IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

PARKERVISION, INC., *Plaintiff* **-v- HISENSE CO., LTD., HISENSE VISUAL TECHNOLOGY CO., LTD.** *Defendants*	§ § § § § § § § § § §	**6-20-CV-00870-ADA**
PARKERVISION, INC., *Plaintiff* **-v- TCL INDUSTRIES HOLDINGS CO., LTD., TCL ELECTRONICS HOLDINGS LTD., SHENZHEN TCL NEW TECHNOLOGY CO., LTD., TCL KING ELECTRICAL APPLIANCES (HUIZHOU) CO., LTD., TCL MOKA INT'L LTD., TCL MOKA MANUFACTURING S.A. DE C.V.** *Defendants*	§ § § § § § § § § § § § § § § § § § §	**6-20-CV-00945-ADA**

SPECIAL MASTER'S REPORT AND RECOMMENDATION REGARDING CLAIM CONSTRUCTION

Before the Court are the Parties' claim construction briefs: Defendants HiSense Co., Ltd. and HiSense Visual Technology Co., Ltd. (collectively "HiSense") and TCL Industries Holdings Co., Ltd., TCL Electronics Holdings Ltd., Shenzhen TCL New Technology Co., Ltd., TCL King Electrical Appliances (Huizhou) Co., Ltd., TCL Moka Int'l Ltd., TCL Moka Manufacturing S.A. De C.V.'s (collectively "TCL") Opening and Reply briefs (No. 6-20-cv-00870, ECF Nos. 33 and 42, respectively, and No. 6-20-cv-00945, ECF Nos. 33 and 40, respectively) ("Opening" and "Reply," respectively) and Plaintiff ParkerVision, Inc. Response and Sur-Reply briefs (No. 6-20-cv-00870, ECF Nos. 40 and 44, respectively, and No. 6-20-cv-00945, ECF Nos. 38 and 42,

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

respectively) ("Response" and "Sur-Reply," respectively). United States District Judge Alan D Albright referred these cases to the undersigned on October 25, 2021. No. 6-20-cv-00870, ECF No. 47 and No. 6-20-cv-00945, ECF No. 45. The undersigned provided preliminary constructions for the disputed terms the day before the hearing. No. 6-20-cv-00870, ECF No. 46 and No. 6-20-cv-00945, ECF No. 44. The undersigned held the *Markman* hearing on October 27, 2021. No. 6-20-cv-00870, ECF No. 48 and No. 6-20-cv-00945, ECF No. 46. During that hearing, the undersigned informed the Parties of the final recommended constructions for the disputed terms. *Id.* This Report does not alter any of those constructions.

I. BACKGROUND

Plaintiff asserts U.S. Patent Nos. 6,049,706, 6,266,518, 6,580,902, 7,110,444, 7,292,835, 8,588,725, 8,660,513, 9,118,528, 9,246,736, and 9,444,673. Plaintiff previously asserted these patents in the Western District of Texas against Intel in two cases (6-20-cv-00108, 6-20-cv-00562) and later against LG (6-21-cv-00520). Judge Albright held *Markman* hearings in the Intel cases on January 26, 2021 (-00108) and July 22, 2021 (-00562). Judge Albright previously construed Terms 3, 5–10, and 14-23 below in the prior Intel cases. 6-20-cv-00870,[1] ECF No. 51 at 3–9, 11-16.

Judge Gilliland held a *Markman* hearing in *LG* case on May 10, 2022. No. 6-20-cv-00520, ECF No. 51. Judge Gilliland entered a *Markman* order and memorandum in support of his claim constructions on June 21, 2022. No. 6:21-cv-00520-ADA, 2022 WL 2240465 (W.D. Tex. June 21, 2022). In that order, Judge Gilliland provided his reasoning for his constructions for two terms (Term #1: "energy storage element" / "energy storage device"/ "energy storage module"/ "storage

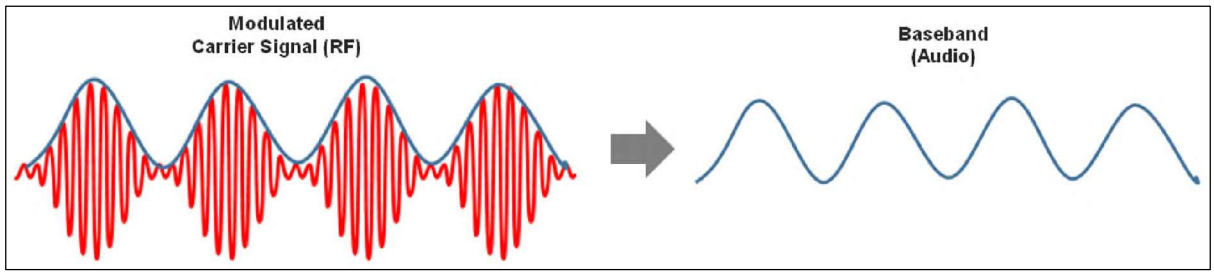
[1] For simplicity, all references to the docket entries will be from the -00870 case.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

element"/ "storage module" and Term #2: whether "cable modem" in U.S. Patent No. 7,292,835 Patent, Cl. 1 was limiting) and adopted Judge Albright's constructions for 28 other terms (Terms #3 to #30). *Id.* Term #3 in this case corresponds to Term #1 in Judge Gilliland's *Markman* order and memorandum in support thereof.

II. DESCRIPTION OF THE ASSERTED PATENTS

The Asserted Patents describe and claim systems for down-conversion of a modulated carrier signal. '518 Patent at Abstract. Down-conversion is the process of recovering the baseband (audio) signal from the carrier signal after it has been transmitted to and received by the receiver. This process is referred to as "down-conversion" because a high frequency signal is being down-converted to a low frequency signal.

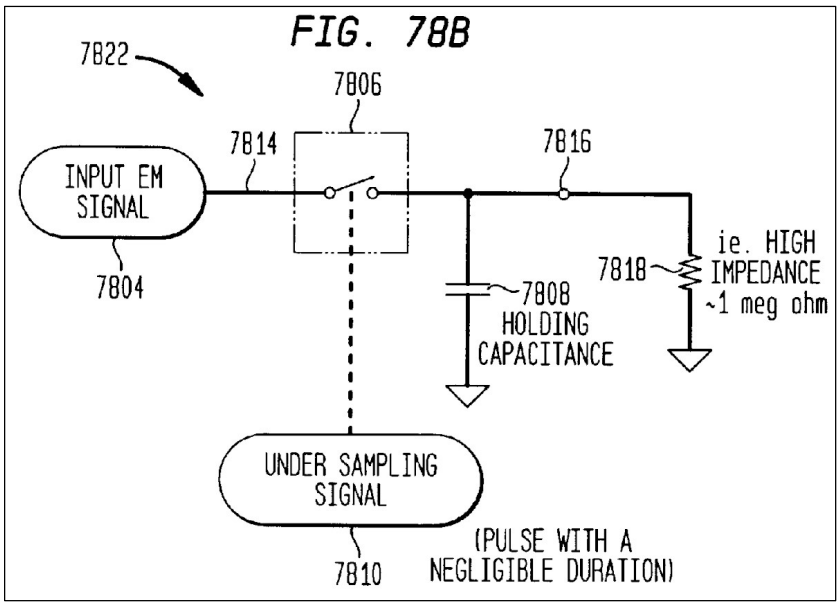


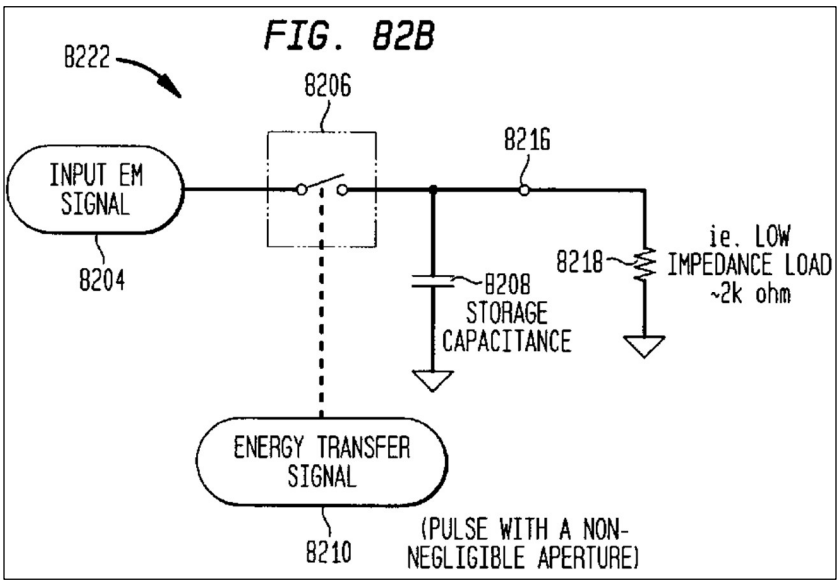
The Asserted Patents disclose at least two types of systems for down-conversion: (1) sample-and-hold (*i.e.*, voltage sampling) and (2) "energy transfer" (also known as "energy sampling"). The key difference between the two is that the former takes a small "sample" of the input signal while the latter takes a very large sample, *i.e.*, a large enough sample that a non-negligible amount of energy is transferred from the input signal. The following sub-sections describes each type of system, their respective operation, and compares them.

A. Circuit configuration of down-sampling systems: sample-and-hold and energy transfer.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Figure 78B depicts an exemplary sample-and-hold system while Figure 82B depicts an exemplary energy transfer system. '518 Patent at 63:19–26 (sample-and-hold) and 7:63–64 (energy transfer).





While Figures 78B and 82B depict that the respective circuits have a similar structure, their respective parameter values (*e.g.*, capacitor and load impedance values)—and concomitantly their respective operation—are very different. It is important to note that the input signal, input EM signal, is the same in both figures.

The circuits in both figures include a switching module (7806 in Figure 78B and 8206 in Figure 82B). *Id.* at 62:65–66 (switching module 7806), 66:13–14 (switching module 8206). The switching module opens and closes (*i.e.*, turns off and on, respectively) based on under-sampling signal 7810 in Figure 78B and energy transfer signal 8210 in Figure 82B. *Id.* at 62:67–63:1 (under-sampling signal 7810), 66:24–26 (energy transfer signal 8210). When the switching module is "closed," input EM signal 7804 and input EM signal 8204 can propagate across the switching module to holding capacitance 7808 and storage capacitance 8208, respectively, but when the switching module is "open," input EM signals 7804/8204 cannot propagate across the switching module. While both switching module 7806 and switching module 8206 open and close, the duration that each module is closed differs significantly. The specifications of the Asserted Patents describe that under-sampling signal 7810 "includes a train of pulses having negligible apertures that tend towards zero time in duration." *Id.* at 63:1–3. The specification discloses an embodiment of the "negligible pulse width" as being "in the range of 1–10 p[ico]sec[onds] ("ps") for under-sampling a 900 MHz signal." *Id.* at 63:3–5. By contrast, the specifications describe that energy transfer signal 8210 "includes a train of energy transfer pulses having non-negligible pulse widths that tend away from zero time in duration." *Id.* at 66:26–28 (emphasis added). The specification discloses an embodiment where the "non-negligible pulse" is approximately 550 ps for a 900 MHz signal.

The specifications describe that holding capacitance 7808 and storage capacitance 8208 are capacitors that charge when switching module 7804 and switching module 8204, respectively, are closed. *Id.* at 63:10–13 (holding capacitance 7808), 66:38–42 (storage capacitance 8208). The specifications also disclose that holding capacitance 7808 "preferably has a small capacitance value" and disclose an embodiment wherein holding capacitance 7808 has a value of 1 picoFarad

("pF"). *Id.* at 63:9–15. By contrast, the specifications disclose that storage capacitance 8208 "preferably has the capacity to handle the power being transferred" and disclose an embodiment wherein storage capacitance 8208 has a value "in the range of 18 pF." *Id.* at 66:38–49.

The specifications describe that holding capacitance 7808 and storage capacitance 8208 discharge through load 7812 and load 8212 when switching module 7804 and switching module 8204, respectively, are open. *See id.* at 63:19–26 (load 7812), 66:61–65 (load 8212). Figure 78B depicts that "high impedance" load 7818 has an impedance of approximately 1 MΩ while Figure 82B depicts that "low impedance" load 8218 has an impedance of approximately 2 kΩ. The specifications describe that "[a] high impedance load is one that is relatively insignificant to an output drive impedance of the system for a given output frequency. A low impedance load is one that is relatively significant." *Id.* at 66:58–61.

B. Operation of down-converting systems

At a very high level, both systems operate similarly. In particular, when the switching module (switching modules 7806 / 8206) is closed, the input signal (input EM signal 7804 / 8204) propagates to the capacitor (holding capacitance 7808 and storage capacitance 8208) and charge the voltage across the capacitor to the voltage of input signal. But when the switching module is open, the input signal cannot propagate to the capacitor, *i.e.*, cannot charge the voltage across the capacitor to the voltage of input signal. Rather, the charge on the capacitor discharges through the load impedance (load 7818 / 8218).

While both systems operate similarly at a high level, differences in (1) the width of the sampling aperture, (2) value of the capacitor, and (3) value of the load are what dictates whether the system operates as a sample-and-hold system or an energy transfer system.

1. Operation of sample-and-hold system

In a sample-and-hold system, the sampling aperture in under-sampling signal 7810 is negligible which means only a small amount of charge from input EM signal 7804 propagates to the holding capacitance 7808 before switching module 7806 opens. *Id.* at 62:63–63:8. Because the sampling aperture has a negligible (*i.e.*, very small) width, there is only enough time take a "sample" of input EM signal 7804, *i.e.*, only a small amount of charge is transferred to holding capacitor 7808. Given that only a small amount of charge is transferred to the capacitor, the value of holding capacitor 7808 needs to be relatively low in order for the voltage across holding capacitance 7808 change to the voltage of input EM signal 7804. More specifically, the relationship between charge (Q) and voltage (V) across a capacitor (with a capacitance of C) is $Q = C * V$, or $Q / C = V$. As such, if the capacitance C is large, more charge Q is needed in order to increase the voltage to V. For example, for the same amount of charge, if the capacitance is 2C in one case and C in other case, the voltage in the former case will be half the voltage of the voltage in the latter case. *Id.* at 65:29–35. Therefore, to ensure that the value of holding capacitance 7808 does not limit the voltage across the capacitor, the value of holding capacitance 7808 needs to be, as described above, low. *Id.* at 63:9–15.

When sampling module 7806 is open, the charge on holding capacitance 7808 discharges through load impedance 7818. *See id.* at 63:19–26. When the value of load impedance 7818 is high, the charge on holding capacitance 7808 discharges very slowly as compared to when the load impedance is low. More specifically, the time to discharge a capacitor is related to $R * C$ (also known as the time constant τ) where R is the value of the load impedance. Using the exemplary values depicted in Figures 78B (1 MΩ) and 82B (2 kΩ), assuming that the capacitance is the same, it will take 500 times longer to discharge the capacitor with the 1 MΩ load impedance

as compared to the circuit with the 2 kΩ load impedance. Because it takes significantly longer to discharge the capacitor using a 1 MΩ load impedance (as compared to the 2 kΩ load impedance), the 1 MΩ load impedance in "holds" the charge.

To summarize, in a sample-and-hold down-sampling system, a negligible sampling aperture for switching module 7806 and a small value for holding capacitance 7808 only allows for a "sample" of the voltage of the input EM signal 7804 when switching module 7806 is closed. And because of the high value of load impedance 7818, the capacitor "holds" that value when switching module 7806 is open.

2. Operation of energy transfer system

As described above, in an energy transfer system, the sampling aperture is non-negligible (*e.g.*, 550 ps versus 1 ps for the sample-and-hold system for a 900 MHz input signal). Therefore, there is significantly more time to transfer charge from the input signal to storage capacitance 8208. *Id.* at 66:42–44. Because significantly more charge is transferred to the capacitor, the value of storage capacitance 8208 can be larger, in spite of the fact that charge and voltage are inversely related (*i.e.*, $V = {}^{Q}/_{C}$). The fact that this system transfers a large amount of charge—or energy—to the capacitor gives rise to the name "energy transfer" system.

When sampling module 8206 is open, the charge on storage capacitance 8208 discharges through load impedance 8218. *See id.* at 66:61–65. Because the load impedance in an energy transfer system is "low," *e.g.*, 2 kΩ, the charge on storage capacitance 8208 discharges much faster than the charge on a capacitor in a sample-and-hold system, *e.g.*, 500 times faster as compared to using a 1 MΩ load impedance.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

To summarize, in an energy transfer down-sampling system, a non-negligible sampling aperture for switching module 8206 and a high value for storage capacitance 8208 allows for a large amount of charge—or energy—to be transferred from the input signal.

C. Comparison of sample-and-hold and energy transfer systems

The following summarizes the key differences between sample-and-hold and energy transfer systems.

Parameter	Sample-and-hold	Energy transfer
Sampling aperture	Negligible (*e.g.*, 1–10 ps)	Non-negligible (*e.g.*, 550 ps)
Capacitor	Holding capacitance (*e.g.*, 1 pF)	Storage capacitance (*e.g.*, 18 pF)
Load impedance	High (*e.g.*, ~1 MΩ)	Low (*e.g.*, ~2 kΩ)

It is important to emphasize that differences in the set of parameter values determines whether a system functions as a sample-and-hold system or an energy transfer system. For example, there is nothing special in the structure of a holding capacitance as compared to the structure of a storage capacitance. A circuit designer could, in theory, swap the holding capacitance in a sample-and-hold system with the storage capacitance in an energy transfer system and still have a sample-and-hold system by appropriately adjusting the sampling aperture and load impedance to "match" the larger capacitor value of the holding capacitance.

It is important to note that changing one parameter without adjusting the other parameters will prevent each system from operating as intended or will have other problems. For example, using a non-negligible sampling aperture in a sample-and-hold system is unnecessary as the holding capacitance can be fully charged (to the voltage of the input signal) with a negligible aperture, but using a non-negligible sampling aperture may distort or destroy the input EM signal by transferring too much of its energy to the holding capacitance. *Id.* at 62:30–39.

Even worse, using a high load impedance in an energy transfer system or a low load impedance in a sample-and-hold system could result in a system with poor performance. *See, e.g.*, *id.* at 65:52–55. More specifically, in the latter situation, the low value of the holding capacitance combined with a low load impedance means that its corresponding time constant τ is very low, which means that the holding capacitance may discharge significantly when the switching module is open. As a result, the down-converted signal "cannot provide optimal voltage reproduction, and has relatively negligible power available at the output." *Id.* at 64:49–51.

In the former situation, the high value of the storage capacitance combined with a high load impedance means that its corresponding time constant τ is very high, therefore it will take considerably more time (as compared to a low load impedance) to discharge the storage capacitance. This may result in less than optimal voltage reproduction, *e.g.*, when the voltage of the input EM signal is lower than the voltage across the capacitor. Furthermore, the down-converted signal could have substantially less power (*e.g.*: V^2/R; ~2 mV and 1 MΩ) than the energy transfer system with a low impedance load (*e.g.*: V^2/R; ~2 mV and 2 kΩ) or even the sample-and-hold system with a high impedance load (*e.g.*: V^2/R; ~5 mV and 1 MΩ). *See id.* at 67:28–33.

III. LEGAL STANDARD

A. General principles

The general rule is that claim terms are generally given their plain-and-ordinary meaning. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (*en banc*); *Azure Networks, LLC v. CSR PLC*, 771 F.3d 1336, 1347 (Fed. Cir. 2014), *vacated on other grounds*, 575 U.S. 959, 959 (2015) ("There is a heavy presumption that claim terms carry their accustomed meaning in the

relevant community at the relevant time.") (internal quotation omitted). The plain-and-ordinary meaning of a term is the "meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention." *Phillips*, 415 F.3d at 1313.

The "only two exceptions to [the] general rule" that claim terms are construed according to their plain-and-ordinary meaning are when the patentee (1) acts as his/her own lexicographer or (2) disavows the full scope of the claim term either in the specification or during prosecution. *Thorner v. Sony Comput. Ent. Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012). The Federal Circuit has counseled that "[t]he standards for finding lexicography and disavowal are exacting." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014). To act as his/her own lexicographer, the patentee must "clearly set forth a definition of the disputed claim term," and "'clearly express an intent' to [define] the term." *Thorner,* 669 F.3d at 1365.

