologies for the UMTS Terrestrial Radio Access,” which includes a “ β -concept based on OFDMA” “as a possible basis for the UTRA standard” as detailed in Annex B. EX1006, 1-3, 5-6, 174. TR “describes the basic concept behind the OFDMA proposal and its advantages and featuers [sic] which is the most advanced of its kind present today.” EX1006, 175.

56. Similar to Ma, TR also discloses a “*random access signal*” as claimed in the ’908 Patent and discloses a “RACH (Random Access Channel) Physical Structure” (reproduced below) and a random access process. EX1006, 191, 196-200, 206.

3.1.3 RACH (Random Access Channel) Physical Structure

The Random Access Channel is an uplink channel, carrying the information from the mobile station.

RACH burst

KERO burst (Figure 2) is also used for the RACH burst which can be detected by KERO

196

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TR 101 146 V3.0.0 (1997-12)

detector in the BS. RACH carries a Random Access Number (RAN) which consists of 7 bits related to the Mobile Station Identification (MSID) number.

Allocation and Power Control of RACH

Two continuous time slots are prepared for the RACH burst, because propagation delay is unknown before communication starts between MS and BS. The RACH burst will be transmitted at the same power which was estimated as the down link signal strength (Open Loop Power Control) based on the received IACH and BCCH information.

MS and BS actions

MS measures RSSI and calculates adequate transmit power.

MS transmit RACH burst at calculated power and timing where a propagation delay of 0[μ s] is assumed.

BS detects RACH using KERO detector and then decodes the RAN.

If detection and decoding was done successfully, BS reports back the RAN and time alignment value and location of DCCH (Dedicated Control Channel) through AGCH (Access Grant Channel) to the MS.

MS listens to AGCH, if the RAN corresponds to the RAN of the mobile, assignment of DCCH can be confirmed.

If the RAN is not detected, MS will transmit RACH again.

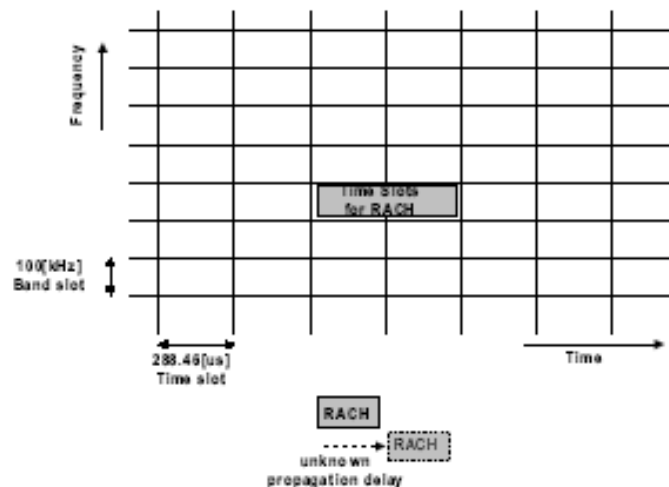
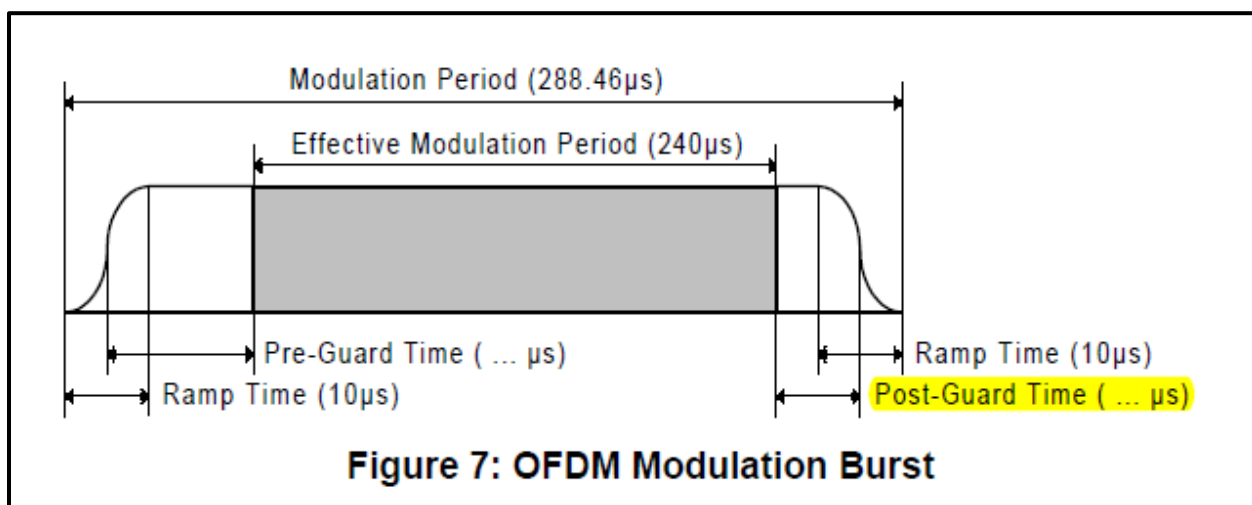


Figure 4: RACH Structure

TR-Excerpt of Pages 196-197

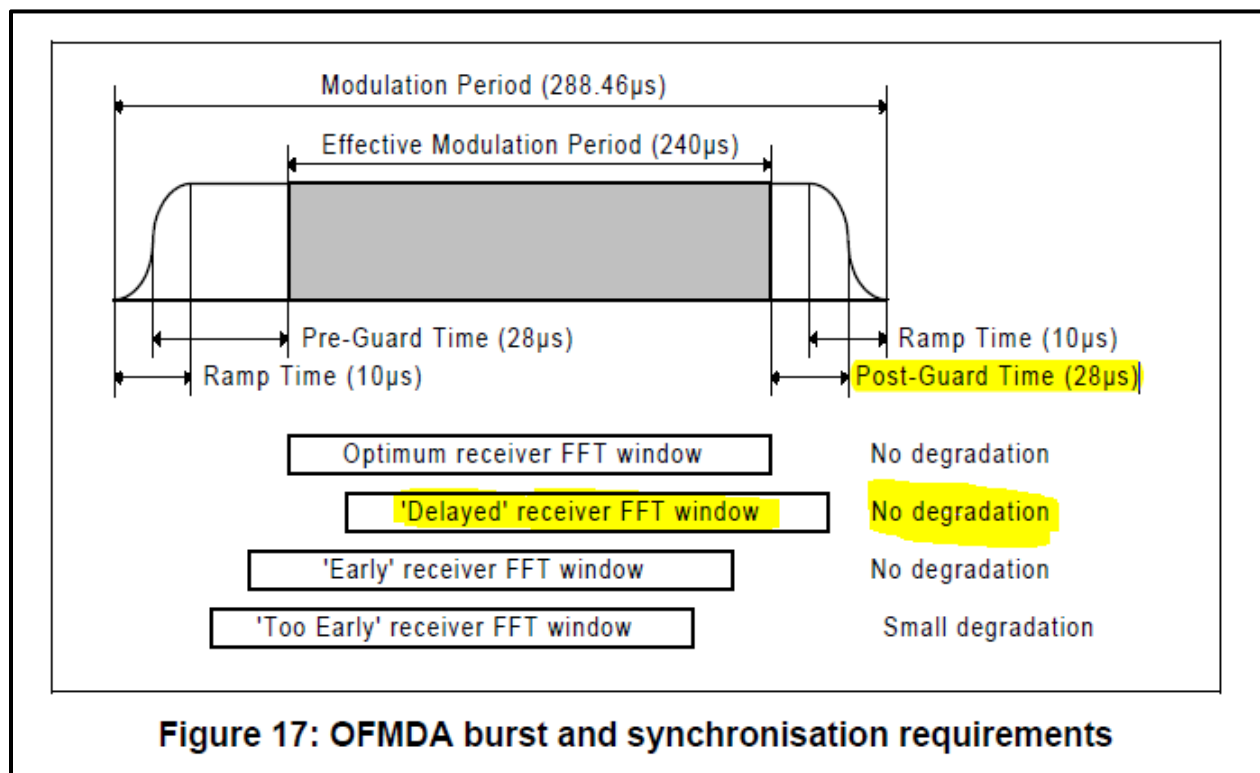
57. TR discloses “a guard period” following a *random access signal* as claimed in the '908 Patent. TR discloses the use of a **guard time** “to be robust against very long multi-path delay.” EX1006, 199. More specifically, as shown in Figure. 7, for an “OFDM Modulation Burst,” TR discloses a “timeslot contains a guard period” including a “Pre-Guard Time” and a “Post-Guard Time.” EX1006, 199.



TR-Figure. 7 (highlighted)

58. Noteworthy, TR proposes the additional “Post-Guard Time” which is “**at the back of the OFDM symbol.**” EX1006, 207. TR discloses that “The current burst design **proposes** a guard interval at the front and **an additional guard interval at the back of the OFDM symbol**, therefore an timing inaccuracy of $\pm 10\mu\text{s}$ can be handled without any performance degradation.” EX1006, 207. As shown in Figure. 17, the **guard interval following the OFDM symbol** can accommodate a received signal falling within the “‘Delayed’ receiver FFT window” and still have “No

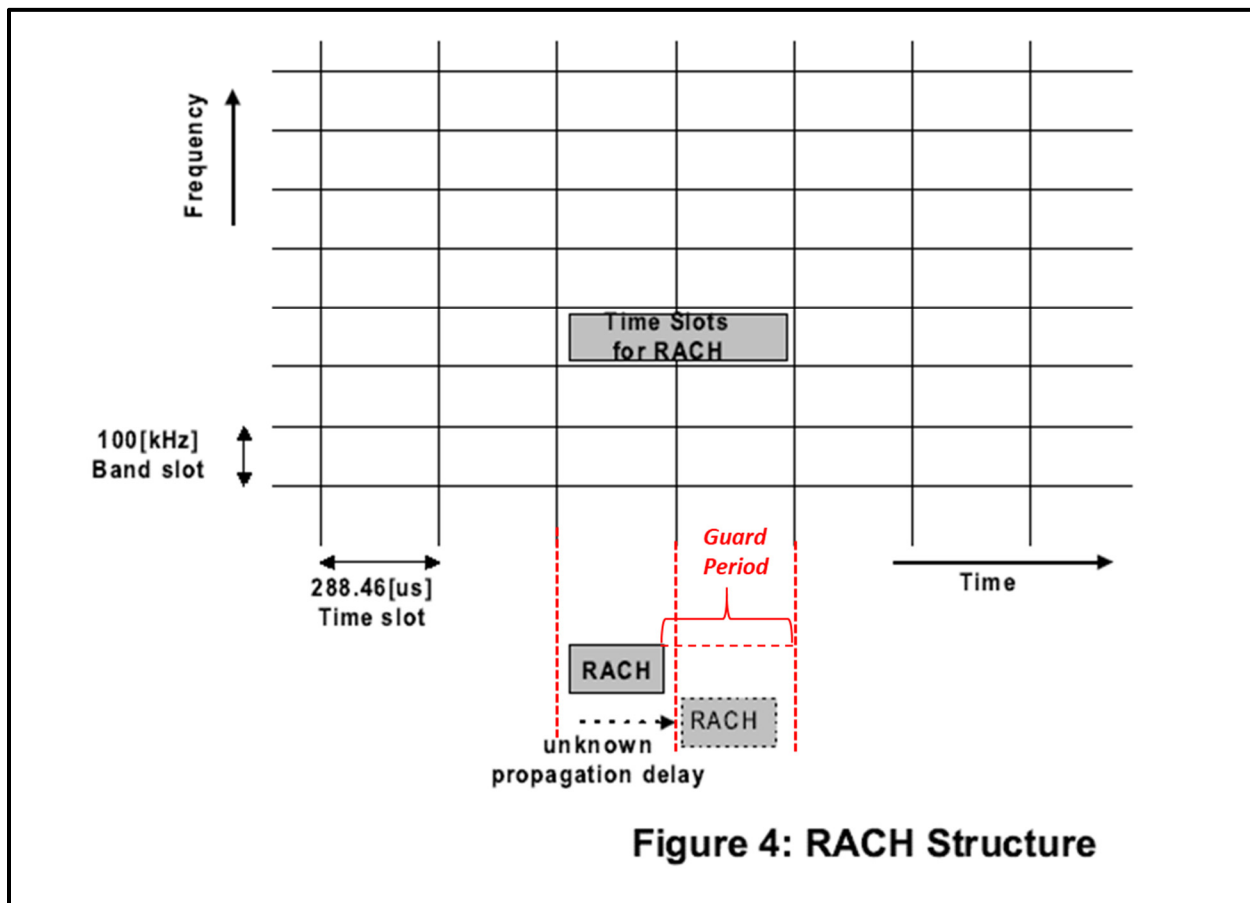
[performance] degradation.” EX1006, 207-208. TR notes that “the **guard time** helps to compensate timing misalignments,” especially for synchronization based on RACH: “In the uplink the rough timing offset is detected by the base station by measuring the arrival time of the RACH burst. This gives an initial time-advance value which is reported back to the mobile.” EX1006, 207.



TR-Figure. 17 (highlighted)

59. More specifically to a *random access signal* (e.g., a “RACH burst” as disclosed by TR), TR discloses “a *guard period*” following the *random access signal*, that includes a guard time (e.g., of a duration of a time slot as shown in Figure. 4) following the RACH burst to account for the “unknown propagation delay.” EX1006, 197. This guard period may be used as an alternative to, or in

addition to the “additional guard interval at the back of the OFDM symbol” discussed in connection with Figures. 7 and 17. EX1006, 197-199, 207-208.



TR-Figure. 4 (annotated)

60. As shown in Figure. 4, while “Two continuous time slots are prepared for the RACH burst,” the actually transmitted RACH burst [*random access signal*] only occupies no more than the first of two time slots, while leaving the second time slot empty. The RACH burst [*random access signal*] is thus followed by a *guard time* including the “guard interval at the back of the OFDM symbol,” and/or the second time slot following the first time slot in which the RACH burst is

transmitted. EX1006, 197, 207-208. TR notes this additional buffer is to account for the propagation delay when transmitting the random access signal “because the propagation delay is unknown before communication starts between MS and BS.” EX1006, 197.

61. Thus, the RACH burst [*random access signal*] is followed by the “guard interval at the back of the OFDM symbol,” and/or another time slot following the time slot in which the RACH burst is transmitted. EX1006, 197, 207-208.

C. Combination of Ma and TR (“Ma-TR”)

62. As explained above, Ma discloses an OFDMA-based air interface system and TR proposes an OFDMA-based air interface for a UMTS system. EX1005, 0002, 0124. EX1006, 175. Moreover, both Ma and TR disclose random access processes using RACH. *See e.g.*, EX1005, 0205. EX1006, 197, 206. To implement Ma’s OFDMA-based air interface system, a POSITA would have reasons to leverage the basic system characteristics of the OFDMA-based air interface proposal for a UMTS system as disclosed in TR, especially given various advantages of the OFDMA-based air interface identified in TR, including flexibility in supporting both circuit switched services (e.g., voice) and packet oriented services, and GSM backwards compatibility. EX1006, 175-177, 180 and 182.

63. Moreover, among the proposed system characteristics of TR, a POSITA would have been motivated to incorporate the guard time feature proposed by TR to Ma's RACH signal to advantageously "be robust against very long multi-path delay," "compensate timing misalignments" and handle "an timing inaccuracy ... without any performance degradation," especially to account for the "unknown propagation delay" when transmitting the random access signal, as discussed in TR. EX1006, 199, 207-208. Indeed, adopting system characteristics (e.g., the frame format, the guard time feature) of the OFDMA-based air interface for UMTS system as proposed by TR in implementing Ma's OFDMA-based air interface system would have been merely the application of a known technique (e.g., applying and adapting proposed "technical parameters and characteristics" of TR's OFDMA system such as transmitting signals in a frame format, adding a guard time after a random access signal) to a known system (Ma's OFDMA communication system) ready for improvement to yield predictable results. EX1006, 177-178, 199, 207-208. For example, an obvious integration of TR into Ma would have involved configuring Ma's RACH channel with the guard period/interval/time feature as disclosed by TR, (e.g., by leaving a guard time after a random access signal) to account for unknown propagation delay when transmitting the random access signal, because per TR, such a guard time/interval/time feature can advantageously (1) "be robust against very long

multi-path delay,” (2) “compensate timing misalignments” and (3) handle “an timing inaccuracy ... without any performance degradation,” especially when transmitting the random access signal, “because the propagation delay is unknown before communication starts between MS and BS.” EX1006, 197-199.

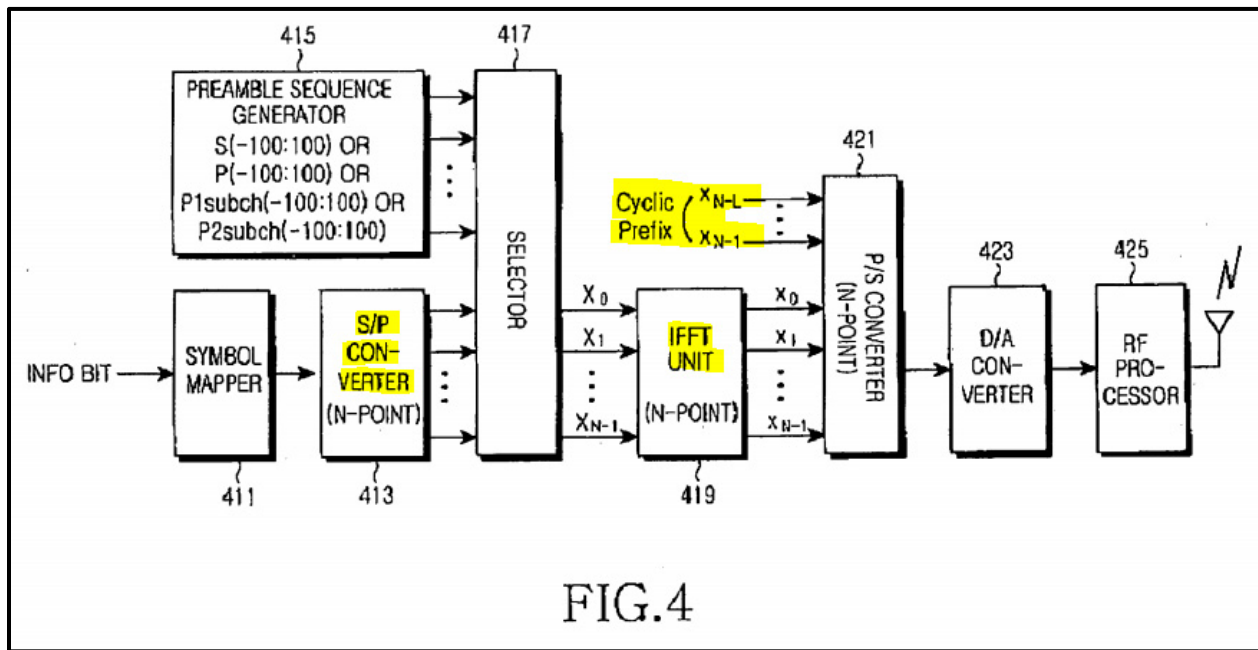
64. A POSITA would have had a reasonable expectation of success in this implementation at least because Ma and TR are related to similar methods and systems (i.e., data transmission and random access in OFDMA-based communication systems).

D. Jung (EX1010)

65. Jung relates to “generating a preamble sequence in an orthogonal frequency division multiplexing (OFDM) communication system having *m* subcarriers in a frequency domain” and “generating a preamble sequence having a minimum peak-to-average power ratio (PAPR).” EX1010, Abstract, 0003.

66. Jung discloses “a structure of a transmitter in an OFDM communication system.” EX1010, 0045. As shown in “FIG. 4 [that] is a block diagram illustrating a structure of a **transmitter in an OFDM** communication system” that includes a “**serial-to-parallel converter 413**,” “**an inverse fast Fourier transformer (IFFT unit) 419**,” and a *cyclic prefix addition circuit* that adds “**a cyclic prefix** that is

applied to the parallel-to-serial converter 421.” EX1010, 0045, 0046.



Jung-FIG. 4 (highlighted).

E. Combination of Ma, TR, and Jung (“Ma-TR-Jung”)

67. As explained above in Section VI-A-C, both Ma and TR disclose transmitting OFDM signals in OFDM systems. EX1005, Abstract. To the extent that one argues that Ma-TR does not explicitly disclose the components of an OFDM transmitter, a POSITA would have referred to existing literature that describes the well-known, conventional structure of an OFDM transmitter as of the Critical Date of the '908 Patent. Jung is one of numerous references that discloses such details. As discussed in Section VI-D, Jung discloses an OFDM transmitter includes, among other things, a “**serial-to-parallel converter 413,**” “**an inverse**

fast Fourier transformer (IFFT unit) 419,” and *a cyclic prefix addition circuit* that adds “**a cyclic prefix** that is applied to the parallel-to-serial converter 421.”

EX1010, 0045, 0046. *See also* Li, another prior art reference that acknowledges the well-known, conventional structure of an OFDM transmitter:

The modulated data on all subcarriers (intended for multiple subscribers) is processed by **Inverse Fast Fourier Transform (IFFT) 405 in a manner well-known in the art.** The outputs of IFFT 405 are input to **parallel-to-serial converter 406**, which converts the parallel outputs of IFFT 405 into a serial **output OFDM signal in a manner well-known in the art.** In one embodiment, an additional guard interval (**cyclic prefix**) is inserted at this point. The resulting OFDM signal is transmitted through the RF channel.

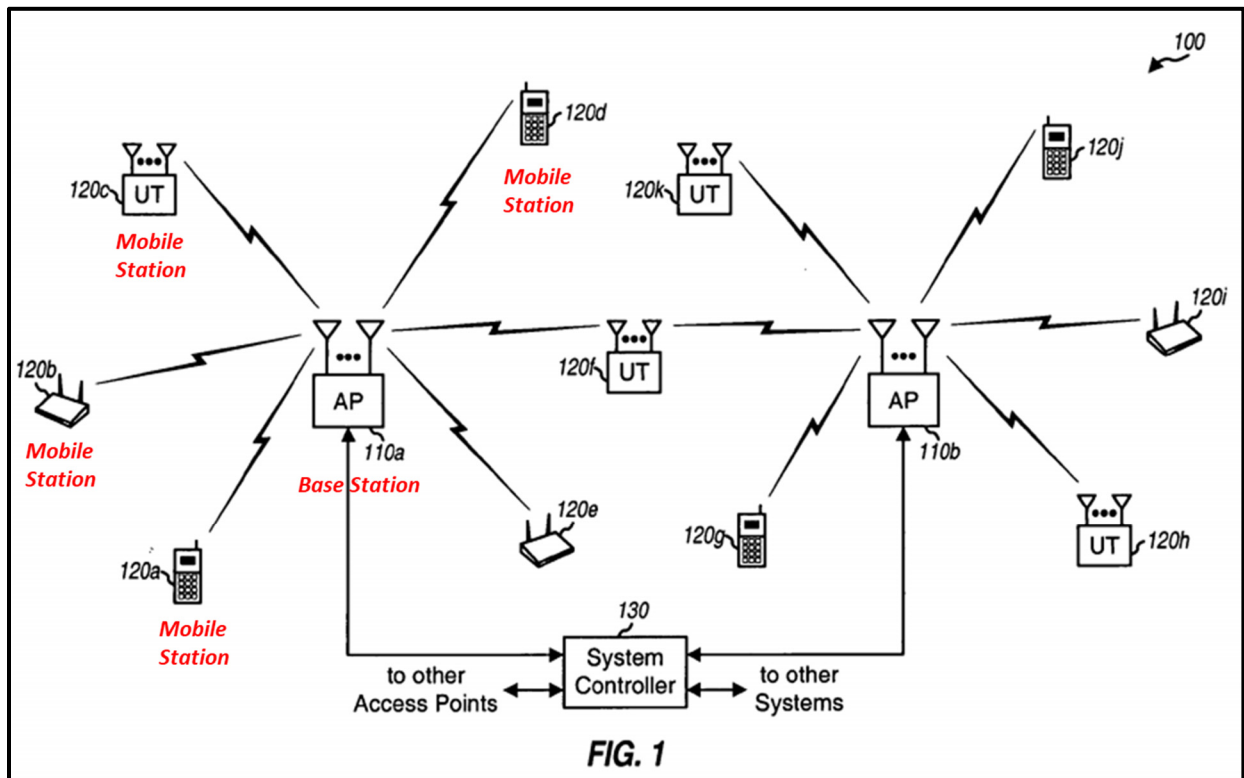
EX1009, [0052]

68. A POSITA would have been prompted to refer to Jung for the details of the OFDM transmitter in implementing the OFDM transmitter disclosed by Ma-TR, which would have been merely the application of a known technique (e.g., implementing an OFDM transmitter well-known in the art) to a known system (Ma’s OFDM communication system) ready for improvement to yield predictable results with a reasonable expectation of success.

F. Walton

69. Walton discloses a “system [that] employs [multiple-input multiple-output (MIMO)] and [(OFDM)] to attain high throughput, combat deleterious path

effects, and provide other benefits.” EX1013, 0011. “FIG. 1 shows a MIMO WLAN system **100** that supports a number of users and is capable of implementing various aspects and embodiments of the invention. MIMO WLAN system **100** includes a number of **access points (APs) 110** that support communication for a number of **user terminals (UTs) 120**.” EX1013, 0040. “An **access point may also be referred to as a *base station***” and “A **user terminal may also be referred to as a *mobile station***[.]” EX1013, 0040-0041. Walton notes that “[e]ach access point in the system can support multiple user terminals.” EX1013, 0011.



Walton-FIG. 1 (annotated)

70. Walton discloses a “channel structure supporting efficient downlink and uplink transmissions,” wherein “[t]he channel structure comprises a number of transport channels that may be used for ... **downlink and uplink data transmissions, random access of the system**, and so on.” EX1013, 0012.

71. Specifically, Walton discloses an uplink Reverse Channel (RCH) that includes a **Random Access Channel (RACH)**, where “The RACH is used by the user terminals to gain access to the system and to send short messages to the access point.” EX1013, 0145, FIG. 6.

72. Walton discloses “a **random access scheme** is employed to allow the user terminals to access the MIMO WLAN system. In an embodiment, the random access scheme is based on a slotted Aloha scheme whereby a **user terminal transmits in a randomly selected RACH slot** to attempt to gain access to the system.” EX1013, 0642-0657. “The RACH segment includes a **guard interval**, which is provided to prevent the uplink transmission from the user terminals from interfering with the next BCH segment, which is a possibility for user terminals that do not compensate for their round trip delay.” EX1013, 0647.

G. Combination of Walton and Jung (“Walton-Jung”)

73. To the extent that one argues that Walton does not explicitly disclose an OFDM transmitter includes a *serial to parallel converter*, a POSITA would have referred to existing literature that describes the well-known, conventional structure

of an OFDM transmitter. Jung is one of numerous references that disclose such details. For example, as shown in “FIG. 4 [that] is a block diagram illustrating a structure of a **transmitter in an OFDM** communication system” that includes a “**serial-to-parallel converter 413**,” besides “**an inverse fast Fourier transformer (IFFT unit) 419**,” and *a cyclic prefix addition circuit* that adds “**a cyclic prefix** that is applied to the parallel-to-serial converter 421.” EX1013, 0045, 0046. Also, Li acknowledges that it is well-known that an OFDM transmitter includes a *serial to parallel converter*, which “converts the parallel outputs of IFFT 405 into a serial **output OFDM signal in a manner well-known in the art**”:

The modulated data on all subcarriers (intended for multiple subscribers) is processed by **Inverse Fast Fourier Transform (IFFT) 405 in a manner well-known in the art**. The outputs of IFFT 405 are input to **parallel-to-serial converter 406**, which converts the parallel outputs of IFFT 405 into a serial **output OFDM signal in a manner well-known in the art**. In one embodiment, an additional guard interval (**cyclic prefix**) is inserted at this point. The resulting OFDM signal is transmitted through the RF channel.

EX1009, [0052]

74. A POSITA would have been prompted to refer to Jung for the details of the OFDM transmitter in implementing the OFDM transmitter disclosed by Walton, which would have been merely the application of a known technique (e.g.,

implementing an OFDM transmitter well-known in the art) to a known system (Walton's OFDM communication system) ready for improvement to yield predictable results with a reasonable expectation of success.

VII. MANNER IN WHICH THE PRIOR ART REFERENCES RENDER THE '908 CLAIMS UNPATENTABLE

A. Ground-A1 - Claims 1-6, 8-16, 18-26, 28-30 are Obvious in view of Ma-TR

[1Pre/21Pre] A mobile station comprising,

[11Pre] A method performed by a mobile station, the method comprising:

75. Ma discloses “[a] wireless network [that] typically includes access points (e.g. base stations) through which **User Equipment (UE)** [*a mobile station*] may access the wireless network.” EX1005, 0003. Ma refers to the UE as “**wireless terminal such as a *mobile station*,**” EX1005, 0264, and discloses that “[a] **wireless terminal** and network terminal are provided for implementing a new uplink OFDM protocol.” EX1005, Abstract.

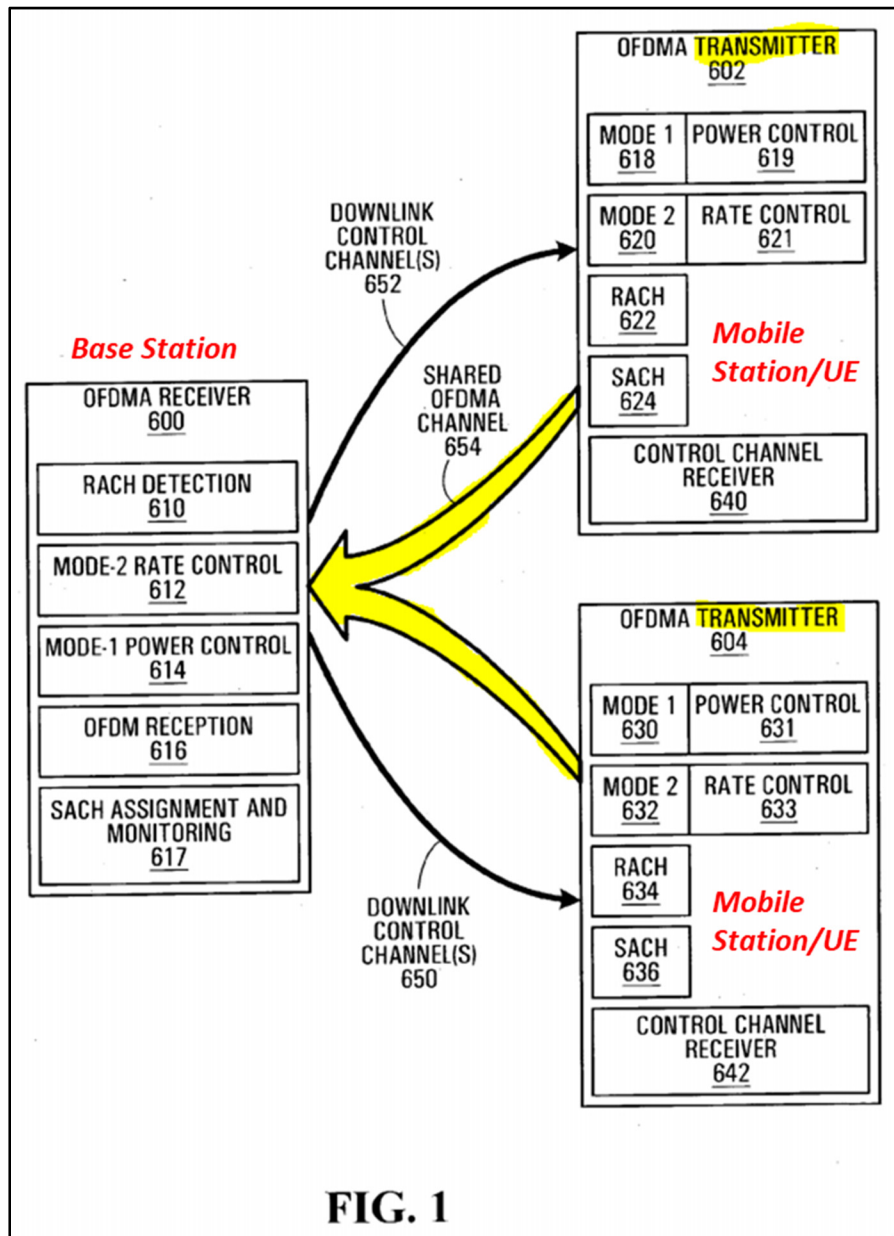
76. Ma explicitly discloses *a mobile station* and *a method performed by a mobile station* in disclosing, e.g., “the invention provides **a wireless terminal** for communicating over a shared OFDM band,” and “the invention provides **a method** of communicating over a shared OFDM band.” EX1005, 0010, 0086.

