

*In the United States Patent Trial and
Appeal Board*

**Apex Beam Tech. LLC
Patent Owner's Presentation**

IPR2023-00599

U.S. Patent No. 10,912,081

FABRICANT LLP

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Before: John D. Hamann

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Administrative Patent Judges



Exemplary Challenged Claim

Claim 1: A method in a User Equipment (UE) for wireless communication, comprising:

receiving a second radio signal;

receiving a first radio signal;

wherein the first radio signal is transmitted within a first time unit, a first bit block is used for generating the first radio signal, and the first radio signal comprises G multicarrier symbols;

the second radio signal is transmitted within the first time unit, and the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols;

as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to the relative position of a time-domain resource occupied by the given multicarrier symbol with respect to a first time point in time domain;

when the time-domain resource occupied by the given multicarrier symbol is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for the given multicarrier symbol; and

when the time-domain resource occupied by the given multicarrier symbol is before the first time point, the multi-antenna related receiving for the given multicarrier symbol is related to the multi-antenna related receiving for the second radio signal;

the first time point is one time point within the first time unit; and

G is a positive integer.

Grounds

Ground 1	Ground 2
Claims 1-12 are not Anticipated under 35 U.S.C. 102 over Lee	Claims 1-12 are not Obvious under 35 U.S.C. 103 over Chen in view of Lee

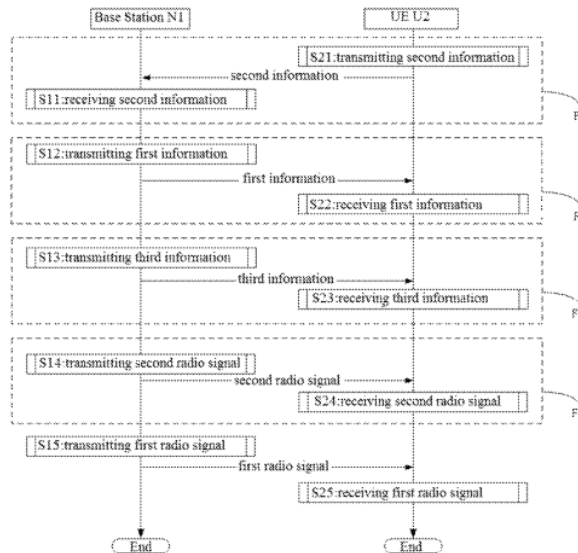
Claim Construction

“[first]/[second] radio signal”

“radio signal” : “signal that transmits particular radio information”

Fig. 5 of the '081 Patent discloses 5 signals, each corresponding to particular information:

- Second information
- First information
- Third information
- Second radio signal
- First radio signal



Ex. 1001, Fig. 5.

12 Q. Could you tell me which are the radio
13 signals in Figure 5?

14 A. It would be -- the first radio signal
15 and the second radio signal are identified in
16 Figure 5 as radio signals.

17 There are other signals that
18 include information.

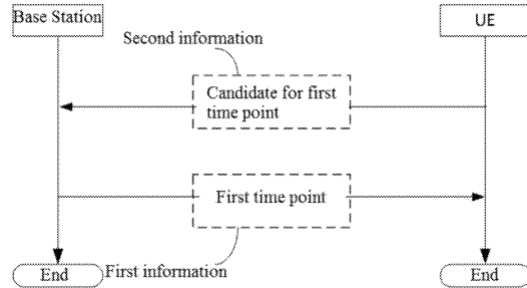
19 Q. How many signals are there in total
20 in Figure 5?

21 A. Well, there's first radio signal,
22 second radio signal, third information, first
23 information, and second information.

Ex. 1024, 31:12-23.

“[first]/[second] radio signal”

For example, the content for the first information signal is a “first time point,” the content for the second information is the “candidate [scheme] for the first time point,” and the content for the third information signal is the “candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols [of the first radio signal]”:



Ex. 1001, Fig. 8.

The third information is used for determining a candidate scheme for the multi-antenna related receiving corresponding to the G multicarrier symbols.

Ex. 1001, 6:4-6.

