

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIATEK INC.,
PETITIONER

v.

PARKERVISION, INC.,
PATENT OWNER.

IPR2025-00030
U.S. Patent No. 8,498,593

**DECLARATION OF DR. LAWRENCE E. LARSON, Ph.D.
IN SUPPORT OF REPLY**

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EXHIBIT LIST

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EX1001	U.S. Patent No. 8,498,593
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EX1003	Larson Declaration
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EX1005	U.S. Patent No. 8,116,704
EX1006	File History of U.S. Patent No. 8,116,704
EX1007	U.S. Patent No. 7,427,897 (“Hau”)
EX1008	U.S. Patent 7,061,213 (“Yoshida”)
EX1009	Sahu <i>et al.</i> , “A High-Efficiency Linear RF Power Amplifier With a Power-Tracking Dynamically Adaptive Buck-Boost Supply,” IEEE Transactions On Microwave Theory And Techniques, Vol. 52, No. 1, January 2004 (“Sahu”)
EX1010	Declaration of June Munford
EX1011	U.S. Patent 6,646,511 (“Canyon”)
EX1012	Ranjan <i>et al.</i> , “Microwave Power Amplifiers with Digitally-Controlled Power Supply Voltage for High Efficiency and High Linearity,” 2000 IEEE MTT-S Digest (“Ranjan”)
EX1013	International Patent Application Publication No. WO 2007/084033 A1 (“Lejon”)
EX1014	Online copy of Ranjan <i>et al.</i> , “Microwave Power Amplifiers with Digitally-Controlled Power Supply Voltage for High Efficiency and High Linearity,” 2000 IEEE MTT-S Digest (“Ranjan”), obtained from https://web.archive.org/web/20031218101536id_/http://sigma.ucsd.edu:80/~mahim/mttfinal-colored.pdf
EX1015	Theodore Rappaport, <i>Wireless Communications: Principles and Practice</i> , 2 nd ed. (excerpts)
EX1016	Kassakian <i>et al.</i> , <i>Principles of Power Electronics</i> , 2 nd ed. (excerpts)

EXHIBIT No.	DESCRIPTION
EX1017	U.S. Patent No. 7,047,032 (“Yun”)
EX1018	U.S. Patent Application Publication No. US2006/0001410 (“Ishikawa”)
EX1019	[not used]
EX1020	[not used]
EX1021	[not used]
EX1022	[not used]
EX1023	[not used]
EX1024	James A. Kaehler, “Periodic-Switched Filter Networks: A Means of Amplifying and Varying Transfer Functions,” <i>IEEE Journal of Solid-State Circuits</i> , Vol. SC-4, No. 4 (August 1969)
EX1025	U.S. Patent No. 8,571,135 B2
EX1026	Guinee <i>et al.</i> , “A Novel Estimation Procedure for the Aperture Time in Asynchronous Sinusoidal PWM Systems,” The 2001 IEEE International Symposium on Circuits and Systems (Cat. No.01CH37196), Sydney, NSW, Australia, 2001, pp. 53-56 vol. 2
EX1027	<i>ParkerVision, Inc. v. MediaTek Inc. et al.</i> , Civ. No. 6:23-cv-00732, Motion for Extension of Time to Respond to Complaint (ECF No. 8) (W.D.Tex. Nov. 28, 2023)
EX1028	Krauss <i>et al.</i> , <i>Solid State Radio Engineering</i> , 1980 (excerpts)
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EX1032	<i>ParkerVision, Inc. v. MediaTek Inc. and MediaTek USA Inc.</i> , Civ. No. 6:23-cv-00732-ADA, email from Joshua J. Yi dated June 16, 2025
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EX1034	<i>ParkerVision, Inc. v. MediaTek Inc. and MediaTek USA Inc.</i> , Civ. No. 6:23-cv-00732-ADA, Plaintiff ParkerVision, Inc.’s Responsive Claim Construction Brief (ECF No. 84) (May 8, 2025)
EX1035	<i>ParkerVision, Inc. v. MediaTek Inc. and MediaTek USA Inc.</i> , Civ. No. 6:23-cv-00732-ADA, Plaintiff ParkerVision, Inc.’s Sur-Reply Claim Construction Brief (ECF No. 94) (June 3, 2025)
EX1036	Robert Boylestad & Louis Nashelsky, <i>Electronic Devices & Circuit Theory</i> , 7 th Ed., excerpts

I, Lawrence Larson, hereby declare as follows:

I. INTRODUCTION

1. I have been retained on behalf of MediaTek, Inc. (“MediaTek” or “Petitioner”) to offer technical opinions related to U.S. Patent No. 8,498,593 (“the ’593 patent”) (EX-1001).

2. I previously submitted a declaration (EX1003) in support of MediaTek’s petition for IPR of the ’593 Patent. Because EX1003 is already a matter of record, this declaration is intended only to respond to ParkerVision’s Patent Owner Response (Paper 14, “POR”) and the exhibits submitted therewith, including the Declaration of Dr. David Ricketts (EX2001). This declaration is based on the information currently available to me. To the extent that additional information becomes available, I reserve the right to continue my investigation and study, which may include a review of documents and information that may be produced, as well as testimony from depositions that may not yet be taken.

II. SUMMARY OF OPINIONS

3. Neither the Patent Owner Response nor the opinions expressed by Dr. Ricketts alter my previous opinion that the Challenged Claims of the ’593 Patent are invalid as obvious. Specifically, having reviewed the Patent Owner Response and Dr. Ricketts’ declaration, it is my opinion that all elements of the Challenged Claims are taught or suggested to a person of ordinary skill in the art (POSITA) by the grounds presented in the petition, including the combinations of Hau and Yoshida (or in further

combination with Sahu or Lejon), and Canyon and Ranjan (or in further combination with Hau or Lejon). It is further my opinion that the interpretation of the claims proposed by ParkerVision, which differs from the claim constructions proposed by MediaTek, is incorrect.

III. QUALIFICATIONS AND MATERIALS RELIED UPON

4. My background and experience are fully outlined in my previous declaration, EX1003.

5. In forming my opinions, I have relied on information and evidence identified in my previous declaration, as well as my review of the POR and Dr. Ricketts' declaration and the documents cited therein. I have further relied on the documents and evidence cited in Petitioner's Reply and in this Declaration, as well as my knowledge and experience in the relevant fields.

IV. PRIORITY DATE AND LEVEL OF ORDINARY SKILL IN THE ART

6. In my previous declaration, I offered the opinion that the appropriate priority date for the '593 Patent was November 9, 2006. Neither the POR nor Dr. Ricketts' declaration addresses the priority date of the '593 Patent.

7. In my previous declaration, I offered the opinion that at the relevant time, a person of ordinary skill in the art relating to the technology of the '593 Patent would have had (1) a Bachelor's degree in Electrical Engineering or a related subject, and two or more years of experience in the field of RF circuit design and/or power supplies for RF circuits, or at least five years of work experience and training in the design and

development of RF circuits and/or power supplies for RF circuits. Additional experience could substitute for the level of education and vice versa.

8. Dr. Ricketts (EX2001, ¶25) proposes a very similar definition of a person of ordinary skill in the art: “(a) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of work experience in the design and development of radio frequency circuits and/or systems, or (b) at least five (5) years of work experience and training in the design and development of radio frequency circuits and systems.”

9. Although very similar, there are slight differences between the two constructions. In my opinion, although the education and experience requirements that I specified might substitute for each other, it is important that such education and experience relate to RF circuit design and/or power supplies for RF circuits. A degree in computer engineering on its own, depending on the amount of coverage in the degree program of principles relevant to RF circuit design, would not necessarily be sufficient education for a POSITA for the technology of the '593 Patent which relates specifically to RF circuits and power supplies for such circuits.

10. However, I am a person of ordinary skill in the art under either definition, and would have been at the time of the alleged invention. In my opinion, the challenged claims of the '593 Patent are invalid according to a person of ordinary skill in the art under either definition.

V. CLAIM CONSTRUCTION

A. “Power Efficiency”

11. In my previous declaration, I proposed construing the term “power efficiency” as “the output power of the power supply compared to its input power.” I stand by that construction.

12. ParkerVision and Dr. Ricketts take issue with that construction, but they fail to explain any substantive error with this construction. Moreover, ParkerVision’s and Dr. Ricketts’ positions on the proper construction of the term are confusing. While ParkerVision asserts that the term should be given its “plain and ordinary meaning” and Dr. Ricketts says that the term “does not require a construction,” those assertions are inconsistent with their other arguments regarding the scope of the term.

13. Based on my review of the POR and Dr. Ricketts’ declaration, the actual dispute between the parties appears to be whether the “plain and ordinary meaning” of the term encompasses certain additional limitations proposed by ParkerVision and Dr. Ricketts that do not come from the plain language of the term “power efficiency” or its use in the claim:

- That the term excludes indirect measurements of power or power efficiency (EX2001, ¶70)
- That the claim requires “determining the power efficiency characteristics of the power supply and setting a threshold based on that determination.” (EX2001, ¶74).

14. As I will explain below, none of these purported requirements are supported by either the plain language of the claim or the specification. It is my opinion that the interpretations proposed by ParkerVision and Dr. Ricketts under the guise of “plain and ordinary meaning” are inconsistent with the actual disclosure of the ’593 Patent, and would read out all of the preferred embodiments disclosed in the ’593 Patent.

15. I will briefly address one issue raised by Dr. Ricketts, which I do not believe raises a substantive dispute. Specifically, Dr. Ricketts takes issue with the proposed inclusion of the words “...of the power supply” in the proposed construction. EX2001, ¶¶65-66. But the claim itself refers to “a power efficiency *of the power supply*.” In my opinion, this complaint by Dr. Ricketts does not raise a dispute over the scope of the claim, since the parties appear to agree that “power efficiency” refers to a relationship between input and output power.

16. Dr. Ricketts also argues that power efficiency must be a “ratio” of input power to output power. EX2001, ¶67. I disagree for two reasons. First, Dr. Ricketts does not cite anything suggesting either that the ordinary meaning of the term or its usage of the term in the specification must be *limited* to a ratio. Although I don’t think that there is any disagreement that power efficiency *may be* expressed as a ratio, nothing in the portions of the specification cited by Dr. Ricketts (e.g. EX1001 1:29-39) indicates that those examples are limiting. However, there is no circuit described in the ’593 Patent that would even enable the circuitry to calculate a “ratio” of input to output

power. The bypass switch may be activated based on a threshold of output power (*id.*, 4:7-10) which may be determined by output voltage (*id.*, 6:25-33, 6:36-7:3, 7:50-8:10, Fig. 4), noise power (*id.*, 4:11-13), or fixed current (*id.*, 9:37-42, Fig. 6), with or without modification by an optional load current sensing circuit (*id.*, 9:1-10), or hysteresis control switch (*id.*, 8:28-67). However, there is no embodiment described in the specification that describes a direct connection from the input power to the ACGM or bypass switch control (BSC) enabling either component to compare the output power to the input power, much less determine a “ratio” of output to input power, particularly in Figures 4-5.

