

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NOKIA OF AMERICA CORPORATION, ERICSSON INC., AND T-MOBILE
USA, INC.
Petitioners

v.

GENERAL ACCESS SOLUTIONS, LTD.,
Patent Owner

Case No. IPR2023-01415

U.S. Patent No. 7,099,383

**DECLARATION OF DANIEL VAN DER WEIDE, Ph.D. IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S PATENT NO. 7,099,383**

DECLARATION OF DANIEL VAN DER WEIDE, PH.D.

I, Daniel van der Weide, Ph.D., do hereby declare and say as follows:

I. Introduction

1. I have been retained as a technical expert by counsel for Petitioners Nokia of America Corporation (“Nokia”), Ericsson, Inc. (“Ericsson”), and T-Mobile USA, Inc. (“T-Mobile”) to address certain issues regarding U.S. Patent No. 7,099,383 (“the ’383 Patent”) (Ex. 1001).¹

2. I have been asked to consider whether certain references disclose or render obvious the features recited in claims 1-17 (“the challenged claims”) of the ’383 patent. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art anticipates and/or renders obvious all limitations of the challenged claims, as I discuss in detail below.

3. I have personal knowledge of the facts contained in this Declaration, am of legal age, and am otherwise competent to testify.

4. Unless otherwise stated, the matters contained in this Declaration are of my own personal knowledge and, if called as a witness, I could and would testify completely and truthfully with regard to the matters set forth herein.

¹ Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the ’383 patent.

5. My opinions are based on my years of education, research, and experience, as well as my study of the relevant materials. A list of materials I considered is included at the beginning of this Declaration.

6. I reserve all available rights to supplement this Declaration if further information becomes available, or if I am asked to consider additional information. This Declaration represents only those opinions I have formed to date.

7. Further, I reserve all available rights to consider and comment on any additional expert statements or testimony of Patent Owner's expert(s) in this matter.

8. I am being compensated at my current consulting rate of \$750 per hour for my time spent working on issues in this matter. My compensation does not depend on the outcome of this matter or the opinions I express.

II. Qualifications

9. I am qualified by education and experience to testify as an expert in the field of telecommunications. Ex. 1004 is a copy of my curriculum vitae detailing my education and experience. Additionally, the following overview of my background pertains to my qualifications for providing expert testimony in this matter.

10. I am a Full Professor in the Department of Electrical and Computer Engineering at the University of Wisconsin-Madison. I received my Bachelor of Science Degree in Electrical Engineering from the University of Iowa in 1987; my Master of Science Degree in Electrical Engineering from Stanford University in

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

acquired by Tektronix in 2012. Before and during the timeframe relevant to the '383 patent's purported invention, I trained students in both analog and digital wireless communications techniques and standards, many of whom have been hired by Qualcomm, Google (formerly Motorola) and Skyworks. I am a Fellow of the IEEE.

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

III. Materials Reviewed

12. The opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, experience, and knowledge.

13. In forming my opinions expressed in this Declaration, I also reviewed the following materials and information:

Exhibit	Short Name	Description
Ex. 1001	'383 Patent	U.S. Patent No. 7,099,383

Exhibit	Short Name	Description
Ex. 1002	'383 File History	File History of U.S. Patent No. 7,099,383
Ex. 1003	Declaration	Declaration of Daniel Van der Weide, PhD
Ex. 1004	CV	Curriculum Vitae of Daniel Van der Weide, PhD
Ex. 1005	Uhlik	U.S. Patent No. 7,430,197
Ex. 1006	Barratt '470	U.S. Patent No. 5,909,470
Ex. 1007	Barratt '490	U.S. Patent No. 5,592,490
Ex. 1008	'383 Contentions	'383 Patent Infringement Contentions, <i>General Access Solutions, Ltd. v. T-Mobile USA, Inc.</i> , C.A. No. 2:23-cv-00158 (E.D. Tex.)
Ex. 1009	District Court DCO	Doc. No. 34, Docket Control Order, <i>General Access Solutions, Ltd. v. T-Mobile USA, Inc.</i> , Case No. 2:23-cv-00158 (E.D. Tex.)
Ex. 1010	Caseload	U.S. District Court – Judicial Caseload Profile (Sept. 2022)

14. I also reviewed any other materials I refer to in this Declaration in support of my opinions.

15. My opinions contained in this Declaration are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would

have understood the state of the art, the prior art, and the claims and specification of the '383 patent at the time of the alleged invention.

IV. Legal Standards

16. Petitioners have explained to me the legal standards that apply in this case. My understanding of those standards is described below. I am not an attorney, and I do not have formal training in the law regarding patents. I have used my understanding of the following legal principles set forth in this section in reaching my opinions.

17. I understand that, in this proceeding, Nokia has the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Anticipation

18. I have been informed that a claim is invalid as anticipated under 35 U.S.C. § 102 (pre-AIA) if a prior art reference discloses, either expressly or inherently, all limitations of a claim as those limitations are arranged in the claim.

19. I have been informed that a limitation is discloses inherently in a reference if it is necessarily present in the process or product described in the prior art reference. I understand that probabilities or possibilities are insufficient to show that a prior art reference inherently discloses something beyond what it discloses explicitly.

B. Obviousness

20. I have been informed that a claim is invalid as obvious under 35 U.S.C. § 103 (pre-AIA) 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 of the invention to a person of ordinary skill in the art. I have been informed that the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time of the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

21. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

22. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill in the art can

implement a predictable variation, such a variation is likely unpatentable. For the same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar device in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

23. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

24. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

25. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently,

known in the prior art. I have been informed that it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I am told that one way the subject matter can be proved obvious is by noting there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

26. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

27. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the product was likely not accomplished by innovation but by using ordinary skill and

common sense. I have been informed that, in such an instance, the fact that the combination was obvious to try may show that the combination was obvious.

28. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

29. I have been informed that, when determining whether a claimed invention is obvious, any “secondary considerations” of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;
- the invention taught away from the technical direction followed by those skilled in the art;
- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;

- the invention achieves results unexpected to those skilled in the art;
- copying of the invention by competitors as distinguished from their independent development;
- unsuccessful attempts by those skilled in the art to make the invention;
- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

30. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

C. Claim Construction

31. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the '383

patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

32. I have been informed that in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.

V. Person of Ordinary Skill in the Art and the Time of the Alleged Invention

33. I have been asked to assume that the '383 patent is entitled to its earliest alleged priority date of January 19, 2001. *See* Ex. 1001, 1 ("Related U.S. Application Data" section). Based on my knowledge and experience, I was a person of ordinary

skill in the art as of January 19, 2001 and can provide opinions regarding the knowledge of a person of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

34. Based on the materials and information I have reviewed and based on my experience in the technical areas relevant to the '383 patent, a person of ordinary skill in the art at the time of the alleged invention of the '383 patent would have had at least a bachelor's degree in computer science, electrical or computer engineering, or a related field, and at least two years of work or research experience in digital communications systems, such as wireless communications systems and networks, or equivalent, or a master's degree in electrical engineering, computer engineering, computer science, or a similar field. I myself had these capabilities at the time of the alleged invention of the '383 patent.

VI. Technical Background

35. Below, I present a brief overview of certain technical concepts and features that would have been known to a person of ordinary skill in the art prior to and at the time of the earliest alleged priority date of the '383 patent. The technical concepts and features that I describe in this Technical Background section reflect the state of the art that a person of ordinary skill in the art would have had knowledge of and would have understood prior to and at the time of the alleged invention of the

'383 patent. I rely on, and incorporate as applicable (even if not expressly mentioned below in Section IX), the following disclosures to support my opinions in this Declaration, including those opinions relating to how the prior art discloses and/or suggests the challenged claims of the '383 patent and how (and why) a person of ordinary skill in the art would have been motivated to consider and combine the disclosures and suggestions from one or more prior art references.

36. Prior to the '383 Patent's earliest alleged priority date, a person of ordinary skill in the art would have been familiar with fixed wireless access communication systems. Fixed wireless access allows service providers to provide wireless connectivity through radio links between two fixed points, providing wireless internet access to homes or businesses in lieu of laying fiber or cables to provide last mile connectivity. A fixed wireless access system is illustrated in the following figure.

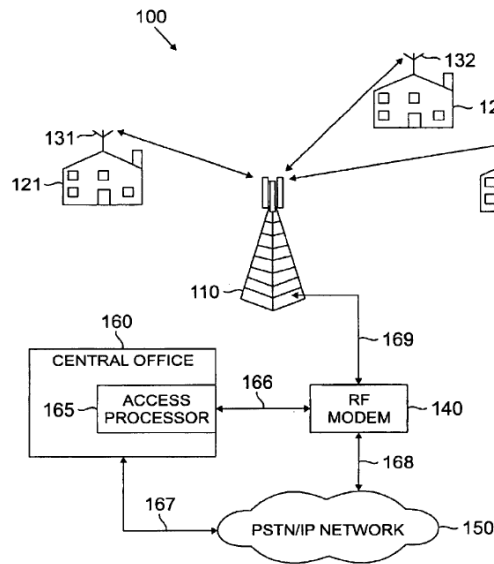
Ex. 1001 at Fig. 1

FIG. 1

37. The base stations 110 of fixed wireless systems transmit downlink signals to a plurality of subscriber premises 121-123 and receive uplink signals from those subscriber premises. Ex. 1001, 8:28-44. The subscriber premises, which may include different types of residential and commercial buildings, transmit and receive via fixed, externally mounted antennas 131-133. *Id.* The base stations also communicate with an external network 150, may be a public switched telephone network or a data network such as the Internet. Ex. 1001, 8:45-60. In particular, the base stations have RF (radio frequency) modems that up-convert baseband data traffic received from external network 150 to RF signals transmitted to subscriber premises and that down-convert RF signals received from subscriber premises to baseband data traffic sent to network 150. *Id.*

VII. Summary of the '383 Patent

A. Claim Construction

38. I have been informed that terms in the claims should receive their respective plain and ordinary meaning as understood by a person of ordinary skill in the art.²

B. The '383 Patent's Specification

39. The '383 Patent discloses a wireless system where uplink data signals are transmitted to the base station in individual “bursts” that are sent in successive timeslots of a TDD frame. Ex. 1001, 9:63-10:33. For example, Annotated Figure 2 (reproduced below) illustrates an exemplary data frame 200 that includes a downlink portion 202 and an uplink portion 204, where the uplink portion includes a contention period 214 followed by a number of successive time slots (216, 218, ...) in which different subscriber stations (SUB1, SUB2, ...) respectively transmit uplink bursts to the base station during each TDD frame. *Id.* For instance, Figure 2 shows that within two consecutive timeslots (e.g., 216, 218), first and second uplink data signals are *successively transmitted* to the base station by a first subscriber station (SUB1) and a second subscriber station (SUB2), respectively. *Id.*

² Petitioner reserves the right to argue alternative constructions before a district court, including with respect to indefiniteness.

Ex. 1001, Fig. 2 (annotated)

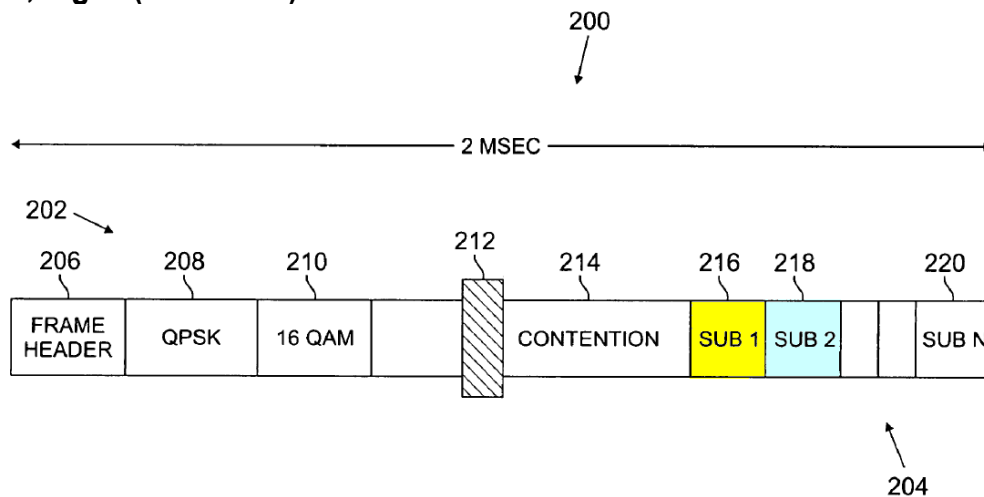


FIG. 2

40. The '383 Patent asserts that, because a large number of subscriber stations can communicate with a single base station, the base station's "RF modems must be capable of communicating with the subscriber stations in manners which permit quick, and accurate, receive operations to be performed upon signals transmitted thereto by the subscriber stations." Ex. 1001, 5:54-67. Thus, according to the '383 Patent, "[a]ny manner by which to provide increased speed and accuracy of receive operations to be performed upon the signals transmitted to a base station ... would be advantageous." *Id.*

41. To address these purported concerns, the '383 Patent discloses a system where "at least two demodulators ... are provided at the receive portion of a base station" to demodulate separate, successive uplink bursts. Ex. 1001, 6:22-35. For example, annotated Figure 3 (reproduced below) illustrates a base station in which

a first data signal received during timeslot “T1” is applied to a first modem (Modem B) and the second data signal received during timeslot “T2” is applied to a different modem (Modem A).

Ex. 1001, Fig. 3 (annotated)

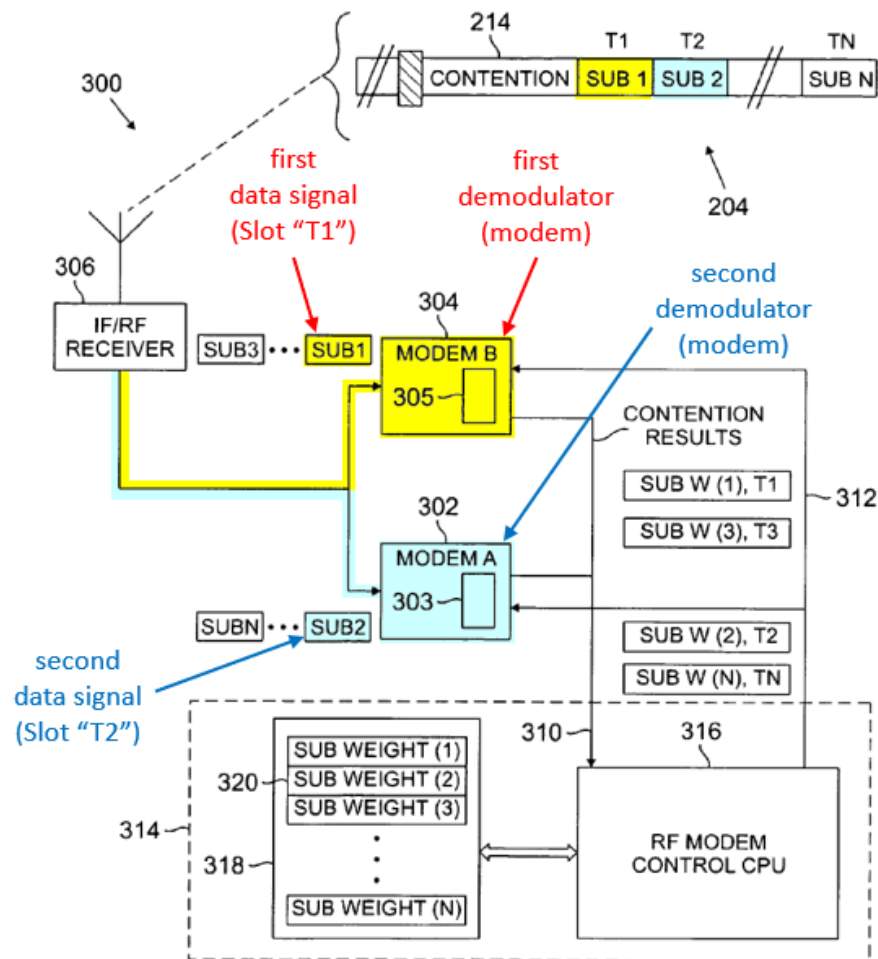


FIG. 3

42. The '383 Patent further discloses that “separate profiles are created and stored at the base station [that] profile the channels upon which bursts of data are transmitted by separate subscriber stations and also characteristics of the data

transmitted by the separate subscriber stations.” Ex. 1001, 6:36-45. “The profiles include values which represent channel characteristics upon which uplink signals are transmitted as well as characteristics of the uplink signals.” Ex. 1001, 10:56-59. The ’383 Patent states that the profiles “include the information required of the demodulators to permit their operation to demodulate bursts of data applied thereto.” Ex. 1001, 6:42-45.

43. According to the ’383 Patent, “[b]y utilizing at least two separate modems, alternating ones of the modems are utilized to demodulate successive bursts of data,” so that “[d]uring a time period in which a demodulator is not being utilized to operate upon a data burst, [profile] values associated with another channel upon which a subsequent data burst is expected to be transmitted is applied to the unused modem,” thereby avoiding delay. Ex. 1001, 12:1-11.

VIII. Summary of the Prior Art

44. The ’383 Patent and the prior art discloses address a common problem of processing data signals received from multiple wireless subscriber stations. Ex. 1005, 1:7-12, 6:5-10; Ex. 1006, 1:66-2:12; Ex. 1007, 2:46-57. The prior art, like the ’383 Patent, discloses that signals received in successive timeslots from the wireless subscriber stations are routed to different processors for demodulation. Ex. 1005, 5:58-6:4; Ex. 1006, 23:64-24:41. In addition, both the ’383 Patent and the prior art references disclose producing and maintaining parameters related to the received

signals that are used in the demodulation and processing of the signals. Ex. 1005, 3:1-38, 3:53-4:23 4:53-5:13, 5:58-6:22; Ex. 1006, 8:48-62, 16:17-43, 16:44-17:7, 17:49-54, 18:8-20, 18:39-45; Ex. 1007, 7:59-8:8, 12:49-66.

