

*In the United States Patent Trial and  
Appeal Board*

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

**IPR2023-00601**

**IPR2023-00602**

**U.S. Patent No. 10,568,113**

**FABRICANT LLP**

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**Before: John D. Hamann**

**Sean P. O'Hanlon**

**Scott Raevsky**

*Administrative Patent Judges*

# Exemplary Challenged Claim

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

receiving a target radio signal;

transmitting a first radio signal on a first channel;

transmitting a second radio signal on a second channel; and

monitoring a third radio signal in a first time window;

wherein a measurement for the target radio signal obtains a target measurement value, the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal; a time resource occupied by the first radio signal is used for determining the start time of the first time window; a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window; a time domain resource occupied by the second radio signal is used for determining a third time window, and the end time of the third time window is the end time of the first time window; and the second time window and the third time window have overlapped time domain resource(s).

# Grounds

| Ground 1                                                                                | Ground 2                                                                                |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Claims 1-20 are not Obvious under 35 U.S.C. 103 over <b>Xia</b> in view of <b>Jover</b> | Claims 1-20 are not Obvious under 35 U.S.C. 103 over <b>Liu</b> in view of <b>Jover</b> |

# Claim Construction

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

“triggering the transmission” : “causing the transmission”

- “triggering the transmission” is different than mere “transmission”
- Otherwise “triggering” is rendered meaningless
- *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021) (citations omitted) (“It is highly disfavored to construe terms in a way that renders them void, *meaningless*, or superfluous.”) (emphasis added).

Triggering:

- “cause to happen”
- Ex. 2006, ¶ 34 (<https://www.thesaurus.com/browse/triggering>).
- “to cause something to start”
- Ex. 2006, ¶ 34 (<https://dictionary.cambridge.org/us/dictionary/english/trigger>).

# “time window” terms

Petitioner construes “first time window,” “second time window,” and “third time window” as three arbitrary periods of time

Petitioner’s apparent construction renders the modifiers of “first,” “second,” and “third” meaningless:

- *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 810 (Fed. Cir. 2021) (“It is highly disfavored to construe terms in a way that renders them void, **meaningless**, or superfluous.”) (emphasis added)

The purpose of a claim term may be used to construe that term where the preferred embodiment is the only embodiment tied to the purpose of the invention.

- *InterDigital Commc'ns, Inc. v. U.S. Int'l Trade Comm'n*, 601 F. App'x 972, 978 (Fed. Cir. 2015) (ordering construction based on description of limitation of preferred embodiment where that was only embodiment and description expressly tied to purpose of the invention, despite limitation not repeated in summary of the invention)
- *KEYnetik, Inc. v. Samsung Elecs. Co.*, 837 F. App'x 786, 792 (Fed. Cir. 2020) (“[a] patent’s statement of the described invention’s purpose informs the proper construction of claim terms”) (citations omitted).

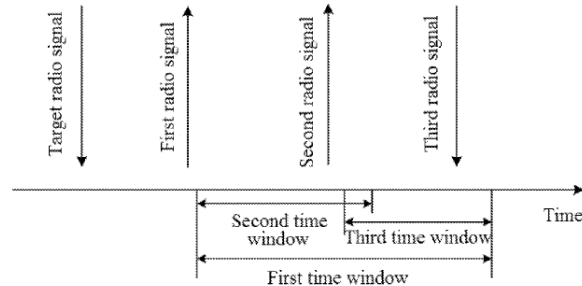
IPR2023-00601, Paper 20 at 11-13

IPR2023-00602, Paper 20 at 10-11

# “first time window”

“first time window”: “a period of time from the first radio signal in which to receive a third radio signal (*i.e.*, a response to either the first or second radio signals)”

- Claim 1: “monitoring a third radio signal in a first time window”
- Claim 1: “a time resource occupied by the first radio signal is used for determining the start time of the first time window”

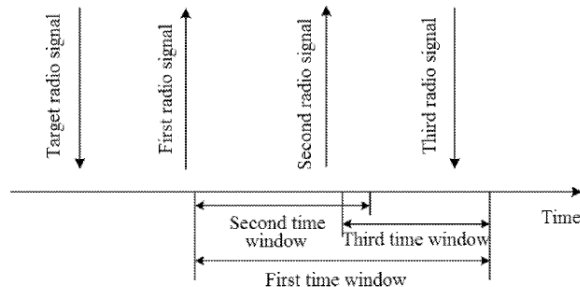


Ex. 1001, FIG. 6

# “third time window”

“third time window”: “a period of time from the second radio signal in which to receive a third radio signal (*i.e.*, a response to either the first or second radio signals)”