"Like the specification, the prosecution history provides evidence of how the PTO and the inventor understood the patent." *Phillips*, 415 F.3d at 1317. "[D]istinguishing the claimed invention over the prior art, an applicant is indicating what a claim does not cover." *Spectrum Int'l, Inc. v. Sterilite Corp.*, 164 F.3d 1372, 1379 (Fed. Cir. 1998). The doctrine of prosecution disclaimer precludes a patentee from recapturing a specific meaning that was previously disclaimed during prosecution. *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003). "[F]or prosecution disclaimer to attach, our precedent requires that the alleged disavowing actions or statements made during prosecution be both clear and unmistakable." *Id.* at 1325–26. Accordingly, when "an applicant's statements are amenable to multiple reasonable interpretations, they cannot be deemed clear and unmistakable." *3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1326 (Fed. Cir. 2013).

A construction of "plain-and-ordinary meaning" may be inadequate when a term has more than one "ordinary" meaning or when reliance on a term's "ordinary" meaning does not resolve the parties' dispute. *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co*., 521 F.3d 1351, 1361 (Fed. Cir. 2008). In that case, the Court must describe what the plain-and-ordinary meaning is. *Id.*

"Although the specification may aid the court in interpreting the meaning of disputed claim language . . ., particular embodiments and examples appearing in the specification will not generally be read into the claims." *Constant v. Advanced Micro-Devices, Inc.*, 848 F.2d 1560, 1571 (Fed. Cir. 1988). "[I]t is improper to read limitations from a preferred embodiment described in the specification—even if it is the only embodiment—into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited." *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004).

Although extrinsic evidence can be useful, it is "less significant than the intrinsic record in determining 'the legally operative meaning of claim language.'" *Phillips*, 415 F.3d at 1317 (quoting *C.R. Bard, Inc. v. United States Surgical Corp.*, 388 F.3d 858, 862 (Fed. Cir. 2004)). Technical dictionaries may be helpful, but they may also provide definitions that are too broad or not indicative of how the term is used in the patent. *Id.* at 1318. Expert testimony may also be helpful, but an expert's conclusory or unsupported assertions as to the meaning of a term are not. *Id.*

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

B. Means-Plus-Function Claiming

A patent claim may be expressed using functional language. *See* 35 U.S.C. § 112, ¶ 6.[2] *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1347–49 (Fed. Cir. 2015). In particular, § 112, ¶ 6 provides that a structure may be claimed as a "means . . . for performing a specified function" and that an act may be claimed as a "step for performing a specified function." *Masco Corp. v. United States*, 303 F.3d 1316, 1326 (Fed. Cir. 2002).

The presumption is that terms reciting "means" are subject to § 112, ¶ 6. *Williamson*, 792 F.3d at 1348. But if the term does not use the word "means," then it is presumed not to be subject to § 112, ¶ 6. *Id.* "That presumption can be overcome, but only if the challenger demonstrates that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function." *Samsung Elecs. Am., Inc. v. Prisua Eng'g Corp.*, 948 F.3d 1342 (Fed. Cir. 2020) (internal quotations removed) (citing *Williamson*, 792 F.3d at 1349). "The correct inquiry, when 'means' is absent from a limitation, is whether the limitation, read in light of the remaining claim language, specification, prosecution history, and relevant extrinsic evidence, has sufficiently definite structure to a person of ordinary skill in the art." *Apple Inc. v. Motorola, Inc.*, 757 F.3d 1286, 1298 (Fed. Cir. 2014), *overruled on other grounds by Williamson*, 792 F.3d at 1349.

When § 112, ¶ 6 applies, it limits the scope of the functional term "to only the structure, materials, or acts described in the specification as corresponding to the claimed function and equivalents thereof." *Williamson*, 792 F.3d at 1347. Construing a means-plus-function limitation involves multiple steps. "The first step . . . is a determination of the function of the means-plus-

[2] The America Invents Act of 2011 changed the numbering of the relevant subsection from § 112, ¶ 6 to § 112(f). Because the substance of the subsection did not change, the undersigned will refer to the relevant subsection as § 112, ¶ 6 in keeping with the numeration at the time of the patent filing.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

function limitation." *Medtronic, Inc. v. Advanced Cardiovascular Sys., Inc.*, 248 F.3d 1303, 1311 (Fed. Cir. 2001). "[T]he next step is to determine the corresponding structure disclosed in the specification and equivalents thereof." *Id.* A "structure disclosed in the specification is 'corresponding' structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Id.* The focus of the "corresponding structure" inquiry is not merely whether a structure is capable of performing the recited function, but rather whether the corresponding structure is "clearly linked or associated with the [recited] function." *Id.* The corresponding structure "must include all structure that actually performs the recited function." *Default Proof Credit Card Sys. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005). However, § 112, ¶ 6 does not permit "incorporation of structure from the written description beyond that necessary to perform the claimed function." *Micro Chem., Inc. v. Great Plains Chem. Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999).

C. Indefiniteness

"[I]ndefiniteness is a question of law and in effect part of claim construction." *ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012). Patent claims must particularly point out and distinctly claim the subject matter regarded as the invention. 35 U.S.C. § 112, ¶ 2§ 112, ¶ 2. A claim, when viewed in light of the intrinsic evidence, must "inform those skilled in the art about the scope of the invention with reasonable certainty." *Nautilus Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 910 (2014). If it does not, the claim fails § 112, ¶ 2 and is therefore invalid as indefinite. *Id.* at 901. Whether a claim is indefinite is determined from the perspective of one of ordinary skill in the art as of the time the application was filed. *Id.* at 911.

In the context of a claim governed by § 112, ¶ 6, the claim is indefinite if the claim fails to disclose adequate corresponding structure to perform the claimed functions. *Williamson*, 792 F.3d

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

at 1351–52. The disclosure is inadequate when one of ordinary skill in the art "would be unable to recognize the structure in the specification and associate it with the corresponding function in the claim." *Id.* at 1352. Computer-implemented means-plus-function claims are indefinite unless the specification discloses an algorithm to perform the function associated with the limitation. *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1319 (Fed. Cir. 2012).

D. Level of Ordinary Skill in the Art

It is well established that patents are interpreted from the perspective of one of ordinary skill in the art. *See Phillips*, 415 F.3d at 1313 ("[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, *i.e.*, as of the effective filing date of the patent application."). The Federal Circuit has advised that the "[f]actors that may be considered in determining the level of skill in the art include: (1) the educational level of the inventors; (2) the type of problems encountered in the art; (3) prior art solutions to those problems; (4) the rapidity with which innovations are made; (5) sophistication of the technology; and (6) education level of active workers in the field." *Env't Designs, Ltd. v. Union Oil Co. of Cal.*, 713 F.2d 693, 696 (Fed. Cir. 1983). "These factors are not exhaustive but are merely a guide to determining the level of ordinary skill in the art." *Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

IV. LEGAL ANALYSIS

A. Level of ordinary skill in the art

Plaintiff's Proposal	Defendants' Proposal
(i) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of experience in the design and development of radio frequency circuits	At least an undergraduate degree in electrical engineering or a related subject and two or more years of experience in the fields of communication systems, signal processing and/or RF circuit design. Less work

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

and/or systems or (at least five (5) years of experience and training in the design and development of radio frequency circuits and/or systems)	experience may be compensated by a higher level of education, such as a master's degree

The Parties' Positions:

Defendants' expert, Dr. Matthew Shoemake, contends that:

> A person having ordinary skill in the relevant art at the time of the purported inventions of the Asserted Patents would have been someone with at least an undergraduate degree in electrical engineering or a related subject and two or more years of experience in the fields of communication systems, signal processing and/or RF circuit design. Less work experience may be compensated by a higher level of education, such as a master's degree.

Opening at 2 (citing Opening, Shoemake Decl. at ¶¶ 29–34).

Plaintiff's expert, Dr. Michael Steer, contends that:

> [A] POSITA with respect to the '706, '736 and '673 patents would have (i) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) additional years of experience in the design and development of radio frequency circuits and/or systems, or (ii) at least five (5) years of experience and training in the design and development of radio frequency circuits and/or systems.

Response, Steer Decl. at ¶ 13.

Plaintiff's expert, Dr. Steer, disagrees with Defendants' expert witness regarding the level of skill required by a POSITA. More specifically, Dr. Steer contends that "because the claims being construed relate specifically to RF circuit design . . . that a POSITA must have knowledge and experience within the relevant field, and in particular with the analysis and design of RF circuits." *Id.* at ¶ 15. Dr. Steer contends that a degree in electrical engineering does not provide enough specific knowledge of the narrow subset needed by a POSITA for these patents. *Id.* Based on that premise, Dr. Steer contends that Defendants' expert is not a POSITA as his Ph.D. are directed to coding, which is a separate and distinct area of study from circuits. *Id.*

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned generally agrees with Plaintiff. In particular, the undersigned agrees that the claims appear to be directed towards RF circuit design. *See, e.g.*, '673 Patent, Cl. 5. The undersigned, who has electrical engineering degrees, also agrees with Plaintiff's argument that electrical engineering is a broad field and that having an electrical engineering degree is not specific enough when the claims relate to RF circuit design.

The parties do not appear to provide any evidence regarding "(1) the educational level of the inventors; (2) the type of problems encountered in the art; (3) prior art solutions to those problems; (4) the rapidity with which innovations are made; (5) sophistication of the technology; and (6) education level of active workers in the field." *Env't Designs*, 713 F.2d at 696. First, Plaintiff's proposed level of skill allows for a POSITA to have a degree in computer engineering. The undersigned finds that including additional engineering disciplines such as computer engineering tends to contradict Plaintiff's argument that the level of ordinary skill needs to include RF circuit design experience because electrical engineering is too broad of a field and thus not specific enough. Furthermore, computer engineering does not include RF circuit design, and thus is irrelevant in terms of the level of ordinary skill in the art. Second, while Plaintiff's alternate level of skill may be acceptable, the undersigned believes that it is a little too specific to be an alternative. Rather, the undersigned thinks that Defendants' alternative—"Less work experience may be compensated by a higher level of education, such as a master's degree"—is a better alternate level of skill as it more generalized.

Therefore, for the reasons provided above, the undersigned recommends that the level of ordinary skill in the art is: "[a] Bachelor of Science degree in electrical engineering (or an

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

equivalent degree) and at least two additional years of experience in the design and development of radio frequency circuits and/or systems. Less experience may be compensated by a higher level of education, such as a master's degree."

B. Term #1: "low impedance load"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#1: "low impedance load" U.S. Patent No. 9,246,736, Claims 26, 27; U.S. Patent No. 9,444,673, Claim 5 Proposed by TCL	Plain-and-ordinary meaning	Indefinite

The Parties' Positions:

TCL contends that "intrinsic evidence does not provide an objective boundary for determining what is a '*low* impedance load.'" Opening at 2 (emphasis in original). The specification describes a "low impedance load" as "one that is ***significant relative*** to the output drive impedance of the system ***for a given output frequency***." *Id.* at 2–3 (quoting '736 Patent at 73:52–58) (emphasis added); *see also*'736 Patent at 76:34–40 ("Recall from the overview of under-sampling that loads can be classified as high impedance loads or low impedance loads. A high impedance load is one that is relatively insignificant to an output drive impedance of the system for a given output frequency. A low impedance load is one that is relatively significant."). TCL contends this only creates another term of degree ("significant relative") which depends on the output. *Id.*

According to TCL, the "dependency of 'low impedance' on a 'given output frequency' renders [low impedance] indeterminate" because the load impedance varies with the output

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

frequency. *Id.* at 3–4. TCL contends that neither the specification nor the claims specify what frequencies result in a "low" impedance. *Id.* at 4.

TCL contends that other references to "low impedance" in the specification do not provide objective guidance. *Id.* at 5. For example, TCL contends that "significantly discharge" in the following passage does not provide any more guidance than "significant relative to" or the dependence of "low impedance" on the output frequency. *Id.*

> When the load 7812 is a low impedance load, the holding capacitance 7808 is *significantly discharged* by the load between pulses 8004 (FIG. 80C). As a result, the holding capacitance 7808 cannot reasonably attain or 'hold' the voltage of the original EM input signal 7804, as was seen in the case of FIG. 79D. Instead, the charge appears as the output illustrated in FIG. 80D.

'736 Patent at 74:10–16 (emphasis added).

TCL contends that Fig. 79D illustrates a circuit with high impedance while Fig. 80D illustrates a circuit with low impedance, but the specification does not provide any guidance as to the distinction between the two. *Id.* at 5–6. TCL contends that the prosecution history does not provide any guidance either. *Id.* at 6.

In its response, Plaintiff contends that "low impedance" is a well-known term within the field of electrical engineering at the time of the invention. Response at 2. Plaintiff points to Figs. 78B and 82B which depict 1 MΩ and 2 kΩ impedances and contends, without citation to the specification, that the former is a high impedance load while the latter is a low impedance. *Id.* at 2–3. Plaintiff also points out that the specification describes that the load is either "high" or "low" impedance. *Id.* at 3 (citing 70:35–36 ("Recall from the overview of under-sampling that loads can be classified as high impedance loads or low impedance loads.")).

Plaintiff contends that the patent specification discloses two systems—an energy transfer/sampling system—which uses low impedance—and a voltage sampling system—which

uses high impedance. *Id.* at 4–5. The former uses a low impedance because energy needs to be transferred from the capacitor across the load while the latter uses a high impedance to prevent discharge of the capacitors. *Id.* at 5.

Plaintiff contends that the claims are directed towards down-converting a modulated carrier signal to a demodulated baseband signal. *Id.* at 5–6. Plaintiff the contends that a "POSITA would understand that the claim language itself defines the 'given output frequency' as a baseband frequency." *Id.* at 6.

In its reply, TCL contends that Plaintiff does not—nor does the specification provide any guidance—as to the boundary between low and high impedance. Reply at 1–2. TCL contends that even if 1 MΩ is high impedance and 2 kΩ is low, the specification does not provide guidance whether a load of 900 kΩ, 500 kΩ, 100 kΩ, etc. is low impedance. *Id.* at 2.

With respect to Plaintiff's argument that low impedance is used in energy transfer systems while high impedance is used in voltage sampling, TCL responds in at least two ways. First, any non-infinite impedance will allow for some discharge. *Id.* at 3. Second, TCL contends that Plaintiff's argument fails to provide guidance as to how much energy must be discharged in order for the impedance to shift from low to high. *Id.*

In its sur-reply, Plaintiff contends that the specification does not need to provide a numerical boundary, but only that the "specification provides *guidance* (and *objective bounds*) to a skilled person (who can impart his/her own knowledge of circuits) as to what constitutes a low impedance load." Sur-Reply at 1 (emphasis in original). Plaintiff also contends that "[t]he degree may be determined by looking to the functionality obtained by the invention." *Id.* (citing *Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1320 (Fed. Cir. 2005)).

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Plaintiff cites several cases where courts found that "low" was not indefinite. Sur-Reply at 1 (*Freeny v. Apple Inc.*, No. 2:13-CV-00361-WCB, 2014 U.S. Dist. LEXIS 120446, at *15–*19 (E.D. Tex. Aug. 28, 2014) (finding "low power communication signals" not indefinite); *CardioFocus, Inc. v. Cardiogenesis Corp.*, 827 F. Supp. 2d 36, 43–44 (D. Mass. 2011) (finding "low hydroxyl ion content" not indefinite); *Input/Output, Inc. v. Sercel, Inc.*, No. 5:06CV236, 2007 U.S. Dist. LEXIS 98316, 2007 WL 6196070, at *30 (E.D. Tex. Dec. 19, 2007)).

Plaintiff argues that the specification describes that "'low impedance load' must be low enough to allow for 'non-negligible amounts of energy' to be transferred and become part of the down-converted signal in an energy transfer system." Sur-Reply at 1–2 (citing'673 Patent at 66:29–36; 70:40–49; 100:28–31). Plaintiff contends that "non-negligible" is not indefinite, as evidenced by TCL's usage in one of its proposed constructions. *Id.* at 2.

Plaintiff further contends that the specification's failure to provide a "boundary" impedance value is the wrong question as "[t]he issue is not about what impedance values to use in the abstract but, rather, what impedance values achieve an energy transfer system (transferring non-negligible amounts of energy) as opposed to a sample-and-hold system (holding a sampled voltage value)." *Id.* at 3. Plaintiff contends that the specification describes that the impedance value is low such that "non-negligible" amounts of energy are transferred. *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term not indefinite and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, based on the undersigned's electrical engineering experience, "low" (and similarly "high"), are terms that electrical engineers frequently

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

use to describe physical attributes such as voltage, current, and impedance. As such, the undersigned finds that, both as a general matter and in the context of this patent, that a POSITA would understand with reasonable certainty the meaning of this claim term.

Second, the undersigned disagrees with TCL that the intrinsic evidence does not adequately explain the meaning and scope of "low impedance load." More specifically, based on the disclosures in the specification, a POSITA would be able to make a reasonable calculation as to what low impedance is. If the impedance is too high, it would take too long to transfer a non-negligible energy to the load; in this situation, the sampling rate would need to be drastically decreased. Unlike a high impedance load, a low impedance load causes the capacitor to significantly discharge the stored energy between the pulses of the energy transfer signal (*i.e.*, when the switch is open). Notably, the specification provides guidance as to the effects of lowering the impedance of the load in a voltage sampling system by replacing the high impedance load with a low impedance load. '673 Patent at 66:29–-36; 70:40–49; 100:28–31. Calculating the impedance value necessarily requires accounting for the output frequency over the operational range of the circuit.

Third, the undersigned concludes that TCL is incorrect in arguing the specification provides no numerical guidance as to the boundary between low and high impedance. The undersigned agrees with the Plaintiff that the issue is not about what impedance values to use in the abstract but, rather, what impedance values achieve an energy transfer system (transferring non-negligible amounts of energy) as opposed to a sample-and-hold system (holding a sampled voltage value). The undersigned concludes that the specification adequately differentiates low and high impedance, as explained above.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Therefore, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty, the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech. Co. v. Publ'ns Int'l, Ltd.*, 844 F.3d 1370, 1377 (Fed. Cir. 2017). As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

C. Term #2: "said energy discharged from said capacitor provides sufficient power to drive the low impedance load"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#2: "said energy discharged from said capacitor provides sufficient power to drive the low impedance load" U.S. Patent No. 9,444,673, Claim 5 Proposed by TCL	Plain-and-ordinary meaning	Indefinite

TCL contends that the '673 Patent fails to inform a POSITA with "reasonable certainty" how much power is "sufficient" to drive a low impedance load. Opening at 7–8. TCL contends that the '673 Patent only uses the phrase "sufficient power" only in Claim 5. *Id.* at 8. TCL points to several passages in the specification to illustrate that there is no guidance as to the meaning of this phrase. *Id.* With respect to column 120, lines 1 to 9, TCL contends that this passage does not say how to determine what is "sufficient power." *Id.*

> [T]he storage module should have an impedance at the desired output frequencies that is preferably greater than or equal to the load that is intended to be driven (for example, in an embodiment, storage module impedance at a desired 1 MHZ output frequency is 2 kΩ and the desired load to be driven is 50 Ω).

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

With respect to column 71, lines 4 to17, TCL contends that this passage describes where energy can "efficiently drive lower impedance loads." *Id.* at 8–9.

> The down-converted signal 8312 is similar to the down-converted signal illustrated in FIG. 79F, except that the down-converted signal 8312 has substantially more power (*e.g.*: V^2/R; approximately (˜) 2 mV and 2 kΩ) than the down-converted signal illustrated in FIG. 79F (*e.g.*: V^2/R; ˜5 mV and 1 MΩ). As a result, the down-converted signals 8310 and 8312 can efficiently drive lower impedance loads, given the input EM signal 8204 would typically have a driving impedance, in an RF environment, of 50 Ohms (*e.g.*: V^2/R; ˜5 mV and 50 Ω).

With respect to column 65, lines 61 to 67, TCL contends that this passage describes embodiments where an energy transfer system can "drive lower impedance loads unassisted." *Id.* at 9.