45. As will be described further below in §VIII.C, one of ordinary skill in the art would have been motivated to combine the prior art references. Each of the prior art references are assigned to a common assignee and relate to the field of telecommunications. In addition, the prior art references are commonly directed to improving the performance of wireless systems. Ex. 1005, 1:42-52; Ex. 1006, 6:19-33; Ex. 1007, 2:46-67. Particularly, a person of ordinary skill in the art would understand that producing and maintaining parameters from more than one of the listed prior art references would be advantageous for facilitating processing and demodulation of signals received from the wireless subscriber stations.

A. U.S. Patent No. 5,909,470 (“Barratt 470”)

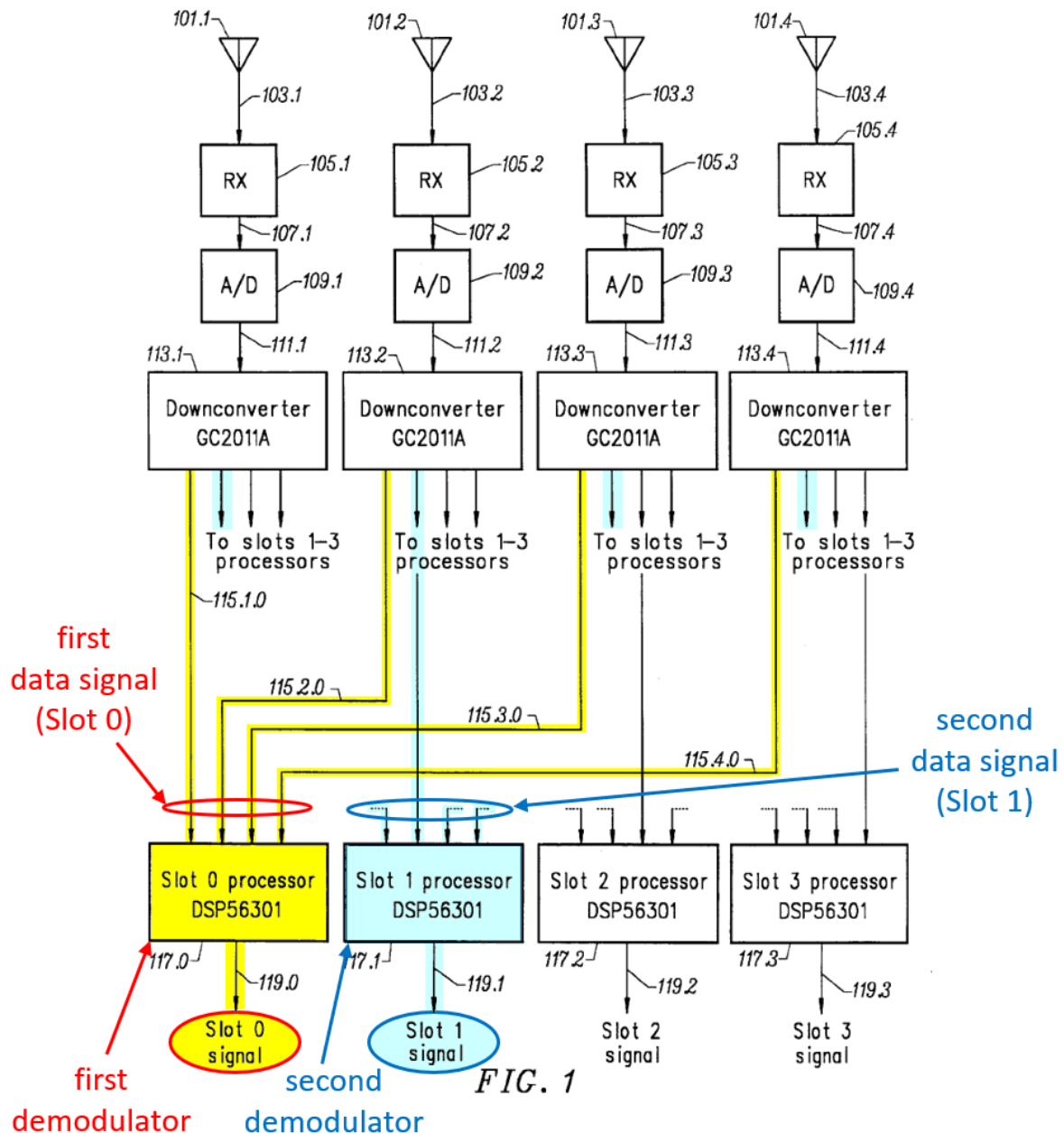
46. I have been informed that I should assume Barratt ’470 was filed on October 11, 1996 and issued on June 1, 1999. Ex. 1006, Cover. I have also been informed that Barratt ’470 qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(b). I have also been informed that Barratt ’470 was not cited and was not considered during the prosecution.

47. Barratt ’470 discloses a wireless system where uplink data signals are transmitted to the base station in individual “bursts” that are sent within successive

uplink timeslots of a TDD frame. Ex. 1006, 7:58-8:22. Bar example, Barratt '470 teaches that each TDD frame consists of 8 timeslots that are divided into four consecutive downlink (“transmit (TX)”) timeslots followed by four consecutive uplink (“receive (RX)”) timeslots, where a new frame “always begins with the first TX timeslot.” *Id.*

48. Annotated Figure 1 (reproduced below) illustrates a base station where, “[f]or each of the four [uplink] timeslots, the four downconverted outputs from the four antennas are fed to a digital signal processor (DSP) device 117 for further processing” including “demodulation.” Ex. 1006, 9:60-67; *see also id.*, 23:64-24:41. Thus, *for each timeslot*, the *m* signals received by the *m* antennas (101.1-101.4) are fed to a particular *one* of the DSP devices 117. Ex. 1006, 24:19-41. “For the 0th time slot, these are shown as signals 115.1.0, 115.2.0, 115.3.0, and 115.4.0.” Ex. 1006, 24:21-23. Figure 1 therefore illustrates that a first data signal received during “Slot 0” will be applied to a *first* DSP device (117.0) whereas a second data signal during “Slot 1” will be applied to a *second*, separate DSP device (117.1) and so on. Ex. 1006, 23:64-24:41.

Ex. 1006, Fig. 1 (annotated)



49. Additionally, as noted above, Barratt '470 discloses that each DSP device 117 performs certain functions including “demodulation.” Ex. 1006, 24:31-41. “The resulting *demodulated* signals [for each uplink timeslot] are shown as 119.0, ... , 119.3.” *Id.* Thus, Barratt '470 discloses that *each* DSP device 117

includes a demodulator for demodulating the signals received during that timeslot.
Id.

50. Further, like the '383 Patent, Barratt '470 discloses that for each subscriber station, the base station produces and maintains various values utilized in the demodulation of the respect data bursts (e.g., antenna weights, frequency offset values, time alignment values, modulation format, etc.). *See* Ex. 1006, 8:48-62, 16:17-43, 16:44-17:7, 17:49-54, 18:8-20, 18:39-45. These values collectively represent channel characteristics upon which the uplink signals are transmitted as well as characteristics of the uplink signals.

B. U.S. Patent No. 7,430,197 (“Uhlik”)

51. I have been informed that I should assume Uhlik was filed on September 29, 2000 and issued on September 30, 2008. Ex. 1005, Cover. I have also been informed that Uhlik qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(e). I have also been informed that Uhlik was not cited and was not considered during prosecution.

52. Like Barratt '470, Uhlik discloses a wireless system where uplink data signals are transmitted to the base station in individual “bursts” that are sent within *successive* uplink timeslots of a TDD frame. Ex. 1005, 5:58-6:12 (noting the system “uses four uplink and four downlink timeslots for each TDD frame”). In fact, as I discuss below, the wireless system disclosed in Uhlik is substantially similar to the

one disclosed in Barratt '470, which is perhaps not surprising as both were filed by the same original assignee.

53. For example, while depicted in a slightly different format, annotated Figure 4 (reproduced below) illustrates a base station receiver that is largely similar to the one shown in Figure 1 of Barratt '470 (discussed above). Specifically, Uhlik Figure 4 shows a base station where, “[f]or each of the four receive timeslots, the four down-converted outputs from the antennas [103] are fed to a digital signal processor (DSP) device 217 (hereinafter ‘timeslot processor’) for further processing.” Ex. 1005, 5:58-6:12. Uhlik additionally teaches that each timeslot processor 217 performs several functions including “*demodulation*” and that “[t]he output of the timeslot processor 217 is *demodulated* burst data for *each of the four receive timeslots*.” Ex. 1005, 6:5-12 (emphasis added).

54. Thus, like Barratt '470, Uhlik discloses a wireless system in which (1) uplink data signals are *successively transmitted* to the base in bursts that are sent within the *successive* uplink timeslots of each TDD frame; and (2) the uplink data signals received at the base station during *each timeslot* are demodulated by a *separate “timeslot processor”* (demodulator) 217, as illustrated below. Ex. 1005, 5:58-6:10.

Ex. 1005, Fig. 4 (annotated)

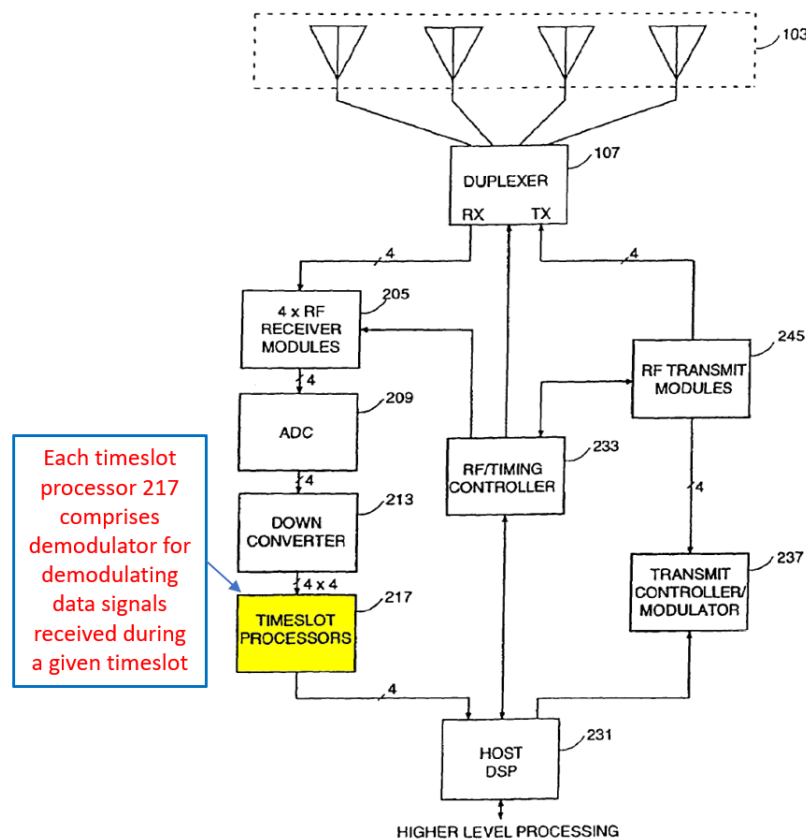


Figure 4

55. Further, Uhlik also discloses that the base station “produces and maintains” various values “for each subscriber station” that are utilized in the demodulation and processing of the respective uplink data bursts. Ex. 1005, 3:1-38, 3:53-4:23 4:53-5:13, 5:58-6:22.

C. U.S. Patent No. 5,592,490 (“Barratt ’490”)

56. I have been informed that I should assume Barratt ’490 was filed on January 20, 1995 and issued on January 7, 1997. Ex. 1007, Cover. I have also been informed that I should assume Barratt ’490 qualifies as prior art under at least Pre-

AIA 35 U.S.C. § 102(b). I have also been informed that I should assume Barratt '490 was not cited and was not considered during prosecution.

57. Barratt '490 is directed to a wireless system that uses spatial processing techniques to increase the capacity of existing “conventional” systems. Ex. 1007, 2:24-57. Barratt '490 teaches that, “[i]n conventional wireless communication systems, only one remote terminal can use any one conventional channel [e.g., time slot] within a cell at any one time.” Ex. 1007, 2:25-37. However, by using spatially directed beams that are narrowly focused on different users, “[c]apacity is increased by allowing multiple users to simultaneously share the same conventional communication channel [e.g., time slot] without interfering with one another.” Ex. 1007, 2:46-57.

IX. The Prior Art Anticipates the Claims of the '383 Patent.

A. Ground 1: Barratt '470 Anticipates Claims 1-3, 5-11, and 13-17 of the '383 Patent.

58. Barratt '470 anticipates Claims 1-3, 5-11, and 13-17 of the '383 Patent.

Claim 1, [pre]: An apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station and a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

59. To the extent the preamble is limiting, Barratt '470 discloses Claim 1, [pre]. Barratt '470 teaches a TDMA system where a plurality of subscriber stations

(i.e., including first and second subscriber stations) can communicate with the base station (i.e., “communication station”) Ex. 1006, 1:66-2:12. The system of Barratt ’470 includes uplink data signals transmitted to the base station in individual “bursts” that are sent within successive uplink timeslots of a TDD frame. Ex. 1006, 7:58-8:22. Thus, Barratt ’470 discloses first and second data signals “successively transmitted” to the base station (i.e., “communication station”) by a first subscriber station (i.e., assigned to a first timeslot) and a second subscriber station (i.e., assigned to a second timeslot), respectively. See Ex. 1008, 2-10.

Claim 1, [1.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

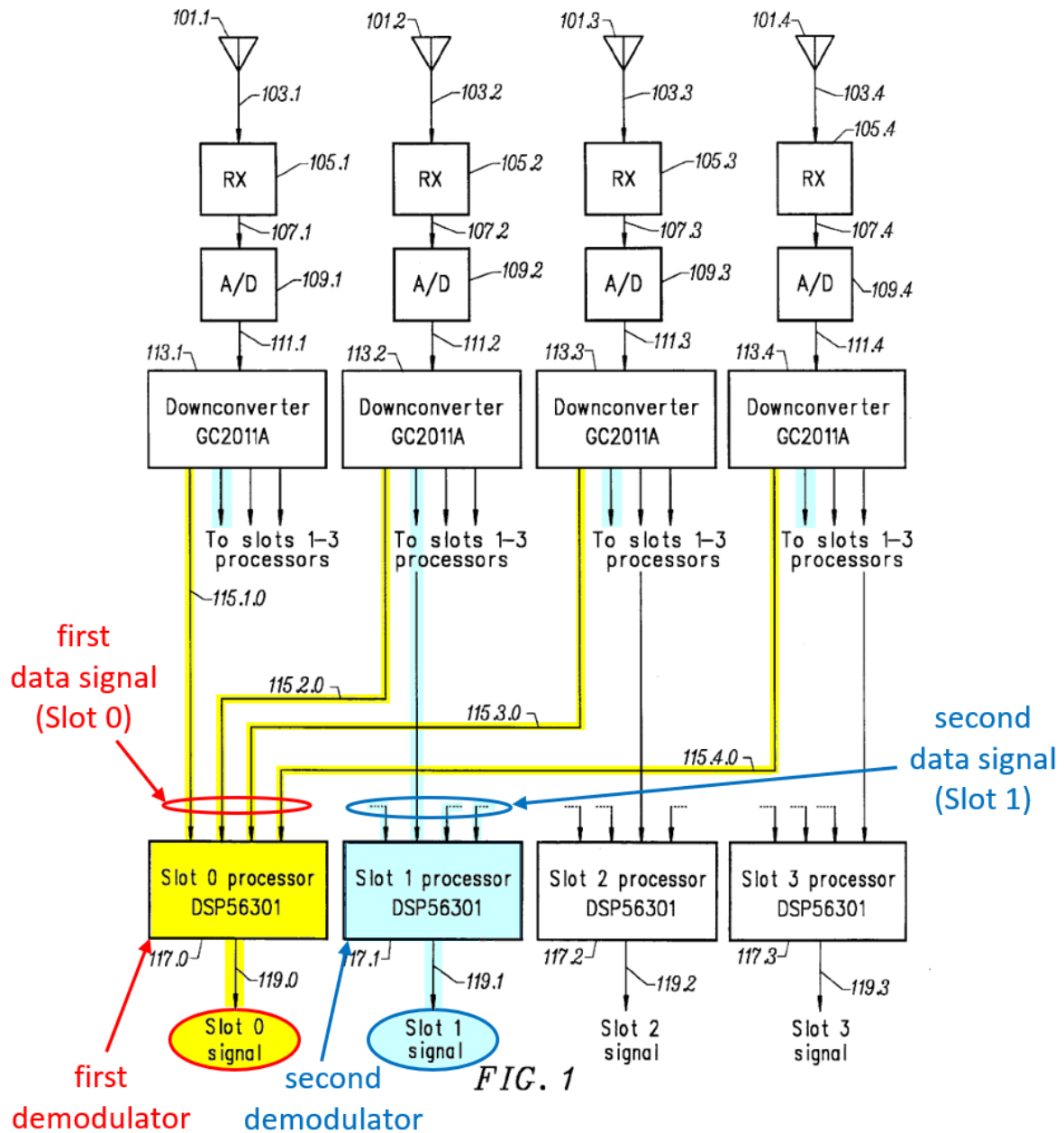
Claim 1, [1.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

60. Barratt ’470 discloses Claim 1 [1.1.1] and [1.1.2]. Annotated Figure 1 (reproduced below) of Barratt ’470 shows a base station (i.e., “communication station”) that includes four separate timeslot processors 117 – “one per receive timeslot” of each TDD frame. Ex. 1006, 9:60-67 (emphasis added); see also *id.*, 24:31-41. As discussed above, Barratt ’470 teaches that “[f]or each of the four [uplink] timeslots, the four downconverted outputs from the four antennas are fed to a digital signal processor (DSP) device 117 for further processing.” Ex. 1006, 9:60-67; see also *id.*, 23:64-24:41. Each digital signal processor 117 performs several functions including “demodulation,” resulting in “demodulated signals” for each

timeslot. Ex. 1006, 24:31-41 (emphasis added). Barratt '470 therefore teaches that *each* digital signal processor 117 includes a demodulator portion for demodulating the data signals received during its respective timeslot.

