

**EXPERT DECLARATION OF JAMES A. PROCTOR JR.
FOR
INTER PARTES REVIEW OF U.S. PATENT NO. 7,230,931**

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I. INTRODUCTION

1. I, James A. Proctor Jr., submit this declaration in support of a Petition for *Inter Partes* Review of United States Patent No. 7,230,931 (“the ’931 Patent”), owned by General Access Solutions, LTD (“GAS” or “Patent Owner”). I have been retained in this matter by McGuire Woods (“Counsel”) on behalf of Sprint Spectrum LP, Virgin Mobile USA, LP, and Boost Mobile, LLC (“Petitioners”). I understand that Petitioners are the Real Parties-in-Interest to this Petition.

2. I make this declaration based upon by personal knowledge. I am over the age of 21 and am competent to make this declaration.

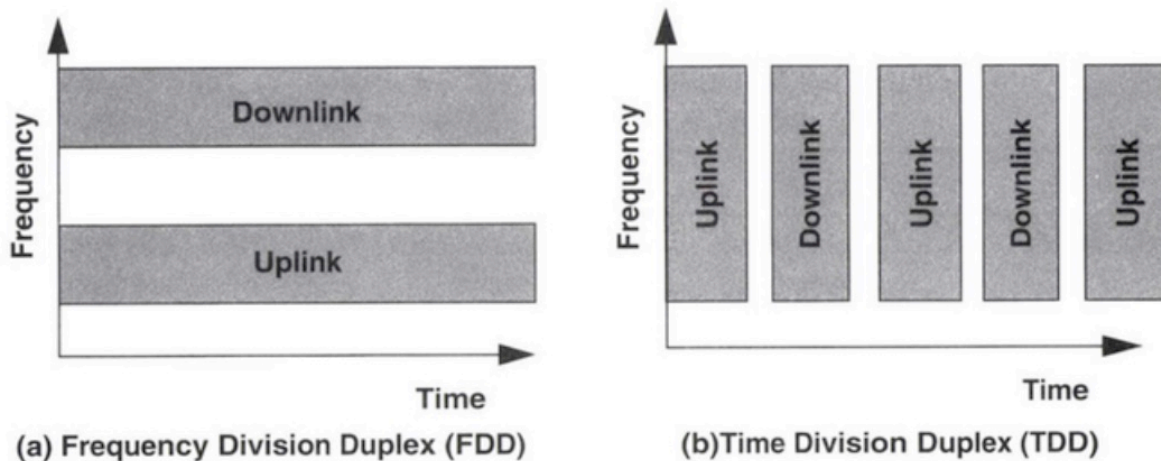
3. The statements herein include my opinions and the bases for those opinions, which relate to at least the following documents of the pending *inter partes* review petition:

- U.S. Patent No. 7,230,931 by Paul F. Struhasker (“the ’931 Patent”) (Ex. 1001).
- File History for the ’931 Patent (Ex. 1002).
- “SDMA Techniques for Wireless ATM,” authored by Ulrich Vornefeld et al., published in IEEE Communications Magazine (November 1999) (“Vornefeld”) (Ex. 1004).
- U.S. Patent No. 6,470,177 to Sören Andersson et al. entitled “Adaptive Sectorization” (“Andersson”) (Ex. 1005).

72. Indeed, in the “Background of the Invention,” the ’931 Patent describes “[f]ixed wireless broadband systems [that] use a group of transceiver base stations to cover a region in the same manner as the base stations of a cellular phone system.” (Ex. 1001 at 5:23-25.) According to the ’931 Patent, “[t]he base stations of a fixed wireless broadband system transmit forward channel (i.e., downstream) signals in directed beams to fixed location antennas attached to the residences or offices of subscribers. The base stations also receive reverse channel (i.e., upstream) signals transmitted by the broadband access equipment of the subscriber.” (Ex. 1001 at 5:25-31.) In contrast to a “fixed” wireless system, in a “mobile wireless access” system, the location of the end user termination is mobile. (Recommendation ITU-R F.1399 “Vocabulary of Terms for Wireless Access,” 1999 at p. 2.)

