

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIATEK INC.,

Petitioner,

v.

PARKERVISION, INC.,

Patent Owner.

IPR2024-00796

Patent No. 7,483,686

**DECLARATION OF DR. LAWRENCE E. LARSON
IN SUPPORT OF PETITIONER'S REPLY**

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EXHIBITS REFERENCED IN DECLARATION

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EX1001	U.S. Patent No. 7,483,686 (“’686 Patent”)
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EX1003	U.S. Patent No. 6,643,522 (“Young”)
EX1004	U.S. Patent No. 6,600,726 (“Nevo”)
EX1005	Estabrook, “The Direct Conversion Receiver: Analysis and Design of the Front-End Components,” Aug. 1989 (“Estabrook-Thesis”)
EX1006	Avitabile, “S-band digital downconverter for radar applications based on a GaAs MMIC fast sample-and-hold,” IEE Proc.-Circuits Devices Syst., Vol. 143, No. 6, December 1996 (“Avitabile”)
EX1007	File History of U.S. Patent No. 7,483,686
EX1008	U.S. Patent No. 6,061,551
EX1009	Joint Claim Construction Chart, <i>ParkerVision v. MediaTek, Inc. et al.</i> , No. 6:23-cv-00375 (W.D. Tex. May 3, 2024), ECF No. 41
EX1010	Final Written Decision, <i>Intel Corp. v. ParkerVision, Inc.</i> , IPR2021-00346, Paper 33 (PTAB June 30, 2022)
EX1011	U.S. Patent No. 8,190,108
EX1012	Markman Order, <i>ParkerVision, Inc. v. Realtek Semiconductor Corp.</i> , No. 6-22-cv-01162 (W.D. Tex. Apr. 2, 2024), ECF No. 93
EX1013	Agreed Scheduling Order, <i>ParkerVision v. MediaTek, Inc.</i> , No. 6:23-cv-00375 (W.D. Tex. Jan. 4, 2024), ECF No. 32
EX1014	Markman Order, <i>ParkerVision, Inc. v. Qualcomm Inc.</i> , No. 3:11-cv-719-RBD-JK (M.D. Fla. Feb. 20, 2013), ECF No. 243.
EX1015	<i>Sotera</i> Stipulation Letter dated May 21, 2024

EX1016	P. Estabrook and B. B. Lusignan, “A Mixer Computer-Aided Design Tool Based in the Time Domain,” IEEE Microwave Theory and Techniques Symposium, 1988, pages 1107- 1110 (“Estabrook-1988”)
EX1017	P. Estabrook and B. B. Lusignan, “The Design of a Mobile Radio Receiver Using a Direct Conversion Architecture,” In Proc. Of the IEEE Vehicular Technology Conference, pages 63-72, May 1989 (“Estabrook-1989”)
EX1018	Declaration of June Munford
EX1019	Declaration of Polly Estabrook, Ph.D.
EX1020	Declaration of G. Avitabile
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EX1031	IEEEXplore Citation search results for Estabrook-1989
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EX1038	Excerpts from the Electrical Engineering Dictionary (ISBN 0-8493-2170-0), pgs. 50, 302, 539, 662
EX1039	IEEE Std 802.11a-1999 (Supplement to IEEE Std 802.11-1999)
EX1040	Excerpts from P. Nahin, The Science of Radio (ISBN 1-56396-347-7) (1996), pgs. 36, 165, 182-184
EX1041	EP0551857
EX1042	Excerpts from Serway, Physics for Scientists and Engineers, 3 rd Ed. (ISBN 0-8493-3128-5) (1999).
EX1043	Excerpts from Davis, Operating Systems, A Systematic View (ISBN 0-201-11116-0) (1983)
EX1044	Bluetooth Spec. V. 1.0 B (1998)
EX1045	Appellant's Brief, <i>ParkerVision Inc. v. Intel Corp.</i> , Case No. 2022-1548 (Fed. Cir. July 15, 2022)
EX1046	Federal Circuit Rule 36 Judgment, Case No. 2022-2173 (May 16, 2024)
EX1047	Reply Claim Construction Brief, <i>ParkerVision v. MediaTek, Inc. et al.</i> , No. 6:23-cv-00375 (W.D.Tex. Apr. 15, 2024)
EX1048	Special Master's Report & Recommendation Regarding Claim Construction, <i>ParkerVision, Inc. v. MediaTek Inc.</i> , No. 6:23-CV-00375 (W.D. Tex. Oct. 21, 2024), ECF No. 52
EX1049	Larson Reply Declaration
EX1050	Claim Construction Order, <i>ParkerVision Inc. v. Apple, Inc. et al.</i> , No. 3:15-cv-1477-J-39JRK (M.D.Fla. July 15, 2019).
EX1051	Ricketts Deposition Transcript
EX1052	Claim Construction Order, <i>ParkerVision, Inc. v. MediaTek Inc. et al.</i> , No. 6:22-cv-01163-ADA (W.D.Tex. Apr. 29, 2024)

EX1053	U.S. Patent No. 6,266,518 (“’518 Patent”)
EX1054	Weisskopf, “Subharmonic Sampling of Microwave Signal Processing Requirements,” <i>Microwave Journal</i> , May 1992, pp. 239-247
EX1055	Specification of the Bluetooth System, Vol. 1, v1.0 B, Dec. 1, 1999
EX1056	National Instruments, Intro to Bluetooth Receiver Testing, September 2016, https://download.ni.com/evaluation/rf/intro_to_bluetooth_test.pdf (last accessed May 28, 2025)
EX1057	ParkerVision Reply Claim Construction Brief, <i>ParkerVision, Inc. v. Intel Corp.</i> , No. 6:20-cv-00108-ADA, ECF No. 65 (W.D.Tex. Dec. 11, 2020)
EX1058	U.S. Patent No. 6,049,706
EX1059	Merceret <i>et al.</i> , “Attenuation of Weather Radome Signals Due to Wetting of the Radome by Rainwater or Incomplete Filling of the Beam Volume,” Report No. NASA/TM-2002-211171
EX1060	Sletten <i>et al.</i> , “Ultrawide-Band Radar Observations of Multipath Propagation over the Sea Surface,” <i>IEEE Transactions on Antennas and Propagation</i> , 44:5 (May 1996)
EX1061	Lord <i>et al.</i> , “Approaches to RF Interference Suppression for VHF/UHF Synthetic Aperture Radar,” <i>Proceedings of the 1998 South African Symposium on Communications and Signal Processing-COMSIG '98</i> , Rondebosch, South Africa, 1998, pp. 95-100
EX1062	Excerpts from Lee, <i>The Design of CMOS Radio-Frequency Integrated Circuits</i> , Cambridge University Press, 2 nd Ed. 2004
EX1063	Pun <i>et al.</i> , “Basic Principles and New Solutions for Analog Sampled-Data Image Rejection Mixers,” 1998 IEEE International Conference on Electronics, Circuits and Systems. <i>Surfing the Waves of Science and Technology</i> , Lisboa, Portugal, 1998, pp. 165-168 vol.3
EX1064	Pache <i>et al.</i> , “An improved 3V 2GHz BICMOS Image Reject Mixer IC,” <i>Proceedings of the IEEE 1995 Custom</i>

	Integrated Circuits Conference, Santa Clara, CA, USA, 1995, pp. 95-98
EX1065	Google Scholar results, “sampling mixer”
EX1066	Google Patents results, “sampling mixer”

LISTING OF CHALLENGED CLAIMS

Reference	Claim Limitation
Claim 1	
1[pre]	An apparatus capable of performing simultaneous multi-platform operations, comprising:
1[a]	at least one multi-platform module including a plurality of transceivers each having at least one frequency translating module, wherein said at least one frequency translating module comprises
1[b]	a switch configured to operate according to an energy transfer signal, and to sub-sample and transfer energy from a first electromagnetic (EM) signal, and
1[c]	a control module configured to enable the at least one multi-platform module to communicate with at least one of a plurality of communication links, the control module including a plurality of protocol/standard sub-modules.
Claim 2	
2	The apparatus of claim 1, wherein the control module is configured to enable the at least one multi-platform module to simultaneously communicate with a quantity of the plurality of communication links by employing an equal quantity of the plurality of standard/protocol sub-modules.
Claim 3	
3	The apparatus of claim 1, wherein the at least one multi-platform module includes a plurality of receivers and a plurality of transmitters each having at least one frequency translating module.
Claim 4	
4	The apparatus of claim 1, wherein the plurality of protocol/standard sub-modules comprise a first protocol/standard sub-module

Reference	Claim Limitation
	configured to operate a first transceiver in conformance with a first protocol/standard combination and a second protocol/standard sub-module configured to simultaneously operate a second transceiver in conformance with a second protocol/standard combination.
Claim 5	
5	The apparatus of claim 4, wherein the first protocol/standard combination is different from the second protocol/standard combination.
Claim 6	
6	The apparatus of claim 4, wherein the first and second protocol/standard sub-modules contain respective first and second implementation and operational instructions for the at least one multi-platform sub-module.
Claim 7	
7	The apparatus of claim 6, wherein the first and second implementation and operational instructions include respective first and second protocol stacks and specification information about the first and second protocol architectures.
Claim 8	
8	The apparatus of claim 6, wherein the first and second implementation and operational instructions can be updated, upgraded, replaced, or modified to provide the at least one multi-platform sub-module with additional functionality.
Claim 9	
9	The apparatus of claim 4, wherein the first and second protocol/standard sub-modules are configured to operate the first and second transceivers in conformance with respective requirements of first and second protocols and operating

Reference	Claim Limitation
	environments.
Claim 10	
10	The apparatus of claim 9, wherein the first and second operating environments include at least one of respective standards, content encoders and decoders, and protocol gateways.
Claim 11	
11[pre]	A method for performing simultaneous multi-platform operations, comprising
11[1.1]	(1) controlling at least one multi-platform module to communicate with at least one of a plurality of communication links
11[1.2]	using a control module
11[1.3]	having a plurality of standard/protocol sub-modules, wherein the at least one multi-platform module includes
11[1.4]	a plurality of transceivers each having at least one frequency translation module, wherein said at least one ¹ frequency translation module comprises
11[FTM-1.1]	a switch
11[FTM-1.2]	configured to operate according to an energy transfer signal
11[FTM-1.3]	and to sub-sample and transfer energy from a first electromagnetic (EM) signal, and

¹ Certificate of Correction replaced “on” with “one.”

Reference	Claim Limitation
11[FTM-2.1]	a storage module coupled to said switch and configured to store said transferred energy
11[FTM-2.2]	wherein a second EM signal is generated from said stored energy, said second EM signal having a frequency different from said first EM signal
11[2]	(2) operating a first transceiver in conformance with a first protocol/standard combination using a first standard/protocol sub-module; and
11[3]	(3) operating a second transceiver in conformance with a second protocol/standard combination using a second standard/protocol sub-module.
Claim 12	
12	The method of claim 11, wherein step (1) comprises: controlling the at least one multi-platform module to simultaneously communicate with a quantity of the plurality of communications links by employing an equal quantity of the plurality of standard/protocol sub-modules.
Claim 13	
13	The method of claim 11, wherein step (1) comprises: controlling the at least one multi-platform module to communicate with at least one of the plurality of communication links using the control module, the at least one multi-platform module including a plurality of receivers and a plurality of transmitters each having at least one frequency translating module.
Claim 14	
14	The method of claim 11, wherein step (3) comprises: simultaneously operating the second transceiver in conformance with a second protocol/standard combination that is different from

Reference	Claim Limitation
	the first protocol/standard combination
Claim 15	
15	The method of claim 11 ² , wherein steps (2) and (3) comprise: programming the first and second protocol/standard sub-modules with respective first and second implementation and operational instructions for the at least one multi-platform sub-module.
Claim 16	
16	The method of claim 15, wherein steps (2) and (3) further comprise: programming the first and second protocol/standard sub-modules with respective first and second protocol stacks and specification information about first and second protocol architectures.
Claim 17	
17	The method of claim 15, wherein steps (2) and (3) further comprise: updating, upgrading, replacing, or modifying the first and second implementation and operational instructions to provide the at least one multi-platform sub-module with additional functionality.
Claim 18	
18	The method of claim 11, wherein steps (2) and (3) further ³ comprise: simultaneously operating the first and second transceivers in conformance with respective requirements of first and second protocols and operating environments.
Claim 19	

² Certificate of Correction replaced “claim 14” with “claim 11.”

³ Certificate of Correction inserted “further” after “(3).”

Reference	Claim Limitation
19	The method of claim 18, wherein steps (2) and (3) further comprise: simultaneously operating the first and second transceivers in conformance with respective standards, content encoders and decoders, and protocol gateways of the first and second protocol and operating environments.
Claim 20	
20	The method of claim 11, wherein step (3) comprises simultaneously operating the second transceiver and the first transceiver.

I, Dr. Lawrence E. Larson, declare as follows:

I. INTRODUCTION

1. I have been retained by Petitioner MediaTek Inc. (“MediaTek”) to serve as an independent expert consultant in *Inter Partes* review (“IPR”) proceedings regarding U.S. Patent No. 7,483,686 (“the ’686 Patent”) (EX-1001). I have been asked to consider the validity of claims 1-20 of the ’686 Patent (the “Challenged Claims”). My opinions are set forth below.

2. I previously submitted a declaration (EX1002) in support of Mediatek’s petition for IPR of the ’686 Patent. Because EX1002 is already a matter of record, this declaration is intended only to respond to ParkerVision’s Patent Owner Response (Paper 15) (“POR”) and the exhibits submitted therewith, including the Declaration of Dr. David Ricketts (EX2006). 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 ’686 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 by the grounds presented in the Petition, including the combinations of Nevo and Avitabile, Young and Estabrook-Thesis, and Young, Estabrook-1988, and Estabrook-1989. It is further my opinion that a person of ordinary skill in the art at the time of the alleged invention would have combined the references in the matter set forth in the Petition. It is also my opinion that certain claim constructions proposed by ParkerVision, which differ from the claim constructions proposed by Mediatek, are incorrect.

III. QUALIFICATIONS AND MATERIALS RELIED ON

4. My background and experience are fully outlined in my previous declaration, EX1002.

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 '686 Patent was no earlier than May 10, 2000, and that the previous applications to which the '686 Patent claims priority before that date did

not provide support for certain claim terms. Neither ParkerVision's POR nor Dr. Ricketts' Declaration addresses the priority date of the '686 Patent.

7. In my previous declaration (EX1002), I offered the opinion that a person of ordinary skill in the art at the time of the alleged invention would have had at least 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, or would have had at least five years of work experience and training in the design and development of RF circuits and/or systems. Less work experience could be compensated by a higher level of education, such as a master's degree.

8. Dr. Ricketts (EX2006, ¶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/or systems."

9. 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 '686 Patent would be invalid according to a person of ordinary skill in the art under either definition.

V. BACKGROUND TECHNOLOGY

10. I provided a general description of the background technology in my original declaration. Dr. Ricketts provides his own description in his declaration. It is not my intention here to repeat my initial description of the technology background or to respond to Dr. Ricketts' summary of the technology point-by-point, so the absence of a response to any particular point should not be taken as an admission of the correctness of Dr. Ricketts' characterization of the technology. However, there are a few points that I believe warrant some commentary.

