IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TYLER DIVISION

ADAPTIX, INC., **Plaintiff**, **v.** **ALCATEL-LUCENT USA, INC. and AT&T MOBILITY LLC,** **Defendants**.	§	No. 6:12CV22
ADAPTIX, INC., **Plaintiff**, **v.** **ALCATEL-LUCENT USA, INC. and CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS,** **Defendants**.	§	No. 6:12CV122
ADAPTIX, INC., **Plaintiff**, **v.** **ALCATEL-LUCENT USA, INC. and SPRINT SPECTRUM, L.P.,** **Defendants**.	§	No. 6:12CV123
ADAPTIX, INC., **Plaintiff**, **v.** **AT&T MOBILITY LLC, ERICSSON INC., METROPCS COMMUNCIATIONS, INC., and TELEFONAKTIEBOLAGET LM ERICSSON,** **Defendants**.	§	No. 6:13CV49

ADAPTIX, INC., **Plaintiff**, **v.** **AT&T MOBILITY LLC, ERICSSON INC., METROPCS COMMUNCIATIONS, INC., and TELEFONAKTIEBOLAGET LM ERICSSON,** **Defendants**.	§	No. 6:13CV50
ADAPTIX, INC., **Plaintiff**, **v.** **T-MOBILE USA, INC.,** **Defendants**.	§	No. 6:12CV369

MEMORANDUM OPINION AND ORDER

The above-referenced case was referred to the undersigned United States Magistrate Judge for pre-trial purposes in accordance with 28 U.S.C. § 636. Before the Court are Plaintiff's Opening Claim Construction Brief (Dkt. No. 112), Defendants' response (Dkt. No. 118), Plaintiff's reply (Dkt. No. 128), and Defendants' sur-reply (Dkt. No. 129). Also before the Court are the parties' Local Patent Rule ("P.R.") 4-3 Joint Claim Construction and Prehearing Statement (Dkt. No. 100) and P.R. 4-5(d) Joint Claim Construction Chart (Dkt. No. 133, Ex. A).

A claim construction hearing, in accordance with *Markman v. Westview Instruments, Inc.*, 52 F.3d 967 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996), was held in Tyler on February 13, 2014. After hearing the arguments of counsel and reviewing the relevant pleadings, presentation materials, other papers, and case law, the Court finds the disputed terms of the patents-in-suit should be construed as set forth herein.

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I. BACKGROUND

Plaintiff brings suit alleging infringement of United States Patents No. 6,870,808 ("'808 Patent"), 6,904,283 ("'283 Patent"), 7,072,315 ("'315 Patent"), 7,146,172 ("'172 Patent"), and 7,573,851 ("'851 Patent") (collectively, the "patents-in-suit").

In general, the patents-in-suit relate to wireless communications, such as for cellular telephones. More specifically, the patents-in-suit relate to orthogonal frequency division multiple access ("OFDMA"), in which the communication frequency bandwidth is divided into smaller "subcarriers." These subcarriers are at closely-spaced frequencies but are "orthogonal," meaning that they do not substantially interfere with one another. The patents-in-suit disclose systems and methods for allocating subcarriers among multiple "subscribers," such as mobile cellular telephone units.

The '808 Patent, titled "Channel Allocation in Broadband Orthogonal Frequency-Division Multiple-Access/Space-Division Multiple-Access Networks," issued on March 22, 2005, and bears a filing date of October 18, 2000.

The '283 Patent, titled "Multi-Carrier Communications with Group-Based Subcarrier Allocation," issued on June 7, 2005. The '172 Patent, titled "Multi-Carrier Communications with Adaptive Cluster Configuration and Switching," issued on December 5, 2006. The '283 Patent and the '172 Patent are both continuations-in-part of United States Patent No. 6,947,748 ("'748 Patent"), which bears a filing date of December 15, 2000.[1]

The '851 Patent, titled "Method and System for Switching Antenna and Channel Assignments in Broadband Wireless Networks," issued on August 11, 2009, and bears a filing date of December 7, 2004.

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[1] Defendants submit that the '283 Patent and the '172 Patent share a common specification. Dkt. No. 118 at 4. Plaintiff disagrees. Dkt. No. 122 at 2 n.2.

The ‘315 Patent, titled “Medium Access Control for Orthogonal Frequency-Division Multiple-Access (OFDMA) Cellular Networks,” issued on July 4, 2006, and bears a filing date of October 10, 2000.

Plaintiff’s opening brief submits that Plaintiff is asserting Claims 1, 2, 4, 9, 13-15, 21, 31, 32, 34 and 41 of the ’808 Patent, Claims 24-28, 30, 32, 33, 35, 38, 40, 43, 44, 46, 70, 73-76, 78, 80, 81, 83, 85, 86, 91-94, 96, 98, 99, 101, 102, 104, 105, 107, 109, 116, 118 and 119 of the ’283 Patent, Claims 1, 2, 4, 5, 7-10, and 13 of the ‘172 Patent, Claims 20, 24, 25, 27, and 28 of the ‘851 Patent, and Claims 1-20, 22-28, 30, 32, 33, and 35 of the ’315 Patent. The accused products operate in accordance with certain LTE (“Long Term Evolution”) wireless communication standards, which are sometimes referred to in common parlance as “4G LTE.”

While the parties were briefing claim construction in the above-captioned case, Judge Paul Grewal of the Northern District of California held a claim construction hearing on December 19, 2013, in *Adaptix, Inc. v. Motorola Mobility LLC, et al.*, No. 5:13-cv-1774, and related cases in that district. Those proceedings concerned the above-mentioned ‘748 Patent as well as United States Patent No. 7,454,212. Judge Grewal entered a claim construction order that same day. *Id.*, Dkt. No. 123 (N.D. Cal. Dec. 19, 2013) (attached to Defendants’ response brief in the above-captioned cases as Exhibit E). Judge Grewal’s claim construction order contains no analysis but states that “a complete opinion will issue before entry of any judgment.” *Id.* at 4.

II. LEGAL PRINCIPLES

The claims of a patent define the invention to which the patentee is entitled the right to exclude. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). Claim terms are given their ordinary and customary meaning to one of ordinary skill in the art at the time of the invention, unless there is clear evidence in the patent's specification or prosecution history that the patentee intended a different meaning. *Phillips*, 415 F.3d at 1312-13. Claim construction is informed by the intrinsic evidence: the patents' specifications and file histories. *Id.* at 1315-17. Courts may also consider evidence such as dictionary definitions and treatises to aid in determining the ordinary and customary meaning of claim terms. *Phillips*, 415 F.3d at 1322. Further, "[o]ther claims, asserted and unasserted, can provide additional instruction because 'terms are normally used consistently throughout the patent.'" *SmartPhone Techs. LLC v. Research in Motion Corp.*, No. 6:10-CV-74-LED-JDL, 2012 WL 489112, at *2 (E.D. Tex. Feb. 13, 2012) (citing *Phillips*, 415 F.3d at 1314). "Differences among claims, such as additional limitations in dependent claims, can provide further guidance." *Id.*

A court should "avoid the danger of reading limitations from the specification into the claim[s]." *Phillips*, 415 F.3d at 1323. For example, "although the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments." *Id.* The Federal Circuit has "expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment." *Id.* This is not only because of the requirements of Section 112 of the Patent Act, but also because "persons of ordinary skill in the art rarely would confine their definitions of terms to the exact representations depicted in the embodiments." *Id.* Limitations from the specification should only be read into the claims if the patentee "acted as his own lexicographer and imbued the claim terms with a particular meaning or disavowed or disclaimed scope of coverage, by using words or expressions of manifest exclusion or restriction." *E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1369 (Fed. Cir.

2003) (citations omitted); *Thorner v. Sony Computer Entm't Am. LLC*, 669 F.3d 1362, 1367 (Fed. Cir. 2012).

Similarly, the prosecution history may not be used to infer the intentional narrowing of a claim absent the applicant's clear disavowal of claim coverage. *Superguide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (citations omitted). "To be given effect, such a disclaimer must be made with reasonable clarity and deliberateness." *Id.*

Guided by these principles of claim construction, this Court directs its attention to the patents-in-suit and the disputed claim terms.

III. CONSTRUCTION OF AGREED TERMS

The Court hereby adopts the following agreed-upon constructions:

Term	Patent / Claims	Agreed Construction
"OFDMA"	'315 Patent, Claims 1, 3, 7, 8, 12, 18, 22, 23, 24, 27, 32	"Orthogonal Frequency Division Multiple Access"
"OFDM"	'315 Patent, Claims 27, 30, 32, 33	"Orthogonal Frequency Division Multiplexing"
"uplink"	'315 Patent, Claims 2, 7, 10-12, 18, 32	"subscriber to base station"
"downlink"	'315 Patent, Claims 2, 7, 10-12, 18, 32	"base station to subscriber"
"SINRs"	'808 Patent, Claims 9 and 41	"Signal-to-Interference-plus-Noise Ratios"
"OFDMA"	'808 Patent, Claims 1, 9, 14, 15, 31, 32, 41	"Orthogonal Frequency Division Multiple Access"
"selection" / "selected"	'283 Patent, Claims 24, 70, 92, 116, 119	"choice" / "chosen"
"SINR"	'283 Patent, Claims 24, 35, 85, 101, 104, 116	"Signal-to-Interference-plus-Noise Ratio"

"an orthogonal frequency division multiplexing (OFDM) transceiver"	'283 Patent, Claims 116, 119	"a component that transmits and receives orthogonal frequency division multiplexing (OFDM) signals"
"antenna resource"	'851 Patent, Claim 25	"a single antenna that is used, or a sub-array of antennas that are collectively used, to transmit and/or receive signals from subscribers"
"uplink . . . channels"	'851 Patent, Claims 20, 28	"channels used for subscriber to base station transmission"
"downlink . . . channels"	'851 Patent, Claims 20, 28	"channels used for base station to subscriber transmission"

Dkt. No. 100, Ex. A at 1-2.

IV. CONSTRUCTION OF DISPUTED TERMS IN THE '172 PATENT

A. "diversity cluster of subcarriers," "diversity cluster," and "coherence cluster"

"diversity cluster of subcarriers" and "diversity cluster" (Claims 1, 4, 5, 10, 13)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"logical unit of at least two disjoint, physical subcarriers spread over the spectrum to achieve frequency diversity"	"defined logical unit of multiple physical subcarriers, where the physical subcarriers are mapped to the logical unit so that at least some of the subcarriers are non-consecutive with and spread far apart from all other subcarriers of the logical unit"
"coherence cluster" (Claims 1, 7, 13)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"logical unit of multiple physical subcarriers that are close together such that their channel response is roughly the same"	"defined logical unit of multiple physical subcarriers, where the physical subcarriers are mapped to the logical unit so that they are consecutive or close together"

Dkt. No. 112 at 5 & 6; Dkt. No. 118 at 6.

(1) The Parties' Positions

Plaintiff argues that Defendants' proposals "inappropriately import[] limitations from the specification," such as requiring a "defined" unit, "mapping" subcarriers to clusters, and spreading subcarriers "far apart from all other subcarriers." Dkt. No. 112 at 5; *see id.* at 6. Plaintiff argues that "the issue is whether the subcarriers as a unit are within a coherence bandwidth (where the channel response is roughly the same) or beyond a coherence bandwidth (so as to provide frequency diversity)." *Id.* at 6.

Defendants respond that the terms "diversity cluster" and "coherence cluster" refer to "two distinct and mutually-exclusive categories of clusters of subcarriers." Dkt. No. 118 at 6. Defendants explain that "when subcarriers are mapped to the logical unit *because* those subcarriers are close together the logical unit is called a 'coherence cluster.' By contrast, when subcarriers are mapped to a logical unit *because* those subcarriers are spread far apart, the logical unit is called a 'diversity cluster.'" *Id.* at 7 (citing '172 Patent at 15:3-5 & 15:8-11) (emphasis added; footnote omitted).[2]

As to Plaintiff's proposals, Defendants respond that "the additional feature that the subcarriers must have roughly the same channel response" is an "optional *preferred* characteristic of a coherence cluster," and "the additional feature that the subcarriers must have different channel responses (actually having achieved frequency diversity) is identified as an

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[2] Defendants also submit: "[Plaintiff's] infringement theory identifies as a 'diversity cluster' a collection of subcarriers that are allocated with absolutely no regard for whether they are close together or spread apart, and with no regard for whether those subcarriers have the same or different channel responses. Instead, [Plaintiff's] theory relies on their assumption that in at least some cases, at least some subcarriers will by happenstance be non-contiguous." Dkt. No. 118 at 7.

optional *preferred* feature" of a "diversity cluster." *Id.* at 8-9 (citing '172 Patent at 14:32-38). Along these lines, Defendants also argue claim differentiation as to Claims 7 and 10. *Id.* at 9-10. Finally, Defendants submit that "[i]n every embodiment shown in the '172 Patent, every subcarrier of the diversity cluster is chosen to be spread apart from every other subcarrier of the diversity cluster, while every subcarrier in a coherence cluster is chosen to be contiguous with another subcarrier in the coherence cluster." *Id.* at 10 (citing '172 Patent at 14:43-53, 15:26-36, 16:61-63 & Figs. 9, 10 & 12).

Plaintiff replies that Defendants' proposal of "spread far apart" would read out the embodiment illustrated in Figure 9 of the '172 Patent. Dkt. No. 128 at 6. Plaintiff also argues that Defendants' proposals err by "equating coherence to close and diversity to far which is clearly incorrect." *Id.* Plaintiff explains: "Coherence doesn't mean close in the sense that Defendants assert in their construction; it means the responses are roughly equal over a certain range of frequencies. Likewise, diversity doesn't mean far in the sense Defendants[] assert; it means a diverse set of responses over a certain range of frequencies." *Id.* at 6-7.

At the February 13, 2014 hearing, Defendants argued that Plaintiff's proposed constructions blur the distinction between diversity and coherence clusters and would allow for post hoc, retrospective identification of such clusters. Defendants also urged that clusters must be classified prior to allocation because otherwise it would be impossible to determine or change the ratio between the types of clusters as required in dependent Claim 9. Defendants further argued that Plaintiff's proposals would eliminate any differentiation between Claim 1 and dependent Claim 7.

Plaintiff responded that Defendants' proposals are far too narrow because, for example, a coherence cluster need not include any adjacent subcarriers. Instead, Plaintiff argued, the issue is the spread between the "outermost" subcarriers in the cluster. Plaintiff also proposed the following alternative constructions: "coherence cluster" means "logical unit of multiple physical subcarriers that are close together such that the outer subcarriers are close to each other"; and "diversity cluster" means "logical unit of at least two disjoint, physical subcarriers spread over the spectrum to make probable that the outermost subcarriers in the cluster are outside the coherence bandwidth."

(2) Analysis

Claims 1, 7, 9, and 10 of the '172 Patent are representative and recite (emphasis added):

> 1. A method for use in allocating subcarriers in an OFDMA system comprising
> allocating at least one *diversity cluster of subcarriers* to a first subscriber; and
> allocating at least one *coherence cluster* to a second subscriber, such that communication with the first and second subscribers is able to occur by simultaneously using the at least one *diversity cluster* and the at least one *coherence cluster*, respectively.
>
> * * *
>
> 7. The method defined in claim 1 wherein subcarriers of one *coherence cluster* are within the coherent bandwidth of a channel between a base station and a subscriber.
>
> * * *
>
> 9. The method defined in claim 1 further comprising reconfiguring cluster classification[3] when population of mobile and fixed subscribers in a cell changes.
>
> 10. The method defined in claim 1 wherein the at least one *diversity cluster* is configured to reduce the effect of inter-cell interference.

The specification discloses "coherence clusters" and "diversity clusters" by contrasting them with one another:

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[3] As noted below, the parties have agreed that the term "reconfiguring cluster classification" means "changing the ratio of the number of diversity clusters to the number of coherence clusters." *See* Dkt. No. 133, Ex. A at 41.

Intelligent Switching between Coherence and Diversity Clusters

In one embodiment, *there are two categories of clusters*: *coherence clusters, containing multiple subcarriers close to each other* and *diversity clusters, containing multiple subcarriers with at least some of the subcarriers spread far apart* over the spectrum. The closeness of the multiple subcarriers in coherence clusters is *preferably* within the channel coherence bandwidth, i.e. the bandwidth within which the channel response remains roughly the same, which is typically within 100 kHz for many cellular systems. On the other hand, the spread of subcarriers in diversity clusters is *preferably* larger than the channel coherence bandwidth, typically within 100 kHz for many cellular systems. Of course, the larger the spread, the better the diversity. Therefore, a general goal in such cases is to maximize the spread.

FIG. 9 illustrates exemplary cluster formats for coherence clusters and diversity clusters for Cells A C. Referring to FIG. 9, for cells A C, the labeling of frequencies (subcarriers) indicates whether the frequencies are part of coherence or diversity clusters. For example, those frequencies labeled 1 8 are diversity clusters and those labeled 9 16 are coherence clusters. For example, all frequencies labeled 1 in a cell are part of one diversity cluster, all frequencies labeled 2 in a cell are part of another diversity cluster, etc., while the group of frequencies labeled 9 are one coherence cluster, the group of frequencies labeled 10 are another coherence cluster, etc. The diversity clusters can be configured differently for different cells to reduce the effect of inter-cell interference through interference averaging.

‘172 Patent at 14:25-55 (emphasis added).

FIG. 12 illustrates a reconfiguration of cluster classification which can support more mobile subscribers than that in FIG. 9.

Id. at 16:61-63. Figures 9 and 12 are reproduced here:

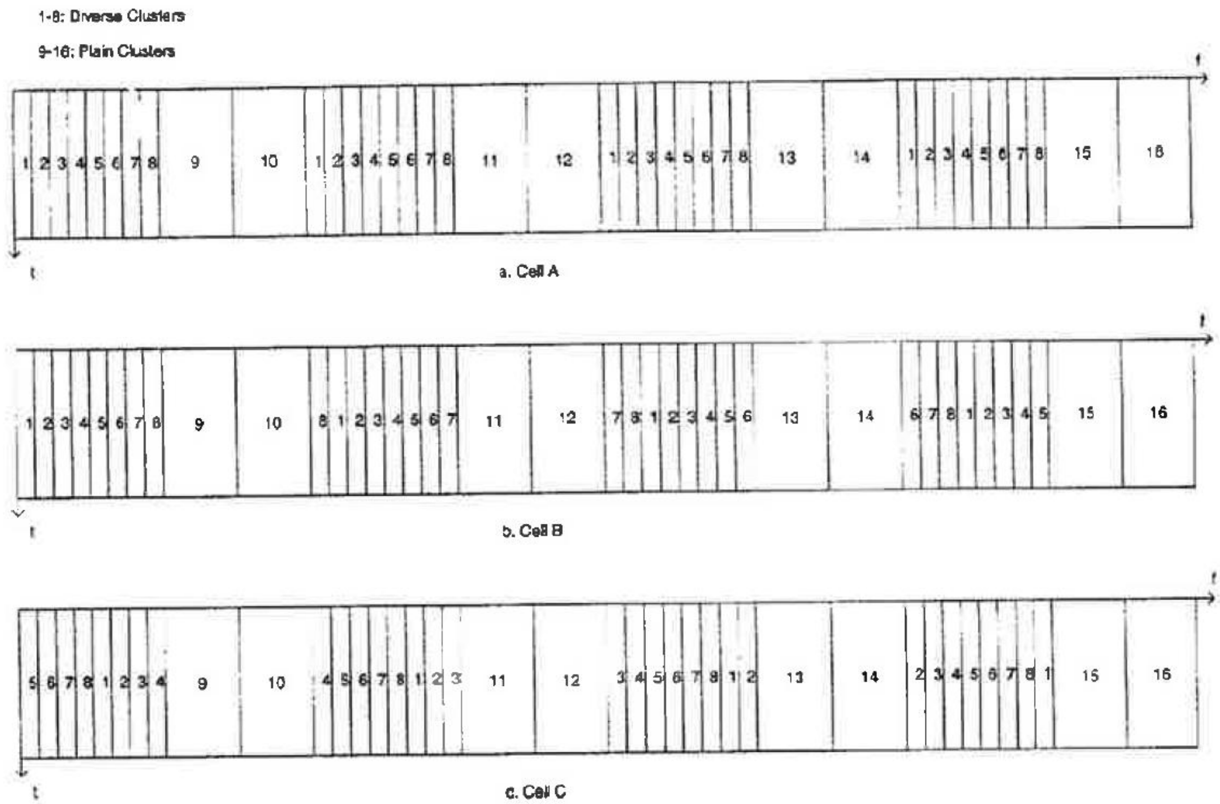

Figure 9

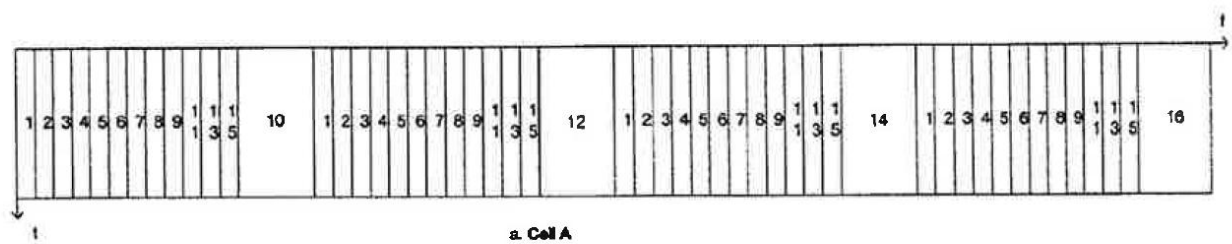

Figure 12

The specification further discloses:

Since the subcarriers in a coherence cluster are consecutive or close (e.g., within the coherent bandwidth) to each other, they are likely within the coherent bandwidth of the channel fading. Therefore, the channel gain of a coherence cluster can vary significantly and cluster selection can greatly improve the performance. On the other hand, the average channel gain of a diversity cluster has less of a degree of variation due to the inherent frequency diversity among the multiple subcarriers spread over the spectrum. With channel coding across the subcarriers within the cluster, diversity clusters are more robust to cluster mis-

> selection (by the nature of diversification itself), while yielding possibly less gain from cluster selection. Channel coding across the subcarriers means that each codeword contains bits transmitted from multiple subcarriers, and more specifically, the difference bits between codewords (error vector) are distributed among multiple subcarriers.
>
> * * *
>
> *For static subscribers, such as in fixed wireless access, the channels change very little over time. Selective cluster allocation using the coherence clusters achieves good performance. On the other hand, for mobile subscribers, the channel time variance (the variance due to changes in the channel over time) can be very large.* A high-gain cluster at one time can be in deep fade at another. Therefore, cluster allocation needs to be updated at a rapid rate, causing significant control overhead. In this case, *diversity clusters can be used to provide extra robustness and to alleviate the overhead of frequent cluster reallocation*. In one embodiment, cluster allocation is performed faster than the channel changing rate, which is often measured by the channel Doppler rate (in Hz), i.e. how many cycles the channel changes per second where the channel is completely different after one cycle. Note that selective cluster allocation can be performed on both coherence and diversity clusters.

