

**UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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**SMARTSKY NETWORKS LLC,**

**Petitioner,**

**v.**

**GOGO BUSINESS AVIATION LLC,**

**Patent Owner**

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**Case: IPR2025-00672**

**Patent 9,954,600**

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**PETITION FOR *INTER PARTES* REVIEW**

**UNDER 35 U.S.C. §312 AND 37 C.F.R. §42.104**

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## LIST OF EXHIBITS

| Exhibit         | Short Name        | Description                                          |
|-----------------|-------------------|------------------------------------------------------|
| <b>Ex. 1001</b> | '600 Patent       | U.S. Patent No. 9,954,600                            |
| <b>Ex. 1002</b> | Declaration       | Declaration of Dr. Gerard James Hayes                |
| <b>Ex. 1003</b> | CV                | <i>Curriculum Vitae</i> of Dr. Gerard James Hayes    |
| <b>Ex. 1004</b> | '600 File History | File History of U.S. Patent No. 9,954,600            |
| <b>Ex. 1005</b> | Chapelle          | U.S. Patent No. 9,306,657                            |
| <b>Ex. 1006</b> | Jalali            | U.S. Patent Application Publication No. 2014/0200045 |
| <b>Ex. 1007</b> | Nelson            | U.S. Patent No. 7,177,939                            |
| <b>Ex. 1008</b> | Mcguffin          | European Patent No. 2,207,275                        |

SmartSky Networks LLC (“SmartSky” or “Petitioner”) petitions for IPR under 35 U.S.C. §§311-319 and 37 C.F.R. §42 of Claims 1-19 (“the Challenged Claims”) of U.S. Patent No. 9,954,600 (“the ‘600 patent”). Petitioner requests cancellation of the Challenged Claims.

#### **I. STANDING UNDER 37 C.F.R. §42.104(a)**

Petitioner certifies the ‘600 patent is available for IPR, and Petitioner is not barred or estopped from requesting IPR.

#### **II. PAYMENT OF FEES**

Petitioner authorizes Account No. 50-0376 to be charged.

#### **III. OVERVIEW OF CHALLENGES AND RELIEF REQUESTED**

Pursuant to 37 C.F.R. §42.22(a)(1) and 42.104(b)(1) (2), Petitioner requests cancellation of the Challenged Claims pursuant to the grounds below. Additional support is provided in the Declaration of Dr. Gerard James Hayes (Ex. 1002).

- **Ground 1:** Claims 1-4, 6, 13-15, 17, and 19 are anticipated by Chapelle.
- **Ground 2:** Claims 1-4, 6-15, and 17-19 are unpatentable over Chapelle and Jalali.
- **Ground 3:** Claims 5 and 16 are unpatentable over Chapelle and Jalali in view of Nelson.

- **Ground 4:** Claims 1-4, 6-15, and 17-19 are unpatentable over Chapelle and Jalali in view of Nelson and McGuffin.

## **IV. BACKGROUND**

### **A. Technical Background**

The '600 patent, entitled "Servicing cell selection in air to ground communication systems" relates to "select serving cells in air to ground communication systems." The '600 patent discusses a scarcity of air-to-ground (ATG) communication system resources that suggest use of unlicensed bands. Given the noise and interference of these bands, cell selection to maximize throughput is accomplished by measuring noise (or SNR) and comparing capacity estimates for links using a decision matrix. Ex. 1002, ¶26.

### **B. Prosecution History**

The '600 patent was filed as U.S. Patent Application No. 15/352,255 on November 15, 2016. Ex. 1001, Cover; Ex. 1002, ¶27. A preliminary amendment was submitted on June 27, 2017 clarifying the independent claims regarding channels/links involved being between a ground station and aircraft, as well as adding the "forward-link user capacity matrix" to claim 1 and the "reverse-link noise matrix" to claim 7. Ex. 1002. ¶31; Ex. 1004, pp. 64-73. Subsequent to an interview with the Examiner, and an Examiner's amendment making minor changes to various claims, a Notice of Allowance was mailed on December 7, 2017, without any claim

rejections being issued. Ex. 1002, ¶¶31; Ex. 1004, pp. 81-93. Another amendment was submitted after allowance to make minor corrections prior to issuance of the ‘600 patent. Ex. 1002, ¶¶31; Ex. 1004, pp. 197-204.

### **C. Priority Date**

In this Petition, Petitioner assumes that the earliest priority date for the ‘600 patent is July 5, 2016. The ‘600 patent has a filing date of November 15, 2016. Ex. 1001, Cover; Ex. 1002, ¶¶27-29. The ‘600 patent claims priority to U.S. Patent Application No. 62/358,437 filed on July 5, 2016. Petitioners assume (without determining) that the priority claims are proper. If Patent owner disputes the prior art status of any of Petitioner’s cited references, Petitioner reserves the right to challenge the priority date.

### **D. Claim Construction**

Generally, the terms should receive their respective plain and ordinary meaning as understood by a person of ordinary skill in the art under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005). Petitioner respectfully submits that, at least for purposes of institution, no claim terms of the ‘600 patent require construction.

## **V. PRIOR ART REFERENCES**

### **Chapelle (Ex. 1005)**

Chapelle, entitled “Soft Handoff Method and Apparatus for Mobile Vehicles Using Directional Antennas,” was published October 12, 2006 from an application

filed on December 21, 2005 that claims priority to a provisional application filed on April 8, 2005. Chapelle addresses an ATG communication problem relating to “insufficient communication capacity in a single ATG channel to provide broadband service to the expected market of 10,000 or more aircraft using the exact communication method and apparatus used for standard terrestrial cellular communication.” Ex. 1005, 1:52-57. Chapelle explains the capacity problem exists “because a typical cell phone antenna is a monopole element that has an omnidirectional gain pattern in the plane perpendicular to the antenna element. This causes transmit power from the antenna to radiate in all directions, thus causing interference into all BTS sites within the radio horizon of its transmissions.” Ex. 1005, 1:64-2:2; Ex. 1002, ¶34. To cure this problem, Chapelle refers to a “well known method for reducing interference on wireless networks is using directional antennas instead of the omnidirectional antennas.” Ex. 1005, 2:9-11; Ex. 1002, ¶34. The problem remained as to how to handoff an aircraft between different ground stations using directional antennas to maintain the communication link through the handoff. Chapelle proposed multiple ways to conduct this handoff while maintaining the communication link that are ultimately aimed at providing “a higher quality communications link.” Ex. 1005, 4:20-23; Ex. 1002, ¶34. Included among the ways described to achieve higher quality communications links while maximizing capacity, are the use of a signal-to-interference ratio (S/I ratio) and

signal-to-noise ratio (SNR) as a basis for comparison. Ex. 1005, 8:57-9:7, 17:48-53; Ex. 1002, ¶34.

#### **Jalali (Ex. 1006)**

Jalali, entitled “High Data Rate Aircraft to Ground Communication Antenna System,” was published July 17, 2014 from an application filed March 17, 2014 that is a divisional of U.S. Patent No. 8,676,192 claiming priority to a provisional application filed February 9, 2011. Jalali discloses ATG communication utilizing multiple ground stations to switch data reception based on different criteria. Jalali discloses that handoff may be conducted based on signal strength measurements for pilot signals. Ex. 1006, [0008]-[0012]; Ex. 1002, ¶35. However, Jalali also describes an example embodiment in which signal-to-noise-plus-interference ratio (SINR) is measured, and handoff is controlled based on selecting beams that provide “improved performance.” Ex. 1006, [0059]-[0060]. Comparing beams based on SINR allows an “optimal beam” to be selected. SINR values are indexed and compared/considered relative to thresholds. Ex. 1006, [0067]. Jalali describes the use of filtering and averaging of values measured to account for variations. Ex. 1006, [0052], [0057]; Ex. 1002, ¶35.

#### **Nelson (Ex. 1007)**

Nelson, entitled “Aircraft Data Communications Services for Users,” was published February 27, 2003 from an application filed on June 19, 2001. Nelson

discloses a communication system between a moving object and ground terminal. Ex. 1007, Abstract. Specifically, Nelson discloses a radio communication path between an aircraft and a ground terminal such that a “data communication server establishes the radio communication path over one of a plurality of wireless data networks including packet data networks and satellite data networks and preferably includes a pre-determined software architecture.” Ex. 1007, Abstract. Nelson also states that data can flow through an air link using an “out-of-band” protocol. Ex. 1007, 10:23-27; Ex. 1002, ¶36.

**Mcguffin (Ex. 1008)**

Mcguffin, entitled “Method and system for datalink ground station selection,” was published July 14, 2010 from an application filed on December 21, 2009. Mcguffin discloses a selection method of ground station for ground to air communication. Specifically, Mcguffin discloses a selection method utilizing “the average of the signal strength values stored in each data structure is calculated to determine an average signal strength, and the average signal strength of each of the one or more ground stations is compared.” Ex. 1008, [0012]. The comparison of values is performed via storage of data in a data structure that is shown in various tables. Ex. 1008, [0034]-[0038]; Ex. 1002, ¶37.

## **VI. LEVEL OF ORDINARY SKILL IN THE ART**

A person of ordinary skill in the art (“POSA”) pertinent to the ‘600 patent would have a degree in electrical engineering or computer science, or a similar discipline, along with 4-5 years of experience with real-time systems architecture, design, and implementation. This POSA would be aware and generally knowledgeable about the aviation and aerospace industry as it relates to telecommunication systems. Ex. 1002, ¶17-18.

## **VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE**

The ‘600 patent contains 19 claims, of which claims 1, 7, and 13 are independent. Independent claim 1 recites a non-transitory computer readable medium; claim 7 recites a computer-implemented method; and claim 13 recites a computer system comprising one or more processors and/or transceivers. The Challenged Claims are disclosed and/or taught by the prior art. Ex. 1002, ¶42.

