

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL INC. and DELL TECHNOLOGIES INC.,
Petitioner,

v.

NEO WIRELESS LLC,
Patent Owner.

Case IPR2021-01486
Patent 10,447,450

EXHIBIT 2001

DECLARATION OF WILLIAM P. ALBERTH, JR.

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I. INTRODUCTION

1. My name is William P. Alberth Jr. I am an expert in mobile telecommunications and wireless technology. As further detailed below and exhibited in my attached Curriculum Vitae, I have over 25 years of experience in the design, development, implementation, and manufacturing of mobile telephones, smartphones, and other electronic equipment in addition to being an inventor on over 100 patents, including those related to telecommunications and wireless communications.

2. I have been retained as an expert witness to provide my independent opinion in regard to the matters at issue in *inter partes* review of U.S. Patent No. 10,447,450 (“the ’450 patent”) in IPR2021-01486. I have been retained by Neo Wireless LLC (“Neo”), the Patent Owner in the above proceedings. Petitioners are Dell Inc. and Dell Technologies Inc. (“Dell” or “Petitioner”).

3. For my work on this case, I am being compensated for my time at my typical consulting rate of \$200 per hour. I am also being reimbursed for expenses that I incur during the course of this work. My compensation does not depend on the substance of my opinions or the outcome of any issues in this case.

4. My analysis of the materials produced in this matter is ongoing and I will continue to review any new material as it is provided. This declaration represents only those opinions I have formed to date. I reserve the right to amend

or supplement my opinions based on additional documents or evidence I am presented, including without limitation any arguments or expert declarations advanced by Dell in this case.

II. QUALIFICATIONS

5. I believe that I am qualified to be an expert witness in this matter as I possess the requisite knowledge, skill, experience, training and education relating to the subject matter covered by the asserted patents.

6. In summary, I have over 25 years of experience in the design, development, implementation, and manufacturing of mobile telephones, smartphones, and other electronic equipment. The majority of my career was spent at Motorola where my final role was serving as the Chief Technology Officer for Motorola Mobile Devices. I held that position from 2007 until August 2012, and in that role, I led the development of differentiating technology that was integrated into Motorola's commercial mobile telephone products.

7. During the early stages of my career with Motorola (between 1987 and 2006, covering the Priority Date of the '450 patent), I was employed as an engineer, working on developing cutting-edge chipsets to enable cellular devices, and in the development of many products that changed the way people communicated, including the development of the Motorola MicroTAC, StarTAC and RAZR mobile telephones. I worked on or directed work on evaluating

transmitter technologies and architectures to mitigate the effects of PAPR (Peak to Average Power Ratio) on the current drain of the devices. Some of the techniques evaluated include for example: pre-distortion; envelope following; EER (Envelope Elimination and Restoration); and adaptive biasing.

8. My educational background includes a B.S. in Electrical Engineering from the University of Illinois Urbana-Champaign (1985), and a M.S. in Electrical Engineering from Illinois Institute of Technology (1992).

9. I am inventor or co-inventor on over 100 patents issued or pending, including patents related to my work on transmitter architectures involved for wireless communications.

10. In forming my opinions here, I am relying on my education and experience, including my over 25 years of experience in a variety of technologies and industries related to various wireless communications systems.

11. Additional information concerning my background, qualifications, publications, conferences, honors, and awards are described in my Curriculum Vitae, a copy of which is attached with this Report as Appendix A.

III. LEGAL STANDARDS

12. I am not a lawyer, and I do not intend to offer any opinions as to the interpretation of the law. However, I have a general understanding of claim construction based on my experience with patents, my work as an expert in other

cases, and my conversations with counsel. When considering the '450 patent and stating my opinions, I rely on the following legal standards as described to me by the attorneys for Neo.

13. I understand that a patent claim is unpatentable if the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the purported invention.

14. I understand that an obviousness analysis involves comparing a claim to the prior art to determine whether the claimed invention would have been obvious to a person of ordinary skill in the art at the time of the invention in view of the prior art and in light of the general knowledge in the art as a whole. I also understand that obviousness is ultimately a legal conclusion based on underlying facts of four general types, all of which must be considered: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) any objective indicia of non-obviousness, including any praise of the invention.

15. I also understand that obviousness may be established under certain circumstances by combining or modifying the teachings of the prior art. Specific teachings, suggestions, or motivations to combine any first prior art reference with a second prior art reference can be explicit or implicit, but must have existed before the date of purported invention. I understand that prior art references

themselves may be one source of a specific teaching or suggestion to combine features of the prior art, but that such suggestions or motivations to combine art may come from the knowledge that a person of ordinary skill in the art would have had.

16. I understand that a reference may be relied upon for all that it teaches, including uses beyond its primary purpose, but also including teachings that lead away from the invention. I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, although the mere disclosure of alternative designs does not teach away.

17. I further understand that whether there is a reasonable expectation of success in combining references in a particular way is also relevant to the analysis.

18. I understand that it is improper to use hindsight to combine references or elements of references to reconstruct the invention using the claims as a guide. My analysis of the prior art is made from the perspective of a person of ordinary skill in the art at the time of the invention.

19. I am not offering any legal opinions in this declaration nor am I qualified to do so. I only consider such legal standards in framing my opinions and conclusions as well as placing assertions made by Petitioner in the Petition into the proper context. Additionally, from a subject matter perspective, I understand that

the petitioner always has the burden of persuasion regarding a challenge of patentability of an invention under an inter partes review.

20. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art, which I understand is sometimes referred to as an “ordinary artisan” or by the acronym “POSITA” as of the date of the invention, which I understand is here assumed to be the filing date (September 28, 2005) of US Provisional Application Serial No. 60/721,451, to which the ’941 claims the benefit of an earlier filing date. My opinion would not change if the date of invention were found to be the filing date of the earliest non-provisional application in the benefit chain (September 28, 2006). I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. By “relevant,” I mean relevant to the challenged claims of the ’450 patent.

