

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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NOKIA OF AMERICA CORPORATION, AT&T SERVICES, INC., T-MOBILE  
USA, INC.

Petitioners,

v.

WOODBURY WIRELESS LLC  
Patent Owner.

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U.S. Patent No. 9,496,930  
Title: METHODS AND APPARATUS FOR OVERLAPPING MIMO  
PHYSICAL SECTORS

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*Inter Partes* Review No.: IPR2025-00048

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**PETITION FOR *INTER PARTES* REVIEW OF U.S. PAT. NO. 9,496,930**

***Mail Stop “PATENT BOARD”***

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### **Petitioners' Exhibit List**

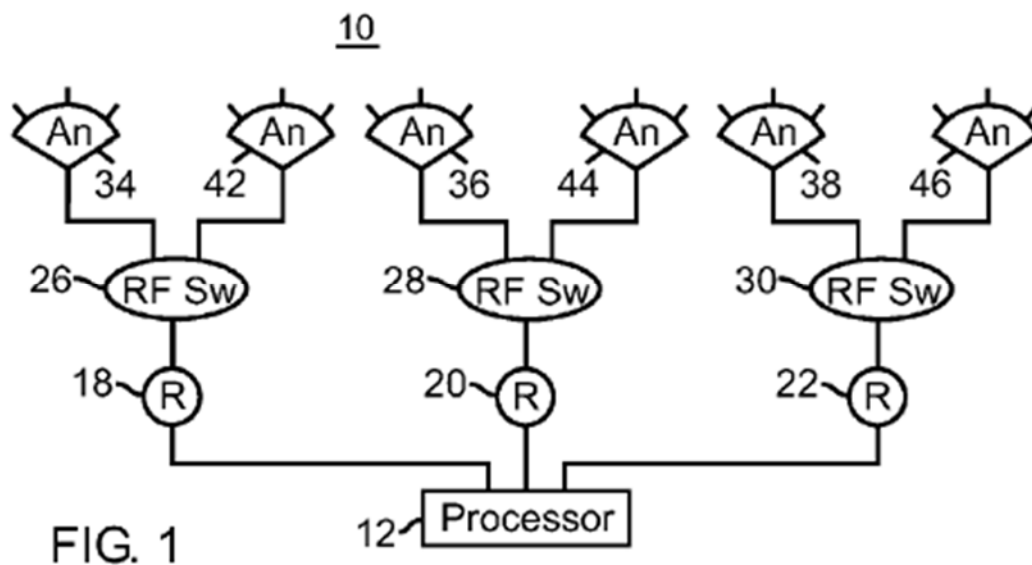
| <b><i>Exhibit #</i></b> | <b><i>Description</i></b>                                                  |
|-------------------------|----------------------------------------------------------------------------|
| <b>1001</b>             | U.S. Patent No. 9,496,930 (the “’930 Patent”)                              |
| <b>1002</b>             | Select portions of prosecution history of the ’930 Patent (“File History”) |
| <b>1003</b>             | Declaration of Petitioners’ Expert Dr. Mark Mahon                          |
| <b>1004</b>             | U.S. Patent Application Publication 2005/0003865 (“Lastinger”)             |
| <b>1005</b>             | U.S. Pat. No. 7,907,971 (“Salo”)                                           |
| <b>1006</b>             | U.S. Pat. No. 9,408,220 (“Gore”)                                           |
| <b>1007</b>             | May 2005 IEEE Draft Specification                                          |
| <b>1008</b>             | January 2006 IEEE Draft Specification (MAC layer)                          |
| <b>1009</b>             | [This Exhibit Intentionally Omitted From This Petition]                    |
| <b>1010</b>             | [This Exhibit Intentionally Omitted From This Petition]                    |
| <b>1011</b>             | [This Exhibit Intentionally Omitted From This Petition]                    |
| <b>1012</b>             | U.S. Pat. No. 8,649,322 (“Grandhi”)                                        |
| <b>1013</b>             | [This Exhibit Intentionally Omitted From This Petition]                    |
| <b>1014</b>             | WO20071088885                                                              |
| <b>1015</b>             | January 2006 IEEE Draft Specification (PHY layer)                          |
| <b>1016</b>             | List of Related Patents to the ’930                                        |
| <b>1017</b>             | U.S. Pat. No. 9,178,577                                                    |
| <b>1018</b>             | [This Exhibit Intentionally Omitted From This Petition]                    |
| <b>1019</b>             | U.S. Pat. No. 7,590,078                                                    |

## **I. INTRODUCTION**

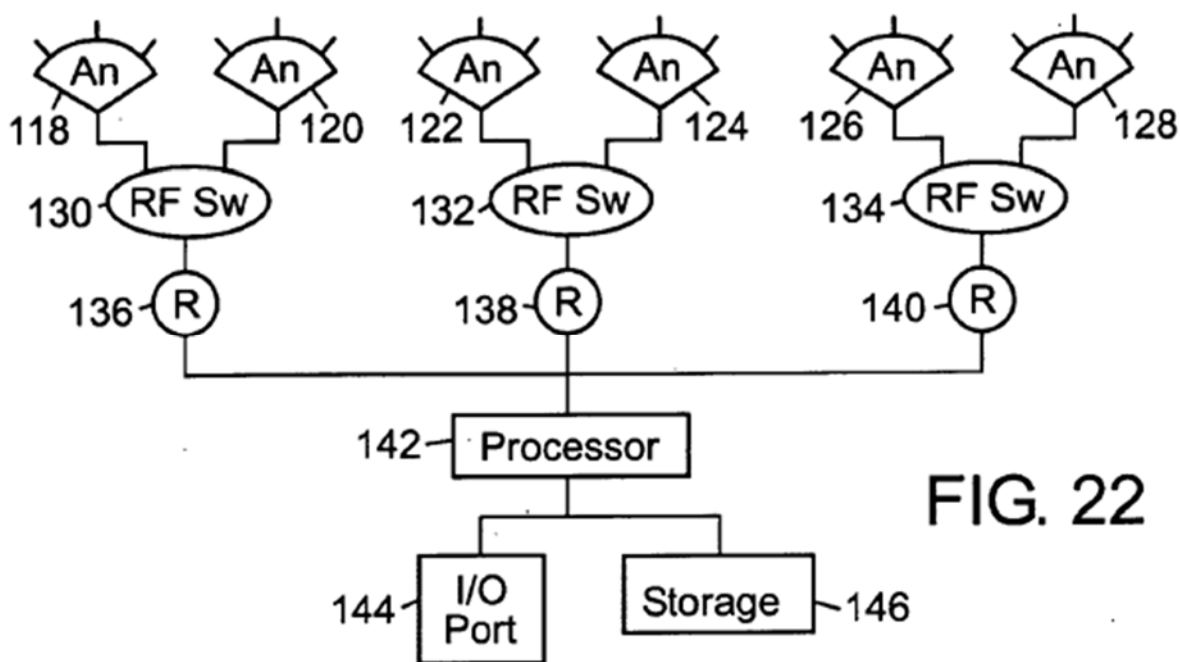
Pursuant to 35 U.S.C. §§ 311 *et seq.* and 37 C.F.R. §§ 42.1 *et seq.*, Nokia of America Corporation (“Nokia”), AT&T Services, Inc. (“AT&T”), and T-Mobile USA, Inc. (“T-Mobile”) (collectively, “Petitioners”) hereby petition for an *inter partes* review of U.S. Patent No. 9,496,930 (the “’930 Patent”). Petitioners respectfully submit that Claims 1-14 and 16-20 (the “Challenged Claims”) of the ’930 Patent are unpatentable under 35 U.S.C. §103 in view of the prior art references discussed herein.

## **II. OVERVIEW**

The Challenged Claims are unpatentable as obvious. The claims are directed to a wireless communication system that uses multiple-in-multiple-out (MIMO) antennas, and allows for selection of the MIMO antennas based on signal measurements received at a wireless device being serviced by the MIMO antennas. Such a broad concept—of selecting MIMO antennas based on signal measurements by a wireless device—were already well-known, as demonstrated by the inventors’ previous U.S. Patent Publication No. 2005/0003865 (“Lastinger”), published more than one year before the claimed priority date of the ’930 Patent. For example, Figure 1 of the ’930 Patent and Figure 22 of Lastinger both illustrate an exemplary embodiment of a three-radio, six-antenna MIMO system which is identical in all material respects:



EX-1001 FIG. 1 ('930 Patent).



EX-1004 FIG. 22 (Lastinger prior art).

Although the '930 Patent and Lastinger use different wording, they describe identical architecture for carrying out identical concepts. While the Challenged

Claims recite terms like “MIMO,” the ‘930 patent does not add any MIMO teachings to the art and relies upon well-known MIMO concepts known to a person of ordinary skill in the art (“POSA”). As detailed below, Lastinger also discloses MIMO concepts as part of its teaching. To the extent an explicit teaching of MIMO is needed, the secondary reference (Gore) expressly supplies the teachings for concepts such as MIMO and beamforming. Therefore, the Challenged Claims are unpatentable over the Patent Owner’s prior publication of Lastinger alone or in combination with Gore supplying well-known wireless concepts.

### **III. GROUNDS FOR STANDING (37 C.F.R. § 42.104(A))**

Petitioners certify that the ‘930 Patent is available for IPR and that Petitioners are not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein. 37 C.F.R. § 42.104(a). This Petition is filed pursuant to 37 C.F.R. §42.106(a).

### **IV. REASONS FOR THE REQUESTED RELIEF**

As explained in §§II and V-VIII of this Petition and in the attached Declaration of Petitioners’ expert (EX-1003), the systems described and claimed in the ‘930 Patent were obvious over the prior art to a POSA at the time of the invention.

## **V. BACKGROUND**

### **A. Summary of the '930 Patent**

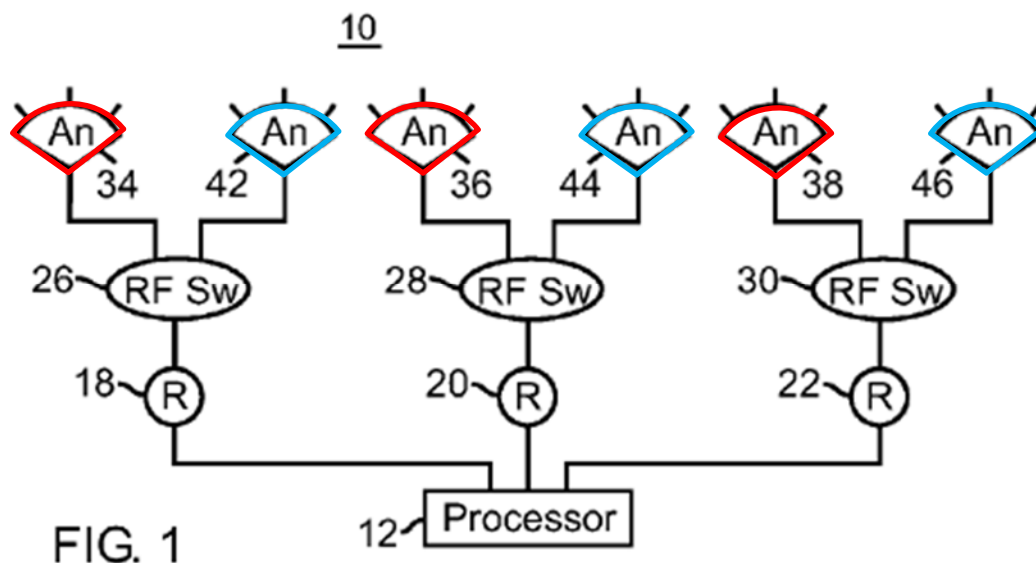
The '930 Patent is directed to wireless systems with MIMO capability. One associated problem it describes is the interference that antennas may face due to noise sources. Prior art solutions included many techniques to reduce the detrimental effect of noise. For example, dividing the area of wireless coverage into sectors, using directional antennas, and using multiple antennas to provide redundancy and spatial diversity were well-known solutions that improved the wireless communications. EX-1001 2:47-55.

The '930 Patent proposed, as a solution, a wireless system that includes directional antennas positioned in such a way that the physical sectors of the antennas of the wireless device overlap, and the antennas selected for communication are the antennas whose physical sectors overlap in an area in a manner that permits the antennas to operate as a MIMO system. EX-1001 2:56-63.

The '930 Patent describes an exemplary wireless device shown in FIG. 1<sup>1</sup>, such as a wireless cell or access point.

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<sup>1</sup> All color annotations of the figures, and all emphasis of any text herein has been added by Petitioners unless otherwise noted.



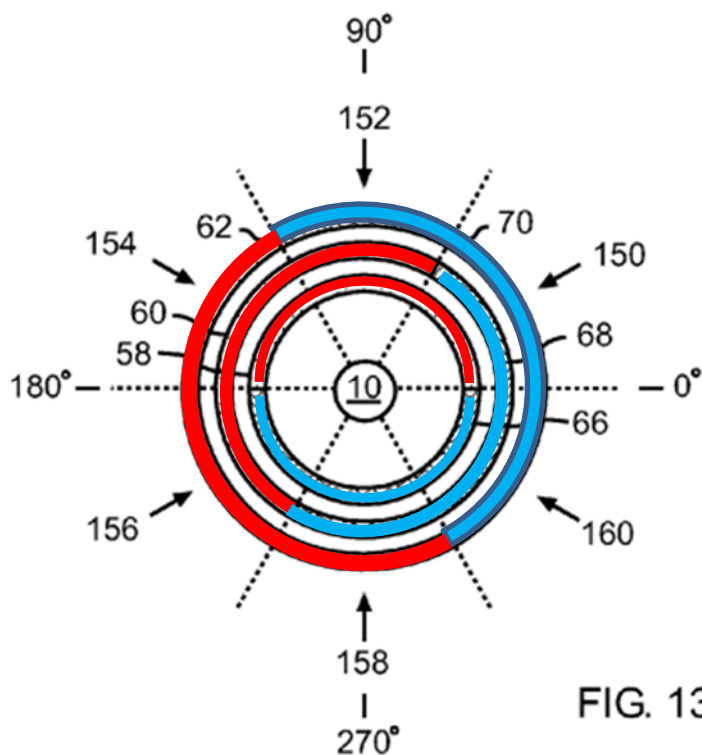
EX-1001 FIG. 1, 3:3-7.

Wireless device 10 comprises processor 12, radios 18, 20 and 22, RF switches 26, 28 and 30, and antennas 34, 36, 38, 42, 44 and 46 where sets of two antennas each interface with one RF switch and radio, respectively. One antenna 34, 36 and 38 for each radio 18, 20 and 22 operate as a first MIMO antenna (red) and the other antenna 42, 44 and 46 for each radio operates as a second MIMO antenna (blue). EX-1001 7:6-39.