[1a/11a] [a transmitter configured to: transmit]/transmitting, to a base station, a first uplink signal⁵ within a frequency band, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal

77. As shown in FIG. 1 (reproduced below), “the OFDMA transmitter 602,604 is a wireless terminal such as *a mobile station*,” and “the wireless terminal has a first transmit chain [the *mobile station comprising a transmitter*] for generating and transmitting a low rate mode OFDM transmission in a first frequency band of the OFDM band; and a second transmit chain [the *mobile station comprising a transmitter*] for generating and transmitting a burst-mode transmission in a second frequency band of the OFDM band.” EX1005, 0264, Abstract. Moreover, Ma discloses different implementations of the transmitters: “FIG. 10A is a block diagram of a transmitter showing both RACH

⁵ The '908 Patent does not define the “uplink signal,” and only recites “a first uplink signal” in independent claims and “a second uplink signal” in claims 2, 3, 12, 13, 22 and 23. EX1001. A POSITA would understand an “uplink signal” would encompass any signal transmitted from a mobile station/UE to a base station/access point, and would understand that the uplink transmission in Ma is consistent with and falls within the plain and ordinary meaning of the claimed *uplink signal*.

and Mode-1 channels combined in Mode-1 frequency space,” “FIG. 10B is another example transmitter design similar to that of FIG. 10A,” and “FIG. 13 is a block diagram of an example transmitter for Mode-2 operation,” and “FIG. 15B illustrates an example of how Mode-1 and Mode-2 are combined in a transmitter architecture.” EX1005, 0102, 0103, 0106, and 0252.



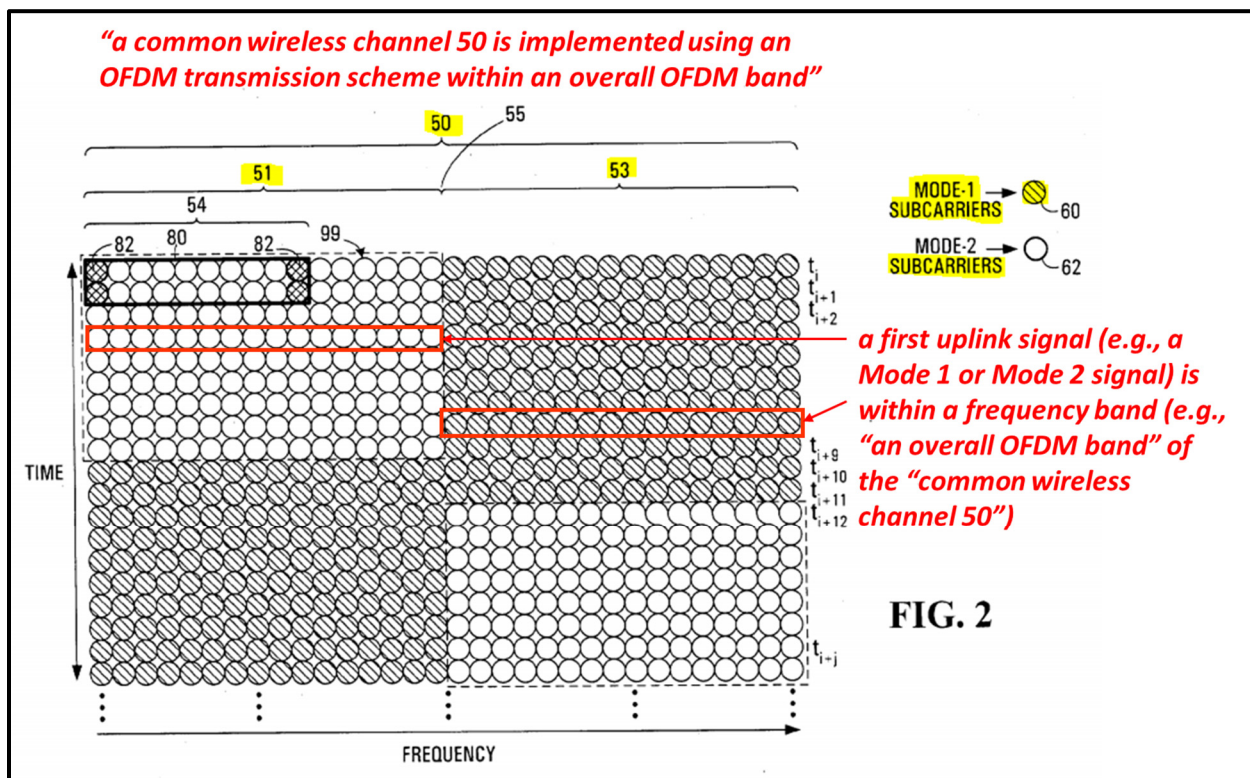
Ma- FIG. 1 (annotated)

78. As shown in FIG. 1, Ma discloses the *mobile station comprising a transmitter* (e.g., “**the OFDMA transmitter 602,604** is a wireless terminal such as a **mobile station**”) *configured to transmit, to a base station* (e.g., “**OFDMA receiver 600** would typically be a **base station**”), *a first uplink signal within a frequency band*, (e.g., an **uplink** transmission via the shared **OFDMA** channel 654). EX1005, 0264. Ma discloses “in a cellular network, **an uplink** consists of many point-to-point **transmissions** that **are all directed to a base station** (access point) and that originate **from** respective **UE's** operating within a cell (coverage area) serviced by the base station.” EX1005, 0004.

79. Ma discloses an uplink transmission (*the first uplink signal*) *is an orthogonal frequency division multiplexing (OFDM) signal*. For example, Ma provides “a method and apparatus for **uplink** multiple-user access The method and apparatus disclosed herein are **based on [OFDM]** adapted so as to provide an effective uplink multiple-user access scheme that can be used in wireless communication networks.” EX1005, 0110.

80. Ma discloses the *first uplink signal* (e.g., an uplink transmission) *is within a frequency band* (e.g., an “overall OFDM band”). For example, Ma discloses “the **uplink transmission [first uplink signal]** **is classified into two modes,**” **Mode-1** and **Mode-2**. EX1005, 0143. As shown in FIG. 2 (reproduced below), the **uplink**

transmission [first uplink signal] is transmitted within “a common wireless channel 50 [] implemented using an OFDM transmission scheme within an overall OFDM band [a frequency band]. ... the OFDM band is divided into two frequency bands 51, 53 which can be used interchangeably to provide two different OFDMA modes... referred to herein generally as **Mode-1** and **Mode-2** respectively.” EX1005, 0124.



Ma- FIG. 2 (annotated)

81. Accordingly, Ma discloses this limitation.

[1b/11b] the first uplink signal ... utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols;

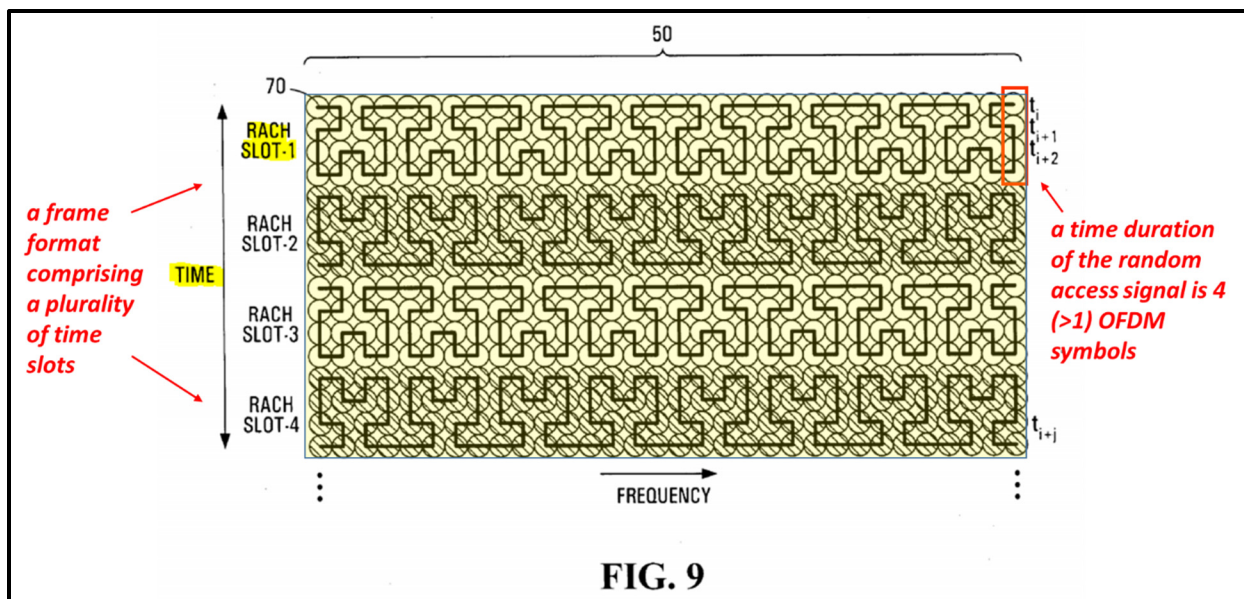
82. Ma discloses “Once the frequency band and mode of operation is assigned to **a given user**, many different approaches to actually **mapping data to the band** may be employed. In an embodiment of the invention, **the mapping pattern defines a** respective **set of** Space-Time Coded Sub-Blocks (**STC-SB**) in the time-frequency dimension. **An STC-SB is a mapping of data to a wireless channel that has both a time and a frequency dimensions.** That is to say, **a single STC-SB spans** multiple sub-carriers and **multiple symbol durations.**” EX1005, 130.

“An example of a single STC-SB 80 is shown in FIG. 1. **An STC-SB includes** a limited number (10 in the illustrated example) of consecutive OFDM sub-carriers in the frequency dimension and **one or more OFDM symbol durations** (two in the illustrated example) in the time dimension.” EX1005, 131.

83. Restated, Ma discloses, for “a given user” (UE), the Mode-1 and/or Mode-2 uplink transmissions [*first uplink signal*] uses “**a respective set of Space-Time Coded Sub-Blocks (STC-SB)** in the **time-frequency dimension**” [*a frame format comprising a plurality of timeslots such as STC-SBs in the time dimension*], wherein “**An STC-SB is a mapping of data to a wireless channel that has both a time and a frequency dimensions.** That is to say, **a single STC-SB spans** multiple sub-carriers and **multiple symbol durations** [*each timeslot, STC-SB, comprising a plurality of OFDM symbols*].” EX1005, 0130. See also EX1005, 0124, 0183-0193; 0245-247.

Ma- FIG. 2 (annotated)

86. Moreover, Ma expressly discloses a RACH signal uses *a frame format comprising a plurality of time slots, each time slot comprising a plurality of OFDM symbols*: “The RACH channel structure in this example consists of the **RACH slots, each RACH slots consisting of 4 OFDM symbols**, with 15 RACH **slots in a 10 ms frame.**” EX1005, 0214, 0081. As shown in FIG. 9, Ma’s RACH signal using *a frame format* is overlaid over the Mode-1 uplink signal. *See also* EX1005, 0081 (“the random access channel comprising: **a plurality of slots, each slot comprising a plurality of OFDM symbol intervals.**”) Ma discloses “**an OFDM access signal occupying a randomly selected slot** selected from **a plurality of slots comprising a frame** [*utilizes a frame format comprising a plurality of timeslots*]” and “**each slot comprises four OFDM symbols** [each timeslot comprising a plurality of OFDM symbols].” EX1005, 0031, 0033, 0049, and 0052.



Ma-FIG. 9 (annotated)

87. The fact that the RACH channel is overlaid on top of the data channel (e.g., Mode-1 channel) would indicate to a POSITA that the data channel would be utilizing a frame format too, to coexist with the RACH channel. *See* EX1005, 0206 (“By ‘overlaid’ it is meant that RACH is transmitted simultaneously both in time and frequency with the transmission of the other Mode-1 signals by other users.”), 0208 (“The RACH channel structure is preferably based on PN spreading, overlaid over the MC-OFDMA,”) wherein “a MC-OFDMA based Mode-1 uplink can support low delay and fixed data rate circuitry data.” EX1005, 0160. A POSITA would have found it obvious that the underlying Mode-1 uplink signal also uses a frame format to be compatible with the overlaid RACH signal such that the transmissions will share a common OFDM symbol boundary in the same time-

frequency resources, and for the ease of system design and correct detection and separation of the RACH signal and Mode-1 uplink signal. Especially Ma discloses “both RACH and Mode-1 channels combined in Mode-1 frequency space,” which enables “joint RACH detection and uplink synchronization” and to “[r]ecover the bits of Mode-1 traffic.” EX1005, 0102, 0104, 0220-0232.

88. Furthermore, it would have been obvious to a POSITA that Ma’s uplink signal (e.g., Mode-1 and/or Mode-2) would use a frame format because a practical communication system would utilize a frame format agreed to by the transmitter and the receiver (e.g., following a communication protocol/standard) so that the receiver would be able to detect the transmission by identifying boundaries of the received signals. For example, TR discloses the frame structure as one of “the key technical parameters and characteristics of the OFDMA UTRA proposal” and specifies example parameters of the frame format, such as a “[d]ata frame length” including “16 slots/frame.” *See e.g.*, EX1006, 177-178, 198, Figure 6. Also, Jung, another prior art reference, discloses that “[t]he Node B and the UE support a **wireless communication service using transmission frames**. Therefore, the Node B and the UE **must mutually acquire synchronization for transmission and reception of transmission frames**.” EX1009, 0005. Further corroborating evidence can be found in Walton, which discloses various “Frame Structures” “to use for the MIMO WLAN system.” EX1013, 0081-0082.

89. In fact, a frame format comprising one or more levels of divisions (e.g., slots, sub-frames) and/or sub-divisions (e.g., symbols) in the time domain has been well-known and commonly implemented in a practical communication system. *See e.g.*, EX1006, 177-178, 198, Figure 6; and EX1013, 0081-0082, FIGS. 3A, 3B and 3C, and FIG. 4. To a POSITA, frames, slots, sub-frames, and/or symbols are all well-known ways to divide up a time-domain resource for signal transmission. Different communication systems or protocols may have different levels of divisions and/or sub-divisions, and may refer to the divisions and/or sub-divisions as different names. The specific duration of each of the divisions and/or sub-divisions can be configured, for example, based on system design criteria, compatibility with other communication protocols/standards, and other factors. For example, Walton discloses that the “specific frame structure to use for the MIMO WLAN system is dependent on various factors such as, for example, (1) whether the same or different frequency bands are used for the downlink and uplink and (2) the multiplexing scheme used to multiplex the transport channels together.” EX1013, 0082. “For clarity, a specific implementation of the TDD-TDM frame structure is described throughout the specification. For this implementation, the duration of each TDD frame is fixed at 2 msec, and the number of OFDM symbols per TDD frame is a function of the length of the cyclic prefix used for the OFDM symbols.... Other frame structures and other implementations may also be used.”

EX1013, 0097. “A PHY frame may also be defined to comprise some other number of OFDM symbols (e.g., one, two, four, eight, and so on)....The PHY frame size may be selected based on the expected traffic such that inefficiency is minimized. In particular, if the frame size is too large, then inefficiency results from using a large PHY frame to send a small amount of data. Alternatively, if the frame size is too small, then the overhead represents a larger fraction of the frame.”

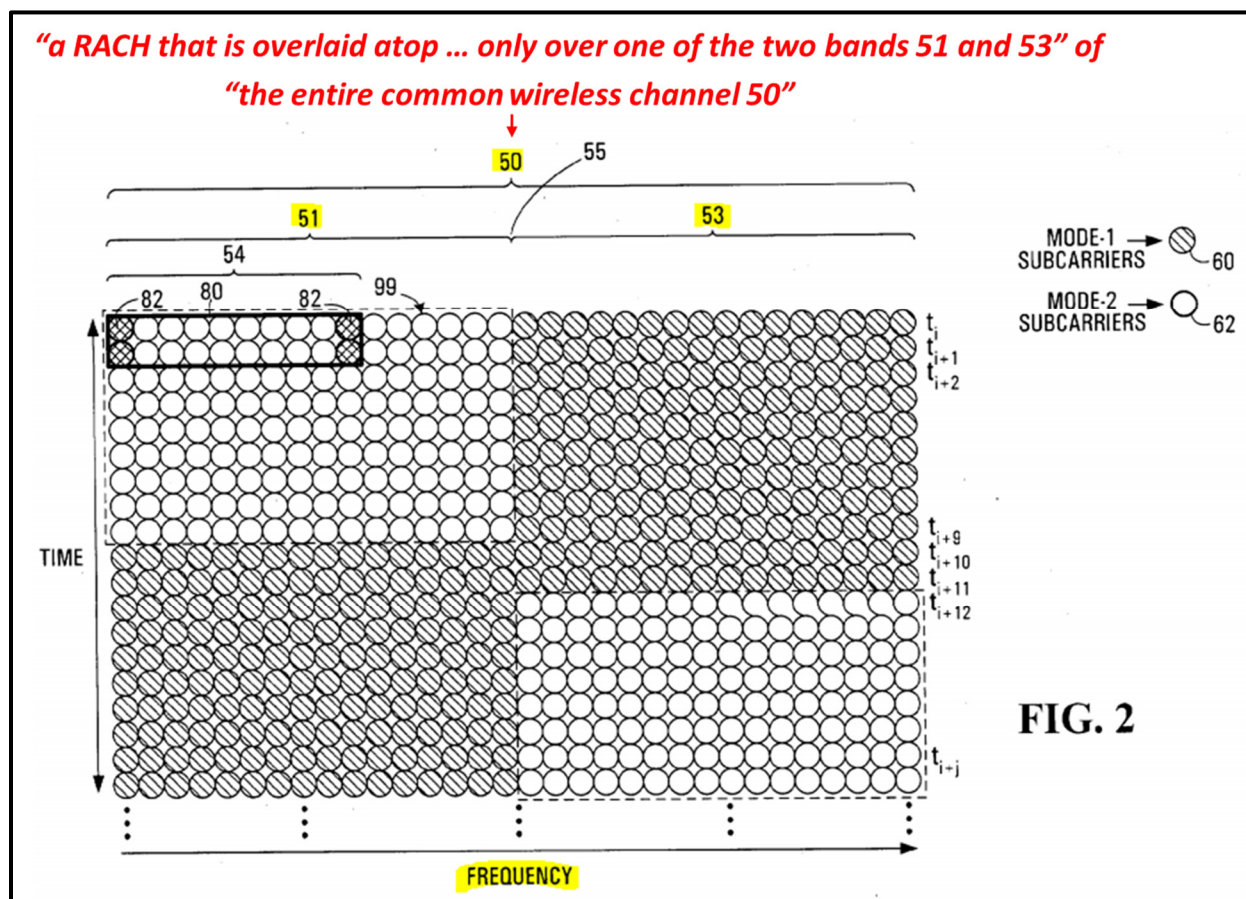
EX1013, 0167.

90. To the extent that one argues that Ma alone does not expressly disclose the “frame format,” it would have been obvious to a POSITA to combine Ma and TR, to adapt TR’s system characteristics (e.g., the frame format) for UMTS system in implementing Ma’s system because it would have been merely the application of known techniques (e.g., transmitting signals in a frame format as taught by TR and well-known and widely used in the art) to a known system (Ma’s OFDMA communication system) ready for improvement to yield predictable results.

EX1006, 177-178. A POSITA would have had a reasonable expectation of success in this implementation at least because Ma and TR are related to similar methods and systems (i.e., data transmission and random access in OFDMA-based communication systems). A POSITA would have understood that the predictable combination Ma-TR would result in transmitting an uplink signal using such a frame structure for at least this reason and the reasons stated in Section VI.C.

[1c/11c] transmit/transmitting, to the base station, a random access signal followed by a guard period in only a portion of the frequency band,

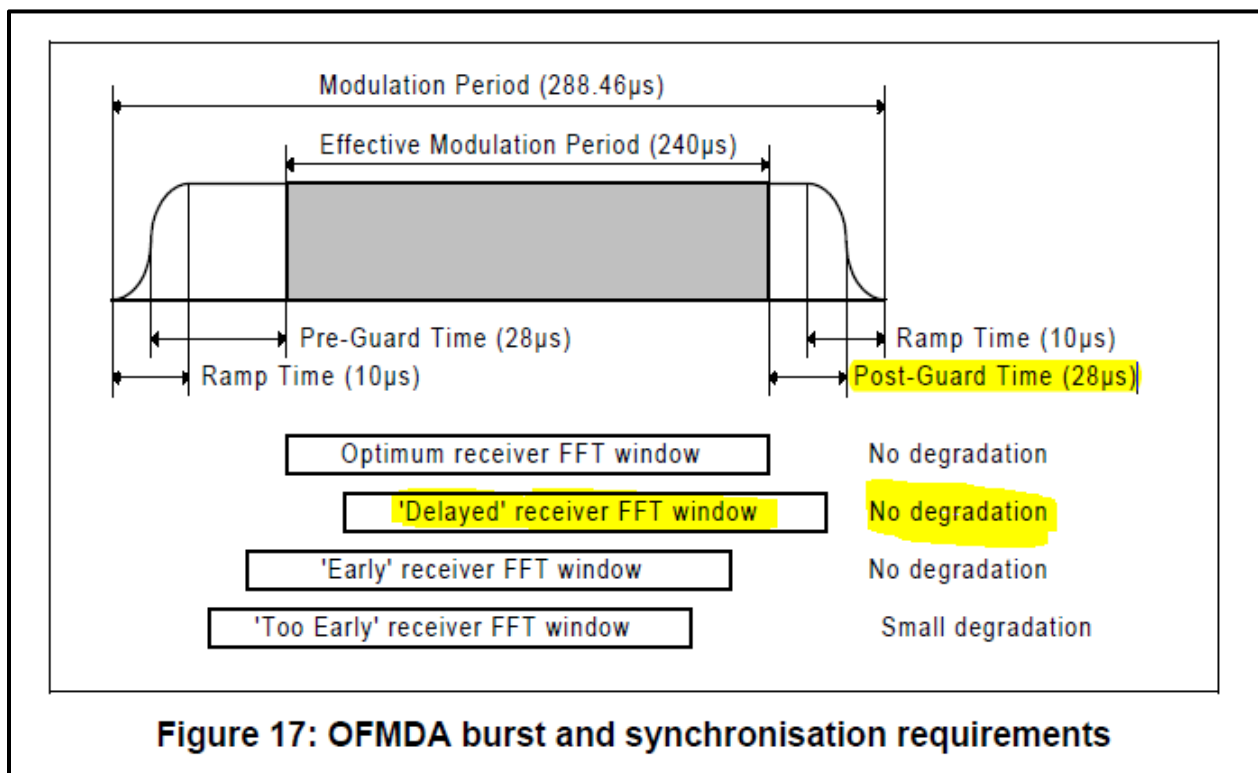
91. Ma discloses a *random access signal* transmitted on “a **RACH that is overlaid atop the entire common wireless channel 50** [*the frequency band*] or **only over one of the two bands 51 and 53** [*only a portion of the frequency band*] shown in FIG. 1 [*sic*].” EX1005, 0206.



Ma-FIG. 2(annotated)

92. As explained in Section VI.B, TR discloses the *random access signal* followed by a guard period. Specifically, TR “**proposes ... an additional guard**

interval at the back of the OFDM symbol, therefore an timing inaccuracy of $\pm 10\mu\text{s}$ can be handled without any performance degradation.” EX1006, 207. As shown in Figure. 17, the **guard interval following the OFDM symbol** can accommodate a received signal falling within the “‘Delayed’ receiver FFT window” and still have “No [performance] degradation.” EX1006, 207-208.



TR-Figure. 17 (highlighted)

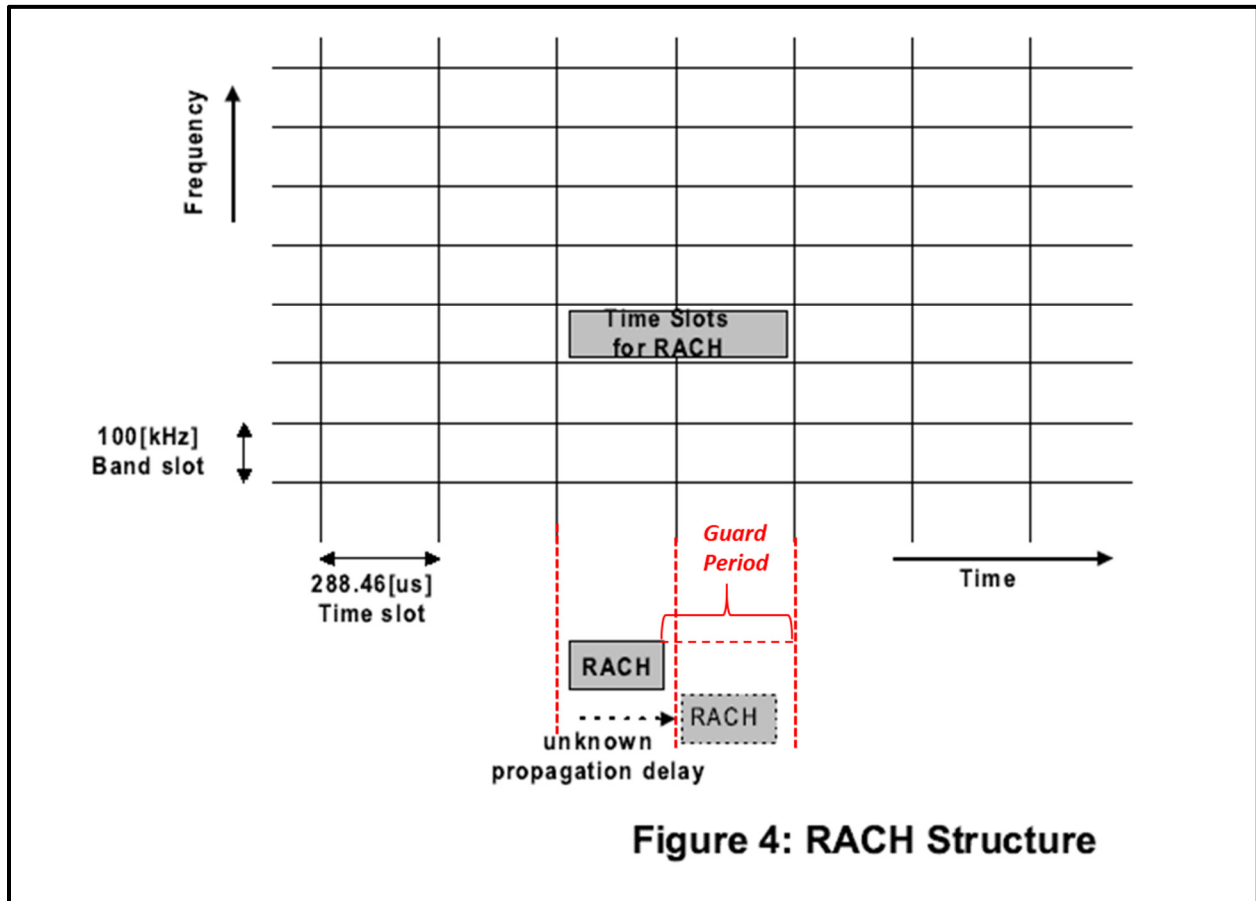
93. TR also notes that “the guard time helps to compensate timing misalignments,” **especially for** the *random access signal* transmitted on **RACH**: “In the uplink the rough timing offset is detected by the base station by measuring the arrival time of the **RACH** burst.” EX1006, 207. In view of these advantages of the “guard interval,” a POSITA would have been motivated to include “an

additional guard interval at the back of the OFDM symbol” as proposed by TR in Ma’s *random access signal* transmitted on the RACH that include one or more OFDM symbols. *See* EX1005, 0207 (“The RACH is preferably implemented using a long spreading code which is then mapped to OFDM symbols in a defined RACH slot. A **RACH slot** is defined as a **set of OFDM symbol durations** in time, preferably consecutive.”) Regardless of the number of OFDM symbols in Ma’s *random access signal*, the “**additional guard interval at the back of the [last] OFDM symbol**” in Ma’s *random access signal* constitutes a *guard period* following the *random access signal*. The resulting Ma-TR combination renders this limitation obvious.

94. Besides the “**guard interval at the back of the OFDM symbol**” within a time slot (of “Modulation Period (288.46 μ s)”), TR also discloses additional guard time following a RACH burst [*random access signal*] to account for the “unknown propagation delay.” EX1006, 197. As shown in Figure. 4, while reserving “Two continuous time slots ... for the RACH burst,” the actually transmitted RACH burst [*random access signal*] occupies no more than one time slot (of 288.46 μ s), leaving another time slot unoccupied as an additional buffer to account for the propagation delay of the random access signal “because the propagation delay is unknown before communication starts between MS and BS.” EX1006, 197. As such, TR discloses the RACH burst [*random access signal*] followed by a *guard*

period that includes the “guard interval at the back of the OFDM symbol” and/or another time slot following the time slot in which the RACH burst is transmitted.

EX1006, 197, 207-208.



TR-Figure. 4 (annotated)

95. In view of the “unknown propagation delay” particular to the random access signal as pointed out by TR, a POSITA would have been inspired to likewise add the additional safeguard following Ma’s random access signal in the time domain to provide more buffer to ensure correct reception of the random access signal.

96. For at least the above reasons, as well as the discussion in Section VI.C, a POSITA would have been motivated to apply the “guard time” feature as disclosed in TR to Ma’s *random access signal*, for example, to achieve various known advantages such as “to be robust against very long multi-path delay,” “to compensate timing misalignments” to handle a “a timing inaccuracy ... without any performance degradation,” especially for transmitting the random access signal “because the propagation delay is unknown before communication starts between MS and BS,” as discussed in TR. EX1006, 197, 199, 207-208. Moreover, this ordinary implementation of the guard time would have been merely the application of a known technique (adding a guard interval after an OFDM symbol in a *random access signal l* and/or adding another guard interval after the entire *random access signal*, as taught by TR) to a known system (Ma’s OFDMA communication system) ready for improvement to create a *guard period* following the *random access signal* to yield predictable results. A POSITA would have had a reasonable expectation of success in such an implementation at least because both Ma and TR are related to similar methods and systems (i.e., random access in OFDM-based communications).

97. Accordingly, Ma-TR renders obvious the limitation.

[1d/11d] wherein the random access signal includes a sequence associated with the base station,

98. Ma's *random access signal* **includes** "a long spreading code"/"RACH code"/ "PN code"/"RACH signature" transmitted in a RACH channel, which can be a "PN *sequence*" or a "Golay *sequence*." See e.g., EX1005, 0207 ("The **RACH is preferably implemented** using a long **spreading code** which is then mapped to OFDM symbols **in a defined RACH slot.**") EX1005, 0208 ("The **RACH channel structure** is preferably **based on PN spreading**, overlaid over the MC-OFDMA. For each RACH slot, **a plurality of Quasi-orthogonal PN codes define a set of RACH signatures.**") EX1005, 0214 ("A Golay sequence can be used as **RACH signature**").