61. Thus, Barratt '470 discloses a “first demodulator” (i.e., *first* digital signal processor 117.0) selectably coupled to receive “first data signals” transmitted to the communication station during a first timeslot (e.g., Slot 0); and at least a “second demodulator” (i.e., *second* digital signal processor 117.1) selectably coupled to receive “second data signals” transmitted to the communication station during a second timeslot (e.g., Slot 1), as illustrated below. *See* Ex. 1008, 10-16.

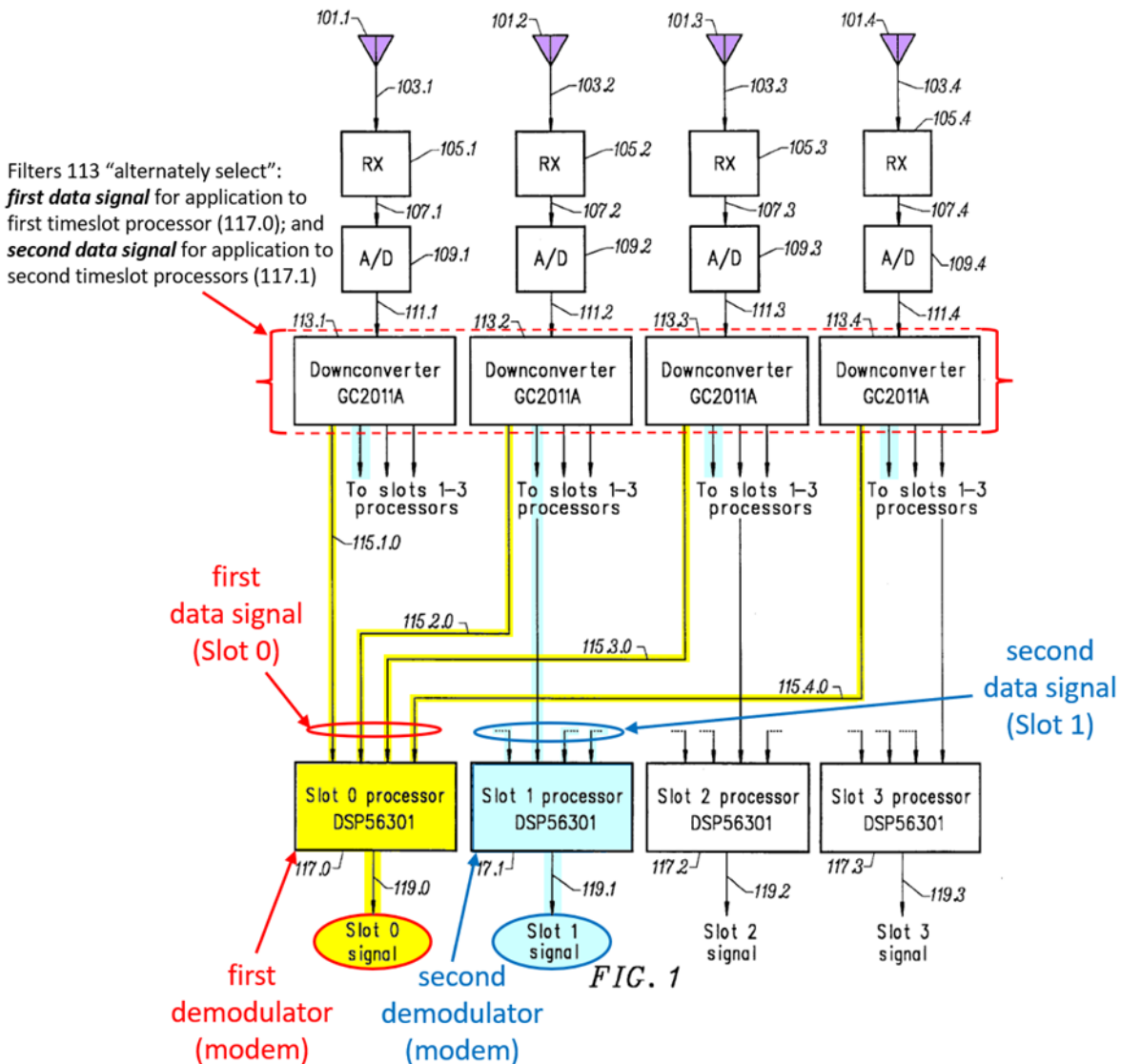
Ex. 1006, Fig. 1 (annotated)



Claim 1, [1.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signals for application to the first demodulator and the second data signals for application to the second demodulator,

62. Barratt '470 discloses Claim 1 [1.2]. Barratt '470 discloses a wireless system containing at least one base station that performs various steps, such as those shown in FIG. 1 and FIGS. 4-7. The base stations disclosed in Barratt '470 necessarily include a controller (e.g., processing unit) for controlling the operation and performance of these steps. The base stations necessarily include a controller because processors (e.g., digital signal processors 117) require controller supervision. For example, annotated Figure 1 (reproduced below) illustrates how a controller in the base station uses filter devices 113 (during each frame) to alternately select the first data signals received during Slot 0 for application to the *first* digital signal processor 117.0 and the second data signals received during Slot 1 for application to the *second* digital signal processor 117.1.

Ex. 1006, Fig. 1 (annotated)



63. Additionally, as illustrated in annotated Figure 6 (reproduced below), Barratt '470 also discloses how the controller in the base station operates each of the digital signal processors "in a feedback arrangement" that involves maintaining and updating various parameter values (e.g., frequency offset) *from one frame to the next*. Ex. 1006, 16:32-17:7.

Ex. 1006, Fig. 6 (annotated)

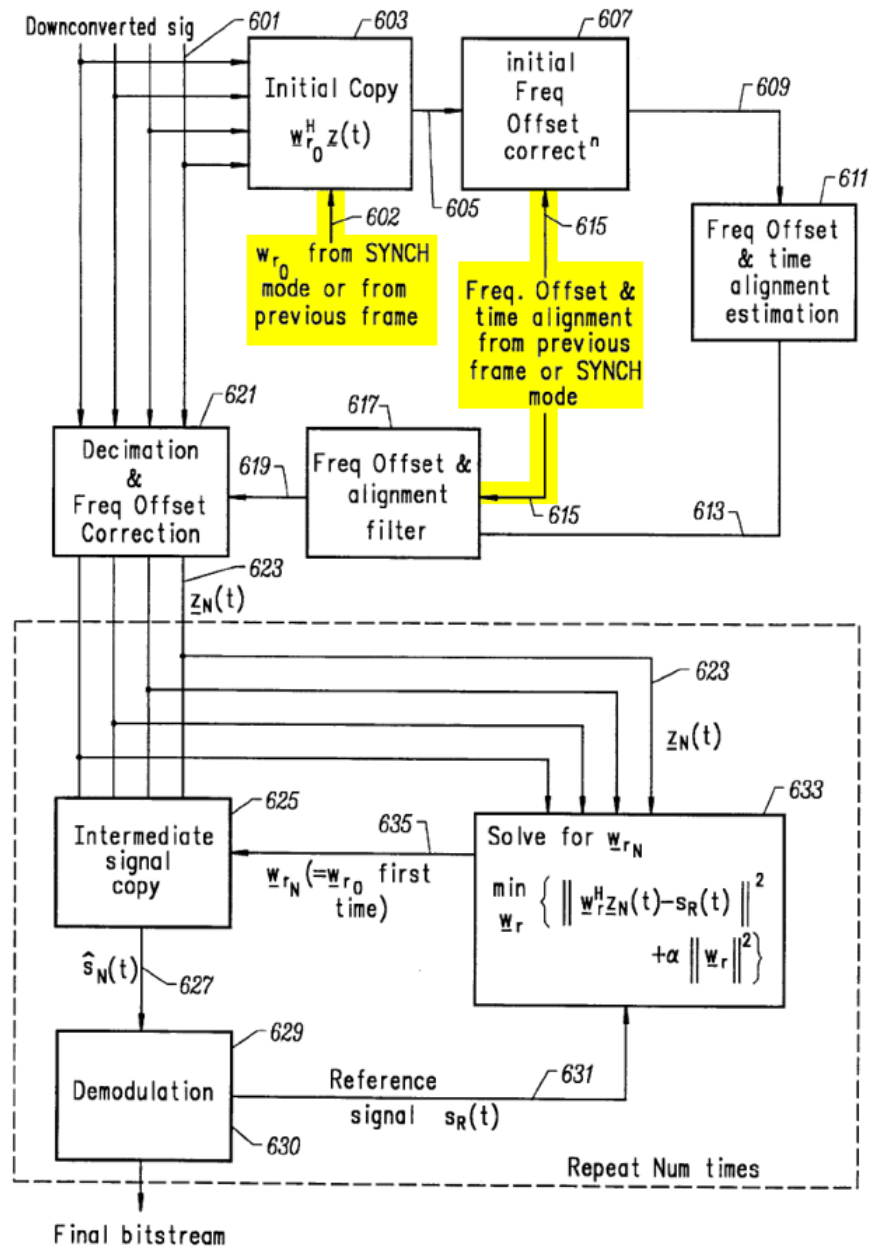


FIG. 6

64. For example, with reference to FIG. 6 (above), Barratt '470 discloses a demodulation process that “involves a recursive loop repeated every frame.” Ex.

1006, 16:32-17:7. “On an ongoing basis, one starts the loop with starting estimate of [weight vector] w_r and of the alignment and frequency offset obtained from the processing of the same signal *on the previous frame*.” Ex. 1006, 16:32-17:7 (emphasis added). “At the end of a frame (or at the end of a burst in burst mode), the method returns to step 603, and *the ending frame’s w_{rN} becomes w_{r0} for the new frame, and the complete loop is repeated*.” Ex. 1006, 18:39-42 (emphasis added). Thus, Barratt ’470 discloses the controller is coupled to the timeslot processors (“demodulators”) in a feedback arrangement. See Ex. 1008, 16-24.

Claim 1, [1.3]: wherein the at least the second subscriber station comprises a plurality of subscriber stations and

65. Barratt ’470 discloses Claim 1 [1.3]. For example, Barratt ’470 discloses that each “base station can communicate with many remote terminals.” Ex. 1006, 1:35-48; *see also id.*, 1:49-214; *see also* Ex. 1008, 24-25 (contending limitation met because “each [accused] base station will receive uplink transmissions from a large number of UEs.”). Further, Barratt ’470 teaches that certain “embodiments of the present invention are for incorporation in a cellular system using the ‘Personal Handyphone System’ (PHS),” which is a type of fixed wireless access system that can include fixed wireless access points that connect multiple subscriber units to a base station. Ex. 1006, 7:58-61; *see also*, Ex. 1008, 25 (contending limitation met because “[s]ubscriber stations in [accused] networks also

include fixed wireless access points that connect multiple subscriber stations to a base station.”).

66. Additionally, Barratt ’470 discloses a system that uses “spatial division multiple access” (SDMA) technology in combination with time division multiple access (TDMA) so that “*several* remote terminals may communicate with [the] base station on the same frequency channel and the same time slot.” Ex. 1006, 1:49-2:14. Barratt ’470 therefore discloses that the data signals received during *each timeslot* may include *multiple* data signals sent by a plurality of spatially multiplexed “subscriber stations” (i.e., remote terminals). *Id.* Thus, Barratt ’470 discloses that “the at least the second subscriber station” comprises a plurality of subscriber stations.

Claim 1, [1.4]: wherein the controller selectively applies the first and second data signals to the first and second demodulators according to a selected pattern by alternately coupling the first demodulator and the second demodulator to receive, selectably, the first and at least second data signals communicated by alternating ones of the plurality of subscriber stations.

67. Barratt ’470 discloses Claim 1 [1.4]. As discussed above, Barratt ’470 discloses that for each TDD frame the base station that applies the data signals received during Slot 0 (i.e., the first timeslot) to a *first* digital signal processor 117.0 (i.e., “first demodulator”) and the data signals received during the Slot 1 (i.e., the second timeslot) to a *second* digital signal processor (i.e., “second demodulator”). Ex. 1006, 23:64-24:41, 1:66-2:13; *see also id.*, 7:58-8:22; *see supra* §IX.A: Claim

1, [1.1.1]-[1.1.2], [1.2]; This is done, in other words, by “coupling” the first digital signal processor 117.0 to receive the data signals sent during “Slot 0” and the second digital signal processor 117.1 to receive the data signals sent during “Slot 1.” Ex. 1006, 23:64-24:41, 1:66-2:13; *see also id.*, 7:58-8:22.

68. Additionally, the '383 Patent states that “data signals communicated to the base station by subscriber stations ... are applied to the separate demodulators *according to a selected pattern*. When two demodulators are provided, *successive bursts of data are applied, for instance to alternating ones of the demodulators.*” Ex. 1001, 6:29-34 (emphasis added). The same is true for Barratt '470 – for example, during each TDD frame, *successive uplink bursts of data* (received during Slots 0-3) *are applied to alternating ones of the four digital signal processors 117, respectively.* *See* Ex. 1006, 9:60-67, 24:31-41. Thus, Barratt '470 discloses applying uplink data signals to the digital signal processors 117 “according to a selected pattern.”

69. Further, Barratt '470 discloses a TDD/TDMA system in which remote terminals are assigned to the available uplink and downlink timeslots in each TDD data frame. *See* Ex. 1006, 7:65-8:4, 9:60-67, 24:31-41. TDMA systems enable access by multiple users on one frequency resource or channel by multiplexing in the time domain, with timeslots assigned to particular users. The base station has knowledge of the timeslot in which each user sends data so that the information can

be separated and reconstructed. This scheduling of radio resources (i.e., timeslots) by the base station therefore determines the *order* in which the uplink data signals from different remote terminals are received at the base station during each frame, and therefore *applied* to a corresponding one of the digital signal processors. *See* Ex. 1006, 7:65-8:4, 9:60-67, 24:31-41. Thus, for this reason as well, Barratt '470 discloses applying uplink data signals to the digital signal processors “according to a selected pattern.”

70. This is also consistent with the Patent Owner’s position in its related infringement contentions, where for this limitation they argue that “[the accused] base stations utilize *uplink scheduling to determine the selected pattern* with which the controller *selectively applies* the first and second data signals to the first and second demodulators.” Ex. 1008, 27 (emphasis added). Thus, Barratt '470 discloses a base station which applies first and second data signals to first and second demodulators by alternately coupling a first digital signal processor 117.0 (i.e., “first demodulator”) and a second digital signal processor 117.1 (i.e., “second demodulator”) to receive, selectably, first data signals (i.e., transmitted in Slot 0) and at least second data signals (i.e., transmitted in Slot 1) communicated by alternating ones of a plurality of remote terminals (i.e., subscriber stations assigned Slot 0 and Slot 1).

Claim 2: The apparatus of claim 1 wherein the wireless communication system comprises a fixed wireless access system, wherein the communication station comprises a base station of the fixed wireless access system in which the data signals transmitted thereto by the first subscriber station comprise first uplink burst data signals and the data signals transmitted thereto by the second subscriber station comprise second uplink burst data signals, the first demodulator embodied at a first modem.

71. Barratt '470 discloses Claim 2. As discussed above for claim element [1.2], Barratt '470 teaches that certain “embodiments of the present invention are for incorporation in a cellular system using the ‘Personal Handyphone System’ (PHS),” which is a type of fixed wireless access system. Ex. 1006, 7:58-61; *see also* Ex. 1008, 36-38.

72. In addition, as discussed above, Barratt '470 discloses a TDD/TDMA system where uplink data signals are transmitted to the base station in “burst” transmissions, where “a burst is defined as the finite duration RF signal that is transmitted or received over the air during a single timeslot.” Ex. 1006, 8:11-13; *see also id.*, 7:65-8:10; *see supra* §VIII.A. As a result, Barratt '470 teaches that “any particular remote terminal and a base station communicate *in bursts* that are a frame apart.” Ex. 1006, 8:26-35 (emphasis added).

73. Further, each digital signal processor 117, shown in Figure 1, comprises a “modem” for performing the disclosed “demodulation” operations. Ex. 1006, 24:31-41; *see also id.*, 9:60-67. The '383 Patent itself states that “typically the demodulators are contained in radio frequency (RF) modems *and demodulators and*

modems will be referred to interchangeably hereinafter.” Ex. 1001, 6:23-26 (emphasis added); *see also id.*, 6:34-35 (“The demodulators form, for instance, the demodulator portions of modems.”). Thus, Barratt ’470 discloses a fixed wireless access system including a base station which receives uplink burst data from first and second remote terminals (i.e., “subscriber stations”), where the uplink burst data is demodulated by a first and second digital signal processor (i.e., “modem”).

Claim 3: The apparatus of claim 2 wherein the second demodulator is embodied at a second modem.

74. Barratt ’470 discloses Claim 3. As discussed above in relation to Claim 2, Barratt ’470 discloses that each demodulator is embodied at a “modem.” *See supra* §IX.A: Claim 2. Thus, Barratt ’470 discloses Claim 3. *See* Ex. 1008, 38-42.

Claim 5, [pre]: Apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station and a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

75. To the extent the preamble is limiting, Barratt ’470 discloses Claim 5, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.A: Claim 1, [pre]. *see also* Ex. 1008, 45-53.

Claim 5, [5.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

Claim 5, [5.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

76. Barratt '470 discloses Claim 5 [5.1.1] and [5.1.2] for the reasons I discussed for Claim 1 [1.1.1] and [1.1.2]. *See supra* §IX.A: Claim 1, [1.1.1]-[1.1.2]; *see also* Ex. 1008, 53-59.

Claim 5, [5.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signal for application to the first demodulator and the second data signal for application to the second demodulator,

77. Barratt '470 discloses Claim 5 [5.2] for the reasons I discussed for Claim 1 [1.2]. *See supra* §IX.A: Claim 1, [1.2]; *see also* Ex. 1008, 59-67.

Claim 5, [5.3]: wherein the controller further comprises a memory portion, the controller further for maintaining profiles associated with each of the first and at least second data signals transmitted upon first and at least second channels, respectively, the profiles stored at the memory portion of the controller.