17. Second, and more significantly, Dr. Ricketts’ “ratio” interpretation assumes that the power efficiency must be calculated or determined at some point, otherwise it would not make sense to speak of the way in which such a calculation is expressed. In my opinion, this premise is incorrect because it mistakes the way in which the claims and the specification describe the use of “power efficiency” as it relates to the claimed “power supply” and method of operating one. As I will explain in more detail below, the claim doesn’t actually require any calculation of efficiency, so it follows that the claim language does not further require a calculation expressed in a particular way. Rather, the claim merely requires that a bypass function (*e.g.*, “deactivates the switching device and passes the input voltage to the output voltage node” in claim 1) occurs “in response to a power efficiency of the power supply exceeding a predetermined threshold.” In the preferred embodiments in the

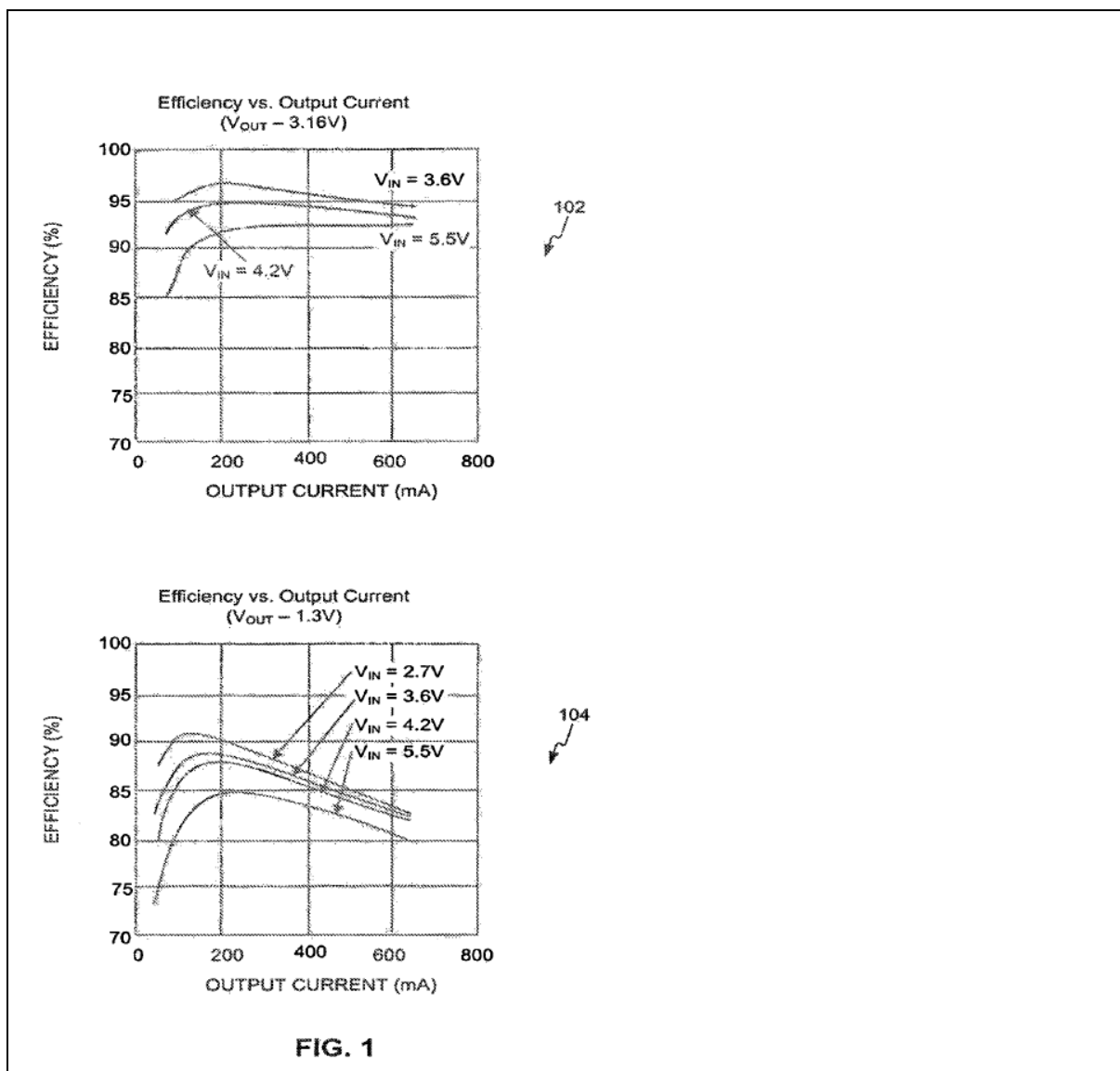
specification, that threshold is indicated indirectly by indicators such as voltage or current, without any calculation of efficiency.

18. Dr. Ricketts argues that “the plain language of the claims requires determining the power efficiency characteristics of the power supply and setting a threshold based on that determination.” EX2001, ¶74. I disagree. First, it is simply wrong to assert that the plain language of the claim says anything of the sort. None of the “power efficiency” elements in any of the independent claims recites anything about “determining the power efficiency characteristics of the power supply,” or any equivalent language, and the references to “the power supply exceeding a predetermined threshold” (e.g. in claim 1) say nothing about that threshold being “based on” such a “determination.” Second, and as I will discuss in more detail, this interpretation is completely unsupported in the specification, which Dr. Ricketts misinterprets. Nothing in the portions of the specification that Dr. Ricketts discusses, nor anywhere else in the specification, supports Dr. Ricketts’ assertion.

19. Specifically, while the ’593 Patent discusses calculations of power efficiency, there is no discussion in the specification that says that those calculations are used to set the voltage and current thresholds used for the bypass function. Both the POR and Dr. Ricketts string together the discussion of Figures 1-3 and 6 to argue that the bypass switch is set based on a determined value of power efficiency. However, these figures and the corresponding discussion, individually and collectively, do not support the assertion that the POR and Dr. Ricketts make. As I will discuss below,

while there are some discussions of efficiency in the context of these figures, and there is a discussion of setting a bypass threshold, the bypass threshold itself is not based on any efficiency calculation, but is simply a fixed voltage based on the operating limits of an amplifier.

20. For example, Dr. Ricketts relies (*e.g.* EX2001 ¶75) on Fig. 1, which shows efficiency curves for an exemplary power supply at various input voltages:



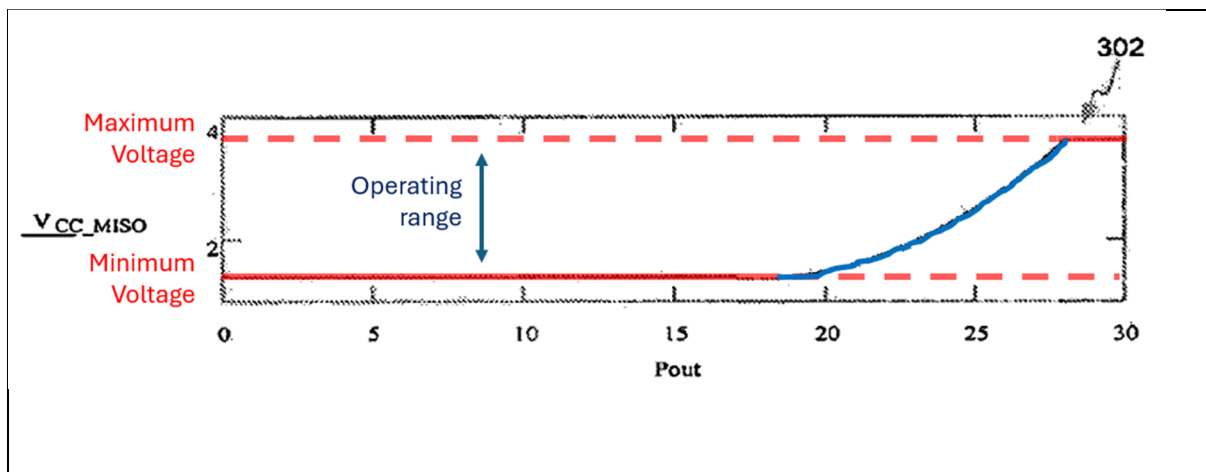
21. The accompanying text for Fig. 1 describes “exemplary plots 102 and 104

of efficiency versus output current of a typical switching power supply for two exemplary values of output power.” EX1001, 4:15-17. In the context of the specification, this discussion appears to be intended as a general introduction to the issue of the impact of power efficiency on system efficiency. The ’593 Patent’s description of these figures as “exemplary” plots from a “typical” power supply is consistent with that understanding. The ’593 Patent does not say that the Fig. 1 plots are even intended to represent any embodiment of the alleged invention, particularly one with a bypass function. Nothing about Fig. 1 depicts any bypass function. And when the specification of the ’593 Patent does introduce bypass thresholds later on (which are consistently either voltage or current), the specification never says that these thresholds are calculated based on the efficiency charts in Fig. 1.

22. Dr. Ricketts goes on to say (EX2001, ¶75) that “**based on Figure 1** and the network characteristic of CDMA shown in Figure 2, it was determined that the power supply should be configured for optimal performance at 17 dBm,” citing the ’593 Patent, 5:10-24. This statement is only partially accurate in that the cited portion refers back to the probability distribution in Fig. 2, and makes the general point that efficiency improvements at power levels that are more frequently used for a given modulation scheme will have greater impacts than for less frequently used levels. Dr. Ricketts’ statement is inaccurate, however, because the cited portion of the specification does not refer back to Fig. 1, or the discussion of it, in any way. Figure 2 relates to the likelihood over time of a generic transceiver operating at particular power levels using a CDMA

transmission scheme, not the efficiency of a specific transceiver.

23. Figure 3 of the '593 Patent also does not show anything about setting a bypass threshold based on efficiency. Fig. 3 depicts “exemplary plots of power supply output voltage and power supply output current versus output power of an example multiple-input-single-output (MISO) amplifier.” EX1001, 3:1-4. The example used in the diagram is an amplifier with a collector/drain voltage range of 1.39V to 3.6V. *Id.*, 5:40-42. This is illustrated in the top plot of Fig. 1, which shows a flat line until approximately 18 dBm, consistent with the amplifier operating at the bottom of its collector/drain voltage range at 1.39V, a curve from approximately 18 to 28 dBm, when the amplifier is within its operating range, and then another flat line at 3.6V, at the maximum collector/drain voltage of the amplifier:



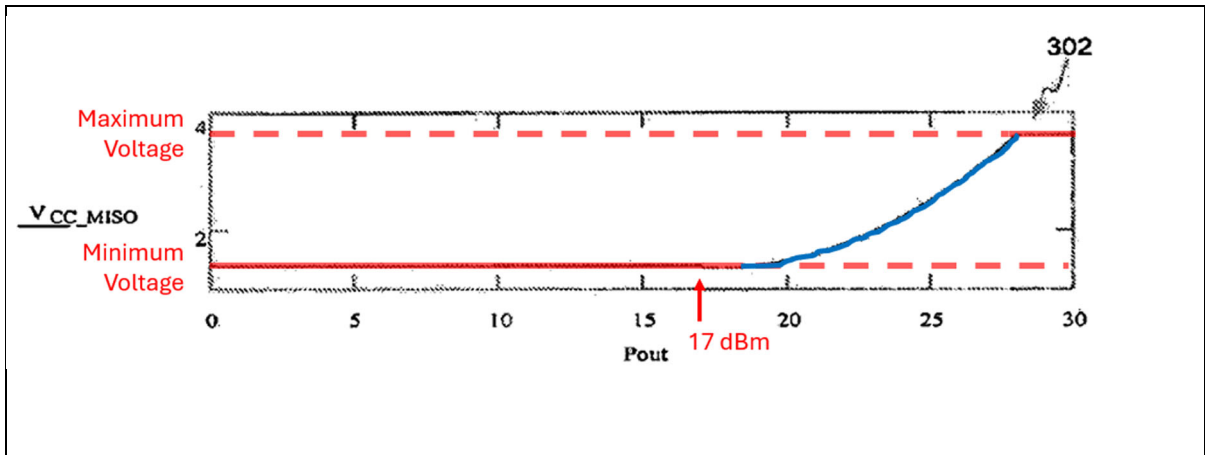
Id., Fig. 3 (excerpted and annotated).

24. Although Fig. 3 itself does not show bypass operation, the specification later teaches (*id.*, 6:28-33) that the bypass may be triggered at a voltage threshold of 3.6V. However, that voltage simply corresponds to the maximum operating voltage of

the amplifier. Dr. Ricketts acknowledged in his deposition that the plot 302 in Fig. 3 of the '593 Patent would be consistent with a system having a bypass at a threshold of 3.6V, the maximum operating voltage of the amplifier. EX1030, 84:24-85:19, 87:20-88:5. There is no discussion in the '593 Patent that suggests in any way that the choice of 3.6V as a threshold is based on any calculation of power efficiency, as opposed to simply being the maximum operating voltage of the amplifier.