In one subembodiment, the second radio signal is a DCI that is used for indicating downlink assignment, and the first radio signal is a PDSCH transmitted on the downlink resource indicated by the second radio signal.

Ex. 1001, 18:21-24.

Because each of the content of the first, second, and third information signals is different, a person of ordinary skill in the art would not consider the first, second, and third information to be part or portions of the same signal. The same is also true of the first and second radio signal.

“[first]/[second] radio signal”

Both Patent Owner’s expert, Mr. Gomez, and Petitioner’s expert, Dr. Kakaes indicate that radio signals correspond to “particular radio information” (including at a different time):

7 Q. What do you mean by "particular radio
8 information"?

9 A. Well, it depends on the content.

10 If the content is changing, the
11 information itself is changing. Then it's a
12 different radio signal.

Ex. 1024, 12:7-22 (indicating that if content/information is different between signals, those are different radio signals.

2 Q. So using any of those signals
3 that you just described, if two of those
4 types of signals have different content,
5 would a person of ordinary skill in the art
6 consider the signals to be different
7 signals?

8 MR. CERULLI: Objection.
9 Form.

10 A. If one of those signals is a
11 physical downlink shared channel that takes
12 place now and the other radio signal is a
13 physical downlink shared channel that takes
14 place five hours from now, the person would
15 consider them to be different.

Ex. 2005, 17:7-15 (indicating that even if the same signal was transmitted but at a different time, that would be considered a different radio signal.

“[first]/[second] radio signal”

Wiley Electrical and Electronics Engineering Dictionary confirms that the content of a signal defines the signal. For example, a signal that transmits control information is a control signal:

Control signal:

2. In telecommunications, a signal that transmits control information.

Steven M. Kaplan, Wiley Electrical and Electronics Engineering Dictionary, p. 145 (2006)

Both Petitioner and Patent Owner understand the claimed “second radio signal” of the ’081 Patent to correspond to control information.

Yet, Petitioner argues that two *different* control signals with different control information somehow comprise one control signal (the claimed second radio signal).

“the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols”

“the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols” : “the second radio signal is used for determining a time-domain resource occupied by *each of* the G multicarrier symbols”

the second radio signal is used for *determining a time-domain resource occupied by the G multicarrier symbols*;

as for any one given multicarrier symbol of the G multicarrier symbols, the multi-antenna related receiving for the given multicarrier symbol is related to *the relative position of a time-domain resource occupied by the given multicarrier symbol* with respect to a first time point in time domain;

when the *time-domain resource occupied by the given multicarrier symbol* is behind the first time point, the second radio signal is used for determining the multi-antenna related receiving for *the given multicarrier symbol*; and

when the *time-domain resource occupied by the given multicarrier symbol* is before the first time point, the *multi-antenna related receiving for the given multicarrier symbol* is related to the multi-antenna related receiving for the second radio signal

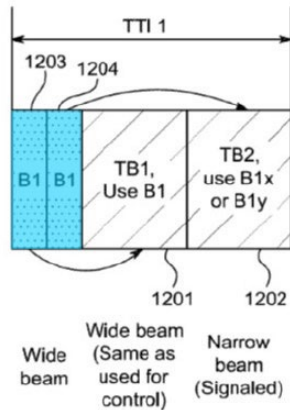
Ex. 1001, Claim 1

A person of ordinary skill in the art would readily understand that the time domain resource occupied by *each one* of the G multicarrier symbols must be determined by the second radio signal. Otherwise, it would not be possible to determine, in the subsequent limitations, whether the time domain resource occupied by each one of the multicarrier symbols is before or behind the first time point.

***Chen* and/or *Lee* Do Not Render
Claim 1 Obvious**

Lee: “receiving a second radio signal”

Petitioner does not identify a single radio signal with particular information as the one incoming “second radio signal.” Petitioner argues that two different control signals (B1 1203 and B1 1204) are collectively the claimed second radio signal :



Lee, FIG. 12 (annotated).