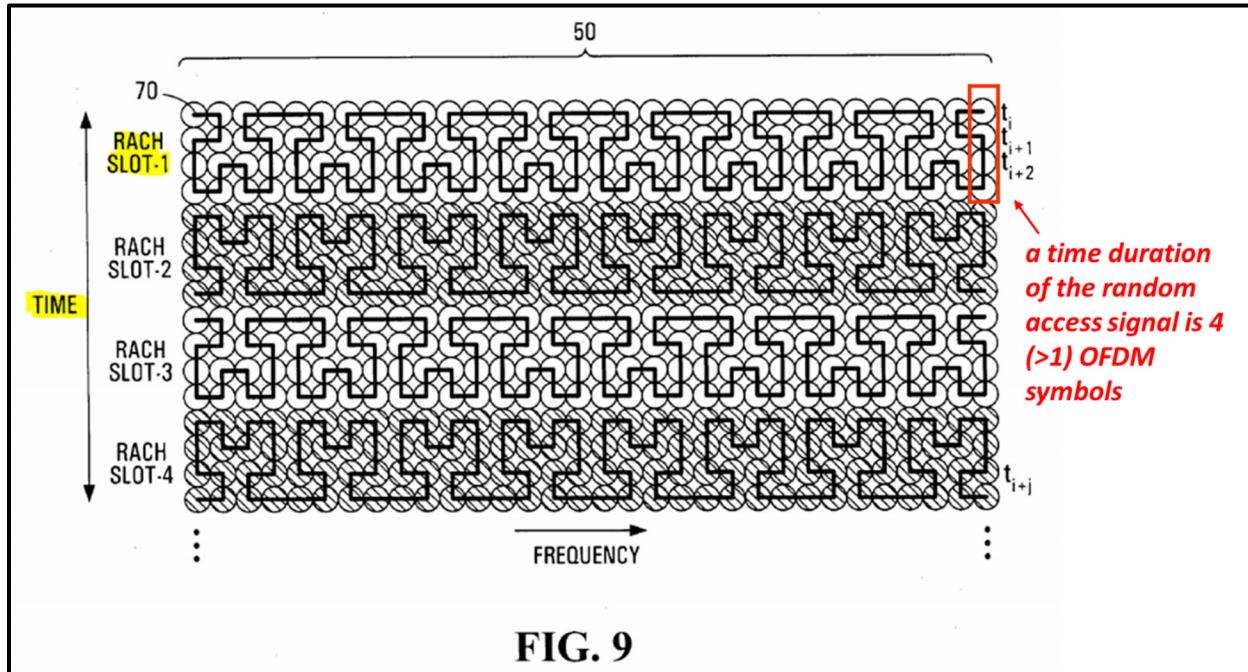
99. Ma discloses "**RACH code** [the *sequence*], **chosen randomly from serving base station's code set**" (i.e., *associated with the base station*). EX1005, 0238. "A dedicated long complex **PN/Golay code set** is **reserved for RACH of each base station.**" EX1005, 0215.

100. Accordingly, Ma discloses the limitation.

[1e/11e] wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols; and

101. Ma discloses *the random access signal*, e.g., "The **RACH [] implemented** using a long spreading code which is then mapped to OFDM symbols **in a defined RACH slot.**" EX1005, 0207. *The time duration of the random access signal* includes "A **RACH slot [that] is defined as a set of OFDM symbol durations in**

time, preferably consecutive. In the example of FIG. 9, **each RACH slot consists of four OFDM symbol durations,**” i.e., **four times** of a time duration of an OFDM symbol, and thus *is greater than a time duration of at least one of the plurality of OFDM symbols. Id.*



Ma-FIG. 9 (annotated)

102. As discussed in Section VI.C, a POSITA would have been motivated to add the “Post-Guard time” (*the guard period*) as disclosed in TR to Ma’s RACH signal that has *a time duration already greater than a time duration of at least one of the plurality of OFDM symbols*. Accordingly, Ma-TR renders obvious *a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols*. EX1005, 0207.

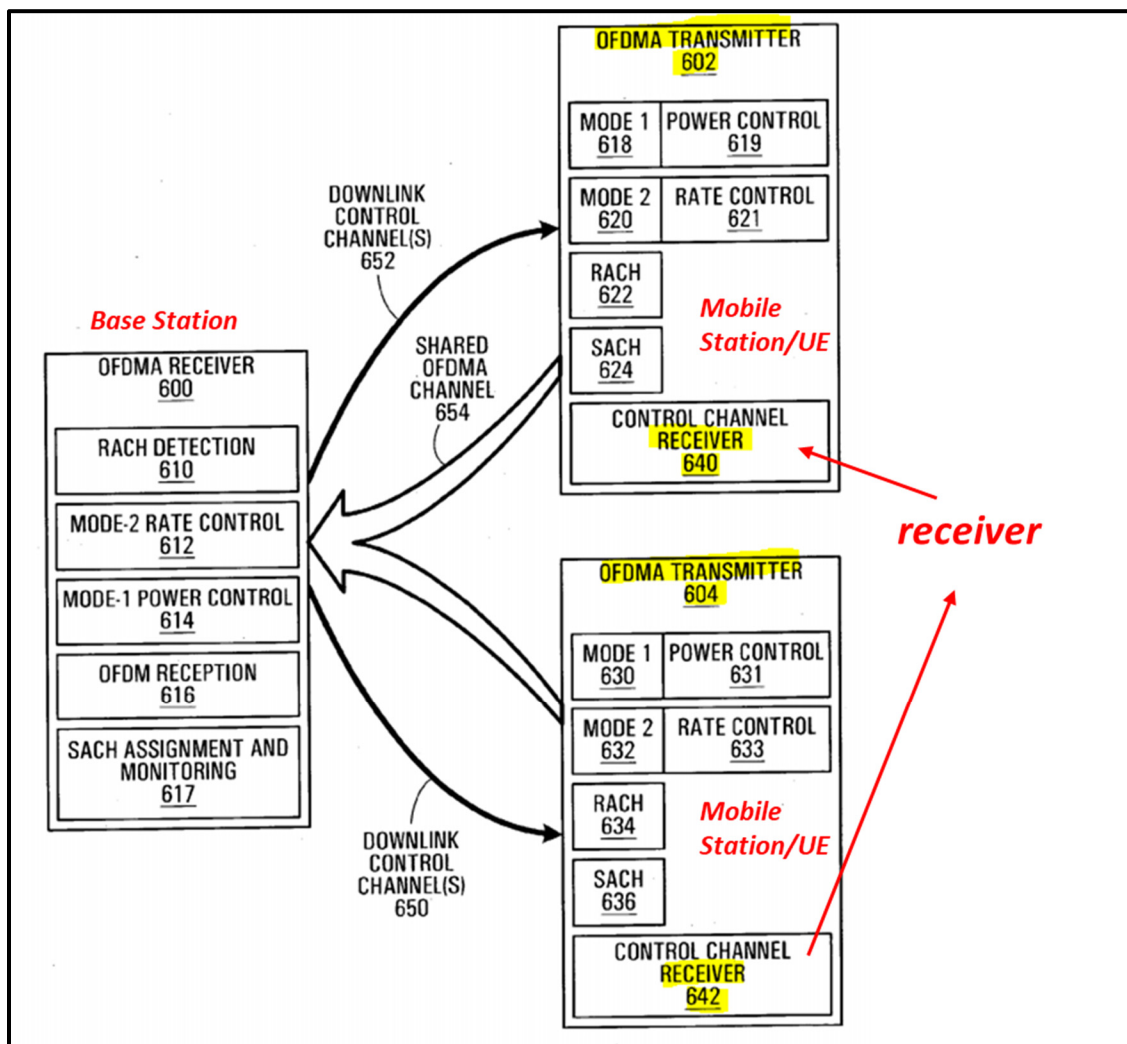
[1f/11f] [a receiver configured to receive]]/[receiving], from the base station, a response message.

103. Ma discloses that, after “UE sends RACH code,” “[i]f the base station detects the RACH code successfully,” the **base station** sends *a response message* that includes “the initial dedicated uplink access channel grant, together with the RACH code index as well as the time offset information.” EX1005, 0238, 0239. “**The UE then detects such signature** to identify access grant **through DL signaling channel**” (i.e., *the mobile station receives, from the base station, the response message*). EX1005, 0239.

104. Ma discloses “the **wireless terminal further comprises: a control channel receiver**” (i.e., *mobile station comprising a receiver*). See e.g., EX1005, 0025, 0026, 0032, 0036, 0044, 0050, 0051, 0053, 0057. Also, FIG. 1 shows “**the OFDMA transmitter 602,604 is a wireless terminal such as a mobile station**” and “**Each OFDMA transmitters 602,604 also are shown having a respective control channel receiver 640,642**” that configured to receive signals through the control channel (i.e., *the response message “through DL signaling channel.”*) EX1005, 0264-0265, 0239.

105. Moreover, Ma also discloses “each of the OFDMA transmitters 602,604” (*mobile station*) can include apparatus(es) to implement the disclosed function. See EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the

functions which are shown **can be implemented** as separate physical blocks, or can be integrated into a single design implemented **in software and/or hardware and/or firmware**. The same is true for each of the OFDMA transmitters 602,604.”) A POSITA would understand that Ma discloses *the mobile station includes a receiver* that performs the disclosed function of “*from the base station, a response message*” as explained above.



Ma-FIG. 1 (annotated)

[21a] a first type of transmitter signal processing circuit configured to: generate a first uplink signal, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols; modulate the first uplink signal onto a first set of OFDM subcarriers;

106. As discussed in Section VII.A.[1a/11a] and [1b/11b], Ma discloses a transmitter configured to: transmit, to a base station, a first uplink signal (e.g., uplink transmission such as a Mode-1 and/or Mode-2 transmission) within a frequency band, wherein the first uplink signal is an OFDM signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols. That is, Ma discloses a transmitter configured to transmit the claimed *first uplink signal*, and either Ma's Mode-1 or Mode-2 uplink transmission constitutes the *first uplink signal*. Correspondingly, the *transmitter signal processing circuit configured to generate and modulate* the Mode-1 or Mode-2 uplink transmission as disclosed by Ma constitutes the claimed *first type of transmitter signal processing circuit*. Indeed, Ma discloses multiple mappings of the claimed *first type of transmitter signal processing circuit*. See e.g., EX1005, 0264 ("It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the **functions** which are shown **can be implemented** as separate physical blocks, or can be integrated into a single design **implemented in software and/or hardware**

and/or firmware. The same is true for each of the OFDMA transmitters 602,604.”)

107. As a first mapping, for a Mode-2 uplink transmission [*a first uplink signal*], Ma discloses “**the wireless terminal has ... a second transmit chain for generating** [*a first type of transmitter signal processing circuit configured to generate*] and **transmitting a burst-mode transmission** [Mode-2 transmission, *a first uplink signal*] in a second frequency band of the **OFDM** band.” EX1005, Abstract. *See* EX1005, 0124, 0143 (“Mode-2 is used to provide higher rate bursty packet connectivity.” “Mode-2 supports the transmission of high speed data bursts.”) The **second transmit chain** (i.e., *the first type of transmitter signal processing circuit*) is configured to modulate the first uplink signal onto a first set of OFDM subcarriers because Ma discloses the “**second transmit chain for generating and transmitting a burst-mode transmission in a second frequency band of the OFDM band,**” and “The **modulation** technique employed in **OFDMA is OFDM. OFDM is a method of digital modulation** in which a set of **data is mapped onto the set of OFDM sub-carriers.**” EX1005, Abstract, 0122.

108. FIG. 13 shows “an example **transmitter for Mode-2** operation” as an example of *the first type of transmitter signal processing circuit* corresponding to the Mode-2 uplink transmission [*a first uplink signal*], EX1005, 0106, 0248-0252.

The transmitter includes at least “**A-STC function 516**” “*configured to modulate the first uplink signal onto a first set of OFDM subcarriers*”:

FIG. 13 is a block diagram of transmitter functionality for Mode-2 operation. This example architecture includes MAC interface **500** through which is received a packet to be transmitted in Mode-2. The packet is then processed with data scrambler **502**, CRC adding block **504**, turbo encoder **506**, rate matching block **508**, bit interleaver **510**, QAM mapping **512** and symbol interleaver **514** the output of which is fed to an **A-STC function 516 which generates the output which is then multiplexed as indicated at 518 with Mode-1 data.** It is to be understood that this diagram is a very specific example and that in general these blocks may not all be required.

It is noted that in the example assignment of **STC sub-blocks for Mode-2 given in FIG. 12, the STC sub-blocks of a given user are contiguously assigned.** In a preferred embodiment, **the STC sub-blocks for Mode-2 transmission are also hopped in frequency.** In this case, when the user is assigned the opportunity for Mode-2 transmission, the assignment needs to contain sufficient information to identify the hopping pattern so that each user can identify exactly where in a time and frequency there packet will be transmitted using STC sub-blocks.

EX1005, 0250-0251

109. The STC sub-blocks carry modulation symbols of *the first uplink signal* that are *modulated onto a first set of OFDM subcarriers*:

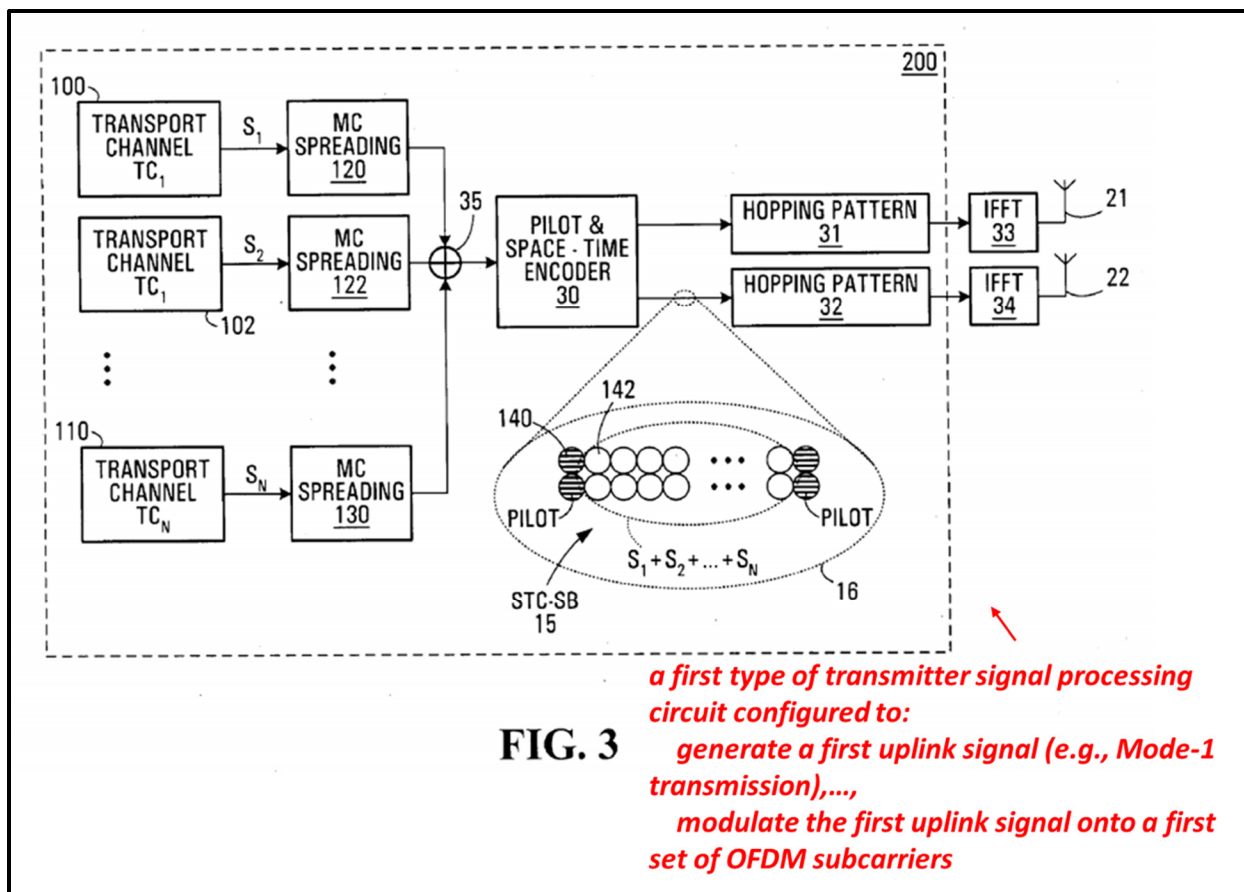
In the illustrated example, there is a frequency band assigned **for Mode-2 operation which is wide enough for three STC sub-blocks**. These can be assigned in any manner for Mode-2 operation. However, preferably they are assigned in contiguous blocks both in time and frequency. Thus, in the illustrated example shown is a first block of STC sub-blocks **84** consisting of two adjacent STC sub-blocks in frequency transmitted for four STC sub-blocks in time. This is used for user **1** pilot **sub-carriers 93** and user **1** data **sub-carriers 94**. Similarly, a block **86** is shown for user **2** pilots **95** and data **96**. In this case, the block consists of a single STC sub-block transmitted for five consecutive STC sub-blocks in frequency. A block of assigned sub-blocks for user **3** is indicated at **89** with user **3** pilot sub-carriers **97** and data sub-carriers **98**. Other groupings of STC sub-blocks are shown as **90** and **92**.

EX1005, 0248

110. As a second example of the *first type of transmitter signal processing circuit*, for a Mode-1 uplink transmission [*a first uplink signal*], Ma discloses “**the wireless terminal has a first transmit chain for generating** [*a first type of transmitter signal processing circuit configured to generate*] and **transmitting a low rate mode OFDM transmission** [Mode-1 transmission, *a first uplink signal*] in a first frequency band of **the OFDM band**.” EX1005, Abstract. *See* EX1005, 0124, 0143 (“Mode-1 is used to provide **low rate circuit oriented connectivity** for multiple users simultaneously preferably using orthogonal code separation.”)

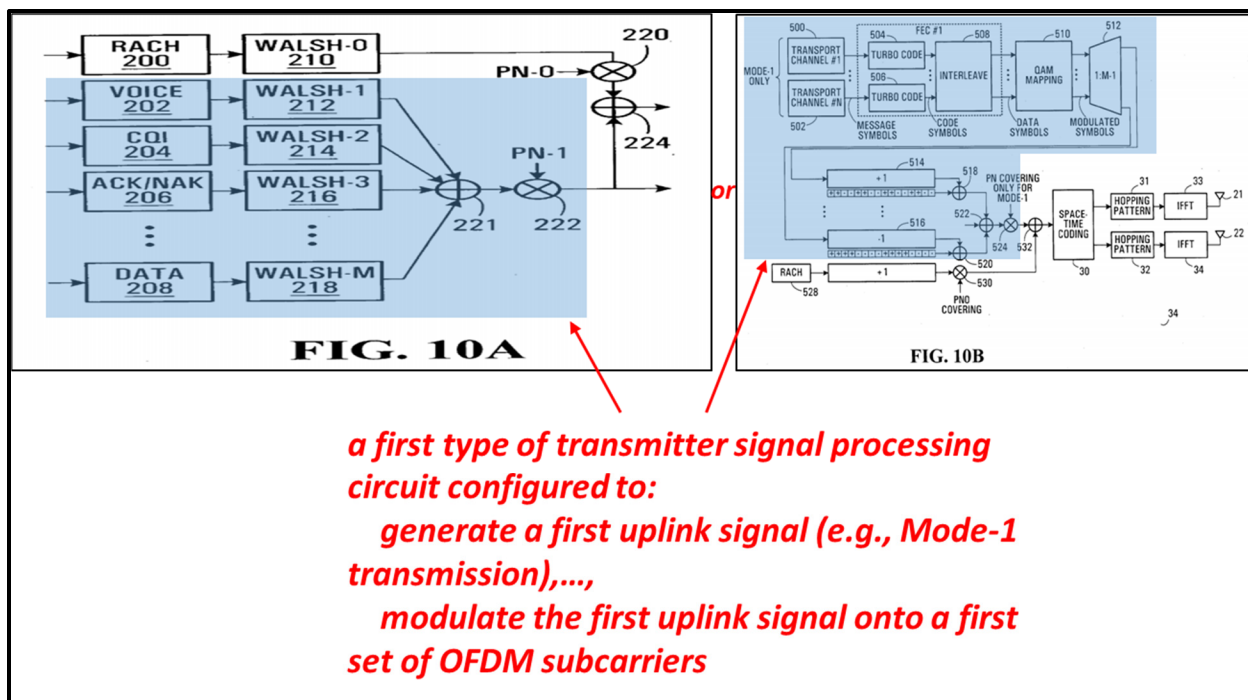
The **first transmit chain** (i.e., *the first type of transmitter signal processing circuit*) is configured to modulate the first uplink signal onto a first set of OFDM subcarriers because Ma discloses the “**first transmit chain for generating and transmitting a low rate mode OFDM transmission** in a first frequency band of **the OFDM band**,” and “The **modulation** technique employed in **OFDMA is OFDM. OFDM is a method of digital modulation** in which a set of **data is mapped onto the set of OFDM sub-carriers.**” EX1005, Abstract, 0122.

111. Ma shows multiple examples of *the first type of transmitter signal processing circuit* corresponding to the Mode-1 uplink transmission [*a first uplink signal*], such as, “FIG. 3 is a block diagram of a **transmission signal chain** that can be used to generate a **Mode-1 uplink signal**,” “FIG. 10A is a block diagram of a **transmitter** showing both RACH and **Mode-1 channels** combined in Mode-1 frequency space” and “FIG. 10B is **another example transmitter design** similar to that of FIG. 10A,” EX1005, 0095, 0102, 0103, and 0252. *See also* EX1005, 0151-0161 (disclosing the transmission signal chain in FIG. 3 includes at least “the Pilot and ST-Encoder 30” *configured to modulate the first uplink signal* (Mode-1 signal including modulation symbols “STC symbols 142”) *onto a first set of OFDM subcarriers* (subcarriers in the “STC sub-block 16” of “the Mode-1 frequency band”).



Ma-FIG. 3 (annotated)

112. To the extent that the claimed *first type of transmitter signal processing circuit* is construed to be different from the *second type of transmitter signal processing circuit configured to generate an random access signal* as discussed infra in claim element [21b], the transmitters shown in FIGS. 10A or 10B, except the circuit for RACH transmission, constitute examples of the first type of transmitter signal processing circuit corresponding to the Mode-1 transmission [a first uplink signal].



Ma-FIGS. 10A, 10B (annotated)

113. Accordingly, Ma discloses this limitation.

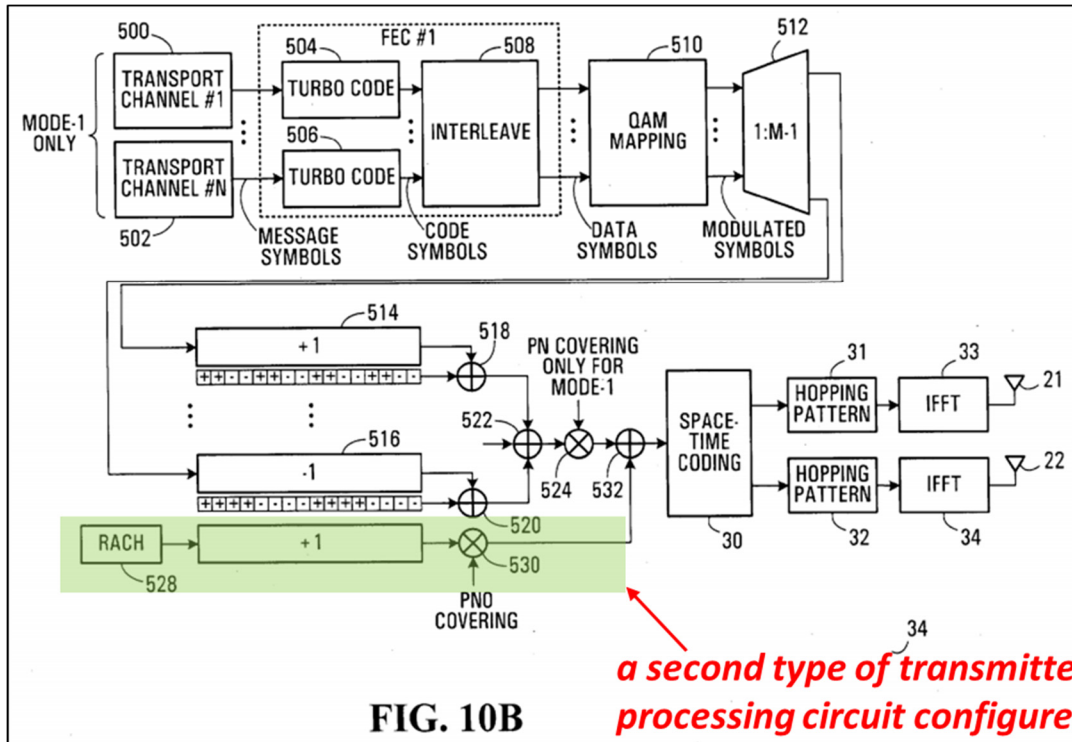
[21b] a second type of transmitter signal processing circuit configured to generate an random access signal followed by a guard period, wherein the random access signal includes a sequence associated with a base station, wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols;

114. As discussed in Section VII.A.[1c/11c], [1d/11d] and [1e/11e], Ma discloses *a transmitter configured to: transmit an [sic] random access signal followed by a guard period, wherein the random access signal includes a sequence associated with a base station, wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the*

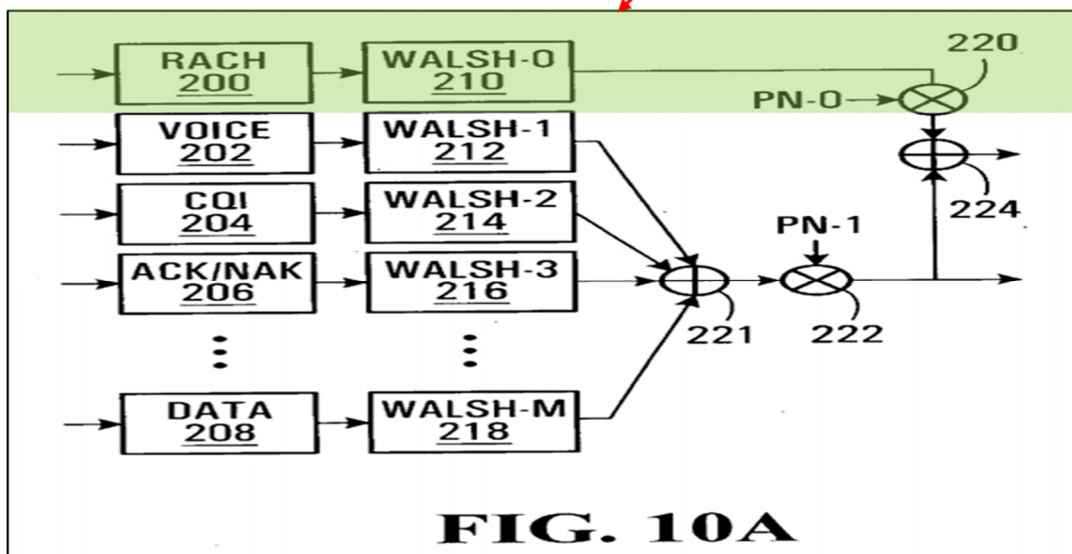
plurality of OFDM symbols. That is, Ma discloses a transmitter configured to transmit the claimed *random access signal*. Correspondingly, the *transmitter signal processing circuit configured to generate the random access signal* as disclosed by Ma constitutes the claimed *second type of transmitter signal processing circuit*. See e.g., EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the **functions** which are shown **can be implemented** as separate physical blocks, or can be integrated into a single design **implemented in software and/or hardware and/or firmware**. The same is true for each of the OFDMA transmitters 602,604.”)

115. More specifically, because Ma’s random access signal can be overlaid with the Mode-1 signal, Ma shows example transmitters including circuits for both RACH and Mode-1 signal: “FIG. 10A is a block diagram of a **transmitter** showing both **RACH** [*configured to generate an random access signal*] and Mode-1 **channels** combined in Mode-1 frequency space” and “**FIG. 10B is another example transmitter design similar to that of FIG. 10A,**” EX1005, 0206, 0102, 0103, and 0252, Abstract. “FIG. 10A shows an example multiplexing scheme to **generate the RACH** [*configured to generate an random access signal*] and Mode-1 traffic channel.” EX1005, 0216. Similarly, in FIG. 10B, “[t]he **RACH channel** is indicated **at 530.**” EX1005, 244.

116. As such, the below annotated FIGS. 10A and 10B shows examples of *the second type of transmitter signal processing circuit configured to generate an random access signal (i.e., RACH signal)*:



a second type of transmitter signal processing circuit configured to generate a random access signal



Ma-FIGS. 10A and 10B (annotated)

117. Accordingly, Ma-TR renders obvious this limitation.

[21c] a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal⁶;

118. As discussed in Section VII.A.[1a/11a]-[1e/11e], Ma discloses the mobile station transmits at least the first uplink signal or the random access signal, each being an OFDM signal and thus a digital signal because “**OFDM is being**

⁶ The '908 Patent does not define “***a digital signal***” but indicates that the “[Multi-Carrier (MC)] signal” (“such as an Orthogonal Frequency Division Multiplexing (OFDM)” signal) and DSSS signal” are both digital signals because they “are added together prior to Digital to Analog (D/A) conversion **830.**” EX1001, 4:64-66; 1:43-46. A POSITA would understand a digital signal to be the input to a D/A converter or the output of an analog-to-digital (A/D) converter, as plainly explained in the Textbook. EX1022, 8-9, Figure 1.3. A POSITA would further understand that a digital signal is a discrete-time signal (i.e., a signal defined only at certain specific values of time) that takes on values from a finite set of possible values. EX 1022, 15, 13. This is in contrast to an analog signal, which a POSITA would understand to be a signal that is defined for every value of time and can take on values over a continuous interval. EX 1022, 12-13.

considered as a **method of obtaining** high-speed **digital data** transmission,” and “**OFDM** is a method of **digital modulation** in which a set of data is mapped onto the set of OFDM sub-carriers.” EX1005, 0008, 0122.