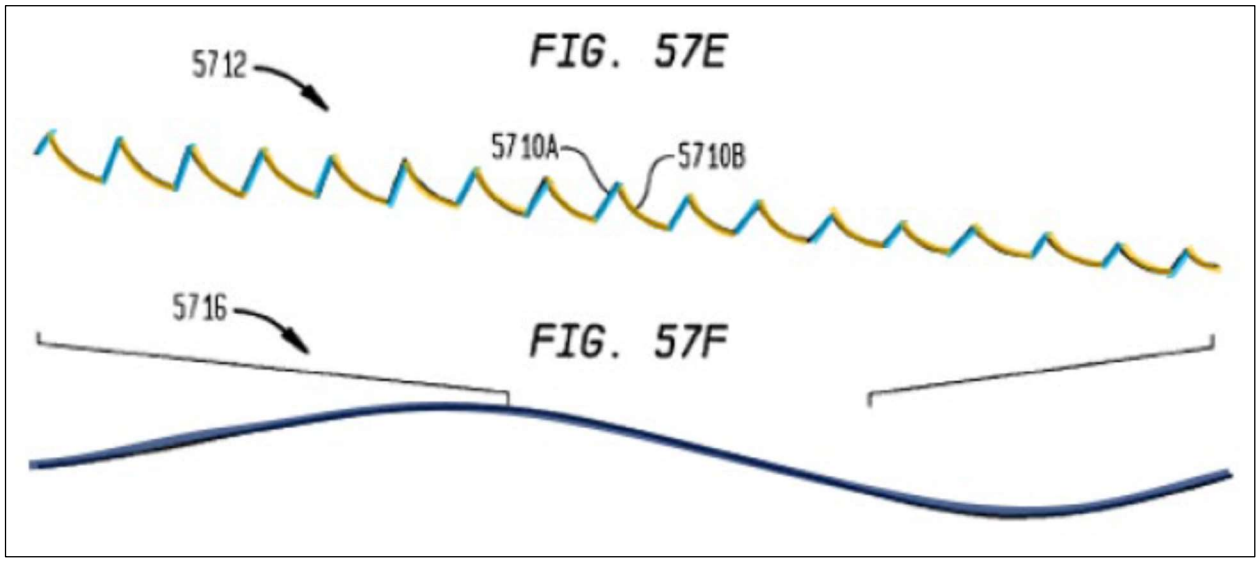
> Portions of the voltages at the outputs 4408 and 4410 also include ripple voltage or noise resulting from the switching action of the switch module 4416. But because the switch module is positioned between the two outputs, the noise introduced by the switch module appears at the outputs 4408 and 4410 as substantially equal and in-phase with one another.

TCL also contends that the dependance of impedance on the output frequency further "compound[s]" the uncertainty. *Id.* at 8.

> In its response, Plaintiff contends that:
>
> In context, the term "*said energy discharged from said capacitor provides sufficient power to drive the low impedance load*" simply means that the capacitor provides a non-negligible amount of energy (sources current) to the low impedance load for the duration of time the switch is open. Otherwise, (*i.e.*, if the capacitor did not supply sufficient power to the low impedance load for the duration of time the switch is open), information would be lost in the down-converted signal, thereby producing a degraded and/or unusable signal that could not be properly processed by a receiving wireless device.

Response at 8 (emphasis in original). In support of this argument, Plaintiff contends that Claims 1 and 5 of the '673 Patent "track[s] the energy transfer shown in Fig. 82B." *Id*. at 7. Plaintiff contends that for the circuit shown in Fig. 82B, the down-converted signal as shown in Fig. 57E is made up of two parts, when the switch is closed and when its open. *Id.* Plaintiff colorized Fig.

57E to show the effect on the down-converted signal when the signal is closed (blue) and when the signal is open (yellow). *Id.*



Based on this understanding, Plaintiff contends that "the term "said energy discharged from said capacitor provides sufficient power to drive the low impedance load" simply means that the capacitor provides a non-negligible amount of energy (sources current) to the low impedance load for the duration of time the switch is open." *Id.* at 8.

In its reply, TCL first contends that Plaintiff's argument is conclusory. Reply at 5. TCL also contends that Plaintiff mainly—and incorrectly—focuses on Claim 1, and not Claim 5. *Id.* TCL contends that Plaintiff's argument renders "sufficient" to be superfluous because any "non-negligible" amount of power could drive the load is thereby "sufficient." *Id.* TCL further contends that:

> And for that matter, if a "low impedance load" effectively means that "the holding capacitance . . . is significantly discharged by the low impedance load between pulses" as ParkerVision argues (PV. Br. at 5), then the entire phrase "and wherein said energy discharged from said capacitor provides sufficient power to drive the low impedance load" recited in claim 5 would be surplusage in view of the earlier-recited term "wherein said load circuitry comprises a low impedance load."

Id. TCL finally contends that if "non-negligible" energy transfer means "sufficient power," then plain-and-ordinary meaning for the latter is incorrect. *Id.*

In its sur-reply, Plaintiff counters the assertion that it incorrectly focuses on Claim 1 by pointing out that Claim 5 depends on Claim 1, so the claims must be read together. Sur-Reply at 4. In particular, Claim 1 recites charging and discharging the capacitor while Claim 5 recites "wherein said energy discharged from said capacitor provides sufficient power to drive the low impedance load." *Id.*

With respect to argument that "sufficient" is rendered superfluous by Plaintiff's arguments, Plaintiff contends that TCL also "mischaracterize[s]" Plaintiff's interpretation of the claim language. *Id.* at 4. Plaintiff contends that TCL also ignores "for the duration of time the switch is open" in Plaintiff's argument. *Id.* ("ParkerVision carefully explained in its opening brief that the term "said energy discharged from said capacitor provides sufficient power to drive the low impedance load" means that the capacitor provides a non-negligible amount of energy to the low impedance load *for the duration of time the switch is open*.") (emphasis in original).

With respect to TCL's "surplusage" argument, Plaintiff contends that TCL's argument "conflates the concept of low impedance load with the amount of energy stored in the capacitor. *Id.* at 5. Plaintiff contends that the "'sufficient power to drive the low impedance load' in claim 5 comes from discharging some of the previously accumulated energy into the load circuitry each time the switch is opened. Each claim element is distinct, and thus, there is no 'surplusage' as Defendant[] contend[s]." *Id.*

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term not indefinite and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, with respect to TCL's argument that the intrinsic evidence does not adequately explain the meaning and scope of the claim term, the undersigned concludes that a POSITA would, in light of the specification, understand with reasonable certainty" how much power is "sufficient" to drive a low impedance load. In particular, the undersigned thinks that Plaintiff's technical explanation of the circuit's operation—which TCL does not seem to dispute—is correct.

Based on this technical explanation, the undersigned finds that "sufficient power" provides a floor as to how big the capacitor needs to be, how long the switch is closed in relation to the impedance value, the output frequency, and how accurate the down-converted signal needs to be. If the capacitor cannot provide "sufficient power," the voltage across the capacitor will drop to zero, which means that the voltage of the down-converted signal will also be zero. In that case, the resultant down-converted signal will be distorted. To avoid that problem, that capacitor needs to be large enough to provide sufficient power. This is further bolstered by other descriptions in the specification: the signal must be "distinguishable from noise," have "sufficient energy to drive lower impedance circuits without buffering," and "drive lower impedance loads unassisted." '673 Patent at 66:29–36; 65:61–65.

Second, the undersigned generally finds TCL's arguments to be unconvincing. Plaintiff's argument correctly relies on Claim 1, as Claim 5 depends on Claim 1, so the claims must be read together. Claim 1 recites charging and discharging the capacitor while Claim 5 recites "wherein said energy discharged from said capacitor provides sufficient power to drive the low impedance

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

load." Based on these two claims, a POSITA would understand what power is "sufficient": the capacitor has to be able to accumulate enough charge in order to provide "sufficient power" to drive the load impedance. If the capacitor does not accumulate sufficient charge, then the output signal will not accurately represent what the down-converted signal.

Therefore, based on the foregoing, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty, the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech.*, 844 F.3d at 1377. As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

D. Term #3: "Storage" terms

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#3: "Storage" terms U.S. Patent No. 6,049,706, Claims 105, 114, 115, 164, 166, 168, 175, 179, 186, 190; U.S. Patent No. 6,580,902, Claim 1; U.S. Patent No. 7,110,444, Claim 3; U.S. Patent No. 7,292,835, Claims 1, 18, 20; U.S. Patent No. 8,588,725, Claims 1, 6, 17, 18, 19; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 9; U.S. Patent No. 9,246,736, Claims 1, 11, 21, 26, 27; U.S. Patent No. 9,444,673, Claims 13, 17, 18 Proposed by ParkerVision	Energy storage element / storage element: "an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal for driving a low impedance load." Energy storage module / storage module: "a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal for driving a low impedance load." Energy storage device: "a device of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic	"an apparatus that stores non-negligible amounts of energy from the carrier signal." (all terms are indefinite under ParkerVision's proposed constructions)

	signal for driving a low impedance load."	

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00108 and 6-20-cv-00562). Judge Gilliland also construed this term and provided a memorandum in support of that construction in *ParkerVision v. LG* (6-20-cv-00520). *ParkerVision, Inc v. LG Elecs., Inc.*, No. 6:21-CV-00520-ADA, 2022 WL 2240465, at *3–*6 (W.D. Tex. June 21, 2022). Both Judge Albright and Judge Gilliland construed this term as "a[n] [element / module / device] of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal."

The Parties' Positions:

The parties make the same arguments, along with a few additional arguments, that the parties made in *ParkerVision, Inc. v. LG Elecs.* *Id.* at *3–7. For brevity, the undersigned incorporates the summary of the parties' common arguments as described in Judge Gilliland's Order. *Id.*

In addition to those common arguments, Defendants contend that Plaintiff's proposed construction imports limitations from the specification by limiting the use of storage capacitances to energy transfer systems. Reply at 7–8 (citing '518 Patent at 66:11–23).

Defendants also contend that ParkerVision's proposed construction is barred by collateral estoppel. More specifically, Defendants contend that the PTAB and the Middle District of Florida construed "means for integrating for integrating the transferred energy over aperture periods" as including a "storage module." Opening at 11–12. As such, at least according to Defendants, "storage module" was an "effective limitation" of the claim the PTAB and the Middle District of

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Florida construed. *Id.* at 12. Defendants further contend that the Federal Circuit "unambiguously determined that a 'storage module' in the context of ParkerVision's patents [] does not need to be part of an energy transfer system." *Id.* at 13. In particular, the Federal Circuit found that the claims-at-issue do "not require that the baseband signal be created by discharging energy from a storage device." *Id.*

Plaintiff contends that Defendants make the same arguments that Judge Albright rejected in the previous *Intel* cases. Response at 10. Plaintiff contends that the term the PTAB and the Middle District of Florida construed is totally different ("means for integrating" versus "energy storage [element / module / device])." Response at 14. Plaintiff further contends that "means for integrating" is a broader term and that the statutory provisions are different. Sur-Reply at 8. Plaintiff also contends that there cannot be a preclusive effect because the PTAB was still using the "Broadest Reasonable Interpretation Standard" and not the *Phillips* standard. Response at 14–15.

Plaintiff further contends that Defendants mistakenly direct to a part of the Federal Circuit opinion handling "means for integrating." Response at 14. Therefore, Plaintiff contends that the Federal Circuit did not "unambiguously determine" that a "storage module" does not need to be part of an energy transfer system and include a "low impedance load." *Id.* In addition, Plaintiff also points out that the "Federal Circuit found the sample-and-hold circuit of Weisskopf includes a 'means for integrating' is not a rejection of ParkerVision's assertion that storage element/module/device are elements of an energy transfer system." Sur-Reply at 8.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Undersigned's Analysis:

After reviewing the parties' arguments, considering the applicable law, and reviewing Judge Gilliland's Claim Construction Order and Memorandum in Support Thereof in *ParkerVision v. LG*, the undersigned declines to adopt Defendants' proposed construction and instead will recommend that the Court adopt its final construction from the other *ParkerVision* cases as the final construction in this case.

For brevity, the undersigned incorporates the Judge Gilliland's analysis with respect to this term. *LG*, 2022 WL 2240465, at *8–9. In general, the undersigned agrees with Judge Gilliland that the specification discloses two types of down-converting systems: energy transfer and sample-and-hold. *Id.* at *1–4, *8–9. The undersigned further agrees with Judge Gilliland that the key difference between a storage [element / module / device] and a holding [element / module / device] is that the former is used only in an energy transfer system while the latter is used only in a sample-and-hold system. *Id.* The undersigned again agrees with Judge Gilliland that the specifications of the Asserted Patents describe that the only difference between a storage [element / module / device] and a holding [element / module / device] is whether it is used in an energy transfer circuit or whether is used in a sample-and-hold circuit. *See id.* In other words, the specifications do not describe that there is anything intrinsic to a storage [element / module / device] that makes it a storage [element / module / device] as compared to a holding [element / module / device]. Rather, the specifications describe that varying the sampling aperture, capacitance value, and load impedance determines whether a particular capacitor functions as a storage [element / module / device] or whether it functions as a holding [element / module / device]. *See id.* at *4.

The undersigned does not find Defendants' other arguments to be persuasive. ***First***, the undersigned disagrees for the immediately above reasons that Plaintiff's proposed construction

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

imports limitations from the specification by limiting a storage [element / module / device] for use only in an energy transfer system. *See also id.* at *1–4, *8–9. ***Second***, with respect to Defendants' collateral estoppel argument, the undersigned agrees with Plaintiff. In particular, the disputed term in this case is a different term than was before the PTAB and the court in the Middle District of Florida, and the statutory provisions are different. Therefore, the undersigned finds that collateral estoppel does not attach.

Finally, Defendants' proposed construction swaps "electromagnetic signal" for "carrier signal," ostensibly based upon an alleged lexicographical statement. In other words, even if there was lexicography, Defendants' proposed construction deviates from the patentee's lexicography.

In conclusion, the undersigned does not find that there was lexicography for the reasons described above. Accordingly, the undersigned declines to adopt Defendants' proposed construction.

With respect to Plaintiff's proposed construction, the undersigned finds that it correctly captures that the "storage" terms describe an [element / module / device] within an energy transfer system. More specifically, for the reasons described above, the undersigned finds that the recommended construction should describe that the "storage" terms are part of an energy-transfer system. The undersigned, however, does not find that it is necessary to include "for driving a low impedance load" in the final construction because that is somewhat redundant with "energy transfer system." Furthermore, the undersigned believes that it is unnecessary to describe the disputed terms in terms of what its "downstream" components are. As such, the undersigned does not believe it should include "for driving a low impedance load" as part of its recommended construction.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Therefore, based on the foregoing, the undersigned recommends that the construction of the "storage" terms to be "a[n] [element / module / device] of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal."

E. Term #4: "voltage of the input modulated carrier signal is not reproduced or approximated at the capacitor during the apertures or outside of the apertures"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#4: "voltage of the input modulated carrier signal is not reproduced or approximated at the capacitor during the apertures or outside of the apertures" U.S. Patent No. 9,444,673, Claim 2 Proposed by TCL	Plain-and-ordinary meaning	Indefinite

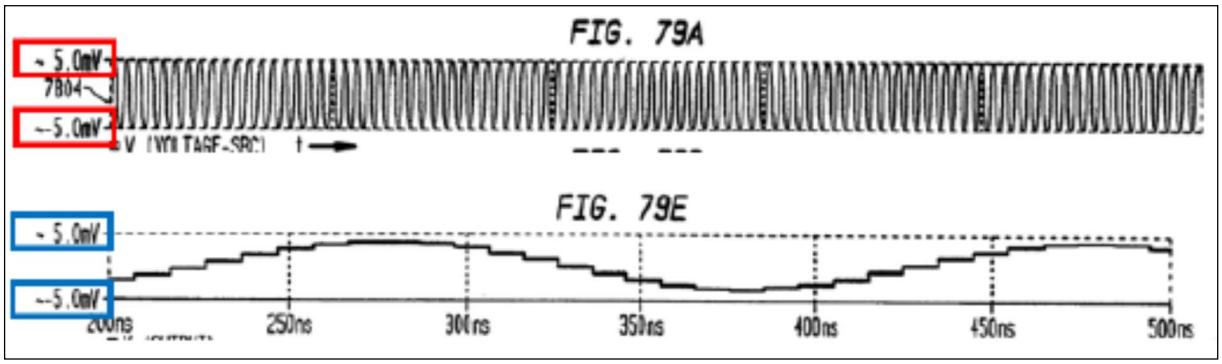
The Parties' Positions:

In its opening, TCL's argument for why this term is indefinite is because sampling—whether above or below the Nyquist rate—is inherently an approximation of the original signal. Opening at 18. As such, at least according to TCL, a POSITA would not understand with reasonable certainty what it is not to reproduce or approximate the voltage of the input modulated carrier signal, as a sampled voltage is already an approximation of the original input signal. *Id.*

In its response, Plaintiff contends that "not reproduced or approximated" is a comparison of using an energy transfer system as compared to a sample-and-hold system. Response at 16–19. Because of the high impedance load in a sample-and-hold system, very little charge on the capacitor discharges. *Id.* at 17. Plaintiff contends that Fig. 79E shows how the sample-and-hold

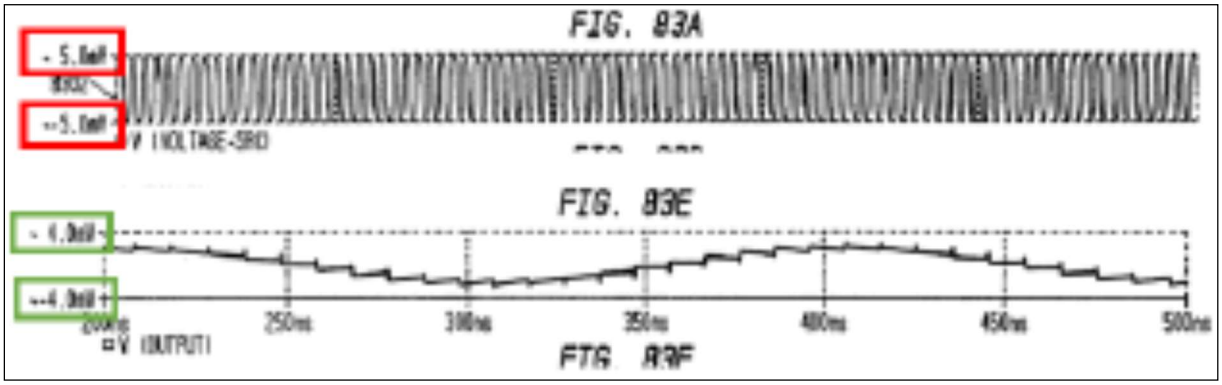
ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

system reproduces or approximates the input modulated signal in Fig. 79A. *Id.* (annotations by Plaintiff).



The voltage of the signal in Fig. 79E reproduces or approximates the voltage of the signal in Fig. 79A.

By contrast, because of the low impedance load in an energy transfer system, when the switch is open, the capacitor discharges more charge across the load (as compared with the capacitor in the sample-and-hold system). *Id.* As such, the voltage across the capacitor drops by more. Fig. 83D shows the effect on the voltage across the capacitor, as compared to the voltage of the input signal which is depicted in Fig. 83A (annotations by Plaintiff). *Id.* at 18.



Plaintiff contends the voltage across the capacitor is lower (-4.0 mV to 4.0 mV) as compared to the voltage of the input carrier signal (-5.0 mV to 5.0 mV). *Id.* Plaintiff further notes that the waveform in Fig. 83E is not a smooth "stair step" signal like that depicted in Fig. 79E, but

rather has little "spikes" and "decays" more due to charge being discharged through the low impedance load. *Id.* Because of this difference in waveforms, Plaintiff contends that a POSITA "would understand that this demonstrates, in energy transfer systems, the voltage of the input modulated carrier signal is *not* reproduced or approximated at the capacitor during the apertures or outside of the apertures." *Id.* at 18–19 (emphasis in original).

In its reply, TCL concedes that a 1 mV voltage difference between the two systems means that the voltage across the capacitor in the energy transfer system is not "reproduced." Reply at 13. TCL, however, still contends that a POSITA still would not understand, with reasonable certainty, whether the input was "approximated." *Id.* TCL also argues that a lack of precision or a numerical boundary also renders the term indefinite. *Id.*

In its sur-reply, Plaintiff first contends that Federal Circuit case law does not require precision or a numerical boundary. Sur-Reply at 10–11. Plaintiff otherwise repeats the arguments it made in its Response. *Id.* at 11–12.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not indefinite and should be construed according to its plain-and-ordinary meaning.