Id. at 15:3-60 (emphasis added).

Plaintiff's proposed constructions refer to "achiev[ing] frequency diversity" and to having "channel response [that] is roughly the same," respectively. On balance, these phrases express desired results rather than mechanisms by which subcarriers could be clustered. *See* '172 Patent at 14:32-38 (quoted above). Moreover, these phrases are vague and would potentially require construction themselves. Plaintiff's proposals, which would thus tend to confuse rather than clarify the scope of the claims, are therefore rejected.

As to the proper constructions, referring to the coherence bandwidth would facilitate evaluation of whether a particular cluster constitutes a coherence cluster or a diversity cluster. Indeed, the disclosure that the coherence bandwidth "is typically within 100 kHz for many cellular systems" is a useful point of reference. *Id.* Such constructions, however, would improperly limit the claims to a particular preferred embodiment because the specification uses the word "preferably" and the phrase "in one embodiment" when referring to the coherence bandwidth. *Id.*; *see Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments."). Moreover, claim differentiation between Claims 1 and 7 (quoted above) weighs in favor of finding that a coherence cluster need not necessarily be within a coherent bandwidth. *See, e.g., Nazomi Commc'ns, Inc. v. Arm Holdings, PLC*, 403 F.3d 1364, 1370 (Fed. Cir. 2005) ("The concept of claim differentiation normally means that limitations stated in dependent claims are not to be read into the independent claim from which they depend.") (citations and internal quotation marks omitted). Thus, although reference to the coherence bandwidth would be convenient, the canons of claim construction ultimately demand rejection of any such constructions.

Instead, the specification teaches that "coherence" and "diversity" are relative terms because those terms are used in relation to one another. For example, the specification explains that in network environments having both fixed subscribers and mobile subscribers, coherence clusters can provide higher performance for fixed subscribers whereas diversity clusters are more reliable for mobile subscribers. *See* '172 Patent at 15:44-16:9; *see also id.* at 15:8-11 (noting that "the average channel gain of a diversity cluster has *less* of a degree of variation" as compared to a coherence cluster) (emphasis added). The degrees of "coherence" and "diversity," as well as the relative number of coherence clusters and diversity clusters, are specific to the particular network environment in which the claimed invention is implemented. *See id.* at 16:56-63 & Figs. 9 & 12 (reproduced above).

Admittedly, defining "diversity cluster" and "coherence cluster" with respect to one another is circular, and circularity in claim constructions is generally disfavored. *See ACTV, Inc.*

v. Walt Disney Co., 346 F.3d 1082, 1086, 1090 (Fed. Cir. 2003) (rejecting district court construction of the term "Internet *address*" as meaning "a particular host on the Internet, specified by a *uniform resource locator* that is unique to that host" because district court construed "*uniform resource locator*" to mean "the complete *address* of a site on the Internet specifying both a protocol type and a resource location") (emphasis added).

Nonetheless, the specification discloses the disputed terms in such a relative manner, as discussed above, and all of the claims of the '172 Patent require both a diversity cluster *and* a coherence cluster, such that the two are necessarily available for mutual comparison. At the February 13, 2014 hearing, Plaintiff had no objection to construing the disputed terms with reference to one another. Defendants had no objection to this general principle but maintained that the identification of diversity clusters and coherence clusters, by whatever measure, must occur prior to allocation and must be done for the purposes set forth in Defendants' proposed constructions.

Defendants' proposals, however, would arguably exclude the preferred embodiment in which "[t]he closeness of the multiple subcarriers in coherence clusters is preferably within the channel coherence bandwidth, i.e. the bandwidth within which the channel response remains roughly the same." '172 Patent at 14:32-34. This disclosure demonstrates that the subcarriers in a coherence cluster need not be adjacent, or even necessarily "close together," as Defendants propose. Instead, subcarriers that are substantially separated from one another could nonetheless still be within the channel coherence bandwidth. Likewise, Defendants' proposed construction for "diversity cluster" requires that subcarriers are separated and "spaced far apart." If the subcarriers were nonetheless within the same coherence bandwidth, those subcarriers would be more appropriately referred to as a coherence cluster.

Finally, Defendants have failed to identify any reasonably clear definition of, or clear support for, the word "defined," which would tend to confuse rather than clarify the scope of the claims. Defendants' proposed constructions are therefore rejected. Defendants' proposal of the word "defined" is also discussed as to the term "cluster of subcarriers" in the '283 Patent, below.

The Court accordingly hereby construes the disputed terms as set forth in the following chart:

<u>Term</u>	<u>Construction</u>
"diversity cluster of subcarriers" **"diversity cluster"** **(Claims 1, 4, 5, 10, 13)**	**"logical unit of multiple physical subcarriers that are relatively far apart, as compared to the subcarriers of a coherence cluster"**
"coherence cluster" (Claims 1, 7, 13)	**"logical unit of multiple physical subcarriers that are relatively close together, as compared to the subcarriers of a diversity cluster"**

B. "coherent bandwidth"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
"the bandwidth within which the channel response remains roughly the same"	Indefinite

Dkt. No. 112 at 6; Dkt. No. 118 at 11.[4] This disputed term appears in Claim 7.

<u>(1) The Parties' Positions</u>

Plaintiff argues that "the specification explicitly defines 'coherent bandwidth' and 'coherence bandwidth' to mean 'the bandwidth within which the channel response remains roughly the same.'" Dkt. No. 112 (citing '172 Patent at 11:58-60).

[4] Defendants argue this disputed term together with the term "coherent bandwidth" in the '283 Patent.

Defendants respond that "the term defined in the specification is 'channel coherence bandwidth,' not the disputed claim term 'coherent bandwidth.'" Dkt. No. 118 at 12. Defendants also argue that "[t]he phrase 'roughly the same' in [Plaintiff's] proposed construction is an indefinite term of degree and should be rejected" because "[t]he patents provide no guidance for how this bandwidth may be determined for any particular cellular system." *Id.*

Plaintiff replies that Defendants' indefiniteness argument should be rejected because Defendants have not filed a motion for summary judgment on indefiniteness, the deadline for which was November 26, 2013. Dkt. No. 128 at 7. Nonetheless, Plaintiff argues, "it is black-letter law that patent claims can include relativistic terms or terms of degree." *Id.* at 8. Plaintiff further urges that "[c]alculating coherence bandwidths is well known in the art." *Id.*

<u>(2) Analysis</u>

As a threshold matter, Defendants have not filed a motion for summary judgment on indefiniteness, and the Court-ordered deadline for such a motion has passed. *See, e.g.,* Dkt. No. 90, 6/19/2013 Amended Scheduling and Discovery Order at 3 ("Deadline to file motion for summary judgment of indefiniteness": "November 26, 2013"). This is an independent, procedural basis for rejecting Defendants' argument that the disputed term is indefinite.

In addition, turning to the merits, Claim 7 of the '172 Patent recites (emphasis added):

> 7. The method defined in claim 1 wherein subcarriers of one coherence cluster are within the *coherent bandwidth* of a channel between a base station and a subscriber.

The specification discloses:

> In one embodiment, the clusters within each group are spaced apart farther than the *channel coherence bandwidth, i.e. the bandwidth within which the channel response remains roughly the same*. A typical value of coherence bandwidth is 100 kHz for many cellular systems. This improves frequency diversity within each group and increases the probability that at least some of the clusters within a group can provide high SINR. The clusters may be allocated in groups.

‘172 Patent at 11:56-64 (emphasis added).

> Intelligent Switching between Coherence and Diversity Clusters
>
> In one embodiment, there are two categories of clusters: coherence clusters, containing multiple subcarriers close to each other and diversity clusters, containing multiple subcarriers with at least some of the subcarriers spread far apart over the spectrum. The closeness of the multiple subcarriers in coherence clusters is preferably within the *channel coherence bandwidth, i.e. the bandwidth within which the channel response remains roughly the same*, which is typically within 100 kHz for many cellular systems. On the other hand, the spread of subcarriers in diversity clusters is preferably larger than the channel coherence bandwidth, typically within 100 kHz for many cellular systems. Of course, the larger the spread, the better the diversity. Therefore, a general goal in such cases is to maximize the spread.

Id. at 14:25-40 (emphasis added); *see also id.* at 15:3-6 (“Since the subcarriers in a coherence cluster are consecutive or close (e.g., within the coherent bandwidth) to each other, they are likely within the coherent bandwidth of the channel fading.”).

The term “i.e.” may be used restrictively or to provide examples. If the latter, then the patentee has not been lexicographer. *See Pfizer, Inc. v. Teva Pharm., USA, Inc.,* 429 F.3d 1364, 1375 (Fed. Cir. 2005). If the former, then the definition in the specification controls. *See Abbott Labs v. Novapharm Ltd.*, 323 F.3d 1324, 1327, 1330 (Fed. Cir. 2003) (relying on language following “i.e.” as “explicitly defin[ing]” the disputed term). The Court is nonetheless mindful that “[a]n invention may possess a number of advantages or purposes, and there is no requirement that every claim directed to that invention be limited to encompass all of them.” *See, e.g., E-Pass*, 343 F.3d at 1369. On balance, however, the patentee used “i.e.” restrictively in the above-quoted passages.

Thus, the specification explicitly defines “coherence bandwidth” not just once, but twice, and in an identical manner. The patentee’s express definition should be given effect in the Court’s construction. *See, e.g., id.* Although Defendants have pointed out that the specification defines "channel coherence bandwidth" rather than, "coherent bandwidth," the context of the claims and the specification demonstrate that these terms are interchangeable. *See Edwards Lifesciences LLC v. Cook Inc.*, 582 F.3d 1322, 1330 (Fed. Cir. 2009) (finding that "the specification consistently uses the words 'graft' and 'intraluminal graft' interchangeably").

As to Defendants' indefiniteness argument, a person of ordinary skill in the art would understand the significance of the disputed term in the context of the entire specification, including the disclosed example of a typical coherence bandwidth of 100 kHz. '172 Patent at 11:60-61 & 14:34-35; *see, e.g., Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (noting that "a claim term, to be definite, requires an objective anchor"). On balance, Defendants have failed to demonstrate that the phrase "roughly the same" is so unwieldy as to warrant a finding of indefiniteness. *See Deere & Co. v. Bush Hog, LLC*, 703 F.3d 1349, 1359 (Fed. Cir. 2012) ("This court has repeatedly confirmed that relative terms such as 'substantially' do not render patent claims so unclear as to prevent a person of skill in the art from ascertaining the scope of the claim."); *see also Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001) ("If the meaning of the claim is discernible, even though the task may be formidable and the conclusion may be one over which reasonable persons will disagree, we have held the claim sufficiently clear to avoid invalidity on indefiniteness grounds."); *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1249-50 (Fed. Cir. 2008) (noting that the "standard [for finding indefiniteness] is met where an accused infringer shows by clear and convincing evidence that a skilled artisan could not discern the boundaries of the claim based on the claim language, the specification, and the prosecution history, as well as her knowledge of the relevant art area"); *Halo Elec., Inc. v. Pulse Eng'g, Inc.*, 721 F. Supp. 2d 989, 1002 (D. Nev. 2010) (court included "roughly the same" in a construction because "a person with ordinary skill in the art would be able to determine how far apart the [relevant elements] are in the present invention"). For these reasons, as well as the above-noted untimeliness of Defendants' indefiniteness argument, Defendants' indefiniteness argument is hereby expressly rejected.

The Court accordingly hereby construes **"coherent bandwidth"** to mean **"bandwidth within which the channel response remains roughly the same."**

C. "reconfiguring cluster classification"

This disputed term appears in Claim 9. Plaintiff has agreed to adopt Defendants' proposed construction. Dkt. No. 112 at 7. The Court therefore hereby construes **"reconfiguring cluster classification"** to mean **"changing the ratio of the number of diversity clusters to the number of coherence clusters."**[5]

V. CONSTRUCTION OF DISPUTED TERMS IN THE '315 PATENT

A. "joint OFDMA channel allocation," "joint OFDM channel allocation," and "jointly allocated"

"joint OFDMA channel allocation" (Claims 1, 7, 22, 24)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"OFDMA channel allocation at the same time"	"OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers"

[5] Plaintiff's brief states that the now-agreed construction is "changing the ratio of the number of *diversity* clusters to the number of *diversity* clusters." Dkt. No. 112 at 7 (emphasis added). The parties' February 6, 2014 Joint Claim Construction Chart confirms that the double reference to diversity clusters was an error. *See* Dkt. No. 133, Ex. A at 41.

“joint OFDM channel allocation” (Claim 32)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
“OFDM channel allocation at the same time”	“OFDM channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers”
“jointly allocated” (Claim 27)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
“allocated for use at the same time”	“allocated to each subscriber based on uplink and downlink channel characteristics of multiple subscribers”

Dkt. No. 112 at 7; Dkt. No. 118 at 18.

(1) The Parties’ Positions

Plaintiff argues that “the ‘joint allocation’ terms do not need an elaborate construction because the surrounding claim language for each claim captures the notion.” Dkt. No. 112 at 8. Plaintiff submits that the claims, as well as the specification, “describe a centralized solution where information from other users is taken into account when allocating channels.” *Id.* Plaintiff further argues that Defendants’ proposal of channel allocation to “each” subscriber “flatly contradict[s], not just augment[s], claim language.” *Id.* at 9. Finally, Plaintiff argues that Defendants’ proposed “uplink and downlink” limitation “only appears in independent claims 7 and 32. It does not appear in independent claims 1, 22, 24, or 27.” *Id.*

Defendants respond that the remaining disputes as to these terms are: “(1) whether ‘joint’ allocation means allocating based on both uplink and downlink channel characteristics of the multiple subscribers; and (2) whether ‘joint’ allocation occurs for each individual subscriber that is being allocated a channel.” Dkt. No. 118 at 18. Defendants argue that Plaintiff’s reliance on claim differentiation must fail because Plaintiff has misstated the content of the claims. *Id.* at 20. In particular, Defendants urge that the claims differ by reciting different *types* of uplink and downlink channel characteristics. *Id.* at 21. Finally, Defendants submit that "[t]o reflect that the 'joint' allocation for any given subscriber is one where the allocation to an individual subscriber is based on channel characteristics of multiple subscribers, Defendants' construction specifies that the 'joint' allocation occurs for 'each' subscriber." *Id.* at 22.

Plaintiff replies that the specification and the prosecution history explain that joint allocation is allocation taking into account channel characteristics of multiple subscribers. Dkt. No. 128 at 9.

<u>(2) Analysis</u>

Claims 1, 7, and 27 of the '315 Patent are representative and recite (emphasis added):

> 1. A cellular network comprising:
>
> a plurality of subscribers each of said subscribers communicating with one base station of a plurality of base stations using orthogonal frequency division multiple access (OFDMA);
>
> each of said base stations having logic to coordinate multiple-access and information exchange between the base station and the plurality of subscribers, the logic selecting a set of OFDMA traffic channels from a plurality of candidate OFDMA traffic channels, based on feedback OFDMA channel information collected from the plurality of subscribers and OFDMA channel information collected from at least one of the other base stations, and in collaboration with said at least one other base station to provide *joint OFDMA channel allocation* to multiple ones of said plurality of subscribers.
>
> * * *
>
> 7. A method comprising:
>
> sending sounding signals to a plurality of subscribers from a plurality of base stations;
>
> receiving, at each base station, channel condition information for a plurality of OFDMA traffic channels from at least one of said subscribers and at least one other base station; and
>
> performing OFDMA multi-user traffic channel assignment to assign OFDMA traffic channels from the plurality of OFDMA traffic channels to the plurality of subscribers, based on the OFDMA channel condition information

received from at least one of said subscribers and at least one other of said base stations and estimated spatial gains for the *uplink and downlink* signals for the plurality of subscribers, and in collaboration with said at least one other of said base stations to provide *joint OFDMA channel allocation* to multiple ones of said plurality of subscribers.

* * *

27. An apparatus comprising:
an OFDMA channel and noise-plus-interference estimator;
an access signal generator coupled to the estimator;
an OFDM modem coupled to the generator; and
a radio frequency transmitter to transmit information on OFDMA traffic channels *jointly allocated* to a plurality of subscribers through a collaborative OFDMA channel assignment among multiple base stations.

Defendants have argued that Plaintiff's claim differentiation argument must fail because the various claims recite different types of uplink and downlink characteristics. On balance, Defendants' argument is unpersuasive. Because some but not all of the claims explicitly recite the use of "uplink and downlink" channel conditions, the context provided by the claims weighs against Defendants' proposal that joint allocation requires consideration of both uplink and downlink channel characteristics. *See Phillips*, 415 F.3d at 1314 ("Because claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.) (citations omitted); *see also DSW, Inc. v. Shoe Pavilion, Inc.*, 537 F.3d 1342, 1347 (Fed. Cir. 2008) ("The district court erroneously imported [a] [l]imitation directly recited in claims 1-3 into the generally phrased . . . language of claims 4-6"); *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 632 F.3d 1246, 1254-55 (Fed. Cir. 2011) ("Reading a split limitation or an incomplete circle limitation into the term 'spring metal adaptor' would render these additional modifiers superfluous, which weighs against doing so.").

As to the specification, the Background of the Invention states:

> Existing approaches for wireless traffic channel assignment are subscriber-initiated and single-subscriber (point-to-point) in nature. Since the total throughput of a multiple-access network depends on the channel fading profiles, noise-plus-interference levels, and in the case of spatially separately transceivers, the spatial channel characteristics, of *all active subscribers*, distributed or subscriber-based channel loading approaches as [*sic*, are] fundamentally sub-optimum.

'315 Patent at 2:6-13 (emphasis added); *see id.* at 2:30-31 (similar). "FIG. 3 shows an exemplary channel allocation of the OFDMA spectrum with *joint channel* assignment for a pair of users." *Id.* at 2:57-59 (emphasis added). The specification further discloses:

> Overview
>
> A medium access control protocol is described that *centralizes* broadband channel characteristics and noise-plus-interference information measured at spatially distributed subscribers and assigns traffic channels for [an] orthogonal frequency-division multiple-access (OFDMA) network. In one embodiment, the assignment is made using spatial multi-plexing (beamforming).
>
> *In one embodiment*, the medium access control protocol controls channel information feedback from multiple subscribers to the base-station, *estimates spatial processing gains for both uplink (subscriber to base-station) and downlink (base-station to subscriber) communications, and performs joint traffic channel assignment*.
>
> *In one embodiment*, a base-station in a wireless network collects broadband channel and noise-plus-interference information measured at *multiple subscribers*, estimates space-time-frequency diversity gains afforded by spatially separated antennas at the base-station, determines the *uplink and downlink OFDMA traffic channel conditions*, and *jointly assigns* traffic channels to needed subscribers. The assignment may be made to substantially increase the network throughput.

Id. at 4:19-41 (emphasis added).

> *In another embodiment*, the protocol for channel assignment that involves multiple base-stations is disclosed. In such an embodiment, in a multi-cell environment, the base-station within each cell first *estimates the uplink and downlink SINRs across all OFDMA traffic channels for all active and accessing subscribers*. Each base-station may also buffer the QoS requirements (e.g., data rate, time-out, bit error rate, waiting time). *Base-stations in neighboring cells*

> exchange such information before *performing a traffic channel allocation jointly for multiple subscribers*.

Id. at 6:48-57 (emphasis added).

> *The present invention* makes intelligent decisions about channel assignments for multi-users [*sic*] so that *multiple channels are jointly allocated to multiple subscribers* based on which channels have desirable characteristics (e.g., higher gains, lower interference, etc.) for each particular subscriber. FIG. 3 illustrates the performance of multiple sub carriers (channels) for two users, user 1 and user 2, and the resulting allocation for those users based, at least in part, on the channel conditions.

Id. at 7:58-67 (emphasis added).

> In one embodiment, the feedback information includes, but is not limited to, downlink channel and noise-plus-interference characteristics under omni-directional transmission and the data rate requests and other QoS requirements of accessing subscribers. Such information, along with that for ongoing subscribers stored in the traffic channel register and broadband channel information storage 606, as [*sic*, is] forwarded to joint traffic channel allocator 605A for channel assignment.

Id. at 9:47-55.

The specification thus discloses that the terms "joint" and "jointly" refer to using channel information of multiple subscribers. Coupled with the recital of uplink and downlink in some claims but not others, as noted above, this intrinsic evidence demonstrates that the disputed terms do *not* require using both uplink and downlink information. *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments."). Defendants' proposals in that regard are therefore rejected.

Finally, Defendants confirmed at the February 13, 2014 hearing that their proposals of joint allocation for "each" subscriber are not intended to mean that resources for *all* subscribers must be allocated based on information regarding multiple subscribers. Instead, the parties agreed that *for a given subscriber*, allocation is based on channel characteristics of *multiple* subscribers.

The Court therefore hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"joint OFDMA channel allocation" (Claims 1, 7, 22, 24)	**"OFDMA channel allocation to a subscriber based on channel characteristics of multiple subscribers"**
"joint OFDM channel allocation" (Claim 32)	**"OFDM channel allocation to a subscriber based on channel characteristics of multiple subscribers"**
"jointly allocated" (Claim 27)	**"allocated to a subscriber based on channel characteristics of multiple subscribers"**

B. Collaboration Terms

"in collaboration with said at least one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers" (Claim 1)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction needed; see "joint OFDMA channel allocation"; other terms have plain and ordinary meaning	"working together with said at least one other base station to provide OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers on the base station and said at least one other base station"

“in collaboration with said at least one other of said base stations to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers” (Claim 7)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction needed; see “joint OFDMA channel allocation”; other terms have plain and ordinary meaning	“working together with said at least one other of said base stations to provide OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers on the base station and said at least one other base station”

“in collaboration with at least said one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers” (Claim 22)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction needed; see “joint OFDMA channel allocation”; other terms have plain and ordinary meaning	“working together with at least said one other base station to provide OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers on the base station and at least said one other base station”

“in collaboration with at least said second base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers” (Claim 24)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction needed; see “joint OFDMA channel allocation”; other terms have plain and ordinary meaning	“working together with at least said second base station to provide OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers on the first base station and at least said second base station”

“OFDMA traffic channels jointly allocated to a plurality of subscribers through a collaborative OFDMA channel assignment among multiple base stations” (Claim 27)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction necessary; see “jointly allocated”; other terms have plain and ordinary meaning	“OFDMA traffic channels allocated as a result of multiple base stations working together to provide OFDMA channel allocation to each subscriber based on uplink and downlink channel characteristics of multiple subscribers on the multiple base stations”

Dkt. No. 100, Ex. B at 2-4; Dkt. No. 112 at 10-11; Dkt. No. 118 at 22-23.