119. Ma discloses *a circuit* (e.g., including one or more of the adder 224 in FIG. 10A, adder 532 in FIG. 10B, the multiplexer 554 and the IFFT 556 in FIG. 15) *configured to provide at least the first uplink signal or the random access signal to output a digital signal* (e.g., an OFDM signal). *See e.g., EX1005, FIG. 10B, 0216 (“Adder 224 combines the RACH and Mode-1 signals. In the event the RACH is only used for access, then the RACH and Mode-1 signals would be mutually exclusive.”)*

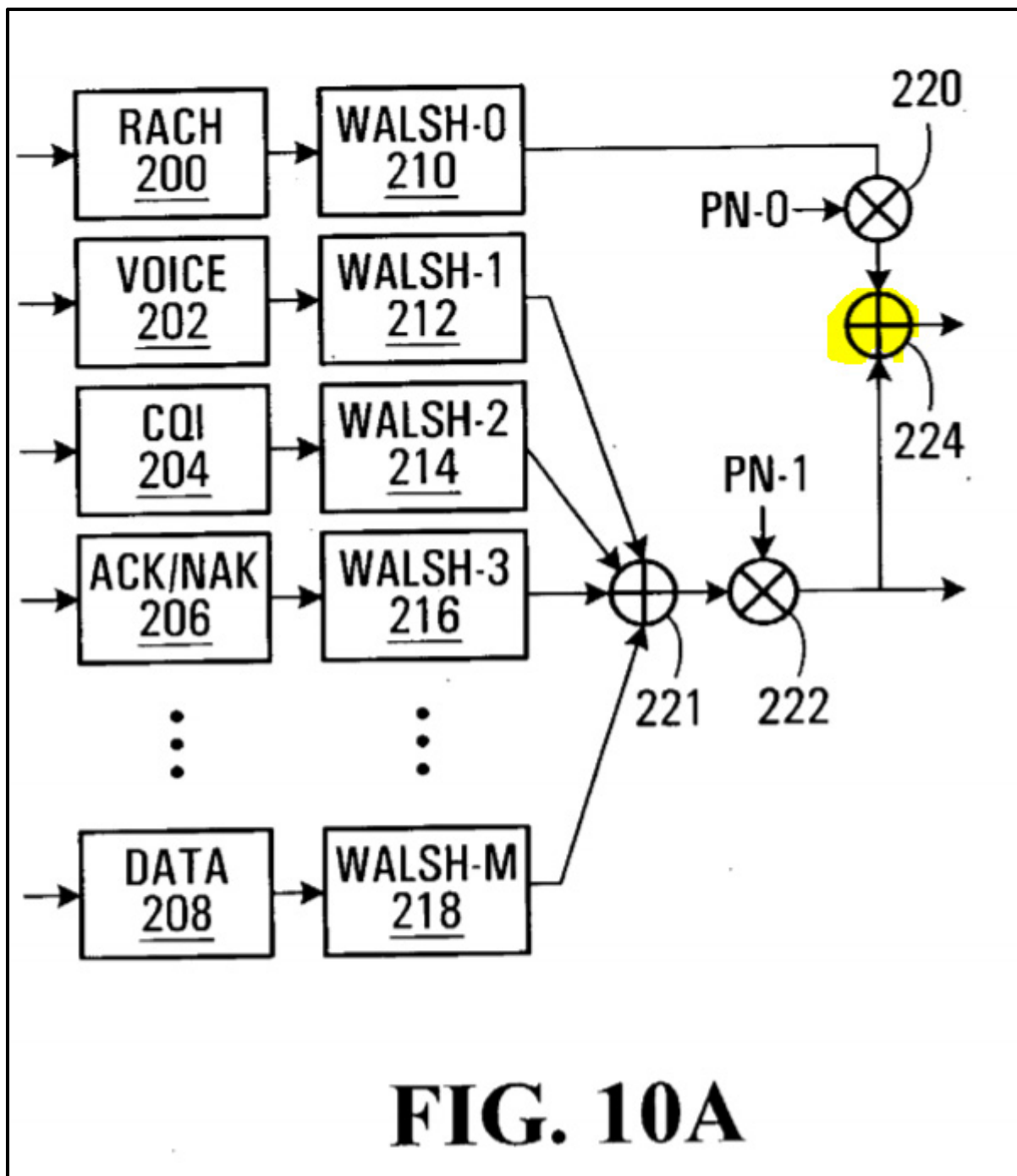
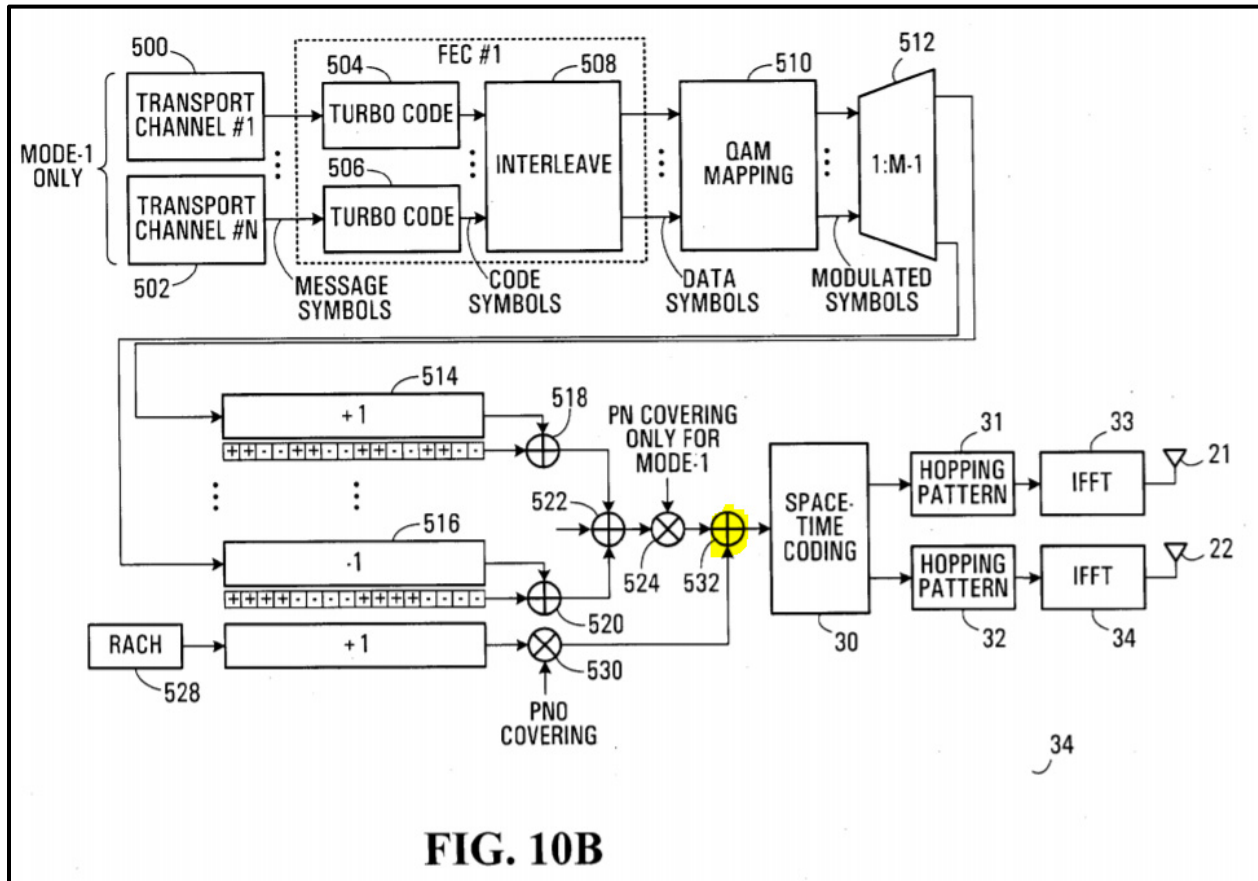


FIG. 10A

Ma-FIG. 10A (highlighted)

120. See also EX1005, FIG. 10B, 244 (“The **RACH channel content and the remaining content is combined in adder 532**.... It is noted that while two inputs

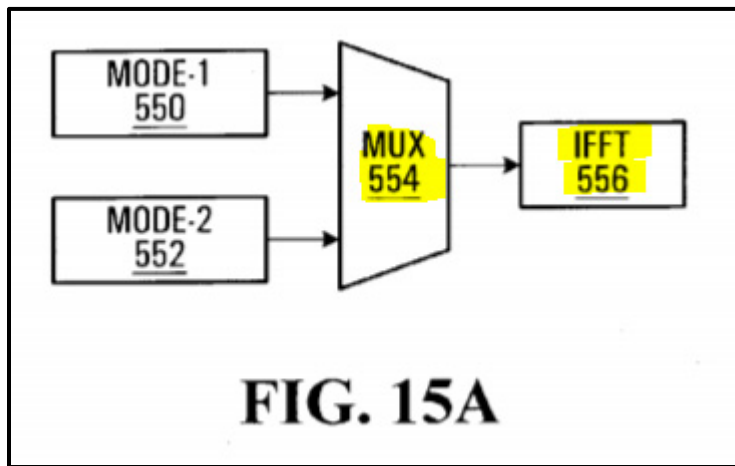
are shown to **adder 532**, typically only **one of them would be active** at a given instant for a single UE [*configured to provide at least the first uplink signal or the random access signal to output a digital signal*].”)



Ma-FIG. 10B (highlighted)

121. See also EX1005, FIG. 15A, 0252 (“The Mode-1 output [] 550, and a Mode-2 output [] 552, ... are **both input to a multiplexer function 554 connected to the IFFT 556** [*configured to provide at least the first uplink signal or the random*

access signal to output a digital signal].”)



Ma-FIG. 15A (highlighted)

122. Accordingly, Ma-TR renders obvious this limitation.

[21d] a digital-to-analog (D/A) conversion circuit configured to convert the digital signal to an analog signal;

123. As discussed in Section VII.A.[1a/11a]-[1e/11e] and [21c], Ma discloses the mobile station transmits at least the first uplink signal or the random access signal and a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal.

124. Ma discloses the *digital signal*, e.g., an OFDM signal output of the “**IFFT** (inverse fast Fourier transform) functions ... are connected to corresponding **antennas 21 and 22**” for transmitting an analog signal in a physical frequency band. *See e.g.*, EX1005, FIG. 3, FIG. 10, 0252 (“FIG. 15B [*sic*] illustrates an example of how Mode-1 and Mode-2 are combined in a transmitter architecture.

The Mode-1 output... and a Mode-2 output... are both input to a multiplexer function 554 connected to the **IFFT 556**. This functionality would be **implemented for each antenna**). *See also* EX1005, 0014 (“**the wireless terminal comprises a plurality N of transmit antennas,**” and “**OFDM transmission**” is “**transmitted on each transmit antenna during each set of N OFDM transmission intervals.**” EX1005, Abstract (“the wireless terminal has a first transmit chain for generating and transmitting a low rate mode OFDM transmission in a **first frequency band of the OFDM band**”).

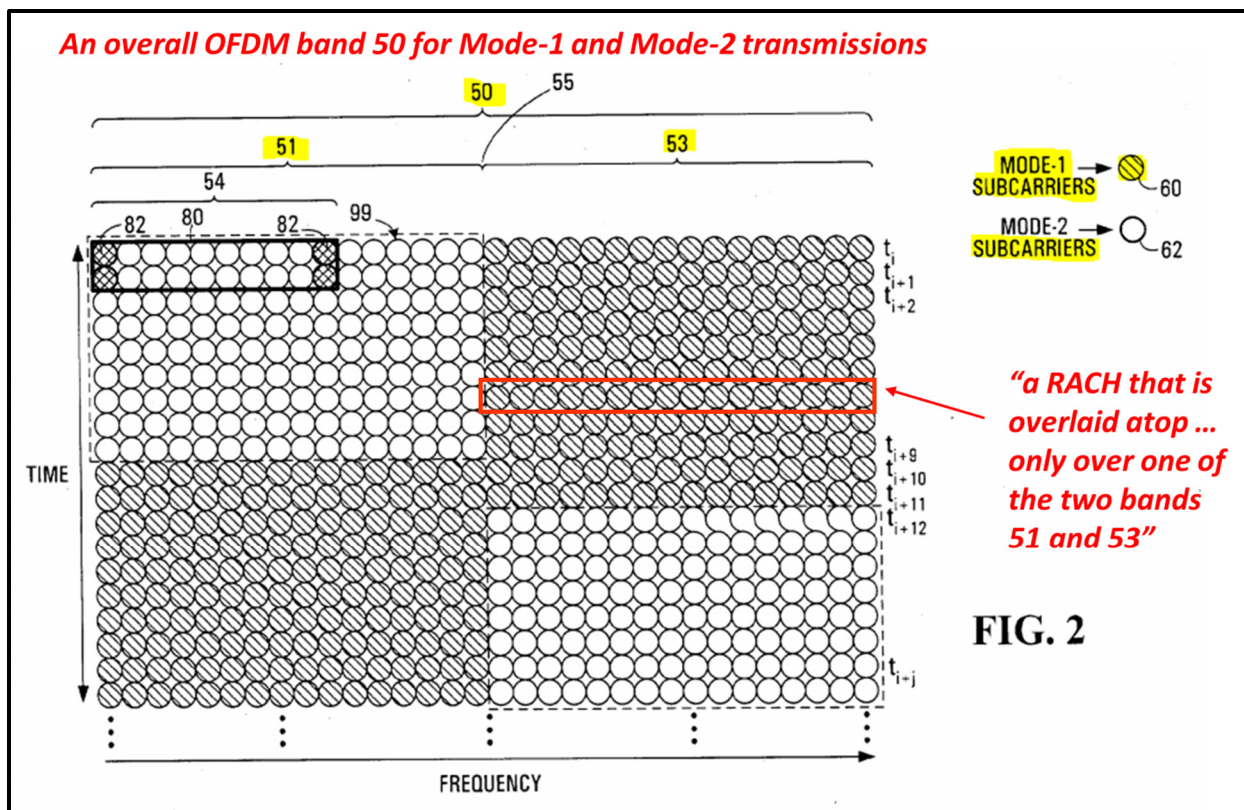
125. A POSITA would have readily understood that Ma’s *mobile station* comprises a *digital-to-analog (D/A) conversion circuit configured to convert the digital signal to an analog signal* because a digital wireless communication system, especially an OFDM-based communication system, includes a *digital-to-analog (D/A) conversion circuit to convert the digital signal* (e.g., the OFDM signal) *to an analog signal* so that the analog signal is transmitted over radio frequency (RF) waveforms to a receiver. In fact, it is common knowledge to a POSITA that a digital communication system such as the OFDM system disclosed by Ma would include a *digital-to-analog (D/A) conversion circuit* in the transmitter and an *analog-to-digital (A/D) conversion circuit* in the receiver. For example, it is well-established that a digital system (such as the OFDM system) would include a D/A converter *configured to convert the digital signal to an*

analog signal and an analog-to-digital (A/D) converter *configured to convert an analog signal to a digital signal* because they are “Basic Elements of a Digital Signal Processing system.” EX1022, 8-9, Figure 1.3. “In applications where the digital output from the digital signal processor is to be given [] in analog form,” such as for transmission over radio frequency (RF) waveforms in a wireless communication system, “we must provide another interface from the digital domain to the analog domain. Such an interface is called a *digital-to-analog (D/A) converter*.” EX1022, 9. Figure 1.3. Also, TR discloses that “General transceiver configuration” includes “digital-analog convert[er],” “the D/A converter in the transmitter,” and on the receiver side, there is a corresponding “ADC before delivery of the samples to the FFT unit.” EX1006, 106, 112 and 300. As such, it would be obvious to a POSITA that Ma renders obvious this limitation. To the extent one argues that Ma alone does not expressly disclose the “*D/A conversion circuit*,” it would be obvious to a POSITA that Ma-TR renders obvious this limitation because TR expressly discloses a transmitter includes a “*D/A conversion circuit*,” a feature that is common knowledge to a POSITA. EX1006, 106, 112 and 300. The combination of Ma and TR would have been merely the application of a known technique (e.g., including a “*D/A conversion circuit*,” expressly disclosed by TR and being well-known in the art) to a known system (Ma’s OFDM

communication system) ready for improvement to yield predictable results with a reasonable expectation of success.

[21e] wherein the mobile station is configured to transmit, to the base station, the analog signal in a frequency band, wherein the random access signal occupies in a frequency domain only a portion of the frequency band;

126. As discussed in Section VII.A.[21d] and [1c/11c], Ma discloses *the mobile station is configured to transmit, to the base station, the analog signal in a frequency band* (e.g., “a **common wireless channel 50** is implemented using an OFDM transmission scheme within an **overall OFDM band**” or “the **OFDM band 50**” for “Mode-1 and Mode-2” transmissions. EX1005, 0124) and *the random access signal occupies in a frequency domain only a portion of the frequency band* (e.g., “a **RACH that is** overlaid atop the entire common wireless channel 50 or **only over one of the two bands 51 and 53.**” EX1005, 0206).



Ma-FIG. 2 (annotated)

127. Accordingly, Ma discloses this limitation.

[21f] wherein the mobile station is further configured to receive, from the base station, a second analog signal; and

128. As discussed in Section VII.A.*[1f/1lf]*, Ma discloses *the mobile station is configured to receive, from the base station, a response message*. Ma discloses “the **wireless terminal** further **comprises: a control channel receiver**” (i.e., *mobile station comprising a receiver*). See e.g., EX1005, 0023-0026, 0032, 0036, 0044, 0050, 0051, 0053, 0057, FIG. 1. Also, Ma discloses *the mobile station* comprises antennas (e.g., EX1005, 0140 (“**OFDMA can be employed using various**

antenna configurations. The simplest embodiment is for **each UE to have one antenna** and each base station to have one antenna (per sector if sectorized).”). It would have been obvious to a POSITA that Ma discloses *the mobile station is configured to receive, from the base station, a second analog signal* that includes the response message because it is known that a digital wireless communication system, especially an OFDM-based communication system as discussed by Ma, would detect analog signals from the RF waveforms (e.g., via the antenna) and convert the analog signals to digital signals for further signal processing and detection as disclosed by Ma. *See e.g.*, EX1005, 0023 (“the wireless terminal further comprises: a control channel receiver for receiving power control commands in respect of the low rate mode OFDM transmissions; a power control function adapted to apply transmit power adjustments to the low rate mode OFDM transmissions as a function of the power control commands”); 0024 (“the wireless terminal further comprises a power control function adapted to: transmit an initial access attempt on an uplink access channel; determine a long term estimated downlink power measurement of a signal received over a downlink channel and to initially transmit said low rate mode OFDM transmission a transmit power determined as a function of the estimated downlink power measurement; control channel receiver for receiving power control commands for increasing/unchanging/decreasing transmit power of the low rate mode OFDM

transmission after said initial access attempt.”) As such, it would been obvious to a POSITA that Ma renders obvious this limitation.

129. Moreover, regarding receiving an analog signal comprising an OFDM signal, TR discloses “Multiband Reception and Filter Requirements” which applies “the **analogue** filtering before ADC.” EX1006, 300. That is, TR discloses receiving an analog signal and the analog signal is converted to a digital signal by ADC. *Id.* To the extent one argues that Ma alone does not expressly disclose the receiver is configured to receive a *second analog signal*, it would been obvious to a POSITA that Ma-TR renders obvious this limitation because TR expressly discloses a common-knowledge feature that a receiver of a mobile station receives an analog signal and then converts the analog signal to a digital signal for further processing in a digital communication system. The combination of Ma and TR would have been merely the application of a known technique (e.g., a receiver configured to receive an analog signal expressly disclosed by TR and being well-known in the art) to a known system (Ma’s OFDM communication system, particularly a mobile station that includes a receiver) ready for improvement to yield predictable results with a reasonable expectation of success.

130. Accordingly, Ma alone or Ma-TR renders obvious this limitation.

[21g] wherein the mobile station further comprises: an analog-to-digital (A/D) conversion circuit configured to convert the second analog signal to a second digital signal; and

131. As discussed in Section VII.A.[21f], it would have been obvious to a POSITA that, in Ma's OFDM-based (i.e., digital-based) communication system, *the second analog signal* including the response message would be converted to a *second digital signal* for further digital signal processing and detection by the mobile station (e.g., “UE then **detects such signature** to identify access grant through DL signaling channel.”) EX1005, 0239. The *analog-to-digital (A/D) conversion* function is essential in a digital communication system. For example, the Textbook explains a D/A converter *configured to convert a digital signal to an analog signal* and an analog-to-digital (A/D) converter *configured to convert an analog signal to a digital signal* as “Basic Elements of a Digital Signal Processing system.” EX1022, 8-9, Figure 1.3. “To perform the processing digitally, there is a need for an interface between the analog signal and the digital processor. This interface is called an *analog-to-digital (A/D) converter*. The output of the A/D converter is a digital signal that is appropriate as an input to the digital processor.” EX1022, 9. Also, Ma discloses such an *analog-to-digital (A/D) conversion circuit* because Ma notes that “each of the OFDMA transmitters 602,604” (*mobile station*) can include apparatus(es) to implement the disclosed functions. See EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the **functions** which are shown **can be implemented** as separate physical blocks, or can be

integrated into a single design **implemented in software and/or hardware and/or firmware**. The same is true for each of the OFDMA transmitters 602,604.”)

Accordingly, the “**hardware and/or firmware**” configured to perform such an analog-to-digital (A/D) conversion constitutes the claimed *analog-to-digital (A/D) conversion circuit*. As such, a POSITA would understand that Ma discloses its *mobile station further comprises an analog-to-digital (A/D) conversion circuit configured to convert the second analog signal to a second digital signal*.

Accordingly, Ma discloses this limitation.

132. Moreover, TR expressly discloses an “ADC” (i.e., *analog-to-digital (A/D) conversion circuit*) and using *analog-to-digital (A/D) conversion circuit to convert* an analog signal to a digital signal. See EX1006, 300 (disclosing applying “the analogue filtering before **ADC**” and the “ADC” (*analog-to-digital (A/D) conversion circuit*) is *configured to convert the analog signal to a digital signal* (“samples [delivered] to the FFT unit”) by sampling the analog signal with “an **oversampling** ratio of **the ADC**.” In fact, it is common knowledge to a POSITA that a digital communication system such as the OFDM system disclosed by Ma would include an *analog-to-digital (A/D) conversion circuit* in the receiver. See e.g., EX1022, 8-9, Figure 1.3.

133. A POSITA in view of Ma and TR would find it obvious that Ma-TR renders obvious that Ma’s mobile station would include an *A/D conversion circuit*, such as

the ADC expressly disclosed by TR, *configured to convert Ma's second analog signal* that includes the response message to a *second digital signal* because a mobile station including an "*A/D conversion circuit*" to convert a received analog signal into a digital signal is a well-known feature to a POSITA. The combination of Ma and TR would have been merely the application of a known technique (e.g., including an "*ADC*" expressly disclosed by TR and being well-known in the art) to a known system (Ma's OFDM communication system, particularly, Ma's mobile station) ready for improvement to yield predictable results with a reasonable expectation of success. EX1005, 0239; EX1006, 300.

134. Accordingly, Ma alone or Ma-TR renders obvious this limitation.

[21h] a receiver circuit configured to receive, based on the second digital signal, a response message.

135. As discussed in Section VII.A.*[1f/1lf]*, Ma discloses the mobile station comprises a receiver/receiver circuit that is configured to receive, from the base station, a response message. As discussed in Section VII.A.*[2lg]*, Ma-TR renders obvious that the mobile station converts the second analog signal to a second digital signal that includes the response message for further signal processing and detection by the mobile station (e.g., "**UE then detects such signature** to identify access grant through DL signaling channel." EX1005, 0239). Accordingly, Ma-TR renders obvious the receiver circuit configured to receive, based on the second digital signal, a response message.

[2a/12a/22a] [the receiver]/[the receiver circuit] is configured to determine/[determining] if the response message identifies the sequence associated with the base station in the random access signal; and,

136. Ma discloses that, after “**UE sends RACH code chosen randomly from serving base station's code set** via an ALOHA RACH channel” (i.e., *the sequence associated with the base station in the random access signal*), “[i]f the base station detects **the RACH code** successfully,” the base station sends *a response message* that includes “the initial dedicated uplink access channel grant, **together with the RACH code index** as well as the time offset information.” EX1005, 0238, 0239. “**The UE then detects such signature** to identify access grant through DL signaling channel” (i.e., *the mobile station determines if the response message identifies the sequence associated with the base station in the random access signal*). EX1005, 0239.

137. As discussed in Section VII.A.*[1f/11f] and [21h]*, Ma discloses the *mobile station comprising a receiver/receiver circuit* (e.g., “a respective control channel **receiver 640,642**”) configured to receive signals through the control channel (i.e., *the response message* “**through DL signaling channel.**”) EX1005, 0265, 0239.

Moreover, Ma also discloses “each of the OFDMA transmitters 602,604” (*mobile station*) can include apparatus(es) to implement the disclosed functions. See EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the

functions which are shown **can be implemented** as separate physical blocks, or **can be integrated into a single design implemented in software and/or hardware and/or firmware**. The **same is true for each of the OFDMA transmitters 602,604.**") As such, a POSITA would understand or find it obvious that Ma discloses its receiver being configured to perform the disclosed *receiving* function as well as the disclosed *determining* function because they "can be integrated into a single design" as needed. EX1005, 0264.

138. Accordingly, Ma discloses *the receiver/receiver circuit is configured to determine if the response message identifies the sequence associated with the base station in the random access signal.*

[2b/12b/22b] on a condition that the response message identifies the sequence associated with the base station in the random access signal, [the transmitter]/[the first type of transmitter signal processing circuit is configured to transmit]/[transmitting] a second uplink signal.

139. Ma discloses, after the "UE then **detects such signature** to identify access grant through DL signaling channel" (i.e., *on a condition that the response message identifies the sequence associated with the base station in the random access signal*), "6) UE adjusts its timing and sends back its ID, its CQI report information, and uplink traffic load request if it wants to start **uplink data transmission** [i.e., *a second uplink signal*], for example via an initial dedicated uplink signalling channel, one of the parallel low delay circuitry data channels discussed previously." EX1005, 0239-0240.

140. As discussed in Section VII.A.[1a/11a], [1c/11c] and [21a], Ma discloses the *mobile station comprising a transmitter/ a first type of transmitter signal processing circuit configured to transmit a first uplink signal*. Ma also discloses “each of the OFDMA transmitters 602,604” (*mobile station*) can include apparatus(es) to implement the disclosed functions. See EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the **functions** which are shown **can be implemented** as separate physical blocks, or **can be integrated into a single design implemented in software and/or hardware and/or firmware**. The **same is true for each of the OFDMA transmitters 602,604.**”) As such, a POSITA would understand or find it obvious that Ma’s *transmitter/first type of transmitter signal processing circuit* could be configured to perform the disclosed *transmitting* functions including *transmitting a second uplink signal*, at least for the benefits of reusing the same circuits for cost-saving.

141. Accordingly, Ma discloses *on a condition that the response message identifies the sequence associated with the base station in the random access signal, the transmitter/the first type of transmitter signal processing circuit is configured to transmit a second uplink signal*.

[3/13/23] wherein the response message includes power adjustment information and wherein the second uplink signal is transmitted according to the power adjustment information.

142. As discussed in Section VII.A.[2b/12b/22b], Ma discloses the mobile stations transmits *a second uplink signal* (e.g., “**uplink data transmission**, for example **via** an initial dedicated uplink signalling channel, **one of the parallel low delay circuitry data channels discussed previously**,” which can be **Mode-1 transmission** because “**Mode-1** operates in an open or closed power control loop to provide parallel transport channels per UE that carry fixed rate circuitry data, **low delay circuitry data** or high-speed packet data.” EX1005, 0240, 0147.

143. Ma further discloses “**Uplink Power Control**” and specifically “The **power control of the Mode-1 traffic channel** can be open-loop power control. In one embodiment power control is achieved as follows:”

1. **UE sends RACH** (described in detail below) with the power inversely proportional to the long-term estimated DL C/I measurement and the RACH signature spreading factor (more generally, RACH power increases as estimate decreases);
2. **Base station measures the power of RACH from UE and sends back the power control command to UE** for increasing/unchanging/decreasing transmit power—this power control transmission may also be construed as an acknowledgement, in the absence of acknowledgement, another [sic] access attempt is with increased power;

3. UE starts the uplink transmission with power based on power of RACH with adjustment based on power control command through the dedicated slow traffic channel;

4. Base station controls the uplink power based on the frame error rate from a particular UE.

EX1005, 0195-0200.

144. In other words, Ma discloses **in response to receiving “RACH from the UE,” “[b]ase station measures the power of RACH from UE and sends back the power control command to UE.”** EX1005, 0198. As such, the **“power control command”** (i.e., *power adjustment information*) is included in a response message from the base station to the UE/mobile station, and **“UE starts the uplink transmission with power based on power of RACH with adjustment based on power control command** through the dedicated slow traffic channel” (i.e., *the second uplink signal is transmitted according to the power adjustment information*). EX1005, 0199.

145. A POSITA would understand that, the **“power control command”** (i.e., *power adjustment information*) is included in the response message from the base station as identified in [2a/12a/22a] because both are in response to UE’s RACH signal and both identify that the power of RACH signal itself is inversely proportional to the DL long term C/I measurement. While Ma discusses “The Set-up of the Uplink Transmission” and “Power Control” of Uplink Transmission in

different sections and does not expressly identify the power control information when describing “The Set-up of the Uplink Transmission” (EX1005, 0233-0242), a POSITA would have reached this understanding given that the power control aspect had already been discussed earlier in the specification when discussing the “Power control” of Uplink Transmission (EX1005, 0195-0200). Indeed, when describing the power control process, Ma expressly refers to the RACH as **“(described in detail below).”** See *cf.* EX1005, 0197 (describing for the power control, “1. UE sends **RACH (described in detail below)** with the **power inversely proportional to the long-term estimated DL C/I measurement** and the RACH signature spreading factor (more generally, RACH power increases as estimate decreases);”) EX1005, 0237-0238 (describing in the “procedure for UE to initiate a connection with access network,” 3) UE measures the DL long term C/I. 4) UE sends **RACH code** chosen randomly from serving base station's code set via an ALOHA RACH channel. The **transmit power is determined inversely proportional to the DL long term C/I measurement.**”).

146. Moreover, it would have been obvious to a POSITA to include the **“power control command”** (i.e., *power adjustment information*) in the response message as identified in [2a/12a/22a] because doing so (rather than including the power control information in a separate response message) would advantageously save signaling overhead and system resources, reduce the latency, and improve the

access speed of the UE to the network because the UE can obtain and gather all necessary information (e.g., “uplink access channel grant,” “time offset information” and power control command) for sending uplink transmission from a single response message, without waiting for a separate power control indication from the base station. EX1005, 0239.

147. Ma also discloses **“UE starts the uplink transmission [the second uplink signal is transmitted] with power based on power of RACH with adjustment based on power control command** through the dedicated slow traffic channel [according to the power adjustment information].” EX1005, 0199. See Section VI.A.[2b/12b/22b] explaining Ma’s **“uplink data transmission”** is a second uplink signal. EX1005, 0240, 0147, 0195-0200.

148. Accordingly, Ma renders obvious that *the response message includes power adjustment information and wherein the second uplink signal is transmitted according to the power adjustment information.*

[4/14/24] wherein the portion of the frequency band used for transmission of the random access signal does not include control channels.

149. As discussed in Section VII.A.[1c/11c] and [21e], Ma discloses a mobile station transmits, to the base station, a random access signal in only a portion of the frequency band. Ma discloses **“a RACH that is overlaid atop ... only over one of the two bands 51 and 53** shown in FIG. 1 [sic].” EX1005, 0206. Ma further discloses **“While the RACH is being used, the user is in an in-active state and**

as such **is not transmitting on the data channels.**” EX1005, 0244. By the same token, a POSITA would have found it obvious that “**While the RACH is being used,** the user is in **an in-active state**” and as such **is not transmitting any control channels** either because the mobile station has not established time synchronization with the base station yet, and any control channels transmitted in *the portion of the frequency band used for transmission of the random access signal* would not be correctly decoded. Accordingly, *the portion of the frequency band used for transmission of the random access signal in the UE’s in-active state does not include* “the system access channel assignment [*control channel*]” in the UE’s standby state.

[5/15/25] wherein the response message includes a mobile station identifier assigned to the mobile station.

150. TR discloses “**BS reports back the RAN ... through AGCH (Access Grant Channel) to the MS,**” wherein “**Random Access Number (RAN) [] consists of 7 bits related to the Mobile Station Identification (MSID) number,**” (i.e., *a mobile station identifier assigned to the mobile station*). EX1006,197. “MS listens to AGCH, **if the RAN corresponds to the RAN of the mobile,** assignment of DCCH can be confirmed.” (i.e., the mobile stations receives *a response message* from the base station that *includes a mobile station identifier assigned to the mobile station.*) *Id.*

151. As discussed in Section VI.C, a POSITA would have been motivated to combine Ma and TR to achieve various advantages as provided by TR. In one aspect, a POSITA would have been motivated to modify Ma to include *a mobile station identifier* such as the RAN as taught by TR in Ma's RACH and the response message in response to the RACH as identified in [2a/12a/22a] to allow the base station to identify the mobile station upon receiving *the random access signal*, assign "Access Grant Channel" to the mobile station, and notify the mobile station in the *response message*. EX1006,197. Such a modification would advantageously allow the mobile station to confirm the assignment control channel for preparing uplink transmission sooner, reduce the latency and improve the access speed, and save another round of back-and-forth information exchange, compared to alternative approaches such as sending the mobile station's ID in another message after receiving the *response message*. EX1005, 0238-0241; EX1006,197.

152. Accordingly, Ma-TR combination renders obvious this limitation.

[6/16/26] wherein the time duration of the combination of the random access signal and the guard period is greater than a time duration of at least two of the plurality of OFDM symbols.

153. As discussed in Section VII.A.[1e/11e] and [21b], Ma-TR combination renders obvious a time duration of a combination of the random access signal and the guard period is equal to or greater than a time duration of four OFDM symbols,

and thus greater than at least two of the plurality of OFDM symbols. See e.g., EX1005, 0207 (“**each RACH slot consists of four OFDM symbol durations.**”)

[8/18/28] wherein the random access signal is a spread spectrum signal⁷.