IV. LEVEL OF ORDINARY SKILL IN THE ART

21. I understand that factual indicators of the level of ordinary skill in the art include the various prior art approaches employed, the types of problems encountered in the art, the rapidity with which innovations are made, the sophistication of the technology involved, and the educational background of those actively working in the field. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems

encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

22. In this case, Dr. Ding has asserted in his declaration the following standard for a person of ordinary skill in the art as of the time of the '450 patent:

One of ordinary skill in the art relating to, and at the time of, the Priority Date would have been someone with at least a Bachelor's degree in an academic area emphasizing electrical engineering, computer science, or a similar discipline, plus at least two years of experience in the field working with, teaching, or researching wireless communication networks. More advanced degrees and additional education could compensate for shorter work experience, and vice versa.

Ex. 1003 [Ding Decl.] ¶ 32.

23. For the purposes of this declaration, I accept Dr. Ding's proposed qualifications of a POSITA. I reserve the right to revisit the issue should the Petition be instituted.

24. Based on my experience and qualifications, I am a person of ordinary skill in the art and was a person of ordinary skill in the art at the relevant date. The opinions I render in this declaration are from the perspective of POSITA.

V. OPINIONS

A. The '450 Patent And 802.16 Standard

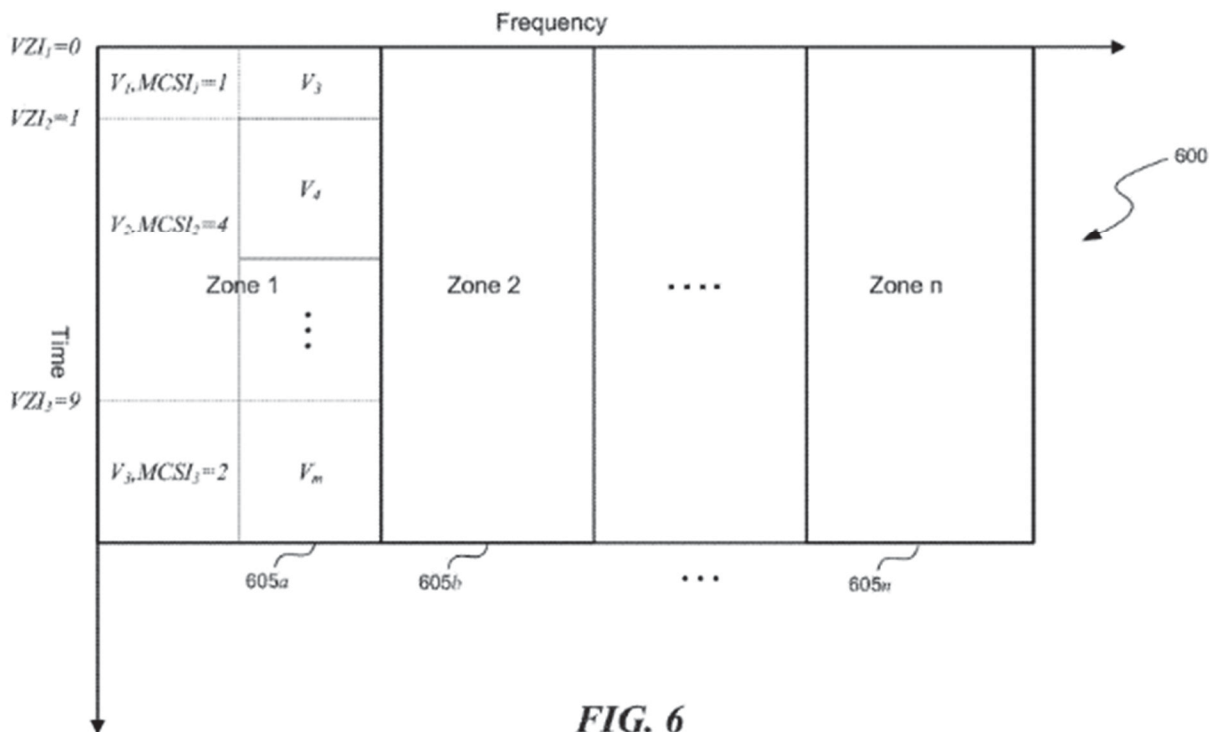
25. Under the 802.16 standard, four parameters are needed to allocate resources in the two independent dimensions of frequency and time. *See* Ex. 1001 ['450 Patent] 1:62-66; *see also* Ex. 1008 [IEEE802.16-2004] 557 (TABLE 275). In the background of the '450 patent they are referred to as the “start symbol offset,” “symbol length,” “start logical subchannel offset” and “number of allocated subchannels.” Ex. 1001 ['450 Patent] 1:62-66. The IEEE802.16-2004 standard refers to these same parameters as “OFDMA symbol offset,” “No. OFDMA Symbols,” Subchannel offset, and “No. Subchannels.” Ex. 1008 [IEEE802.16-2004] 557 (TABLE 275).

26. The inventors observed the “significant control overhead” needed to communicate these values from a base station to mobile stations. Ex. 1001 ['450 Patent] 1:51-52. Addressing these issues, they said that they conceived as an aspect of their invention “an alternative way of managing multiple packet streams” to “overcome the inefficiencies associated with maintaining” mappings under the IEEE 802.16 standard. *Id.*, 5:41-43.

27. Instead of spreading the various applications carried in packet streams throughout the available resource region, following the IEEE 802.16 standard, the

inventors said they instead “group[ed] like applications together.” *Id.*, 5:43-53.

The '450 patent's FIG. 6, reproduced here, illustrates this grouping approach:



28. The “zones” shown above are designated for particular applications. *Id.*, 2:48-49. In the example embodiment, Zone 1 (605a) is associated with voice applications and Zone 2 (605b) is associated with video applications. *Id.*, 5:46-49.