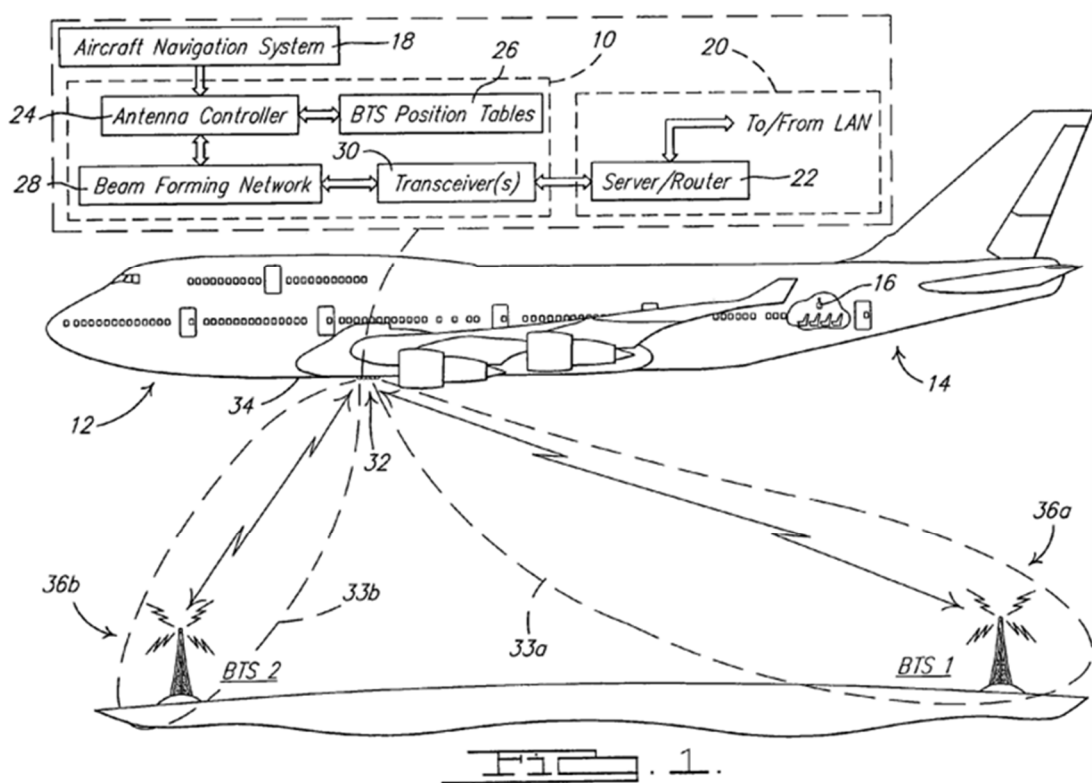
## **VIII. GROUND 1: Chappelle Discloses all Limitations of Claims 1-4, 6, 13-15, 17, and 19**

Chappelle (Ex. 1005) *addresses the same issue in the same manner* as the ‘600 patent. Specifically, each deals with the issue of providing ATG communication services to airborne aircraft using directional beams that are handed off based on signal measurements of candidate cells. *Compare* Ex. 1001, 4:46-50 (“[b]y employing a high directivity antenna to measure the noise levels in many different

possible directions of communication and refreshing such information periodically, the ATG supplementary IFC network may select serving cells that provide the best available SINR”), *with* Ex. 1005, 8:57 ([a] second method for determining when to initiate a hand off involves using a “best Signal/Interference (S/I) ratio” algorithm as part of periodic, real time calculation. For example, if the BTSs were uniformly distributed, the “nearest BTS” algorithm would work near-optimally. In practice there is typically clustering of BTSs in metropolitan areas, and in particular close to airports. If there are 2 BTSs close to each other, then during a receive operation, if the antenna system 32 steers its primary lobe to work with one of these BTSs, there may be strong interference coupled into the antenna system 32 from the other BTS, as both BTSs, may be within the relatively wide single lobe beam. In such situations, a higher S/I ratio and hence better system performance would be obtained by selecting and using another BTS which is actually not the next closest BTS to the aircraft. Preliminary testing has indicated that for realistic BTS locations (including some BTS clustering), using the “best S/I” approach increased the worst case S/I by around 5 dB”). Ex. 1002, ¶43.

Chapelle teaches all limitations of, and therefore anticipates, claim 1. The preamble of claim 1 recites “a non-transitory computer readable medium, comprising processor executable instructions that when executed by a computer processor disposed within an airborne aircraft cause the computer processor to”

carry out various further claimed elements. To the extent the preamble of claim 1 is deemed a limitation, Chapelle discloses “an antenna controller 24 that is in communication with a base transceiver station (BTS) position look-up table 26.” Ex. 1005, 5:48-51; Ex. 1002, ¶44. A POSA would understand that it is inherent that the BTS look-up table is stored in a non-transitory computer readable medium, and that the antenna controller inherently possesses a processor capable of executing instructions. Ex. 1002, ¶44. Moreover, the antenna controller is clearly on the aircraft in FIG. 1. Ex. 1005, FIG.1.



A first element of claim 1 (“element 1a”) recites: “command a directional antenna installed on the aircraft and a transceiver disposed within the aircraft to

measure a first signal-to-noise ratio of a first communication channel corresponding to a first location on the ground, the first communication channel configured to support transmissions to/from the airborne aircraft.” Chapelle discloses a beamforming network, via which the controller controls an antenna system to create a single beam that a POSA would clearly understand to correspond to a directional antenna and corresponding transceiver. Ex. 1005, 5:62-6:4; Ex. 1002, ¶45.

Chapelle also discloses that an S/I ratio, which a POSA would understand to be interchangeable with SNR mentioned in claim 1 of the ‘600 patent, is used in signal-to-interference analysis that is performed regarding multiple base stations (BTSs). Ex. 1002, ¶46. Notably, Chapelle clearly indicates interchangeability of SNR with the S/I ratio by virtue of the substitution of SNR in the description of 17:48-53 for the S/I ratio otherwise discussed for similar use at 8:63-9:4 of Ex. 1005. Thus, a POSA would clearly understand that the S/I ratio measurements and SNR calculations of Chapelle are made on corresponding communication channels associated with each of the BTSs. Ex. 1002, ¶46. For evaluation of any potential handoff, Chapelle discloses measurements regarding at least two BTSs, of which one of them would necessarily be considered to correspond to the “first communication channel” among the first and second communication channels of claim 1. Ex. 1005, 8:63-9:4, 17:48-53; Ex. 1002, ¶46.

A second element of claim 1 (“element 1b”) recites: “command the directional antenna and the transceiver to measure a second signal-to-noise ratio of a second communication channel corresponding to a second location on the ground, the second communication channel configured to support transmissions to/from the airborne aircraft.” This merely repeats the prior step for a second channel, which Chapelle discloses as a necessity to consider a handoff. Ex. 1005, 8:63-9:4, 17:48-53; Ex. 1002, ¶47.

A third element of claim 1 (“element 1c”) recites: “calculate a first forward-link user capacity estimate using the first signal-to-noise ratio of the first communication channel.” Interference experienced on the receive operation from the aircraft perspective is discussed, which a POSA understands to be the forward link. Ex. 1005, 8:63-67. A POSA would also understand that in order to determine the “best S/I”, a comparison of some estimate of the capacity of the network, which is defined by its channels, is necessary. In this regard, Chapelle expressly notes that communication capacity of networks, and thereby also their channels, is limited by interference. Ex. 1005, 2:4-8. This is an immutable characteristic of communication networks. Thus, capacity is known by a POSA to be directly related to interference levels, and the signal to interference measurements and SNR calculations of Chapelle are therefore also directly associated with estimations of channel capacity. Ex. 1002, ¶48. A POSA would appreciate that Chapelle’s teaching the “best S/I”

algorithm, describes a particular way to employ a “best capacity” algorithm or “best quality” algorithm for BTS selection in handoff given that Chapelle specifically discusses the focus on capacity in its background section, and also specifically discloses conducting a handoff from one link to another when a second BTS is expected to provide a “higher quality communications link.” Ex. 1005, 4:20-27; Ex. 1002, ¶48. Chapelle describes this process with more specificity in connection with operation 110 of FIG. 16, where signal strength measurement is expressly disclosed in connection with quality determination. Ex. 1005, 16:43-50. A POSA understands the term “quality” in wireless communication to mean colloquially, how “clean” or “clear” a signal is. Ex. 1002, ¶48. This cleanliness or clarity is directly related to signal strength, interference, and noise and is also very well known to a POSA. *Id.* The higher quality link in this regard, would be understood by a POSA to have a better combination of signal strength, interference and/or noise, and therefore also correspondingly higher capacity. *Id.* The ‘600 patent does not teach any method for calculating a capacity estimate using SNR. Instead, the only detail provided for forward link capacity seems to be the provision of an exemplary system to collect and calculate the capacity. Ex. 1001, 8:46-9:56; Ex. 1002, ¶48. This section extols the virtue of a simple approach to estimating SINR based on noise plus interference measurements and power settings. Ex. 1001, 9:14-16; Ex. 1002, ¶48. The first forward-link user capacity estimate of element 1c is therefore nothing more than a

quality estimate based on signal to interference ratio and/or SNR, both of which are clearly disclosed by Chapelle, and a POSA would appreciate these descriptions to be equivalent to that which is recited in element 1c. Ex. 1005, 1:52-2:19, 8:63-9:4; Ex. 1002, ¶48.

A fourth element of claim 1 (“element 1d”) recites: “calculate a second forward-link user capacity estimate using the second signal-to-noise ratio of the second communication channel.” This merely repeats the prior step for a second channel, which Chapelle discloses as a necessity to consider a handoff. Ex. 1005, 1:52-2:19 and 8:63-9:4; Ex. 1002, ¶49.

A fifth element of claim 1 (“element 1e”) recites: “calculate a forward-link user capacity matrix using the first forward-link user capacity estimate and the second forward-link user capacity estimate.” Chapelle describes a handover involving “determining when a second BTS becomes available that is expected to provide a higher quality communications link with the terrestrial cellular network” (see Ex. 1005, 4:20-22), which a POSA understands to necessarily include a comparison of quality related parameters between two BTSs. The quality related parameters (e.g., signal strength, interference and noise) must be stored in a computer for comparison of the candidate BTSs for the forward link. This necessity for storage thereby inherently creates a matrix of parameters that can be compared.

FIG. 5 of the ‘600 patent (reproduced below for convenience) illustrates an example of the forward-link user capacity matrix. Ex. 1005, 4:11-31; Ex. 1002, ¶50.

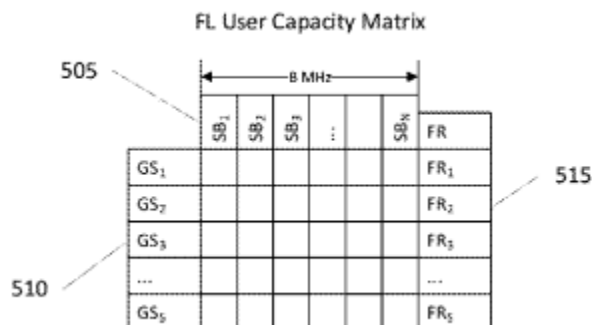


FIG. 5

It is evident from FIG. 5 that the matrix of the ‘600 patent is merely a collection of data in a common tabular form of columns and rows that is representative of how such data is stored in a computer conventionally to permit comparisons or decisions to be made regarding the data of the matrix. Ex. 1002, ¶50. For the quality related parameters of Chapelle to be compared for its stated purpose of determining when a higher quality communications link is available, the computing device of Chapelle (i.e., the antenna controller) would inherently employ a matrix of the quality related parameters in order to perform the task. As noted above, signal strength, interference and noise measurements/estimates are all expressly described as being made by Chapelle. Ex 1005, 16:43-50, 9:16-21, 17:48-53. Chapelle’s description of determining when a higher quality communications link becomes available is therefore inherently performed using a matrix involving the compared forward link collected parameters indicating quality like signal strength, interference and noise,

which are also directly related to channel capacity, and easily interchangeable in this context by a POSA. Ex. 1002, ¶50.