(1) The Parties’ Positions

Plaintiff argues that “Defendants attempt to use each of the five terms as an opportunity to read in a limitation requiring ‘uplink and downlink characteristics of multiple subscribers.’ This conjunctive reading of uplink and downlink is more restrictive than disclosed by the intrinsic record.” Dkt. No. 112 at 12. Plaintiff explains that Defendants’ proposal would limit the claims to certain preferred embodiments and would also read out other preferred embodiments disclosed in the specification. *Id.*

Defendants respond that “[c]ontrary to [Plaintiff’s] argument that language supporting Defendants’ construction appears only in connection with certain embodiments, this description appears specifically in connection with the only description of a multiple-base-station embodiment, and characterizes the ‘uplink and downlink’ portion of Defendants’ construction as required ‘to enable’ the claimed feature.” Dkt. No. 118 at 25. Defendants also submit that “the ‘315 Patent disparages prior art techniques for relying only on downlink characteristics and failing to ‘jointly’ consider uplink and downlink characteristics.” *Id.* at 26 (citing ‘315 Patent at 2:6-31). Defendants conclude that “[t]he intrinsic evidence uniformly confirms that performing 'joint' channel allocation '*in collaboration with*' another base-station refers to *multiple base-stations working together* to provide channel allocation to each subscriber based on *uplink and downlink* channel characteristics of *multiple subscribers on multiple base-stations*." Dkt. No. 118 at 26.

Plaintiff replies:

> Defendants do not adequately explain why the simple term "collaborative" needs to be re-written as "working together." Likewise, there is no justification for turning "plurality of subscribers" into "each subscriber." The Defendants insert "each" into many of their constructions as a way to create non-infringement arguments. Here, they seem to be requiring that every subscriber be allocated resources each time, which is just not how systems work. Similarly, there is no requirement that the information from the multiple base stations must come from multiple subscribers.

Dkt. No. 128 at 10-11.

(2) Analysis

Claim 1 of the '315 Patent is representative and recites (emphasis added):

> 1. A cellular network comprising:
> a plurality of subscribers each of said subscribers communicating with one base station of a plurality of base stations using orthogonal frequency division multiple access (OFDMA);
> each of said base stations having logic to coordinate multiple-access and information exchange between the base station and the plurality of subscribers, the logic selecting a set of OFDMA traffic channels from a plurality of candidate OFDMA traffic channels, based on feedback OFDMA channel information collected from the plurality of subscribers and OFDMA channel information collected from at least one of the other base stations, and *in collaboration with said at least one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers*.

The specification discloses "jointly" allocating channels for multiple subscribers across multiple base stations:

> In another embodiment, *the protocol for channel assignment that involves multiple base-stations* is disclosed. In such an embodiment, in a multi-cell environment, the base-station within each cell first estimates the *uplink and downlink* SINRs across all OFDMA traffic channels *for all active and accessing*

> *subscribers*. Each base-station may also buffer the QoS requirements (e.g., data rate, time-out, bit error rate, waiting time). *Base-stations in neighboring cells exchange such information before performing a traffic channel allocation jointly for multiple subscribers*.

'315 Patent at 6:48-57 (emphasis added).

> In one embodiment, the feedback information includes, but is not limited to, downlink channel and noise-plus-interference characteristics under omni-directional transmission and the data rate requests and other QoS requirements of accessing subscribers. Such information, along with that for ongoing subscribers stored in the traffic channel register and broadband channel information storage 606, as [*sic*, is] forwarded to joint traffic channel allocator 605A for channel assignment.

Id. at 9:47-55.

> Protocols for Multiple Base-Stations
>
> One application of *joint* traffic channel assignment is *multi-cell* OFDMA networks. In such setup, the network capacity can benefit significantly from dynamic loading/adaptive modulation that increases, and potentially maximizes, the throughput in any given situation. Essentially, *multiple cells can share the overall spectral resources* and provide 'on-demand' traffic channel allocation in a dynamic network.
>
> To enable *joint multi-cell* traffic channel allocation, the base-station within each cell performs uplink and downlink traffic channel estimation using the protocols and schemes described above. In addition, as illustrated in FIG. 9, neighboring base-stations exchange such information through the base-station controller, or dedicated links between base-stations.

Id. at 11:23-37 (emphasis added).

The specification also explains that relying upon measurements of a base station's "omni-directional sounding signal" may be misleading:

> Furthermore, subscriber-initiated loading algorithms are problematic when multiple transceivers are employed as the base-station, since the signal-to-noise-plus-interference ratio (SINR) measured based on an omni-directional sounding signal does not reveal the actual quality of a particular traffic channel with spatial processing gain. In other words, a "bad" traffic channel measured at the subscriber based on the omni-directional sounding signal may very well be a "good" channel with proper spatial beamforming from the base-station.

‘315 Patent at 2:14-23.

For the same reasons as for the “joint OFDMA channel allocation” terms, above, the disputed terms do not require using both uplink and downlink information. *See Phillips*, 415 F.3d at 1323 (“[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments.”). Defendants’ proposals in that regard are therefore rejected.

As to Defendants’ proposal of “working together,” this phrase adds nothing that is not already present in the ordinary meaning of “collaboration.”

Defendants’ proposed constructions are therefore hereby expressly rejected. No further construction is necessary apart from the constructions of the constituent terms “joint . . . allocation” and “jointly allocated,” which are addressed above. *See U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1568 (Fed. Cir. 1997) (“Claim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement. It is not an obligatory exercise in redundancy.”); *see also O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (“[D]istrict courts are not (and should not be) required to construe every limitation present in a patent’s asserted claims.”); *Finjan, Inc. v. Secure Computing Corp.*, 626 F.3d 1197, 1207 (Fed. Cir. 2010) (“Unlike *O2 Micro*, where the court failed to resolve the parties’ quarrel, the district court rejected Defendants’ construction.”).

Nonetheless, to whatever extent Plaintiff maintains that the information from multiple base stations need not pertain to multiple subscribers (*see* Dkt. No. 128 at 11), Plaintiff’s argument is hereby expressly rejected as contrary to the plain language of the disputed terms, which recite—particularly when read in light of the above-quoted portions of the specification—that "joint" allocation involves information regarding multiple subscribers.

The Court therefore hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"in collaboration with said at least one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers" (Claim 1)	**Plain meaning**
"in collaboration with said at least one other of said base stations to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers" (Claim 7)	**Plain meaning**
"in collaboration with at least said one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers" (Claim 22)	**Plain meaning**
"in collaboration with at least said second base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers" (Claim 24)	**Plain meaning**
"OFDMA traffic channels jointly allocated to a plurality of subscribers through a collaborative OFDMA channel assignment among multiple base stations" (Claim 27)	**Plain meaning**

C. OFDMA/OFDM Terms

"subscribers communicating with one base station of a plurality of base stations using orthogonal frequency division multiple access (OFDMA)" (Claim 1)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No construction needed; plain and ordinary meaning	"subscribers communicating with one base station of a plurality of base stations using orthogonal frequency division multiple access (OFDMA) for downlink and uplink communications"

"performing OFDMA multi-user traffic channel assignment" (Claim 7)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction necessary; see "OFDMA"; other terms have plain and ordinary meaning	"assigning downlink and uplink OFDMA traffic channels to multiple subscribers"

"an OFDMA network" (Claim 22)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction necessary; see "OFDMA"; other terms have plain and ordinary meaning	"a network using orthogonal frequency division multiple access (OFDMA) for downlink and uplink communications"

"OFDMA channel assignment" (Claim 32)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction necessary; see "OFDMA"; other terms have plain and ordinary meaning	"OFDMA channel assignment for downlink and uplink communications"

“an OFDM modem” (Claims 27 and 32)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction necessary; see “OFDMA”; other terms have plain and ordinary meaning	“a component that modulates and demodulates orthogonal frequency division multiplexing (OFDM) signals for downlink and uplink communications”

Dkt. No. 100, Ex. B at 4; Dkt. No. 112 at 13.

Plaintiff argues that “[t]he plain meaning of the OFDMA terms as used in the claims is broad. In isolation, the disputed terms all encompass a system employing OFDMA only on the downlink or OFDMA only on the uplink or both. They are not restricted to the conjunction of uplink *and* downlink.” Dkt. No. 112 at 14. In response, Defendants have agreed that these disputed terms “need not be construed at present.” Dkt. No. 118 at 3; *see* Dkt. No. 133, Ex. A at 66-73.

The Court therefore hereby construes these disputed terms to have their **plain meaning**, as now agreed by the parties.

D. “broadband spatial channel estimates”

Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“estimates of the spatial characteristics of frequency selective channels”	“estimates of the spatial characteristics of each of multiple frequency selective traffic channels”

Dkt. No. 112 at 16; Dkt. No. 118 at 26. This disputed term appears in Claim 32.

(1) The Parties’ Positions

Plaintiff argues that whereas its proposal of “frequency selective channels” “provide[s] meaning to the term ‘broadband,’” Defendants’ proposal of “each of multiple traffic channels” is improper because “no such limitation exists in the claim language and the patentee made no such disavowal of claim scope.” Dkt. No. 112 at 16-17. Plaintiff urges that “[t]he intrinsic record confirms that [Plaintiff’s] proposal is correct in allowing the estimated spatial characteristics [to] be of certain traffic channels instead of all (each) of a set of multiple channels as proposed by Defendants.” *Id.* at 17 (citing ‘315 Patent at 4:33-41, 4:59-63, 5:26-47, 9:41-46 & 10:45-64).

Defendants respond that “[t]he intrinsic evidence confirms that the plural term ‘channel estimates’ refers to estimates of *each of multiple channels*.” Dkt. No. 118 at 26.

Plaintiff replies that “‘[b]roadband spatial channel estimates’ could be plural to be grammatically consistent with ‘from subscriber and at least two base stations.’ Nothing in the claim or specification mandate[es] that the estimates be [of] ‘each of multiple frequency selective traffic channels.’” Dkt. No. 128 at 11 (citation omitted).

<u>(2) Analysis</u>

Claim 32 of the ‘315 Patent recites (emphasis added):

> 32. An apparatus comprising:
> at least one spatially separated transceiver;
> an access signal detector and demodulator coupled to the at least one spatially separated transceivers;
> a spatial channel and spatial gain estimator;
> an uplink and downlink signal-to-noise-plus-interference estimator;
> a multi-user traffic channel allocator coupled to said estimators to determine OFDMA channel assignment based on *broadband spatial channel estimates* and measured OFDMA channel and noise-plus-interference information feedback from subscribers and from at least two base stations to provide joint OFDM channel allocation to multiple subscribers; and
> an OFDM modem coupled to the allocator.

The specification discloses:

> In one embodiment, a base-station in a wireless network collects broadband channel and noise-plus-interference information *measured at multiple subscribers*, estimates space-time-frequency diversity gains afforded by spatially separated antennas at the base-station, determines the uplink and downlink OFDMA traffic channel conditions, and jointly assigns traffic channels to needed

> subscribers. The assignment may be made to substantially increase the network throughput.

'315 Patent at 4:33-41 (emphasis added).

> The base-station demodulates the access signals and estimates the broadband spatial processing gains across *all* available OFDMA traffic channels for each of the accessing subscribers (subscribers sending or desiring to send information to the base station).

Id. at 4:59-63 (emphasis added).

> A base-station that communicates with multiple subscribers using OFDMA protocol is also disclosed. In one embodiment, the base-station includes one or more spatially separated transceivers, an access signal detector and demodulator, a broadband spatial channel and spatial gain estimator, an uplink and downlink signal-to-noise-plus-interference calculator, a multi-user traffic channel allocator, and an OFDM modem. The access signal detector and demodulator detects access signals transmitted from subscribers and demodulates the feedback channel gain and noise-plus-interference information measured at the subscribers. Based on the received accessing signals, the spatial channel and spatial gain estimator *estimates the broadband spatial channel, i.e., the spatial characteristics of all or a subset of traffic channel*[*s*], between the base-station and each of the accessing subscribers. The broadband spatial channel estimates, together with the measured channel and noise-plus-interference information feedback from the access subscribers, are used by the multi-user traffic channel allocator to determine a traffic channel assignment and code and modulation combination for each of the accessing subscribers.

Id. at 5:26-47 (emphasis added).

> The row accessing signals are fed to a broadband channel and noise-plus-interference estimator 604, which, together with OFDM demodulator 603, estimates the broadband channel and noise-plus-interference characteristics and decodes the feedback information encoded in the accessing signals.

Id. at 9:41-46.

> Once paged or when the standby subscriber has packets to transmit, the subscriber sends back the measured SINR information to the base-station though one of the access channels. A broadband spatial channel estimator at the base-station estimates the uplink spatial channels:
>
> (a_li, a_2i, . . . , a_Mi), i=1, . . . , K

> where a_m1 is the antenna response of the ith traffic channel from the mth antenna, M is the total number of antenna elements.
>
> Based on the spatial channel estimated [*sic*, estimates], the base-station predicts the “additional” spatial gain of beamforming over omni-directional transmission as, for example,
>
>> G_i=10 log 10(|a_1i|^2+|a_2i|^2+ . . . +|a_Mi|^2)/|a_1i+ a_2i+ . . . +a_Mi|^2[dB], i=1. . . , K.
>
> Many other approaches can be used to estimate the spatial processing gains over omni-directional transmission. Once G_i is calculated, the expected SINR_i over traffic channel i with downlink beamforming can be determined as
>
>> SINR_i,new—SINR_i+G_i, i-1, . . . , K
>
> The above information is used by the traffic channel allocator of the base-station to determine a channel assignment.

Id. at 10:45-67.

On balance, to whatever extent Defendants are arguing that estimates must be made as to *all* channels, Defendants have failed to demonstrate that such a requirement exists in all embodiments. To the contrary, as quoted above, at least one embodiment contemplates that estimates may be made as to less than all channels. *See id.* at 5:26-47. Defendants’ proposed construction is therefore rejected. *See Vitronics Corp. v. Conceptronic Inc.*, 90 F.3d 1576, 1582-83 (Fed. Cir. 1996) (noting that a claim interpretation in which the only embodiment or a preferred embodiment “would not fall within the scope of the patent claim . . . is rarely, if ever, correct and would require highly persuasive evidentiary support”). Nonetheless, Defendants have adequately shown that the disputed term refers to estimates for *multiple* channels, and Plaintiff appears to be in substantive agreement.

The Court therefore hereby construes **“broadband spatial channel estimates”** to mean **“estimates of the spatial characteristics of multiple frequency selective channels.”**

E. "spatial gains" and "spatial gain"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
"increase in capacity associated with spatial processing"	"gain(s) resulting from spatial processing"

Dkt. No. 100, Ex. B at 5; Dkt. No. 112 at 17. These disputed terms appear in Claims 2, 7, 10, and 32.

Plaintiff submits that "[t]he parties disagree whether the gains must 'result' from spatial processing or be 'associated with' spatial processing. Defendants' restrictive 'resulting' language is inconsistent with the plain language of the claims and the specification." Dkt. No. 112 at 17. Plaintiff argues that "[t]his is another attempt by Defendants to import a limitation into the meaning of a term based on how it is used, as opposed to what it is." *Id.* at 18.

In response, Defendants now propose that these disputed terms "need not be construed at present." Dkt. No. 118 at 3; *see* Dkt. No. 133, Ex. A at 83.

Defendants having thus withdrawn their proposal of "resulting," as to which Plaintiff objected, the Court finds that no construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362.

The Court accordingly hereby construes **"spatial gains"** and **"spatial gain"** to have their **plain meaning**.

F. "access signal"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
"signal comprising channel information"	"signal from a subscriber requesting access to a network that is encoded with OFDMA channel and noise-plus-interference information"

Dkt. No. 112 at 18; Dkt. No. 118 at 27. This disputed term appears in Claims 27, 30, 32, and 35.

(1) The Parties' Positions

Plaintiff submits: "Defendants seek to limit the term only to access signals that come 'from a subscriber requesting access to a network.' They point to two cites in support of this position. ['315 Patent at] 5:17-46; 8:15-43. They ignore a third cite that explicitly teaches access signals sent by subscribers other than just accessing subscribers. [*Id.* at] 4:50-58." Dkt. No. 112 at 19.

Defendants respond that their proposed construction "properly recognize[s] the meaning of an access signal in the context of the patent, while [Plaintiff] seeks to improperly read the word 'access' out of the claim and to cover any signal that contains any channel information." Dkt. No. 118 at 27. Defendants explain that "[a]ccess channels are pre-allocated so that 'accessing subscribers,' which do not already have links established with the base-station, can communicate with the base-station and request that channels be assigned." *Id.* (citing '315 Patent at 4:50-54 & 11:16-21). As to Plaintiff's argument that Defendants' proposal is inconsistent with one of the disclosed embodiments, Defendants respond: "That passage describes a subscriber that is seeking access to the network because it has been paged or has packets to send. Such a user does not have a channel assigned and must therefore send an access signal to the base-station. On-going subscribers, who already have established links, need not send such a signal." *Id.* at 28.

Plaintiff replies that "[a] proper construction does not need to define where the signal comes from, only what it is. Moreover, the specification discloses circumstances where the access signal is not from a subscriber requesting access." Dkt. No. 128 at 11 (citing '315 Patent at 4:54-58 & 5:1-24).

(2) Analysis

Claims 27, 30, 32 and 35 of the '315 Patent recite (emphasis added):

27. An apparatus comprising:
an OFDMA channel and noise-plus-interference estimator;
an *access signal* generator coupled to the estimator;
an OFDM modem coupled to the generator; and
a radio frequency transmitter to transmit information on OFDMA traffic channels jointly allocated to a plurality of subscribers through a collaborative OFDMA channel assignment among multiple base stations.

* * *

30. The apparatus defined in claim 29 wherein the OFDM modem modulates the *access signal* and transmits a modulated version of the *access signal* through an access channel.

* * *

32. An apparatus comprising:
at least one spatially separated transceiver;
an *access signal* detector and demodulator coupled to the at least one spatially separated transceivers;
a spatial channel and spatial gain estimator;
an uplink and downlink signal-to-noise-plus-interference estimator;
a multi-user traffic channel allocator coupled to said estimators to determine OFDMA channel assignment based on broadband spatial channel estimates and measured OFDMA channel and noise-plus-interference information feedback from subscribers and from at least two base stations to provide joint OFDM channel allocation to multiple subscribers; and
an OFDM modem coupled to the allocator.

* * *

35. The apparatus defined in [claim] 32 wherein the *access signal* detector and demodulator detects *access signals* transmitted by subscribers and demodulates the measured channel and noise-plus-interference information feedback from subscribers.

Defendants have cited a technical dictionary definition of "access" as meaning the "ability of a user to enter a given network" or the point "at which entry is gained." Dkt. No. 118, Ex. M, *Telephony's Dictionary* 2 (2d ed. 1986). The same dictionary also defines "access attempt" as: "The process by which one or more users interact with a telecommunications system in order to initiate user information transfer." *Id.*

On one hand, Defendants' proposal to construe "access signal" as a signal requesting access is not an unreasonable reading of the term on its face, particularly in light of the above-cited extrinsic dictionary definitions. Defendants' proposal creates no obvious contradiction with any other claim language and is seemingly consistent with the contrast in the specification between "accessing and/or ongoing subscribers." *See, e.g.,* '315 Patent at 4:66-67 & 11:16-21. Further, Plaintiff has agreed that in the '808 Patent, the terms "*new* subscriber" and "*access*ing subscriber" have the same meaning, as noted below.

On the other hand, the specification discloses that "access channels" and "access signals" are used by accessing subscribers and, in some instances, by on-going subscribers:

> When one or more subscribers are paged or when one or more subscribers have packets to transmit to the base-station, such subscribers transmit measured channel and noise-plus-interference information to the base-station through pre-allocated *access channels*. Those *subscribers with links to the base-station already allocated* need not resend their information unless the base-station is performing *retraining* (globally reallocating). The access channels are preallocated by the base station.
>
> The base-station demodulates the *access signals* and estimates the broadband spatial processing gains across all available OFDMA traffic channels for each of the *accessing subscribers (subscribers sending or desiring to send information to the base station*). The results, together with the feedback channel and noise-plus-interference information, are used to determine the optimum set of uplink and downlink traffic channels for *accessing and/or ongoing subscribers*.

'315 Patent at 4:50-67 (emphasis added).

> The access signal generator encodes the channel and noise-plus-interference information to form an *access signal*. The OFDM modem modulates the access signal and transmits the modulated signal through an *access channel*. The access channel is comprised of all or a subset of traffic channels during an access time slot. The *accessing signal* from the subscriber is used by the base-station to perform spatial channel and spatial processing gain estimation for all or a subset of traffic channels and traffic channel assignment.

> * * * The broadband spatial channel estimates, together with the measured channel and noise-plus-interference information feedback from the access subscribers, are used by the multi-user traffic channel allocator to determine a traffic channel assignment and code and modulation combination for each of the accessing subscribers.

Id. at 5:17-46 (emphasis added).

> The *access signal* is transmitted to the base-station through one or more access channels within a dedicated access time slot, such as with signal 402.

Id. at 8:23-26 (emphasis added).

The above-quoted portions of the specification demonstrate that "access" has a broader meaning than Defendants propose, in particular the disclosure that during "retraining (globally reallocating)," "access channels" may be used by "[t]hose subscribers with links to the base-station already allocated." *Id.* at 4:54-57. On balance, the term "access signal" refers to a signal that contains information relevant to a subscriber's access to the network. In other words, although the term relates to subscriber access, the term is not constrained to requesting access.

The Court therefore hereby construes **"access signal"** to mean **"signal comprising channel information."**

VI. CONSTRUCTION OF DISPUTED TERMS IN THE '808 PATENT

A. "spatial signature," "spatial signature vectors," "broadband spatial signature vectors," and "2-D spatial signature vectors"

"spatial signature" (Claims 1, 2, 9, 13, 14, 31, 32, 34, 41)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"spatial characteristics of a channel"	No separate construction needed apart from other terms that include this term

"spatial signature vectors" (Claims 1, 2, 3, 13, 14)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"vectors representing spatial characteristics of channels"	No separate construction needed apart from other terms that include this term

"broadband spatial signature vectors" and "2-D spatial signature vectors" (Claims 1, 2, 13, 14)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"vectors representing a set of spatial signatures that are a function of frequency"	"relative complex gains (amplitude and phase patterns) of a transmitted signal received by an antenna array for each of multiple frequency traffic channels"

Dkt. No. 112 at 19 & 21-22; Dkt. No. 118 at 30-31; Dkt. No. 133, Ex. A at 101 (adding the word "frequency" to Defendants' previous proposal).

