

Mediatek, Inc. v. ParkerVision, Inc., IPR2024-00796
September 9, 2025 Oral Hearing
Mediatek's Demonstratives

Roadmap

- Overview
- Claim Construction
- Nevo + Avitabile
- Young + Estabrook-Thesis

Overview

Mediatek's Combinations

Ground (all under 35 U.S.C. § 103)	Claims	References
1	1-20	Nevo, Avitable
2A	1-20	Young, Estabrook-Thesis
2B	1-20	Young, Estabrook-1988, Estabrook-1989

- **Nevo** (Ground 1) and **Young** (Grounds 2A, 2B) teach a “multi-platform module”
- **Avitable** (Ground 1) and **Estabrook-Thesis** (Ground 2A) or **Estabrook-1988** and **Estabrook-1989** (Ground 2B) teach “frequency translation module”

Person of Ordinary Skill in the Art (POSITA)

- Petitioner: “...at least a bachelor’s degree in electrical engineering or a related subject and two or more years of experience in the field of RF circuit design, or at least five years of work experience and training in the design and development of RF circuits and/or systems. Less work experience may be compensated by a higher level of education, such as a master’s degree.”
- Patent Owner: “(a) a Bachelor of Science degree in electrical or computer engineering (or a related academic field), and at least two (2) years of work experience in the design and development of radio frequency circuits and/or systems, or (b) at least five (5) years of work experience and training in the design and development of radio frequency circuits and/or systems.”

Independent Claim 11

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

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

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

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

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

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

Independent Claim 1

1. [pre] An apparatus capable of performing simultaneous multi-platform operations, comprising:

1[a] at least one **multi-platform module** including a plurality of transceivers each having at least one frequency translating module, wherein said at least one frequency translating module comprises

1[b] a **switch** configured to operate according to an **energy transfer signal**, and to **sub-sample** and transfer energy from a first electromagnetic (EM) signal, and

1[c] a control module configured to enable the at least one **multi-platform module** to communicate with at least one of a plurality of communication links, the control module including a plurality of protocol/standard sub-modules.

Key Issues

- Whether “energy transfer signal” should be construed to add multiple limitations
- Whether references should be compared to broad description of technology or specific claim limitations
- Whether “a second EM signal is generated from said stored energy” requires energy to be discharged from a storage module (e.g. capacitor) across a load
- Whether any claim limitation excludes sampling a combined RF input/control signal
- Whether Petitioner was required to show bodily incorporation of down-converters into standard-compliant receivers

Claim Construction

Claim Construction

- Most relevant dispute concerns “energy transfer signal”
- “Switch” and “storage module” not disputed here, but resolution of previous disputes relevant to current “energy transfer signal” dispute
- “Sample” not disputed, but relevant to analysis of Grounds 2A/2B
- No other terms impact outcome

Claim Construction- “energy transfer signal”

MediaTek's Proposal	ParkerVision's Proposal
Plain and ordinary meaning	“an independent control input of an energy transfer system having pulses with non-negligible apertures”

Claim Construction- “energy transfer signal”

Parties agreed in District Court to give “energy transfer signal” plain and ordinary meaning

I. AGREED CONSTRUCTIONS

Claim Term	Agreed Construction
“energy transfer signal” (’686 patent, claim 11)	Plain-and-ordinary meaning

Claim Construction- “energy transfer signal”

Elements of ParkerVision’s proposed construction previously rejected by the District Court with respect to other claim terms

“an **independent control input** of an **energy transfer system** having pulses with non-negligible apertures”

Term	Plaintiff's Proposed Construction	Defendants' Proposed Construction	Special Master's Recommended Construction
#1: “storage module” / “energy storage element” U.S. Patent No. 7,483,686, Claim 11; U.S. Patent No. 9,118,528, Claims 1, 5, 8, 17, 18, 19, 23, 26, 35, 36 Proposed by Both Sides	Storage module: “a module of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal” Energy storage element: “an element of an energy transfer system that stores non-negligible amounts of energy from an input electromagnetic signal”	“[energy] storage [module / element]” - “a [module / element] that stores non-negligible amounts of energy from an input electromagnetic signal”	“[an element / a module] of a system that stores non-negligible amounts of energy from an input electromagnetic signal” Not adopted
#2: “switch” / “switching device” U.S. Patent No. 7,483,686, Claim 11; U.S. Patent No. 9,118,528, Claims 1, 5, 8, 17, 18, 19, 23, 26, 35, 36 Proposed by Both Sides	Main-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”	“an electronic device for opening and closing a circuit”	“an electronic device for opening and closing a circuit.” Not adopted

Claim Construction- “energy transfer signal”

ParkerVision’s proposed constructions rejected by PTAB, Federal Circuit regarding related patents

- PTAB rejected “independent control input:”
 - “Patent Owner further argues that *each* disclosed embodiment in the ’108 patent depicts a switch with an input, an output, and an independent control input... but **the ’108 patent specification ‘does not describe the invention as limited to embodiments having’ an independent control input.**”
 - Final Written Decision, *Intel Corp. v. ParkerVision, Inc.*, IPR2021-00346, Paper 33 at 23-24 (June 30, 2022) (EX1010)
 - Affirmed by Federal Circuit (EX1046)
- Federal Circuit rejected “energy transfer system:”
 - “**ParkerVision invites us to read into claim 3 an entire system (an energy transfer system) simply on the basis that claim 3 recites a single component (a storage element) that can be part of that system.**”
 - *Parkervision, Inc. v. Vidal*, 88 F.4th 969, 977 (Fed. Cir. 2023)

Claim Construction- “energy transfer signal”

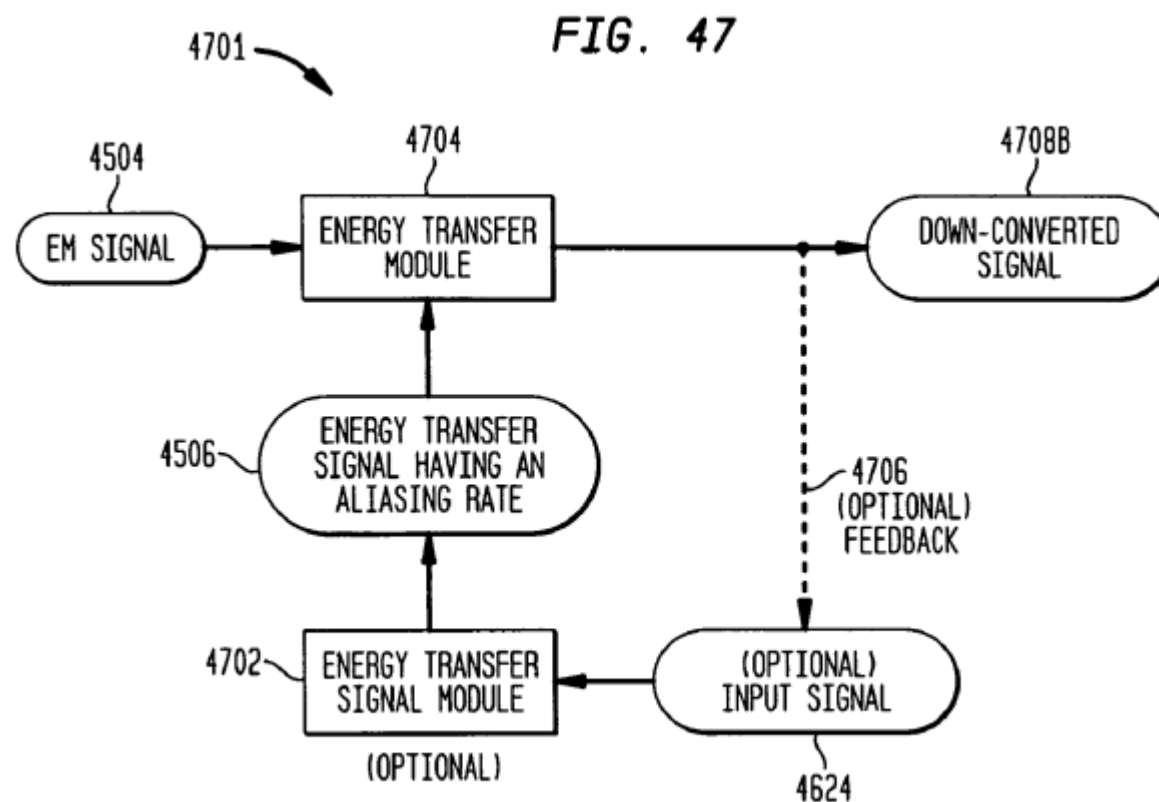
“Pulse” embodiments in the specification are not claim limitations

“When the pulses of the control signal **2006** have non-negligible apertures, the aliasing module **2000** is referred to interchangeably herein as an energy transfer module or a gated transfer module, and the control signal **2006** is referred to as an energy transfer signal.”