A sixth element of claim 1 (“element 1f”) recites: “the forward-link user capacity matrix is utilized to select communication channels to utilize for transmissions between a plurality of ground stations disposed on the ground and the airborne aircraft.” A handover “to provide a higher quality communications link” is described (*see* Ex. 1005, 4:20-22), which a POSA understands to necessarily include a comparison of quality related parameters between two BTSs in the inherently stored user capacity matrix described above. In particular, the quality related parameters (e.g., signal strength, interference and noise) that are necessarily stored in a computer for comparison of the candidate BTSs for the forward link inherently define a matrix of parameters to permit the comparison. Signal strength, interference and/or noise measurements are all expressly described as being made by Chapelle. Ex. 1005, 16:43-50, 9:16-21, 17:48-53. The express description of determining when a higher quality communications link becomes available inherently involves using a matrix involving the compared forward link collected parameters indicating quality and are also directly related to channel capacity, and easily interchangeable in this context by a POSA. Ex. 1005, 4:11-31; Ex. 1002, ¶51.

Chapelle therefore expressly describes a handoff involving candidate forward link BTSs in a way that a POSA would understand to be equivalent to that which is

recited in claim 1. Claim 1 merely describes a conventional handoff in terms that are understood to be the same by a POSA in Chapelle, even though they may appear to be different given only a cursory read. Parameters of candidate channels are compared to determine when to conduct the handoff using a common decision tool (i.e., a decision matrix) for common computers. Ex. 1002, ¶52.

Regarding claim 2, Chapelle teaches that “the first communication channel comprises a first center frequency and a first bandwidth, wherein the second communication channel comprises a second center frequency and a second bandwidth, and wherein the first communication channel does not overlap the second communication channel.” Ex. 1005, 5:55-61, 16:34-36. In this regard, Chapelle indicates that the communication links involve various RF frequency bands, each of which bands inherently has a center frequency and corresponding width. A POSA clearly understands that channels must not interfere with each other, and therefore should not overlap. Moreover, Chapelle expressly notes that the beamformer includes a plurality of “distinct channels,” which a POSA would understand to be non-overlapping. Ex. 1005, 10:37-40; Ex. 1002, ¶53.

Claim 3 further provides that “the processor executable instructions, when executed by the computer processor, cause the computer processor to” perform a series of recited features including (“element 3a”): “command the directional antenna and the transceiver to measure a short-term average of the first signal-to-

noise ratio of the first communication channel;” (“element 3b”): “command the directional antenna and the transceiver to measure a short-term average of the second signal-to-noise ratio of the second communication channel;” (“element 3c”): “calculate the first forward-link user capacity estimate using the short-term average of the first signal-to-noise ratio of the first communication channel; and” (“element 3d”): “calculate the second forward-link user capacity estimate using the short-term average of the second signal-to-noise ratio of the second communication channel.” This is effectively a restatement of claim 1 while incorporating short-term averaging for the signal-to-noise ratio involved. The ‘600 patent does not define a “short-term” time frame. Thus, any averaging over a reasonably short time period would constitute a short-term average in the same terms provided by claim 3. Ex. 1002, ¶54. Meanwhile, Chapelle describes real time performance, which is necessarily short-term, involving calculating the S/I ratio. *Id.* While “real time” provides no specific short time, it unquestionably demonstrates a variable time frame for measurement, where the interference in the denominator is an “aggregate interference” that is aggregated over a selected time period (e.g., a short time suitable for real time application) among the variable time frames available, to effectively define a short-term average. *Id.* Any suitable time frame that is usable in a real time context explained by Chapelle would therefore be understood by a POSA to provide

a short term averaging function for the performance of the ratio calculation. Ex. 1005, 8:63-9:4, 17:48-53, 9:13-21; Ex. 1002, ¶¶54-57.

Claim 4 further provides that “the processor executable instructions, when executed by the computer processor, cause the computer processor to” perform a series of recited features including (“element 4a”): “command the directional antenna and the transceiver to measure a long-term average of the first signal-to-noise ratio of the first communication channel;” (“element 4b”): “command the directional antenna and the transceiver to measure a long-term average of the second signal-to-noise ratio of the second communication channel;” (“element 4c”): “calculate the first forward-link user capacity estimate using the long-term average of the first signal-to-noise ratio of the first communication channel; and” (“element 4d”): “calculate the second forward-link user capacity estimate using the long-term average of the second signal-to-noise ratio of the second communication channel.” The ‘600 patent does not provide any definition for what constitutes a “long-term” time frame. Thus, any averaging over a reasonably long time period would constitute a long-term average in the same terms provided by claim 4. Meanwhile, Chapelle describes a repeated cycle every 30 seconds involving calculating the S/I ratio. Ex. 1005, 9:13-21; Ex. 1002, ¶58. This demonstrates a variable time frame for measurement over which aggregated values are considered to effectively define an averaging function. Ex. 1002, ¶58. The time period of 30 seconds, or anything on

the order of 30 seconds would be understood by a POSA to provide a long term averaging function for the performance of the ratio calculation. Ex. 1005, 8:63-9:4, 17:48-53, 9:13-21; Ex. 1002, ¶¶58-61.

Regarding claim 6, Chapelle teaches “additional processor executable instructions that when executed by the computer processor cause the computer processor to” perform various recited features including “element 6a”: “command the directional antenna and the transceiver to measure a third signal-to-noise ratio of a third communication channel corresponding to a third location on the ground, the third communication channel configured to support transmissions to/from the airborne aircraft;” “element 6b”: “calculate a third forward-link user capacity estimate using the third signal-to-noise ratio of the third communication channel;” and “element 6c: “calculate the forward-link user capacity matrix using the first forward-link user capacity estimate, the second forward-link user capacity estimate, and the third forward-link user capacity estimate.” Ex. 1005, 9:13-21; Ex. 1002, ¶62. These operations merely add a third station, measurement, capacity estimate and matrix to what was already discussed above. Chapelle discusses identifying which BTSs are above the horizon and visible, and then calculating the S/I ratio for each visible BTS. Accordingly, Chapelle clearly contemplates the comparisons to extend beyond two BTSs to a third BTS. Moreover, this requires the operations of commanding the directional antenna regarding measurement, capacity estimates and

matrices discussed above to be repeated for a third communication channel corresponding to a third location on the ground. Ex. 1002, ¶¶62-64.

The preamble of claim 13 recites “a computer system comprising one or more processors and/or transceivers” carry out various further claimed elements. To the extent the preamble of claim 13 is deemed a limitation, Chapelle discloses these features because Chapelle discloses “a plurality of base transceiver stations (BTSs)” and that each BTS has “a radio transceiver.” Ex. 1005, 3:29-37; Ex. 1002, ¶65.

Chapelle further teaches that the processors and/or transceivers are “configured to: retrieve at least one of: (i) a forward-link user capacity matrix comprising a plurality of forward-link user capacity estimates each associated with a respective signal-to-noise ratio measurement of a respective communication channel corresponding to a respective location on the ground,” which feature will be referred to herein as “element 13a.” Ex. 1005, 4:11-31; Ex. 1002, ¶66. A handover “to provide a higher quality communications link” is described (*see* Ex. 1005, 4:20-22), which a POSA understands to necessarily include a comparison of quality related parameters between two BTSs. The quality related parameters (e.g., signal strength, interference and noise) must be stored in a computer for comparison of the candidate BTSs for the forward link. This necessity for storage thereby inherently creates a matrix of parameters that can be compared. Ex. 1002, ¶66. As noted above, signal strength, interference and/or noise measurements or estimates are all

expressly described as being made by Chapelle. Ex. 1005, 16:43-50, 9:16-21, 17:48-53. The express description in Chapelle of determining when a higher quality communications link becomes available is therefore inherently performed using a matrix involving the compared forward link collected parameters indicating quality (i.e., signal strength, interference and/or noise), which are also directly related to channel capacity, and easily interchangeable in this context by a POSA. Ex. 1002, ¶66.

Claim 13 recites “element 13b”, which provides the processors and/or transceivers are alternatively configured to retrieve “a return-link user capacity matrix comprising a plurality of return-link user capacity estimates each associated with a respective noise power level of a respective communication channel corresponding to a respective azimuth and a respective elevation from a current location of an airborne aircraft.” Ex. 1002, ¶67. Notably, the recitation of this phrase as an alternative to the prior one means that anticipation is achieved without expressly showing this feature since the forward-link user capacity matrix is already shown by Chapelle in the manner recited in element 13b. Nevertheless, it is noteworthy that it would be well within the capability of a POSA to perform the same operations described above for the forward-link on the return-link. Ex. 1002, ¶67.

Chapelle also discloses a third feature (“element 13c”) which provides “determine, using at least one of (i) the forward-link user capacity matrix or (ii) the return-link user capacity matrix, a candidate serving cell that is disposed on the ground.” Ex. 1005, 4:11-31; Ex. 1002, ¶68. Chapelle describes a handover “to provide a higher quality communications link.” Ex. 1005, 4:20-22. A POSA understands this necessarily includes a comparison of quality related parameters (e.g., signal strength, interference and noise) between two BTSs in the inherently stored user capacity matrix described above. Ex. 1005, 16:43-50, 9:16-21, 17:48-53. The express description in Chapelle of determining when a higher quality communications link becomes available inherently involves using a matrix involving the compared forward link collected parameters indicating quality, which are also directly related to channel capacity, and easily interchangeable in this context by a POSA. Ex. 1002, ¶68. For anticipation, claim 13 only requires that the forward link user capacity matrix be determined, and a POSA would understand that it is determined as part of the handoff process noted above. Nevertheless, the same process being performed for the reverse link would clearly also be within the capability of a POSA. *Id.*

Chapelle discloses a fourth feature (“element 13d”), which recites: “command a directional antenna and a particular transceiver to transmit or receive data between the airborne aircraft and the candidate serving cell.” This feature

describes completing a handoff to the candidate cell selected to maintain the communication link after handoff. Chapelle describes this feature in many places as it describes different handoff strategies. Ex. 1005, 4:23-31; Ex. 1002, ¶69.

Claim 14 recites: “the one or more processors and/or transceivers are configured to: retrieve the at least one of (i) the forward-link user capacity matrix or (ii) the return-link user capacity matrix from an air-to-ground network controller disposed on the ground and in communicative with a plurality of serving cells, the plurality of serving cells including the candidate serving cell.” Notably, this passage includes alternative language, and anticipation only requires that one of the alternative passages be expressly or inherently disclosed. The first passage relating to the forward-link user capacity matrix is inherently disclosed by Chapelle. Ex. 1005, 4:11-31; Ex. 1002, ¶70. As noted above, Chapelle discloses handover based on providing “a higher quality communications link.” Ex. 1005, 4:20-22. A POSA understands this necessarily includes a comparison of quality related parameters in a matrix of parameters. Ex. 1005, 16:43-50, 9:16-21, 17:48-53; Ex. 1002, ¶70. The express description in Chapelle of determining when a higher quality communications link becomes available is therefore inherently performed using a matrix involving the compared forward link collected parameters indicating quality, which are also directly related to channel capacity, and interchangeable in this context by a POSA. Ex. 1002, ¶70. That matrix must be retrieved by the antenna

controller to permit the comparison, and all of the features of claim 14 are therefore expressly or inherently shown in Chapelle. *Id.*

Regarding claim 15, Chapelle teaches that “the candidate serving cell comprises a respective noise power level above a threshold.” In this regard, Chapelle describes handoff to the candidate cell based on higher quality, which directly takes accounting of noise power levels, as noted above. Chapelle further expressly states that noise power levels are considered relative to “a predetermined threshold” in relation to handoff. Thus, a POSA would understand that all of the features of claim 15 are disclosed by Chapelle. Ex. 1005, 4:11-31, 17:51-53; Ex. 1002, ¶71.