(1) The Parties' Positions

Plaintiff cites Claim 14 as providing context that supports Plaintiff's proposed construction because "[w]hile the first step determines 'spatial characteristics,' the second step uses those spatial characteristics to allocate channels to subscribers, and refers to the spatial characteristics as 'spatial signature[s].' The term 'spatial signature' is shorthand for 'spatial characteristics of [the] . . . channels.'" Dkt. No. 112 at 20. Plaintiff also submits that "the specification uses the term 'spatial signature' as shorthand for the spatial characteristics of a channel between different transmit antennas of a base station and receive antennas of subscribers." *Id.* at 20-21 (citing '808 Patent at 2:1-5). As to Defendants' proposal of the phrase "relative complex gains (amplitude and phase patterns) of a transmitted signal received by an antenna array," Plaintiff argues that Defendants' proposal is an example that should not be read into the claims. *Id.* at 21.

As to "spatial signature vector," Plaintiff submits that "[t]he term 'vector,' as used in the claims and specification in this context, means a one dimensional array." *Id.* Plaintiff argues that "a spatial signature vector is a vector that represents spatial characteristics of a channel which by necessity requires at least two entries to characterize the at least two antenna paths for there to be any useful 'spatial' information." *Id.*

As to the "broadband" and "2-D" terms, Plaintiff argues that Defendants' proposed construction "improperly imports detailed aspects of an embodiment, and relate[s] to one example of the content of a given vector." *Id.* at 22. Plaintiff also argues that "each of the terms '2-D' and 'broadband' in the context of these terms simply mean that the signatures are as a function of frequency. These terms simply do not require that values are included for 'each of multiple traffic channels' as proposed by Defendants." *Id.*

Defendants respond that their proposed construction for "broadband spatial signature" follows the well-established and ordinary meaning of spatial signature, that is adopted by the '808 Patent. Dkt. No. 118 at 32. Defendants urge that Plaintiff's proposal of "characteristic" would "read the term 'signature' out of the claims." *Id.*; *see id.* at 37. Defendants cite various technical articles, one of which is cited in the '808 Patent. *Id.* at 33-36.

Defendants also argue that "[n]ot every spatial characteristic of a channel will allow determination of the level of interference between co-channel subscribers," which Defendants submit is disclosed in the specification as the function of spatial signatures. *Id.* at 38 (citing '808 Patent at 5:12-24). Defendants note that Claim 14 recites "determining frequency and spatial characteristics," and Defendants argue that "the subscriber's spatial signature could be one such characteristic, but it is not the only spatial characteristic." *Id.*

Defendants further argue that "every narrowband 'spatial signature' is, by definition, a vector: '[E]ach spatial channel can be described by a vector, referred to herein as a narrowband 'spatial signature.'" *Id.* at 39 (quoting '808 Patent at 5:6-7). Defendants conclude: "[A]ll spatial signatures are inherently vectors. That some claims recite a 'spatial signature' and other claims recite a 'spatial signature vector' does not change the definition of a 'spatial signature,' because those terms both mean the same thing and are used interchangeably in the specification." *Id.* at 40 (emphasis omitted).

Finally, Defendants argue that "Applicants unequivocally disavowed the use of narrowband spatial signatures with respect to all asserted claims, and explicitly with respect to Claim 31, and are precluded from recapturing that subject matter through claim construction." Dkt. No. 118 at 44.

Plaintiff replies: (1) "a 'spatial signature' need not be a vector in all instances"; (2) "the term 'vector' is not used in the sense that it represents both a magnitude and direction; rather it is used to refer to an array of values"; (3) "a 'spatial signature' is not a measurement of a subscriber signal; rather, it represents *characteristics* of a *channel*"; and (4) "the terms '2-D' and 'broadband' require 'as a function of frequency,' not that values are included for 'each of multiple traffic channels.'" Dkt. No. 128 at 12.

Plaintiff argues that "Defendants' position is erroneous because they assert that a specific example, described in terms of what the spatial signature *can be*, supports their construction." Dkt. No. 128 at 13. Plaintiff further urges that "[t]he claims recite 'vector' when there is a lexicographic intent to limit the spatial signature to a vector. Otherwise, the claims do not require that the spatial signature be a vector." *Id.* at 16. Instead, Plaintiff argues, the spatial signature could be a two-dimensional matrix, and the term "vector" as used in the '808 Patent does "not . . . require values that indicate direction (a use of the term 'vector' in a different sense)." *Id.* at 17.

Plaintiff further replies that "the term 'spatial signature' in claim 31 is not limited to a vector or an array, despite the 2D nature of OFDMA." Dkt. No. 122 at 12. Plaintiff argues that "the argument [Defendants] refer to makes clear that the channel assignment decision is based on a two dimensional spatial signature, but explains that two dimensional may 'e.g.' require a matrix or vector." *Id.* at 18 (citing Dkt. No. 118, Ex. Y, 7/14/2004 Amendment and Response to Office Action at 15 ("OFDMA is two-dimensional (e.g., a matrix or vector)")).

At the February 13, 2014 hearing, Plaintiff urged that the "spatial signature" terms refer to properties of a particular link rather than to relative gains between antennas. Plaintiff also reiterated that "2-D" spatial signatures contain information on a "per frequency basis." Defendants responded that Plaintiff's proposal of the phrase "function of frequency" is overbroad because anything that varies depending on frequency could be deemed "a function of frequency." Defendants also argued that Plaintiff's proposal effectively eliminates the constituent term "signature," which Defendants have submitted is a term of art, and replaces it with the all-encompassing word "characteristics."

<u>(2) Analysis</u>

Claims 1, 2, 3, 13, 14, and 31 of the '808 Patent are representative and recite (emphasis added):

> 1. A network comprising:
> a base station; and
> a plurality of subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol;

the base station including
a memory to store *broadband spatial signature vectors* associated with each subscriber, the vectors being a function of frequency; and
traffic channel allocation logic to allocate OFDMA channels using the *broadband spatial signature vectors* of the subscribers.

2. The network defined in claim 1 wherein the *broadband spatial signature vectors* are indicative of fading and spatial characteristics of the subscribers.

3. The network defined in claim 1 wherein at least one of *the spatial signature vectors* is indicative of channel fading conditions of a new subscriber at all OFDMA traffic channels.

* * *

13. The network defined in claim 1 wherein the *broadband spatial signature vectors* of the subscribers are *2-D spatial signature vectors*.

14. A method comprising:
determining frequency and spatial characteristics of a plurality of orthogonal frequency division multiple access (OFDMA) channels for a new subscriber and one or more subscribers with on-going traffic;
allocating a subscriber one or more OFDMA channels based on *2-D spatial signature vectors* of the new subscriber and other subscribers with on-going traffic and data rates of on-going traffic.

* * *

31. A base station comprising:
a plurality of receiving antennas;
a plurality of down converters coupled to the plurality of receiving antennas;
a new accessing subscriber *spatial signature* register;
an on-going traffic *spatial signature* register; and
an OFDMA traffic channel allocator coupled to the new accessing subscriber *spatial signature* register and the on-going traffic *spatial signature* register.

The specification discusses "spatial signatures" in terms of "spatial characteristics," "spatial channel characteristics," "base-station array responses," "vectors," "a one-dimensional vector," and a "two-dimensional matrix":

> Since the effectiveness of spatial separation depends on the *base-station array responses (often referred to as the spatial signatures)* of all co-slot subscribers and the spatial processing technique employed, the instantaneous signal-to-noise-plus-interference ratio (SINR) of spatially multiplexed outputs can vary dramatically. . . .
>
> A fundamental solution to the above problem is the "channel-aware" MAC protocol that assigns traffic channels based on the *spatial characteristics* of the subscribers. Using such a protocol, the performance of SDMA system[s] can be enhanced with *spatial signature-based scheduling (e.g., assigning the "less-interfering" subscribers to the same time slot to increase the traffic throughput)*. The MAC treatment allows a system to exploit the spatial diversity in an efficient manner using spatial processing with fixed-complexity. Several scheduling algorithms are proposed and studied for *"narrow band" systems where the spatial characteristics can be described by a one-dimensional vector*; see Shad et al., "Indoor SDMA Capacity Using a Smart Antenna Base Station," IEEE Proc. ICUPC'97, pp. 868-872, 1997; Farsakh et al., "On the Mobile Radio Capacity Increase through SDMA," Accessing, Transmission, Networking Proceedings, pp. 293-297, 1998; and U.S. Pat. No. 6,041,237, "Method of Channel Allocation," issued Mar. 21, 2000.

'808 Patent at 1:55-2:18 (emphasis added); *see id.* at 1:15 ("medium access control (MAC)") & 1:26 ("space-division multiple-access (SDMA), or spatial multiplexing").

> Efficient exploitation of spatial diversity in high-speed wireless network[s] is a challenging task due to the broadband nature of *spatial channel characteristics*. In OFDMA networks, the wide spectrum is partitioned into parallel narrowband traffic channels. The methodology described herein increases, and potentially maximizes, the capacity of a broadband OFDMA/SDMA network through intelligent traffic channel assignment.

Id. at 4:63-5:3 (emphasis added).

> The concept of channel assignment for narrowband SDMA networks is illustrated in FIG. 1. In such application, *each spatial channel can be described by a vector, referred to herein as a narrowband "spatial signature."* For a system with M antenna elements, the spatial signature *can be* represented as A_i a_i, where A_i is a fading coefficient of the channel and a_i=[a_1i, a_{13} 2i [*sic*, a_2i], . . . , a_Mi] is an Mx1 *vector that characterizes the relative complex gains* between antennas. The level of interference between co-channel subscribers (sharing the same spectral resource, e.g., the same time slot/the same frequency/the same code (e.g., the spreading code)[)] is determined by the degree of orthogonality between their corresponding *spatial signatures*. (See Farsakh et al., "On the Mobile Radio Capacity Increase Through SDMA", Accessing, Transmission, Networking Proceedings, pp. 293-297, 1998.) Referring to the example in FIG. 1A, the

spatial signatures of subscribers 1, 3, and 5 are almost orthogonal, so are those of subscribers 2 and 4. On the other hand, the *spatial signatures* of subscribers 1 and 2 are near aligned, indicating strong mutual interference should they be assigned to the same traffic channel.

Id. at 5:4-24 (emphasis added). Figure 1 is reproduced here:

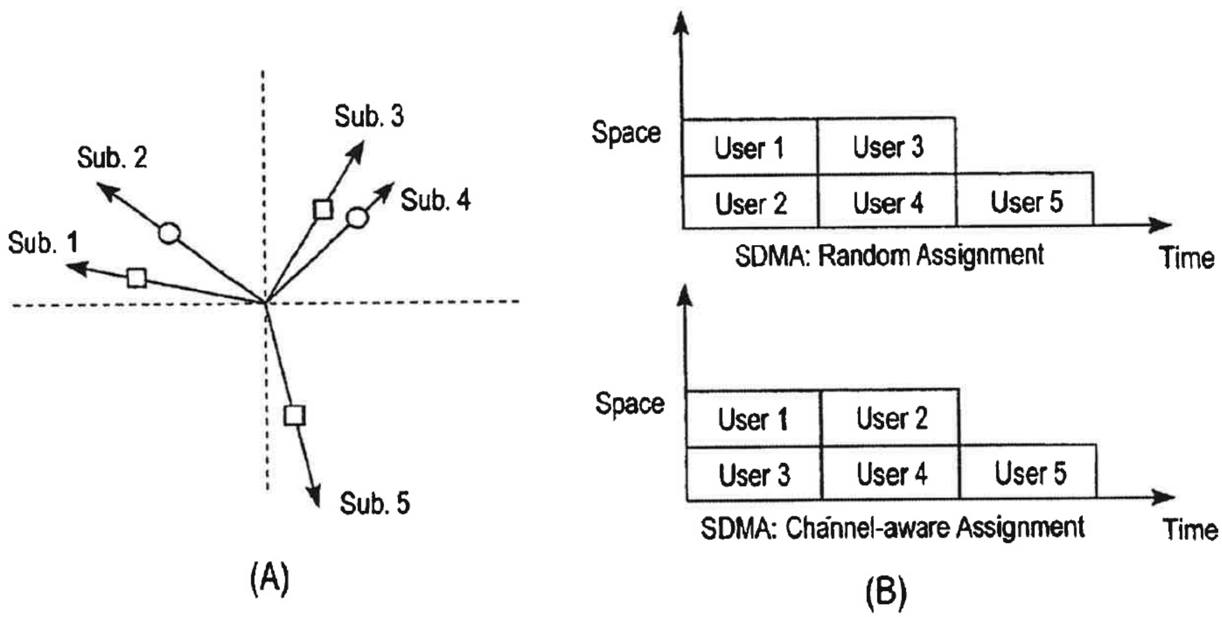

FIG. 1

[T]he *"broadband spatial signature"* associated with each subscriber becomes a *two-dimensional matrix*, or a *set of narrowband spatial signature vectors that are a function of the frequency*. In one embodiment, the *spatial signature* of subscriber i in OFDMA is given by

[A_i1 a_i1, A_i2, . . . , A_iK a_iK],

where A_ik is the fading coefficient of traffic channel k, a_ik is the Mx1 *spatial signature vector* of traffic channel k, and K is the total number of OFDMA traffic channels (in frequency). When K=1, the above reduces to a narrowband setup. In contrast to the narrowband case where the *spatial signature* is "invariant" to the channel assignment, a broadband subscriber experiences different fading and spatial characteristics in different traffic channels.

Id. at 5:53-57 (emphasis added).

In one embodiment, several factors may be considered in determining which set of traffic channels are to be assigned to a new subscriber: (a) the channel fading

> conditions of the new subscriber at all traffic channels, (b) the *spatial signature vectors* of the new subscriber across all traffic channels, (c) the *spatial signature vectors* of on-going traffic, and (d) the data rate of on-going traffic of subscribers that have already been in communication with the base-station.

Id. at 6:14-21 (emphasis added). Figure 5 is noteworthy for illustrating a "broadband (*2-D*) spatial signature estimator 503." *Id.* at 7:11-12 (emphasis added).

The '808 Patent also cites a technical article identified as "Xu, Guanghan and Li, San-Qi, Throughput Multiplication of Wireless Lans for Multimedia Services: SDMA Protocol Design, 1994 IEEE, pp. 1326-1332" and as "'Throughput Multiplication of Wireless LANs for Multimedia Services: SDMA Protocol Design,' Proc. Globecom'94, San Francisco, Calif., November 1994" ("1994 Xu Paper," which is attached to Defendants' response brief as Exhibit N). *See* '808 Patent at 1:35-37. The 1994 Xu Paper can be considered during claim construction as intrinsic evidence. *See V-Formation, Inc. v. Benetton Group SpA*, 401 F.3d 1307, 1311 (Fed. Cir. 2005) ("[P]rior art cited in a patent or cited in the prosecution history of the patent constitutes intrinsic evidence.") (citations omitted).

The 1994 Xu Paper explains:

> [S]patial diversity is demonstrated by the <u>amplitude and phase pattern</u> of the data vectors received by an antenna array. Each transmitter located at a certain place has its *unique* pattern, also called a *spatial signature*.
>
> * * *
>
> At a base station, an M-element antenna array receives signals from different spatial terminals. Let us assume the array response vector to a transmitted signal s_1(t) from a direction of arrival (DOA) θ is a(θ) = [1, $a_1(\theta)$, . . . , $a_M(\theta)$], where $a_i(\theta)$ denotes the <u>amplitude gain and phase shift</u> of the signal at the $(i + 1)^{th}$ antenna in relative to that at the first antenna. Besides the direct path signal, the antenna array also receives its multipath signals. Hence the signal vector received at time *t* can be written as below:

$$\mathbf{x}(t) = \underbrace{\mathbf{a}(\theta_1)s_1(t)}_{\text{direct path}} + \underbrace{\sum_{l=2}^{N_m} \alpha_l \mathbf{a}(\theta_l)s_1(t)}_{\text{multipath}} = \mathbf{a}_1 s_1(t),$$

> where $N_m - 1$ is the total number of multipath signals, α_l the phase and amplitude difference between the l^{th} multipath and the direct path, and $a_1 = {}_{l=1}^{N_m} a(\theta_l)$, which is referred to as a *spatial signature* associated with source 1.

1994 Xu Paper at 1326-1327 (italics in original; underlining added).

Of particular note, the 1994 Xu Paper states that "[e]ach transmitter located at a certain place has its *unique* pattern, also called *spatial signature*," and that the antenna array at the base-station has an "array response vector to a transmitted signal." 1994 Xu Paper at 1326-1327; *see id.* at 1327 ("We place[d] the transmitters at 50 random locations in the lab and measure[d] their spatial signatures."); *see also id.* ("A simple scheme is to allow only one transmitter to operate at a particular time slot so that the antenna array can acquire its spatial signature.").[6]

As to extrinsic evidence, Defendants have presented a document dated June 16, 2006, prepared by or for Plaintiff, that states:

> A spatial signature can be defined as a complex "vector" containing *amplitudes and phases* of signals received by elements of an antenna array. The spatial signature, also referred to as the composite channel response or spatial *characteristics*, characterizes the spatial propagation channel between the transmitter and the receiver antenna array at the BS [(base station)] for each subscriber. Each MS [(mobile station)] has a unique spatial signature in a narrowband wireless system. In broadband wireless systems using OFDMA, subscribers' spatial channels are two-dimensional, in both frequency and space.

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[6] Defendants have also cited the "1998 Xu Paper," which appears to be an extrinsic document. Dkt. No. 118 at 29 (citing Ex. O, Guanghan Xu, et al., *Experimental Studies of Spatial Signature Variation at 900 MHz for Smart Antenna Systems* 953, 956 (1998)). In particular, the 1998 Xu Paper explains that "the spatial signature represents the response of an array antenna to an emitter at a certain location in a given environment" and that "different mobile users . . . have different spatial signatures at the base-station antenna array." *Id.* at 956. The 1998 Xu Paper also states that "the array response vector to a transmitted signal . . . is a complex number denoting the amplitude gain and phase shift of the signal . . . ." *Id.* at 954.

Dkt. No. 118, Ex. W at ADITC2317322 (emphasis added).

Defendants have also presented a brief prepared by International Trade Commission ("ITC") staff attorneys in a proceeding involving the '808 Patent. *Id.*, Ex. S, No. 337-TA-871, 11/4/2013 Commission Investigative Staff's Pre-Hearing Brief ("ITC Staff Brief"). The ITC Staff Brief stated that "in the Staff's view, the proper construction of the term 'spatial signature' is 'relative complex gains (amplitude and phase patterns) of subscriber signals received or transmitted by a base-station antenna array.'" *Id.* at 15. At the February 13, 2014 hearing, the parties agreed that the ITC Staff Brief is extrinsic evidence and that the ITC proceeding was terminated before the ITC made any findings. *See* Dkt. No. 118 at 2 n.2. The parties did not cite any authorities specifying the weight that the ITC Staff Brief should be given as evidence in the present claim construction proceedings, and the Court concludes that the ITC Staff Brief can be reviewed for persuasive value but need not be given any deference.

Finally, Defendants have cited statements made by Plaintiff in that same ITC proceeding:

> The '808 patent is generally directed to techniques for increasing the throughput (i.e., the amount of data that may be transmitted per time period for a given frequency band) between a base station and mobile-subscriber units. The '808 patent achieves this increased throughput by using traffic-channel-allocation logic to allocate OFDMA channels based on the spatial characteristics of the channels (*i.e. the relative complex gains across multiple antennas*).

Id. at 36 (citing Ex. V, 1/24/2013 Verified Complaint Under Section 337 of the Tariff Act of 1930 at ¶ 20) (emphasis Defendants').

First, the parties' proposed constructions reflect agreement that the disputed terms refer to "channels."

Second, the specification suggests that the constituent terms "broadband" and "2-D" are synonymous. '808 Patent at 7:11-12; *see Edwards,* 582 F.3d at 1330 (finding that "the specification consistently uses the words 'graft' and 'intraluminal graft' interchangeably").

Although this interpretation seemingly renders above-quoted Claim 13 redundant, the parties agreed at the February 13, 2014 hearing that the constituent terms "broadband" and "2-D" are interchangeable. *See, e.g.*, Dkt. No. 100, Ex. B at 5-6; Dkt. No. 118 at 40; *see Bancorp Servs., L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1373 (Fed. Cir. 2004) ("[I]t is not unknown for different words to be used to express similar concepts, even though it may be poor drafting practice").

Third, the specification explains that whereas a narrowband "spatial signature" is a vector, a broadband "spatial signature" can be a "two-dimensional matrix, or a set of narrowband spatial signature vectors that are a function of the frequency." '808 Patent at 5:4-7 & 5:53-56.

Fourth, Claim 1 recites "the vectors being a function of frequency." The claim language thus weighs against construing "broadband spatial signature vectors" as being a function of frequency. *See Phillips*, 415 F.3d at 1314 ("[T]he claim in this case refers to 'steel baffles,' which strongly implies that the term 'baffles' does not inherently mean objects made of steel.")

Fifth, Defendants' proposal of "relative complex gains (amplitude and phase patterns)" relates to a preferred embodiment and should not be imported into the claims. *See* '808 Patent at 5:4-12; *see also Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments."). Instead, as quoted above, the specification refers more generally to "characteristics." *See* '808 Patent at 2:1-18 & 4:63-65. Although the 1994 Xu Paper refers to spatial signatures in terms of amplitude and phase differences, as quoted above, this disclosure in a cited technical paper does not amount to a lexicography and does not warrant limiting the disputed terms. *See Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("[A]n inventor may choose to be his own lexicographer if he defines the specific terms used to describe the invention with reasonable *clarity, deliberateness, and precision*.”) (citation and internal quotation marks omitted; emphasis added). Likewise, Defendants have not demonstrated that Plaintiff’s above-quoted statements in an ITC proceeding are binding or determinative. The ITC Staff Brief is similarly unpersuasive.

Likewise, Defendants’ proposed reference to an antenna array is rejected as improperly limiting the claims to a preferred embodiment. For example, the specification describes “broadband applications (*e.g.*, broadband antenna array systems, *etc.*).” *See* ‘808 Patent at 5:42-43 (emphasis added).

