

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANWHA SOLUTIONS CORP.,
Petitioner,

v.

MAXEON SOLAR PTE. LTD.,
Patent Owner

IPR2024-01198
Patent 11,251,315 B2

Record of Oral Hearing
Held: December 3, 2025

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and AVELYN
M. ROSS, *Administrative Patent Judges*.

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The above-entitled matter came on for hearing on December 3, 2025, commencing at 3:09 p.m., via video teleconference.

P R O C E E D I N G S

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JUDGE KOKOSKI: Good morning or I guess, as the case may be, good afternoon. Today we will hear arguments in IPR2024-01198 concerning U.S. Patent Number 11,251,315. I'm Judge Kokoski and I'm joined today by Judges Ross and Kalan. Let's start with appearances, beginning with Petitioner.

MR. SELWYN: Good afternoon, Your Honor. My name is Mark Selwyn. With me today is John Hobgood, Dave Cavanaugh, Robert Stiller, and Nora Xu. Mr. Hobgood and I will present for Petitioner.

JUDGE KOKOSKI: Great. Thank you. Patent Owner?

MR. SNODGRASS: Hello, Your Honors. This is Jacob Snodgrass with PV Law. I'll be presenting on behalf of Patent Owner.

JUDGE KOKOSKI: Great. Thank you. Before we begin, I just want to remind the parties that we do have a copy of your demonstratives. During your argument, if you could identify clearly and specifically the demonstrative (INDISCERNIBLE - TECHNICAL DIFFICULTY). I am back. That was different.

Okay. So again, just refer to the slide number so we can keep the record straight and the court reporter's transcript accurate. Keep your line muted when you're not speaking and please try to take a pause prior to speaking so as to avoid speaking over others with the lag that's usually attended with these kinds of remote hearings.

As set forth in our hearing order, each party has 60 minutes to present their arguments. Petitioner will proceed first and may reserve time

1 for rebuttal. How much time would you like to reserve?

2 MR. SELWYN: Fifteen minutes, if you -- if we could.

3 JUDGE KOKOSKI: Fifteen minutes? Okay. Great. Patent
4 Owner will then have 60 minutes to present their case, and you may also
5 reserve time for surrebuttal. How much time would you like to reserve?

6 MR. SNODGRASS: Fifteen minutes, please.

7 JUDGE KOKOSKI: Great. Okay. With that, Petitioner, you can
8 begin when you're ready.

9 MR. SELWYN: Thank you. And good afternoon, my name is
10 Mark Selwyn. And together with my colleague John Hobgood, I represent
11 Hanwha Solutions in this IPR. Mr. Hobgood and I will divide the argument
12 today.

13 Slide 2. Slide 2 is an agenda for what Mr. Hobgood and I will
14 discuss today. I will cover the issues related to the construction of the term
15 metal impurities and the disputes that relate to the term's application in the
16 context of the references. Mr. Hobgood will then cover the disputes related
17 to the dopant concentration in the dependent claims.

18 Slide 6, please. Independent Claim 10 is reproduced on Slide 6.
19 The limitations that we will address are highlighted, the metal impurities
20 limitation in green and the dopant concentration limitation in yellow.
21 Maxeon does not dispute that both the primary references Choi and Cousins
22 disclose all the non-highlighted limitations of Claim 10.

23 Slide 7. As a roadmap for our presentation, first, I will address the
24 claim construction of metal impurities which applies to the Choi reference.
25 Second, I will address the gettering of metal impurities from the substrate
26 into the emitter regions, which applies to the combinations of the Istratov

1 reference with Choi or Cousins. Third, Mr. Hobgood will address the
2 dopant concentration which applies to the combination of the Marvin or
3 Granek reference with Choi or Cousins. Then finally -- may I have Slide 10
4 -- Mr. Hobgood will address certain obviousness combinations specific to
5 the dependent claims.

6 Slide 11, please. Before I address the first disputed issue, I'd like
7 to make a few brief comments about the Canadian Solar IPR challenging the
8 same '315 Patent for which this panel recently heard arguments. In that IPR,
9 Your Honors heard considerable debate on the issue of inherency in the
10 context of the metal impurities limitation. Inherency is not an issue that
11 Hanwha has raised in this IPR. Hanwha's petition includes references that
12 Hanwha believes explicitly disclose that limitation.

13 In addition to the inherency issue that is unique to the Canadian
14 Solar IPR, there are several other differences as well. First, there are no
15 overlapping primary references between Hanwha's and Canadian Solar's
16 IPRs challenging the '315 Patent. Here, Grounds 1 and 2 are based on Choi
17 as the primary reference, and Ground 3 is based on Cousins as the primary
18 reference. Canadian Solar relied on neither of those references in any
19 ground.

20 Second, this IPR addresses more claims than the Canadian Solar
21 IPR. Specifically, Claims 17, 18, and 20 are challenged in this proceeding,
22 but they were not at issue in the Canadian Solar IPR. And third, between
23 Hanwha's and Canadian Solar IPR, there's only one overlapping secondary
24 reference, that's Marvin, which relates to the dopant concentration limitation
25 of Claim 10.

26 Slide 12, please. Turning to the metal impurities limitation, I'll

1 address first, whether Choi discloses an emitter having metal impurities; and
2 second, whether the combination of Choi or Cousins with Istratov renders
3 obvious the gettering of metal impurities into the emitter.

4 Slide 13, please. Now, Choi expressly discloses an emitter having
5 metal impurities. Portions of paragraph 37 of Choi are shown on this slide.
6 And specifically, Choi discloses in this paragraph a, quote, "second
7 conductive type area with a second conductive type dopant," which Choi
8 explains can be, quote, "any impurity having a conductive type opposite to
9 the substrate." And Maxeon --

10 JUDGE KOKOSKI: Counsel --

11 MR. SELWYN: -- doesn't dispute that --

12 JUDGE KOKOSKI: -- can I just interrupt you there? What is the
13 plain and ordinary meaning of metal impurities that you're applying here?

14 MR. SELWYN: Sure. The plain and ordinary meaning is any
15 element foreign to the elements of a host material, including intentionally
16 introduced dopants. So Maxeon doesn't dispute that Choi's first and second
17 conductive type areas disclose the claimed first and second emitter regions.
18 And Maxeon also doesn't dispute that Choi discloses metallic elements in
19 the conductive type areas and that those metallic elements are impurities. As
20 shown on Slide 13, Choi specifically discloses doping the conductive type
21 areas with, quote, any impurity, including metals such as aluminum, gallium,
22 indium, and bismuth.

23 We turn to Slide 14. So let me pause on this point. Maxeon and
24 its expert agree that paragraph 37 of Choi discloses impurities, and they
25 agree that the impurities are metals. That should be the end of the story, that
26 Choi discloses the metal impurities limitation of the '315 Patent. But what

1 Maxeon says is that paragraph 37 of Choi doesn't disclose metal impurities
2 because the metal impurities in paragraph 37 are doping metal impurities
3 -- the reasons that I'll discuss in a moment.

4 Nothing in the '315 Patent justifies reading the term metal
5 impurities to exclude doping metal impurities. Doping metal impurities
6 quite simply are metal impurities. And the Board's preliminary finding at
7 page 20 of the institution decision, that Choi discloses a first emitter region
8 having metal impurities formed over the dielectric region, was absolutely
9 correct.

10 Slide 15, please. If the Board adheres to the reasoning of the
11 institution decision, then Choi alone satisfies the metal impurities limitation,
12 and it would be unnecessary to consider the combinations of Choi or
13 Cousins with Istratov.

14 Slide 16. And nothing in the intrinsic evidence changes the plain
15 meaning of metal impurities such that the term would exclude doping metal
16 impurities. And before offering his declaration in this IPR, Maxeon's expert,
17 Dr. Schubert, defined the term metal -- defined the term impurities in his
18 textbook as, quote, "unintentional as well as intentional foreign atoms in the
19 semiconductor," which covers intentionally introduced dopants as in Choi.
20 We have his definition on the screen. In other words, he understood the
21 term in the same manner as Hanwha's expert, Dr. Holman, and in the same
22 manner as the Board applied in its institution decision.

23 So recognizing that Dr. Schubert's definition of impurities in his
24 own textbook is inconsistent with its argument, Maxeon claimed in its sur-
25 reply that we were just misinterpreting his textbook. And they point to the
26 statement in Dr. Schubert's textbook that, quote, "The deliberate doping of

1 semiconductors with impurities required that the usage of the term
2 impurities was broadened to suggest that impurities carries two plain and
3 ordinary meanings, one of which broadly encompasses all foreign atoms and
4 the other of which only includes contaminants."

5 But if you look at Dr. Schubert's textbook, it doesn't say that at all.
6 It states that, quote, "The usage of the term impurities was broadened." And,
7 quote, "To include the deliberate doping of semiconductors with impurities."
8 And it cites as an example of that usage from 1950. Dr. Schubert's book
9 therefore demonstrates that the plain meaning of impurities included
10 intentionally introduced impurities, that is dopants, for nearly 65 years
11 before the priority date of the '315 Patent. And in our reply brief, we've also
12 offered multiple technical dictionaries, such as Exhibits 1108 and 1109, that
13 offer substantively the same definition of impurities as Dr. Schubert did in
14 his textbook and as Dr. Holman did in this case and as I answered in
15 response to Your Honor's question a moment ago.

16 We can have Slide 18, please. And when we deposed Maxeon's
17 expert, Dr. Schubert agreed that impurities, as used in the '315 Patent, should
18 be construed by its plain and ordinary meaning. And in fact, Maxeon
19 admits, at page 14 of its Patent Owner's response, that a plain and ordinary
20 meaning of impurities is, quote, "any material within another material" and
21 further admits on the same page that, quote, "To be sure, the term has in
22 some instances been used to cover even desired materials, such as dopants."

23 Slide 19. The prosecution history here further confirms that the
24 Applicant for the '315 Patent meant metal impurities to encompass
25 intentionally introduced dopants consistent with the term's plain and
26 ordinary meaning. During the prosecution of a current application to the

1 '315 Patent, the examiner rejected a claim that included an identical
2 limitation to Claim 10 of the '315 Patent based on a patent application
3 publication called Yelundur, with essentially the identical disclosure as
4 Choi. And in response, the Applicant didn't argue, as Maxeon is trying to do
5 here, that impurity somehow excludes intentionally introduced dopants.
6 Instead, what the Applicant did is amend the claims to include other
7 limitations to avoid prior art.

8 Now, in its sur-reply, Maxeon attempts to dismiss this evidence of
9 how the Applicant itself as well as the examiner understood the meaning of
10 impurities by arguing, first, that the file history is cut off; and second, that
11 the Applicant possibly might have disputed the examiner's apparent
12 interpretation of metal impurities but just didn't include that in the written
13 record. We would suggest that Maxeon's arguments fail for two primary
14 reasons.

15 First, while it's true that the rejection appears cut off in the file
16 history, that makes no difference because Yelundur only uses the term
17 impurities to refer to intentionally introduced dopants and Maxeon has not
18 identified any other disclosure from Yelundur on which the rejection could
19 possibly have been based. And second, while we don't know what the
20 record -- what the Applicant may have argued off the record, whatever it
21 argued off the record is irrelevant as a matter of law in determining the
22 meaning and scope of the patent.