Time Division Duplexing

73. Duplexing refers to the coordination of resource between the uplink and the downlink. The two most common techniques are frequency division duplex (FDD) in which the uplink and downlink are separated in frequency, and time division duplex (TDD) in which the uplink and downlink are separated in time. In the case of TDD, the uplink and downlink operate in the same frequency band and at different times within the TDD frame. The figure below compares the structure of FDD versus TDD:



(See Rappaport, “Smart Antennas for Wireless Communications IS-95 and Third Generation CDMA Applications,” (1999) at Figure 1-4, pg. 5.)

74. At the time of the asserted patents (and the provisional applications they rely on), many mobile cellular systems used FDD. There was, however, commercial use of TDD in personal telephone communication systems. One example of a time division duplexed system, commercially deployed at the time is the **Personal Handy Phone System (PHS)**, defined by the Association of Radio Industries and Businesses (ARIB) Standard (RCR STD-28). The PHS standard was first published in December of 1993, and had reached Version 3.3 by the priority date of the ‘931 Patent. (See http://www.arib.or.jp/english/html/overview/doc/5-STD-28v6_0-1p2-E.pdf and, <http://www.arib.or.jp/english/html/overview>).

75. At the time of the filing of the ‘931 provisional applications, a company called ArrayComm had deployed substantial numbers of their

“intellacell” adaptive antenna array bases stations, utilizing the time division duplex (TDD) PHS protocol. In a **Federal Communications Commission (FCC)** Filing by ArrayComm entitled “REPLY COMMENTS OF ARRAYCOMM, INC.” on March 9th, 2001, ArrayComm states they had “furnished 65,000 base stations world-wide with its adaptive antenna technology,” and “PHS had nine million subscribers at the end of 2000” (See pages 2-3, <https://ecfsapi.fcc.gov/file/6512561686.pdf>)

76. An example of one of ArrayComm’s patented antenna array technologies is detailed in U.S. Patent 6,154,661 to Marc. H. Goldberg (hereinafter “Goldberg”) with a priority date of December 12, 1997 and an issue date of November 28, 2000. Goldberg teaches a single transmitter antenna array within a cellular system producing both A) an omnidirectional antenna pattern, and B) directed beam antenna patterns for different signals and uses at the same of different times in a time division duplexed (TDD) system. Figure 2 of the Goldberg is reproduced below:

U.S. Patent Nov. 28, 2000 Sheet 2 of 4 6,154,661

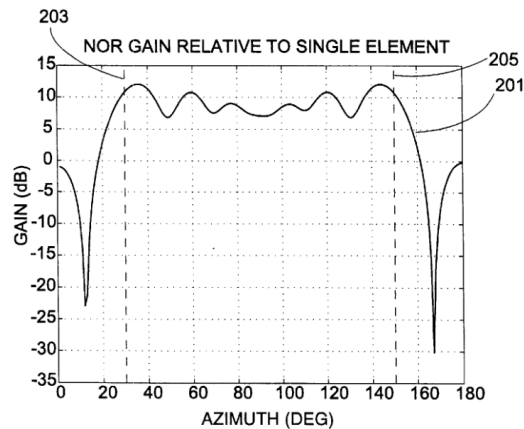


Figure 2

77. Goldberg further states “[t]he two vertical dotted lines 203 and 205 in FIG. 2 are the limits of the sector $[30^{\circ}, 150^{\circ}]$.” (Goldberg at 17:9-10).

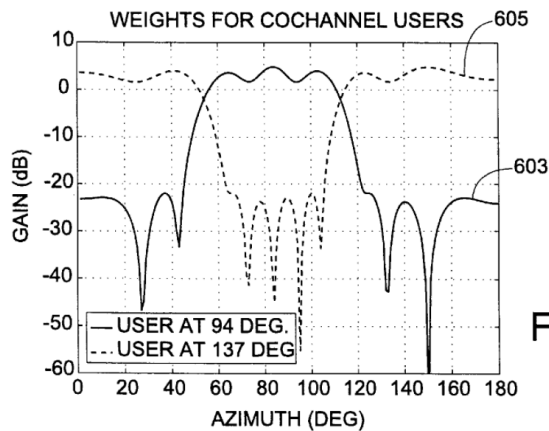


Figure 6

78. Goldberg further explains, “For user angles of 94° and 137° , the resultant patterns are displayed in FIG. 6 as plots 603 and 605.” (Goldberg at 22:2-3).