The '930 Patent uses MIMO techniques long known in the prior art. The '930 Patent describes that "MIMO antenna" means at least two antennas that each transmits and/or receives signals that can be combined. Antennas may be positioned in such a way that their physical sectors overlap. Antennas whose physical sectors overlap in the same area may be configured to operate as a MIMO antenna in that area. Each individual antenna of a MIMO antenna operates on the

same channel (*e.g.*, frequency, encoding, or other method of dividing the radio spectrum for communication). A MIMO antenna provides spatial diversity between the antennas, redundancy, and temporal diversity to reduce the effects of noise on transmission and reception. Reducing the effects of noise permits a wireless device to communicate more reliability. EX-1001 3:20-34. Known algorithms may be used to process the signal received by each antenna that form the MIMO antenna to construct a resultant receive signal that contains as much of the receive signal information as can be extracted. EX-1001 6:17-42.

For example, using the architecture of FIG. 1 with three radios each having two antennas, the patterns for overlapping physical sectors in FIG. 13 is shown below. Each antenna has a 180° physical sector, which causes overlap of three antennas (red and blue) for each “virtual sector.”



The term “virtual sector” means the area where the physical sectors of antennas overlap. Referring to FIG. 13, physical sectors 58, 60, 62, 66, 68 and 70 each have an angle of coverage of about 180 degrees respectively. The antennas associated with physical sectors 58, 60, 62, 66, 68 and 70 are positioned in such a way that in area 150, physical sectors 58, 68, and 70 overlap. In area 152, physical sectors 58, 60, and 70 overlap and so forth for areas 154-160. Each one area 150-160 comprises a virtual sector because the antennas whose physical sectors overlap in the area may operate as a MIMO antenna. EX-1001 4:46-48.

The '930 Patent describes that the wireless device may select for communication any suitable combination of directional antennas that operate as a

MIMO antenna and are oriented in a desired direction of communication.

Furthermore, the wireless device may assign any available channel to the antennas to improve performance. EX-1001 2:64-3:3

The '930 Patent describes that the antennas that form a MIMO antenna may be used in any manner to transmit and/or receive signals—for example, any number of antennas that operate as the MIMO antenna may transmit only, receive only, or both transmit and receive. EX-1001 6:12-16.

The '930 Patent describes that antennas may be selected for communication according to any criteria, such as data throughput, signal strength, signal quality, signal-to-noise ratio, reduced signal error, reduced data errors, reduced retransmission requests, reduced interference, rejection of multipath signals, and higher transmission rates. EX-1001 5:28-32; 5:67-6:3.

The '930 Patent includes a description of the benefits of using MIMO antennas, but these “improvements” are merely the known benefits provided by conventional MIMO systems. EX-1001 5:3-14.

Likewise, the '930 Patent includes a basic description of the operation of a conventional MIMO antenna and the benefits it provides. For example, the '930 Patent describes that MIMO permits a wireless device to communicate with increased performance. MIMO virtual sectors permit a wireless device to select an area to transmit and receive in accordance with the MIMO virtual sector that

provides a desired level of performance. A wireless device having multiple MIMO virtual sectors may select between the various MIMO virtual sectors. A wireless device may select the MIMO virtual sector that provides an increased level of performance. Positioning the antennas of a wireless device to form MIMO virtual sectors that are oriented in different directions permits the wireless device to select a MIMO physical sector based on the orientation of the virtual sector with relation to the position of noise sources. EX-1001 5:14-27.

All of the concepts of using MIMO antennas as described and claimed in the '930 Patent, including selecting MIMO antennas based on measurements made by a mobile device in communication with the antennas, were known to a POSA as demonstrated by the Patent Owner's ("PO") previous patent publication (Lastinger, EX-1004) by the same inventors.

## **B. Prosecution History**

The '930 Patent issued from U.S. Pat. App. No. 14/952,850 filed November 25, 2015 claiming priority to U.S. Provisional Pat. App. No. 60/743,376, filed on Feb. 28, 2006 through various continuation applications. The first Office Action rejected all claims for double patenting over U.S. Pat Nos. 9,525,468, 9,496,931 and 9,584,197 (all then pending). The applicant filed terminal disclaimers, and the '930 Patent was allowed and subsequently issued.

### **C. Claim Construction**

Petitioners propose that each claim term be given its plain and ordinary meaning in this proceeding. The prior art relied on in this Petition meets each claim limitation under any reasonable construction.

### **D. Priority Date of the Challenged Claims**

The '930 Patent claims priority to US. Provisional Pat. App. No. 60/743,376 filed on February 28, 2006.

As noted below, the '930 Patent claims recite terms that were not in the '930 priority application (reflected by WO20071088885 at EX-1014). These new terms include “transmission points,” “coordinates,” “channel characteristics,” “aspect of the [] transmission,” and “identifies.” Many of these terms were added in the new “Summary of the Invention” in the November 25, 2015 non-Provisional application. Woodbury bears the burden of establishing priority to the Provisional application.

The prior art below predates the earliest possible priority date of Provisional No. 60/743,376 filed on February 28, 2006.

### **E. Person of Ordinary Skill in the Art**

With respect to the '930 Patent, a POSA in February 2006 would have understood the use of and selection of MIMO antennas in a wireless communication system and protocols for exchanging information between wireless devices. A POSA would have gained knowledge of these concepts through a

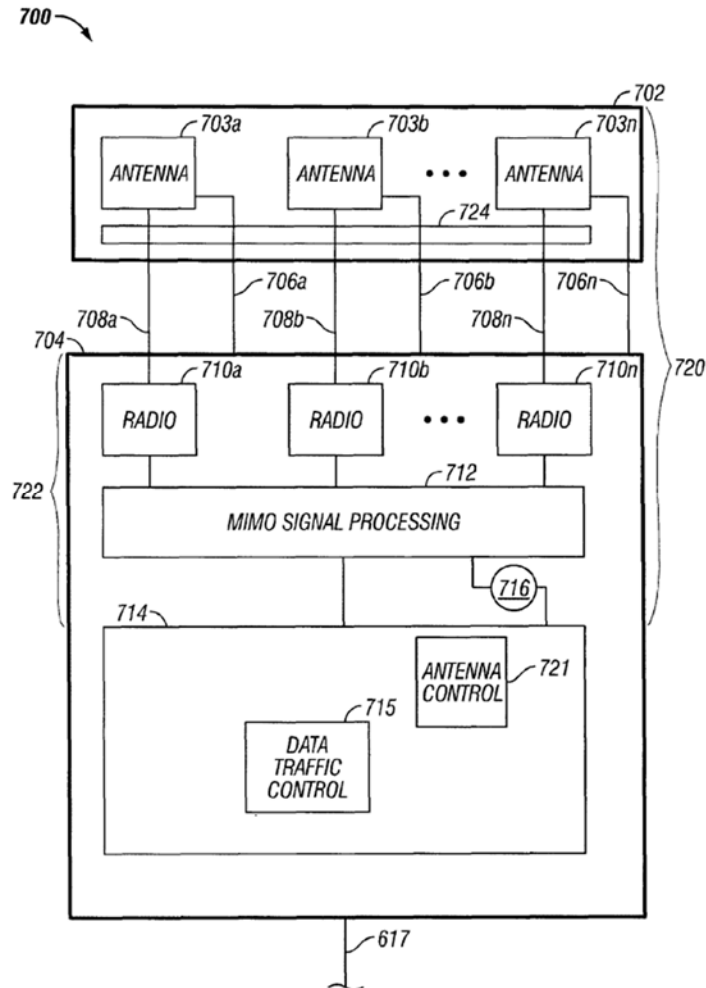
mixture of training and work experience, such as by having a Bachelor's degree in electrical engineering and four years of experience; or by obtaining a Master's degree in electrical engineering, in addition to having one to two years of experience. EX-1003 ¶¶38-40.

## **F. State of the Art**

The following section describes the state of the art for the use of and selection of MIMO antennas in a cellular telephone and other wireless communication system as of February 26, 2006. The prior art references, and the discussions of what was known to a POSA, provide the factual support for the general description of the state of the art at the time of the invention, assist in understanding how a POSA understood the disclosures of the prior art, and provide the motivation to modify or combine the teachings of references. EX-1003 ¶¶169-186, 204-241.

### **1. Prior Art MIMO Antenna Systems**

It was known to use MIMO antennas at an access point in a wireless communication system. EX-1003 ¶¶100-164, 170-179. For example, the prior art system illustrated below is directed to a wireless access point having a configurable antenna system:



EX-1005 FIG. 7 (U.S. Pat. No. 7,907,971 (“Salo”)).

Salo’s Figure 7 illustrates a wireless mobile access point 700 that teaches MIMO technology. Device 700 includes a configurable antenna system 702 that includes a plurality of configurable antennas 703a-n that each includes one or more directional antennas. The antenna system may direct or steer the gain of each configurable antenna for transmitting and receiving in more than one direction or pattern. EX-1005 13:26-50, 3:13-4:9.

Salo's antenna system can be selectively configured in response to control signals to create different antenna configurations which can include different antenna patterns. EX-1005 13:51-54. The control signals are based upon signal quality metrics such as signal to noise ratio or error rates. EX-1005 5:12-6:34.

The radio system 704 includes a plurality of radios 710a-n and a MIMO signal processing module 712. EX-1005 14:6-10. The signal processing module 712 implements MIMO processing. MIMO processing was well known in the art and includes the processing to send information out over two or more radio channels on two or more antennas and to receive information via multiple radio channels and antennas. The signal processing module can combine the information received via multiple antennas into a single data stream. EX-1005 14:21-27. EX-1003 ¶¶171-173.

## **2. Selection of MIMO Antennas Based on Environmental Measurements**

It was well-known in the prior art that measurements of channel conditions could control the selection of MIMO antennas for transmissions to particular devices. EX-1003 ¶¶174-176. For example, Salo discloses that the antenna control module 721 determines the desired configuration for each of the antennas 703a-n and generates the control signals to be sent to the antenna system 702 based on signal quality metrics for each link. EX-1005 14:48-53, 15:7:11. The signal quality metric, such as received signal strength, can also be supplied from the

radios 710a-n. EX-1005 15:22-26. Various signal quality metrics or a combination of signal quality metrics can be used including the signal strength, signal to noise ratio, error rates, and the forward error correction value used by the radios. A POSA understood that many factors can affect the signal quality metrics including distance, reflectance, path, multi-path, interference, weather, moving objects, and fixed objects can all affect the signal quality. EX-1005 5:12-17.

The use of channel information to alter transmission characteristics was well-known to a POSA. EX-1012 2:12-16 (U.S. Pat. No. 8,649,322); EX-1019 7:35-8:16 (U.S. Pat. No. 7,590,078); EX-1017 5:9-67 (U.S. Pat. No. 9,178,577) EX-1003 ¶¶174-176.

## **VI. IDENTIFICATION OF CHALLENGES**

### **A. Challenged Claims**

This Petition challenges claims 1-14 and 16-20 of the '930 Patent.

### **B. Statutory Grounds for Challenges**

The Challenges are set forth in detail below and summarized as follows:

| <b>Ground</b> | <b>Claims</b> | <b>Basis</b> | <b>Reference</b>                            |
|---------------|---------------|--------------|---------------------------------------------|
| 1             | 1-14, 16-20   | § 103        | Lastinger alone or in combination with Gore |

#### **Ground 1:**

U.S. Patent Application Publication No. 2005/0003865 (“Lastinger”) is titled METHOD AND APPARATUS FOR HIGH THROUGHPUT MULTIPLE RADIO SECTORIZED WIRELESS CELL and published on January 6, 2005, from an application filed June 15, 2004. Although the '930 Patent specification incorporates Lastinger by reference, the '930 Patent does not claim priority to it. Therefore, Lastinger qualifies as prior art under §102(b). Lastinger was provided by the applicant during the prosecution of the '930 Patent, but it was not applied or otherwise mentioned by the Examiner.

U.S. Pat. No. 9,408,220 (“Gore”) is titled “CHANNEL QUALITY REPORTING FOR ADAPTIVE SECTORIZATION,” was filed on October 27, 2005, and qualifies as prior art under at least §102(a)/(e)/(g). Gore claims priority to Provisional Application Nos. 60/672,575 and 60/710,419 filed

April 19, 2005 and August 22, 2005, respectively. Petitioners reserve the right to establish that Gore's teachings are entitled to an earlier filing date.

## **VII. IDENTIFICATION OF HOW THE CHALLENGED CLAIMS ARE UNPATENTABLE**

### **A. Ground 1: Claims 1-14 and 16-20 are unpatentable over Lastinger and Gore**

#### **1. Overview of Lastinger**

Lastinger has identical inventors as the '930 Patent and describes the identical concepts described and claimed in the '930 Patent but uses slightly different terminology. EX-1003 ¶¶204-226. For example, the abstract describes wireless cells as an access point for a cellular telephone system, where the wireless cells are equipped with multiple radios to increase the amount of throughput available through a single wireless cell. In addition, multiple antennas are attached to the radios through RF switches to enable the wireless cell to service multiple clients simultaneously. The physical sectors of the antennas may overlap to form virtual sectors that provide greater flexibility in client load management and in simultaneously servicing multiple clients. EX-1004 Abstract.

This described architecture is illustrated in FIG. 22 of Lastinger:

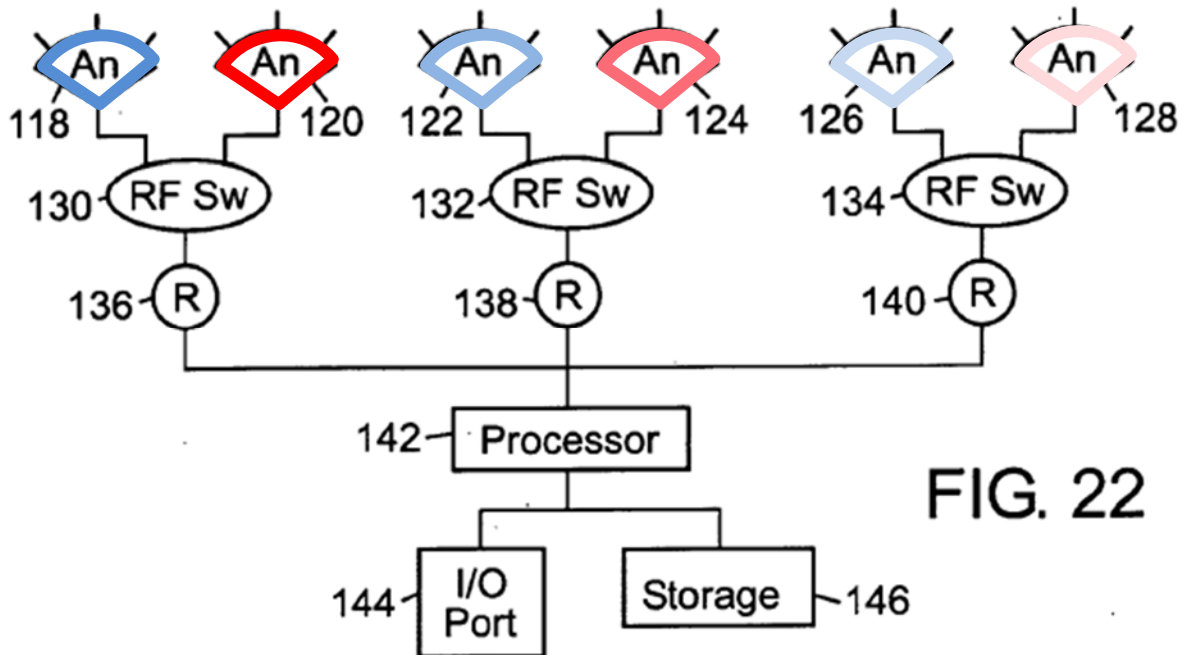


**FIG. 22**

Lastinger's FIG. 22 is nearly identical to FIG. 1 of the '930 Patent.