23 And further, we know what the Applicant did. It sought claims for
24 citing an emitter having metal impurities and then when faced with a prior
25 art reference with the same disclosure as Choi, it amended the claims to
26 overcome the rejection without any written record or argument that the

1 intentionally introduced dopants disclosed by the prior art are not the right
2 kind of impurities.

3 Slide 20. Maxeon has made a series of alternative arguments of
4 why metal impurities, as used in the '315, don't cover doping metal
5 impurities. First, Maxeon contends that metal impurities has two plain and
6 ordinary meanings, the second being narrower than the first and the second
7 one excluding metal impurities -- excluding doping metal impurities. But
8 Maxeon has not cited any reference defining impurities so narrowly,
9 defining impurities as limited to undesired foreign metals in the
10 semiconductor or solar fields.

11 And second, Maxeon contends that if impurities is not construed as
12 undesired foreign materials, then it should be redefined as contaminants
13 only, based upon the specifications statement at column 5, lines 8 and 9, that
14 contaminants and/or impurities can be used interchangeably. That language
15 does not mean, as Maxeon suggests, that the word contaminants somehow
16 replaces the word impurities in the claim. An emitter having metal
17 impurities, as Claims 10 and 16 require, still must cover metal impurities
18 and not just contaminants, which are a subset of metal impurities.

19 And as the Federal Circuit explains in the Cochlear Bone
20 Anchored Solutions case cited in our reply brief, the plain meaning of a
21 and/or b is a only, b only, or a and b. So same contaminants and/or
22 impurities can be used interchangeably doesn't mean that the claim language
23 regarding emitters having metal impurities can somehow be limited to
24 emitters having contaminants only. If Maxeon had intended the claims to be
25 limited to contaminants, as opposed to the broader term metal impurities, it
26 should have used the word contaminants in the claims.

1 Now, in addition, Maxeon cites three cases in its sur-reply: Baran,
2 Tehrani, and Wasica. They are not on point. In Baran and the Tehrani
3 cases, the Court construed two different claim terms to have the same
4 meaning where the intrinsic evidence had used them interchangeably. With
5 the '315 Patent, we're addressing a single claim term, metal impurities. That
6 claim term must cover those impurities and contaminants -- again,
7 contaminants being a subset of impurities.

8 In Wasica, like here, the Patentee sought a narrow construction of
9 the term emit to exclude wired communications to avoid prior art. And
10 notably, the Court there initially said, quote, "Absent a clear disavowal or
11 alternative lexicography by a Patentee, he or she is free to choose a broad
12 term and expect to obtain the full scope of its plain and ordinary meaning."

13 And there, the Court concluded that the plain and ordinary
14 meaning of emit is simply to send out and should not be construed to
15 exclude wired communications. Here, as in Wasica, the Patentee chose to
16 claim the broader term impurities, as opposed to contaminants alone or
17 undesired foreign materials or any other narrower term.

18 Also notably, the Court in Wasica held that, quote, "Using the
19 disjunctive or, as in numbers or symbols, designates numbers and symbols
20 as distinct alternatives to one another." And that's what the '315 Patent does
21 when it refers to contaminants and/or impurities. The claim must cover
22 both.

23 Slide 21. As I guess a backup, Maxeon argues for the first time in
24 its sur-reply that the Patentee both clearly and unambiguously disclaimed the
25 portions of impurities that covers tokens or alternatively, that the Patentee
26 clearly manifested their intent to act as their own lexicographer. First, both

1 of those arguments should be deemed waived because Maxeon raised them
2 for the first time only in its sur-reply. Second, Maxeon's lexicography and
3 disavowal arguments in its sur-reply are contrary to Dr. Schubert's testimony
4 about plain and ordinary meaning and also contrary to what Maxeon itself
5 said, in its Patent Owner response, where it suggested that plain and ordinary
6 meaning should control. And third, Maxeon's arguments, just on their
7 merits, are wrong.

8 For disavowal, the intrinsic evidence must include expressions of
9 manifest exclusion or restriction. And for lexicography, the Patentee must
10 clearly set forth a definition of the disputed term, must clearly express an
11 intent to redefine the term. Here, the intrinsic evidence meets neither
12 standard. To the contrary, it points in the opposite direction.

13 As discussed, the file history shows that in prosecuting a parent to
14 the '315 Patent, the Applicant didn't dispute that metal impurities includes
15 doping metal impurities. And the Patentee's repeated use of contaminants
16 and/or impurities is the opposite expression of manifest exclusion. If the
17 specification had said something like, for purposes of this patent the term
18 metal impurities shall mean contaminants, that would be lexicography. But
19 the reference to contaminants or impurities indicates that the items are
20 alternatives to each other, that is metal impurities in the claims covers both,
21 not that one is somehow redefined by the other.

22 Slide 24. Let me turn now to the combinations of Choi, per
23 Cousins with Istratov. And again, Your Honors need only reach the issues
24 involving Istratov if you apply metal impurities differently from what you
25 did in the institution decision. If metal impurities is understood to
26 encompass doping metal impurities, then Choi alone discloses the emitter

1 region having metal impurities limitation, and there's no need to rely on
2 Istratov for that limitation.

3 In addition to Choi disclosing the metal impurities limitation under
4 plain and ordinary meaning, both Choi or Cousins with Istratov render
5 obvious that limitation under either party's proposed construction and for
6 three primary reasons. As Hanwha explained in its petition, at pages 43
7 through 45 and 70 through 71, for example, there was a motivation to reduce
8 the metal impurity concentration in Choi's and Cousins' substrates through
9 Istratov's gettering process to improve solar cell efficiency.

10 Now, many of Maxeon's arguments against the Choi and Istratov
11 and Cousins and Istratov combinations appear for the first time in its sur-
12 reply. Those should be rejected as untimely. We'd also suggest that they're
13 not supported by anything other than attorney arguments. And as I'll explain
14 in a moment, on their merits, the evidence developed in this proceeding
15 shows that they are also wrong.

16 Slide 25. Starting with the first reason for why a skilled artisan
17 would have been motivated to combine Choi or Cousins with Istratov, it's
18 undisputed that by 2014, gettering was a well-known way to reduce the
19 harmful effects of metal impurities in the silicon semiconductor devices.

20 Slide 26. And in addition to the admissions of Maxeon's experts,
21 there are simply a wealth of publications from before 2014 of record that
22 describe gettering as necessary for and widely used in solar cell fabrication
23 because the solar cell materials were of relatively low quality -- much, much
24 lower quality than used for microprocessor fabrication. As Dr. Holman,
25 Hanwha's expert, explained, gettering was needed for solar cell fabrication
26 using either multicrystalline silicon or monocrystalline silicon, such as Choi

1 or Cousins. Before 2014, both those forms of silicon typically contain
2 significant amounts of metal impurities for which gettering was needed.

3 In addition, solar cell fabrication itself, that process, introduced
4 significant amounts of metal impurities into the production lines and
5 gettering was therefore necessary -- a prerequisite, as the publications and
6 Dr. Holman explained, for solar cell fabrication as of 2014.

7 Slide 28, please. Turning to the second reason for the motivation
8 to combine Choi or Cousins with Istratov, Istratov teaches an effective
9 process to getter metal impurities through a similar structure of layers as
10 those found in Choi's and Cousins' solar cells. And specifically, Istratov
11 teaches a process in which the iron and copper metal impurities are moved
12 from the silicon substrate through the silicon dioxide layer into the
13 polysilicon layer.

14 Slide 29. And if we look side by side with Choi, Cousins, and
15 Istratov, we see that they all have a very similar structure of a silicon
16 substrate, silicon dioxide layer, and polysilicon layer. On this slide, those
17 corresponding layers are annotated in blue, orange, and red in Choi's and
18 Cousins' solar cells, respectively. And for that reason, the teachings of
19 Istratov regarding the behavior of iron and copper impurities apply equally
20 to Choi and to Cousins.

21 Slide 30, please. Now, Maxeon tries to rebut the motivation to
22 combine by arguing that Istratov's gettering process would have been
23 detrimental to Choi or Cousins. First, we suggest respectfully that that's just
24 attorney argument that lacks anything but the most conclusory speculative
25 support from Dr. Schubert. And second, a POSITA would have adapted
26 Istratov's gettering process for Choi's and Cousins' solar cells to avoid any

1 detrimental impacts.

2 And Dr. Holman explains this at length in his reply declaration,
3 how Choi's silicon dioxide layer, located between the substrate and
4 polysilicon layer, is thinner than Istratov's silicon dioxide layer. So to avoid
5 any detrimental impact, a POSITA would have simply turned down
6 Istratov's gettering temperature or reduced the processing time when
7 implementing Istratov's gettering process in Choi's solar cell.

8 Slide 31. Maxeon also tries to rebut the motivation to combine by
9 suggesting, in its Patent Owner response, that there might not be a
10 temperature-time combination for implementing gettering in Choi and
11 Cousins without damaging their solar cells. But Dr. Holman rebutted that in
12 paragraphs 81 and 82 of his reply declaration by showing that a skilled
13 artisan would have been able to calculate a time-temperature combination to
14 implement gettering in Choi and Cousins, such as by using gettering
15 simulation tools that were widely available before 2014. He cited
16 references, including the one we see on Slide 31, describing software tools
17 that simulate contamination in gettering processes.

18 Slide 32. In its Patent Owner response, Maxeon spends a
19 considerable amount of time trying to argue that Istratov is not analogous
20 art. But as I'll show, Dr. Schubert, Maxeon's expert, could not defend that
21 argument in his deposition. And Maxeon hardly mentions the issue at all in
22 its sur-reply.

23 Slide 33. In its Patent Owner response, Maxeon had argued that
24 Istratov is not analogous art because Istratov is in the integrated circuits
25 field. But Dr. Schubert contradicted that argument in his deposition by
26 testifying, incorrectly testifying, that the semiconductor field encompasses

1 solar technology and that they are not separate fields because solar cells are
2 made of semiconductors.

3 Slide 34. Maxeon also attempted in its POR to argue that Istratov
4 is not analogous art because Istratov reportedly moves metal impurities in
5 the opposite direction compared to the '315 Patent. But again, Dr. Schubert
6 admitted in his deposition, as shown on this slide, that Istratov's gettering
7 process moves iron and copper metal impurities in the same direction as the
8 '315 Patent.

9 Slide 35. Dr. Schubert also agreed when deposed that both Istratov
10 and the '315 Patent are directed to improving device efficiency by reducing
11 recombination caused by metal impurities through gettering. And because
12 Istratov is pertinent to the very same problem addressed by the '315 Patent,
13 it's analogous art.

14 Slide 36. In its sur-reply, Maxeon has argued for the first time that
15 gettering may not necessarily move the impurities into the polysilicon layer.
16 Again, that's unsupported attorney argument, and it's undermined by Dr.
17 Schubert's own deposition. Dr. Schubert admitted in his deposition, as
18 shown on the screen, that Figure 4 of Istratov showed that copper had moved
19 through the silicon dioxide layer into the polysilicon layer.