29. Grouping by common application allowed the inventors to establish common resource requirements among all users, which in turn allowed the inventors to map the time-frequency resource by one-dimensional “time-frequency resource units” designed to fit these common resource requirements. The '450 patent specification refers to these time-frequency resource units as basic resource units. *See id.*, 6:49-50, 7:12-30.

30. As shown in FIG. 6 of the '450 patent, Zone 1 is “further subdivided into time-frequency [resource] segments,” $V_1, V_2, V_3, V_4, \dots, V_m$, each representing a packet stream associated with an application for Zone 1. *Id.*, 6:3-6, 6:10-11, 6:22-23. Each time-frequency resource segment can be expressed in terms of a number (N) of “basic resource unit[s],” each having a fixed number of symbols and subcarriers. *Id.*, 6:9-10, 6:49-50. In the example in the '450 patent, the basic resource unit has 80 raw symbols in a certain number of subcarriers, which as discussed below, is selected specifically for VOIP applications. *Id.*, 6:9-10, TABLE 1.

31. TABLE 1 of the '450 patent, reproduced below, provides a value (an “MCS index” or MCSI) that indicates how many basic resource units (“Units”) are in any given time-frequency resource segment as used in a VOIP application:

MCSI	Modulation	Coding rate	Information bits	Raw symbols	Units
1	16QAM	$\frac{1}{2}$	160	80	1
2	QPSK	$\frac{1}{2}$	160	160	2
3	QPSK	$\frac{1}{4}$	160	320	4
4	QPSK	$\frac{1}{6}$	160	640	8

Id., 6:56-58 (“For a known vocoder, MCSI ... implies the number of ... resource units required for a voice packet.”). FIG. 6, above, shows, for example, that time-frequency resource segment V_1 has an MCS index $MCSI_1$ of 1. If one follows the

blue line for MCSI_1 over to Units in TABLE 1, one sees that this corresponds with one basic resource unit. As for time-frequency resource segment V_2 , it has an MCS index MCSI_2 of 4, that corresponds with eight basic resource units, as shown by the orange line.

32. In this example embodiment, the number of Units $N=2, 4$, or 8 refers to a case where the packet stream corresponding to the time-frequency resource segment is transmitted using QPSK modulation using rate- $1/2$, $1/4$, or $1/8$ coding. *Id.*, 6:45-62.

33. Returning to the embodiment of FIG. 6, reproduced again below with color annotations added, the one-dimensional time-frequency starting coordinate (VZI_m), e.g., $0, 1, 9$, etc., highlighted in yellow, defines where a packet stream's associated time-frequency resource segment (V_m) starts in a zone both in time *and* frequency. *Id.*, 7:10-27.

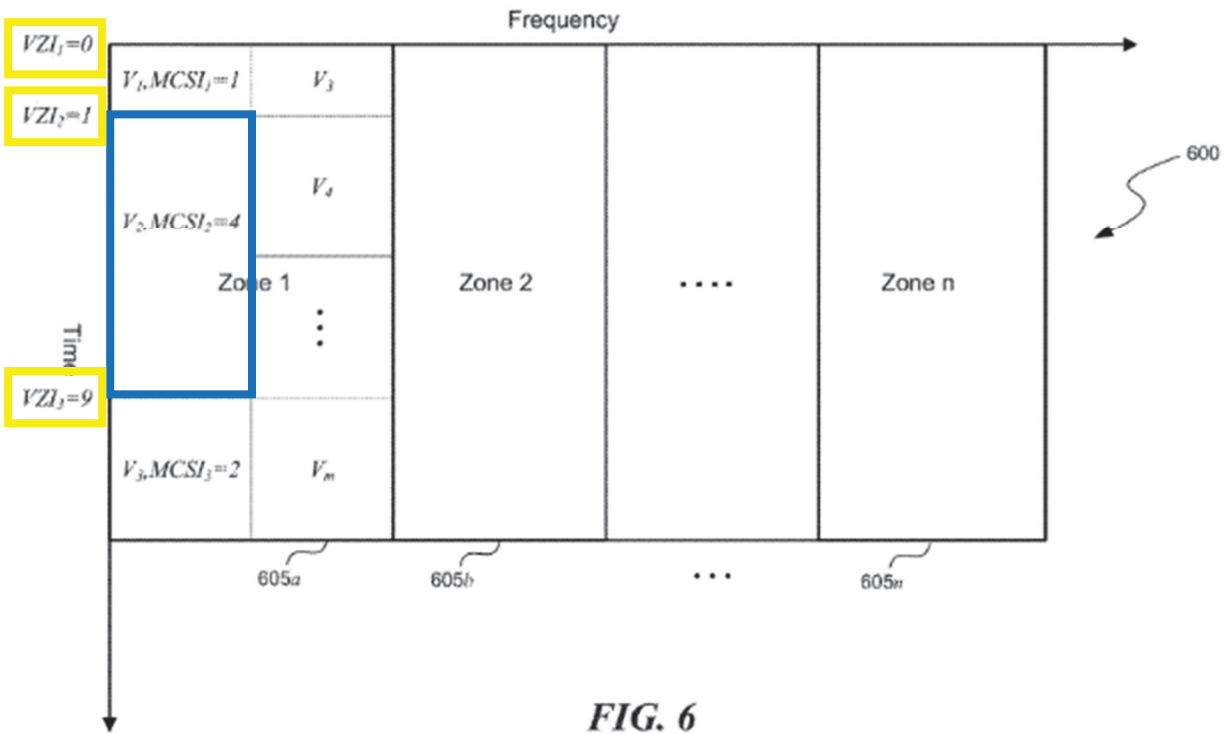


FIG. 6

34. FIG. 6 does not show using a time coordinate and an independent frequency coordinate to specify V_2 , highlighted in blue. FIG. 6 shows, instead, that only one time-frequency coordinate, $VZI_2=1$, is needed to specify where V_2 starts in both time and frequency. That is consistent with the invention's objective of reducing control overhead.