Regarding claim 17, Chapelle teaches that “the forward-link user capacity matrix indicates a lower signal-to-noise ratio associated with the candidate serving cell than an alternative serving cell, and wherein the alternative serving cell is located at a distance from the airborne aircraft that is greater than a distance from the airborne aircraft of the candidate serving cell.” The use of the antenna controller to inherently employ a user capacity matrix for the handoff is described in Chapelle. Ex. 1002, ¶50. Claim 17 further adds the possibility that a more distant cell could be picked for handoff among two candidate cells being considered for such handoff. However, this is a conventional and well known result of employing handoffs in many contexts where signal quality (or S/I, SNR, etc.) is used as the basis for conducting handoffs instead of merely relying on distance. Ex. 1002, ¶72. Moreover,

Chapelle expressly describes the basic “nearest BTS” algorithm as one option. Ex. 1005, 8:5-56. However, Chapelle further expressly explains how real world interference renders the “nearest BTS” algorithm inferior sometimes, and therefore further explains that using the best S/I ratio or using SNR can avoid this problem. Ex. 1005, 8:57-9:27, 17:51-53. Based on these disclosures a POSA would appreciate that claim 17 is also anticipated by Chapelle. Ex. 1005, 4:11-31, 8:5-9:27, 17:51-53; Ex. 1002, ¶72.

Regarding claim 19, Chapelle teaches that “the threshold comprises at least one of: a short-term noise threshold that enables a serving cell selection decision among a plurality of serving cells; or a long-term noise threshold that enables a future serving cell restriction decision.” Variable timeframes for averaging are discussed in Chapelle as explained above. Ex. 1005, 4:11-31, 8:14-19, 8:57-59, 17:51-53; Ex. 1002, ¶73. Thus, claim 19 is anticipated also by Chapelle.

## **IX. GROUND 2: Jalali and Chapelle Disclose All Limitations of Claims 1-4, 6-15, and 17-19**

The combination of Chapelle and Jalali renders claims 1-4, 6-15, and 17-19 obvious. The preamble of claim 1 recites “a non-transitory computer readable medium comprising processor executable instructions that when executed by a computer processor disposed within an airborne aircraft cause the computer processor.” To the extent the preamble of claim 1 is deemed a limitation, Chapelle

inherently teaches this feature by virtue of its disclosure of the antenna controller and look-up table. Ex. 1005, 5:48-51. Jalali also discloses of a processor and memory on an aircraft. Ex. 1006, [0011]; Ex. 1002, ¶74.

Regarding element 1a, Chapelle teaches this feature. Ex. 1005, 5:62-6:4, 8:63-9:4, 17:48-53. Jalali also teaches element 1a via describing both the aircraft and ground station adjusting their beams to increase or maximize SINR received at the aircraft or ground station at [0059]. The measuring of SINR inherently includes the measurement of signal and noise, and placing such values in ratio. A POSA understands that the inclusion of interference in the ratio to the noise in the denominator simply involves adding another parameter (i.e., interference), which in some cases may be zero, and therefore reduces to SNR. Thus, measuring SINR necessarily includes measuring SNR, and also measuring interference, if it exists. Nevertheless, the measurement of SNR is expressly taught by Chapelle in connection with handoff and a POSA would find it obvious to substitute the SNR measurement of Chapelle for the SINR measurement of Jalali since both are used in the same conventional handoff procedure of directional antenna beams as common alternatives that do not produce any unexpected results when substituted for each other. Ex. 1005, 17:48-53; Ex. 1002, ¶75.

Chapelle also teaches claim element 1b. Ex. 1005, 8:63-9:4, 17:48-53; Ex. 1002, ¶¶47, 76. Jalali also teaches this feature. Ex. 1006, [0059], [0062]; Ex. 1002,

¶76. In this regard, measuring SINR, which is expressly described by Jalali, necessarily includes measuring SNR. Ex. 1002, ¶76. Moreover, Jalali expressly notes that such measurements are performed for two ground stations. A POSA would also consider the use of SNR and SINR as disclosed in Chapelle and Jalali to be obvious alternatives of one another for use in the same process described in each reference and in the ‘600 patent. *Id.*

Chapelle teaches claim element 1c as noted above. Ex. 1005, 1:52-2:19, 8:63-9:4; Ex. 1002, ¶¶48, 77. Jalali describes conventional handoff means in connection with a network that communicates with aircraft using beams at [0069] that involves comparing a signal strength of pilot signals from respective different ground base stations at [0070]. A POSA understands the pilot signals to be synonymous with control channels, which is a specific type of communication channel. Control channels, like any communication channel, necessarily and inherently have a bandwidth defined by the frequency bounds that possess particular signal power levels above a predefined threshold. Ex. 1002, ¶77. Jalali does not use the word “capacity” in describing any aspect of the characteristics of the control channels mentioned in these paragraphs. However, the ‘600 patent also does not specifically define the term “capacity.” Nevertheless, a POSA reviewing in particular FIG. 5 of the ‘600 patent can determine from the illustrated example of the forward-link user

capacity matrix, some characteristics of channels or links that may be considered to correlate to or define “capacity.” Ex. 1006, [0069]-[0070]; Ex. 1002, ¶77.

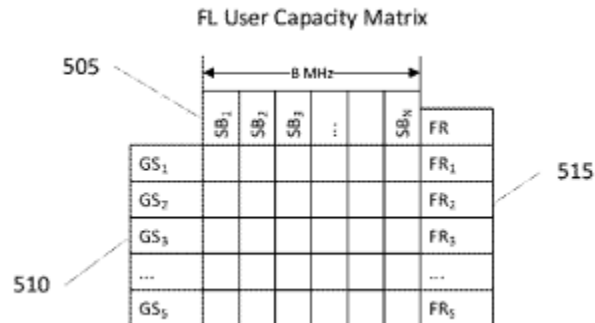


FIG. 5

In this regard, it is evident from FIG. 5 and its corresponding description (*see* Ex. 1001, 9:37-56) that “capacity” is effectively an estimate of an expected data rate for each ground station. For example, the ‘600 patent explains that “the matrix **500** depicts the case where expected data rate for S ground stations (e.g. GS1, GS2, GSS) **510** is characterized.” Ex. 1001, 9:45-47. The ‘600 patent also explains that “[u]sing the SINR at each sub-band and the spectral efficiency vs SINR for the air interface technology in use the UE can estimate the expected data rate for each sub-band and the total expected data rate for each GS (e.g. FR1, FR2, FRS) **515**.” Ex. 1001, 9:47-51. Thus, while not specifically defined, a POSA would understand the ‘600 patent to relate the term “capacity” to various other terms that are very well known by a POSA including “quality,” and “expected data rate,” and various other terms that simply imply that one beam will provide a “better” communications link under prevailing conditions than another. Based on these

explanations, a POSA would understand that the term “capacity,” as used in the ‘600 patent can be understood to be described also by, or a synonym of, “expected data rate.” Ex. 1002, ¶77. Accordingly, the “first forward-link user capacity estimate” is an estimate of the expected data rate provided by a ground base station whose channel characteristics are being evaluated. Furthermore, this feature of element 1c dictates that the capacity estimate (expected data rate) is determined based on SNR. Jalali is expressly concerned with providing a high data rate to aircraft as is clearly evident from its title and express statements at [0025]. Moreover, the handoff means described by Jalali would be understood by a POSA to be aimed at being conducted with the goal of preserving a high data rate. Ex. 1002, ¶77. In short, both Chapelle and Jalali describe the use of SNR or SINR or other similar parameters all well known by a POSA to be indicative of higher channel capacity, higher quality, or better communication link performance as a basis for determining when to conduct a handoff. *Id.*

Chapelle teaches claim element 1d. Ex. 1005, 1:52-2:19, 8:63-9:4; Ex. 1002, ¶¶49, 78. Jalali also discloses this element. Ex. 1006, [0069]-[0070]. As noted above, Jalali teaches calculation of estimates of parameters that are synonyms of “user capacity” by virtue of its measurement of parameters aimed at maximizing data rate across a handoff using SINR, which is an obvious substitute for SNR that is specifically described in Chapelle. Jalali further explicitly uses such parameters in

relation to a “second pilot signal” as described in [0070]. This element would be considered obvious by a POSA in consideration of the teachings of both Jalali and Chapelle, which use obvious alternative parameters as basis for conducting a beam handoff. Ex. 1002, ¶78.

Claim element 1e is taught by Chapelle. Ex. 1005, 4:11-31; Ex. 1002, ¶¶50, 78, 79. Jalali also discloses this element. Ex. 1006, [0034]. In this regard, Jalali describes a search for pilot signals that a POSA would clearly understand to be control channels that are used to evaluate different potential communication links on either side of a potential handoff (which is expressly the same context in which this element of claim 1 is being described). Ex. 1002, ¶79. Jalali then describes how the received pilot signals are “ranked to determine whether or not the aircraft modem should handoff to another ground base station” and mentions the station selected as being a station from which a stronger pilot signal is received as one example of a parameter that could be used in a decision matrix that must inherently be used in any computer that compares parameters to make a decision. *Id.* Computers cannot make analog comparisons, and must instead store values in tables (e.g., matrices) for comparison of the values. *Id.* The use of a matrix is an inherent feature of computer based comparison or decision tools based on lists of measured parameters. *Id.* The only potential difference between element 1e and Jalali is the parameter in the matrix, which is used to make the handoff decision. *Id.* Both Jalali and Chapelle

teach using various parameters as the basis for a handoff decision using a computer, which inherently does so with a matrix of stored parameter values. *Id.* Moreover, both Jalali and Chapelle measure the same or similar parameters (e.g., SNR and SINR) that are the basis for values that can ultimately be used for comparison to decide when to handoff for the same reasons identified in the ‘600 patent. *Id.* Whereas element 1e merely uses a different term (i.e., “user capacity matrix”) for what is compared than that which is described in both Jalali and Chapelle, the terms used instead in Jalali and Chapelle are essentially equivalent or in any case obvious variants to a POSA. *Id.*

Claim 1 ends with claim element 1f, which is disclosed in Chapelle. Ex. 1005, 4:11-31; Ex. 1002, ¶80. This element is also disclosed by Jalali. Ex. 1006, [0025], [0034], [0059]-[0060]. Jalali’s ranking of pilot signals represents the use of a decision matrix for parameters indicative of links having improved performance, which is ultimately estimated based on SINR (an obvious alternative for SNR expressly disclosed in Chapelle). Ex. 1002, ¶80. Jalali discusses the reporting of SINR measurements and adjustment of beams based on SINR feedback to pick an “improved or optimal beam” if the beams provide “improved performance.” Ex. 1006, [0059]; Ex. 1002, ¶80. Given the title of Jalali and other explicit descriptions of the goal of having high data rate links (see Ex. 1006, [0025]), a POSA would clearly understand that Jalali teaches building a decision matrix for parameters

indicative of high data rate from measured SINR. Ex. 1002, ¶80. Calling the matrix a “user capacity matrix” is merely a choice of descriptive words that mean the same thing already described in Jalali, or at least obvious to a POSA based on the descriptions of Jalali and Chapelle. *Id.* A POSA would be motivated to combine Jalali and Chapelle since they provide similar solutions to the same problem, and would have had a reasonable expectation of success since there are a limited number of parameters of the directional beams that can be measured and estimated for consideration and comparison in making handoff decisions. *Id.* The resulting combination also combines known prior art elements according to known methods to yield nothing more than predictable results. *Id.*

Regarding claim 2, both Chapelle and Jalali teach that “the first communication channel comprises a first center frequency and a first bandwidth, wherein the second communication channel comprises a second center frequency and a second bandwidth, and wherein the first communication channel does not overlap the second communication channel.” Claim 2 merely recites immutable characteristics of communication channels also disclosed in both Jalali and Chapelle. Ex. 1005, 5:55-61, 16:34-36; Ex. 1006, [0046]-[0047], [0052]-[0053]; Ex. 1002, ¶81.