20 Slide 37. Turning to the third reason for the motivation to combine
21 Choi or Cousins with Istratov, there would have been a motivation to reduce
22 the metal impurities level in Choi's and Cousins' substrates using Istratov's
23 gettering process to improve overall solar cell efficiency. Now, at
24 institution, Your Honors question whether Choi discloses, quote, "the
25 presence of metal impurities in its silicon substrate," and also questioned
26 whether Cousins has the same shortcomings as Choi.

1 So let me take those head on if I can. Cousins expressly discloses
2 that metal contamination was present in the substrate. Specifically, as
3 shown on Slide 37 on the screen, Cousins discloses at column 4, lines 23
4 through 25, quote, "cleaning of substrate 101 to remove metal
5 contamination."

6 And as Dr. Holman explains in his reply declaration, at paragraph
7 155, a skilled artisan would have understood based on this disclosure and
8 Cousins, that the metal contamination in the substrate was present in the
9 silicon wafers and also introduced through solar cell processing using steps,
10 such as etching and sawing. And Cousins discloses etching and sawing
11 processing steps in the same paragraph when describing the metal
12 contamination in its substrate and therefore, a POSITA would have
13 recognized that it would be desirable to apply the teachings of Istratov's
14 gettering to Cousins to reduce the metal contamination in Cousins substrate
15 and improve Cousins' solar cell efficiency.

16 Slide 42, please. Turning to the Choi base grounds, Maxeon
17 argues that there was no motivation to combine because Choi doesn't
18 explicitly disclose its substrate contains metal impurities. Choi didn't need
19 to explicitly disclose its substrate contains metal impurities because as I've
20 explained, a POSITA as of 2014 would have known that silicon substrates,
21 such as those used in Choi and Cousins, contained high levels of metal
22 impurities, particularly iron, that needed to be gettered.

23 And again, the record is just replete with publications to this effect.
24 As shown on the publications on this slide, there were significant levels of
25 these metal impurities in silicon wafers for solar cells. These impurities
26 were present in the silicon wafers both from the silicon feedstock and from

1 the solar cell fabrication process. The solar industry used lower quality
2 silicon substrates than the microelectronics industry and therefore, as of
3 2014, gettering was a prerequisite to the production of efficient solar cells.

4 Slide 44. Because metal impurities were a pressing concern in the
5 solar industry as of 2014, it would have been a motivation to combine
6 Istratov's gettering process with Choi's and Cousins' solar cells so as to
7 reduce the detrimental metal impurities in their substrates. And again, we
8 can go to Dr. Schubert's deposition. He agreed that as of 2014, a POSITA
9 would have known that metal impurities in solar cells are sources of
10 recombination and lead to poor lifetime and lower solar cell efficiency.

11 And with that, I will turn it over to Mr. Hobgood to continue our
12 presentation.

13 MR. HOBGOOD: Let's go to Slide 47. And thank you, Your
14 Honors. John Hobgood for Petitioner Hanwha Solutions Corporation. I'll
15 address the second disputed issue with respect to Independent Claim 10, and
16 that's the dopant concentration. Next slide, please.

17 Specifically, Claim 10 recites a silicon substrate, wherein a portion
18 of the silicon substrate has a dopant concentration of approximately less than
19 or equal to $2 \times 10^{18} \text{ cm}^{-3}$ and wherein the portion of the silicon substrate is
20 formed at the front side of the solar cell. Now, there's no dispute that Choi
21 and Cousins disclose a front surface field that corresponds to this claimed
22 portion of the silicon substrate. Moreover, although Choi and Cousins do
23 not disclose the dopant concentration of their respective front surface fields,
24 there's no dispute that Marvin and Granek each disclose a front surface field
25 having a dopant concentration less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$.

26 Slide 49, please. So, as an initial matter, front surface fields are a

1 form of surface passivation and have been known since at least the 1970s.

2 Slide 50. The claimed dopant concentration of less than or equal $2 \times 10^{18} \text{ cm}^{-3}$
3 ^{3} was also widely disclosed. Granek and Marvin, from the obviousness
4 grounds on this Slide 50, are just two examples.

5 Slide 51. Numerous publications prior to 2012 disclosed that such
6 a dopant concentration would balance surface recombination and J_0
7 recombination, such as 3 shown on Slide 51. Next slide. Thank you.

8 I'll start with the teachings of Granek. Slide 53, please. Maxeon
9 does not dispute that Granek discloses the claimed dopant concentration.
10 Rather, Patent Owner only argues that one of ordinary skill in the art would
11 not have used the disclosed concentrations below $2 \times 10^{18} \text{ cm}^{-3}$ in the solar
12 cells of Choi and Cousins. Now, Granek provides precisely the type of
13 methodology a person of ordinary skill in the art would follow to find the
14 appropriate dopant concentration for the front surface fields of Choi and
15 Cousins.

16 Specifically, Granek starts with conducting a series of simulations
17 and then verifies the simulation results with experiments, as shown here in
18 Figure 7-1 and Figure 7-3, Granek found that a front surface field dopant
19 concentration less than 2×10^{18} , as required by Claim 10 results in an
20 improved solar cell efficiency.

21 Slide 54. At institution, Your Honors considered Granek's Figure
22 7-1 and agreed that this figure, quote, "shows that the highest efficiencies are
23 expected when the dopant concentration is $1 \times 10^{18} \text{ cm}^{-3}$." Next slide.

24 Similarly, at institution, Your Honors considered Granek's Figure 7-3 and
25 agreed that this figure shows that the highest efficiencies are expected when
26 the dopant concentration is around $1 \times 10^{18} \text{ cm}^{-3}$.

1 Slide 56. One of ordinary skill in the art would have been
2 motivated to apply the teachings of Granek to the solar cells of Choi and
3 Cousins. Choi and Cousins disclose solar cell structures with front surface
4 fields. However, neither Choi nor Cousins discloses the specific dopant
5 concentration of those layers. But as shown in Granek, dopant
6 concentrations below 2×10^{18} were well within the range of values one of
7 ordinary skill in the art would have considered in 2014.

8 As a result, there was nothing inventive or nonobvious about
9 choosing a front surface field dopant concentration of, quote, approximately
10 less than or equal to $2 \times 10^{18} \text{ cm}^{-3}$ and as Your Honors agreed at Institution,
11 stating specifically that the use of Granek's concentration was a, quote,
12 "predictable use of prior art elements according to their established
13 functions."

14 Slide 57. Maxeon's criticisms of Granek boil down to saying that
15 Granek does not disclose that dopant concentrations of 1×10^{18} are preferred.
16 However, the law does not require the particular combination to be the
17 preferred or the most desirable one in the prior art. For this reason alone, the
18 Board should reject Maxeon's arguments against the combinations of Choi
19 and Granek and Cousins and Granek. Moreover, as I will now explain,
20 Maxeon is taking Granek's teachings out of context and Maxeon is incorrect
21 that $1 \times 10^{18} \text{ cm}^{-3}$ is not the preferred concentration.

22 Slide 58. First, Maxeon argues that Granek's experimental results
23 indicate that 3.8×10^{18} shows the highest efficiency. But this is wrong
24 because taking all of Granek's teachings, one of ordinary skill in the art
25 would have understood that a front surface field dopant concentration below
26 2×10^{18} was desirable. Here we see on Slide 58, the Board found that

1 Hanwha's expert, Dr. Holman, was persuasive in stating that Granek's
2 experimental results corroborate his simulation results, that a front surface
3 field dopant concentration within the claimed range would result in
4 improved solar cell efficiency.

5 Slide 59. Specifically, Granek's experimental results confirm that
6 reducing the front surface field dopant concentration results in increased
7 solar cell efficiency. The graphs and tables depicted in this slide show
8 Granek's experimental results. For example, Figure 7-10 on the left side of
9 this slide shows solar cell efficiency increases with decreasing front surface
10 field dopant concentration by capturing the relationship between front
11 surface field sheet resistance and the saturation current density. Similarly,
12 Table 7-5 on the right of this slide shows that solar cell efficiency increases
13 as front surface field dopant concentration decreases.

14 Although Granek did not fabricate a solar cell with a front surface
15 field dopant concentration as low as 1×10^{18} , his experimental results show
16 that reducing the front surface field dopant concentration results in improved
17 solar cell efficiency. In other words, one of ordinary skill in the art would
18 have expected that decreasing the front surface field dopant concentration
19 below 3.8×10^{18} would have resulted in a solar cell efficiency of greater than
20 20.8 percent.

21 Slide 60. Maxeon argues that a person of ordinary skill in the art
22 would take from Granek a front surface field dopant concentration of greater
23 than 2×10^{18} , which Maxeon alleges is appropriate when the front surface
24 recombination velocity is above 500 centimeters per second. Specifically,
25 Maxeon argued that Figure 7 point -- 7-1 of Granek shows that for front
26 surface recombination velocities above 500 centimeters per second, solar

1 cells with a front surface field dopant concentration of $1 \times 10^{19} \text{ cm}^{-3}$ are more
2 efficient than solar cells with a lower front surface field dopant
3 concentration.

4 However, as Dr. Holman explains, one of ordinary skill in the art
5 would not have expected such high front surface field dopant -- front surface
6 recombination velocities for Choi and Cousins because both disclose
7 structures for passivating the front surface of the solar cell. And as Dr.
8 Holman explains, by 2014, front surface recombination velocities lower than
9 500 centimeters per second were easily achievable and common.

10 Slide 61. Indeed, Granek itself shows that the surface
11 recombination velocity for a dopant concentration of 1×10^{18} corresponds to
12 100 centimeters per second. Analyzing Granek's teachings for front surface
13 recombination velocities that correspond to well passivated surfaces, as is
14 the case for Choi and Cousins, one of ordinary skill in the art would have
15 understood that a front surface field dopant concentration of around 1×10^{18}
16 cm^{-3} would have resulted in increased solar cell efficiency.

17 Let's move to Slide 70, please. I'll now address Maxeon's
18 arguments regarding Dependent Claims 13 and 14. Slide 71. Dependent
19 Claim 13 and 14 specify that the claimed portion of the silicon substrate,
20 which corresponds to the front surface field, comprises a P-type dopant in
21 Claim 13 and specifically boron in Claim 14.

22 Slide 72. First, Maxeon does not dispute that the additional
23 limitations of Claims 13 and 14 would have been obvious under the
24 combinations of Choi and Marvin. So if the Board agrees that it would have
25 been obvious to implement Marvin's dopant concentration in Choi's front
26 surface field, then Maxeon does not dispute that Dependent Claims 13 and

1 14 would also have been obvious with respect to the combination of
2 Granek's dopant concentration with Choi, in a P-type front surface field.

3 Maxeon also cannot credibly dispute that a P-type silicon
4 accounted for nearly the entire market as of the priority date of the '315
5 Patent and was cheaper than N-type silicon, and Maxeon hasn't attempted to
6 provide any evidence to the contrary. Rather, Maxeon argues that a person
7 of ordinary skill in the art wouldn't have been motivated to implement
8 Granek's dopant concentration in P-type silicon because N-type silicon may
9 have had some benefits over P-type silicon, which Maxeon apparently
10 contends would dissuade one of ordinary skill in the art from doing what
11 nearly the entire market was doing and what would have resulted in a more
12 expensive product. But it's well established that a motivation to combine
13 can arise from technologically independent improvements, including costs.