11. As a general matter, much of Dr. Ricketts' technology background section isn't really dedicated to describing the technological background at all, but rather to arguments about ParkerVision's purported technology being some type of radical break from the state of the art at the time. For example, there are several places in Dr. Ricketts' declaration where he suggests that the state of the technology abruptly changed in 2000, or even more specifically in March 2000, following ParkerVision's purported inventions:

- EX2006, ¶91: "From the late 1980s through 2000, the industry was focused on the use of non-sampling mixers and heterodyne receivers for down-conversion."

- *Id.*, ¶101: “In the late 1980s through 2000, heterodyning mixers could not efficiently handle baseband signals that varied widely in amplitude such as the range of amplitudes used in advanced communication protocols.”
- *Id.*, ¶102: “The term ‘mixer’ has changed meaning over time and has lost its original meaning. Prior to the time of the invention of the ’686 Patent, a ‘mixer’ referred to the configuration set forth above, which was not an energy sampler. After the time of the invention of the ’686 Patent, companies began to develop energy samplers and refer to them as ‘mixers.’ As such, the term ‘mixer’ has become a generic term to refer to different configurations that performs down-conversion or up-conversion.”
- *Id.*, ¶104: “In the late 1980s through 2000, the direct conversion schemes used non-sampling or time-varying devices to effect conversion.”

12. Dr. Ricketts cites no evidence, either from before or after 2000, of the supposed abrupt shift in the entire technological field and the terminology used in the industry following the filing of ParkerVision’s patents. In my view, if the entire technological field really shifted so much that the terminology changed because of ParkerVision’s contribution to the field, I would have expected that someone like Dr. Ricketts would have been aware of it during that time. Yet Dr. Ricketts testified at his deposition that he couldn’t “say that I recall knowing the name” of

ParkerVision prior to being retained by them as a litigation expert. EX1051, 10:12-15.

13. I also disagree with Dr. Ricketts' characterization of the field and the abrupt change that he claims to have occurred. The concepts discussed by the ParkerVision patents were all generally well-known in the field before the priority dates of those patents. The field did not suddenly start retroactively referring to sampling systems as "mixers" after ParkerVision's patents were filed; sampling methods were used in mixers before and were referred to as such. For example, exhibits 1065 and 1066 show the hits for the phrase "sampling mixer" in Google Scholar and Google Patents, respectively, through the end of 1999. From my own experience, it is true that there was some shift over the course of the 1990s toward increasing use of field-effect transistors (FETs) in mixers (in some cases replacing diodes), but the use of FETs in mixers was already well-known well before 2000 and simply became more frequent during that time period. This shift also had nothing to do with ParkerVision or its patents.

14. I also note that while Dr. Ricketts' summary of the technology (EX2006 ¶¶27-122, particularly at 90-122) does not reflect what the claims of the '686 Patent actually require. Much of his discussion about purported features of "energy sampling" as he describes it are not features required by the claims. Indeed, when Dr. Ricketts was asked several questions in his deposition about whether features he

described as part of an “energy sampling” system were required by the claims, many of his responses basically said that this portion of his declaration was not meant to be a claim analysis. EX1051, 36:25-37:24, e.g. at 37:15-16 (“that sentence is not part of a claim element analysis”), 37:25-39:2, e.g. at 38:25-39:2 (“what we’re looking at here is a high-level overview section. It’s not a claim analysis in my declaration.”). Many of the purported features that Dr. Ricketts describes in this section are irrelevant because they are not requirements of the claim, either according to the plain language of the claim or the claims as properly construed, and in some cases not even the claim as ParkerVision proposes construing it.

VI. THE CHALLENGED CLAIMS OF THE ’686 PATENT

15. MediaTek challenges the patentability of claims 1-20 of the ’686 Patent. The full listing of the Challenged Claims is reproduced at the beginning of this declaration. Since claim 11 is representative, I have reproduced it again in this declaration below (with claim numbering annotations added):

11. A method for performing simultaneous multi-platform operations, comprising:

(1) controlling [1.1] at least one multi-platform module to communicate with at least one of a plurality of communication links using [1.2] a control module having [1.3] a plurality of standard/protocol sub-modules, wherein the at least one multi-platform module includes [1.4] a plurality of transceivers each having at least one frequency translation module, wherein said at least [one] frequency translation module comprises

[FTM-1.1] a switch configured to operate according to [FTM-1.2] an energy transfer signal, and [FTM-1.3] to sub-sample and transfer energy from a first electromagnetic (EM) signal, and

[FTM-2.1] a storage module coupled to said switch and configured to store said transferred energy, wherein [FTM-2.2] a second EM signal is generated from said stored energy, said second EM signal having a [frequency] different from said first EM signal;

(2) operating a first transceiver in conformance with a first protocol/standard combination using a first standard/protocol sub-module; and

(3) operating a second transceiver in conformance with a second protocol/standard combination using a second standard/protocol sub-module.

'686 Patent, Claim 11 (annotated).

VII. CLAIM CONSTRUCTION

16. I previously explained the principles that I applied in reaching my opinions regarding claim construction, and provided opinions on several terms. Since I provided my original opinions in my initial declaration, the Magistrate Judge in the District Court litigation issued a Report and Recommendation regarding claim construction (EX1048), which the District Court judge adopted as the Court's Order (EX1052). The claim constructions adopted by the District Court with respect to the '686 Patent are generally broad, and for the most part rejected narrowing claim limitations whether they were offered by ParkerVision or Mediatek. While I maintain the position that the claims should be construed as I set forth in my initial

declaration, the constructions adopted by the District Court support my opinions that the Challenged Claims are invalid for the reasons set forth in my initial declaration.

17. ParkerVision and Dr. Ricketts also offered proposed constructions for several claim elements. Although some of these constructions are similar to those offered by MediaTek and ordered by the District Court, there are elements (particularly “energy transfer signal”) where ParkerVision’s proposed constructions are wildly different. I discuss these terms below.

A. “Energy transfer signal” in claims 1 and 11

18. In my initial declaration, I proposed that the term “energy transfer signal,” along with all of the other terms that MediaTek did not propose a construction for, be given its plain and ordinary meaning. EX1002, ¶74. I do not believe that any further construction of the term is required because the meaning of the term is clear to a person of ordinary skill in the art from the words of the claim term, as well its use in the claims and the specification. For example, claim 11 recites “a switch configured to operate according to an energy transfer signal, and to sub-sample and transfer energy from a first electromagnetic signal.” This claim language explains what the energy transfer signal is without further construction: it is a signal according to which the switch operates, to transfer energy from a first EM signal.

19. The parties in the District Court litigation, including ParkerVision, agreed that the term “energy transfer signal” should be given its plain and ordinary

meaning. EX1009, 2. ParkerVision and Dr. Ricketts now propose a lengthy construction for “energy transfer signal,” specifically “an independent control input of an energy transfer system having pulses with non-negligible apertures.” POR at 34-36; EX2006, ¶¶160-165. This proposed construction is much lengthier and narrower than the term itself or the original agreed plain-and-ordinary meaning construction in district court. Neither ParkerVision’s POR nor Dr. Ricketts’ declaration explains why ParkerVision or Dr. Ricketts is changing their position, nor why the term should be construed differently in the District Court from in front of the Board. It is also my understanding that ParkerVision has not informed the District Court of its narrower proposed construction here since it filed its Reply, and continues to seek to use the plain-and-ordinary construction in the district court. In other words, ParkerVision seems to be saying now that the claims should be narrower when the Board analyzes validity than they should be when ParkerVision itself is trying to prove infringement. I understand that the Board now interprets claims according to the same standard for IPRs as district courts in patent litigation, so the claims should not be narrower here.

20. In any event, ParkerVision’s new proposed construction is wrong, and several parts of its construction have already been rejected either by various courts or by the Board in different contexts. For example, ParkerVision proposes that the “energy transfer signal” should be interpreted to require an “independent control

input.” As I noted in my original declaration at paragraphs 78-80, ParkerVision originally proposed including the same requirement in its proposed construction of “switch” in the district court litigation. In my opinion, the “energy transfer signal” and “switch” are closely linked in the claims because the switch is configured to operate according to an energy transfer signal. Likewise, the specification depicts the “energy transfer signal” as the input controlling the switch. *See, e.g.* EX1001, Fig. 51A. Therefore, if the switch is not required to have an independent control input, neither is the energy transfer signal. Because the “switch” and “energy transfer signal” are linked for the reasons that I described above, the reasons that I discussed in my original declaration why the “switch” should not be construed to require an “independent control input” also apply to the “energy transfer signal.” I note that neither ParkerVision nor Dr. Ricketts responds to this analysis in my declaration.

21. Since I offered my original declaration, the Magistrate Judge and District Judge in the district court litigation have both concluded that the “switch” did not require an “independent control input.” EX1048, 22-24; EX1052. I understand that ruling was based partially on a ruling from the Federal Circuit, which affirmed a decision by the Board which in turn had rejected adding the “independent control input” to the construction of “switch.” EX1010, 15-26. These decisions from the Board, Federal Circuit, and both judges in the District Court case support

my opinion that an “independent control input” is not a requirement of the claims of the ’686 Patent as properly construed, whether the term being construed is “switch” or “energy transfer signal.” I note that neither ParkerVision nor Dr. Ricketts addresses any of these decisions. While Dr. Ricketts cited the PTAB decision in his declaration (EX2006, ¶50), his deposition testimony suggested that he did not review the entire decision, including the lengthy discussion about why the “switch” should not be construed to require an “independent control input.” EX1051, 20:8-22. As a result, Dr. Ricketts does not provide any response to this decision, and it is not clear whether he was even aware (or made aware) of it at the time he provided his declaration.

22. Even setting aside the previous decisions, I also disagree with ParkerVision’s and Dr. Ricketts’ arguments (which are largely identical) for its construction. ParkerVision and Dr. Ricketts rely on the following excerpt from the ’686 Patent (at 13:27-31) to argue that the “energy transfer signal” must be made up of “pulses:”

[w]hen the pulses of the control signal 2006 have non-negligible apertures, the aliasing module 2000 is referred to interchangeably herein as an energy transfer module or a gated transfer module, and the control signal 2006 is referred to as an energy transfer signal.

23. In my opinion, a POSITA would not view this disclosure as expressing a clear definition of the term “energy transfer signal” to require “pulses.” It describes

a particular embodiment in which pulses are used, but it does not state that the signal must be a pulse. The purpose of this statement is to distinguish between a signal which closes a switch for a significant enough time for transfer of energy to occur and one that does not. It does not mean that the signal must be a “pulse.” In my opinion, the fact that the claims of the ’686 Patent use the broader term “signal” rather than the more specific term “pulse” indicates that the claims are not limited by the narrower term.

24. In my view, a person of ordinary skill in the art would also not view a “pulse” as a necessity for a signal to operate as claimed by the ’686 Patent. Diodes and switches, which are both commonly used forms of switches in high-frequency microelectronic circuits, both generally become conductive enough to be considered “closed” or “on” when a certain threshold voltage value is reached, e.g. the gate-source voltage in MOSFET or the forward voltage in a diode, and stay on as long as the voltage exceeds that value. Therefore, a person of ordinary skill in the art would understand that different types of waveforms, not limited to a “pulse” could satisfy the purpose of keeping the switch closed for a defined time period or “aperture.”

25. ParkerVision and Dr. Ricketts also now argue (again, contrary to the plain and ordinary meaning construction agreed in the District Court) that an “energy transfer signal” must be part of an “energy transfer system.” I disagree. I noted in my original declaration (EX1002, ¶77) that ParkerVision’s proposed construction of

“storage module” in the district court had sought to add the same requirement of an “energy transfer system” (which does not appear in any of the ’686 Patent claims themselves) into its construction another term, “storage module.” Neither ParkerVision nor Dr. Ricketts responds to this discussion. Moreover, since I provided my original declaration, both the Magistrate Judge and the District Judge in the related District Court litigation have issued claim construction rulings which rejected ParkerVision’s attempt to add an “energy transfer system” requirement to the claims. EX1048, 56; EX1052, 49. Neither ParkerVision nor Dr. Ricketts addresses these rulings. Both District Court rulings further cited a 2023 Federal Circuit ruling that also rejected ParkerVision’s attempt to require an “energy transfer system” where it does not exist in the claims. *ParkerVision, Inc. v. Vidal*, 88 F.4th 969, 975-77 (Fed. Cir. 2023). In that opinion, the Federal Circuit noted that “ParkerVision invites us to read into claim 3 an entire system (an energy transfer system) simply on the basis that claim 3 recites a single component (a storage element) that can be part of that system,” but found that the examples cited by ParkerVision “merely indicate that the term ‘storage element’ encompasses storage elements that are part of energy transfer systems, not that this term by itself necessarily invokes an entire energy transfer system.” I am not a lawyer and I cannot offer any opinion about whether a prior court opinion is legally binding on this case. However, it is my opinion that a person of ordinary skill in the art would at minimum

recognize that the logic applied by the Federal Circuit to reject an “energy transfer system” requirement also applies in this case; that is, just because an “energy transfer signal” may be used in an “energy transfer system” in some embodiments does not mean that the use of the first term implies the second. I agree that a person of ordinary skill in the art would not infer an “energy transfer system” from an “energy transfer signal” merely because some embodiments in the ’686 Patent use the “signal” in the “system.”