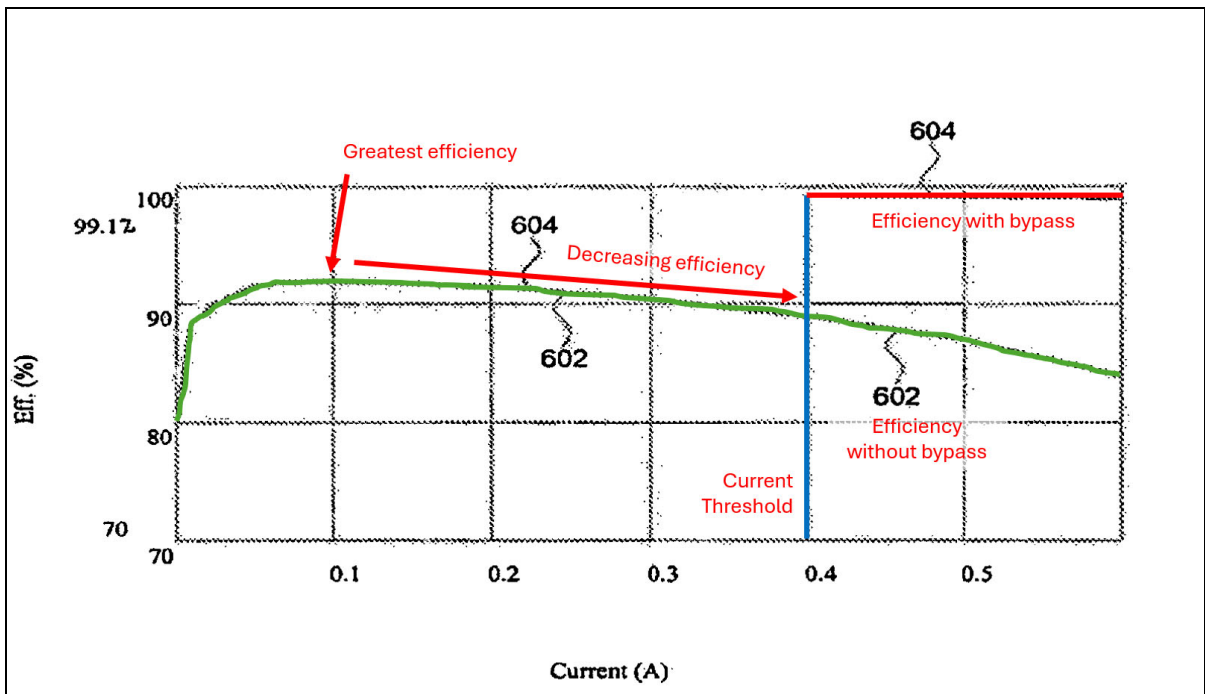
25. Dr. Ricketts repeatedly quotes various discussions of the optimal operating efficiency of the power supply, *e.g.* EX2001, ¶75 (“...it was determined that the power supply should be configured for optimal performance at +17 dBm”), ¶76 (“...the exemplary MISO amplifier is optimized for power efficiency at +1.39V and 100mA”), ¶78 (“...the resulting power supply design ‘is optimized for a +17 dBm output (1.39V output voltage and 100 mA output current’).”

26. However, in each of these instances, the point taught as corresponding to optimal operating efficiency (that is, the mean power setting at which the system is most likely to operate, and for which it should be optimized) is not the bypass threshold. For example, in Fig. 3, the 17 dBm point (annotated below) corresponds to the ***minimum*** operating voltage of the amplifier at 1.39 V, not the 3.6V maximum which the '593 Patent later (6:28-33) suggests using for the bypass:



EX1001, Fig. 3 (excerpted and annotated).

27. Likewise, in Fig. 6, the point of greatest efficiency on curves 602 and 604 occurs at 0.1A of current, but the efficiency actually decreases between that point and the triggering of the bypass, which appears to be at a current of 0.4A:



Id., Fig. 6 (annotated).

28. Nothing in this disclosure, nor the accompanying text in the specification, says that the 0.4A threshold in Fig. 6 is based on a calculation of efficiency at that point.

Nor does Dr. Ricketts show anywhere else in the specification that shows that the voltage and current thresholds taught in the specification are based on power efficiency. In particular, Dr. Ricketts fails to identify any teaching of a bypass threshold in the specification which would meet his definition of “determining the power efficiency characteristics of the power supply and setting a threshold based on that determination” (EX2001, ¶74) or in which “the ’593 Patent determines the threshold voltage based on power efficiency that was actually measured and calculated” (*id.*, ¶79).

29. Dr. Ricketts also misrepresents what I said in my original declaration. I noted in ¶85 my original declaration that the ’593 Patent never teaches that “*the circuitry* directly calculates the power efficiency (*e.g.*, by comparing input and output power”). Dr. Ricketts never actually addresses this point, nor does he cite anything to refute it, *i.e.* showing that the circuitry calculates power efficiency. Even though Dr. Ricketts never cites anything to dispute this point, he refers back to it twice (at ¶¶73, 81) and argues that the conclusion is incorrect. However, Dr. Ricketts appears to be suggesting that I said that there was no disclosure of calculating power efficiency in any way in the ’593 Patent, which is not what I said. It is true, however, that the actual bypass thresholds are not based on such calculations.

30. Dr. Ricketts appears to be confusing calculating power efficiency for any purpose with the setting of the threshold. Although Fig. 1 of the ’593 Patent shows power efficiency calculations, nothing in the ’593 Patent relates that calculation of power efficiency to the setting of the bypass threshold, or “determining the power

efficiency characteristics of the power supply and setting a threshold based on that determination” in Dr. Ricketts’ language, and he fails to show anything that does that.

31. The examples in the ’593 Patent’s specification cited by Dr. Ricketts further support my conclusion that the term does not exclude indirect measurements such as voltage and current, either by its plain language or as used in the specification. For example, Figure 3 of the ’593 Patent shows a bypass threshold at 3.6V (that is, a **voltage** threshold), while Fig. 6 shows a bypass threshold at 400 mA (a **current** threshold). Dr. Ricketts also suggested in his deposition that Fig. 6 was consistent with the bypass threshold of 3.6 **volts** in Fig. 3, which is the maximum voltage of the amplifier. EX1030, 87:20-88:5, 103:19-104:1. If Dr. Ricketts is correct that Fig. 6 is “using... the same numbers as looked at in Figure 3,” the bypass threshold is based entirely on the maximum operating voltage of the amplifier. Even though the circuit happens to have an efficiency of around 89% at that point (the same efficiency as it has at about 20 mA, and slightly less than it has between 20 and 400 mA), the bypass threshold is not based on the calculation of efficiency. While Dr. Ricketts argues (EX2001, ¶78) that the 3.6V voltage threshold in Fig. 3 “corresponds to” a known power efficiency, nothing in that figure or the corresponding discussion says that the threshold voltage was set based on the efficiency calculation. As I will show below with respect to the prior art at issue, the prior art combinations at issue also teach bypass thresholds that “correspond to” a readily ascertainable power efficiency.

32. Even if it were accurate that the voltage and current thresholds taught by

the '593 Patent were based on power efficiency calculations during the design process (and it is not), I disagree that the claims should be construed based on such a calculation. It is my understanding that it is inappropriate to construe claims so that infringement depends on the intent of the accused infringer (or prior art designer), but that is exactly what the interpretation of the claims advanced by Dr. Ricketts would do. Dr. Ricketts relies on whether power efficiency was “measured and calculated” (EX2001, ¶79) at some point in the design process. Under that interpretation, two devices could have identical circuits (such as the circuit shown in Fig. 4) with identical voltage or current thresholds, yet one might practice the patent and the other would not based solely on whether the designer had calculated the efficiency at some point.

33. In my view, a POSITA would not read either the plain language of the claims of the '593 Patent or read them in view of the specification to require such a mental step. In my opinion, a POSITA would interpret the independent claims of the '593 Patent, such as claim 1, in such a way that a power supply itself would either practice or not practice the claim, not make a distinction based on a calculation that the designer may or may not have performed when designing it.

34. In short, nothing in ParkerVision's POR nor in Dr. Ricketts' declaration changes my opinion that the plain language of the phrase “in response to the power efficiency of the power supply exceeding a predetermined threshold” does not exclude indirect measurements that indicate whether the power efficiency of the power supply has indicated a predetermined threshold, such as voltage or current. Moreover, as I will

discuss in more detail with respect to the asserted prior art combinations, each of the prior art combinations teaches or suggests a bypass threshold that corresponds to a readily ascertainable power efficiency level.

35. Finally, I noted in my initial declaration (EX1003, ¶86) that dependent claim 2 requires that “the aperture generator and control module is configured to deactivate the switching device based on a load current at the output voltage node,” while dependent claim 6 requires that the same bypass function is performed “based on a comparison of the down-converted input voltage to a threshold voltage.” ParkerVision and Dr. Ricketts both respond to this very briefly, by asserting that “a POSITA would not have read dependent claims 2 and 6 as within the scope of ‘power efficiency.’” EX2001, ¶82.

36. In my opinion, this misreads the claims. Claim 1 recites that the bypass function (that the AGCM “deactivates the switching device and passes the input voltage to the output voltage node”) occurs “in response to the power efficiency of the power supply exceeding a predetermined threshold.” Claims 2 and 6 depend from claim 1 and recite that the same bypass function (“deactivate the switching device” in claim 2, “deactivate the switching device and pass the input voltage to the output voltage node”) occurs based on a current threshold in claim 2 (“based on a load current at the output voltage node”) and a voltage threshold in claim 6 (“based on a comparison of the down-converted input voltage to a threshold voltage”). In my opinion, because these claims refer to the same function and depend from claim 1, a POSITA would have understood

that performing the bypass function “in response to the power efficiency of the power supply exceeding a predetermined threshold” specifically includes (but is not limited to) voltage and current thresholds. Nothing in the ’593 Patent suggests any embodiment with more than one “threshold” for performing the bypass function. Therefore, a POSITA would understand these dependent claims to explicitly teach that voltage or current thresholds are within the scope of the claim language in claim 1. The fact that the words “power efficiency” are not repeated in these claims is irrelevant, because they explicitly refer back to the bypass function in claim 1.

37. I am aware that the claim term “power efficiency” is a term of dispute in the related district court litigation. In the related district court litigation, the Court appointed a special master, who provided a preliminary construction of “plain and ordinary meaning” by email to the parties. However, neither the Special Master nor the Court has issued a claim construction ruling at the time of this declaration. In my opinion, the fact that the Special Master’s preliminary constructions did not provide any construction for the term “power efficiency” does not say anything one way or another about the disputes raised by the parties in this IPR. For example, it is my opinion that the “plain and ordinary meaning” preliminary construction does not say whether the plain and ordinary meaning of “power efficiency” excludes indirect indicators of power efficiency such as voltage or current, or if it requires power efficiency to be calculated or measured in order to implement the bypass threshold. Additionally, I have reviewed the portions of ParkerVision’s claim construction briefs in the related litigation related

to this term (EX1034, EX1035), and none of them makes the argument made by Dr. Ricketts that the plain and ordinary meaning of the term really means “determining the power efficiency characteristics of the power supply and setting a threshold based on that determination.” Therefore, in my opinion, the Special Master’s “plain and ordinary meaning” preliminary construction should not be read as an endorsement of ParkerVision’s new argument in this proceeding. If a claim construction ruling issues (either from the Special Master or from the District Court), I reserve the right to provide further opinions.

B. Other Claim Terms

38. Neither ParkerVision nor Dr. Ricketts raises any other claim construction disputes, nor do they rely on the construction of any other term for their responsive arguments. For example, I explained in my initial declaration that “aperture generator and control module” should be given its plain and ordinary meaning and not construed as means-plus-function, and neither ParkerVision nor Dr. Ricketts appears to argue that the term should be construed as means-plus-function.

VI. The Challenged Claims are invalid

A. Ground 1A (Hau in view of Yoshida)

- 1. Hau in view of Yoshida teaches deactivating a switching device “in response to a power efficiency of the power supply exceeding a predetermined threshold” in claims 1, 9, and 15**

39. For the independent claims of the ’593 Patent (claims 1, 9, and 15), the only element that ParkerVision argues is not taught or suggested by the prior art is the

bypass function, *i.e.* de-activating the switching device and passing the input voltage to the output voltage node “in response to a power efficiency of the power supply exceeding a predetermined threshold.” ParkerVision does not, for example, dispute whether a POSITA would have combined Hau and Yoshida. In any event, ParkerVision’s arguments for that one claim term are misplaced for the reasons that I discuss below.

