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Paper 31
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

THETA IP, LLC,
Patent Owner

IPR2024-00816 (Patent 7,010,330 B1)
IPR2024-00817 (Patent 10,129,825 B2)
IPR2024-00818 (Patent 10,524,202 B2)
IPR2024-00819 (Patent 11,564,164 B2)
IPR2024-00820 (Patent 11,638,210 B1)

Record of Oral Hearing
Held: August 27, 2025

Before KARA L. SZPONDOWSKI, AARON W. MOORE, and RUSSELL E. CASS, *Administrative Patent Judges*.

IPR2024-00816 (Patent 7,010,330 B1)
IPR2024-00817 (Patent 10,129,825 B2)
IPR2024-00818 (Patent 10,524,202 B2)
IPR2024-00819 (Patent 11,564,164 B2)
IPR2024-00820 (Patent 11,638,210 B1)

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The above-entitled matter came on for hearing on August 27, 2025, commencing at 11:00 a.m. MT at the Rocky Mountain Regional Outreach Office in Denver, Colorado.

1 P R O C E E D I N G S

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3 JUDGE CASS: Morning, everyone. This is an oral hearing in a
4 series of related cases between Apple Incorporated and Theta IP. They are
5 2024-816, -817, -818, -819, -820. I am Judge Russell Cass, and with me on
6 panel today are Judge Szpondowski and Judge Moore. Can we now have
7 identification from each side from who is present? Petitioner's counsel, why
8 don't you go first?

9 MR. HART: Thank you, Your Honor. Paul Hart with Erise IP for
10 Petitioner Apple. With me today is Chris Hann from Apple, as well as
11 peanut gallery from Erise's Denver office down the street.

12 JUDGE CASS: All right, thank you. Patent Owner?

13 MR. HAND: Good morning, Your Honor. Aaron Hand of
14 Bunsow de Mory. With me here and primarily speaking today will be Corey
15 Johanningmeier. Also on the line remotely is a client representative
16 Demetris Paraskevopoulos from Theta IP.

17 JUDGE CASS: Thank you. In our hearing order, we say that each
18 party will have 90 minutes of time to present arguments including all related
19 pieces. As far as the order of presentation goes, Petitioner will speak first,
20 followed by Patent Owner's response. Petitioner may then use any
21 remaining time for rebuttal, and then Patent Owner may use any of his
22 remaining time for surrebuttal to respond to the arguments in Petitioner's
23 rebuttal.

A few reminders before we begin. As we've observed, there's a public audience at this case. We're not aware of any confidential information that may be discussed. If that's not the case, please speak up. When you're arguing, please speak clearly, and if you hear another voice such as one of us judges here or anyone remotely, please stop so that we don't talk over each other. If either party believes that the other party is raising improper argument, such as a new argument that was not made in the briefs, please raise that issue during your presentation, do not interrupt the other party. I will keep time and can give you a warning when you've gone into rebuttal time, if you'd like. We've received the parties' demonstrative exhibits, here you've both provided me hard copies, which is appreciated. If, for the record, as you switch demonstratives, you could just refer to them by slide number, that would be helpful and would keep the record clear.

Now, because each side has 90 minutes, we will probably take a break at a suitable time during the argument. I'm assuming that you all are continuing to plan to use your 90 minutes each. So, if that changes, no, but I'm guessing we'll try to have a break maybe halfway or a little bit that way. The way it might work out is, we might potentially do it at a point that we shift arguments in Patent Owner's presentation, but we'll see how it ends up. Are there any questions from the parties before we begin?

MR. HART: None from Petitioner, Your Honor.

MR. HAND: None from Patent Owner.

JUDGE CASS: All right. Well, counsel for Petitioner, we'll start with you. How much time would you like to reserve for rebuttal?

1 MR. HART: I'll reserve 30 minutes for rebuttal.
2 JUDGE CASS: Okay, let me get my timer ready. And you may
3 proceed when you're ready.
4 MR. HART: Thank you, Your Honor. These proceedings present
5 an interesting story of two well-known academic researchers who both
6 identified the same problem in the art and proposed the same solution. The
7 five patents at issue are all related, they all name a single inventor, Dr.
8 Yannis Tsividis, a professor of electrical engineering at Columbia
9 University. The prior art in these proceedings describe research performed
10 by and at the direction of Dr. Asad Abidi, a professor of electrical
11 engineering at UCLA. All three references that form the basis of our
12 proposed grounds in these proceedings describe a single project that Dr.
13 Abidi oversaw at UCLA. I'll refer to these papers collectively as the
14 Behbahani papers, and I'll refer to the challenged patents collectively as the
15 Theta patents.
16 Now, as the record reflects, the Theta patents and the Behbahani
17 papers describe the same idea. They both acknowledge that wireless
18 receivers in the prior art were generally designed in a dynamic range to
19 accommodate worst case conditions, worst case conditions meaning where
20 your desired signal, the signal you're trying to recover is small, and the
21 interferer signals are large. They both observe that a large dynamic range of
22 these wireless receivers consumes a large amount of power, and they both
23 propose dynamically decreasing the dynamic range in that wireless receiver
24 to save power when conditions are better than worst case. Finally, both the

1 Theta patents and the Behbahani papers were both scaling a filter circuit to
2 decrease its bias current, saving power during periods of better than worst
3 case conditions.
4 One important distinction between the Theta patents and the
5 Behbahani papers is the level of detail with which they describe their
6 respective concepts. The Theta patents describe these concepts at a high
7 level. They generally describe the components of a receiver, including its
8 amplifiers, mixers, and filters as function blocks. They do not describe the
9 internals of those function blocks, and importantly, they do not describe how
10 those function blocks internally are scaled or dynamically adjusted to save
11 power. In contrast, the Behbahani papers are extremely detailed. They
12 describe the underlying circuits for the transistor level, they provide circuit
13 schematics, test results, and even images of an integrated circuit prototype
14 chip that was built and tested as part of that project at UCLA.
15 Importantly, the Behbahani papers acknowledge that scaling filters
16 in a wireless receiver involves more than simply adjusting values of resistors
17 and capacitors. You also have to scale the transconductors, the components
18 of those filters that can take transistors, to make sure those transistors
19 continue operating properly even when you decrease the DC bias current
20 that they are providing.
21 Now, Inventor Tsividis published a number of papers describing
22 his inventions. One in 2003 and another in 2018 that both parties have
23 discussed at length. Both those papers acknowledge full scale of these filter
24 circuits. They both propose scaling, not just resistors and capacitors, but

1 also transconductors. He even expressly identified Behbahani's approach of
2 switching between filter branches as one way to implement his invention.
3 But the Theta patents themselves, they just don't get to that level of detail.
4 Now, as the papers in these proceedings established, Patent Owner
5 seeks to capitalize on the stark disparity between the Theta patents and the
6 Behbahani papers. It insists that the Theta patent's high level and general
7 description of the invention should support limiting the claims to only
8 simple, minimal dynamic adjustments of these function blocks, to the
9 exclusion of more substantial and more sophisticated adjustments, such as
10 the Behbahani approach. The reality is that the Theta patents just don't
11 wrestle with these technical (INDISCERNIBLE). As the Board correctly
12 held at Institution, the patent's high-level treatment falls far short of
13 supporting a claim construction that mandates minimal adjustments to the
14 exclusion of more substantial adjustments, such as those in Behbahani's
15 circuit.
16 DX-3 through DX-5 in my presentation, I just want to kick off by
17 providing a high-level overview of the Theta patent to get us started. So, as
18 I mentioned, the basic premise of the Theta patents is that power can be
19 saved in better than worst case conditions by dynamically adjusting a
20 function block and a wireless receiver.
21 The first step in that process is determining -- did I do that? Oh,
22 there we go. Is determining what those conditions are. Figure 4 is the Theta
23 patent's approach to determining what the prevailing signal conditions are.
24 The goal here is to determine the relative strength of your desired signal and

1 your interference signals. And the way the Theta patents do that is they take
2 a total signal energy measurement before a filter, and internal signal
3 measurement after the filter. And that's here at 410 and 450, on either side
4 of filter 430. Filter 430 here on DX-3 and Figure 4 of the Theta patent is
5 designed to remove interferer signal strength. So, you take measurements on
6 either side and you compare them, and that tells you how much of the
7 interferer signal was removed, and then gives you a sense for the relative
8 strength between the desired signal and the interferer signals.
9 Once you have the relative strengths of the desired interferer
10 signals, then you make your dynamic adjustments. Most of the Theta
11 patents --
12 JUDGE CASS: Let me ask a quick question. So, the assumption,
13 I take it, is that the desired signal is going to be the same at the input and
14 output of the gain element?
15 MR. HART: That's exactly right, and I believe, if I go to a later
16 slide where I have the description of Figure 4, which I'll cover, it actually
17 explains that gain element 420 is a gain of one. The intent is to not disturb
18 the strength of the desired signal on either side. So, you're exactly right.
19 Most of the Theta patents focus on a function block level, in a level of detail.
20 They describe exerting impedance control and bias control on a function
21 block in order to dynamically adjust these function blocks, potentially saving
22 power when conditions are better than worst case.
23 Figure 6 is the most detailed description of what might be beside
24 those function blocks. This is a simple, passive RC filter. On the left we

1 have a low impedance version, and on the right we have a high impedance
2 version. The Theta patents use this example to explain that the high
3 impedance version requires less current, and it provides opportunities to save
4 power when you can live with that higher impedance version of the function
5 block.
6 Quickly, on DX-5 I have an exemplary claim. This is Claim 1
7 from the '330 Patent, the earliest issuing patent in these proceedings. As we
8 see here, the preamble simply lays out the structure of a receiver, it recites a
9 low-noise amplifier, followed by a mixer, which is then followed by a low-
10 pass filter. Limitation 1A simply requires determining a first signal strength
11 at a first node in the signal path, and Limitation 1B recites dynamically
12 changing an impedance of a component in the signal path based on that
13 measurement. So again, Figure 4 is really the Theta patent's disclosure of
14 how we determine the signal strengths, and then we have this one example
15 in Figure 6, at the bottom of DX-5, this shows us a low-impedance and a
16 high impedance version of a passive RCA filter.
17 The proposed grounds, as I alluded to in my intro, combines
18 Behbahani, Leete, and Tan from four of the five proceedings, and just
19 Behbahani and Tan for the fifth proceeding. Turning to DX-7, I want to
20 cover before I get into the details of those papers what is not disputed on this
21 record. The parties are not fighting about whether those Behbahani papers
22 are prior art to the Theta patent. That is undisputed. The parties are also not
23 fighting about whether Behbahani, Leete, and Tan, are properly combined.
24 What is conceded on this record is that Behbahani, Leete, and Tan describe

1 different aspects of a single research project, and are properly treated
2 conjunctively. So, we don't have the typical motivations to combine and
3 settle expectations of success arguments that most, in fact probably every
4 IPR I've been involved in, centers on.
5 What's also undisputed on this record, very importantly, is how
6 Behbahani's receiver actually works. It's undisputed on this record that
7 Behbahani has a variable filter block that is dynamically adjusted to save
8 power. It's undisputed that those dynamic adjustments are based on
9 measured desire and interferer signals. It's undisputed that within that
10 variable filter block there is a high-power filter branch and a low power filter
11 branch, and that the high power filter branch has a lower impedance and
12 requires a higher bias current than the low power filter branch. So, we all
13 agree how it works. We all agree that Behbahani, Leete, and Tan are
14 properly treated together, conjunctively.
15 DX-8 introduces Behbahani. Behbahani's the base reference in
16 every proposed ground. It describes the overall architecture of the receiver,
17 it also introduces what it calls an adaptive dynamic range process, by which
18 the filter component is dynamically adjusted based on signal conditions to
19 save power in better than worst case conditions.
20 Here at DX-9 I have an image from Behbahani showing the overall
21 architecture of that receiver. In purple, we have an image reject
22 downconverter. And just to get ahead of myself, that component is
23 described by the Leete paper. That's the purpose of the Leete paper, is to tell
24 us once inside that purple image reject downconverter, that is followed by a

1 programmable gain stage in orange, followed by a variable bandwidth,
2 adaptive dynamic range band-pass filter in green. That green box right there
3 is the variable filter block that the parties have spent nearly the entirety of
4 these proceedings talking about.
5 So down on the left column, on DX-9, we see the signal conditions
6 step of Behbahani's process. Behbahani looks at the desired signal strength
7 and the interferer signal strength, just like the Theta patents, to determine
8 whether a small instant dynamic range is okay saving power, or when you're
9 in worst case conditions, whether you need a high instant dynamic range.
10 On the left, Figure 3a, we have a large desired signal, which is the grey,
11 bullet-shaped blob on these images. So, we have a large desired signal, and
12 we have large interferer signals. Because we have large desired and large
13 interferes, we can get away with what Behbahani refers to as a low instant
14 dynamic range. Behbahani teaches using a gain stage to slide that small
15 dynamic range up to meet the levels of those signals. In 3b, we have a small
16 desired and small interferes. So again, we can get away with that low instant
17 dynamic range, and we slide with the gain stage, we slide that small dynamic
18 range down to match the level of the signals.
19 Figure 3c is worst case conditions. This is small desire, large
20 interferes. This is where we need a high instant dynamic range. So, we
21 need to expand the dynamic range of our receiver, and we do that in
22 Behbahani, right here. I just realized my pointer doesn't work on this slide.
23 In Figure 4b, we're scaling between a circuit block on the left and a circuit
24 block on the right. The one on the right is a larger filter circuit block, so all

1 the components are scaled up. That would be a high power low-pass filter
2 branch in Behbahani's filter. That provides us a larger dynamic range from
3 which we can recover our desired signal, even in worse case conditions, and
4 it comes at the cost of larger power consumption. It requires a larger DC
5 bias current to operate that scaled-up version of the filter.
6 As I forecasted, Leete provides details of that purple component
7 that is the first component in the analog chip in Behbahani's receiver. And
8 we're really relying on Leete here to show that within that purple box there is
9 a low-noise amplifier as well as a mixer. Those are undisputed issues in this
10 case, but they are expressly recited in certain challenged claims. Tan is the
11 third reference. Tan provides details of that variable filter block. So, you
12 can see here on DX-12, Tan includes circuit diagrams down to the transistors
13 and resistor level, showing how the low power filter branch and high power
14 filter branch are designed, how they operate, and it is from this detailed
15 description in Tan that Petitioner and its expert establish that the low power
16 filter branch has a higher impedance, requires lower DC bias current saving
17 power. So, that's really where all the detail comes from on that variable
18 filter block, and that's how the proposed grounds fit together.
19 Now, because so many of the issues in these proceedings have
20 been agreed upon, I don't want to get lost how similar the Theta patents are
21 to the Behbahani papers. So, I'm just very briefly going to tackle the
22 similarities between their problems identified and their proposed solutions.
23 In DX-13, as I've alluded to, the purpose of the Theta patents is really to
24 identify whether you are in worst case conditions or better than worst case

