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Distinguished by [Genband US LLC v. Metaswitch Networks Ltd](#), E.D.Tex., September 29, 2016

621 Fed.Appx. 1009

This case was not selected for publication in West's Federal Reporter. See Fed. Rule of Appellate Procedure 32.1 generally governing citation of judicial decisions issued on or after Jan. 1, 2007. See also U.S.Ct. of App. Fed. Cir. Rule 32.1.

United States Court of Appeals,
Federal Circuit.

PARKERVISION, INC., A Florida Corporation, Plaintiff–Appellant

v.

QUALCOMM INCORPORATED, A Delaware Corporation, Defendant–Cross–Appellant.

Nos. 2014–1612, 2014–1655.

|
July 31, 2015.

Synopsis

Background: Patentee brought action against competitor, alleging infringement of patents for technology used to down-convert a high-frequency electromagnetic signal using energy sampling. Following a jury verdict finding direct and indirect infringement, competitor moved for judgment as a matter of law and for a new trial. The United States District Court for the Middle District of Florida, [Roy B. Dalton Jr., J.](#), [27 F.Supp.3d 1266](#), entered an order granting competitor's motion for judgment as a matter of law as to infringement but denying its motion as to invalidity, and parties cross-appealed.

Holdings: The Court of Appeals, [Bryson](#), Circuit Judge, held that:

[1] accused products did not infringe patents' “generating” limitation;

[2] evidence supported finding that claim that included additional step of transferring energy to a load during off-time was not anticipated; and

[3] claim reciting a method for down-converting a signal based on a differential configuration of patentee's energy sampling system was invalid as anticipated.

Affirmed in part and reversed in part.

Procedural Posture(s): On Appeal; Motion for Judgment as a Matter of Law (JMOL)/Directed Verdict.

West Headnotes (6)

[1] **Patents** Radio and telecommunications equipment

Accused products did not infringe “generating” limitation of patents for technology used to down-convert a high-frequency electromagnetic signal using energy sampling; limitation required that accused products produce a low-frequency baseband signal using energy transferred from a high-frequency carrier signal into a storage medium, but baseband signal in accused products was created before, or upstream from, storage capacitor.

2 Cases that cite this headnote

[2] **Patents** Particular fields of invention


Expert's testimony that actual duty cycles of competitor's 50% duty products could vary to less than 50% was insufficient to establish that competitor's products infringed “sampling” limitation of patents for technology used to down-convert a high-frequency electromagnetic signal using energy sampling, where expert failed to explain how a variance in duty cycle helped to produce discrete on and off periods or how variance prevented a continuous input and continuous output that existed in traditional double-balanced mixers using a perfect 50% duty cycle.

[3] **Patents** Particular products or processes

Evidence supported finding that patent claim reciting a method for down-converting a carrier signal to a low-frequency electromagnetic

signal was not invalid as anticipated by a reference exploring theory behind subharmonic sampling, where claim included additional step of transferring energy to a load during off-time, and reference explicitly taught that discharging energy from a storage capacitor may result in poor hold duration.

[1 Cases that cite this headnote](#)

[4] **Patents**  Radio and telecommunications equipment





Patents for technology used to down-convert a high-frequency electromagnetic signal using energy sampling were invalid as anticipated by a reference that disclosed a circuit diagram similar to diagram disclosed in patents, where asserted claims required transfer of non-negligible amounts of energy from carrier signal to a storage device, and reference disclosed a circuit to down-convert a high frequency carrier signal to a baseband with great efficiency and without loss of fidelity.

[1 Cases that cite this headnote](#)

[5] **Patents**  Radio and telecommunications equipment

Patent claim reciting a method for down-converting an electromagnetic signal based on a differential configuration of patentee's energy sampling system was invalid as anticipated by a reference disclosing a circuit diagram for a dual balanced mixer, where claim contained a limitation requiring performance of a plurality of charging and discharging cycles to generate down-converted information signals, and that limitation was implicit in reference.

[6] **Patents**  In general; utility

 US Patent 6,061,551,  US Patent 6,266,518,  US Patent 6,370,371,  US Patent 7,496,342. Invalid in Part.

***1011** Appeals from the United States District Court for the Middle District of Florida in No. 3:11-cv-00719-RBD-JRK, Judge [Roy B. Dalton, Jr.](#)

Attorneys and Law Firms





[Donald Robert Dunner](#), Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, Washington, DC, argued for plaintiff-appellant. Also represented by [Erik R. Puknys](#), Palo Alto, CA; [Joshua Wright Budwin](#), [Kevin Lee Burgess](#), McKool Smith, PC, Austin, TX; [Douglas Aaron Cawley](#), Dallas, TX.