With respect to TCL's argument that the intrinsic evidence does not adequately explain the meaning and scope of "not reproduced or approximated", the undersigned concludes that a POSITA would, in light of the specification, understand with reasonable certainty that it is not to reproduce or approximate the voltage of the input modulated carrier signal. More specifically, the difference in the size of the load impedance, *inter alia*, in a sample-and-hold system and an energy

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

transfer system determines whether the "voltage of the input modulated carrier signal is not reproduced or approximated." In the former system, because the load impedance is large, very little of the charge stored on the capacitor discharges through the load impedance. As such, the voltage across the capacitor reproduces or approximates the voltage of the input modulated carrier signal. By contrast, in the latter system, because the load impedance is small, a significant amount of the charge stored on the capacitor discharges through the load impedance. Accordingly, the voltage across the capacitor does not reproduce or approximate the voltage of the input modulated carrier signal.

Based on the foregoing, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty, the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech.*, 844 F.3d at 1377. As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

F. Term #5: "a down-convert and delay module to under-sample an input signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#5: "a down-convert and delay module to under-sample an input signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample" U.S. Patent No. 6,049,706, Claims 1, 7 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6 Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. **Function**: "under-sample an input signal according to a control signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

		Structure: "the down-convert and delay module 2624 in Fig. 26 and described at 26:1–27:21 and 28:2041, that includes the switches 2650 and 2654, and the capacitors 2652 and 2656; and equivalents thereof"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00562) as "Not subject to § 112, ¶ 6. Plain-and-ordinary meaning."

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

The Parties' Positions Regarding Whether § 112, ¶ 6 Applies:

TCL contends that this term is subject to § 112, ¶ 6 because this term fails to connote sufficient, definite structure given that (1) "module" is a well-known nonce word that operates as a substitute for "means," (2) this term does not have a well-understood specific structural meaning to a POSITA, and (3) that the words before "module" are purely functional. Opening at 19.

Plaintiff first contends that TCL makes the same arguments that the Court rejected in the previous *Intel* cases. Response at 19. Plaintiff contends that this term is not subject to § 112, ¶ 6 because (1) the term does not contain the word "means for" so it is presumed not to be subject to § 112, ¶ 6, (2) the claims recite definite structure (*e.g.*, "down-convert and delay" has a known structure that incorporates components/circuits, such as a capacitor), and (3) dependent claims 3 and 4 make it clear that this module includes structural components/circuits. *Id.* at 19–20.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Undersigned's Analysis Whether § 112, ¶ 6 Applies:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not subject to § 112, ¶ 6 and should be construed as having its plain-and-ordinary meaning for the reasons that follow. ***First***, there is no dispute that the term does not contain the words "means for" and thus that the presumption that the term is subject to § 112, ¶ 6 does not apply. ***Second***, although the undersigned agrees with TCL that the words "down-convert and delay module" are functional, the undersigned concludes that that fact does not provide support for TCL's position because, at most, the words before "module"—"down-convert and delay module"—are redundant with the words after "module"—"to under-sample an input signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample." Furthermore, many devices are named after the function they perform but are not subject to § 112, ¶ 6. *Hill-Rom Servs.,* 755 F.3d at 1375 ("Many devices take their names from the functions they perform. The examples are innumerable, such as 'filter,' 'brake,' 'clamp,' 'screwdriver,' or 'lock.'").

Third, a POSITA would understand that to down-convert and delay an electrical signal requires using physical components such as a switch, sampling aperture signal, capacitor, impedance, *etc.* In other words, these components provide sufficient structure to prevent the application of § 112, ¶ 6. *TEK Glob., S.R.L. v. Sealant Sys. Int'l, Inc.*, 920 F.3d 777, 786 (Fed. Cir. 2019) ("Although connoting precise physical structure is not a necessary condition to avoid § 112, ¶ 6 application, it is generally sufficient."). Relatedly, dependent claims 3 and 4 expressly describe that the down-convert and delay module comprises physical components such as a switch, storage element, and voltage ("reference potential"). *Id.*

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Therefore, based on the foregoing, the undersigned recommends that this term is not subject to § 112, ¶ 6 and that it should be construed as having its plain-and-ordinary meaning.

G. Term #6: "delay module" terms

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#6: "delay module" terms U.S. Patent No. 6,049,706, Claims 1, 7, 34, 140 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. **Function**: "delay instances of an output signal / further delay one or more of said delayed and down-converted input samples" **Structure**: "structure including "first delay module 2628," "second delay module 2630" shown in Fig 26, "delay module 3204" shown in Fig. 32 and described at 35:118; the sample and hold circuit 4501 and 4503 in Fig. 45 and described at 32:44–33:19; or an analog delay line having a combination of capacitors, inductors and/or resistors described at 35:19–27; or equivalents thereof"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00562) as "Not subject to § 112, ¶ 6. Plain-and-ordinary meaning."

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Parties' Positions Regarding Whether § 112, ¶ 6 Applies:

TCL contends that this term is subject to § 112, ¶ 6 because this term fails to connote sufficient, definite structure given that (1) "module" is a well-known nonce word that operates as a substitute for "means," (2) "delay module" does not have a well-understood specific structural means to a POSITA, and that Plaintiff does not show that it does, and (3) the specification describes this term in functional terms. Opening at 20–21.

Plaintiff first contends that TCL makes the same arguments that the Court rejected in previous *Intel* cases. Response at 20. Plaintiff contends that this term is not subject to § 112, ¶ 6 because (1) the term does not contain the word "means for" so it is presumed not to be subject to § 112, ¶ 6 and (2) the claims recite definite structure (*e.g.*, "delay" has a known structure that incorporates components/circuits, such as a capacitor). *Id.* at 20–21.

The Undersigned's Analysis Whether § 112, ¶ 6 Applies:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not subject to § 112, ¶ 6 and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, there is no dispute that the term does not contain the words "means for" and that the presumption that the term is subject to § 112, ¶ 6 concomitantly does not apply. ***Second***, while the word "delay" may be functional, the undersigned concludes that this device is simply named after the function it performs, but that does not necessarily mean that § 112, ¶ 6 applies. *Hill-Rom Servs.,* 755 F.3d at 1375 ("Many devices take their names from the functions they perform. The examples are innumerable, such as 'filter,' 'brake,' 'clamp,' 'screwdriver,' or 'lock.'"). ***Third***, a POSITA would understand that delaying an electrical signal requires using physical components such as a switch, sampling aperture signal,

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

capacitor, impedance, *etc.* In addition, dependent claims 3 and 4 describe that the down-convert and delay module comprises physical components such as a switch, storage element, and voltage ("reference potential"). Furthermore, the delay module is part of a larger electrical circuit. For example, Claim 1, Limitation [b] recites a filter that comprises a delay module. A POSITA would understand that a filter is an electrical circuit that filters out a range of frequencies, depending on the type of the filter (*e.g.*, low-pass, high-pass, band-pass, and band-reject). These components provide sufficient structure to prevent the application of § 112, ¶ 6. *TEK Glob.,* 920 F.3d at 786 ("Although connoting precise physical structure is not a necessary condition to avoid § 112, ¶ 6 application, it is generally sufficient.").

Fourth, the surrounding claim language describes the input, output and connections of the delay module, which describes the structure of the claim term. *Apple*, 757 F.3d at 1299, *rev'd on other grounds by Williamson*, 792 F.3d at 1349 ("Structure may also be provided by describing the claim limitation's operation, such as its input, output, or connections."). For example, as described above, Claim 1, Limitation [b] recites a filter that comprises a delay module. This claim language describes that the input to the delay module is "an output signal" and the output is a delayed version of the output signal. '706 Patent, Cl. 1, Limitation [b] ("at least one delay module to delay instances of an output signal; and (c) an adder to combine at least said delayed input sample."). This claim language also describes that the output of the delay module is used as an input to an adder. *Id.* Language in the other claims similarly recite inputs, outputs, and/or connections of the delay module. *Id.*, Cl. 7[b], 7[c]; 34[b]; 140[a], 140[b].

Therefore, based on the foregoing, the undersigned recommends that this term is not subject to § 112, ¶ 6 and that it should be construed according to its plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

H. Term #7: "said control signal comprises a train of pulses having pulse widths that are established to improve energy transfer from said input signal to said down-converted image"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#7: "said control signal comprises a train of pulses having pulse widths that are established to improve energy transfer from said input signal to said down-converted image" U.S. Patent No. 6,049,706, Claim 2 Proposed by TCL	Plain-and-ordinary meaning	Indefinite

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00562) as "Not indefinite. Plain-and-ordinary meaning."

The Parties' Positions:

TCL contends this term is indefinite because: the intrinsic evidence does not (1) describe what an "improvement" in energy transfer is, (2) how to measure such an improvement, and (3) how much of an improvement is necessary to satisfy this claim term. Opening at 22. TCL further contends that "established to" creates further ambiguity because it suggests that there is an intent requirement to this term. *Id.*

Plaintiff contends that TCL makes the same arguments that Judge Albright rejected in the -00562 *Intel* case. Response at 21. According to Plaintiff, the meaning of "'pulse widths that are established to improve energy transfer' simply means that pulses having non-negligible apertures are being used." *Id.* Plaintiff contends that by using non-negligible apertures (which are apertures

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

which tend away from zero)—as compared to negligible apertures—the switch is closed longer, which allows more energy to be transferred from the input voltage signal to the capacitor. *Id.* at 21–22. Plaintiff further contends that the specification provides guidance to a skilled person on how to improve energy transfer. *Id.* at 22–23. In particular, Plaintiff points to the following passage:

> In another embodiment, the pulses of the control signal 5306 have non-negligible apertures that tend away from zero. This makes the UFT module 5302 a lower input impedance device. This allows the lower input impedance of the UFT module 5302 to be substantially matched with a source impedance of the input signal 5304. **This also improves the energy transfer from the input signal 5304 to the down-converted output signal 5312**, and hence the efficiency and signal to noise (s/n) ratio of UFT module 5302.

'706 Patent at 32:9–18 (emphasis added). Plaintiff contends that this passage describes that the use of non-negligible apertures improves energy transfer from the input signal to the down-converted output signal. Response at 23.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not indefinite and should be construed according to its plain-and-ordinary meaning for the reasons that follow.

First, with respect to TCL's first argument that the intrinsic evidence does not adequately explain the meaning and scope of "improvement," the undersigned concludes that a POSITA would, in light of the specification, understand with reasonable certainty the meaning of this claim term. More specifically, the specification describes that in an energy transfer system sampling apertures are non-negligible and that the input impedance to the down-converter is both "low" and "substantially matche[s]" the source impedance of the input signal. '706 Patent at 32:9–14. The specification then describes that "[t]his also improves the energy transfer from the input signal

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

5304 to the down-converted output signal 5312, and hence the efficiency and signal to noise (s/n) ratio of UFT module 5302." *Id.* at 32:14–18. A POSITA would understand that this passage describes that using sampling apertures that are non-negligible (and/or matching the impedance) maximizes the power transfer between the input signal source and the down-converter. More specifically, as described in the above background, using non-negligible sampling apertures allows more of the input signal's energy to be transferred by increasing the amount of time that the energy may be transferred, at least as compared to negligible sampling apertures. Similarly, matching impedances also maximizes power / energy transfer. Because voltage sources ideally have low output impedances, the input impedance of the down-converter likewise needs to be low in order to match impedances. Based on this passage, the undersigned concludes that a POSITA would understand with reasonable certainty that using non-negligible sampling apertures increases—*i.e.*, improves—the amount of energy that is transferred to the down-converter (and, concomitantly, to the down-converted signal).

The specification contrasts the use of negligible sampling apertures (and high and unmatched input impedances) in a sample-and-hold system to reduce the amount of energy transfer. More specifically, the specification recites "In an embodiment, the pulses of the control signal 5306 have negligible apertures that tend towards zero. This makes the UFT module 5302 a high input impedance device. This configuration is useful for situations where minimal disturbance of the input signal may be desired." *Id.* at 32:4–8. When the sampling aperture is negligible (and/or input impedance is high), less energy is transferred from the input signal to the down-converter.

Second, with respect to TCL's arguments that the claim language does not describe how to measure such an improvement, or much of an improvement is necessary to satisfy this claim

term, the undersigned disagrees that a failure to do so makes the claim term indefinite. TCL's arguments improperly conflate breadth with indefiniteness. *BASF Corp. v. Johnson Matthey Inc.*, 875 F.3d 1360, 1367 (Fed. Cir. 2017) ("Breadth is not indefiniteness."). Rather, the undersigned finds that a POSITA would understand than the plain language of the claim broadly allows for any measurement approach and any amount of improvement.

Third, with respect to TCL's arguments that the word "established" adds an intent requirement to the claim term, which makes it indefinite, the undersigned disagrees with both with TC's premise and conclusion. More specifically, the undersigned finds that, based on the claim language and in light of the specification, the undersigned understands that "established" in this claim term means "is used." Furthermore, to the extent that an intent requirement would render the claim term to be indefinite, the undersigned declines to construe this term to add an intent requirement when the plain meaning of "established" does not necessarily require an intent. *Phillips*, 415 F.3d at 1327 ("claims should be so construed, if possible, as to sustain their validity") (internal quotation marks omitted). Therefore, the undersigned does not find that "established" adds an intent requirement nor that the term is indefinite for adding an intent requirement.

Therefore, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty, the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech.*, 844 F.3d at 1377. As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

I. Term #8: "means for under-sampling an input signal to produce an input sample of a down-converted image of said input signal"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#8: "means for under-sampling an input signal to produce an input sample of a down-converted image of said input signal" U.S. Patent No. 6,049,706, Claim 6 Proposed by TCL	Subject to § 112, ¶ 6. **Function**: under-sampling an input signal to produce an input sample of a down-converted image of the input signal and under-sampling the input signal according to a control signal **Structure**: switch 2650 in Fig. 26; switch 5308 in Figs. 53A/53A-1; and equivalents thereof	Subject to § 112, ¶ 6. **Function**: "under-sampling an input signal to produce an input sample of a down-converted image of said input signal and under-sampling the input signal according to a control signal" **Structure**: "the switch 2650 and the capacitor 2652 in Fig. 26; the switch 5308 and capacitor 5310 in Figs. 53A/53A-1, and equivalents thereof"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00108 and 6-20-cv-00562).

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

Whether § 112, ¶ 6 Applies:

The parties agree that this term is subject to § 112, ¶ 6. As the parties do not dispute this issue and because it is presumed to be subject to § 112, ¶ 6, the undersigned agrees.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

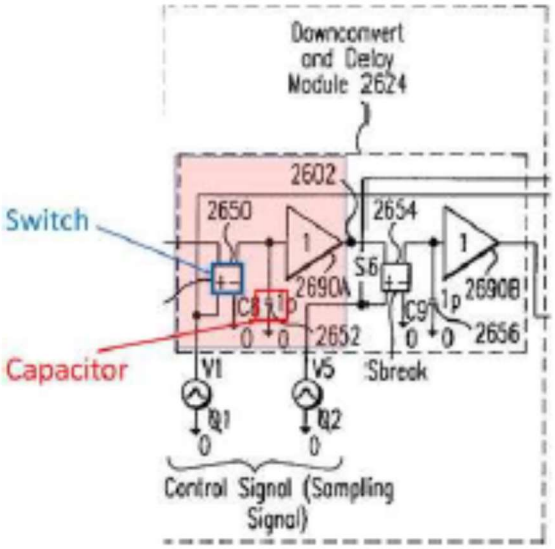
What the Claimed Function is:

The parties agree that the claimed function is: "under-sampling an input signal to produce an input sample of a down-converted image of the input signal and under-sampling the input signal according to a control signal." As the parties do not dispute this issue, the undersigned agrees.

The Parties' Positions Regarding the Corresponding Structure:

The parties agree that the corresponding structure should include "switch 2650 in Fig. 26; switch 5308 in Figs. 53A/53A-1; and equivalents thereof," but dispute whether "capacitor 2652 in Fig. 26" and "capacitor 5310 in Figs. 53A/53A-1" should be included as well. *See, e.g.*, Opening at 23. TC contends that the capacitors should be included while Plaintiff does not. *Id.*

TCL contends that the parties agree that there are two embodiments that perform the under-sampling to down-convert function, and which are depicted in Figures 26 and 53A/53A-1. Opening at 23. Figure 26 (annotated by TCL) depicts:



Id. TCL contends that the specification describes that the switch and capacitor work together to perform the agreed function. *Id.* at 24. In particular TCL points to at least two passages for each

figure. With respect to Figure 26, TCL points to 28:24–28 ("[T]he switch 2650 and the capacitor 2652 operate to down-convert the input signal VI.") and 26:5–8 ("[T]he combination of the switch 2650 and the capacitor 2652 in the down-convert and delay module 2624 operates to translate the frequency of the input signal VI to a desired lower frequency."). With respect to Figure 53, TCL points to 28:43–44 (stating that "aliasing module 5300"—switch 5308 and capacitor 5310—performs the down-conversion) and 28:61–67 ("In one implementation, aliasing module 5300 down-converts the input signal 5304 to an intermediate frequency (IF) signal. In another implementation, the aliasing module 5300 down-converts the input signal 5304 to a demodulated baseband signal. In yet another implementation . . . the aliasing module 5300 down-converts it to a non-FM signal.").

Plaintiff contends that a switch alone (and not a capacitor) performs the following functions: (1) "means for under-sampling an input signal to produce an input sample of a down-converted image of said input signal" and (2) "under-sampling means under-samples said input signal according to a control signal." Response at 25. Plaintiff further contends that the capacitor only receives charge from the opening and closing of the switch and that it is the switch—and not the capacitor—that performs the undersampling function. *Id.* Finally, Plaintiff contends that TCL ignores other passages from the specification that support Plaintiff's contention that the capacitor should not be added ('706 Patent at 29:4–8, 39:25–28, 24:40–25:67). *Id.* at 25–26.

The Undersigned's Analysis Regarding the Corresponding Structure:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with TCL that the corresponding structure should include "capacitor 2652 in Fig. 26" and "capacitor 5310 in Figs. 53A/53A-1" for the reasons that follow. ***First***, with respect to Plaintiff's

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

argument that a capacitor does not perform the claimed function, the undersigned disagrees because while a switch is necessary to produce a sample, it is not sufficient. More specifically, the specification describes an "input sample of a down-converted image of said input signal" as the amplitude (*e.g.*, voltage), phase, *etc.* of the input signal at a specific instance of time when the switch is closed. *Id.* at 15:36–38 ("This input sample includes information (such as amplitude, phase, *etc.*) representative of the input signal existing at the time the sample was taken."). In other words, because the input sample is representative of the input signal existing at a specific time, the means for under-sampling must include a capacitor to store the voltage of the input signal existing at that specific time. Without a capacitor, the means for under-sampling cannot store the voltage from that specific time.