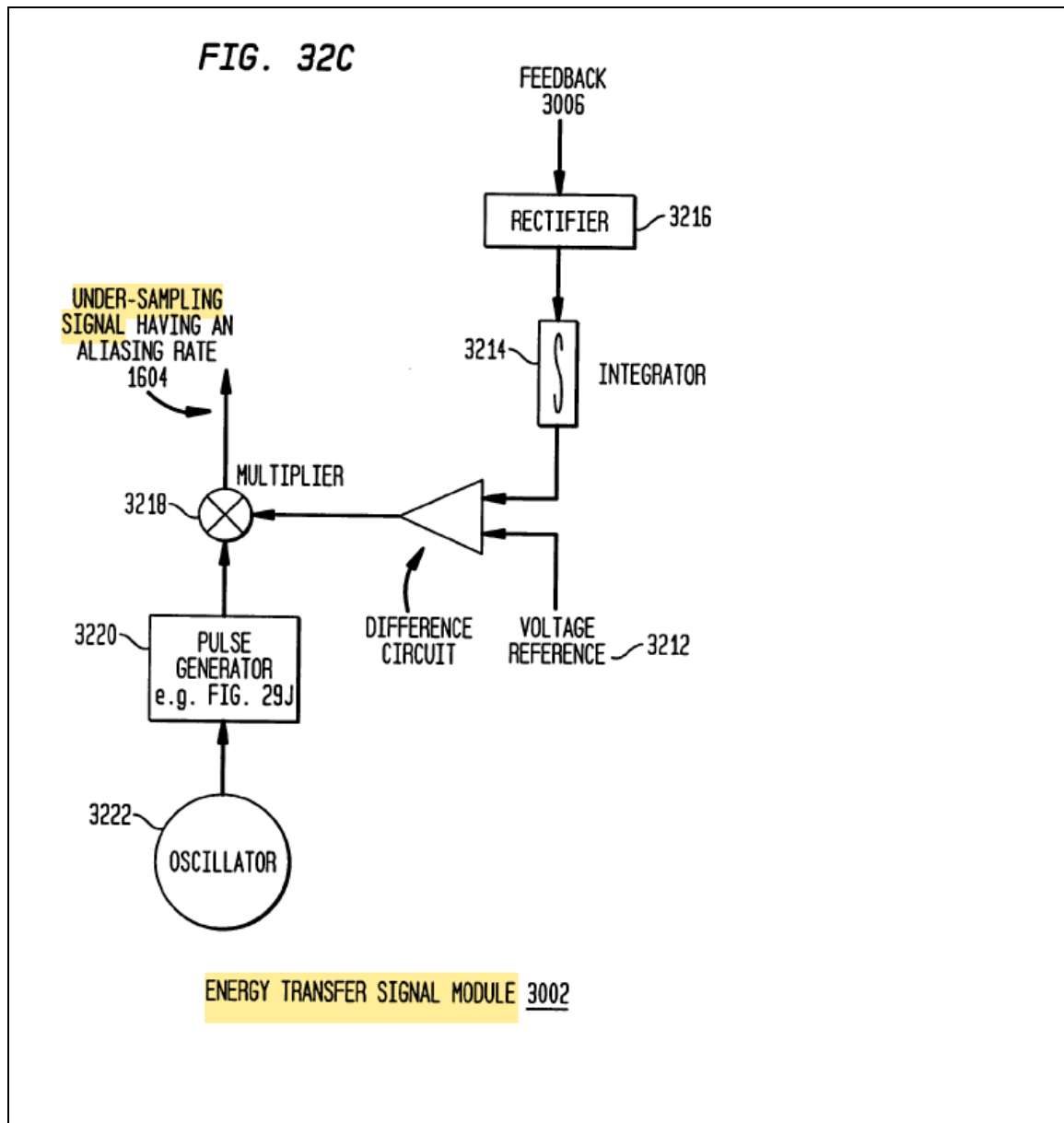
26. The phrase “energy transfer system” also introduces uncertainty about the scope of the claim, in my opinion. While ParkerVision’s construction seeks to add the phrase “energy transfer system” into their construction of the claim, neither they nor Dr. Ricketts defined what an “energy transfer system” is, nor what aspects of an “energy transfer system” are required by the claims if the Board adopts their construction. This is particularly troubling to me since ParkerVision (in its POR at 23-28) and Dr. Ricketts (in paragraphs 114-122), list a number of other features that they assert to be characteristics of an “energy transfer system,” yet which do not appear in the claims. For example, ParkerVision and Dr. Ricketts suggest that an energy transfer system uses a capacitor which integrates energy over successive sampling cycles, discharges energy from a capacitor, uses a low impedance load, and in which energy that passes through the switch must actually make up part of the down-converted signal (as opposed to the signal simply being generated from it).

None of these features appear in the claims, however, and it is not clear which of these ParkerVision is arguing are necessary requirements of the claim.

27. ParkerVision and Dr. Ricketts also list a litany of figures in the '686 Patent and make a conclusory assertion that the '686 Patent and '551 Patent use the phrase “energy transfer signal” exclusively to describe the signal in an energy transfer system. POR, 35; EX2006, ¶163. Neither of them gives any further support or reasoning for this assertion, and I disagree. I have reviewed the various figures cited in paragraph 163 of Dr. Ricketts' declaration, and in my opinion none of them provides any sort of clear definition that explicitly requires an energy transfer system when an energy transfer signal is used. At most, there are suggestions in the '686 Patent that an energy transfer signal may be used in an energy transfer system, but there is no requirement that it must be.

28. ParkerVision and Dr. Ricketts also assert (in identical wording) that “the '686 and '551 Patents specifically use the term ‘energy transfer signal’ to exclusively describe the signal in an energy transfer system. The specification reserved the term ‘under sampling signal’ to be used exclusively to describe the signal in a voltage sampling system.” POR, 49-50; EX2006, ¶163. Neither of them provides any citation or reasoning to support this assertion, and I disagree. I did not find any clear statement anywhere in either the '686 Patent or the '551 Patent that if the phrase “energy transfer signal” is used it must be an “energy transfer system,”

and if the phrase “under-sampling signal” is used it must be a “voltage sampling” system. Indeed, the phrase “under-sampling signal” does not appear in the ’686 Patent itself, and where it does appear in the ’551 Patent, the ’551 Patent suggests that such an “under-sampling signal” may be the output of an “energy transfer signal module:”



See also Fig. 46D (“energy transfer signal” results in “under-sampling”).

29. I also note that ParkerVision appears to have made exactly the opposite argument regarding the meaning of “under-sampling signal” in another case involving a related patent where a nearly identical term (“under-samples”) was used in the claims (although it is not here). In *ParkerVision v. Intel Corp.*, the defendant proposed a construction requiring “under-samples” to be (in ParkerVision’s characterization) “synonymous with sample/hold systems and the use of negligible apertures.” EX1057, 16. ParkerVision vigorously refuted this position, arguing that “the specification makes it clear that under-sampling is performed by energy transfer system [sic] using non-negligible apertures.” *Id.* at 17 (emphasis in original). The patent at issue there, U.S. 6,049,706, (EX1058) claims priority to and incorporates by reference the ’551 Patent, so the “specification” in that case is the same as the ’686 Patent (which does not itself use “under-sampling signal”), as I discuss above.

30. ParkerVision and Dr. Ricketts also assert that the “energy transfer signal” must be an “independent control input.” I disagree. As an initial matter, as with the proposed requirement for an “energy transfer system,” ParkerVision ignores the fact that it previously proposed the same limitation as part of its construction of “switch” either for the ’686 Patent or an identical limitation of a related patent, but that same construction was rejected by the PTAB (EX1010, 1-26) which was summarily affirmed by the Federal Circuit (EX1046). Likewise, both the Magistrate

Judge and District Judge omitted the “independent control input” from the construction of “switch.” EX1048, 22-24; EX1052. Neither ParkerVision nor Dr. Ricketts explains why these rulings do not apply here, or why the PTAB, Board, or District Court got their analysis wrong. In my opinion, the terms “switch” and “energy transfer signal” are closely linked by the claims; both claims 1 and 11 recite “a switch configured to operate according to an energy transfer signal.” Since the switch is configured to operate according to an energy transfer signal, the question of whether an “independent control input” is required is the same for both claim terms. In my opinion, it is not.

31. ParkerVision’s proposed construction raises another concern about what “independent control input” even means. The phrase “independent control input” doesn’t appear anywhere in the ’686 Patent or the ’551 Patent, so there is no clear definition of it. If this construction were used, my opinion is that a person of ordinary skill in the art would ordinarily understand the phrase to refer to a control input that doesn’t depend on another source; for example, it might be a local oscillator (LO) signal that is “independent” because that signal is generated independently from other signals, such as at a fixed frequency. However, Dr. Ricketts appears to define “independent control input” as something different, *i.e.* that “the signal is a separate input from the signal input into switch [sic] and the signal output from the switch.” EX2006, ¶164. In my opinion, this explanation is

not even the ordinary meaning of the construction that Dr. Ricketts proposes (“independent control input”) and it has nothing to do with the plain and ordinary meaning of the actual claim term being construed, “energy transfer signal.”

32. Dr. Ricketts further cites another string of figures in paragraph 164 of his declaration in support of his assertion that the “energy transfer signal” must be a separate from both the input and output, but does not explain how any of these figures purportedly support this assertion. At least two of the figures that he cites, Figs. 28C, and 28D, would not meet his second-order definition (that is, the way he defines an “independent control input,” which is not in the claims) because the control signal is wired to the same node of a diode as an output signal. In my opinion, a person of ordinary skill in the art would not view any of the figures that Dr. Ricketts cites as redefining the term “energy transfer signal” beyond its plain and ordinary meaning to require it to say something about the configuration of the inputs to a switch. The claim itself is silent about how the energy transfer signal is configured, other than that the switch must be configured to operate according to such a signal. A person of ordinary skill in the art would understand that there are myriad ways to configure an energy transfer signal to operate a switch, and the claims of the ’686 Patent do not limit the approaches that can be used.

33. I also disagree with Dr. Ricketts’ assertion (paragraph 165) that an “independent control input” is “how the claimed system works.” Again, Dr. Ricketts

provides no explanation at all for the basis of this assertion, and in my opinion a person of ordinary skill in the art would disagree. Dr. Ricketts states that “the systems shown in the figures identified above would not work to transfer energy and generate a signal from storage energy [sic] without the energy transfer signal being an independent control input,” but he provides no explanation why this is the case. Moreover, the proper question as I understand it is not whether a particular exemplary figure works in a particular way, but whether the claim requires a system to work in a particular way. In my opinion, a person of ordinary skill in the art reading the claims of the '686 Patent in view of the specification would understand that what the claims require of an energy transfer signal is that a switch must be configured to operate according to that signal so that the switch sub-samples and transfers energy from a first EM signal. A person of ordinary skill in the art would understand that the requirements specified by the claim do not require any particular waveform or configuration for the signal as long as it meets the requirements set forth by the claim.

34. Therefore, it is my opinion that the term “energy transfer signal” should be given its plain and ordinary meaning, as the parties agreed in litigation.

B. “Sample” in claims 1 and 11

35. In my original declaration, I explained the concept of sampling (EX1002, ¶59), but did not propose a specific construction for the term “sample.”

However, having reviewed ParkerVision's POR and Dr. Ricketts' declaration, I believe that construction of this term may be helpful to the Board, particularly in relation to the arguments that ParkerVision and Dr. Ricketts made with respect to the Estabrook references, which they argued did not "sample."

36. In my opinion, if construction of "sample" is necessary, the plain and ordinary meaning of the term is consistent with "reduce a continuous-time signal to a discrete-time signal." As I explained in my original declaration, and the definition that I referred to in my original declaration, this is how a person of ordinary skill in the art would understand the term "sample" in this technical context. EX1002, ¶59; EX1038, 9.

37. ParkerVision also appeared to agree with this construction for a related term, "sampling aperture," in litigation concerning a related patent, U.S. Patent No. 9,118,528. In that case, ParkerVision agreed to construe "sampling aperture" as "a period of time during which the claimed switch is in its closed (on) state, thereby reducing a continuous-time signal to a discrete-time signal." The first part of that construction, "a period of time during which the claimed switch is in its closed (on) state," refers to the "aperture" part of that term, while the second portion, "thereby reducing a continuous-time signal to a discrete-time signal," refers to the "sampling" portion. Dr. Ricketts also appeared to generally agree with this definition of "sample" in his deposition. EX1051, 60:22-62:24.

C. “Storage module” in claim 11

38. ParkerVision’s proposed construction does not appear to be substantively different from mine, “an element of a system that stores non-negligible amounts of energy from an input EM signal.” POR, 36. The only difference is that my definition uses the claim term “module,” while ParkerVision uses “an element of a system.” This difference would not impact my analysis, and neither ParkerVision nor Dr. Ricketts appears to rely on this difference in construction in their arguments. Therefore, my opinions would not change if this construction were applied.

39. However, as I noted above and in my original declaration (EX1002, ¶77), the district court, PTAB, and Federal Circuit have all rejected ParkerVision’s proposal to incorporate an “energy transfer system” into this term, and it is my opinion that the same reasons apply to ParkerVision’s current effort to import this limitation into the “energy transfer signal” limitation.

D. “Switch” in claims 1 and 11

40. ParkerVision and Dr. Ricketts appear to agree with my definition of “switch,” “an electronic device for opening and closing a circuit.” However, as I noted above and in my original declaration (EX1002, ¶¶78-80), the district court, PTAB, and Federal Circuit have all rejected ParkerVision’s proposal to incorporate an “independent control input” into this term, and it is my opinion that the same

reasons apply to ParkerVision's current effort to import this limitation into the "energy transfer signal" limitation.

E. "Coupled" in claim 11

41. I understand that in a related proceeding, PO contends that the term "coupled" should have its plain and ordinary meaning while MediaTek contends that the term should be construed as "directly connected or connected through a wire (or a closed switch)." Since my original declaration, the District Court construed this term according to its plain and ordinary meaning. I have considered both constructions and my opinions regarding the unpatentability of the challenged claims would not change based on which construction is applied.

F. "Multi-Platform Module" in claims 1 and 11

42. In my opinion, the term "multi-platform module" should be given its plain and ordinary meaning. I noted in my original declaration that a "platform" refers to a communications protocol and/or bearer service (which is supported by the intrinsic record). EX1009, 4; EX1047, 12. Since my original declaration, the District Court construed the term according to its plain and ordinary meaning. In my opinion, however, it does not appear that it is necessary to construe the term "platform" because there is no dispute that it includes at least communications protocols and/or bearer services. In other words, ParkerVision does not contend that a "platform" cannot be a communications protocol and/or bearer service. The

parties' disputes around whether that term is satisfied also do not depend on whether that term is construed. Therefore, my opinions are the same whether or not the term "platform" is construed.

G. "Sub-sample" in claims 1 and 11.

43. In my original declaration, I noted that in a previous litigation involving related patents, a district court adopted ParkerVision's proposal to construe the term "sub-sample" to "refer to sampling at an aliasing rate, i.e., at a rate that is less than or equal to twice the frequency of the signal being sampled." EX1014, 6-10; EX1002, ¶83. ParkerVision and Dr. Ricketts propose construing the term as "sampling at an aliasing rate," although they do not address the second part of the proposed construction which defines what an aliasing rate is. However, this difference does not appear to be material since there is no dispute raised in the patent owner response with regard to whether any sampling occurs at an "aliasing rate." My opinions would not change regardless of whether the additional language is included in the proposed construction.

VIII. THE CHALLENGED CLAIMS ARE INVALID

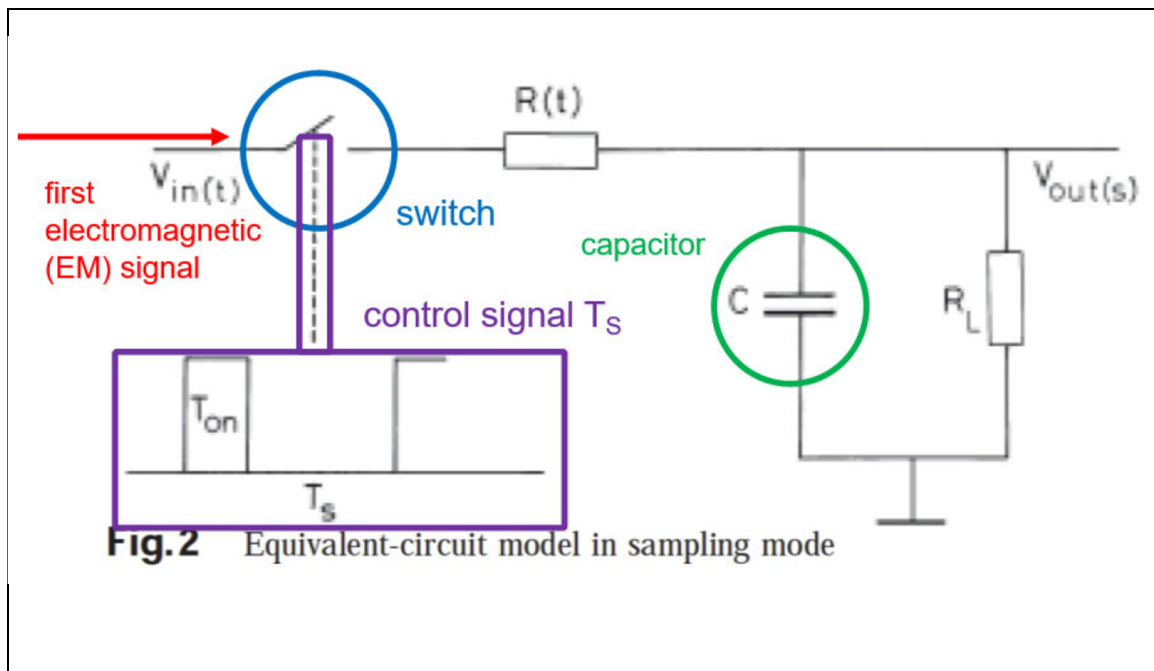
A. Ground 1: Claims 1-20 are Unpatentable as Obvious Over Nevo in view of Avitabile

1. Avitabile teaches "wherein a second EM signal is generated from said stored energy" in claim 11

44. I explained in my initial declaration that Avitabile teaches this element because it teaches that energy is stored on a capacitor (that is, "said stored energy")

and that a second EM signal is generated from that stored energy. EX1002, ¶¶141-142. In my opinion, ParkerVision and Dr. Ricketts' arguments to the contrary are incorrect.