154. Ma discloses “The **RACH** is preferably **implemented using a long spreading code** which is then mapped to OFDM symbols in a defined RACH slot.” EX1005, 0207. Accordingly, Ma discloses *the random access signal is a spread spectrum signal.*

[9/19/29] [wherein: the receiver/the receiver circuit is further configured to receive]/further comprising: receiving/ broadcast information from the base station, the broadcast information indicating at least one sequence associated with the base station for use in producing the random access signal.

⁷The '908 Patent does not define the “*spread spectrum signal*” but generally recites “The **spread spectrum signal**, which is designed to have a high **spread gain** for overcoming severe interference, is used for facilitating system functions such as initial random access, channel probing, or short messaging;” “A direct Sequence **Spread Spectrum** (DSSS) system is inherently capable of supporting multi-cell and multi-user access applications through the use of orthogonal **spreading codes**,” and a “**sequence [is] used to spread the DSSS signal.**” EX1001, Abstract, 1:32-35, 7:56-57. A POSITA would understand a *spread spectrum signal* would encompass any signal using a spreading code or sequence.

155. Ma discloses that “The base station can broadcast this information [, the active RACH PN/Golay code length,] through a DL signaling channel [*broadcast information from the base station*],” wherein “the active RACH PN/Golay code length” *indicates at least one sequence associated with the base station for use in producing the random access signal* because “A dedicated long complex PN/Golay code set is reserved for RACH of each base station” EX1005, 0215.

156. As discussed in Section VII.A.[*1d/11d*] and [*21h*], Ma discloses the *mobile station comprising a receiver/receiver circuit* (e.g., “a control channel **receiver for receiving** an identity of a **plurality of signature definitions for use in a coverage area**,” “a respective **control channel receiver 640,642**”) configured to receive signals through the control channel (i.e., “**this information through a DL signaling channel.**”) *See e.g.*, EX1005, 0032, 0265, 0215. Moreover, Ma also discloses “each of the OFDMA transmitters 602,604” (*mobile station*) can include apparatus(es) to implement the disclosed functions. *See* EX1005, 0264 (“It is to be understood that in the OFDMA receiver 600, typically **many other functions would be required** in a complete system. Furthermore, the **functions** which are shown **can be implemented** as separate physical blocks, or **can be integrated into a single design implemented in software and/or hardware and/or firmware.** The **same is true for each of the OFDMA transmitters 602,604.**”) As such, a POSITA would understand that Ma discloses its receiver could be configured to

perform the disclosed *receiving* function. Accordingly, Ma discloses this limitation.

[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.

[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

157. As discussed in Section VII.A.[1a/11a], [1b/11b], and [21a], Ma discloses the transmitter/the first type of transmitter signal processing circuit includes/is an OFDM transmitter signal processing circuit and the OFDM transmitter signal processing circuit outputs the first uplink signal (e.g., an uplink transmission such as Mode-1 or Mode-2 transmission). For example, Ma discloses “**OFDMA transmitters 602,604,**” EX1005, 0264 and “the wireless terminal has a **first transmit chain for generating** and transmitting a low rate mode **OFDM transmission** in a first frequency band of the OFDM band; and a **second transmit chain for generating** and transmitting a burst-mode transmission in a second frequency band of the **OFDM band.**”) EX1005, Abstract, 0122, 0143.

158. Ma discloses *the first uplink signal* (e.g., an uplink transmission such as Mode-1 or Mode-2 transmission) *is output/provided by an OFDM transmitter*

signal processing circuit because Ma discloses “the uplink transmission is classified into two modes. Mode-1 supports the provision of user dedicated channels with fixed data rate to support real-time service, uplink signalling and simple messaging. Mode-2 supports the transmission of high speed data bursts;” and both are OFDM signals output from *an OFDM transmitter signal processing circuit*. See e.g., EX1005, 0122 (“The modulation technique employed in OFDMA is OFDM. OFDM is a method of digital modulation in which a set of data is mapped onto the set of OFDM sub-carriers.” EX1005, 0143 (“the OFDM band is divided into two frequency bands 51, 53 which can be used interchangeably to provide two different OFDMA modes provided by embodiments of the invention. The two different OFDMA modes are referred to herein generally as Mode-1 and Mode-2 respectively. In the Figure legend, sub-carriers used for Mode-1 are generally indicated by 60, while sub-carriers used for Mode-2 are generally indicated by 62.”)

159. A POSITA would have readily understood that Ma’s *OFDM transmitter signal processing circuit* comprises a *serial to parallel converter*, an *inverse Fourier transform*, and a *cyclic prefix addition circuit* because those are well-known and standard components of an OFDM transmitter. For example, Li repeatedly attributes these components of the OFDM transmitter are well-known,

and can process the data to generate an OFDM signal “**a manner well-known in the art**”:

The modulated data on all subcarriers (intended for multiple subscribers) is processed by **Inverse Fast Fourier Transform (IFFT) 405 in a manner well-known in the art**. The outputs of IFFT 405 are input to **parallel-to-serial converter 406**, which converts the parallel outputs of IFFT 405 into a serial **output OFDM signal in a manner well-known in the art**. In one embodiment, an additional guard interval (**cyclic prefix**) is inserted at this point. The resulting OFDM signal is transmitted through the RF channel.

EX1009, [0052]

160. See also Jung’s disclosure of such a conventional “structure of a transmitter in an OFDM communication system.” EX1010, 0045, 0046. Accordingly, Ma renders obvious claims 10, 20 and 30.

B. Ground-A2 - Claims 10, 20, and 30 are Obvious in view of Ma-TR-Jung

[10]wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.

[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter,

an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

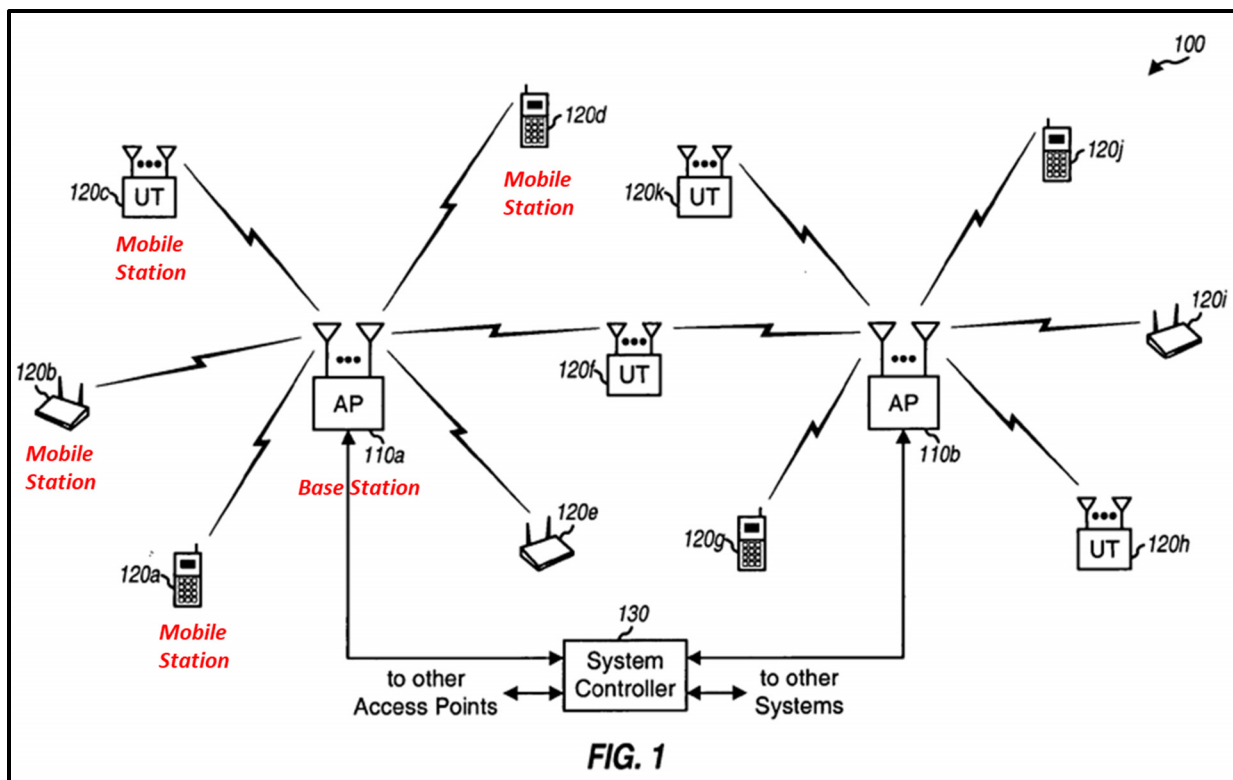
161. As discussed in Section VI.E, a POSITA would have been motivated to apply the known implementation details of “*OFDM transmitter*” as disclosed in Jung to the “*OFDM transmitter*” as disclosed in Ma-TR. The resulting Ma-TR-Jung combination renders obvious claims 10, 20, and 30.

C. Ground-B1 - Claims 1-6, 8-16, 18-26, 28-30 are anticipated or rendered obvious by Walton

[1Pre/21Pre] A mobile station comprising,

[11Pre] A method performed by a mobile station, the method comprising:

162. Walton discloses *a mobile station* (i.e., “user terminal (UT)”). “FIG. 1 shows a MIMO WLAN system 100 that includes a number of access points (APs) 110 that support communication for a number of **user terminals (UTs)** 120.” EX1013, 0040. Walton makes it clear that “A **user terminal may also be referred to as a *mobile station***[.]” EX1013, 0041.



Walton-FIG. 1 (annotated)

163. Walton also discloses a *method performed by a mobile station* in disclosing various operations of the user terminal (i.e., *mobile station*) as discussed below. See also e.g., EX1013, 0034 (“FIGS. 12A and 12B show a state diagram for **operation of a user terminal**;”) 0038 (“FIG. 16 shows a **process** for adjusting the uplink timing of a **user terminal**”), claim 135 (“A **method** of receiving signaling information **at a user terminal** in a wireless [MIMO] communication system.”), claim 167 (“A **method of accessing** a wireless multiple-access [MIMO] communication system,”)

[1a/11a] [a transmitter configured to: transmit]/transmitting, to a base station, a first uplink signal within a frequency band, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal

164. Walton discloses the mobile station *transmits, to a base station, a first uplink signal* (e.g., an uplink transmission on “Reverse Channel (RCH)”) by disclosing “The **RCH is used by the user terminals to transmit uplink data** and pilot **to the access point**. The RCH may be allocated on a per TDD frame basis. One or more **user terminals** may be designated to **transmit on the RCH in any given TDD frame**. A number of **RCH PDU types** are provided to accommodate different operating modes **on the RCH**.” EX1013, 0168-0169.

165. Walton discloses “**A packet sent on the RCH** (for PDU Types 0 and 1) [*the first uplink signal*] **comprises** an integer number of **PHY frames** and “**A PHY frame** may also **be defined to comprise some other number of OFDM symbols**.” EX1013, 0169, 0174, 0167, FIG. 6. Walton thus discloses *the first uplink signal* (e.g., an uplink transmission such as a “packet sent on the RCH”) *is an orthogonal frequency division multiplexing (OFDM) signal*.

166. Walton discloses *the first uplink signal* (e.g., an uplink transmission such as a “packet sent on the RCH”) *is transmitted within a frequency band* (e.g., “overall system bandwidth”) because Walton provides “the MIMO WLAN system **employs OFDM** to effectively partition the **overall system bandwidth** into a number of (NF) orthogonal subbands.” EX1013, 0064.

167. Walton discloses the *mobile station* (e.g., “user terminal (UT)”) *comprising a transmitter* (e.g., “a transmitter unit”). For example, Walton discloses “the user terminal” comprises a “transmitter/receiver.” *See e.g.*, EX1013, 0623 (“If calibration of the **transmitter**/receiver is warranted, the **user terminal** enters the Access state with a calibration request.”) Walton also explains that “In a wireless communication system, a radio frequency (RF) modulated signal from a **transmitter unit** may reach a receiver unit via a number of propagation paths” and discloses the mobile station transmits the uplink signal as discussed above.

EX1013, 0007. FIG. 7 shows “two **user terminals**,” each including *a transmitter* (e.g., “a **transmitter unit**”) that includes, for example, “a **TX data processor 790** and a **TX spatial processor 792** (if present), conditioned by **one or more modulators 754**, and transmitted via **one or more antennas 752** back to the access point.” EX1013, 0026, 0217.

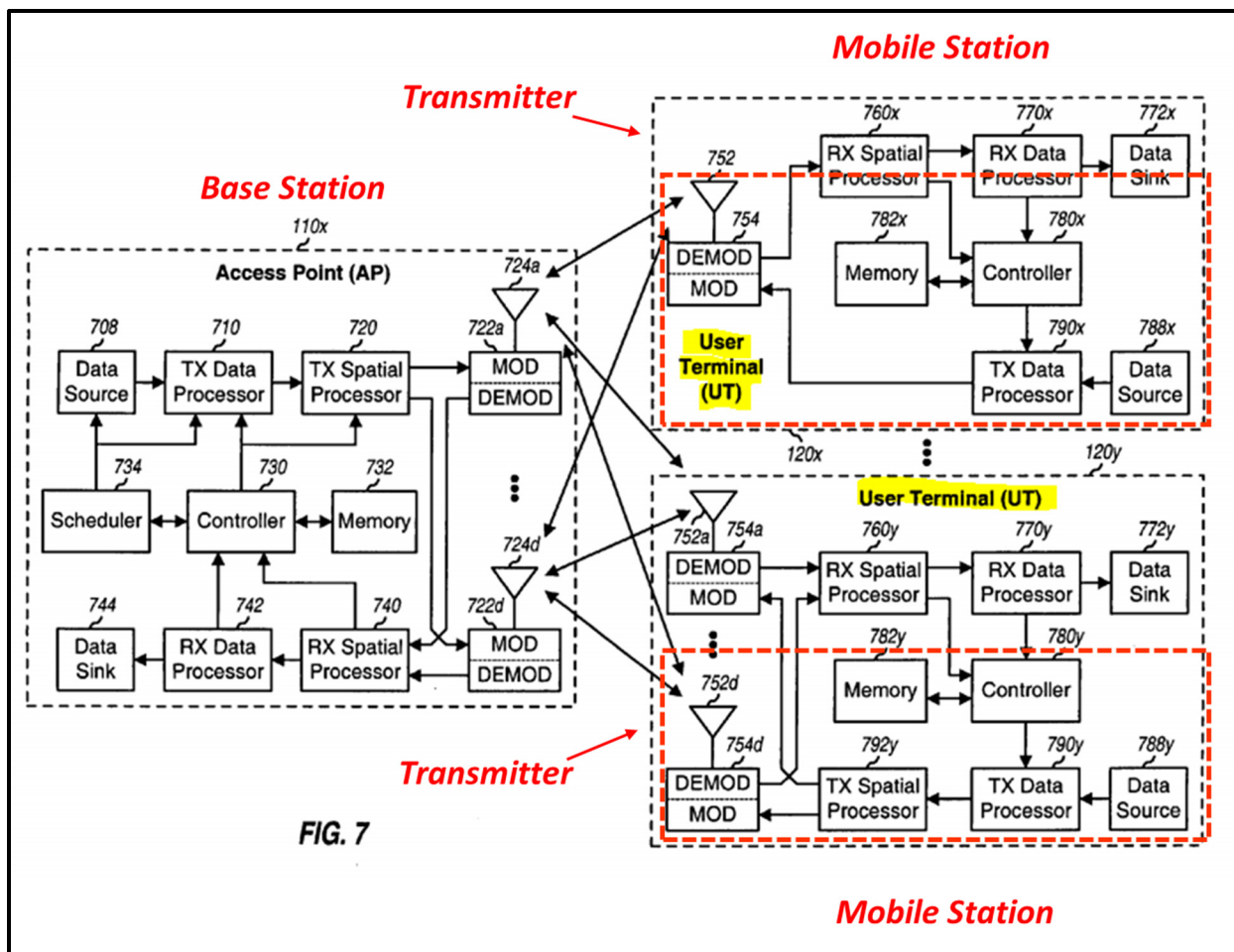
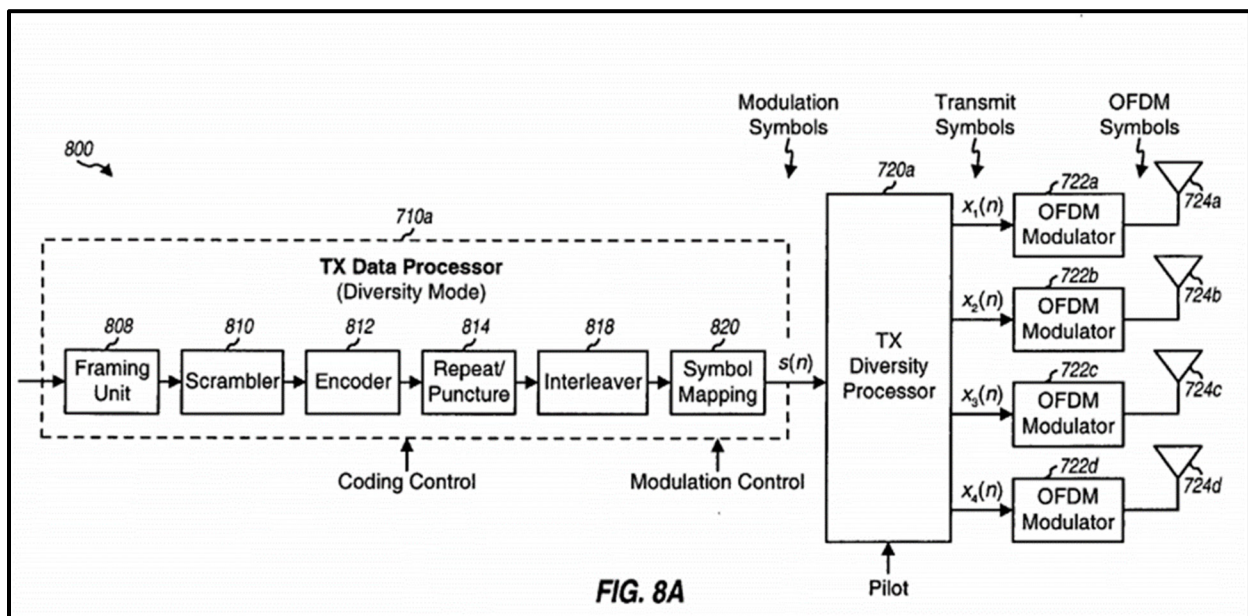


FIG. 7

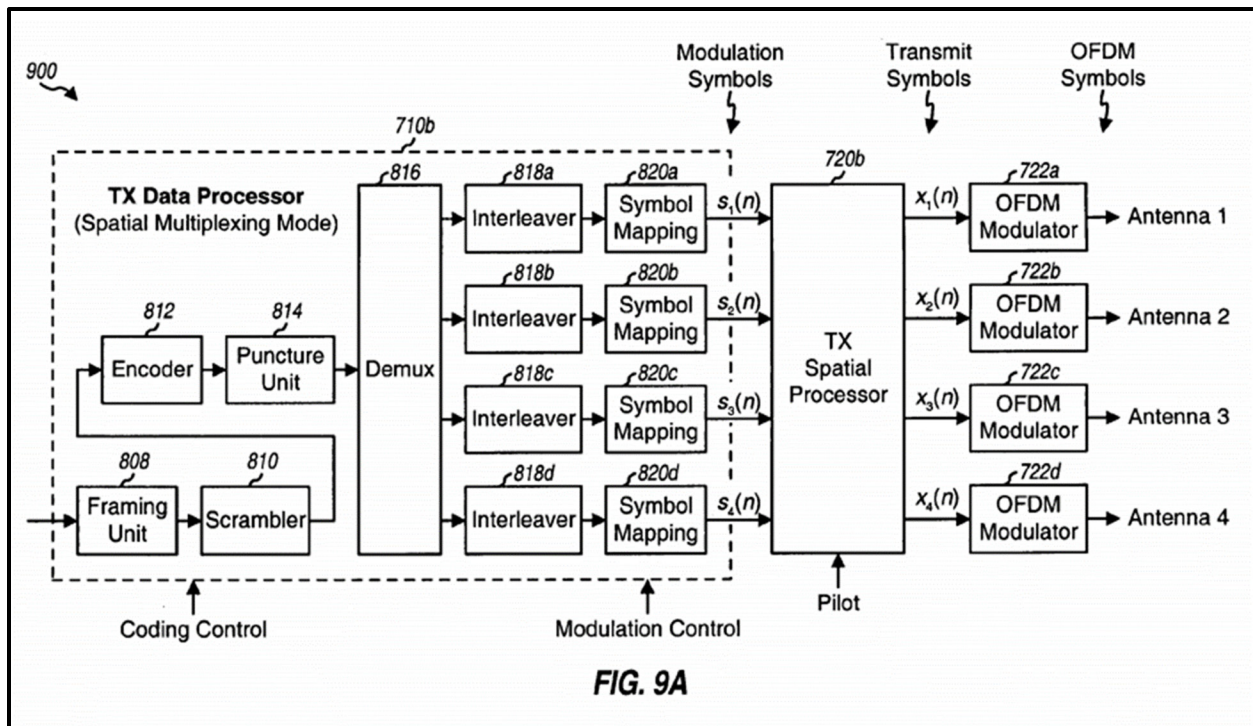
Walton-FIG. 7 (annotated).

168. See also EX1013, 0027 (“FIGS. 8A, 9A, and 10A [that] show **three transmitter units** for the diversity, spatial multiplexing, and beam-steering modes, respectively”). EX1013, 0222 (“FIG. 8A shows a block diagram of an embodiment of a **transmitter unit 800** capable of performing the transmit processing for the diversity mode. **Transmitter unit 800** may be used for transmitter portion of the access point and **the user terminal.**”) EX1013, 0267 (“FIG. 9A shows a block diagram of a **transmitter unit 900** capable of performing the transmit processing

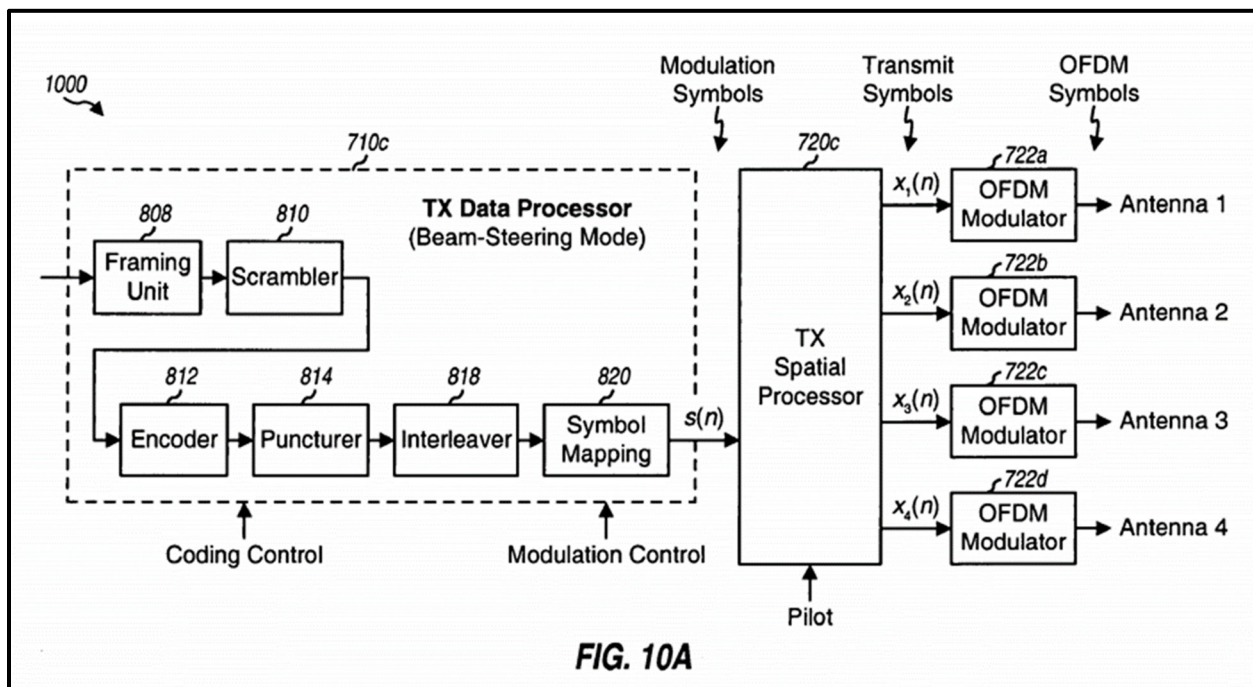
for the spatial multiplexing mode. **Transmitter unit 900** is another embodiment of the transmitter portion of the access point and the user terminal.) EX1013, 0330 (“FIG. 10A shows a block diagram of a **transmitter unit 1000** capable of performing the transmit processing for the beam-steering mode. **Transmitter unit 1000** is yet another embodiment of the transmitter portion of the access point and the user terminal.”)



Walton-FIG. 8A



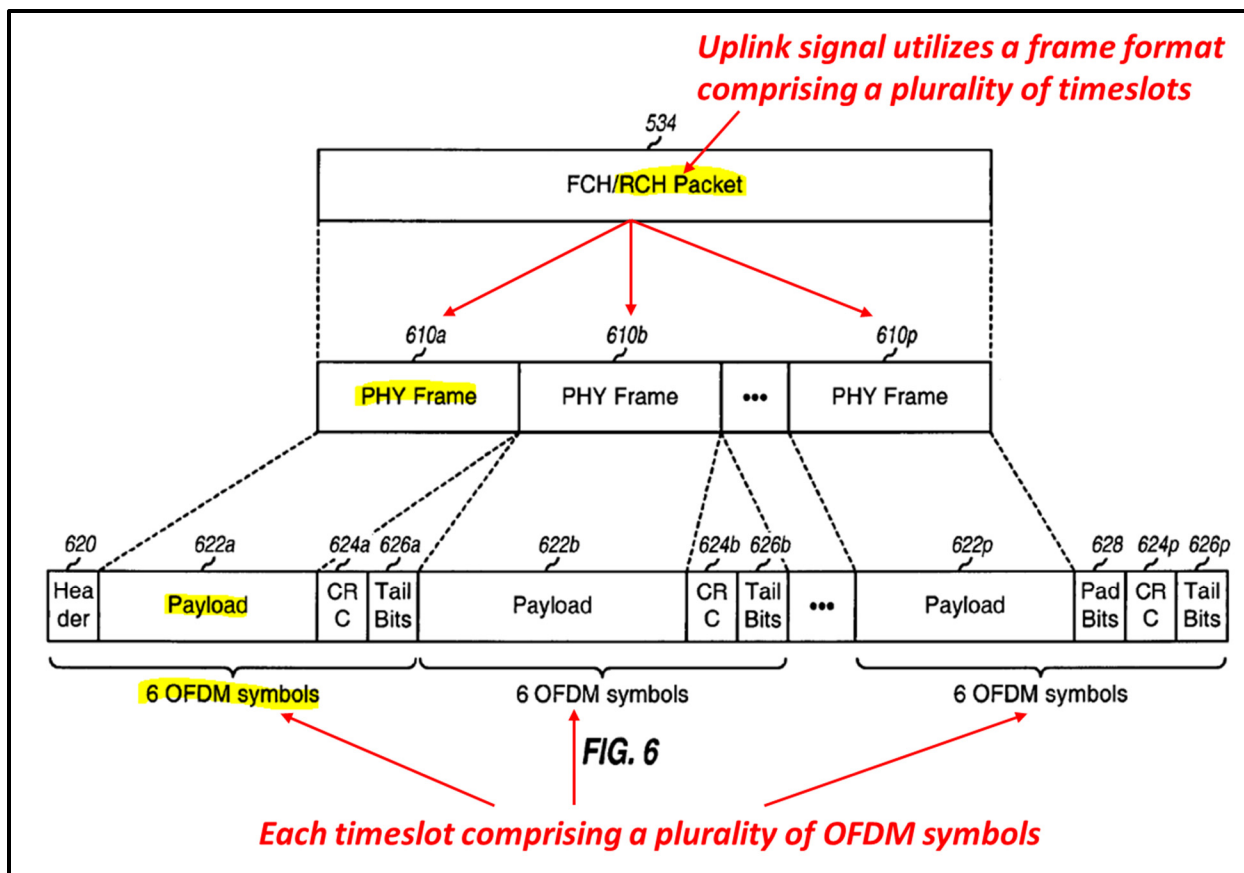
Walton-FIG. 9A



Walton-FIG. 10A

[1b/11b] the first uplink signal ... utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols;

169. Walton discloses *the first uplink signal* (e.g., an uplink transmission such as a “packet sent on the RCH”) *utilizes a frame format comprising a plurality of timeslots* (e.g., “PHY frames”), *each timeslot comprising a plurality of OFDM symbols* (e.g., “6 OFDM symbols”). For example, Walton discloses “**A packet sent on the RCH** (for PDU Types 0 and 1) [*the first uplink signal*] **comprises** an integer number of **PHY frames**” e.g., as shown in FIG. 6. “**The RCH packet comprises** an integer number of **PHY frames** 610;” “**each PHY frame comprises 6 OFDM symbols;**” and “**A PHY frame may also be defined to comprise some other number of OFDM symbols.**” EX1013, 0169, 0174, 0164, 0167.