Lastinger's enhanced antenna system as shown in FIG. 22 uses multiple directional antennas arranged such that the antenna physical sectors overlap. Multiple antennas may be simultaneously active. Lastinger discloses exemplary patterns for overlapping physical sectors in FIGS. 4, 5, 14, 17, and 20. The coverage of two antennas in each virtual sector allow selection of the best antenna of two antennas to communicate with a device in the virtual sector. EX-1004 [0110]. For example, using the architecture of FIG. 22, with respect to three radios each having two antennas, the patterns for overlapping physical sectors in FIG. 14 is as follows:

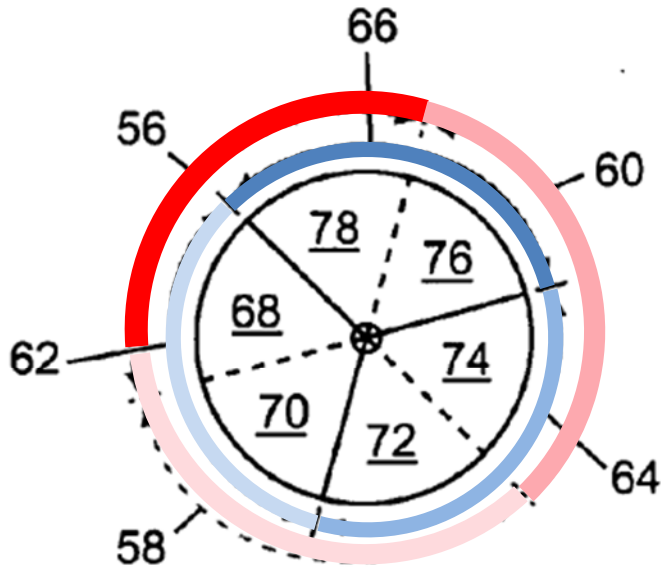


**FIG. 14**

The only difference between FIG. 14 of Lastinger and FIG. 13 of the '930 Patent are that each antenna has a 120° physical sector in FIG. 14 and a 180° physical sector in FIG. 13, which causes overlap of two antennas for each virtual sector in FIG 14 (Lastinger), and overlap of three antennas for each virtual sector in FIG. 13 ('930 Patent). However, Lastinger makes clear that “the number of physical sectors that overlap to form a virtual sector is not limited. Wireless cell coverage depends on the characteristics of the individual physical sectors and how they combine. There are no requirements or limitations on size or method of combination.” EX-1004 [0092]. EX-1003 ¶¶207-208.

Lastinger's wireless cell communicates with a client, wherein a client may be any type of wireless apparatus that communicates or cooperates with a wireless

cell. EX-1004 [0097]. Like the wireless cell, clients may have one or more radios and one or more antennas. A client can send control information to the cell, including signal quality, desired antenna, error rate, number of dropped frames, desired throughput, throughput delivered, wireless cells detected, and/or any other conceivable information. A client may also request information or action from the cell, including retransmission, channel change, throughput demands, authentication, variation in transmit power, and/or a request to modify any communication factor. EX-1004 [0098].

Lastinger discloses that the communications between the cell and clients may be MIMO transmissions using known existing MIMO techniques. EX-1004 [0103]-[0105], claims 5, 15, 25, 34, 41, 48, 53, 62, 71, 96, 122 (all reciting MIMO). Known MIMO techniques included transmitting the same data from multiple antennas. *E.g.*, '930 patent at 3:20-23 (“The term ‘MIMO antenna’ is understood to mean at least two antennas that each transmits and/or receives signals on the same channel in the area where the physical sectors of the antennas overlap.”). EX-1003 ¶¶210-211.

Lastinger teaches that the MIMO transmission encompasses transmitting from more than one set of antennas/radios using, for example, the same channel. For example, Lastinger’s claim 104 teaches two different groups of antennas in which different groups overlap:

104. A method for facilitating the assignment of channels to at least partially **overlapping** physical sectors, said method comprising:

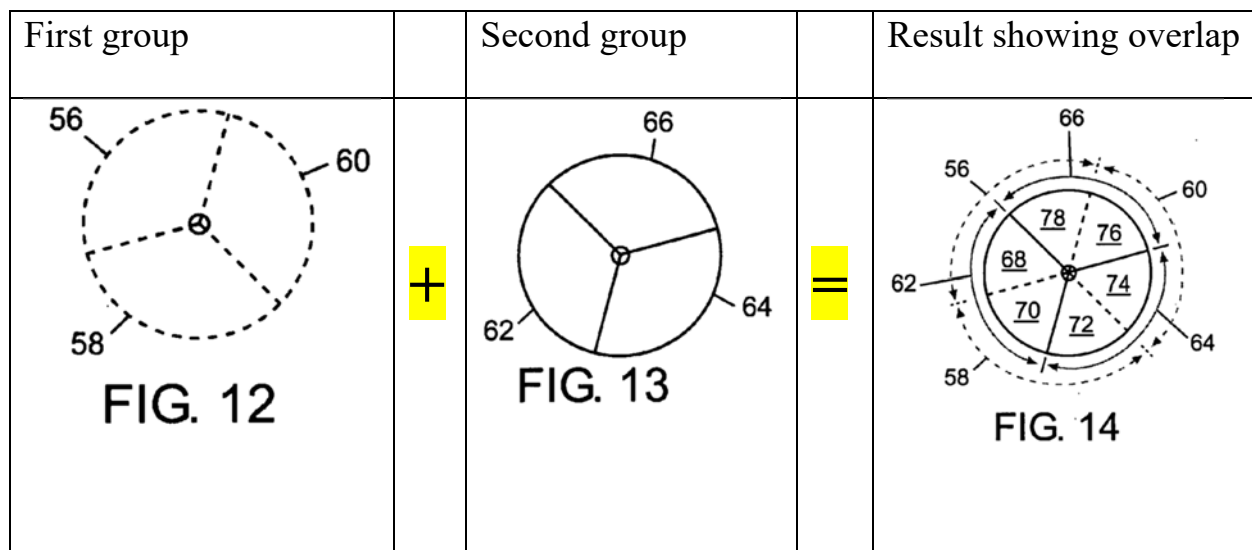
selecting a wireless cell having a first group of non-overlapping physical sectors and a second group of non-overlapping physical sectors superimposed such that **each physical sector of said second group at least partially overlaps at least one physical sector of said first group**;

assigning a channel to each physical sector of said first group;

and,

assigning a channel to each physical sector of said second group.

EX-1004, claim 104. Lastinger taught this arrangement using FIG. 12 (first group of antennas), FIG. 13 (second group of antennas), and FIG. 14 (result). EX-1004 0091 (“If the antennas from FIG. 12 were combined with the antennas of FIG. 13 into the same wireless cell while preserving their orientation, the wireless cell may have the coverage shown in FIG. 14.”). EX-1003 ¶¶211-212.



The “groups” of antennas in Lastinger’s claim 104 include a single antenna associated with each of the radios in FIG. 22 above. EX-1004 [0111] (“One exemplary antenna assignment is to assign the physical sectors of antennas 118, 120, 122, 124, 126, and 128 to substantially correspond to 56, 64, 58, 66, 60, and 62 respectively.”). Thus, for example, the “first group” would correspond to the red rectangles in FIG. 22 below (with antennas 118, 122, and 126 that service sectors 56, 58, and 60, respectively) and the second group would correspond to the blue rectangles (with antennas 120, 124, 128 that service sectors 64, 66, and 62 respectively). EX-1003 ¶¶212-213.

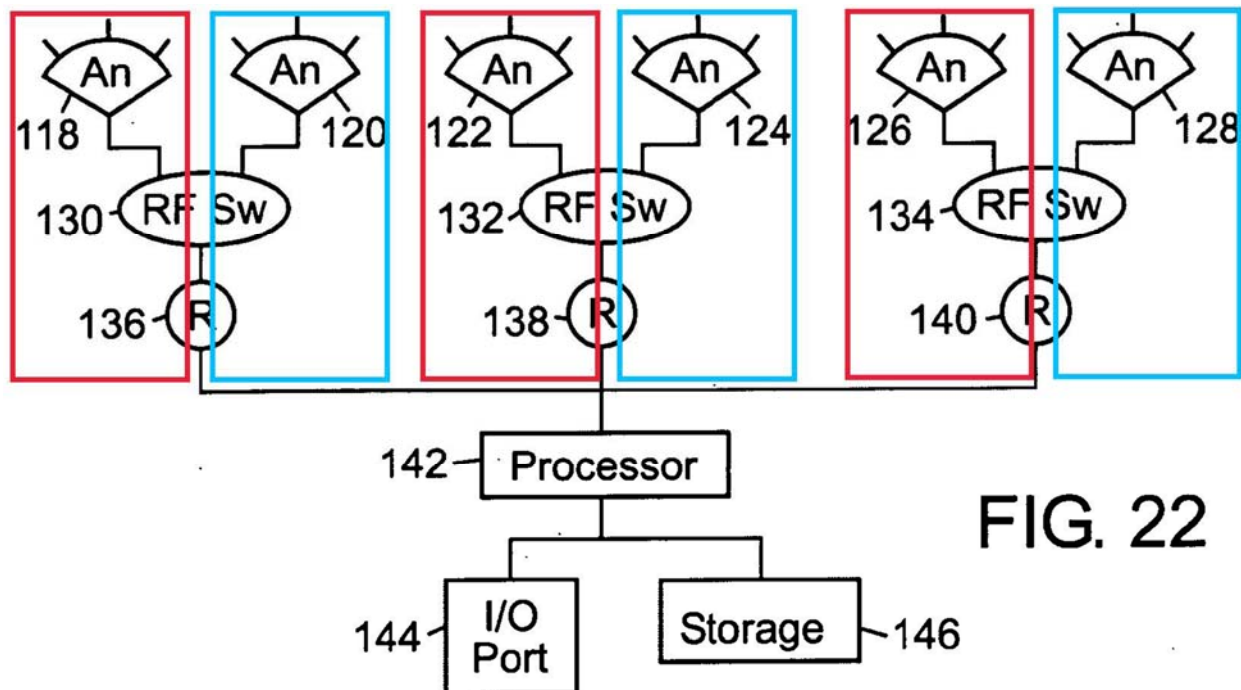


FIG. 22

EX-1004, Fig. 22.

Further, Lastinger’s claim 106 teaches that the two groups of antennas recited in claim 104 may use the same channel:

106. The method of claim 104, wherein each physical sector of said first group and said second group **is assigned a same channel.**

EX-1004, claim 106.

Lastinger also teaches that, in the overlapping physical sector scenario, “multiple antennas ... may be simultaneously active.” EX-1004 [0110]. The “collection of antennas, radios, and potentially other devices (*e.g.*, attenuators, RF switches, etc.) under the common control of a processor....” EX-1004 0090.

Thus, in looking at FIG. 14, virtual sector 78 is serviced by antennas 118 (which services sector 56 and uses radio 136) and antenna 124 (which services sector 66 and uses radio 138). EX-1003 ¶¶213-216.

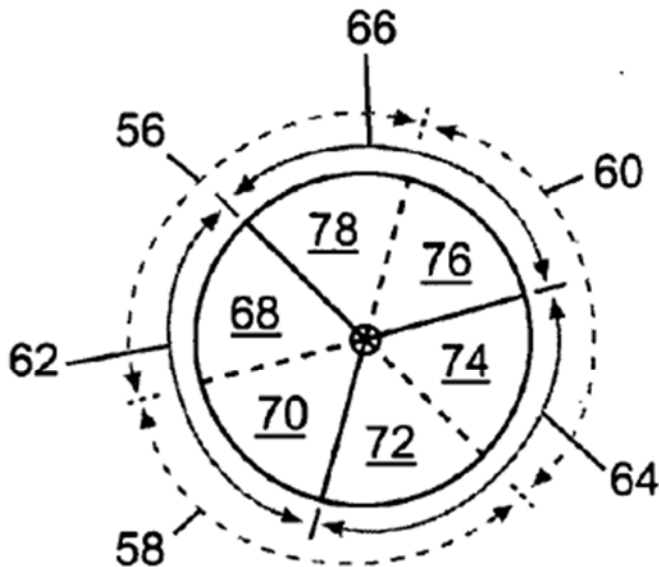


FIG. 14

A POSA would have understood that one example of MIMO transmissions may use the same channel with different antennas. EX-1003 ¶¶217, 104-117, 128-134. Lastinger's system can use this concept known as spatial diversity. EX-1004 [0103] ("MIMO antennas may use any combination of spatial, polarization, or angle antenna diversity."). Thus, a POSA understood that Lastinger taught forming a MIMO transmission for sector 78 by transmitting from antenna 118 (using radio 136) and antenna 124 (using radio 138) using the same channel (as noted in Lastinger's claim 106). EX-1003 ¶217.

Thus, Lastinger teaches:

- using the known MIMO techniques,
- that the different antenna groups are commonly controlled by the same processor,
- that the antenna groups can be simultaneously transmitting, and
- that the antenna groups can all use the same channel.

Thus, Lastinger teaches that the different antenna groups (using different radios) can be used for the same MIMO transmissions. EX-1003 ¶¶218-219. Lastinger further teaches that the type and selection of antennas was broad and well-known. Lastinger discloses that the antennas used by the cell or the client may be MIMO antennas using any combination of spatial, polarization, or angle antenna diversity. The MIMO may use any type of encoding, including for example, OFDM, space-

time-codes, or weighting of the antenna signals in the array to accomplish beam steering. During transmission or reception, all or any subset of antennas in the MIMO array may be used or selection diversity may be used to limit the number of antennas used. EX-1004 [0103]. Adaptive arrays may use adaptive array weights to transmit directional beams within the angle and area of coverage to send a stronger signal to a desired client. During reception, an adaptive array may use array weights to direct a beam substantially towards the transmitting client and substantially null out any sources of interference. EX-1004 [0105]. EX-1003 ¶¶219.