[Timothy Teter](#), Cooley LLP, Palo Alto, CA, argued for defendant-cross-appellant. Also represented by Benjamin G. Damstedt, [Jeffrey S. Karr](#), [Lori R. Mason](#), [Stephen C. Neal](#); [Jeffrey A. Lamken](#), [Martin Totaro](#), MoloLamken LLP, Washington, DC; [John M. Whealan](#), Chevy Chase, MD.


Before [LOURIE](#), [BRYSON](#), and [CHEN](#), Circuit Judges.

Opinion

[BRYSON](#), Circuit Judge.

In this patent infringement action, ParkerVision, Inc., alleged that Qualcomm Inc. infringed ParkerVision's patented technology relating to “down-converting” electromagnetic signals. At issue are  U.S. Patent Nos. 6,061,551 (“the ‘551 patent”),  6,266,518 (“the ‘518 patent”),  6,370,371 (“the ‘371 patent”), and  7,496,342 (“the ‘342 patent”), all owned by ParkerVision.

“Down-converting” refers to converting a modulated high-frequency electromagnetic signal into a low-frequency or “baseband” signal in an electronic device such as a wireless receiver. ParkerVision claims methods, systems, and apparatuses for down-converting a high-frequency signal using a technique called “energy sampling.” That technique differs from the technique of “voltage sampling,” which was used in conventional down-converting systems.

ParkerVision's energy sampling system uses the same circuit configuration as a voltage sampling system. At the most basic level, the energy sampling system consists of an electronic switch connected on one end to an input electromagnetic signal and on the other end to a storage capacitor followed by a load device or resistor. *See, e.g.*,  551 patent, Figs. 82A, 82B. ParkerVision designed its down-converting system to perform energy sampling, rather than voltage sampling, by

increasing the size of the capacitor, increasing the duration of the period that the switch is closed, and decreasing the impedance value of the load.

Claim 23 of the '551 patent is representative of the asserted claims. It recites:

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

an energy transfer signal generator;

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

a storage module coupled to said switch module;

wherein said storage module receives non-negligible amounts of energy transferred from a carrier signal at an aliasing rate that is substantially equal to a frequency of the carrier signal plus or minus a frequency of the lower frequency signal, divided by n where n represents a harmonic or sub-harmonic of the carrier signal, wherein a lower frequency *1012 signal is generated from the transferred energy.

Other asserted claims use slightly different language. The parties agree that the differences in the claim language do not materially affect the issues on appeal.

ParkerVision developed energy sampling in 1996 and 1997, and it applied for its first patent relating to that technology in October 1998. Before any patent issued, ParkerVision approached Qualcomm to license its invention. No agreement was reached, however.

In 2011 ParkerVision filed this action against Qualcomm, alleging that Qualcomm had been infringing its energy-sampling patents since 2006. The district court bifurcated the trial. The first phase dealt with validity and infringement, and the second phase dealt with damages and willfulness. At the conclusion of the validity and infringement phase, the jury returned a verdict rejecting Qualcomm's invalidity claims and finding that Qualcomm directly and indirectly infringed claims 23, 25, 161, 193, and 202 of the '551 patent; claims 27, 82, 90, and 91 of the '518 patent; claim 2 of the '371 patent; and claim 18 of the '342 patent. At the conclusion of the damages and willfulness phase, the jury

awarded ParkerVision \$172.7 million in damages but found that Qualcomm's infringement was not willful.

Following the trial, Qualcomm filed motions for judgment as a matter of law ("JMOL") and for a new trial on both invalidity and infringement. The court granted Qualcomm's motion for JMOL of non-infringement but denied Qualcomm's motions relating to invalidity. This appeal and cross-appeal followed.

I

At trial, ParkerVision accused 19 Qualcomm products of infringing the asserted claims.¹ To prove infringement, ParkerVision called Paul Prucnal, its technical expert, and David Sorrells, one of the inventors. Dr. Prucnal's testimony focused on Qualcomm's Magellan product, but he stated that his opinion regarding the Magellan product applied to each of Qualcomm's accused products.² Mr. Sorrells testified with regard to only one of the 19 accused products, the Solo product.