- Claim 1: “a time domain resource occupied by the second radio signal is used for determining a third time window”
- Claim 1: “monitoring a third radio signal in a first time window”
- Claim 1: “the end time of the third time window is the end time of the first time window”

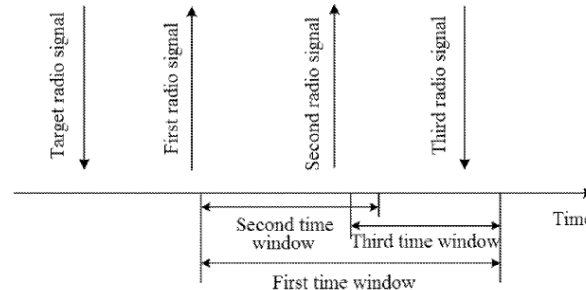


Ex. 1001, FIG. 6

# “second time window”

“second time window”: “a period of time from the first radio signal in which to transmit the second radio signal”

- Claim 1: “the target measurement value, when higher than a target threshold is used for triggering *the transmission of the first radio signal and the second radio signal*”
  - A designated time window ensures that both transmissions occur
- Claim 1: “a time domain resource occupied by the first radio signal is used for determining a second time window, a time domain resource occupied by the second radio signal is within the second time window, and the second time window is within the first time window



Ex. 1001, FIG. 6

***Xia/Jover and Liu/Jover Do Not  
Render Claim 1 Obvious***

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

## Xia:

The only trigger disclosed in Xia is a *beam failure* trigger instead of a target threshold that is used as a trigger for *transmission*:

[0076] To detect a beam failure, the UE (e.g., UE 404) monitors a reference signal (beam failure detection RS) to assess whether a beam failure trigger condition has been met (e.g., beam signal strength has dropped below a threshold). The beam failure detection RS includes, in one embodiment, a periodic CSI-RS for beam management, where an SS-block within the serving cell can be considered if the SS-block is also employed in beam management.

Ex. 1004, [0076]. Xia is silent on whether the beam signal strength value is used for triggering the transmission of the first and second radio signals

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

## Xia:

Xia only discloses that BFRQs are transmitted after a single beam failure event, not that they are triggered by the event:

[0066] In order for the system to recover from such a beam failure, the user equipment (UE) 404 sends a beam failure recovery request (BFRQ) to the base station (gNB) 402. In one embodiment, when only the DL beam has failed (FIG. 4A), the user equipment 404 may use the active PUCCH (originally allocated for UCI) to report the beam failure and request recovery from the base station 402, as agreed upon during the 3GPP TSG RAN WG1 #89 meeting. In another embodiment, when the DL and UL beams have faded, the user equipment 404 may also attempt to use the PUCCH for BFRQ. Beam failure recovery in this instance is less likely to be successful since both the UL and DL beams have failed. In either case, the BFRQ sent by the user equipment 404 requires a response message (BFRQ response) from the base station 402 if beam failure is to be recovered. However, the user equipment 404 does not know which DL beam will be used by the base station 402 to transmit a BFRQ response.

Ex. 1004, [0066].

[0091] In the depicted embodiment, more than one BFRQ (e.g., PUCCH-BFRQ, PRACH-BFRQ) is transmitted by a UE 404 for a single beam failure (BFR) event. Since more than one BFRQ may be transmitted by the UE 404, different channels (e.g., PUCCH and PRACH) may be used to send the BFRQ (and receive the BFRP). In order for the gNB 402 to transmit a BFRP in response to a respective BFRQ, the BFRQs should be associated with an event such that the gNB 402 can categorize each of the BFRQs and send back a response (BFRP) to the appropriate BFRQ without duplication. Accordingly, the gNB 402 should determine how to handle a response (BFRP) such that a single BFRP is sent back to the UE 404 from the gNB 402 per BFR event.

Ex. 1004, [0091].

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

## Xia:

Even if Xia’s BFRQ is sent in response to a beam failure event:

- Sending a BFRQ in response to a beam failure event does not disclose the claimed “target measurement value...used for triggering the transmission”
- FIGS. 7A and 7B of Xia only show “send[ing] a second BFRQ for same beam failure event,” which is not related to “send a first BFRQ” in response to “detect beam failure event.” In other words, the two BFRQs of Xia are not tied to the same target threshold that triggers both transmissions.