45. Because claim 11 first recites “a storage module coupled to said switch and configured to store said transferred energy” (element 11[FTM-2.1]), “said stored energy” refers to the energy stored by the capacitor. As I previously explained in paragraph 135-138 of my original declaration, Avitabile teaches that when a switch (annotated blue in Fig. 2, below) is closed, current flows onto the capacitor C (green):

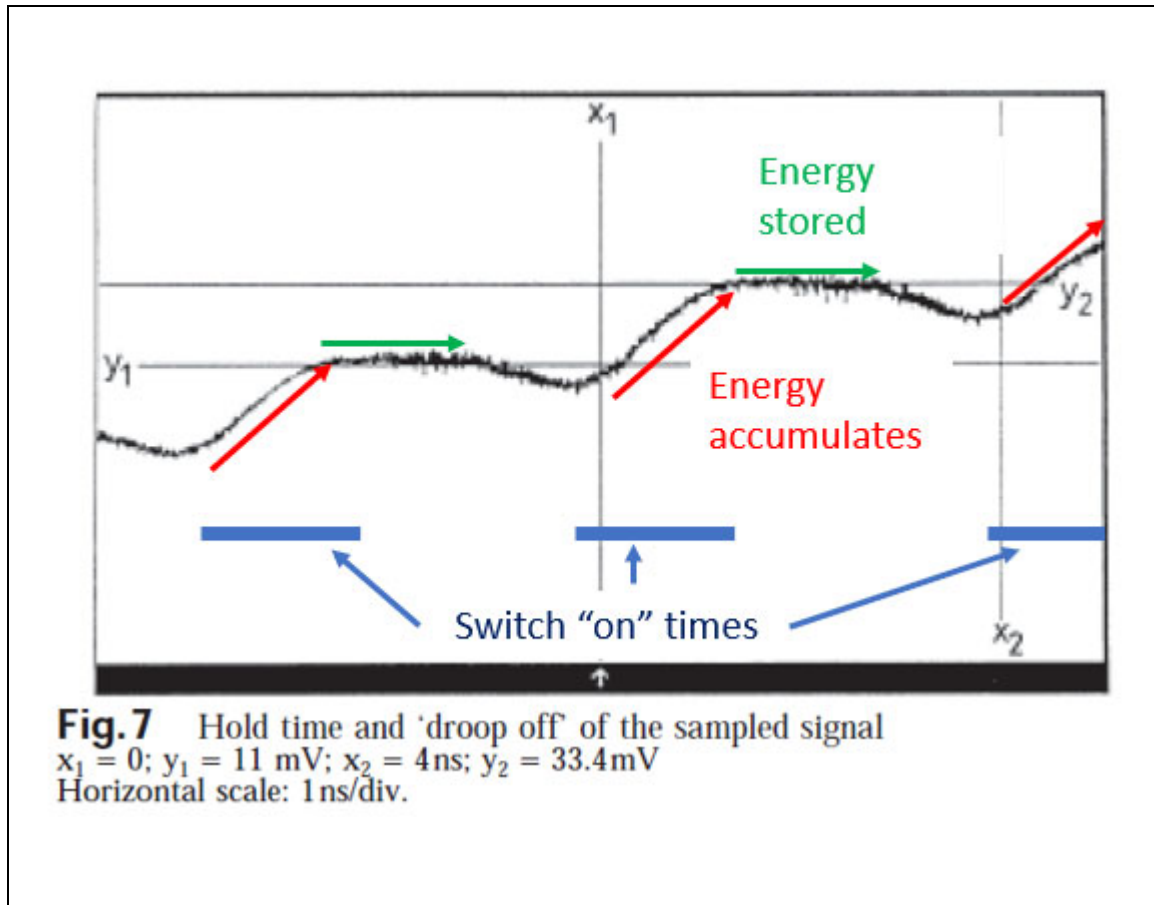


46. A person of ordinary skill in the art would understand that capacitors store energy, which is proportional to the square of the voltage across the capacitor and the charge stored by the capacitor:

$$E_{cap} = \frac{QV}{2} = \frac{CV^2}{2} = \frac{Q^2}{2C}$$

47. Note that for a fixed capacitor (which is the case for the capacitor in Avitable), the capacitance C is a constant. Therefore, the voltage on the capacitor increases as energy accumulates on the capacitor. Dr. Ricketts agrees with this general principle regarding the operation of a capacitor. EX1051, 29:1-22.

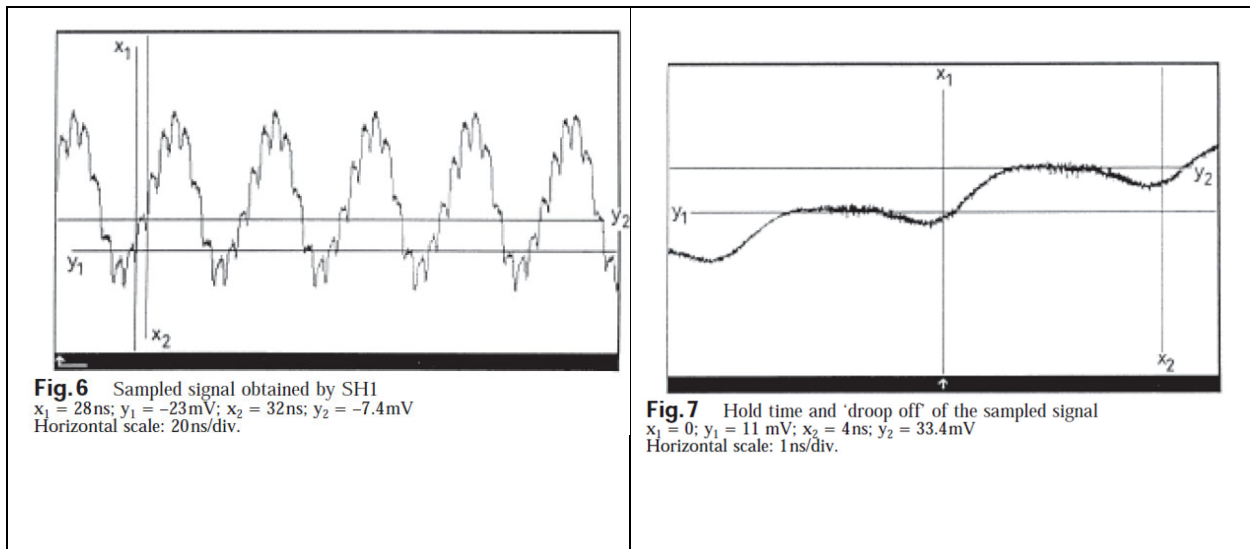
48. In the case of Avitable, the capacitor accumulates energy during the “sample” period (which is non-negligible because it comprises about 40% of the duty cycle) during which the switch is closed, and during which energy is stored on the capacitor. This energy is also distinguishable from noise because the voltage created by the stored energy is used to create the down-converted signal.



49. Therefore, energy must accumulate on the capacitor in Avitabile for it to store a voltage. While ParkerVision argues that “the voltage across the capacitor is is merely a snapshot of the sampled input signal at a discrete moment in time” (POR, 56) that argument is misleading because the capacitor must accumulate energy for that voltage to exist. Moreover, Avitabile does not accumulate energy instantaneously; rather, energy is stored over time during the non-negligible interval (a 40% duty cycle) during which the switch is closed. A person of ordinary skill in the art would also recognize that the energy stored by the capacitor in Avitabile during the sampling interval is non-negligible. In Figs. 6 and 7 of Avitabile, the

voltage clearly changes during successive sampling periods by an amount significantly higher than the noise in the sample (e.g. the difference between Y1 and Y2 in Fig. 7), which means that the energy stored in the capacitor is likewise distinguishable from noise.

50. ParkerVision and Dr. Ricketts both argue that the second EM signal in Avitabile is not “generated from” the energy stored in the capacitor. POR, 58; EX2006, ¶231. I disagree. The baseband signal in Avitabile is generated from the voltage on the capacitor, which is a function of the energy stored on the capacitor. Figs. 6 and 7 show the sampled signal generated from that stored energy at different time resolutions:



51. Looking at these figures in reverse order, the zoomed-in figure in Fig. 7 shows how the capacitor stores energy during individual cycles, and Fig. 6

illustrates how the second EM signal is generated from that stored energy over multiple cycles. No more is needed to satisfy the claim.

52. Most of ParkerVision's and Dr. Ricketts' arguments relating to this claim element are based on requirements that are not actually part of the claims, in my opinion. For example, in my opinion, there is no requirement that "the sampled energy makes up/becomes part of the second signal." POR, 58; EX2006, ¶117. The actual claim language, "generated from," is much broader than that, and does not require the stored energy to be directly input into a second signal. By analogy, the output of a microphone is still "generated from" sound even though the format of the output signal is an electrical wave rather than kinetic energy. In Avitabile's system, storing energy in the capacitor creates the voltages which create the second EM signal, and thus the second EM signal is generated from that stored energy.

53. In my opinion, several of the arguments that ParkerVision and Dr. Ricketts make are based on alleged requirements that do not appear in the claims, and are not requirements of the claims as properly construed. For example, there is no requirement that energy be provided to a "low impedance load." POR, 58, EX2006, ¶¶148, 231. I note that the claims of the '551 Patent include elements which explicitly include such a limitation. For example, claim 14 of the '551 Patent recites "providing the lower frequency signal directly to a low impedance load." However, when drafting the '686 Patent, ParkerVision included no such requirement

in the claims, nor is there any explicit indication that any of the terms which are in the claims should be redefined to include such a limitation. Claim 11 also does not require the capacitor to discharge across the load, nor does it preclude a signal from being held at a given voltage during an “off” period. Claim 11 does not specify the contents of the second EM signal or what electrical properties must make up that signal (*i.e.*, whether the signal is a voltage or current signal), only that the signal must be generated from the stored energy. In other words, it does not exclude a voltage signal.

54. ParkerVision’s POR (at 55) cites a reexamination decision (EX2009) on another ParkerVision patent, U.S. Patent No. 6,266,518 (“’518 Patent,” EX1053). However, in my opinion, ParkerVision’s characterization of that decision is inaccurate, and the reexamination decision is not applicable to the claims here. Unlike the claims of the ’686 Patent, the ’518 Patent explicitly required “integrating the energy over the aperture periods,” and the reexamination Examiner interpreted that language as “accumulating energy over multiple aperture periods.” EX2009, 7. The claims of the ’518 Patent went on to require “generating [a] stored signal from the integrated energy.” The Examiner in that case concluded that Avitabile (which the Examiner himself raised) was missing the “integrating” step; therefore, because Avitabile did not store “integrated” energy, it did not generate a second signal from such “integrated” energy. Therefore, the Examiner’s decision in that case did not

directly impact the exact claim language here, which does not include an “integrated” requirement. Indeed, Dr. Ricketts appears to have acknowledged in his deposition that there is no “integrated” requirement in the claims here. EX1051, 101:12-24. To be clear, I am not offering any opinion on the ’518 Patent or the reexamination of the ’518 Patent other than how it appears to differ from the ’686 Patent with respect to this specific issue.

55. I am also aware of a Federal Circuit decision that is more directly applicable to the arguments that ParkerVision is advancing here. I have reviewed the technical discussion in *ParkerVision, Inc. v. Qualcomm Inc.*, 621 Fed. Appx. 1009, 1019 (Fed. Cir. 2015) (“*ParkerVision 2015*”), which discusses the ’551 Patent. Claim 23 of the ’551 Patent is reproduced below:

An apparatus for down-converting a carrier signal to a lower frequency signal, comprising:

an energy transfer signal generator;

a switch module controlled by said energy transfer signal generator; and

a storage module coupled to said switch module;

wherein said storage module receives non-negligible amounts of energy transferred from a carrier signal at an aliasing rate that is substantially equal to a frequency of the carrier signal plus or minus a frequency of the lower frequency signal, divided by n where n represents a harmonic or sub-harmonic of the carrier signal, wherein a

lower frequency signal is generated from the transferred energy⁴

56. The last bolded portion above was in dispute in the *ParkerVision 2015* opinion. With respect to invalidity, the dispute was primarily whether the Weisskopf reference (EX1054) satisfied the “generated from” limitation. Based on both the court’s characterization of Weisskopf and my own review of it, Weisskopf is a reference which generated a lower-frequency signal by measuring the voltage across a storage capacitor, just like Avitabile. *See ParkerVision 2015*, 621 Fed. Appx. At 1019 (“It is undisputed that Weisskopf generates a baseband signal, and that the baseband signal is generated by measuring the voltage across the storage capacitor”). In my opinion, the “generated from the transferred energy” element in claim 23 of the ‘551 Patent has substantially the same scope as the “generated from said stored energy” element in claim 11 of the ’686 Patent, since both rely for antecedent basis on energy that has been transferred from a source signal (a “carrier signal” in the ‘551 Patent, a “first EM signal” in the ’686 Patent) and then stored in a storage module. Therefore, it is my opinion that the technical dispute in that case (i.e., whether the “generated from” element is satisfied by sampling the voltage across a capacitor) is substantially the same issue in dispute with regard to this element in

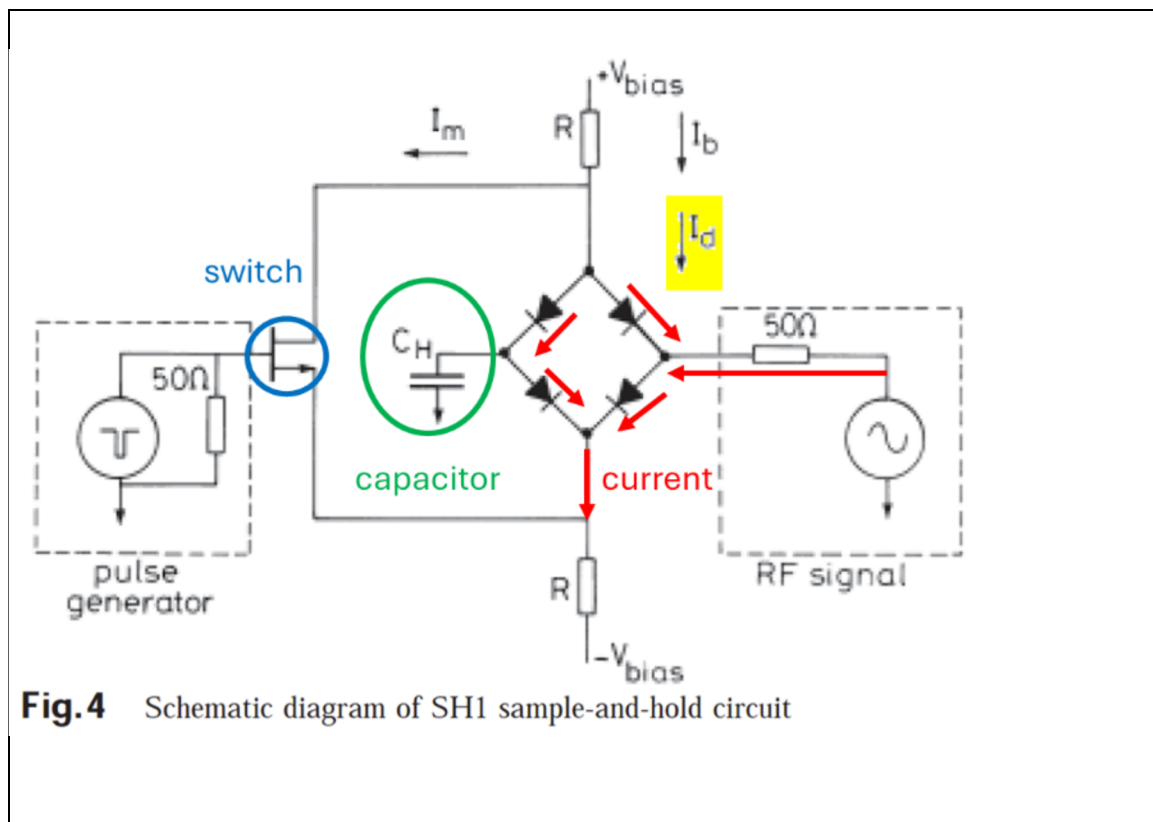
⁴ All emphasis added unless otherwise noted.

the '686 Patent. In that case, the court found that “the generating limitation does not require that the baseband signal be created by discharging energy from a storage device” and that Weisskopf’s voltage-sampling circuit accordingly satisfied the claim. *Id.* at 1020. It is my opinion that the same reasoning also applies to Avitable, where ParkerVision is making the same argument.