78. Barratt '470 discloses Claim 5 [5.3]. Barratt '470 discloses base stations that necessarily comprise “memory portions,” which may be included within the base station’s “controller” or other parts of the base station. The '383 Patent states that “[t]he profiles include values which represent channel characteristics upon which uplink signals are transmitted as well as characteristics of the uplink signals.

Ex. 1001, 10:56-59. This can include, for instance, “antenna combining parameters when antenna diversity and/or beam-forming is utilized.” Ex. 1001, 12:22-29.

79. Barratt '470 discloses that the base station produces and maintains various parameters (e.g., antenna weights, frequency offset, time alignment, etc.) for each subscriber station. *See* Ex. 1006, 8:48-62, 16:17-43, 16:44-17:7, 18:8-20, 18:39-45; *see supra* §IX.A: Claim 1, [1.2]. For example, as discussed above, Barratt '470 also teaches that “[t]he previous frame's frequency offset and [time] alignment estimates are used ... for the initial frequency offset correction step 607 and for the estimate filter 617.” Ex. 1006, 18:42-45. Barratt '470 further discloses determining a “*weighted sum of the antenna signals*.” Ex. 1006, 2:47-61. In addition, the base station of Barratt '470 “continually updates estimates of frequency offset, time alignment, and the weight vector.” Ex. 1006, 8:47-61. Thus, Barratt '470 discloses “maintaining profiles” (including, e.g., frequency offset, time alignment, and antenna “weights”) that are associated with each of the data signals communicated to the base station. *See* Ex. 1008, 67-71.

Claim 6: The apparatus of claim 5 wherein the profiles maintained at the memory portion of the controller comprise at least one channel-related parameter associated with the first and at least second channels upon which the first and at least second data signals are communicated, respectively.

80. Barratt '470 discloses Claim 6. As discussed above in relation to Claim 5, Barratt '470 discloses maintaining spatial processing “weights” for each

subscriber station. Ex. 1006, 8:48-61; *see also id.*, 2:47-49. Consistent with the '383 Patent, these spatial antenna “weights” comprise “values which represent channel characteristics upon which uplink signals [from different subscriber stations] are transmitted.” Ex. 1001, 10:56-59.

81. In addition, Barratt '470 discloses that “[t]he more general situation is that the received antenna signals need also to be temporally *equalized*, and in that situation, rather than a weighted sum, for each signal of interest, a sum of convolutions of the antenna signals is determined. That is, the weight vector is generalized, for the linear time invariant *equalization* situation, to a vector of complex valued impulse responses.” Ex. 1006, 2:51-57 (emphasis added). Barratt '470 teaches that “[f]or the purposes of this invention, the term weight vector shall apply either to a vector of complex weights or to a vector of impulse responses, depending on whether temporal equalization is included.” Ex. 1006, 2:58-61. In its related infringement contentions, Patent Owner contends that this limitation is met because the “[accused] eNodeB calculates and stores parameters related to *equalization weighting*, antenna parameters (including but not limited to beamforming), etc.” Ex. 1008, 71. Thus, Barratt '470 discloses maintaining profiles that comprise at least one “channel-related parameter: (e.g., the weight vector) associated with each uplink channel.

Claim 7: The apparatus of claim 6 wherein the first demodulator and the second demodulator each include equalizer portions for equalizing the at least one of the first and second data signals selectably applied to the first demodulator and the second demodulator, respectively.

82. Barratt '470 discloses Claim 7. As discussed above in the analysis of Claim 6, Barratt '470 teaches that temporal “equalization” may be included in relation to the spatial processing operations performed on each data signal received at the base station. Ex. 1006, 2:47-61; *see supra* §IX.A: Claim 6. Thus, Barratt '470 discloses the demodulators in the base station each include an “equalizer portion” for equalizing the uplink data digital signals that are applied to each digital signal processor 117. *See* Ex. 1008, 74-76.

Claim 8: The apparatus of claim 7 wherein filter weight values form portions of the profiles maintained by the controller and stored at the memory portion thereof.

83. Barratt '470 discloses Claim 8. As discussed above in the analysis of Claim 6, Barratt '470 discloses maintaining antenna weights and/or equalization related weights, which are types of “filter weight values.” *See* Ex. 1006, 2:47-61, 8:48-61, 12:43-59; *see supra* §IX.A: Claim 6; *see also* Ex. 1008, 76-77. Thus, Barratt '470 discloses maintaining profiles for each subscriber station that include “filter weight values” (e.g., antenna weights). *See* Ex. 1008, 76-77 (contending this limitation is met because the “[accused] base stations maintain ... *antenna weights* for each UE.”) (emphasis added).

Claim 9: The apparatus in claim 5 wherein the profiles maintained at the memory portion of the controller comprise at least one signal-related parameter associated with the first and at least second data signals, respectively.

84. Barratt '470 discloses Claim 9. As discussed above in the analysis of Claim 5, Barratt '470 discloses maintaining profiles associated with the first and at least second data signals. *See supra* §IX.A: Claim 5, [5.3]. Barratt '470 teaches that the digital signal processors 117 process the burst data signal to determine values of “frequency offset” and “time alignment” parameters, which are describe characteristics of an uplink signal and thus are “signal-related parameters.” Ex. 1006, 24:24-48. Thus, Barratt '470 discloses maintaining profiles that include at least one “signal-related parameter” (e.g., frequency offset and time alignment). *See* Ex. 1008, 77-79.

Claim 10: The apparatus of claim 9 wherein the first and at least second data signals are characterized by modulation indexes, and wherein values of the modulation indexes form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

85. Barratt '470 discloses Claim 10. As discussed above in the analysis of Claim 5, Barratt '470 discloses maintaining profiles associated with the first and at least second data signals. *See supra* §IX.A: Claim 5, [5.3], Claim 9. Barratt '470 states that certain “embodiments of the present invention are for incorporation in a cellular system using the ‘Personal Handyphone System’ (PHS).” Ex. 1006, 7:58-61. Barratt '470 teaches that “[t]he PHS system uses $\pi/4$ differential quaternary (or

quadrature) phase shift keying ($\pi/4$ DQPSK) modulation.” Ex. 1006, 8:62-64; *see also id.*, 3:54-57.

86. In these embodiments, the base station maintains (i.e., stores) information indicating that each of the first and second data signals are characterized by using $\pi/4$ DQPSK modulation. Further, in describing the “demodulation method” of Figure 6, Barratt ’470 notes that, in Step 629, the base station uses “properties of ... *the known modulation format* to produce the reference signal $S_R(t)$.” Ex. 1006, 17:51-53 (emphasis added). Thus, Barratt ’470 discloses maintaining profiles comprising information on the “modulation index” (i.e., format) associated with each uplink data signal. *See* Ex. 1008, 80-84.

Claim 11: The apparatus of claim 9 wherein the first and at least second data signals are characterized by modulation orthogonalizations and wherein values of the modulation orthogonalizations form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

87. Barratt ’470 discloses Claim 11. As discussed above in the analysis of Claim 5, Barratt ’470 discloses maintaining profiles associated with each of the data signals received at the base station. *See supra* §IX.A: Claim 5, [5.3], Claim 9. In addition, Barratt ’470 discloses that the disclosed SDMA systems may be used in combination with different multiple access systems including “*code* division multiple access (CDMA)”. Ex. 1006, 2:1-14 (emphasis added).

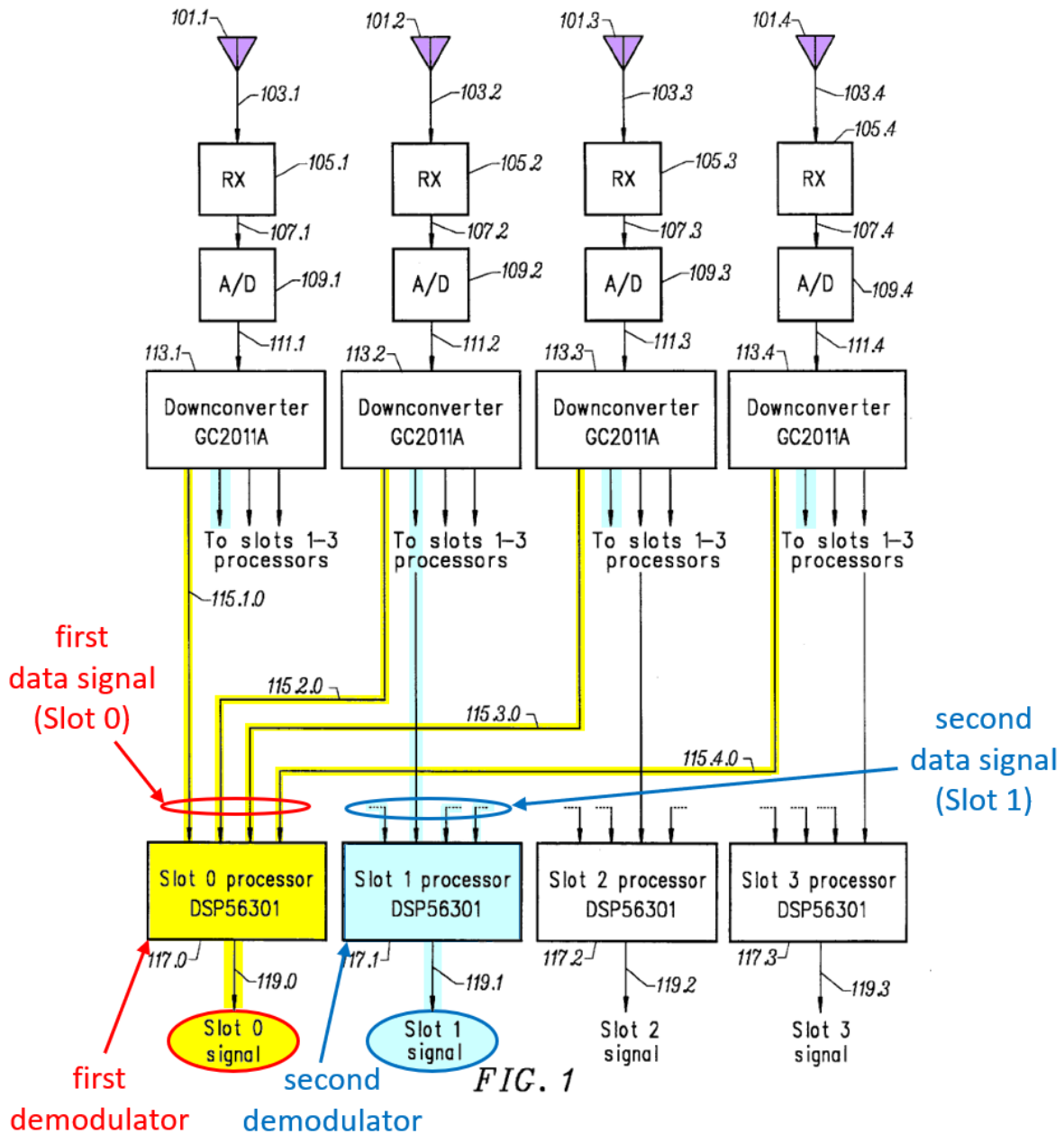
88. A person of ordinary skill in the art would have known that a CDMA system necessarily involves each subscriber station being assigned a different orthogonal spreading code for communicating with the network. CMDA is consistent with the language of the '383 Patent, which states that the bursts use “*modulation short orthogonalization codes* when utilizing a *spread* spectrum arrangement.” Ex. 1001, 11:21-26 (emphasis added). Such orthogonal spreading codes are a type of “modulation orthogonalizations” because they allow different users, using different spreading codes, to transmit on the same frequency channel without causing undue interference. In addition, a person of ordinary skill in the art would have understood the signals received at the base station to be orthogonal in order to avoid interference between signals. Thus, Barratt '470 discloses maintaining profiles that include “modulation orthogonalizations” (e.g., allocated CDMA codes). See Ex. 1008, 84-88.

Claim 13: The apparatus of claim 5 wherein the communication station to which the first and at least second data signals are transmitted by the first ant [sic] at least second subscriber stations, respectively, exhibits antenna diversity provided by a first antenna transducer and at least a second antenna transducer, the first and at least second data signals transduced by the first and at least second antenna transducer, respectively, combined utilizing antenna combining parameters, and wherein the antenna combining parameters form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

89. Barratt '470 discloses Claim 13. Figure 1 of Barratt '470 (reproduced below) illustrates a base station (i.e., “communication station”) that exhibits antenna

diversity provided by using *four* antennas 101.1, ..., 101.4 (shown in purple). Each antenna necessarily includes an “antenna transducer” for converting received radio waves to an electric current. In addition, each uplink signal received at the base station (e.g., during a given timeslot) is transduced by *each* of the four antennas 101, thus providing four different versions of the received signal for further processing by *one* of the digital signal processors 117. Ex. 1006, 23:64-24:41; *see also id.*, 9:60-67, Barratt ’470 teaches that “[f]or each of the four timeslots, the four downconverted outputs [115] from the four antennas are fed to a digital signal processor (DSP) device 117 for further processing.” Ex. 1006, 9:60-67. This is illustrated, for example, by the four yellow lines shown in Figure 1 (below) for Slot 0.

Ex. 1006 at FIG. 1 (annotated)



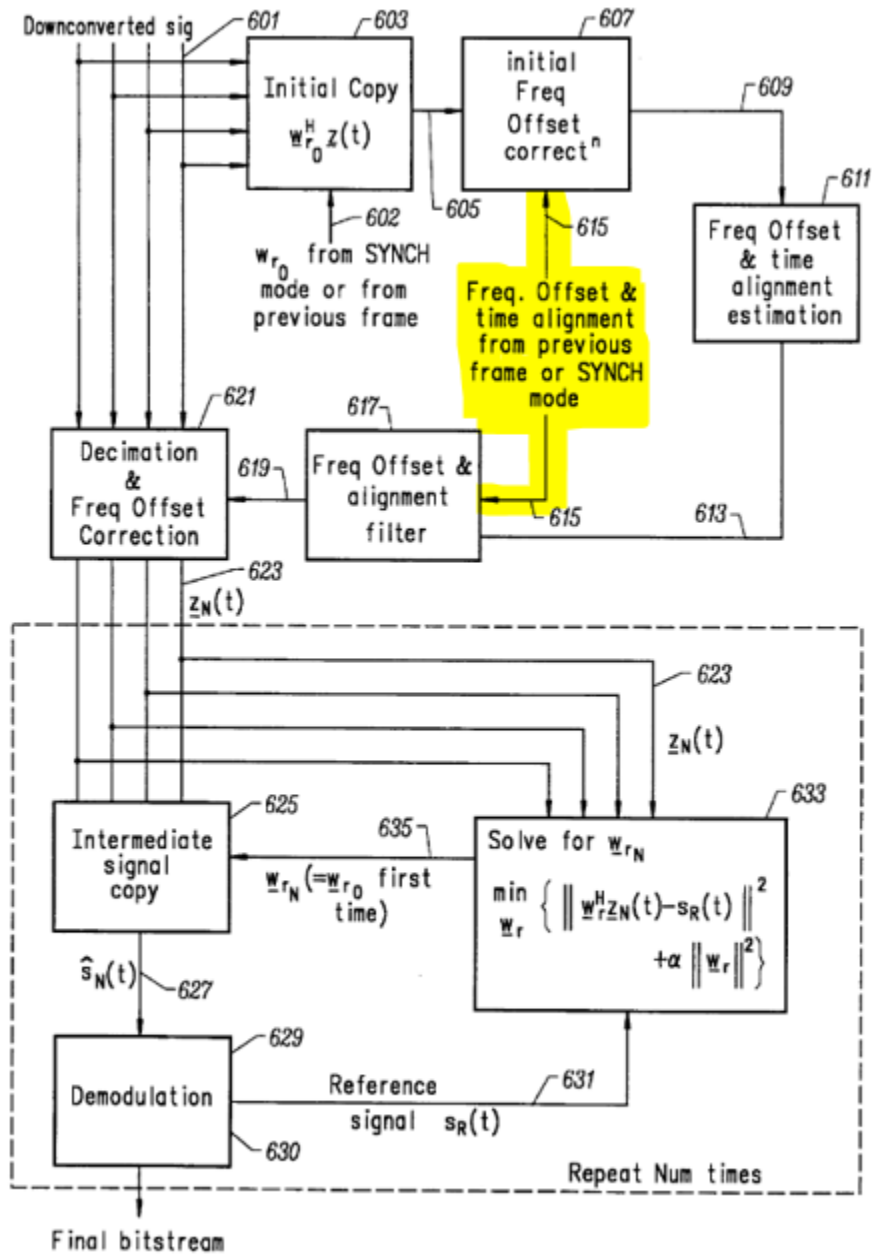
90. Barratt '470 further teaches that “[s]patial processing of the (complex valued) m signals at the m antennas comprises for each signal of interest determining a weighted sum of the antenna signals. The complex valued weights can be

represented by a vector called herein a weight vector,” which the base station maintains and “continually updates” for each subscriber station. Ex. 1006, 2:47-61, 8:48-61 (emphasis added). Thus, Barratt ’470 discloses maintaining antenna combining parameters (i.e., spatial processing “weights”) for combining outputs from a first and at least a second antenna. *See* Ex. 1008, 94-107.

Claim 14: The apparatus of claim 5 wherein profiles maintained by the controller and stored at the memory portion thereof comprise values of Band timing adjustments by which to adjust the first and at least second data signals.

91. Barratt ’470 discloses Claim 14. Barratt ’470 discloses maintaining “time alignment” values for each data signal received at the base station. Ex. 1006, 5:7-22, 8:48-61, 11:39-41, 16:17-43. For example, as illustrated in annotated Figure 6 (reproduced below), Barratt ’470 teaches determining time alignment values for each frame based on values maintained “*from previous frames*” for the same signal, which necessarily involves storing time alignment values in a memory portion of the base station associated with each subscriber station prior to applying the determined time alignment values to the appropriate corresponding uplink data signal. Ex. 1006, 16:40-17:7. Thus, Barratt ’470 discloses maintaining profiles that include values of “Band timing adjustments” (i.e., time alignment values) by which to adjust the timing of each data signal. *See* Ex. 1008, 107-109.