14 Slide 73, please. Maxeon criticizes the use of Granek's dopant
15 concentration with P-type silicon because Granek discloses higher surface
16 recombination velocities for boron rather than for phosphorus, which would
17 affect the optimal dopant concentration. But Maxeon ignores that the
18 surface recombination velocities for P-type dopants in Granek does not
19 reflect the state of the art as of the priority date in 2014. Rather, Granek
20 points to the parameterization of a reference from 1997.

21 However, as shown in Figure 4 of Hoex, by at least 2007, it was
22 known that similarly low surface recombination velocities could be achieved
23 for both N- and P-type dopants. And in fact, Maxeon doesn't dispute any of
24 this in its sur-reply. Instead, they say that it's a new theory and that the
25 Board should ignore it. But this is wrong. The Petitioner is simply
26 responding to an argument raised in Maxeon's Patent Owner response and

1 Petitioner is clearly permitted by the rules and controlling precedent to
2 respond to such an argument.

3 Slide 74. Maxeon cannot credibly argue that one of ordinary skill
4 in the art would not have been able to implement Granek's dopant
5 concentration in a P-type front surface field. First, the '315 Patent itself
6 claims both N-type and P-type front surface fields but discloses only one
7 dopant concentration and it doesn't describe any adjustments to account for
8 different types of dopants or dopants of a different polarity.

9 Dr. Schubert even asserted that one of ordinary skill in the art
10 would have been able to practice the '315 Patent, quote, "as it is described,"
11 that is, without any guidance on how to implement the same dopant
12 concentration in both N- and P-type silicon. Thus, Claims 13 and 14 are
13 unpatentable over the combinations involving Granek as well as those
14 involving the combinations with Marvin.

15 And if Your Honors have no other questions, I'll reserve the
16 remaining time for our rebuttal.

17 JUDGE ROSS: I did have a question about claim construction in
18 relation to Patent Owner's Slide 5, pointing to Petitioner's reply, page 2. Is
19 that characterization of Petitioner's proposed construction accurate in that
20 they say Petitioner is giving the term metal impurities it's plain and ordinary
21 meaning, i.e., any element that is foreign to the elements of the host
22 material, including intentionally introduced dopants?

23 MR. HOBGOOD: I'm sorry, Your Honor, I didn't quite follow.
24 Could you repeat it for me?

25 JUDGE ROSS: Patent Owner is saying the Petitioner's proposed
26 construction is plain and ordinary meaning, specifically any element that is

1 foreign to the elements of the host material including intentionally
2 introduced dopants; is that accurate?

3 MR. HOBGOOD: Yes, Your Honor. That is the claim
4 construction that Petitioners are advancing, as such that it would include the
5 metal contaminants that are in there and intentionally introduced metal
6 dopants.

7 JUDGE ROSS: All right. It does say any element rather than any
8 metal. Is that your position?

9 MR. HOBGOOD: In order for it to be a metal impurity, that
10 element that would -- the foreign element would need to be a metal.

11 JUDGE ROSS: So would it be accurate to read that as any metal
12 that is foreign to the elements of the host material, or are you sticking with --

13 MR. HOBGOOD: No. I would say for the construction for metal
14 impurity, it would be any metal that is foreign to the host material.

15 JUDGE ROSS: And then it seems like there is at least some
16 overlap between your plain and ordinary meaning proposed construction and
17 Patent Owner's proposed construction in that they say undesired foreign
18 metals. The foreign metals part seems to be common to both, but the
19 undesired part of Patent Owner's proposed construction is obviously not
20 common. What is your best explanation as to where the undesired portion
21 comes from? Does it come from the specification? Is it something that
22 Patent Owner has derived from some other source?

23 MR. HOBGOOD: It's our position, Your Honor, that the
24 specification does not support inserting the word undesired, that Patent
25 Owner must be pulling that from outside the record.

26 JUDGE ROSS: Thank you.

1 MR. HOBGOOD: Thank you, Your Honor.

2 JUDGE KOKOSKI: Thank you for that. I've got you at 15
3 minutes left for your rebuttal. Patent Owner, you can begin when you're
4 ready.

5 MR. SNODGRASS: Thank you. Just one second while I pull up
6 our slides?

7 JUDGE KOKOSKI: Of course.

8 MR. SNODGRASS: And may I proceed, Your Honors?

9 JUDGE KOKOSKI: Yes, please proceed.

10 MR. SNODGRASS: Right. I have our demonstratives which have
11 been filed as Exhibit 2041 in this proceeding. First I want to address claim
12 construction, which should be addressed before we compare the prior art to
13 the to the claims. On Slide 4, we have reproduced the instances of where the
14 only disputed term metal impurities appears in the challenged claims.

15 On Slide 5, we have the parties' respective proposed constructions.
16 Following up on that discussion at the end of Petitioner's presentation, we
17 want to clarify our reproduction of Petitioner's proposed construction. They
18 say plain and ordinary meaning, and we've tried to search their papers for
19 what they contend that to be. And we found that at their reply page 2 and
20 that's what we've reproduced there.

21 It is our contention that our construction is also a plain and
22 ordinary meaning of metal impurities. We contend that the term has
23 multiple plain and ordinary meanings. So just to be clear, that is not our
24 -- in any way, a concession as to what we believe the plain and ordinary
25 meaning to be. In fact, we believe there could be multiple plain and
26 ordinary meanings.

1 And the specification is the best guide as to what a claim term
2 means. Often it is dispositive, as the Federal Circuit tells us. And we spent
3 very little time talking about the specification in Petitioner's presentation.
4 Here is an instance where the Board definitely should render a construction.
5 It should not say that no construction is necessary or that the plain and
6 ordinary meaning applies. Because as the Federal Circuit recognized in O2
7 Micro, multiple plain and ordinary meanings can be applicable. And by
8 rendering a plain and ordinary meaning construction that does not resolve
9 the party's dispute. Thus, per the Federal Circuit's direction in O2 Micro, the
10 Board should issue a construction on this term and resolve the parties'
11 dispute.

12 Here on Slide 7, we have another directive from the Federal
13 Circuit. The Board should not ask what is the plain and ordinary meaning of
14 this term in the abstract, but rather what is the plain and ordinary meaning
15 within the context of the specification.

16 Slide 8 is another similar directive from the Phillips case. All that
17 matters is what these terms mean in the context of the patent. And the patent
18 tells us very explicitly what metal impurities means, what impurities means.
19 Column 5, lines 8 through 9, as referred throughout -- which is the entirety
20 of the patent, including the claims -- contaminants and/or impurities can be
21 used interchangeably. Petitioner spent very little time on this very important
22 passage.

23 As best we can understand, they have a quibbling with the word
24 interchangeably and suggesting that that somehow does not convey
25 equivalence of the meanings. That is refuted by multiple Federal Circuit
26 decisions that we have cited in our papers and reproduced here at Slides 10

1 and 11.

2 Here, the Federal Circuit often will use the word interchangeably,
3 or some variation thereof, to show the equivalency between various terms.
4 Multiple terms have the same meaning. They are used interchangeably.
5 That is why the Federal Circuit has found in the Baran case on Slide 10 and
6 also in the two cases quoted here on Slide 11.

7 If that wasn't enough, if column 8 -- excuse me, column 5, lines 8
8 through 9, was not enough, there's other portions of the specification that
9 support Patent Owner's construction. The specification is solving a problem
10 of metals that are not desired, that are not yielding a benefit to a device but
11 are instead inhibiting the proper function of a device. And the specification
12 accomplishes or solves that problem by, among other things, transferring
13 those metals from the substrate into an emitter region. That only makes
14 sense if those metals are contaminants, if they're undesired foreign metals, if
15 they're purposefully introduced dopants, that doesn't achieve the purpose of
16 the '315 Patent.

17 So the passage here on Slide 12, from column 5, lines 1 through 5,
18 is one instance in which the '315 Patent is conveying the purpose of its
19 solution, and that is to get the metal impurities -- which are detrimental
20 when they're in the substrate -- to a different region of the device. Figure 1
21 is also relevant. We have that also reproduced here on Slide 12. That's an
22 instance in which the patent is very clearly using dopant separate from
23 contaminant. And this contrasts -- this shows a contrast between how the
24 specification will often use contaminants and impurities interchangeably in
25 the same breath, never uses impurities and dopants in the same breath.

26 So all the intrinsic evidence supports Patent Owner's construction.

1 The extrinsic evidence need not be considered. It's less helpful. And the
2 intrinsic evidence is dispositive. Nevertheless, it likewise supports Patent
3 Owner.

4 Petitioner made a bold claim, in one of their papers that they've
5 still not backed down from, and that is that publications in the field
6 consistently use impurities to include intentionally introduced dopants. That
7 is disproven by exhibits that Petitioner itself has introduced into this
8 proceeding. Their statement is reproduced on Slide 13.

9 Slide 14, we have one of their exhibits which in many instances
10 talks about contamination as a result of impurities and draws that link
11 between impurities and contaminants. Exhibit 1047 never uses impurities to
12 refer to dopants. And that's a point even their expert, Dr. Holman, conceded.
13 When asked if Exhibit 1040 ever uses impurities to refer to dopants, he had
14 to admit that it does not.

15 Exhibit 1033, here on Slide 16, is another instance where
16 impurities is used to show something that causes contamination. And
17 Exhibit 1033 never uses impurities to refer to a dopant. So it's Petitioner's
18 statement that publications in the field consistently use impurities to
19 encompass dopants is simply invalid.

20 I want to discuss Dr. Schubert's textbook, which supports our
21 contention that there are multiple meanings to metal impurities. And it's
22 telling that in this textbook, Dr. Schubert devotes a good portion of his
23 preface to the etymology of impurities. And he has to -- and he explains that
24 when it was discovered that one could introduce a foreign element into a
25 semiconductor device and achieve positive benefits -- but before the
26 introduction of the word dopant, the field had to broaden the term impurity

1 to cover that introduced metal that yielded positive benefits.

2 So we have highlighted here on Slide 17, Dr. Schubert's
3 recognition that the term impurity was, quote, "broadened." And then he
4 goes on to explain how, in 1963, the word dopant came along and that could
5 be used to refer to a purposefully introduced foreign material that yields
6 positive benefits.

7 And it's very telling that Dr. Schubert here, in the preface of his
8 book, alerts the reader to how impurity may be used in his book under that
9 broadened definition. And that contrasts with the '315 Patent's specification,
10 which clearly tells a person of ordinary skill in the art that impurity refers to
11 contaminants. It can be used interchangeably with that term.

12 For extrinsic evidence dictionary definitions, here we have Exhibit
13 2030, this is on Slide 18. This well encapsulates the multiple meanings the
14 term can have. We favor the first meaning, which is undesired foreign
15 material in a pure substance. Petitioner favors the second meaning.

16 And be that as it may, the Board need not decide in the abstract in
17 a vacuum which of these two definitions is correct. The specification tells
18 us which is correct. The specification says it's a contaminant. It is an
19 undesired foreign material. The first definition applies.

20 JUDGE ROSS: Let me just interrupt for a second. I'd like for you
21 to address Petitioner's argument about the and/or, if you could, how you
22 harmonize that. Because you seem to argue that "and" versus "or" means
23 "equal to". And I'd just like to hear a little bit more about that.