Finally, Defendants have cited prosecution history in which, Defendants argue, the patentee “unequivocally represented to the Patent Office that all spatial signatures used in the context of OFDMA channels—specifically the spatial signatures claimed in Claim 31 (which was Claim 21 during prosecution)—necessarily are 2-D spatial signatures.” Dkt. No. 118 at 44. The patentee stated:

> The Examiner rejected Claims 1-12, 15, 21, 22, and 27 under 35 U.S.C. §103(a) as being unpatentable over Yun et al. in view of Alamouti et al. Yun discloses a conventional FDMA system. The Examiner recognizes that Yun fails to disclose the use of the OFDMA protocol. However, the Examiner believes it was well known in the art that OFDMA protocols are an improvement over FDMA protocols and cited Alamouti to teach the use of OFDMA protocols. The Examiner believes that it would have been obvious to a person of ordinary skill in the art at the time of the invention to incorporate the use of OFDMA as taught by Alamouti into Yun. Applicants respectfully disagree.
>
> FDMA is fundamentally different than the OFDMA protocol. In OFDMA, each subscriber can occupy an arbitrary number of subcarriers of the entire channel bandwidth, while in FDMA, each subscriber is assigned to only one voice channel. In other words, each assignment decision in Yun is made based on a one-dimensional spatial signature, while [a] *spatial signature in OFDMA is two-dimensional* (e.g., a matrix or vector). Thus, *the channel assignment decision of the present invention is claimed as based on* [*a*] *two-dimensional (matrix) spatial signature*, which is much more difficult than a narrow band case (e.g., TDMA, CDMA, FDMA). Applicants respectfully submit that this feature is set forth in the claims since *OFDMA channels are already specified in the claims*. Even so,

> Applicants have amended claims 11 and 14 and added claims 36, 41, and 43 to explicitly set forth the two-dimensional nature of the spatial signatures.
>
> Therefore, in view of this, Applicants respectfully submit that the present invention as claimed in Claims 1-12, 15, 21, 22, and 27 is not obvious in view of the combination of Yun and Alamouti.

Dkt. No. 118, Ex. Y, 7/14/2004 Amendment and Response to Office Action at 15-16 (emphasis added).

On balance, this prosecution history is not definitive regarding the construction of "spatial signature" because the patentee explained that "OFDMA channels are already specified in the claims." *Id.* That is, the patentee explained that the two-dimensional nature of OFDMA is specified by other claim language where applicable. Defendants' reliance on the prosecution history for a narrower construction of "spatial signature" as to Claim 31 is therefore hereby expressly rejected. *See Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1324 (Fed. Cir. 2003) ("As a basic principle of claim interpretation, prosecution disclaimer promotes the public notice function of the intrinsic evidence and protects the public's reliance on *definitive* statements made during prosecution.") (emphasis added).

The Court therefore hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"spatial signature" (Claims 1, 2, 9, 13, 14, 31, 32, 34, 41)	**"vector representing spatial characteristics of a channel"**
"spatial signature vectors" (Claims 1, 2, 3, 13, 14)	**"vectors representing spatial characteristics of channels"**

"broadband spatial signature vectors" **"2-D spatial signature vectors"** **(Claims 1, 2, 13, 14)**	**"two-dimensional matrices, or sets of vectors, that represent spatial characteristics of multiple channels"**

B. "broadband spatial signature vectors . . ." and "2-D spatial signatures . . ."

"broadband spatial signature vectors associated with each subscriber" and "broadband spatial signature vectors of the subscribers" (Claims 1, 2, 13)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
See construction for "broadband spatial signature vectors"; other terms have plain and ordinary meaning	"relative complex gains (amplitude and phase patterns) of subscriber signals received by a base station antenna array for each of multiple frequency traffic channels"
"2-D spatial signatures" (Claims 9, 34, 41)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"a set of spatial signatures that are a function of frequency"	"relative complex gains (amplitude and phase patterns) of a transmitted signal received by an antenna array for each of multiple frequency traffic channels"
"2-D spatial signatures of an accessing subscriber and one or more subscribers with on-going traffic" (Claim 9)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
See construction for "2-D spatial signatures"; other terms have plain and ordinary meaning.	"relative complex gains (amplitude and phase patterns) of subscriber signals, from an accessing subscriber and one or more subscribers with on-going traffic, received by a base station antenna array for each of multiple frequency traffic channels"

“2-D spatial signature vectors of the new subscriber and other subscribers with on-going traffic” (Claim 14)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
See construction for “2-D spatial signatures”; other terms have plain and ordinary meaning	“relative complex gains (amplitude and phase patterns) of subscriber signals, from a new subscriber and other subscribers with on-going traffic, received by a base-station antenna array for each of multiple frequency traffic channels”

“2-D spatial signatures of the new subscriber and one or more subscribers with on-going traffic” (Claim 41)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
See construction for “2-D spatial signatures”; other terms have plain and ordinary meaning	“relative complex gains (amplitude and phase patterns) of subscriber signals, from a new subscriber and one or more subscribers with on-going traffic, received by a base-station antenna array for each of multiple frequency traffic channels”

Dkt. No. 100, Ex. B at 6-7; Dkt. No. 112 at 24; Dkt. No. 118 at 31; Dkt. No. 133, Ex. A at 105 (adding the word “frequency” to Defendants’ previous proposals).

(1) The Parties’ Positions

Plaintiff argues that no separate construction is required because: (1) “‘[b]roadband’ [and ‘2-D’] in this context simply means ‘as a function of frequency’”; (2) “[v]ectors mean arrays, and do[es] not require the use of relative complex gains as stated by Defendants”; and (3) “[s]patial signature simply means spatial characteristics . . . .” Dkt. No. 112 at 23-25. Plaintiff also argues that Defendants’ proposal of the phrase “of subscriber signals” “at best adds confusion and fails to provide any useful jury guidance.” *Id.*

Defendants respond that "the spatial signature of a subscriber refers to the way the receiving base-station antennas perceive the subscriber's transmitted signal." Dkt. No. 118 at 41 (emphasis omitted). Defendants explain that "an antenna array response to a base-station's transmitted signal (the characteristic [Plaintiff] focuses on, which is nowhere discussed in the '808 Patent) would be a spatial signature of the base-station." *Id.* at 42.

Defendants also argue that "a 'broadband' or '2-D' spatial signature is a set of narrowband spatial signature vectors—one for each frequency in the broadband system. Thus, each spatial signature of a subscriber in an OFDMA system is an MxK array, where M is the number of receiving antennas at the base-station, and K is the number of frequencies (traffic channels) available to each subscriber." *Id.* at 43 (citing '808 Patent at 5:53-63 & Fig. 6 (item 602)).

Plaintiff replies that the constructions should not be limited to subscriber signals received by a base station antenna array because "multipath effects in both the uplink and downlink directions may be similar such that measurements in one direction . . . are indicative of the multipath effects on channels in the other . . . direction." Dkt. No. 128 at 15. "Moreover," Plaintiff argues, "the claims are agnostic as to whether the spatial signature 'of the subscriber' (i.e., for assessing an uplink and/or downlink channel for the subscriber) is determined with downlink measurements or with uplink measurements." *Id.* at 16. Plaintiff concludes that Defendants' proposal of the phrase "of a subscriber signal" should be rejected. *Id.* at 17.[7]

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[7] In sur-reply, Defendants challenge Plaintiff's characterizations of the "Shad" and "Farsakh" references that are cited by the '808 Patent. *See* Dkt. No. 129; *see also* '808 Patent at 1:30-34, 2:12-18. In particular, Defendants argue that: (1) Shad refers only to the signatures of subscriber stations rather than of base stations; (2) certain disclosed "spatial signature vectors represent different subscribers and therefore cannot, as [Plaintiff] argues, show that spatial signatures come in various forms"; and (3) "Shad repeatedly describes the components of the spatial signatures as complex." *Id.* at 2-3 (emphasis omitted). As to the "spatial covariance matrix" disclosed in

(2) Analysis

Claims 1 and 9 are representative and recite (emphasis added):

1. A network comprising:
a base station; and
a plurality of subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol;
the base station including
a memory to store *broadband spatial signature vectors associated with each subscriber*, the vectors being a function of frequency; and
traffic channel allocation logic to allocate OFDMA channels using the *broadband spatial signature vectors of the subscribers*.

* * *

9. The network defined in claim 1 wherein the traffic channel allocation logic allocates the OFDMA channels, in response to receiving *2-D spatial signatures of an accessing subscriber and one or more subscribers with on-going traffic* and data rates of on-going traffic, by selecting OFDMA channels, based on SINRs, for use by the accessing subscriber.

These disputed terms present no distinct issues that require a separate analysis here. The term "2-D spatial signatures" is synonymous with the term "2-D spatial signature vectors" because, as noted above, spatial signatures are vectors. *See* '808 Patent at 5:4-7 & 5:53-56; *see Bancorp Servs.*, 359 F.3d at 1373 ("[I]t is not unknown for different words to be used to express similar concepts, even though it may be poor drafting practice"). Further, the parties have not presented any relevant disagreements regarding the meanings of the constituent phrases "associated with each subscriber," "of the subscribers," "of the new subscriber," "subscribers with on-going traffic," or any similar phrase. The meanings of these phrases are readily apparent or are addressed elsewhere in this Memorandum Opinion and Order. As a result, no further construction of these phrases is required. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2*

Farsakh, Defendants submit that a "spatial covariance matrix is not a spatial signature, so it matters not whether Defendants' construction is in harmony with it." *Id.* at 3.

Micro, 521 F.3d at 1362. In particular, the disputed terms need not be construed apart from the terms "broadband spatial signature vectors" and "2-D spatial signature vectors," which are construed above.

Finally, Defendants have argued that because the disputed terms refer to spatial signatures of the subscribers, the disputed terms are necessarily referring to the base station array response, *i.e.*, the reception of uplink signals by the base station. On balance, Defendants have not adequately countered Plaintiff's argument that "multipath effects in both the uplink and downlink directions may be similar such that measurements in one direction . . . are indicative of the multipath effects on channels in the other . . . direction." Dkt. No. 128 at 15. Further, Plaintiff persuasively argued at the February 13, 2014 hearing that a signature is associated with a subscriber so long as it pertains to a link with the subscriber, regardless of whether the link is an uplink or downlink. Defendants' proposals that the spatial signatures of subscribers must be as "received by a base station antenna array" are therefore hereby expressly rejected.

The Court accordingly hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"broadband spatial signature vectors associated with each subscriber" **"broadband spatial signature vectors of the subscribers"** **(Claims 1, 2, 13)**	**No construction necessary apart from the separate construction of "broadband spatial signature vectors," above.**
"2-D spatial signatures" (Claims 9, 34, 41)	**"two-dimensional matrices, or sets of vectors, that represent spatial characteristics of multiple channels"**

"2-D spatial signatures of an accessing subscriber and one or more subscribers with on-going traffic" (Claim 9)	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**
"2-D spatial signature vectors of the new subscriber and other subscribers with on-going traffic" (Claim 14)	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**
"2-D spatial signatures of the new subscriber and one or more subscribers with on-going traffic" (Claim 41)	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**

C. "new subscriber," "accessing subscriber," "new accessing subscriber," and "subscribers with on-going traffic"

"new subscriber" (Claims 14, 32, 41)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
Plain and ordinary meaning	"subscriber that has requested access but not been assigned a traffic channel"
"accessing subscriber" and "new accessing subscriber" (Claims 9, 31, 34)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction needed; *see* construction for "new subscriber"	"subscriber that has requested access but not been assigned a traffic channel"
"subscribers with on-going traffic" (Claims 9, 14, 41)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
Plain and ordinary meaning	"subscribers that have been allocated traffic channels for use on an on-going basis"

Dkt. No. 112 at 26-27; Dkt. No. 118 at 45; *see* Dkt. No. 133, Ex. A at 117 & 119 (in the parties' Joint Claim Construction Chart, Defendants' proposals for "new subscriber," "accessing subscriber," and "new accessing subscriber" omit the word "access").

The parties have reached agreement that "new subscriber," "accessing subscriber," and "new accessing subscriber" should be given the same meaning. Dkt. No. 112 at 27; Dkt. No. 118 at 45 n.41.

(1) The Parties' Positions

(a) "new subscriber," "accessing subscriber," and "new accessing subscriber"

Plaintiff argues that "Defendants['] construction includes a negative limitation . . . without any support from the intrinsic evidence" and "unnecessarily requires that the subscriber has made a request for a channel and is, therefore, effectively limited to uplink communications from the subscriber unit to the base station." Dkt. No. 112 at 26-27.

Defendants respond that "[c]onstruction of this term is necessitated by [Plaintiff's] refusal during the meet and confer process to explain what it believes is the difference between these two mutually-exclusive types of subscribers," namely "[t]he 'new/accessing' subscriber . . . that has requested access to the network, but has not yet been allocated any traffic channels," and "the 'subscriber with on-going traffic' . . . that already has been allocated traffic channels for use on an on-going basis." Dkt. No. 118 at 45. As to Plaintiff's criticism of Defendants' proposed construction, Defendants respond that their proposal "is not limited to a subscriber requesting allocation of an uplink channel, but rather encompasses 'a subscriber that has requested *access*.' Consistent with the specification, the subscriber requests access to the network, and the base-station responds by allocating a traffic channel to the subscriber." *Id.* at 46 n.42. Defendants further explain that "[t]he '808 Patent seeks to intelligently allocate traffic channels to the new/accessing subscribers in a way that takes into account the allocation's effect on the traffic already assigned to those traffic channels." *Id.* at 47 (citing '808 Patent at 6:48-51, 6:55-61 & 7:62-8:7).

Plaintiff replies that "[t]he point is not whether there should be some distinction between these types of subscribers, but the fact that these specific distinctions are not entirely clear in their impact and are lacking in support in the specification." Dkt. No. 128 at 18.

(b) "subscribers with on-going traffic"

Plaintiff argues that "the term 'on-going traffic' is neither a subscriber nor a data rate, but instead the data that is being exchanged on a communications link." Dkt. No. 112 at 28. Plaintiff further explains: "The term 'on-going traffic' has a distinct meaning from the term 'traffic channels' that may be used to carry such traffic, which is already reflected in other claim language. Similarly, the term 'on-going traffic' has a distinct meaning from the term 'subscribers' since such traffic may or may not involve subscribers. Further, Defendants' proposed construction . . . seems to preclude the possibility that a subscriber may be re-allocated a traffic channel." *Id.* Finally, Plaintiff argues that "[b]ecause the broadband spatial channel characteristics of . . . subscribers can change with time, then clearly the allocation will also change with time." *Id.*

Defendants respond that "[t]he parties' dispute does not center on the meaning of 'on-going traffic,' but rather the meaning of a '*subscriber* with on-going traffic.'" Dkt. No. 118 at 47. Defendants also submit that "[t]he '808 Patent is silent . . . on the issue of 'reallocating' traffic channels." *Id.*

Plaintiff replies that "if a subscriber has 'already been in communication with the base station,' this does not mean the subscriber has been allocated a specific type of channel deemed an 'ongoing' channel. Defendants are seeking a construction that is narrower than even the embodiment of the specification describes." Dkt. No. 128 at 18.

At the February 13, 2014 hearing, Defendants argued that Plaintiff is attempting to completely eliminate any distinction between a "new subscriber" and a "subscriber with on-going traffic." Plaintiff responded that Defendants' proposal is too strict because allocations happen so quickly in OFDMA systems. Plaintiff argued that a subscriber that received an allocation only one millisecond ago could still be considered a "new" subscriber.

(2) Analysis

Claims 14, 31, and 32 of the '808 Patent are representative and recite (emphasis added):

> 14. A method comprising:
> determining frequency and spatial characteristics of a plurality of orthogonal frequency division multiple access (OFDMA) channels for a *new subscriber* and one or more *subscribers with on-going traffic*;
> allocating a subscriber one or more OFDMA channels based on 2-D spatial signature vectors of the *new subscriber* and other *subscribers with on-going traffic* and data rates of *on-going traffic*.
>
> * * *
>
> 31. A base station comprising:
> a plurality of receiving antennas;
> a plurality of down converters coupled to the plurality of receiving antennas;
> a *new accessing subscriber* spatial signature register;
> an *on-going traffic* spatial signature register; and
> an OFDMA traffic channel allocator coupled to the *new accessing subscriber* spatial signature register and the *on-going traffic* spatial signature register.
>
> 32. The base station defined in claim 31 wherein the channel allocation logic allocates OFDMA channels to a *new subscriber* based on information from the *new subscriber* spatial signature register and the *on-going traffic* spatial signature register.

The specification states: "The term 'subscriber' or 'subscribers' is used herein to refer to a subscriber unit or device." '808 Patent at 3:18-19. The specification then distinguishes between "new" subscribers and "on-going" subscribers:

> When a new link between the base-station and a subscriber is to be established, the traffic channel allocation logic first estimates two-dimensional (space and frequency/time) broadband propagation channels between the base-station and the new subscriber. Frequency and time are the same time represented in two different domains. *The traffic channel allocation logic then accommodates a rate request received from the new subscriber by assigning traffic channels* that utilizes [*sic*] a predetermined (e.g., the minimum) amount of transmission power (in comparison to the amount of transmission power necessary to transmit over one or more other OFDMA traffic channels that were not assigned to the new subscriber) and causes a certain amount of interference (e.g., the least interference in comparison to the interference to other subscribers caused by the new subscriber using one or more of the OFDMA traffic channels that were not assigned to the new subscriber) to co-channel subscribers. The rate request is received from the subscriber either prior to the process of establishing the new link or concurrently therewith.

Id. at 3:26-46 (emphasis added).

> A goal of broadband traffic channel assignment in OFDMA described herein is to *allocate traffic channels to new subscribers (in the presence of on-going traffics)* in a way that increases, and potentially maximizes, the system capacity. The process may be illustrated using FIG. 3. Referring to FIG. 3, *on-going traffic* identified by solid blocks occupy certain numbers of OFDMA traffic channels (e.g., channels 1, 2, 3, and 6), some of which, e.g., traffic channel 1, are shared by more than one subscribers using spatial multiplexing. The unshaded blocks represent OFDMA channels that are unoccupied (i.e., not being used). The shaded block represents traffic that is to be allocated or assigned to one or more OFDMA channels.
>
> In one embodiment, several factors may be considered in *determining which set of traffic channels are to be assigned to a new subscriber*: (a) the channel fading conditions of the new subscriber at all traffic channels, (b) the spatial signature vectors of the new subscriber across all traffic channels, (c) the spatial signature vectors of on-going traffic, and (d) the data rate of on-going traffic of subscribers that have already been in communication with the base-station.

Id. at 6:1-21 (emphasis added).

> FIG. 6 illustrates operations performed by one embodiment of the traffic channel allocation logic. Referring to FIG. 6, inputs to the channel allocation logic

> include the 2-D spatial signature of the *accessing subscriber*, A_new,1 a_new,1, . . . , A_new,K a_new,K; the requested data rate, R_new from storage (not shown); the data rates of *on-going traffic* in each of the traffic channels from on-going traffic storage 601; and the 2-D spatial signatures of *on-going subscribers* from storage 602.

Id. at 8:10-18 (emphasis added).

Of particular note, the specification refers to "the data rate of *on-going* traffic of subscribers that have already been in communication with the base-station" and "traffic channel assignment based on broadband spatial channel characteristics of a *requesting* subscriber and *on-going* subscribers." '808 Patent at 6:20-21 & 6:28-30 (emphasis added). Finally, various claims contrast accessing subscribers with subscribers that have on-going traffic. For example, Claim 9 recites, in relevant part: "receiving 2-D spatial signatures of an *accessing subscriber* and one or more *subscribers with on-going traffic*."

These various distinctions in the claims and the specification between "on-going" subscribers and "new," "accessing," or "new accessing" subscribers provide ample support for Defendants' proposal that whereas "on-going" subscribers have already been assigned traffic channels, "new," "accessing," or "new accessing" subscribers have not. Nonetheless, to whatever extent Defendants are proposing that a subscriber with on-going traffic must continue to use the *same* traffic channel(s), Defendants' proposal is rejected.

The Court therefore hereby construes the disputed terms as set forth in the following chart:

<u>Term</u>	<u>Construction</u>
“new subscriber” **“accessing subscriber”** **“new accessing subscriber”** **(Claims 9, 14, 31, 32, 34, 41)**	**“subscriber that has requested access but has not been assigned a traffic channel”**
“subscribers with on-going traffic” (Claims 9, 14, 41)	**“subscribers that have been allocated traffic channels and that have on-going traffic”**

D. “new accessing subscriber spatial signature,” “new subscriber spatial signature,” and “on-going traffic spatial signature”

“new accessing subscriber spatial signature” (Claims 31, 32, 34) and “new subscriber spatial signature” (Claim 32)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
See construction for “spatial signature”; other terms have plain and ordinary meaning	“relative complex gains (amplitude and phase patterns) of the new accessing subscriber signals received by a base-station antenna array for each of multiple frequency traffic channels”
“on-going traffic spatial signature” (Claims 31, 32, 34)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
See construction for “spatial signature”; other terms have plain and ordinary meaning	“relative complex gains (amplitude and phase patterns) of on-going traffic signals received by a base-station antenna array for each of multiple frequency traffic channels”

Dkt. No. 112 at 25; Dkt. No. 118 at 31.

Plaintiff argues that "[i]n addition to improperly characterizing claim terms and [*sic*, as] addressed hereinabove, here mainly the term 'spatial signature,' these constructions as proposed by Defendants fail to provide any useful jury guidance." Dkt. No. 112 at 25.

Claims 31 and 32 of the '808 Patent are representative and recite (emphasis added):

> 31. A base station comprising:
> a plurality of receiving antennas;
> a plurality of down converters coupled to the plurality of receiving antennas;
> a *new accessing subscriber spatial signature* register;
> an *on-going traffic spatial signature* register; and
> an OFDMA traffic channel allocator coupled to the *new accessing subscriber spatial signature* register and the *on-going traffic spatial signature* register.
>
> 32. The base station defined in claim 31 wherein the channel allocation logic allocates OFDMA channels to a new subscriber based on information from the *new subscriber spatial signature* register and the *on-going traffic spatial signature* register.

The present disputed terms have been substantially addressed through the analysis of the "spatial signature" terms, discussed above. Further, the parties have presented "new subscriber," "accessing subscriber," and "subscribers with on-going traffic" as distinct disputed terms, above. No further construction is required. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362.

The Court therefore hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"new accessing subscriber spatial signature" (Claims 31, 32, 34) **"new subscriber spatial signature" (Claim 32)**	**No construction necessary apart from the separate constructions of "spatial signature," "new subscriber," and "new accessing subscriber," above.**

"on-going traffic spatial signature" (Claims 31, 32, 34)	**No construction necessary apart from the separate constructions of "spatial signature" and "subscribers with on-going traffic," above.**

E. "new subscriber spatial signature register," "new accessing subscriber spatial signature register," and "on-going traffic spatial signature register"

"new subscriber spatial signature register" and "new accessing subscriber spatial signature register" (Claims 31, 32, 34)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
See construction for "spatial signature"; other terms have plain and ordinary meaning	"register for storing only 'new accessing subscriber spatial signatures'"
"on-going traffic spatial signature register" (Claims 31, 32, 34)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
See construction for "spatial signature"; other terms have plain and ordinary meaning	"register for storing only 'on-going traffic spatial signatures'"

Dkt. No. 112 at 29; Dkt. No. 118 at 47.

(1) The Parties' Positions

Plaintiff submits that the constituent term "spatial signature" has been presented as a separate disputed term and that "the claim term 'register' is clear on its face and requires no construction; it means a storage unit." Dkt. No. 112 at 29. Plaintiff also argues that "the same register can be used for other values at a different time." *Id.* at 30. "Accordingly, it is the value stored . . . which gives rise to [the] register name . . ., rather than the contrived notion that this register is a dedicated register location that is permitted to store only a 'new accessing subscriber spatial signature'" and so forth. *Id.*; *see id.* at 30-31.