40. In my initial declaration, I explained that Hau teaches that the voltages V_{cc2} , V_{in} , and P_{det} are proportional. EX1003, ¶123, citing EX1007, 6:28-30. Hau explains this relationship as follows:

As implemented herein the voltage, V_{in} , from the first stage of the power amplifier to the power detector 4 is used to adjust linearly the optimum supply voltage, V_{cc2} , that supplies current and optimizes the output power of the power amplifier. The output power of the power amplifier is proportional to the square of the voltage V_{in} . The power detector 4 outputs an DC voltage, P_{det} , which is proportional to the voltage V_{in} . The DC to DC converter outputs a supply voltage V_{cc2} , which is linearly related to the voltage V_{in} . The maximum output voltage signal swing of the power amplifier is proportional to the square of the supply voltage V_{cc2} . The maximum output power from the power amplifier is therefore directly proportional to the square of V_{cc2} . Thus, the linear relationship between P_{det} and V_{cc2} is achieved, and the

optimum output power of the power amplifier is controlled by Vcc2 accordingly.

EX1007, 6:22-28.

41. A POSITA would have understood that this relationship occurs because Vcc2 is the supply voltage that provides power for the power amplifier PA1. Therefore, the power output from PA1, which is measured by Pdet, is proportional to the supply voltage Vcc2, and Pdet is also an indicator of the Vcc2. EX1003, ¶123.

42. Neither ParkerVision nor Dr. Ricketts addresses these teachings. However, both argue (ParkerVision in the POR at 29, EX2001, ¶110) that the argument in the Petition “conflates RF power and supply power.” This argument is misplaced because it ignores the relationship between the power supply Vcc2 and Vin (and therefore Pdet) entirely. The paragraph on page 29 of the POR and the corresponding ¶110 of Dr. Ricketts’ declaration that make this argument do not discuss the relationship between Vcc2 (that is, the power supply for the power amplifier PA1) and Pdet at all. The RF power signal RFin is the signal being amplified by PA1, while Vcc2 provides the power for PA1.

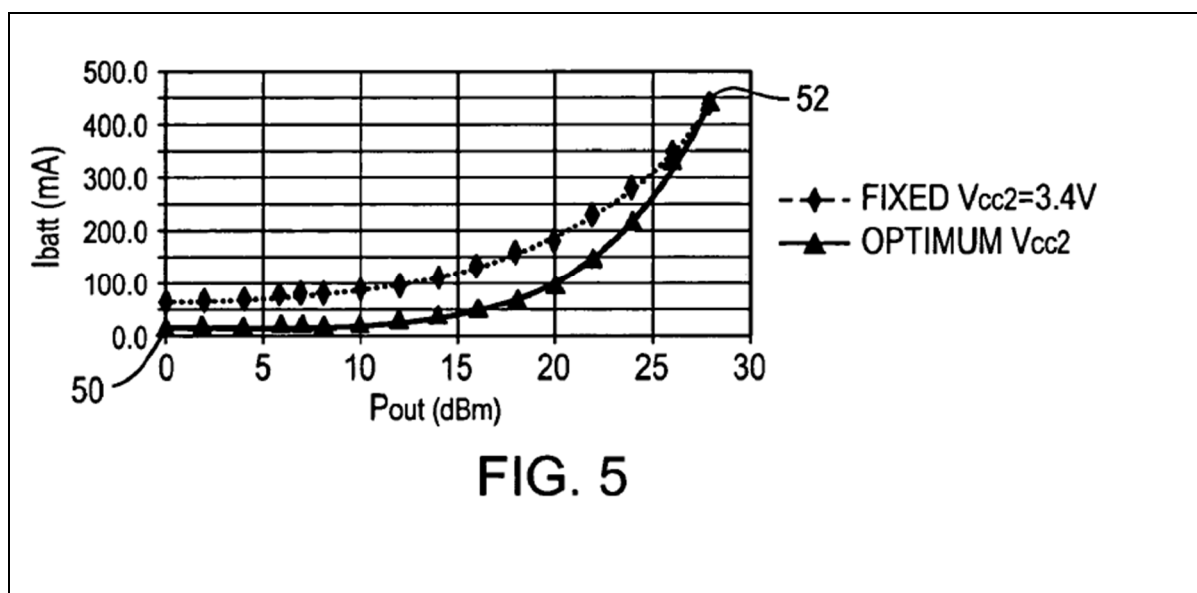
43. ParkerVision’s and Dr. Ricketts’ arguments that Pdet cannot be an indicator of power efficiency because it is based on an AC signal rather than a DC signal are also misplaced. The independent claims of the ’593 Patent say nothing about what type of signal is measured to indicate power efficiency. Moreover, Pdet itself is a DC signal that tracks the output power of the power amplifier. EX1007, 6:27-28.

ParkerVision asserts (POR, 29) that “[t]hey are distinct quantities (AC for RF power, DC for supply power) relating to separate circuit elements (power amplifier for RF power, power supply for supply power),” while Dr. Ricketts asserts (EX2001, ¶110) that “RF power (upon which Pdet is based) cannot be an indicator of power efficiency of the power supply because they are separate circuits relating to distinct quantities (AC and DC, respectively).” In my opinion, both of these statements are nonsensical with respect to Hau. There is nothing even remotely unusual to a POSITA about a DC signal being indicative of the strength of an AC signal or vice versa, and that is exactly what Hau teaches: Pdet is proportional to Vin, which in turn is proportional to Vcc2. Additionally, the power supply and power amplifier are not “separate” because Vcc2 provides the power for the power amplifier, whose power output is in turn related to Vcc2.

44. ParkerVision also argues that “Hau’s Pdet does not account for variation in input and output current, which respectively impacts input power and output power, and thus power efficiency as a whole.” POR, 30. As previously discussed, a requirement to account for variation in input current would read out every embodiment in the ’593 Patent, which does not teach any circuit that measures the input current to the power supply. For example, the preferred embodiment showing in the circuit diagram in Fig. 4 of the ’593 Patent and described in the accompanying text at EX1001, 7:46-8:8 relies solely on a voltage threshold as an indication of output power. This embodiment does not consider either input or output current with respect to the bypass

threshold. Neither ParkerVision nor Dr. Ricketts attempts to reconcile these embodiments with its arguments.

45. However, even if the claims required “account[ing] for variation in input and output current,” Hau teaches it. For example, Hau’s Fig. 5 shows a plot of input current (I_{BATT}) against output power in dBm for both a fixed voltage V_{cc2} and the optimum voltage provided by embodiments of Hau’s invention:



EX1007, Fig. 5, 3:56-57, 4:66-5:22.

46. Hau also teaches that power is provided from a 3.4V battery. EX1007, Figs. 1, 6; 4:7-10, 4:23-26, 4:63-65, 5:31-32, 5:40-43. Therefore, the input power to the power supply (that is, the output from the battery) in watts can be measured by multiplying the current output from the battery I_{BATT} by the fixed 3.4V voltage. The X-axis of Hau’s Fig. 5 provides the output power in dBm (decibel-milliwatts). dBm is simply a logarithmic expression of power which can be converted to watts by the

formula $P(W) = 10^{\frac{dBm}{10}} \times 10^{-3}$. Therefore, because both the output power and the input power can be derived from Hau's Fig. 5, the resulting efficiency can also be calculated.

47. Therefore, ParkerVision and Dr. Ricketts are simply incorrect when they say that Hau does not account for variation in input and output current, even though that is not required by the claims either. And as I discussed previously, because Hau's Pdet is directly proportional to Vcc2, the power output of the power supply is accordingly proportional to its input.

48. ParkerVision (POR, 30-31) and Dr. Ricketts (EX2001, ¶111) both also raise arguments based on the potential for non-linear relationships between efficiency and voltage, citing Fig. 1 of the '593 Patent. Neither ParkerVision nor Dr. Ricketts explains the relevance of these arguments to the claim. Nothing in the plain language of the claim, nor any party's proposed construction or interpretation of it, says anything about whether power efficiency must be measured directly or whether there must be a linear relationship between power efficiency and the quantity directly measured by the circuit. As I discussed previously, and neither ParkerVision nor Dr. Ricketts rebuts, the '593 Patent itself explicitly relies on voltage and current thresholds. EX1003, ¶¶85-86; EX1001, 2:21-22, 4:7-10, 7:59-8:8, 7:1-3, 8:41-60. The fact that the **'593 Patent itself** teaches that such values do not have a linear relationship with power efficiency, as ParkerVision and Dr. Ricketts argue, actually goes to show that a POSITA reading the claims in view of the specification would not interpret the claims to require such a

limitation. In other words, in my opinion, this argument just shows that the claims are not limited in the way that ParkerVision and Dr. Ricketts argue. It is my opinion that the possibility that some non-linear relationship exists between voltage and power efficiency (as it does in the '593 Patent itself) does not negate the fact that voltage is an indicator of power efficiency in Hau.

49. In my opinion, ParkerVision and Dr. Ricketts are also both incorrect in their arguments that Hau's Pdet threshold "does not involve power efficiency determinations." POR, 31-32, EX2001, ¶¶112-116. As I noted above, there is no requirement for a "determination" in claims 1, 9, or 15 of the '593 Patent. Nor is there a requirement for a "calculation" of power efficiency or that the claimed power supply (or method or device) "ensure" power efficiency as Dr. Ricketts says in paragraph 114.

50. Both ParkerVision and Dr. Ricketts rely on the relationship between Hau's bypass threshold and the voltage range of the DC to DC buck converter. For example, Dr. Ricketts argues (EX2001, ¶114) that "Hau's threshold is set based on the operating range of the power supply (*i.e.*, 'maximum voltage output') based solely on the properties and limitations of the power supply (*i.e.* compliance with minimum voltage differential)." However, the reason for Hau's bypass function is irrelevant because the independent claims of the '593 Patent do not say anything about why a particular threshold is chosen for the bypass function. The claim merely requires that when the power efficiency exceeds a predetermined threshold (which is indicated by voltage in Hau, as it is in preferred embodiments of the '593 Patent), the bypass function is

activated.

51. Additionally, ParkerVision's argument that Hau does not teach the claims because it teaches setting a bypass threshold based on "properties and limitations of the power supply" ignores the fact that the same is true in embodiments of the '593 Patent. For example, as I discussed above, the '593 Patent teaches an embodiment which provides power to an amplifier with a maximum operating voltage of 3.6V, and the bypass is triggered when the voltage reaches that value. EX1001, 6:28-45. Both ParkerVision and Dr. Ricketts rely on this teaching in their claim construction arguments. POR, 9-10; EX2001, ¶¶ 54, 81. ParkerVision's argument that the bypass threshold cannot be based on "properties and limitations of the power supply" would exclude this embodiment. In both cases (the '593 Patent and Hau) the claim limitation of activating the bypass function "in response to the power efficiency of the power supply exceeding a predetermined threshold" is met when the power efficiency of the power supply exceeds a predetermined threshold and the bypass function is activated, regardless of how the threshold is indicated or why the bypass function is activated.

2. Hau teaches or suggests to "deactivate the switching device based on a load current at the output voltage node" in claim 2

52. As I explained in my initial declaration (EX1003, ¶131), Hau teaches that the prior art specifically taught measuring output power based on current, using the well-known, fundamental relationships between power, current, and voltage. Specifically, Hau states that the "prior art related the output current to the output power from the $(I)(V)=\text{power}$ relationship." EX1007, 6:40-44.

53. Neither ParkerVision nor Dr. Ricketts appears to dispute any of this, but they argue instead that Hau discourages or teaches away from using current as an indicator of power because it teaches advantages of its own preferred method. POR, 34, citing EX1007, 2:1-11. I disagree with this analysis, because a method that is known in the art does not become less obvious simply because another method becomes preferred. Indeed, the portions of Hau that both ParkerVision and Dr. Ricketts cite specifically refer to other known prior art references that explicitly teach “monitoring the output power of the power amplifier through the current in the voltage bias line to the power amplifier.” EX1007, 2:1-11. The voltage bias line to the power amplifier corresponds to the claimed “output voltage node.”