Regarding claim 3, Chapelle and Jalali both teach claim elements 3a, 3b, 3c and 3d. Claim 3 only adds relative to claim 1 that short-term averaging is employed

relative to the first and second SNR values. Chapelle discusses real time performance, which necessarily would involve short term averaging of the S/I ratios that employ aggregate interference measured over the short time frame needed for real time performance in Chapelle. Ex. 1005, 9:13-21; Ex. 1002, ¶54. Jalali expressly describes consideration of sufficient time to enable detection of pilot signals. Ex. 1006, [0057]. The sufficient time could be guaranteed via having enough data for calculating a short-term average, which would be obvious to a POSA in view of the related descriptions of Jalali and Chapelle, particularly in the absence of any clear definition provided by the '600 patent. Ex. 1002, ¶82. Moreover, any time period can be considered to be short or long dependent on perspective, and a POSA would choose the perspective best suited to achieving the goals of improving handoff performance, which are the clear goals of both Jalali and Chapelle. Jalali also expressly describes the use of filtering and/or averaging regarding measured parameters to account for variations. Ex. 1006, [0052], [0057]. Accordingly, a POSA would appreciate that the benefits of averaging described in Jalali would yield predictable and desirable results either alone or when combined with the teachings of Chapelle in relation to the measured parameters to be compared to improve the performance of handoff. Ex. 1005, 8:63-9:4, 17:48-53, 9:13-21; Ex. 1006, [0057], [0059], [0061]; Ex. 1002, ¶¶54, 77, 82-85.

For claim 4, Chapelle and Jalali teach claim elements 4a, 4b, 4c and 4d. Chapelle discusses effectively averaging over variable timeframes. Ex. 1005, 8:63-9:4, 17:48-53, 9:13-21. Jalali describes consideration of sufficient time to enable detection of pilot signals and the sufficient time could be guaranteed via having enough data for calculating a long-term average, which would be obvious to a POSA in view of the related descriptions of Jalali and Chapelle, particularly in the absence of any clear definition of “long-term” provided by the ‘600 patent. Ex. 1006, [0057], [0059], [0061]. Moreover, any time period can be considered to be short or long dependent on perspective, and a POSA would choose the perspective best suited to achieving the goals of improving handoff performance, which are the clear goals of both Jalali and Chapelle. Ex. 1002, ¶86. Jalali also expressly describes the use of filtering and/or averaging regarding measured parameters to account for variations. Ex. 1006, [0052], [0057]. Accordingly, a POSA would appreciate that the benefits of averaging described in Jalali would yield predictable and desirable results either alone or when combined with the teachings of Chapelle in relation to the measured parameters to be compared to improve the performance of handoff. Ex. 1002, ¶¶54, 58, 77, 86-89.

For claim 6, Chapelle and Jalali teach claim elements 6a, 6b and 6c. Claim 6 effectively only adds a third ground station, communication channel, and corresponding instances of measurement and estimation to that which has already

been clearly discussed in relation to two instances above. Meanwhile, both Chapelle clearly contemplate more than two stations, channels and instances of measurement, estimation, etc. Ex. 1005, 9:13-21; Ex. 1006, [0034], [0062], [0070]; Ex. 1002, ¶¶62-64, 77-79, 90. Moreover, Jalali discloses “at least one second pilot signal” in [0062], which clearly implies more than just two pilot signals, and adding a processor would be obvious if not already taught by Chapelle. Ex. 1002, ¶90. A POSA would be motivated to combine Jalali and Chapelle to include a decision matrix based on data rate or capacity for multiple signals to obtain the best data throughput and quality to maximize capacity by considering multiple options. *Id.*

Jalali and Chapelle combine to teach or suggest all features of claim 7. The preamble of claim 7 recites “a computer-implemented method, executed with a computer processor disposed within an air-to-ground communication ground station.” To the extent the preamble of claim 7 is deemed a limitation, Chapelle discloses “an antenna controller that is in communication with a base transceiver station (BTS) position look-up table.” Ex. 1005, 5:48-51. A POSA would understand that it is inherent that the BTS look-up table is stored in a non-transitory computer readable medium, and that the antenna controller inherently possesses a processor capable of executing instructions. Moreover, the antenna controller is clearly shown on the aircraft in FIG. 1. Jalali also discloses computer hardware by virtue of

discussing a controller/processor at the ground base station. Ex. 1006, [0040]; Ex. 1002; ¶93.

Jalali and Chapelle also disclose “commanding, with the computer processor, a directional antenna installed at the ground station and a transceiver disposed within the ground station.” Chapelle discloses a beamforming network, which controls an antenna system to create a single beam that a POSA would clearly understand to correspond to a directional antenna and corresponding transceiver, the antenna controller is disposed at an aircraft. Ex. 1005, 5:62-6:4. Jalali discloses ground station antenna arrays and that directional beams are generated using a beam steering computer. Ex. 1006, [0043], [0046]. A POSA would appreciate that the nature of wireless communication between a ground station and aircraft requires a two way link, and to the extent beamforming is performed at either end involving a transceiver, its duplication at the other end would be an obvious modification as using a known technique to improve similar devices in the same way, and would in any case yield nothing more than predictable results. Ex. 1002; ¶94.

Jalali and Chapelle discloses commanding a directional antenna and transceiver “to measure a first noise power level of a first communication channel at a first elevation and a first azimuth from a current position of the ground station.” Chapelle discusses that SNR is calculated for a first communication channel. Ex. 1005, 17:48-53. The calculation of SNR necessarily requires measurement of a first

noise power level. Ex. 1002; ¶95. A POSA understands that both signal power and noise power must be measured and put in ratio to arrive at any calculation of SNR, so calculating SNR inherently involves measurement of a noise power level. *Id.* Since Chapelle is explicit in stating that such calculation is for signals received by a first communication lobe, a POSA would clearly understand that the signals are directional antenna signals that are inherently formed at a given elevation and azimuth, which directly correlate to the first azimuth and first elevation recited in claim 7. *Id.* Jalali discloses that base stations are enabled to search at different elevations, and that communication between air and ground assets can be supported “at any azimuth angle.” Ex. 1006, [0030], [0028]. Jalali also describes adjustment of beams to increase or maximize SINR at [0059]. Increasing or maximizing SINR necessarily requires measurement of noise power and thus Jalali necessarily requires measurement of a first noise power level. Ex. 1002, ¶95. A POSA would appreciate that the nature of wireless communication between a ground station and aircraft requires a two way link, and to the extent beamforming is performed at either end involving certain capabilities for communicating at various azimuths and elevation angles, its duplication at the other end would be an obvious modification as using a known technique to improve similar devices in the same way, if not otherwise necessary, and would in any case yield nothing more than predictable results. *Id.*

Jalali and Chapelle discloses “the first communication channel configured to support transmissions between the ground station and airborne aircraft.” Both Jalali and Chapelle are explicitly focused on handoffs of a first communication channel between ground stations and airborne aircraft and a second communication channel, and thus replete with descriptions of this feature. Ex. 1005, 2:63-4:31; Ex. 1006, [0008]-[0012]; Ex. 1002; ¶96.

Jalali and Chapelle disclose “commanding, with the computer processor, the directional antenna and the transceiver to measure a second noise power level of a second communication channel at a second elevation and a second azimuth from the current position of the ground station, the second communication channel configured to support transmissions between the ground station and the airborne aircraft.” This feature differs from the prior feature only by repeating the same activities discussed above for a second channel. Both Jalali and Chapelle are explicitly focused on handoffs of a first communication channel between ground stations and airborne aircraft and a second communication channel, and thus include descriptions of the measurements on both communication channels to permit comparison to enable the handoff. Ex. 1005, 2:63-4:31; Ex. 1006, [0008]-[0012]; Ex. 1002; ¶97.

Jalali and Chapelle disclose “calculating, with the computer processor, a first reverse-link noise estimate using the first noise power level of the first communication channel.” Chapelle discloses that SNR is calculated for a first

communication channel. Ex. 1005, 17:48-53. The calculation of SNR is understood by a POSA as a representation of estimated noise based on the noise power measurement inherently required to be employed to determine SNR. Ex. 1002; ¶98. Jalali also describes adjustment of beams to increase or maximize SINR. Ex. 1006, [0059]. Increasing or maximizing SINR necessarily requires measurement of noise power. Ex. 1002; ¶98. Thus, Jalali is explicit in necessarily requiring measurement of a first noise power level, which is also used to estimate noise, since SINR necessarily includes an estimate of noise based on the measured noise power level. *Id.* A POSA would find it obvious to combine Jalali and Chapelle since the descriptions of both are known prior art elements that would be combinable to yield predictable results in this context. *Id.*

Jalali and Chapelle discloses “calculating, with the computer processor, a second reverse-link noise estimate using the second noise power level of the second communication channel.” This feature merely repeats operations discussed above for a second channel. Both Jalali and Chapelle are focused on handoffs of multiple communication channels between ground stations and airborne aircraft, and thus include descriptions of repeating measurements on both communication channels to permit comparison to enable the handoff. Ex. 1005, 2:63-4:31; Ex. 1006, [0008]-[0012]; Ex. 1002; ¶99.