- EX1001, 12:27-31

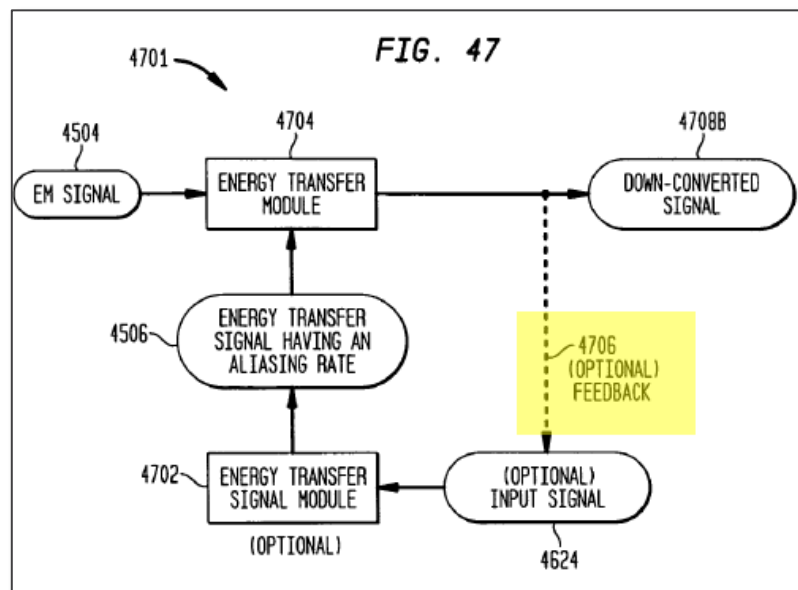
Diode and FET switches can be kept on for a non-negligible aperture by different waveforms

- EX1049, ¶24

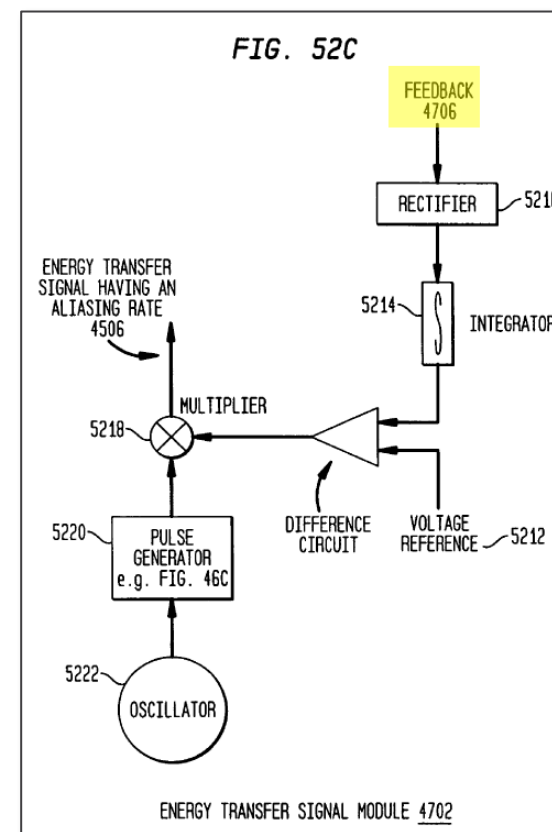


Claim Construction- “energy transfer signal”

Embodiments in the specification do not meet “independent control input” construction regardless of how the construction is interpreted



‘686 Patent,
Fig. 47



‘686 Patent,
Fig. 52C

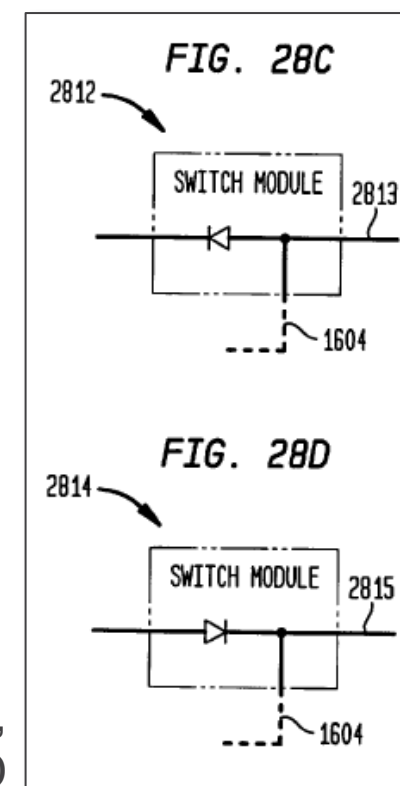
Claim Construction- “energy transfer signal”

Embodiments in the specification do not meet “independent control input” construction as Patent Owner’s expert defined the term:

164. Moreover, the specification discloses that the energy transfer signal is an independent control input – i.e., the signal is a separate input from the signal input into switch and the signal output from the switch. See Figures 1A-1C, 2, 19, 20A, 20A-1, 25B, 28, 29, 45A-45D, 47, 51A, 51B, 61; '551 patent, Figures 28A-28D, 63, 64A, 64B, 65, 66A-66D, 67A, 68G, 69, 74, 76A-76E, 82A, 82B, 94A, 95.

EX2006, ¶164

'551 Patent (EX1008),
Figs. 28C, 28D



Claim construction- “sample”

Sample: “reduce a continuous-time signal to a discrete-time signal”

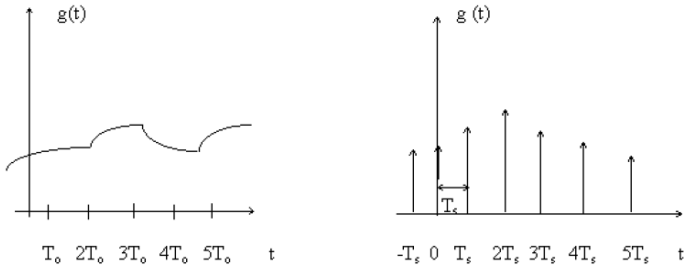
Agreed construction in other ParkerVision litigation:

c. Agreed upon claim constructions	
The parties agree on the constructions for the following claim terms and phrases found in the '528 Patent:	
'528 Patent Phrase	Agreed Upon Construction
switch	"an electronic device for opening and closing a circuit"
sampling aperture	"a period of time during which the claimed switch is in its closed (on) state, thereby reducing a continuous-time signal to a discrete-time signal"

EX1050 at 28

Definition cited in Dr. Larson’s opening declaration:

sampling the act of turning a time-continuous signal into a signal that is time-discrete or time-discontinuous. See the following diagrams, where T_S is the sampling period.



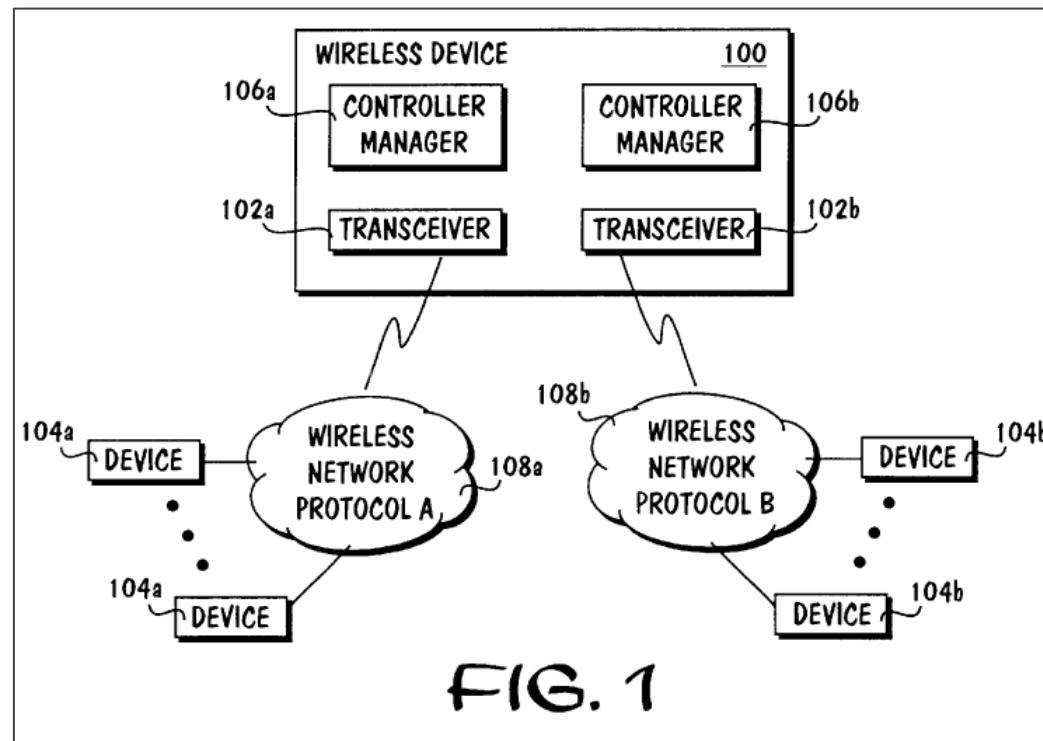
The sampling process.