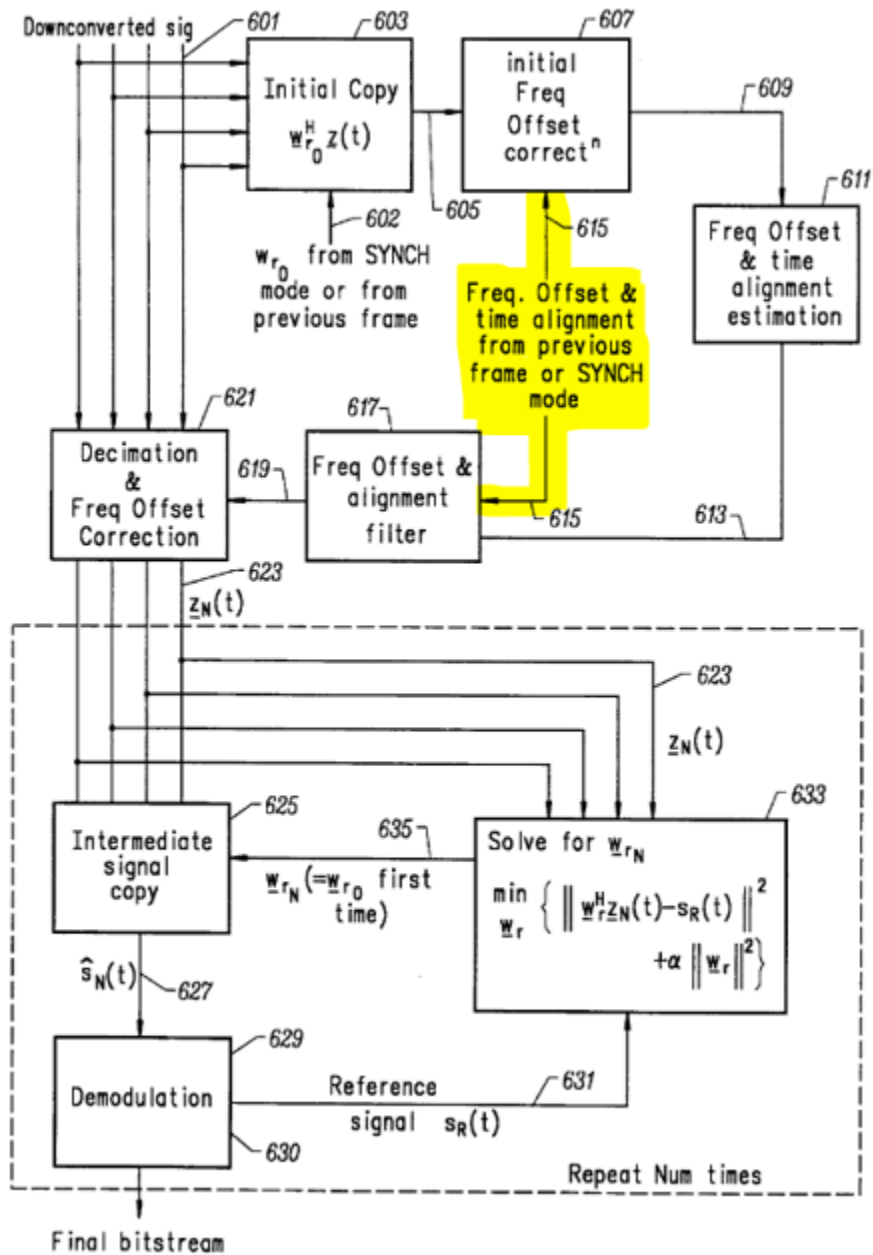
Ex. 1006, Fig. 6 (annotated)



Claim 15: The apparatus of claim 5 wherein profiles maintained by the controller and stored at the memory portion thereof comprise values of residual carrier adjustments by which to adjust the first and at least second data signals.

92. Barratt '470 discloses Claim 15. Barratt '470 discloses maintaining “frequency offset” values for each data signal received at the base station. Ex. 1006, 4:56-5:6, 8:48-61, 16:17-43. For example, as illustrated in annotated Figure 6 (reproduced above), Barratt '470 teaches determining frequency offset values for each frame based on values maintained “*from previous frames*” for the same signal, which necessarily involves storing frequency offset values in a memory portion of the base station associated with each subscriber station prior to applying the determined frequency offset values to the appropriate corresponding uplink data signal. Ex. 1006, 16:40-17:7. Thus, Barratt '470 discloses maintaining profiles that include values of “residual carrier adjustments” (i.e., frequency offset values) by which to adjust the frequency of each data signal. *See* Ex. 1008, 109-110.

Ex. 1006, Fig. 6 (annotated)



Claim 16, [pre]: A method for acting upon first and successive data signals transmitted to a communication station operable in a wireless communication system by a first subscriber station and at least a second subscriber station, the method comprising:

93. To the extent the preamble is limiting, Barratt '470 discloses Claim 16, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.A: Claim 1, [pre]; *see also* Ex. 1008, 110.

Claim 16 [16.1.1]: selecting at which of a first demodulator and at least a second demodulator to apply at least one of the first data signals and the second data signals, wherein the first and second successive data signals and any subsequent data signals are alternately applied to the first and second demodulators;

Claim 16 [16.1.2]: demodulating the at least one of the first and at least second data signals at the first demodulator when the first demodulator is selected during the operation of selecting; and

Claim 16 [16.1.3]: demodulating the at least one of the first and at least second data signals at the second demodulator when the second demodulator is selected during the operation of selecting; and

94. Barratt '470 discloses Claim 16 [16.1.1]-[16.1.3] for the reasons I discussed for Claim 1 [1.1.1]-[1.1.2] and [1.2]. *See supra* §IX.A: Claim 1, [1.1.1]-[1.1.2], [1.2]; *see also* Ex. 1008, 111.

Claim 16 [16.2]: maintaining profiles associated with each of the first and at least second data signals transmitted upon the first and at least second channels respectively, and wherein the operations of demodulating further comprise accessing the profiles.

95. Barratt '470 discloses Claim 16 [16.2] for the reasons I discussed for Claim 5 [5.3]. *See supra* §IX.A: Claim 5, [5.3]; *see also* Ex. 1008, 111.

Claim 17: The method of claim 16 wherein selections made during the operation of selecting are made according to a selected pattern.

96. Barratt '470 discloses Claim 17 for the reasons I discussed for Claim 1 [1.4]. *See supra* §IX.A: Claim 1, [1.4]; *see also* Ex. 1008, 112.

B. Ground 2: Barratt '470 Renders Obvious Claim 4 of the '383 Patent.

97. Barratt '470 Renders Obvious Claim 4 of the '383 Patent.

Claim 4, [pre]: An apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

98. To the extent the preamble is limiting, Barratt '470 discloses Claim 4, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.A: Claim 1, [pre]; *see also* Ex. 1008, 42.

Claim 4, [4.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

Claim 4, [4.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

99. Barratt '470 discloses Claim 4 [4.1.1] and [4.1.2] for the reasons I discussed for Claim 1 [1.1.1] and [1.1.2]. *See supra* §IX.A: Claim 1, [1.1.1]-[1.1.2]; *see also* Ex. 1008, 43.

Claim 4, [4.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signals for application to the first demodulator and the second data signals for application to the second demodulator,

100. Barratt '470 discloses Claim 4 [4.2] for the reasons I discussed for Claim 1 [1.2]. *See supra* §IX.A: Claim 1, [1.2]; *see also* Ex. 1008, 43.

Claim 4, [4.3]: wherein the first and at least second data signals transmitted to the communication station by the first and at least second subscriber stations are transmitted in bursts of selected time durations and wherein the controller further determines times of arrival and time directions of the bursts which form the data signals,

101. Barratt '470 renders obvious Claim 4 [4.3]. As discussed above in relation to Claim 2, Barratt '470 discloses a system in which data signals are transmitted to the base station as a series of “bursts,” where “a [single] burst is defined as the finite duration RF signal that is transmitted or received over the air during a single timeslot.” Ex. 1006, 8:11-35; *see supra* §IX.A: Claim 2; *see also* Ex. 1008, 43-44. Thus, each burst is of a selected time duration.

102. In addition, Barratt '470 discloses determining “time alignment” values for the bursts received at the base station from each subscriber station. Ex. 1006, 8:48-61. Barrett '470 teaches that the “[time] alignment problem is to synchronize exactly the initial timing of the symbols in the signals sent and the signals received in the base station.” Ex. 1006, 5:7-9. Barratt '470 further teaches “[t]here are a number of techniques in the prior art for performing the alignment.” Ex. 1006, 5:9-

16. A person of ordinary skill in the art would have understood that these time alignment techniques involve determining “times of arrival” of the bursts transmitted to the base station by each subscriber station.

103. With respect to “time *directions*,” the ’383 Patent does not clearly define what this term allegedly means. Ex. 1001. In fact, “time directions” appears nowhere in the patent outside this claim element. Ex. 1001. However, Patent Owner’s related contentions interpret the concept of “time directions” broadly to cover “direction measurements [that] can be used to determine the settings for transmitting in the direction of a subscriber and/or to focus reception of an uplink burst from a subscriber.” Ex. 1008, 44. Such techniques are disclosed in Barratt ’470. Ex. 1006, 2:47-51, 8:48-61, 18:32-38.

104. For example, Barratt ’470 discloses determining “spatial processing weight vectors” for each subscriber station for use in achieving spatially directed transmit and receive antenna beams. Ex. 1006, 2:47-51, 8:48-61, 18:32-38. A person of ordinary skill in the art would have known that these operations involve determining the direction from which bursts are received at each of the antenna elements (101.1-101.4) employed at the base station. Furthermore, a person of ordinary skill in the art would have been motivated to determine the times of arrival and time directions of received bursts in order to more efficiently process signals from the base station from which they were received. Thus, Barratt ’470 renders

obvious determining “times of arrival” and “time directions” of the received bursts which form the data signals.

Claim 4, [4.4] wherein the at least the second subscriber station comprises a plurality of subscriber stations and

105. Barratt ’470 discloses Claim 4 [4.4] for the reasons I discussed for Claim 1 [1.3]. *See supra*, §IX.A: Claim 1, [1.3]; *see also* Ex. 1008, 44.

Claim 4, [4.5]: wherein said controller selectively applies the first and second data signals to the first and second demodulators according to a selected pattern by alternately coupling the first demodulator and the second demodulator to receive, selectably, the first and at least second data signals communicated by alternating ones of the plurality of subscriber stations.

106. Barratt ’470 discloses Claim 4 [4.5] for the reasons I discussed for Claim 1 [1.4]. *See supra*, §IX.A: Claim 1, [1.4]; *see also* Ex. 1008, 44-45.

C. Ground 3: Barratt ’470 in View of Barratt ’490 Renders Obvious Claim 12 of the ’383 Patent.

107. Barratt ’470 in View of Barratt ’490 Renders Obvious Claim 12 of the ’383 Patent.

Motivation to Combine

108. A person of ordinary skill in the art would have been motivated to combine Barratt ’470 and Barratt ’490 for the following reasons. Like Barratt ’470, the disclosures taught in Barratt ’490 are directed towards a wireless communication system containing a plurality of remote terminals connected via a plurality of channels to a base station. Ex. 1007, Abstract. In particular, both Barratt ’470 and

Barratt '490 are directed to communications between remote terminals and a base station, where the base station includes a plurality of antennas for receiving uplink signals and transmitting downlink signals. *Id.*; Ex. 1006, Abstract.

109. Additionally, both Barratt '470 and Barratt '490 share the same goals of using antenna arrays and signal processing to increase the performance of wireless communication systems, including increasing efficiency, capacity, signal quality, and coverage of wireless communication systems. Ex. 1006, 6:19-40; Ex. 1007, 2:46-3:7.

110. Further, a person of ordinary skill in the art would have been motivated to combine Barratt '490 with Barratt '470 because Barratt '470 expressly references Barratt '490 in its specification, describing it as a patent that “previously disclosed spatial processing with antenna arrays to increase the spectrum efficiency of such systems.” Ex. 1006, 1:49-63. Barratt '470 expressly teaches building on the disclosures of Barratt '490 to increase performance of the system. *Id.* Therefore, a person of ordinary skill in the art would have known to look to Barratt '490 to disclose a system and method that would operate with the invention disclosed in Barratt '470. Thus, a person of ordinary skill in the art would have been motivated to combine Barratt '490 and Barratt '470.

111. In addition, each of Barratt '470 and Barratt '490 disclose maintaining profiles (i.e., parameters) associated with data signals received from the remote

terminals. *See* Ex. 1006, 8:48-62, 16:17-43, 16:44-17:7, 18:8-20, 18:39-45; *see also* Ex. 1007, 7:59-8:8, 12:49-66. Since Barratt '470 and Barratt '490 both maintain these parameters in order to improve the performance of wireless communication systems, one of ordinary skill in the art would have expected that maintaining specific parameters from either Barratt '470 and Barratt '490 would be advantageous for achieving this goal. *See* Ex. 1006, 6:19-40; *see also* Ex. 1007, 2:46-3:7. Thus, a person of ordinary skill in the art would have been motivated to maintain parameters from both Barratt '470 and Barratt '490 to improve performance of the system.

Claim 12: The apparatus of claim 9 wherein the first and at least second data signals include FEC (forward error correction), the FEC characterized by FEC parameters and wherein values of the FEC parameters form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

112. The combination of Barratt '470 and Barratt '490 discloses Claim 12. As discussed above in the analysis of Claim 5, Barratt '470 discloses maintaining profiles (i.e., parameters) associated with each data signal. *See supra* §IX.A: Claim 5, [5.3]. Like Barratt '470, Barratt '490 also discloses maintaining profiles (i.e., parameters) associated with data signals received from remote terminals. Ex. 1007, 7:59-8:8, 12:49-66. For example, in addition to maintaining “spatial signatures for each remote terminal,” Barratt '490 discloses that “[o]ther parameters of the remote terminals such as modulation formats currently used, receiver noise levels in current frequency channels, and current signal quality requirements are stored as well.” *Id.*

113. In addition, Barratt '490 teaches that in “embodiments where *well known channel coding techniques* are used to encode the signals to be transmitted to remote terminals, remote terminals employ *well known decoding techniques* to estimate BERs which are then reported back to the base station on their uplink channel.” Ex. 1007, 10:21-26 (emphasis added). In addition, for uplink, Barratt '490 likewise teaches that where channel coding techniques are used to encode the signals sent by remote terminals to the base station, the base station controller 3, “*using well known decoding techniques*, estimates Bit-Error-Rates (BERs) and compares them against acceptable thresholds stored in the remote terminal database.” Ex. 1007, 8:45-51 (emphasis added). A person of ordinary skill in the art would have known that these “well known decoding techniques” include forward error correction (FEC). In addition, a person of ordinary skill in the art would have been motivated to combine the widely known use of forward error correction from Barratt '490 with the profiles maintained in Barratt '470 in order to estimate Bit-Error-Rates of signals sent by remote terminals to the base station, correct errors in the signals, and reduce the number of retransmissions. Thus, Barratt '470 in view of Barratt '490 renders obvious Claim 12. *See* Ex. 1008, 89-94.

D. Ground 4: Uhlik Anticipates Claims 1-10, 13, and 16-17 of the '383

Patent.

114. Uhlik anticipates Claims 1-10, 13, and 16-17 of the '383 Patent.

Claim 1, [pre]: An apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station and a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

115. To the extent the preamble is limiting, Uhlik discloses Claim 1, [pre].

Annotated Figure 1 (reproduced below) illustrates a base station (i.e., “communication station”) that is operable in a wireless communication system to receive first and second data signals transmitted by first and second subscriber station within a plurality of subscriber stations.

Ex. 1005, Fig. 1 (annotated)

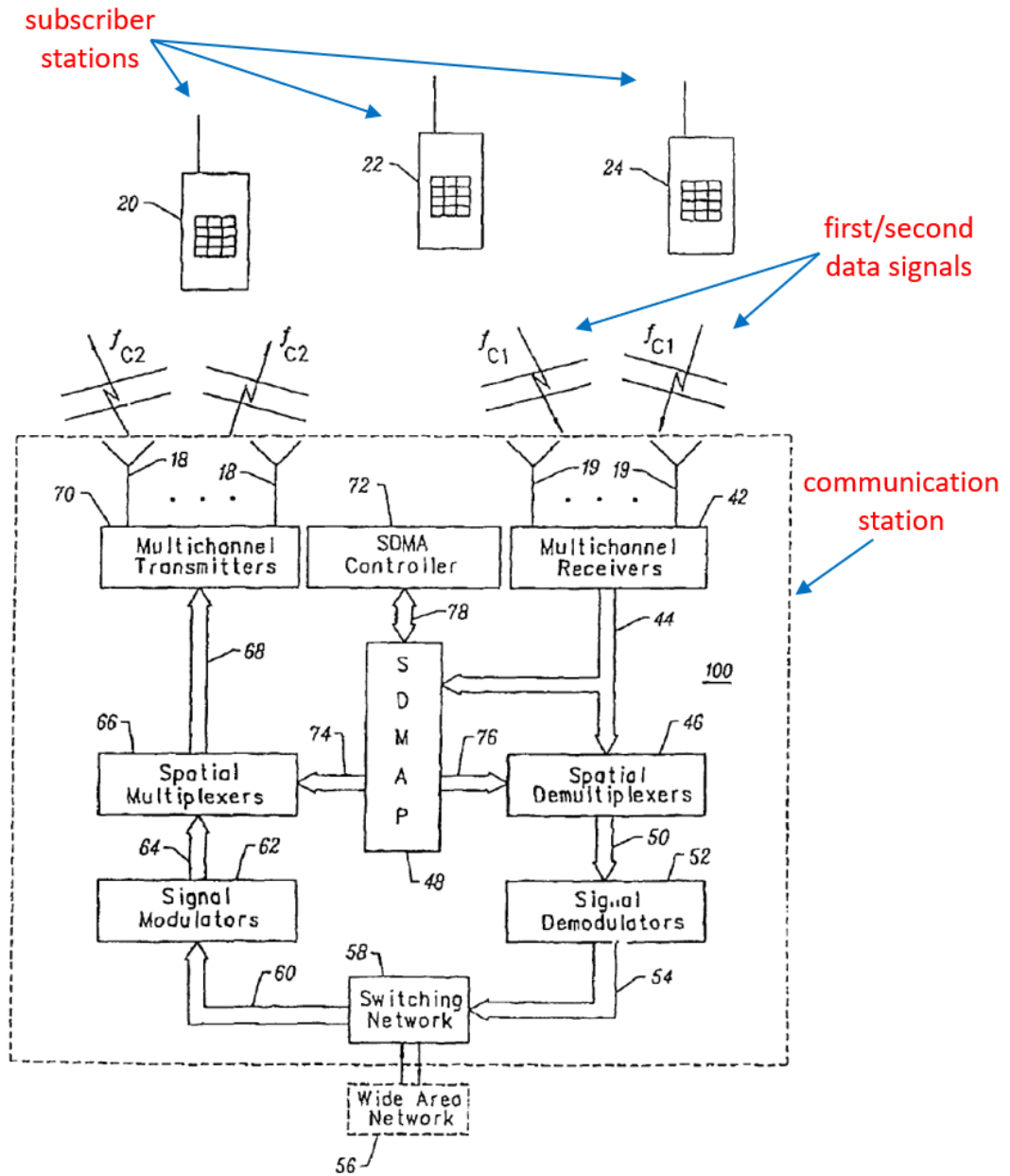


FIG. 1

116. Further, as discussed above, Uhlik discloses a wireless system where the uplink data signals are transmitted to the base station in individual bursts that are sent within *successive* uplink timeslots of each TDD frame. Ex. 1005, 5:58-6:12.