24 MR. SNODGRASS: Sure. Two things, I believe that Petitioner
25 cited a case where and/or was used in a patent claim and a Court had
26 weighed in on the default understanding of that conjunction, which it does

1 not apply here because we're not talking about a patent claim and we're not
2 reciting a and/or b being present in a claim where that's satisfied by a only, b
3 only, or a and b.

4 We have language in the patent, column 5 lines 8 through 9
5 -- jump back to it, as referred throughout, contaminants and/or impurities
6 can be used interchangeably. Trying to apply that holding of what and/or
7 may mean in another patent in a patent claim, when it makes sense in this
8 context, one would try to say as modifying this passage as referred
9 throughout, contaminants only, and/or impurities only, and/or contaminants
10 and impurities can be used interchangeably.

11 Is that Petitioner's suggestion? If so, that seems illogical and does
12 not seem to elucidate the passage at all. I think the Patentee, by using and/or
13 -- not only here but throughout the specification -- was using it in a way of
14 equating both sides of that conjunction.

15 I also heard something today too -- which possibly I misheard
16 because it did not appear in any of their papers, but I thought I heard the
17 contention that in view of the and/or, the claims require impurities and
18 contaminants. If that is in fact Petitioner's position, then their grounds are
19 defeated. They have not shown that Cousins or Choi discloses contaminants
20 and impurities. They have a theory that Choi discloses impurities because it
21 discloses dopants, but they do not contend that it shows contaminants. And
22 they don't even contend that Cousins discloses impurities in the relevant
23 emitter region.

24 So again, Your Honor, while "and/or" may be used to mean a
25 particular thing in some other patent that was addressed in some other case
26 and perhaps is used that way elsewhere, it doesn't -- that doesn't fit -- that

1 meaning doesn't fit in the context of this patent, of the '315 Patent. And
2 that's what we're trying to get at.

3 At the end of the day, we're trying to understand what did the '315
4 Patent inventors want to claim, what did they intend? So we need to try to
5 understand the way that they're using "and/or," and that's to show
6 equivalence.

7 JUDGE KOKOSKI: Counsel, I have a follow-up question on that.
8 I can see your argument. If it just said "and," contaminants and impurities
9 could be used interchangeably, what is the "or" doing there? Contaminants
10 or impurities can be used interchangeably? What is your position on that?

11 MR. SNODGRASS: Yeah. Your Honor, it's just the conjunction
12 that the Patentee has favored. "And/or" appear -- is replete in the '315 Patent
13 and it's a conjunction that when read -- when the '315 Patent is read in its
14 entirety, it is clear that the inventors are meaning to equate those terms.

15 We can scrutinize the specification and query whether different
16 language could have been used to convey the same concept, but that's not
17 what we should be doing in the context of claim construction. Claim
18 construction, we're trying to understand what the Patentee's meanings
19 -- meaning is.

20 And they're using a and/or conjunction to convey equivalence.
21 Perhaps they could have gotten away with it by using a shorter conjunction,
22 just an "and," but the slash or does not defeat their attempt to equate these
23 terms.

24 JUDGE KOKOSKI: Okay. Thank you.

25 JUDGE ROSS: I have a follow-up question. If we're looking at
26 that slide and reading the phrase as contaminants and impurities, or reading

1 the phrase as contaminants or impurities, both of those readings infer that
2 contaminants and impurities are different. But your position is that by using
3 the word interchangeably, the drafters intended here to equate the two terms,
4 contaminants and impurities, rather than distinguish them?

5 MR. SNODGRASS: Your Honor, yes, it is clear that by using
6 interchangeably here in this passage, the inventors are telling a person of
7 ordinary skill in the art reading this patent that when you see contaminants
8 or when you see impurities, you can use either one; they're interchangeable.
9 So whatever you see, you can think the other.

10 And you struck on a point there where you proposed that maybe
11 "and" was the conjunction, or maybe "or" was the conjunction. Perhaps that
12 is the inventor's desire there was to erase any sort of ambiguity. Was "and"
13 the preferable term? Was "or" the preferable term? Well, "and/or" covers
14 everything. And maybe that was their way of safely ensuring that these
15 terms are going to have the same meaning throughout this patent.

16 JUDGE ROSS: I'm curious to see how the "and/or" term appears
17 in other parts of the patent. Because if I recall correctly, there are other
18 portions of the patent where "and/or" is used and it does -- does it do the
19 same thing in other usages within the specification, or is it always used in
20 this particular manner, as it is in column 5, lines 8 through 9, where it's
21 intended to equate terms on either side of the and/or conjunction?

22 MR. SNODGRASS: Your Honor, what equates the terms is
23 interchangeably. So the and/or by itself doesn't necessarily convey an
24 equivalence. What conveys the equivalence is this entire passage right here
25 that includes interchangeably. There's two terms here, and they're used
26 interchangeably.

1 The conjunction and/or, you can use and, you can use or, you can
2 use and/or. Either way, I have two terms, and the Patentee is telling me I
3 should be reading those interchangeably. Frankly, there's -- in order to give
4 this passage any meaning, I cannot interpret impurities to be something
5 different than contaminants or vice versa, two terms and interchangeably. I
6 think the conjunction is --

7 JUDGE ROSS: So we're back where the --

8 MR. SNODGRASS: I'm sorry, Your Honor?

9 JUDGE ROSS: Please finish.

10 MR. SNODGRASS: I was just going to say I think the
11 conjunction is subsidiary. I think it could be "and," I think it could be "or,"
12 and I think it could be "and/or." And I think it'd have the same meaning.

13 JUDGE ROSS: Thank you. And I'll ask you the same question I
14 had asked Petitioner's counsel about where the undesired term in your
15 proposed construction comes from. There was a dictionary definition that
16 used undesirable, I believe. But if you could provide a little more
17 background, that would be appreciated.

18 MR. SNODGRASS: Yes, Your Honor. So Slide 19, I think, starts
19 to answer that. I don't believe that there's been a dispute from Petitioner as
20 to what a contaminant is. And here, we have a dictionary that both parties
21 have cited, Exhibit 2030. Contaminate is to render unfit or to soil by the
22 introduction of foreign or unwanted material.

23 We have another dictionary on Slide 20, Exhibit 2031. We have
24 the concept of an undesirable element there on the last line. So undesired,
25 unwanted, we're not wedded to any particular word there. But it definitely
26 excludes a dopant, which is purposefully introduced.

1 JUDGE ROSS: Thank you.

2 MR. SNODGRASS: Turning to Slide 21, there was some
3 discussion about the prosecution history of the -- I believe it's the great, great
4 grandparent. And Petitioner seems to know things that are not in the record.
5 They have declared today and they say in their slides that they know that the
6 Applicant did not make a certain argument. But the Applicant made
7 arguments that we don't know what they are because they were in an
8 examiner interview. And we do know that the Applicant disputed the
9 examiner's rejections. So we know that there was some issue that the
10 Applicant thought was lacking in the examiner's rejections and Petitioner has
11 no basis to assert that it was not this metal impurities limitation.

12 Another issue is -- and wouldn't it be surprising if it was because if
13 you look at the office action -- this is going to be on Slide 19 of their
14 demonstratives, the office action doesn't really say what is alleged to be the
15 metal impurities in the prior art reference. They cite on that slide, paragraph
16 40, of the Yelundur reference but 40 is discussing dopants that are in the
17 substrate, nothing that would be an emitter region, so that's in opposite. So
18 in view of all these unknowns, it would be inappropriate to find that the
19 Applicant somehow acquiesced to some meaning that was 180 degrees from
20 what they say in the specification.

21 And here we have on Slide 21, we have Petitioner's assertion on
22 the reply, which they doubled down on today, that contrasts with the actual
23 record, which is at lower part of Slide 21. The Applicants are disputing that
24 they did not initially amend the claims. After the interview, they were
25 unable to persuade the examiner and then later amended the claims. We cite
26 authority in our sur-reply that an Applicant is not charged with fighting tooth

1 and nail every examiner rejection. So a later amendment just to get around
2 the rejection is not an acquiescence in everything the examiner has said
3 before.

4 Choi and Cousins do not disclose the metal impurities limitation
5 -- this is Slide 22. There's no contention from Petitioners that Cousins
6 discloses metal impurities. And they only contend that Choi discloses it if
7 metal impurities is understood to encompass dopants, which it should not be
8 for the foregoing reasons.

9 I'll jump ahead to Slide 25 where we'll start with the Istratov
10 combination. Slide 26, we have reproduced certain portions of the
11 institution decision where the panel found lacking Petitioner's obviousness
12 arguments with Istratov. And they told the Petitioner what was lacking,
13 namely Petitioner failed to explain, one, why a POSITA would have been
14 concerned with the level of metal impurities in the substrate in Choi or
15 Cousins; two, what level of metal impurities would be detrimental; and
16 three, what detriment the metal impurities would cause.

17 Petitioner did not address those issues in this trial. The panel
18 invited the parties to further explore these issues during the trial and
19 Petitioner elected not to. There is a lot of discussion today and in the papers
20 about metal impurities in certain references. It's unclear what legal theory
21 Petitioner is operating under.

22 They said today very clearly that they're not operating under an
23 inherency theory, trying to distinguish themselves from Canadian Solar. But
24 what we heard today sounded a lot like quasi-inherency arguments, which
25 would necessarily fail because Petitioner has not shown first that either Choi
26 or Cousins has an alarming number or an appreciable number of metal

1 impurities, or that the only way to get rid of those would be to transfer them
2 from a substrate to an emitter region.

3 It's telling here that Petitioner's own expert, in his declaration, said
4 that gettering was only required in solar cells with significant impurity levels
5 in the wafer. So in order to show that gettering would have been necessary
6 or even obvious, Petitioner should be showing that either Choi or Cousins
7 has significant metal impurity levels, and it has utterly failed to do that.

8 I do want to take a second here to talk about gettering. Petitioners
9 would have the Board believe that gettering satisfies the claims. In other
10 words, if there's gettering, then there's metal impurities in the emitter region.
11 And that is not true. For one thing, gettering does not even necessarily
12 include removal of a contaminant. And this was explained by Dr. Carroll in
13 his deposition and un rebutted by Petitioner.

14 Second, even if you are employing a version of gettering that
15 removes a contaminant or an impurity, it can travel to different locations. It
16 doesn't need to go to a specific region. And the claims require that
17 impurities are in the emitter regions.

18 So for example, there was some discussion today about a passage
19 in Cousins where there's some -- through a sawing process, there may be
20 some contamination. And then there's a quick cleaning of that process. That
21 cleaning occurs before the emitter region is even created on the substrate.
22 So whatever cleaning is going on there, certainly it's not being transferred to
23 an emitter region.

24 So again, in order for this Istratov combination to gain traction,
25 Petitioner would have to show that Choi or Cousins has significant metal
26 impurity levels, and it does not do that. In fact, Dr. Holman admitted that he

1 doesn't contend that Choi or Cousins necessarily has a significant level of
2 metal impurities. This is on Slide 28 of our demonstratives.

3 And in fact, if anything, it's likely that Cousins at least does not
4 have significant levels of metal impurities. Cousins assignee was SunPower,
5 which was a predecessor -- which is a predecessor, excuse me, to Maxeon,
6 the Patent Owner in this case. And the -- it was known that SunPower
7 -- here, I'm looking on the right-hand side of Slide 29, SunPower was using
8 wafers with lifetimes greater than 1 millisecond.