Jalali and Chapelle combine to teach or suggest “calculating, with the computer processor, a reverse-link noise matrix using the first reverse-link noise estimate and the second reverse-link noise estimate.” The use of a matrix for making a decision involving comparing values is an inherent feature of a computer, and also the antenna controller of Chapelle. Ex. 1002; ¶¶48 and 100. Chapelle describes a handoff “to provide a higher quality communications link.” Ex. 1005, 4:20-22. A POSA understands this includes a comparison of quality related parameters between two BTSs. Ex. 1002; ¶100. The quality related parameters (e.g., signal strength, interference and noise) must be stored in a computer for comparison of the candidate BTSs for the forward link to inherently create a matrix of parameters that can be compared. *Id.* Moreover, for the comparison of SNR values that are used for one example handoff means described in Chapelle, the matrix would necessarily include noise estimates. *Id.* Since the links are two directional between the ground station and the aircraft, noise on either link is highly relevant and of interest to a POSA to manage relative to conducting a successful handoff that maintains link quality. Thus, Chapelle inherently discloses calculation of a reverse link noise matrix to permit comparisons that will be used as the basis for handoff based on SNR. Also, notably FIG. 7 of the ‘600 patent (reproduced below for convenience) illustrates an example of the reverse link noise matrix. *Id.*

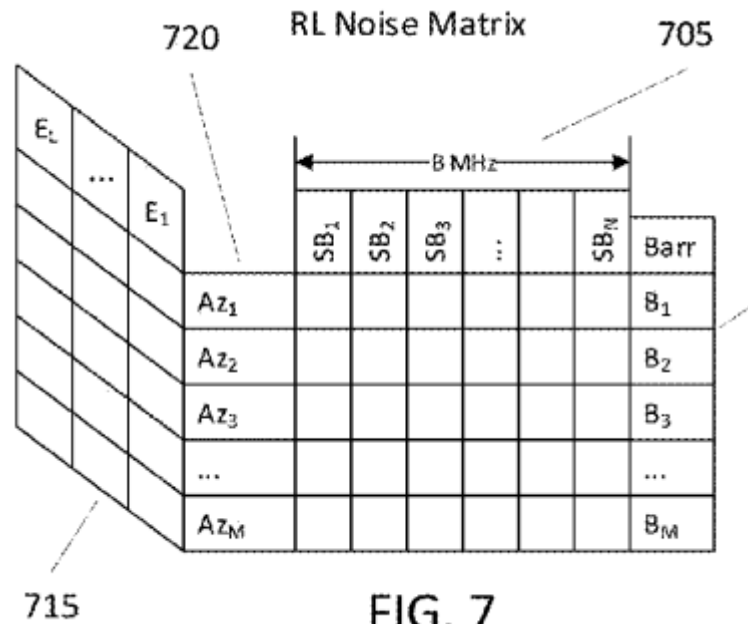


FIG. 7

It is evident from FIG. 7 that the noise matrix is defined by columns and rows of information that provide a characterization of noise plus interference. Ex. 1001, 10:29-33. The collection of data in a common tabular form of columns and rows that represents how such data is stored in a computer conventionally to permit making comparisons/decisions regarding the data of the matrix is also inherently included in the description of comparisons for quality related parameters of Chapelle as that is how data is compared for its stated purpose of determining when a higher quality communications link is available using the computing device (antenna controller) of Chapelle. Ex. 1002; ¶100. Signal strength, interference and noise measurements/estimates are all expressly described as being made by Chapelle. Ex. 1005, 16:43-50, 9:16-21, 17:48-53. Chapelle's description of determining when a higher quality communications link becomes available is therefore inherently

performed using a matrix involving the compared forward link collected parameters indicating quality (i.e., noise). Jalali expressly states that channels for the forward and reverse links are reciprocal. Ex. 1006, [0060]. Thus, a POSA would understand that calculations, estimates and/or processing techniques for forward and reverse links can also be identical. Ex. 1002; ¶100. Moreover, Jalali also compares SINR from adjacent beams to manage handoff. *Id.* Thus, a POSA would understand from Jalali and Chapelle that noise parameters can advantageously be used in a matrix form to enable a computer to manage handoff of beams of either or both of the forward and reverse link to maximize quality, data rate, or any other desirable parameter. *Id.* Doing so merely combines known elements to yield predictable results, and could be advantageous in improving communication channel performance. *Id.*

Jalali and Chapelle further disclose “the reverse-link noise matrix is utilized to select communication channels to utilize for transmissions between a plurality of ground stations disposed on the ground and the airborne aircraft.” Chapelle describes a handover “to provide a higher quality communications link.” Ex. 1005, 4:11-31. A POSA understands this determination to necessarily include a comparison of quality related parameters between two BTSs in a matrix form within a computer as discussed repeatedly above. Ex. 1005, 17:48-53; Ex. 1002; ¶101. Jalali expressly describes using SINR from adjacent beams to manage handoff. Ex. 1006, [0060]. A

POSA would clearly understand from Jalali and Chapelle that noise parameters can advantageously be used in a matrix form to enable a computer to manage handoff of beams of either or both of the forward and reverse link to maximize quality, data rate, or any other desirable parameter. Ex. 1002; ¶101. Doing so merely combines known elements to yield predictable results, and could be advantageous in improving communication channel performance. *Id.*

For claim 8, Chapelle and Jalali teach that “the first communication channel comprises a first center frequency and a first bandwidth, wherein the second communication channel comprises a second center frequency and a second bandwidth, and wherein the first communication channel does not overlap the second communication channel.” These are immutable channel characteristics and are disclosed in both Chapelle and Jalali. Ex. 1005, 5:55-61 and 16:34-36; Ex. 1006, [0046], [0047], [0052]-[0053]; Ex. 1002; ¶102.

For claim 9, Chapelle and Jalali teach “the method further comprising: commanding, with the computer processor, the directional antenna and the transceiver to measure a short-term average of the first noise power level of the first communication channel at the first elevation and the first azimuth; commanding, with the computer processor, the directional antenna and the transceiver to measure a short-term average of the second noise power level of the second communication channel at the second elevation and the second azimuth; calculating, with the

computer processor, the first reverse-link noise estimate using the short-term average of the first noise power level of the first communication channel; and calculating, with the computer processor, the second reverse-link noise estimate using the short-term average of the second noise power level of the second communication channel.” Claim 9 merely adds the concept of short-term averaging of noise power levels to that which was already discussed above in relation to the contents of claim 7. However, averaging of values is well known, and provides predictable results. Moreover, Chapelle describes the applicability of processing data in various time frames, including aggregation of data over such timeframes. Ex. 1005, 9:8-27. Jalali expressly discusses filtering and averaging of values. Ex. 1006, [0052], [0057]. A POSA would appreciate the advantage of using average values for the compared values being used to manage handoff. Ex. 1002, ¶103. Moreover, in the context of managing handoff based on noise values, which is discussed in both Chapelle and Jalali, averaging values over various timeframes that include short time frames would provide an obvious advantage of optimizing link quality and data rate, which are stated goals of both Chapelle and Jalali. *Id.*

For claim 10, Chapelle and Jalali teach “the method further comprising: commanding, with the computer processor, the directional antenna and the transceiver to measure a long-term average of the first noise power level of the first communication channel at the first elevation and the first azimuth; commanding,

with the computer processor, the directional antenna and the transceiver to measure a long-term average of the second noise power level of the second communication channel at the second elevation and the second azimuth; calculating, with the computer processor, the first reverse-link noise estimate using the long-term average of the first noise power level of the first communication channel; and calculating, with the computer processor, the second reverse-link noise estimate using the long-term average of the second noise power level of the second communication channel.” Claim 10 merely adds the concept of long-term averaging of noise power levels to that which was already discussed above in relation to the contents of claim 7. However, averaging of values is well known, and provides no unexpected results. Moreover, the applicability of processing data in various time frames, including aggregation of data over such timeframes, is described by Chapelle. Ex. 1005, 9:8-27. Jalali expressly discusses filtering and averaging of values. Ex. 1006, [0052], [0057]. A POSA would appreciate the advantage of using average values for the compared values being used to manage handoff. Ex. 1002; ¶104. In the context of managing handoff based on noise values, which is clearly discussed in both Chapelle and Jalali, averaging values over various timeframes including long time frames would provide an obvious advantage of optimizing link quality and data rate, which are stated goals of both Chapelle and Jalali. *Id.*

For claim 11, Chapelle and Jalali teach the “method further comprising commanding, with the computer processor, the ground station to transmit the reverse-link noise matrix to a ground station controller, the ground station controller disposed on the ground and in communicative connection with the plurality of ground stations.” Both Chapelle and Jalali disclose a noise matrix. Ex. 1002, ¶100. Jalali expressly describes that the ground stations have controllers that are networked, and that SINR measurements at the aircraft are sent to the ground station. Ex. 1006, [0071], [0061], [0059]. A POSA understands that these values can either be formed into the matrix of noise measurements at the aircraft and sent in matrix form to the ground station, or may be sent for formation into the matrix of noise measurements to occur at the ground station as obvious variants of each other. Ex. 1002, ¶105. Thus, a POSA would find it obvious from the descriptions of Jalali to transmit the reverse-link noise matrix to a ground station and all of the features of claim 11 are known from Chapelle and Jalali, which a POSA would find obvious to combine as no more than combining prior art elements to known methods to achieve predictable results. *Id.*

For claim 12, Chapelle and Jalali teach “the method further comprising: commanding, with the computer processor, the directional antenna and the transceiver to measure a third noise power level of a third communication channel at a third elevation and a third azimuth from the current position of the ground

station, the third communication channel configured to support transmissions between the ground station and airborne aircraft; calculating, with the computer processor, a third reverse-link noise estimate using the third noise power level of the third communication channel; and calculating, with the computer processor, the reverse-link noise matrix using the first reverse-link noise estimate, the second reverse-link noise estimate, and the third reverse-link noise matrix.” Claim 12 merely repeats actions performed above in connection with claim 7 for a third ground station. Both Chapelle and Jalali describe a handoff between two ground stations or base stations. Ex. 1002, ¶106. However, in both cases, the handoff is also performed in a context in which other candidate ground stations or base stations are also considered and therefore have parameters measured thereby disclosing a third station and corresponding measurements, estimates and matrices. Ex. 1005, 9:13-21; Ex. 1006, [0061]; Ex. 1002, ¶106. Jalali also describes an environment in which a third (or more) ground station and its interactions with the aircraft are considered for comparisons in connection with handoff. Ex. 1002, ¶106. Thus, all of the features of claim 12 are known from Chapelle and Jalali, and a POSA would find combining the references obvious because the combination does no more than combine prior art elements to known methods to achieve predictable results. *Id.*

Jalali and Chapelle disclose all features of claim 13. The preamble of claim 13 recites a “computer system comprising one or more processors and/or

transceivers.” To the extent the preamble of claim 13 is deemed a limitation, Chapelle discloses these features. Ex. 1005, 5:48-54; Ex. 1006, [0040]; Ex. 1002, ¶107.

Regarding claim 13, Chapelle and Jalali both disclose claim element 13a. The calculation of forward-link user capacity estimates based on SNR and user capacity matrix is described in Chapelle. Ex. 1002, ¶¶ 48, 50, 107. A POSA would understand that the antenna controller of Chapelle would retrieve this information for different respective channels involved in potential handoffs for each ground location based on all of the visible stations mentioned for consideration by Chapelle. Ex. 1005, 16:43-50, 9:16-21, 17:48-53; Ex. 1002, ¶108. Jalali discloses ranking the pilot signals for handoff determination. Ex. 1006, [0034], which necessarily includes the use of a matrix of values for SINR. Ex. 1002, ¶¶ 79, 108. A POSA would find the substitution of SNR matrix comparisons inherent in the description of Chapelle for the SINR ranking matrix operations of Jalali to be obvious as nothing more than a simple substitution of one known element for another to obtain predictable results, or use of a known technique to improve similar devices in the same way. Ex. 1002, ¶108.