79. Goldberg also states that “*In one implementation, the system operates with fixed subscriber unit locations and uses the PHS communications protocol,*” which is a time division duplexed system. (Goldberg at 9:36-38 (emphasis added)).

Goldberg further teaches transmitting some signals (broadcast signals) using an omnidirectional antenna pattern, while transmitting others (traffic signals) using a directed antenna pattern.

“Such paging and control information is broadcast on what are called common control channels. Because often there is no prior information regarding the location of the remote user(s) that need to receive the paging or control information, or because such information is intended for several users, it is preferable to transmit such signals omnidirectionally, or near omnidirectionally, where omnidirectional in general means that the radiated power pattern of the base station is independent of azimuth and elevation within the prescribed coverage area of the base station.” (Goldberg at 1:29-39)

“The present invention is applicable to all downlink broadcasts and transmissions. It is especially applicable for BCCH and PCH that are used by a base station to simultaneously transmit common information to more than one subscriber (i.e., to broadcast). It is also applicable to other situations where it is desired to transmit RF energy omnidirectionally.” (Goldberg at 2:6-12)

80. While the forgoing discusses transmitting “common” signals using a near omnidirectional antenna patterns, the following discloses transmitting directed beams signals to individual subscriber units.

“The use of antenna arrays for the radiation of radio frequency (RF) energy is well established in a variety of radio disciplines. For the purposes of transmitting in the downlink from a base station which includes an antenna array to a remote receiver (the subscriber unit), the signal intended for the SU can be provided as input to each of the radiating elements of the array, differing from element to element only by gain and phase factors, usually resulting, by design, in a directional radiation pattern focused at the subscriber unit.” (Goldberg at 2:12-21)

81. In addition there was significant interest in the industry for using TDD in other cellular communication systems, both mobile and fixed wireless access.

82. For example, US. Patent 6,122,260 entitled “Smart antenna CDMA wireless communication system” was filed on December 16, 1996 and issued on September 19, 2000. The ’260 Patent discloses the use of a TDD based CDMA system referred to “S-CDMA”, utilizing an adaptive antenna array at a base station.

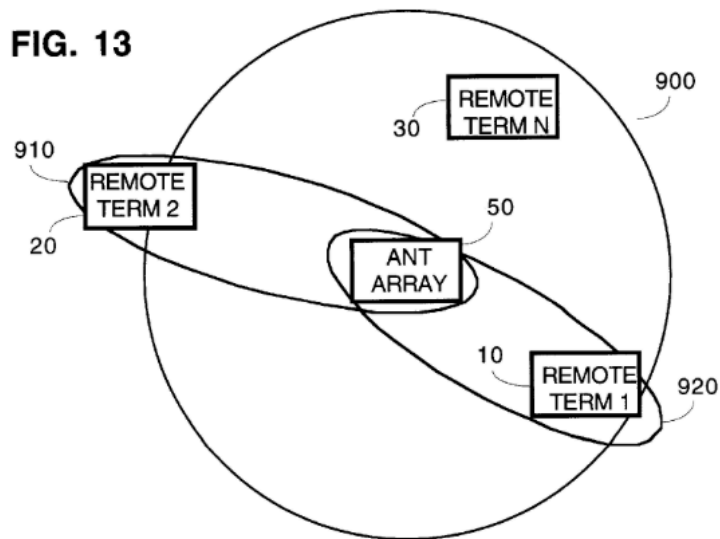
83. U.S. Patent 6,005,854 entitled “Synchronous wireless access protocol method and apparatus” issued on December 21, 1999, and discloses the use of both omnidirectional antenna patterns and directional patterns for different signals.