57. I note that neither ParkerVision in the POR nor Dr. Ricketts in his declaration raised any dispute about whether the combination of Nevo and Avitable taught a switch configured to “sub-sample and transfer energy from a first electromagnetic (EM) signal” in claim elements 1[b] and 11[FTM-1.3]. In fact, Dr. Ricketts conceded in paragraph 234 that “the sample-and-hold circuit in Avitable takes a sample of the input signal by turning the switch ON (closing the switch) and OFF (opening the switch).” It is my understanding that under the Board rules, ParkerVision waived any argument about whether the combination teaches a circuit configured to “sub-sample and transfer energy from a first electromagnetic (EM) signal.” However, some of Dr. Ricketts’ responses in deposition suggested that energy stored on the capacitor of Avitable does not come from the RF input. *See, e.g.* EX1051, 93:2-7. In case ParkerVision attempts to rely on Dr. Ricketts’ deposition testimony to introduce a new argument to this effect, I will address this issue. Please note that by doing so, I am not conceding that the question of whether Avitable meets the “storage module” or “transfer energy from a first

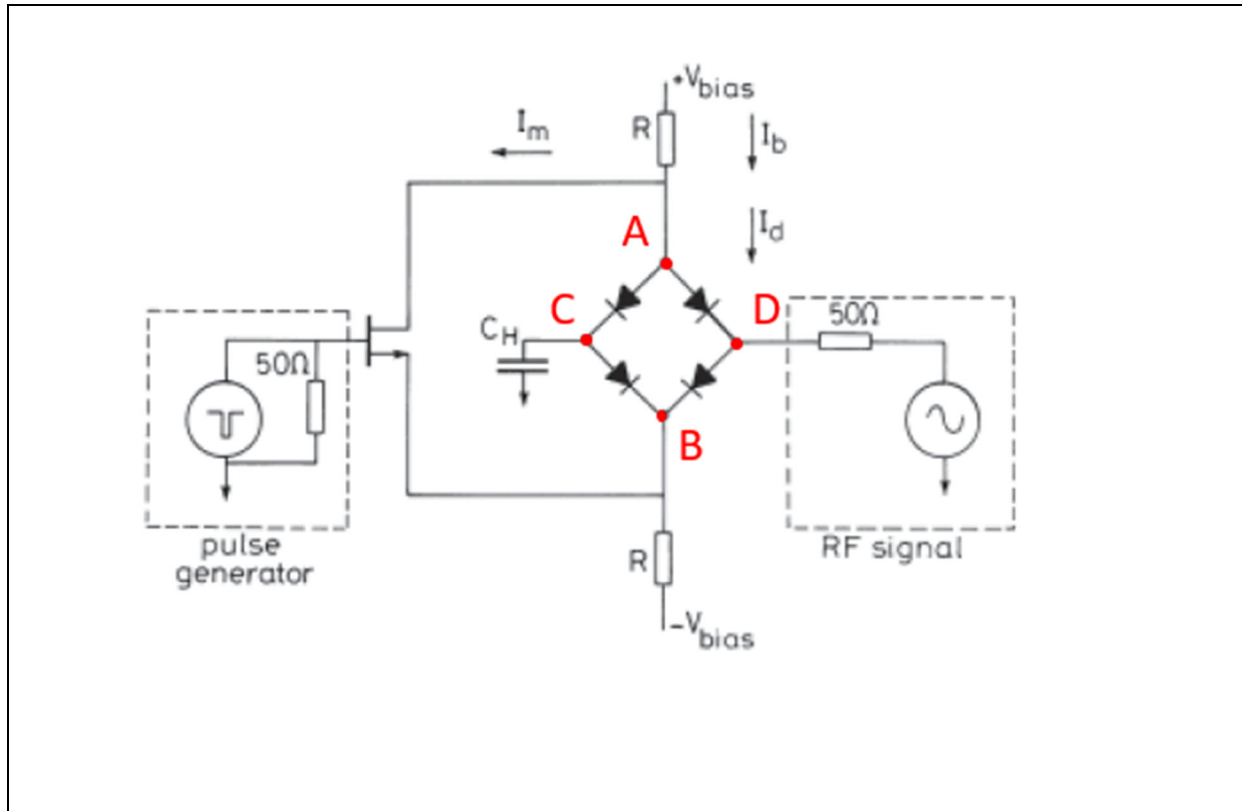
electromagnetic (EM) signal” elements of claims 1 or 11 of the ’686 Patent is still properly at issue in this proceeding.

58. Avitabile’s Figure 7 (as I annotated it and described in in paragraphs 137-138 in my original declaration) depicts the configuration of the SH1 sample and hold-circuit:



59. As I noted in my original declaration, this circuit controls the flow of energy to the capacitor (green) by controlling the diode bridge (red). EX1002, ¶¶124, 131. The switch annotated in blue controls the diode bridge: when the switch is open, the diodes are directly biased and can conduct current, and are thus “on;” when the switch is closed, the diodes do not conduct current. When the diode bridge

is in its “on” state, the bridge is balanced in two ways: the current is balanced at points A and B, and the voltage is balanced between points C and D:



60. Dr. Ricketts acknowledged this property of the diode bridge in his deposition. EX1051, 95:19-97:6 (“during the rising portion, C_H would follow the RF signal that’s on the right side of the diode bridge”). Because of this balancing of the diode, when the diode bridge is active (that is, when the switch is “on”), raising the voltage at D will raise the voltage at C and thus transfer energy into the capacitor. The functional effect of the circuit is substantially the same as a single switch connecting the RF signal and the capacitor. The energy input into the capacitor therefore comes from the input RF signal, and literally satisfies the claim elements

of the “storage module” and “transfer energy from a first electromagnetic (EM) signal.” Again, neither ParkerVision’s POR nor Dr. Ricketts’ declaration disputed that Avitabile met these elements. No claim element requires any individual electron to go directly from the RF input to the capacitor. By analogy, if a seaside building is struck by a tsunami, the energy of the wave striking the building comes from the earthquake that created the tsunami, even though the molecules of water that made contact with the building may have been many miles away from the location of the earthquake.

2. Avitabile teaches a “switch configured to operate according to an energy transfer signal”

61. In my opinion, and as I explained in my original declaration (at paragraphs 126-128), Avitabile teaches an “energy transfer signal,” because it teaches a signal that closes a switch for a non-negligible period, resulting transferring energy from an RF signal (first EM signal) to a capacitor (storage module). Neither ParkerVision nor Dr. Ricketts responds to this analysis, nor do they argue that Avitabile does not teach an “energy transfer signal” according to its plain and ordinary meaning, so if the Board declines to adopt ParkerVision’s proposed construction, no more analysis is necessary.

62. Even if the Board adopts ParkerVision’s proposed construction of “energy transfer signal,” Avitabile teaches it. The only aspect of that construction that ParkerVision challenges whether Avitabile meets is the “energy transfer

system.” ParkerVision does not propose any further construction of “energy transfer system,” however, so even if the Board adopted ParkerVision’s proposed construction, the only question is whether Avitabile teaches an “energy transfer system” under its plain and ordinary meaning, a system that transfers energy. Avitabile teaches a system that transfers energy from a first EM signal and stores it on a storage module, which is the only transfer of energy required by the claims. As I explained in my original declaration, to which neither ParkerVision nor Dr. Ricketts responds, it does. EX1002, ¶¶126-128. ParkerVision doesn’t dispute whether Avitabile meets any other element of its proposed construction. For example, the signal that controls the switch in Avitabile is explicitly from a “pulse generator” which is independent of the RF input (on the opposite side of the schematic in Fig. 4, for example) by any possible definition, and has a non-negligible aperture (400 ps).

63. While ParkerVision argues that Avitabile does not teach certain other features that it alleges are parts of an “energy transfer system,” such as a low impedance load, integrating energy over successive cycles, etc., none of these are elements of the claim nor even of the construction that ParkerVision has proposed.

64. Although I am not a lawyer, I do not believe that the Federal Circuit’s opinion in its 2024 *ParkerVision, Inc. vs. Qualcomm Inc.* case supports the argument that ParkerVision is making. 116 F.4th 1345, 1349 (Fed. Cir. 2024). In my opinion,

the background description in the '686 Patent and the '551 Patent contains a general description of potential features and advantages of a system that may be characterized as an “energy transfer system,” but does not provide a clear inventor definition or disclaimer showing that all of those features are necessary elements of an “energy transfer system,” even if one were required by the claims. The portion of the Federal Circuit decision that ParkerVision cites also appears to merely be a general background description of energy transfer systems, not a ruling on what an energy transfer system must have.

65. Moreover, 2024 *ParkerVision*, 116 F.4th 1345 decision cites back to *ParkerVision 2015*, which I discussed above. The claims of the '551 Patent that were at issue in that 2015 case (*e.g.* claim 23) also required an “energy transfer signal,” as do the claims here:

An apparatus for down-converting a carrier signal to a lower frequency signal, comprising:

an **energy transfer signal** generator;

a switch module controlled by said **energy transfer signal** generator; and

a storage module coupled to said switch module;

wherein said storage module receives non-negligible amounts of energy transferred from a carrier signal at an aliasing rate that is substantially equal to a frequency of the carrier signal plus or minus a frequency of the lower frequency signal, divided by n where n represents a harmonic or sub-harmonic of the carrier signal, wherein a

lower frequency signal is generated from the transferred energy.

66. In my opinion, the “energy transfer signal” has the same meaning in claim 23 of the ’551 Patent that it has in the claims of the ’686 Patent. Although claim 23 of the ’551 Patent recites an energy transfer signal “generator,” the function of the signal is to control a switch module, as it is in the ’686 Patent. As I noted previously in §VII(A)(1) above, the Weisskopf reference that the Federal Circuit found that claim invalid over also generated a second signal by measuring the voltage across a storage capacitor. *See ParkerVision 2015*, 621 Fed. Appx. At 1019 (“It is undisputed that Weisskopf generates a baseband signal, and that the baseband signal is generated by measuring the voltage across the storage capacitor”). If the use of the term “energy transfer signal” in the claim was enough to exclude a voltage-sampling system, claim 23 of the ’551 Patent would not have been invalid over Weisskopf, which is a voltage-sampling system. Therefore, in my opinion, ParkerVision’s current arguments that the use of the phrase “energy transfer signal” excludes “voltage sampling” are inconsistent with the *ParkerVision 2015* decision.

3. Nevo in view of Avitable teaches “a plurality of protocol/standard sub-modules” (elements 11[1.3], 1[c]) and “operating a [first/second] transceiver in conformance with a [first/second] protocol/standard combination” (elements 11[2-3])

67. In my opinion, Nevo in view of Avitable teaches these elements, and neither ParkerVision nor Dr. Ricketts has shown otherwise. As I explained in my original declaration (EX1002, ¶¶86, 100, 112-114), Nevo teaches a plurality of controller managers 106a and 106b, each of which controls communications with separate wireless network protocols A and B (items 108a and 108b in fig. 1), via separate transceivers. The wireless network protocols can be, for example, Bluetooth and IEEE 802.11. These controller managers, either alone or in combination with the associated transceivers, satisfy the claim requirement of a “standard/protocol sub-module,” and when they are operated according to their respective protocols, satisfy the elements of operating the first and second transceiver according to first and second protocol combinations.

68. Neither ParkerVision nor Dr. Ricketts responds to this teaching at all. Instead, both merely attack Avitable by itself, and argue that Avitable does not meet various alleged protocol requirements (which neither ParkerVision nor Dr. Ricketts actually cites). POR, 59-62; EX2006, ¶¶246-254. In my opinion, this argument is a non sequitur and does not respond to the showing in the Petition. The combination discussed in the Petition, and that I explained in my original

declaration, used Nevo's multi-platform transceiver to show the elements relating to a transceiver operating simultaneously in two separate protocols, and referred to Avitabile relating to teachings specifically related to the down-conversion circuitry, which is merely a component of such a receiver. However, a person of ordinary skill in the art would recognize that an entire transceiver would meet protocol standards, not the down-conversion circuitry by itself. In my opinion, ParkerVision's argument is analogous to saying that a fuel injector wouldn't meet vehicle safety standards because it doesn't have brakes. Operating in conformance with a protocol/standard would be assessed relative to the entire transceiver, not the down-conversion circuitry in isolation.

69. There is no dispute that Nevo teaches a device which simultaneously operates transceivers in two separate protocols. Transceivers compliant with Bluetooth and IEEE 802.11 protocols were known to those of ordinary skill in the art at the '686 Patent's priority date, and a person of ordinary skill in the art would have known how to design such a transceiver. Indeed, it would not make sense if it were otherwise, since the industry would not adopt standards that persons of ordinary skill in the art would not know how to comply with. Avitabile's down-conversion circuit effectively performs the one function that the combination requires it to perform—down-converting a signal—and in my opinion, a person of ordinary skill in the art would know how to integrate that circuitry into (for example)

a Bluetooth or IEEE 802.11 compliant transceiver as taught by Nevo, and have a reasonable expectation of success doing so.