For example, *transport block 1201 may be associated with control Tx beam 1203 and transport block 1202 may be associated with control Tx beam 1204.* The first transport block may be mapped on to a *first codeword provided in the control Tx beam 1203* and the second transport block may be mapped on to a *second codeword provided in control Tx beam 1204.* The codeword may be associated with: a specific beam or beam ID, a BRS, and/or a time/frequency location. As used herein, a codeword represents user data before it is formatted for transmission.

Ex. 1004, [0169] (disclosing two different codewords associated with each different Tx beam).

Lee: “receiving a second radio signal”

Petitioner’s expert confirms the understanding that each of Lee’s B1 1203 and B1 1204 contains a different particular information, namely different code words that correspond to downlink control information for respective (i.e., separate) data:

Q. So each of 1203 and 1204 contains a code word, correct?
A. Provide a code word that could respond to the DCI that provides the downlink control information for the respective data.

Ex. 2005, 22:17-22.

Q. So 1203 provides a **first code word**, right?
A. Yes, it does.
Q. And control transmission being 1204 provides a **second code word**, right?
A. Yes, I think that’s correct as well.

Ex. 2005, 23:16-22.

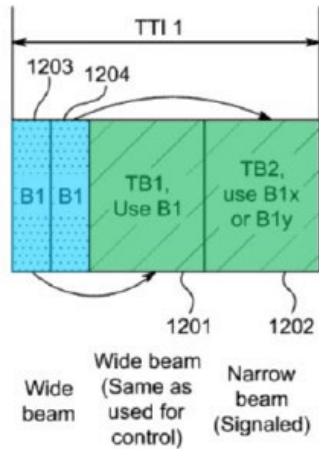
Q. Would a person of ordinary skill in the art expect the code words associated with each of TB1 and TB2 to be different?

A. One would expect them to be the same structure, but **would provide different information. . . those specific values will be different in 1203 and 1204** because TB1 and TB2 are located at **different places on the time frequency resources and they’re using different beams and that information would have -- would be conveyed in 1203 and in 1204** for the respective portions of the signal representing the data in TB1 and TB2.

Ex. 2005, 25:2-25.

Lee: “receiving a first radio signal”

Petitioner does not identify a single radio signal with particular information as the one incoming “first radio signal.” Petitioner argues that two different transport block signals (TB1 1201 and TB1 1202) are collectively the claimed first radio signal :



Lee, FIG. 12 (annotated).

FIG. 12 shows a diagram for a **dual TB transmission scheme**. **Two or more transport blocks** may be transmitted with a same beam as the control channel, or may be transmitted with different beams. For example, FIG. 12 illustrates two transport blocks 1201 and 1202 transmitted (multiplexed) in a TDM fashion within a single TTI (e.g., TTI1). The transmission of the **individual transport blocks** may use the same beam as the control channel (e.g., transport block 1201 which uses a wide beam), or may use a different beam (e.g., transport block 1202 which uses a narrow beam).

Ex. 1004, [0167] (disclosing TB1 and TB2 are “individual” signals in a “dual TB transmission” with different particular information carried, and different modulation and coding schemes).

As noted above, each transport block in a dual TB transmission scheme is associated with separate codewords in separate control Tx beams and therefore, each transport block comprises separate particular information.

Lee: “receiving a first radio signal”

Petitioner’s expert confirms the understanding that each of Lee’s TB 1201 and TB 1202 contains different particular information, for example, “different places on the time frequency resources” and “using different beams”:

Q. Would a person of ordinary skill in the art expect the code words associated with each of TB1 and TB2 to be different?

A. TB1 is being transmitted using a wide beam, as he explains in the figure 12, and TB2 is transmitted using a narrow beam and the specific aspects needed to receive those respective portions of the data block, for example, beam IDs time and frequency resource locations used for each of them, those specific values will be different in 1203 and 1204 because *TB1 and TB2 are located at different places on the time frequency resources and they’re using different beams* and that information would have -- would be conveyed in 1203 and in 1204 for the respective portions of the signal representing the data in TB1 and TB2.

Ex. 2005, 25:2-24.