To illustrate that both a switch and a capacitor are needed in order to "produce an input sample," consider the circuit depicted in Figure 53A:

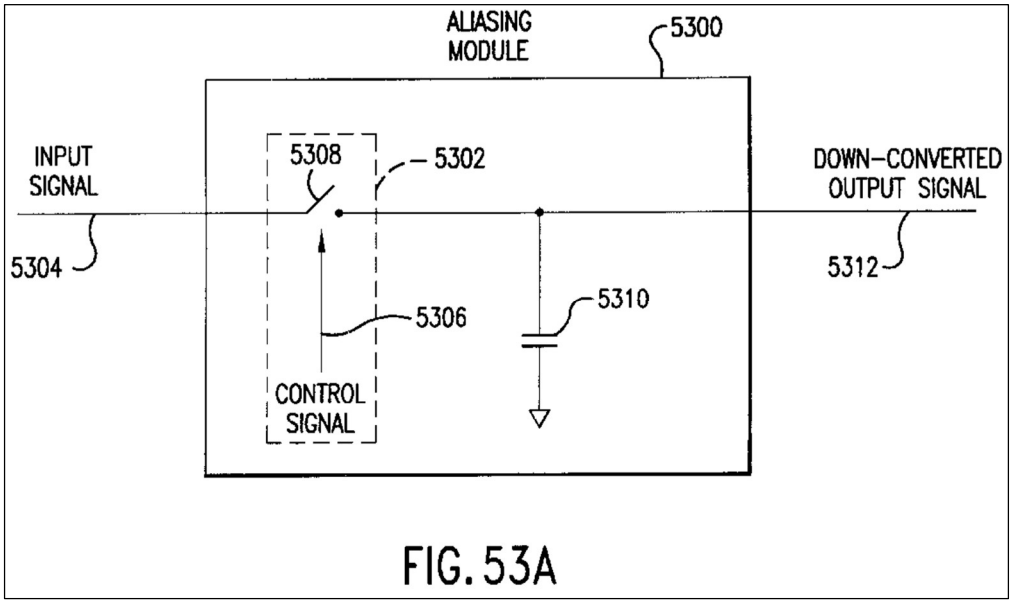


FIG. 53A

When switch 5308 closes, input signal 5304 propagates through switch 5308, which charges up capacitor 5310 to the voltage of input signal 5304. The voltage across capacitor 5310 is also the voltage of down-converted output signal 5312. As the voltage of input signal 5304 changes, so

does the voltage across capacitor 5310. But when switch 5308 opens, there is an open circuit, which means there is no current flow between input signal 5304 and down-converted output signal 5312. As a result, the voltage across capacitor 5310 stops varying along with input signal 5304, but rather retains the voltage it had right before switch 5308 opened. '706 Patent at 32:51–53. Thus, the voltage on capacitor 5310 is representative of input signal 5304 the moment before the switch opened; as such, it is an "input sample" of input signal 5304. *Id.*

Assuming that the means for under-sampling did not include a capacitor, *i.e.*, capacitor 5310 was not present in Figure 53A, when switch 5308 closes, current flows through the circuit such that the voltage at the output of switch 5308 (which is also the voltage at down-converted output signal 5312) is the voltage of input signal 5304. But when the switch opens, there is an open circuit, which means there is no current flow between input signal 5304 and down-converted output signal 5312. Because there is no current flow, the voltage at the output of switch 5308 is likely zero, but it is certainly not the voltage of input signal 5304. In other words, absent capacitor 5310, after the switch opens, the voltage at the output of switch 5308 is likely zero, which is not representative of input signal 5304 the moment before the switch opened.

Because a capacitor is needed in order to store the voltage that is representative of input signal 5304 the moment before the switch opened, the corresponding structures needs to include both a switch and capacitor.

Finally, it is worth noting that while Figure 26 is significantly more complex, the same analysis as above applies.

Second, after reviewing the passages from the specification cited by both sides, the undersigned concludes that while the cited passages do not conclusively support either side's proposed construction, the passages TCL cites appear to provide slightly more support. With

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

respect to the passages TCL cites (*Id.* at 28:24–28, 26:5–8, 28:43–44, and 28:61–67), they generally recite that both the switch and capacitor collectively down-convert the input signal. But the passages do not necessarily describe that the capacitor is required to "produce an input sample of a down-converted image of said input signal." By contrast, none of the passages that Plaintiff cites (*Id.* at 29:4–8, 39:25–28, 24:40–25:67) describe that the switch alone is all that is needed to "produce an input sample of a down-converted image of said input signal," or that a capacitor is not needed. In fact, the second passage that Plaintiff cites describes that both a switch and capacitor perform down-conversion, which is closer to TCL's position than Plaintiff's. Therefore, the undersigned finds that the passages cited by the parties ever so slightly favor TCL's proposed construction.

Therefore, based on the foregoing, the undersigned finds that capacitor 2652 in Figure 26 and capacitor 5310 in Figures 53A/53A-1 should be included in the corresponding structure and recommends that the Court adopt the following construction for this term:

> Subject to § 112, ¶ 6.
>
> **Function**: under-sampling an input signal to produce an input sample of a down-converted image of said input signal and under-sampling the input signal according to a control signal
>
> **Structure**: the switch 2650 and the capacitor 2652 in Fig. 26 the switch 5308 and capacitor 5310 in Figs. 53A/53A-1, and equivalents thereof.

J. Term #9: "first delaying means for delaying said input sample"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#9: "first delaying means for delaying said input sample" U.S. Patent No. 6,049,706, Claim 6	Subject to § 112, ¶ 6. **Function**: delaying the input sample of a down-converted image of said input signal	Subject to § 112, ¶ 6. **Function**: "delaying said input sample"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Proposed by TCL	**Structure**: capacitor 2656 in Fig. 26 or capacitor 5310 in Figs. 53A/53A1; and equivalents thereof	**Structure**: "switch 2654 and capacitor 2656 shown in Fig. 26"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00108 and 6-20-cv-00562).

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

Whether § 112, ¶ 6 Applies:

The parties agree that this term is subject to § 112, ¶ 6. As the parties do not dispute this issue and because it is presumed to be subject to § 112, ¶ 6, the undersigned agrees.

The Parties' Positions Regarding the Claimed Function:

The parties disagree whether the claimed function should include "of a down-converted image of said input signal." Plaintiff contends that it should be included in the claimed function while TCL's proposed function excludes that phrase. TCL contends that Plaintiff's proposed function deviates from the claim language. Opening at 24. Plaintiff contends that TCL's failure to include "of a down-converted image of said input signal" after "said input sample" in the claimed function reads out the antecedent relationship in the claim, *i.e.*, with respect to "[an / said] input sample of a down-converted image of said input signal" between Limitations (1)(a) and (1)(b). Response at 26.

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with TCL that the claimed function should not include the phrase "of a down-converted

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

image of said input signal" for at least two reasons. ***First***, the phrase does not appear in the claim term, so it arguably improper to include it. *Micro Chem.*, 194 F.3d at 1258 ("The statute does not permit limitation of a means-plus-function claim by adopting a function different from that explicitly recited in the claim."). ***Second***, the undersigned disagrees with Plaintiff that omitting the disputed phrase reads out the antecedent relationship with respect to "[an / said] input sample." More specifically, Claim 6, Limitation (1)(b) recites "said input sample," which clearly refers back to "an input sample of a down-converted image of said input signal" in Claim 6, Limitation (1)(a). Therefore, omitting the disputed phrase does not read out the antecedent relationship with respect "[an / said] input sample."

The Parties' Positions Regarding the Corresponding Structure:

The parties have two disputes: (1) whether the corresponding structure includes a switch and (2) whether the corresponding structure includes the components in Figures 53/53A.

With respect to the first dispute, Plaintiff contends that the corresponding structure does not include a switch while TCL maintains that it does. TCL contends that the corresponding structure needs to include a switch because if there were no switch, there would be no delay as the input sample would immediately transfer to the capacitor just as if the switch were closed. Opening at 25–26. Plaintiff contends that "the capacitor is the structure that delays the input sample" by storing the input signal's charge and that the switch itself does not perform the function of delaying the input sample. Response at 28.

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with TCL that the corresponding structure should include a switch, namely "switch 2654" in Figure 26. The undersigned disagrees with Plaintiff that the functions of "producing an input

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

sample" and "delaying said input sample" can be assigned to the switch alone and the capacitor alone, respectively. As described with respect to Term #8, a switch and capacitor work together to "produce an input sample," and likewise work together to delay the sample. More specifically, the specification teaches that the input sample is "representative of the input signal existing at the time the sample was taken." But without a switch, the down-converter does not take a sample. In other words, without a switch, the voltage across the capacitor is just the voltage of the input signal, which is not a sample because it is not "representative" of the input signal but rather is just the input signal itself.

Furthermore, without a switch, a capacitor alone is unable to delay a sample. The specification describes that "a delay module operates to delay samples/instances of a signal presented at its input by a known amount." '706 Patent at 32:27–29; 32:64–67 (delaying by a "predetermined amount"). Without a switch, the voltage across the capacitor is just the voltage of the input signal. *Id.* at 32:49–51. As such, there is either no delay (as the voltage across the capacitor varies along with the voltage of the input signal) or the delay will be an unknown / variable amount (due to the exponential charging / discharging time of a capacitor and the varying input signal).

Additionally, the specification teaches that the switch and capacitor work together to produce an input sample and then delay that input sample. For example, Figure 48 depicts how the circuit in Figure 45 generates delays. *Id.* at 32:16–17.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

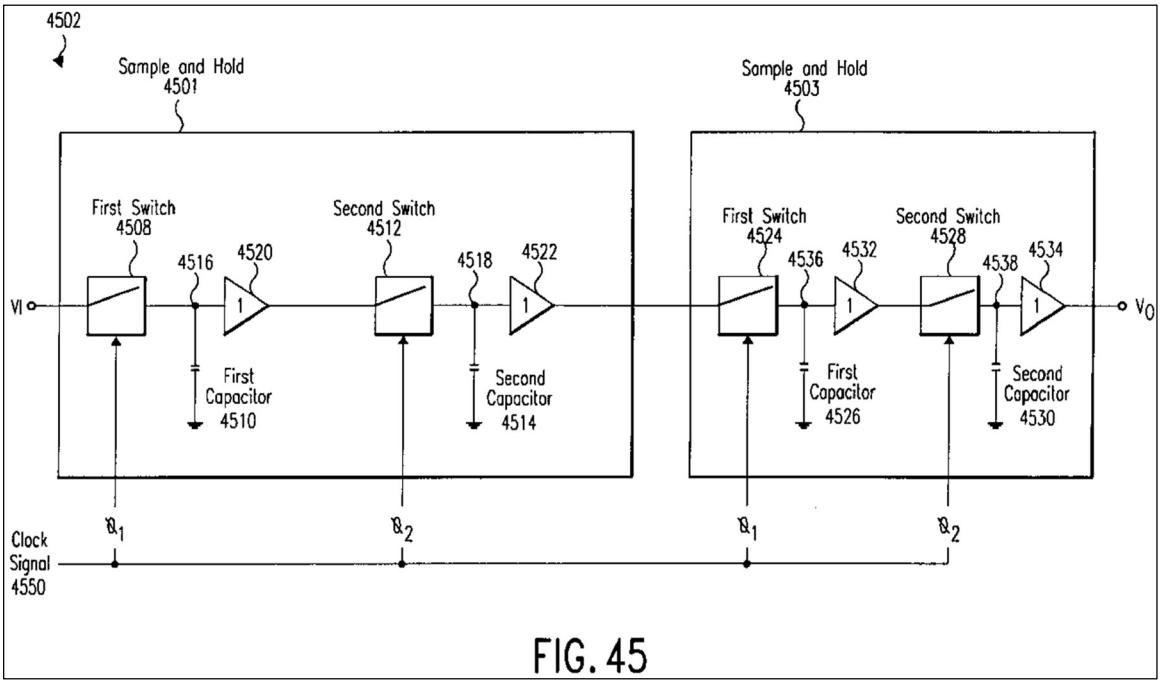


FIG. 45

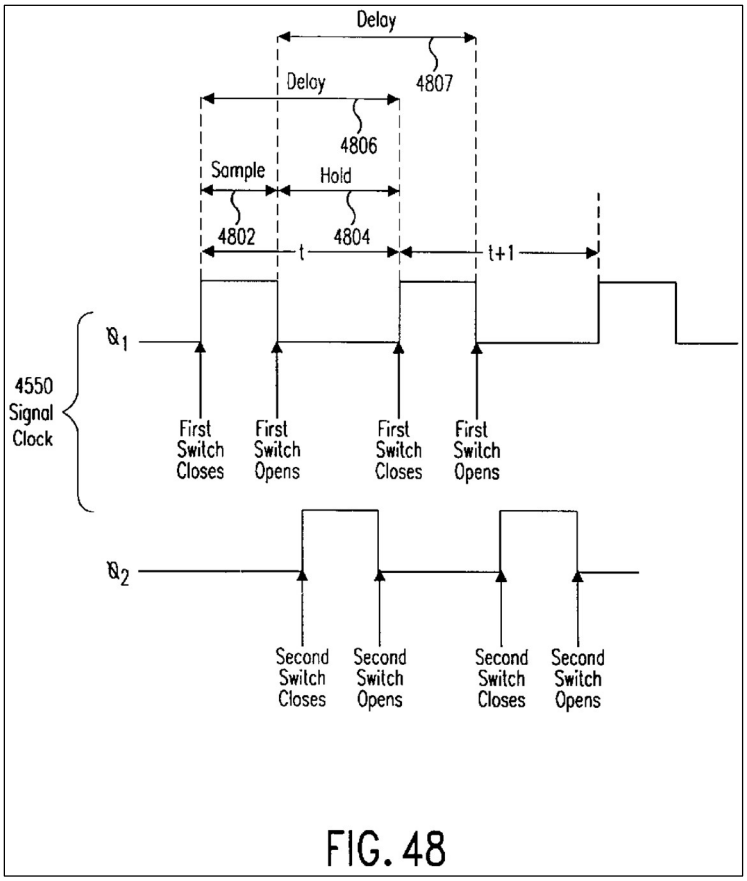


FIG. 48

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

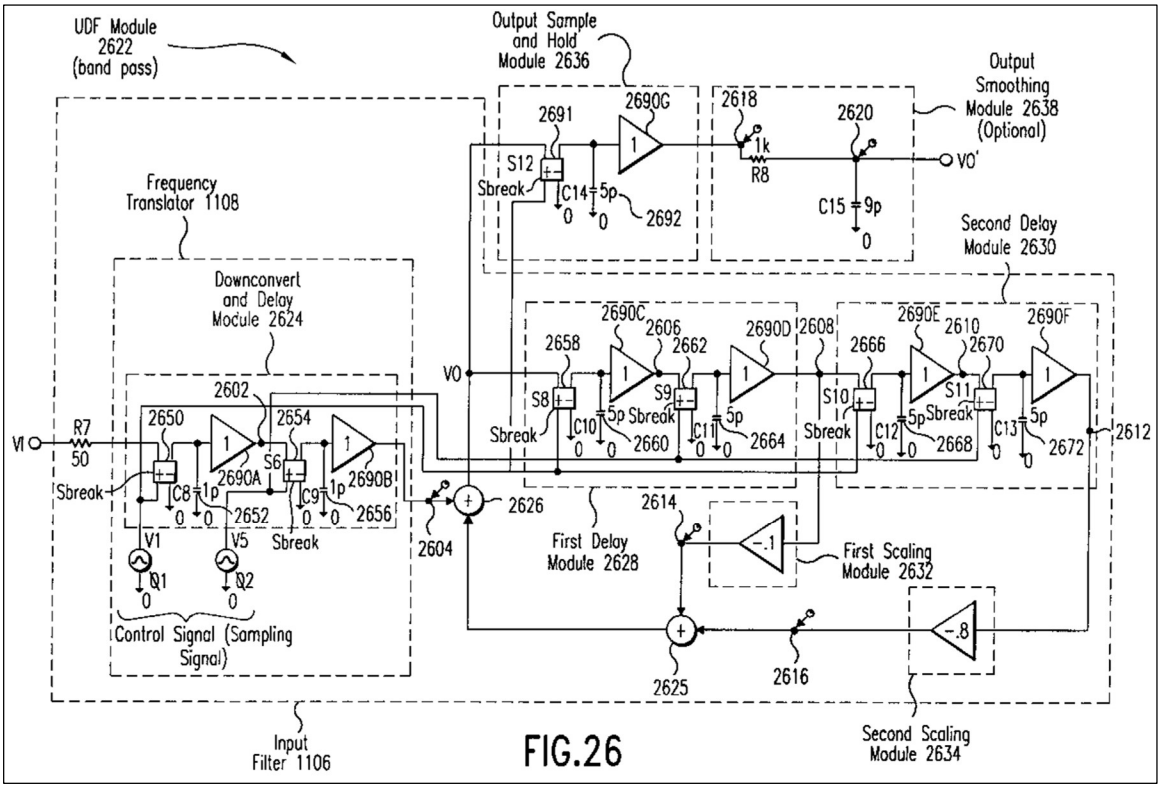
The specification describes that the capacitor charges while the first switch is closed. *Id.* at 32:49–51. The specification goes on to describe that, in practice, the sample is taken when the first switch opens. *Id.* at 32:51–53. The specification further describes that the capacitor "holds or delays" the sample for one time period, until the first switch closes again. *Id.* at 32:55–57; *see also id.* at 32:46–48. Figure 48 depicts this delay—the period of time between when the first switch opens the first time and when it opens for the second time—as delay 4807. *Id.* at 32:57–59. Therefore, these disclosures clearly describe that the switch and capacitor work together to delay the input sample.

With respect to the second dispute, whether the corresponding structure includes the components in Figures 53/53A, Plaintiff contends that TCL's proposed construction excludes the energy transfer system embodiment (depicted in Figures 53/53A). Response at 27. Plaintiff contends that the Court has already rejected TCL's position that "under-sampling" is not performed by an energy transfer system when the Court declined to limit the construction of "under-sampling" to sampling using negligible apertures. *Id.* TCL does not appear to directly address whether Figures 53/53A discloses corresponding structure. *See* Opening at 22–24; Reply at 14.

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with TCL that the corresponding structure does not include the components in Figures 53/53A for at least the following reasons. ***First***, the specification does not clearly link or associate the components in Figure 53/53A as a delay module. Structure is only "corresponding" if "the specification or prosecution history clearly links or associates that structure to the function recited in the claim." *Medtronic*, 248 F.3d at 1311. The specification expressly describes that Figure 26

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

depicts structure for a delay module (down-convert and delay module 2624). '706 Patent at Fig. 26;



see also '706 Patent at 24:61–63 ("The UDF module 2622 includes a down-convert and delay module 2624, first and second delay modules 2628 and 2630"), 25:6–7 (discussing delay module 2624), 25:24–25 (same). By contrast, the specification does not describe Figures 53/53A in the same way. Rather, the specification describes the delay module in Figures 53/53A as an "aliasing module" and not a "delay module." '706 Patent at Fig. 53A, 28:42–29:22.

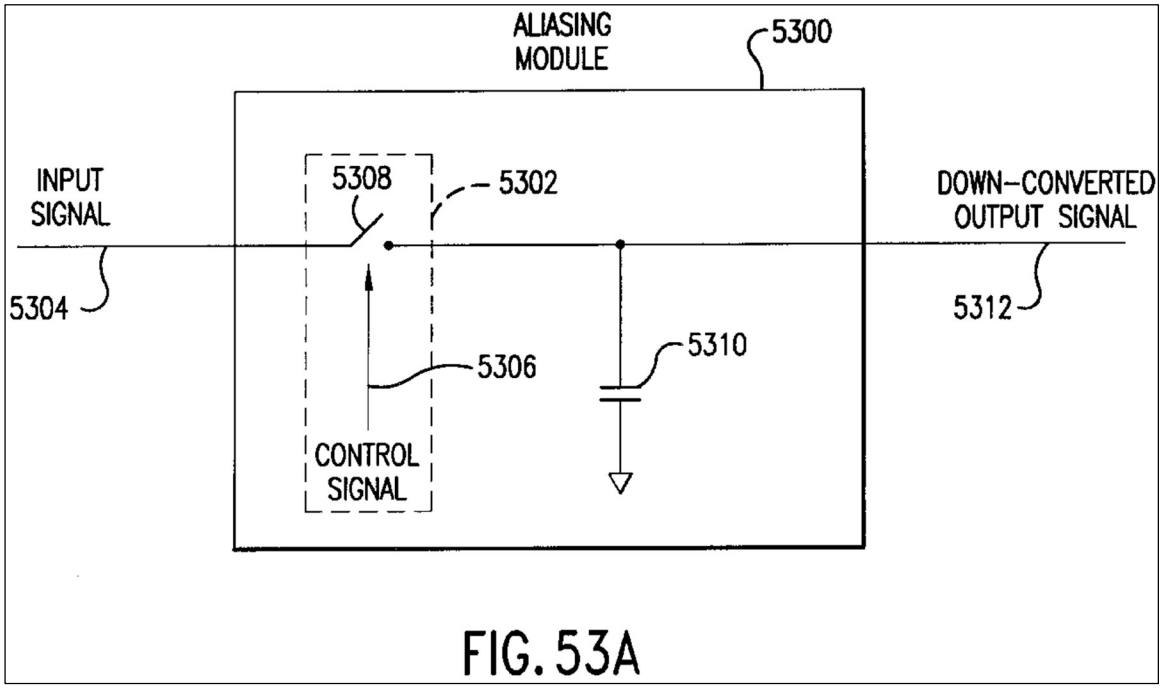


FIG. 53A

Based on the disclosures with respect to Figures 53/53A—especially as compared to the disclosures for Figure 26—the undersigned concludes that the specification does not "clearly link or associate" the components in Figures 53/53A as a delay module. As such, the components in Figures 53/53A are not corresponding structure.