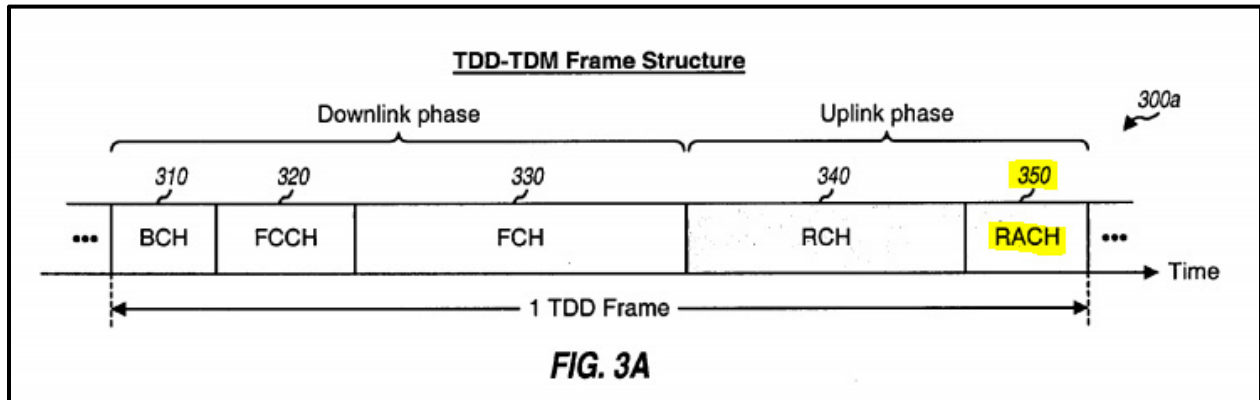


Walton-FIG. 6 (annotated)

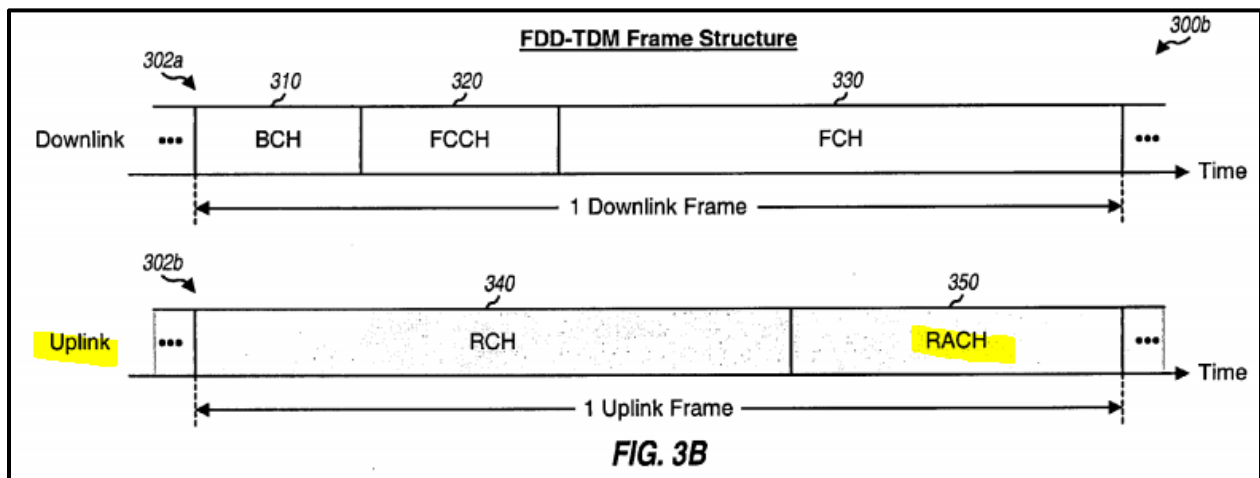
[1c/11c] transmit/transmitting, to the base station, a random access signal followed by a guard period in only a portion of the frequency band,

170. Walton discloses “The user terminal then transmits the RACH PDU [*a random access signal*] starting in the selected RACH slot.” EX1013, 0648. As shown in FIG. 3A, 3B and 4, Walton discloses an “**uplink frame**,” either TDD or FDD, include a **RACH segment 350** and “A number of **RACH PDUs 450** may be sent in **RACH segment 350** by a number of **user terminals to access the system**”[*transmit, to the base station*]. EX1013, 0102. See also EX1013, 0089

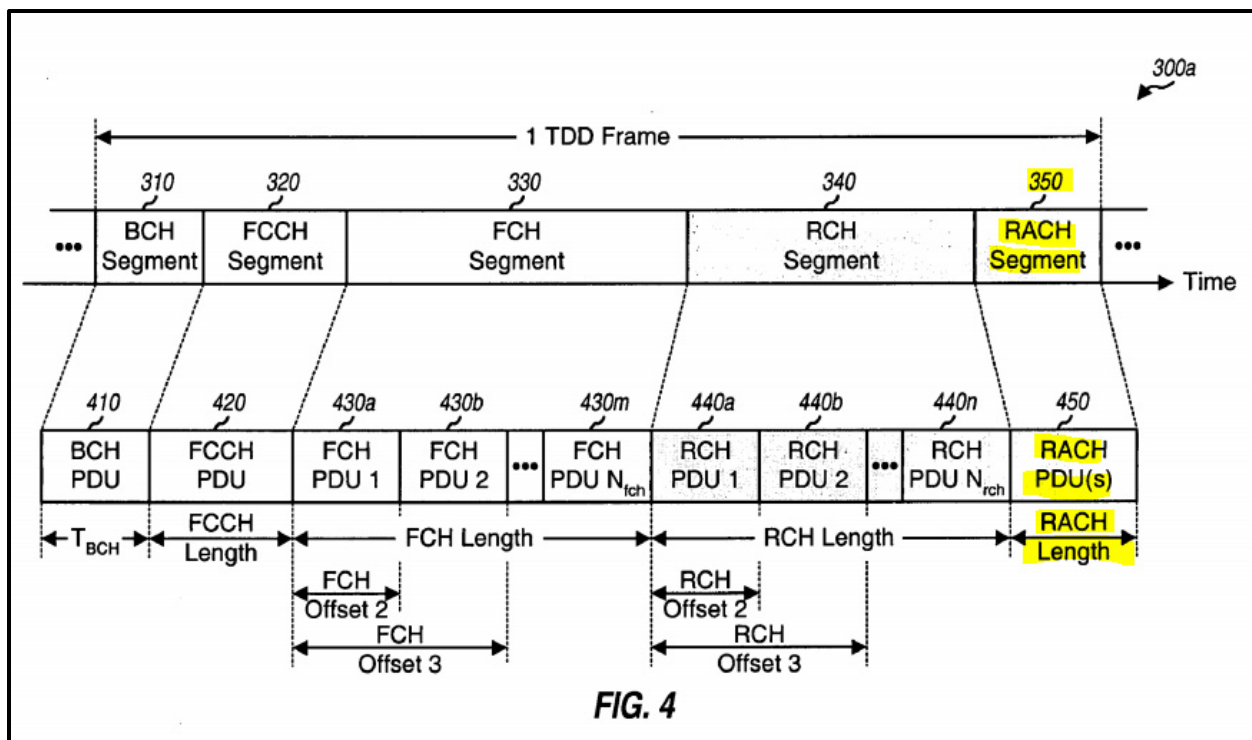
(“On the uplink phase, ..., one or more **RACH PDUs** are transmitted in a fifth segment **350** of the TDD frame.”) EX1013, 0093 (“The uplink frame carries ... one or more **RACH PDUs** in segments [] **350**, respectively.”)



Walton-FIG. 3A (highlighted)



Walton-FIG. 3B (highlighted)



Walton-FIG. 4 (highlighted)

171. Walton discloses “**RACH segment includes a guard interval**, which is provided to prevent the uplink transmission from the user terminals from interfering with the next BCH segment,” wherein “**the guard interval [is] at the end of the RACH segment** [*a random access signal followed by a guard period*]” EX1013, 0647, 0097, and Table 5 (“**Guard Interval at the end of RACH.**”)

172. Walton discloses *transmitting* uplink signals including the *random access signal in only a portion of the frequency band* because of the “guard subbands.” EX1013, 0064-0066. For example, Walton discloses “**overall system bandwidth** into a number of (NF) orthogonal subbands;” “In an embodiment, **the system**

bandwidth is partitioned into 64 orthogonal subbands (i.e., $N_F=64$).... Of these 64 subbands, 48 subbands ... are used for data, 4 subbands are used for pilot and possibly signaling, the DC subband (with index of 0) is not used, and **the remaining subbands are also not used and serve as guard subbands** [*in only a portion of the frequency band*].” EX1013, 0064-0065. “For OFDM,..., **Zeros are provided for the unused subbands.**” EX1013, 0066. *See also* VII.C.[4/14/24] explaining that it would have further been obvious to use guard intervals in Walton’s FDD-CDM/FDM frame structure of FIG. 3C where the RACH is transmitted in *only a portion of the frequency band* (e.g., “overall system bandwidth”) because RACH occupies a portion of the uplink bandwidth. EX1013, 0064, 0094.

173. Walton’s *random access signal*, “RACH PDU,” is an OFDM signal because Walton discloses the RACH PDU being sent in units of OFDM symbols. *See* EX1013, 0146 (“the RACH PDU includes a preamble portion **552** and a message portion **554**.... Preamble portion **552** has a fixed duration of at least 2 OFDM symbols. Message portion **554** carries an RACH message and has a variable duration.”) As shown in Table 15, the RACH message size is in “OFDM symbols.”); *see also* EX1013, FIG. 5C, 0111, Table 5 (showing the RACH slot size in increments of OFDM symbols) and the corresponding description in; 0110 (disclosing RACH, one of the transport channels, has variable “OFDM symbol

duration”). Accordingly, a POSITA would understand that Walton’s *random access signal*, as an OFDM signal, follows the “OFDM subband structure” with the “guard subbands,” would be transmitted *in only a portion of* the overall system bandwidth (i.e., *the frequency band*). EX1013, 0064-0066, 0093.

174. See also VII.C.[4/14/24] explaining that it would further have been obvious to use guard intervals in Walton’s FDD-CDM/FDM frame structure of FIG. 3C where the RACH is in only a portion of the uplink frequency band/full system frequency band.

175. Accordingly, Walton discloses this limitation.

[1d/11d] wherein the random access signal includes a sequence associated with the base station,

176. Walton discloses “**This RACH PDU** [*the random access signal*] includes a RACH message that ... **includes the user terminal's assigned MAC ID** [*a sequence associated with the base station*] **that allows the access point to identify the user terminal**. A registration MAC ID (i.e., a specific MAC ID value) may be reserved for unregistered user terminals.” EX1013, 0645. See also EX1013, 0122 (The “**unique MAC ID**” is “**assigned ...by the access point**” [*associated with the base station*]); 0650 (disclosing MAC ID assignment “If the user terminal is performing a registration, then it uses the registration MAC ID (e.g., 0×0001). The access point responds by sending a MAC ID Assignment Message on the FCH.”)

177. The **MAC ID** is a *sequence* (e.g., binary bit sequence) that has a length of 10 bits, as shown in Table 16.

TABLE 16					
RACH Message Sizes					
Fields/ Parameter Names	96 bits	192 bits	384 bits	768 bits	Description
Message Duration	2	2	2	2	Duration of message
MAC PDU Type	4	4	4	4	RACH message type
MAC ID	10	10	10	10	MAC ID
Slot ID	6	6	6	6	Tx Slot ID
Payload	44	140	332	716	Info bits
CRC	24	24	24	24	CRC value for the RACH message
Tail Bits	6	6	6	6	Tail bits

Walton- Table 16 (highlighted)

[1e/11e] wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols; and

178. Walton discloses that “The user terminal then **transmits the RACH PDU** starting **in the selected RACH slot**” and “The duration of **each RACH slot** [*a time duration of the random access signal*] is given by the RACH Slot Size field, **in units of OFDM symbols.**” EX1013, 0648, 0111. Walton shows in Table 5, “The **RACH Guard Interval** [*the guard period*] field indicates the amount of time between the last RACH slot and the start of the BCH segment for the next TDD frame.” EX1013, 0111.

TABLE 5-continued

<u>BCH Message</u>		
Fields/ Parameter Names	Length (bits)	Description
FCCH Length	6	Duration of FCCH (in units of OFDM symbols)
FCCH Rate	2	Physical layer rate of FCCH
FCH Length	9	Duration of FCH (in units of OFDM symbols)
RCH Length	9	Duration of RCH (in units of OFDM symbols)
RACH Length	5	Duration of RACH (in units of RACH slots)
RACH Slot Size	2	Duration of each RACH slot (in units of OFDM symbols)
RACH Guard Interval	2	Guard interval at the end of RACH
Cyclic Prefix Duration	1	Cyclic prefix duration
Page Bit	1	"0" = page message sent on FCH "1" = no page message sent
Broadcast Bit	1	"0" = broadcast message sent on FCH "1" = no broadcast message sent
RACH Acknowledgment Bit	1	"0" = RACH acknowledgment sent on FCH "1" = no RACH acknowledgment sent
CRC	16	CRC value for the BCH message
Tail Bits	6	Tail bits for convolutional encoder
Reserved	32	Reserved for future use

Walton-Table. 5 (highlighted)

179. As an example, “the **RACH PDU includes a preamble portion 552** and a **message portion 554,**” where “**Preamble portion 552** has a fixed duration of **at least 2 OFDM symbols**. Message portion 554 carries an RACH message and has a

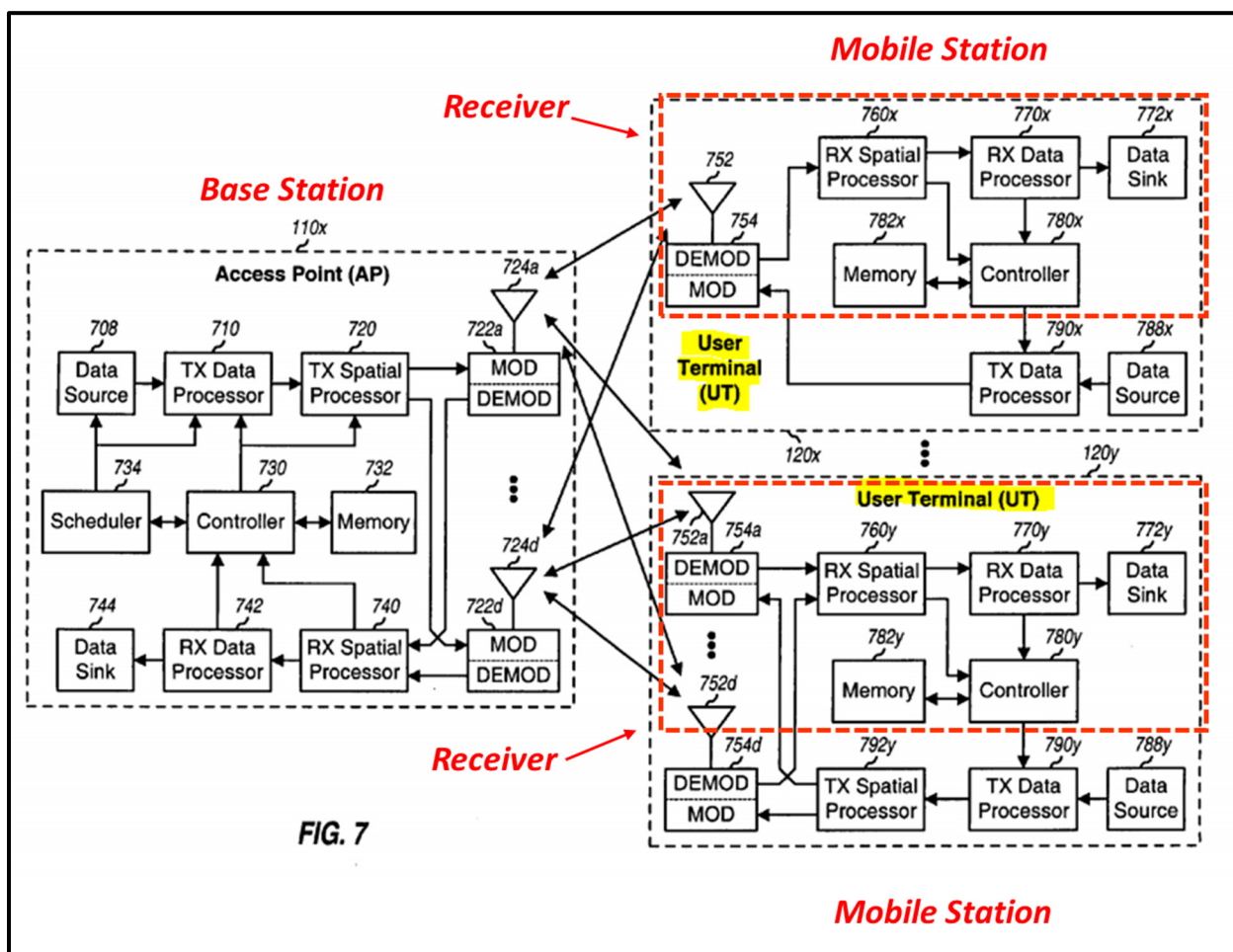
variable duration.” EX1013, 0146. Accordingly, Walton discloses *a time duration of the random access signal* (e.g., “duration of the RACH PDU”) *is* at least more than two times *a time duration of an OFDM symbol* without even accounting for the additional *the guard period* (“Guard Interval”). *Id.* Therefore, Walton discloses *a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols.* EX1013, 0207.

[1f/11f] [a receiver configured to receive]/[receiving], from the base station, a response message.

180. Walton discloses the user terminal *receives a response message* such as an FCCH message (a message transmitted on the FCCH). For example, Walton discloses “**After the user terminal sends the RACH PDU, it monitors ... FCCH ... [and] further processes the FCCH to obtain IE Type 3 information elements containing acknowledgements.**” (i.e., the *mobile station* receives a *response message* transmitted on the FCCH). EX1013, 0649, 0651.

181. Walton discloses the *mobile station* (e.g., “user terminal (UT)”) *comprising a receiver* (e.g., a “receiver” or “receiving unit”). For example, Walton discloses “the user terminal” comprises a “transmitter/**receiver**.” *See e.g.*, EX1013, 0623. Walton also discloses *the mobile station receives a response message* as discussed above and explains that “In a wireless communication system, a radio frequency (RF) modulated **signal** from a transmitter unit may **reach a receiver unit** via a

number of propagation paths.” EX1013, 0026. FIG. 7 shows “two **user terminals**,” each including *a receiver* that includes, for example, “**one or multiple antennas 752** receive the transmitted downlink modulated signals, ... a respective demodulator (DEMOD) 754.... A **receive (RX)** spatial processor 760 ..., An **RX** data processor 770 ..., a data sink 772 ... and/or a controller 780[.]” EX1013, 0214, 0215.



Walton-FIG. 7 (annotated)

[21a] a first type of transmitter signal processing circuit configured to: generate a first uplink signal, wherein the first uplink signal is an orthogonal frequency division multiplexing (OFDM) signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols; modulate the first uplink signal onto a first set of OFDM subcarriers;

182. As discussed in Section VII.C.[1a/11a] and [1b/11b], Walton discloses a transmitter configured to: transmit, to a base station, a first uplink signal (e.g., a “packet sent on the RCH”) within a frequency band, wherein the first uplink signal is an OFDM signal and utilizes a frame format comprising a plurality of timeslots, each timeslot comprising a plurality of OFDM symbols. That is, Walton discloses a transmitter configured to transmit the claimed *first uplink signal* (e.g., a “packet sent on the RCH”). Correspondingly, the *transmitter signal processing circuit configured to generate and modulate* the “packet sent on the RCH” as disclosed by Walton constitutes the claimed *first type of transmitter signal processing circuit*.

183. “RCH” is a transport channel. EX1013, 0077-0079, Table 3. Walton discloses each transport channel is configured with respective transmission modes that have respective specific spatial processing at the transmitter: “for the transport channels. **Each transmission mode** is associated with **specific spatial processing at the transmitter** and receiver[.]” EX1013, 0194.

TABLE 24				
Transport Channels	Transmission Modes			
	SIMO	Tx Diversity	Beam-Steering	Spatial Multiplexing
BCH	—	X		—
FCCH	—	X	—	—
RACH	X	—	X	—
FCH	—	X	X	X
RCH	X	X	X	X

Walton-Table. 24 (highlighted)

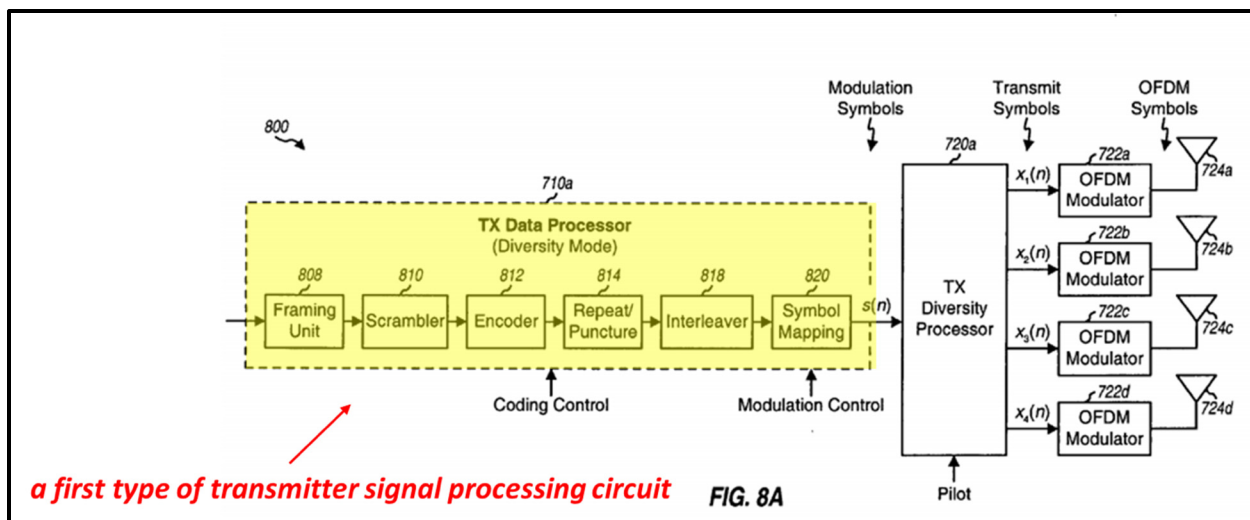
184. “Table 24 lists the transmission mode(s) supported by each of the transport channels,” EX1013, 0194-0195. As shown, for a “packet sent on the RCH” (*a first uplink signal*), transmission modes including “Tx Diversity,” “Beam-Steering,” and “Spatial Multiplexing” are supported. EX1013, 0079, 0194-0199.

Accordingly, Walton discloses a *first type of transmitter signal processing circuit configured to generate and modulate* the “packet sent **on the RCH**” (*first uplink signal*) using one or more of the supported transmission modes. *Id.* Walton shows examples of the *first type of transmitter signal processing circuit* in the “**three transmitter units for the diversity, spatial multiplexing, and beam-steering modes**” of FIGS. 8A, 9A, and 10A, respectively. EX1013, 0027.

185. As an example shown in FIG. 8A, for the “Transmitter unit 800 [that] may be used for transmitter portion of ... the user terminal,” Walton discloses an example of the *first type of transmitter signal processing circuit* (e.g., including at

least “**a TX data processor 710 a**”) *configured to generate and modulate the first uplink signal* (a “**packet** sent on the **RCH**”). EX1013, 0222-0226. The “**TX data processor 710 a**” includes a “**framing unit 808** frames the data for **each packet** to **be transmitted** on the FCH or **RCH**.... The framing may be performed as illustrated in FIG. 6 **to generate** one or more PHY frames for each user **packet**” (i.e., *generate the first uplink signal* (a “**packet** sent on the **RCH**”)). EX1013, 0222-0223. The “**TX data processor 710 a**” also includes a “**symbol mapping unit 820** ... to provide modulation symbols” (i.e., *to modulate the first uplink signal onto a first set of OFDM subcarriers*) because Walton discloses “For OFDM, the **data to be transmitted on each subband** [*subcarrier*]⁸ is first **modulated (i.e., symbol mapped)** using a particular modulation scheme selected for use for that subband.” EX1013, 0226, 0066.

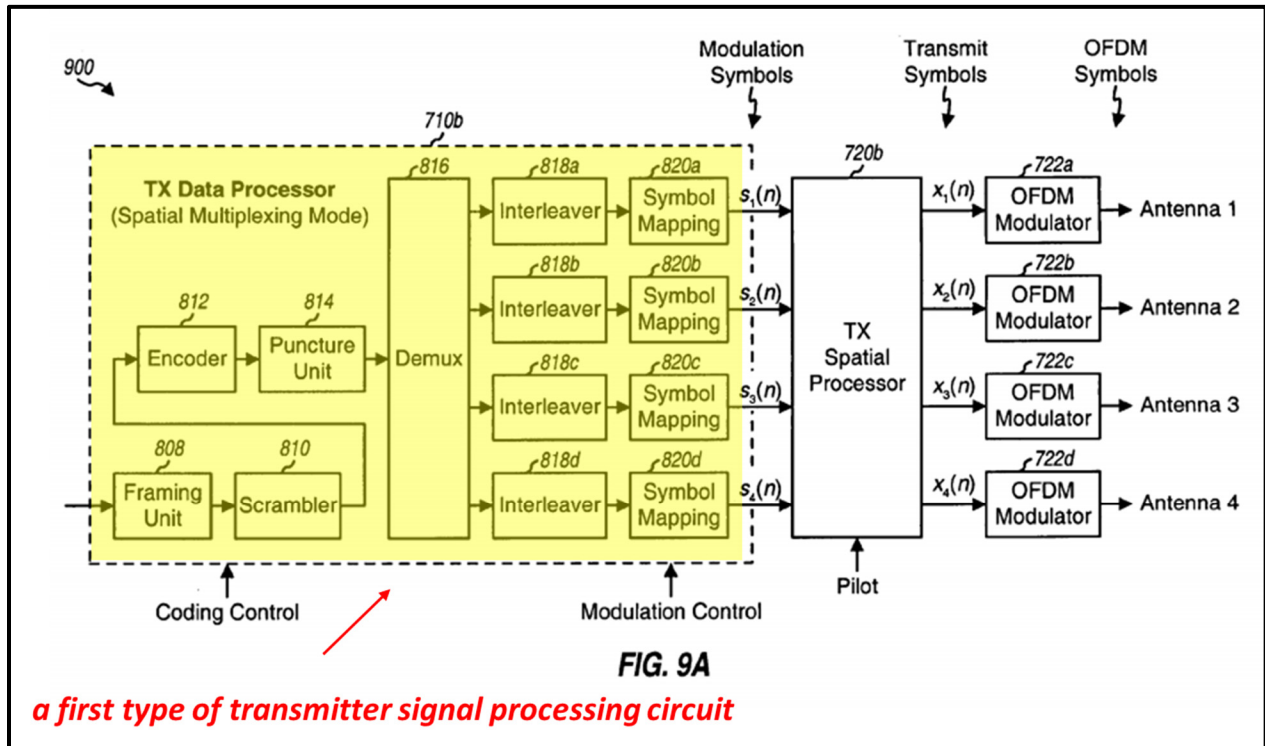
⁸ See EX1013, 0064 (“With OFDM, **each subband** is **associated with a respective subcarrier** that may be modulated with data.”)



Walton-FIG. 8A (annotated)

186. As another example of the *first type of transmitter signal processing circuit*, for the “Transmitter unit 900 [that] is another embodiment of the transmitter portion of ... the user terminal” of FIG. 9A, Walton discloses this example of the *first type of transmitter signal processing circuit* (e.g., including at least a **TX data processor 710 b**”) configured to generate the first uplink signal (a “**packet** sent on the **RCH**”), which includes “framing unit 808 frames the data for each FCH/RCH **packet to generate** one or more PHY frames for the **packet**” (i.e., configured to generate the first uplink signal (a “**packet** sent on the **RCH**”) and “**symbol mapping unit 820** ... to provide modulation symbols” (i.e., to *modulate the first uplink signal onto a first set of OFDM subcarriers*) because Walton discloses “For OFDM, the **data to be transmitted on each subband** [*subcarrier*] is first

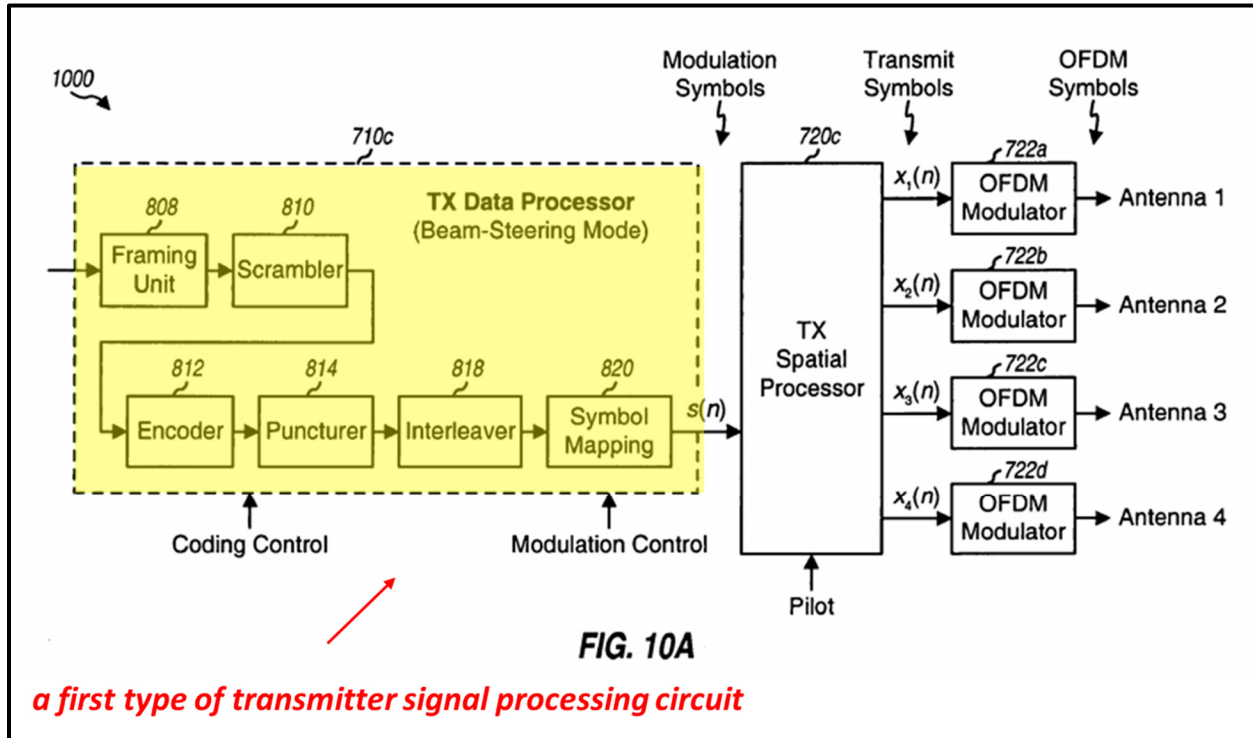
modulated (i.e., symbol mapped) using a particular modulation scheme selected for use for that subband.” EX1013, 0267-0271, 0064, 0066.



Walton-FIG. 9A (annotated)

187. As yet another example of the *first type of transmitter signal processing circuit*, for the “Transmitter unit 1000 [] of the user terminal” of FIG. 10A, Walton discloses this example of the *first type of transmitter signal processing circuit* that includes at least “a **TX data processor 710 c** [that includes] framing unit 808 frames the data **for each FCH/RCH packet to generate** one or more PHY frames for the **packet**” (i.e., *configured to generate the first uplink signal*) and “[s]ymbol mapping unit 820 ... to provide modulation symbols” (i.e., to *modulate*

the first uplink signal onto a first set of OFDM subcarriers) because Walton discloses “For OFDM, the **data to be transmitted on each subband** [subcarrier] is first **modulated (i.e., symbol mapped)** using a particular modulation scheme selected for use for that subband.” EX1013,. EX1013, 0330-0331, 0064, 0066.



Walton-FIG. 10A (annotated)

188. Accordingly, Walton shows multiple mappings of this limitation.

[21b] a second type of transmitter signal processing circuit configured to generate an random access signal followed by a guard period, wherein the random access signal includes a sequence associated with a base station, wherein a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least one of the plurality of OFDM symbols;

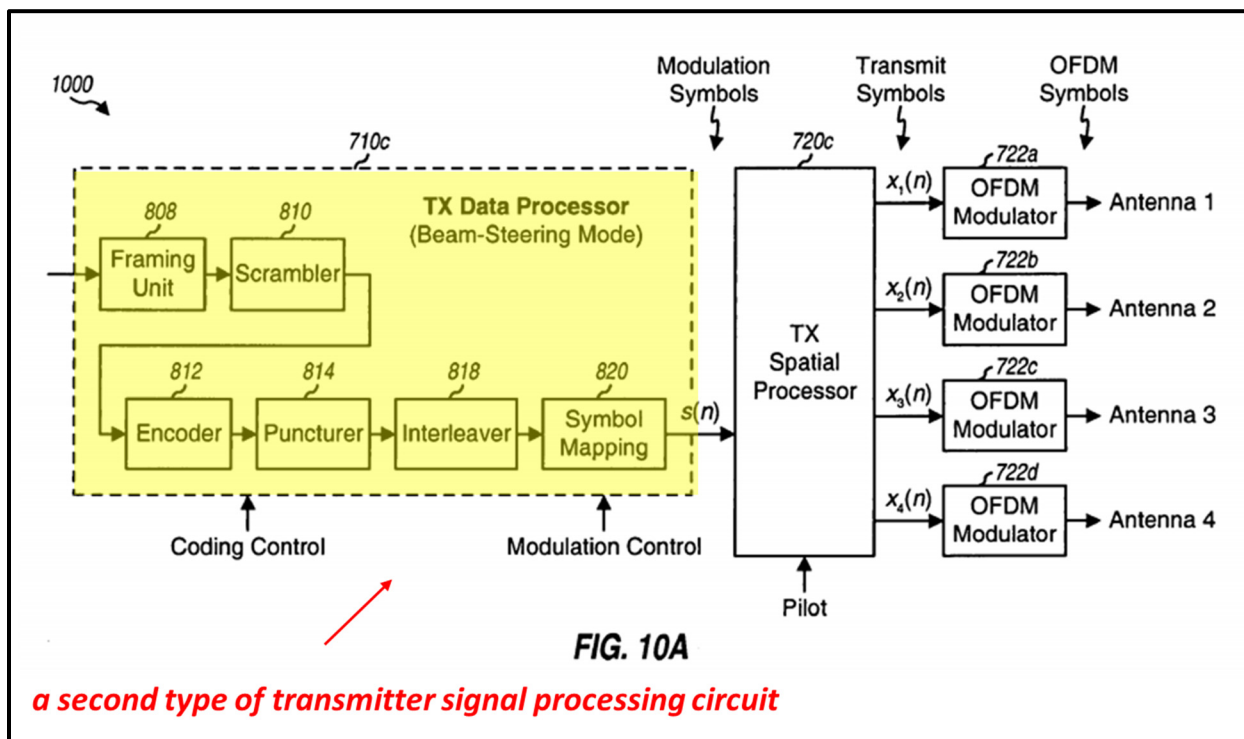
189. As discussed in VII.C.[1c/11c], [1d/11d] and [1e/11e], Walton discloses a *transmitter configured to: transmit a random access signal* (e.g., a “RACH PDU”) as claimed. Correspondingly, the *transmitter signal processing circuit configured to generate the RACH PDU* constitutes the claimed *second type of transmitter signal processing circuit*.