Lastinger's selection of antenna(s) can be based on information provided by a client. For example, a client may send information that helps the wireless cell manage its communication with the clients it serves, including desired throughput, buffer fullness, signal quality, and/or other relevant information. EX-1004 [0100]. EX-1003 ¶220

Although FIG. 2 shows two antennas per virtual sector, Lastinger states that there is essentially no limitation on the number of antennas per virtual sector. EX-1004 [0110].

Lastinger further discloses that wireless communication typically cannot take place between a wireless cell and a client until a relationship is established. In the simplest setting, a client requests to associate with a wireless cell, and if the

wireless cell grants the association, a relationship is established and communication may occur. A client may not only associate with the wireless cell, but also with a specific physical sector of the wireless cell. The client detects radio signals from physical sectors and makes a request to associate with one of the physical sectors generally based on the quality of the signal the client receives from each sector. The wireless cell tracks the clients serviced by each physical sector. EX-1004 [0170]. EX-1003 ¶¶221-222.

Lastinger discloses that signal quality is a term used to describe radio signals wherein higher quality signals typically more accurately transmit and receive information, and provide higher data transfer rates (i.e., throughput). In contrast, lower quality signals potentially suffer losses in transmission and reception, thereby resulting in low throughput. Signal quality is a measure of, for example, signal level, noise level, error rate, and other operational and environmental factors from a radio's perspective. EX-1004 [0167].

Lastinger discloses that a radio at the wireless cell or the client may measure signal quality by listening to receive signals and ranking them by their signal quality. Radios may be capable of using more than one channel scan and ranking all signals received on all channels. EX-1004 [0168]. A wireless cell may perform a traffic load scan by setting its radios into the receive mode and counting the number of frames or the amount of traffic sent by foreign wireless cells on all

possible channels. A traffic scan reveals the traffic load on each channel and the signal quality of the channels used by the detected foreign wireless cells. Traffic load information may be used when assigning channels to physical sectors.

EX-1004 [0169]. A wireless cell may dynamically balance its load by disassociating a particular client with a particular physical sector and accepting an association with a different sector, or the wireless cell may use control commands to move an advanced client to a different physical sector and different channel without requiring the client to repeat the association process. A client may disassociate with its current physical sector and request association with another physical sector of the same wireless cell. EX-1004 [0175]. EX-1003 ¶¶223-224.

## **2. OVERVIEW OF GORE**

Like Lastinger, Gore teaches multi-sector base stations that adapt transmissions (including MIMO) based on feedback information from wireless client devices. Gore teaches that:

... the channel quality is monitored. Channel quality indicators can be used to select a scheduling technique, such as space division multiplexing (SDM), multiple-input multiple output (MIMO) transmission and opportunistic beamforming for one or more user devices. In addition, the CQI can be used to determine the appropriate beam assignment or to update the beam pattern.

EX-1006 Abstract.

Gore teaches a base station with an exemplary MIMO wireless configuration that is essentially identical to Lastinger's FIG. 22 above:

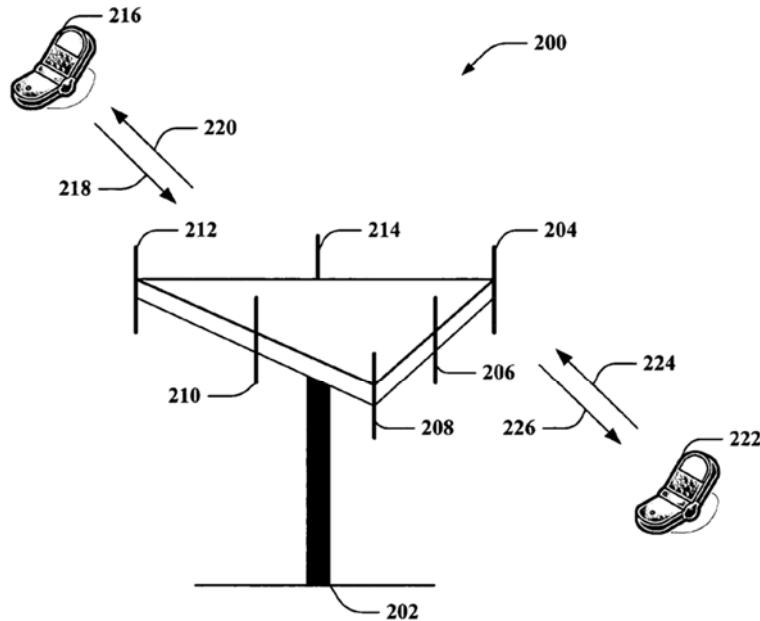


**FIG. 2**

EX-1006 FIG. 2. FIG. 2 shows:

A 3-sector base station 202 includes multiple antenna groups, one including antennas 204 and 206, another including antennas 208 and 210, and a third including antennas 212 and 214. According to the figure, only two antennas are shown for each antenna group, however, more or fewer antennas may be utilized for each antenna group.

EX-1006, 5:13-21. Each antenna group is part of a “transmitter chain” which “comprise a plurality of components associated with signal transmission and reception (e.g., processors, modulators, multiplexers, demodulators, demultiplexers, antennas, etc.)...” that constitute radios. EX-1006, 4:61-67. These

various radio elements are under the common control of a processor which performs the processing for the various functions on the base station. EX-1006, FIG. 8, 22-58. EX-1003 ¶¶232-235.

Gore teaches the extensive use of beamformed transmissions for different techniques including SDM, MIMO, and opportunistic beamforming. EX-1006, 6:35-7:26. Exemplary beams are shown in FIG. 3:

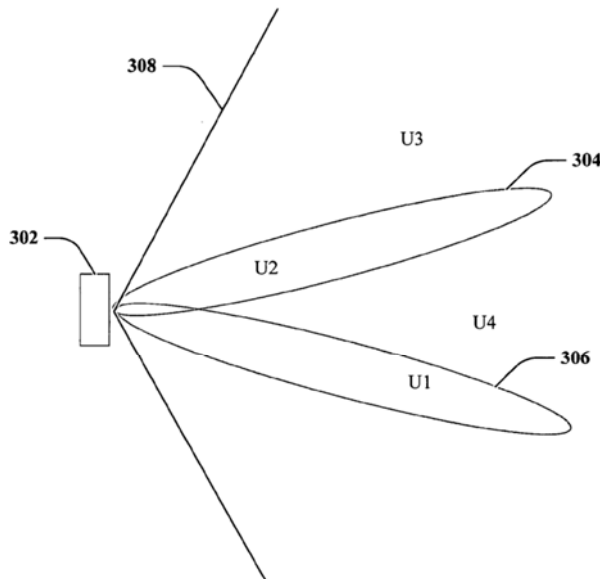


**FIG. 3**

EX-1006 FIG. 3.

Gore uses known MIMO techniques. EX-1006 6:57-7:26. Various “channel quality indicators” (“CQI”) are used to coordinate and alter the “transmitter chain” transmissions in at least three different ways (1) to “select a scheduling technique, such as space division multiplexing (SDM), multiple-input multiple output

(MIMO) transmission and opportunistic beamforming”; (2) to “select” / “assign” or “reassign” particular beams for a client device and (3) to “update” beam patterns. EX-1006 Abstract, 2:42-48, 6:3-5 8:35-51, 8:55-9:17, 9:20-22, 9:47-54, 10:15-17, 13:1-4, claims 1-36. EX-1003 ¶¶236-239.

Gore’s CQI includes “signal to interference and noise ratio” and “supportable rate” received from the wireless clients. EX-1006 7:53-55. Gore’s beamforming techniques included altering beam weights based on the CQI. EX-1006 8:22-54, claim 8.

As with Lastinger, Gore teaches that a base station with three physical sectors (as shown in FIG.2 above) and “beam patterns may provide multiple transmit directions in the sectors of a 3-sector base station, resulting in a virtual 6-sector base station.” EX-1006, 6:28-34. *See also* EX-1006 2:1-16, 7:6-26.

### **3. MOTIVATION TO COMBINE LASTINGER AND GORE WITH A REASONABLE EXPECTATION OF SUCCESS.**

Lastinger discloses the use of MIMO techniques including beamforming. To the extent that Lastinger does not explicitly include certain specific, well-known details associated with MIMO techniques and beamforming, Gore does so. A POSA would have been motivated to combine Lastinger with Gore because Gore provides additional teachings regarding the types of transmissions, such as known MIMO techniques, that are referenced in Lastinger. EX-1003 ¶¶241-253. Lastinger’s references to MIMO transmissions would motivate a POSA to consider

the details in Gore regarding such MIMO transmissions. Similarly, Lastinger references the ability to form beams using weights, and a POSA would have been motivated to apply Gore's detailed teachings regarding beamforming weights because Gore provides the specificity regarding a teaching identified as desirable in Lastinger itself.

Lastinger and Gore are directed to the same problems of increasing system capacity and performance (including overcoming interferences) at wireless base stations communicating to clients. Lastinger and Gore teach a common architecture in which a base station has, for example, three physical sectors each with their own antenna groups and radios with the physical sector transmissions combining to form six "virtual" sectors. Lastinger and Gore both teach altering their transmissions to wireless devices based upon feedback information from those devices regarding channel conditions (such as interference / signal to noise ratios). Gore mirrors Lastinger in teaching that Gore's access points receiving "channel quality information" ("CQI") that includes "signal to interference and noise ratio" and "supportable rate" received from the wireless clients. EX-1006 7:53-55, 9:4-6 ("user device can report CQIs ... such that the base station receives CQIs continually..."); 9:19-46, claims 3, 4, 16. EX-1003 ¶¶242-253.

Thus, the motivation to combine the teachings are found in the references themselves, and a POSA would be confident of the success of combining the teachings.

#### **4. Detailed Application of Lastinger and Gore**

##### **a. Claim 1**

***[1.0] A system comprising:***

Lastinger discloses<sup>2</sup> and claims an enhanced antennas system. EX-1004; FIG 2, Claims 1-72.

***[1.1] a single wireless station configured to operate in a packet-switched cellular network, the single wireless station including:***

***a first transmission point with a multiple-input-multiple-output (MIMO) capability, the first transmission point having:***

***a plurality of first directional antennas,***

***at least one first radio in communication with the first directional antennas, and***

***first circuitry in communication with the at least one first radio;***

Lastinger discloses a single wireless station configured to operate in a packet switched cellular network as illustrated in annotated FIG. 22:

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<sup>2</sup> As used throughout this Petition, “discloses” encompasses what a reference would teach or suggest to a POSA for obviousness purposes.

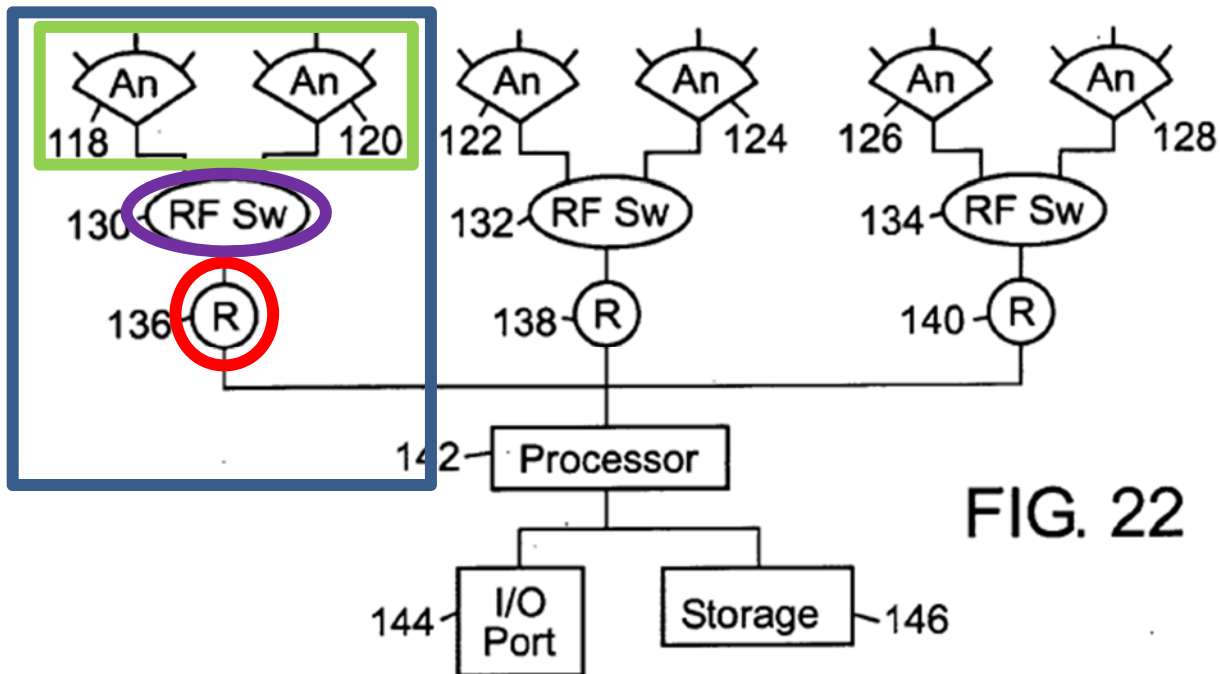


FIG. 22

EX-1004 FIG. 22.

Lastinger discloses that FIG. 22 is an exemplary six antenna, three-radio wireless cell and that the wireless cell does packet switching (*a single wireless station configured to operate in a packet-switched cellular network*). EX-1004 [0031];

Radios are an additional, indispensable part of a wireless cell. Other components of a wireless cell may include, for example, at least one of RF switches, ASDS, processors, I/O ports, storage, attenuators in addition to those used in the enhanced antenna system, **packet switches**, horns, base band processors, digital signal processors, and other analog or digital electronic components, or connections, and busses. No limitation is placed on the number of radios, antennas, other components, or the organization of the components in a wireless cell.

EX-1004 [0130]. *See also* EX-1004, FIGS. 22-31 (showing various component configurations). “Exemplary communication protocols may use packets...”

EX-1004, [0179]. EX-1003 ¶¶256-257.

A POSA understood that Lastinger’s “wireless cell” is a shorthand for “wireless cellular station” that may use any protocol to communicate including 802.11, 802.15, 802.16, Bluetooth, and ultra-wideband. EX-1004 [0134]. EX-1003 ¶¶258-260.