“A wireless communication system has a protocol enabling synchronous code division multiple access (CDMA) communication on **a time division duplex (TDD) frequency, and provides for a smart antenna system as an integral component of the system.** The protocol has downlink time slots (DTS) which provide for **synchronization and paging of all remote terminals from a base station on a omnidirectional code channel** and while providing for **traffic signals on directional traffic channels.**” (’854 patent, abstract, emphasis added)

84. The ’854 patent further discloses the TDD protocol utilizing a frame structure wherein portions of the frame are transmitted omnidirectionally (i.e., in all directions), while other portions transmitted with directed beams within the omnidirectional patterns: “Note that beam former 142, for the access channel, transmits both a wide area radiation pattern and a directional radiation pattern, the purpose of which will be described herein.” (’854 patent at 4:25-28.) For example, in Fig. 4, line 310 depicts a transmitted “access channel” in omnidirectional

transmission mode, and line 330 depicts traffic channels in directional transmission modes, simultaneously in the downlink time slot: “Line 330 shows the protocol format of the DTS traffic channel of frame 306. . . . Preferably there are up to thirty one concurrent orthogonally modulated traffic channels plus the concurrent access channel 310 having a common carrier frequency within a DTS frame.” (’854 patent at 6:1-2, 54-57)).

85. The ’854 patent further describes a downlink “access channel” being transmitted in omnidirectional and directional modes at different times, and traffic channels being transmitted to remote terminals at other times using directional transmissions, as depicting in Fig. 13.



“FIG. 13 shows the antenna array of the base station 50 in communication with remote terminals 10, 20 and 30 in a subsequent DTS frame. The antenna array transmits a wide area training signal having a radiation pattern corresponding to circle 900 on the access

channel. Thereafter a **directional link grant signal 920 is transmitted to terminal 10 on the access channel.** Concurrently with transmission of directional signal 920, the base station transmits a direction traffic signal 910 to remote terminal 2. Thus, in the DTS frame of FIG. 14, the base station concurrently transmits a wide area training signal during a first portion of the access channel and switches from wide area to a direction link grant signal during a second portion of the access channel.” (’854 patent at 15:48-60, emphasis added.)

86. Within the cellular standard organization 3GPP, there was significant activity relating to time division duplexed systems as well for Third Generation (3G) systems, at the time of the filing of the ’931 patent. For example, the 3GPP released standards in 2000 (Release 99) and 2001 (Release 4) included TDD modes of operation. The 3GPP Release 4 system utilizing TDD was referred to a TD-SCDMA (See 3GPP25.201-400 available at http://www.3gpp.org/ftp/specs/archive/25_series/25.201/).

87. A paper entitled “Performance of Smart Antenna in TD-SCDMA” published in 2000 provides some details related to TD-SCDMA as a time division duplex (TDD) protocol using adaptive antenna arrays in cellular base stations. (http://www2.tu-ilmenau.de/nt/generic/paper_pdfs/00889187.pdf). Figure 1 describes the overall frame structure of TD-SCDMA.