Defendants respond by agreeing with Plaintiff that "it is the value stored . . . which gives rise to [the] register name." Dkt. No. 118 at 48 (quoting Dkt. No. 112 at 30). Defendants nonetheless maintain that the claims require distinct registers: "The point is that one register stores spatial signatures of new accessing subscribers, and another register stores spatial signatures of subscribers with ongoing traffic, and . . . you can tell which type of signature is in the register by the designation given to that register at that time." Dkt. No. 118 at 48.

Plaintiff replies by reiterating that "the proposed negative limitations 'storing only [one type of signatures]' are limitations without support in the specification." Dkt. No. 128 at 19 (square brackets Plaintiff's).

At the February 13, 2014 hearing, Defendants urged that because the claims recite two different registers, Plaintiff should not be permitted to point to a single register as satisfying both of the register limitations. Plaintiff responded that nothing precludes a single physical memory element from being used for both purposes, *i.e.*, for holding both registers.

<u>(2) Analysis</u>

Claims 31, 32, and 34 of the '808 Patent recite (emphasis added):

> 31. A base station comprising:
> a plurality of receiving antennas;
> a plurality of down converters coupled to the plurality of receiving antennas;
> a *new accessing subscriber spatial signature register*;
> an *on-going traffic spatial signature register*; and
> an OFDMA traffic channel allocator coupled to the *new accessing subscriber spatial signature register* and the *on-going traffic spatial signature register*.
>
> 32. The base station defined in claim 31 wherein the channel allocation logic allocates OFDMA channels to a new subscriber based on information from the *new subscriber spatial signature register* and the *on-going traffic spatial signature register*.
>
> * * *

> 34. The base station defined in claim 1 wherein the *new accessing subscriber spatial signature register* and the *on-going traffic spatial signature register* store 2-D spatial signatures.

Distinctly recited limitations are usually interpreted as distinct structures. *See Becton, Dickinson & Co. v. Tyco Healthcare Group, LP*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) ("Where a claim lists elements separately, the clear implication of the claim language is that those elements are distinct components of the patented invention.") (citations and internal quotation marks omitted). Likewise, the specification discloses distinct registers:

> The estimated 2-D spatial signature, along with spatial signature [*sic*, signatures] of subscribers corresponding to on-going traffic stored in the *on-going traffic spatial signature register 506* and on-going traffic information stored in the on-going traffic register 504, are fed to OFDMA/SDMA traffic channel allocation logic 505 to determine a traffic channel assignment for the accessing subscriber, and possibly partial or all of the on-going subscribers.

'808 Patent at 7:26-35 (emphasis added); *see id.* at Fig. 5. Figure 6, which appears to illustrate separate registers for new accessing subscriber spatial signatures and on-going traffic spatial signatures, is reproduced here:

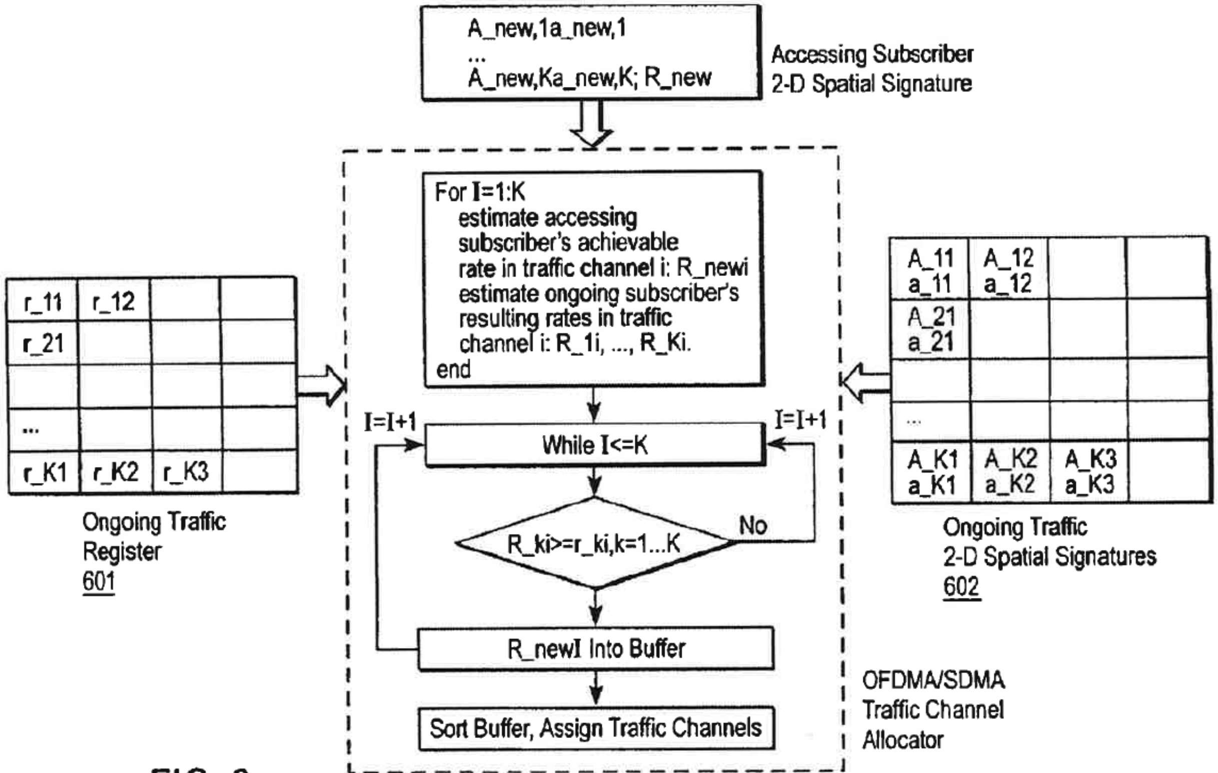

FIG. 6

As to extrinsic evidence, Plaintiff has submitted a technical dictionary definition of "register" in the context of "electronic computation" as meaning: "A device capable of retaining information, often that contained in a small subset (for example, one word), of the aggregate information in a digital computer." Dkt. No. 112, Ex. F, *The IEEE Standard Dictionary of Electrical and Electronics Terms* 894 (6th ed. 1996).

On balance, Defendants have failed to demonstrate that a register can store only one type of data at a time, i.e., *either* "new" subscriber spatial signatures *or* "on-going" subscriber spatial signatures. Instead, as Plaintiff has argued, a single structure could be organized or subdivided so as to constitute both a "new subscriber spatial signature register" and an "on-going traffic spatial signature register." Defendants' proposed constructions are therefore hereby expressly rejected.

The Court having expressly rejected Defendants' proposed constructions, no further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362; *Finjan*, 626 F.3d at 1207.

The Court accordingly hereby construes the disputed terms as set forth in the following chart:

Term	Construction
"new subscriber spatial signature register" **"new accessing subscriber spatial signature register"** **(Claims 31, 32, 34)**	**Plain meaning**
"on-going traffic spatial signature register" (Claims 31, 32, 34)	**Plain meaning**

F. "allocate OFDMA channels using the broadband spatial signature vectors of the subscribers"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
See "broadband spatial signature vectors" and "OFDMA"; other terms have plain and ordinary meaning	"allocate each of multiple OFDMA channels using more than one subscriber's broadband spatial signature vectors"

Dkt. No. 112 at 31; Dkt. No. 118 at 49. This disputed term appears in Claim 1.

(1) The Parties' Positions

Plaintiff argues that this disputed term "should be construed to incorporate the previously described meaning for the terms 'broadband spatial signature vectors' and 'OFDMA' and that all other terms should be construed to have their plain and ordinary meaning." Dkt. No. 112 at 31.

Defendants respond that "[b]y the plain language of this claim, each channel is allocated using more than one subscriber's broadband spatial signature vector." Dkt. No. 118 at 49. Defendants emphasize that "the '808 Patent criticizes 'conventional' approaches that assigned traffic channels without considering multiple subscribers' spatial signatures[,] and [the '808 Patent] note[s] that, '[t]he possibility of strong interference between co-channel subscribers . . . is high.'" *Id.* (quoting '808 Patent at 5:30-33).

Plaintiff replies that "Defendants want to read in embodiments to require a one-to-many correspondence," which Plaintiff argues is unsupported. Dkt. No. 128 at 19.

(2) Analysis

Claim 1 of the '808 Patent recites (emphasis added):

> 1. A network comprising:
> a base station; and
> a plurality of subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol;
> the base station including
> a memory to store broadband spatial signature vectors associated with each subscriber, the vectors being a function of frequency; and
> traffic channel allocation logic to *allocate OFDMA channels using the broadband spatial signature vectors of the subscribers*.

The specification discloses:

> A fundamental solution to the above problem is the "channel-aware" MAC protocol that *assigns traffic channels based on the spatial characteristics of the subscribers*. Using such a protocol, the performance of SDMA system[s] can be enhanced with spatial signature-based scheduling (e.g., assigning the "less-interfering" subscribers to the same time slot to increase the traffic throughput).

'808 Patent at 2:1-7 (emphasis added); *see id.* at 1:15 ("medium access control (MAC)") & 1:26 ("space-division multiple-access (SDMA), or spatial multiplexing")

> The level of interference between co-channel subscribers (sharing the same spectral resource, e.g., the same time slot/the same frequency/the same code (e.g.,

> the spreading code) is determined by the degree of orthogonality between their corresponding spatial signatures.

Id. at 5:4-16.

Defendants have also cited Figure 6 as illustrating, in Defendants words, "an allocation algorithm with an 'accessing subscriber 2-D spatial signature' input and 'ongoing traffic 2-D spatial signatures 602' input." Dkt. No. 118 at 50. The specification discloses with regard to Figure 6:

> FIG. 6 illustrates operations performed by one embodiment of the traffic channel allocation logic. Referring to FIG. 6, inputs to the channel allocation logic include the *2-D spatial signature of the accessing subscriber*, A_new,1 a_new,1, . . . , A_new,K a_new,K; the requested data rate, R_new from storage (not shown); the data rates of on-going traffic in each of the traffic channels from on-going traffic storage 601; and the *2-D spatial signatures of on-going subscribers* from storage 602.
>
> In one embodiment, the logic starts a loop from traffic channel 1 to traffic channel K and calculates the achievable rate for the accessing subscriber over each of the traffic channels. The results, R new,1, . . . , R_new,K, are saved for further evaluation. In another embodiment, the logic calculates the SINRs in a manner well-known in the art for the requesting subscriber over each of the traffic channels.
>
> In calculating the achievable rate or the SINR value, different spatial processing algorithms, e.g., single-user detection and multi-user detection, may be used. The achievable rate or the SINR value depends on the actual spatial processing algorithm used in practice.
>
> Also calculated are the achievable rates of on-going subscribers at each of the traffic channels with on-going traffic for the case that the requesting subscriber is added to that traffic channel: R_i,k, k=1, . . . , K. Similarly, in an alternative embodiment, the logic can calculate the SINR values of on-going subscriber at each of the traffic channels, for that case that the requesting subscriber is added to that traffic channel.
>
> The logic then examines whether these updated achievable rates (or SINRs) are lower than the actual rates (or SINR) requirements of subscribers with on-going traffic (e.g., a minimum data rate requirement that must be satisfied). Note the actual rate may be higher when extra resources are available of [*sic*, for] subscribers with on-going traffic. Traffic channels in which the requesting subscriber is added and, therefore, in which the new rates or SINRs drop below

> the on-going rates or SINR thresholds are labeled "unusable" for the requesting subscriber. The remaining traffic channels are ranked and assigned in a descending order of the achievable rates or SINR values for the requesting subscribers. The thresholds may be set to ensure a specific signal quality at a particular data rate.
>
> The process stops when the total rates for the requesting subscriber exceed a pre-determined value for the requesting subscriber.

'808 Patent at 8:10-55 (emphasis added).

On balance, the claim language and the above-quoted disclosures demonstrate that each of multiple OFDMA channels are assigned using more than one subscriber's broadband spatial signature vectors, as Defendants have proposed. To be clear, however, Defendants have not established that *all* OFDMA channels must be assigned using broadband spatial signature vectors of multiple subscribers. *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments."). At the February 13, 2014 hearing, Defendants clarified they are proposing that *each* of multiple channels must be allocated based on signatures of *multiple* subscribers; Defendants do not propose that *all* channels must be so assigned.

With that understanding, the Court hereby construes **"allocate OFDMA channels using the broadband spatial signature vectors of the subscribers"** to mean **"allocate each of multiple OFDMA channels using more than one subscriber's broadband spatial signature vectors."**

G. "an OFDMA traffic channel allocator"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
"logic configured to allocate OFDMA traffic channels"	"logic configured to allocate OFDMA traffic channels to a subscriber using 2-D spatial signatures of multiple subscribers"[8]

Dkt. No. 112 at 31. This disputed term appears in Claim 31.

(1) The Parties' Positions

As to Defendants' original proposed construction, Plaintiff argues that "Defendants' proposed construction improperly imports extraneous limitations as neither the claim language nor the specification limits the meaning of this term to a 'subscriber' or 'on-going traffic.'" Dkt. No. 112 at 32.

Defendants respond by modifying their proposed construction, as noted above, and by arguing that "the parties agree and the '808 Patent confirms that the 'OFDMA traffic channel allocator' recited in Claim 31 means at least 'logic configured to allocate OFDMA traffic channels to a subscriber using 2-D spatial signatures." Dkt. No. 118 at 50-51. Defendants also reiterate that "the intrinsic evidence uniformly supports that the claimed channel allocation must use *more than one* 2-D spatial signature to allocate each subscriber's channel, so that it can avoid co-channel subscribers with high interference." *Id.* at 51 (citing '808 Patent at 3:27-46, 6:1-57, 7:18-26, 7:47-8:55 & Figs. 4-6). At the February 13, 2014 hearing, Defendants further noted that Claim 31 recites the OFDMA traffic channel allocator as being coupled to registers that contain spatial signatures of *multiple* subscribers.

[8] Defendants originally proposed: "logic configured to allocate OFDMA traffic channels to a subscriber using a 'new accessing subscriber spatial signature' and one or more 'on-going traffic spatial signatures.'" Dkt. No. 100, Ex. B at 9.

(2) Analysis

Claim 31 of the '808 Patent recites (emphasis added):

31. A base station comprising:
a plurality of receiving antennas;
a plurality of down converters coupled to the plurality of receiving antennas;
a new accessing subscriber spatial signature register;
an on-going traffic spatial signature register; and
an OFDMA traffic channel allocator coupled to the new accessing subscriber spatial signature register and the on-going traffic spatial signature register.

The specification discloses:

> FIG. 6 illustrates operations performed by one embodiment of the traffic channel allocation logic. Referring to FIG. 6, *inputs to the channel allocation logic include the 2-D spatial signature of the accessing subscriber*, A_new,1 a_new,1, . . . , A_new,K a_new,K; the requested data rate, R_new from storage (not shown); the data rates of on-going traffic in each of the traffic channels from on-going traffic storage 601; *and the 2-D spatial signatures of on-going subscribers* from storage 602.

'808 Patent at 8:10-18 (emphasis added).

As to extrinsic evidence, the ITC Staff Brief found that "the proper construction, in the Staff's view, is: 'Logic configured to assign OFDMA traffic channels while considering more than one 2-D spatial signature.'" Dkt. No. 118, Ex. A at 28 (emphasis omitted).

On balance, although Claim 31 recites that the OFDMA traffic channel allocator must be "coupled" to two spatial signature registers, Claim 31 does not specify that the allocator must allocate based on 2-D spatial signatures of multiple subscribers. Likewise, the disputed term is not so defined in the specification, and the ITC Staff Brief is not persuasive on this term. Instead, Defendants' proposal improperly imports a limitation from a preferred embodiment. *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments.”). Defendants’ proposed construction is therefore hereby expressly rejected.

The Court accordingly hereby construes **“an OFDMA Traffic Channel Allocator”** to mean **“logic configured to allocate OFDMA traffic channels.”**

H. “subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol”

Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No construction needed; plain and ordinary meaning	“subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol for downlink and uplink communications”

Dkt. No. 100, Ex. B at 9; Dkt. No. 112 at 32. This disputed term appears in Claim 1.

Plaintiff argues that the disputed term “is not restricted to the conjunction of uplink *and* downlink communications,” as Defendants have proposed. Dkt. No. 112 at 32. In response, Defendants have agreed that this disputed term “need not be construed at present.” Dkt. No. 118 at 3; *see* Dkt. No. 133, Ex. A at 129.

The Court therefore hereby construes **“subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol”** to have its **plain meaning**.

VII. CONSTRUCTION OF DISPUTED TERMS IN THE ‘283 PATENT

A. “cluster of subcarriers”

Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
“logical unit of multiple physical subcarriers”	“defined logical unit of multiple physical subcarriers”

Dkt. No. 112 at 32; Dkt. No. 118 at 4. This disputed term appears in Claims 24, 70, 92, 109, 116, 118, and 119.

(1) The Parties' Positions

Plaintiff argues that Defendants' proposal of "defined" "is not tethered in any way to the specification or other intrinsic record." Dkt. No. 112 at 33.

Defendants respond that "[t]he intrinsic evidence confirms that a 'cluster of subcarriers' as claimed in the '172 and '283 Patents is a logical unit that is defined before the allocation process begins. This allows the subscribers to report on a 'cluster' as a recognizable unit to the base-station and for the base-station to select for allocation an entire 'cluster' of subcarriers." Dkt. No. 118 at 4; *see id.* at 5-6. Defendants argue that "without that definition, the subscriber would have no way to correlate the clusters allocated to it with the subcarriers in those clusters." *Id.* at 6. Defendants further explain: "Put simply, the 'clusters' are logical units that have been defined before the allocation process such that they can be reported on as a unit by a subscriber and selected for allocation as a unit by the base-station. A 'cluster' is not merely the happenstance collection of subcarriers that results from an allocation ([Plaintiff's] construction)." *Id.*

Plaintiff replies:

> The patent uses clusters in essentially three contexts: (1) when the subscriber is providing feedback on a candidate cluster; (2) when the base station allocates a cluster; and (3) when the base station is allocating coherence and diversity clusters. Defendants' intrinsic evidence largely points to feedback which would naturally need to be done on a defined cluster basis. The other circumstances do not have such a requirement.

Dkt. No. 128 at 2. Plaintiff cites an embodiment that takes into account the traffic load on each subcarrier, and Plaintiff submits that "[i]f only defined *clusters* could be allocated, there would be no need to consider traffic load information on each *subcarrier*." *Id.* at 2 (emphasis added).

(2) Analysis

Claim 24 of the '283 Patent is representative and recites (emphasis added):

> 24. A method for subcarrier selection for a system employing orthogonal frequency division multiple access (OFDMA) comprising:
> *partitioning subcarriers into a plurality of groups of at least one cluster of subcarriers*; and
> receiving an indication of a selection by a subscriber of one or more groups in the plurality of groups;
> receiving feedback information on the one or more groups of *clusters of subcarriers* from the subscriber, and wherein the feedback information comprises a group identifier and SINR value of each *cluster* within each group; and
> allocating at least one *cluster* in the one or more groups of *clusters* selected by the subscriber for use in communication with the subscriber.

As a threshold matter, the plain language of Claim 24 recites that the clusters used for feedback purposes are the same clusters used for allocation. *See, e.g., PODS, Inc. v. Porta Stor, Inc.*, 484 F.3d 1359, 1366 (Fed. Cir. 2007) ("[T]he same terms appearing in different portions of the claims should be given the same meaning."); *Warner-Lambert Co. v. Apotex Corp.*, 316 F.3d 1348, 1356 (Fed. Cir. 2003) ("The words 'the use' require antecedent basis; thus, 'the use' refers to a specific 'use' rather than a previously undefined 'use.'"); *Process Control Corp. v. HydReclaim Corp.*, 190 F.3d 1350, 1356 (Fed. Cir. 1999) (noting "the identical language associated with the term 'discharge rate' in both clauses [b] and [d], namely 'from the common hopper to the material processing machine,'" and concluding that "the presence of that identical language clearly indicates that 'a discharge rate' in clause [b] is the same as 'the discharge rate' in clause [d].") (square brackets in original). The Court therefore hereby expressly rejects

Plaintiff's argument that "there is no basis for tying the definition of clusters used for purposes of providing feedback to allocated clusters as the Defendants propose." *Id.* at 3.

The recital of "partitioning subcarriers" seemingly lends support to Defendants' proposal of the word "defined." The specification, however, discloses that clusters of subcarriers are "reconfigurable" and that cluster allocation can depend upon subcarrier-specific information:

> FIG. 1A illustrates multiple subcarriers, such as subcarrier 101, and cluster 102. A cluster, such as cluster 102, is *defined* as a logical unit that contains at least one physical subcarrier, as shown in FIG. 1A. A cluster can contain consecutive or disjoint subcarriers. *The mapping between a cluster and its subcarriers can be fixed or reconfigurable.* In the latter case, the base station informs the subscribers when the clusters are *redefined*. In one embodiment, the frequency spectrum includes 512 subcarriers and each cluster includes four consecutive subcarriers, thereby resulting in 128 clusters.

'283 Patent at 5:18-27 (emphasis added).

> Upon receiving the feedback from a subscriber, the base station further selects one or more clusters for the subscriber among the candidates (processing block 104). The base station may utilize additional information available at the base station, *e.g., the traffic load information on each subcarrier,* amount of traffic requests queued at the base station for each frequency band, whether frequency bands are overused, and how long a subscriber has been waiting to send information. The *subcarrier loading information of neighboring cells* can also be exchanged between base stations. The base stations can use this information in *subcarrier allocation* to reduce inter-cell interference.

Id. at 6:18-29 (emphasis added).

On balance, Defendants have failed to identify any reasonably clear definition of, or clear support for, the word "defined." As to Defendants' underlying argument that a cluster must be "defined" before it can be allocated (*see, e.g.,* Dkt. No. 118 at 4), Defendants have not proposed that the Court impose any required order of steps for the claims in which the disputed term appears. Nonetheless, the agreed-upon proposal that a cluster must be a "logical *unit*" suggests that the cluster must exist before it can be allocated. This requirement is also evident on the face of the claims, such as in the recital of "allocating at least one cluster in the one or more groups of clusters . . .” in above-quoted Claim 24. Ultimately, the question of whether an accused instrumentality includes a “logical unit” of subcarriers (as opposed to a “random” collection of subcarriers, as Defendants have stated Plaintiff may rely upon) is a factual dispute regarding infringement rather than a legal dispute regarding claim construction. *See PPG Indus. v. Guardian Indus. Corp.*, 156 F.3d 1351, 1355 (Fed. Cir. 1998) (noting that “the task of determining whether the construed claim reads on the accused product is for the finder of fact”).