The *first transmission point* (outlined in blue) includes:

- *a plurality of first directional antennas having MIMO capability*  
(green) EX-1004 [0102]-[0105]; Claim 5.
- *at least one radio in communication with the first directional antenna*  
(red), EX-1004 [0110]-[0111], [0135]
- *first circuitry in communication with the at least one first radio*  
(purple) EX-1004 [0110]-[0111], [0135].

*See also* EX-1004, [0145-0146], [0135-0138], [0090-0098] (all disclosing various permutations of components used in Lastinger’s wireless cells). EX-1003 ¶¶258-265.

**[1.2] a second transmission point with a multiple-input-multiple-output (MIMO) capability, the second transmission point having:**

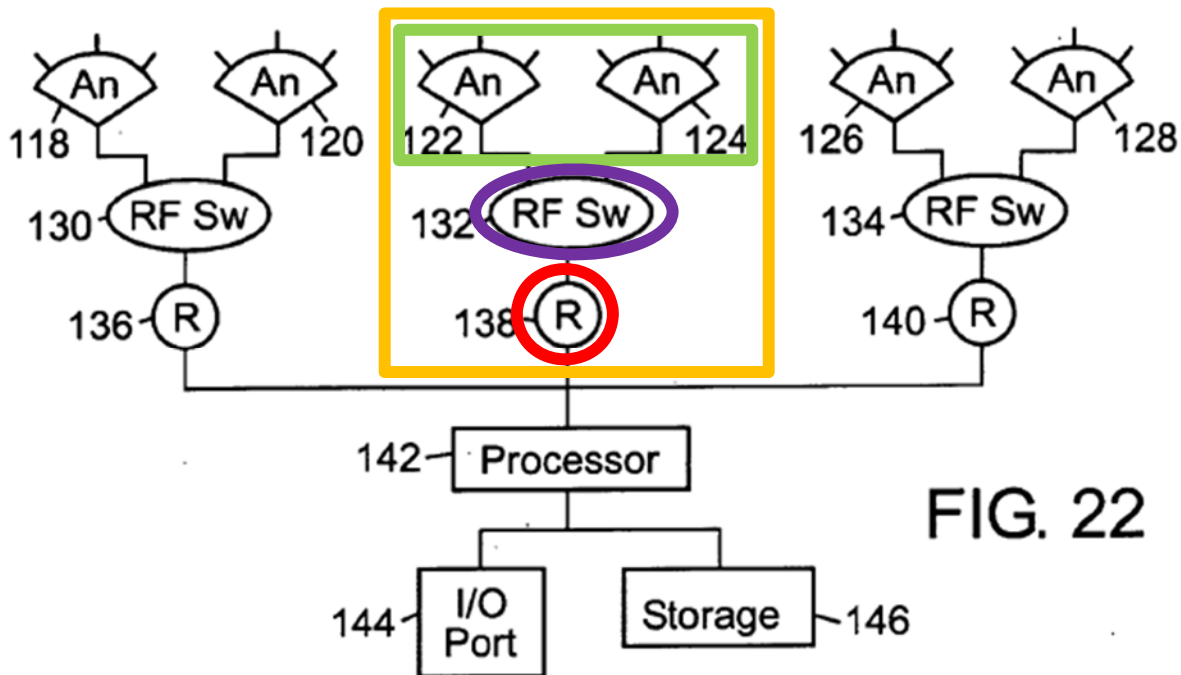
***a plurality of second directional antennas, at least one second radio in communication with the second directional antennas, and***

*second circuitry in communication with the at least one second radio;*

Lastinger discloses this limitation for the reasons cited for limitation 1.1.

Lastinger discloses a *second transmission point* (outlined in gold) that includes:

- *a plurality of second directional antennas having MIMO capability* (green) EX-1004 [0102]-[0105]; Claim 5.
- *at least one second radio in communication with the first directional antenna* (red), EX-1004 [0110]-[0111], [0135]
- *second circuitry in communication with the at least one first radio* (purple) EX-1004 [0110]-[0111], [0135].



EX-1004 FIG. 2. EX-1003 ¶266.

**[1.3] third circuitry in communication with the first circuitry of the first transmission point with the multiple-input-multiple-output (MIMO) capability and the second circuitry of the second transmission point with the multiple-input-multiple-output (MIMO) capability;**

Lastinger discloses a processor (*third circuitry*) (**yellow**) in communication with the RF switches (*first circuitry and second circuitry*) (**purple**) of the *first and second transmission points* (**blue** and **gold** respectively). EX-1003 ¶¶267-269.

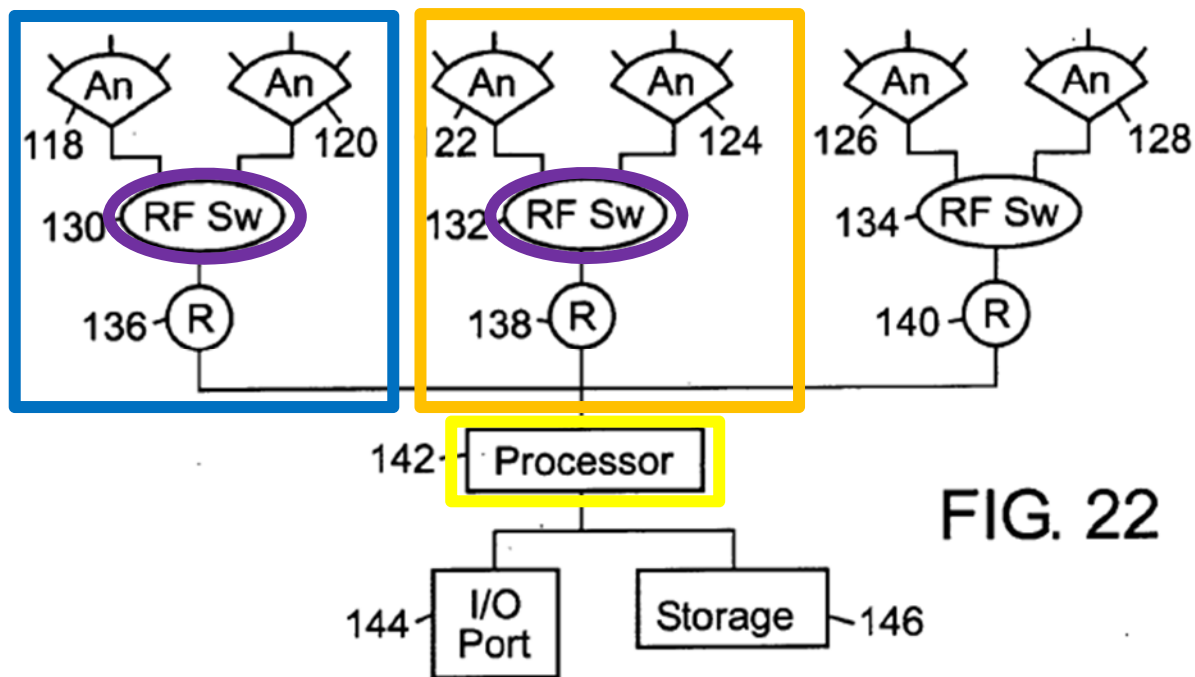


FIG. 22

EX-1004 FIG. 2.

Lastinger discloses that the processor (**yellow**) controls the RF switches (**purple**) to adjust the physical sector attached to the radio to increase efficiency, increase performance and decrease interference. EX-1004 [0132].

***[1.4] said single wireless station configured such that the first transmission point with the multiple-input-multiple-output (MIMO) capability cooperates with the second transmission point with the multiple-input-multiple-output (MIMO) capability in connection with a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device, for improving the first transmission;***

Lastinger discloses that the wireless cell (*first and second transmission site*) and the client device (*portable wireless device*) are *MIMO capable*, which improves the communications between the wireless cell and the client device (*improving the first transmission*).<sup>3</sup> EX-1003 ¶¶270-272. For example, Lastinger discloses that the antennas used by the cell or the client may be MIMO antennas. EX-1004 [0103][0105].

Lastinger discloses the claimed cooperation in multiple different ways. EX-1003 ¶¶270-279. First, Lastinger discloses that the MIMO antennas can be used during transmission to the client by forming an array of at least one antenna from the first transmission site and one antenna from the second transmission site (*the first transmission point ... cooperates with the second transmission point*) thus

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<sup>3</sup> The '930 specification does not include the word “cooperate” nor does it explain any particular meaning for this term. The '930 Abstract and Summary of the Invention recite “cooperate” but both the Abstract and Summary of the Invention were not present in the February 2006 priority document.

forming a MIMO array that transmits directional beams within the angle and area of coverage to send a stronger signal to a desired client, which a POSA understood would *improve the first transmission*. EX-1004 [0105]. This MIMO cooperation between Lastinger's transmission points is detailed in section VII.A.1, *supra*.

Second, Lastinger expressly discloses that adjusting the physical sectors associated with the MIMO antennas of the first and second transmission site will “increase efficiency, increase performance and decrease interference.” EX-1004 [0132]. Lastinger teaches “adjusting radio transmission power” and “adjusting attenuation” can be used for “facilitating adjustment of physical sector size”. EX-1004 claim 79. *See also* EX-1004 [0088-0089] (teaching cooperation and altering physical sector with power and attenuation changes). EX-1003 ¶272.

Third, Lastinger teaches cooperation in an embodiment in which there is a determination of which transmission point is selected for a particular client. EX-1003 ¶273. For example, Lastinger teaches that the “physical sectors of the antennas may overlap to form virtual sectors.” EX-1004 Abstract. *See also* EX-1004 [0085]. The “physical sectors” are created by each radio/antenna grouping as shown in FIG. 22 above (claimed “transmission point”). EX-1004, [0111]. Thus, each “virtual sector” may be serviced by multiple different transmission points. EX-1004 [0085] (“If antennas 14 and 20 are attached to different radios, then the virtual sectors are serviced by two radios instead of the single radio that services

either physical sector.”). The selection of a “radio” (transmission point) also includes the selection of a channel used by that radio. EX-1004 [0111] (“since a radio uses a single channel...”).

Lastinger teaches that the transmission points for a “virtual sector” can cooperate to select the “best” radio/antenna (“transmission point”) for a particular client device. EX-1003 ¶¶274-276. Lastinger teaches this in FIG. 58:

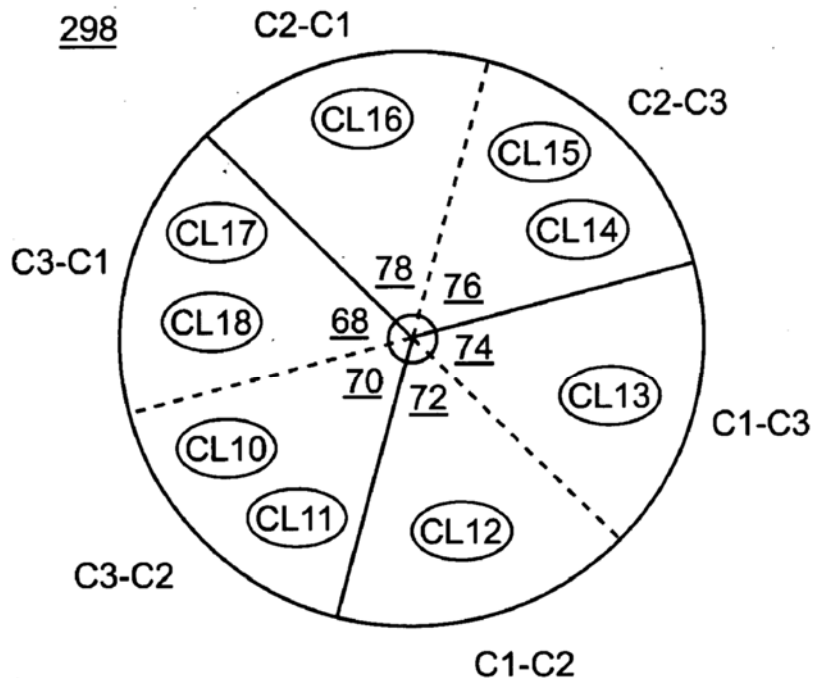


**FIG. 58**

EX-1004, FIG. 58. FIG. 58 shows six different “virtual sectors” (68, 70, 72, 74, 76, 78). Each “virtual sector” is serviced by two physical sectors. EX-1004, [0181]. Lastinger then explains how a particular client (denoted by “CL”) may be serviced by either of two different radios/antennas (“transmission points”).

In the scenario of FIG. 58 and when the hardware of FIG. 22 is used, each client of wireless cell 298 may associate with one of two radios that service each virtual sector. .... For example, assume client CL10 associates with radio 138 using channel C2...

EX-1004, [0182]. EX-1003 ¶¶273-275.

Lastinger also explains that, when using the virtual sectors, the “best” of the two transmission points is chosen for a particular device:

A second embodiment of an enhanced antenna system uses multiple directional antennas arranged such that the antenna physical sectors overlap....The exemplary antennas and hardware shown in FIG. 22, FIG. 25, FIG. 28, or FIG. 29 may be adapted to provide overlapping coverage and to implement the second embodiment of an enhanced antenna system. The coverage of two antennas in each virtual sector may allow the second embodiment of an enhanced antenna system to use the best antenna of two antennas to communicate with a device in the virtual sector.

EX-1004 [0110].

Lastinger teaches a different form of “cooperation” when the physical sectors (created by each transmission point) are not overlapping. EX-1003 ¶¶277-278. In that situation, the two transmission points “cooperate” to determine which of the transmission points should service a particular client. In one example, the “best reception” is used as the criteria for the cooperation between the transmission points:

A first embodiment of an enhanced antenna system uses multiple directional antennas arranged such that the antenna's physical sectors are adjacent, but non-overlapping. During communication, only one antenna is active at a time. The antenna used to communicate is selected by measuring the signal strength of the desired receive signal through each antenna. The antenna that detects the strongest receive signal is used and the other antennas are either disabled or ignored. The first embodiment of an enhanced antenna system provides increased performance by using the antenna that provides the best reception.

EX-1004, [0107]. *See also* EX-1004, [0109] (showing different criteria for selecting the transmission point). *See also* EX-1004, FIG. 57, [0170-0171].

Lastinger teaches that the “environmental conditions” (which are reported to the wireless cell by the clients as in 1.5 and 1.6) “may affect the association and servicing of clients....” EX-1004, [0171]. *See also* EX-1004, claims 44-49 (selecting only transmission point with highest incoming signal quality); claims 73-78; claims 120-123.

Thus, Lastinger also teaches the claimed “cooperation” also in the selection of the transmission point(s) used to provide service to a particular client. EX-1003 ¶¶272-279.