1 conditions. You're only providing a full large dynamic range, which we see
2 down here in Figure 2B, when you experience worst case conditions. So
3 again, that's small desired, large interferes. That consumes a lot of power,
4 and so that's why we only use that large dynamic range when there are worst
5 case conditions experienced on a wireless channel.
6 Figure 2A is an example of better than worst case conditions.
7 Here, we see a large desired signal and a small interfere. And as those
8 dotted lines suggest, the dynamic range is decreased, saving power during
9 those periods of better than worst case conditions. Behbahani proposes
10 exactly the same solution, and I've already covered Figure 3. In Figure 3a
11 and Figure 3a, we have situations where we're in better than worst case
12 conditions, and we can get away with a low instant dynamic range. In 3c,
13 we see worst case conditions, and that's the case where we require a high
14 instant dynamic range. As Behbahani explains in the abstract, it implements
15 an adaptive dynamic range process to dissipate only the necessary power at
16 prevailing channel conditions. So, exactly the same problem, exactly the
17 same solution as we see in the Theta patents.
18 DX-15 shows how the Theta patents actually determine the
19 prevailing signal conditions. So, here we have, as I've already talked about,
20 Figure 4 on DX-15 from the Theta patents, this is a measurement before the
21 filter and a measurement after the filter. The measurement before the filter
22 captures total cumulative signal strength energy before that filter, including
23 both desired and interferes, and then after the filter, where much of the
24 interferer signal strength has been removed, it captures that total energy, and

1 comparing them tells you the relative strengths of your desired and your
2 interferer signals.
3 And I believe this is where Your Honor pointed out that the gain
4 stage is intended to be one. I may not actually have that portion of the
5 specification on DX-15, where it says that gain 420 is -- oh, I'm sorry. It's at
6 the bottom on the left side. In this specific example of the gain and filter
7 circuit combinations is shown as approximately one, while interfering
8 signals and 416 signal levels are reduced. So, this is intended to keep the
9 desired signal the same.
10 DX-16 shows how Behbahani determines prevailing signal
11 conditions. As we see here, Behbahani also takes a measurement before the
12 filter in green, and after the filter. So, before the filter, that's measurement
13 point AI, the analog input to the filter block, and after the filter it's AO, the
14 analog output of the filter block. Behbahani, like the Theta patents, explains
15 that the difference between AI and AO is a measure of the interferes being
16 rejected by the analog band-pass filters. So, it's the exact same process. We
17 measure before a filter, we measure after a filter. That filter is supposed to
18 take out the interferers, and so comparing those two measurements tells us
19 how much interferer signal strength existed before the filter.
20 Now, I'll get into this in detail later, but Behbahani takes it a step
21 further than the Theta patents. It actually has a digital signal path that we
22 see here, DSP chip. There is a second filter, that's the FIR LPF, that is a
23 digital filter, with two additional measurement points. So, there is a DI, a
24 measurement before the filter, and DO, a measurement after the filter. That

1 filter removes all remaining interferer signal strength, so that we have DO as
2 a representative of the absolute value of the desired signal. That's the signal
3 we want to obtain from the wireless channel. Behbahani, beyond what the
4 Theta patents provide, gives you that absolute value of the desired signal.
5 DX-17, the Theta patents teach scaling a filter block. Here we
6 have, again Figure 6. There aren't many useful figures, so I'm going to keep
7 coming back to the same ones over and over again. Figure 6 shows a low
8 impedance version of an RC filter on the left, and a high impedance on the
9 right. And the corresponding disclosure explains that the high impedance
10 version of this RC load allows you to reduce drive currents, reduce
11 associated bias currents, and save power in the process.
12 DX-18, Behbahani does exactly those same things. It scales a
13 filter block, it scales from the low power filter block to the high power filter
14 block, it is decreasing the impedance and using more DC bias current. And
15 so, in the other direction, when you go from worst case to better than worst
16 case, you use 10 times less bias current, which offers a 10 times power
17 savings, by switching to that smaller scale circuit.
18 There are four remaining disputes in this proceeding. The first two
19 largely turn on the detailed disparity between the Theta patents and the
20 Behbahani papers. First is, what theory did Petitioner present? Patent
21 Owner argues that because Petitioner and its expert spent so much time
22 talking about the internal low-level details of Behbahani's variable filter
23 block, that their theory should be limited to those internal details to the
24 exclusion of reliance on the overall variable filter block as a whole. Now,

1 the Board rejected this at Institution, Patent Owner provides the Board no
2 reason to deviate from that preliminary finding in its final written decision.
3 The second issue is one of claim construction. And again, it really
4 turns on this level of detail disparity. Patent Owner insists that Behbahani's
5 variable filter block does too much, it makes too substantial of a dynamic
6 adjustment by going between its filter branches, and therefore should be
7 excluded from the scope of the challenged claims. And, it relies largely on
8 the simple and generic disclosures in the Theta patents to support that
9 attempted claim construction. Again, the Board weighed in on this issue at
10 Institution and correctly found that the intrinsic record provides no basis to
11 exclude Behbahani's approach.
12 For the third issue, Patent Owner takes a 180 and actually criticizes
13 Behbahani for providing too little detail on the signal strength measurement
14 circuit. Now, Patent Owner does not dispute that Behbahani teaches the
15 same process for measuring signal strength as the Theta patents, also does
16 not dispute that Behbahani provides at least as much detail as the Theta
17 patents, but it nonetheless suggests that Behbahani is deficient.
18 Finally, discretionary denial. We are at the conclusion of these
19 five proceedings. The Board has invested most of the resources it will
20 invest, the parties have invested all of the resources they will invest.
21 Nonetheless, Patent Owner asks this board to vacate Institution based on
22 discretionary considerations that the PTAB is currently applying to newly
23 filed petitions. There is no basis in the law to agree with Petitioner on this.
24 Slides 20 through 25, I want to briefly address the theory presented

1 and establish that Petitioner did in fact rely on Behbahani's variable filter
2 block as a whole as the dynamically adjusted circuit component in the signal
3 path. As I alluded to, on DX-21, this was an issue raised pre-Institution.
4 There was pre-Institution, post proper briefing by the parties. In Patent
5 Owner's preliminary surreply, it argued that the Petition relied exclusively
6 on switching between filter branches inside Behbahani's variable filter block,
7 and did not rely on Behbahani's variable filter block as a whole for the
8 dynamically adjusted circuit or component in the signal path. As we see
9 here at DX-21, the Institution Decision correctly rejected this, finding that
10 Petitioner clearly relied upon Behbahani's variable filter block in its
11 methods.
12 DX-22, Patent Owner has continued to raise this same argument,
13 arguing that the Petition and the original expert declaration, Exhibit 1003 in
14 these proceedings, failed to rely on the overall filter circuit block, and then
15 said it focused exclusively on the internal adjustments. Now, Patent
16 Owner's arguments largely turn on selectively and partially, quoting the
17 record. So, what I would like to do to kind of go through this issue, is just to
18 walk through the mapping in context, rather than individual and partial
19 quotations from the record.
20 So, I want to start with Claim 1 from the '330 Patent, here on DX-
21 23. Claim 1 starts out in the preamble, reciting a signal path including a
22 low-pass filter. If I skip to the next slide DX-24, Claim 1B comes in, and
23 are required dynamically changing the impedance of a component in the
24 signal path, and then we see in some of the dependent claims like Claim 9,

1 the component in the signal path is included in the low-pass filter. So, the
2 theory that was presented by Petitioner and supported by Petitioner's expert
3 is that Behbahani's variable filter block, annotated in green here on DX-23,
4 is the low-pass filter component in the signal path that is dynamically
5 adjusted.
6 We see that on both sides of DX-23, that every time we're talking
7 about a recited component, a recited low-pass filter in this claim, we are
8 pointing to the green box. That is the entirety of Behbahani's variable filter
9 block. At the bottom of the excerpt on the left of DX-23, Behbahani's band-
10 pass filter, that is the whole filter block, includes a low-pass filter, satisfying
11 the filter component recited in the brief. Again, it is the whole box, the
12 whole variable filter block that satisfies the filter component. It satisfies a
13 low-pass filter component because it includes a low-pass filter portion.
14 On the right, again we're talking about an analog chip. It includes
15 a signal path annotated in red, and when we talk about a low-pass filter
16 annotated in green, as we see here, it is Behbahani's entire variable filter
17 block that is annotated in green, and that sits on that red signal path.
18 Turning to DX-24, under plan Limitation 1B, we walk through all
19 the gory details of Behbahani's adapted dynamic range process, and every
20 time we are referring to the component, the low-pass filter component in the
21 signal path, we are referring to the entire filter box, the entire filter block.
22 Through a filter load, impedance of a component, in parenthesis, the filter in
23 the signal block, increases the signal path impedance to the filter stage. So,
24 there is no suggestion or discussion in our Claim 1B mapping that indicates

1 we are relying on the internal adjustments only to the exclusion of reliance
2 on the filter block itself. And that becomes even more clear on the right side
3 of DX-24, when we look at the Claim 9 mapping.
4 As described above, with respect to the preamble, Behbahani
5 discloses that the component, i.e., the variable filter block in the signal path,
6 includes a low-pass filter. And then we continue on and explain that the
7 portion of the variable filter block that has its impedance adjusted is the low-
8 pass stage of that variable filter block. So again, the mapping in full context,
9 not selectively quoted, establishes that Petitioner was in fact relying on
10 Behbahani's variable filter block, as a whole, as the dynamically adjusted
11 component or circuit in the signal path.
12 Very briefly, on DX-25, Dr. Abidi's supporting declaration
13 confirms just the same thing. In paragraph 77, these citations are to the '330
14 Patent proceeding, proceeding 816. In paragraph 77, he states, Behbahani
15 describes that its band-pass filter is realized by a low-pass filter in theory
16 with a high-pass filter. Because the band-pass filter includes a low-pass
17 filter stage, it satisfies the green low-pass filter. So, he's explaining why this
18 larger box satisfies the claimed low-pass filter, and it's because that larger
19 box includes a stage that is a low-pass filter stage.
20 Down in paragraph 85, Dr. Abidi talks about the signal path
21 annotated in red, and a low-pass filter annotated in green. Just like we saw
22 in the petition, the green low-pass filter is the entirety of Behbahani's
23 variable filter block, and in paragraph 136 on the right, he states Behbahani
24 teaches changing the signal path impedance of the filter component, and in

1 parentheses he explains that that occurs by switching between those filter
2 branches within that filter component. So in sum, viewing the mapping in
3 full context, there's simply no validity to Patent Owner's argument that
4 Petitioner and its expert focused exclusively on the internal dynamic
5 adjustments within Behbahani's filter component. Instead, they both rely,
6 we both rely on the variable filter block as a whole.
7 Slides 26 through 40 address the main dispute between the parties.
8 This is whether the claims capture Behbahani's approach of switching
9 between a high power filter branch and a low power filter branch in that
10 variable filter block. Starting with DX-27, as an initial very important point,
11 I want to reiterate that the parties don't dispute how Behbahani's circuit
12 works. DX-27 here, from our reply, paper 18 in the '330 Patent proceeding,
13 the signal enters the variable filter block in Behbahani's receiver, it traverses
14 either the low power low-pass filter branch, or the high power low-pass filter
15 branch, and then it traverses a common high-pass filter branch before exiting
16 that variable filter block.
17 Turning to DX-28, Patent Owner's expert --
18 JUDGE SZPONDOWSKI: I have a question about, if you could
19 go back to the previous slide?
20 MR. HART: Yes, Your Honor.
21 JUDGE SZPONDOWSKI: Could you just highlight what you
22 believe to be the receiver signal path in Behbahani?
23 MR. HART: Yes, Your Honor. And I think if we go back, we've
24 annotated it in red in our petition. So, here on DX-25 in red, the signal path

1 is the path that flows through that low-noise amplifier in blue, the mixer in
2 yellow, that programmable gain stage in orange, and then through that
3 variable filter block in green. And so, if I come back to the slide you asked
4 your question on, DX-27, the arrow pointing into the variable filter block in
5 green is the input of the signal path, and the arrow coming out of that
6 variable filter block on the right is the output of the signal path into and out
7 of that variable filter block. And so --
8 JUDGE SZPONDOWSKI: Then regardless what happens inside
9 of the variable block there, the signal path is going in and then following,
10 just doing whatever it's doing inside of it?
11 MR. HART: That is absolutely -- that is the key dispute in this
12 case. And our position, as I will walk through in detail, is that the signal
13 path flows through that variable filter block, it does not change based on
14 what happens inside that filter block. That filter block is the claimed circuit
15 or component on the signal path that is dynamically adjusted, and therefore
16 we look at the input of that box, the output of that box, and the whole box is
17 on the signal path.
18 JUDGE SZPONDOWSKI: Okay, thank you.
19 MR. HART: Thank you, Your Honor. Coming back to DX-28,
20 this is from Patent Owner's expert. He depicts the same understanding of
21 Behbahani's variable filter. On the high power filter path, the signal flows in
22 and traverses that high power filter branch before traversing the high-pass
23 filter, and then if the low power filter branch is switched in, that's indicated
24 on the right. He confirms that the impedance of the low power filter branch

is 10 times higher than the high power filter branch. He also confirmed that the bias current applied to the low power filter branch is 10 times lower than the high power filter branch.

So, both parties agree that the signal comes in, it traverses either a high power or low power filter branch before going through the same high-pass filter. They both agree that the high power filter branch has a lower impedance and a higher DC bias current than the low power branch.

Given the agreement on Behbahani's operation, the question from the Board is one of claim construction. Now, the challenged claims across the five patents recite variations on a theme. Some recite adjusting the signal path itself, some recite adjusting a circuit or a component on the signal path. Patent Owner largely advances the same argument with respect to all variations on this claimed concept. It insists that Behbahani's filter block makes internal adjustments that are too significant to be captured by the claims. And I think --

JUDGE CASS: Counsel, if I may interrupt. Is there a claim construction issue lurking here as to whether component versus circuit versus, just, on the same signal path has a different meaning? Do those mean all the same thing? What's your position on that?