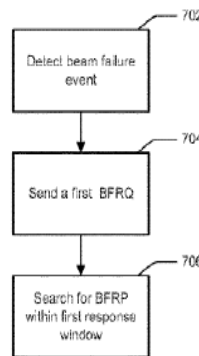


FIG. 7A

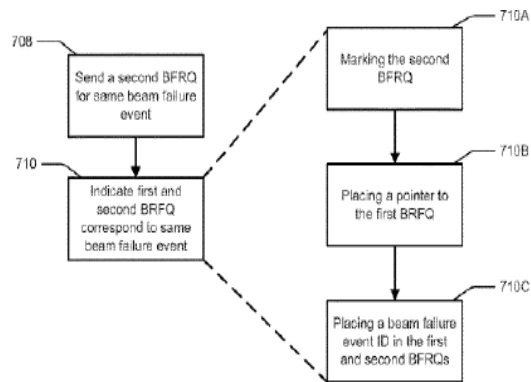


FIG. 7B

Ex. 1004, FIGs. 7A, 7B.

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

## Liu:

Liu only describes a user equipment measuring channel quality, but this channel quality does not trigger Liu’s BFRRs. *See* Ex. 1007, [0005], [0076]-[0078], [0084], [0087], [0091], [0114].

There is no trigger for both *the first and second* radio signals.

[0069] If the user equipment 110A-110C does not support Rx beamforming, the user equipment 110A-110C measures the channel quality of a reference signal (RS) in each transmission beam and reports the measurements to the base station 202. The station 202 selects the best beam for the user equipment 110A-110C from among a plurality of Tx beams. If the user equipment 110A-110C is configured to

Ex. 1007, [0069].

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

## Liu:

Liu’s channel quality is reported *to the base station* to “select[] the best beam for the user equipment [] from among a plurality of Tx beams”:

[0069] If the user equipment 110A-110C does not support Rx beamforming, the user equipment 110A-110C measures the channel quality of a reference signal (RS) in each transmission beam and reports the measurements to the base station 202. The station 202 selects the best beam for the user equipment 110A-110C from among a plurality of Tx beams. If the user equipment 110A-110C is configured to

Ex. 1007, [0069]. The claim language is clear that “*a User Equipment (UE)* for wireless communication” “receiv[es] a target radio signal” and “the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal and the second radio signal” without base station input. Liu only describes a base station receiving the channel quality.

# “the target threshold is used for triggering the transmission of the first radio signal and the second radio signal”

- Petitioner admits that Jover has nothing to do with disclosing “triggering a transmission of the first and second radio signal” because, allegedly, “[You]/[Liu] already discloses these features.”
- Petitioner further admits that Jover only teaches “a [specific] triggering condition” completely divorced from the claimed “transmission of the first and second radio signal.”

IPR2023-00601, Paper 20 at 8-9

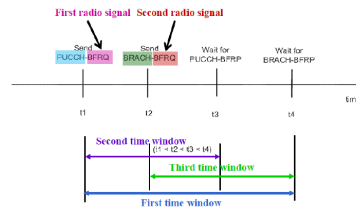
IPR2023-00602, Paper 20 at 7-8

# No “Second Time Window” in Xia

Petitioner argues that the time between Xia’s t1 and t3 discloses the claimed “second time window.”

However, Xia does not teach a requirement that t1 (the time that PUCCH-BFRQ is transmitted) and t3 (the time to wait for PUCCH-BFRP) are related to t2 (the time that PRACH-BFRQ is transmitted) and t4 (the time to wait for PRACH-BFRP).

Instead, t2 could occur after t3 or before t1 because t2 exists regardless of whether a BRACH-BFRQ is transmitted in some separate time window.



Xia, FIG. 6B (annotated); Xia Provisional, FIG. 6.

IPR2023-00601, Paper 18 at 19-21  
IPR2023-00601, Paper 20 at 18-20

# No “Second Time Window” in Xia

Xia does not disclose any temporal relationship (*i.e.*, second time window) between its PUCCH-BFRQ and PRACH-BFRQ to indicate the same beam failure event

Instead, Xia utilizes either:

- Marking the second BFR event as not being a first request;
- Placing a pointer to the first BFRQ in the second BFRQ; or
- Placing a BFR event ID in both the first and second BFRQs

[0094] In one embodiment, the UE 404 may notify the gNB 402 by marking the second BFR event, when sending the BFRQ, as being second in time or order such the gNB 402 identifies the second BFRQ (PRACH-BFRQ) as not being a first request.

[0095] In another embodiment, the UE 404 may notify the gNB 402 by placing a pointer to the first BFRQ (PUCCH-BFRQ) in the second BFRQ (PRACH-BFRQ), which indicates that the PUCCH-BFRQ and the PRACH-BFRQ correspond to the same BFR event.