54. It is also my opinion that methods of monitoring power output by measuring current would have been well-known to a POSITA. For example, a POSITA would have known how to measure current at a specified point using a current shunt, which is a (typically small) resistor placed in series with current flow, allowing current to be measured based on voltage drop. Although a shunt dissipates some power, the use of a small resistor means that the power loss may be small relative to the power requirements of the system. Dr. Ricketts agrees that such methods, and the design trade-offs involved in them, were known to a POSITA. EX1030, 69:20-72:10.

55. In my opinion, several of ParkerVision’s and Dr. Ricketts’ arguments are misplaced because they emphasize distinctions with Hau’s preferred embodiment rather than whether Hau teaches that current measurements were already known, as they

clearly were. For example, ParkerVision argues (POR, 36) that “Hau nowhere discloses any relationship between the RF AC output of the power amplifier and the output current of the DC-DC converter.” But as explained above, Hau teaches that prior art measured current at the voltage bias line to the power amplifier, which in Hau is the “output voltage node” of the DC-DC converter. A POSITA would not need to engage in some massive redesign as implied by ParkerVision and Dr. Ricketts, but rather simply replicate the methods of monitoring current at an output voltage node that were already known in the prior art. ParkerVision’s and Dr. Ricketts’ arguments about the linear relationship between P_{det} and V_{cc2} are irrelevant in my opinion for the same reason, because the prior art directly measured power at the same node as V_{cc2} (that is, V_{cc2} and I_{cc2} are measurements of power supplied from the DC-DC converter and to the amplifier) directly.

3. The Hau-Yoshida combination teaches or suggests “an output current at a maximum power efficiency associated with the down-converted input voltage” in claims 5 and 11

56. I previously explained that Hau teaches this limitation because it provides an output current from a DC-DC converter (which is in turn input to the power amplifier) at an “optimum” power level which “provides the most efficient current consumption for each power output level.” EX1003, ¶133, citing EX1007:4:51-54; *see also* EX1007, Figs. 2-5, 8-9, 3:30-28, 4:12-16, 4:66-5:22, 6:15- 21, 6:34-37, claim 1. Neither ParkerVision nor Dr. Ricketts disputes these teachings.

57. Rather, they both argue that Petition “conflates current consumption with

power efficiency, which are disparate and distinct concepts.” *See, e.g.* POR, 37-38. It is not clear to me what ParkerVision means by current consumption and power efficiency being “disparate and distinct,” but a POSITA would understand (and Hau itself teaches) that the power efficiency of a power supply is related to its input current. Hau specifically provides a formula that relates current consumption to DC-DC converter conversion efficiency. EX1007, 5:10-15. This disclosed relationship is consistent with concepts that would have been very well known to a POSITA, and show that in a system with a fixed input voltage (such as Hau’s battery-powered system) at a given output power level, a more efficient system will draw less input current. The input power is the product of battery current (I_{BATT}) and voltage (V_{BATT}), so the efficiency can be expressed as $\frac{P_{OUT}}{(V_{BATT} \times I_{BATT})}$. Because Hau’s battery has a fixed voltage of 3.4V (*id.*, Figs. 1, 6; 4:7-10, 4:23-26), the maximum efficiency for a given P_{OUT} is achieved when I_{BATT} is minimized. Therefore, a system which “provides the most efficient current consumption” for a given power level also provides a maximum power efficiency. ParkerVision’s argument that “the object of Hau is to minimize input current at each output power level of the power amplifier” (POR, 38) actually shows how this claim element is met, because the minimum current consumption for a specified power output will achieve optimum efficiency, as Hau explicitly teaches. While ParkerVision argues that Hau “does not aim to minimize the output current at the load of the DC-DC convertor,” there is no requirement in the claims to do so. POR, 38. Claims 5 and 14 require providing an “output current at a maximum efficiency,” not minimizing the

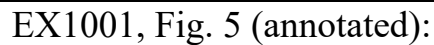
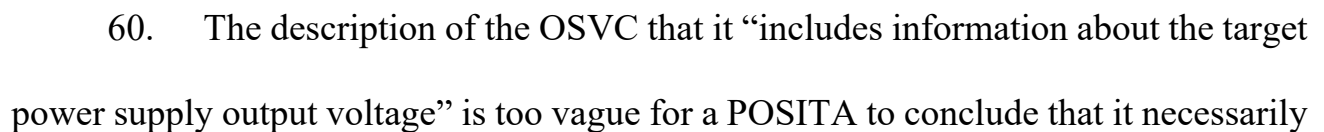
output current.

4. **Hau teaches “deactivat[e/ing] the switching device and pass[ing] the input voltage to the output voltage node [based a/comprises] compar[ison/ing] the down-converted [input] voltage to a threshold voltage” in claims 6-8 and 12-14**

58. In my opinion, Hau teaches these similar elements because Hau teaches that the bypass controller compares the signal Pdet, which is proportional to the voltage Vcc2 input to the power amplifier, to a threshold voltage. EX1007, 5:48-51, 6:63-66. ParkerVision’s and Dr. Ricketts’ responsive arguments appear to center around the assumption that the claim requires a *direct* comparison between the “down-converted [input] voltage” and a threshold voltage, or stated differently that the claims *exclude* any form of *indirect* comparison. I disagree because there is nothing in the plain language of the claim, the file history, or the specification which precludes an indirect comparison. ParkerVision and Dr. Ricketts just assume that the word “comparison” must be direct without showing why that is the case, and in my opinion it is not.

59. The preferred embodiments in the specification of the ’593 Patent shed no light on whether the voltage being compared to the threshold is a direct or indirect measure of output voltage. For example, the specification teaches that the bypass switch control module 402 (“BSCM,” annotated purple in Figs. 4-5 below), which controls the bypass function, receives an Output Stage Voltage Control 416 (“OSVC,” pink) from a control module, and compares the OSVC (or the sum of the OSVC and optional hysteresis control signal) to a threshold (grey) to determine whether to switch to bypass mode. EX1001, 6:46-51, 7:50-8:10, 8:36-60. Nowhere in the specification shows or

EX1001, Fig. 4 (annotated):



must provide a direct comparison to the target voltage. In my opinion, at the very least, this does not constitute a clear disavowal of any type of indirect comparison.

61. ParkerVision (POR, 41-42) highlights Hau's Fig. 8, which shows the nearly perfectly linear relationship between P_{det} and V_{cc2} , but relies on it to argue that a given value of P_{det} will correspond to a different value of V_{cc2} . But nothing in the claim says that the values being compared have to be equal; when the threshold is compared to P_{det} , it is still indirectly compared to V_{cc2} because of the known relationship between P_{det} and V_{cc2} . Likewise, while ParkerVision bolds the word "approximately" in its argument, nothing in the claims at issue says that the comparison being made must be exact. Therefore, in my opinion, comparing P_{det} to a threshold satisfies the claim language at issue because that is a comparison of the threshold to the down-converted output voltage.

B. Ground 1B

1. A POSITA would have been motivated to combine Sahu with Hau and Yoshida

62. In my opinion, a POSITA would have been motivated to combine Sahu with Hau and Yoshida. I note as an initial matter that there does not seem to be any dispute with respect to the use of Yoshida's down-converter in the combined system, since neither ParkerVision nor Dr. Ricketts raised any issue with motivation to combine with respect to Ground 1A. However, I also disagree with ParkerVision's and Dr. Ricketts' responses regarding the motivation to combine Sahu with the combined Hau-Yoshida system.

63. As I explained in my initial declaration, Sahu teaches two insights that a POSITA would have been motivated to apply to the Hau-Yoshida system. EX1003, ¶¶155-56.

64. First, Sahu teaches that a designer should consider the likelihood of a transceiver operating at a given power level when designing the power supply of that transceiver. Specifically, Sahu illustrates a probability curve (Fig. 1) for the likelihood of operating at a given power which is very similar to the '593 Patent's Fig. 2, except that Sahu illustrates probability curves for both urban and suburban environments. Sahu then explains that "it is extremely important to calculate the average efficiency when considering the optimum PA configuration." EX1009 at 113. Therefore, a POSITA would have understood from Sahu the importance of designing a transceiver for optimal performance at its most probable power output, and would accordingly understand that the performance of such a power supply can be optimized by designing the configuration of the PA and its power supply to be most efficient and the power levels at which it is most likely to operate.

65. Second, Sahu shows in Fig. 8(a) that while a dynamic-supply power amplifier may be more efficient over most of its operating range, a fixed-supply system may be more efficient at the highest power levels. As I previously explained, a POSITA would have been motivated by these teachings in view of Hau to set the threshold for a bypass switch as taught by Hau at this "crossover" point, so that the system would always operate on the pathway providing the greater efficiency.

66. I disagree with the contrary arguments made by ParkerVision and Dr. Ricketts. ParkerVision argues that “Sahu does not teach how to improve a system’s weighted efficiency other than using a dynamic supply system.” POR, 44. I disagree with this assertion, which does not take into account the inferences that a POSITA would draw from Sahu’s teachings. A POSITA would have understood this teaching not just to mean using a dynamic supply system of some kind, but that the design process should be carried out to optimize efficiency at the power levels where the system is most likely to operate. Moreover, a POSITA would have recognized that such a process would be based on efficiency at the power levels where a system is most likely to operate for a given modulation scheme. The example that Sahu teaches is a CDMA system, and no more is required for, *e.g.* claim 3. Nevertheless, a POSITA would have recognized that the same concept (designing the system based on the power levels at which it is most likely to operate) would apply for any selected modulation scheme.

67. In my opinion, ParkerVision’s criticism that Sahu “does not teach how to improve a system’s weighted efficiency” is misplaced. The language of claim 3, “control the switching device based on a probable output power point of operation for a selected modulation scheme based on one or more power efficiency characteristics of an electronic device coupled to the power supply,” does not impose any requirement for how the power supply is controlled.

68. I also disagree with ParkerVision’s and Dr. Ricketts’ arguments that Hau “teaches away” from the design used in Sahu. These arguments have to do with the

way that Sahu's preferred embodiments teach controlling the DC bias current. *See, e.g.*, EX2001, ¶¶165-66. In my opinion, these arguments are completely irrelevant to the combination because the teachings of Sahu that the Petition and I relied on originally do not depend on the circuit structure of the gate bias current in Sahu, nor did I propose incorporating the specific details of the gate bias current for Sahu's amplifier into the structure of Hau.

2. Hau in view of Yoshida and Sahu renders obvious controlling the switching device “based on a probable output power point of operation for a selected modulation scheme...” in claims 3-4, 10, and 19

69. Most of the arguments made by ParkerVision and Dr. Ricketts regarding this element largely repeat its motivation-to-combine arguments, and I disagree for the same reasons that I explained above.

70. ParkerVision argues that “Sahu... does not teach how its proposed system can be optimized for a different modulation scheme.” POR, 49. Dr. Ricketts does not discuss this argument in the corresponding section of his declaration (¶¶169-72). In my opinion, ParkerVision's argument is both irrelevant and inaccurate. It is irrelevant because claim 3 does not require any “optimiz[ation] for a different modulation scheme.” As long as the switching device is controlled “based on *a* probable output power point of operation to *a* selected modulation scheme based on one or more power efficiency characteristics of an electronic device coupled to the power supply,” the claim element is met. There is no requirement in the claim for more than one

modulation scheme, and CDMA alone would satisfy the claim.

71. Even if the claim required optimizing for different modulation schemes, a POSITA would have recognized that it is suggested by Sahu, because a POSITA would have recognized that the same logical insight (that a system will achieve greater efficiency if it is designed for optimum efficiency at the power levels where it is most likely to operate) would apply to other selected modulation schemes.

**3. Hau in view of Yoshida and Sahu renders obvious
“programming the threshold voltage based on a
communication waveform efficiency” in claims 8 and 13**

72. As with claims 3-4, 10, and 19, which I discuss above, most of the arguments made by ParkerVision and Dr. Ricketts regarding this element largely repeat its motivation-to-combine arguments, and I disagree for the same reasons that I explained above. As I previously explained, a POSITA would have understood that Sahu shows that a fixed power supply becomes more efficient at higher power levels, and a setting the threshold for a bypass (as in Hau) at the point where the fixed power supply becomes more efficient would improve the efficiency of the system. Even if Hau itself describes a different motivation for the bypass operation, a POSITA would have recognized the advantage of operating the bypass threshold at the point that would provide the most efficient possible operation at every power level, which is clearly suggested by Sahu’s Fig. 8(a).