Claim element 13b is recited as an alternative to element 13a, such that only one of elements 13a and 13b need be shown to demonstrate obviousness. Nevertheless, element 13b is also taught by Jalali, which provides that channels for

the forward and reverse links are reciprocal. Ex. 1006, [0060]. A POSA would understand that calculations, estimates and/or processing techniques for forward and reverse links are often identical. Ex. 1002, ¶109. Thus, a POSA would clearly understand from Jalali and Chapelle that both forward and reverse link measurements, estimates, matrices and comparisons of parameters in the matrices would be used for handoff decisions to define links that maintain high quality and data rate for the best user capacity that can be provided through handoff. *Id.*

Chapelle and Jalali also teach element 13c. In this regard, Chapelle describes a handover “to provide a higher quality communications link.” Ex. 1005, 4:20-22. A POSA would understand this passage to necessarily include a comparison of quality related parameters between two BTSs in the inherently stored user capacity matrix. Ex. 1002, ¶¶50, 110. In particular, the quality related parameters (e.g., signal strength, interference and noise) necessarily stored in a computer for comparison of candidate BTSs inherently define a matrix of parameters to permit the comparison. Signal strength, interference and/or noise measurements are all expressly described in Chapelle. Ex. 1005, 16:43-50, 9:16-21, 17:48-53. Determining when a higher quality communications link becomes available, as Chapelle explains, inherently involves using a matrix with compared forward link collected parameters indicating quality, which are also directly related to channel capacity, and easily interchangeable in this context by a POSA. Ex. 1002, ¶110. Jalali discusses

searching “all pilot signals received from ground base stations” and ranking the pilot signals for handoff determination. Ex. 1006, [0034]. A POSA would find the substitution of SNR matrix comparisons inherent in the description of Chapelle for the SINR ranking matrix operations of Jalali to be obvious as nothing more than a simple substitution of one known element for another to obtain predictable results, or use of a known technique to improve similar devices in the same way. Ex. 1002, ¶110.

Chapelle and Jalali also teach claim element 13d. Chapelle describes a handover “to provide a higher quality communications link” and then “initiating a handoff of the first communications link from the first BTS to the second BTS by using a second, independently aimable lobe of the single antenna beam to establish a second communications link with the BTS while maintaining the first communications link with the first BTS; and gradually fading out the first communications link with the first BTS while simultaneously fading in the second communications link to complete the handoff of the cellular communications link from the first BTS to the second BTS.” Ex. 1005, 4:20-31. Jalali similarly describes completion of a handoff in many locations, and notes that “the ground base station repeatedly determines the desired or optimal receive beam and adjusts the transmit beam accordingly.” Ex. 1006, [0060]. Based on the descriptions in Chapelle and Jalali, a POSA would understand completion of the handoff necessarily involves

commanding a directional antenna to transmit or receive data between the airborne aircraft and the candidate serving cell to complete the handoff. Ex. 1002, ¶111. Accordingly, a POSA would understand all of the features of claim 13 to be disclosed in Chappelle and Jalali. *Id.*

Regarding claim 14, Jalali teaches “the one or more processors and/or transceivers are configured to retrieve the at least one of (i) the forward-link user capacity matrix or (ii) the return-link user capacity matrix from an air-to-ground network controller disposed on the ground and in communicative with a plurality of serving cells, the plurality of serving cells including the candidate serving cell.” Chappelle and Jalali describe a handoff that is performed to optimize quality or data rate using a comparison of measured or estimated parameters that are necessarily compared via a matrix, and the optimization of quality and data rate is in either case akin to managing the handoff based on capacity, and a capacity matrix. Ex. 1002, ¶¶50, 108, 112. In both cases, the handoff is also performed in a context in which other candidate ground stations or base stations are also considered and therefore have parameters measured. Ex. 1005, 9:13-21; Ex. 1006, [0059]-[0061]; Ex. 1002, ¶112. Thus, Jalali describes an environment where the ground station receives the information used for comparisons, and therefore receives information that is either inherently inclusive of the user capacity matrix, or is at least obvious to a POSA in view of the teachings of Jalali and Chappelle. Ex. 1002, ¶112. A POSA would

appreciate the advantage of enabling both ground stations and aircraft transceivers to have the ability to participate in managing handoffs. *Id.* Moreover, Jalali expressly indicated that channels for the forward and reverse links are reciprocal. Ex. 1006, [0060]; Ex. 1002, ¶112. A POSA would understand that calculations, estimates and processing techniques for forward and reverse links can also be identical and either end of the links must be equipped to access the user capacity matrix. Ex. 1002, ¶112. Thus, claim 14 is known from Chapelle and Jalali, and a POSA would find it obvious to combine them because the combination does no more than combine prior art elements to known methods to achieve predictable results. *Id.*

Regarding claim 15, Chapelle and Jalali teach that “the candidate serving cell comprises a respective noise power level above a threshold.” In particular, Chapelle describes handoff to the candidate cell based on higher quality, which directly takes accounting of noise power levels considered relative to “a predetermined threshold” in relation to handoff. Ex. 1005, 17:51-53; Ex. 1006, [0067]; Ex. 1002, ¶113.

Regarding claim 17, Chapelle and Jalali teach that “the forward-link user capacity matrix indicates a lower signal-to-noise ratio associated with the candidate serving cell than an alternative serving cell, and wherein the alternative serving cell is located at a distance from the airborne aircraft that is greater than a distance from the airborne aircraft of the candidate serving cell.” Chapelle and Jalali teach conducting handoff based not on proximity, but measured channel parameters. Ex.

1005, 17:48-53; Ex. 1006, [0034]. A POSA would clearly understand from Chapelle and Jalali that when handoff is managed based on measured parameters other than proximity, a more distant ground station may be selected as the serving cell as a necessary result. Ex. 1002, ¶114. Thus, claim 17 is obvious in view of Chapelle and Jalali. *Id.*

Regarding claim 18, Chapelle and Jalali teach “the return-link user capacity matrix indicates a higher noise power level associated with the candidate serving cell than a noise power level associated with an alternative serving cell, and wherein the alternative serving cell is located at a distance from the airborne aircraft that is greater than a distance from the airborne aircraft of the candidate serving cell.” Chapelle and Jalali teach conducting handoff not based on proximity, but measured parameters via discussion of managing handoff based on SNR and signal ranking. Ex. 1005, 17:48-53; Ex. 1006, [0034]. Jalali states that the forward and reverse links are reciprocal. Ex. 1006, [0060], and more distant stations are necessarily selected, as noted above. Ex. 1002, ¶115.

Regarding claim 19, Chapelle and Jalali teach “the threshold comprises at least one of: a short-term noise threshold that enables a serving cell selection decision among a plurality of serving cells; or a long-term noise threshold that enables a future serving cell restriction decision.” Claim 19 merely indicates that the threshold of claim 15 could be a short-term or long-term threshold. This

encompasses every possible threshold, and is therefore not a limitation at all on claim 19 from a logical perspective. Nevertheless, claim 19 is obvious in view of Chapelle and Jalali. Ex. 1002, ¶116.

#### **X. GROUND 3: Jalali, Chapelle and Nelson Discloses All Limitations of Claims 5 and 16**

Claim 5 recites “additional processor executable instructions that when executed by the computer processor cause the computer processor to command the directional antenna and the transceiver to transmit the forward-link user capacity matrix to a ground station controller using an out-of-band communication channel, the ground station controller disposed on the ground and in communicative connection with the plurality of ground stations.” Chapelle and Jalali teach all of the features of claim 5 relating to the forward-link user capacity matrix, directional antenna control, and ground station controllers, for the reasons noted above. Ex. 1002, ¶100. Jalali also describes that the ground stations have networked controllers with SINR measurements at the aircraft being sent to the ground station. Ex. 1006, [0071], [0061], [0059]. A POSA would understand that these measurements can either be formed into the matrix of noise measurements at the aircraft and sent in matrix form to the ground station, or sent for formation into the matrix of noise measurements at the ground station, and would consider either option an obvious variant of the other. Ex. 1002, ¶117. Thus, a POSA would find it

obvious from Jalali's descriptions to transmit the reverse-link noise matrix to a ground station and all features of claim 5 are known from Chapelle and Jalali, except perhaps "out-of-band" transmission of the capacity matrix. *Id.* A POSA would understand that providing noise measurement information in Jalali could be performed using out-of-band protocols, particularly given Jalali's description of other bands including the Ka and Ku bands. Ex. 1006, [0065]. It would be obvious to a POSA to provide the matrix information via out-of-band communications using the Ka or Ku band to avoid using bandwidth of the data channels. Ex. 1002, ¶117. However, Nelson also shows that it was well known to use out-of-band protocols for communication of data. Ex. 1007, [0069]. A POSA would find motivation from Nelson's discussion of the use of out-of-band protocols to employ the Ka and Ku bands of Jalali to provide the forward-link user capacity matrix to a ground station controller as it merely combines known elements to yield predictable results, and could be advantageous in improving communication channel performance by not overburdening data channels. Ex. 1002, ¶117.

Claim 16 recites "the one or more processors and/or transceivers are further configured to transmit the at least one of (i) the forward-link user capacity matrix or (ii) the return-link user capacity matrix using an out-of-band channel." Thus, claim 16 adds, similar to claim 5, that a user capacity matrix for either the forward

or reverse link is transmitted via an out-of-band channel, which is obvious in view of Nelson. Ex. 1007, [0069]; Ex. 1002, ¶118.

#### **XI. GROUND 4: Jalali, Chapelle, Nelson and McGuffin Discloses All Limitations of Claims 1-19**

As noted above in connection with Grounds 2 and 3, a POSA would find claims 1-4, 6-15 and 17-19 to be obvious in view of Chapelle and Jalali, and claims 5 and 16 to be obvious by further considering the content of Nelson. Ex. 1002, ¶¶117-118. Nevertheless, to the extent the term “matrix” in the ‘600 patent is not considered to be inherently disclosed by Chapelle or Jalali, it would nevertheless be obvious to a POSA, and is well known as evidenced by McGuffin. Ex. 1002, ¶119-120. Using a matrix for comparing information is a known data structure for providing data in an efficient manner for storage, transmission and/or comparison, and McGuffin provides explicit disclosure this point. In this regard, McGuffin discloses multiple tables showing data structures for storing information used at ground stations to assist with handoff decisions that are made similar to those of Chapelle and Jalali. Ex. 1008, [0034]-[0038]. The data structures (see Table 2 below) include message traffic density, signal strength and average (dB), which could easily be augmented or substituted with noise, capacity, data rate, or any other desired values.

| TABLE 2        |                         |                           |              |
|----------------|-------------------------|---------------------------|--------------|
| GROUND STATION | MESSAGE TRAFFIC DENSITY | SIGNAL STRENGTH DATA (dB) | AVERAGE (dB) |
| 1              | 4                       | 1, 1, 2, 2                | 1.5          |
| 2              | 3                       | 0, 1, 0                   | 0.3          |
| 3              | 5                       | 6, 5, 3, 5, 4             | 4.6          |
| 4              |                         |                           |              |
| .              | .                       | .                         | .            |
| .              | .                       | .                         | .            |
| .              | .                       | .                         | .            |
| <i>n</i>       |                         |                           |              |

The descriptions of applicability of Chapelle, Jalali and Nelson to claims 1-19 as described above in Ex. 1002, ¶¶74-118, apply equally to all of claims 1-19. It would be obvious for a POSA to modify the storage and/or transmission of data at the aircraft controller and/or ground station of Jalali to include the data structure of McGuffin for data defining a user capacity matrix or noise matrix to ensure the best communication link is available to the aircraft. Doing so merely combines known elements to yield predictable results, and would be advantageous in improving communication channel performance by providing a consistent format for storing, sharing and processing the information used to manage a handoff. Ex. 1002, ¶121.