[0096] In still another embodiment, the UE 404 may notify the gNB 402 by placing a BFR event ID in both the first and second BFRQs (PUCCH-BFRQ and PRACH-BFRQ), such that all BFRQs with the same BFR event ID correspond to the same BFR event.

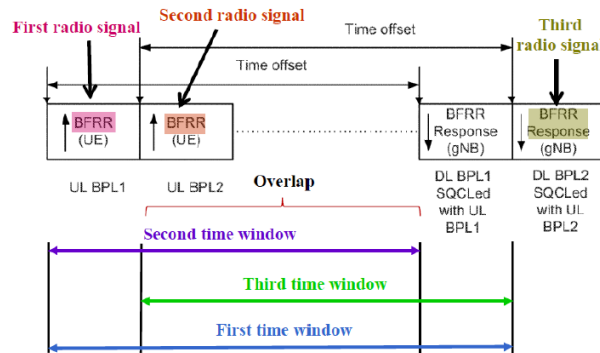
Ex. 1004, [0094]-[0096].

IPR2023-00601, Paper 16 at 5-6  
IPR2023-00601, Paper 20 at 18-20

# No “Second Time Window” in Liu

Petitioner argues that the time offset between the transmission of Liu’s first BFRR and its corresponding BFRR response discloses the claimed “second time window.”

However, Liu’s time offset has nothing to do with the second BFRR and exists regardless of whether a second BFRR is transmitted in some separate time window.



*Liu*, FIG. 5B (annotated); *Liu Provisional*, FIG. 5B.

IPR2023-00602, Paper 18 at 16-18  
IPR2023-00602, Paper 20 at 16-18

# Liu Does Not Disclose “transmitting a first radio signal on a first channel” and “transmitting a second radio signal on a second channel”

Petitioner’s leading example explicitly states that one embodiment of Liu transmits the BFRR on the PUCCH and the other embodiment transmits the BFRR on the PRACH.

## PUCCH Embodiment

ery request (BFRR) to the base station 402. In one embodiment, when only the DL beam has failed (FIG. 4A), the user equipment 404 may use the active PUCCH (originally allocated for UCI) to report the beam failure and request recovery from the base station 402, as agreed upon during Ex. 1007, [0084]).

## PRACH Embodiment

DL beams have failed. In still another embodiment, when the DL and UL beams have failed, the user equipment 404 may also attempt to use the PRACH or PRACH-like channel for BFRR. The PRACH or PRACH-like resource is directly associated with candidate beams identified by the UE. This

There is no singular embodiment of Liu where two BFRRs are sent on each of PRACH and PUCCH, respectively. *See* Ex. 1007 at [0009]-[0011], [0085], [0103]-[0104], Claims 5-7.

IPR2023-00602, Paper 20 at 18

## Liu Does Not Disclose “transmitting a first radio signal on a first channel” and “transmitting a second radio signal on a second channel”

The Board acknowledged that Liu discloses sending multiple BFRRs over one channel and the existence of different channels (each channel in different embodiments, as shown in the previous slide)

The Board also correctly noted that “it is unclear on this record whether it can be read to explicitly teach transmitting BFRR signals on two different channels. Elsewhere, as Patent Owner notes, *Liu appears to describe using the PUCCH and PRACH as alternatives.*”

IPR2023-00602, Paper 11 at 18-19

## Liu Does Not Disclose “transmitting a first radio signal on a first channel” and “transmitting a second radio signal on a second channel”

Petitioner’s expert fails to indicate that a hardware or software modification of Liu, which only discloses transmitting two radio signals on the same channel, to transmit two radio signals on different channels would be straightforward or that such modifications would have a reasonable expectation of success.

- Dr. Bims’ suggestion that source code can be modified to switch between channels does not meet the claim limitations
  - switching between channels does not meet the claimed limitation of “the target measurement value, when higher than a target threshold is used for triggering the transmission of the first radio signal *and* the second radio signal.”
- Dr. Bims’ suggestion to add logic gates (*i.e.*, switches) that redirect messages is vague and does not meet the claim limitations

IPR2023-00602, Paper 20, 19-20

# Liu Does Not Disclose “transmitting a first radio signal on a first channel” and “transmitting a second radio signal on a second channel”

Like Liu, conventional systems at the time of the '113 Patent's invention, utilized one channel at a time, which had drawbacks resolved by the '113 Patent disclosing two channels for each beam recovery request.