9 So what is a lifetime of 1 millisecond? How does that relate to
10 impurities? Well, we can look at the chart here on Slide 30. This comes
11 from one of Petitioner's exhibits. In fact, we saw a variation of it, I believe,
12 earlier today, where there's -- the relationship shown between iron atoms and
13 a lifetime. And keep in mind, we also cite in our paper how Cousins not
14 only has the asking yield of SunPower in the 1 millisecond passage here on
15 slide -- excuse me, in Exhibit 1084.

16 But Cousins also says that the lifetime of the substrate can be 2 to
17 5 milliseconds. So we're talking about somewhere between 1 to 5
18 milliseconds likely in Cousins. That's literally off this chart. This chart goes
19 down to a lowest impurity level of 1×10^{11} atoms cm^{-3} . That yields a lifetime.
20 This is on a log scale, so it's a little difficult to know the number precisely.
21 But it's well less than 1000 microseconds, which would be 1 millisecond.

22 So 1 millisecond, or possibly as high as 5 milliseconds, which is
23 what Cousins likely has, is literally off this chart and likely something less
24 than 1×10^{10} atoms cm^{-3} , far less than we see in these other references that
25 that Petitioner has scattered throughout its papers and shown us today.

26 And the same thing with Choi. Choi -- there was a statement today

1 that Choi's silence is not surprising or not an impediment to Petitioner's
2 theory because other references show that metal impurities could be -- could
3 exist in a substrate. There are a couple of problems with that. I thought we
4 had just been told that they were not relying on inherency, and that sure
5 sounds like an inherency argument. And two, Petitioner does not discharge
6 its burden by showing what is possible in the prior art. They would need to
7 show that Choi necessarily would have had significant levels of metal
8 impurities before we even need to think about gettering.

9 And then if we're at gettering, then we can decide what form of
10 gettering are we going to do. Is it going to be something where we're
11 introducing another atom to effectively remove the initial contaminant
12 -- which of course wouldn't result in contamination moving to the emitters
13 -- or some other process somewhere else in the manufacturing line that
14 would maybe remove the undesired metals but not necessarily put them in
15 the emitter region?

16 JUDGE KALAN: Counsel --

17 MR. SNODGRASS: So Istratov -- yes, Your Honor?

18 JUDGE KALAN: Excuse me. What significant -- how would you
19 quantify significant metal impurities? What's significant, I guess, is what
20 I'm trying to find out.

21 MR. SNODGRASS: Well, this is Dr. Holman's word, and so one
22 would reasonably expect Petitioner to explain what that level is and why
23 Choi and Cousins have that level, but we don't get that from Petitioners.
24 What we do know is that it's certainly not everything, because Dr. Holman is
25 telling us gettering was only required where there is a significant level. So
26 naturally, there's some level that you can achieve that's not significant where

1 gettering is not required.

2 So what it is, I don't think is actually all that relevant. Because
3 under their theory -- which again, they represent it's not inherency, but it
4 sure kind of sounds like inherency -- they need to show Choi or Cousins has
5 metal impurities that have to be dealt with a certain way. And they've
6 simply not even tried to satisfy that burden. And they fail because Choi or
7 Cousins likely can have these level of metal impurities that are lower than
8 what's even measured on this chart on Exhibit 1139.

9 I think, you know, if it's off this chart, if it's lower than the chart
10 that Petitioners have put into the record, then it's certainly not significant.
11 That would be our position. But again, this would be -- it's properly a
12 question for them, what is significant and why does Choi and Cousins
13 necessarily have that level?

14 JUDGE KALAN: Okay. Thank you.

15 MR. SNODGRASS: So Petitioners would have the Board believe
16 that Dr. Carroll thinks that gettering is a necessary prerequisite in solar cell
17 fabrication. He does not have that opinion. And what we have here on Slide
18 31, he's discussing how solar cells can be made from lower quality silicon.
19 And then he says, you don't have to do that. You can use the higher quality
20 stuff, but it will cost you more.

21 And that statement undercuts entirely this theory that they have,
22 that gettering is required, must use low quality silicon, it must be full of
23 metal impurities, and you must getter it and you must getter a certain way to
24 result in metal impurities in the emitter region. Dr. Holman does not have
25 that opinion; Dr. Schubert does not have that opinion; and neither does Dr.
26 Carroll. So all three experts are in agreement on that position.

1 Here on Slide 32, I alluded to this earlier, this is Dr. Carroll
2 explaining how gettering encompasses a lot of things, including the
3 introduction of other materials that effectively remove the first material.
4 Obviously, that form of gettering would not help Petitioners because it
5 doesn't remove any materials from the substrate, much less put them in any
6 particular region, i.e., the emitter region. That point also is unrebutted.

7 One other point on Dr. Carroll's testimony, Petitioner told the
8 Board in its last filed paper, which is Paper 47, that it was not relying on Dr.
9 Carroll's testimony for the truth of the matter. And that's impossible to
10 square with the arguments in its papers and with the arguments we heard
11 today. Petitioner is clearly relying on Dr. Carroll's testimony, which was
12 provided in the CSI IPR, IPR2024-01038 -- not in this proceeding, so it's
13 hearsay -- and they're relying on that for the truth of the matter. They're
14 relying on it to show -- to prove what Dr. Carroll has said.

15 Now if they wanted to rely on some other hearsay exception, they
16 could have done that in their Paper 47, which is the opposition to the motion
17 to exclude. They chose not to. They went all in on this idea that they're not
18 relying on it for the truth of the matter, which is defeated by the arguments
19 we heard today and the arguments that we see in their papers.

20 So in here, on Slide 33, we have an excerpt from their opposition
21 paper. On Exhibit 1029 is Dr. Carroll's deposition transcript from the CSI
22 IPR. And the same applies for the declaration of Dr. Carroll in that
23 proceeding as well as Dr. Ruby's testimony in other proceedings. Those are
24 hearsay; they should be excluded. But if they're not, they should not be read
25 as supporting truth of the matter. We're happy with them. They actually
26 support us.

1 Like I said, Slide 32, this is nice testimony from Dr. Carroll which
2 does a good job of defeating Petitioner's theories. But Petitioner should, you
3 know, come out and say something consistent. Either it's relying on these
4 out of proceeding statements and -- for the truth of the matter -- and there's a
5 hearsay exception that applies -- or they're not relying in them at all. And
6 they should not rely on them.

7 Now, I want to switch over to Slide 34 and talk about the doping
8 concentration limitation. This is a separate independent basis to reject all of
9 the grounds. The ground relying on Choi should be rejected for the
10 foregoing reasons. Choi does not disclose contaminants. And the Choi and
11 Cousins Grounds should be rejected because the combination with Istratov is
12 unsound. As a separate basis, it would not have been obvious to implement
13 Choi or Cousins with the doping concentration required by the claims, which
14 is less than 2×10^{18} .

15 For all grounds, the Petitioner relies on Marvin and Granek. And
16 Petitioner has misread Granek. Granek teaches that a doping concentration
17 in a terrestrial environment, which is what Petitioner's theories are based on,
18 should be 5×10^{18} . That's outside the claim range.

19 Marvin says that in the conclusion on page 25 of it's -- of that
20 paper here, reproduced here at Slide 35. And the passage specifically talks
21 about a low radiation environment. And on slide -- excuse me, on page 16,
22 also on Slide 35, Marvin draws the link between a low radiation
23 environment and a terrestrial environment.

24 Petitioner had a curious response to this finding. Petitioner
25 complains that this relates to a space use. Marvin is related to space. I mean
26 the title is Interdigitated Back Contact Silicon Solar Cell Analysis and

1 Design Recommendations for Space Use. And this is a reference that they
2 voluntarily put into every single one of their grounds. And now they're
3 complaining that it doesn't apply because it deals with space and their theory
4 is terrestrial.

5 The only instance in which Marvin uses terrestrial is on page 16,
6 when it talks about a low radiation environment. Page 25, the conclusion,
7 says in a low radiation environment use 5×10^{18} .

8 Jumping forward to Slide 37, the range that they like, the Petitioner
9 likes, 1×10^{17} to 1×10^{18} appears where there's a different design. And that's
10 for high radiation environments. Those are space uses, the very uses that
11 Petitioner claims its theory is not based on, in the same basis that it must
12 want to criticize our theory. It's relying on the space-based numbers.

13 And Petitioner's confusion may be attributable to its expert not
14 meaningfully reviewing this reference. He was unaware that Marvin even
15 discussed 5×10^{18} as being an ideal doping concentration when he was
16 directed to it. In his deposition, he confessed that he needed to spend more
17 time with that reference with Marvin. That is an unsatisfying response. This
18 is, again, a reference in every single one of their grounds. And their expert
19 was unfamiliar with its key conclusions.

20 I want to discuss Granek. Granek likewise does not show that
21 1×10^{18} is an optimal doping concentration. Here we have on Slide 40 one of
22 the figures that Petitioner relies on heavily and it shows that the green,
23 which is 1×10^{19} , is preferable to 1×10^{18} for a wide range of recombination
24 velocities. And this is on a logarithmic scale.

25 So even though appears that roughly half of this range, the right-
26 hand half, is preferable at 1×10^{19} , it's actually much, much greater than that.

1 It's actually anything over 500 and this graph goes all the way to 105, so
2 that's 100,000. So anything from 500 centimeters per second to 100,000
3 centimeters per second is preferable at 1×10^{19} over 1×10^{18} . That's one issue
4 that we have with the reliance on Granek.

5 And importantly, 1×10^3 is a common typical recombination
6 velocity. There was some discussion about super low recombination
7 velocities being -- I think easy may have been the word used. I don't believe
8 there's any evidence that supports that, possible would be something
9 different. But to say it would be easy is I don't believe supported by the
10 record. And possible doesn't get you there. You'd have to show that it's
11 obvious.

12 Why would a person of ordinary skill in the art have gone to the
13 great expense of getting a super low recombination velocity with the
14 prospect of achieving an efficiency gain that is, in Dr. Schubert's words,
15 negligible and probably smaller than the uncertainties that result in the
16 simulations that yielded these? Both of those points -- Dr. Schubert had two
17 points here: one, it'd be expensive to go low on your recombination velocity;
18 and two, these gains are likely illusory. And both of those points were
19 un rebutted by Petitioner.

20 Here we have on Slide 41 the evidence that 1,000 -- so in this
21 -- 1,000 centimeters per second for recombination velocity. Here, we have
22 1×10^{19} is preferable to 1×10^{18} . This is per Granek itself.

23 Petitioner also relies on Figure 7-3 -- this is on 42. In its petition,
24 it reproduces this image and cites Figure 7.3. That's only half of 7.3. 7.3
25 here on Slide 43, on the left-hand side is -- actually has two images. The
26 one on the top is very unfavorable to Petitioner. It shows an optimum

1 doping concentration of 1×10^{19} .

2 What is the difference between those two figures -- those two
3 images, excuse me, on Figure 7-3? Well, it's what is the surface
4 recombination velocity. In the top one, it's 1×10^6 . In the bottom one, it's
5 provided by a model proposed by Cuevas. And I'm pretty sure the Petitioner
6 today criticized that very model that they're relying on in trying to argue
7 against Claims 13 and 14. But we'll get to that in a second.