EX1038 at 9

Ground 1- Nevo + Avitabile

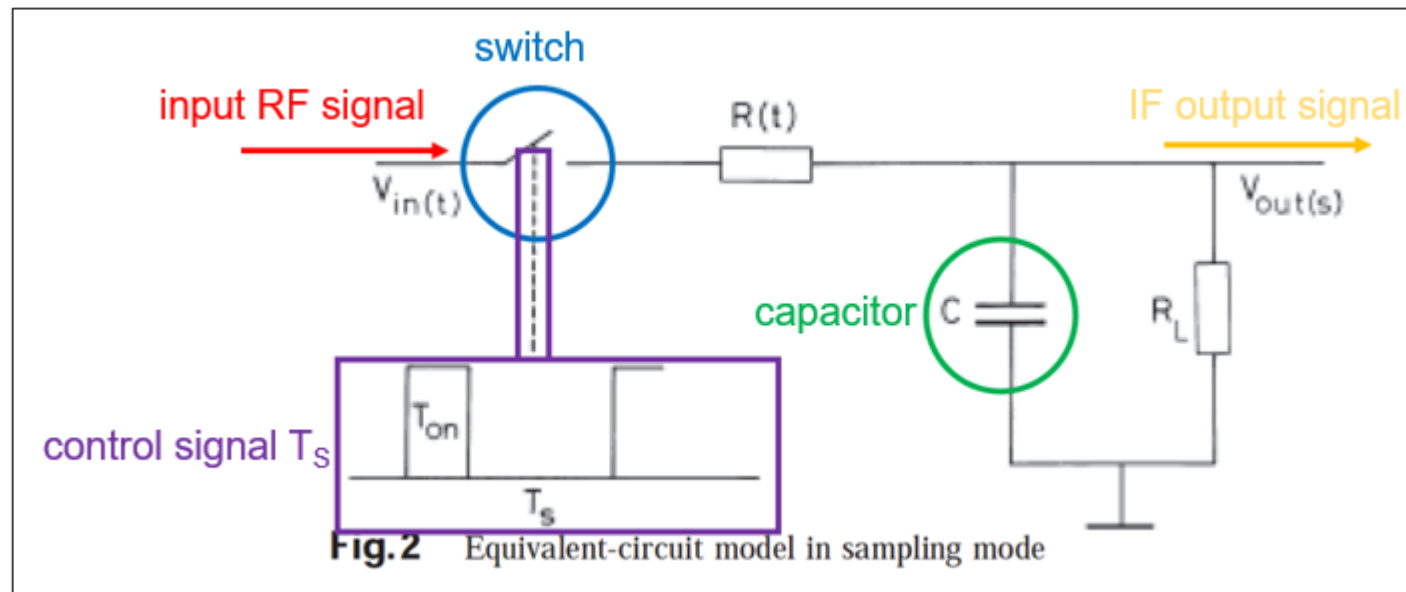
Ground 1- Nevo + Avitable

- Nevo teaches a wireless device (*multi-platform module*) that can simultaneously operate in two or more wireless network protocols (*protocol/standard combination*) (e.g. Bluetooth, Wi-Fi, HomeRF) via controller managers and transceivers

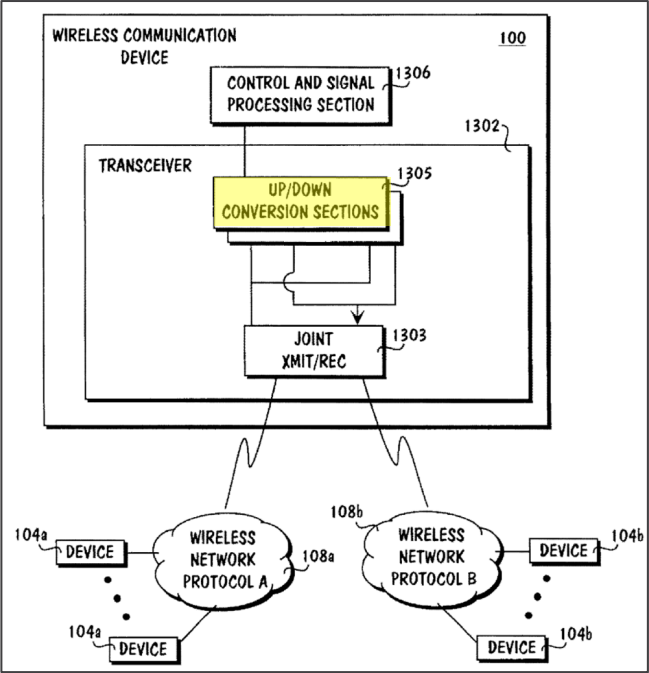


Ground 1- Nevo + Avitabile

- Avitabile teaches a down-converter (*frequency translation module*) that samples an input RF signal (*1st EM signal*) via a *switch* controlled by a control signal with a 40% “on” time/aperture (*energy transfer signal*) to sub-sample and transfer energy onto a capacitor (*storage module*), from which an intermediate frequency output (*2nd EM signal*) is then generated



Ground 1 Motivation to Combine: Nevo's transceivers require down-conversion circuitry



EX1004, Fig. 13

Radar and communication systems often require complex waveform detection to be implemented for separately processing the in-phase (I) and quadrature (Q) components of the received complex waveform. Subsequent conversion in numeric form, if requested, requires that the sampling and holding operation to be performed after demodulation. The resulting downconverter architecture represents a critical and costly unit of the receiver. This paper describes a new digital downconverter configuration which performs complex detection by means of the sample-and-hold (SH) in a single step by using a single-channel configuration. The key element of the down-converter is a very fast sampling circuit directly operating within the S-band.

EX1006, 337

An extensive time-domain and frequency characterisation of each component of the system has been carried out. The experimental results on an SSB-SC AM test signal show a digital intermediate-frequency signal format with 5.8-bit equivalent accuracy at a frequency of 1GHz. Downconverter operation up to 3GHz is feasible using the proposed SH configuration with 4.5 bit accuracy.

EX1006, 341

Indexing terms: Digital downconverters, Radar receivers, Gallium arsenide devices

Abstract: A digital coherent-downconverter configuration is described whose operation principle is based on the theory of subharmonic sampling for narrowband waveforms. This

EX1006, 337

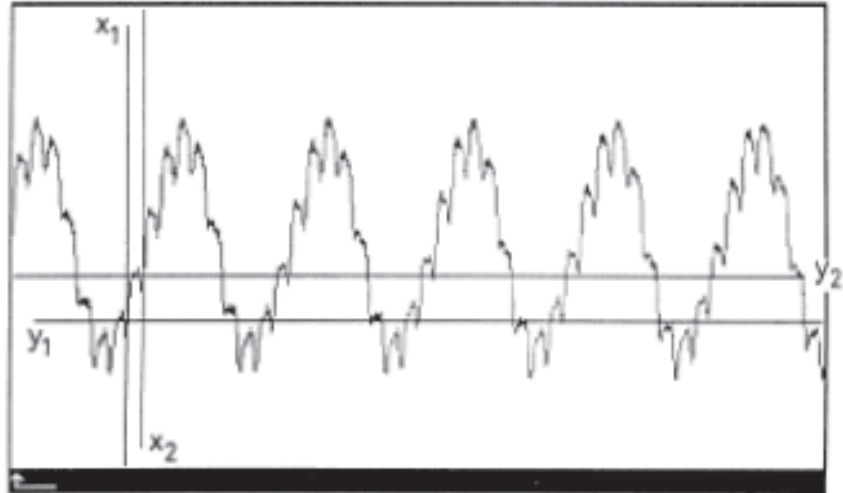


Fig.6 Sampled signal obtained by SH1
 $x_1 = 28\text{ns}$; $y_1 = -23\text{mV}$; $x_2 = 32\text{ns}$; $y_2 = -7.4\text{mV}$
Horizontal scale: 20ns/div.