MR. HART: So, in these proceedings, these five proceedings, circuit and component on the signal path mean the same thing. They describe the function block, and that is conceded by Patent Owner, let me get to it. Circuit or component refers to the function block, the low-pass filter or the mixer. These are quoting from the same portions of the

1 specification that talk about the function block, which the Board addressed
2 at Institution, right? The function block is a filter, mixer, an amplifier, a
3 circuit or circuits. And so, there's no dispute between the parties that the
4 circuit or component on the signal path is referring to these function blocks.
5 The key question for the Board is whether there is intrinsic support
6 to exclude Behbahani's approach from function block. Should we treat, as
7 Patent Owner insists, the three circuits within Behbahani's variable filter
8 block as three distinct circuits or components? Or should we treat the entire
9 variable filter block as a single circuit or component that exists on a single
10 path?
11 JUDGE CASS: So Counsel, if I could just go back again to that
12 issue. Can we put up Slide 32? I take it you're using this excerpt for the
13 proposition that Patent Owner is construing the term circuit and component
14 to mean the same thing?
15 MR. HART: Yes, Your Honor.
16 JUDGE CASS: It looks to me like the point they're trying to make
17 there is kind opposite of what you're saying, which is that they're saying,
18 either of those things refer to some sort of digital unit, resistor or transistor,
19 something like that.
20 MR. HART: Well, I think the important part of this yellow
21 annotated statement is the low-pass filter, the mixer, and the amplifier, right?
22 These are multi-component, multi-element circuit blocks. And so, this is the
23 concession from Patent Owner, that the circuit or component on the signal
24 path is not simply an individual resistor and an individual capacitor, an

1 individual resistor or transistor. It is an entire circuit block like a filter or
2 mixer or an amplifier, and that is what ties it back to the function block
3 disclosures in the specification.
4 JUDGE CASS: So, I suppose, the center of your argument is, the
5 component can refer to a low-pass filter, an individual component but also to
6 those who a larger band-pass filter that you could use both a low-pass and a
7 high-pass filter?
8 MR. HART: That's certainly where I'm heading, Your Honor, yes,
9 and I will walk through the intrinsic support for our read of the claim, which
10 you have correctly described.
11 So, coming back to the Institution Decision. The Board addressed
12 the two categories of intrinsic support that Patent Owner points to in support
13 of its narrow construction claims. Number one is the function block,
14 number two is Figure 6. With respect to the function block teachings in the
15 intrinsic record, the Board correctly observed that the Theta patents treat
16 function blocks broadly, teaching that they may be filters, mixers,
17 amplifiers, or other circuit or circuits. And that circuit or circuits was
18 annotated by the Board, correctly observing that the patent does not limit in
19 its function block discussions a function block to one and only one circuit.
20 There can be multiple circuits within a function block.
21 From that, the Board says based on this disclosure, we see no
22 reason why function block A-20 could not include multiple filters, such as
23 the ones used in Behbahani's filter swap. Now, the record with respect to
24 function blocks and how function blocks inform the scope of these claims

1 has remained largely unchanged since Institution. What has developed, and
2 what I want to spend a little time on is the record with respect to Figure 6.
3 Now, the Board also rejected Patent Owner's reliance on Figure 6, as
4 supporting a claim construction that excluded Behbahani's approach. That is
5 really, Figure 6 has been the focus of the parties briefing and expert opinions
6 post Institution.
7 So let me jump down and explain how the record has developed
8 with respect to Figure 6, and why it supports Petitioner's interpretation of the
9 claims as capturing Behbahani's approach. So, Figure 6, as I've talked about
10 a number of times, depicts two passive RC filters, each one driven by a
11 driver. On the left we have Driver 612, on the right we have Driver 622.
12 Now, Patent Owner interprets Figure 6 to suggest that the yellow signal path
13 on the left becomes the yellow signal path on the right by simply increasing
14 the resistor value and decreasing the capacitor value. It does not wrestle
15 with the drivers, 612 and 622. It does not explain whether Driver 622 is the
16 same or different from 622.
17 I asked -- and the reason that's important, before I get to the
18 testimony, is that if you are just at Driver 612 and Driver 622 are the same,
19 and you are just adjusting the resistor and capacitor values, then the left does
20 become the right just by making those tweaks to the individual elements.
21 However, if 612 is different than 622, the left becomes the right by
22 switching between the yellow path on the left and the red path on the right,
23 just like Behbahani. If 612 and 622 are different drivers, then we're
24 switching between them in our filter function block.

1 I asked Patent Owner's expert, could Driver 612 be a different
2 circuit than Driver 622, based on the description in the '330 Patent? Answer,
3 it could be different, it could be the same, the patent is silent on this issue.
4 That is right. The patent is silent on this issue. The patent treats these
5 function blocks and the dynamic changes within these function blocks as a
6 general kind of a genus of dynamic adjustment. It does not specify simple, it
7 does not distinguish between simple dynamic adjustments or complicated
8 adjustments, and it certainly provides no basis to exclude Behbahani's
9 approach from the scope of these claims.
10 Now, turning to DX-34, because the Theta patents include so little
11 detail, both parties have resorted to discussing Inventor Tsividis's articles
12 describing his invention. Both these articles include substantially more
13 detail than the Theta patents themselves, and illuminate the meaning of his
14 invention and the scope of the claims. On the left, I have an article from
15 Inventor Tsividis from 2003, just before the patents were filed, and on the
16 right from 2018, long after these patents were filed. The left is Exhibit 1011,
17 and the right is Exhibit 2004. Now, both of these articles support concluding
18 that Behbahani's approach of switching between filter pass within a variable
19 filter block are consistent with and captured by these challenged claims in
20 the Theta patents.
21 Starting with the 2018 article on DX-35, Patent Owner spends a lot
22 of time talking about Figure 16 from that 2018 article that I have here on the
23 left side of DX-35, it points out that when Inventor Tsividis is explaining the
24 scaling of this filter component, he notes that the resistors are scaled up by

that ceiling factor N, and the capacitors are scaling down by that ceiling factor N, and the bias current is also scaled down by that same factor N. What they do not discuss, and ignore in Figure 16 and the corresponding discussion from this 2018 article, is that Inventor Tsividis is also scaling the transconductors. When we see that GM over N. So, he is acknowledging exactly what Behbahani acknowledged, that when you decrease the DC bias current in a transconductor based filter, you also have to scale the transconductors. That's exactly what Behbahani does. It scales the resistors, the capacitors, as well as the transconductors, ensuring that the entire filter circuit, including the transistors in those transconductors, continue to operate properly, even when they're supplied significantly less DC bias current.

In DX-36, we have an excerpt from the 2003 article from Inventor Tsividis. In this portion of his 2003 article, he describes his invention, dynamic impedance scale. Now, it is undisputed between the parties that this is describing the invention. This portion acknowledges that large usable dynamic range is required to recover worst case conditions, recover a desired signal during worst case conditions. It acknowledges that those worst case conditions will not always exist. It then proposes scaling a filter in order to decrease that usable dynamic range, saving power when better than worst case conditions exist.

It talks about scaling the capacitances. It notes that of course the transconductances will also have to scaled with capacitances, and then it says lowering capacitances and transconductances allow you to lower the DC bias current, and thus the total power dissipation can be made small.

1 Now, right after this description of the Theta patent's invention, Inventor
2 Tsividis states one way to achieve the above scenario would be to use two
3 filters in place of one or the other in service as required, turning the other
4 off. So, he is pointing to an example where we are switching between filters
5 that are scaled versions of the same filter, in order to implement his dynamic
6 impedance scaling invention.
7 Now, there's a reference in brackets to 34 that I've highlighted here
8 in the center. 34 is Behbahani. Both parties agree that Inventor Tsividis was
9 referring to Behbahani's approach of switching between filter branches as
10 one way to achieve the dynamic impedance scaling that is the heart of the
11 Theta patents.
12 Now, we spent a lot of time in our petition talking about why this
13 reference, this disclosure, in pointing the reader to Behbahani's approach,
14 supports concluding that Behbahani is in fact captured by the Theta
15 invention. Patent Owner focuses on the grand language here. This is
16 Inventor Tsividis recognizing that switching between two filter branches
17 causes temporary transients at the outlet. They argue that because Inventor
18 Tsividis recognized a transient that results from Behbahani's approach, it
19 was actually teaching away from Behbahani's approach.
20 Now, as we cover in DX-37, it's just an excerpt from the Patent
21 owner response where they make this argument. They argue that by
22 pointing out the transient issue in Behbahani, Inventor Tsividis was actually
23 teaching away from using Behbahani's approach. The problem with that is
24 that the patents themselves acknowledge and even claim an accommodation

1 for systems like Behbahani's that create temporary transients when they
2 make their dynamic adjustments.
3 On the left side of DX-38 we have an excerpt from that 2003
4 article that Inventor Tsividis authored. He explains that outputs -- I'm sorry,
5 transients at an output are undesirable, but he knows that sometimes this is
6 not a problem. For example, if you make your dynamic adjustments during
7 the preamble slot, before you start to receive your useful signal, it is not an
8 issue that you have temporary transients that have not yet died out. That
9 same recognition is in the '330 Patent on the right side of DX-38, specific
10 embodiments of the present invention perform some or all of their variations
11 during the preamble. The '330 Patent even claims this. The impedance of
12 the component is changed while receiving the preamble portion.
13 Now, I would also like to note that Behbahani itself has this same
14 discussion and also proposed making its dynamic adjustments between the
15 low power filter branch and the high power filter branch during the preamble
16 to avoid having any ill effect from those temporary transients. You want to
17 make sure those die out before the usable signal is received. So, 2003 article
18 from Inventor Tsividis, Behbahani paper itself, and the '330 Patent
19 specification as well has claimed, all recognize and embrace systems that
20 create temporary transients upon making dynamic adjustments. So, that is
21 no reason to interpret Inventor Tsividis's 2003 article to teach away from the
22 Theta invention. It's no reason to interpret Inventor Tsividis to have been
23 teaching away from Behbahani.
24 JUDGE CASS: Is there expert testimony on this, the teaching?

1 MR. HART: On the preamble?
2 JUDGE CASS: No, the teaching away point.
3 MR. HART: Yes, Your Honor, there is expert testimony on the
4 teaching away point. Let's see. We address this at some length in our
5 petition. So, Dr. Abidi, and I can get specific citations for you --
6 JUDGE CASS: You can give citations in your rebuttal.
7 MR. HART: Absolutely, let me make a note about that. Dr. Abidi
8 addressed this in his original declaration, it's in 1003, and he was discussing
9 the 2003 article. All right.
10 One last point on the article, starting at DX-39. Patent Owner has
11 interpreted that 2003 article, and specifically its Technique 4: Dynamic
12 Structure Variation, to be the invention that is captured by the Theta patents.
13 And this is just a fairly confused reading of that 2003 article, so I just want
14 to very briefly address this. Patent Owner points to Technique 4, which in
15 that article states the fourth possibility is to dynamically vary the structure of
16 the circuit, e.g., change the architecture of the filter dynamically. This
17 approach has not been investigated to any extent yet, but Patent Owner
18 repeatedly in its papers points to that discussion and to Figure 12 from the
19 2003 article as an example of what the Theta patents actually invented, and
20 what they capture.
21 We see here in these three excerpts from Patent Owner's paper, it
22 repeatedly argues that dynamic structure variation is the invention, and it
23 points to Figure 12 from that article as an example of dynamically varying
24 the structure of the filter.

I asked Dr. Larson, Patent Owner's expert, about this. Do you consider Figure 12, switching in and out a resistor and a capacitor to vary the structure of the circuit? His answer: it's an interesting question. I would have to say it does not vary the structure of the circuit; it varies the elements within the circuit. The structure does not change.

So, again, this point, I don't know if Patent Owner's going to spend much time on this so I wanted to get ahead of that. Patent Owner's own expert disagrees that the Theta patents require dynamically varying the structure of a circuit.

Forty-one through 50 -- I don't have much time left, so I'll try and get through this quickly. Forty-one through 50 address the final merits-based argument between the parties that relates to the signal strength measurement circuit, whether Behbahani's signal strength measuring teaching sufficiently satisfies -- or teaches or suggests the claimed signal strength measurement limitations.

There are really two categories of arguments here. A first category focuses on whether Behbahani adequately teaches or suggests circuits for determining signal strength, and the second category really focuses on comparing the strengths of the desired signal to the interference signals.

Starting with the patents themselves on DX-43. I've covered Figure 4 a couple times already, but I'll come back to it here because it is the only description in the Theta patents related to measuring strengths of desired and interferer signals. Again, Figure 4 depicts a first signal strength indicator 1, before a filter, and a second signal strength indicator 2 after the

1 filter. The filter is designed to remove interferers.
2 The Theta patents expressly -- I have here on the left side excerpts,
3 the signal strength indicators 440 and 450 do not provide information as to
4 the relative sizes of the desired and interfering signals. Rather, the
5 cumulative signal level is provided at their output.
6 So again, we're just measuring total energy before the filter, total
7 energy after the filter. We're comparing those to get a sense for the relative
8 strengths of the desired and interferer signals being received on that line or
9 this channel.
10 On DX-44, this is exactly what Behbahani is describing.
11 Behbahani also takes a total signal energy measurement before it is filtered,
12 and a total signal energy measurement after it's filtered. AI, AO, the input
13 and the output. It also compares those to determine how much of the out of
14 band interference signals are being rejected by that analog variable filter
15 block in green.
16 But Behbahani goes a step further than the Theta patents, as I
17 alluded to earlier. They take that signal, that filtered signal and puts it
18 between a digital path and a digital signal processor chip. Within that DSP
19 chip there is a digital low-pass filter. That digital low-pass filter, according
20 to Behbahani, removes all remaining interferer signals, and so the output of
21 the digital low-pass filter and DO is a measure of the absolute value of the
22 desired signal. This is above and beyond what is described and suggested by
23 the Theta patents. So Behbahani is describing the exact same process on its
24 analog signal path, then it goes a step further and uses this additional digital

1 filter in order to provide an absolute value, something the Theta patents do
2 not.
3 Now, it is true that neither the Theta patents nor the Behbahani
4 paper get into the internal circuit structure of the circuits that are measuring,
5 that are taking those cumulative signal strength measurements. Petitioner's
6 expert addressed this, he explained he analyzed the Theta patents, he pointed
7 out that the signal strength indicator boxes are just boxes, there is no
8 information in the Theta patents -- I'm sorry, I'm on DX-45 -- with no
9 information about the circuitry, logic, or algorithms that perform signal
10 strength measurements in the Theta patents. And from that he opined that a
11 POSITA would understand the '330 Patent assumes use of conventional,
12 well-understood techniques for measuring signal strengths.
13 Behbahani also assumes that a POSITA would have understood
14 how to implement conventional and well-understood circuits for measuring
15 signal strengths. They both describe where you measure, what you measure,
16 how you use the outputs of those measurements. Both the Theta patents and
17 the Behbahani paper assume that a POSITA would understand how to
18 implement a basic signal strength measurement circuit, and so neither
19 describes the internal makeup of those signal strength measurement circuits.
20 The petition, and it's supported by Dr. Abidi, rely on this well
21 understood concept of the well-developed status of signal strength
22 measurement circuits, explaining that Behbahani by describing those
23 measurements at AI, AO, DI, DO, those fairly suggest to a POSITA some
24 circuit for taking those measurements. That is the primary theory presented

1 by Petitioner, and Patent Owner largely fails to engage that issue. It argues
2 that because Petitioner and its expert conceded there are no specific signal
3 strength measurement circuits described in Behbahani, it has failed to carry
4 its burden.
5 Now importantly, Patent Owner's expert has not engaged this issue
6 at all. There is no opinion from Patent Owner's expert related to signal
7 strength measurements. Patent Owner's case on this third merit-based
8 argument is entirely based on attorney argument. And it's notable what
9 Patent Owner's attorney argument does not dispute. It does not dispute that
10 Behbahani's AI and AO measurements must be measured with some type of
11 signal strength measurement circuit, it does not dispute that both the Theta
12 patents and the Behbahani papers fail to describe internal makeup of any
13 signal strength measurement circuits, it does not dispute that signal strength
14 measurement circuits were well understood as of 2003, and it does not
15 dispute that a POSITA would have understood how to implement signal
16 strength measurements using conventional circuits in both the Theta patents'
17 receiver and the Behbahani receiver.
18 JUDGE CASS: Counsel, I have a question. So, is your argument
19 here based on, is it that Behbahani closes this circuit? The signal strength is
20 so much that the circuit would be inherent, or that assertion would be
21 obvious?
22 MR. HART: Obvious, Your Honor. It does not describe the
23 internals of the signal specifically. It describes taking the measurements,
24 what those measurements are, and how those measurements are used, in the

1 same way that the Theta patents do. So, it fairly suggests to a POSITA a
2 circuit pertaining to those measurements. So it's not an express teaching,
3 and it's within our obviousness theory. It's also not inherency, it is an
4 obviousness theory that Behbahani, a POSITA would understand
5 Behbahani's teachings fairly suggest circuits for taking those measurements
6 that it expressly describes.
7 Now, under the governing law, Bradium Techs 923 F.3d 1032
8 from the Federal Circuit, prior art reference must be credited not only for
9 what it expressly discloses, but also what it fairly suggests to a POSITA.
10 That is our theory here based on Behbahani as interpreted by Dr. Abidi.
11 Omega Liner, a PTAB decision, IPR2023-01372, paper 85, that's a nice
12 discussion of rejecting a patent owner's argument that the prior art should be
13 held to a higher standard of disclosure than the challenged patents itself,
14 more expressly rejected the patent owner's intent there to hold the prior art to
15 a higher standard of disclosure. That's exactly what's happening here. Both
16 the Theta patents and the Behbahani papers recognize that circuits for
17 detecting signal strength were well-understood, easily implemented. So they
18 describe what the measurements are, where they are taken, and how they are
19 used. They don't spend time talking about the internal circuit structure of
20 those measurement circuits.
21 JUDGE CASS: Counsel, am I reading correctly that Patent Owner
22 has an argument that what they're doing here is capturing principles
23 (INDISCERNIBLE) in the prior art? What's your response to that?
24 MR. HART: Well, I think I walked through that. This is not a

1 situation where we have no discussion of signal strength measurement. We
2 have an express discussion in Behbahani that aligns perfectly with the Theta
3 patent's own description of measuring signal strengths. They measure the
4 same points, the same nodes on the signal path, they measure them in the
5 same way, they use the outputs of those measurements in exactly the same
6 way.
7 So we are relying on the express discussion, express disclosure in
8 Behbahani that would be interpreted by a POSITA as being performed by
9 some circuit. Our position is that the claims do not require any specific
10 circuit; they just require any circuit for taking those measurements that aren't
11 expressly described in Behbahani.
12 JUDGE CASS: So, since you're relying on obviousness, what is it
13 that you say would be missing from Behbahani?
14 MR. HART: Yeah, I'm not sure what's missing from Behbahani. I
15 think the argument really boils down to -- you know, it's premised on the
16 idea that the claims require some specific circuit. And that's just -- it can't be
17 true because there is no disclosure for any specific circuit. And the claims
18 don't recite a specific circuit; they just use the term circuit.
19 JUDGE CASS: Yeah, that's where I guess I'm a little bit -- I mean,
20 I see your basic point, that one could certainly suggest a function -- even one
21 of ordinary skill would understand that. But I'm trying to understand, you
22 know, if you're saying something is missing from Behbahani, why is it
23 obviousness? Why wouldn't it be (INDISCERNIBLE) express or inherent
24 disclosure?