8 But what we do know about the Cuevas model is that it is
9 imprecise. We know that because -- let me jump forward here to Slide 61
10 -- it has recombination velocity as a function of doping concentration only.
11 Here, I'm on the left-hand side of Slide 61, the Figure 3-6, we know that's
12 not right because King, which is one of Petitioner's exhibits -- I'm going to
13 jump back up to Slide 46 -- says that it is strongly dependent on
14 technological factors, some of which are difficult to control. It then lists
15 some of those factors.

16 So recombination velocity depends on many things other than
17 doping concentration. So that already calls into question Cuevas' model
18 upon which Petitioners rely heavily. And again, Figure 7-3 is relying on a
19 Cuevas model, at least the bottom half is the one that Petitioners cite.

20 On Slide 44, there was some discussion today; we see it in their
21 papers too. Petitioners insist that Choi and Cousins have, quote, "well
22 passivated front surfaces." There's no evidence that supports that. This long
23 string cite that follows that assertion is curious. It's curious that they need to
24 have so many different cites for one proposition, suggests that maybe none
25 of those do. And in fact, none of them actually do. None of the cites
26 actually support that proposition.

1 Dr. Schubert's deposition transcript, he said that Choi and Cousins
2 have passivated surfaces. He never said they were poorly passivated, well
3 passivated, or anything in between. And these other references do not even
4 purport to describe how well Choi's or Cousins' surfaces are passivated. So
5 this is an unsupported assertion. And this is their way of trying to explain
6 away Figure 7-1 and it's unavailing. I want to address Claims 13 and 14 --

7 JUDGE KOKOSKI: Petitioner?

8 MR. SNODGRASS: Yes, Your Honor?

9 JUDGE KOKOSKI: Sorry, Patent Owner, you are just going into
10 your rebuttal time. You're free to keep going. Just wanted to flag that for
11 you.

12 MR. SNODGRASS: Thank you, Your Honors. I do want to
13 spend a couple of minutes on Claims 13 and 14. These have further
14 limitations regarding "the portion," quote, unquote. This is the portion at the
15 front of the substrate -- excuse me, at the front of the solar cell, that is doped
16 with a dopant at a concentration less than 2×10^{18} , as we have been
17 discussing, okay? Claims 13 and 14 further require that this doping -- this
18 dopant, excuse me, be a P-type dopant and a particular boron.

19 Petitioner's theories fall apart for these two claims because all this
20 evidence that we've been discussing from Granek, about Figure 7-3, Figure
21 7-1, those were all modeled based on phosphorus as the dopant. And you
22 get very different results when you use boron as a dopant. In fact, we can
23 use the same logic that Petitioner puts forward using the same evidence, and
24 we see that Claims 13 and 14 are not obvious.

25 In particular, we heard today Petitioners cite Figure 3-6, and they
26 pointed to -- on Slide 61, they pointed to a surface recombination velocity

1 of, they said, 100 if you have a doping concentration of 10^{18} . That's,
2 according to Figure 3-6, only for phosphorus. Using boron, you get a very
3 different result.

4 Here on the right-hand side of Figure 3-6 -- I'll jump forward to
5 Slide 62 -- where the red arrow is, that's at 10^{18} doping concentration. The
6 surface recombination velocity there is greater than a thousand. So we're
7 well into the region. Even under Granek's view of things under -- even
8 under Granek's simulations, 1×10^{19} is preferable to 1×10^{18} .

9 And we have that here -- we've had that Figure 7-1 reproduced on
10 figure -- excuse me, on Slide 62. And of course, it goes without saying, a
11 person of ordinary skill in the art would understand they wouldn't be limited
12 to 1×10^{18} or 1×10^{19} . They would understand that numbers like 5×10^{18} are
13 also available.

14 In fact, that's what Marvin teaches, and Marvin is part of every
15 ground. There was some discussion that we don't dispute a Marvin
16 combination, that it doesn't -- we don't dispute that it teaches certain
17 limitations. We do dispute that Marvin disputes -- excuse me, discloses
18 anything because Marvin discloses a doping concentration outside of the
19 claim range. So again, we are using Petitioner's evidence, Petitioner's theory
20 for boron or N-type dopant, we don't get the claimed range.

21 So with that, Your Honor, I will reserve the remainder of my time.

22 JUDGE KOKOSKI: Okay. Thank you. I have you at 12 minutes
23 for your rebuttal.

24 MR. SNODGRASS: Thank you, Your Honor.

25 MR. SELWYN: Your Honor, may I proceed?

26 JUDGE KOKOSKI: Petitioner, you may begin when ready.

1 MR. SELWYN: Thank you, Your Honor. Let's start, if we can,
2 with claim construction of the metal impurities limitation. And if we could
3 turn to Maxeon Slide 12, Maxeon pointed to the specification statement that,
4 quote, "Metal impurities can be detrimental to the electromagnetic
5 conduction of the solar cell, as these impurities can be sources of
6 recombination."

7 That specification statement, that metal impurities can be
8 detrimental, doesn't mean that metal impurities excludes doping metal
9 impurities, nor does it say that all metal impurities are always detrimental.
10 Rather, the statement simply means that some or certain metal impurities can
11 be detrimental. And no one disagrees with that because the plain meaning of
12 impurities includes intentionally introduced dopants as well as contaminants.

13 With respect to Figure 1, also shown in Maxeon Slide 12,
14 contaminants and dopants are both subsets of impurities. So referring
15 specifically to those subsets doesn't suggest that impurities is redefined to
16 mean contaminants. If anything, it shows that the Patentee knew how to
17 distinguish between contaminants and dopants when it needed to do so.

18 Maxeon has also pointed to several of our references to suggest
19 that they support a narrower construction. They do not, as shown in Maxeon
20 Slide 14 -- if we can pull that up, Istratov-2000, that's Exhibit 1047, uses
21 impurities consistent with plain meaning of impurities because the plain
22 meaning of impurities includes contaminant impurities. It's not limited to
23 contaminant impurities, however. On Maxeon Slide 15, the same is true for
24 Exhibit 1033, Perichaud. There's no indication that any of those references
25 uses impurities to exclude doping impurities.

26 And if we turn to Maxeon Slide 18, Maxeon also pointed to a

1 technical dictionary to suggest that extrinsic evidence supports its proposed
2 construction. That's not right. In Petitioner's reply brief and also as shown
3 on Hanwha's Slide 17, we've offered multiple technical dictionaries,
4 including Exhibits 1108 and 1109 that define impurities to include
5 intentional doping.

6 And we need to go no further than Maxeon's own dictionary here,
7 Exhibit 2030, page 1058, which includes a definition of impurities specific
8 to solid state field, that is semiconductors, that includes intentional doping
9 impurities. In short, none of Maxeon's citations to reference this usage of
10 impurities is inconsistent with impurities, including intentionally introduced
11 dopants. The references describe subsets of impurities, which are not
12 inconsistent with impurities, including dopants.

13 And to be clear, Hanwha is not arguing that impurities is
14 synonymous or coextensive with dopants. Rather, dopants are a subset of
15 impurities, and it's well understood that impurities includes other things.
16 And then the last thing I'll say on claim construction is using and/or would
17 be extraneous, superfluous if impurities is limited to only contaminants.

18 So let's move now to the combinations of Choi and Cousins with
19 Istratov -- if we can pull up Maxeon Slide 27. Maxeon has taken Dr.
20 Holman's testimony out of context to argue that gettering would not have
21 been needed in Choi and Cousins because their wafers purportedly did not
22 contain significant metal impurity levels.

23 And there was a suggestion in the presentation you just heard that
24 Hanwha just whiffed on this issue, that it didn't have any discussion of what
25 significant means. That's not right. Dr. Holman's reply declaration,
26 beginning at paragraphs 50 through about paragraph 56, discussed this in

1 some length.

2 Dr. Holman also testified in paragraph 65 and 66 of his reply
3 declaration that the solar cell materials in Choi and Cousins as of 2014 had
4 significant metal impurity levels and therefore gettering was a prerequisite.
5 Specifically, he testified that the solar grade wafers that Choi and Cousins
6 used -- contain significant levels of metal impurities, explained what that is,
7 and that independence of the metal impurities contained in those solar grade
8 wafers, the fabrication process itself introduced additional metal impurities
9 on the production lines.

10 And he also explained that a POSITA as of 2014 would have
11 known that the levels at which the metal impurities were present was
12 detrimental to solar cell efficiencies and that represented significant metal
13 impurities. If we can show Hanwha Slide 26. This is why gettering was
14 described in the publications as, quote, "a prerequisite for the production of
15 efficient solar cells," which is shown on the first excerpt of Exhibit 1095.

16 Turning to Hanwha Slide 27, Dr. Carroll -- and you heard a lot in
17 Maxeon's presentation about Dr. Carroll -- actually, I didn't mention him
18 once in my presentation. But since Maxeon has, I will as well. Dr. Carroll
19 was Maxeon's original expert in this IPR and he agreed during his deposition
20 in the Canadian Solar IPR proceeding that gettering was typically needed for
21 solar cell fabrication. He testified that the solar cell industry needed to do
22 post-processing as part of the silicon solar cell fabrication typically through
23 gettering.

24 Now, if we turn to Maxeon Slide 28, Maxeon is suggesting that
25 there wouldn't have necessarily been a motivation to combine because Choi
26 and Cousins don't necessarily contain iron or copper. Maxeon is trying to

1 apply an inherency standard to Hanwha's combination of express teachings
2 in Choi or Cousins with Istratov. Hanwha is not relying on inherency to
3 establish the existence of a claim limitation, rather, to establish the metal
4 impurities limitation, we are relying on express disclosures from Istratov of
5 metal impurities present in the polysilicon regions.

6 Maxeon's attempt to apply a heightened inherency standard to this
7 combination of express disclosures is legally incorrect. The proper
8 framework for obviousness under KSR provides that the motivation to
9 combine can be found in the background knowledge possessed by a person
10 of ordinary skill in the art. And that's what we have done.

11 We can turn to Hanwha Slide 40, please. Slide 40 from Hanwha
12 -- to dispute the clear teachings from Cousins that metal contamination was
13 present in its substrate, Maxeon's sur-reply raised an argument for the first
14 time -- and it was just mentioned a moment ago -- based on Cousins'
15 disclosure, that the silicon substrate may comprise a long lifetime. And
16 Maxeon advanced the argument that Cousins' statement that the silicon
17 substrate may last -- may comprise a long lifetime must mean that the level
18 of iron contamination and Cousins' substrate is minuscule. That ignores the
19 record.

20 Dr. Holman explained that this disclosure from Cousins doesn't
21 mean that its substrate contains minuscule levels of impurities. The reason
22 that Cousins substrate could have a high lifetime is because metal impurities
23 were removed through gettering during solar cell fabrication.