To the extent PO argues “cooperation” requires beamforming or MIMO and PO argues that Lastinger does not disclose the details of beamforming or MIMO, Gore does. EX-1003 ¶¶280-283. Gore confirms Lastinger's teachings of

cooperation and fills any gaps that the PO might allege exist in Lastinger. First, Gore confirms that two separate transmission points (Gore’s “transmitter chains”) transmit to the same mobile device using beamforming techniques to create virtual sectors. For example, “a virtual six-sector system” is “generated from a conventional three-sector system” by using the beams formed by different sectors. This use of different sectors to transmit to individual devices matches Lastinger’s teachings (discussed above) and meets the “cooperates” element. This form of “cooperates” is shown by the “SDM” and MIMO techniques. *E.g.*, EX-1006 6:35-43 (SDM), 6:44-51 (“In a MIMO system, multiple data streams corresponding to a single user device are scheduled at the same time and frequency on different beams.”). EX-1003 ¶280.

Gore also teaches Lastinger’s form of cooperation in which a single transmission point is selected to serve the device. EX-1006, 6:35-43 (“in opportunistic beamforming, also referred to as beam selection, the base station transmits to a single user device over a given set of frequencies and time using a single beam.”). EX-1003 ¶281.

Gore confirms that “multiple antennas at a base station” are used to “emit beams.” 6:5-10. *See also* EX-1006, 5:21-23 (beamforming requires multiple transmit antennas to transmit beams). EX-1003 ¶¶282, 138-164.

In both types of cooperation, Gore’s base station “assigns” or “reassigns” user devices to one or more beams with the assignment being a form of cooperation. EX-1006, 9:47-55, 11:52-57, 13:1-4, 2:17-25, 6:35-7:4, claims 15, 31. EX-1003 ¶283.

A POSA would be motivated to combine the teachings of Lastinger with the teachings of Gore for the reasons discussed in the Motivation to Combine section.

Thus, Lastinger, alone or in combination with Gore, teaches this element.

***[1.5] said single wireless station configured for: receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on a measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;***

Lastinger discloses several examples of this limitation. EX-1003 ¶¶285-288. Lastinger discloses that “[a]n advanced client may report, for example, at least one of its desired minimum and maximum throughput needs, desired channel, signal quality for all channels, all detectable wireless cells and physical sectors, physical distance to all wireless cells....” EX-1004 [0173]; *see also* EX-1004 [0189]. To report these metrics, the client device “may measure receive signal strength, or signal quality....” EX-1004 [0146]. Lastinger further discloses:

- That its “client also uses extensions to the 802.11 protocols to communicate control information and requests to the wireless cell to

improve data throughput, transmission signal strengths, noise suppression, and other performance factors.” EX-1004 [0147].

- That signal quality is a measure of signal level, noise level, error rate, and other operational and environmental factors from a radio's perspective, and that a radio may perform a signal quality scan by listening to receive signals and ranking them by their signal quality. EX-[0167-0168].
- That a client can send control information to the wireless cell, including signal quality, desired antenna, error rate, number of dropped frames, desired throughput, throughput delivered, wireless cells detected, and/or any other conceivable information (*first information... based on a first measurement performed by the first portable wireless device*). EX-1004 [0097-0100];
- That the access point (“AP”) receives environment, performance or any other information measured by the client (*receiving first information... based on a first measurement performed by the first portable wireless device*). EX-1004 [0193].
- That the communication of control or environmental information between a wireless cell and advanced clients may occur at association,

during active or passive scans, or at any time allowed by the communication protocol. EX-1004 [0189].

*See also* EX-1006 [0173-0175], claims 126, 73, 76.

Lastinger also discloses that a client may also request information or action from the cell, including retransmission, channel change, throughput demands, authentication, variation in transmit power, and/or a request to modify any communication factor (*first information... based on a first measurement performed by the first portable wireless device*). EX-1004 [0098].

Further, Lastinger expressly recites that this first information received by the wireless cell “helps the wireless cell manage its communication with the clients it serves”, including desired throughput, buffer fullness, signal quality, and/or other relevant information. EX-1004 [0100].

Thus, the information would include environment, performance, “control information,” or any other information measured by the client, including a signal quality measurement and other measurements discussed above. EX-1003 ¶¶285-288.

***[1.6] receiving second information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on another measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;***

Lastinger discloses this limitation for the reasons discussed for limitation [1.5]. Specifically, Lastinger discloses that the client device can make measurements of the signal quality of a transmission received from a wireless cell antenna. EX-1004 [0098], [0168]. As discussed for limitation [1.5] first information would include a signal quality measurement for a transmission from a first transmission point, and second information would include a signal quality measurement for a transmission from a second transmission point.

***[1.7] altering at least one aspect of the first transmission in connection with at least one of: multiple of the first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or multiple of the second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability, based on the first information and the second information;***

Lastinger discloses several examples of this limitation. EX-1003 ¶¶291-297. First, assigning (or re-assigning/changing) channels is *altering one aspect of the first transmission*, and Lastinger discloses that the “signal quality collected from each radio may be used to determine potential channel assignments for each radio to substantially comply with throughput, or loading specifications” (*altering at least one aspect of the first transmission... based on the first information and the second information*). EX-1004 [0176]. Second, Lastinger discloses changing the channels used for transmission based on signal quality information from the clients:

The channel used between the wireless cell and the client may also be established at association. The wireless cell **may change the channels assigned to its physical sectors in response to, for example, interference, loading, throughput demands, or other factors.** In one embodiment, when the wireless cell **changes the channel** used in a physical sector, all clients associated with the physical sector detected, and **follow to the new channel.** Advanced clients may be capable of either negotiating the use of a different channel, or **providing the wireless cell with signal quality information from each client's perspective to assist the wireless cell in determining the best channels to use.**

EX-1004 [0174]. *See also* EX-1004, [0196-0199] (describing specific example of changing channels to reduce interference based on information from clients), [0189] (“changing channels, changing protocols, ... moving a client to another physical sector, and/or any other type of action” in response to information from the client). EX-1003 ¶291.

Third, changing physical sectors to a client is *altering one aspect of the first transmission*, and Lastinger discloses this change may be done for load balancing purposes which a POSA understood to be based on the “throughput demand” received from the clients (*altering at least one aspect of the first transmission... based on the first information and the second information*):

A wireless cell may **dynamically balance its load by disassociating a particular client with a particular physical sector and accepting**

**an association with a different sector**, or the wireless cell may use control commands to move an advanced client to a different physical sector and different channel without requiring the client to repeat the association process. **A client may disassociate with its current physical sector and request association with another physical sector of the same wireless cell**, but in one embodiment, the wireless cell approves the new association request.

EX-1004 [0175][0190]. The change of physical sector(s) changes the antenna/radio grouping used to service the client. The antenna selection may depend on the feedback information from the clients. EX-1004, [0146], [0110], [0185-0188], [0196-0198].

Lastinger's option to change physical sectors is highlighted by FIG. 53 (showing physical sectors overlapping to create virtual sectors served by at least two physical sectors). EX-1004 [0153-0164]. EX-1003 ¶¶292-293.

Fourth, changing priority of a transmission to a client is *altering one aspect of the first transmission*, and Lastinger discloses changing priority of a transmission to a high throughput client (*altering at least one aspect of the first transmission... based on the first information and the second information.*) EX-1004 [0191][0192].

Fifth, Lastinger teaches “[a]n exemplary client also uses extensions to the 802.11 protocols to communicate control information and requests to the wireless cell to improve data throughput, transmission signal strengths, noise suppression,

and other performance factors.” EX-1004 [0147]; *see also* EX-1004 [0098-0100]. Lastinger teaches altering the power or transmit attenuation of its transmissions based on the information returned from the devices. EX-1004, [0088-0089], [0125] (adjustable attenuation). EX-1003 ¶¶295.

Lastinger also teaches that various MIMO characteristics may be altered based on the feedback information from the clients. EX-1004 [0103]-[0105]. This includes the selection of different antenna and/or transmission points for a particular transmission. EX-1004, [0103] (“During transmission or reception, all or any subset of antennas in the MIMO array may be used or selection diversity may be used to limit the number of antennas used.”). This alteration would include selecting whether to even use the MIMO capability. EX-1004, [0105] (“any antenna array may be used as a single antenna or a MIMO antenna may be used.”). EX-1003 ¶296.

Lastinger’s claims recite altering various aspects of the transmission to reduce interference. EX-1004 claim 76 (“adjusting attenuation...”); claim 12, claim 66; claim 79 (“adjusting radio transmission power...”); claim 79 (“adjustment of physical sector size”); claims 83-86; claim 87 (adjusting “transmission range and reception range”); 91 (“adjusting a size of the physical sectors...”); 120-126; 130-141 (all changing channels); 126. Moreover, Lastinger teaches that one may use “a combination of techniques” which alter transmission

characteristics “to improve performance” which would include reducing interference and that “all or any of the techniques” maybe used to increase performance. EX-1004, [0101], [0193]. EX-1003 ¶297.

Thus, Lastinger discloses this limitation. EX-1003 ¶¶291-297.

As further examples of this limitation, Gore teaches several forms of alteration that are all based upon the CQI information received from the various client devices. EX-1003 ¶¶298-301. First, Gore teaches to select different “select a scheduling technique, such as space division multiplexing (SDM), multiple-input multiple output (MIMO) transmission and opportunistic beamforming.” This teaching supplements Lastinger’s teaching on selecting whether to use MIMO or not.

Second, Gore teaches the base station may to “select” particular beams for a client device. This supplements Lastinger’s teaching that the base station may assign (or re-assign) clients to the transmissions from particular sectors / antennas.

Third, Gore teaches the base station may “update” one or more of the beam patterns – including though applying weights to form/alter the beams. This supplements Lastinger’s teaching of using weights to update beamforming.

Each of Gore’s alterations are done based on CQI. EX-1006 Abstract, 2:42-62, 3:15-32, 6:3-5, 8:22-51, 8:55-9:17, 9:20-22, 9:47-54, 10:15-17, 13:1-4, claims 1-36. Gore’s CQI are based upon measurements, including interference, done at

the client devices. EX-1006, FIG. 6, 8:33-37, 8:59-63, 9:18-46, 10:35-37, 12:29-31. Gore's alterations are done to reduce interference, increase the signal-to-noise ratio, and increase system capacity. EX-1006, 2: 10-12, 5:44-52, 6:32-34, 7:11-13.

A POSA would be motivated to combine the teachings of Lastinger with the teachings of Gore for the reasons discussed in the Motivation to Combine section.

Thus, Lastinger, alone or in combination with Gore, teaches this limitation. EX-1003 ¶¶291-302.

***[1.8] transmitting data in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing at least one of: the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability.***

Lastinger discloses transmitting to clients by one or more transmission points. See elements 1.5, 1.6 *supra* discussing coordinating and altering transmissions to clients. As shown in FIG. 14 of Lastinger, each virtual sector is serviced by two antennas, *one of the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability* (shades of red) *or the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability* (shades of blue).

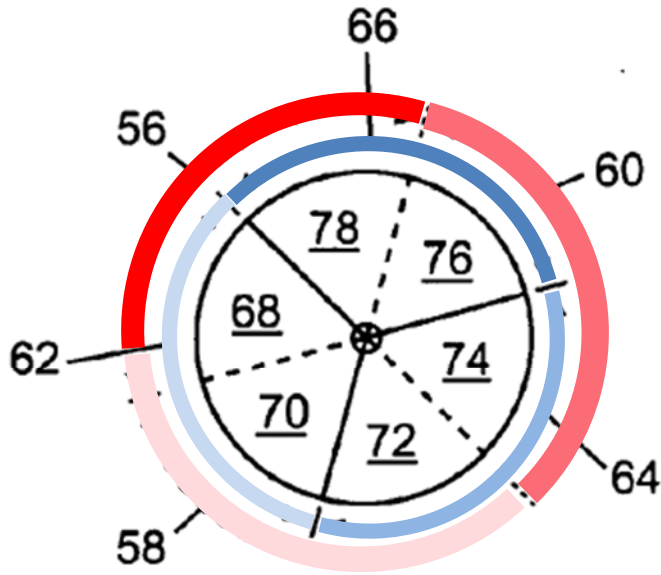


FIG. 14

EX-1004, Fig. 14.

Lastinger discloses that the antennas used by the cell or the client may be MIMO antennas using any of many well-known MIMO techniques. EX-1004 [0103-0105].

Thus, Lastinger, alone or in combination with Gore, discloses this claim limitation. EX-1003 ¶¶303-306.

**b. Claim 2**

**[2] The system of claim 1, wherein the system is configured such that the first directional antennas and the second directional antennas include multiple-input-multiple-output (MIMO) antennas.**

This limitation is disclosed by Lastinger for the reasons discussed for Claim 1.

c. **Claim 3**

***[3] The system of claim 1, wherein the system is configured such that the first information is identified by enabling at least one of the first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, and measuring an ability of the at least one first directional antenna of the first transmission point with the multiple-input-multiple-output (MIMO) capability to communicate with the first multiple-input-multiple-output (MIMO)-capable portable wireless device.***

Lastinger discloses this limitation in several respects. EX-1003 ¶¶308-309. See element 1.5 discussing Lastinger’s client measuring and reporting information to the wireless cell from clients. “Control information from a client may include, for example, signal quality, desired antenna, error rate, number of dropped frames, desired throughput, throughput delivered, wireless cells detected, and/or any other conceivable information.” EX-1004, [0098]. Of these types of information, at least signal quality, error rate, number of dropped frames, throughput delivered, and wireless cells detected are measured and identified by enabling the transmission point antennas and measuring an ability to communicate.

For example, Lastinger teaches how radios (including clients) measure signal quality including by active or passive scans including signal quality for each channel available. EX-1004 [0167-0168]. For example, “the radio may measure receive signal strength, or signal quality, through each available antenna” and may be measured and reported “periodically by fixed or random interval, after each

transmission, after each frame, as commanded by the wireless cell, when the signal strength of the receive signal decreases below a predetermined threshold, or any at any other time.” EX-1004, [0146]. Gore teaches this through use of its pilot signal. EX-1006, 2:49-62, 3:2-5. EX-1003 ¶310.