35. As I noted above, TABLE 1, above, shows a specific manner to utilize the invention to make time-frequency resource units that support the VOIP requirements faced by each VOIP user. The time-frequency resource units are said to be designed to carry a single VOIP packet. *Id.*, 6:56-58; *see also id.*, 2:8-10 ("20 byte" payload times 8 bits per byte equals 160 information bits, exactly as stated in TABLE 1). Granularity in allocating resources at a smaller scale than a

single VOIP packet is not needed in a VOIP application and providing more granularity would require additional overhead. This time-frequency resource unit is designed to fit the VOIP packets for voice applications while allowing a one-dimensional allocation that balances the precision required for the VOIP application with the minimum amount of overhead.

36. In summary, the '450 patent's inventors transform the two independent dimensions of time and frequency into one time-frequency dimension measured by a basic resource unit or time-frequency resource unit having a fixed number of symbols in a fixed number of subcarriers that fits the resource requirements of a given application and thus achieve an advantageous reduction in the amount of data required to allocate resources. Ex. 1001 ['450 Patent] 7:28-30 (“Using basic resource units as the granularity of a location offset to the packet stream reduces the number of bits required to represent its location with[in] the zone 605a.”).

37. Given the identity (m) of the relevant packet stream (*id.*, 6:3-21), the packet stream can be described by **(1)** the value of its one-dimensional time-frequency starting coordinate (VZI_m), which defines where the packet stream's associated time-frequency resource segment (V_m) starts in the zone both in time and frequency (*id.*, 7:10-27); and **(2)** the number of time-frequency basic resource units in the time-frequency resource segment (based on $MCSI_m$), which defines

where V_m ends, again both in time and frequency (*id.*, 7:7-39). Using time-frequency resource units, “each ... containing a set of frequency subcarriers in a group of OFDM symbols,” to define a new dimension of “time-frequency,” one can specify a resource in two parameters: a starting time-frequency coordinate and the number of time-frequency resource units in a time-frequency resource segment, as claimed.

38. The “time-frequency resource unit,” recited in the claims was significant and innovative as it allowed for reduction of the overhead required to transmit and recover data in a multi-carrier packet communication system because, using this basic resource unit, the resource space can be defined with two parameters instead of four. This “time frequency resource unit” is thus not an arbitrary combination of time and frequency units. Instead, it is a parameter designed according to the application requirements of the application that is being grouped. By intentionally foregoing the flexibility of irregular resource allocation at the lowest granularity level, which requires multidimensional allocation, the inventors instead created regularly shaped time-frequency resource units allocated at the application granularity level. These resource units used a single dimension to provide the control overhead reduction. Without enforcing similar resource requirements between users of the same application the regularity of the time-frequency resource unit would not have been possible.

B. Time-Frequency Resource Units

39. As discussed next, no “time-frequency” resource unit is shown to be taught or suggested by the combination of Kim and IEEE802.16-2004. Just as in the IEEE 802.16 standard distinguished in the background of the patent, these two references describe time units (symbols) and frequency units (subchannels), and suggest no “time-frequency” resource unit that transforms the time and frequency units into one combined dimension as disclosed and claimed by the ’450 patent. Because there is no time-frequency dimension taught in Kim or IEEE802.16-2004, the combination lacks both of these innovative parameters. Instead, Kim and IEEE802.16-2004, both alone and in combination, use an independent time dimension and an independent frequency dimension and require four parameters to map a packet stream, just like the prior art distinguished in the Background of the ’450 patent. These references did not even recognize that control message overhead was a problem that needed to be solved, so they did not propose a method to solve it.

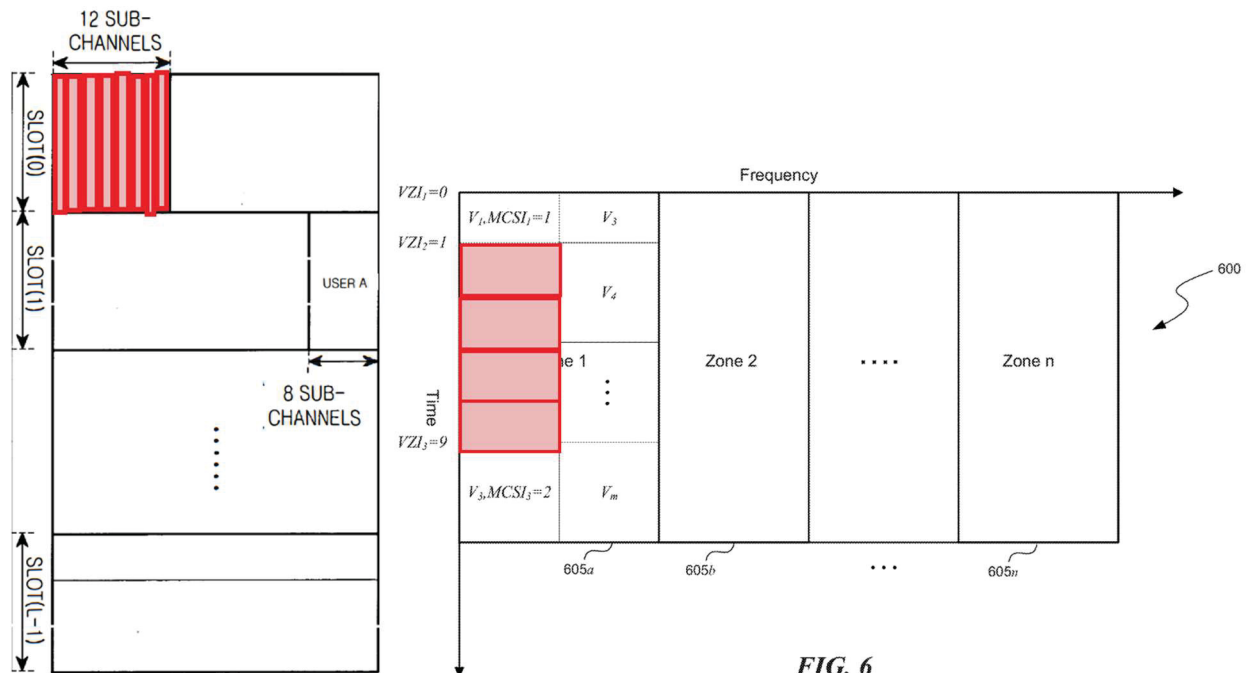
40. All the independent claims recite “the segment comprising N time-frequency resource units within a time interval.” Dr. Ding asserts that a POSITA would have understood that “each resource unit [is] defined by a *single subchannel (in frequency) and a single slot (in time)*.” Ex. 1003 [Ding Decl.] ¶ 129 (emphasis added). Furthermore, he states, “Kim discloses allocating