24 And with that, in our last few minutes, let me turn it back to Mr.
25 Hobgood.

26 MR. HOBGOOD: Thank you, Your Honors. So let's turn to

1 Marvin, Petitioner's Slide 64, please. So Maxeon relies on a higher dopant
2 concentration of 5×10^{18} from Marvin's conclusion section, which Marvin
3 clearly teaches in that same paragraph is for solar cells designed for space
4 use. And we don't run from that; we don't hide from that. Rather, what we
5 recognize is that one of ordinary skill in the art would read the entire
6 reference and would take from it everything that is offered.

7 The Maxeon's assertion, that the low radiation environment in that
8 same paragraph corresponding to 5×10^{18} means it's for terrestrial
9 environments is simply not right. In that same paragraph, Marvin
10 emphasizes that the doping concentration is for space use for missions and
11 much more critical for 100 sun operation. Elsewhere, in Marvin, as shown
12 on this slide, Marvin teaches that for space use and for end-of-life, those
13 base cell parameters are appropriate, which include the 5×10^{18} .

14 If we could go to Patent Owner's Slide 37, please. Petitioners are
15 accused of misreading Marvin, but that's not the case. Rather, we're reading
16 all of Marvin. Maxeon tries to argue that based upon a separate disclosure
17 from Marvin's page 25, that the range of 1×10^{17} to 1×10^{18} is for high
18 radiation environment. But again, that's for a different embodiment than
19 Marvin's page 15, which is what Petitioner relies upon for its combination.

20 The disclosure from page 15 of Marvin -- we see it on the lower
21 portion of this -- of Patent Owner's Slide 37, this is what Petitioner relied
22 upon. It's for a beginning-of-life measurement at 1 sun radiation, which
23 that's what's appropriate for terrestrial cells. And we see the range is, quote,
24 "around 1×10^{17} to 1×10^{18} ."

25 Finally, if we could go to Patent Owner Slide 38, Maxeon cites two
26 select portions from Dr. Holman's deposition transcript to suggest that he

1 was not familiar with Marvin. That's not the full story during his deposition.
2 If one reads the full transcript, not these two cites separated by pages, Dr.
3 Holman clearly testified that he read and considered all of Marvin and that
4 Marvin's disclosure of 5×10^{18} was for different conditions than beginning-of-
5 life and 1 sun conditions, which is what Dr. Holman relied upon for the
6 claimed dopant concentration.

7 Let's please go to Maxeon Slide 46. Maxeon also argues -- now,
8 we're speaking of Granek, Maxeon also argues that low surface
9 recombination velocities were difficult to achieve and very expensive. But
10 the paper that is being cited by Maxeon to support this was published in
11 1990. And as Dr. Holman explains, by 2014, solar cell technology has
12 significantly improved, and it was well-known how to achieve front surface
13 recombination velocities below 500 centimeters per second. Indeed, Dr.
14 Holman explains that it was known how to achieve surface recombination
15 velocities as low as 10 centimeters per second.

16 If we could go to Petitioner's Slide 60, Maxeon criticizes the use of
17 a portion of Granek's Figure 7.3. Specifically, they say that instead of using
18 the lower portion, which is what Petitioners use, one of ordinary skill in the
19 art would have used the upper portion. It's clear, as pointed out -- as Dr.
20 Holman pointed out in his declaration, that Cousins and Choi both disclose
21 structures for passivating the front surface of the solar cell. Dr. Schubert, in
22 his deposition transcript, agreed that they were passivated.

23 And it's striking the difference between the top portion of 7.3 and
24 -- I'm sorry, I don't have Figure 7.3 here on the screen, but this is getting at
25 the surface recombination velocity. The striking difference between the top
26 portion of 7-3 and the bottom portion is the top portion is clearly for surfaces

1 that are not passivated or even metallized. And even Dr. Schubert agreed
2 with that during his deposition. Whatever the value may be, it is clear that
3 the bottom portion of Figure 7-3 for passivated surfaces would apply
4 because the experts agree that both Choi and Cousins disclose structures for
5 passivating the front surfaces of a solar cell.

6 If we could then move to -- I want to move back to Maxeon's Slide
7 41, please. Maxeon points to references that Petitioner used to support these
8 higher surface recombination velocities. To be clear, we're not criticizing
9 what was done in the references that we advanced, but rather criticizing
10 Patent Owner's use of information that's not current, that was not what was
11 the state of the art at the time of the '315.

12 And so keeping that in mind, both Claims 13 and 14 are
13 unpatentable. Resurface combination velocities in the proper range could
14 have easily been achieved. Our reference Hoex shows that. And Maxeon
15 has not disputed that Hoex shows that the low surface recombination
16 velocities could be achieved.

17 And I think that's my time. Thank you, Your Honors.

18 JUDGE KOKOSKI: Thank you very much. Patent Owner, you
19 can begin when you're ready.

20 MR. SNODGRASS: Thank you, Your Honor. I'll try to address
21 the points that Petitioner raised in order. First, Petitioner did not defend the
22 statement that we have on Slide 13, that publications in the field consistently
23 use impurities to include intentionally introduced dopants. That was the
24 purpose of the excerpts on Slides 14 through 16. And again, that statement
25 is incorrect and undefended by Petitioners.

26 Petitioners did not answer the question of what is a significant

1 level of metal impurities and also why is it that Cousins and Choi necessarily
2 have that level of mental impurities. Again, we heard conflicting arguments
3 from Petitioner as to whether or not they're relying on inherency. They
4 declare not to be, and yet they are citing other references in an effort to show
5 what Cousins or Choi allegedly would have had.

6 We have put forward evidence that, at least for the case of Cousins,
7 it likely did not have levels of metal impurities that that are cited in other
8 references. And it certainly is the case that there's no evidence it must have
9 had such levels of metal impurities.

10 And that's just -- and that would be question zero for Petitioners.
11 From there, they'd have to then go to show how much would they have to
12 remove, what are the mechanisms by which they could remove it, and why
13 would it have been obvious to employ one mechanism that would result in
14 claims being satisfied, i.e., metal impurities being transmitted to the emitter
15 region? They have not answered those questions.

16 Petitioners suggest that Dr. Holman responded to this point in his
17 reply declaration. Well, a reply declaration is not a paper. Had Petitioner
18 actually put in some argument in their paper, we could respond. But having
19 their expert bury something in a reply declaration is not sufficient. They cite
20 their Slide 27 in their most recent response. And here we have more of Dr.
21 Carroll testimony.

22 Is it for the truth of the matter or is it not? They declare in a paper
23 to this Board that they are not relying on Dr. Carroll's testimony for the truth
24 of the matter. And yet everything we hear from them regarding Dr. Carroll,
25 they are quoting him in support of the truth of the matter that he asserted. So
26 something's not right.

1 We also heard an interesting argument regarding Istratov and that
2 was that the disclosure regarding impurities doesn't come from Cousins or
3 Choi, but it comes from Istratov. And that just turns obviousness on its
4 head. That makes no sense. One of skill in the art, in order to modify
5 Cousins or Choi, must have been prompted to do so based on the disclosure
6 of Cousins or Choi or what would have been inherent in Cousins or Choi.
7 One of skill in the art would not have been prompted to find impurities in
8 Choi because Istratov has impurities. One of skill in the art would not have
9 been prompted to find impurities in Cousins because Istratov has impurities
10 in its substrate. So that argument fails.

11 Their Slide 40, they have what they think is an answer to this low
12 level of metal impurities in Cousins. Cousins discloses the long lifetimes, 2
13 to 5 milliseconds, which are well off the chart. They say that perhaps those
14 were measured after some gettering occurred. That fails. Here on Slide 29,
15 if we look at the Exhibit 1084 -- this is one of Petitioner's exhibits -- just
16 above the highlighted portion, I'll read the entire sentence, because the
17 minority carriers must diffuse through the entire wafer thickness to reach the
18 collecting junctions at the rear, the IBC, Interdigitated Back Contact, solar
19 cell design requires extraordinarily high lifetime silicon starting material.

20 SunPower is using wafers of lifetimes greater than 1 millisecond.
21 That lifetime of 1 millisecond refers to the starting material, not the ending
22 material. So that argument from their expert on their Slide 40 fails.

23 They cite their -- page 64, they are suggesting, again, that this
24 5×10^{18} is for space applications. Again, this is just a curious argument, that
25 Marvin itself is directed at space applications and they voluntarily put
26 Marvin as part of their grounds. Every single one of their grounds has

1 Marvin in it. So that criticism is just -- it's just strange. It's also incorrect.

2 The only instance in which terrestrial appears in Marvin is on page
3 16 when it talks about low radiation environments. We rely on the
4 conclusion section of Marvin relating to low radiation environments.
5 Marvin's very clear, you use 5×10^{18} . That is ideal.

6 There's another issue kind of flowing around here, which is just
7 because Petitioners think they've found the magical doping concentration
8 somewhere in the prior art. We saw some new references today that weren't
9 in their paper, where they have found 10^{18} . This is on their Slide 51, those
10 are -- at least Exhibit 1103 is not in their papers. Just because it's maybe a
11 preferred doping concentration in some other design and some other
12 application does not mean it would have been appropriate in Cousins and/or
13 Choi. And that is another failure on of their obviousness theories.

14 Similarly, they contend that low surface recombination velocities
15 were achievable by 2014. And some of these references that we've seen
16 today are antiquated. And perhaps the state of the art -- that phrase was used
17 in the response just now, the state of the art designs were super low
18 recombination velocities.

19 Again, they've not disputed Dr. Schubert's observations that
20 attempting to achieve those recombination velocities would have been
21 expensive. Sure, getting the state-of-the-art device, you can do it, but it's
22 going to be expensive. Second, Dr. Schubert said that one of skill in the art
23 would not have been prompted to undergo such expense for likely illusory
24 benefits. Those points remain undisputed. So the question is not is it
25 achievable? The question is, would it have been obvious? Do the benefits
26 outweigh the costs? And there, Petitioners have failed to make that

1 showing.

2 Finally, there was some discussion about the Hoex reference,
3 which frankly surprised me. I was unfamiliar with that reference. I'm
4 suspecting that they are referring to an exhibit which they did not cite in any
5 of their papers. And that is Exhibit 1114 -- which I see on Slide 73 of their
6 demonstratives -- was not cited in any of their papers. So they make a big
7 deal by just not rebutting it, not responding to it. Well, we never had an
8 opportunity to. You never relied on it.

9 Same thing with Exhibit 1111, which we see on Slide 74. This is
10 all in relation to Dependent Claims 13 and 14. That's not cited in any of
11 their papers either. So this is all new. They're trying to backfill their weak
12 Claim 13 and 14 arguments, which are lacking and were exposed to be so in
13 our papers. It's improper for them to do so in an oral hearing, citing exhibits
14 for the first time.

15 The evidence that they cite, they rely on Claim 10. And their
16 methodology shows that when boron is used, you get high recombination
17 velocities. And it would not have been obvious to use a low doping
18 concentration, at least with boron and other P-type dopants.

19 With that, Your Honor, I'm happy to submit our case.

20 JUDGE KOKOSKI: Okay. Thank you. With that, the case is now
21 submitted to the panel for determination and preparation of the final written
22 decision. If the parties could just stay on the line for a few minutes after we
23 adjourn, in case the court reporter needs anything, we would appreciate that.
24 With that, we are adjourned.

25 (Whereupon, the above-entitled matter went off the record at 5:09
26 p.m.)

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Patent 11,251,315 B2

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