1 MR. HART: And I think that's, you know -- because there is no
2 express discussion, the claims require a circuit, any circuit, Behbahani
3 teaches these specific measurements, where they're made, how they're made,
4 how they're used, but it never gets into the details of a circuit. So that really
5 is where we're relying on the fairly suggests case law within the obviousness
6 doctrine. It's not an express teaching. Maybe we could have made an
7 argument that there is an express teaching we could rely on. Instead, we are
8 relying on the fairly suggests doctrine within the obviousness law here.
9 JUDGE CASS: And is that set forth in this case --
10 MR. HART: That's exactly right. Bradium Techs, 923 F.3d 1032,
11 is the Federal Circuit case that establishes a prior art reference is credited for
12 not just what it expressly discloses, but what it fairly suggests to a POSITA.
13 Now, we have an additional theory, based on Tan. So, again, Tan
14 is an expressed component of all of those grounds. Tan describes the
15 internal makeup of a variable filter block in Behbahani's receiver. Tan also
16 implements a signal strength measurement process in order to ensure that the
17 filter circuit itself is not saturated in the feedback loop. So it takes
18 measurements at every node across that filter and compares them to a
19 reference value to make sure no node exceeds a specific reference value.
20 Now, in our petition, supported by expert declaration, we propose
21 that even if a specific circuit is required of the claims, despite the fact that
22 there is no intrinsic support for mandating such a read of the claims in the
23 Theta patents, it would have been obvious to use Tan's specific signal
24 strength measurement circuit in Behbahani's receiver. And we walked

through the motivation to do that, how it would work, and the benefits that you would gain from making sure those Tan measurement circuits are included in Behbahani's filter.

JUDGE CASS: This is Judge Cass. There seems to be a factual dispute based on the arguments and how, I think -- and Patent Owner doesn't have expert testimony on this, but I think you're arguing that Dr. Abidi's declaration relies on Figure 8 of Tan -- I think it's Paragraph 15. And I just wanted to see if I could understand a little bit more on this circuit actually it works. (INDISCERNIBLE) peak detectors, and I just want to make sure I understand how this thing works. (INDISCERNIBLE).

MR. HART: I did happen to notice you're the electrical engineer on the panel, so I'm not too surprised to get this question from you, Your Honor. I would love to walk through how the Tan peak detector works.

So here we have -- we're at my desktop, I wasn't planning on showing you, but here we have Figure 8 from Tan. The way this works is, Tan places a peak detector circuit at every node across this branch, this transconductor branch within the filter. And what these are doing is, they're collecting total signal energy at an individual node, they're feeding that down into this comparator. The comparator has a voltage reference as one input, and it's looking at the outputs of these peak detectors as its other input.

Now, when any of these peak detectors detects a node within that transconductor core, then it sees the reference voltage here. This has a control signal up to a programmable gain component, and that programmable gain component will decrease the overall gain of the signal

1 entering the transconductor core to prevent any of the nodes saturating. So
2 this is an anti-saturation feedback loop to ensure that no node across the
3 length of the transconductor have received a particular value.
4 Now, what we proposed in our combination of Behbahani and Tan
5 is not that this feedback loop -- this feedback loop has a specific purpose,
6 right? It's to make sure none of these nodes have received a value. What we
7 proposed is using these peak detector circuits that collect total cumulative
8 energy at a given node as the circuit that measures AI, the circuit that
9 measures AO. That's all AI and AO require is, what is the total energy
10 before the filter, what is the total energy after the filter? That's exactly what
11 Tan's peak detectors do.
12 So when Dr. Abidi explained how these peak detectors work as
13 components that collect total signal energy at a given node, and explained
14 how those would work to provide AI and AO, that is supporting our theory
15 that it would have been obvious to use Tan's specific signal strength
16 measurement circuits as the AI and AO measurement nodes within
17 Behbahani's overall receiver.
18 JUDGE CASS: So a peak detector will detect the overall signal
19 energy, I think, is my reading. A peak detector basically just detects
20 whether a threshold is being met, is that not correct?
21 MR. HART: The entire circuit -- that's correct, right. So the entire
22 circuit is taking the output of all of these peak detectors, and it's funneling
23 them down as an input to this comparator in order to see if any of them have
24 exceeded that reference voltage.

1 In that respect, it is configured this way, detecting whether any of
2 those signals have exceeded an amount, but the individual peak detectors are
3 just signal strength measurement circuits. And that's what Dr. Abidi -- you
4 know, this is what happens when only one side's expert engages the issue, is
5 you get technical arguments made by an attorney, unsupported by an expert
6 in the field.
7 I mean, there's no question that Dr. Larson, Patent Owner's expert,
8 he was Provost of Brown, in the Electrical Engineering Department; he
9 could have helped vet this issue for Patent Owner, but instead we have a
10 technically incorrect argument made by Patent Owner's attorneys, and we
11 only have Dr. Abidi on Petitioner's side to explain how this really works.
12 And that's exactly what he described. Each peak detector in Tan's circuit
13 rectifies the total composite wave form at a given point along the filter path.
14 It is measuring the strength of both the desired signal and any interferes at
15 each point along the filter path.
16 So, if I come back to how Behbahani's circuit strength
17 measurements work, this is exactly what we need here. We want total
18 energy at AI, we want total energy at AO, that is exactly the output of the
19 peak detectors within Tan's circuit provided.
20 JUDGE CASS: All right, thank you very much. Thank you for
21 providing some insight. I just wanted to let you know, actually you're about
22 four minutes into your rebuttal time, I should have told you sooner.
23 MR. HART: Fair enough. All I had left is discretionary denial. I
24 think for preservation of time I might just handle that on rebuttal, unless you

have any specific questions you would like to pose on the discretionary denial.

JUDGE SZPONDOWSKI: I actually have a question about the comparison limitation, back with, you know, the signal strength measurements.

MR. HART: Yes, Your Honor.

JUDGE SZPONDOWSKI: So I feel like a lot of the discussion has been around the determination of recommended signal strength, and I wonder if you could go over quickly your theory about how Behbahani teaches comparing the strength of the desired signals and the strength of the interferer signals?

MR. HART: Yes, Your Honor. I also have another desktop cued up for that issue. So, this is the petition in the -818 proceeding, addressing the '202 Patent. This is one of the patents that expressly claims determining the desired signal, determining the interfere, and comparing the desired to the interfere. And so here we walk through, as I have already today -- I'm sorry, can you all see my screen as I scroll through this? Okay, very good.

We walk through Behbahani's process of taking measurements on either side of the analog filter, either side of the digital filter, we walk through how that is identical to the process disclosed in the Theta patent of taking on total measurement before, one total measurement after the filter, and then we get into Behbahani's process. So we acknowledge that Behbahani teaches a nearly identical process for determining relative strengths of desire and interferes.

1 Importantly, however, the petition states Behbahani teaches
2 additional measurement nodes that allow the system to determine absolute
3 signal strength in addition to relative signal strengths. So regardless of
4 whether the claim language is interpreted to require measuring only relative
5 strength as described by the Theta patents, or more narrowly to require
6 measuring absolute signal strength, Behbahani renders obvious this
7 limitation.
8 And that's where we come down and explain how Behbahani's
9 process of determining the desired signal strength, the interferer signal
10 strength, is performed with these four measurements, AI/AI, AI/AO, DI/DO.
11 This is really where Patent Owner's slides stop, but this is the most important
12 part of our mapping, this is where we explain how Behbahani uses those
13 measurements in order to compare the desired to the interfere, in order to
14 implement its adaptive dynamic range process.
15 So the whole point of Behbahani's process, which is identical to
16 the Theta patents, is to get a sense for the compare, the strength of your
17 desired to the strength of your interferer signals. And that's exactly what's
18 being described here in Figure 3A.
19 So, the mapping of the petition leading up to this point is
20 describing what measurements are being taken, how they are being used to
21 calculate the desired signal strength and the interferer signal strength, and
22 then down here is where we get into how those are used, and use of those
23 measurements is a comparison of a desired to the interferer signal strength.
24 This high instant dynamic range case in Figure 3C is worst case conditions.

1 We only know we are in worst case conditions by comparing the desired
2 signal to the interferer signals, acknowledging that we have a low desired
3 and a high interferer signal strength, and require a large instant dynamic
4 range to accommodate those worst case conditions.
5 JUDGE SZPONDOWSKI: Okay, thank you.
6 JUDGE CASS: I had another question. You have a section in
7 your petition about Behbahani expressly teaches calculating an absolute
8 desired signal strength. Is that referenced in the claim or claim language?
9 I'm just trying to figure out how that fits into your overall argument.
10 MR. HART: That's a great example. So, this is a great example,
11 the '202 Patent. So the '202 Patent, if I scroll back up here, claim language
12 recites, determining the strength of the desired, determining the strength of
13 the interferer signals, and comparing them. And then the next limitation
14 comes in and makes a dynamic adjustment.
15 So, what we explained in our mapping is that in the Theta patents,
16 you're only doing relative, right? The only disclosure of signal strength
17 measurements in those patents is total energy before filter, total energy after
18 the filter, to give you a general sense for how the desired signal compares to
19 the interferer signals. We accounted for the possibility that these claims
20 would be construed much more narrowly than supported by the Theta
21 intrinsic record to require calculating or determining an absolute value of the
22 desired signal and an absolute value of the interferes. That's where that
23 comes in. So it's just to account for the possibility of a narrower claim
24 construction that is not supported by the specification.

JUDGE CASS: All right, thank you.

MR. HART: Thank you, Your Honor.

JUDGE CASS: Yes, I think you're finished, but I just wanted to check.

MR. HART: Yes. Thank you, Your Honor. I'll reserve the rest of my time for rebuttal.

JUDGE CASS: All right. Counsel, you've used nine minutes of your rebuttal time, so let me give you 21 minutes. So, Counsel for Patent Owner, would you like to reserve time for rebuttal?

MR. JOHANNINGMEIER: Yes, I'll take 30 minutes.

JUDGE CASS: Taking a look at the clock, as I mentioned, kind of taking a break at some point and we'll kind of see how the day progresses. Are you guys doing okay?

MR. JOHANNINGMEIER: That's fine, Your Honor. I'm fine to take a break if I have to in the middle, but whenever could be good for Your Honors

JUDGE CASS: Okay, you can begin when ready.

MR. JOHANNINGMEIER: Okay. So, first off thank you. Theta and Professor Tsividis really appreciate your time and consideration on these proceedings. I'll say, please interrupt me with questions. I would rather answer questions than hear myself talk about this stuff, so please do interrupt.

Now, I have a lot that I disagree with about the characterizations of Opposing Counsel of our argument and of the patents, but rather than go

1 point by point rebuttal, I'd rather just explain our argument, so I'll start there.
2 I will also say, you know, these are very important patents for my client.
3 These are patents that have been litigated all the way to the day before trial.
4 These are patents that have gone through an entire round of IPRs in another
5 litigation, successfully without claims cancelled, which also turn on the
6 signal path argument as I'll explain more later. So there's an element of déjà
7 vu in these proceedings. And, you know, these patents were examined
8 against this art 20 years ago, when Professor Tsividis put this art in front of
9 the Office, ultimately, as is his practice to do.
10 JUDGE CASS: Counsel, you're not suggesting that the prior art
11 IPRs in some way control the outcome of this case --
12 MR. JOHANNINGMEIER: No, but I think there's a very --
13 JUDGE CASS: -- (CROSSTALK) one argument versus another,
14 right?
15 MR. JOHANNINGMEIER: No, no, but I do think that -- and as
16 you'll see as I go through my argument, I'm going to talk about the signal
17 path. In those prior art proceedings, there was an argument about the signal
18 path. The prior rebuttal had identified the impedance adjustments, that we
19 said, look, that's not in the signal path. And we showed, here's the signal
20 path, here's the -- there was an impedance adjustment in a separate circuit,
21 and we showed that, the Board agreed with us. They came back and they
22 said, oh, well, you draw a bigger box around the whole mixer, that's in the
23 signal path. Mixer's in the signal path. So, it doesn't matter that there's an
24 internal thing, right? And we said no --

JUDGE CASS: I don't want to hear --

MR. JOHANNINGMEIER: No, I understand. Well, it's in our petition, actually, page 29 to 31. So, on the hearing, there was intent to draw a bigger box, which is essentially exactly what Apple was doing here, because they're looking at -- we are looking at the signal path through this device and saying there is no instance anywhere in these devices where an impedance that's in the path changes. And, instead, Behbahani is changing the path, right? And what they've done is they've said, well, draw a bigger box around the part of the path, and then don't pay attention to what's inside the band-pass filter, then they're fine.

That's essentially the same argument that we had before. So that, I suppose, is relevant. Obviously, the prior art proceedings aren't dispositive, so I'm not suggesting that. I'm just pointing out that we've sort of tread this ground before, so.

JUDGE CASS: Yeah. I don't want to confuse arguments that aren't on the record. If there's something you think is inconsistent with a prior IPR or prior ruling, you can identify those without argument, then we can look at it, but --

(Simultaneous speaking.)

MR. JOHANNINGMEIER: Yeah, well -- sorry to interrupt. I would just say, you can read this, there's a description of the prior art that goes exactly to this point in our response starting at page 29. So you can read it there and see how we analogize the arguments. But to start on what we actually want to say here, let's put up Slide 2.