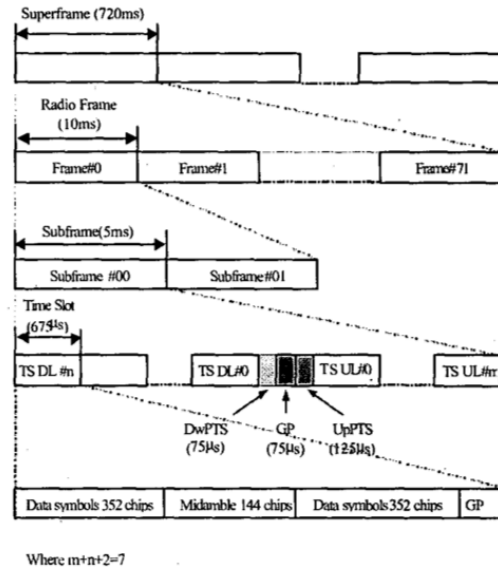


Figure 1. TD-SCDMA physical channel format

88. As further evidence of this industry trend, one publication reported in 1999 that “[i]n contrast to this legacy method, TDD is a commercially proven technique that separates upstream and downstream traffic in time. TDD has been successfully deployed in Personal Handyphone Service networks throughout Japan and Digital European Cordless Telecommunications networks in Europe. As a low-cost and low-power wireless platform for both base-stations and customer premises equipment, TDD systems perform well in the rigorous mobile telephone environment. These systems can be optimized for fixed wireless access to deliver multiple types of communications.” (O’Neal, Carlton, “Broadband finds multilayer help,” *Electronic Engineering Times* (Nov. 29, 1999) at 3.)

89. As further evidence of the prevalence of TDD protocols as state of the art, the ’931 Patent also notes in the “Background of the Invention” that ETSI

HIPERLAN/2 and IEEE 802.16 are two standards based on TDD. (Ex. 1001 at 7:43-58.)

HIPERLAN/2 Format

90. Providing more detail, the frame structure of HIPERLAN/2 is shown in Figure 2 of “Structure of Performance of the HIPERLAN/2 Physical Layer” by Khun-Jush et al. published in September 1999. “There is a basic frame with fixed length, which comprises five fields for broadcast control, frame control, downlink, uplink and random access as depicted in Fig. 2.” (Khun-Jush at 2.)

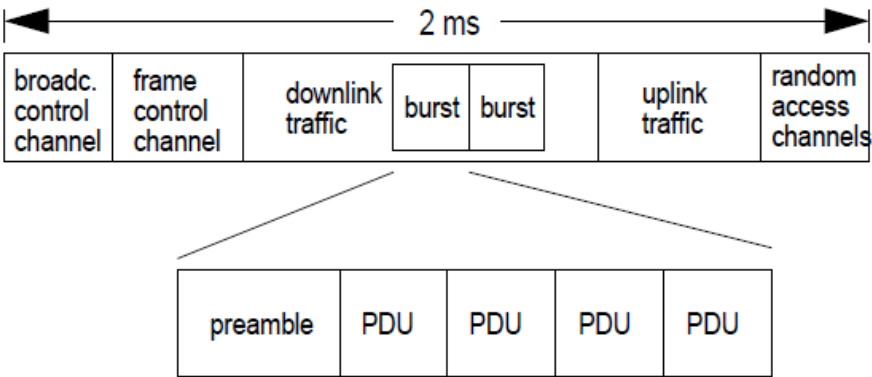


Figure 2: Frame structure of HIPERLAN/2

91. The TDD frame structure begins with a broadcast control channel (BCH) which contains a preamble: “The preamble in the broadcast control channel enables frame synchronization, automatic gain control, frequency synchronization as well as channel estimation.” (Khun-Jush at 2.) The preamble for the broadcast control channel is shown in Figure 3 of Khun-Jush, annotated below.