Thus, Lastinger, alone or in combination with Gore, discloses this limitation. EX-1003 ¶¶308-311.

d. **Claim 4**

***[4] The system of claim 1, wherein the system is configured such that at least one of the first information or the second information is a function of at least one of: a data throughput, a signal-to-noise ratio, a reduced signal error, a reduced data error, a reduced retransmission request, a reduced interference, a rejection of multipath signal, a higher transmission rate, or a signal strength, in connection with the first multiple-input-multiple-output (MIMO)-capable portable wireless device.***

As discussed for claim limitation [1.5, 1.6, and 3], Lastinger discloses that the first and second information can be *signal quality, error rate, desired throughput, throughput delivered*, “and/or any other conceivable information.” EX-1004 [0098]. *See also* EX-1004, [0167] (exemplifying “signal quality” as “a measure” of many different possible factors), [0125], [0147]. As noted in Lastinger [0167], the purpose of information that is designated as “signal quality” or “channel quality” is to allow one or more different measured factors to be inputs into the determination of a fewer number of metrics (perhaps a single metric

referenced as “signal quality” or channel quality or similar) so that the metric(s) can be meaningfully compared across the different channels to help with a determination of which channels might be optimally used. EX-1003 ¶312.

e. **Claim 5**

***[5] The system of claim 1, wherein the system is configured such that the first transmission point with the multiple-input-multiple-output (MIMO) capability and the second transmission point with the multiple-input-multiple-output (MIMO) capability are capable of communicating with the first multiple-input-multiple-output (MIMO)-capable portable wireless device utilizing the same channel with at least one different channel characteristic.***

As discussed for Claim 1, Lastinger discloses that each of the antennas in the first transmission point and the second transmission point illustrated in FIG. 22 can be a MIMO capable antenna. As detailed in section VII.A.1 *supra*, the antennas in one or more transmission points have the ability to communicate with a MIMO capable portable device in a physical sector utilizing the same channel. For example, Lastinger discloses that each physical sector of a first group of antennas and a second group is assigned a same channel. EX-1004 Claim 106.

The '930 specification does not define or use the term “channel characteristic.” Dependent claims 6-9 below use “channel characteristics” to describe the factors measured and reported by clients (also as recited in claim 4 *supra*). See also EX-1001 at 5:28-33.

As discussed for claim limitations [1.5, 1.6, 3, and 4], Lastinger discloses that a portable device can measure and provide to the wireless cell environment, performance or any other information, including signal strength, signal quality, signal level, noise level, error rate, desired antenna, error rate, number of dropped frames, desired throughput, throughput delivered, wireless cells detected, minimum and maximum throughput needs, desired channel, signal quality for all channels, all detectable wireless cells and physical sectors, physical distance to all wireless cells, local storage capacity, additional available communication protocols, ability to physically move, and/or any other conceivable information (*different channel characteristics*). EX-1004 [0098], [0146], [00167], [0168], [0173], [0193].

A POSA understood that two transmission points communicating with a portable wireless device on the same channel can have different channel characteristics even using the same channel because, for example, the two transmission points would be physically located in different locations and would likely be oriented in different directions. This would result in different channel characteristics. EX-1003 ¶¶313-316.

Moreover, Lastinger teaches that the different transmission points can use different transmissions characteristics for the channels. These include different “encoding including, for example, OFDM, space-time-codes, or weighting of the

antenna signals in the array to accomplish beam steering.” EX-1004, [0103]. It might also include different “encoding and decoding schemes, modulating and demodulating schemes, and other methods to enable a channel to send and receive information.” EX-1004 [0153]. These various transmission characteristics would all relate to factors such as throughput, signal-to-noise ratio, signal strength, and multipath because, for example, choosing different transmission characteristics would impact how these factors are measured at the client for the different transmissions. EX-1003 ¶317.

To the extent that PO argues that Lastinger does not disclose this limitation, Gore teaches that one or more of its transmitter chains (“*transmission points*”) can communicate with the client devices using the same channel. *E.g.*, EX-1006 6:35-43 (SDM), 6:44-51 (“In a MIMO system, multiple data streams corresponding to a single user device are scheduled at the same time and frequency on different beams.”). Gore also teaches that any of its scheduling techniques can use different forms of multiplexing that may use the same channel from multiple transmitters. EX-1006, 7:30-33; 13:8-13. Gore teaches that the CQI is measured for each beam because it will be different for different beams. EX-1006, 7:64-66 (“CQI for each beam to be determined”). The clients measure and calculate the devices even for other beams that are not specifically being used. EX-1006, 8:59-67. EX-1003 ¶318. A POSA would be motivated to combine the teachings of Lastinger with

the teachings of Gore for the reasons discussed in the Motivation to Combine section.

Thus, Lastinger, alone or in combination with Gore discloses this limitation.

f. **Claim 6**

*[6] The system of claim 5, wherein the system is configured such that the at least one different channel characteristic includes at least one of: a channel characteristic that is throughput-related, a channel characteristic that is signal-to-noise ratio-related, a channel characteristic that is signal strength-related, or a channel characteristic that is multipath signal-related, in connection with the same channel.*

This limitation is disclosed by Lastinger, alone or in combination with Gore, for the reasons discussed for Claims 4 and 5. EX-1003 ¶319.

g. **Claim 7**

*[7] The system of claim 5, wherein the system is configured such that the at least one different channel characteristic includes at least two of: [reciting same characteristics as claim 6].*

This limitation is disclosed by Lastinger, alone or in combination with Gore, for the reasons discussed for Claims 4 and 5. A POSA understood that Lastinger does not limit the number of different channel characteristics between transmission points communicating with a portable wireless device on the same channel can have. EX-1003 ¶320.

**h. Claim 8**

***[8] The system of claim 5, wherein the system is configured such that the at least one different channel characteristic includes at least three of: [reciting same characteristics as claim 6].***

This limitation is disclosed by Lastinger, alone or in combination with Gore, for the reasons discussed for Claims 4 and 5. A POSA understood that Lastinger does not limit the number of different channel characteristics between transmission points communicating with a portable wireless device on the same channel can have. EX-1003 ¶321.

**i. Claim 9**

***[9] The system of claim 5, wherein the system is configured such that the at least one different channel characteristic includes at least four of: [reciting same characteristics as claim 6].***

This limitation is disclosed by Lastinger, alone or in combination with Gore, for the reasons discussed for Claims 4 and 5. A POSA understood that Lastinger does not limit the number of different channel characteristics between transmission points communicating with a portable wireless device on the same channel can have. EX-1003 ¶322.

**j. Claim 10**

***[10] The system of claim 1, wherein the system is configured such that the altering the at least one aspect includes selecting both the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability and the multiple second directional antennas of the second transmission***

*point with the multiple-input-multiple-output (MIMO) capability in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the same data is transmitted in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device via a same channel, utilizing both the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability and the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability.*

As discussed in [1.7], Lastinger discloses many forms of “altering” including the selection of different transmission points (such as physical sectors or antennas), as well as the option to use MIMO, to service a client. EX-1003 ¶¶324-332.

As discussed in section VII.A.1, Lastinger discloses that multiple transmission points can be selected (as part of the selection process) to transmit the same data using the same channel to a client.

Furthermore, Lastinger discloses the use of known MIMO techniques including “antenna diversity” / “spatial diversity” in the transmit path.

MIMO antennas may use any combination of **spatial**, polarization, or angle antenna **diversity**. The MIMO antenna array may be fixed or adaptive for either transmit, receive, or both. When receiving, the MIMO antenna may use, for example, a maximum ratio combiner, an optimal linear combiner, selection diversity, or any combination of these methods or other methods for combining the signals from multiple antennas into a single signal. When transmitting, the MIMO

antenna may use any type of encoding including, for example, OFDM, space-time-codes, or weighting of the antenna signals in the array to accomplish beam steering. **During transmission or reception, all or any subset of antennas in the MIMO array may be used** or selection diversity may be used to limit the number of antennas used. **Antenna diversity may be used in the transmit path, in the receive path, or in both transmit and receive paths.** The signal from each antenna, transmitted or received, may or may not be weighted.

EX-1004 [0103].

Lastinger's disclosure is essentially identical to the disclosure of the '930 Patent regarding MIMO antennas:

MIMO antennas may use any combination of spatial, polarization, or angle antenna diversity. The MIMO antenna array may be fixed or adaptive for either transmit, receive, or both. When receiving, the MIMO antenna may use, for example, a maximum ratio combiner, an optimal linear combiner, selection diversity, or any combination of these methods or other methods for combining the signals from multiple antennas into a single signal. When transmitting, the MIMO antenna may use any type of encoding including, for example, OFDM, space-time-codes, or weighting of the antenna signals in the array to accomplish beam steering.

During transmission or reception, all or any subset of antennas in the MIMO array may be used or selection diversity may be used to limit the number of antennas used. **Antenna diversity may be used in the transmit path, in the receive path, or in both transmit and receive**

**paths.** The signal from each antenna, transmitted or received, may or may not be weighted.

EX-1001 12:47-64.

Antenna diversity includes using multiple MIMO antennas to transmit the same data (signals) to a client using the same channel at the same time. EX-1003 ¶¶313-316, 100-108, 124-128.

Thus, a POSA understood that Lastinger’s selection of the transmission points including an “altering” would include selecting the specific antenna(s) for transmission. This includes selecting the first transmission point and the second transmission point antennas to achieve antenna diversity. “During transmission ..., all or any subset of antennas in the MIMO array may be used or selection diversity may be used to limit the number of antennas used.” EX-1004, [0103]. *See also* EX-1004, [0145-0146] (“the embodiments may include any number of antennas available, any number of antennas in simultaneous use, any number of radios, overlapping or non-overlapping physical sectors, physical sector positioning, and/or communication protocols used.”), [0085], [0110]. EX-1003 ¶¶327-329.

If PO argues that Lastinger does not disclose this limitation, Gore discloses this limitation as discussed for claim limitations [1.4], [1.7] and [5]. Gore teaches that one or more of the transmitter chains (“*transmission points*”) can communicate with the client devices using the same channel at the same time. EX-1006 6:44-51 (“In a MIMO system, multiple data streams corresponding to a single user device

are scheduled at the same time and frequency on different beams.”). Gore also teaches that any of its scheduling techniques can use different forms of multiplexing that may use the same channel from multiple transmitters. EX-1006, 7:30-33; 13:8-13.

Thus, when Gore alters its transmission to “select” the MIMO scheduling technique, the limitation is met for the two distinct reasons that there is an “altering” to select MIMO and that there is an altering to select the beam(s) (using two (or more) specific transmitter chains (transmission points) that are combined to form the beam) on which the MIMO transmission is used to transmit the data at the same time on the same channel/frequency. EX-1003 ¶¶330-331. This matches Lastinger’s teachings that multiple transmitter points combine to transmit on the same channel as discussed above. A POSA would be motivated to combine the teachings of Lastinger with the teachings of Gore for the reasons discussed in the Motivation to Combine section.

Thus, Lastinger, alone or in combination with Gore, teaches this limitation.

**k. Claim 11**

***[11] The system of claim 1, wherein the system is configured such that the altering the at least one aspect includes selecting only one of: the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second transmission point with the multiple-input-***

***multiple-output (MIMO) capability in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the data is transmitted in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing only the selected one of: the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability.***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons in limitations [1.7] and [11]. Essentially, this claim describes altering results in transmission by a single antenna of a single transmission point – which has been known and used since the earliest wireless systems.

Lastinger discloses that “[d]uring transmission or reception, all or any subset of antennas in the MIMO array may be used.” EX-1004 [0103]. A POSA understood that utilizing only the selected one of the multiple first directional antennas of the first transmission point or the multiple second directional antennas of the second transmission point is utilizing only a subset of the antennas in the MIMO array. *See also* EX-1004, [0146] (“the embodiments may include any number of antennas available, any number of antennas in simultaneous use, any number of radios...”). EX-1003 ¶¶333-334.

To the extent that PO asserts that Lastinger does not disclose this limitation, Gore teaches that a single antenna from one of the transmitter chains (“*transmission points*”) can communicate with the client devices as discussed for claim limitations [1.4], [1.7] and [5]. *E.g.*, EX-1006 5:18-21 (each sector can contain one antenna); 5:44-46 (beamforming is optional because it “can” be used); 1:50-67 (describing system without beams). EX-1003 ¶335.

**I. Claim 12**

***[12] The system of claim 1, wherein the system is configured such that coordination is performed for selectively directing a beam associated with the first transmission to improve the transmission of the data by overcoming interference.***

Lastinger, alone or in combination with Gore, discloses that the MIMO array can use beamforming to improve the transmission by overcoming interference:

When transmitting, the MIMO antenna may use any type of encoding including, ... weighting of the antenna signals in the array to accomplish beam steering... The signal from each antenna, transmitted or received, may or may not be weighted.

EX-1004 [0103]. *See also* EX01004, [0105] (“Adaptive arrays may use adaptive array weights to transmit directional beams within the angle and area of coverage to send a stronger signal to a desired client. During reception, an adaptive array may use array weights to direct a beam substantially towards the transmitting client and substantially null out any sources of interference.”). EX-1003 ¶¶336-337.

If PO argues that Lastinger does not disclose this limitation, Gore discloses this limitation as discussed for claim limitations [1.4], [1.7] and [5]. Specifically, Gore teaches directing beams to specific devices to overcome interference. Gore's alterations are done to reduce interference, and increase the signal-to-noise ratio. EX-1006, 2:10-12, 2:17-18 ("appropriate beams to optimize performance"); 5:44-58, 7:58-60, 11:22-55, claims 136 ("improving performance"). A POSA would understand Gore's teaching to "improve" or "enhance" performance to include overcoming interference. As detailed in [1.4], [1.7], the beam patterns can coordinate by directing the beams to improve the transmissions. EX-1006 Abstract, 2:46-58, 6:3-5, 8:22-51, 9:47-54, 10:15-17, claims 13, 29. EX-1003 ¶337.

**m. Claim 13**

***[13] The system of claim 1, wherein the system is configured such that the altering the at least one aspect includes altering beamforming in connection with at least one of: the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, and the data is transmitted in connection with the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the beamforming in connection with the at least one of: the multiple first directional antennas of the first transmission point with the multiple-input-multiple-output (MIMO) capability, or***

***the multiple second directional antennas of the second transmission point with the multiple-input-multiple-output (MIMO) capability.***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for limitations [1.4], [1.7], 5 and 12. EX-1003 ¶¶338-339.

To the extent that PO argues that Lastinger does not disclose this limitation, Gore discloses this limitation as discussed for claim limitations [1.4], [1.7] and [5]. Gore teaches that its alterations (including both selecting beams and altering beams) are done based on the CQI. For example, selection and modification of beams are all based on CQI. EX-1006 Abstract, 9:47-54 (“User devices can be reassigned to beams or the entire beam pattern can be modified depending on the CQI values...”), 2:46-58, 6:3-5, 8:22-51, 10:15-17, claims 13, 29.

**n. Claim 14**

***[14] The system of claim 13, wherein the system is configured such that the beamforming involves weighting and the altering is performed to improve the first transmission independent of a handoff.***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for Claims 12 and 13. EX-1003 ¶¶341-342. Further Lastinger discloses that “adaptive arrays may use adaptive array weights to transmit directional beams within the angle and area of coverage to send a stronger signal to a desired client.” EX-1004 [0130]. Further, Lastinger disclose that “the signal from each antenna, transmitted or received, may or may not be weighted.” EX-1004 [0103].