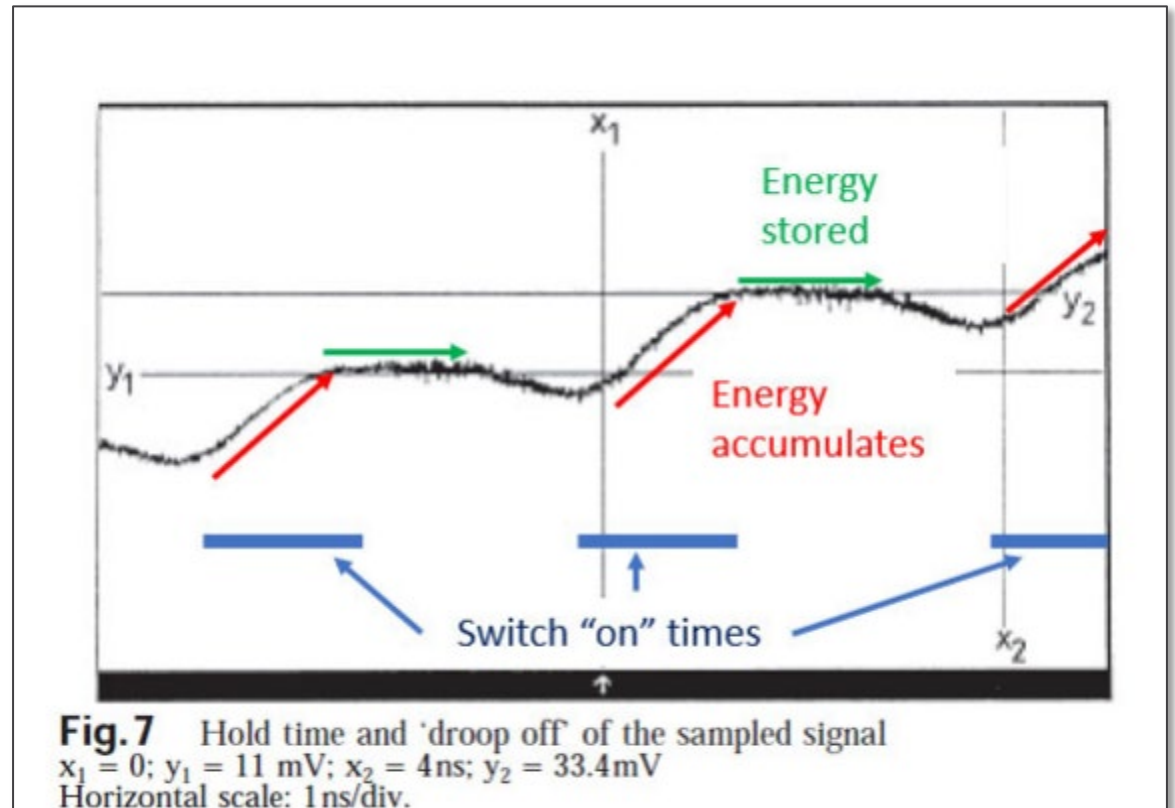
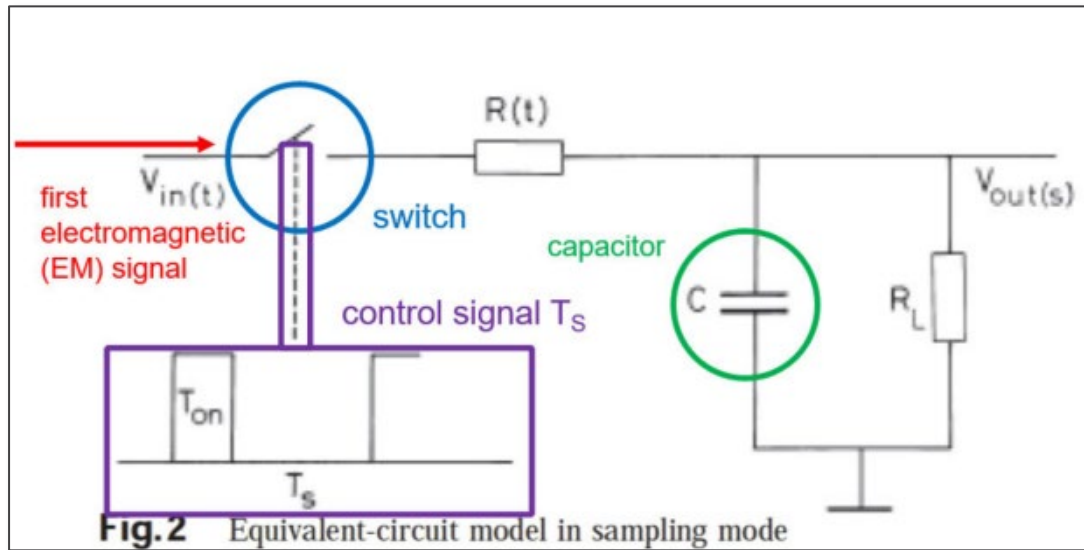
EX1006, Fig. 6

Ground 1 (Nevo + Avitable) disputed issues

- “wherein a second EM signal is generated from said stored energy” (claim 11)
- “a switch configured to operate according to an energy transfer signal” (claims 1, 11)
- Protocol/standard issues
 - Motivation to combine
 - “a plurality of protocol/standard sub-modules” (claims 1, 11) and “operating a [first/second] transceiver in conformance with a [first/second] protocol/standard combination” (claim 11)

Ground 1: “wherein a second EM signal is generated from said stored energy”

Avitabile’s capacitor stores energy during “on” times



Ground 1: “wherein a second EM signal is generated from said stored energy”

Sampled signal “generated from” energy stored on Avitabile’s capacitor

- “**generated from**” does not require stored energy to be **part of** second signal
- “The actual claim language, ‘generated from,’ is much broader than that, and does not require the stored energy to be directly input into a second signal. By analogy, the output of a microphone is still ‘generated from’ sound even though the format of the output signal is an electrical wave rather than kinetic energy. In Avitabile’s system, storing energy in the capacitor creates the voltages which create the second EM signal, and thus the second EM signal is generated from that stored energy.” EX1049, ¶52

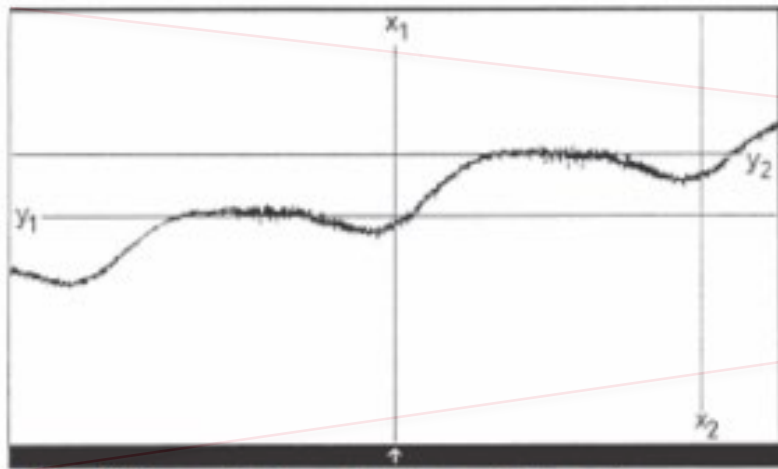


Fig. 7 Hold time and ‘droop off’ of the sampled signal
 $x_1 = 0$; $y_1 = 11$ mV; $x_2 = 4$ ns; $y_2 = 33.4$ mV
Horizontal scale: 1 ns/div.