Second, with respect to Plaintiff's argument that TCL's proposed construction improperly excludes the energy transfer system embodiment depicted in Figures 53/53A, the undersigned disagrees because the specification does not disclose that Figures 53/53A even contains a delay module. Plaintiff does not point to any disclosures that energy transfer systems comprise a delay module, let alone that Figures 53/53A contains a delay module. *See* Response at 26–29, Sur-Reply at 13.

Therefore, based on the foregoing, the undersigned finds that the claimed function should not include "of a down-converted image of said input signal" and that corresponding structure should include switch 2654 in Figure 26, but should not include Figures 53/53A, and recommends that the Court adopt the following construction for this term:

Subject to § 112, ¶ 6.

Function: delaying said input sample

Structure: switch 2654 and capacitor 2656 shown in Fig. 26.

K. Term #10: "a frequency translator to produce a sample of a down-converted image of an input signal, and to delay said sample"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#10: "a frequency translator to produce a sample of a down-converted image of an input signal, and to delay said sample" U.S. Patent No. 6,049,706, Claim 34 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. Function: "produce a sample of a down-converted image of an input signal according to a control signal, and delay said sample" Structure: "the down-convert and delay module 2624 in Fig. 26 and described at 26:1–27:21 and 28:20–41, that includes the switches 2650 and 2654, and the capacitors 2652 and 2656; and equivalents thereof"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00562) as "Not subject to § 112, ¶ 6. Plain-and-ordinary meaning."

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Parties' Positions Regarding Whether § 112, ¶ 6 Applies:

TCL contends that § 112, ¶ 6 applies because (1) "frequency translator" fails to connote sufficient structure, but merely designates the function of translating a frequency and (3) that the specification describes this term in functional terms. Opening at 26.

Plaintiff contends that TCL makes the same arguments that the Court rejected in the -00562 *Intel* case. Response at 29. Plaintiff contends that this term is not subject to § 112, ¶ 6 because (1) it is presumed not to be in the absence of "means," (2) the claims recite definite structure (*e.g.*, "frequency translator" has a known structure that incorporates components/circuits, such as a switch and a capacitor), and (3) dependent claim 186 makes it clear that this module includes structural components/circuits. *Id.*

The Undersigned's Analysis Whether § 112, ¶ 6 Applies:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not subject to § 112, ¶ 6 and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, there is no dispute that the term does not contain the words "means for" and that the presumption that the term is subject to § 112, ¶ 6 concomitantly does not apply. ***Second***, the claim language describes that the frequency translator (1) "produce[s] a sample of a down-converted image of an input signal" and "delay[s] said sample." This mirrors the language of Term #5 ("a down-convert and delay module to under-sample an input signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample"); likewise, a POSITA would understand that to down-convert and delay an electrical signal requires using physical components such as a switch, sampling aperture signal, capacitor, impedance, *etc.* In other words, these components provide sufficient structure

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

to prevent the application of § 112, ¶ 6. *TEK Glob.,* 920 F.3d at 786 ("Although connoting precise physical structure is not a necessary condition to avoid § 112, ¶ 6 application, it is generally sufficient."). Further confirming this conclusion is Claim 186, which recites that the frequency translator comprises "a switch" and "a storage module electrically coupled to said switch."

Therefore, based on the foregoing, the undersigned recommends that this term is not subject to § 112, ¶ 6 and that it should be construed according to its plain-and-ordinary meaning.

L. Term #11: "wherein said energy transfer signal generator in widening said apertures of said pulses by a non-negligible amount that tends away from zero time in duration to extend the time that said switch is closed for the purpose of increasing energy transferred from said input signal does so at the expense of reproducing said input signal, such that said increased energy transferred from said input signal when said switch is closed in response to said energy transfer signal prevents substantial voltage reproduction of said input signal"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#11: "wherein said energy transfer signal generator in widening said apertures of said pulses by a non-negligible amount that tends away from zero time in duration to extend the time that said switch is closed for the purpose of increasing energy transferred from said input signal does so at the expense of reproducing said input signal, such that said increased energy transferred from said input signal when said switch is closed in response to said energy transfer signal prevents substantial voltage reproduction of said input signal"	Plain-and-ordinary meaning	Indefinite

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

U.S. Patent No. 6,049,706, Claim 111 Proposed by TCL		

The Parties' Positions:

TCL contends that this term is indefinite because: (1) it is unclear "how much voltage reproduction of the input signal is allowed before it becomes a 'substantial voltage reproduction,'" (2) no metric is defined to make that determination, and (3) "for the purpose of" language creates further ambiguity by suggesting that the claim turns on intentionality. Opening at 28.

Plaintiff contends that this term simply means that "pulses having non-negligible apertures are being used, and the use of pulses having non-negligible apertures prevents an accurate reproduction of the original, unaffected voltage level of the input EM signal." Response at 30. More specifically, Plaintiff explains that "using pulses having non-negligible apertures increases the time the switch is closed (ON), thereby transferring non-negligible amounts of energy from an input EM signal. The transfer of non-negligible amounts of energy prevents "accurately reproducing the original, unaffected voltage level of the input EM signal." *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term not indefinite and should be construed according to its plain-and-ordinary meaning for the reasons that follow.

First, with respect to TCL's first argument that it is unclear "how much voltage reproduction of the input signal is allowed before it becomes a 'substantial voltage reproduction," the undersigned concludes that a POSITA would, in light of the specification, understand with

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

reasonable certainty the meaning of this claim term. Plaintiff effectively makes the same argument it made for Term 7 ("said control signal comprises a train of pulses having pulse widths that are established to improve energy transfer from said input signal to said down-converted image"): pulses having non-negligible apertures "improve" energy transfer. In particular, the specification informs a POSITA to use pulses with non-negligible apertures (*i.e.*, which tend away from zero) to increase energy transfer, instead of pulses that have negligible apertures (*i.e.*, which tend towards zero). By using non-negligible apertures, more energy is transferred to a storage device (*e.g.*, capacitor) from an input signal than would be transferred by using negligible apertures—hence the language "for the purpose of increasing energy transferred." Based on this passage, a POSITA would understand what it means to prevent "substantial" voltage reproduction.

Second, the undersigned disagrees with the argument that the language "for the purpose of" creates further ambiguity by suggesting that the claim turns on intentionality. TCL has not cited a case that potential "intentionality" may mean that a claim term is indefinite. The language "for the purpose of" appears instead to be the patentee's way of describing what happens when the switch is closed.

Therefore, based on the foregoing, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty, the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech.*, 844 F.3d at 1377. As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

M. Term #12: "establishing apertures" terms

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

#12: "establishing apertures" terms U.S. Patent No. 6,049,706, Claims 165, 107, 176, 187 Proposed by TCL	Plain-and-ordinary meaning	Indefinite

The Parties' Positions:

TCL's sole basis for indefiniteness is that words like "to increase," "to reduce", and "for the purpose of" suggest that infringement of the claim turns on intentionality and is thus indefinite. Opening at 29.

Plaintiff contends that these claim terms simply mean "the control signal generator creates pulses having non-negligible aperture." Response at 31. Plaintiff contends that non-negligible apertures mean that the switch is closed for a longer duration than when negligible apertures are used, which means that more energy is transferred to the capacitor. *Id.* at 32.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term not indefinite and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, the undersigned finds that a POSITA would understand that the claim terms "to reduce," "to increase," and "for the purpose of reducing," indicate what happens when the sampling apertures are wider. ***Second***, TCL has not cited a case that potential "intentionality" means that a claim term is indefinite.

Therefore, based on the foregoing, the undersigned does not find that TCL has provided clear-and-convincing evidence that a POSITA would not understand, with reasonable certainty,

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

the meaning of this claim term. *Nautilus*, 572 U.S. at 901; *Sonix Tech.*, 844 F.3d at 1377. As such, the undersigned recommends that this term is not indefinite and that it should be construed according to its plain-and-ordinary meaning.

N. Term #13: "frequency down-conversion module"

Term	Plaintiff's Proposed Construction	TCL's Proposed Construction
#13: "frequency down-conversion module" U.S. Patent No. 7,110,444, Claims 2, 3 Proposed by TCL	Plain-and-ordinary meaning	Subject to § 112, ¶ 6. **Function**: "to down-convert the input signal ... according to a [] control signal and output[] a [] down-converted signal." **Structure**: an "aliasing module 2000" (blue) comprising at least one switch and one capacitor (Figures 20A and 20A-1).

Judge Albright previously construed this in the *ParkerVision v. Intel* (6-20-cv-00108) case as being "Not subject to 35 U.S.C. § 112, ¶ 6" and "Plain-and-ordinary meaning."

The undersigned first analyzes whether § 112, ¶ 6 applies. If so, the undersigned will then analyze what the function and corresponding structure is for this term.

The Parties' Positions Regarding Whether § 112, ¶ 6 Applies:

TCL contends that § 112, ¶ 6 applies because (1) "module" is a well-known nonce word that operates as a substitute for means, (2) "frequency down-conversion" fails to connote sufficient structure, but merely designates the function of translating a frequency, and (3) that the specification describes this term in functional terms. Opening at 30.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Plaintiff contends that TCL makes the same arguments that the Court rejected in the 6-20-cv-00108 *Intel* case. Response at 33. Plaintiff contends that this term is not subject to § 112, ¶ 6 because (1) it is presumed not to be because of the absence of "means" and (2) the claims recite definite structure (*e.g.*, "frequency down-conversion" which receives an "input signal," receives a "control signal," and "outputs a first down-converted signal," and "wherein said . . . down-conversion modules each comprise a switch and a storage element"). *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff that this term is not subject to § 112, ¶ 6 and should be construed according to its plain-and-ordinary meaning for the reasons that follow. ***First***, there is no dispute that the term does not contain the words "means for" and that the presumption that the term is subject to § 112, ¶ 6 concomitantly does not apply. ***Second***, a POSITA would understand that the claim term describes that the frequency translator "down-converts said input signal," which would require using physical components including a switch and capacitor. A POSITA would also understand that the "control signal" recited in the claim language is used to control the electrical switch. The surrounding claim language also indicates that the frequency translator is a component within a physical device. For example, both claims describes that the frequency translator is a component within a wireless receiver. *See, e.g.*, '444 Patent, Cl. 2, Lim. [a]. The undersigned finds that this physical structure is sufficient to prevent the application of § 112, ¶ 6. *TEK Glob.,* 920 F.3d at 786. ***Third***, the surrounding claim language describes the input, output and connections of the delay module, which describes the structure of the claim term. *Apple*, 757 F.3d at 1299 (Fed. Cir. 2014) ("Structure may also be provided by describing the claim limitation's operation, such as its

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

input, output, or connections."). Here, the claim language describes that the input to the frequency translator is the input signal. *See, e.g.*, '444 Patent, Cl. 2, Lim. [b] ("wherein said first frequency down-conversion module down-converts said input signal"). The claim language further describes that a control signal is an input into the frequency translator. *Id.* ("wherein said first frequency down-conversion module down-converts . . . according to a first control signal."). The claim language also describes that a frequency translator outputs a down-converted signal into a subtractor. *See, e.g.*, *Id.,* Cl. 2, Lim. [c]

Therefore, based on the foregoing, the undersigned recommends that this term is not subject to § 112, ¶ 6 and that it should be construed according to its plain-and-ordinary meaning.

O. Term #14: "Under-Sample" / "Under-Samples" / "Under-Sampling"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#14: "Under-Sample" / "Under-Samples" / "Under-Sampling" U.S. Patent No. 6,049,706, Cls. 1, 6, 7, 28; U.S. Patent No. 7,110,444, Cl. 2 Proposed by ParkerVision	"sampling at an aliasing rate" or "sampling at less than or equal to twice the frequency of the input signal"	"sampling at less than or equal to twice the frequency of the input signal"

Judge Albright previously construed this term this in the *ParkerVision v. Intel* (6-20-cv-00108 and 6-20-cv-00562) case as being "sampling at an aliasing rate" or "sampling at less than or equal to twice the frequency of the input signal."

The Parties' Positions:

The parties agree that the construction of this term should at least include "sampling at less than or equal to twice the frequency of the input signal." But the parties dispute whether the construction of this term should also include "sampling at an aliasing rate."

Defendants propose excluding "sampling at an aliasing rate," as it does not provide insight for a POSITA, and having two constructions may confuse a jury. Opening at 31.

Plaintiff contends that Defendants make the same arguments that Judge Albright rejected in both *Intel* cases. Response at 3. Plaintiff contends that alternate construction is proper because it "tracks both the lexicography provided in the patent specifications and [the Middle District of Florida's] prior construction of these terms." *Id.* at 34 (citing '551 Patent at 19:45–54; '444 Patent at 9:32–38). Plaintiff accuses Defendants of attempting to cherry-pick the construction that best suits their case. *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff's position that "sampling at an aliasing rate" should be included for the reasons that follow. ***First***, the specification of the '444 Patent appears to equate under-sampling and "aliasing." More specifically, the '444 Patent incorporates the specification of the '551 Patent. '444 Patent at 9:32–38. The '551 Patent describes the relationship between "aliasing" and "undersampling" as follows: "[w]hen a signal is sampled at less than or equal to twice the frequency of the signal, the signal is said to be under-sampled, or aliased." '551 Patent at 19:49–51. Because this passage equates under-sampling with aliasing, construing "undersampling" as

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

"sampling at an aliasing rate" is technically correct, and Defendants do not appear to contend otherwise.

Second, the undersigned is not persuaded by Defendants' argument that "sampling at an aliasing rate" provides no insight for a POSITA. Rather, the undersigned find that this phrase provides a POSITA as much insight as the phrase "sampling at less than or equal to twice the frequency of the input signal," which is in both sides' proposed constructions.

Third, with respect to Defendants' argument that two constructions may confuse a jury, the undersigned agrees with that sentiment and would generally not include this phrase as part of the undersigned's recommended construction. But given that Judge Albright and the Middle District of Florida court included "sampling at an aliasing rate" as part of its construction, and given that this phrase is technically correct, the undersigned believes it is better to recommend the same construction in order to align the constructions at the district court level.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "under-sample" terms to be "sampling at an aliasing rate" or "sampling at less than or equal to twice the frequency of the input signal."

P. Term #15: "harmonic" / "harmonics"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#15: "harmonic" / "harmonics" U.S. Patent No. 6,049,706, Claims 1, 6–7, 28, 34; U.S. Patent No. 6,266,518, Claim 1 Proposed by ParkerVision	**Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic waveform and including the fundamental frequency as the first harmonic"	**Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic wave" **Harmonics**: "Sinusoidal components of a periodic wave each of which have a

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

	Harmonics: "A frequency or tone that, when compared to its fundamental or reference frequency or tone, is an integer multiple of it and including the fundamental frequency as the first harmonic"	frequency that is an integer multiple of the fundamental frequency of the periodic wave"

Judge Albright previously construed this term in *ParkerVision v. Intel* (6-20-cv-00108) as having their plain-and-ordinary meanings, namely:

- **Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic waveform and including the fundamental frequency as the first harmonic"
- **Harmonics**: "A frequency or tone that, when compared to its fundamental or reference frequency or tone, is an integer multiple of it and including the fundamental frequency as the first harmonic"

The Parties' Positions:

The dispute between the parties is whether "the fundamental frequency as the first harmonic" should be included in the recommended construction. The fundamental frequency is the frequency of the periodic wave, *e.g.*, the carrier frequency. A harmonic is a frequency that is a positive integer multiple of the fundamental frequency.

Defendants contend that the patentee acted as his/her own lexicographer. Opening at 32. More specifically, Defendants contend that "the '706 Patent—which the '518 Patent incorporates by reference ('518 Patent at 1:14–15, 1:25–27)—expressly defines "Harmonic: A harmonic is a sinusoidal component of a periodic wave. It has a frequency that is an integer multiple of the fundamental frequency of the periodic wave." *Id.* (citing '706 Patent at 9:39–47).

Plaintiff contends that Defendants make the same arguments that Judge Albright rejected in the -00562 Intel case. Response at 35. Plaintiff also contends that:

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

> [H]armonic/harmonics should be construed to include the fundamental frequency as a first harmonic in part because: (1) "the lexicography in the specifications demonstrates that the 'fundamental frequency' is a 'harmonic;'" and (2) "every waveform has a first harmonic (fundamental frequency) as well as additional harmonics (second harmonic, third harmonic, and so on) whose frequencies are a function of the first harmonic (fundamental frequency).

Id. Plaintiff contends that Defendants' proposed construction is wrong because Defendants' purported definition allows for the integer multiple to be 1, which means that the fundamental frequency is the first harmonic. *Id.* Plaintiff also points to the rest of the section which recites "the periodic waveform has a fundamental frequency of 'f' (also called the first harmonic)." *Id.* (citing '706 Patent at 9:42–43).

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff's position that that these terms should be construed according to the above plain-and-ordinary meanings for at least the reasons that follow. ***First***, the specification expressly describes the fundamental frequency "as the first harmonic." '706 Patent at 9:42–43 ("if the periodic waveform has a fundamental frequency of 'f' (also called the first harmonic)." This passage directly undercuts Defendants' argument that the patentee acted as his/her own lexicographer to define the fundamental frequency as not a harmonic. Furthermore, the use of the words "also called" indicates that it was known in the art that the fundamental frequency is a harmonic, the first harmonic. ***Second***, Plaintiff's proposed construction is entirely consistent with the passage Defendants contend is a lexicographical statement. More specifically, the allegedly lexicographical statement that Defendants cite simply states that the frequency of a harmonic is "an integer multiple" of the fundamental frequency, which is completely consistent with Plaintiff's

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

proposed construction that effectively describes that the fundamental frequency has an integer multiple to be 1, which means that the fundamental frequency is the first harmonic.

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of "harmonic" and "harmonics" should be as follows:

- **Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic waveform and including the fundamental frequency as the first harmonic"
- **Harmonics**: "A frequency or tone that, when compared to its fundamental or reference frequency or tone, is an integer multiple of it and including the fundamental frequency as the first harmonic"

Q. Term #16: "integral filter/frequency translator to filter and down-convert an input signal"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#16: "integral filter/frequency translator to filter and down-convert an input signal" U.S. Patent No. 6,049,706, Claim 28 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "a circuit having a unified input filter and frequency translator."	Plain-and-ordinary meaning

Judge Albright previously construed this term this in the *ParkerVision v. Intel* (6-20-cv-00562) case as plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "a circuit having a unified input filter and frequency translator."

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

The Parties' Positions:

Defendants contend that the parties agree that plain-and-ordinary meaning should control, but that Plaintiff's addition of "wherein the plain-and-ordinary meaning is 'a circuit having a unified input filter and frequency translator'" "adds no clarity to the claim language itself, and thus would only serve to complicate these proceedings." Opening at 32.

Plaintiff contends that Defendants fail to address why Judge Albright's previous construction is incorrect. Response at 36. Plaintiff argued that the "specification explains that an 'integrated' filter and frequency translator simply means that the filter and frequency translator are structurally 'unified' so that their operations—filtering/frequency selection and frequency translation—are performed 'concurrently.'" *Id.* (citing '706 Patent at 13:53–58). Plaintiff also contends that the specification describes module 1102 in Figures 11 and 12, as follows: (1) "the input filtering operation performed by the UDF module 1102 is integrated with the frequency translation operation;" and (2) "the UDF module 1102 performs the frequency selectivity operation and the frequency translation operation as a single, unified (integrated) operation." *Id.* at 36–37 (quoting '706 Patent at 13:53–58; 14:40–48).

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned agrees with Plaintiff's position that the phrase "wherein the plain-and-ordinary meaning is 'a circuit having a unified input filter and frequency translator'" should be added to the recommended construction for at least the following reasons. ***First***, the parties appear to dispute what the plain-and-ordinary meaning is. Therefore, to avoid an *O2 Micro* problem, the undersigned believes that it is necessary to add the clarifying phrase "wherein the plain-and-ordinary meaning is 'a circuit

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

having a unified input filter and frequency translator'" to a plain-and-ordinary meaning construction. *O2 Micro*, 521 F.3d at 1361.