resources (the claimed ‘segment’) with an *integer number of subchannels per slot (the claimed ‘resource units’)*, such as 8 subchannels within slot (0) and 12 subchannels within slot (1).” *Id.* ¶ 132 (original emphasis removed and new emphasis added). He concludes: “[w]ith this type of allocation, Kim discloses examples in which each user is allocated a resource ‘segment’ including multiple (‘N’) resource units, such as 8 resources units and 12 resource units, *within a single time slot (the claimed ‘time interval’)*. Thus, a POSITA would have understood that, in the Kim-IEEE802.16-2004 network, allocates a resource segment ‘comprising N time-frequency resource units within a time interval.’” *Id.* ¶ 133 (original emphasis removed and new emphasis added).

41. In other words, he identifies an alleged frequency unit (“a single subchannel”). *Id.* ¶ 129. He identifies an alleged time unit (“a single slot (in time)”). *Id.* And he alleges that the identified frequency unit can be assigned a corresponding time unit (“an integer number of subchannels per slot”). *Id.* ¶ 132. But the analysis does not show any unifying time-frequency resource unit that transforms the dimensions of time and frequency into one dimension of time-frequency to achieve the reduction in control overhead that is central to the invention. As I explain next, this argument, while it purports to identify a “resource unit” defined as one subchannel in one time slot, it in reality defines the resource unit merely as one subchannel and fails to consider any time component.

Put simply, there is no “time-frequency resource unit” in either Kim or IEEE802.16-2004, so the Petition must rely on the same independent time and frequency units utilized in the IEEE 802.16 standard upon which the invention is said to improve.

42. In essence, Dr. Ding’s analysis defines a “time-frequency resource unit[] within a time interval” as a subchannel in a single time slot in the same single time slot and, thus, equates time-frequency resource units with subchannels. As shown below in a side-by-side comparison of Kim’s FIG. 7 and the ’450 patent’s FIG. 6, FIG. 6 has time-frequency resource units within a time interval that is tied to the number (N) of resource units, while Dr. Ding’s theory has an arbitrary number of subchannels, with the time interval (a single time slot) having no relationship with the number of subchannels.



Kim, FIG. 7 (altered)

'450 patent, FIG. 6 (altered)

43. As shown above, what Dr. Ding calls a “time-frequency resource unit” is, in reality, a *frequency* resource unit—a subchannel. This is incorrect because it interprets “time-frequency” such that the word “time” has no meaning. And this erroneous conclusion is not unexpected, because the time-frequency dimension that provides the reduction in control overhead is not taught in Kim or IEEE802.16-2004, for that matter.

44. Rather than describe the invention’s time-frequency resource units, Kim and IEEE802.16-2004 describe the same IEEE 802.16 prior art distinguished in the '450 patent’s Background section. Again, the patent explains that the existing IEEE 802.16 standard required *four* parameters in two independent

dimensions to allocate resources: a start symbol offset (8 bits) and a symbol length (7 bits) in the time dimension and a start logical subchannel offset (6 bits) and a number of allocated subchannels (6 bits) in the frequency dimension. Ex. 1001 [’450 Patent] 1:62-66. As I noted above, IEEE802.16-2004 shows those very four parameters in Table 275:

Table 275—OFDMA **DL-MAP IE** format

Syntax	Size	Notes
DL-MAP_IE() {		
DIUC	4 bits	
if (DIUC == 15) {		
Extended DIUC dependent IE	variable	See subclauses following 8.4.5.3.1
} else {		
if (INC_CID == 1) {		The DL-MAP starts with INC_CID = 0. INC_CID is toggled between 0 and 1 by the CID-SWITCH_IE() (8.4.5.3.7)
N_CID	8 bits	Number of CIDs assigned for this IE
for (n=0; n< N_CID; n++) {		
CID	16 bits	
}		
}		
OFDMA Symbol offset	8 bits	
Subchannel offset	6 bits	
Boosting	3 bits	000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB;
No. OFDMA Symbols	7 bits	
No. Subchannels	6 bits	
Repetition Coding Indication	2 bits	0b00 – No repetition coding 0b01 – Repetition coding of 2 used 0b10 – Repetition coding of 4 used 0b11– Repetition coding of 6 used