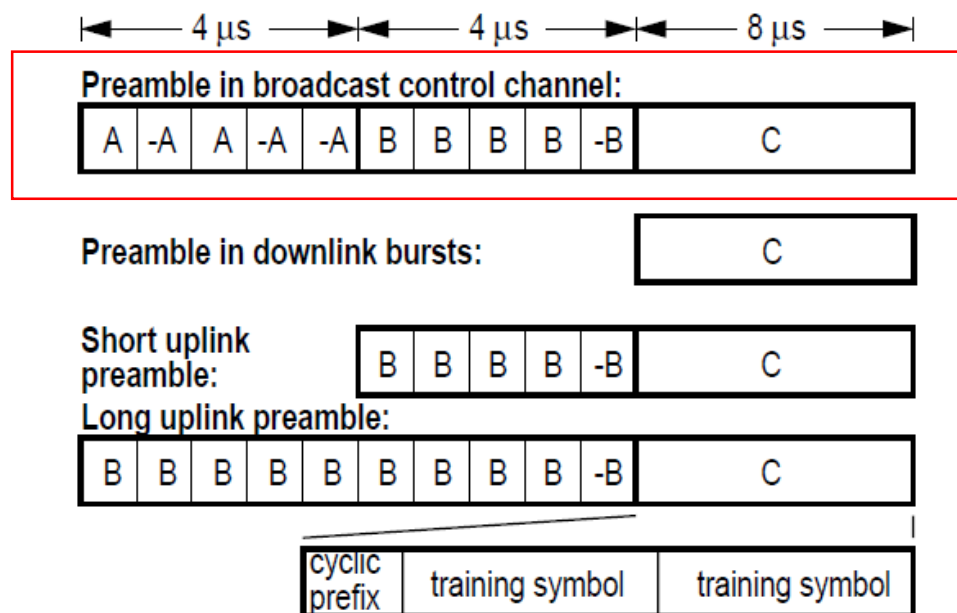


Figure 3: Structure of preambles of HIPERLAN/2

Adaptive Modulation and Coding

92. The modulation and coding schemes used for transmission between the base station and subscriber equipment (and vice versa) has an impact on both the data rate (i.e., how quickly data can be transmitted) and the likelihood that errors will occur (i.e., the bit error rate). The bit error rate also strongly depends on the quality of the signal (the signal level relative to the received noise level or Signal to Noise Ratio (SNR)) when it is received at the destination. When channel conditions are poor, the destination may receive the signal at a lower power level resulting in a noisy signal which can result in a high error rate. On the other hand, when channel conditions are good, the destination can receive a signal at a much stronger power level, and be much less affected by noise which can result in a low error rate. Channel conditions in a wireless system change over time due to a

IX. GROUNDS OF UNPATENTABILITY

108. In my opinion, Vornefeld anticipates Claims 1-3, 6-7, 10-12, 15-16, 19-21, 24-25, and 28-29 of the '931 Patent for at least the reasons described herein.

109. In my opinion, Vornefeld in view of the Ahy Patent renders obvious at least Claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 of the '931 Patent for at least the reasons described herein.

110. In my opinion, Vornefeld in view of Andersson renders obvious at least Claims 1-3, 6-7, 10-12, 15-16, 19-21, 24-25, and 28-29 of the '931 Patent for at least the reasons described herein.

111. In my opinion, Vornefeld in view of Andersson, further in view of the Ahy Patent renders obvious at least Claims 4, 5, 8, 9, 13, 14, 17, 18, 22, 23, 26, and 27 of the '931 Patent for at least the reasons described herein.

112. In my opinion, Newman in view of the Ahy Patent, further in view of Andersson renders obvious at least Claims 1-29 of the '931 Patent for at least the reasons described herein.

113. A general overview is given for Vornefeld at ¶ 103 above, Andersson at ¶ 104 above, the Ahy Patent at ¶ 105 above, and for Newman at ¶¶ 106-107 above.

devices (i.e., CPE 130) disposed at a plurality of subscriber premises (i.e., buildings as shown in FIG. 1).

122. Disclosure of Newman and Ahy (Reza): Alternatively, the features of claim 1[a] are disclosed in Newman and Ahy. Newman discloses a transceiver for a multi-beam antenna system: “a multi-beam antenna system, suitable for use in a communication system including a sector antenna having a beamwidth providing sector coverage, a transmitter and a receiver system for receiving user signals from a user located in the sector, includes the following.” (Ex. 1007 at 2:10-15.) The transceiver is associated with a base station in a cellular system comprised of a plurality of base stations providing coverage over a geographic area. (Ex. 1007 at FIG. 1.) Specifically, Newman explains that “[r]adio communication with mobile users... is typically provided via fixed base stations or cell sites” where a pattern of adjacent cells provides “coverage over a geographic area”. (Ex. 1007 at 1:12-14, 1:24-29.) To the extent Newman fails to teach or suggest that each of the base stations are capable of TDD communications, Ahy discloses this feature.