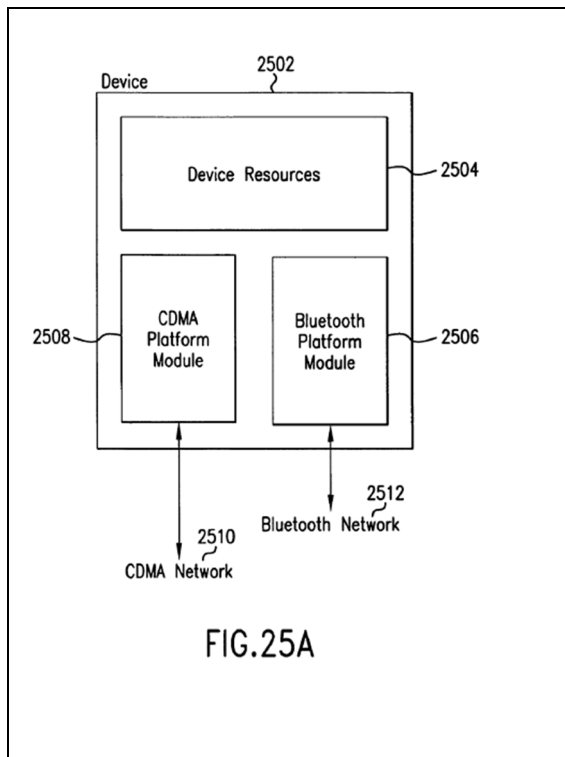
70. For example, “protocol-specific modulation,” “error correction,” and “synchronization” would all be performed by other elements of a transceiver, not by the down-conversion circuitry itself. In my opinion, these are all features of transceivers that would have been well known to a person of ordinary skill in the art at the time of the alleged invention, and ParkerVision and Dr. Ricketts have not introduced any evidence to the contrary. For example, error correction is typically performed after a received signal has been digitized, not in the analog portion of the receiver (which is what I referenced Avitabile for in the combination). Dr. Ricketts acknowledged as much in his deposition. EX1051, 70:4-9. Synchronization would also be performed on the digitized received signal, and is the technique of “synchronizing” the clock rate of the received signal to the clock rate of the transmitted signal, so that the received signal can be demodulated correctly. Finally, “protocol specific modulation” is performed in the transmitter portion of the transceiver, and encodes the input digital data into the analog waveforms to be up-converted to higher frequencies and eventually transmitted.

71. Likewise, the performance characteristics that ParkerVision cites (e.g. “dynamic range, sensitivity, and interference tolerance,” POR, 63) would be assessed by evaluating a complete device rather than looking at down-conversion

circuitry in isolation. Numerous elements outside of the down-conversion circuitry itself would impact the performance, such as the gain of the antenna, amplifier performance (gain and noise figure), filters, and balanced circuits. Again, all of these types of circuits and methods of adjusting their performance to meet wireless transmission standards would have been well known to a person of ordinary skill in the art at the time of the alleged invention date of the '686 Patent.

72. The '686 Patent itself does not describe any Bluetooth or IEEE 802.11 embodiment at the level of detail that ParkerVision and Dr. Ricketts claim that the Petition should have shown with respect to the combination of Nevo and Avitabile. For example, nothing in the '686 Patent describes image rejection, error correction, protocol-specific modulation, or synchronization for a Bluetooth or IEEE 802.11 transceiver.

73. I have reviewed all of the references to Bluetooth and IEEE 802.11 in the '686 Patent, as well as the '551 Patent that it incorporates by reference. For the most part, Bluetooth and IEEE 802.11 are generally just listed as examples of protocols that might be used. '686 Patent, 7:52-62. The only figures that show anything related to either protocol, such as Figs. 25A (below) and 43, just show a Bluetooth platform module or sub-module as a box:



74. Similar examples are at Figures 26B, 26C, 32, and 37-44.

75. The '686 Patent also has some discussion of general features of protocols and standards; for example, the protocol stacks and overall standard architecture. *See, e.g.* '686 Patent, 7:48-8:18, 37:40-38:10. These disclosures also do not relate to the specific features that ParkerVision claims are missing from the Nevo/Avitabile combination.

76. In my opinion, neither these disclosures nor anything else in the '686 Patent provides the level of disclosure relating to implementation and performance of specific Bluetooth or IEEE 802.11 systems that ParkerVision and Dr. Ricketts claim to be absent from the prior art in the Petition. There is no disclosure in the '686

Patent of performing error correction, protocol-specific modulation, or synchronization in either a Bluetooth or IEEE 802.11 system. The '686 Patent itself simply assumes that a person of ordinary skill in the art would know how to design systems that performed those functions. Likewise, there is no disclosure in the '686 Patent itself of any completed system that both contains the claimed “frequency translation module” and meets the performance specifications for Bluetooth and IEEE 802.11 that ParkerVision claims are missing, such as sensitivity, interference, and dynamic range, either through testing of an actual system or simulation of a theoretical one. Again, the '686 Patent relies on the knowledge of a person of ordinary skill in the art to fill that gap and incorporate the claimed frequency translation module into a functional system. In my opinion, a person of ordinary skill in the art would not suddenly become more capable simply because he was looking at the disclosure of the '686 Patent rather than the teachings of the prior art, and the prior art enables the claims to at least the same degree as the patent itself.

77. ParkerVision and Dr. Ricketts also rely on discussion of radar applications in Avitable to argue that it is incompatible with a receiver. POR, 60-61; EX2006, ¶¶250, 253. I disagree. Both ParkerVision and Dr. Ricketts ignore that Avitable’s first sentence (at 337) recites that “Radar *and communications systems* often require complex waveform detection...” In my opinion, a person of ordinary skill in the art would recognize that Avitable generally describes a down-conversion

circuit for processing received modulated signals, and even beyond the fact that Avitable explicitly references communication system, the entire reference describes a down-conversion circuit that is readily applicable to both types of systems. Dr. Ricketts states (at his paragraph 253) that Radar systems provide “input signal levels [which] are typically high and stable” compared to Bluetooth and IEEE 802.11 receivers. I strongly disagree with this statement. A person of ordinary skill in the art would have known that Radar receivers are one of the most difficult and unpredictable signal processing environments known in the field. Radar applications face a litany of challenges impacting the ability of a receiver to separate out valid signals, including targets actively avoiding being found or intentionally creating interfering signals, all kinds of artificial and natural reflection of signals in different directions (from terrain, weather, atmospheric conditions, other targets, etc.), attenuation from weather, long range attenuation of signals, etc. Dr. Ricketts goes on to state that “Bluetooth and IEEE 802.11, however, require handling of widely varying signal strengths due to real-world conditions like multipath fading, attenuation, and interference.” Dr. Ricketts cites no sources for this statement, and I strongly disagree that a person of ordinary skill in the art of skill in the art would consider Bluetooth or IEEE 802.11 reception to be more difficult than Radar with respect to these issues. Every one of these conditions— multipath fading, attenuation, and interference— is a well-known problem in radar signal processing.

Exs. 1059-1061. And in any event, the teachings of Avitabile which I relied on in my original declaration, that is, down-converting a modulated signal from a higher frequency to a lower frequency, relate to a technical issue that is common to both radar and communications systems. There does not appear to be any actual dispute that Avitabile teaches circuitry which is functional for that purpose.

78. Dr. Ricketts also claims that his simulations of *Estabrook* show that the down-conversion system of *Avitabile* would not work in combination with Nevo or in a Bluetooth or IEEE 802.11 system. I will address those simulations later on in my declaration with respect to Estabrook, since they are largely irrelevant even as to Estabrook for reasons that I will discuss. However, they are even more irrelevant to any argument about Avitabile, since Dr. Ricketts' simulations plainly show nothing about Avitabile.

4. A person of ordinary skill in the art would have been motivated to combine Nevo and Avitabile

79. In my opinion, a person of ordinary skill in the art would have been motivated to combine Nevo and Avitabile. As the Petition explained (at 25-26), and I explained in my original declaration (EX1002, ¶¶93-99), Nevo teaches a transceiver which operates on signals in the GHz range, which would necessarily require down-conversion circuitry. Since Nevo does not teach the particular circuitry for down-conversion, a person of ordinary skill in the art would need to fill

the gap with references that describe such down-conversion circuitry, such as Avitable.

80. ParkerVision and Dr. Ricketts briefly acknowledge this motivation to combine, but do not respond directly to it. Instead, in my view, both ParkerVision's and Dr. Ricketts' arguments about motivation to combine mostly just repeat their arguments about standards compliance. POR, 62-64, EX2006, ¶¶259-269. These arguments are incorrect for the same reasons that I discussed above. For example "dynamic range, sensitivity, and interference tolerance," are performance characteristics of a complete transceiver, rather than a down-conversion circuit in isolation. The '686 Patent does not describe how to meet these requirements in a Bluetooth or IEEE 802.11 environment, but relies on the skill of a person of ordinary skill in the art to do so. Likewise, "protocol-specific modulation, demodulation, and signal processing techniques" are features of other elements of a transceiver besides the down-conversion circuit that would be known to a person of ordinary skill in the art.

81. Additionally, as I understand the law, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the second reference. In my opinion, ParkerVision's and Dr. Ricketts' arguments suggest that some showing was required that is far beyond both what is required to show obviousness and what the '686 Patent itself teaches. In my opinion,

a person of ordinary skill in the art would have known how to design a transceiver capable of operating according to known standards, and to incorporate suitable down-conversion circuitry into such a transceiver. As I explained previously, the industry would not have adopted standards that persons of ordinary skill in the art were not capable of designing transceivers to meet. It is also my opinion that Avitable performs the down-conversion function that the combination requires it to perform, and therefore, it is my opinion that when taking into account the ordinary creativity of an artisan at the time of the alleged invention, such a person would have a reasonable expectation of success in making the combination.

5. Dependent claims 2-10 and 12-20

82. Neither ParkerVision nor Dr. Ricketts raises any separate arguments with respect to the dependent claims of the '686 Patent, claims 2-10 and 12-20. Therefore, these claims are invalid over the combination of Nevo and Avitable for the reasons that I previously explained.

B. Ground 2A: Claims 1-20 are Unpatentable as Obvious Over Young in view of Estabrook-Thesis

1. Estabrook-Thesis teaches “a switch configured to operate according to an energy transfer signal”

83. In my opinion, Estabrook-Thesis teaches “a switch configured to operate according to an energy transfer signal,” and neither ParkerVision nor Dr. Ricketts has shown otherwise. I explained in my original declaration (at paragraphs 244-254) that Estabrook-Thesis teaches an energy transfer signal in the form of an

independent local oscillator, which activates the diode switch and causes the transfer of energy (including energy from the RF input IRF) through the switch, which is then stored on a capacitor. EX1005, Figs. 14(a), 16(b).

84. Neither ParkerVision nor Dr. Ricketts disputes that the ILO is a signal. Nor do they dispute that the diode is a switch configured to operate according to the ILO, because only the ILO has sufficient voltage to activate the diode. EX1002, ¶¶249, 251. Nor do they dispute that the ILO causes energy from the IRF to be transferred through the diode. EX1002, ¶251. I explained in my original declaration that the plain language of claim 11 does not require the energy transferred according to the energy transfer signal to be exclusively energy from the first EM signal (EX1002, ¶256), and neither ParkerVision nor Dr. Ricketts disputes this.

85. ParkerVision does not appear to dispute my factual characterization of Estabrook-Thesis. ParkerVision's arguments (and Dr. Ricketts') rely mainly on their construction of the phrase "energy transfer signal." POR, 69-74; EX2006, ¶¶272-284. Their arguments go even further than the actual construction that they propose for "energy transfer signal," and rely at times on broad characterizations of the technology rather than elements that are actually in the claim. Neither ParkerVision nor Dr. Ricketts makes any argument that Estabrook-Thesis fails to teach an "energy transfer signal" according to the plain and ordinary meaning of the

term, which is how the parties agreed to construe the term in the related district court litigation. EX1009, 2.

86. Therefore, if the term is simply given its plain and ordinary meaning, Dr. Ricketts' arguments are entirely irrelevant. I will still address some of the points that he makes in this section of his declaration, as well as ParkerVision's corresponding section of the Patent Owner Response, however.

87. In my opinion, there is nothing about the plain meaning of the term "energy transfer signal" or "switch" that says anything about whether the switch is "active" or "passive." POR, 76-77; EX2006, ¶¶281, 300. Indeed, diodes were well-known to those of skill in the art and ubiquitously used as switches for decades prior to the alleged invention date. Likewise, there is nothing about the plain meaning of the term that says anything about the configuration of control signal and input signal going to the switch relative to each other. In my opinion, a person of ordinary skill in the art would have recognized that a signal that causes a diode to turn on and off and transfer energy during the "on" times satisfies the "energy transfer signal" element even if that signal is connected to the same node of the diode as the signal being sampled.

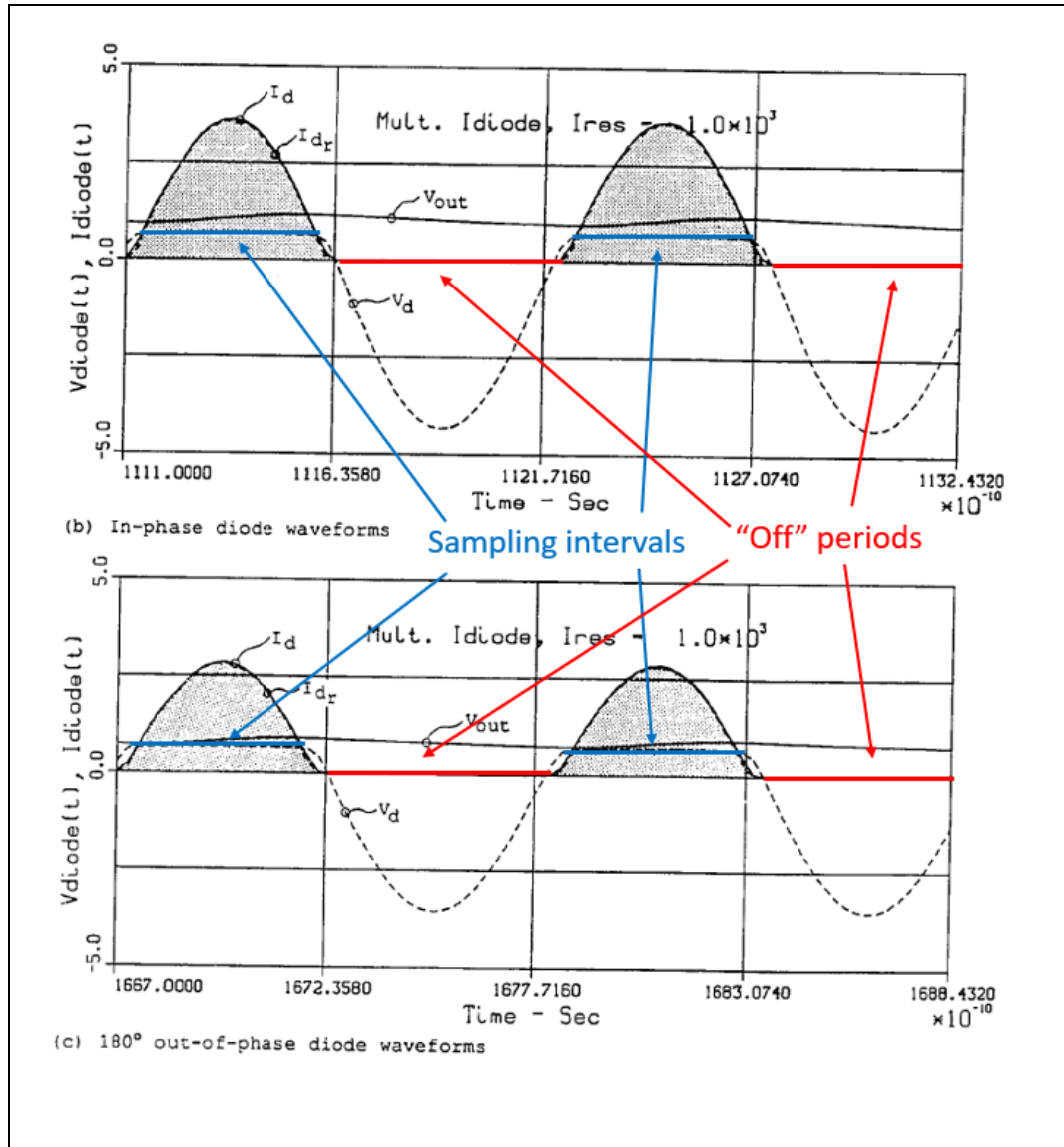
88. The ILO of Estabrook-Thesis is also an "independent control input." Again, only the ILO has sufficient amplitude to reach the forward bias voltage of the diode and thus turn the diode "on." The ILO does not depend in any way on the

IRF. Even ParkerVision's own construction doesn't say anything about how the switch is wired.