Start symbol offset

Start logical channel offset

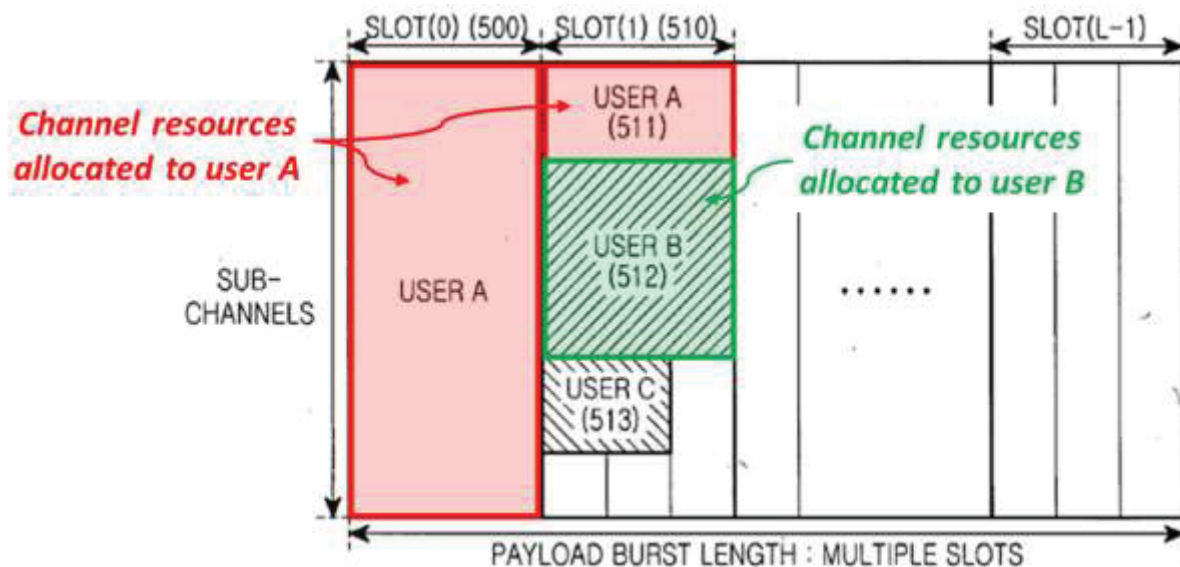
Symbol length

Number of allocated subchannels

45. Because IEEE802.16-2004 does not group users by application it must support flexible intermixing of applications where an individual user resource

requirement may vary widely. Accordingly, IEEE802.16 requires four parameters, two in time and two in frequency, to define a resource.

46. Kim does not disclose a different configuration. In fact, a POSITA would have understood that it teaches the same configuration as IEEE802.16-2004, because Kim's FIG. 5 shows a variety of irregularly shaped blocks that are positioned in time and frequency according to a user's exact needs which may vary greatly depending on the application being performed at that time. Kim needs to support applications with different resource granularity requirements, and thus different dimensions in time and frequency, as shown in Dr. Ding's annotations:



Ex. 1003 [Ding Decl.] ¶ 69. It can be seen that User C's block, which supports a HARQ application, has different resource granularity requirements than User B's block. See Ex. 1005 [Kim] ¶ 53.

47. The situation shown above illustrates the problem with IEEE 802.16 described in the Background of the '450 patent: “[d]ue to the fact that different applications have different resource requirements, the allocated resource region is *irregular from connection to connection*.” Ex. 1001 [’450 Patent] 1:66-2:2. As a result of that irregularity, in order to fully specify each User’s blocks Kim needs to define frequency *and* time in two independent dimensions, just like the IEEE 802.16 standard discussed in the ’450 patent Background and expressly improved upon by the claimed invention.

48. Thus, the combination of Kim and IEEE802.16 does not teach the use of time-frequency resource units and N from the ’450 patent. It uses the same two independent dimensions of time and frequency and known configuration of frequency units and independently mapped time units distinguished in the background of the ’450 patent. The combination of Kim and IEEE802.16-2004 do not provide a reduction in control overhead as advantageously taught in the ’450 patent.

C. Segment Of Time-Frequency Resource, The Segment Having A Starting Time-Frequency Coordinate

49. The independent claims also all require a “segment of a time-frequency resource, the segment having a starting time-frequency coordinate.” Dr. Ding opines that the OFDMA symbol specified by IEEE802.16-2004’s OFDMA symbol offset and the subchannel specified by IEEE802.16-2004’s “subchannel

offset” are collectively the claimed “time-frequency coordinate.” Ex. 1003 [Ding Decl.] ¶ 127. In other words, Dr. Ding is alleging that the time-frequency coordinate is a combination of two coordinates: a time coordinate and a frequency coordinate.

50. The ’450 patent does not support a construction of “time-frequency coordinate” that is a combination of a time coordinate and a frequency coordinate. The specification makes clear that one “index” specifies where a resource segment V_m starts in both time *and* frequency:

If a MCS from Table 1 is selected for each packet stream contained in a particular zone, the offset to a segment representing a particular packet stream may be easily calculated. *For example, an index $VZI_1, VZI_2, \dots VZI_m$ is shown at the origin of each segment that is contained in the zone 605a.* The index for any selected packet stream is defined as the sum of all basic resource units associated with each packet stream preceding the selected packet stream, with an optional adjustment depending on the location where the division of the time-frequency resource is started (typically no adjustment is required since the division starts at the origin of the zone). *For example, the location index for the first voice packet stream is $VZI_1=0$ since it starts at the origin of the zone 605a. The first packet stream has an MCS of 1, which implies that one basic resource unit is used. As a result, the index for the second voice packet stream is $VZI_2=1$. The second packet stream has an MCS of 4, which implies that eight basic resource units are used. As a result, the index for*

the third voice packet stream is $VZI_3=9$, arrived by summing the basic resource units used for the preceding first and second packet streams.

Ex. 1001 ['450 Patent] 7:7-27 (emphasis added).

51. The passage that Dr. Ding relies on to support his construction is actually a description of four parameters in the prior art being distinguished and does not mention any time-frequency coordinate. Ex. 1003 [Ding Decl.] ¶ 123 (citing Ex. 1001 ['450 Patent] 1:60-66).