The district court based its non-infringement ruling on two grounds. First, the court found that the accused products did not practice the limitation that recites "generating a lower frequency signal," which is present in each asserted claim. The court held that ParkerVision's infringement expert conceded that in the accused products the baseband signal was created before, or "upstream from," the storage capacitor. That concession, the court concluded, was fatal to ParkerVision's claim under the "generating" limitation. Second, the court concluded that Qualcomm's "50% duty cycle" products did not practice the "sampling" limitation, which is found in claims 27, 82, 90, and 91 of the '518 patent, and in claim 2 of the '371 patent.³ We agree with the district court on both grounds.

*1013 A

The generating limitation in each of the asserted claims requires that the accused products produce a low-frequency baseband signal using energy that has been transferred from a high-frequency carrier signal into a storage medium, such as a capacitor or set of capacitors.

Dr. Prucnal testified that the accused products satisfy the generating limitation by using a specific type of circuitry called a “double-balanced mixer” combined with a pair of capacitors connected to the output ports of the mixer. It is undisputed that double-balanced mixers existed prior to ParkerVision's invention and that a double-balanced mixer by itself (i.e., without the addition of output capacitors) can be used to convert high-frequency carrier signals into low-frequency baseband signals. ParkerVision argues that Qualcomm implements the double-balanced mixer in an infringing configuration because it uses storage capacitors to interact with the mixer in producing the baseband signal. According to Dr. Prucnal, the mixer and the capacitors in Qualcomm's circuit collectively function to convert the high-frequency carrier signal into the low-frequency baseband signal. In doing so, Dr. Prucnal testified, the mixer-capacitor combination satisfies the generating limitation.

Qualcomm contends that the mixer alone converts the carrier signal into the baseband signal and that the capacitors identified by ParkerVision do not generate the baseband signal. According to Qualcomm, those capacitors are used to filter out unwanted high-frequency signals known as “jammers.” Because the capacitors are not involved in the down-converting function, the baseband signal necessarily comes from “somewhere other than ... energy that has been stored in the capacitor.” For that reason, Qualcomm contends, its products do not infringe.

The parties' dispute thus centers on whether the capacitors immediately downstream from the mixer are involved in generating the baseband signal. In order for ParkerVision to prevail under its infringement theory, it was required to show that the baseband signal is generated from the energy stored in those capacitors.

Dr. Prucnal testified that the identified capacitors in the accused products contribute to the generation of the baseband signal by going through a “charging and discharging” cycle, which is controlled by a switch inside the mixer circuit. Closing the switch allows energy from the carrier signal to flow into the capacitor and accumulate there (“charging”); opening the switch allows the capacitor to release the accumulated energy into the rest of the circuit (“discharging”). Dr. Prucnal testified that the charging and discharging cycle results in an accumulation of energy from the carrier signal, which is then used “to generate the baseband signal following the capacitor.”

On cross-examination, however, Dr. Prucnal admitted that the baseband signal in the accused products has already been created before the signal reaches the identified capacitors. He also testified that the “output” of the double-balanced mixer “is the baseband,” and that the double-balanced mixer “in fact” creates the baseband signal.⁴

***1014** Dr. Prucnal's testimony is internally inconsistent. He testified that energy accumulated in the storage capacitor is used to generate a baseband signal “following the capacitor” but admitted that the baseband already exists before the capacitor. He also testified that the switch inside the mixer circuit works together with the storage capacitors to generate the baseband signal, while agreeing that the mixer itself creates the baseband.

ParkerVision made no attempt to reconcile the two strands of Dr. Prucnal's testimony at trial. The only other testimony that the jury heard regarding the respective role of the mixer and the storage capacitors in the accused products came from Qualcomm's witness, Jim Jaffee, an engineer who was responsible for designing the Magellan product.⁵ Mr. Jaffee testified—consistent with Dr. Prucnal's admission on cross-examination—that the baseband signal is created in the crisscrossed transistors of the double-balanced mixer. He added that the capacitors immediately following the mixer “play no role” in generating the baseband and are designed to “have no effect” on the baseband; instead, the capacitors serve only to suppress the unwanted “transmit jamming” signal.

The inconsistencies in Dr. Prucnal's testimony concern matters that are at the heart of the parties' dispute. Mr. Sorrells conceded that Qualcomm would not infringe if the Qualcomm products obtain the baseband signal “somewhere other than from the ... energy that has been stored in the capacitor.” He acknowledged that to meet its burden to prove infringement, ParkerVision had to prove that “the current that has gone into the storage capacitor is then what is generating the baseband signal” in the accused products.