73. ParkerVision and Dr. Ricketts are also incorrect that Sahu’s Fig. 8(a) does not relate to communications waveform efficiency. Sahu states (EX1009 at 117) that

its “prototype PA system was tested with a CDMA IS-95 signal for a center frequency of 915 MHz and a 1.25-MHz baseband signal BW,” and (*id.*, 118) that Fig. 8 shows the “ratio of RF output power to the input supply power.” Therefore, a POSITA would have recognized that Fig. 8(a), including the crossover point, is a representation of efficiency based on output power, which is the amplified RF signal. The output power is therefore related to both the supply power and the efficiency of the waveform which is being amplified. Additionally, a POSITA would have recognized that the amount of power needed to communicate with another terminal in a given scenario will vary with the efficiency of the waveform being used to communicate; that is, a more efficient waveform will require less power to communicate with a base station at the same distance. Therefore, the probability of using a specified power setting as shown in Sahu’s Fig. 1, like the ’593 Patent’s Fig. 2, is correlated with communications waveform efficiency. Therefore, the combination teaches this claim element.

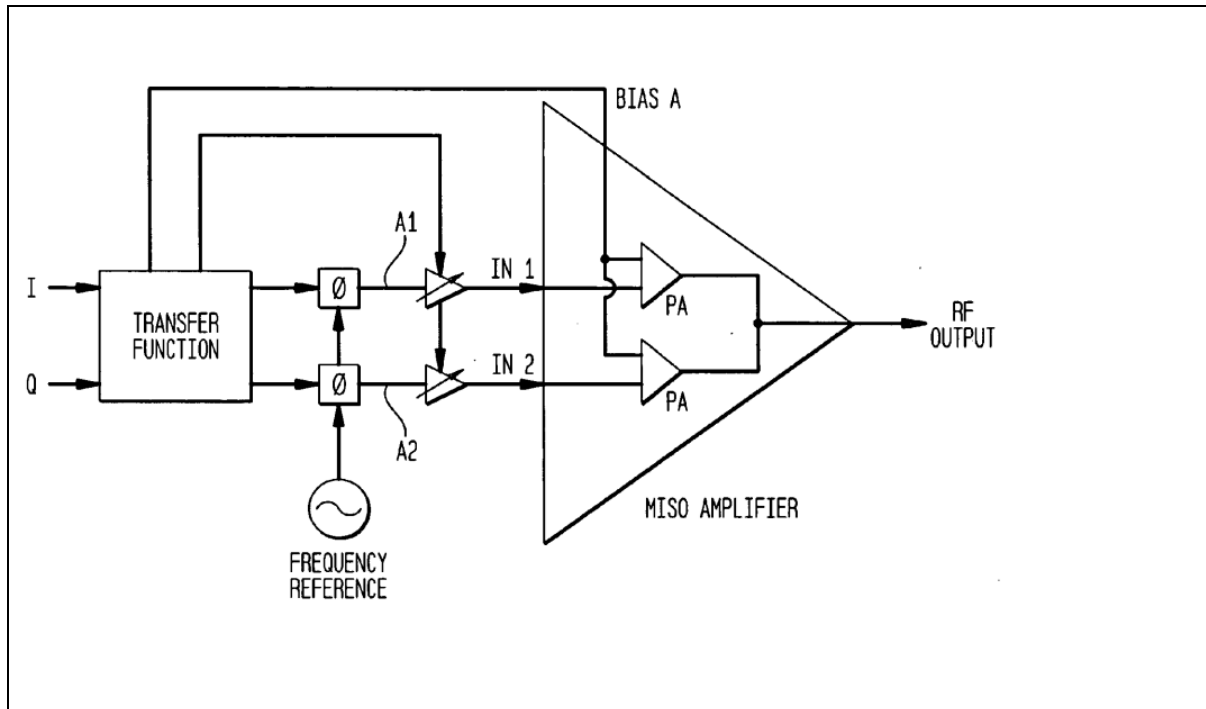
C. Ground 1C

1. Hau in view of Yoshida and Lejon teaches a MISO amplifier in claim 16

74. ParkerVision (POR, 52-53) and Dr. Ricketts each argue that Lejon does not teach or suggest a “multiple-input-single-output (MISO) amplifier” because Lejon’s system describes an amplifier system which splits a quadrature signal into two phasor fragments. I disagree. As an initial matter, the plain language of the claim does not say anything about the source of the signals being amplified. If an amplifier has two or more inputs and a single output, that amplifier is a “MISO” amplifier regardless of how

the inputs were generated. In the case of Lejon, I explained in my original declaration that it contains two figures which each show amplifiers with multiple inputs (210, 220 in Fig. 9; 310, 320 in Fig. 10) and a single output (load 290 in Fig. 9, 390 in Fig. 10). Nothing in the plain language of the claim, nor in the specification (*e.g.* Fig. 8 or the description at 9:66-10:22 of the '593 Patent), suggests any reason to exclude multiple inputs because they are phasors of the same original signal.

75. Indeed, excluding quadrature signals as ParkerVision and Dr. Ricketts argue appears to be inconsistent with other descriptions of “MISO” amplifiers by ParkerVision and its amplifiers. For example, the '593 Patent's discussion of “MISO” amplifiers refers back to two U.S. patent applications, nos. 11/256,172 and 11/508,989. The second application, No. 11/508,989, was published as U.S. Patent Application Publication No. 2007/0247217 (EX1033, the “'989 Application”). The '989 Application describes embodiments explicitly called MISO amplifiers which take phased components of an input signal as their inputs. For example, Fig. 71 of the published application, which is reproduced on its cover, shows a “MISO amplifier” which takes “I” and “Q” channels (that is, the in-phase and quadrature components of a signal) as its inputs in the left side of the figure:



EX1033, cover.

76. It is therefore my opinion that the phrase “MISO amplifier” does not exclude amplifiers which take components of a quadrature signal as their inputs. Therefore, in my opinion, ParkerVision and Dr. Ricketts have no basis to assert that Lejon does not teach a MISO amplifier, and Lejon clearly does so.

D. Ground 2A

1. A POSITA would have been motivated to combine Canyon and Ranjan

77. I explained in my previous declaration that “in a power supply such as Canyon with a voltage regulator and a bypass switch, maximum overall efficiency would be achieved by setting the threshold to operate the bypass switch at the point where a fixed power supply (the bypass path) becomes more efficient than the variable power supply from the regulator.” EX1003, ¶196. In my opinion, neither ParkerVision

nor Dr. Ricketts has rebutted this motivation to combine.

a. The source of the DC-DC converter control signal is irrelevant

78. Both ParkerVision and Dr. Ricketts make lengthy arguments that “Ranjan’s power amplifier and DC-DC convertor design is fundamentally different from Canyon’s.” *See, e.g.* POR, 53. Although the characterization of the differences between Canyon and Ranjan as “fundamental” is exaggerated at best, in my opinion, none of these differences are relevant to the motivation to combine the two references that Mediatek explained in the Petition and that I explained in my original declaration.

79. Both ParkerVision’s and Dr. Ricketts’ arguments appear to be primarily based on the source of the signal used to control the power supply output voltage, *i.e.*, that Ranjan discloses a signal from an envelope detector to control the DC-DC converter in one embodiment and a signal from a DSP in another, whereas Canyon places a power meter either at the output of the power supply or the output of a power amplifier. However, the combination proposed in the Petition does not rely on adapting the exact wiring diagram from either Ranjan’s control circuit embodiments to Canyon. As discussed above and in my original declaration, the basic concept of setting a bypass threshold (as taught by Canyon) at the point where a bypass pathway becomes more efficient than a down-converted pathway (as taught by Ranjan) would apply to either power management configuration taught by Canyon.

80. In my opinion, the statement in the POR that “a POSITA would not have found the measured efficiency of Ranjan’s system shown in Figure 3 to be indicative of

the efficiency of Canyon’s system” (repeated verbatim at EX2001, ¶185) is similarly irrelevant. As I explained in EX1003, ¶196 of my original declaration, a POSITA “would have been able to calculate or empirically determine [the threshold where a fixed power supply becomes more efficient] for a given device operating in a given modulation scheme without undue experimentation.” Neither ParkerVision nor Dr. Ricketts rebuts this point. While Ranjan provides the insight that a crossover point would exist above which a bypass pathway becomes more efficient, a POSITA would have known how to determine where that point is in Canyon’s system, and neither ParkerVision nor Dr. Ricketts provides any evidence to the contrary.

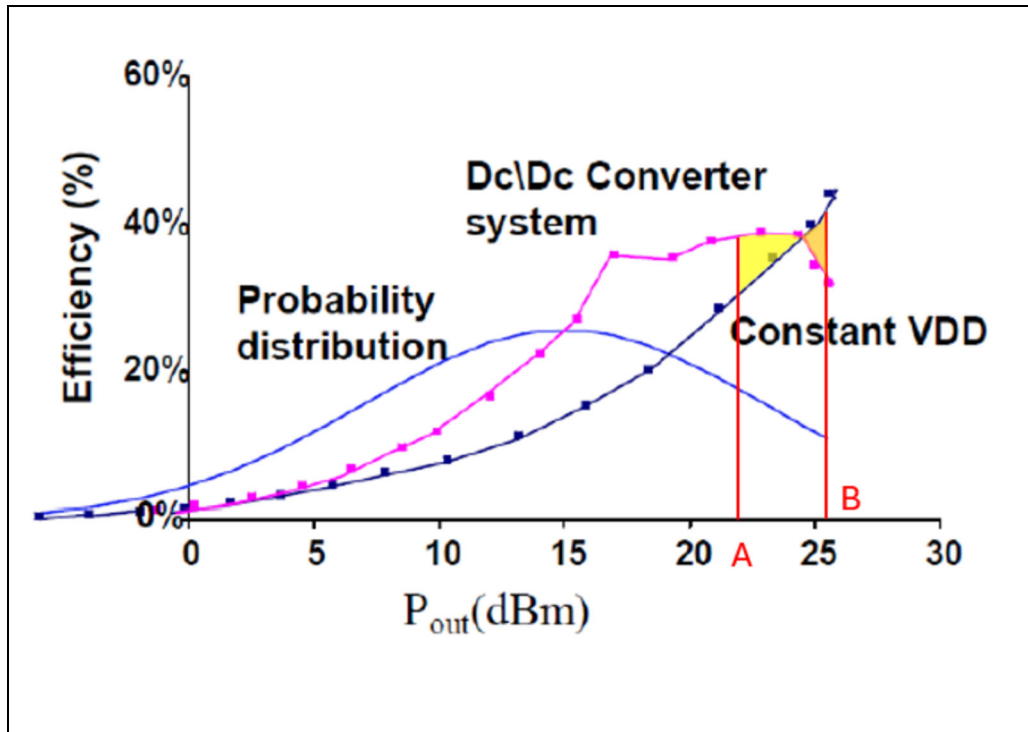
b. A POSITA would have been motivated to improve the efficiency of Canyon’s bypass threshold based on Ranjan’s teachings

81. ParkerVision and Dr. Ricketts make two contradictory arguments in the POR and Dr. Ricketts’ declaration, respectively. Both argue that Canyon’s disclosure of operating the bypass switch is “complete” (POR, 57; EX2001, ¶187), while simultaneously arguing that Canyon fails to provide any explanation whatsoever for the operation of the bypass threshold in connection with Fig. 1 (POR, 59; EX2001, ¶191). Both arguments are incorrect, but I will address them separately.

82. ParkerVision and Dr. Ricketts first argue that Canyon’s disclosure regarding the bypass switch is “complete” and that a POSITA therefore would not have looked to Ranjan. I disagree because this statement is both factually incorrect and would not negate the motivation to combine.