In sum, Defendants’ proposal of “defined” is redundant and would tend to confuse rather than clarify the scope of the claims. Defendants’ proposed construction is therefore rejected. The parties are otherwise in agreement as to the proper construction.

The Court accordingly hereby construes **“cluster of subcarriers”** to mean **“logical unit of multiple physical subcarriers.”**

B. “SINR value”

Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
Plain and ordinary meaning; no construction necessary	“Signal-to-Interference-plus-Noise Ratio measurement”

Dkt. No. 112 at 33; Dkt. No. 118 at 13. This disputed term appears in Claims 24, 26, 43, 73, 85, 104, and 116.

<u>(1) The Parties’ Positions</u>

Plaintiff argues that “[t]he plain and ordinary meaning of ‘value’ may include ‘measurement,’ but it is broader.” Dkt. No. 112 at 33. Plaintiff explains:

> Defendants’ proposed construction suffers from two fundamental errors. First, they latch onto the phrase “measurement” and ignore any disclosure referring to “estimation.” There are numerous passages referring to “estimating,” not “measuring,” the SINR value. [‘283 Patent] at 7:50-61; 7:66-8:1; and 9:55-60. Second, they blur the distinction between the first “measuring or estimating step” and the second “SINR value feedback step.”

Dkt. No. 112 at 34.

Defendants respond that "[t]he '283 Patent uses the term 'SINR value' interchangeably with 'SINR measurement'" and that "a cluster's 'SINR value' is an actual numerical amount of SINR for the cluster." Dkt. No. 118 at 13 & 14.

Plaintiff replies that "[t]he '283 patent specification is replete with different examples of SINR values that are not SINR measurements per se – rather they are calculations based on SINR." Dkt. No. 128 at 3. Plaintiff also cites Judge Grewal's construction of "SINR value" as meaning "calculation based on the Signal-to-Interference-plus-Noise Ratios of the cluster's subcarriers." *Id.*

(2) Analysis

Claim 24 of the '283 Patent is representative and recites (emphasis added):

> 24. A method for subcarrier selection for a system employing orthogonal frequency division multiple access (OFDMA) comprising:
>
> partitioning subcarriers into a plurality of groups of at least one cluster of subcarriers; and
>
> receiving an indication of a selection by a subscriber of one or more groups in the plurality of groups;
>
> receiving feedback information on the one or more groups of clusters of subcarriers from the subscriber, and wherein the feedback information comprises a group identifier and *SINR value* of each cluster within each group; and
>
> allocating at least one cluster in the one or more groups of clusters selected by the subscriber for use in communication with the subscriber.

The specification uses the term "SINR value" in various contexts, including "measurement," "estimation," and "averaging":

> Next, each subscriber continuously monitors the reception of the pilot symbols and *measures the SINR* and/or other parameters, including inter-cell interference and intra-cell traffic, of each cluster (processing block 102). Based on this information, each subscriber selects one or more clusters with good performance (e.g., *high SINR* and low traffic loading) relative to each other and feeds back the information on these candidate clusters to the base station through predefined uplink access channels (processing block 103). For example, *SINR values* higher

> than 10 dB may indicate good performance. Likewise, a cluster utilization factor less than 50% may be indicative of good performance. Each subscriber selects the clusters with relatively better performance than others. The selection results in each subscriber selecting clusters they would prefer to use based on the *measured* parameters.
>
> In one embodiment, each subscriber *measures the SINR* of each subcarrier cluster and reports these *SINR measurements* to their base station through an access channel. The *SINR value* may comprise the *average of the SINR values* of each of the subcarriers in the cluster. Alternatively, the *SINR value* for the cluster may be the *worst SINR* among the *SINR values* of the subcarriers in the cluster. In still another embodiment, a *weighted averaging of SINR values* of the subcarriers in the cluster is used to generate an *SINR value* for the cluster. This may be particularly useful in diversity clusters where the weighting applied to the subcarriers may be different.

‘283 Patent at 5:46-6:6 (emphasis added).

> A subscriber *estimates the SINR* for each cluster from the pilot symbols. In one embodiment, the subscriber first estimates the channel response, including the amplitude and phase, as if there is no interference or noise. Once the channel is estimated, the subscriber calculates the interference/noise from the received signal.
>
> The *estimated SINR values* may be ordered from *largest to smallest SINRs* and the clusters with large *SINR values* are selected. In one embodiment, the selected clusters have *SINR values* that are larger than the *minimum SINR* which still allows a reliable (albeit low-rate) transmission supported by the system. The number of clusters selected may depend on the feedback bandwidth and the request transmission rate. In one embodiment, the subscriber always tries to send the information about as many clusters as possible from which the base station chooses.
>
> The *estimated SINR values* are also used to choose the appropriate coding/modulation rate for each cluster as discussed above. By using an appropriate SINR indexing scheme, an *SINR index* may also indicate a particular coding and modulation rate that a subscriber desires to use. Note that even for the same subscribers, different clusters can have different modulation/coding rates.
>
> Pilot symbols serve an additional purpose in determining interference among the cells. Since the pilots of multiple cells are broadcast at the same time, they will interfere with each other (because they occupy the entire frequency band). This collision of pilot symbols may be used to determine the amount of interference as a worst case scenario. Therefore, in one embodiment, the above *SINR estimation* using this method is conservative in that the measured interference level is the worst-case scenario, assuming that all the interference sources are on. Thus, the

> structure of pilot symbols is such that it occupies the entire frequency band and causes collisions among different cells for use in detecting the *worst case SINR* in packet transmission systems.

Id. at 7:50-8:17 (emphasis added).

> Referring to FIG. 4, a subscriber includes SINR estimation processing block 401 to *perform SINR estimation for each cluster* in pilot periods, power calculation processing block 402 to perform power calculations for each cluster in pilot periods, and power calculation processing block 403 to perform power calculations in data periods for each cluster. Subtractor 404 subtracts the power calculations for data periods from processing block 403 from those in pilot periods from processing block 402. The output of subtractor 404 is input to power difference ordering (and group selection) processing block 405 that performs cluster ordering and selection based on *SINR* and the power difference between pilot periods and data periods. Once the clusters have been selected, the subscriber requests the selected clusters and the coding/modulation rates with processing block 406.

Id. at 9:55-10:3 (emphasis added).

> Typically, *an index to the SINR level*, instead of the *SINR* itself is sufficient to indicate the appropriate coding/modulation for the cluster. For example, a 3-bit field can be used for *SINR indexing* to indicate 8 different rates of adaptive coding/modulation.

Id. at 11:5-9 (emphasis added).

In general, "[e]ven when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using 'words or expressions of manifest exclusion or restriction.'" *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (quoting *Teleflex*, 299 F.3d at 1327).

Nonetheless, Plaintiff's proposal that no construction is necessary should be rejected because, for example, the term "SINR values" might be read as encompassing a numerical ranking of subcarriers in order of performance. *See* '283 Patent at 3:26-30 ("In case of providing information on only a portion of the subcarriers, a subscriber may provide a list of subcarriers ordered starting with those subcarriers which the subscriber desires to use, usually because their performance is good or better than that of other subcarriers.”); *see also id.* at 6:13-16, 7:56-58, 9:35-46 & 10:67-11:4 (similar); *id.* at 12:5-14 (“Many criteria can be used to choose and order the groups, based on the channel information, the inter-cell interference levels, and the intra-cell traffic load on each cluster. . . . The subscriber may order the groups based on their number of clusters for which the SINR is higher than a predefined threshold.”).

Instead, the above-quoted passages in the specification consistently use “SINR value” to refer to a measurement. *See Nystrom v. TREX Co.*, 424 F.3d 1136, 1144-46 (Fed. Cir. 2005) (construing term “board” to mean “wood cut from a log” in light of the patentee’s consistent usage of the term; noting that patentee “is not entitled to a claim construction divorced from the context of the written description and prosecution history”); *see also Edwards*, 582 F.3d at 1330 (finding that “the specification consistently uses the words ‘graft’ and ‘intraluminal graft’ interchangeably”)

On balance, Defendants’ proposal of a “measurement” is appropriate, albeit with the understanding that the scope of the word “measurement” includes calculations based on measured values, for example an average of multiple distinct measurements. With such an understanding, construing “SINR value” as referring to a SINR “measurement” is supported by the specification. *See* ‘283 Patent at 5:46-6:6 (quoted above); *see also id.* at 5:42-45, 7:36, 8:12-13, 9:55-56, 10:21-24, 10:49-50, 13:59 & 15:67-16:7. In this regard, some persuasive weight is also given to Judge Grewal’s construction of “SINR value” as meaning “*calculation* based on the Signal-to-Interference-plus-Noise Ratios of the cluster’s subcarriers.” *Adaptix, Inc. v. Motorola Mobility LLC, et al.*, No. 5:13-cv-1774, Dkt. No. 123 (N.D. Cal. Dec. 19, 2013) (attached to Defendants' response brief in the above-captioned cases as Exhibit E) (emphasis added).

With the above-stated understanding that the word "measurement" can encompass, for example, an average of multiple distinct measurements, the Court hereby construes **"SINR value"** to mean **"Signal-to-Interference-plus-Noise Ratio measurement."**

C. "a group identifier"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
"a group identifier"	"one or more data bits that identify the group"

Dkt. No. 100, Ex. B at 10; Dkt. No. 112 at 34. This disputed term appears in Claims 24, 26, 43, 73, 74, 83, 85, 86, 102, 104, 105, and 116.

Plaintiff has agreed to adopt Defendants' proposed construction. Dkt. No. 112 at 7. The Court therefore hereby construes **"a group identifier"** to mean **"one or more data bits that identify the group."**

D. "allocating additional clusters to the subscriber" and "allocate additional clusters to the subscriber"

"allocating additional clusters to the subscriber" (Claims 46, 91, 92)	
Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No separate construction needed; see "cluster of subcarriers;" other terms have plain and ordinary meaning	"allocating more clusters to the subscriber beyond those currently allocated to the subscriber"

“allocate additional clusters to the subscriber” (Claim 119)	
Plaintiff’s Proposed Construction	**Defendants’ Proposed Construction**
No separate construction needed; see “cluster of subcarriers;” other terms have plain and ordinary meaning	“allocate more clusters to the subscriber beyond those currently allocated to the subscriber”

Dkt. No. 112 at 34; Dkt. No. 118 at 14.

(1) The Parties’ Positions

Plaintiff argues that “the ordinary meaning of the words adequately expresses what is covered by the claim and any attempt to further define it would only heighten the potential for jury confusion.” Dkt. No. 112 at 34-35. Plaintiff further argues that “Defendants have proposed a construction that limits the scope of the claim to an embodiment of the ’283 patent.” *Id.* at 35.

Defendants respond that in contrast to the specification, which discloses increasing a subscriber’s bandwidth by allocating more subcarriers, “[i]n [the accused] LTE [systems], each time slot involves a completely new analysis, where subscribers’ allocations of subcarriers are conducted without regard for which subcarriers they may have had in the past.” Dkt. No. 118 at 14. Defendants argue that they “simply ask that the claim term ‘additional’ be given meaning, and not be read out of the claims.” *Id.* at 15. Finally, Defendants cite extrinsic dictionary definitions of “additional,” which are quoted below. *Id.*

Plaintiff’s reply, in full, is: “Defendants improperly seek to add a limitation that varies from the plain meaning of the term. Defendants are blatantly attempting to manufacture a non-infringement argument. Because this term presents no ambiguity, the Court should find that no construction is necessary.” Dkt. No. 128 at 4.

At the February 13, 2014 hearing, Defendants submitted that the parties' dispute is whether "additional" means "new," as Plaintiff effectively proposes, or "more," as Defendants are urging. Plaintiff responded that the constituent term "additional" means in addition to something previously allocated, not necessarily something currently allocated, as Defendants are proposing.

(2) Analysis

Claim 92 of the '283 Patent is representative and recites (emphasis added):

> 92. A method for subcarrier selection for a system employing orthogonal frequency division multiple access (OFDMA) comprising:
>
> partitioning subcarriers into a plurality of groups of at least one cluster of subcarriers; and
>
> receiving an indication of a selection by a subscriber of one or more groups in the plurality of groups;
>
> allocating at least one cluster in the one or more groups of clusters selected by the subscriber for use in communication with the subscriber;
>
> receiving additional feedback information on the one or more groups of clusters; and
>
> *allocating additional clusters to the subscriber*.

The specification discloses:

> In one embodiment, the base station allocates all the clusters to be used by a subscriber at once. In an alternative embodiment, the base station first allocates multiple clusters, referred to herein as the basic clusters, to establish a data link between the base station and the subscriber. *The base station then subsequently allocates more clusters, referred to herein as the auxiliary clusters, to the subscriber to increase the communication bandwidth.* Higher priorities can be given to the assignment of basic clusters and lower priorities may be given to that of auxiliary clusters. For example, the base station first ensures the assignment of the basic clusters to the subscribers and then tries to satisfy further requests on the auxiliary clusters from the subscribers. Alternatively, the base station may assign auxiliary clusters to one or more subscribers before allocating basic clusters to other subscribers. For example, a base station may allocate basic and auxiliary clusters to one subscriber before allocating any clusters to other subscribers. In one embodiment, the base station allocates basic clusters to a new subscriber and then determines if there are any other subscribers requesting clusters. If not, then the base station allocates the auxiliary clusters to that new subscriber.

'283 Patent at 6:41-62 (emphasis added).

As to extrinsic evidence, Defendants have submitted dictionaries that define "additional" as meaning "added; more; supplementary" and that define "addition" as meaning "anything joined to something previously existing," "[t]he act or process of adding," and "[s]omething added." Dkt. No. 118, Ex. I, *Random House Webster's College Dictionary* 15 (2d ed. 1999); *id.*, Ex. J, *The American Heritage Dictionary* 78 (2d college ed. 1985).

As noted above, Defendants have urged that construction is necessary because the accused instrumentalities do not involve allocating "additional" clusters. Defendants have submitted authority that "a trial court may consult the accused device for context that informs the claim construction process." *Serio-US Indus., Inc. v. Plastic Recovery Techs. Corp.*, 459 F.3d 1311, 1319 (Fed. Cir. 2006) (citing *Wilson Sporting Goods Co. v. Hillerich & Bradsby Co.*, 442 F.3d 1322, 1326-27 (Fed. Cir. 2006) & *Pall Corp. v. Hemasure Inc.*, 181 F.3d 1305, 1308 (Fed. Cir. 1999)). On balance, however, Defendants have raised a factual dispute regarding infringement rather than a legal dispute regarding claim construction. *See PPG Indus.*, 156 F.3d at 1355 (noting that "the task of determining whether the construed claim reads on the accused product is for the finder of fact").

Moreover, the intrinsic evidence does not demand that "additional clusters" must be "beyond those currently allocated," as Defendants have proposed. *See Phillips*, 415 F.3d at 1323 ("[A]lthough the specification often describes very specific embodiments of the invention, [the Federal Circuit has] repeatedly warned against confining the claims to those embodiments.").

Defendants' proposed constructions are therefore hereby expressly rejected. The Court having expressly rejected Defendants' proposed constructions, no further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362; *Finjan*, 626 F.3d at 1207.

The Court accordingly hereby construes **"allocating additional clusters to the subscriber"** and **"allocate additional clusters to the subscriber"** to have their **plain meaning**.

E. "a system employing orthogonal frequency division multiple access (OFDMA)"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
As to "OFDMA": orthogonal frequency division multiple access; otherwise, no construction necessary; plain and ordinary meaning	"a system using orthogonal frequency division multiple access (OFDMA) for downlink and uplink communications"

Dkt. No. 112 at 35; Dkt. No. 118 at 16. This disputed term appears in Claims 24, 70, and 92.

(1) The Parties' Positions

Plaintiff argues that the claims do not require using OFDMA for both uplink *and* downlink. Dkt. No. 112 at 35-36. In particular, Plaintiff argues that the "feedback information" recited in the claims, and described in the specification, "is only collected for, and the claims only relate to, allocating downlink OFDMA subcarriers." *Id.* at 36.

Defendants respond that each claim at issue "recites steps that use the uplink" and so is "directed to a method that uses downlink *and* uplink communications—not solely downlink communications as [Plaintiff] suggests in its brief." Dkt. No. 118 at 16. Defendants also argue that "the specification consistently describes that an OFDMA system must use OFDMA for both downlink and uplink communications." *Id.* at 16 (citing '283 Patent at Fig. 13).

Plaintiff replies that "Defendants try to read the downlink OFDMA subcarrier allocation into the uplink communication." Dkt. No. 128 at 5. Plaintiff argues that "a 'system employing OFDMA' plainly encompasses a system employing OFDMA only on the downlink or only on the uplink or both." *Id.* Plaintiff also cites Judge Grewal's construction of this disputed term as having its "plain and ordinary meaning." *Id.* at 4; *Adaptix, Inc. v. Motorola Mobility LLC, et al.*, No. 5:13-cv-1774, Dkt. No. 123 (N.D. Cal. Dec. 19, 2013) (attached to Defendants' response brief in the above-captioned cases as Exhibit E). Finally, Plaintiff submits that "the subscriber feedback step occurs for downlink subcarrier allocation because the base station otherwise would not know the relative performance of the downlink subcarriers. By contrast, the patent discloses a methodology for uplink subcarrier allocation but does not direct any claims to it." *Id.* at 5 (citing '283 Patent at 3:60-64).

(2) Analysis

Claim 24 of the '283 Patent is representative and recites (emphasis added):

> 24. A method for subcarrier selection for *a system employing orthogonal frequency division multiple access (OFDMA)* comprising:
>
> partitioning subcarriers into a plurality of groups of at least one cluster of subcarriers; and
>
> *receiving* an indication of a *selection by a subscriber* of one or more groups in the plurality of groups;
>
> *receiving* feedback information on the one or more groups of clusters of subcarriers *from the subscriber*, and wherein the feedback information comprises a group identifier and SINR value of each cluster within each group; and
>
> *allocating* at least one cluster in the one or more groups of clusters selected by the subscriber *for use in communication with the subscriber*.

Defendants have cited the "receiving" and "allocating" steps in Claim 24 as reciting uplink and downlink, respectively. Defendants conclude that both uplink and downlink must fall under the OFDMA umbrella set forth in the preamble. Defendants have also cited Figure 13 as illustrating a system that "can both *transmit* and *receive* communications (as indicated by the bidirectional arrow to the left of 'OFDM Signal')." Dkt. No. 118 at 17. Figure 13 is reproduced here:

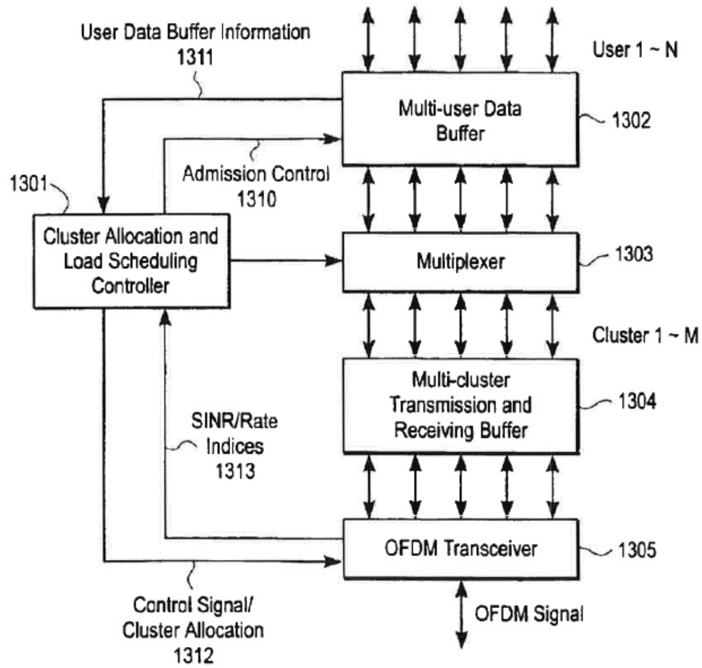

FIG. 13

For substantially the same reasons discussed above regarding the "joint OFDMA channel allocation" terms in the '315 Patent, the systems recited in Claims 24, 70, and 92 of the '283 Patent do not require that OFDMA must be used for both uplink and downlink. Further, "patent coverage is not necessarily limited to inventions that look like the ones in the figures." *MBO Labs., Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007). Defendants' proposed construction is therefore hereby expressly rejected.

The Court having expressly rejected Defendants' proposed construction, no further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362; *Finjan*, 626 F.3d at 1207.

The Court accordingly hereby construes **"a system employing orthogonal frequency division multiple access (OFDMA)"** to have its **plain meaning**.

F. “coherent bandwidth”

Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
“the bandwidth within which the channel response remains roughly the same”	Indefinite

Dkt. No. 112 at 36; Dkt. No. 118 at 11. This disputed term appears in Claims 30, 78 and 96.

The parties present the same arguments as for the same term in the ‘172 Patent, discussed above. *See* Dkt. No. 112 at 36-37; *see also* Dkt. No. 118 at 11-12. The Court accordingly hereby construes **“coherent bandwidth”** to mean **“bandwidth within which the channel response remains roughly the same.”**

VIII. CONSTRUCTION OF DISPUTED TERMS IN THE ‘851 PATENT

A. “the set of available subchannels for each of available antennas”

Plaintiff’s Proposed Construction	Defendants’ Proposed Construction
No construction necessary; plain and ordinary meaning	“for each of multiple available antennas, an identification of available subchannels on that antenna”

Dkt. No. 112 at 37; Dkt. No. 118 at 52. This disputed term appears in Claims 20 and 28.

(1) The Parties’ Positions

Plaintiff argues that the disputed term is readily understandable and that “Defendants propose to distort this plain term by adding redundant and extraneous language that at best contributes nothing but meaningless verbiage to its understanding, and at worst limits the term in ways never intended.” Dkt. No. 112 at 37. In particular, Plaintiff explains that the claims already recite a plurality of “available antennas.” *Id.* Plaintiff also argues that Defendants’ proposal of “identification” is “a blatant attempt to manufacture a non-infringement position by requiring an explicit identification of an antenna where no such requirement is called for in the claim and no such disavowal of a larger scope is made in the specification." *Id.* at 38.

Defendants respond that this disputed term should be construed because "[Plaintiff's] infringement contentions confirm that [Plaintiff] plans to ignore this claim language in its infringement analysis[] because the accused devices do not practice the concept of antenna switching, much less the concept of identifying available subchannels on available antennas." Dkt. No. 118 at 52. Defendants argue that "[t]o select an available subchannel on an available antenna (from a set of available subchannels for each of available antennas), it necessarily follows that available subchannels for each antenna must be identified." *Id.* at 53.

Plaintiff replies by reiterating its opening arguments. *See* Dkt. No. 128 at 19-20.