1 And I'm going to start with the claim language of the claims, and
2 I'm starting here for a couple reasons. First, this is what matters; this is what
3 determines the outcome of the claim language; it's what we're talking about.
4 And also, it is what Apple hardly talks about at all in their arguments, right?
5 And so application of the plain understanding of this claim language -- this
6 isn't claim construction, this is an application of the language that answers
7 the questions in this, and distinguishes these two approaches between the
8 Behbahani approach and the Tsividis approach.
9 So, we want to start with the claim language, and specifically we
10 want to start with '330 Patent, Claim 1. The requirement is to dynamically
11 change an impedance of the component in the signal path. That's what this
12 claim requires. And I emphasize those words, 'an' and 'in' for a reason,
13 because changing -- 'an' means singular, of something that's in the signal
14 path. That's what the claim says we have to do.
15 JUDGE CASS: Counsel, I need to ask you to follow up on
16 questions I asked Petitioner's Counsel when they pointed to Slide 32 of
17 Petitioner's presentation. And, you know, my question was, is there any
18 difference of claim construction with claims that say (INDISCERNIBLE) on
19 a circuit, whether changing or impeding generally? And they pointed to
20 page 65 of your Patent Owner response, which said, referring to
21 (INDISCERNIBLE) circuit or component refers to (INDISCERNIBLE)
22 units or elements of a receiver from a high- or low-pass filter, et cetera. So,
23 I just want to get your position on (INDISCERNIBLE) terms or claims
24 within the scope? What's your position?

1 MR. JOHANNINGMEIER: Right. So, I think the testimony itself
2 -- and I'll walk through it, but the claim language, the intrinsic evidence, our
3 expert's testimony is that these claims are reading on changing anything in
4 the signal path, right? And so the language a circuit, we're not attempting to
5 carve out the claimed circuit from the claimed signal point, or whatever.
6 We're just not doing that, because as a matter of claim construction that isn't
7 -- that's just not what we're doing, right?
8 But if we look at the next claim -- actually, let's go to the next
9 slide, Claim 3, right? So this one is 23, and it says an impedance in the
10 signal path, right? So the language we're focusing on, the language that
11 distinguishes between these two approaches is, again, an impedance that is
12 arranged in the signal path is dynamically adjusted.
13 And, you know, there's not a dispute here, but I'll just remind Your
14 Honors that there is -- the construction of dynamically adjusted that is
15 grieved here, and actually that the District Court has found in Texas now, is
16 a change in operation. So this is changed during operation, which, you
17 know, the word dynamically, I think that makes sense. But something is
18 changed in operation while it's in the signal path. That is what these claims
19 are hanging on, and that is what is distinct from changing the signal path
20 without changing any impedances in the circuit.
21 JUDGE CASS: But you're not distinguishing between a
22 component in this circuit --
23 MR. JOHANNINGMEIER: Right, no, I mean, is the base band
24 filter that has multiple filters inside of it a component? I think probably not,

1 but that's not the argument we made. I mean basically, we're saying that this
2 band filter has multiple components in it. None of them are changed by
3 virtue of anything. The impedance is not changed, the bias currents are not
4 changed on those components while they're in the signal path, they're
5 swapping a path.
6 The analogy that I've used that I think makes the point very well, is
7 you can have a lightbulb with a dimmer switch. Change the electricity going
8 into the lightbulb, change the brightness. You can also swap out a 25-watt
9 bulb for a 100-watt bulb, right? And then you would have a different
10 brightness, different impedance through that thing. But those are two
11 different approaches to the same problem, right? So there is a distinction
12 here. There are two different approaches: swapping circuits versus actively
13 changing something, a bias current, an impedance, a singular thing in the
14 signal path while it's running. That's what we're saying these claims require.
15 So the next one, I won't go through all of them, but I want to make
16 a point that they're consistent. In the second circuit -- so I guess the thing
17 that I would call out here is, they don't say a circuit change, they say an
18 impedance in the circuit, right?
19 So this is not the function part changing, this is an impedance in
20 the circuit wire, whatever you want to call it. Something in there is
21 changing dynamically while it's in the path. And so then this next one
22 would be the 825, causing a bias current to vary in one or more of the
23 priority circuits in the receiver signal path. So, again, this is changing
24 something while it's in the signal path dynamically. The next one would be

1 '202, Claim 7, dynamically adjusting one or more of an impedance, a bias, or
2 a gain, one or more of the (INDISCERNIBLE) in the signal path.
3 So this is the language that we are basing the whole distinction on
4 here. And it's in all the claims. They don't address it. In Your Honors'
5 Institution Decision, I have discussion about the meaning of signal path, I
6 was just providing discussion about the meaning of signal path. That means
7 the signal path claim language distinguishes between the approach that
8 Behbahani took and the approach that the Professor Tsividis took.
9 So, let's go to --
10 JUDGE MOORE: Counsel? This is Judge Moore. Is the band-
11 pass filter, is the variable band-pass filter within the signal path?
12 MR. JOHANNINGMEIER: Well, the short answer to that is, we
13 would say no. Portions of that are in the signal path before, and portions are
14 in it after. The high-pass filter within that block stays within the signal path,
15 but you know, there's a good slide on this that they have in theirs, and let me
16 just jump to it to answer your question.
17 This should be our Slide 22. So, we have here -- and this is all in
18 Professor Larson's declaration, the testimony before and after this, but this
19 makes the point. That is a picture of the dye of the Behbahani band-pass
20 filter, and so there is a low power LPF, low-pass filter, and then what's
21 labeled LPF is the high power LPF, and then there is a high-pass filter
22 below.
23 And so what Behbahani says to do is either run the signal path
24 through one or the other of the low-pass filters, right, and then doing that, it

1 changes the -- and we acknowledge, it changes the impedance that's
2 experienced by the signal. It's like with the light bulbs, changing the bulbs
3 changes the light in the room. But no impedance in that block changes. No
4 bias current changes. See the impedance of the low-pass filter -- the high-
5 power, low-pass filter is x before and after the change. The impedance of
6 the low-power LPF is 10x before and after the change in the signal path.
7 And then of course the high-pass filter which stays in the signal path stays
8 the same, right?
9 And so if you go to the previous slide, Slide 21, Professor Larson
10 explained this, basically. When we understood that they were going to be
11 making this argument, we had to kind of opine about this interpretation that
12 he said. I understand that wanting to do band-pass builds a functional block,
13 but zooming out doesn't change the way the circuit operates. The band-pass
14 filter has two alternate low-pass filters, and each of those, for the purpose of
15 the swap, has a static impedance. And if you go I think to the slide after
16 this, there's some more testimony -- yeah.
17 So, in here, what the band-pass filter of the Behbahani papers does
18 not have is any individual impedance in the signal path that changes
19 dynamically during operation, no impedance, both remains in the circuit
20 path and is adjusted.
21 Now, this is unrebutted expert testimony. They're not saying this
22 is wrong; they're saying they want to just draw, they want to go one level
23 higher in the block diagram and draw a red line through the band-pass filter
24 and say that's in the signal path. But this is the core question that you've

1 asked, Judge Moore. The whole thing doesn't stay in the path. And when
2 you change the path, the impedance experienced by the circuit may well, by
3 the signal, may well change. And that's what Professor Abidi said, that's
4 what their argument says, but that's not what the claims states.
5 JUDGE MOORE: What constitutes the signal path? Is it the path
6 that the signal's taking to get to (INDISCERNIBLE)?
7 MR. JOHANNINGMEIER: The path the signal goes through, yes,
8 yes.
9 JUDGE MOORE: At one point in time?
10 MR. JOHANNINGMEIER: Yes, right. And we're getting that
11 from the claim language, basically. And from all of the disclosures, which I
12 can walk through, but there are multiple disclosures about how this works,
13 the claim language, basically just, we point out the application of the claim
14 language, there has to be something that's in the signal path that changes.
15 JUDGE MOORE: But if -- on Slide 18, on the left, you have an
16 impedance, one impedance in the signal path, and on the right you have a
17 different impedance in the signal path, is that not correct?
18 MR. JOHANNINGMEIER: Right, the signal path is changed, yes.
19 JUDGE MOORE: That's not the signal path in the claims?
20 MR. JOHANNINGMEIER: Right, because nothing that stays in
21 the signal path has changed, right? Another way to think of this is, you can
22 imagine a gravel road and a paved road, right? You have a different
23 experience driving down a gravel road as you do a paved road, right, but if
24 the claim says change the road to have a different experience, a different

1 paving, then that doesn't -- changing the path to go around something is not
2 changing that thing, I think is the way to state it. So, to get back to the
3 -- and also, I think on our slide --
4 JUDGE MOORE: Are you saying that's a different road?
5 MR. JOHANNINGMEIER: Right. Yes, that's what we're saying.
6 Another example, on Slide 18, the difference between the Behbahani
7 approach -- I'm sort of going backwards through my slides here, but there is
8 no dispute that in the Behbahani papers they have something they call a
9 circuit block, and they swap it for a new one. Turn the old one on, turn the
10 new one on, the path has changed to run through one or the other, right? But
11 you can't look at this diagram and identify any impedance in the signal path
12 that changes. Because that path doesn't change.
13 JUDGE MOORE: They're both labeled signal path, so this is -- if
14 the signal path is whatever path the signal is taking at a given point in time,
15 then it looks like you do have a few impedances in the signal path depending
16 on what time it is.
17 MR. JOHANNINGMEIER: Right, you have a different
18 impedance by virtue of changing the signal path, which is a different
19 approach than changing something while it stays in the path. It's the claim
20 language as a whole. An impedance in the signal path must change. You
21 cannot find that in these diagrams. Well, you can find it in the Behbahani
22 diagram -- or you cannot find that in the Behbahani diagram. The
23 Behbahani diagram is showing changing the path. So that the path goes
24 through a different impedance. That is the distinction. And so basically

1 -- now remember, Professor Tsividis knew about the Behbahani solution.
2 He wrote articles about the solution, right?
3 I mean, Professor Tsividis is a teacher, he's written multiple well
4 regarded text books, lots of articles, including ones in this record. The
5 article from 2003 that's in this record cites the Behbahani, the patents cite to
6 Behbahani, the article from 2018 that he published, and I actually believe
7 about the same solution, cites to Behbahani. Professor Tsividis understands
8 that solution as one of the things that could be done, right? And we're not
9 disputing that. But what we have here is, there are other things that could be
10 done. And so when you get into his articles, he talks about changing
11 individual elements in a filter instead of swapping the filters. That's a
12 different approach, right? No dispute, there's lots of different ways to do
13 this.
14 So the question here is, what does the claim language read on?
15 What did he claim? Did he claim something that reads on Behbahani's paper
16 that he cited to everyone and gave credit to Behbahani for? That doesn't
17 make sense that he would do that. He's a smart guy, he knows what he's
18 doing, he understands a solution. He wants to write a claim that reads on
19 changing individual elements in these blocks. And so he says an impedance
20 in the circuit has to change, and that's --
21 JUDGE MOORE: And so how is the patent different than what's
22 shown on Slide 18?
23 MR. JOHANNINGMEIER: Well, what's described in the patent
24 -- so let's go to Slide 10. So this is two different approaches. This is a

1 different version of what's shown on the previous slide, but the two circuit
2 blocks swapping, right? You scale and you swap in a new one and you
3 change the path. It's a different approach from having dynamically changing
4 something in that function block while it's in the path. Right?
5 JUDGE MOORE: But how do you know it's happening in the
6 function block?
7 MR. JOHANNINGMEIER: Because the patents and the claims
8 say that --
9 (Simultaneous speaking.)
10 JUDGE MOORE: -- the language that's shown on the right there?
11 MR. JOHANNINGMEIER: So, because the patents in the claim
12 say that. So if we go to the next slide, the claims say an impedance of a
13 component in the signal path is changed, right? Disclosure in the patent says
14 that it has to be in the receiver path. It says one or more impedance in the
15 function block may be increased, right? So you're changing something
16 inside the blocks. If you go back to the previous slide, you're changing
17 something in the function block in Figure 9A, according to the disclosure,
18 but in the figure from Behbahani you're just changing the entire block,
19 you're swapping it out. Nothing in the block changes, right?
20 JUDGE MOORE: No, one of the ways the block is the variable
21 band-pass filter the whole time?
22 MR. JOHANNINGMEIER: It's the same thing. I mean, that goes
23 to the slide I just showed, slide number --
24 JUDGE MOORE: And Counsel, what's the best reason why a

band-pass filter should be in a function block, in Figure 9A, on a band-pass filter in Behbahani?

MR. JOHANNINGMEIER: So that's kind of the point, you can. Let's say, just for point of argument, they've argued that it's -- okay. Now, we have our disputes with, given the proceeding, but let's just take it from that point, as Professor Larson did. Professor Larson said, I understand that they're arguing that, so let's swap it in. So this is back to Slide 21. If you're going to call the band-pass filter the functional block, right, it has nothing but static impedances within it. Nothing in it changes. So, on the next slide, before and after, nothing changes in that block. No impedance of anything in that block changes. There's no -- sorry.

JUDGE MOORE: Impedance of the whole block, so you look at it, at the whole block. Impedance of the whole block changes.

MR. JOHANNINGMEIER: Not while it's in the signal path, no. The impedance of the -- I mean this runs into a problem, I mean, why not draw a box around the entire integrated circuit and say that the impedances are represented and nobody gets our claim. The issue here is that --

JUDGE MOORE: Well, no, no. We're just drawing a box around the variable band-pass filter. But if that is in the signal path is not (INDISCERNIBLE).

MR. JOHANNINGMEIER: Right. Well so, the Behbahani approach is to change the signal path. And so what's in the testimony that's unrebutted is that by virtue of doing that, no impedance of any block or any portion, no impedance in that block changes. And to your question of what

about the impedance of the block? The claims don't say on this block, the claims say in the block, right? So if we go back to slide number -- and this is where, yeah, so Slide 11.

An impedance in the signal path, then, that's the best one is, actually there's a claim number -- it's the one that says an impedance of a circuit in the signal path. The disclosure on this slide here, at column 9, one or more impedance in the function block (INDISCERNIBLE) increase. It's an impedance, another component of the circuit, right, in the signal path. So, there is nothing that stays -- because the signal path through the band-pass filter changes, and one low-pass filter drops out, the other one comes in. Neither of them have their impedance changed by virtue of that. So the high-pass filter doesn't have the impedance changed by virtue of that. So, there is nothing in the band-pass filter that changes. It's a different approach. It's Slide 9A.

JUDGE MOORE: Well, we don't know the approach of the patent, right, because we don't know what's happening in the function block of the patent?

MR. JOHANNINGMEIER: Well you do know what's happening in the function block. Basically, the -- so --

(Simultaneous speaking.)

JUDGE MOORE: It's not rebuttal. I read the patent, I don't (INDISCERNIBLE).