Second, the clarifying phrase may be helpful for a lay jury to understand and apply the meaning of the claim term. *Sulzer Textil A.G. v. Picanol N.V.*, 358 F.3d 1356, 1366 (Fed. Cir. 2004) ("The district court simply must give the jury guidance that can be understood and given effect by the jury once it resolves the issues of fact which are in dispute."). Here, a jury may wonder whether the word "integral" means "unified" or what it means "necessary." But the specification makes clear that "integral" means "unified." '706 Patent at 14:40–48 ("Specifically, according to the present invention, the UDF module 1102 performs the frequency selectivity operation and the frequency translation operation as a ***single, unified (integrated) operation***.") (emphasis added).

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "integral filter/frequency translator to filter and down-convert an input signal" should be the plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "a circuit having a unified input filter and frequency translator."

R. Term #17: "modulated signal" / "modulated carrier signal"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#17: "modulated signal" / "modulated carrier signal"	"an electromagnetic signal at a transmission frequency having at least one characteristic that has been	Plain-and-ordinary meaning

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

U.S. Patent No. 6,049,706, Claim 127; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 5; U.S. Patent No. 9,246,736, Claims 1, 11, 15; U.S. Patent No. 9,444,673, Claims 1, 2, 7, 13, 19 Proposed by ParkerVision	modulated by a baseband signal"	

Judge Albright previously construed "modulated carrier signal" in the *ParkerVision v. Intel* (6-20-cv-00108) and "modulated signal" in the *ParkerVision v. Intel* (6-20-cv-00562) cases as "an electromagnetic signal at a transmission frequency having at least one characteristic that has been modulated by a baseband signal."

The Parties' Positions:

Defendants contend that the parties agree that the plain-and-ordinary meaning should control. Opening at 33. Defendants also contend that Plaintiff's proposed construction vitiates the meaning of "carrier." *Id.*

Plaintiff contends that Defendants do not explain why Judge Albright's previous construction is incorrect and what the plain-and-ordinary meaning is. Response at 37. Plaintiff contends that its proposed construction is taken directly from the specification. *Id.* at 38. In particular, Plaintiff points to '528 Patent at 20:58–60 ("The term modulated carrier signal, when used herein, refers to a[n] earlier signal that is modulated by a baseband signal."), 2:18–22 ("Modulation refers to a variety of techniques for impressing information from the baseband signals onto the higher frequency carrier signals. The resultant signals are referred to herein as modulated carrier signals."), 21:33–35 ("The term carrier signal, when used herein, refers to an EM wave having at

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

least one characteristic that may be varied by modulation, that is capable of carrying information via modulation."). *Id*.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends a plain-and-ordinary meaning wherein the plain-and-ordinary meaning is Plaintiff's proposed construction for the reasons that follow. ***First***, this construction is based on the specification and makes clear that the modulation is of at least one characteristic of the electromagnetic wave. '528 Patent at 20:58–60, 21:33–35. ***Second***, the undersigned disagrees with Defendants that this construction "vitiates" carrier. More specifically, when the signal is the carrier signal, the carrier signal is the electromagnetic signal. ***Third***, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "integral filter/frequency translator to filter and down-convert an input signal" should be plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electromagnetic signal at a transmission frequency having at least one characteristic that has been modulated by a baseband signal."

S. Term #18: "universal frequency downconverter (UFD)"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#18: "universal frequency downconverter (UFD)"	"circuitry that generates a down converted output signal	Plain-and-ordinary meaning

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

U.S. Patent No. 6,266,518, Claim 50 Proposed by ParkerVision	from an input signal from a wide range of electromagnetic frequencies"	

Judge Albright previously construed "modulated carrier signal" in the *ParkerVision v. Intel* (6-20-cv-00108) case as "circuitry that generates a down converted output signal from an input signal from a wide range of electromagnetic frequencies."

The Parties' Positions:

Defendants contend that the claim recites that a UFD includes a switch, integrator coupled to said switch, and a pulse generator. Opening at 33. Defendants further contend that even a lay juror will understand all of those terms. *Id.*

Defendants also argue that Plaintiff's proposed construction is "unnecessary and contradicts the intrinsic evidence" in several ways. *Id.* First, Plaintiff's proposed construction substitutes "circuitry," which is open-ended when the claim recites specific components (switch, integrator, and generator). *Id.* Second, there is no basis for Plaintiff's proposed construction to require that every UFD generate an "output signal" as some devices may further process or filter the signal produced by the UFD before generating the ultimate output signal. *Id.* Third, the claim language requires that the UFD produce a "lower frequency signal," not an "output signal." *Id.* Fourth, Defendants contend that there is no reason to refer to an "input signal" because the claim itself refers to a "carrier signal." *Id.* Fifth, Defendants contend that there is no reason to refer to a "wide range" of frequencies when the claim recites "down-converting a carrier signal to a lower frequency signal," but is silent as to any "wide range" of frequencies. *Id.* at 33–34.

Plaintiff contends that this term needs to be construed because the word "universal" may confuse a jury. Response at 38. Plaintiff contends that this simply means that the UFD can convert a "number of different frequencies." *Id.* at 38–39

Plaintiff responds to the arguments that its proposed construction is "unnecessary and contradicts the intrinsic evidence" as follows. First, Plaintiff responds that the "UFD comprises 'circuitry,' and the claim language then sets forth the specific circuitry." Response at 39. Second, Plaintiff contends that the devices "are still '*generating the ultimate output signal*.'" *Id.* (emphasis in original). Third and fourth, Plaintiff contends the discussion of the "carrier signal" and "lower frequency signal" "pertains to the *apparatus*, but not the *UFD* specifically." *Id.* at 40 (emphasis in original). Fifth, Plaintiff contends that a "wide range of frequencies" is necessary to give meaning to the word "universal." *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follow. ***First***, the parties' constructions fundamentally differ regarding whether it is necessary to provide clarification as to what "universal" means. The undersigned believes that providing a construction to clarify the meaning of "universal" would be helpful for a jury as a lay jury may not understand in what way a frequency down-converter is "universal." ***Second***, the undersigned does not agree with Defendants argument that Plaintiff's construction is "unnecessary and contradicted by the intrinsic evidence." Rather, the undersigned finds the Plaintiff's counter more persuasive. ***Third***, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "universal frequency down-converter (UFD)" should be "circuitry that generates a down-converted output signal from an input signal from a wide range of electromagnetic frequencies."

T. Term #19: [wherein said storage elements comprises] "a capacitor that reduces a DC offset voltage in said first-down converted signal and said second down converted signal"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#19: [wherein said storage elements comprises] "a capacitor that reduces a DC offset voltage in said first-down converted signal and said second down converted signal" U.S. Patent No. 7,110,444, Claim 4 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the "a capacitor" in each of the storage elements reduces a DC offset voltage in the corresponding down-converted signal	[wherein said storage elements comprises] "a capacitor that reduces a DC offset voltage in both said first down-converted signal and said second down-converted signal

Judge Albright previously construed this term in the *ParkerVision v. Intel* (6-20-cv-00108) case as plain-and-ordinary meaning wherein the "'a capacitor' in each of the storage elements reduces a DC offset voltage in the corresponding down-converted signal."

The Parties' Positions:

Defendants contend that Plaintiff's proposed construction—which expressly recites that there is a capacitor in both the first and second storage elements—is incorrect because the "plain

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

language of this term requires a single capacitor." Opening at 34. Defendants contend that there is no basis for the Court to re-write this claim as ParkerVision proposes. *Id.*

Plaintiff contends that Defendants' proposed construction is incorrect because it improperly requires a reduction in the DC offset voltage in "both" down-converted signals when the claim language only requires a reduction in "a" DC offset voltage. Response at 41. Plaintiff further contends that its construction is consistent with independent claim 3 and Figure 70A. *Id.* More specifically, Claim 4 depends on Claim 3 which recites, in part, "wherein said first and said second frequency down-conversion modules each comprise a switch and a storage element." *Id.* Figure 70A likewise shows a capacitor is used for each of the first and second down-converted signals (capacitor 7078 and capacitor 7080).

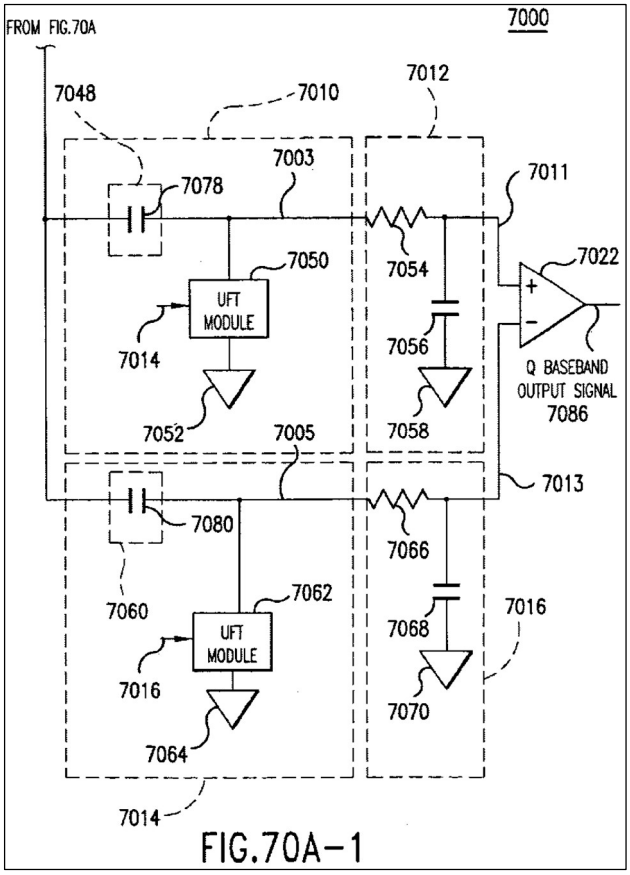


FIG.70A-1

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follow. ***First***, based on the claim language of Claims 3 and 4, a POSITA would understand that there is a capacitor associated with each down-converting signal. Claims 3 and 4 provide:

> 3. A wireless modem apparatus, comprising:
> [a] a receiver for frequency down-converting an input signal including,
> [b] a first frequency down-conversion module to down-convert the input signal, wherein said first frequency down-conversion module down-converts said input signal according to a first control signal and outputs a first down-converted signal;
> [c] a second frequency down-conversion module to down-convert said input signal, wherein said second frequency down-conversion module down-converts said input signal according to a second control signal and outputs a second down-converted signal; and
> [d] a subtractor module that subtracts said second down-converted signal from said first down-converted signal and outputs a down-converted signal;
> [e] wherein said first and said second frequency down-conversion modules each comprise a switch and a storage element.
> 4. The apparatus of claim 3, wherein said storage elements comprises a capacitor that reduces a DC offset voltage in said first down-converted signal and said second down-converted signal.

Claim 3 requires two down-conversion modules, *i.e.*, the first and second down-conversion modules. '444 Patent, Cl. 3, Lims. [b], [c]. Each down-conversion module outputs a down-converted signal, and the two down-converted signals are then subtracted. *Id.*, Lim. [d]. Each down-conversion module comprises a storage element. *Id.*, Lim. [e]. Claim 4 further requires that "said storage elements comprises a capacitor that reduces a DC offset voltage." *Id.*, Cl. 4.

Based on these limitations, a POSITA would understand that the two down-conversion modules are parallel circuits that have a common input and whose respective outputs are combined together (via subtraction). By contrast, a POSITA would not understand that there is any cross-connection between the common input and when the two down-converted signals are subtracted. As such, because the two down-conversion modules are in parallel, each signal is independently

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

down-converted by each down-conversion module, *i.e.*, without being processed by the other down-conversion module.

Given that Claim 3 recites parallel and separate down-conversation modules, a POSITA would likewise not understand that Claim 4 recites that a single capacitor is shared by both parallel down-conversion modules. Rather, given that Claim 4 recites that the storage modules comprise a capacitor and given that Claim 3 recites storage modules that are parallel, a POSITA would understand that Claim 4 recites two capacitors, one for each storage module.

Second, the recommended construction matches the embodiment depicted in Figure 70A which shows a capacitor is used for each of the first and second down-converted signals.

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "[wherein said storage elements comprises] 'a capacitor that reduces a DC offset voltage in said first-down converted signal and said second down converted signal'" should be plain-and-ordinary meaning wherein the "'a capacitor' in each of the storage elements reduces a DC offset voltage in the corresponding down-converted signal."

U. Term #20: "DC offset voltage"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#20: "DC offset voltage" U.S. Patent No. 7,110,444, Claim 4 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the plain-and ordinary meaning is "the difference between the DC voltage of a signal and a	Plain-and-ordinary meaning

	reference voltage, e.g., ground"	

Judge Albright previously construed this term in the *ParkerVision v. Intel* (6-20-cv-00108) case as plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "the difference between the DC voltage of a signal and a reference voltage, *e.g.*, ground."

The Parties' Positions:

Defendants contend that the parties agree that the plain-and-ordinary meaning should control, but that Plaintiff's addition of "wherein the plain-and-ordinary meaning is 'the difference between the DC voltage of a signal and a reference voltage, *e.g.*, ground'" adds no clarity to the claim language. Opening at 35.

Plaintiff contends that its proposed construction is consistent with the specification. Response at 41 (citing '444 Patent at 42:59–63). Plaintiff further contends that Defendants do not explain why Judge Albright's previous construction is incorrect. *Id.* at 42.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follow. ***First***, the parties appear to dispute what the plain-and-ordinary meaning is. Therefore, to avoid an *O2 Micro* problem, the undersigned believes that it is necessary to add the clarifying phrase "wherein the plain-and ordinary meaning is 'the difference between the DC voltage of a signal and a reference voltage, *e.g.*, ground'" to a plain-and-ordinary meaning construction. *O2 Micro*, 521 F.3d at 1361.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Second, the clarifying phrase may be helpful for a lay jury to understand and apply the meaning of the claim term. *Sulzer Textil*, 358 F.3d at 1366. Here, while a POSITA would understand the meaning of this claim term, a lay jury would likely not. Therefore, adding the clarifying phrase will help a jury understand the meaning of this term, which will help them apply it.

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "DC offset voltage" should be plain-and-ordinary meaning wherein the plain-and ordinary meaning is "the difference between the DC voltage of a signal and a reference voltage, e.g., ground."

V. Term #21: "sampling aperture"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#21: "sampling aperture" U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claim 1; U.S. Patent No. 9,246,736, claims 1, 11; U.S. Patent No. 9,444,673, Claims 13, 17, 19 Proposed by ParkerVision	"a period of time during which the switch is in its closed (*i.e.*, on) state"	"a period of time during which the switch is in its closed (*i.e.*, on) state as part of the process of reducing a continuous-time signal to a discrete-time signal"

Judge Albright previously construed this term in the *ParkerVision v. Intel* (6-20-cv-00108) case as "a period of time during which the switch is in its closed (*i.e.*, on) state."

The Parties' Positions:

The dispute is whether "as part of the process of reducing a continuous-time signal to a discrete-time signal" should be included in the final construction. Opening at 35. Defendants contend that the patents "make clear that closing a switch alone is not sufficient to sample an electromagnetic signal." *Id.* Defendants contend that the construction should also include when the switch is open among other things. *Id.*

Plaintiff contends that Defendants do not explain why Judge Albright's previous construction is incorrect. Response at 42. Plaintiff contends that Defendants' additional limitation is purposefully vague. *Id.* at 42–43. Plaintiff further contends that the term being construed is the sampling aperture and not the energy sampling process. *Id.* at 43.

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follows. ***First***, as described above in Section II, the sampling aperture simply is the duration of time when the switch is closed. Plaintiff's proposed construction captures that understanding. On the other hand, Defendants' argument that the construction of this term should include when the switch is open, appears to be redundant. More specifically, the fact that the sampling aperture is the period of time that the switch is closed also necessarily implies that the switch is open outside of the duration of the sampling aperture. As such, Defendants' argument that the construction should also recite that the sampling aperture excludes the time when the switch is open is redundant.

Second, the undersigned finds that the disputed portion of Defendants' proposed construction—"as part of the process of reducing a continuous-time signal to a discrete-time

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

signal"—is incorrect as it improperly narrows the scope of the term. More specifically, a sampling aperture describes the amount of time that a switch is closed. A switch with a specific sampling aperture may be used as part of a circuit that is used to take discrete-time samples of a continuous signal, but the time a switch is closed does not only become a sampling aperture because it is used as part of a continuous-time sampling circuit.

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "sampling aperture" should be "a period of time during which the switch is in its closed (*i.e.*, on) state."

W. Term #22: "switch" / "switching device" / "switching module" / "switch module"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#22: "switch" / "switching device" / "switching module" / "switch module" U.S. Patent No. 6,049,706, Claims 105, 107, 109, 111, 114, 115, 164, 165, 166, 168, 175, 176, 179, 186, 187, 190; U.S. Patent No. 6,266,518, Claim 50; U.S. Patent No. 6,580,902, Claim 1; U.S. Patent No. 7,110,444, Claim 3; U.S. Patent No. 7,292,835, Claims 18, 19, 20; U.S. Patent No. 8,588,725, Claim 1; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 5, 8, 17;	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electronic device for opening and closing a circuit as dictated by an independent control input"	Plain-and-ordinary meaning

U.S. Patent No. 9,246,736,, claims 1, 11, 15, 21, 26, 27; U.S. Patent No. 9,444,673, Claims 1, 6, 7, 13, 17, 18 Proposed by ParkerVision		

Judge Albright previously construed this term in both *ParkerVision v. Intel* cases as plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electronic device for opening and closing a circuit as dictated by an independent control input."

The Parties' Positions:

Defendants contend that the parties agree that plain-and-ordinary meaning should control, but that Plaintiff's addition of "an independent control input" is problematic because "doing so creates tangential questions of fact (*e.g.*, what qualifies a control input as 'independent'?) that will only complicate the proceedings and potentially confuse the jury." Opening at 36.

Plaintiff contends that the specification discloses "an independent control signal. Response at 44 (citing '518 Patent at Figures 73, 74, 76A-E, 82A-B, 95, and at 66:24-26, 106:16-18, and 107:9-11). Plaintiff also points out that the court in the Middle District of Florida adopted this construction. *Id.*

The Undersigned's Analysis:

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follow. ***First***, the parties appear to dispute what the plain-and-ordinary meaning is. Therefore, to avoid an *O2 Micro* problem, the undersigned believes that it is necessary to add the clarifying phrase "wherein the

plain-and-ordinary meaning is 'an electronic device for opening and closing a circuit as dictated by an independent control input'" to a plain-and-ordinary meaning construction. *O2 Micro*, 521 F.3d at 1361.

Second, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's and the Middle District of Florida court's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the "switch" / "switching device" / "switching module" / "switch module" should be plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electronic device for opening and closing a circuit as dictated by an independent control input."

X. Term #23: "a down-converted signal being generated from said sampled energy"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction
#23: "a down-converted signal being generated from said sampled energy" U.S. Patent No. 6,580,902, Claim 1 Proposed by ParkerVision	"a lower frequency signal formed from sampled energy transferred from the electromagnetic signal when the switch module is closed and from sampled energy discharged from the storage module when the switch module is open"	"a down-converted signal being created from sampled energy stored in the energy storage module"

Judge Albright previously construed this term in the *ParkerVision v. Intel* (6-20-cv-00108) case as "a lower frequency signal formed from sampled energy transferred from the electromagnetic signal when the switch module is closed and from sampled energy discharged from the storage module when the switch module is open."

The Parties' Positions:

Defendants contend that the down-converted signal is created from the "sampled energy" obtained by the "energy storage module," and not from any other energy source, *e.g.*, the input signal. Opening at 37 (citing '902 Patent at Fig. 65). Defendants contend that Plaintiff's proposed construction describing that the down-converted signal is generated both when the switch is open (from the energy storage module) and closed (from the input signal) contradicts the claim language because there is no basis that the down-converted signal be generated from two places. *Id.* at 38.

Defendant further contends that Plaintiff should be collaterally estopped from redefining that "generating" requires "discharging." *Id.* More specifically, Defendants argue that the Federal Circuit noted that the Middle District of Florida court rejected this argument (for another patent (and for another term) and that Plaintiff did not challenge that holding on appeal). *Id.*; *see also* Reply at 16. At minimum, Defendants contend that the Middle District of Florida court's judgment should have some persuasive effect. Opening at 38; *see also* Reply at 16.