83. ParkerVision and Dr. Ricketts appear to base their argument that Canyon's bypass teachings are "complete" on Canyon's disclosure at 4:20-26 that the bypass switch may be closed when the power supply is consuming a "high power level," such as 22-24 dBm. This disclosure of a general principle that the bypass switch should be operated for a "high" power level, however, still does not teach exactly where to set the threshold. Because dBm is a logarithmic scale (that is, each additional 10 dBm corresponds to the power expressed in watts or milliwatts increasing by a *factor* of 10), 22-24 dBm is actually a significant range, *i.e.* 159-251 mW, a difference of nearly 60%. A POSITA familiar with the teachings of both Canyon and Ranjan, however, would have recognized that optimal efficiency would be achieved by setting the bypass threshold at the power level where a fixed power supply becomes more efficient than a down-converted power supply, as taught by Ranjan.

84. For example, for a system with the efficiency shown in Ranjan's Fig. 3, a system with a bypass threshold shown at point A would still have sub-optimal efficiency in the yellow shaded region (that is, the system could be made more efficient in this region by using the DC-DC converter system), whereas a system with a bypass threshold shown at point B would have sub-optimal efficiency in the orange shaded region due to using a DC-DC-converter system rather than a constant voltage:



EX1014, Fig. 3.

85. A POSITA would have further recognized that because these regions occur near the highest power consumption levels, even minor differences in efficiency in this region of operation could have significant impacts on the overall efficiency of the device. For example, in the case of a CDMA phone being operated at the outer limits of a cellular coverage area, the device would be operating at high power levels such that even minor improvements in efficiency would result in noticeable differences in battery life. For example, Ranjan’s discussion of Fig. 3 (p. 494) notes that the DC-DC converter may be “detrimental to efficiency” at maximum output levels, e.g. in the orange shaded region above. A POSITA would have recognized the significance of efficiency gains at high power and would accordingly have been motivated to seek even improvements that resulted in relatively small gains in efficiency.

86. Even if Canyon's description were "complete," it is my opinion that a POSITA would still have been motivated to look to Ranjan's teachings to improve Canyon's bypass threshold by setting the threshold for maximum efficiency. As the law has been explained to me, and based on my own understanding as a POSITA, a POSITA would not have ignored potential improvements to a prior art device just because one description of such a device might be deemed "complete." If the device taught by Canyon would have been made more efficient by setting the bypass threshold at the point where a bypass pathway becomes more efficient than a DC-DC converter, a POSITA would have been motivated to seek such an improvement.

87. It is also my opinion that a POSITA would have been motivated to make the combination by the combined teaching of the references. ParkerVision and Dr. Ricketts, however, both err by considering the teachings of the references in isolation. For example, ParkerVision (POR at 57) argues that Ranjan does not teach an architecture with a bypass switch, which Dr. Ricketts repeats with identical language at his EX2001, ¶187. However, a POSITA familiar with both Canyon, which undisputedly teaches a bypass switch, would still have seen the advantage in setting the threshold for the bypass switch to maintain the greatest efficiency between a DC-DC converter or bypass pathway as taught by Ranjan, regardless of whether Ranjan itself teaches a bypass switch.

88. Both ParkerVision and Dr. Ricketts make a similar error (*i.e.*, focusing on the teaching of one reference in isolation) in their discussions of Ranjan's Figure 3,

which emphasize that Fig. 3 of Ranjan shows output power levels. For example, both ParkerVision (POR, 61) and Dr. Ricketts (EX2001, ¶195) state identically that “Critically, Ranjan nowhere discloses any relationship between power supply output current and power amplifier output power.” This ignores both the teachings of Canyon and the knowledge of a POSITA. For example, in my opinion, a POSITA would have been aware that the power output of an amplifier is proportional to the power input of the amplifier. Canyon itself teaches that measuring power at the output of the power supply (the input to the power amplifier) as in Fig. 1 and measuring power at the output of the amplifier as in Fig. 2 are alternatives for accomplishing the same purpose (providing a power signal X used by the controller 170 to control the regulator 160 via signal Z and bypass 190 via signal Z’) in otherwise identical circuits.

89. In my opinion, Canyon even teaches the relationship between power supply power and power amplifier current explicitly, stating that “for a given current flow power indicator X, there is a corresponding output power level at which the power amplifier unit 120 operates” and “[b]y monitoring the current I_{bb} drawn by the power amplifier unit 120, it is possible to determine the power output of the power amplifier unit 120.” And as I noted previously, Dr. Ricketts acknowledges that the power “consum[ed]” by the PA is the power entering from V_{bb} , which is measured by power meter 180 in Figure 1. EX1030, 28:9-14, 161:11-162:6.

90. Therefore, in my opinion, a POSITA would have been motivated, based on Ranjan’s teaching that an amplifier using a down-converted voltage supply is more

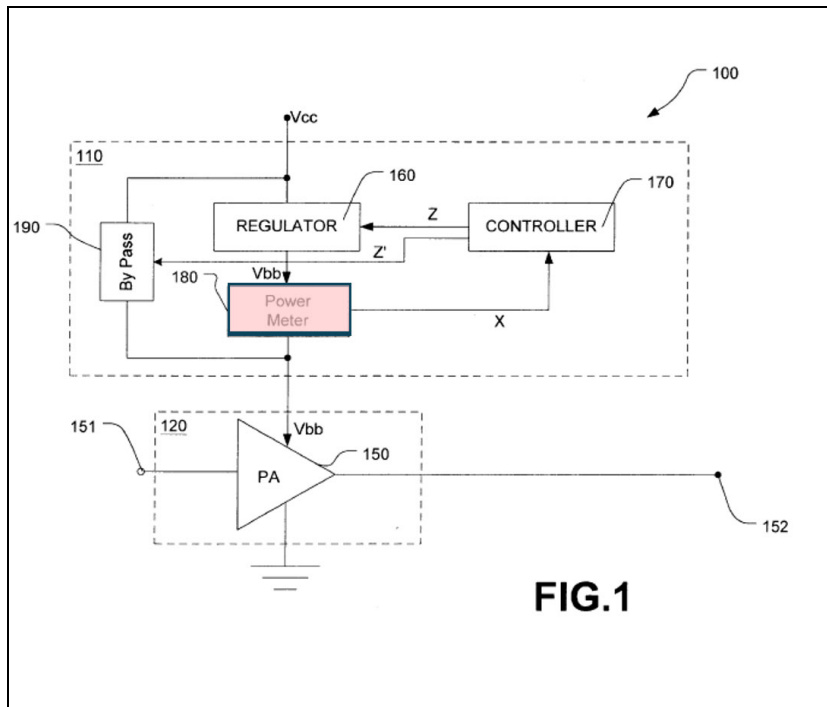
efficient up to a certain power level where constant voltage becomes more efficient, to set the bypass threshold of Canyon in either the Figure 1 or Figure 2 embodiment at the corresponding power level. Because Canyon already teaches measuring power using a power meter at the output of the down-converter (which is the input of the amplifier), a POSITA would have known how to make the combination and have had a reasonable expectation of success in doing so.

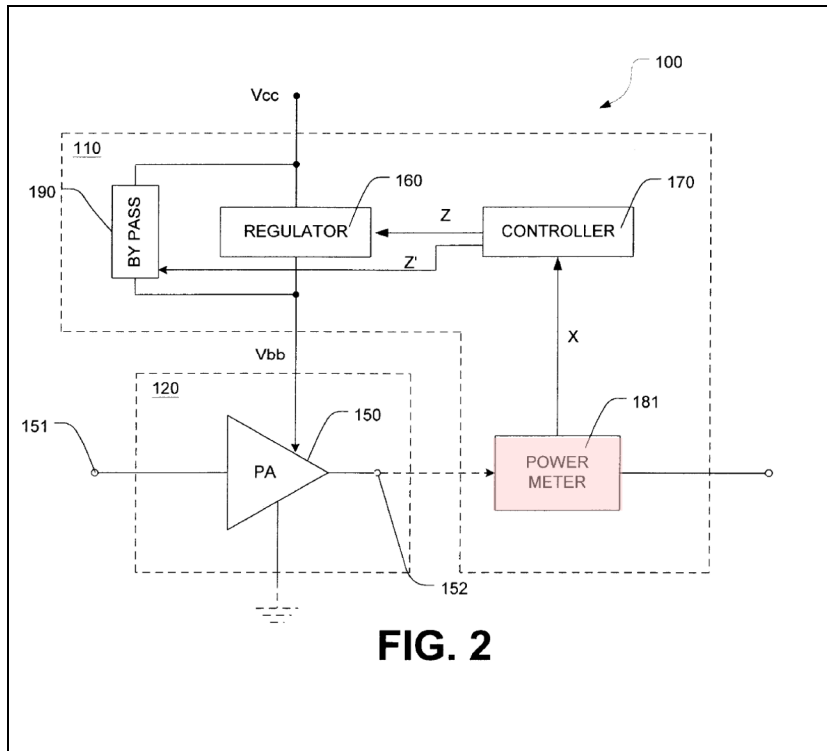
c. ParkerVision's characterization of Canyon's bypass threshold misreads Canyon

91. ParkerVision and Dr. Ricketts are also incorrect regarding their characterizations of the description of the bypass function in Canyon. While Canyon describes the bypass function at 4:14-29 and then describes a more detailed illustration in Figure 3 and the accompanying text at 4:30-36, ParkerVision and Dr. Ricketts assert that these descriptions apply *only* to the embodiment shown in Canyon's Fig. 2. In my opinion, such characterization misreads Canyon, and a POSITA would not have read Canyon that way.

92. Canyon's Figs. 1 and 2 contain numerous elements which are identical, and identically labeled, between both embodiments, including the regulator 160, controller 170, bypass unit 190, and power amplifier 150. Both figures also show several identical connections between these units. For example, in both figures, the regulator 160 takes an input voltage V_{cc} and outputs voltage V_{bb} to the regulator 150, while the controller receives an input signal X and controls regulator 160 via signal Z and bypass 190 via signal Z. However, the two figures differ in the power meter which

provides the signal X to the controller. In Figure 1, the power meter is placed between the regulator 160 and the PA 150, and thus measures power output by the regulator and consumed by the PA. In Figure 2, the power meter is placed at the output of the PA. Indeed, as shown below, every other element in the two figures other than the power meter 180 (in Fig. 1) and 181 (in Fig. 2) is identical between the two figures:





EX1011, Figs. 1-2 (annotated).

93. The text of Canyon's specification describes both the elements unique to each figure (*id.*, 3:1-43 for Fig. 1 and 3:43-65 for Fig. 2) and the elements common to both of them at 3:66-4:29. This is clear from the structure of these portions of Canyon's specification. For example, the portion of the text describing Fig. 1 alone ends with a description of how the controller 170 controls the regulator 160 based on an input X from the power meter 180 (3:31-43) before moving on to describe Fig. 2, while the description of Fig. 2 ends with the description of the corresponding features in Fig. 2 (*id.*, 3:55-65). The specification then describes in detail features which appear in both figures, including the operation of the regulator 160 (*id.*, 3:66-4:13) and the bypass switch 190 (*id.*, 4:14-29).

94. In my opinion, a POSITA would have recognized that these descriptions

(*id.*, 3:66-4:29) in Canyon apply to both Figures 1 and 2 because they describe common elements of both figures, including the regulator 160 and bypass switch 190. Neither ParkerVision nor Dr. Ricketts provides any explanation for their assertion that the description of the bypass switch at 190 at 4:14-29 applies only to Figure 2. It is possible that the assertion may be based on the description appearing after the introduction to Figure 2, but that does not mean that everything between first reference to Figure 2 and the first reference to Figure 3 only applies to Figure 2. In my opinion, a POSITA would not have read Canyon that way, because a POSITA would have seen common elements in both figures and recognized that the specification describes them once rather than repeating the same description. This interpretation is far more reasonable than assuming that Canyon simply omitted descriptions of significant portions of the first figure describing an embodiment of its invention.

95. Additionally, the text of the description of the bypass switch confirms that it applies to both the Figure 1 and Figure 2 embodiments. For example, the description of the bypass switch teaches that “bypass switch 190 is closed when the power output indicator signal X indicates that the power amplifier unit 120 is *consuming or operating at* a high power level.” EX1011, 4:20-23 (emphasis added). Between the alternative embodiments in Figs. 1 and 2, the power meter 180 placed at the power supply to the power amplifier in Fig. 1 measures the power *consumption* of the power amplifier, while the power meter 181 at the output of the power amplifier in Fig. 2 measures power *output*. Dr. Ricketts acknowledged in his deposition that “[t]he power consumption of

a power amplifier would refer to the power entering the power amplifier from the supply.” EX1030, 28:9-14. In my opinion, a POSITA would have recognized that Fig. 1 of Canyon shows a power meter 180 that measures power consumption.