TABLE 24				
Transport Channels	Transmission Modes			
	SIMO	Tx Diversity	Beam-Steering	Spatial Multiplexing
BCH	—	X	—	—
FCCH	—	X	—	—
RACH	X	—	X	—
FCH	—	X	X	X
RCH	X	X	X	X

Walton-Table. 24 (highlighted)

190. As shown in Table 24, for a *random access signal* (e.g., a “RACH PDU [that] includes a RACH message”) transmitted on RACH which supports the SIMO and Beam-Steering modes. and thus and can be generated and transmitted using at least the “**transmitter unit**” for the “**beam-steering mode**” in FIG. 10A. EX1013, 0079, 0194-0199. Accordingly, Walton discloses a *second type of transmitter signal processing circuit* configured to generate the *random access signal* (e.g., a “RACH PDU”) using one or more of the SIMO and beam-steering modes. *Id.*

191. One example of the *second type of transmitter signal processing circuit* is shown in “[t]ransmitter unit 1000” of FIG. 10A corresponding to the “beam-steering mode.” EX1013, 0027, 0194-0195, 0645. In this example, Walton discloses a *second type of transmitter signal processing circuit* (e.g., including at least “TX data processor 710 c” configured to generate “messages sent on... RACH [a random access signal].” EX1013, 0331.



Walton-FIG. 10A (annotated)

192. To the extent that the *second type of transmitter signal processing circuit* is construed to be different from the claimed *first type of transmitter signal processing circuit* as discussed *supra* in claim element [21a], Walton discloses

such different types of *type of transmitter signal processing circuits* because the example *first type of transmitter signal processing circuit* shown in FIG. 9A includes circuit components such as “demultiplexer 816” that is not present in the example *second type of transmitter signal processing circuit* shown in FIG. 10A. EX1013, 0269, FIGS. 9A, 10A.

193. Accordingly, Walton satisfies this limitation.

[21c] a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal⁹;

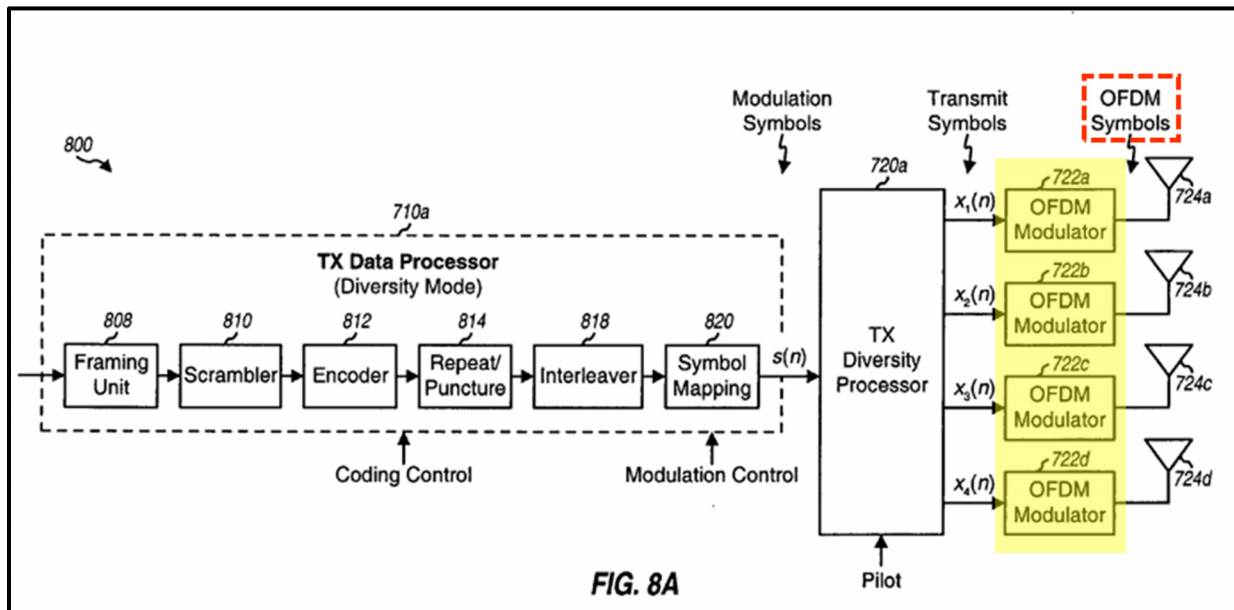
⁹ The '908 Patent does not define “***a digital signal***” but indicates that the “[Multi-Carrier (MC)] signal” (“such as an Orthogonal Frequency Division Multiplexing (OFDM)” signal) and DSSS signal” are both digital signals because they “are added together prior to Digital to Analog (D/A) conversion **830.**” EX1001, 4:64-66; 1:43-46. A POSITA would understand a digital signal to be the input to a D/A converter or the output of an analog-to-digital (A/D) converter, as plainly explained in the Textbook. EX1022, 8-9, Figure 1.3. A POSITA would further understand that a digital signal is a discrete-time signal (i.e., a signal defined only at certain specific values of time) that takes on values from a finite set of possible values. EX 1022, 15, 13. This is in contrast to an analog signal, which

194. As discussed in VII.C.[1a/11a]-[1e/11e], Walton discloses the mobile station transmits at least the first uplink signal or the random access signal, each being an OFDM signal that includes one or more OFDM symbols. See e.g., EX1013, 0064 (“the MIMO WLAN system employs OFDM”); EX1013, 0174 (“**A packet sent on the RCH ... comprises an integer number of PHY frames....The RCH packet comprises an integer number of PHY frames 610**”); EX1013, 0167 (“**A PHY frame may also be defined to comprise some other number of OFDM symbols.**”) EX1013, 0646 (“**RACH PDU also has a variable length of 1, 2, 4, or 8 OFDM symbols.**”)

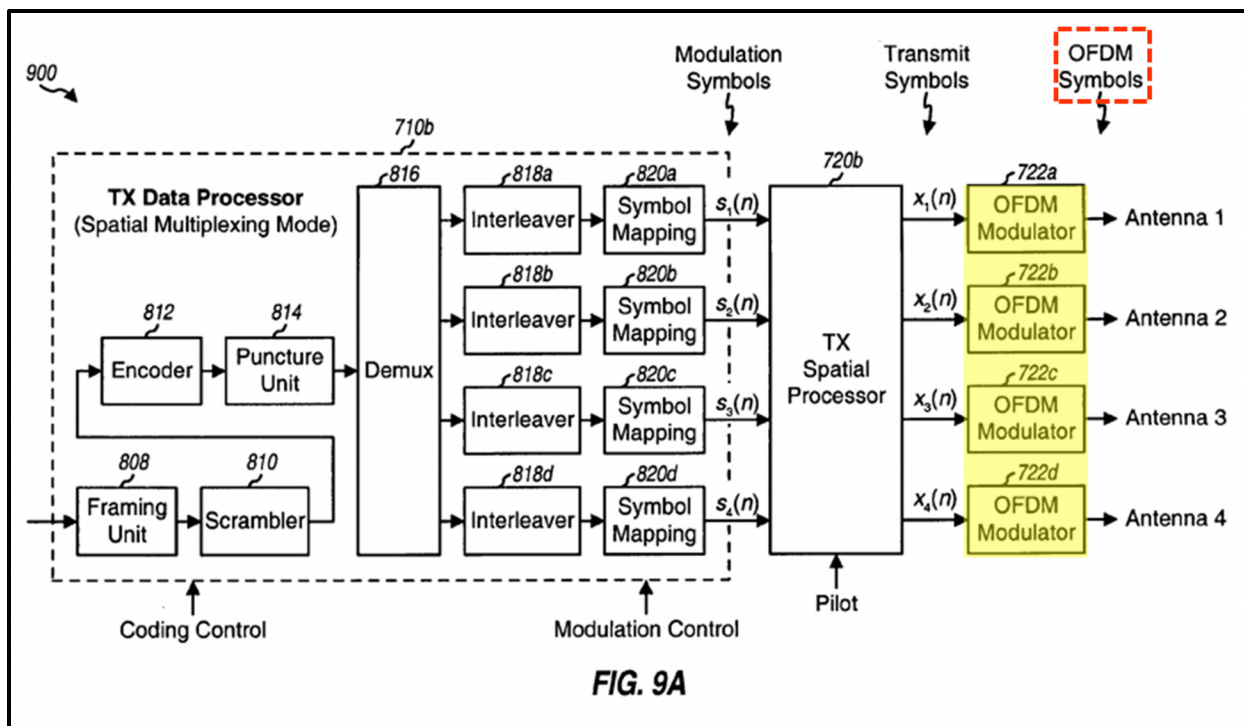
195. The *OFDM signal* is a *digital signal* because it includes one or more OFDM symbols that include “time-domain **samples**” transformed “**using an inverse fast Fourier transform (IFFT).**” EX1013, 0066, 0256. See e.g., EX1013, 0258 (“The OFDM symbol is composed of two parts: a cyclic prefix having a duration of 400 or 800 nsec (8 or 16 **samples**) and a transformed symbol with a duration of 3.2 μ sec (64 **samples**).”)

a POSITA would understand to be a signal that is defined for every value of time and can take on values over a continuous interval. EX 1022, 12-13.

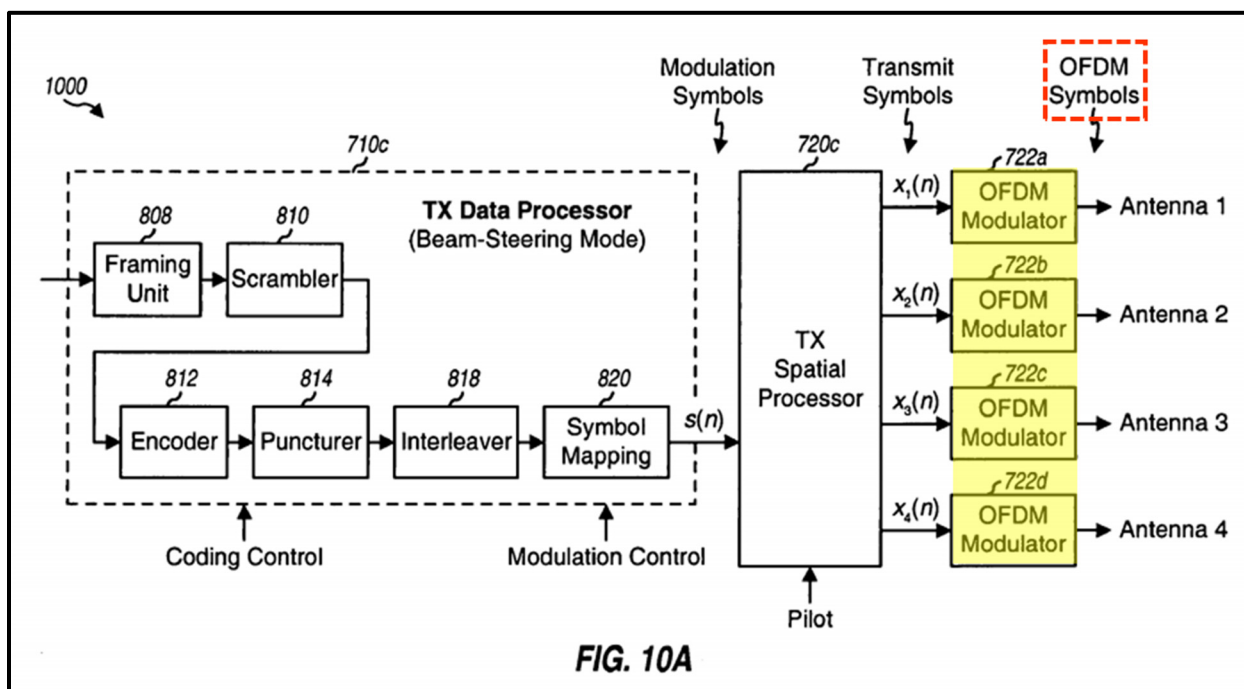
196. As shown in FIGS. 8A, 9A, and 10A, each of the “three transmitter units” 800, 900, and 1000 includes an “OFDM modulator” which *outputs a digital signal* (e.g., an OFDM signal including OFDM symbols). EX1013, 0027, 0222, 0267, 0330. Walton thus discloses *a circuit configured to provide at least the first uplink signal or the random access signal to output a digital signal.*



Walton-FIG. 8A (annotated)



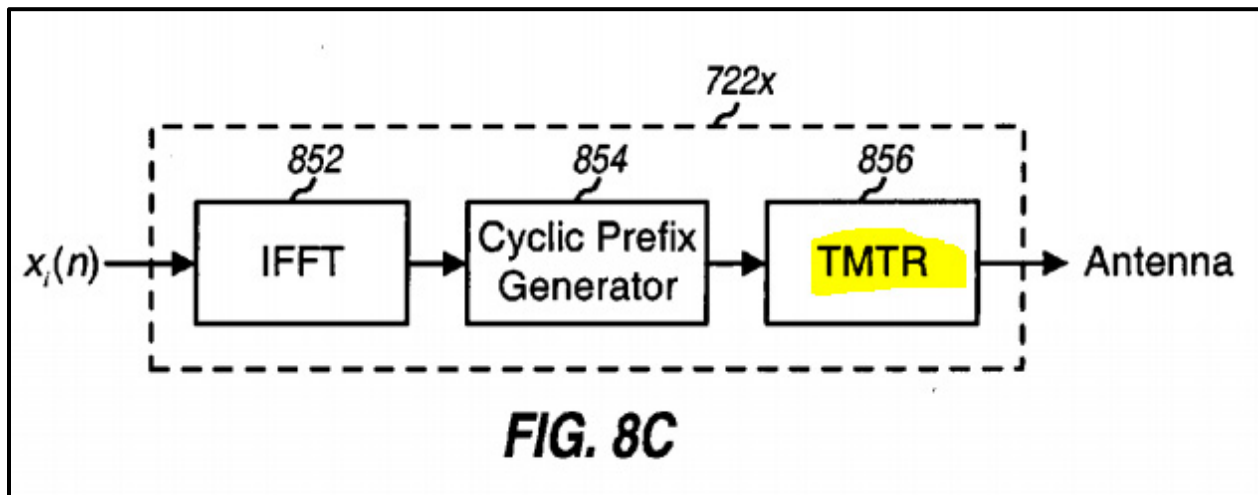
Walton-FIG. 9A (annotated)



Walton-FIG. 10A (annotated)

[21d] a digital-to-analog (D/A) conversion circuit configured to convert the digital signal to an analog signal;

197. As shown in FIG. 8C, Walton's "OFDM modulator 722 x" can include "a transmitter (TMTR) 856" and "Transmitter 856 converts the OFDM symbol stream into one or more analog signals, and further ... upconverts the analog signals to generate a modulated signal suitable for transmission[.]" EX1013, 0256-0259.



Walton-FIG. 8C (highlighted)

198. As discussed above, the "OFDM symbol stream" is a digital signal comprising one or more OFDM symbols that includes "time-domain **samples**" transformed "using an [IFFT]." EX1013, 0066, 0256. See e.g., EX1013, 0258 ("The OFDM symbol is composed of ...8 or 16 **samples** [] and [] 64 **samples** [.]") A POSITA would readily understand that Walton's *mobile station* comprising the "Transmitter 856" that comprises a *digital-to-analog (D/A) conversion circuit*

configured to convert that “**converts the OFDM symbol stream** [i.e., *the digital signal*] into one or more **analog signals.**” EX1013, 0259. In fact, it is common knowledge to a POSITA that a digital communication system such as the one disclosed by Walton would include *a digital-to-analog (D/A) conversion circuit* in the transmitter and an *analog-to-digital (A/D) conversion circuit* in the receiver. For example, it is well-established that a digital system (such as the OFDM system) would include a D/A converter *configured to convert the digital signal to an analog signal* and an analog-to-digital (A/D) converter *configured to convert an analog signal to a digital signal* because they are “Basic Elements of a Digital Signal Processing system.” EX1022, 8-9, Figure 1.3. “In applications where the digital output from the digital signal processor is to be given [] in analog form,” such as for transmission over RF waveforms in a wireless communication system, “we must provide another interface from the digital domain to the analog domain. Such an interface is called a *digital-to-analog (D/A) converter.*” EX1022, 9. Figure 1.3. In addition, TR discloses that “General transceiver configuration” includes “digital-analog convert[er],” “the D/A converter in the transmitter,” and on the receiver side, there is a corresponding “ADC before delivery of the samples to the FFT unit.” EX1006, 106, 112 and 300.

199. Accordingly, Walton renders obvious this limitation.

[21e] wherein the mobile station is configured to transmit, to the base station, the analog signal in a frequency band, wherein the random access signal occupies in a frequency domain only a portion of the frequency band;

200. As discussed in VII.C.[1c/11c], Walton discloses *the mobile station is configured to transmit, to the base station, the analog signal* by disclosing the mobile station including an **“OFDM modulator 722 x”** that includes **“Transmitter (TMTR) 856 converts the OFDM symbol stream** into one or more **analog signals**, and further amplifies, filters, and frequency upconverts **the analog signals** to generate a modulated signal **suitable for transmission from an associated antenna.**” EX1013, 0256-0259.

201. Walton discloses the analog signal converted from the OFDM signal is transmitted *in a frequency band* (e.g., “The MIMO WLAN system may be operated in various **frequency bands (e.g., the 2.4 GHz and 5.× GHz U-NII bands)**,” EX1013, 0050, “the MIMO WLAN system employs OFDM to effectively partition the **overall system bandwidth** into a number of (NF) orthogonal subbands;” or “In an embodiment, **the system bandwidth is partitioned into 64 orthogonal subbands** (i.e., $N_F=64$), which are assigned indices of -32 to $+31$. Of these 64 subbands, **48 subbands ... are used for data[.]**” EX1013, 0064-0065).

202. As discussed in VII.C.[1c/11c], Walton discloses the random access signal occupies in a frequency domain only a portion of the frequency band. EX1013, 0064-0066, 0093.

203. Accordingly, Walton discloses the limitation.

[21f] wherein the mobile station is further configured to receive, from the base station, a second analog signal; and

204. As discussed in VII.C.[1f/11f], Walton discloses *the mobile station comprises a receiver configured to receive, from the base station, a response message* (e.g., a message transmitted on the FCCH). EX1013, 0623. Moreover, Walton discloses *the mobile station receives* analog signals (e.g., a **radio frequency (RF) modulated signal** from a transmitter unit may **reach a receiver unit** via a number of propagation paths”). EX1013, 0026. *See also* FIG. 7 showing “two **user terminals**,” each including *a receiver* that includes, for example, “**one or multiple antennas 752** receive the transmitted downlink **modulated signals**, and each receive antenna provides a received signal to a respective **demodulator (DEMOD) 754**.”

205. It would have been obvious to a POSITA that the *response message* disclosed by Walton would be included in *a second analog signal* received by *the mobile station from the base station* because it is known that a digital wireless communication system, especially an OFDM-based communication system as discussed by Walton, would first receive analog signals (e.g., “**radio frequency**

(RF) modulated signal” via the “antennas 752”) and convert the analog signals to digital signals for further signal processing and detection as disclosed by Walton (e.g., “Each **demodulator 754 performs processing** complementary to that performed at modulator 722 and provides **received symbols**. A **receive (RX) spatial processor 760 then performs spatial processing on the received symbols** from all demodulators 754 to provide recovered symbols, which are estimates of the modulation symbols **sent by the access point** [*base station*]).

206. Accordingly, Walton renders obvious this limitation.

[21g] wherein the mobile station further comprises: an analog-to-digital (A/D) conversion circuit configured to convert the second analog signal to a second digital signal; and

207. As discussed in VII.C.[21f], it would have been obvious to a POSITA that, in Walton’s OFDM-based communication system, the mobile station would comprise an *A/D conversion circuit configured to convert the second analog signal* (that includes the *response message*) into a *second digital signal* (e.g., “the recovered **symbols**”) for further digital signal processing and detection by the mobile station (e.g., “A **receive (RX) spatial processor 760 then performs spatial processing on the received symbols** from all demodulators 754 to provide **recovered symbols**.” EX1013, 0214. A POSITA would understand that the “recovered symbols” are a *digital signal* because they “are **estimates of the modulation symbols** sent by the access point,” *id.*, and Walton discloses the

modulation symbols sent on the transport channels are subject to digital modulation schemes such as BPSK, QPSK, 16QAM as shown in Tables 25-28. EX1013, 0200-0208. Also, Walton discloses “The **recovered symbols** for each transport channel may be [subject to various **digital signal processing techniques** such as] **symbol demapped, deinterleaved, decoded, and descrambled to provide decoded data** for that transport channel.” EX1013, 0214, 0215. It is well-established that an A/D converter is an essential and “Basic Element[] of a **Digital Signal Processing system**” because “[t]o perform the processing digitally, there is a **need for** an interface between the analog signal and the digital processor. This interface is called an *analog-to-digital (A/D) converter*. The output of the A/D converter is a digital signal that is appropriate as an input to the digital processor.” EX1022, 9. EX1022, 8-9, Figure 1.3.

208. Accordingly, Walton renders obvious this limitation.

[21h] a receiver circuit configured to receive, based on the second digital signal, a response message.

209. As discussed in Section VII.C.[1f/1lf] and [2lf], Walton discloses the mobile station comprises a receiver/receiver circuit configured to receive, from the base station, a response message (e.g., a message transmitted on the FCCH), and the response message would be included in the second analog signal. As discussed in Section VII.C.[2lg], Walton discloses that the mobile station converts the second analog signal to the second digital signal (e.g., “**recovered symbols**”). The

second digital signal would include the response message (e.g., the message transmitted on the FCCH) because Walton discloses a receiver circuit that includes at least “**An RX data processor 770** [that] receives and demultiplexes the **recovered symbols to provide decoded data for that transport channel.** The **decoded data for each transport channel** [e.g., an FCCH¹⁰] **may include recovered** packet data, **messages** [e.g., response message, the message transmitted on the FCCH]..., which are provided to a data sink 772 for storage and/or a controller 780 **for further processing.**” EX1013, 0214, 0215.

210. Accordingly, Walton renders obvious *a receiver circuit* that includes at least “An RX data processor 770” *configured to receive, based on the second digital signal* (e.g., “recovered symbols” for FCCH), *a response message* (e.g., a message transmitted on the FCCH).

[2a/12a/22a] [the receiver]/[the receiver circuit] is configured to determine/[determining] if the response message identifies the sequence associated with the base station in the random access signal; and,

211. As discussed in VII.C.*[If/If]*, Walton discloses the user terminal *receives a response message* such as an FCCH message that includes “an RACH acknowledgement.” Moreover, Walton discloses “**the user terminal** further

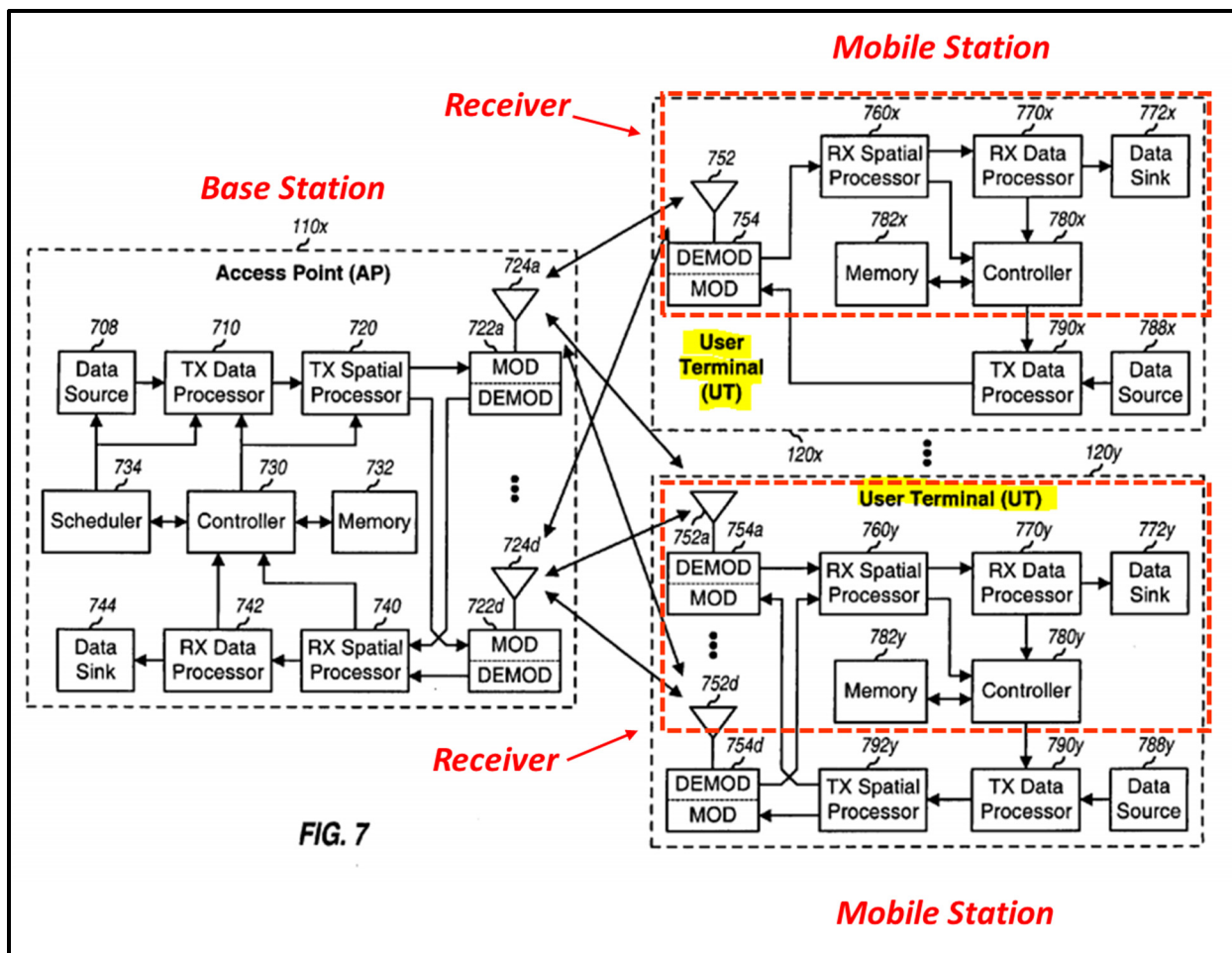
¹⁰ Walton discloses FCCH is one type of the “transport channels.” EX1013, 0098-0100.

processes the FCCH [*response message*] to obtain IE Type 3 information elements containing **acknowledgements**,” where “**Each acknowledgement information element contains the MAC ID** associated with the user terminal.” EX1013, 0649, 0651, 0652. *See also* EX1013, 0141 (“A single or multiple types of **acknowledgment** may be defined and **sent on the FCCH**.”) As explained in Section VII.C.[*1d/11d*], the “**the MAC ID** associated with the user terminal” is “*the sequence associated with the base station in the random access signal*” because it is “**assigned by the access point**.” *See e.g.*, EX1013, 0645.

Accordingly, Walton discloses *the mobile station determines if the response message* (e.g., an FCCH message that includes “an RACH acknowledgement”) *identifies the sequence associated with the base station in the random access signal* (e.g., “**the MAC ID** associated with the user terminal”).

212. As discussed in VII.C.[*1f/11f*], Walton discloses the *mobile station comprising a receiver* that includes, among others as shown in FIG. 7, a “**controller 780**,” wherein “The **decoded data for each transport channel** may include **recovered packet data, messages, signaling**, and so on, **which are provided to** a data sink 772 for storage and/or a **controller 780** for **further processing**” (e.g., *determining if the response message identifies the sequence*). EX1013, 0214, 0215.

213. Walton also discloses “Various parts of the MIMO WLAN system and various techniques described herein may be implemented by various means. For example, **the processing at the access point and user terminal may be implemented in hardware, software, or a combination thereof...** For a software implementation, the processing may be implemented with modules (e.g., procedures, functions, and so on) that **perform the functions described herein.** The software codes may be stored in a memory unit (e.g., memory 732 or 782 in FIG. 7) and **executed by a processor (e.g., controller 730 or 780).**” EX1013, 0687-0688. A POSITA would understand that Walton discloses its receiver including at least the controller 780, which is configured to perform the disclosed *determining* function as discussed above. Accordingly, Walton discloses this limitation.



Walton-FIG. 7 (annotated)

[2b/12b/22b] on a condition that the response message identifies the sequence associated with the base station in the random access signal, [the transmitter]/[the first type of transmitter signal processing circuit is configured to transmit]/[transmitting] a second uplink signal.

214. Walton discloses “**If** [on a condition that] the user terminal receives an **assignment-based acknowledgement** [the response message]” wherein “Each **acknowledgement** information element **contains the MAC ID associated with**

the user terminal [*the sequence associated with the base station*¹¹] **for which the acknowledgment is sent, it** [*mobile station*] ... **begins using the FCH/RCH** as assigned in the current TDD frame” [*transmit a second uplink signal such as a RCH signal on the assigned RCH*]. EX1013, 0651-0652.

215. As discussed in Section VII.C.[*1a/11a/21a*], Walton discloses the *mobile station comprising a transmitter/first type of transmitter signal processing circuit* (e.g., one or more of the “**three transmitter units for the diversity, spatial multiplexing, and beam-steering modes**” as shown in FIGS. 8A, 9A, and 10A, respectively. EX1013, 0027). A POSITA would understand that Walton discloses such a *transmitter/first type of transmitter signal processing circuit* could be configured to perform the disclosed *transmitting* functions including *transmitting a second uplink signal* (e.g., a RCH signal on the assigned RCH) at least because the “**three transmitter units for the diversity, spatial multiplexing, and beam-steering modes**” as shown in FIGS. 8A, 9A, and 10A, respectively support transmission of an RCH signal on the assigned RCH. EX1013, 0027, Table 24. EX1013, 0651-0652.

216. Accordingly, Walton discloses these limitations.

¹¹ See explanation in Section VII.C.[*1d/11d*].

[3/13/23] wherein the response message includes power adjustment information and wherein the second uplink signal is transmitted according to the power adjustment information.

217. As discussed in VII.C.***[2b/12b/22b]***, Walton discloses the mobile stations transmits *a second uplink signal* on the “**RCH as assigned** in the current TDD frame.” EX1013, 0651-0652. As discussed in VII.C.***[1f/11f/21h]***, Walton discloses the FCCH message [*response message*], which include “**the FCCH assignments**” that further includes “**the power control commands** [*the power adjustment information*].” EX1013, 0649, 0651, 0637.

218. Walton discloses “If **power control** is being applied for the uplink transmission, then **the user terminal adjusts its transmit power** [*the second uplink signal is transmitted*] **based on the power control commands** [*the power adjustment information*] **included in the FCCH assignment.**” EX1013, 0637.

219. Accordingly, Walton discloses the limitation.

[4/14/24] wherein the portion of the frequency band used for transmission of the random access signal does not include control channels.