At the February 13, 2014 hearing, Defendants emphasized that the claimed "selecting" cannot occur unless the available subchannels have been identified.

<u>(2) Analysis</u>

Claim 20 of the '851 Patent is representative and recites (emphasis added):

> 20. A base station, comprising:
> multiple antenna resources to support wireless communications system transmissions;
> a transmission module to generate signals over various downlink or bi-directional channels via which data is transmitted via the multiple antenna resources to multiple subscribers;
> a reception module to extract data indicative of reception quality for a corresponding channel from signals received at the multiple antenna resources over various uplink or the bi-directional channels from the subscribers; and
> channel allocation logic to assign at least one of uplink, downlink and the bi-directional channels for the multiple subscribers based at least on channel characteristics indicative of reception quality obtained for the uplink, downlink and/or bi-directional channels;
> wherein said assigning comprises:
> maintaining and updating the *set of available subchannels for each of available antennas* on an ongoing basis, and
> selecting the available subchannel with the highest gain among available antennas.

The specification discloses, with reference to Figure 6:

> As depicted by start and end loop blocks 602 and 612, the operations depicted in the blocks 604, 606, and 610 are performed for each of users 1 to P. First, in block 604, the available subchannel with the highest gain is selected among all available antennas (or combined antenna resources, if applicable). As depicted by input data block 606, *the set of available subchannels for each of antennas* [*sic*] is maintained and updated on an ongoing basis to provide current subchannel allocation information to block 604. In addition, channel characteristic profile data measured in blocks 402 and/or 452 (as applicable) is stored in a subscribers' channel profile register 608 and updated on an ongoing basis. During channel selection for a particular subscriber, corresponding channel characteristic profile data is retrieved from subscribers' channel profile register 608 as an input to block 604.
>
> In view of input data from data blocks 606 and 608, a subchannel k and antenna j are assigned to the user i in block 610. The process then moves to the next user (e.g., user i+1) to assign a channel comprising a *subchannel/antenna combination* for that user via the operations of block 604 in view of updated input data from data blocks 606 and 608. In general, these operations are repeated on an ongoing basis.

'851 Patent at 10:27-48 (emphasis added).

Defendants are thus correct that the claims, the written description, and the figures contemplate the use of multiple "antenna resources." *See* '851 Patent at 5:38-42 ("As used herein, an antenna resource may comprise a single antenna, or a sub-array of antennas (from an array of an [*sic*] antennas for a given base station) that are collectively used to transmit and/or receive signals from subscribers."); *see also* Dkt. No. 100, Ex. A at 2 (noting parties' agreement that "antenna resource" means "a single antenna that is used, or a sub-array of antennas that are collectively used, to transmit and/or receive signals from subscribers").

Nonetheless, because the claims already recite "multiple antenna resources," and because the disputed term refers to "*each* of available antennas," plural, Defendants' proposed construction is unnecessary and would tend to confuse rather than clarify the scope of the claims. Defendants' proposed construction is therefore hereby expressly rejected.

The Court having expressly rejected Defendants' proposed construction, no further construction is necessary. *See U.S. Surgical*, 103 F.3d at 1568; *see also O2 Micro*, 521 F.3d at 1362; *Finjan*, 626 F.3d at 1207.

The Court accordingly hereby construes **"the set of available subchannels for each of available antennas"** to have its **plain meaning**.

B. "selecting the available subchannel with the highest gain among available antennas"

Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
No construction necessary; plain and ordinary meaning	"[selecting/choosing] one of the available subchannels and one of the available antennas because that combination has the highest gain"

Dkt. No. 112 at 38; Dkt. No. 118 at 54. This disputed term appears in Claims 20 and 28.

<u>(1) The Parties' Positions</u>

Plaintiff submits that the disputed term's "meaning is clear, whereas Defendants' proposed construction fails to further elucidate the term, and also creates unneeded confusion." Dkt. No. 112 at 38. Plaintiff argues that Defendants' proposal is a "tortured" reading of the claim language that "eliminates the notion expressed in the claim term that 'the available subchannel' must be selected from among available antennas rather than, as Defendants propose, that the available subchannel need not be chosen from among available antennas." *Id.* Plaintiff further argues that Defendants' proposal of "choosing" should be rejected because whereas the claim language recites selecting the subchannel with the highest gain, "choosing" assumes two or more "appropriate" alternatives. *Id.* at 39. Finally, Plaintiff urges that Defendants incorrectly "dissociate 'highest gain' from the subchannel and ascribe it to the combination, as if somehow gain were measured for various combinations of available subchannels and available antennas and the combination with the highest was selected. Rather, it is the level of the subchannel's gain that matters, not the combination." *Id.*

Defendants respond that the claim language plainly states, in Defendants words: "of all of the available combinations of subchannels and antennas, select the combination of subchannel and antenna that is determined to have the highest gain." Dkt. No. 118 at 54. Defendants argue that the Court should reject Plaintiff's attempt to read part of the claim language out of the claim by, as Defendants put it, "requiring only determination of a subchannel's gain in the abstract, . . . unconnected to any particular antenna." *Id.* Further, as to Plaintiff's argument that Defendants' construction would encompass selecting a combination of an *un*available antenna and an available subchannel, Defendants respond: "This is incorrect. Defendants' proposed construction explicitly requires selecting an *available* antenna." *Id.* at 55. Finally, Defendants submit that they "do not object to a construction that maintains the claim term 'selecting.'" *Id.* at 54 n.46.

Plaintiff replies that "Defendants' propos[al] to add the word 'and' such that the act of selecting would now require also selecting an antenna" has "[n]o support . . . in the specification." Dkt. No. 128 at 20.

(2) Analysis

Claim 20 of the '851 Patent is representative and recites (emphasis added):

> 20. A base station, comprising:
> multiple antenna resources to support wireless communications system transmissions;
> a transmission module to generate signals over various downlink or bi-directional channels via which data is transmitted via the multiple antenna resources to multiple subscribers;
> a reception module to extract data indicative of reception quality for a corresponding channel from signals received at the multiple antenna resources over various uplink or the bi-directional channels from the subscribers; and

channel allocation logic to assign at least one of uplink, downlink and the bi-directional channels for the multiple subscribers based at least on channel characteristics indicative of reception quality obtained for the uplink, downlink and/or bi-directional channels;

wherein said assigning comprises:

maintaining and updating the set of available subchannels for each of available antennas on an ongoing basis, and

selecting the available subchannel with the highest gain among available antennas.

On one hand, the specification in some instances refers to selecting a "subchannel," without reference to an antenna. *Id.* at 9:4 ("select the desirable subchannel") & 9:15-16 ("the base station selects a subchannel").

On the other hand, the specification discloses the use of "subchannel/antenna combination[s]":

> FIG. 1 shows a base station employing a pair of switched antennas that are used to communicate with various subscribers, wherein each subscriber is assigned to a channel corresponding to a respective *subchannel/antenna combination*.
>
> * * *
>
> FIG. 6 shows a flowchart illustrating operations performed to assign channels to various users for a base station having multiple antenna resources, wherein a channel comprising the best available *subchannel/antenna combination* is assigned to a new user based on measured or estimated subchannel characteristics for each antenna.

'851 Patent at 3:1-4 & 3:26-31 (emphasis added). Figure 6 of the '851 Patent is reproduced here:

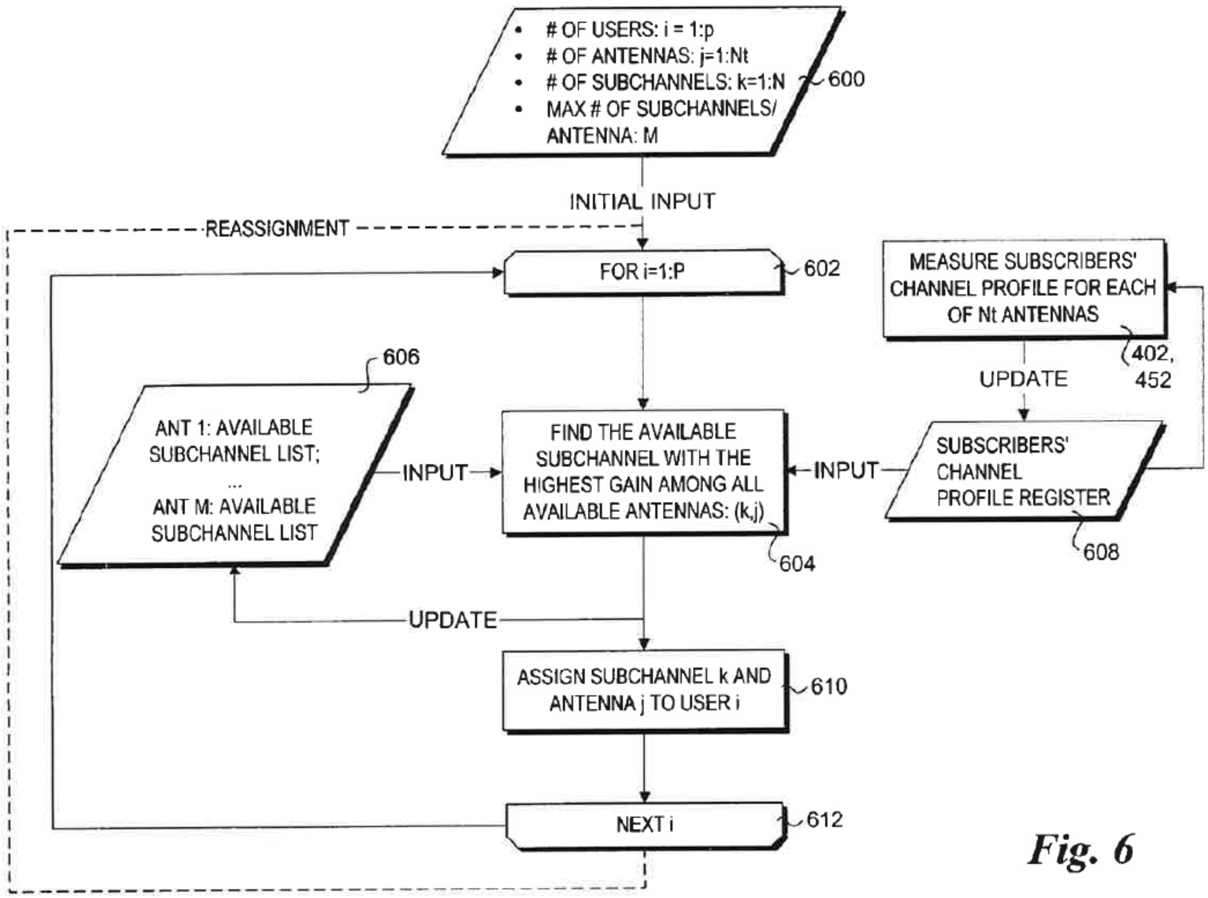

Fig. 6

The specification repeatedly refers to such "subchannel/antenna" combinations. *Id.* at 3:50-52 ("OFDMA subchannel/antenna resource combination"), 7:15-18 ("The overall approach is to assign channel/antenna or subchannel/antenna combinations having the best channel characteristics to new and on-going subscribers."), 7:50-53 ("Under a channel scheme that supports multiple channels operating on the same frequencies (such as OFDMA), the broadcast signal will include applicable sub-channel/frequency combination [*sic*, combinations] per antenna resource."), 8:15-16 ("BER [(bit error rate)] measurements are made for each channel/antenna resource combination"), 10:45-46 ("assign a channel comprising a subchannel/antenna combination"), 11:27-28 ("The subchannel/antenna combination with the highest gain is then selected for assignment to the new subscriber.") & 11:30 ("selection of subchannel 3 for antenna #2").

Further, Claim 20 itself recites "updating the set of available subchannels *for each of available antennas* on an ongoing basis," which demonstrates that the subchannels do not stand in isolation but rather correspond to antennas. Because the disputed term refers to selecting one of those available subchannels, the disputed term necessarily refers to selecting a subchannel/antenna combination. Such is the best reading of the claims, particularly in light of the numerous, consistent disclosures quoted above regarding subchannel/antenna combinations. *See Phillips*, 415 F.3d at 1313 ("Importantly, the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification.").

Finally, as noted above, the parties have reached agreement that the constituent term "selecting" need not be construed. *See* Dkt. No. 118 at 54 n.46; *see also* Dkt. No. 112 at 38-39.

The Court accordingly hereby construes **"selecting the available subchannel with the highest gain among available antennas"** to mean **"selecting one of the available subchannels and one of the available antennas because that combination has the highest gain."**

C. "multiple antenna resources"

Plaintiff's Proposed Construction	Defendants' Proposed Construction
No separate construction needed; see "antenna resource"; other term has plain and ordinary meaning	"more than one antenna resource"

Dkt. No. 100, Ex. B at 11. This disputed term appears in Claims 20, 24, and 28.

Plaintiff has agreed to adopt Defendants' proposed construction. Dkt. No. 112 at 7; *see* Dkt. No. 133, Ex. A at 144. The Court therefore hereby construes **"multiple antenna resources"** to mean **"more than one antenna resource."**

D. "bi-directional channels"

Plaintiff's Proposed Construction	**Defendants' Proposed Construction**
"channels used by both the base station for transmission to the subscriber and for the subscriber transmission to the base station"	"channels that are each used for both subscriber to base station transmission and base station to subscriber transmission"

Dkt. No. 100, Ex. B at 11; Dkt. No. 112 at 39. This disputed term appears in Claims 20 and 28.

Plaintiff argues:

> Defendants propose adding the limitation "each" to the construction in an apparent attempt to define a *single* bi-directional channel as one that is used both for uplink and downlink transmission. As the claim term [at] issue only addresses bi-directional channels *plural*, two competing constructions are possible. First, bi-directional channels could mean a set of more than one channel, some of which are used for uplink only, while the remaining channels are used for downlink only, such that all channels in the set are, on the whole, used for both uplink and downlink. Conversely, bi-directional channels could also mean that *each individual bi-directional channel* is used for both uplink and downlink, and that no bi-directional channel is used for either only uplink or only downlink.
>
> [Plaintiff] will agree to this latter construction and to Defendants' insertion of "each" provided that Defendants will agree that bi-directional channels cannot be defined as using both uplink and downlink at a single point in time, and that a channel can be bi-directional where it is at one time used for uplink alone and at another time used for downlink alone.

Dkt. No. 112 at 39-40.

Defendants respond "[t]here is no dispute that a bi-directional channel can be used for uplink at one time and downlink at another time, but cannot be used for both uplink and downlink at the same time." Dkt. No. 118 at 3 & n.3; *see* Dkt. No. 133, Ex. A at 147.

Plaintiff replies:

> Defendants misstate [Plaintiff's] proposed agreement with respect to the construction of the term "bi-directional channels." Defendants' Brief, at 3, fn. 3. [Plaintiff] will agree that "bi-directional channels" cannot be defined to *require* using both uplink and downlink at a single point in time, and that a channel can be bi-directional where it is at one time used for uplink alone and at another time used for downlink alone. While the claim language does not require such transmissions at the same time, the language also does not preclude it.

Dkt. No. 128 at 2 n.1.

Thus, the only apparent remaining dispute is whether the term "bi-directional channels" excludes channels that can be used for both uplink and downlink at the same time. No support for such a limitation is evident in the claims or in the specification. Any such interpretation of the disputed term is hereby expressly rejected.

Based on this understanding that uplink and downlink can occur on the same "bi-directional" channel at the same time or on the same "bi-directional" channel at different times, the Court hereby construes **"bi-directional channels"** to mean **"channels that are each used for both subscriber to base station transmission and base station to subscriber transmission."**

IX. CONCLUSION

The Court hereby orders the claim terms addressed herein construed as indicated. Summary charts are attached below as Exhibit A (agreed terms) and Exhibit B (disputed terms).

The parties are further ordered that they may not refer, directly or indirectly, to each other's claim construction positions in the presence of the jury. Likewise, the parties are ordered to refrain from mentioning any portion of this opinion, other than the actual constructions adopted by the Court, in the presence of the jury. Any reference to claim construction proceedings is limited to informing the jury of the constructions adopted by the Court.

SIGNED this 26th day of February, 2014.

CAROLINE M. CRAVEN
UNITED STATES MAGISTRATE JUDGE

EXHIBIT A

Agreed Claim Term	Patent / Claims	Court's Construction
"OFDMA"	'315 Patent, Claims 1, 3, 7, 8, 12, 18, 22, 23, 24, 27, 32	"Orthogonal Frequency Division Multiple Access"
"OFDM"	'315 Patent, Claims 27, 30, 32, 33	"Orthogonal Frequency Division Multiplexing"
"uplink"	'315 Patent, Claims 2, 7, 10-12, 18, 32	"subscriber to base station"
"downlink"	'315 Patent, Claims 2, 7, 10-12, 18, 32	"base station to subscriber"
"SINRs"	'808 Patent, Claims 9, 41	"Signal-to-Interference-plus-Noise Ratios"
"OFDMA"	'808 Patent, Claims 1, 9, 14, 15, 31, 32, 41	"Orthogonal Frequency Division Multiple Access"
"selection" / "selected"	'283 Patent, Claims 24, 70, 92, 116, 119	"choice / "chosen"
"SINR"	'283 Patent, Claims 24, 35, 85, 101, 104, 116	"Signal-to-Interference-plus-Noise Ratio"
"an orthogonal frequency division multiplexing (OFDM) transceiver"	'283 Patent, Claims 116, 119	"a component that transmits and receives orthogonal frequency division multiplexing (OFDM) signals"
"antenna resource"	'851 Patent, Claim 25	"a single antenna that is used, or a sub-array of antennas that are collectively used, to transmit and/or receive signals from subscribers"
"uplink . . . channels"	'851 Patent, Claims 20, 28	"channels used for subscriber to base station transmission"
"downlink . . . channels"	'851 Patent, Claims 20, 28	"channels used for base station to subscriber transmission"

EXHIBIT B

United States Patent No. 7,146,172	
Disputed Claim Term	Court's Construction
"diversity cluster [of subcarriers]"	**"logical unit of multiple physical subcarriers that are relatively far apart, as compared to the subcarriers of a coherence cluster"**
"coherence cluster"	**"logical unit of multiple physical subcarriers that are relatively close together, as compared to the subcarriers of a diversity cluster"**
"coherent bandwidth"	**"bandwidth within which the channel response remains roughly the same"**
"reconfiguring cluster classification"	**"changing the ratio of the number of diversity clusters to the number of coherence clusters"**

United States Patent No. 7,072,315	
Disputed Claim Term	Court's Construction
"joint OFDM[A] channel allocation"	**"OFDM[A] channel allocation to a subscriber based on channel characteristics of multiple subscribers"**
"jointly allocated"	**"allocated to a subscriber based on channel characteristics of multiple subscribers"**
"in collaboration with said at least one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers"	**Plain meaning**
"in collaboration with said at least one other of said base stations to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers"	**Plain meaning**

"in collaboration with at least said one other base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers"	**Plain meaning**
"in collaboration with at least said second base station to provide joint OFDMA channel allocation to multiple ones of said plurality of subscribers"	**Plain meaning**
"OFDMA traffic channels jointly allocated to a plurality of subscribers through a collaborative OFDMA channel assignment among multiple base stations"	**Plain meaning**
"subscribers communicating with one base station of a plurality of base stations using orthogonal frequency division multiple access (OFDMA)"	**Plain meaning**
"performing OFDMA multi-user traffic channel assignment"	**Plain meaning**
"an OFDMA network"	**Plain meaning**
"OFDMA channel assignment"	**Plain meaning**
"an OFDM modem"	**Plain meaning**
"broadband spatial channel estimates"	**"estimates of the spatial characteristics of multiple frequency selective channels"**
"spatial gain[s]"	**Plain meaning**
"access signal"	**"signal comprising channel information"**

United States Patent No. 6,870,808

Disputed Claim Term	Court's Construction
"spatial signature"	**"vector representing spatial characteristics of a channel"**
"spatial signature vectors"	**"vectors representing spatial characteristics of channels"**
"broadband spatial signature vectors" **"2-D spatial signature vectors"**	**"two-dimensional matrices, or sets of vectors, that represent spatial characteristics of multiple channels"**

"broadband spatial signature vectors associated with each subscriber" **"broadband spatial signature vectors of the subscribers"**	**No construction necessary apart from separate construction of "broadband spatial signature vectors," above.**
"2-D spatial signatures"	**"two-dimensional matrices, or sets of vectors, that represent spatial characteristics of multiple channels"**
"2-D spatial signatures of an accessing subscriber and one or more subscribers with on-going traffic"	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**
"2-D spatial signature vectors of the new subscriber and other subscribers with on-going traffic"	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**
"2-D spatial signatures of the new subscriber and one or more subscribers with on-going traffic"	**No construction necessary apart from the separate construction of "2-D spatial signatures," above.**
"new subscriber" **"accessing subscriber"** **"new accessing subscriber"**	**"subscriber that has requested access but has not been assigned a traffic channel"**
"subscribers with on-going traffic"	**"subscribers that have been allocated traffic channels and that have on-going traffic"**
"new accessing subscriber spatial signature" **"new subscriber spatial signature"**	**No construction necessary apart from the separate constructions of "spatial signature," "new subscriber," and "new accessing subscriber," above.**
"on-going traffic spatial signature"	**No construction necessary apart from the separate constructions of "spatial signature" and "subscribers with on-going traffic," above.**

"new subscriber spatial signature register" **"new accessing subscriber spatial signature register"**	**Plain meaning**
"on-going traffic spatial signature register"	**Plain meaning**
"allocate OFDMA channels using the broadband spatial signature vectors of the subscribers"	**"allocate each of multiple OFDMA channels using more than one subscriber's broadband spatial signature vectors"**
"an OFDMA traffic channel allocator"	**"logic configured to allocate OFDMA traffic channels"**
"subscriber units to communicate with the base station using an orthogonal frequency-division multiple-access (OFDMA) protocol"	**Plain meaning**
United States Patent No. 6,904,283	
Disputed Claim Term	Court's Construction
"cluster of subcarriers"	**"logical unit of multiple physical subcarriers"**
"SINR value"	**"Signal-to-Interference-plus-Noise Ratio measurement"**
"a group identifier"	**"one or more data bits that identify the group"**
"allocating additional clusters to the subscriber" **"allocate additional clusters to the subscriber"**	**Plain meaning**
"a system employing orthogonal frequency division multiple access (OFDMA)"	**Plain meaning**
"coherent bandwidth"	**"bandwidth within which the channel response remains roughly the same"**

United States Patent No. 7,573,851	
Disputed Claim Term	Court's Construction
"the set of available subchannels for each of available antennas"	**Plain meaning**
"selecting the available subchannel with the highest gain among available antennas"	**"selecting one of the available subchannels and one of the available antennas because that combination has the highest gain"**
"multiple antenna resources"	**"more than one antenna resource"**
"bi-directional channels"	**"channels that are each used for both subscriber to base station transmission and base station to subscriber transmission"**