Lee: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols”

Petitioner only describes that “*Lee* discloses that the control channel may carry scheduling information for the data channel.” Ex. 1004, [0110]). But a person of ordinary skill in the art would understand that Lee is limited to disclosing a codeword that “may be associated with: . . . a time/frequency location” of the respective entire transport block mapped to that codeword. Ex. 1004, [0169]).

[0110] A physical downlink data channel may carry payload information in the form of Medium Access Control (MAC) Protocol Data Unit (PDU) from the MAC layer. The resource allocation of this channel may be carried in the scheduling information in the physical downlink control channel.

Ex. 1004, [0110].

A person of ordinary skill in the art would understand that nowhere does Lee (or Petitioner) describe how a determination of occupied time domain resources is made *for each of G multicarrier symbols*, but only on a transport block basis.

[0169] In an example which the two transport blocks may be transmitted in a TDM fashion, the control channel and the DL data assignment may be in the same TTI. For example, transport block 1201 may be associated with control Tx beam 1203 and transport block 1202 may be associated with control Tx beam 1204. The first transport block may be mapped on to a first codeword provided in the control Tx beam 1203 and the second transport block may be mapped on to a second codeword provided in control Tx beam 1204. The codeword may be associated with: a specific beam or beam ID, a BRS, and/or a time/frequency location. As used herein, a codeword represents user data before it is formatted for transmission.

Ex. 1004, [0169].

Chen/ Lee: “first bit block is used for generating the first radio signal”

Patent Owner does not address Chen and Lee individually

Patent Owner’s Response acknowledges that Petitioner alleges Lee’s teachings of a data message generated by a bit block (MAC PDU) could be implemented into Chen’s method.

Patent Owner argues that the combination is deficient because Lee’s MAC PDU does not generate a first radio signal as required by the claims.

As discussed, Lee’s alleged first bit block (MAC PDU) generates two different signals (*i.e.*, TB1 and TB2) associated with two different code words (CW), instead of generating one radio signal.

Petitioner cannot change the operation of Lee’s MAC PDU in proposing to combine the references.

Petitioner relies on improper hindsight and fails to address this shortcoming.

Chen/Lee: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols”

Chen does not mention multicarrier symbols. Chen only discusses indicating time-domain resource occupation for the full data message, not on an individual multicarrier symbol basis, as the claim requires:

message” for the first message. *Chen*, 12; *Chen Priority*, [0123]. Thus, a POSITA would have understood that *Chen*’s control message and/or scheduling message includes information indicating a time-domain resource occupied by *Chen*’s data message (“first message”). Kakaes, ¶¶212-214.

Pet. at 60.

Chen/Lee: “the second radio signal is used for determining a time-domain resource occupied by the G multicarrier symbols”

Petitioner’s citations to Chen are inapposite because, while they describe switching beams based on parameters at a given point in time (i.e., what Petitioner alleges is the claimed first time point), Chen does not describe any determination of the time domain resource occupied by each multicarrier symbol in order to further determine whether each time domain resource is before or behind a first time point.

target receiver parameter.” *Chen*, 13; *Chen Priority*, [0128]. *Chen* further discloses that “a reception beam indicated by the parameter indication information may be a receiver parameter different from the receiver parameter currently used by the receiving end device; at this time, the receiving end device needs to switch the receiver parameter.” *Id.*

Pet. at 63.

For example, *Chen* discloses that “the **default receiver parameter** may be the receiver parameter **currently used** by the receiving end device for rapid decoding of the message transmitted by the transmitting end device.” *Chen*, 13; *Chen*

Pet. at 65.

***Chen and Lee Do Not Render
Claims 2-4 Obvious***

Chen and Lee Do Not Render Claims 2-5 Obvious

Claims 2-4 are dependent on Claim 1 — for at least the same reasons as Claim 1, *Chen* and/or *Lee* fails to obviate Claims 2-4

IPR2023-00599, Paper 12 at 41.