To the extent that PO argues Lastinger does not disclose this limitation, Gore's teaching provides details regarding the weights used to form beams. EX-1006 8:38-39 ("beams are formed using a set of weights ... if the beam pattern is updated, the base station should ... send/signal the updated set of beam weights..."); 8:22-54; claims 8, 20.

Neither Lastinger nor Gore restricts beamforming to during handoff.

**o. Claim 16**

***[16.0] A system, comprising:***

Lastinger disclose this limitation for the reasons discussed for claim limitation [1.0].

***[16.1] a single wireless station configured to operate in a packet-switched cellular network, the single wireless station including:***

***a first portion ...:***

***16.2] a second portion...***

***[16.3] third circuitry...***

***[16.4] said single wireless station configured...***

These limitations are identical to limitations [1.1]-[1.4], with the only difference being that use of a "first portion" substituted for "a first transmission point" recited in [1.1]-[1.4].

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for [1.1] through [1.4]

***[16.4] said single wireless station configured such that the first portion with the multiple-input-multiple-output (MIMO) capability cooperates with the second portion with the multiple-input-multiple-output (MIMO) capability to support a first transmission to a first multiple-input-multiple-output (MIMO)-capable portable wireless device, for improving the first transmission to address interference, by:***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for claim limitation [1.4].

***[16.5] in response to at least one first signal sent by the single wireless station, receiving first information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on an interference-based measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for claim limitations [1.5], [3]. As discussed in claim 3, many of Lastinger's and Gore's different types of information measured by the client and reported to the wireless cell are in response to one or more signal(s) sent by the wireless cell.

Further, Lastinger discloses that the wireless cell can send commands (*first signal sent by the wireless station*) to the client requesting signal quality information from the client's perspective (*in response to ... receiving first information*) or any other type of action, and can do so at any time allowed by the communication protocol. EX-1004 [0189]. EX-1003 ¶¶347-348.

***[16.6] in response to at least one second signal sent by the single wireless station, receiving second information from the first multiple-input-multiple-output (MIMO)-capable portable wireless device that is based on another interference-based measurement performed by the first multiple-input-multiple-output (MIMO)-capable portable wireless device;***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for claim limitation [16.5].

***[16.7] performing beamforming to support the first transmission utilizing at least one of: multiple of the first directional antennas of the first portion with the multiple-input-multiple-output (MIMO) capability, or multiple of the second directional antennas of the second portion with the multiple-input-multiple-output (MIMO) capability, based on the first information and the second information; and***

Lastinger, alone or in combination with Gore, disclose this limitation for the reasons discussed for limitations [1.4], [1.7] and Claims 12-14. Limitations [1.4], [1.7], 10 and 11 detail Lastinger and Gore's ability to utilize one or more of the transmission points.

***[16.8] transmitting data during the first transmission to the first multiple-input-multiple-output (MIMO)-capable portable wireless device, utilizing the beamforming with at least one of: the multiple first directional antennas of the first portion with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second portion with the multiple-input-multiple-output (MIMO) capability.***

Lastinger disclose this limitation for the reasons discussed for claim limitations [1.8], [16.7] and Claims 12-14.

p. **Claim 17**

*[17] The system of claim 16, wherein the system is configured such that a channel between the first portion and the first multiple-input-multiple-output (MIMO)-capable portable wireless device differs from another channel between the second portion and the first multiple-input-multiple-output (MIMO)-capable portable wireless device in terms of at least one channel characteristic that includes at least one of: a channel characteristic that is throughput-related, a channel characteristic that is signal-to-noise ratio-related, a channel characteristic that is signal strength-related, or a channel characteristic that is multipath signal-related.*

Lastinger, alone or in combination with Gore, disclose this limitation for the reasons discussed for Claim 5.

q. **Claim 18**

*[18] A system, comprising*

Lastinger discloses this limitation for the reasons discussed for claim limitation [1.0].

*[18.1] a packet-switched cellular network including a plurality of wireless stations including a particular wireless station including:*

*a first group ...*

*[18.2] a second group...*

*[18.3] third circuitry in communication with...*

*[18.4] said particular wireless station configured such...*

*[18.5] receiving first information...*

*[18.6] receiving second information ...*

These elements recite the same limitations as in 1.1 through 1.6 except they replace “transmission point” with “group.” Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for limitations 1.1-1.6.

***[18.7] coordinating utilization of at least one of multiple of the first directional antennas of the first group with the multiple-input-multiple-output (MIMO) capability, or multiple of the second directional antennas of the second group with the multiple-input-multiple-output (MIMO) capability, based on the first information and the second information; and***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for claim limitation [1.7] and Claims 11-13.

***[18.8] transmitting data with the first transmission to the first multiple-input multiple-output (MIMO)-capable portable wireless device, utilizing at least one of: the multiple first directional antennas of the first group with the multiple-input-multiple-output (MIMO) capability, or the multiple second directional antennas of the second group with the multiple-input-multiple-output (MIMO) capability.***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for claim limitation [1.8] and Claims 11-13.

**r. Claim 19**

***[19] The system of claim 18, [reciting same language as claim 17 except replacing “portion” with “group”].***

Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for Claims 4, 5, 6, and 17.

s. **Claim 20**

*[20] The system of claim 18, wherein the system is configured ....*

This claim recites the same limitation as claim 19 except this claim recites “at least two channel characteristics” rather than “at least one.” Lastinger, alone or in combination with Gore, discloses this limitation for the reasons discussed for Claims 4, 5, 6, 7, and 17.

**VIII. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION TO DENY INSTITUTION**

**A. The Board Should Not Deny Institution Under 35 U.S.C. § 325(d)**

The '930 Patent has not been previously challenged in an IPR. While Lastinger was cited on the face of the '930 Patent, it was not applied by the examiner. Instead, during prosecution of the '930 Patent, Lastinger was provided in an IDS with over 700 other references. Moreover, although the specification for the '930 Patent identified the application number of Lastinger and incorporated it by reference, the applicant did not disclose that the identified application published as Lastinger more than one year before the priority date of the '930 Patent. Nor did the applicant make any attempt to identify that Lastinger disclosed each of the limitations of the pending claims. Thus, Lastinger was buried with hundreds of other references and not effectively before the examiner. As a result, the examiner allowed the claims of the '930 Patent based on the filing of a terminal disclaimer and without issuing a substantive rejection of the claims over the prior art.

**B. The Board Should Not Deny Institution Under 35 U.S.C. § 314(a)**

Related to the Director’s June 2022 interim guidance regarding application of the *Fintiv* factors<sup>4</sup>, this Petition is particularly strong in the underlying merits as it demonstrates that the exact functionality and structure recited in the claims existed in the prior art. Thus, under the Interim Guidance, the Board should not deny institution.

Nevertheless, the Board’s decision in *Sotera Wireless, Inc. v. Masimo Corp.*, IPR2020-01019, Paper 12 (Dec. 1, 2020) instructs that a holistic view of the remaining *Fintiv* factors also weighs in favor of institution.

Factor 1 is neutral because no request for stay has been filed.

Under factor 2, the trial date in the Related Litigation has been set for October 20, 2025, but that is not a date certain, considering the “Court’s long-standing practice ... to set multiple cases to begin trial on the same day,” which can result in the court having a “backlog of cases to try later.” *Atlas Global Techns. LLC v. TP-Link Techns. Co., Ltd., et al.*, Case No. 2:21-cv-00430-JRG, Dkt. 295 (E.D.Tex. Aug. 24, 2023). A Final Written Decision is expected in the

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<sup>4</sup> Interim Procedure For Discretionary Denials In AIA Post Grant Proceedings With Parallel District Court Litigation, PTO Director’s Memorandum (June 21, 2022).

present matter in December of 2025. Thus, this factor is neutral or only slightly favors discretionary denial.

Factor 3 favors institution. The Markman hearing is scheduled for April 30, 2025, with fact discovery closing on May 16, 2025, and expert discovery closing on July 3, 2025. Thus, the Related Litigation is in its early stages, and the investment in it has been minimal.

Under factor 4, there will not be complete overlap in the issues raised in the IPR and the Related Litigation. Although Petitioners challenge here all claims asserted in the Related Litigation, PO has asserted over 400 claims from seven patents in the Related Litigation – an amount that, both individually and collectively, far exceeds the number of claims that the district court will allow to be presented at trial. See <https://txed.uscourts.gov/?q=model-order-focusing-patent-claims-and-prior-art-reduce-costs>. (Model Order limiting patentees to a “Final Election of Asserted Claims, which shall identify no more than five asserted claims per patent from among the ten previously identified claims and no more than a total of 16 claims”). Given that the patentee will likely be limited to only five claims from the ’930 patent (at most), it is highly unlikely the district court will be addressing the validity of all of the claims challenged by this Petition.

Under factor 5, Petitioner Nokia of America Corporation is not a defendant in the Related Litigation. Nokia of America Corporation is a supplier to other

customers not involved in the Related Litigation and thus has an independent basis to seek review of the '930 Patent, separate and apart from the liability at issue in the Related Litigation. Thus, Petitioner Nokia of America Corporation is not the same party under *Sotera*. Therefore, this factor favors institution.

Under factor 6, other circumstances weigh in favor of institution. Here, the merits of the Petition are particularly strong. For example, Lastinger is directed at the same problem and proposes the same solution as the '930 Patent, and discloses identical architecture and the identical concepts disclosed in the '930 Patent, demonstrating that the Petition is particularly strong in the underlying merits.

When viewed holistically, the timing of the present Petition is reasonable, there has been relatively limited investment in the Related Litigation, and there is minimal overlap between the present IPR and the Related Litigation. Coupling these *Fintiv* considerations with the compelling evidence of unpatentability presented in the Petition, the efficiency and integrity of the IPR process is best served by instituting review.

## **IX. Mandatory Notices Under 37 C.F.R. §42.8**

### **A. Real Parties-in-Interest (37 C.F.R. § 42.8(b)(1))**

The real parties-in-interest in this Petition are Nokia of America Corporation, T-Mobile USA, Inc., AT&T Mobility LLC, AT&T Mobility LLC II,

and AT&T Services, Inc.<sup>5</sup> No other parties have directed, funded, or controlled the filing of this IPR, and this IPR was not filed at the behest of any other party.

**B. Related Matters (37 C.F.R. § 42.8(b)(2))**

**1. Judicial Matters**

As of the filing date of this Petition and to the best knowledge of Petitioners, the '930 Patent is involved in the following litigations:

- *Woodbury Wireless LLC v. AT&T Corp. et al.* U.S.D.C. EDTX Case No. 2:24-cv-00099-JRG; and

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<sup>5</sup> Out of an abundance of caution, Petitioners identifies all current defendants in the below identified cases as potential real parties in interest only for the purpose of this proceeding and only to the extent that Patent Owner contends that these separate legal entities should be named real parties in interest in this IPR.

Petitioners do so to avoid the potential expenditure of resources to resolve such a challenge. Petitioners also acknowledges that they have a number of affiliates. No unnamed entity is funding, controlling, or otherwise has an opportunity to control or direct Petitioners or Petitioners' participation in any resulting IPR. Petitioners are also not aware of any affiliate that would be barred from filing this Petition under 35 U.S.C. § 315(e).

- *Woodbury Wireless LLC v. T-Mobile USA, Inc.* U.S.D.C. EDTX Case No. 2:24-cv-00088-JRG.

These are referenced collectively herein as the “Related Litigation(s).”

Different entities unrelated to Petitioners filed IPR2023-01364 which challenges U.S. Pat. No. 10,211,895 which is related to the ’930 patent challenged herein. P-TACTS indicates that IPR2023-01364 was terminated as a result of settlement.

## 2. Administrative Matters

As of the filing date of this Petition and to the best knowledge of Petitioners, the ’930 Patent was not subject to any administrative matters.

## 3. Related Patents

*See* EX-1016.

### C. Lead/Back-up Counsel (37 C.F.R. § 42.8(b)(3)):

#### **Lead Counsel:**

Kevin Anderson, USPTO Reg. No. 43,471  
DUANE MORRIS LLP, 901 New York Ave. NW Suite 700 East,  
Washington, D.C. 20001  
P: (202) 776-5213; [KPAnderson@duanemorris.com](mailto:KPAnderson@duanemorris.com)

#### **Back-Up Counsel:**

Patrick D. McPherson, USPTO Reg. No. 46,255  
DUANE MORRIS LLP, 901 New York Ave. NW Suite 700 East,

Washington, D.C. 20001

P: (202) 776-5214; [PDMcPherson@duanemorris.com](mailto:PDMcPherson@duanemorris.com)

**D. Notice of Service Information (37 C.F.R. § 42.8(b)(4)):**

Please direct all correspondence to lead and back-up counsel at the above addresses. Petitioners consent to electronic service at the email addresses above.

## **X. CONCLUSION**

Petitioners request the Board institute *inter partes* review and then cancel all Challenged Claims.

Respectfully submitted,

DUANE MORRIS LLP

BY: /Kevin P. Anderson/

Kevin P. Anderson

USPTO Reg. No. 43,4715

Duane Morris LLP

901 New York Ave. NW

Suite 700 East,

Washington, D.C. 20001

Dated: October 17, 2024

**CERTIFICATION OF SERVICE ON PATENT OWNER**

Pursuant to 37 C.F.R. §§ 42.6(e), 42.8(b)(4) and 42.105, the undersigned certifies that on the 17th of October, 2024, a complete and entire copy of this Petition for *Inter Partes* Review of U.S. Patent No. 9,496,930 and all supporting exhibits were served by agreement via email to the following litigation counsel for Patent Owner::

Clifford Chad Henson (Bar No. 24087711)  
chenson@devlinlawfirm.com  
Timothy Devlin  
tdevlin@devlinlawfirm.com  
Derek Dahlgren (pro hac vice to be filed)  
ddahlgren@devlinlawfirm.com  
1526 Gilpin Avenue  
Wilmington, Delaware 19806  
Telephone: (302) 449-9010  
Facsimile: (302) 353-4251

/Kevin P. Anderson  
Kevin P. Anderson, Reg. No. 43,471  
901 New York Ave. NW  
Suite 700 East  
Washington, D.C. 20001  
P: (202) 776-7800  
F: (202) 776-7801  
kpanderson@duanemorris.com

*ATTORNEY FOR PETITIONERS*

**CERTIFICATE OF COMPLIANCE**

Pursuant to 37 C.F.R. § 42.24 *et seq.*, the undersigned certifies that this document complies with the type-volume limitations. This document contains 13,941 words as calculated by the “Word Count” feature of Microsoft Word 2010, the word processing program used to create it.

Dated: October 17, 2024

By: Kevin P. Anderson  
Kevin P. Anderson  
Reg. No. 43,471  
Duane Morris LLP  
901 New York Ave. NW  
Suite 700 East,  
Washington D.C., 20001  
P: (202) 776-7800  
F: (202) 776-7801  
kpanderson@duanemorris.com