Defendants point to Claim 1 of the related patent ('673 Patent) which recites "the demodulated baseband signal is generated from (i) the accumulating of the energy transferred to the capacitor each time the switch is closed and (ii) the discharging of said some of the previously accumulated energy into the load circuitry each time the switch is opened." Opening at 38–39; *see also* Reply at 16–17. Defendants contend that if the patentees had wanted to include that limitation in this case, they could have done so. Opening at 39; *see also* Reply at 16–17.

In its response, Plaintiff contends that its proposed construction is consistent with the intrinsic evidence shown in Figures 82B, 83E, 57A–F, and 89:46–56. Response at 44.

With respect to Defendants' argument that the claim language does not describe that the down-converted signal is generated when the switch is both open and closed, Plaintiff contends

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

that Defendants are wrong because the down-converted signal is generated based on when the switch is on (*e.g.*, capacitor charges) and when it is off (*e.g.*, capacitor discharges). *Id.* at 45.

With respect to Defendants' collateral estoppel argument, Plaintiff contends that the that Middle District of Florida court did not construe this term, but rather construed "means for generating the baseband signal from the integrated energy." *Id.* Plaintiff contends that "integrated energy" and "sampled energy" are two different terms with different meanings. *Id.* More specifically, the former is energy from the capacitor, while the latter is broader as its energy both from the capacitor and the input signal. *Id.*

In its reply, with respect to its argument that the claim language does not describe that the down-converted signal is generated when the switch is both open and closed, Defendants contend that Claim 1 recites "to obtain sampled energy, said sampled energy being stored by said energy storage module, a down-converted signal being generated from said sampled energy." Reply at 15. Defendants contend that all three recitations of "sampled energy" are the same thing. *Id.* at 15–16.

With respect the Defendants' argument in its reply, Plaintiff contends that Defendants omit critical language from the claim (underlined) while focusing on the italicized language:

> An energy transfer module having a switch module and an energy storage module, said energy transfer module sampling the electromagnetic signal at an energy transfer rate, according to an energy transfer signal, *to obtain sampled energy, said sampled energy being stored by said energy storage module, a down-converted signal being generated from said sampled energy*.

Sur-Reply at 15 (quoting '902 Patent at 134:56–64). Plaintiff contends that "[b]y doing so, Defendants try to hide the fact that the sampled energy is what comes off of the switch module and is not just the energy stored in the storage module." *Id.* Plaintiff contends that sampled energy is what comes off from the switch module and not just the energy stored in the storage module.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Id. at 15–16. Plaintiff explains how the sample energy could come from two sources, depending on whether the switch is open or closed:

> Two things happen to the sampled energy when the switch module is ON (closed): (1) some of the energy passes through to a low impedance load, and (2) some of the energy is stored in a storage module. When the switch module is OFF (opened), the energy in the storage module is subsequently discharged to a low impedance load. As such, the sampled energy that passes through to the load from the switch module and the sampled energy stored in the storage module are *both* used to generate a down-converted signal.

Id. at 16 (emphasis in original).

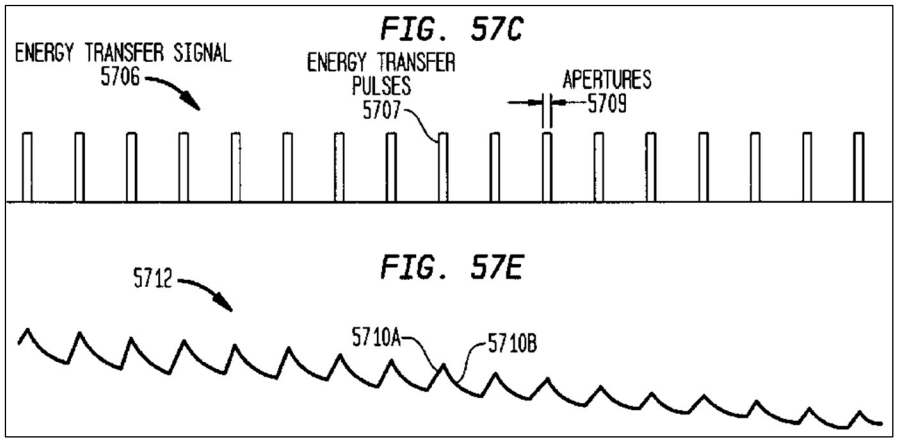
Finally, Plaintiff contends that "the only way that sampled energy stored in a storage module is used to generate a down-converted signal is for that energy to be discharged from the storage module – not merely used to create the down-converted signal as Defendants assert." *Id.* at 16–17.

The Undersigned's Analysis:

The dispute between the parties is whether the "down-converted signal" is generated from "sampled energy stored in the energy storage module" alone when the switching module is open (Defendants' position) or whether it also includes "sampled energy transferred from the electromagnetic signal" when the switching module is closed (Plaintiff's position).

After reviewing the parties' arguments and considering the applicable law, the undersigned recommends adopting Plaintiff's proposed construction for the reasons that follow. ***First***, the specification makes it clear that the switch module generates the sample that forms part of the down-converted signal when the switch is closed and then the "sampled energy" is at least partially discharged which forms another part of the down-converted signal when the switch is open. For example, Figure 57E depicts a demodulated baseband signal 5712, which is generated by the down-conversion process. '902 Patent at 89:38–39.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936



The specification recites that demodulated baseband signal 5712 consists of two portions, 5710A and 5710B. *Id.* at 89:46–49. Portion 5710A is the part of the down-conversion signal which correlates with the energy transfer pulses 5707 in Figure 57C. *Id.* at 89:46–47. Portion 5710B is the part of the down-conversion signal which correlates with the time between energy transfer pulses 5707 in Figure 57C. *Id.* at 89:48–49. The energy transfer pulses represent the times when the switching module is closed. *Id.* at 89:52–53, 89:55–56; *see also id.* at 89:20–25.

When the switching module is open, the down-converted signal represented by portion 5710B decays in value because the charge that was stored in the storage module discharges through the load impedance. By contrast, when the switching module is closed, the value of the down-converted signal represented by portion 5710A increases in value because sampled energy is transferred from the input signal to the down-converted signal.

Therefore, this explanation of Figure 57 shows that down-converted signal 5712 is a lower frequency signal formed [1] from sampled energy transferred from the electromagnetic signal when the switch module is closed (portion 5712A) and [2] from sampled energy discharged from the storage module when the switch module is open (portion 5712B), which is accurately captured by Plaintiff's proposed construction.

Second, the undersigned agrees with Plaintiff that collateral estoppel does not apply as "sampled energy" is a distinct term with a different meaning than "integrated energy." In other words, because the dispute in the prior Middle District of Florida case is different than the instant cases, collateral estoppel does not apply.

Third, in addition to the above reasons, given that Judge Albright previously adopted Plaintiff's construction, the undersigned believes it is better to recommend the same construction in order to align the recommended construction with Judge Albright's previous construction.

Therefore, based on the foregoing, the undersigned recommends that the construction of the term "a down-converted signal being generated from said sampled energy" should be "a lower frequency signal formed from sampled energy transferred from the electromagnetic signal when the switch module is closed and from sampled energy discharged from the storage module when the switch module is open."

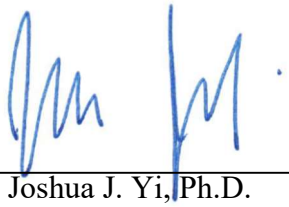
V. CONCLUSION

For the reasons described herein, the undersigned recommends that the Court adopt the following recommended constructions.

Pursuant to the Order Appointing Special Master (No. 6-20-cv-00870, ECF No. 47 and No. 6-20-cv-00945, ECF No. 45), the parties may, in a manner mirroring Federal Rule of Civil Procedure 72 and 28 U.S.C. § 636, file timely objections to any of the findings, conclusions, and recommendations contained in this Report.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

SIGNED on the 29th day of August, 2022.



Joshua J. Yi, Ph.D.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

I. Level of ordinary skill in the art

Plaintiff's Proposal	Defendants' Proposal	Special Master's Recommendation
(i) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two 2 additional years of experience in the design and development of radio frequency circuits and/or systems or (at least five 5 years of experience and training in the design and development of radio frequency circuits and/or systems	At least an undergraduate degree in electrical engineering or a related subject and two or more years of experience in the fields of communication systems, signal processing and/or RF circuit design Less work experience may be compensated by a higher level of education, such as a master's degree	A Bachelor of Science degree in electrical engineering (or an equivalent degree) and at least two additional years of experience in the design and development of radio frequency circuits and/or systems. Less experience may be compensated by a higher level of education, such as a master's degree.

II. Disputed constructions

Note: The Court previously construed the shaded terms in *ParkerVision v. Intel* (6-20-cv-00108 and 6-20-cv-00562).

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#1: "low impedance load" U.S. Patent No. 9,246,736, Claims 26, 27; 9,444,673, Claim 5 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#2: "said energy discharged from said capacitor provides sufficient power to drive the low impedance load" U.S. Patent No. 9,444,673, Claim 5 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#3: "Storage" terms U.S. Patent No. 6,049,706, Claims 105, 114, 115, 164, 166, 168, 175, 179, 186, 190; U.S. Patent No. 6,580,902, Claim 1; U.S. Patent No. 7,110,444, Claim 3; U.S. Patent No. 7,292,835, Claims 1, 18, 20; U.S. Patent No. 8,588,725, Claims 1, 6, 17, 18, 19; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 9; U.S. Patent No. 9,246,736, Claims 1, 11, 21, 26, 27; U.S. Patent No. 9,444,673, Claims 13, 17, 18 Proposed by ParkerVision	Energy storage element / storage element: "an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal for driving a low impedance load." Energy storage module / storage module: "a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal for driving a low impedance load. Energy storage device: "a device of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal for driving a low impedance load."	"an apparatus that stores non-negligible amounts of energy from the carrier signal." (all terms are indefinite under ParkerVision's proposed constructions)	**Energy storage element / storage element**: "an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal." **Energy storage module / storage module**: "a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal. **Energy storage device**: "a device of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal."

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#4: "voltage of the input modulated carrier signal is not reproduced or approximated at the capacitor during the apertures or outside of the apertures" U.S. Patent No. 9,444,673, Claim 2 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.
#5: "a down-convert and delay module to under-sample an input signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample" U.S. Patent No. 6,049,706, Claims 1, 7 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6 Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. **Function**: "under-sample an input signal according to a control signal to produce an input sample of a down-converted image of said input signal, and to delay said input sample" **Structure**: "the down-convert and delay module 2624 in Fig. 26 and described at 26:1–27:21 and 28:2041, that includes the switches 2650 and 2654, and the capacitors 2652 and 2656; and equivalents thereof"	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#6: "delay module" terms U.S. Patent No. 6,049,706, Claims 1, 7, 34, 140 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. **Function**: "delay instances of an output signal / further delay one or more of said delayed and down-converted input samples" **Structure**: "structure including "first delay module 2628," "second delay module 2630" shown in Fig 26, "delay module 3204" shown in Fig. 32 and described at 35:118; the sample and hold circuit 4501 and 4503 in Fig. 45 and described at 32:44–33:19; or an analog delay line having a combination of capacitors, inductors and/or resistors described at 35:19–27; or equivalents thereof"	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#7: "said control signal comprises a train of pulses having pulse widths that are established to improve energy transfer from said input signal to said down-converted image" U.S. Patent No. 6,049,706, Claim 2 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.
#8: "means for under-sampling an input signal to produce an input sample of a down-converted image of said input signal" U.S. Patent No. 6,049,706, Claim 6 Proposed by TCL	Subject to § 112, ¶ 6. **Function**: under-sampling an input signal to produce an input sample of a down-converted image of the input signal and under-sampling the input signal according to a control signal **Structure**: switch 2650 in Fig. 26; switch 5308 in Figs. 53A/53A-1; and equivalents thereof	Subject to § 112, ¶ 6. **Function**: "under-sampling an input signal to produce an input sample of a down-converted image of said input signal and under-sampling the input signal according to a control signal" **Structure**: "the switch 2650 and the capacitor 2652 in Fig. 26; the switch 5308 and capacitor 5310 in Figs. 53A/53A-1, and equivalents thereof"	Subject to § 112, ¶ 6. **Function**: under-sampling an input signal to produce an input sample of a down-converted image of said input signal and under-sampling the input signal according to a control signal **Structure**: the switch 2650 and the capacitor 2652 in Fig. 26 the switch 5308 and capacitor 5310 in Figs. 53A/53A-1, and equivalents thereof.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#9: "first delaying means for delaying said input sample" U.S. Patent No. 6,049,706, Claim 6 Proposed by TCL	Subject to § 112, ¶ 6. **Function**: delaying the input sample of a down-converted image of said input signal **Structure**: capacitor 2656 in Fig. 26 or capacitor 5310 in Figs. 53A/53A1; and equivalents thereof	Subject to § 112, ¶ 6. **Function**: "delaying said input sample" **Structure**: "switch 2654 and capacitor 2656 shown in Fig. 26"	Subject to § 112, ¶ 6. **Function**: delaying said input sample **Structure**: switch 2654 and capacitor 2656 shown in Fig. 26.
#10: "a frequency translator to produce a sample of a down-converted image of an input signal, and to delay said sample" U.S. Patent No. 6,049,706, Claim 34 Proposed by TCL	Not subject to 35 U.S.C. § 112, ¶ 6. Plain-and-ordinary meaning	Subject to 35 U.S.C. § 112, ¶ 6. Function: "produce a sample of a down-converted image of an input signal according to a control signal, and delay said sample" Structure: "the down-convert and delay module 2624 in Fig. 26 and described at 26:1–27:21 and 28:20–41, that includes the switches 2650 and 2654, and the capacitors 2652 and 2656; and equivalents thereof"	Not subject to § 112, ¶ 6. Plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#11: "wherein said energy transfer signal generator in widening said apertures of said pulses by a nonnegligible amount that tends away from zero time in duration to extend the time that said switch is closed for the purpose of increasing energy transferred from said input signal does so at the expense of reproducing said input signal, such that said increased energy transferred from said input signal when said switch is closed in response to said energy transfer signal prevents substantial voltage reproduction of said input signal" U.S. Patent No. 6,049,706, Claim 111 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#12: "establishing apertures" terms U.S. Patent No. 6,049,706, Claims 165, 107, 176, 187 Proposed by TCL	Plain-and-ordinary meaning	Indefinite	Not indefinite. Plain-and-ordinary meaning.
#13: "frequency down-conversion module" U.S. Patent No. 7,110,444, Claims 2, 3 Proposed by TCL	Plain-and-ordinary meaning	Subject to § 112, ¶ 6. **Function**: "to down-convert the input signal ... according to a [] control signal and output[] a [] down-converted signal." **Structure**: an "aliasing module 2000" (blue) comprising at least one switch and one capacitor (Figures 20A and 20A-1).	Not subject to § 112, ¶ 6. Plain-and-ordinary meaning.
#14: "Under-Sample" / "Under-Samples" / "Under-Sampling" U.S. Patent No., Cls. 1, 6, 7, 28; U.S. Patent No. 7,110,444, Cl. 2 Proposed by ParkerVision	"sampling at an aliasing rate" or "sampling at less than or equal to twice the frequency of the input signal"	"sampling at less than or equal to twice the frequency of the input signal"	"sampling at an aliasing rate" or "sampling at less than or equal to twice the frequency of the input signal"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#15: "harmonic" / "harmonics" U.S. Patent No. 6,049,706, Claims 1, 6–7, 28, 34; U.S. Patent No. 6,266,518, Claim 1 Proposed by ParkerVision	**Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic waveform and including the fundamental frequency as the first harmonic" **Harmonics**: "A frequency or tone that, when compared to its fundamental or reference frequency or tone, is an integer multiple of it and including the fundamental frequency as the first harmonic"	**Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic wave" **Harmonics**: "Sinusoidal components of a periodic wave each of which have a frequency that is an integer multiple of the fundamental frequency of the periodic wave"	Plain-and-ordinary meanings: • **Harmonic**: "A sinusoidal component of a periodic wave that has a frequency that is an integer multiple of the fundamental frequency of the periodic waveform and including the fundamental frequency as the first harmonic" • **Harmonics**: "A frequency or tone that, when compared to its fundamental or reference frequency or tone, is an integer multiple of it and including the fundamental frequency as the first harmonic"
#16: "integral filter/frequency translator to filter and down-convert an input signal" U.S. Patent No. 6,049,706, Claim 28 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "a circuit having a unified input filter and frequency translator."	Plain-and-ordinary meaning	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "a circuit having a unified input filter and frequency translator."

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#17: "modulated signal" / "modulated carrier signal" U.S. Patent No. 6,049,706, Claim 127; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 5; U.S. Patent No. 9,246,736, Claims 1, 11, 15; U.S. Patent No. 9,444,673, Claims 1, 2, 7, 13, 19 Proposed by ParkerVision	"an electromagnetic signal at a transmission frequency having at least one characteristic that has been modulated by a baseband signal"	Plain-and-ordinary meaning	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electromagnetic signal at a transmission frequency having at least one characteristic that has been modulated by a baseband signal"
#18: "universal frequency downconverter (UFD)" U.S. Patent No. 6,266,518, Claim 50 Proposed by ParkerVision	"circuitry that generates a down converted output signal from an input signal from a wide range of electromagnetic frequencies"	Plain-and-ordinary meaning	"circuitry that generates a down converted output signal from an input signal from a wide range of electromagnetic frequencies"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#19: [wherein said storage elements comprises] "a capacitor that reduces a DC offset voltage in said first-down converted signal and said second down converted signal" U.S. Patent No. 7,110,444, Claim 4 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the "a capacitor" in each of the storage elements reduces a DC offset voltage in the corresponding down-converted signal	[wherein said storage elements comprises] "a capacitor that reduces a DC offset voltage in both said first down-converted signal and said second down-converted signal	Plain-and-ordinary meaning wherein the "a capacitor" in each of the storage elements reduces a DC offset voltage in the corresponding down-converted signal."
#20: "DC offset voltage" U.S. Patent No. 7,110,444, Claim 4 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the plain-and ordinary meaning is "the difference between the DC voltage of a signal and a reference voltage, e.g., ground"	Plain-and-ordinary meaning	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "the difference between the DC voltage of a signal and a reference voltage, e.g., ground"
#21: "sampling aperture" U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claim 1; U.S. Patent No. 9,246,736, claims 1, 11; U.S. Patent No. 9,444,673, Claims 13, 17, 19 Proposed by ParkerVision	"a period of time during which the switch is in its closed (i.e., on) state"	"a period of time during which the switch is in its closed (i.e., on) state as part of the process of reducing a continuous-time signal to a discrete-time signal"	"a period of time during which the switch is in its closed (i.e., on) state"

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#22: "switch" / "switching device" / "switching module" / "switch module" U.S. Patent No. 6,049,706, Claims 105, 107, 109, 111, 114, 115, 164, 165, 166, 168, 175, 176, 179, 186, 187, 190; U.S. Patent No. 6,266,518, Claim 50; U.S. Patent No. 6,580,902, Claim 1; U.S. Patent No. 7,110,444, Claim 3; U.S. Patent No. 7,292,835, Claims 18, 19, 20; U.S. Patent No. 8,588,725, Claim 1; U.S. Patent No. 8,660,513, Claim 19; U.S. Patent No. 9,118,528, Claims 1, 5, 8, 17; U.S. Patent No. 9,246,736,, claims 1, 11, 15, 21, 26, 27; U.S. Patent No. 9,444,673, Claims 1, 6, 7, 13, 17, 18 Proposed by ParkerVision	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electronic device for opening and closing a circuit as dictated by an independent control input"	Plain-and-ordinary meaning	Plain-and-ordinary meaning wherein the plain-and-ordinary meaning is "an electronic device for opening and closing a circuit as dictated by an independent control input"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#23: "a down-converted signal being generated from said sampled energy" U.S. Patent No. 6,580,902, Claim 1 Proposed by ParkerVision	"a lower frequency signal formed from sampled energy transferred from the electromagnetic signal when the switch module is closed and from sampled energy discharged from the storage module when the switch module is open"	"a down-converted signal being created from sampled energy stored in the energy storage module"	"a lower frequency signal formed from sampled energy transferred from the electromagnetic signal when the switch module is closed and from sampled energy discharged from the storage module when the switch module is open"

ParkerVision Exhibit 2048
TI and NXP v. ParkerVision - IPR2024-00936