The inventor finds through researches that: if a UE, after using one channel to transmit a beam recovery request, cannot transmit the beam recovery request again during the time window of waiting a response, then a time-frequency resource configured within the time window of waiting the response to transmit a beam recovery request cannot be used by the UE to transmit a beam recovery request, which consequently results in a low utilization of the time-frequency resource configured for transmitting the beam recovery request.

'113 Patent, at 1:43-54.

Petitioner's argument that “the use of different channels for the first and second BFRs would ‘ensure greater reliability of the base station's response’” is only due to impermissible hindsight.

IPR2023-00602, Paper 18, 23  
IPR2023-00602, Paper 20, 20

**No Motivation to Combine**  
***Xia or Liu with Jover***

# No Motivation to Combine Xia/Liu with Jover

Xia/Liu are directed to beam failure while Jover looks to solve a channel impairment specific to a region in space, such as jamming, by steering beams to ignore signals from a certain area:

In particular, the present disclosure relates to any cellular network suitable for use with endpoint devices having multiple antennas/directional antennas for beam steering and null generation.

Ex. 1005, at [0033]; *see also* Ex. 1005, [0003].

IPR2023-00601, Paper 20, 20-21  
IPR2023-00602, Paper 20, 20-22

# No Motivation to Combine Xia/Liu with Jover

## Jover's disclosure is not related to beam recovery requests:

- Petitioner admits that “Jover does not mention beam recovery requests.”

## Jover teaches away because its solution diverges from the '113 Patent:

- '113 Patent, 2:8-12 (“In one embodiment, the above method is advantageous in *improving the utilization of the aerial resources* configured to transmit a report request that is determined autonomously by the UE.”)
- Jover's only disclosed solution does not improve beam strength but rather teaches beam steering and null generation. Ex. 1005, at [0033]; *see also* Ex. 1005, [0003].

***In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994):** there is teaching away if “a person of ordinary skill, upon reading the reference . . . would be led in a direction divergent from the path that was taken by the applicant”

IPR2023-00601, Paper 20, 20-21

IPR2023-00602, Paper 20, 20-22

***Xia/Jover and Liu/Jover Does***  
**Not Render Claims 2-5 Obvious**

# *Xia/Jover and Liu/Jover* Does Not Render Claims 2-5 Obvious

Claims 2-5 depend on Claim 1—for at least the same reasons as Claim 1, any combination of *Xia/Jover* or *Liu/Jover* fails to obviate Claims 2-5

***Xia/Jover and Liu/Jover Does Not  
Render Claims 6-10 Obvious***

# *Xia/Jover and Liu/Jover* Does Not Render Claims 6-10 Obvious

Claim 6 recites: “[a] method in a base station for wireless communication”

- This mirrors the limitations of Claims 1-5 which recite: “[a] method in a User Equipment (UE) for wireless communication”
- Claims 6-10 disclose a method from the perspective of the base station that is in communication with the UE in Claims 1-5
- For at least the same reasons as Claims 1-5, any combination of *Xia/Jover* or *Liu/Jover* fails to obviate Claims 6-10

***Xia/Jover and Liu/Jover Does Not  
Render Claims 11-15 Obvious***

# *Xia/Jover* and *Liu/Jover* Does Not Render Claims 6-10 Obvious

Claims 11-15 recite “[a] UE for wireless communication” which are the apparatus claims for Claims 1-5

For at least the same reasons as Claims 1-5, *Xia/Jover* or *Liu/Jover* fails to obviate Claims 11-15

***Xia/Jover and Liu/Jover Does Not  
Render Claims 16-20 Obvious***

# *Xia/Jover* and *Liu/Jover* Does Not Render Claims 6-10 Obvious

Claims 16-20 recite “[a] base station for wireless communication” that mirrors the limitations of Claims 11-15, which recite: “[a] UE for wireless communication”

Claims 16-20 disclose the base station device that is in communication with the UE in Claims 11-15

For the same reasons as Claim 11, any combination of *Xia/Jover* or *Liu/Jover* fails to obviate Claims 16-20

# 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”

IPR2023-00601, Paper 20 at 22-25  
IPR2023-00602, Paper 20 at 22-25

# 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

IPR2023-00601, Paper 20 at 22-25

IPR2023-00602, Paper 20 at 22-25

# 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

IPR2023-00601, Paper 20 at 22-25  
IPR2023-00602, Paper 20 at 22-25

# 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

# 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

IPR2023-00601, Paper 20 at 22-25  
IPR2023-00602, Paper 20 at 22-25