MR. JOHANNINGMEIER: Well, so, these patents, right, are coming from a point where everyone understands how they implement

1 filters, and everyone understands how they implement gains and whatever.
2 These patents are about dynamically adjusting things on the fly in order to
3 react to signal conditions, right? That's what these patents are about.
4 So, you know, measuring the determining signal, measuring the
5 interferer signal, comparing those things and making specific adjustments to
6 individual components that are -- in order to reduce the power. And that's
7 something that is described in Professor Tsividis's article, the 2003 article.
8 At the end, he describes the approach of changing individual filter
9 components instead of changing entire filters. And he says this is an area for
10 future investigation, right?
11 And that is, at that time, Theta was investigating, Theta was
12 patenting in this space. This is what they were patenting. I mean, it's a
13 different approach than what was in Behbahani. And so in his article he
14 discusses Behbahani, he talks about well, here's some things in Behbahani
15 that are problems, here's some ways that you could fix that by changing the
16 swap around, and here's a whole other different approach you could use.
17 And so --
18 JUDGE MOORE: I understand it may be a different approach, but
19 the question for us is, do these claims capture that different approach. And I
20 think that's what we're wrestling with is, how do we distinguish, other than
21 just you saying that what is in these claims is different than what's in the
22 prior art.
23 MR. JOHANNINGMEIER: Well, I'm not just saying that. What
24 I'm saying is that the plain meaning of the claim language when it says

1 dynamically adjusting an impedance in the signal path makes a distinction
2 between changing something in the path and swapping something in, right?
3 I'm saying that we have expert testimony to the same effect. So on Slide 12,
4 this is a summation here on the left, along multiple paragraphs of his
5 testimony, but these are teaching adjustments as changes effective in a single
6 circuit block.
7 And if you look at those paragraphs in the declaration, he's got
8 cites to the, and we have in our petition, cites to the patent, cites to the prior
9 art figures, including Figure 6. So on Slide 13, Figure 6 shows the before
10 and after changing the impedance. And you know, the disclosure about that
11 circuit says it is an example of how a circuit's impedances may be scaled.
12 JUDGE MOORE: Do we know how far those are -- how close we
13 are (INDISCERNIBLE) on the left on Slide 13 (CROSSTALK) -- how does
14 that happen?
15 MR. JOHANNINGMEIER: What's described in the patent is, the
16 impedance is changed by doubling the resistance and halving the
17 capacitants, and that causes a change to the impedance of the filter. And this
18 is -- so, it's -- you know, and that's basically electrical engineering, basic
19 electrical engineering. He's not describing it beyond that level because he
20 doesn't think that he needs to, and he knows that people know how to change
21 impedances in circuits. But what he's claiming specifically is actually
22 changing an impedance in a circuit while it's in the path.
23 And so, there is support in the figure on Slide 13, on Slide 14,
24 again, we have from the claims and from the patent, dynamically changing

1 an impedance of a component in the signal path. It has to be something that
2 changes while it's in operation in the signal path. It's all over the claims, it's
3 in the spec.
4 Looking at Slide 15, here's Professor Larson talking about the
5 patents and saying again, that dynamic adjustments -- this is a person of
6 ordinary skill in the art, would readily understand this claim language to be
7 referring to dynamic adjustments made to a parameter of a circuit in the
8 signal path by the internal components or structure of one circuit block.
9 This is not rebutted testimony. This is expert testimony about what
10 this patent would mean to a person of ordinary skill in the art, and it would
11 come straight out of reading the claims, reading the patent, the spec, and the
12 figures. And then contrast that with the next slide, the Behbahani approach,
13 which is substituting a scaled circuit block, substituting a scaled circuit,
14 switching it in. And in his deposition, Professor Abidi said what we've
15 chosen to do is substitute a bigger transconductor for a smaller one. That's a
16 different approach.
17 On the next page, 17 --
18 JUDGE MOORE: Is it fair to say then that (INDISCERNIBLE)?
19 MR. JOHANNINGMEIER: So here, Professor Larson's talking
20 about the Behbahani papers, a person of ordinary skill would understand that
21 the impedance of each of these circuits doesn't change by virtue of the signal
22 path being rerouted to pass through it. Again, unrebutted testimony.
23 They're not saying that's not true; that is true. Neither filter experiences an
24 impedance change by virtue of this block. Neither filter is in the signal path

1 throughout the swap. So, changing the path is different from changing
2 something that's in the path. Bottom line.
3 JUDGE CASS: Counsel, this is Judge Cass. I have a hypothetical
4 for you. If you could go back to your Slide 22? What if within, let's say, the
5 low power filter signal path, that was all you had, but you could swap in or
6 like add in transistor in parallel to one of the resistors that's on it so that the
7 current would then flow slightly differently through that low-power filter
8 signal? Would that be a change in impedance in the signal path?
9 MR. JOHANNINGMEIER: Well, yes, I think like, if you --
10 JUDGE CASS: And I brought it up, what I'm trying to get at is
11 when you say signal path, does it have to be an exact trace of where the
12 electrons go that cannot be varied whatsoever?
13 MR. JOHANNINGMEIER: No, no.
14 JUDGE CASS: Or can you have some variation, and the question
15 is just how much?
16 MR. JOHANNINGMEIER: Well, I wouldn't say it's a question of
17 how much. I mean, I guess, so for instance the example of this we can show
18 is on Slide 26. And this is actually from his article, Figure 12.
19 JUDGE CASS: Yeah, that's what I was thinking.
20 MR. JOHANNINGMEIER: Yeah. So, you know, the input
21 impedance to the op amp there in the first case R, and then in the second
22 case they've added a parallel resistor, so it's R over two, if I remember -- it's
23 either 2R or 2M. I'm a little rusty on my -- but the point is they've changed
24 the impedance going into the op amp by essentially adding something in

1 parallel. But there still is a signal path there; they have not completely
2 rerouted to a different block. And so that is the distinction here, but it's not a
3 distinction of, I don't think, like how much can be changed. He suggested
4 we're, you know, that -- we're not saying you can change a resistor but you
5 couldn't change a filter --
6 JUDGE CASS: Yeah --
7 (Simultaneous speaking.)
8 JUDGE CASS: -- to Slide 26, suppose, in the figure on the right in
9 red, you switched out the lower resistor and switched in the upper resistor.
10 In that case the electrons would be moving on a different path than the
11 (INDISCERNIBLE) switch? So would that be through a signal path, or
12 would that be a different signal path? How would you interpret it?
13 MR. JOHANNINGMEIER: What I would say there, I think, is
14 that the impedance -- the input impedance of the op amp has been changed
15 in that circumstance. So I mean, I think it has to -- going back to the claim
16 language, rather than -- the problem is that, you know, drawing, you know,
17 how you switch it, I don't think you can turn on where you put the switches,
18 essentially, right, because that wouldn't make sense. But I think if you go
19 back to the claim language, it says an impedance, and I think a person of
20 ordinary skill would, according to Professor Larson, would understand an
21 impedance to be singular, but not like a resistor, right? An electrical
22 engineer, which actually both Counsel and Your Honor are, I guess, would
23 say potentially that the input impedance to that op amp is -- you are
24 -- however you switch them in, right? So I don't -- that to me seems like a

-- and the other thing about this too is, that what's being done there is, you are varying something in the block, right?

JUDGE CASS: Yeah, I think what I'm trying to tease out here with your arguments is, you know, again, on the right, you switched out the bottom resistor and switched in the top resistor, the electrons are going to move on a different path. Is that in your view the same signal path, or is that a different signal path, and why?

MR. JOHANNINGMEIER: It seems to me that that's the same signal path because it's basically like that it is, you know, this is traversing a block, you know, a circuit, a circuit block, and you're making an adjustment inside the block. So I think if you read the claim language, as Professor Larson has read it and said a person of ordinary skill would read it, to mean that you have to make a change within a block to something while it's in the signal path, this reads on that. And the exact implementation details are, you know, that would be something that we would want to have claim construction and argument on, but I think by taking a step back to the actual claim language, you can say there is nothing, this is clearly making adjustments within a circuit, within a block, you know, it's making individual adjustments to the circuits, right? And that is what is claimed.

JUDGE CASS: So if you make adjustments that alter the path of electrons within a function block, that would be considered a separate signal path, according to the claims?

MR. JOHANNINGMEIER: You'd have to change an impedance, right, is, I think, the issue, right?

(Simultaneous speaking.)

MR. JOHANNINGMEIER: I think that's what --

JUDGE CASS: -- signal path --

MR. JOHANNINGMEIER: Right, see that's what distinguishes it from the band-pass filter, right? Because in the band-pass filter example, you're rerouting through static impedances, you're not changing any impedance, right? Rerouting through static impedances would not be -- that's the swapping of Behbahani, but actually changing an impedance dynamically is what is in the claims. And so, you know, this figure, you know, we've said this is an example of switching individual filter elements rather than entire filters to sort of show that this article talked about both approaches, right? This article talks about using a single filter and varying its structure dynamically during individual elements rather than entire filters. Clearly Professor Tsividis is saying in, you know, 2003, while this application is pending, that there are multiple approaches to doing this, and he's distinguishing between the two. So, and it's that way in all of his articles.

So, and I think the other one that I really want to draw more attention to is on Slide 28. Because, I mean, and this is actually, this '251 Patent is something that Apple brought up in their papers, but when you look at it, I mean, that's an unasserted patent that is owned by Columbia, but it's also (INDISCERNIBLE). I mean, it's one of his. And there, that patent is actually about changing the signal path to swap circuit blocks. And so he's got disclosure of changing the operating signal pathway from upper filter

1 308 to lower filter 10. Now, presumably there's other things distinguishing
2 it from Behbahani, but the point is that Professor Tsividis claims in plain
3 language, and when he wants to talk about swapping filters, he talks about
4 swapping filters, and when he wants to talk about changing --
5 JUDGE CASS: I think I understand that point. Let me ask a
6 related question. If you could go to your Slide 13? You talked about this a
7 little bit. So Petitioner made the argument that in the '330 Patent it doesn't
8 specifically say that this amplifier 212 and resistor 614 is the same amplifier
9 and resistor as 622 and 624. So the patent could be, or at least doesn't
10 exclude the possibility that these could be an alternate (INDISCERNIBLE)
11 added in the function block. And so you could have, depending on which
12 result you want, you could have the yellow option and have it go through R,
13 or you could go with the red option and issue 2R. What's your response to
14 that?
15 MR. JOHANNINGMEIER: Well, my response to that is in the
16 grey box on the slide. Basically the patent does say that this is a circuit, a
17 singular circuit. Like how you would change a circuit. It's not talking about
18 swapping between two circuits, it's talking about an example of how a
19 circuit's impedances may be scaled. So the thing that matters about this
20 diagram is the fact that R goes to 2R and C goes to C -- C divided by 2.
21 Right, and then it says this a few lines later as well, In this way an
22 impedance can be scaled in order to decrease the circuit's required drive
23 strength. So it's -- the patent is actually referring to Figure 6, and this is the
24 disclosure around Figure 6. It's referring to Figure 6 as a circuit, so it's one,

1 according to the patent. And, you know, I think the -- Counsel --
2 JUDGE CASS: I don't see anything, and I'm looking at the spec at
3 column 7 that says a circuit's impedances, where the circuit is either yellow
4 or red, I mean a circuit could be much larger than that, and it could be
5 swapped out. Well, something more specific in here that's saying that -- for
6 instance, you could have, you sometimes see those figures with a variable
7 resistor with a line through it that shows you that resistor is adjustable, and I
8 don't see that here. So it's not -- I mean, if they're clearly saying that you've
9 got one resistor that has a variable value.
10 MR. JOHANNINGMEIER: Right, and so what I would say about
11 that is, I think that the surrounding disclosure calling it a circuit, is
12 indicative, you know, pushes that question in one direction. I also think that,
13 you know, the other disclosures, claim language and all the other disclosures
14 around this that talk about changing something in a function block might
15 resolve this question as well.
16 I mean, they've suggested that this is the only thing we're relying
17 on. It's clearly not. Go back a slide, we have figures that show actual
18 arrows going into a function block in order to implement changes, right, an
19 impedance control. There is no impedance control going into the band-pass
20 filter block of Behbahani that's going to change something in there, right, it
21 just doesn't exist. There's a gain control arrow, so, you know, that gain
22 block is a variable gain, right, AV, that has a control signal that's controlling
23 it, right? There is an actual change being affected in those boxes, which
24 contrasts to what Behbahani shows is two boxes that are swapped out one

1 for the other, right, which is a completely different approach. And then if
2 Your Honors read all the paragraphs that I cited, 43 to 48, I think there's
3 discussion in Professor Larson's declaration about why he thinks this, why
4 he made this conclusion. That's based on various things that the spec says
5 and various things that the claims say, and the figures. So collectively this
6 all adds up to this patent's reading on making changes inside blocks to
7 individual impedances or bias currents.
8 And there is nothing -- if we go to, I mean, on their -- Slide 16,
9 they're just substituting -- if we go to the Slide 22 again -- and actually, you
10 know what, let me -- maybe we should pull it. Their slide, they have the
11 same diagram that's actually more --
12 JUDGE CASS: I mean, go on; maybe you can come back to that.
13 MR. JOHANNINGMEIER: Well, I mean the point is he's got a
14 version of the slide in his presentation where he talks about the signal and
15 says the signal path is -- the impedance experienced by the signal, which is
16 what they argued. And that is the exact distinction, right? The only thing
17 that changes is as you go through what the signal is experiencing, that isn't
18 the thing that's actually -- so the testimony from Abidi and the testimony
19 from Professor Larson is that, you know, the impedance experienced by the
20 signal that flows through the high-power low-pass filter will be different
21 before and after the swap. But the testimony is also that the impedance of
22 every individual thing in there doesn't change, and so if the claims require
23 something in that block to change, it's not met. And the claims clearly do
24 require that, all of the testimony. They haven't addressed this, they haven't

1 regarded this testimony or said anything about that. What they have done is
2 simply say, well, this whole block is in the path. Which was the same thing
3 that Lenovo did in the prior IPR, when we drew a distinction within a circuit
4 between something that was and wasn't, right? And they said oh, but the
5 whole thing is in the path. It's not. The path varies, and there's no thing
6 that's changed while it is dynamically in the path. So that whole element
7 together resolves this dispute, just applying that claim language.
8 Now, let me just make sure that we haven't missed any -- because
9 we kind of bounced around. So even looking at it from the point of view of
10 a band-pass, that whole block is not in the signal path. The path switches
11 through that block, and when it does so, some portions switched in, some
12 portions switched out, the signal takes a different path. No portion both
13 stays in the path and gets changed. They're not going to say it does. Right?
14 Nothing in that block stays in the path and gets changed by what's in the
15 path. That's not dynamically adjusting an impedance of a circuit or a
16 component or adjusting impedance in the signal path.
17 So unless Your Honors have any further questions on that, let me
18 jump to the determining elements.
19 JUDGE CASS: I think this might be a good time for us to take a
20 break.
21 MR. JOHANNINGMEIER: Yeah, it might be actually. I could
22 use some water.
23 JUDGE CASS: Yeah, let's go ahead and -- why don't we take a
24 10-minute break?

(Whereupon, the above-entitled matter went off the record at 1:00 p.m. and resumed at 1:08 p.m.)

JUDGE CASS: Looks like we have everyone. So, Counsel for Patent Owner, please proceed.

MR. JOHANNINGMEIER: Thank you. And even though I indicated I was going to move on, I do have one more thing I want to say about the previous argument, actually, and it's this question of function block, and how you define function block, and I just wanted to make it clear. I think the place to do it is in paragraph 46 of Professor Larson's declaration. If you can take the function block to be the band-pass filter, the patent talks about function block may be a filter, so let's say it's the band-pass filter, and it says one or more bias currents in the function block are under control of one or more signals on bias control. It says one or more impedance in the function block 920 may be increased. It says the noise floor is increased by increasing impedances in the function block.

And we have other things all over our slides, but I just wanted to drive that point, that if you take the function block to be the band-pass filter, you still have to identify something in that block that's changed, and there isn't anything in that block that's changed.