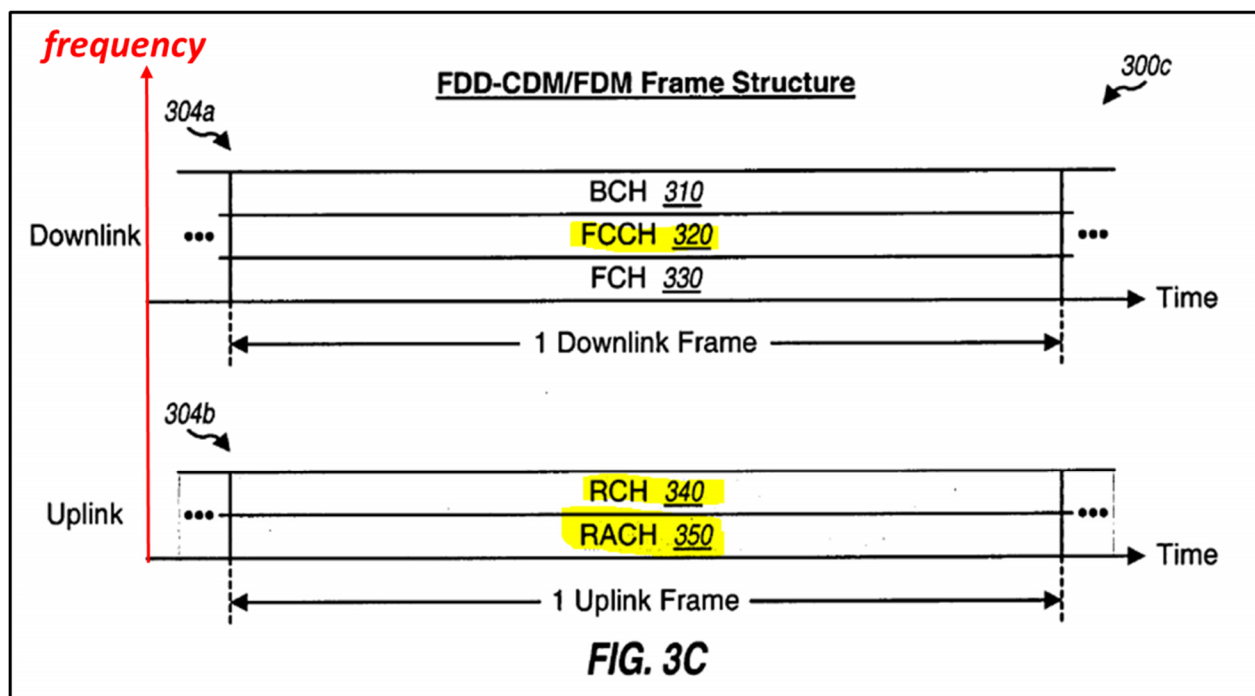
220. As discussed in VII.C.***[1c/11c/21c]***, Walton discloses a mobile station transmits, to the base station, a random access signal in only a portion of the frequency band. For control channels, Walton discloses a downlink control channel, Forward Control Channel (FCCH), transmitted from the base station to the mobile station, while on the uplink, Walton discloses the RACH and the other uplink channel, Reverse Channel (RCH). EX1013, 0098-0101. To the extent that

one argues that the RCH includes any control channels, Walton discloses “an embodiment of an FDD-CDM/FDM frame structure 300 c” where “the downlink and uplink are transmitted **using separate frequency bands.... For FDM, the transport channels** [e.g., RACH and RCH] **for each link** [e.g., uplink] **are assigned different portions of the frequency band for the link.**” EX1013, 0094-0095, 0098-0101. As shown in FIG. 3C, in the frequency domain, the RACH 350 [the portion of the frequency band used for transmission of the random access signal] does not include control channels, regardless of the Forward Control Channel (FCCH) 320 or any control channels that might be included in the RCH 340. EX1013, EX1013, 0094-0097.

221. In fact, Walton makes clear that “[o]**ther frame structures may also be defined for the downlink and uplink transport channels, and this is within the scope of the invention.** Moreover, **it is possible to use different types of frame structure for the downlink and uplink.**” “For example, a TDM-based frame structure may be used for the downlink and a CDM-based frame structure may be used for the uplink.” Walton notes that “**a specific implementation of the TDD-TDM frame structure is described throughout the specification**” “**for clarity**” and “**[o]ther frame structures and other implementations may also be used, and this is within the scope of the invention**”:

In the following description, the MIMO WLAN system is assumed to use one frequency band for both downlink and uplink transmissions. For clarity, the TDD-TDM frame structure shown in FIG. 3A is used for the MIMO WLAN system. **For clarity, a specific implementation of the TDD-TDM frame structure is described throughout the specification.** For this implementation, the duration of each TDD frame is fixed at 2 msec, and the number of OFDM symbols per TDD frame is a function of the length of the cyclic prefix used for the OFDM symbols. The BCH has a fixed duration of 80 μ sec and uses the 800 nsec cyclic prefix for the OFDM symbols transmitted. The remainder of the TDD frame contains 480 OFDM symbols if the 800 nsec cyclic prefix is used, and 533 OFDM symbols plus 1.2 μ sec of excess time if the 400 nsec cyclic prefix is used. The excess time can be added to the guard interval at the end of the RACH segment. **Other frame structures and other implementations may also be used, and this is within the scope of the invention.**

EX1013, 0096.



Walton-FIG. 3C (annotated).

222. Notably, although Walton focuses the TDD-TDM frame structure in FIG.3A in the Specification as an example, Walton notes that “[o]ther frame structures,” such as the FDD frame structure shown in FIG.3C, “may also be used, and this is within the scope of the invention.” EX1013, 0097. It would have been obvious to a POSITA that advantageous features such as the guard interval feature especially after a RACH signal can be incorporated into other frame structures, such as the FDD frame structures shown in FIG. 3C. The guard interval would help prevent/decrease interference as identified by Walton, as well as achieving known advantages such as “to be robust against very long multi-path delay,” “to compensate timing misalignments” to handle a “timing inaccuracy ... without any

performance degradation,” to account for the propagation delay of the random access signal “because the propagation delay is unknown before communication starts between MS and BS” as discussed in prior art such as TR. EX1006, 197, 199, 207-208.

[5/15/25] wherein the response message includes a mobile station identifier assigned to the mobile station.

223. As discussed in VII.C.[1f/11f/21h], Walton discloses the *response message*, e.g., the FCCH message including “**acknowledgments on the FCCH**” “**using the MAC ID assigned to the user terminal**,” [includes *a mobile station identifier assigned to the mobile station*]. See also EX1013, 0650-0652.

[6/16/26] wherein the time duration of the combination of the random access signal and the guard period is greater than a time duration of at least two of the plurality of OFDM symbols.

224. As discussed in VII.C.[1e/11e], Walton discloses *a time duration of the random access signal* (e.g., “duration of the RACH PDU” including a “**Preamble portion 552** [that] has a fixed duration of **at least 2 OFDM symbols**.”) *is at least more than two times a time duration of an OFDM symbol*, even without considering the additional “Guard Interval.” EX1013, 0648, 0111, 0146, Table 5. Therefore, Walton discloses *a time duration of a combination of the random access signal and the guard period is greater than a time duration of at least two of the plurality of OFDM symbols*. EX1013, 0207.

*[8/18/28] wherein the random access signal is a spread spectrum signal*¹².

225. Walton discloses “a CDM-based frame structure may be used for the uplink” and “For CDM, the transport channels for each link are “channelized” with different channelization codes, which may be Walsh codes, orthogonal variable spreading factor (OVSF) codes[.]” EX1013, 0095-0096. A POSITA would recognize Walsh codes and OVSF codes as spreading codes. RACH is one type of the “transport channels.” EX1013, 0098-0100. As such, at least in the “CDM-based frame structure,” the RACH PDU transmitted on the RACH (i.e., *the random access signal*) is ““channelized’ with different channelization codes, which may be

¹²The ’908 Patent does not define the “*spread spectrum signal*” but generally recites “The **spread spectrum signal**, which is designed to have a high **spread gain** for overcoming severe interference, is used for facilitating system functions such as initial random access, channel probing, or short messaging;” “A direct Sequence **Spread Spectrum** (DSSS) system is inherently capable of supporting multi-cell and multi-user access applications through the use of orthogonal **spreading codes**,” and a “**sequence [is] used to spread the DSSS signal**.” EX1001, Abstract, 1:32-35, 7:56-57. A POSITA would understand a *spread spectrum signal* would encompass any signal using a spreading code or sequence.

Walsh codes, orthogonal variable spreading factor (OVSF) codes,” and thus *is a spread spectrum signal*. EX1013, 0095-0096.

[9/19/29] [wherein: the receiver/the receiver circuit is further configured to receive]/further comprising: receiving/ broadcast information from the base station, the broadcast information indicating at least one sequence associated with the base station for use in producing the random access signal.

226. Walton discloses “Broadcast Channel (BCH)—Downlink” message (i.e., *broadcast information from the base station*). EX1013, 0104. “The **BCH is used by the access point to transmit ... system parameters to the user terminals....**

The **system parameters** specify various **attributes** of the downlink and uplink transmissions [f]or example, [] the durations of the FCCH, FCH, **RACH**, ... in the **BCH**.” EX1013, 0105.

227. The '908 Patent does not define the “at least one sequence associated with the base station for use in producing the random access signal” and claims 9, 19, and 29 do not refer to the “at least one sequence associated with the base station” as “the sequence associated with the base station” recited in respective independent claims. A POSITA would understand the plain and ordinary meaning of “at least one sequence associated with the base station for use in producing the random access signal” would encompass Walton’s “**system parameters**” included in the **BCH message** (i.e., broadcast information from the base station) such as the “**RACH Length field**” (5 bits), “**RACH Slot Size field**” (2 bits), and/or “**RACH Guard Interval field**” (2 bits) as shown in FIG. 5, which are bit sequences for use

in producing the random access signal because “**When a user terminal desires to access the system, it first processes the BCH to obtain pertinent system parameters. The user terminal then sends a RACH PDU on the RACH.**”

EX1013, 0645. EX1013, 0111.

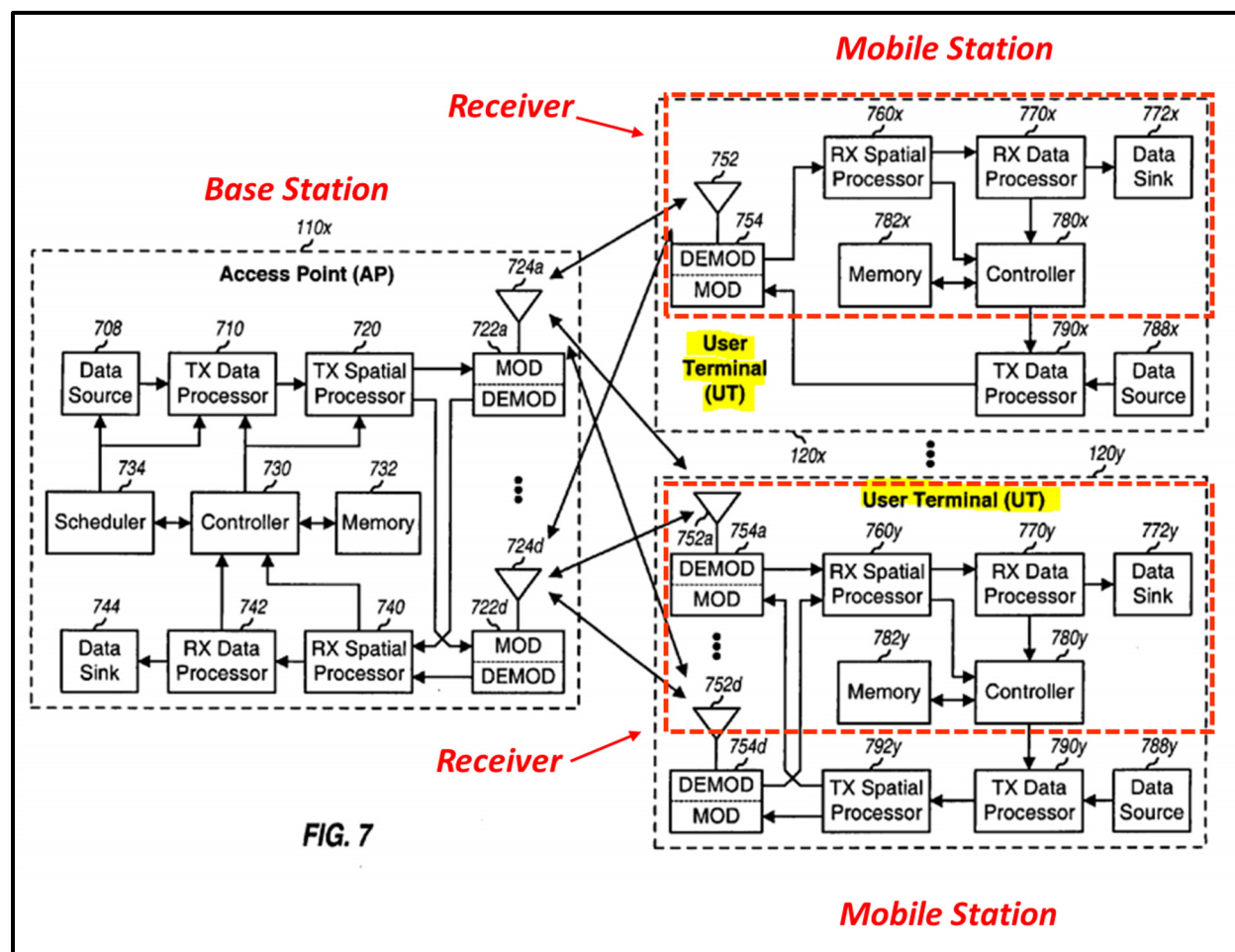
TABLE 5-continued		
BCH Message		
Fields/ Parameter Names	Length (bits)	Description
FCCH Length	6	Duration of FCCH (in units of OFDM symbols)
FCCH Rate	2	Physical layer rate of FCCH
FCH Length	9	Duration of FCH (in units of OFDM symbols)
RCH Length	9	Duration of RCH (in units of OFDM symbols)
RACH Length	5	Duration of RACH (in units of RACH slots)
RACH Slot Size	2	Duration of each RACH slot (in units of OFDM symbols)
RACH Guard Interval	2	Guard interval at the end of RACH
Cyclic Prefix Duration	1	Cyclic prefix duration
Page Bit	1	“0” = page message sent on FCH “1” = no page message sent
Broadcast Bit	1	“0” = broadcast message sent on FCH “1” = no broadcast message sent
RACH Acknowledgment Bit	1	“0” = RACH acknowledgment sent on FCH “1” = no RACH acknowledgment sent
CRC	16	CRC value for the BCH message
Tail Bits	6	Tail bits for convolutional encoder
Reserved	32	Reserved for future use

Walton-Table. 5 (highlighted)

228. Accordingly, Walton discloses the mobile station receives broadcast information from the base station, the broadcast information indicating at least one sequence associated with the base station for use in producing the random access signal.

229. As discussed in VII.C.[*If/If*], Walton discloses the *mobile station comprising a receiver*, for example, as shown in FIG. 7. “**At each user terminal 120**, one or multiple **antennas 752 receive the transmitted downlink modulated signals**,” (e.g., *broadcast information from the base station*). EX1013, 0214, 0215. A POSITA would understand that Walton discloses its receiver including at least the antennas 752 is configured to perform the disclosed *receiving* function as discussed above. *See also* EX1013, 0687-0688 (“Various parts of the MIMO WLAN system and various techniques described herein may be implemented by various means. For example, **the processing at the access point and user terminal may be implemented in hardware, software, or a combination thereof**.... For a software implementation, the processing may be implemented with modules (e.g., procedures, functions, and so on) that **perform the functions described herein**. The software codes may be stored in a memory unit (e.g., memory 732 or 782 in FIG. 7) and **executed by a processor (e.g.,**

controller 730 or 780).”) Accordingly, Walton discloses this limitation.



Walton-FIG. 7 (annotated)

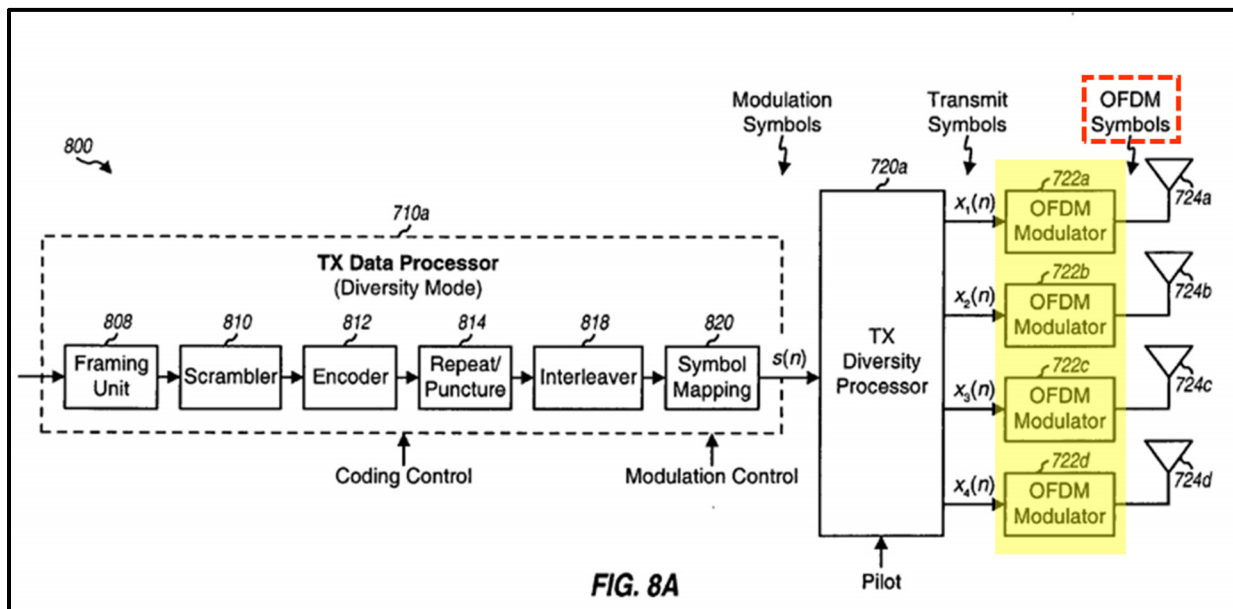
[10] wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.

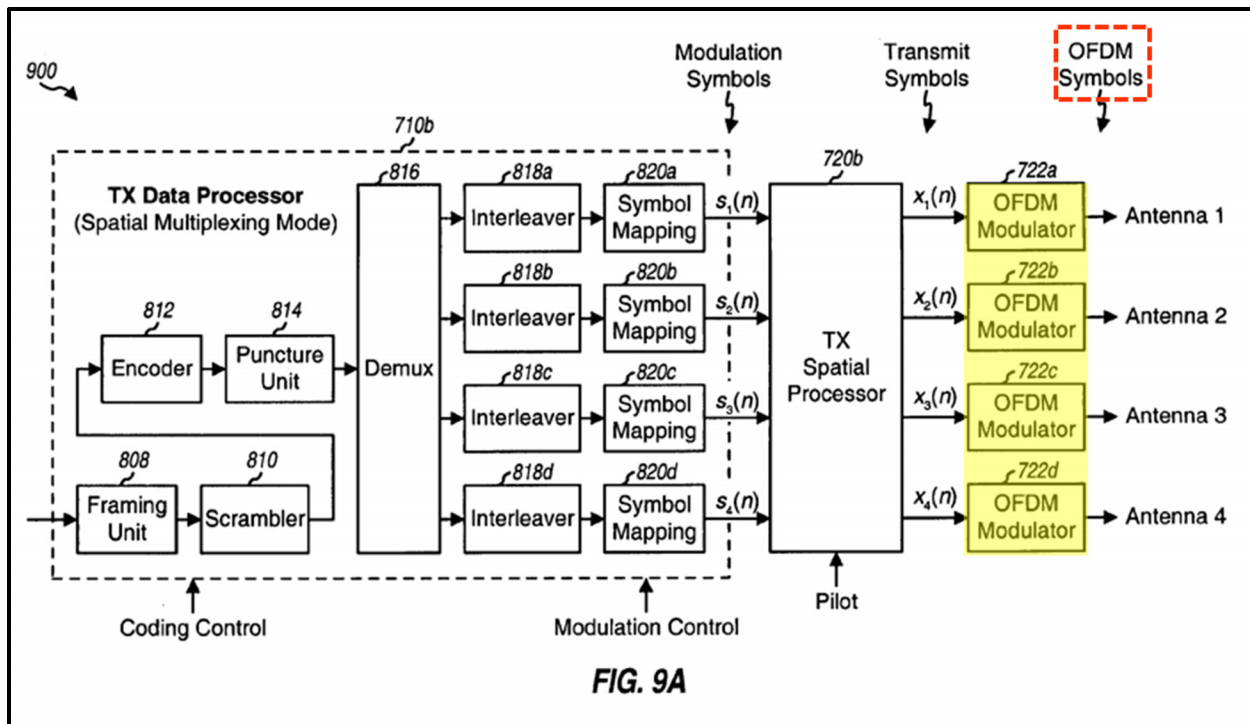
[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter,

an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

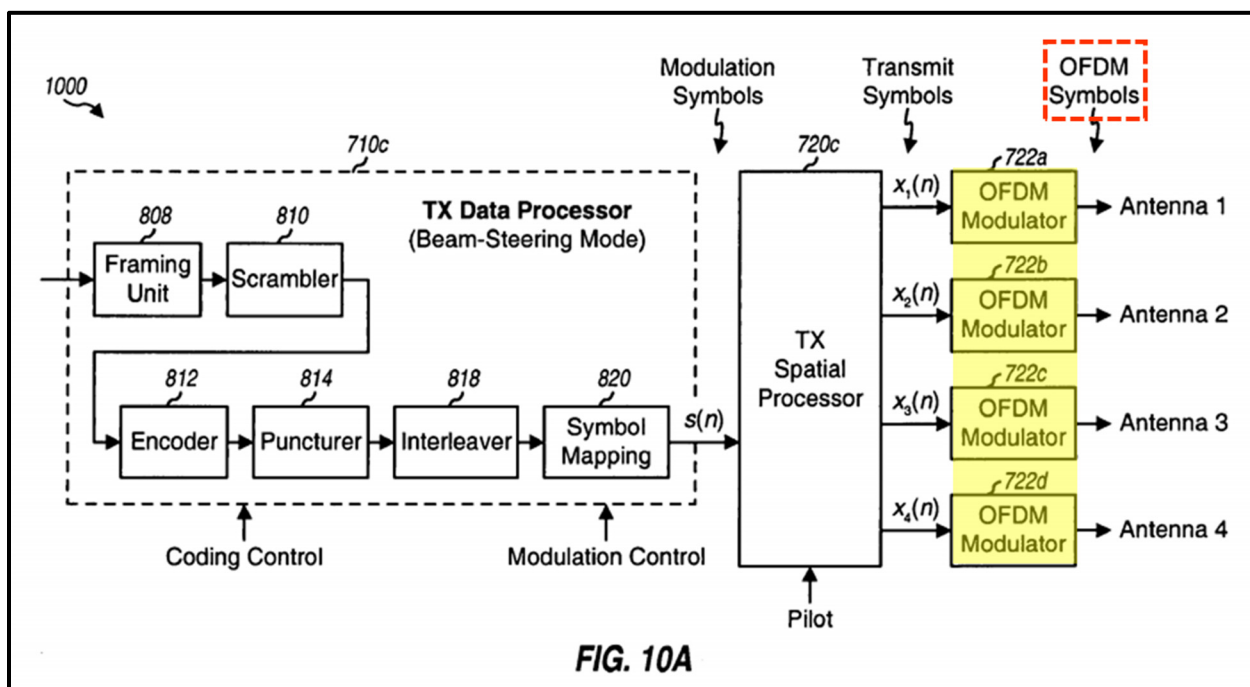
230. As discussed in VII.C.[1a/11a], [1b/11b], and [21a], Walton discloses *the transmitter/the first type of transmitter signal processing circuit* can be one or more of the “three transmitter units” 800, 900, and 1000 as shown in FIGS. 8A, 9A, and 10A, each including an “**OFDM modulator**.” EX1013, 0027, 0222, 0267, 0330. Walton thus discloses *the transmitter/the first type of transmitter signal processing circuit includes/is an OFDM transmitter signal processing circuit.*



Walton-FIG. 8A (annotated)



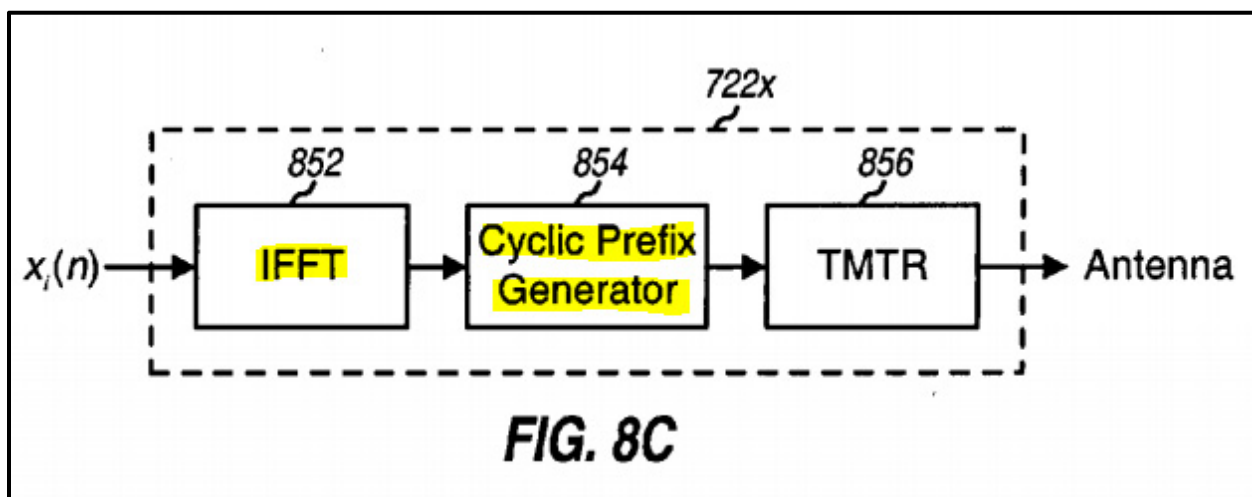
Walton-FIG. 9A (annotated)



Walton-FIG. 10A (annotated)

231. As discussed in VII.C.[1a/11a], [1b/11b], and [21a], Walton discloses *the first uplink signal* (e.g., “packet sent on the RCH”) *is provided by an OFDM transmitter signal processing circuit* because the “**packet sent on the RCH ... comprises OFDM symbols,**” and “OFDM symbols” are output from “an **OFDM modulator**” as shown in FIGS. 8A, 9A and 10A, EX1013, 0169, 0174, 0167, 0256.

232. As shown in FIG. 8C, the “**OFDM modulator 722 x**” includes “an **inverse fast Fourier transform (IFFT) unit 852**” (i.e., *an inverse Fourier transform*), a “**cyclic prefix generator 854**” (i.e., *a cyclic prefix addition circuit*), and “a transmitter (TMTR) 856.” EX1013, 0256-0259.



233. A POSITA would readily understand that Walton’s *OFDM transmitter signal processing circuit* comprises a *serial to parallel converter* because the *serial to parallel converter* is a well-known and standard component of an OFDM modulator. For example, Li identifies the *serial to parallel converter* is a well-

known component of the OFDM transmitter, and can process the data to generate an OFDM signal “**a manner well-known in the art**”:

The modulated data on all subcarriers (intended for multiple subscribers) is processed by **Inverse Fast Fourier Transform (IFFT) 405 in a manner well-known in the art**. The outputs of IFFT 405 are input to **parallel-to-serial converter 406**, which converts the parallel outputs of IFFT 405 into a serial **output OFDM signal in a manner well-known in the art**. In one embodiment, an additional guard interval (**cyclic prefix**) is inserted at this point. The resulting OFDM signal is transmitted through the RF channel.

EX1009, [0052]

234. *See also* Jung’s disclosure of such a conventional “structure of a transmitter in an OFDM communication system.” EX1010, 0045, 0046. Accordingly, Walton renders obvious claims 10, 20 and 30.

D. Ground-B2 - Claims 10, 20 and 30 are obvious by Walton-Jung

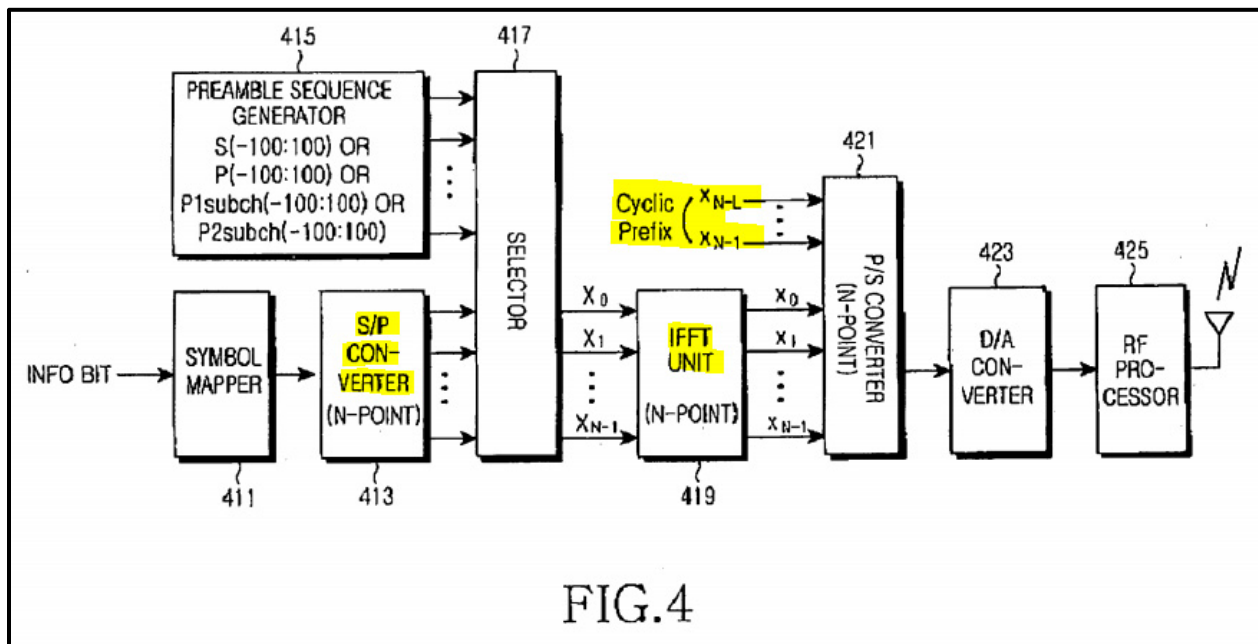
[10]wherein the transmitter includes an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

[20] wherein the first uplink signal is provided by an OFDM transmitter signal processing circuit comprising: a serial to parallel converter, an inverse Fourier transform, and a cyclic prefix addition circuit.

[30] wherein: the first type of transmitter signal processing circuit is an OFDM transmitter signal processing circuit comprising: a serial to parallel converter,

an inverse Fourier transform, and a cyclic prefix addition circuit; and the OFDM transmitter signal processing circuit outputs the first uplink signal.

235. To the extent that one argues that Walton does not explicitly disclose an OFDM transmitter includes a *serial to parallel converter*, a POSITA would have referred to existing literature that describes the well-known, conventional structure of an OFDM transmitter. Jung is one of numerous references that discloses such details. For example, as shown in “FIG. 4 [that] is a block diagram illustrating a structure of a **transmitter in an OFDM** communication system” includes a “**serial-to-parallel converter 413,**” besides “**an inverse fast Fourier transformer (IFFT unit) 419,**” and a *cyclic prefix addition circuit* that adds “**a cyclic prefix** that is applied to the parallel-to-serial converter 421.” EX1013, 0045, 0046.



Jung-FIG. 4 (highlighted).

236. As discussed in Section VI.G, a POSITA would have been motivated to apply the known implementation details of “*OFDM transmitter*” as disclosed in Jung to the “*OFDM transmitter*” as disclosed in Walton. The resulting Walton-Jung combination renders obvious claims 10, 20, and 30.

CONCLUSION

237. For all the reasons I have noted in the foregoing paragraphs, the Challenged claims of the '908 Patent are obvious in view of the references discussed above.