89. I also disagree with ParkerVision's and Dr. Ricketts' arguments about the shape of the waveform that makes up the "energy transfer signal." The term itself and its plain and ordinary meaning says nothing about the shape of the waveform of the signal. POR, 72-75; EX2006, ¶¶282-284, 294. All that is required, viewed in the context of the claim, is that the switch is configured to operate according to the signal and to sub-sample and transfer energy from a first EM signal. A sinusoidal waveform can perform this function when applied to a switch (such as a diode) that is in its "on" state when a threshold voltage is exceeded. In the case of a sine wave applied to a diode, as in Estabrook-Thesis, that is precisely what happens: the diode will conduct non-negligible amounts of current, and thus transfer energy, for the portion of the sine wave when the input voltage exceeds the forward bias voltage.

90. I have annotated Figs. 16(b)-(c) of Estabrook-Thesis below to annotate exactly how Estabrook-Thesis' ILO closes the diode switch for a defined sampling aperture or "on" time. The diode only conducts current (and therefore energy, shown by the shaded area) once the diode voltage V_D reaches a defined threshold, at which point the diode will be "on" and the voltage remains constant until the end of the

aperture when voltage drops below the threshold and the diode is “off” again. This constant voltage “on” time is annotated with blue lines below.



91. During the time period that the diode is “on” (the blue lines above), the current from the RF input is conducted, while it is not conducted during the remainder of the cycle (the “off” periods shown with red lines indicating zero or substantially zero current flow). The transitions between these two states are very

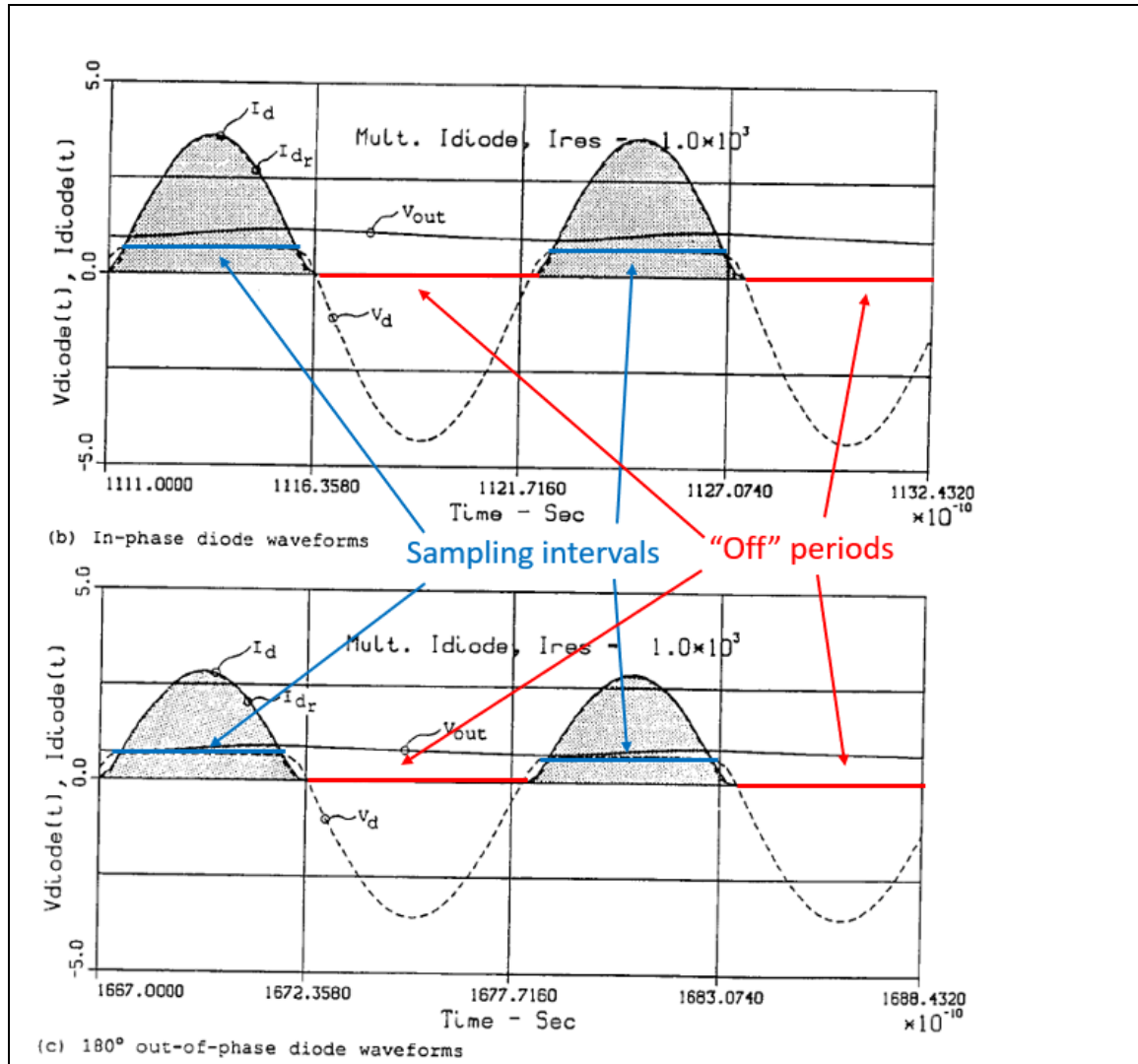
rapid, just as they would be with a square wave or “pulsed” control signal. Therefore, Estabrook-Thesis teaches an “energy transfer signal” according to the plain and ordinary meaning of the term, and according to any construction that might be applied.

2. Estabrook-Thesis teaches a switch “configured to... sub-sample and transfer energy”

92. As I explained in my original declaration, Estabrook-Thesis teaches that its diode switch “sub-samples” energy from a first EM signal because it closes (turns on) for a discrete interval, during which it transfers energy from the IRF (and ILO) and stores that energy in a capacitor. EX1002, ¶¶250-257. Neither ParkerVision nor Dr. Ricketts responds to this discussion. ParkerVision and Dr. Ricketts both assert that the diode in Estabrook-Thesis does not “sample,” but it is not clear why they make this assertion, and many of the factual assertions both in ParkerVision’s Response and in Dr. Ricketts’ declaration are either unsupported, unexplained, or both. POR, 74-77; EX2006, ¶¶293-300.

93. For example, ParkerVision asserts several times that the diode in Estabrook-Thesis does not “turn on and off in discrete intervals” to sample energy. POR, 76. However, as I explained above with respect to the “energy transfer signal,” Estabrook does exactly that: it turns “on” in distinct intervals when the diode conducts, separated by clear “off” intervals where zero or negligible current flows.

Again, Figs. 16(b)-(c), as I have annotated them, clearly show the “on” intervals in blue and the “off” intervals in red:



94. ParkerVision’s assertions in the POR that the diode in Estabrook-Thesis is “continuously conducting” are therefore incorrect. POR, 75, 77.

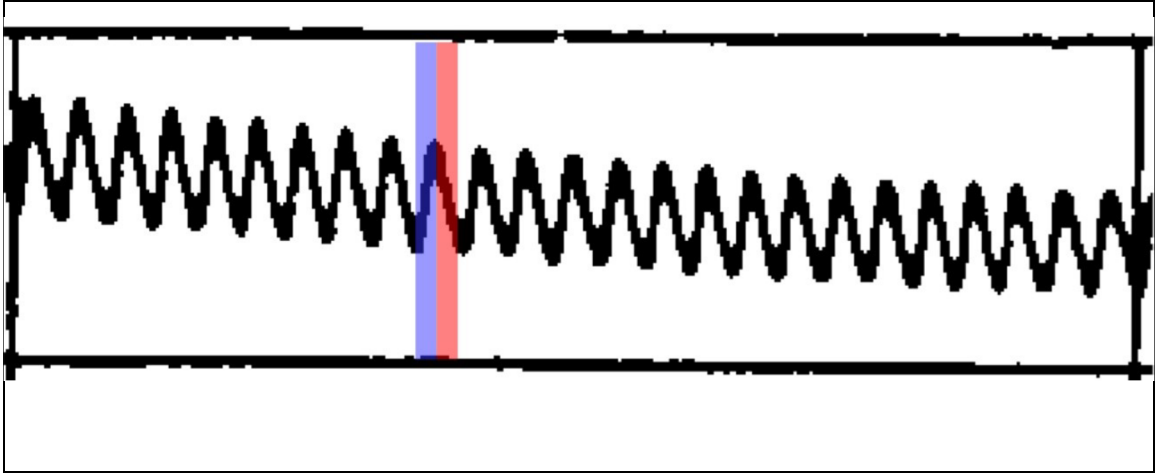
95. ParkerVision’s Patent Owner Response did not explain the basis of its assertion that Estabrook-Thesis’ diode was “continuously conducting.” However, Dr. Ricketts made some comments in deposition that suggested that there might be

some current flowing in Estabrook-Thesis's diode even during the "off" times. EX1051, 118:5-13. Although I am not a lawyer, I understand that under Board rules ParkerVision may have waived arguments that it either didn't make or did not explain in detail in its Patent Owner Response. Therefore, nothing in this declaration should be interpreted as any sort of concession that Dr. Ricketts' deposition arguments are properly at issue.

96. In any event, neither ParkerVision nor Dr. Ricketts cites any evidence of any current whatsoever flowing through Estabrook's diode during the "off" times. In both Fig. 16 of Estabrook-Thesis and in Dr. Ricketts' simulations (e.g. EX2006, ¶218), the current during the "off" periods (when the sine of the voltage is negative) is visually indistinguishable from zero, and there is no indication of any current, even an infinitesimal amount, during those times. Moreover, even Dr. Ricketts' new deposition testimony would not suggest that there is current flowing during these times. Dr. Ricketts suggested that there might be some amount of current flowing as long as there is any forward voltage bias. However, during the "off" periods, the diode is reverse biased because the voltage across it is negative; there is no indication of any current in the forward direction during this time.

97. Even if there were some minimal current flowing during the "off" times, that would not change the fact that the diode still "samples" because such current flow would be entirely negligible compared to the current flow during the

“on” times. The capacitor still charges during the “on” times (annotated in blue in Fig. 16(a) below) and discharges during the “off” times (red):



98. The “sawtooth” figure in Fig. 16(a) clearly shows that there are discrete portions of the down-conversion cycle in Estabrook-Thesis when the switch is “on” and the capacitor charges (blue) and when the switch is “off” and the capacitor discharges. This satisfies the plain and ordinary meaning of the word “sample” and the construction that Mediatek has proposed, which is also consistent with ParkerVision’s agreed position in prior litigation. The diode takes a continuous signal (which includes the IRF signal) as its input, and reduces that signal to the discrete-time output shown in Fig. 16(a).

99. Moreover, even if there were some negligible current during the “off” period (which has not been shown), a person of ordinary skill in the art would not understand that to negate sampling. Both diodes and field-effect transistors, both of which are disclosed as examples of “switches” in the ’686 Patent and ’551 Patent,

may allow negligible amounts of current to pass even during “off” times. A person of ordinary skill in the art would understand that such elements still perform a “switching” function if the current passing through the switch during the “off” time is negligible for the purposes that the switch is being used for. For example, when FETs are used in gates in binary logic circuits, a very small current is not problematic if the current is low enough that the output of the transistor is still recognized as a logical “low.” That is similar to the case with Estabrook-Thesis, where if any current at all exists in the “off” state (and again, there is no evidence of this) it does not negate the clear division in functions and circuit behavior between the “on” and “off” portions of the sampling cycle.

100. I also disagree with ParkerVision’s and Dr. Ricketts’ arguments that Estabrook-Thesis’s diode does not “sample” because it does not “operate independently” on the IRF signal. POR, 76, EX2006, ¶299. In my opinion, this argument is irrelevant to the claim language, because there is no requirement in the claims that the sampled energy must come exclusively from the first EM signal. Indeed, as I explained in Section VII(A) and VII(D) above, there is no requirement of an “independent control input” in the claims either through the “energy transfer signal” element or the “switch” element (where ParkerVision’s attempts to introduce such a requirement have been rejected multiple times). It is no more appropriate to

read in an “independent” requirement into the “sampling” term, where ParkerVision has not even proposed it as part of its construction.

101. I also previously explained in my initial declaration that there is no requirement in the claims that the switch sample energy exclusively from the first EM signal. EX1002, ¶268. ParkerVision and Dr. Ricketts do not respond to this. However, they both assert that the diode in Estabrook-Thesis does not “sample” because it operates on a “combined” signal. POR, 76, EX2006, ¶¶ 280-281, 299-300. However, there is nothing in the claims that precludes operating on a “combined” signal as long as the sampling of the first EM signal still meets the claim language. As I previously explained, Estabrook-Thesis’s diode still samples energy which includes the RF input signal (first EM signal) and transfers that energy to the capacitor, and it is the energy from the IRF which causes the variation in the output waveform (that is, the difference in the heights of the peaks of the sawtooths) that is used to generate the down-converted output.

3. Young in view of Estabrook-Thesis teaches “a plurality of protocol/standard sub-modules” (elements 11[1.3], 1[c]) and “operating a [first/second] transceiver in conformance with a [first/second] protocol/standard combination” (elements 11[2-3])

102. As I explained in my initial declaration, Young teaches both elements because it teaches operating the transceivers and associated sub-modules of Radios A and B to send and receive using different protocols, such as Bluetooth and IEEE

802.11. Young, Abstract, 1:8-12, 1:29-43, 2:65-67, 10:31-37; EX1002, ¶¶271-272.

As with its protocol compliance arguments regarding Ground 1, ParkerVision and Dr. Ricketts ignore this showing, and do not actually dispute the teachings of Young. Rather, their arguments are largely the same as the arguments that they made regarding Ground 1 to which I previously responded. For example, ParkerVision and Dr. Ricketts ignore the ability of a person of ordinary skill in the art to implement a communication standard and incorporate a suitable down-converter into that standard, and argue that the Petition was required to show a level of disclosure from the prior art that is missing from the '686 Patent itself.

103. I have reviewed the simulations provided by Dr. Ricketts regarding Estabrook-Thesis, and in my opinion they are largely irrelevant and do not change this analysis. As I understand Dr. Ricketts' arguments, he claims that the various simulations that he performed supposedly show that the single-ended mixer of Estabrook-Thesis would be incompatible with Bluetooth standards. In my opinion, they show nothing of the sort.