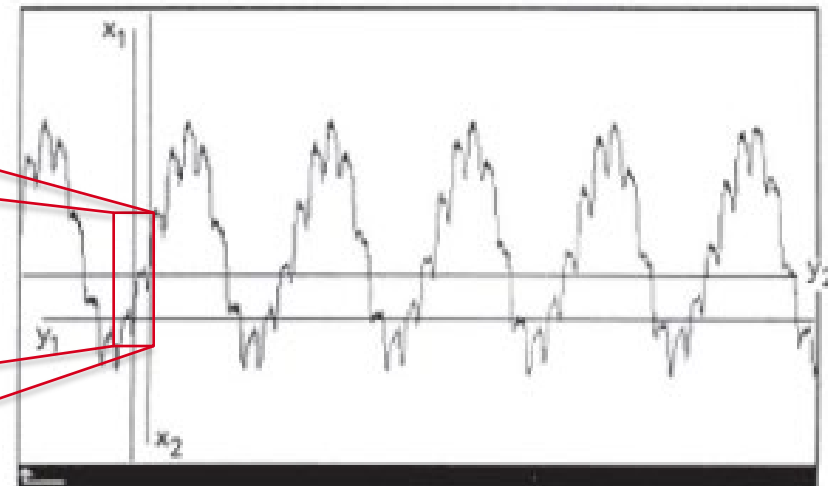


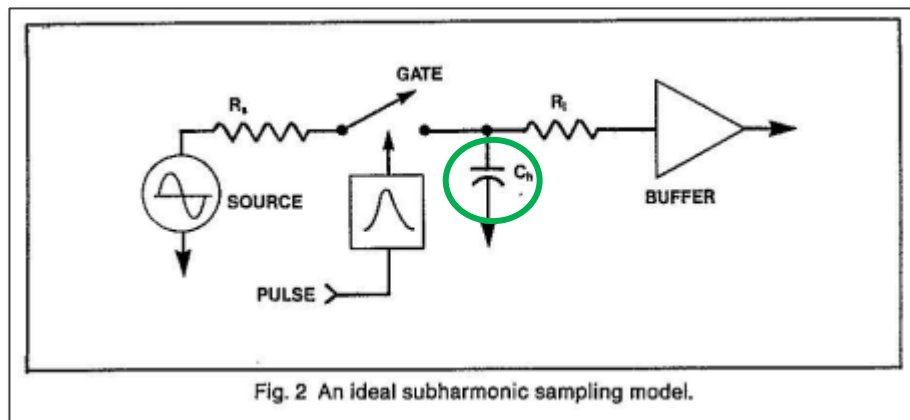
Fig. 6 Sampled signal obtained by SH1
 $x_1 = 28$ ns; $y_1 = -23$ mV; $x_2 = 32$ ns; $y_2 = -7.4$ mV
Horizontal scale: 20 ns/div.

Ground 1: “wherein a second EM signal is generated from said stored energy”

ParkerVision, Inc. v. Qualcomm Inc., 621 Fed. Appx. 1009 (Fed Cir. 2015)
 (“*ParkerVision 2015*”) is directly on point:

'551 Patent Claim 23

23. An apparatus for down-converting a carrier signal to a lower frequency signal, comprising:
... a **storage module** coupled to said switch module;
wherein **said storage module receives non-negligible amounts of energy transferred from a carrier signal ...**
wherein **a lower frequency signal is generated from the transferred energy.**



EX1054 (Weisskopf)

“It is undisputed that Weisskopf generates a baseband signal, and that **the baseband signal is generated by measuring the voltage across the storage capacitor.**”

- *ParkerVision 2015*, at 1019

“Because **the generating limitation does not require that the baseband signal be created by discharging energy from a storage device**, ParkerVision cannot rely on the absence of that feature...”

- *ParkerVision 2015*, at 1020

Ground 1: “wherein a second EM signal is generated from said stored energy”

ParkerVision’s attempt to distinguish *ParkerVision 2015* misstates the opinion

- ParkerVision’s sur-reply (at 28): “The claim **does not say that a second signal is generated from the stored energy** as in the ’686 patent”
- What the Federal Circuit actually said: “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.”
 - *ParkerVision 2015*, 621 Fed.Appx. at 1013

Ground 1: “wherein a second EM signal is generated from said stored energy”

Load impedance is irrelevant because there is no such claim limitation

- “Nor does claim 11 require energy to be provided to a ‘low impedance load.’ ParkerVision included such a limitation explicitly in the claims of the [] ’551 Patent... yet omitted it in the ’686 Patent.” Reply at 12-13.

13. The method according to claim 1, further comprising the step of:
providing the lower frequency signal directly to a relatively low impedance load.

’551 Patent (EX1008), claim 13

Not included

’686 Patent,
claim 11

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

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

a switch configured to operate according to an energy transfer signal, and to sub-sample and transfer energy from a first electromagnetic (EM) signal, and

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

Ground 1: “wherein a second EM signal is generated from said stored energy”

'518 Patent Reexam relied on by Patent Owner is distinguishable

- '518 Patent Reexam depended on “integrating” element (interpreted by Examiner as requiring “multiple aperture periods”) not present in '686 claims

29. A method of down-converting a first signal to a second signal, comprising the steps of:

- (1) receiving the first signal;
- (2) sampling the first signal over aperture periods to transfer energy from the first signal;
- (3) integrating the energy over the aperture periods; and
- (4) generating the second signal from the integrated energy.

EX1053 ('518 Patent),
claim 29

Avitabile's sample-and-hold (voltage sampling) system is the one in which each voltage sample is independent of the previous one, so integrating (accumulating) energy over multiple aperture periods would distort the voltage representation of the input signal at each sampling instance, preventing an accurate reading of voltage and thus, preventing the baseband signal from being accurately recreated.

EX2009 ('518 Patent
Reexam excerpt), 7

Ground 1 “a switch configured to operate according to an energy transfer signal”

- POR argument based entirely on construction requiring an “energy transfer system”
 - POR, 58-59
- Avitable teaches an “energy transfer system” even if required because it transfers non-negligible amounts of energy from source EM signal to storage module
 - Pet. 42-43; EX1006, 339-341, Figs. 2, 5, 7; EX1002, ¶¶ 137-139; Reply 15-16; EX1049, ¶¶ 62-63

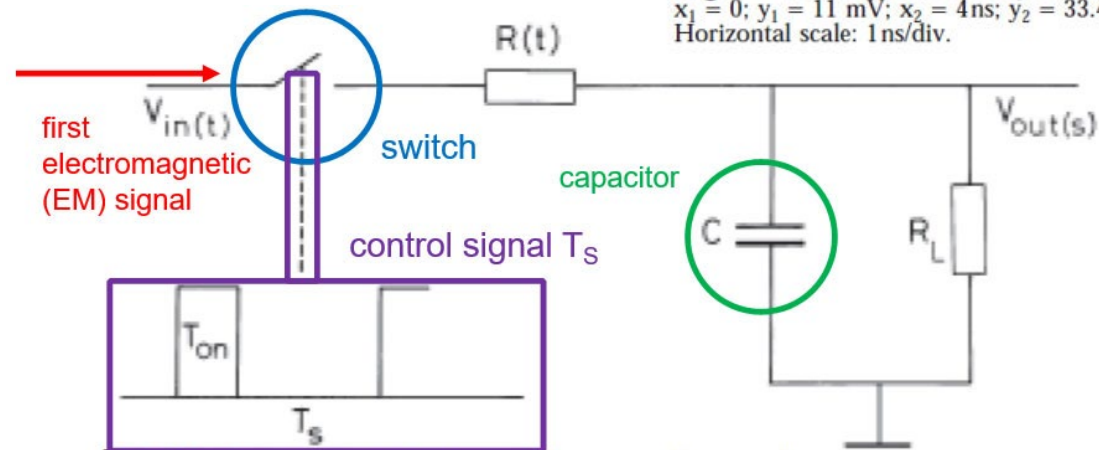


Fig.2 Equivalent-circuit model in sampling mode

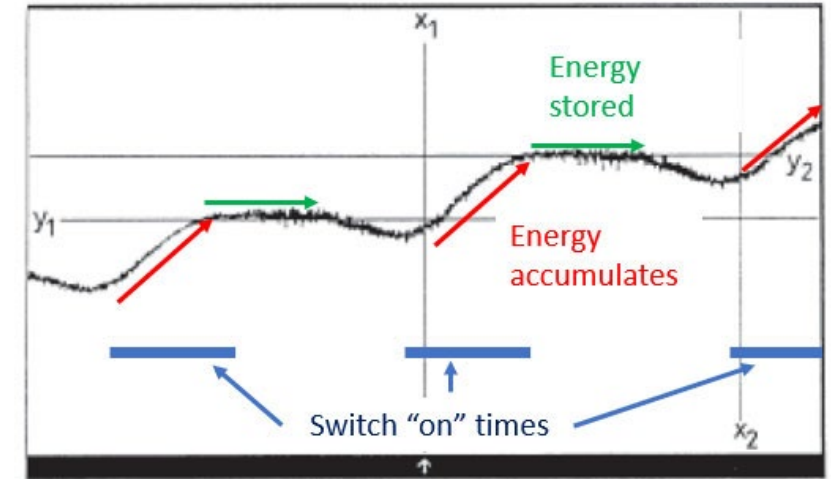


Fig.7 Hold time and 'droop off' of the sampled signal
 $x_1 = 0$; $y_1 = 11$ mV; $x_2 = 4$ ns; $y_2 = 33.4$ mV
Horizontal scale: 1 ns/div.