Chapelle, Jalali, Nelson and McGuffin address the same issues that are addressed by the ‘600 patent, and do so in similar ways. A POSA looking to conduct handoffs between beams looks for the optimal or best performing handoff candidates available. Ex. 1002, ¶122. The ways to select the best candidates for handoff include using distance or signal strength as relatively simple and well known alternatives, but there are limited other options available that are generally

limited by the parameters that can be measured and used as a basis for comparison (e.g., SNR, SINR, noise, etc.). *Id.* These measured values can be used to estimate further characteristics like quality, data rate, or capacity that might be achievable on candidate beams. The ‘600 patent generally uses noise, and SNR via a matrix data structure for comparison. However, that same method was already known by Chapelle, and any small change apparent in the description of the ‘600 patent is only a different use of terminology, or at least obvious to a POSA based on the further descriptions of Jalali, Nelson and McGuffin. *Id.*

A POSA would have been motivated to combine the teachings of Jalali and Chapelle (along with Nelson and McGuffin), since the references clearly teach similar methods for solving the same problem. A POSA looking to improve capacity without interference would look to those other references that have dealt with the same problem to understand the state of the art, and would necessarily have also understood the contents of the ‘600 patent to merely restate that which was already known in the art. Ex. 1002, ¶123.

A POSA would have had a reasonable expectation of success in combining the teachings of Jalali and Chapelle (with Nelson and McGuffin), since the references clearly teach alternative methods for solving the same problem and to the extent the processes differ, they would be seen to provide alternatives that

would be obvious to try to a POSA given the relatively limited number of parameters that can be measured in the handoff context. Ex. 1002, ¶124.

## **XII. DISCRETIONARY ISSUES**

### **A. The Petition Does Not Present the Same References Addressed in Prosecution**

Under *Advanced Bionics*, the Board should not deny institution under §325(d). *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, No. IPR2019-01469, Paper 6 at 7-8 (P.T.A.B. Feb. 13, 2020) (precedential).

The Board has held that the first prong of *Advanced Bionics* is not met where "neither [the combination references] nor similar prior art was before the examiner ... [and] the prosecution history does not include any overlapping arguments directed to this prior art. *Godsbern-Smith Constr. Co. v. Guntert & Zimmerman Const. Div., Inc.*, No. IPR2021-00050, Paper 24 at 19-21 (PTAB May 7, 2021). None of the prior art references here were cited during original prosecution and are not cumulative of any of the art considered by the Examiner during prosecution. *See supra* § V.

Further, while there is no need to reach Part Two of the *Advanced Bionics* framework and *Beckton Dickinson* factors (e)-(f), the record shows that the Challenged Claims were allowed based on a material error by the Examiner. For example, as explained in this Petition, Chapelle, by itself or combined with Jalali and McGuffin, renders all features of the independent claims obvious. The Examiner erred

by never considering combinations herein, and not considering equivalent terminology to the term “matrix.” Thus, none of the *Beckton Dickinson* factors and *Advanced Bionics* prongs support a finding of discretionary denial under 35 U.S.C. § 325(d). *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 (PTAB Feb. 13, 2020) (precedential).

**B. The Board Should Not Deny Institution Under *Fintiv***

The claims of the '600 patent have never been tested in view of the most relevant prior art. In view of these compelling challenges, the ongoing district court litigation with SmartSky, and the ongoing cloud over SmartSky's business, institution should not be discretionarily denied under §314(a). *See NHK Spring Co. v. Intri-Plex Techs., Inc.*, IPR2018-00752, Paper 8 at 19-20 (PTAB Sept. 12, 2018) (precedential); *Apple v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 13-14 (PTAB Mar. 20, 2020) (precedential).

Factor 1- potential stay of the district court litigation is at least neutral because no party has requested a stay in the corresponding litigation. *VMWare, Inc. v. Intellectual Ventures I LLC*, IPR2020-00470, Paper 13 at 17 (PTAB Aug. 18, 2020) (finding in the absence of a stay motion that this factor "does not weigh for or against discretionary denial").

Factor 2- the district court trial date and the Board's statutory deadline-weighs against discretionary denial because of the fact that the trial date for

litigation involving the ‘600 patent is set beyond the statutory timeframe by which this proceeding must conclude.

Factor 3- investment in the district court proceedings weighs against discretionary denial. The district court case is in its early stages and the district court has not issued any substantive rulings in regarding the ‘600 patent. Thus, there is much work to be done in the district court and most of the work will be well in the future. Accordingly, the district court will not invest significant resources related to the challenged patent prior to the issuance of an institution decision. See *Fintiv*, IPR2020-00019, Paper 11 at 9-12; *DISH Network*, IPR2020-01280, Paper 17 at 18-21.

Factor 4- overlap between this proceeding and the district court proceedings favors institution. In this regard, whereas all 19 claims of the ‘600 patent are challenged here, it is highly likely that the Patent Owner will condense the claims at issue in the district court cases before trial. This factor thus weighs against discretionary denial.

Factor 5- overlapping parties does not strongly weigh against institution. In any case, although the parties overlap, the weight of the other factors discussed herein clearly outweigh any consideration given to the overlapping of parties.

The final *Fintiv* factor (other considerations) weighs strongly against discretionary denial. As detailed herein, the merits of the Petition are strong. More

specifically, all of the cited references in the Petition teach the same concept as the ‘600 patent (managing handoff to maximize ATG communication performance). Moreover, none of the grounds asserted herein were previously considered by either the Office or district courts. Cf. *Comcast Cable Commn's, LLC v. Rovi Guides, Inc.*, IPR2019-00231, Paper 14 at 11 (PTAB May 20, 2019).

**C. The Board Should Not Deny Institution Under *General Plastic***

The *General Plastic* factors do not apply because this is the first and only *inter partes* review ("IPR") petition filed by Petitioner regarding the ‘600 patent. There are no other proceedings involving the ‘600 patent, and therefore, no concern of serial petitions. Given the merits raised in this Petition have not been addressed to date, denial of institution under *General Plastic* is unwarranted. *Code200, UAB v. Bright Data, Ltd.*, IPR2022-00861, Paper 18 at 5-6 (P.T.A.B. Aug. 23, 2022) (precedential).

**XIII. CONCLUSION**

Petitioners respectfully request cancellation of the Challenged Claims.

**XIV. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8**

**A. Real Party-In-Interest 37 C.F.R. § 42.8 (b)(1)**

The real party in interest is SmartSky Networks LLC.

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

The ‘600 patent is the subject of the following litigation:

- *SmartSky Networks, LLC. v. Gogo Business Aviation, LLC et al.*, No. 1:22-cv-00266-JLH

Petitioners are not aware of any other judicial or administrative matter that would affect or be affected by a decision in this IPR.

**C. Designation of Counsel Under 37 C.F.R. § 42.8 (b)(3)**

Petitioners provide the following designation of counsel.

| Lead Counsel                                                                                                                                                                                                                           | Backup Counsel                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chad L. Thorson<br>Reg. No. 55,675<br><br><b>Burr &amp; Forman LLP</b><br>Bank of America Plaza<br>101 South Tryon Street, Suite 2610<br>Charlotte, NC 28280<br>Tel: (704) 347-6477<br>Fax: (704) 444-9133<br>Email: cthorson@burr.com | Lance A. Lawson<br>Reg. No. 44,862<br><br><b>Burr &amp; Forman LLP</b><br>Bank of America Plaza<br>101 South Tryon Street, Suite 2610<br>Charlotte, NC 28280<br>Tel: (704) 347-6475<br>Fax: (704) 444-9126<br>Email: llawson@burr.com |

Pursuant to 37 C.F.R. § 42.8(b)(4), counsel agrees to service by mail as detailed above, and to electronic service by email as detailed above. Pursuant to 37 C.F.R §42.10(b), a Power of Attorney executed by Petitioners accompanies this Petition.

### **Service Information**

Please address all correspondence and service to the addresses listed above.

Petitioners consent to electronic service at the addresses above.

Date: February 28, 2025

By: /Chad L. Thorson/

Chad L. Thorson  
Reg. No. 55,675  
**Burr & Forman LLP**  
Bank of America Plaza  
101 South Tryon Street, Suite 2610  
Charlotte, NC 28280  
Tel: (704) 347-6477  
Fax: (704) 444-9133  
Email: cthorson@burr.com

**CERTIFICATION UNDER 37 C.F.R. §42.24**

Petitioner certifies that the word count in this Petition is 13,957 words, as counted by the word-processing program (Microsoft Word for Office 365) used to generate this Petition, where such word count excludes the table of contents, table of authorities, mandatory notices, certificate of service, appendix of exhibits, and this certificate of word count. This Petition is in compliance with the 14,000-word limit set in 37 C.F.R. §42.24(a)(1)(i).

Date: February 28, 2025

By: /Chad L. Thorson/

Chad L. Thorson  
Reg. No. 55,675  
**Burr & Forman LLP**  
Bank of America Plaza  
101 South Tryon Street, Suite 2610  
Charlotte, NC 28280  
Tel: (704) 347-6477  
Fax: (704) 444-9133  
Email: [cthorsen@burr.com](mailto:cthorsen@burr.com)

## **CERTIFICATE OF SERVICE**

The undersigned certifies that a complete copy of this Petition for *Inter Partes Review* of U.S. Patent No. 9,954,600 and all Exhibits and other documents filed together with this Petition were served on the official correspondence address for the patent shown in Patent Center via Priority Mail Express and electronic mail on February 28, 2025:

MARSHALL, GERSTEIN & BORUN LLP

233 SOUTH WACKER DRIVE

6300 WILLIS TOWER

CHICAGO, IL

UNITED STATES

[docket@marshallip.com](mailto:docket@marshallip.com)

Date: February 28, 2025

By: /Chad L. Thorson/

Chad L. Thorson

Reg. No. 55,675

**Burr & Forman LLP**

Bank of America Plaza

101 South Tryon Street, Suite 2610

Charlotte, NC 28280

Tel: (704) 347-6477

Fax: (704) 444-9133

Email: cthorson@burr.com