52. In his “Overview of the '450 Patent” (starting at page 17), Dr. Ding also include a short discussion of the “starting time frequency coordinate,” citing the '450 patent at 5:57-63. Ex. 1003 [Ding Decl.] ¶ 57. That passage, however, describes an unclaimed embodiment and relates to the granularity of the time-frequency coordinate:

In some embodiments, the identification of the time-frequency segment associated with a particular packet stream can be indicated by the starting time-frequency coordinate and the ending time-frequency coordinate relative to the starting point of the zone. The granularity in the time coordinates can be one or multiple OFDM symbols, and that in the frequency coordinates can be one or multiple subcarriers.

Ex. 1001 ['450 Patent] 5:57-64. This passage does not define “time-frequency coordinate” to mean the combination of a time coordinate and a frequency

coordinate, nor does Dr. Ding contend that it does. Instead, this passage is discussing granularity.

53. To understand why granularity does not redefine a one-dimensional coordinate as a combination of two coordinates, consider the torque, which like the claimed time-frequency resource unit, transforms two independent dimensions (force and distance) into one dimension. One can change the granularity of torque's force component and torque's distance component, to, for example, express torque in terms of ounce-inches instead of foot-pounds. That does not mean, however, that one specifies a torque by specifying a force and an independent distance. In a similar way, the granularity of the time-frequency coordinate can be specified in different ways, e.g., by reducing the number of subchannels in a time-frequency so that it is more granular in frequency and less granular in time, but this does not mean one may specify the claimed time-frequency coordinate by specifying a time coordinate and an independent frequency coordinate.

54. At any rate, as I noted above, this embodiment is unclaimed. It is clear that this embodiment is not claimed because the time-frequency segment is specified by a starting time-frequency coordinate and an ending time-frequency coordinate rather than the "starting time-frequency coordinate" and "N time-frequency resource units." Thus, unlike the claims, it uses two coordinates to map

the packet streams rather than a starting coordinate and the number of time-frequency resource units. This passage at 5:57-63 of the '450 patent teaches that the time-frequency coordinates used in this embodiment to specify the beginning and ending of the resource unit can be specified based on changing the number of OFDM symbols in the time dimension or the number of subchannels in the frequency dimension. It does not, however, teach that the time coordinate and frequency coordinate can be independently specified. Regardless of what is taught regarding this embodiment, the claimed embodiment recites a time-frequency coordinate which requires that time and frequency be specified together.

55. Unlike the claimed invention, the combination of Kim and IEEE802.16-2004 does not teach a way to reduce the number of bits necessary to map a packet stream, which further confirms that the combination does not teach using a time-frequency coordinate to perform the mapping.

VI. CONCLUSION

56. I declare that the information contained in this declaration is true and accurate to the best of my knowledge. If called upon to testify, I would do so consistent with the statements and opinions contained in this declaration.

DATED: December 20, 2021 SIGNED: 

William P. Alberth, Jr.

APPENDIX A

William (Bill) P. Alberth, Jr

Harnessing the Power of Technology to Transform Businesses, Deliver Profitability,
and Solve Complex Problems

San Jose, CA ♦ (847) 404.7871 ♦ Bill.Alberth10@gmail.com ♦

Global, Business-Centric Technology Executive who delivers billion-dollar outcomes through hardware, software, engineering, and innovative technology development. Recognized technology leader in the wireless, systems communications, and consumer products – from startups to Fortune 500s. Partners across the business to establish technology strategy, products/solutions, roadmaps, and execution to commercialization plan's that deliver innovative, profitable products to market. Respected for building, developing, and leading world-class teams through vision-inspired leadership, with accountability in dynamic, high-tech environments. **Elected Dan Noble Fellow**, Motorola's highest engineering award, Top .001%.

Notable achievements:

- **Executive Leadership:** Led global \$7B+ business with dispersed teams of 700+ hardware/software engineers implementing advanced technology to commercialize world-class products.
- **Billion-dollar Impact:** Designed Reference Hardware across multi-generation chipsets used in \$4B worth of products annually, reducing time to market by 6 weeks and increasing reuse. Also defined, developed and commercialized advanced hardware/software technologies that supported \$3B of iconic products.
- **Leading High-performance:** Created and led high-performing teams of scientists, engineers and PhDs delivering roadmaps, technology innovation and commercialization of solutions. Led strategic component teams to develop high value components and solutions, including imager systems, touch displays, energy systems, RF solutions including Bluetooth and 802.11, acoustics, integrated circuit systems, batteries, sensors and differentiating technologies.
- **Advisor:** Advising Startups, VCs Firms and Fortune 500s on technology acquisitions, M&A, new technology direction, product development and innovation. Also advise industry partners and government on broad technology areas including spectrum compatibility, RF, performance, communications, wireless, and IP.
- **Patented, Profitable Innovations:** Led as Top Innovator at Motorola Mobility with 140+ patents on mobile systems, manufacturing components, user interface, solutions and solutions. Partner to support Principal Investigators to identify and patent high-technology for \$2B+ patent portfolio.
- **Board Experience:** Served as Board Member of Open Mobile Alliance; currently serve on NextNav Board of Advisors; as Industrial Board of Advisors of SiNode (now Nanograf); and Advisory Board Member of Northwestern University Electrical EE and CS.

Areas of Expertise

Executive Leadership: Recruiting, Team Building & Talent Development – Global, Cultural Team Success

Technology Strategy/Execution: Innovation – R&D – Tech Evaluation & Acquisition – Commercialization

Technologies Expertise: Hardware – Software – Wireless – VR – AR – ML – AI – IoT

Industries: Manufacturing – Communications – Government – Home Automation – Consumer Products

Professional Experience

VICE PRESIDENT, MOBILE TECHNOLOGY – Roberson and Associates, LLC Chicago, IL **2014 - Present**

Consult with Industry partners and government on Spectrum Compatibility, Communications, Wireless Technology, and Intellectual Property. Lead cross-functional team to build and test an Air to Ground LTE communication system.