Ground 1 “protocol/standard” elements

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

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

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

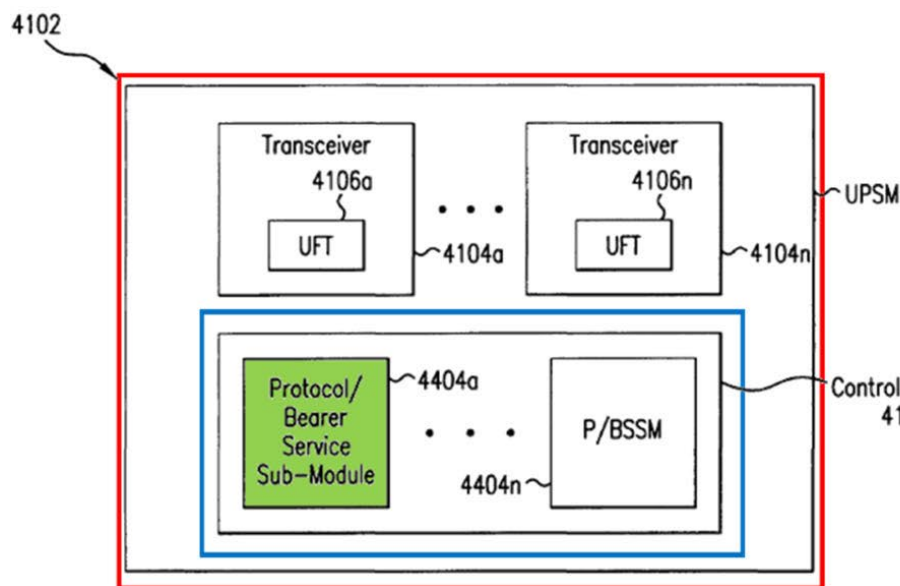
[FTM-2.1] a storage module coupled to said switch and configured to store said transferred energy, [FTM-2.2] wherein a second EM signal is generated from said stored energy, said second EM signal having a frequency different from said first EM signal;

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

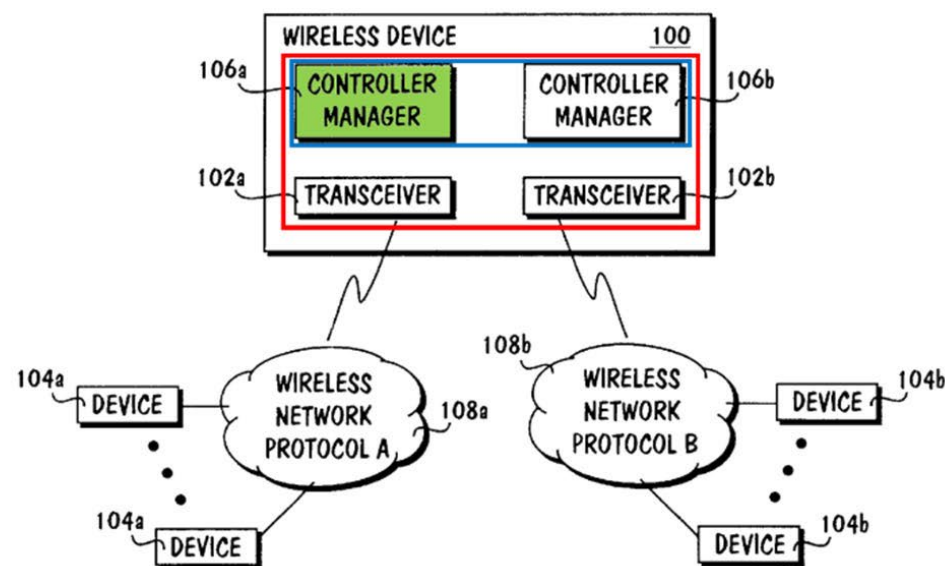
[3](3) operating a second transceiver in conformance with **a second protocol/standard combination** using **a second standard/protocol sub-module**.

Ground 1 “protocol/standard” elements

- No dispute that Nevo teaches “protocol/standard” elements: controller managers each control communications with wireless network protocols (e.g. Bluetooth, IEEE 802.11)
 - Nevo (EX1004) Fig. 1, 3:39-41, 4:1-5, 4:46-55
- Similar disclosure to '686 Patent



'686 Patent, Fig. 44



Nevo, Fig. 1

Federal Circuit law does not require showing bodily incorporation



“The test for obviousness is **not whether the features of a secondary reference may be bodily incorporated** into the structure of the primary reference.”

Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC, 825 F.3d 1373, 1381 (Fed. Cir. 2016) (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

“The question is whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole... **whether one prior art reference can be incorporated into another is basically irrelevant**”

Uber Techs., Inc. V. X One, Inc., 957 F.3d 1334, 1341 (Fed. Cir. 2020) (quoting *In re Etter*, 756 F.2d 852, 859 (Fed. Cir. 1985)).

The level of disclosure in the “686 Patent is indicative of the level of ordinary skill

Manual of PATENT EXAMINING PROCEDURE

Original Ninth Edition, March 2014

Latest Revision November 2024
[R-01.2024]

U.S. DEPARTMENT OF
COMMERCE



United States Patent and
Trademark Office

“The level of disclosure in the specification of the application under examination or in relevant references may also be informative of the knowledge and skills of a person of ordinary skill in the art. For example, **if the specification is entirely silent on how a certain step or function is achieved, that silence may suggest that figuring out how to achieve that step or function is within the ordinary skill in the art**, provided that the specification complies with 35 U.S.C. 112.”

MPEP 241.03(I).

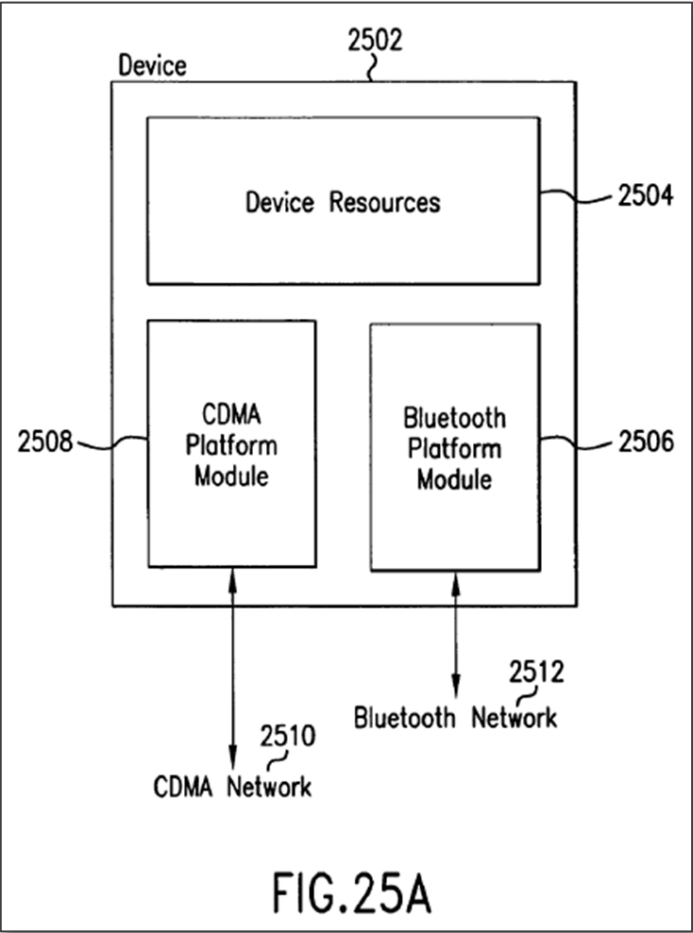


“The specification of the [asserted patent] is **entirely silent** on how to transmit user locations and maps from a server to user’s mobile device, **suggesting that a person of ordinary skill in the art was more than capable** of selecting between the known methods of accomplishing this.”