104. As an initial matter, none of Dr. Ricketts' simulations appears to correspond to any actual performance standard that he could identify. Dr. Ricketts makes general assertions that he referenced the Bluetooth standard, but never cites a specific portion of that standard, nor could he clearly answer questions about

whether he actually referred to any specific standard before performing the simulations referenced in his declaration:

Q. Did you check the Bluetooth specification to come up with that requirement?

A. I mean, I have checked it before. Like I said, we use it in my research lab.

Q. Did you check it specifically before you conducted the simulation?

A. I guess—I think the answer to that is I've checked the spec many times, and so I – I mean. Let me put it this way: our work in Bluetooth has been going on for years. I did the simulations more recent to the March time frame when I submitted the declaration.

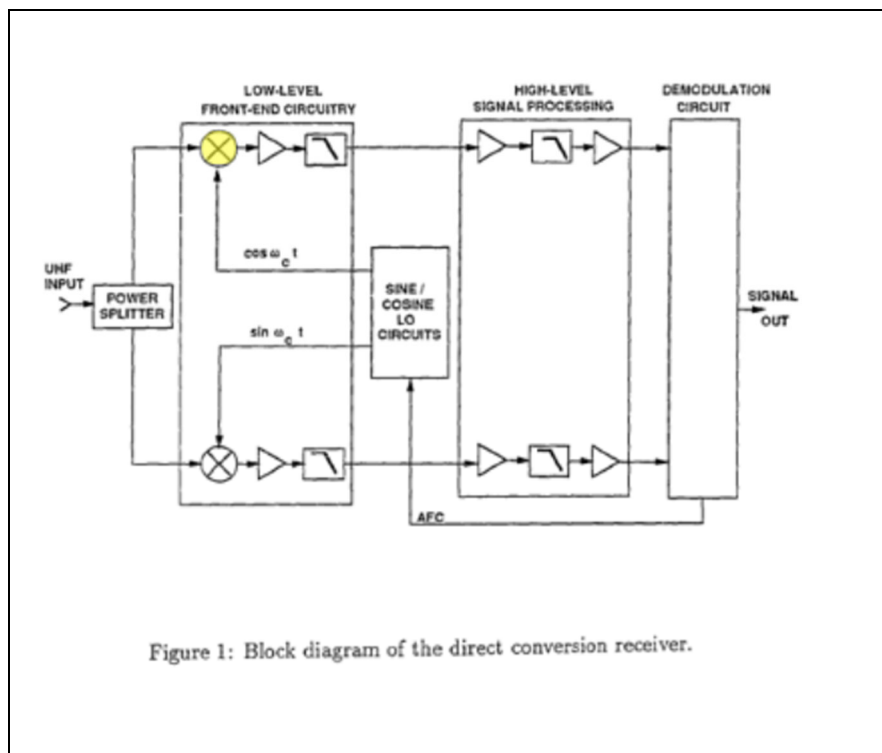
EX1051, 126:7-18.

105. Dr. Ricketts does not identify any specific Bluetooth performance standard that his simulations supposedly correspond to, and none of them accurately match any actual performance standard.

106. One common problem with all of Dr. Ricketts' simulations is that they only simulate the performance of the single-ended mixer of Estabrook-Thesis in isolation. His simulations accordingly do not correspond to any actual Bluetooth performance requirements because the performance requirements in the Bluetooth specification generally relate to a completed transceiver. Nothing in the Bluetooth performance specification refers to requirements for the performance of a down-conversion circuit in isolation. A person of ordinary skill in the art would recognize

that a down-conversion circuit would simply be part of a larger transceiver with other components that would impact the signal quality.

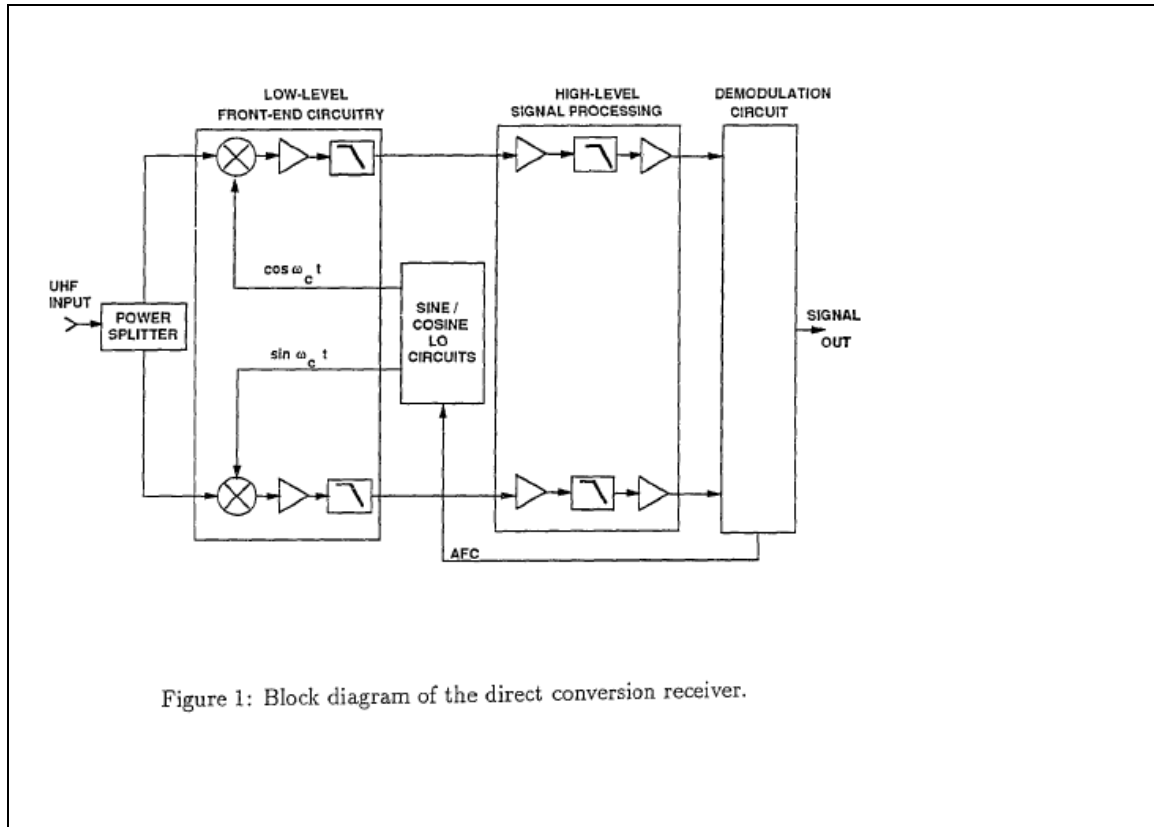
107. For example, the down-conversion and demodulation circuitry shown in Fig. 1 of Estabrook-Thesis includes, among other things, two sine/cosine demodulation circuits which I will discuss further, amplifiers, several low-pass filters, and two signal processing stages. The mixer that Dr. Ricketts simulated would correspond only to one of the two mixers shown. This is significant because the other components shown would all have substantial impacts on the overall signal quality and function of the overall circuit, such as amplifying desired signals, filtering out unwanted signals, and maintaining appropriate frequency rejection of unwanted signals.



108. This circuitry itself would be used within a larger transceiver, with components that would have been well-known to a person of ordinary skill in the art. A person of ordinary skill in the art would understand that compliance with a standard would be based on the performance of the entire transceiver.

109. This basic error makes some of Dr. Ricketts' assertions about the purported significance of his tests meaningless. For example, Dr. Ricketts asserts that Estabrook "does not provide image rejection" based on a simulation of the single-ended mixer alone. However, a person of ordinary skill in the art would recognize that the larger receiver architecture described in Estabrook-Thesis in fact uses a well-known image rejection architecture. Indeed, Estabrook-Thesis explicitly describes how its direct-conversion architecture provides image rejection. EX1005 at 30. Referring to Fig. 1 again, Estabrook-Thesis teaches that the receiver utilizes two pathways with sine/cosine local oscillator signals— that is, signals offset from each other by 90 degrees, so that when used with a diode mixer, the signals will take samples one quarter of the wavelength of the oscillator apart. EX1005, 32-33. These pathways are shown on the top and bottom of Fig. 1. When tuned properly, this type of design can provide image rejection by causing the down-converted signals from the image frequency to have different signs from the desired frequency and therefore wholly or partially cancel each other out. This type of image rejection architecture

is known as a Hartley architecture, and would have been well-known to a person of ordinary skill in the art as a way to provide image rejection. EX1062, 700-701; EX1063, 165-166, Fig. 1; EX1064, 95, Fig. 1.



110. In any event, the Hartley architecture was just one method of image rejection known at the time of the alleged invention date, of which a person of ordinary skill in the art would have been familiar with many which would have been compatible with the mixer described by Estabrook-Thesis. To say that the mixer alone does not provide image rejection, as Dr. Ricketts does, is nonsensical and irrelevant.

111. Dr. Ricketts' other two simulations (relating to intermodulation products and carrier to interference ratio) also make the same mistake in that they purport to simulate the behavior of an isolated component rather than an entire transceiver.

112. None of Dr. Ricketts' simulations are an accurate simulation of a Bluetooth test for a second reason. In each case, Dr. Ricketts' simulations relied entirely on measuring (simulated) analog outputs at various frequencies. That is not how interference tests are done for a digital communication standard such as Bluetooth.

113. To assess interference in digital communication standards, the relevant question is whether the receiver can still accurately determine ones and zeros in a received digitally modulated signal under specified conditions. The accuracy of a digital signal is measured as the Bit Error Rate, or BER, which is defined as the fraction of transmitted bits which are received incorrectly or not at all. In the Bluetooth standard applicable at the time of the alleged invention (EX1055), the acceptable BER in most of the relevant tests is 0.1% or less. EX1055, 24.

114. For example, to measure interference, the receiver is supplied with a wanted digital signal and interfering signals at known frequencies (relative to the wanted frequency) and power levels. The measure of whether a transceiver passes the test is whether it can achieve less than a 0.1% BER under those defined

conditions. This measure is explained by the Bluetooth specification itself, as well as documents provided by testing companies which routinely assess Bluetooth compliance. For example, EX1056 is an explanation of Bluetooth testing provided by National Instruments, which is one well-known company that provides such tests. EX1056 explains (at page 89) that for a carrier/interference (C/I) test, “the DUT [Device Under Test] is tested by placing interfering signals at a known set of frequencies and amplitudes and measuring the wanted signal’s bit error rate.” The same basic concept— setting up the test with a known set of input signals and confirming that the device being tested can still meet BER requirements with that set of inputs— also applies to the other two factors that Dr. Ricketts claims to have simulated, intermodulation (*id.*, 84-87) and image rejection (which is also included within the C/I testing at pp. 87-90). Dr. Ricketts’ simulations which tested output power ratios rely on an entirely different construct than the Bluetooth interference standards. Even if simulating a mixer in isolation was an appropriate measure (and it is not), Dr. Ricketts’ simulations are not set up in a way that accurately represents the Bluetooth standards that he claims to have been simulating, and they are irrelevant to the conclusion that he draws from them that a down-converter using Estabrook-Thesis’s teachings would not meet Bluetooth standards.

115. I note again that the ’686 Patent contains no indication whatsoever that the circuits that it describes and claims would meet these standards, nor any other

Bluetooth or IEEE 802.11 standards. For example, it contains no description of testing an actual device against these standards, nor of simulating any of the circuits described relative to these standards. The '686 Patent simply assumes that by mentioning Bluetooth and IEEE 802.11, a person of ordinary skill in the art would know how to design a transceiver to those standards. In my opinion, a person having the degree of skill that would be needed in order to do so based on the disclosure of the '686 Patent would also be capable of doing so based on the combined disclosures of Young and Estabrook-Thesis.

4. A person of ordinary skill in the art would have been motivated to combine Young and Estabrook-Thesis

116. I explained in my original declaration that a person of ordinary skill in the art would have been motivated to combine Young and Estabrook-Thesis because Young teaches that its transceiver requires a down-conversion block, while Estabrook-Thesis fills that gap with a down-converter that provides efficiency advantages over traditional receivers. Young, Fig. 5; Estabrook-Thesis, Figs. 1, 14a; EX1002, ¶¶223-229. Again, neither ParkerVision nor Dr. Ricketts directly responds to this motivation. In my opinion, the arguments made by both Dr. Ricketts and ParkerVision are largely repetitive of their arguments that Estabrook-Thesis does not teach standards compliance, and the same responses apply.

117. Additionally, their arguments are flawed for substantially similar reasons to those that I addressed with respect to Ground 1. For example, as with the

Ground 1 combination, the performance characteristics that ParkerVision and Dr. Ricketts assert that Estabrook-Thesis fails to meet are requirements that would be applied to an entire transceiver, not a down-conversion circuit in isolation. Likewise, additional required elements to meet protocol requirements (e.g. “protocol-specific modulation, demodulation, and signal processing techniques” are features of other elements of a transceiver that would have been well-known to a person of ordinary skill in the art. And as I explained previously, the level of ordinary skill that would be required to go from the disclosures of the ’686 Patent itself to a functioning, standards-compliant transceiver would also enable a person of ordinary skill in the art to design and implement a functioning, standards compliant transceiver based on the combined disclosure of Young and Estabrook-Thesis without undue experimentation and with a reasonable expectation of success. And as I explained above, Dr. Ricketts’ simulations of Estabrook-Thesis’s mixer alone do not show that such a mixer could not be incorporated into a Bluetooth or IEEE 802.11 compliant device. These simulations are irrelevant to the motivation to combine for the same reasons. Therefore, I incorporate by reference my arguments in sections VIII(A)(3), VIII(A)(4), and VIII(B)(3) above, and it is my opinion that a person of ordinary skill in the art would have been motivated to combine Young and Estabrook-Thesis.

5. Dependent claims 2-10 and 12-20

118. Neither ParkerVision nor Dr. Ricketts raises any separate arguments with respect to the dependent claims of the '686 Patent, claims 2-10 and 12-20. Therefore, these claims are invalid over the combination of Young and Estabrook-Thesis for the reasons that I previously explained.

C. Ground 3: Claims 1-20 are Unpatentable over Young in view of Estabrook-1988 and Estabrook-1989

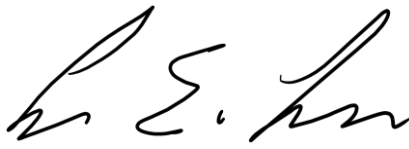
119. Both ParkerVision and Dr. Ricketts rely on the same arguments with respect to the combination of Young with Estabrook-1988 and Estabrook-1989 that they raised with respect to the Ground 2 combination of Young with Estabrook-Thesis. Stated differently, neither ParkerVision nor Dr. Ricketts raises any new issues with respect to Ground 3. I understand that MediaTek raised Ground 3 in case ParkerVision challenged the public availability of Estabrook-Thesis, but ParkerVision did not make any such challenge in its Patent Owner Response. Since ParkerVision relies on the same arguments that it raised for Ground 2, my responses in Section VIII(B) above apply with respect to Ground 3 as well.

IX. CONCLUSION

120. For all the reasons I have explained above, it is my opinion that (1) all of Challenged Claims 1–20 of the '686 Patent are unpatentable because they are rendered obvious by the prior art and analysis I have cited herein.

I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willfully false statements and the like are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code.

Dated: July 3, 2024

By: 

Dr. Lawrence E. Larson