Dr. Prucnal's admission that the double-balanced mixer creates the baseband signal before that signal reaches the identified capacitors means that Qualcomm products obtained the baseband signal from “somewhere other than” the energy stored in the capacitors, precluding a finding of infringement. Because ParkerVision provided no explanation at trial for the inconsistencies in Dr. Prucnal's testimony, no reasonable jury could be satisfied that Dr. Prucnal's opinion, taken as a whole, provides a substantial basis for a finding of infringement.⁶

During the hearing on Qualcomm's post-trial JMOL motion, ParkerVision attempted to reconcile Dr. Prucnal's admission that the baseband signal exists at the output of the mixer and before the storage capacitors with his testimony that energy stored in the capacitors is used to generate the baseband signal following the capacitors. *1015 ParkerVision argued that what comes out of the mixer is merely a "lower frequency signal" (compared to the carrier signal), but was not the baseband. According to ParkerVision, the lower frequency signal goes into the capacitors, where it is stored as energy, and that energy is then used to generate the baseband signal—a different signal than the "lower frequency signal"—following the capacitors.

No evidence supports such a theory, however. Dr. Prucnal affirmatively identified the output of the double balanced mixer as "the baseband." He did so during both cross and redirect examination. Neither Dr. Prucnal nor any other witness alluded to the possibility that the signal that comes out of the mixer is different from the base-band. Thus, the record does not support ParkerVision's theory at the JMOL hearing that the output of the mixer is something other than the baseband signal; its effort to reconcile the inconsistencies in Dr. Prucnal's testimony fails.

ParkerVision alludes to the "two baseband signals" theory in its brief, but disclaims reliance on it. *See* App. Br. 55, Reply Br. 20. Instead, ParkerVision argues on appeal that the district court misunderstood the underlying technology when it distinguished between a signal appearing upstream from the capacitor and a signal appearing downstream from the capacitor on the same electric wire. According to ParkerVision, it "makes no sense" to pinpoint a specific location along a wire where the baseband signal is generated, because all the points along the wire "are one and the same point."

ParkerVision did not present its "one and the same point" theory to the jury or explain the relevance of that theory to its infringement claim. The only evidence ParkerVision now relies on to support that theory is the testimony of Dr. Razavi, Qualcomm's invalidity expert, who testified that, in one of the prior art references the wire "right above the capacitor ... is the same point."

Dr. Razavi's testimony, however, does not support ParkerVision's theory. In the prior art reference that Dr. Razavi was discussing, the baseband signal is represented by

voltage across the capacitor. As Dr. Razavi testified, voltage is the same at all points along an electric wire. It is undisputed, however, that the accused products are not "voltage-mode" products, but are "current-mode" products, in which the baseband signal is represented by variations in current, not by variations in voltage.

At trial, Dr. Prucnal agreed that within the TX filter in Qualcomm's design, a larger current flows before the capacitor while a smaller current flows after the capacitor, which indicates that part of the incoming current has been "filtered out" by the capacitor.⁷ Dr. Prucnal further explained that the relationship between the currents flowing before and after the capacitor (along the same wire) and the current going into the capacitor are governed by what is known as Kirchhoff's current law.

Dr. Prucnal's testimony demonstrates that, unlike a voltage signal, which is the same everywhere along an electric wire, currents flowing along the same wire may be different before and after a capacitor. That difference, in accordance with Kirchhoff's current law, is determined by how much current is absorbed, or filtered out, by the capacitor. Dr. Razavi's "one and the same point" testimony, which was directed to a voltage signal, is thus inapplicable *1016 to current-mode devices such as Qualcomm's accused products.

The testimony of ParkerVision's witnesses makes clear that, in order to generate the baseband signal according to ParkerVision's invention, electric current from the carrier signal first flows into the storage capacitor and is accumulated there as energy. When that energy is discharged to the rest of the circuit, a baseband signal "following the capacitor" is created. But Dr. Prucnal admitted that the double-balanced mixer creates the baseband current in the accused Qualcomm products and that the electric current upstream from the identified capacitors in those products is already "the baseband." In other words, the accused products do not require an electric current from the carrier signal to go in and out of the storage capacitors in order to create the baseband signal; instead, the baseband current is created by the double-balanced mixer before the current reaches the capacitors. The district court therefore did not err in finding Dr. Prucnal's admission to be "fatal" to ParkerVision's infringement theory.

[1] ParkerVision argues that simply because the base-band signal appears upstream from the identified capacitors does not mean the capacitors have no role in generating the signal, because the patents explain how capacitors can

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