Uber Techs. V. X One, Inc., 957 F.3d 1334, 1339 (Fed. Cir. 2020).

'686 Patent itself doesn't show standards compliance under PO's argument in the POR

Feature alleged by ParkerVision to be missing	Taught by '686 Patent spec for:	
	Bluetooth	IEEE 802.11
Sensitivity	X	X
Image rejection	X	X
Error correction	X	X
Protocol-specific modulation	X	X
Automatic gain control	X	X
Interference tolerance	X	X
Dynamic range	X	X



'686 Patent, Fig. 25A

Ground 2A- Young + Estabrook-Thesis

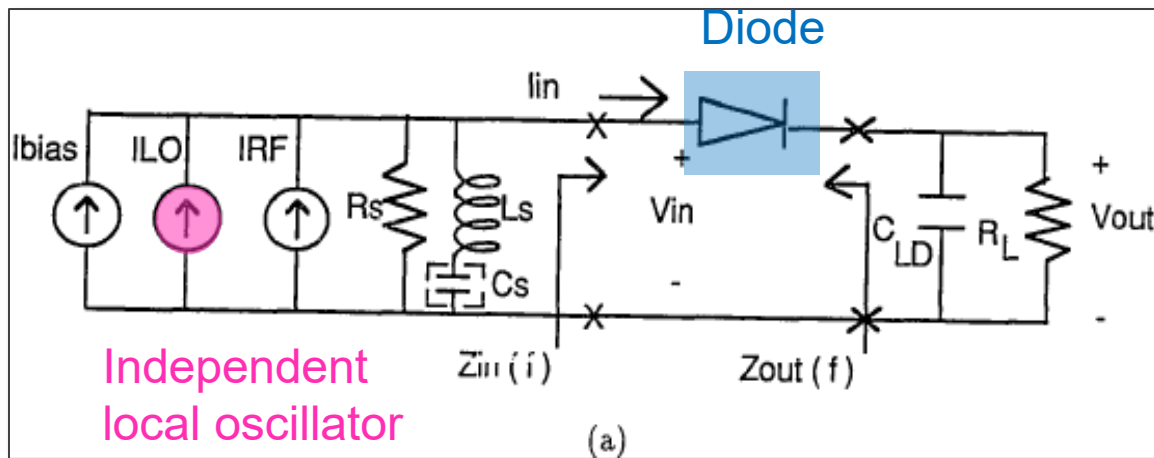
Ground 2A (Young + Estabrook-Thesis) disputed issues

- “a switch configured to operate according to an energy transfer signal” (claims 1, 11)
- “a switch configured... to sub-sample and transfer energy” (claims 1, 11)
- Protocol/standard issues
 - Motivation to combine
 - “a plurality of protocol/standard sub-modules” and “operating a [first/second] transceiver in conformance with a [first/second] protocol/standard combination” (claims 1, 11)

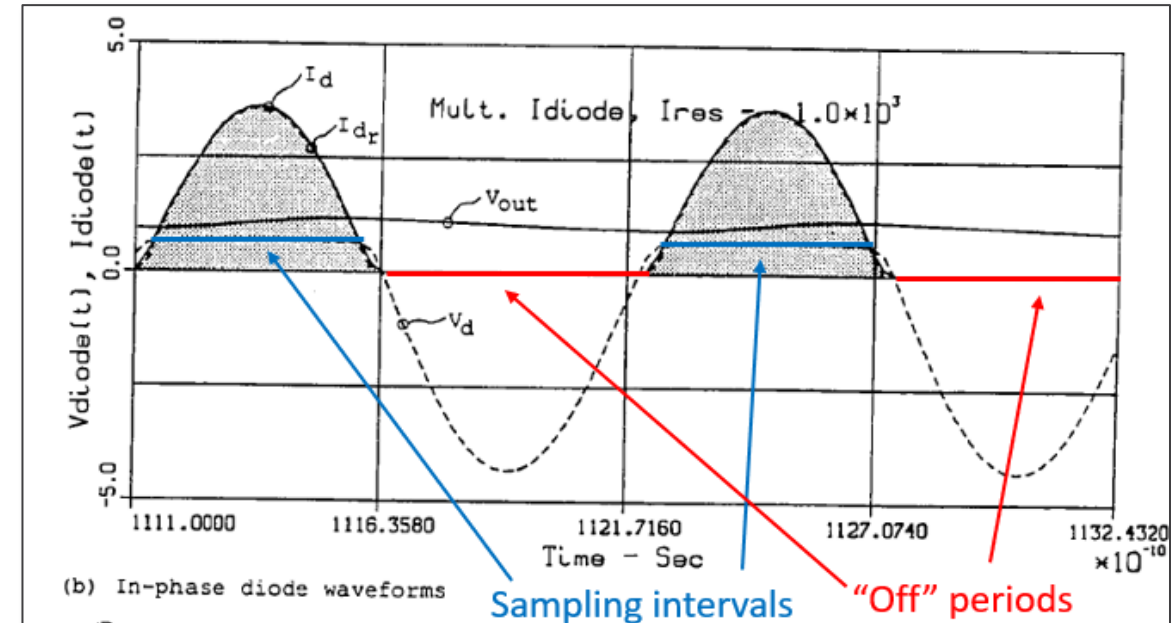
Ground 2A “a switch configured to operate according to an energy transfer signal”

Estabrook-Thesis teaches a diode (switch) activated by an independent local oscillator (ILO) (energy transfer signal) which controls switching on and off

- Diode turns “on” at specified forward voltage; only ILO meets this voltage



EX1005, Fig. 13(a)
(p. 60)

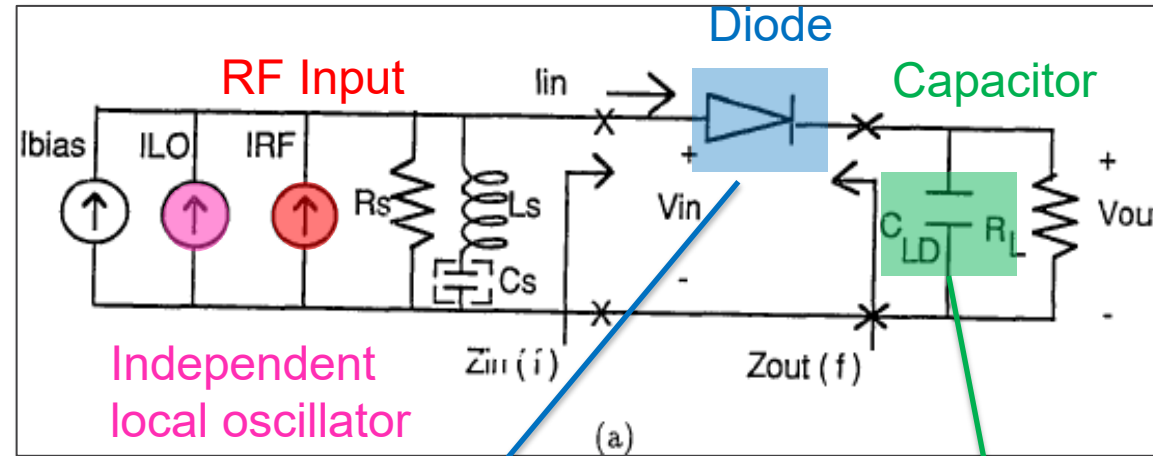


EX1005, Fig. 16(b)
(p. 71)