Thus, Uhlik discloses first and second data signals “successively transmitted” to the base station (i.e., “communication station”) by a first subscriber station (i.e., assigned to a first timeslot) and a second subscriber station (i.e., assigned to a second timeslot), respectively. *See* Ex. 1008, 2-10.

Claim 1, [1.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

Claim 1, [1.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

117. Uhlik discloses Claim 1 [1.1.1] and [1.1.2]. Annotated Figure 4 (reproduced below) illustrates a base station (i.e., “communication station”) that uses four separate “timeslot processors, *one per receive timeslot*” of each TDD frame. Ex. 1005, 5:58-6:4 (emphasis added). As discussed above, Uhlik teaches that, “[f]or each of the four receive timeslots, the four down-converted outputs from the four antennas are fed to a [‘timeslot processor’ 217] for further processing.” *Id.* Uhlik further teaches that each timeslot processor 217 performs several functions including “*demodulation*,” such that “[t]he output of the timeslot processor 217 is *demodulated* burst data for each of the four receive timeslots.” Ex. 1005, 6:5-12 (emphasis added). Uhlik therefore teaches that *each* timeslot processor 217 includes a demodulator portion for demodulating the data signals received during its respective timeslot.

118. Thus, Uhlik discloses a “first demodulator” (i.e., *first* timeslot processor 217) selectably coupled to receive “first data signals” transmitted to the

communication station during a first timeslot (i.e., the first timeslot of a TDD frame); and at least a “second demodulator” (i.e., *second* timeslot processor 217) selectably coupled to receive “second data signals” transmitted to the communication station during a next timeslot (i.e., the second timeslot of the TDD frame). *See* Ex. 1008, 10-16.

Ex. 1005, Fig. 4 (annotated)

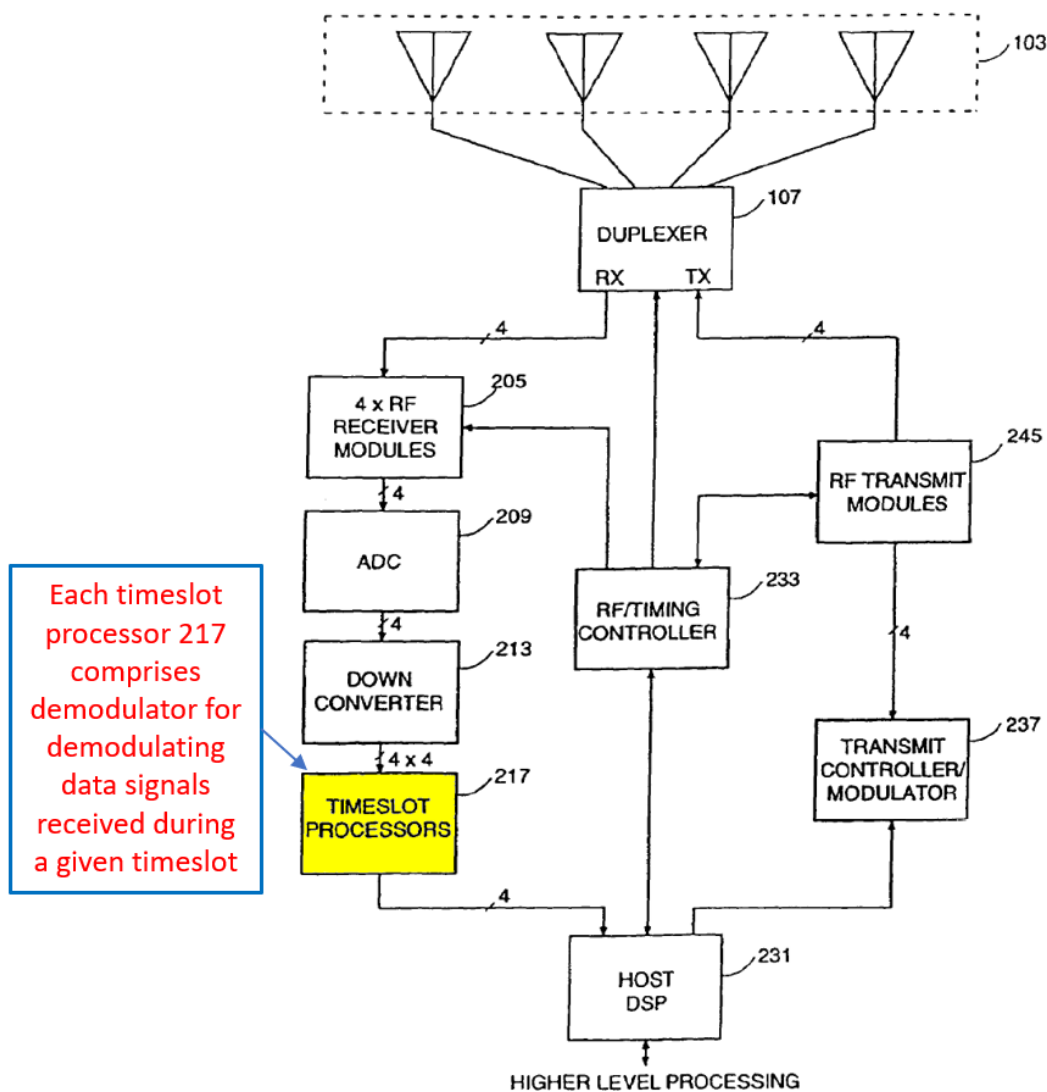


Figure 4

Claim 1, [1.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signals for application to the first demodulator and the second data signals for application to the second demodulator,

119. Uhlik discloses Claim 1 [1.2]. Uhlik discloses that the four timeslot processors 217 (shown in Fig. 4 below in yellow) are coupled to a host DSP processor 231 (blue) “whose main function is to control all elements of the system.” Ex. 1005, 6:11-15. Thus, Uhlik discloses a host DSP processor (i.e., “controller”) whose functions include alternately selecting the data signals received during each timeslot for application to one of the four timeslot processors (i.e., “demodulators”).

120. Additionally, Uhlik teaches that the base station “produces and maintains spatial signatures for each subscriber station,” including “spatial multiplexing and demultiplexing weights.” Ex. 1005, 3:1-27. These “weights” and other location-related parameter estimates are passed to a “source tracker” whose function “is to keep track of the positions of each of the transmitters as a function of time.” Ex. 1005, 4:61-5:13; *see also id.*, 6:19-58. Thus, Uhlik further discloses that the host processor (i.e., “controller”) is coupled to each timeslot processor (i.e., “demodulator”) in a feedback arrangement for processing additional, subsequent bursts received from the same subscriber station. *See* Ex. 1008, 16-24.

Ex. 1005, Fig. 4 (annotated)

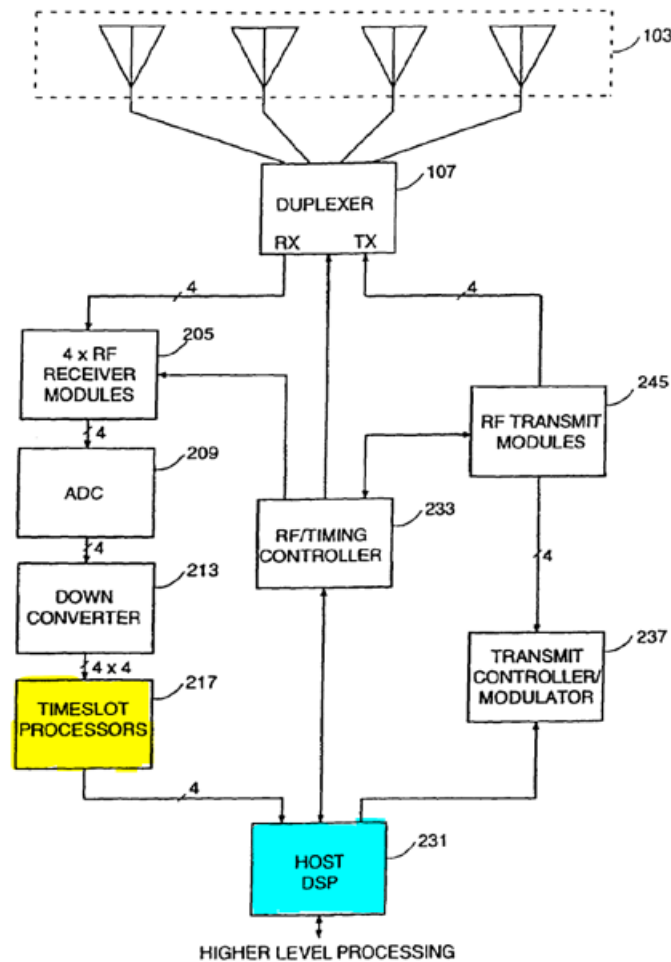


Figure 4

Claim 1, [1.3]: wherein the at least the second subscriber station comprises a plurality of subscriber stations and

121. Uhlik discloses Claim 1 [1.3]. For example, annotated Figure 1 (reproduced below) shows that the base station 100 is operable to receive uplink transmissions from a plurality of subscriber stations (20-24). *See* Ex. 1008, 24-25 (contending limitation met because “each [accused] base station will receive uplink transmissions from a large number of UEs.”).

Ex. 1005, Fig. 1 (annotated)

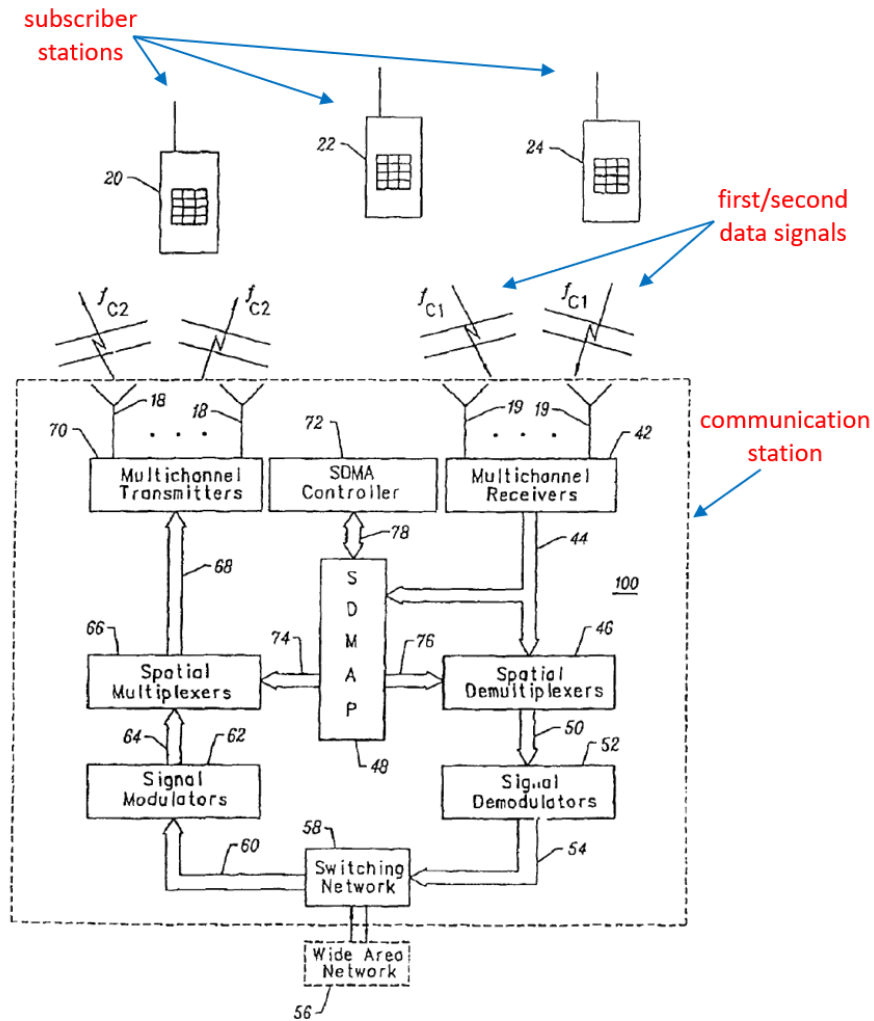


FIG. 1

122. Uhlik further discloses that its system may be used in a “fixed-access” wireless network, which includes fixed wireless access points that connect multiple subscriber units to a base station. Ex. 1005, 2:55-63; *see also, id.*, 15:55-57 (“The present invention can be applied to *fixed remote terminals* as well as to low and high mobility terminals.”) (emphasis added); *see also*, Ex. 1008, 25 (contending limitation met because “[s]ubscriber stations in [accused] networks also include

fixed wireless access points that connect multiple subscriber stations to a base station.”).

123. Additionally, Uhlik discloses a system that uses “spatial division multiple access (SDMA) technology in combination with [conventional] multiple access systems, such as time division multiple access (TDMA),” so that *several* remote terminals may communicate with the base station on a *single* “conventional channel” (e.g., timeslot) at the same time. Ex. 1005, 2:55-3:27. Uhlik therefore discloses that the data signals received during *each timeslot* may include *multiple* data signals sent by a plurality of spatially multiplexed subscriber stations. Ex. 1005, 2:55-3:27. Thus, Uhlik discloses “the at least the second subscriber station” comprises a plurality of subscriber stations.

Claim 1, [1.4]: wherein the controller selectively applies the first and second data signals to the first and second demodulators according to a selected pattern by alternately coupling the first demodulator and the second demodulator to receive, selectably, the first and at least second data signals communicated by alternating ones of the plurality of subscriber stations.

124. Uhlik discloses Claim 1 [1.4]. As discussed above, Uhlik discloses that for each TDD frame the base station applies the data signals received during the first uplink timeslot to a *first* one of the timeslot processors 217 (i.e., “first demodulator”) and the data signals received during the second uplink timeslot to a *second* one of the timeslot processors 217 (i.e., “second demodulator”). Ex. 1005, 5:58-6:12; *see supra* §IX.D, Claim 1 [1.1.1]-[1.1.2]. This is done, in other words, by “coupling” the

first timeslot processor to receive the data signals sent during the *first* timeslot and the second timeslot processor to receive the data signals sent during the *second* timeslot. Ex. 1005, 5:58-6:12; *see supra* §IX.D, Claim 1 [1.1.1]-[1.1.2].

125. Additionally, the '383 Patent states that “data signals communicated to the base station by subscriber stations ... are applied to the separate demodulators *according to a **selected pattern***. When two demodulators are provided, *successive bursts of data are applied, for instance to alternating ones of the demodulators.*” Ex. 1001, 6:29-34 (emphasis added). The same is true for Uhlik – for example, during each TDD frame, *successive uplink bursts of data* (received during Slots 0-3) *are applied to alternating ones of the four timeslot processors 217*, respectively. Ex. 1005, 5:58-6:12. Thus, Uhlik discloses applying uplink data signals to the timeslot processors 217 “according to a selected pattern.”

126. Further, Uhlik discloses a TDD/TDMA system in which active subscriber stations are assigned to the available uplink and downlink timeslots in each TDD data frame. Ex. 1005, 5:58-6:12. TDMA systems enable access by multiple users on one frequency resource or channel by multiplexing in the time domain, with timeslots assigned to particular users. The base station has knowledge of the timeslot in which each user sends data so that the information can be separated and reconstructed. This scheduling of radio resources (i.e., timeslots) by the base station therefore determines the *order* in which the uplink data signals from different

subscriber stations are received at the base station during each frame, and therefore *applied* to a corresponding one of the timeslot processors. Ex. 1005, 5:58-6:12. Thus, for this reason as well, Uhlik discloses applying uplink data signals to the timeslot processors “according to a selected pattern.”

127. This is also consistent with the Patent Owner’s position in its related infringement contentions, where for this limitation Patent Owner argues that “[the accused] base stations utilize *uplink scheduling to determine the selected pattern* with which the controller *selectively applies* the first and second data signals to the first and second demodulators.” Ex. 1008, 27 (emphasis added). Thus, Uhlik discloses a DSP Processor (i.e., “controller”) which applies first and second data signals to first and second demodulators by alternately coupling a first timeslot processor (i.e., “first demodulator”) and a second timeslot processor (i.e., “second demodulator”) to receive, selectably, first data signals (i.e., transmitted in a *first timeslot*) and at least second data signals (i.e., transmitted in a *second timeslot*) communicated by alternating ones of a plurality of subscriber stations (i.e., subscriber stations assigned to the first timeslot and the second timeslot).