123. Ahy discloses a base station and base station controller (BSC) implemented within a cellular system comprising cells with multiple sectors. (Ex. 1006 at 2:15-32.) Ahy is directed at communication with a plurality of customer premise equipment (CPE) (i.e., “wireless access devices disposed at a plurality of subscriber premises”). (Ex. 1006 at 2:15-32.) Ahy teaches bidirectional time

division duplex (TDD) communication between the base station and wireless access devices: “Communication between the BSC 120 and each CPE 130 is conducted using a TDD technique, in which time durations are divided into repeated individual frames, each one of which includes a “downstream” portion and an “upstream” portion.” (Ex. 1006 at 7:1-5.)

124. In my opinion, it would have been obvious to incorporate the capability of communicating using TDD described in Ahy into the communications system in Newman. Incorporating the TDD frame structure in Ahy into the communications system in Newman would have amounted to nothing more than the use of known techniques to improve similar methods in the same way or the combination of prior art elements according to known methods to yield predictable results. *KSR*, 550 U.S. at 417; MPEP § 2143. While cellular communications systems in use at the time of the invention were primarily FDD based, TDD based cellular systems had gained significant attention in the research and commercial communities before the invention of the ‘931 patent. (*See supra*, ¶¶ 73-91.) The ‘931 patent itself provides numerous examples of prior art TDD-based systems that were well known at the time of the invention, including the ALOHA TDD system, TDD systems associated with wireless LAN equipment in IEEE 802.11, the ETSI Personal Access Communications (PAC) system, and the ETSI HYPERLAN II specification. (Ex. 1001 at 6:32-41, 6:59-8:11.) The

152. Vornefeld further describes that at the end of each MAC frame, the scheduler updates its information database about an individual MT's capacity demands by evaluating the received resource request messages. (Ex. 1004 at 55.) The scheduler then uses this information to determine the structure of the subsequent MAC frame, and the base station broadcasts this structure on the FCH "to inform all the terminals about their individual transmission and reception schedules for the next MAC frame." (Ex. 1004 at 55.) Thus, the FCH (which is part of the broadcast channel in Vornefeld) is equivalent to the claimed "first beam map" in claim 2.

153. Disclosure by Ahy: Ahy discloses "broadcast beam signal further comprises a first beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals." Specifically, Ahy teaches that the start of each TDD frame includes the following parameter values: "a first value for transmission by the BSC 120 and a second value for transmission by the CPE 130. Thus, the BSC 120 can transmit using a first set of parameters while the CPE 130 is instructed to transmit using a second set of parameters." (Ex. 1006 at 7:67-8:3.) The first part of the frame also includes a value of the length for subsequent downstream payload elements for each CPE. (Ex. 1006 at 15:25-30.) Thus, Ahy teaches providing information useable by CPEs (e.g., wireless access devices) to detect directed scanning beam signals.

154. In my opinion, it would have been obvious to incorporate the TDD frame structure in Ahy into the beam forming network disclosed in Newman, for all the reasons summarized in ¶¶ 124-125 above with respect to claim 1[a]. Accordingly, in my opinion, this claim is obvious over the combination of Newman, Ahy, and Andersson under the broadest reasonable interpretation.

'931 Patent: Claim 3

3. The transceiver as set forth in claim 2 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which said one of said directed scanning beam signals transmits said downlink data traffic.

3: The transceiver as set forth in claim 2 wherein said scanning beam information identifies a downlink time slot in said downlink portion during which said one of said directed scanning beam signals transmits said downlink data traffic.

155. Vornefeld, or Vornefeld in combination with Andersson, disclose the features of claim 2 of this claim for at least the reasons summarized in ¶¶ 151-152 above. Moreover, the combination of Newman, Andersson, and Ahy renders claim 2 obvious for at least the reasons summarized in ¶¶ 153-154 above.

156. Disclosure by Vornefeld: As shown above with respect to claim 2, Vornefeld discloses the claimed “beam map containing scanning beam information usable by said wireless access devices to detect said directed scanning beam signals.” Furthermore, Vornefeld discloses that the scanning beam information identifies a downlink time slot in said downlink portion during which the direct scanning beam signal transmits downlink data traffic. Vornefeld states that the