96. Therefore, it is my opinion that the function of the bypass unit 190 in Fig. 1 of Canyon is described in part at EX1011, 4:14-29, as well as the more detailed following description of Fig. 3 at *id.*, 4:30-37. ParkerVision’s and Dr. Ricketts’ assertions that these descriptions only apply to Canyon’s Figure 1, and the arguments that they make based on these assertions, are incorrect.

97. Even if ParkerVision and Dr. Ricketts were correct that the description in Canyon at *id.*, 4:14-29 were intended by Canyon’s authors to apply only to Fig. 2 (they are not), this argument ignores the inferences that a POSITA would have made. Specifically, in my opinion, a POSITA would have recognized that the description at Canyon’s *id.* of the operation of the bypass switch provides a reasonable description of how to operate the functionality depicted in Fig. 1 (that is, a bypass unit 190 controlled by a signal Z’ from a regulator, which is itself controlled by a signal X from a power meter) regardless of whether the power meter is measuring power consumption (as in Fig. 1) or power output (as in Fig. 2) of the power amplifier. In my opinion, a POSITA would have recognized the benefit of setting the bypass threshold at the “crossover” point of efficiency whether power was measured at the output of the power supply or the output of the amplifier. Because Canyon already teaches measuring power using a power meter at the output of the down-converter (which is the input of the amplifier), a

POSITA would have known how to make the combination and have had a reasonable expectation of success in doing so.

2. Canyon in view of Ranjan renders obvious controlling the switching device “in response to a power efficiency of the power supply exceeding a predetermined threshold

98. In my opinion, ParkerVision’s argument on pages 62-64 of the POR with respect to this limitation appears to rely on the same set of errors as its motivation-to-combine arguments with respect to Canyon and Ranjan, particularly the mischaracterization of Canyon’s Figures 1 and 2 and the accompanying text. As I explained above, a POSITA would have understood that Canyon’s text at *id.*, 4:14-29 describing the operation of bypass unit 190 applies to the corresponding unit in both Figures 1 and 2.

99. It is also my opinion that this limitation would nevertheless have been obvious to a POSITA even if a POSITA misinterpreted Canyon’s Figures 1 and 2 and accompanying text in the same manner as ParkerVision. That is, it would be intuitive and suggested by Canyon to use the output X of Power Meter 180 for controller 170 to determine when to activate bypass 190 using signal Z’. Even based on the figure alone, a POSITA would have recognized from the description of the components and the connections between them in Figure 1 that the controller 170 uses the signal X as the input to make the determinations used to generate output control signals Z and X’. The operational relationship between these components is consistent with the description of the bypass 190 at *id.*, 4:14-36. Therefore, even if that description was not already

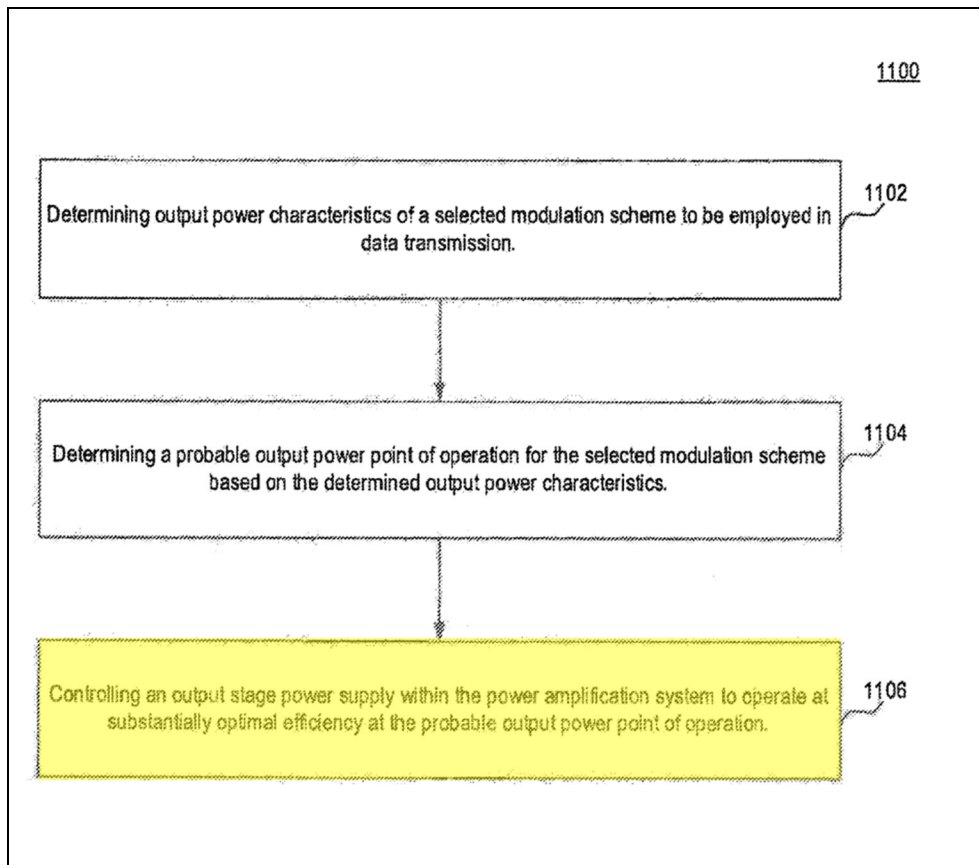
intended to apply to both embodiments (which a POSITA would have correctly recognized that it was), it would have been obvious to a POSITA to apply the teachings from that description to Fig. 1. Canyon itself teaches at *id.*, 3:20-30 that the power signal 180 measures power consumption of the power amplifier. As I explained previously, a POSITA would also have understood the relationship between input and output power of a power amplifier. A POSITA would also know how to generate a bypass control signal (such as signal Z) based on a comparison to a known reference or threshold. For example, such a comparison could be performed either by a comparator in a simple circuit, or by programmed logic in a digital controller based on a digitized input value and a stored threshold. EX1036 at 721-22.

100. I also note that Ranjan suggests this element even under ParkerVision's narrow interpretation of the claim term "power efficiency." Ranjan expressly represents PA efficiency as a percentage (*i.e.*, a ratio). As discussed above, a POSITA would have recognized that Ranjan's teachings that a bypass pathway could be more efficient above a certain point would also apply when measuring power at the output of the power supply, as taught by Canyon. Therefore, when making the combination (setting the bypass threshold at the point where bypass pathway becomes more efficient), the claim term would be satisfied even according to the additional limitations that ParkerVision proposes for this term, *i.e.* that efficiency must be a "ratio" and that the threshold must be "based on" a determination of "power efficiency characteristics of the power supply."

3. Ranjan suggests “controlling the switching device based on a probable output power point of operation for a selected modulation scheme based on one or more power efficiency characteristics of an electronic device coupled to the power supply” (claims 3-4, 10, 19)

101. In my opinion, Ranjan teaches or suggests this element. As I previously noted in paragraph 218 of my initial declaration, Ranjan’s Figure 3 teaches a probability distribution for power output in an electronic device using CDMA transmission, and notes in the Abstract that its experimental results were all derived in an IS-95 CDMA handset application. Therefore, in my opinion, a POSITA would have understood Ranjan as teaching the performance of the system is optimized by using (controlling) the DC/DC converter system for maximum efficiency at the most likely point of operation, *e.g.*, at the peak of the curve. I disagree with ParkerVision’s argument that Ranjan’s disclosure (EX1012, 494) that the “average efficiency can be computed based on power usage probabilities” does not “disclose[] controlling the switching device based on the computed average efficiency.” POR, 65-66. In my opinion, this argument does not consider the reasonable inferences a POSITA would make from Ranjan’s teachings. In particular, in my opinion, a POSITA seeing Ranjan’s explicit comparison in the same graph (Figure 3) of the probability distribution of operating at a given power level with the efficiency of such a power level would have recognized the need to optimize the performance of the system, including controlling the switching device, based on the power levels where it is most likely to operate.

102. It is also my opinion that the '593 Patent relies on the skill of a POSITA to fill in gaps in its own teaching with respect to this element. The '593 Patent itself does not describe how to perform this element beyond a single block 1106 in the flowchart in Fig. 11:



EX1001, Fig. 11 (annotated).

103. When Dr. Ricketts was asked about how a POSITA would know how to optimize the efficiency of a power supply for a given power level, his response appeared to admit that a POSITA would have to rely on their own knowledge to optimize efficiency for a given power level:

Q. How would a person of ordinary skill in the art optimize the

efficiency of [] a power supply for a given power level?

Q. So there's a tradeoff in power supply design between conduction currents and switching currents and the peak of that can be shifted by your component choice. So you can move it to peak at a different current depending on your component choice.

Q. And would a person of ordinary skill in the art understand that tradeoff?

A. Yes. That's a common tradeoff that we discuss in [] power supply design.

Q. Does the '593 Patent itself specifically describe that tradeoff?

A. No. That's something a POSITA would just know from basic power supplies.

...

Q. Would a POSITA know how to perform that step described in Block 1106 of Figure 11 of the '593 Patent?

A. Yes, I believe a POSITA would understand that.

Q. And would [] a POSITA's understanding relate to that description you gave a few answers ago about the tradeoff in power supply between conduction currents and switching currents?

A. Certainly a POSITA would understand how to optimize the power efficiency of a DC to DC for a specific operating point such as the most probable point for a communication waveform.

EX1030, 113:24-114:17, 115:14-116:5.

104. In my opinion, the same level of ordinary skill in the art that Dr. Ricketts described in his deposition as enabling a POSITA to practice the corresponding claim element based on the disclosure of the '593 Patent would also inform a POSITA's understanding of the disclosure of Ranjan.

E. Ground 2B

1. Claims 6-8 and 12-14

105. With respect to these claims, ParkerVision and Dr. Ricketts just refer back to the same arguments made regarding Ground 1 for the same claims. I previously addressed these arguments in Section VI(B) above regarding Ground 1B.

2. Canyon-Ranjan-Hau renders obvious “programming the threshold voltage based on a communication waveform efficiency” (claims 8, 13)

106. In my opinion, the combination of Canyon, Ranjan, and Hau teaches or suggests this element to the same extent as the '593 Patent itself. The “probability distribution” portion of Ranjan's Fig. 3 (that is, the curve showing the likelihood of operating at a given power setting for a wireless application) is similar to the '593 Patent's Fig. 2. The only explanation beyond that given by the '593 Patent with respect to this claim element is a single sentence at EX1001, 6:64-67 which notes that “Threshold Voltage 414 can be pre-programmed based on waveform efficiency requirements” without any further explanation. However, as I previously noted, Hau teaches both a “threshold setting” and that the performance characteristics are related to power requirements of a WCDMA modulation scheme using a CDMA waveform.

EX1007, claim 5, 1:49-51; EX1003, ¶249. As I explained in section VI(D)(1) above and in section IX(D)(3) of my original declaration (discussing motivation to combine), a POSITA would have been motivated in the Canyon-Ranjan combination to set a bypass threshold based on efficiency of output power for a wireless application. A POSITA would have therefore understood the “crossover” point where the threshold should be set is related to the efficiency characteristics of a specified transmission scheme (including the efficiency of the waveform), and the combination teaches this limitation at the same level of detail as the ’593 Patent.

F. Ground 2C

107. ParkerVision’s and Dr. Ricketts’ arguments regarding ground 2C simply refer back to their arguments regarding the Lejon reference in Ground 1C. POR at 68, EX2001, ¶217. These arguments are incorrect for the reasons that I previously explained regarding Ground 1C.

I. CONCLUSION

I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct to the best of my knowledge. I understand that willful false statements are punishable by fine or imprisonment or both. *See* 18 U.S.C. § 1001.

Date: November _14,
2025

By:



Lawrence Larson, Ph.D.