Claim 2: The apparatus of claim 1 wherein the wireless communication system comprises a fixed wireless access system, wherein the communication station comprises a base station of the fixed wireless access system in which the data signals transmitted thereto by the first subscriber station comprise first uplink burst data signals and the data signals transmitted thereto by the second subscriber station comprise second uplink burst data signals, the first demodulator embodied at a first modem.

128. Uhlik discloses Claim 2. First, Uhlik discloses that its wireless system and related base stations can be used in a “*fixed-access* or mobile-access wireless network.” Ex. 1005, 2:55-63 (emphasis added); *see also id.*, 15:55-57 (“The present invention can be applied to *fixed remote terminals* as well as to low and high mobility terminals.”) (emphasis added).

129. Additionally, as discussed above, Uhlik discloses a TDD/TDMA system where uplink data signals are transmitted to the base station in individual bursts that are sent within successive uplink timeslots of a TDD frame. Ex. 1005, 5:58-6:12 (“The output of timeslot processor 217 is demodulated *burst* data for each of the four receive timeslots.”) (emphasis added); *see supra* §VIII.B.

130. Further, Uhlik teaches that each “modulator/demodulator set” in the disclosed base stations is embodied at a “modem.” Ex. 1005, 9:1-6 (“A base station can be considered a collection of base station *modems* ... Alternatively, a base station can be an installation with a *set of modems* ... For other system configurations each *modem modulator/demodulator set* 52, 62 can be considered a base station.”) (emphasis added); *see also id.*, 6:21-45 (noting one of the main functions of host

DSP 231 is “maintaining and reporting *modem* status information”), 6:46-48 (noting that the RF controller 233 produces “timing signals that are used by both the RF system and *the modem*.”), 8:30-33 (“Bsload represents the transmit and receive bit rates of *each modem* of the base station...”), 9:64-67 (“This handover may be from ... another base station *modem* on the same base station ... or even from a hibernating session on the same base station *modem*.”) (emphasis added).

131. The '383 Patent itself confirms that “typically the demodulators are contained in radio frequency (RF) modems *and demodulators and modems will be referred to interchangeably hereinafter*.” Ex. 1001, 6:23-25 (emphasis added); *see also id.*, 6:34-35 (“The demodulators form, for instance, the demodulator portions of modems.”). Thus, Uhlik discloses a fixed wireless access system including a base station which receives uplink burst data from first and second subscriber stations, where the uplink burst data is demodulated by first and second timeslot processors (i.e., “modem”). *See* Ex. 1008, 36-38.

Claim 3: The apparatus of claim 2 wherein the second demodulator is embodied at a second modem.

132. Uhlik discloses Claim 3. As discussed in relation to Claim 2, Uhlik discloses that each demodulator is embodied at a “modem.” Ex. 1005, 9:1-6; *see supra* §IX.D: Claim 2. Thus, Uhlik discloses Claim 3. *See* Ex. 1008, 38-42.

Claim 4, [pre]: An apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

133. To the extent the preamble is limiting, Uhlik discloses Claim 4, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.D: Claim 1, [pre] *see also* Ex. 1008, 42.

Claim 4, [4.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

Claim 4, [4.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

134. Uhlik discloses Claim 4 [4.1.2] and [4.1.2] for the reasons I discussed for Claim 1 [1.1.1] and [1.1.2]. *See supra* §IX.D: Claim 1, [1.1.1]-[1.1.2]; *see also* Ex. 1008, 43.

Claim 4, [4.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signals for application to the first demodulator and the second data signals for application to the second demodulator,

135. Uhlik discloses Claim 4 [4.2] for the reasons I discussed for Claim 1 [1.2]. *See supra* §IX.D: Claim 1, [1.2]; *see also* Ex. 1008, 43.

Claim 4, [4.3]: wherein the first and at least second data signals transmitted to the communication station by the first and at least second subscriber stations are transmitted in bursts of selected time durations and wherein the controller further determines times of arrival and time directions of the bursts which form the data signals,

136. Uhlik discloses Claim 4 [4.3]. As discussed above, Uhlik discloses a TDD/TDMA system where uplink data signals are transmitted to the base station in bursts of selected time durations (i.e., timeslots). Ex. 1005, 2:55-63; *see also id.*, 5:58-6:4; *see supra* §VIII.B.

137. Additionally, Uhlik teaches determining “time-of-arrival (TOA)” values of the bursts which form the form the data signals. Ex. 1005, 4:17-21 (“In a third embodiment, *time-of-arrival (TOA)*-related parameters from the parameter estimator are used...”), 4:53-60 (“In a third embodiment, data compression also includes using known signal information ... to calculate *time-of-arrival (TOA)*”), 5:10-12 (“Inputs to the EKF ... include the DOAS *and TOAs*”) (emphasis added).

138. In its related infringement contentions, Patent Owner contends “[the accused] base stations determine *timing-advance* values for each UE.” Ex. 1008, 44 (emphasis added); In the same way, Uhlik discloses determining such “timing-advance” values. Ex. 1005, 13:1-4 (“If this burst is seen by the base station, and replied to, the corresponding [Configuration Message burst] will contain a *timing advance adjustment* which will properly position subsequent data bursts.”) (emphasis added); *see also id.*, 10:38-43, 11:14-18, 12:62-64, 15:1-3.

139. Further, for “*time directions*,” Patent Owner alleges this limitation is met because “directions of the bursts of the data signals can be detected... Those direction measurements can be used to determine the settings for transmitting in the direction of a subscriber and/or to focus reception of an uplink burst from a subscriber.” Ex. 1008, 44. In the same way, Uhlik discloses determining “*time directions*” by “estimating signal parameters such as the spatial location of the transmitters (i.e., directions-of-arrival (DOAs) and distance from the base station).” Ex. 1005, 3:54-60; *see also id.*, 3:1-38, 4:61-5:12. Thus, Uhlik discloses Claim 4, [4.3].

Claim 4, [4.4] wherein the at least the second subscriber station comprises a plurality of subscriber stations and

140. Uhlik discloses Claim 4 [4.4] for the reasons I discussed for Claim 1 [1.3]. *See supra*, §IX.D: Claim 1, [1.3]; *see also* Ex. 1008, 44.

Claim 4, [4.5]: wherein said controller selectively applies the first and second data signals to the first and second demodulators according to a selected pattern by alternately coupling the first demodulator and the second demodulator to receive, selectably, the first and at least second data signals communicated by alternating ones of the plurality of subscriber stations.

141. Uhlik discloses Claim 4 [4.5] for the reasons I discussed for Claim 1 [1.4]. *See supra*, §IX.D: Claim 1, [1.4] *see also* Ex. 1008, 44-45.

Claim 5, [pre]: Apparatus for a communication station operable in a wireless communication system at least to receive first and second data signals successively transmitted thereto by a first subscriber station and a second subscriber station, respectively, within a plurality of subscriber stations, the apparatus comprising:

142. To the extent the preamble is limiting, Uhlik discloses Claim 5, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.D: Claim 1, [pre]; *see also* Ex. 1008, 45-53.

Claim 5, [5.1.1]: a first demodulator selectably coupled to receive the first data signals transmitted to the communication station;

Claim 5, [5.1.2]: at least a second demodulator also selectably coupled to receive the second data signals transmitted to the communication station; and

143. Uhlik discloses Claim 5 [5.1.1] and [5.1.2] for the reasons I discussed for Claim 1 [1.1.1] and [1.1.2]. *See supra* §IX.D: Claim 1, [1.1.1]-[1.1.2]; *see also* Ex. 1008, 53-59.

Claim 5, [5.2]: a controller, coupled to the first demodulator and to the at least second demodulator in a feedback arrangement, the controller alternately selecting the first data signal for application to the first demodulator and the second data signal for application to the second demodulator,

144. Uhlik discloses Claim 5 [5.2] for the reasons I discussed for Claim 1 [1.2]. *See supra* §IX.D: Claim 1, [1.2]; *see also* Ex. 1008, 59-67.

Claim 5, [5.3]: wherein the controller further comprises a memory portion, the controller further for maintaining profiles associated with each of the first and at least second data signals transmitted upon first and at least second channels, respectively, the profiles stored at the memory portion of the controller.

145. Uhlik discloses Claim 5 [5.3]. Uhlik discloses base stations that comprise memory portions, which may be included within the host processor 231 (“controller”) or other parts of the base station. Ex. 1005, 15:34-49 (“The present invention ... may include a machine-readable medium having stored thereon instructions which may be used to...”). The base station necessarily must include a memory portion to perform the recited functions in Uhlik such as producing and maintaining spatial signatures for each subscriber station.

146. With respect to “profiles,” the ’383 Patent states that “[t]he profiles include values which represent channel characteristics upon which uplink signals are transmitted as well as characteristics of the uplink signals.” Ex. 1001, 10:56-59. This can include, for instance, “antenna combining parameters when antenna diversity and/or beam-forming is utilized.” Ex. 1001, 12:22-29.

147. Similarly, Uhlik discloses that the base station “produces and *maintains* [i.e., stores] spatial signatures for each subscriber station for each conventional channel.” Ex. 1005, 3:1-38 (emphasis added). These signatures include “spatial multiplexing and demultiplexing weights” that are antenna combining parameters used in forming directed antenna beams for subscriber station. Ex. 1005, 3:1-38. An

example of these optimized antenna beams is illustrated in Figure 2 (reproduced below). Thus, Uhlik discloses “maintaining profiles” (including, e.g., antenna combining parameters such as antenna “weights”) that are associated with each of the data signals communicated to the base station. *See* Ex. 1008, 67-71.

Ex. 1005, Fig. 2

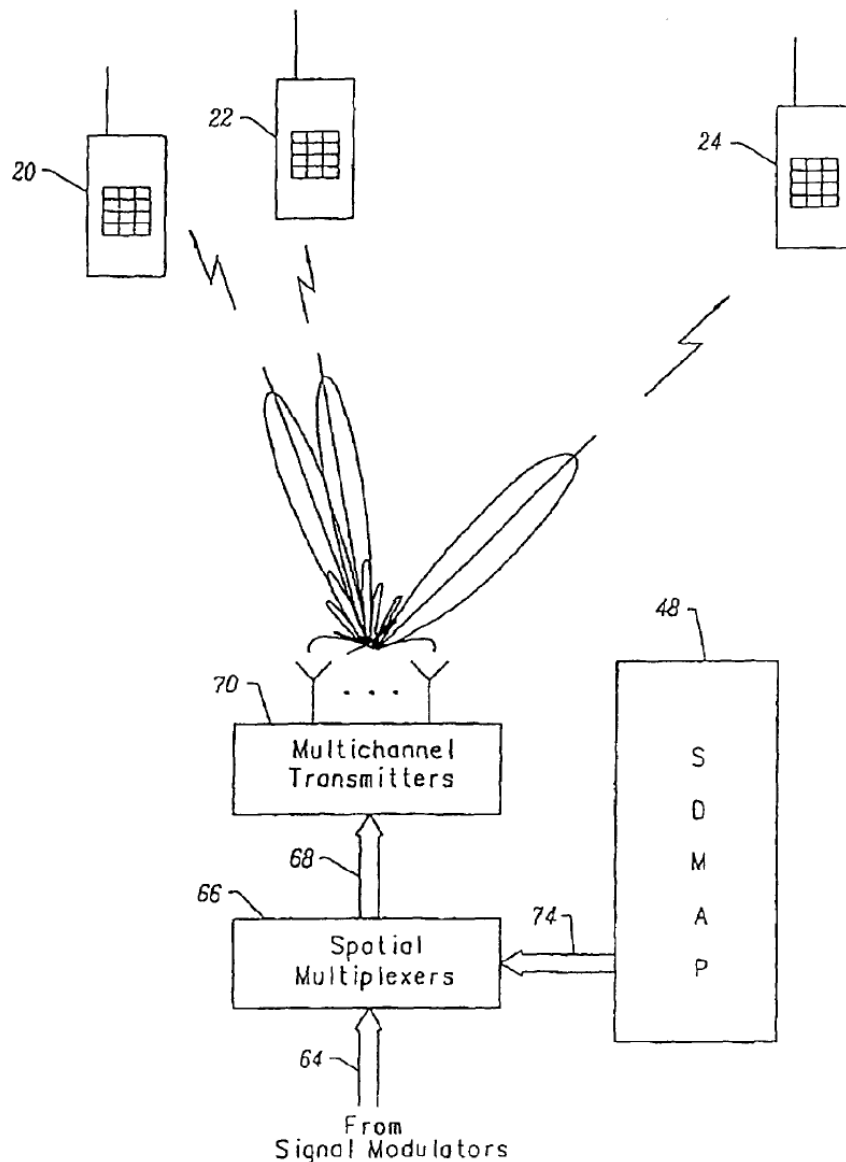


FIG. 2

Claim 6: The apparatus of claim 5 wherein the profiles maintained at the memory portion of the controller comprise at least one channel-related parameter associated with the first and at least second channels upon which the first and at least second data signals are communicated, respectively.

148. Uhlik discloses Claim 6. As discussed in relation to Claim 5, Uhlik discloses maintaining “spatial multiplexing and demultiplexing weights” for forming spatially directed antenna beams for each subscriber station as illustrated in Figure 2. Ex. 1005, 3:1-38; *see supra* §IX.D: Claim 5, [5.3]. Consistent with the ’383 Patent, these spatial antenna “weights” comprise “values which represent channel characteristics upon which uplink signals [from different subscriber stations] are transmitted.” Ex. 1001, 10:56-59. For example, Uhlik teaches that “[w]hen communicating from the base station to the subscriber stations, an optimized multi-lobe antenna radiation pattern tailored to the current active subscriber station connections and interference situation is created.” Ex. 1005, 3:1-38. Thus, Uhlik discloses maintaining profiles that include at least one “channel-related parameter” (e.g., antenna “weights”) associated with each uplink channel. *See* Ex. 1008, 71-73.

Claim 7: The apparatus of claim 6 wherein the first demodulator and the second demodulator each include equalizer portions for equalizing the at least one of the first and second data signals selectably applied to the first demodulator and the second demodulator, respectively.

149. Uhlik discloses Claim 7. Uhlik teaches that “known training sequences placed in digital data streams *for the purpose of channel equalization* can be used in conjunction with sensor array information to calculate signal parameter estimates

such as DOAs and signal power levels” for each data signal received at the base station. Ex. 1005, 4:4-14 (emphasis added). Thus, Uhlik discloses that the demodulators in the base station each include an “equalizer portion” for equalizing the uplink digital data signals that are applied to each timeslot processor 217, shown in Figure 4. *See* Ex. 1008, 74-76.

Ex. 1005, Fig. 4 (annotated)

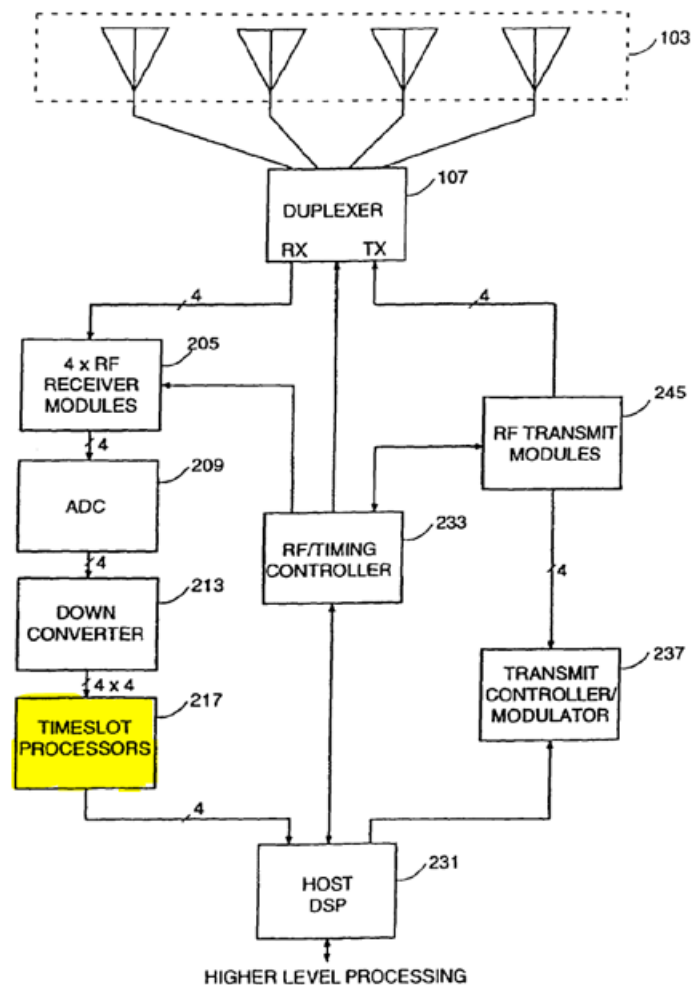


Figure 4

Claim 8: The apparatus of claim 7 wherein filter weight values form portions of the profiles maintained by the controller and stored at the memory portion thereof.

150. Uhlik discloses Claim 8. As discussed above in the analysis of Claim 5 [5.3], Uhlik discloses maintaining “spatial multiplexing and demultiplexing weights” which are a type of filter weight values. Ex. 1005, 3:1-27; *see supra* §IX.D: Claim 5, [5.3]. Additionally, Uhlik teaches that “[l]ocation-related parameter estimates 172 are passed to a source tracker ... the function of [which] is to keep track of the positions of each of the transmitters as a function of time.” Ex. 1005, 5:3-6. Uhlik states that “[t]his is implemented by known nonlinear *filtering* techniques such as the aforementioned extended Kalman *filter* (EKF) ... Inputs to the EKF in one embodiment include the DOAs and TOAs” maintained by the base station for each subscriber station. Ex. 1005, 5:3-12 (emphasis added). The outputs of the tracker are fed to a “spatial demultiplexing controller” which controls the function of the spatial demultiplexer and a “spatial multiplexing controller” which controls the function of the spatial multiplexer. Ex. 1005, 5:17-21.