So to go on to the next point, being the determining signal strength. So we'll start here with our Slide 30. Now, the claims here require specific determinations of components of signal, the desired signal strength and the interferer signal strength. So those aren't the whole signal; these are portions of it. The claims here require circuit -- surrebuttal (PHONETIC)), meaning

1 if the claims require a circuit for determining. So this is just baseline the
2 claims, I think Your Honors know this, but again there wasn't a lot of claim
3 discussion in the prior presentation.
4 So in the next slide, Slide 31, so what we have here is essentially,
5 the testimony was -- well, Petitioner admits that Behbahani doesn't expressly
6 teach calculating interferer signal strengths. Professor Abidi admitted at his
7 deposition, but not discussed the papers. What you have are basically nodes
8 A0 and A1 that are measurement points with no discussion of a circuit.
9 They acknowledge in the reply declaration that it does not provide details
10 about specific circuit use. So Your Honors covered all this with co-counsel,
11 and then what they're essentially saying in their reply declaration for the first
12 time is, it was our intent, which a person of ordinary skill would have
13 understood to describe functionality. So essentially the reply testimony,
14 which we say, first off, it shouldn't even be considered because at this point
15 -- it's new.
16 What he's saying is that basically he meant to put something in,
17 and a person of ordinary skill would understand that, because it's
18 conventional in the art. So we're here trying to find circuits in the art, which
19 this is not a minor element that you can just go out and find in the arts. It's a
20 core element, and the cases don't allow finding elements in the art based on
21 conclusory expert testimony. I think on one of these slides, it might be the
22 next one, I have a cite to the DSS case that we cited in our brief which
23 basically says look, you can't -- finding things in the prior art like this that
24 are conventional is a fraught enterprise. There's cases that say you can only

1 do it under certain circumstances. There's a recent memo from the acting
2 director saying that the Board isn't going to do that anymore. Now it says
3 the -- we cite that in our brief. That obviously says retroactive, but the cases
4 that are supporting that memo exist in our -- in the Federal Circuit. We can't
5 just go out into the prior art and say well, these circuits are conventionally
6 known and then read them into the claims from that. That would be an error.
7 So on the next slide, this is to the point that, you know, what
8 -- their alternative to say that they would -- to point to Tan, and in their reply
9 declaration for the very first time, again, improperly, they suggest that
10 they're not going to use Tan, they're going to use a modified version of Tan,
11 which for the first time here at the podium he said was going to be taking out
12 the absolute signal strength measure from that. So this is an evolving new
13 theory that's not well supported. What we pointed out is, you can't take a
14 peak detector threshold measurement and determine the individual
15 components of a signal, and then I've just drawn a demonstrative on the slide
16 to make that point graphically. But they admit that these are cumulative
17 signal strength measures at best. They're being measured in the Tan
18 circumstance with a threshold detector that's only detecting that it's some
19 number greater than the voltage reference, and from that you can't figure out
20 anything, other than --
21 JUDGE CASS: So, Counsel, one of the arguments that Petitioner
22 made was that essentially (INDISCERNIBLE) them onto a higher standard
23 than (INDISCERNIBLE) and that the (INDISCERNIBLE) and other
24 counsel provided greater detail on determining signal strengths in

1 Behbahani. So what's your response to that?
2 MR. JOHANNINGMEIER: Well, I would say that it actually
3 does. Well, I'd say a couple things. The first thing I would say is, those
4 cases are in contention with the do not find elements in the prior art cases,
5 because that's -- and another thing I would say is this isn't a 112 is the
6 disclosure is sufficient inquiry, right? I mean, obviously that's not for the
7 Board to decide whether the patent discloses enough, but there is something
8 that was on one of his slides, which is Figure 14 from the patent, from the
9 '101 Patent.
10 And let me just pull it. Figure 14 is the one he didn't show -- well,
11 he talked a lot about Figure 4, said, oh, Figure 4, that's an embodiment in the
12 patent, right? Isn't necessarily determined with the claims, as Your Honors
13 well know, but Figure 14 of the patent -- I'll pull it up on the screen here. So
14 at the bottom of this, there's something added on to what's in Figure 4, which
15 is a computational circuit that leads to and from a DSP for doing analysis of
16 signal strength. So can you use a DSP to extract from signal strength
17 measures and come up with the individual measurements? Yes, right, this is
18 in the patent. It's disclosed. It's not disclosed in Behbahani, though. You
19 just have the point AO and point A1. So I would say that it isn't true that
20 these disclosures are equivalent, that there is more disclosure. And, you
21 know, obviously this figure has accompanying -- but, you know, the main
22 point being, there is a separate computational circuit for determining the
23 signal strengths, which is what's in the claims, right? And it talks about
24 potentially even using additional signal processing in order to do those

1 measurements. So I think that basically disposes of that point with the, you
2 know, in the -- disclosures.
3 JUDGE CASS: I guess, on a related question, so Petitioner was
4 talking about Figure 4, do you think Figure 4 and the Figure 4 embodiment
5 is the claims at issue here?
6 MR. JOHANNINGMEIER: Well, I mean I try to resist, because of
7 the nature of these proceedings, everything I say goes into the record as
8 being, like -- so I try to resist saying things like, this embodiment reads on
9 these claims. I think Figure 4 only discloses cumulative signal strength
10 measures at various points, which is what they're saying Behbahani does.
11 And so they're to -- they're trying to compare the embodiment of Figure 4 to
12 the disclosure in Behbahani. If we're talking about the claims, I guess what I
13 would say is that I do know that the computational circuit in Figure 14 is
14 clearly being used to determine signal strengths. And so, I mean, I guess
15 that's what I would say.
16 JUDGE CASS: So are you saying that you can't take a position on
17 whether Figure 4 embodiment meets the claims?
18 MR. JOHANNINGMEIER: These claims? I mean, I don't know
19 that that's -- I mean, the Figure 4 embodiment discloses an SSI that I think
20 the parties agree is a cumulative signal strength indication, right? And so if
21 the claim says you have to determine the desired signal and the interferer
22 signal components of that cumulative signal, then, no, Figure 4 is not a
23 -- right? So, yes, I would say that, but there is enough in Figure 14 for that.
24 And there isn't a computational circuit in Behbahani that

1 (INDISCERNIBLE) author of the paper and, you know, supposed to be
2 (INDISCERNIBLE) right? Correct, correct. At Slide 31.
3 So the Tan detectors cannot do this determination. So I'll get into
4 Slide 34. Now Your Honors have clarified that they're raising this as
5 obviousness and they're attempting to essentially, at the bottom, say that this
6 is coming from the fact that these are general -- generic circuits, that would
7 be well understood. Well, for all the reasons we've said, now first off, again,
8 this is not -- those cites on this slide from EX 1042, that's the reply
9 declaration. This didn't come in until after -- before -- before their reply, all
10 we had was the Tan circuit, and so we responded to say the Tan circuit can't
11 do the thresholds. The thresholds of the Tan circuit can't do the
12 determinations that are required.
13 And we didn't have Professor Larson say that because it seemed so
14 evident from -- I guess you can call it attorney argument, but he's an attorney
15 making the opposite argument where they haven't rebutted, they haven't
16 come back with Professor Abidi saying, you know, oh, yes, you can
17 determine these things from a peak detector. What Professor Abidi has said
18 is oh, no, we have to modify Tan and take out an intermediate portion of that
19 and somehow put that into the circuit. And, you know, it was our intent to
20 talk about this (INDISCERNIBLE) anyway, I mean that's essentially what
21 he said in his reply. That doesn't meet Apple's burden on these elements,
22 even if it's allowed in, which it shouldn't be.
23 So the obviousness of important elements, it has to be in the
24 references; it can't come from common or background knowledge, you

1 know, including knowledge of how to modify a circuit to cause something to
2 happen. So we cited the TSS Technology case, that's a good one. Also, I
3 guess Apple -- but has a discussion in there of when and how this is allowed,
4 and the sort of the key point is you can't just find these things based on
5 cursory statements from experts. And that's all we have here, so Apple has
6 the burden on this; we don't. If they say something that's wrong, we don't
7 have to come back with expert testimony to rebut it, but what they've said is
8 wrong, it was late and is inconsistent with the law.
9 So I guess then I would use the few minutes I have left, I want to
10 talk about the comparing element. I think Your Honor asked about this. So
11 they just kind of missed this one entirely. What they point to -- let's go to
12 slide -- well, I mean, it's clear from the claims, you have to compare the
13 desired signal strength to the interferer signal strength. You have to
14 compare those two components of the signal, and if you look in their petition
15 for this, and it's on the next slide, the only time they mention comparing is in
16 the heading, and then they discuss it in the portion when they're talking
17 about how you could use the two points to determine the interferer strength.
18 They're basically saying to compare it before and after to get the interferer
19 signal strength.
20 Well, that's not a comparison of the desired signal to the interferer
21 signal, that's the comparison of a cumulative signal before and a cumulative
22 signal after, in order to get to a -- what they say is an interferer signal
23 strength. It's not the right comparison. It's in the claims. They don't discuss
24 any other comparison. He's talking about relative measures, and he's talking

about cumulative signal strengths, right, and you cannot, from those, without a computational circuit and potentially a DSP, derive the actual comparison, you know, derive those initial signal components and then compare them to each other. So they fall down on that element, on their burden.

So on the next slide, I think this is just making the same point. They're only discussing this in the context of how they're saying you would derive the interferer signal by computing something with those two measures, right? Of course, you know, this is what we just looked at, the difference between Figure 4 and 14. Figure 14 showed computational circuit doing that; Figure 4 and Behbahani do not. They never really acknowledge that this specific comparison has to be the desired signal component and the interferer signal component, so they haven't -- basically, they've just not shown it to all of us anywhere.

So on the next slide -- and that also means that they haven't shown any of the elements that require doing something based on that comparison, which follows logically, right? If they have not shown the comparison, they haven't shown the adjustment being responsive to the comparison. They're talking about the measures and what they say are the signal strength measures and only ever discussing the responsive elements based on measurements, when they require --

JUDGE CASS: Counsel, I just want to let you know you're going into your rebuttal time.

MR. JOHANNINGMEIER: Yeah, yeah. So the last thing I'll say on this, I mean, I think that's fairly straightforward. I do have a slide here on

1 the motion to strike and this whole question of basic theory, and I think, you
2 know, the Slide 43, I just wanted to point this out because this is something
3 -- I think I asked Professor Abidi at his deposition the exact question here.
4 Okay, so dynamically changing an impedance of a component in a signal
5 path. So in your opinion, what component in the signal path has its
6 impedance dynamically changed? He says, the transconductors. I say, of
7 the low-pass filter? Yes.
8 That's his depo testimony, right? So, and we, you know, we relied
9 on that to think that's what they were -- although we were aware that in
10 attorney argument in the surreply they said something else, but the first time
11 that they actually have any testimony about the filter block is in his reply
12 declaration, where he says that Behbahani's variable filter block is the
13 component or circuit in the signal path whose impedance is dynamically
14 varied, as claimed. Right, so that's the situation we have. Putting aside
15 attorney argument, whether or not it's in the briefs at what point, his
16 testimony changed between when we asked him and when we got his reply
17 brief. And so we think that is improper and justifies disregarding that.
18 Striking, disregarding, or finding no credibility to this testimony that has
19 changed, right? They didn't have with their preliminary surreply anything
20 from Professor Abidi. They didn't put it on until the end, and they didn't
21 even have him -- when I asked him the straight up question, he didn't even
22 say what he would ultimately say in his reply declaration. So there's that.
23 And I guess on the points of discretionary denial --
24 JUDGE CASS: Before you move on, Counsel, I was just looking,

is there somewhere in the record that you talk about Figure 14 of the '330 Patent?

MR. JOHANNINGMEIER: I will have to look.

JUDGE CASS: If you look --

MR. JOHANNINGMEIER: It's in their record. I mean, it's on his slide, but I think, you know, I think -- we certainly said that there's nothing disclosed. So I will go back and check.

JUDGE CASS: Yes, if you can do that for me.

MR. JOHANNINGMEIER: All right. But, you know, responsive to what he just said, I was reminded of it by his slide, essentially, to be honest, that they put up, that had that figure on it. Now, the last thing I'll just say on the discretionary denial points, I mean, obviously we're here today, right? So we do think that, you know, they would have been required under the current law to have (INDISCERNIBLE) material error that they didn't do here. That does matter to us, and, you know, I do think that the -- well, just the other day the acting director (INDISCERNIBLE) proceedings that can happen, but we've put this here for reserving the position and, you know, stating our position on this.

But I want to go back to what I said in the beginning is that they lose on the merits because the thing they're identifying does not have the impedance in the signal path. It changes in that function block. Even if you allow that in, take that function block, there's nothing in that block. There's no impedance, no bias current that changes dynamic (INDISCERNIBLE). So I'll reserve the rest of my time for rebuttal, and thank you very much,

1 Your Honors, for your time and your questions.
2 JUDGE CASS: All right. Thank you. You used about four
3 minutes of your rebuttal time. Petitioner, your time, about 21 minutes
4 remaining in rebuttal time. I'll set the clock here. You may begin when
5 ready.
6 MR. HART: Thank you, Your Honor. I wanted to come back to
7 the pin I put in the preamble and transient discussion in my opening
8 remarks, and point the Board to where this issue is discussed in the record.
9 So on Petitioner's slide, in our expert's declaration which is Exhibit 1003,
10 and this specifically is in IPR2024-00816, involving the '330 Patent. Our
11 expert addressed Behbahani's teachings on implementing dynamic changes
12 during the preamble, so that those dynamic -- I'm sorry, so that those
13 temporary transients die out before the data sector is received. And that
14 avoids or eliminates an increase in bit error rate. This is the discussion that I
15 alluded to earlier, where both Inventor Tsividis's papers and patents as well
16 as Behbahani all recognize that if you're going to experience temporary
17 transients as a result of making your dynamic change, you want to do it
18 during the preamble to make sure you're not losing any bits by the time the
19 data sector arrives.
20 Now, the other portion of the record I would point the Board to is
21 the cross-examination testimony of Dr. Larson. I discussed this same issue
22 with Dr. Larson at length. So I pointed him to, this is a discussion of Exhibit
23 1011, the 2003 article from Inventor Tsividis, and I pointed him to the
24 section that I read into --

1 JUDGE CASS: For the record, could you just identify what
2 exhibit that is?
3 MR. HART: This is going to be Exhibit 1043 in all five
4 proceedings, so I pointed him to that portion of Inventor Tsividis's 2003
5 article, which is Exhibit 1011, where it discusses the downside of transients,
6 but says they may not be a problem if you make your dynamic adjustments
7 during the preamble. So I pointed him to that, do you see that? Yes. How
8 does making a dynamic change to the circuit during a preamble solve the
9 problem? We get into a long discussion about preambles, and we eventually
10 get to an answer. To answer your question, you do that so there's enough
11 time for the system to have settled down, for the transients to have died out,
12 but still complete the preamble period before the useful data arrives.
13 And so if you -- question, so if you get some bit errors in your
14 section of the preamble, it's not as critical as if you get bit errors in the data
15 recession after the preamble, is that fair? I think that's a fair way to put it, he
16 answers. Then I take him to the '330 Patent to confirm that when the '330
17 Patent is talking about making dynamic changes during the preamble, it is to
18 accommodate this same situation. Can I have you turn to the '330 Patent,
19 column 12, it states that specific embodiments of the present invention
20 perform some or all of the variations during the preamble. Coming down a
21 little lower to page 111, consistent with what we just saw in Dr. Tsividis's
22 papers at 1011, would a POSITA understand that making dynamic
23 adjustments during a preamble as described here in the '330 Patent is
24 beneficial because it avoids issues associated with transients? Yeah, if