- **Innovative System:** Developed and deployed prototype Air-to ground LTE communication system, which exceeded customer requirements and expectations.
- **Testing Expert:** Created/executed testing protocol to determine multi-communication system compatibility. Testing results submitted to FCC, resulting in favorable rule making for client.
- **M&A Acquisitions:** Completed M&A due diligence and presented results to CEO to support acquisition decisions.

VP and CTO – Green Edge Technology, San Diego, CA

Aug 2013 – June 2015

Tapped to lead technology strategy in this start-up developing IOT Wireless Home Automation products.

- **IoT Solutions:** Created working, user friendly IOT Wireless Home Automation products/solutions, including outlets, thermostats, HVAC and control system.
- **Wireless Automation:** Led building and demonstrating a working, user-friendly home automation system using wireless interconnect.
- **Patent Expert:** Generated patent portfolio to protect intellectual property.

PRESIDENT AND FOUNDER – Innovations Technologies Consulting, Inc., Prairie Grove, IL 2012 - Present

Advising Startups, Venture Capital Firms and Fortune 500 companies providing technical direction on New Technology, Product Development and Innovation.

- **International Tech Advisory:** Led assessment/advisory for the \$44.9B, T-Mobile, in Germany—reviewed CTO organization and technology initiatives.
- **Platform Architecture:** Engaged with international fitness manufacturer to provide an architecture for a new platform providing compatibility with user devices, facility media connectivity, while also meeting cost and complexity goals.
- **Intellectual Property Expert:** Lead IP Defense, IP portfolio management, and Expert Witness for numerous Fortune 50 clients.

Motorola Mobility, Libertyville, IL

1986 – 2012

VP AND CHIEF TECHNOLOGY OFFICER, Mobile Devices, 2007 – 2012

Chosen as End-to-End Leadership of Motorola Mobility's Hardware and Software Technology Innovation and Development, a \$7B business, overseeing \$150M budget and 700-member global team. Directed technology strategy and communication with domestic/international customers and suppliers to influence roadmaps and build relationships. Led Motorola's standards driving IP into 3GPP and other international standards.

- **Billion-dollar Impact:** Designed Reference Hardware across multiple generations of chipsets that were used in \$4B worth of products annually, reducing time to market by 6 weeks and increasing reuse.
- **Commercialization Wins:** Defined, developed, and commercialized advanced Hardware and Software differentiating technologies supporting \$3B of products across business segment owners.
- **Technology Evaluations:** Evaluated global 3rd party technology evaluations of assets pursuant to multi-million dollar investments.
- **Intellectual Property:** Led team and created 60% of the intellectual property for Motorola Mobility.
- **Platforms Expertise:** Led strategic component teams in developing high value components and platform solutions, including design protocols still in use today, along with imager systems, touch displays, energy systems, acoustics, integrated circuit systems, batteries, sensors and differentiating technologies.
 - Enabled new, iconic and world's thinnest form factor by creating modified battery packs; developed and commercialized multiple generations of vivid displays with world-class power and performance.
- **Key Product Launch:** Collaborated with customers and launched highest performing LTE Phone, supporting simultaneous voice and LTE with 30 dB improved performance, delivering ~ \$400M.

FELLOW, Technical Staff, Motorola, 2004 – 2007

Elected Motorola Fellow. Established Motorola's technology direction in partnership with customers and suppliers as the Technical Lead for the CDMA business unit, managing 50 direct reports.

- **Tech Innovator:** Identified technology solutions and drove next generation platform development.
- **Team Building:** Recruited top team members and developed best in class RF and call processing performance, driving success across all Motorola products.
- **Strategy and Planning:** Spearheaded Motorola strategy on key Spectrum issues. Co-authored and presented Motorola's position paper to the FCC. Trusted advisor and technology collaborator with customers, including Verizon, ATT, and Sprint, providing key assistance in generating their business plans regarding spectrum and on new technology development.
- **Technical Advisor:** Trusted technical advisor to Carriers on Technology and Deployment.

Additional Roles

CTO – Akhan Semiconductor, Gurnee, IL**June 2016 – July 2021**

Emerging start-up, stood up class 3 clean room and started commercialization of Diamond films. Collaborate to develop new technology and determine ways to use diamond to solve commercial problems. Growing Diamond for commercial partners, working to sell technology capability to commercial/defense partners.

Argonne National Lab, Lemont, IL**2014-2015****SPECIAL TECHNICAL ADVISOR (STA)**

Created and categorized Argonne's IP portfolio. Built database of 952 Argonne inventions characterizing them into 24 categories to enable development of the assets by Argonne management. Database was used to identify solutions to commercial requests submitted to Argonne.

- Sr. Advisor Argonne National Laboratory, transferring new technology to industry.
- Worked with 15 PhD's and scientists to patent technology.
- Partnered with Argonne Legal to manage Patent Portfolio and determine foreign filing status.

Education

MSEE, Illinois Institute of Technology, Chicago, IL**BSEE**, University of Illinois Urbana-Champaign IL

Boards and Professional Affiliations

Board of Directors – Open Mobile Alliance 2014-2016**Board of Advisors** – NextNav, Sunnyvale, CA 2014-Present**Industrial Board of Advisors** – SiNode now Nanograf, Chicago, IL 2016-Present**Member Advisory Board** - Northwestern University Electrical EE and CS (EECS) 1999 - Present**Treasurer**, Boy Scout Troop 158, 1995 – 2013

Patents and Awards Shortlist

Patents: 140+ Granted Patents | Distinguished and Master Innovator Award Patents**Leader of Motorola's Professional Technical Ladder**, managing career development and promotions**Elected Motorola Fellow****Elected Dan Noble Fellow**, Motorola's highest engineering award, Top .001% of Engineers**Elected to Motorola SABA (Science Advisory Board)**, Top 1% of Engineers**Member**, Motorola Mobile Devices Patent Committee