151. Thus, Uhlik discloses maintaining profiles for each subscriber station that include “filter weight values” (e.g., antenna “weights”). *See* Ex. 1008, 76-77 (contending this limitation met because the “[accused] base stations maintain ... *antenna weights* for each UE.”) (emphasis added). Antenna weights necessarily are

filter weight values because they are used to emphasize or suppress outputs of some antennas compared to others.

Claim 9: The apparatus in claim 5 wherein the profiles maintained at the memory portion of the controller comprise at least one signal-related parameter associated with the first and at least second data signals, respectively.

152. Uhlik discloses Claim 9. As discussed above in the analysis of Claim 5, Uhlik discloses maintaining parameters for each subscriber station. Ex. 1005, 3:1-38; *see supra* §IX.D: Claim 5, [5.3]. Additionally, Uhlik teaches that the base station includes “a parameter estimator 170 where estimates of *signal parameters* including those related to the source locations (e.g., DOAs and range) are obtained.” Ex. 1005, 4:53-5:12 (emphasis added). Thus, Uhlik discloses maintaining profiles that include at least one “signal-related parameter” (e.g., power level, timing advance, frequency offset, modulation, etc.). Ex. 1005, 6:5-10; *see also* Ex. 1008, 77-79.

Claim 10: The apparatus of claim 9 wherein the first and at least second data signals are characterized by modulation indexes, and wherein values of the modulation indexes form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

153. Uhlik discloses Claim 10. As discussed in the analysis of Claim 5, Uhlik discloses maintaining profiles associated with the first and at least second data signals. *See supra* §IX.D: Claim 5, [5.3]. Additionally, Uhlik teaches that each data signal received at the base station is “demodulated” by one of the timeslot processors 217. Ex. 1005, 5:58-6:15. To *de*-modulate a received signal as described in Uhlik,

the base station necessarily needs to know what modulation format was used to *modulate* that signal. *See* Ex. 1005, 13:37-63 (noting each user terminal provides the base station with a list of its capabilities during registration including its “highest modulation class”). It is necessary for the base station to know the modulation format in order to perform the correct demodulation technique. This parameter would necessarily be stored in the memory portion of the base station for each subscriber station in order to properly perform demodulation on signals received from that subscriber station. Thus, Uhlik discloses maintaining profiles that include a “modulation index” (e.g., format) associated with each uplink data signal. *See* Ex. 1008, 80-84.

Claim 13: The apparatus of claim 5, wherein the communication station to which the first and at least second data signals are transmitted by the first ant [sic] at least second subscriber stations, respectively, exhibits antenna diversity provided by a first antenna transducer and at least a second antenna transducer, the first and at least second data signals transduced by the first and at least second antenna transducer, respectively, combined utilizing antenna combining parameters, and wherein the antenna combining parameters form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

154. Uhlik discloses Claim 13. Figure 4 (reproduced below) of Uhlik shows a base station (i.e., “communication station”) that exhibits antenna diversity by using *four* separate antennas 103 (orange). Each antenna necessarily includes an “antenna transducer” for converting received radio waves to an electric current. The antennas would necessarily have to include a transducer so that the signals they receive from

the subscriber station could be fed to the components of the base station, such as the timeslot processors 217. In addition, each uplink signal received at the base station (e.g., during a given timeslot) is transduced by *each* of the four antennas 103, thus providing four different versions of the received signal for further processing by *one* of the timeslot processors 217 (yellow). Ex. 1005, 5:58-6:12.

Ex. 1005, Fig. 4 (annotated)

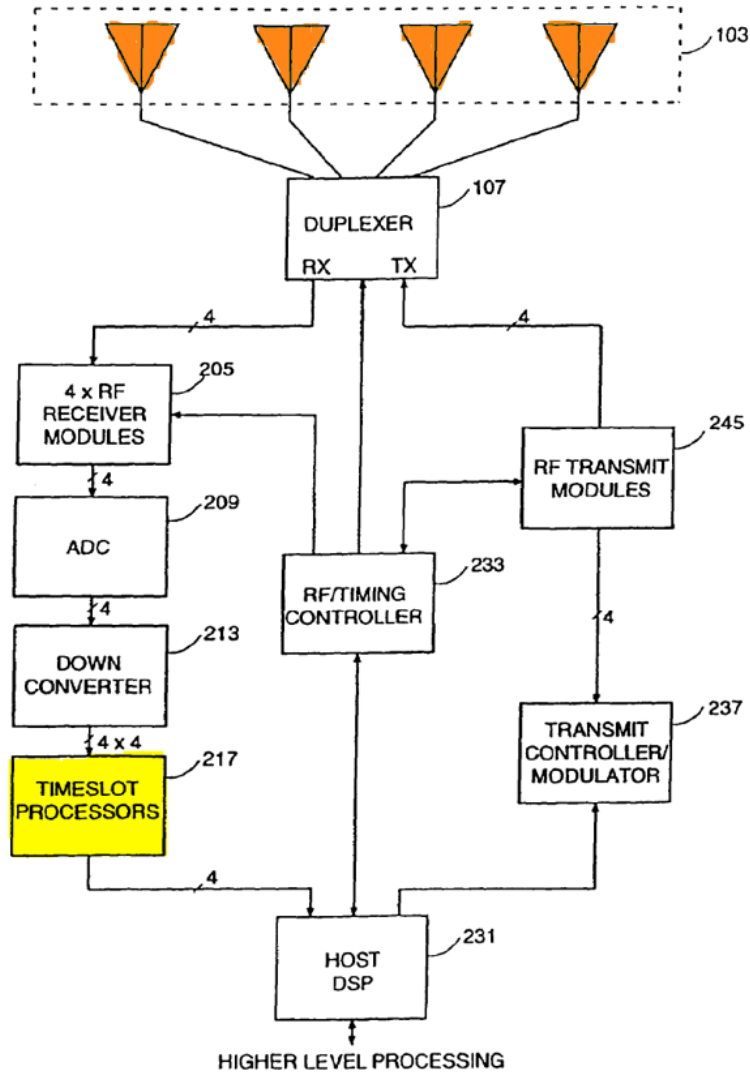


Figure 4

155. Further, as discussed in the analysis of Claim 5, Uhlik discloses maintaining profiles that include “spatial multiplexing and demultiplexing weights” for each subscriber station. *See supra* §IX.D: Claim 5, [5.3]. Uhlik teaches that these weights can be used to achieve both transmit and receive beamforming techniques. Ex. 1005, 2:55-3:45. For example, Figure 2 (reproduced below) illustrated how the

spatial multiplexing weights can be used for achieving spatially directed antenna beams uniquely tailored to each active subscriber station. *Id.* Uhlik further teaches that the weights are used in “a linear combiner” to form a weighted combination (i.e., a weighted sum) of the signals received by the four antenna elements (103). Ex. 1005, 4:10-17, 6:5-10.

156. This is also consistent with Patent Owner’s position in its related infringement contentions. Ex. 1008, 94 (contending limitation met because “[accused] base stations include a plurality of antenna transducers which are used in antenna combining techniques *such as beamforming* (including both transmit and receive beamforming) and MIMO.”) (emphasis added).

157. Thus, Uhlik discloses maintaining “antenna combining parameters” (e.g., weights) for combining outputs from a first and at least a second antenna. *See* Ex. 1008, 94-107.

Ex. 1005, Fig. 2

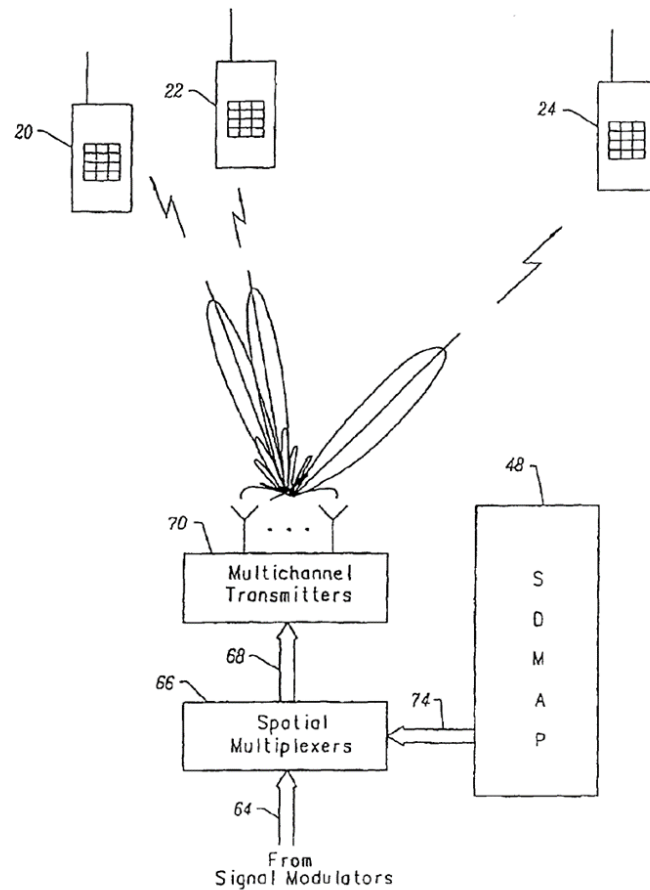


FIG. 2

Claim 16, [pre]: A method for acting upon first and successive data signals transmitted to a communication station operable in a wireless communication system by a first subscriber station and at least a second subscriber station, the method comprising:

158. To the extent the preamble is limiting, Uhlik discloses Claim 16, [pre] for the reasons I discussed for Claim 1, [pre]. *See supra* §IX.D: Claim 1, [pre]; *see also* Ex. 1008, 110.

Claim 16 [16.1.1]: selecting at which of a first demodulator and at least a second demodulator to apply at least one of the first data signals and the second data signals, wherein the first and second successive data signals and any subsequent data signals are alternately applied to the first and second demodulators;

Claim 16 [16.1.2]: demodulating the at least one of the first and at least second data signals at the first demodulator when the first demodulator is selected during the operation of selecting; and

Claim 16 [16.1.3]: demodulating the at least one of the first and at least second data signals at the second demodulator when the second demodulator is selected during the operation of selecting; and

159. Uhlik discloses Claim 16 [16.1.1]-[16.1.3] for the reasons I discussed for Claim 1 [1.1.1]-[1.1.2] and [1.2]. *See supra* §IX.D: Claim 1, [1.1.1]-[1.1.2], [1.2]; *see also* Ex. 1008, 111.

Claim 16 [16.2]: maintaining profiles associated with each of the first and at least second data signals transmitted upon the first and at least second channels respectively, and wherein the operations of demodulating further comprise accessing the profiles.

160. Uhlik discloses Claim 16 [16.2] for the reasons I discussed for Claim 5 [5.3]. *See supra* §IX.D: Claim 5, [5.3]; *see also* Ex. 1008, 111.

Claim 17: The method of claim 16 wherein selections made during the operation of selecting are made according to a selected pattern

161. Uhlik discloses Claim 17 for the reasons I discussed for Claim 1 [1.4]. *See supra* §IX.D: Claim 1, [1.4]; *see also* Ex. 1008, 111.

E. Ground 5: Uhlik Renders Obvious Claims 11-12 and 14-15 of the '383 Patent.

162. Uhlik renders obvious Claims 11-12 and 14-15 of the '383 Patent.

Claim 11: The apparatus of claim 9 wherein the first and at least second data signals are characterized by modulation orthogonalizations and wherein values of the modulation orthogonalizations form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

163. Uhlik renders obvious Claim 11. As I discussed in the analysis of Claim 5, Uhlik discloses maintaining profiles associated with the first and at least second data signals. *See supra* §IX.D: Claim 5, [5.3].

164. Additionally, Uhlik teaches that its SDMA system may be used in combination with “conventional” multiple access systems such as a *code* division multiple access (CDMA) system. Ex. 1005, 2:49-63 (emphasis added), 3:45-52. A person of ordinary skill in the art would have understood that such “conventional” CDMA systems necessarily involve using different orthogonal spreading codes for communicating with the base station. *See* Ex. 1001, 11:21-26. CMDA is consistent with the language of the ’383 Patent, which states that the bursts use “*modulation short orthogonalization codes* when utilizing a *spread* spectrum arrangement.” Ex. 1001, 11:21-26 (emphasis added).

165. First, the person of ordinary skill in the art would have known that the signals received at the base station would have to be orthogonal in order to allow different users, using different spreading codes, to transmit on the same frequency channel without causing undue interference to each other. The person of ordinary skill in the art would have understood that the orthogonal spreading codes are a type

of “modulation orthogonalizations” because they allow modulated signals to be transmitted on the same frequency channel (i.e., because the signals are orthogonal). Second, the person of ordinary skill in the art would have been motivated to use such orthogonal spreading codes (“modulation orthogonalizations”) in order to allow multiple remote terminals to communicate with a base station, thus enhancing communication.

166. Thus, Uhlik renders obvious maintaining profiles that include “modulation orthogonalizations” (e.g., allocated CDMA codes). *See* Ex. 1008, 84-88.

Claim 12: The apparatus of claim 9 wherein the first and at least second data signals include FEC (forward error correction), the FEC characterized by FEC parameters and wherein values of the FEC parameters form portions of the profiles maintained by the controller and stored at the memory portion of the controller.

167. Uhlik renders obvious Claim 12. As discussed in the analysis of Claim 5, Uhlik discloses maintaining profiles associated with the first and at least second data signals. *See supra* §IX.D: Claim 5, [5.3]. Uhlik further discloses that the host DSP processor 231 (i.e., “controller”) performs various functions “including ... *error correcting code checking.*” Ex. 1005, 6:21-29 (emphasis added). A person of ordinary skill in the art would have understood that such error correcting code checking as disclosed in Uhlik can be accomplished using forward error correction (FEC) parameters.

168. First, the person of ordinary skill in the art would have known that error correcting code is redundant data included in transmitted signals. The person of ordinary skill in the art would have known that forward error correction is a technique used to determine if any errors are present in the received signal by “checking” the error correcting code, and if so, determine whether those errors can be corrected at the base station in view of the error correction scheme. Thus, the person of ordinary skill in the art would have known “forward error correction (FEC) parameters” would be used to perform the error correcting code checking. A person of ordinary skill in the art would have further known that these parameters would be stored as part of the “profiles” in the memory portion of the base station prior to checking the signal for errors. Second, a person of ordinary skill in the art would have been motivated use forward error correction parameters to estimate the Bit-Error-Rate of the received signals, correct errors in the received signals, and reduce the number of retransmissions.

169. Thus, Uhlik renders obvious maintaining profiles that include FEC parameters. *See* Ex. 1008, 89-94.

Claim 14: The apparatus of claim 5 wherein profiles maintained by the controller and stored at the memory portion thereof comprise values of Band timing adjustments by which to adjust the first and at least second data signals.

170. Uhlik renders obvious Claim 14. Uhlik discloses a network registration process in which a user terminal sends a “Configuration Request burst” (CR) to the

base station and receives a “Configuration Message burst” (CM) in response. Ex. 1005, 9:40-53. Uhlik teaches that “[i]f this [CR] burst is seen by the base station, and replied to, the corresponding CM will contain a *timing advance adjustment* which will *properly position* subsequent data bursts.” Ex. 1005, 13:1-4 (emphasis added); *see also id.*, 15:1-3. A person of ordinary skill in the art would have known that the timing advance adjustment is a value of Band timing adjustment.

171. First, the person of ordinary skill in the art would have known that the timing advance adjustment value of Uhlik is determined based on the spatial signature of the subscriber station. *See* Ex. 1005, 10:34-36 (the base station “unscrambles the CR [], and determines the spatial signature of the user terminal”). The person of ordinary skill in the art would have known that the “timing advance adjustment” values and “Band timing adjustments” refer to a shift in timing of transmission of burst from the subscriber stations to the base station. *See*, Ex. 1005, 15:1-3 (timing advance values given in μs); *see also* Ex. 1008, 107-109 (contending “Band timing adjustments” limitation met by “Timing Advance Command”). Because the timing advance adjustment is used to “properly position subsequent data bursts” from each user terminal (“subscriber station”), the person of ordinary skill in the art would have known that the timing advance adjustment values would be stored in a memory portion of the base station associated with its associated user

terminal prior to sending the values to the appropriate user terminal in a corresponding Configuration Message. Ex. 1005, 13:1-4.

172. Thus, Uhlik renders obvious that the profiles maintained by the base station include values of “Band timing adjustments” by which to adjust each uplink data signal.

Claim 15: The apparatus of claim 5 wherein profiles maintained by the controller and stored at the memory portion thereof comprise values of residual carrier adjustments by which to adjust the first and at least second data signals.

173. Uhlik renders obvious Claim 15. As discussed above, Uhlik teaches that “[t]he timeslot processors 217 perform several functions including ... *frequency offset estimation*,” which involves estimating the carrier frequency offsets that can occur between the base station and a subscriber station, e.g., due to slight differences in the frequencies of their respective local oscillators. Ex. 1005, 6:5-10 (emphasis added).

174. First, a person of ordinary skill in the art would have known that the determined offset values would be stored in a memory portion of the base station associated with each subscriber station prior to applying the determined offset values to the corresponding uplink data signal, so that the appropriate offset values are applied to the appropriate uplink data signals (i.e., based on which subscriber station they are received from). Second, to the extent this not inherently disclosed, a person of ordinary skill in the art would nevertheless find it obvious to store the determined

offset values because it would be more efficient to refine estimated frequency offset values for a subscriber station based on previously estimated frequency offset values from the same subscriber station. Thus, Uhlik renders obvious that the profiles maintained by the base station include values of “residual carrier adjustments” by which to adjust each uplink data signal. *See* Ex. 1008, 110 (asserting “[accused] base stations utilize *residual carrier adjustments* to minimize the effects of the *carrier frequency and timing offsets* that can occur between base stations and UEs.”) (emphasis added).

X. Conclusion

I declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and 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.

Dated: September 21, 2023



Daniel van der Weide, Ph.D.