1 you're going to make these changes, these dynamic variations, the preamble
2 is probably the best time to do it. The whole point of making these dynamic
3 adjustments in the preamble is so that you let everything settle out before the
4 real data arrives so you don't experience any bit errors when the real data
5 arrives.
6 So, again, Behbahani, Dr. Tsividis's academic article, and the
7 Theta patents themselves all recognize that transients are accommodated by
8 making your dynamic changes during a preamble.
9 JUDGE CASS: Just for the record, I'll just note, what you're
10 showing us is in the 816 IPR, Exhibit 1043, pages 7 to 111
11 (INDISCERNIBLE) and you also have the (INDISCERNIBLE) here at page
12 7 --
13 MR. HART: Yes, Your Honor. And --
14 JUDGE CASS: -- to the records.
15 MR. HART: I really appreciate -- I have that in my notes, I did not
16 read it in, but, yes, Exhibit --
17 JUDGE CASS: It helps us.
18 MR. HART: Exhibit 1043 is the same in all five proceedings, and
19 I think I started at page 108, line four, and I ended at page 111, line 21.
20 All right. The next issue I wanted to pick up, just briefly, is the
21 signal path issue, the main claim construction dispute. I heard Counsel for
22 Patent Owner repeatedly describe the Theta patents as requiring a change to
23 an individual impedance, and characterize the Behbahani approach as
24 involving static impedances. And Your Honor, Judge Cass, asked, what

1 support in the specification do we have for that? And we looked at Figure 6.
2 That was the exact right question. And I want to reiterate this point. There
3 is no distinction between minimal, minor adjustments that Theta would like
4 to limit its claims to, and more substantial adjustments as we see in
5 Behbahani.
6 The patents describe this all at a high level. They capture the
7 genus of making dynamic adjustments within a function block. The
8 question for the Board is whether Behbahani's variable filter block is a
9 function block, or whether too much happens inside there for it to be deemed
10 a function block. And there is simply no support in the intrinsic record for
11 excluding Behbahani. And we know Inventor Tsividis didn't intend to,
12 because when he describes his invention in his academic articles, he points
13 to Behbahani as an example of how to implement his dynamic impedance
14 scaling.
15 The next point I wanted to raise was Figure 14. This is the signal
16 strength indicators. So let me pull up Figure 14 for us to take a look at.
17 Figure 14, first Your Honor asked whether the Patent Owner addressed this.
18 It did not, as far as I'm aware. The important point here is that Figure 14
19 describes the same SSI blocks, SSI 1470, SSI 1472, and SSI 1474. Those
20 are the signal strength indicator circuits. Those are identical to the black
21 boxes in Figure 4 that I discussed earlier, SSI 440 and SSI 450 in Figure 4.
22 Now, Counsel for Patent Owner suggested that the DSP circuit that
23 receives the outputs of those SSI signal strength indicator boxes is part of a
24 signal strength indicator circuit or measurement circuit. That is not

1 consistent with the patent's description of that box. Now I believe for the
2 record, if you go to search for 1490, which is what Figure 14 labels that DSP
3 computation block, I believe there's a typo. So we're looking at column 11
4 in the '330 Patent, Figure 14 description begins at 140. And here where it
5 talks about the computational circuit, it calls it 1470; I believe, in the figure,
6 it's 1490. But importantly this describes these signals being measured by the
7 signal strength indicator circuits, 1470 and 1472, 1474. Their outputs go to
8 the computational circuit, which then controls gain and power.
9 The computational circuit is not part of the signal strength
10 measurement circuit. It is what receives the signal strength measurement, in
11 the same way as Behbahani's circuit, AI and AO are measurements that are
12 taken, and those are then sent to a processor to determine how to
13 dynamically adjust the filter block in Behbahani's receiver. So, there is no
14 additional discussion, no additional detail in the Theta patents beyond
15 generic signal strength indicators in Figure 4 in that same disclosure with
16 reference to Figure 14.
17 Motion to strike, Counsel addressed that briefly. I don't have a lot
18 of time, but I would like to walk through the sequence of events because I
19 think it's really important. The premise of a motion to strike is that the non-
20 moving party did something that is so prejudicial to the moving party that
21 the moving party must have evidence stricken from the record, otherwise
22 they would not have an opportunity to fairly respond to this new evidence.
23 So there are two separate buckets of evidence addressed by the motion to
24 stroke. The first is whether Petitioner relied on Behbahani's variable circuit

1 block as a whole. Patent Owner argues that this was not in advance of the
2 petition and that it saw this argument for the first time in the reply, but as
3 we've already seen on the slide, this was an issue that was flagged pre-
4 Institution, right? Patent Owner addressed it in their preliminary surreply.
5 The Board addressed this issue in its Institution Decision. After the
6 Institution Decision, this issue is live. Everybody is aware that this is a
7 dispute. Post-Institution, Patent Owner has the opportunity for response
8 brief, surreply brief, in expert declaration, get to depose our expert twice.
9 There is a fully full and fair opportunity for Patent Owner to say anything it
10 wants to say about our reliance on the entirety of Behbahani's filter block.
11 So there is no prejudice here; they had a full and fair opportunity.
12 With respect to the circuit strength measurement circuits, the
13 complaint here is that our expert responded to the attorney argument about
14 Tan's circuit and whether Tan's circuit was capable of measuring AI and AO.
15 Again, the Tan combination was presented in the petition. The Tan
16 combination was described in our opening expert declaration, 1003. Patent
17 Owner deposed Dr. Abidi on his original declaration, Exhibit 1003. He
18 asked him questions about Tan's circuit. Dr. Larson, Patent Owner's expert,
19 had every opportunity to address the circuit strength measurement circuits.
20 If he had an opinion that Tan's circuit was somehow incapable of providing
21 the functionality required of AI and AO, he had a fair opportunity to address
22 it. He did not.
23 Dr. Larson remained silent about circuit strength measurements.
24 There is zero opinion from Patent Owner's expert about any of the circuit

1 strength measurement limitations in this case. When Dr. Abidi corrected the
2 record in a supplemental expert declaration responding to the attorney
3 argument about Tan's circuit, Patent Owner decided to depose him. There
4 was no cross examination from Patent Owner with respect to Dr. Abidi's
5 supplemental declaration. They just forfeited that opportunity to address the
6 record on those points in the supplemental declaration, and now -- nor did
7 they ask to submit a supplemental declaration from Dr. Larson to be
8 submitted with their surreply. They have forfeited multiple opportunities to
9 relieve any prejudice from these alleged slides that they complain about in
10 the motion to strike, and therefore they should not be heard to complain that
11 we have engaged in any unfair gamesmanship. We flagged these issues
12 from the very beginning; they have just failed to take advantage of the
13 procedural mechanisms that PTAB accords them to do.
14 Now, Slide 43 relates to this change theory related to the motion to
15 strike. Now, Patent Owner's Counsel points out this question and answer
16 and claims that Dr. Abidi very clearly pinned down his theory as focused
17 only on the internals of the variable filter block to the exclusion of the block
18 itself. I just want to briefly walk through that testimony. So he is getting
19 questions about what component changes its impedance; the transconductors
20 change impedance within that variable filter block. The question then
21 transitioned to, if you look at the high-power filter, it has a certain
22 theoretical transconductance; you turn it off and now you're using a different
23 transconductance. By turning it on, you haven't changed its
24 transconductance. Dr. Abidi explains, but you have changed the

1 transconductance of the filter functional block.
2 He elaborates on this. He says the important thing is what does the
3 signal experience? It's experiencing a high impedance when it's flowing
4 through the low-power transconductor, and then it experiences a ten times
5 lower interference when it flows through the high-power transconductor. It
6 is the signal that experiences the filter. His theory, he got into the details of
7 why the impedance is different between the high-power filter branch and the
8 low-power filter branch, but the entire time in his testimony he was
9 consistent that the theory of invalidity here was based on what's happening
10 inside variable filter block as a whole.
11 JUDGE CASS: And I'll ask again for the record, and you can just
12 read in the exhibit and preceding page and line numbers.
13 MR. HART: Thank you for keeping me honest here; I keep
14 getting ahead of myself. This is Exhibit 2021, and I was specifically reading
15 Exhibit 2021 from the '330 Patent proceeding, IPR2024-00816. I believe
16 that exhibit number is the same in all five proceedings that this was
17 introduced (INDISCERNIBLE) Patent Owners still have 100 percent.
18 JUDGE CASS: All right, thank you.
19 MR. HART: Thank you, Your Honor. And I -- I would like -- I
20 have just seven minutes left, are there any other questions, any other issues
21 that the Board would like clarification on? I certainly don't need to use all
22 seven minutes if I don't -- if there aren't any questions, but I want to open the
23 floor to make sure I've clarified anything that may still need it.
24 JUDGE CASS: All right, I don't have any, and I'm not seeing any

1 from any of my co-panel members. So we're all set.
2 MR. HART: Thank you very much.
3 JUDGE CASS: All right, thank you. Counsel, you have 26
4 minutes remaining of your rebuttal time.
5 MR. JOHANNINGMEIER: Okay. Well, I'll start with, what he
6 did, which is informing the Court where, because you asked where we talked
7 about Figure 14. So obviously it's in the patent, we found it in the surreply.
8 So in the '210 Patent surreply to this proceeding at 00820 in the surreply at
9 page 6, also in the '164 surreply at page 6, it's cited amongst things for the
10 proposition. Clearly it's in the patent, and, you know, obviously I can make
11 an argument it's responsive to the suggestion that somehow the patent
12 doesn't disclose these things. So that's what we have in here. I think they
13 mentioned it in their petition but didn't raise that particular point. Anyways,
14 it's clearly -- it's all -- they put it on their slides in their reply, but we at least
15 brought it up in our surreply.
16 Now, as to the first issue, the Behbahani, the impedances, again,
17 Counsel was suggesting that somehow we're trying to distinguish between a
18 minimal change and a large change, but that's not what we're doing. We're
19 going back to the claim language, and we are looking at -- and the
20 specification teaches (INDISCERNIBLE) that claim language, and we are
21 looking at the singular thing that has to change in the signal path. Now, that
22 thing could be the filter, and that's the -- there's the circuit, the -- functional
23 block, right, but the other thing that we obviously hit on before the break is
24 that that thing has to, if it's a functional block, the change has to be inside of

1 it, and we have tons and tons of disclosure in our papers for it, that that is
2 what it has to be.
3 Now I will say one thing on this motion to strike. The question
4 about, you know, I'm not sure there's a prejudice requirement in the rule, but
5 I just, you know, what we saw for the first time in the reply was the
6 testimony from an expert on basically changing -- to say that, the first time
7 that Professor Abidi said that the band-pass filter functional block is the
8 component that's changed was in his reply declaration, in the heading to
9 paragraph 4, right? And that's why, you know, we've had a lot of talk about
10 attorney argument, I mean, attorney argument is attorney argument, and they
11 clearly made attorney arguments that we put on expert testimony to rebut.
12 So that's clear, that's why we're here on the merits of this, and trying to
13 convince Your Honors that the merits of this clearly are on our side.
14 But the first time that Professor Abidi said that that larger thing,
15 right, he was talking, when I deposed him, he was talking about the
16 transconductors inside that block, right? And then, you know, the testimony
17 they just read, it goes on. When he says the higher transconductance -- so
18 this is basically Exhibit 2021, starting on page 73. So -- I don't want to read
19 too much of this into the record for you, I would encourage you to -- so I
20 went through the lightbulb analogy with him. He said that's a different way
21 of doing it, but that wouldn't have been a good way for their circuit. So I
22 think the -- sorry, on page 76. Well, 75, line 23.
23 What I'm saying, this is me asking him, what I'm suggesting that
24 these are different approaches, so applying it to your circuit and having two

1 filters, you clearly have one filter with a variable attenuator in front of it and
2 used the attenuator to vary the amount of signal going in, right? Yes, but
3 that would have not been a good solution to the problem of a receiver. So he
4 doesn't like Professor Tsividis's approach. I'm not suggesting that it would;
5 I'm saying that's a possible approach, right? Just to vary, you know, use a
6 variable impedance in front of one filter in order to adjust the level of signal
7 going in. Is that something that could have been done? It's hypothetical and
8 does not serve our purpose.
9 So then I basically say, right, so to go back to the original question
10 here, if the claim requires an impedance of a component in the signal path to
11 change, what in your view is the component that changes? The
12 transconductor and the capacitors. Okay, and when you say transconductor,
13 do you mean a particular transconductor, or you mean you've swapped in a
14 new transconductor? I mean the transconductor through which the signal
15 flows to experience filtering. Okay, so the transconductor that the signal is
16 flowing through has changed, right? The impedance of that transconductor
17 has changed? Well, I guess maybe we're going in circles. Actually, when I
18 said changed, I didn't mean that the particular transconductance circuit that
19 the signal is going through has been substituted for a different one, right? It
20 has been substituted for a different one, right? But the signal can't tell the
21 difference?
22 So Professor Abidi's opinion is about swapping two filters inside
23 that block that don't individually change, and the change being the
24 experience of the signal as it goes through. That's his theory. That's their

1 theory. I don't think they're denying it. And that, fundamentally, is different
2 from what is claimed. And so that is, that both Professor Abidi and
3 Professor Tsividis understand the two approaches, right? Professor Abidi
4 even said well, that wouldn't have been a good solution for us. He likes
5 what he chose, right? And Professor Tsividis presumably likes what he
6 claimed in these patents. But the claims determine the outcome here; the
7 claims clearly require something that is not done in the functional block that
8 they have identified even if the (INDISCERNIBLE) less than two to identify
9 that one. Professor Abidi's testimony does not -- right, he's not saying that
10 the impedance of that block changes. He's saying I swapped impedances
11 within that block to make a change in what's experienced. That's something
12 else entirely. The claims don't say what the signal experienced. So if they
13 did this, it would be a whole different thing, but that's not what's in the
14 claims.
15 So I don't have anything further, unless there's something else I can
16 clarify for Your Honors.
17 JUDGE CASS: I don't have anything, and I'm not seeing anything
18 from my co-panelists. So nothing further from us.
19 MR. JOHANNINGMEIER: All right, well thank you very much
20 for your time.
21 JUDGE CASS: Thank you. All right, Counsel, I just wanted to
22 thank all of you for a very well-prepared and clearly presented arguments
23 today. It's clear that you both put a lot of work into this, and we appreciate
24 that. We will take this under advisement. Were there any matters that

anybody feels need to be addressed before we adjourn here?

MR. HART: Nothing from Petitioner, Your Honor.

MR. JOHANNINGMEIER: No, we'll await the decision.

JUDGE CASS: All right, thank you. Before we adjourn, if Counsel could stay here and check with the court reporter, if the court reporter has any spellings or proper names or anything else that she might need help with, that would be great. But as far as we're concerned, the hearing is adjourned.

(Whereupon, the above-entitled matter went off the record at 1:53 p.m.)

IPR2024-00816 (Patent 7,010,330 B1)
IPR2024-00817 (Patent 10,129,825 B2)
IPR2024-00818 (Patent 10,524,202 B2)
IPR2024-00819 (Patent 11,564,164 B2)
IPR2024-00820 (Patent 11,638,210 B1)

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