***Chen and Lee Do Not Render
Claims 5-8 Obvious***

Chen and Lee Do Not Render Claims 5-8 Obvious

Claim 5 recites: “[a] method in a base station device for wireless communication”

- This mirrors the limitations of Claims 1-4 which recite: “[a] method in a User Equipment (UE) for wireless communication”
- Claims 5-8 disclose a method from the perspective of the base station that is in communication with the UE in Claims 1-4
- For at least the same reasons as Claims 1-4, any combination of *Chen* and/or *Lee* fails to obviate Claims 5-8

IPR2023-00599, Paper 12 at 40-41

***Chen and Lee Do Not Render
Claims 9-10 Obvious***

Chen and Lee Do Not Render Claims 9-10 Obvious

Claims 9-10 recite “[a] UE for wireless communication” which are the apparatus claims for Claims 1-4

For at least the same reasons as Claims 1-4, *Chen* and/or *Lee* fails to obviate Claims 9-10.

IPR2023-00599, Paper 12 at 40-41

***Chen and Lee Do Not Render
Claims 11-12 Obvious***

Chen and Lee Do Not Render Claims 11-12 Obvious

Claims 16-20 recite “[a] base station device for wireless communication” that mirrors the limitations of Claims 9-10, which recite: “[a] UE for wireless communication”

Claims 11-12 disclose the base station device that is in communication with the UE in Claims 9-10

For the same reasons as Claims 11-12, *Chen* and/or *Lee* fails to obviate Claims 11-12.

IPR2023-00599, Paper 12 at 40-41

Patent Owner's Expert is Qualified to Offer Testimony

Patent Owner's Expert is Qualified to Offer Expert Testimony

Parties agreed on the definition of a POSITA in this proceeding:
“more than five years of relevant work and/or research experience can compensate for a lesser level of education”

Mr. Gomez has a Bachelor of Science Degree from Yale University in Electrical Engineering and over “thirty five years in the design and development of hardware and software technology used in telecommunications, data communications, wireless transmission and related protocols”

IPR2023-00599, Paper 16 at 18-21

Patent Owner's Expert is Qualified to Offer Expert Testimony

Mr. Gomez's Relevant Experience:

- Designed products that utilize the underlining technologies of Spread Spectrum (802.11a,b,g,n), LTE, OFDM, RF Transmission and Reception, which are in turn utilized by LTE and by 5G NR
- ROLM Corporation: designed transmission protocols for business telephone equipment (1983)
- Founding member of Stratacom Inc.: designed long haul voice and data routing equipment and developed compression algorithms for voice communications; designing methods to include data on the voice transmission paths that later became known as Frame Relay

IPR2023-00599, Paper 16 at 18-21

Patent Owner's Expert is Qualified to Offer Expert Testimony

Mr. Gomez's Relevant Experience:

- 1990 Consultant Work: worked on circuit design in “computing, telephony and data systems which included paging devices”
- ActSolar (Aug 2006 to Mar 2009): Vice President, tasked with implementing power conversion circuitry and radio system to convey the health status of the solar array to a web server

IPR2023-00599, Paper 16 at 18-21

Patent Owner's Expert is Qualified to Offer Expert Testimony

Petitioner's argument that Mr. Gomez is not qualified as a POSITA are based on an incorrect heightened standard

“A person may not need to be a person of ordinary skill in the art in order to testify as an expert under Rule 702, but rather must be ‘qualified in the pertinent art’” and “there is no requirement of a perfect match between the expert's experience and the relevant field.” Trial Practice Guide, 34

IPR2023-00599, Paper 16 at 18-21

Patent Owner's Expert is Qualified to Offer Expert Testimony

Mr. Gomez's Relevant Expert Experience:

- Engaged in several cases relating to OFCM
- *WiLan Inc. v. HTC Corp.*, No. 2:11-CV-68-JRG (September 2012-August 2013): supported WiLan investigating VHDL, Verilog, C, and C++ source code that implemented OFDM and SC-OFDMA
- *WiLan v. Acer*, No. 2:07-CV-473: investigated OFDM implementations used in 802.11a,b,g,n; supported WiLan investigating Verilog, C, and C++ source code that implemented OFDM

IPR2023-00599, Paper 16 at 18-21