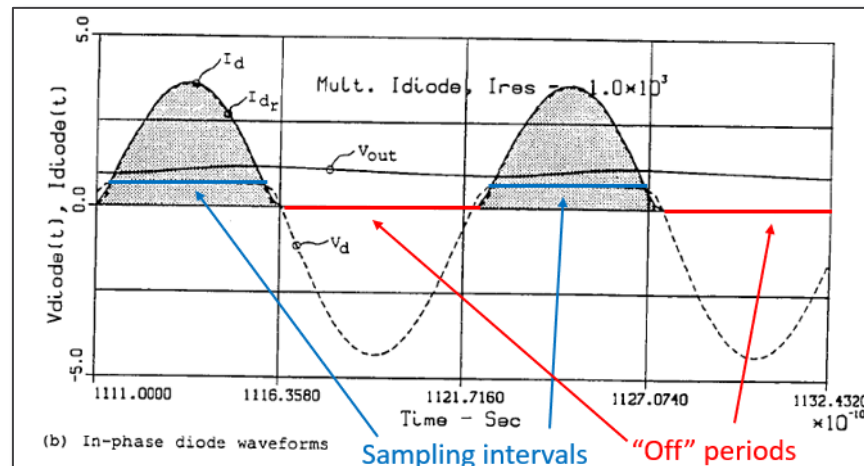
Ground 2A “a switch configured to operate according to an energy transfer signal”

The ILO controls the transfer of energy through the diode (switch) to a capacitor (storage module)

EX1005, Fig. 13(a)
(p. 60)



EX1005, Fig. 13(b)
(p. 71)

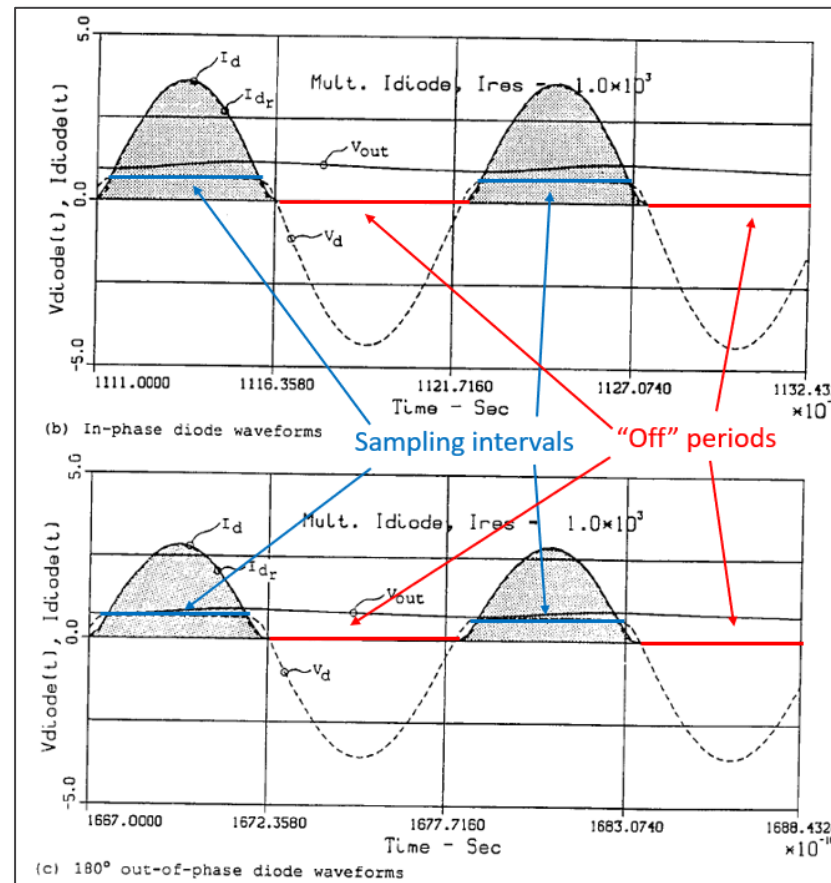


EX1005, Fig. 13(a)
(p. 71)



Ground 2A “a switch configured to... sub-sample and transfer energy”

Estabrook-Thesis’s diode transfers energy to the capacitor during discrete sampling periods

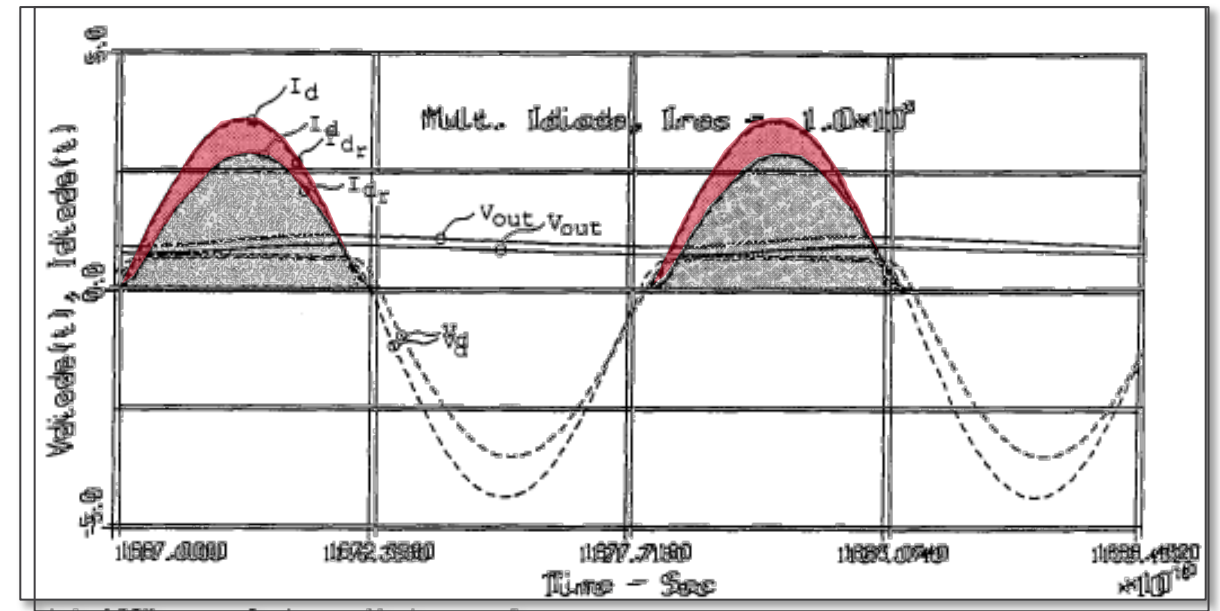
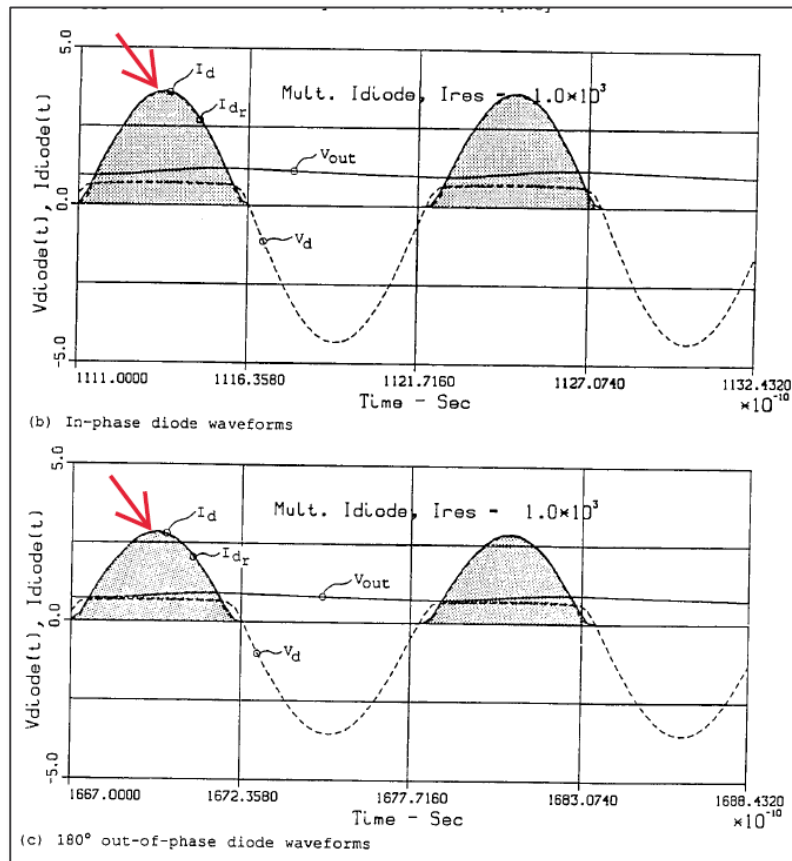


EX1005, Fig.
16(b)-(c) (p. 71)

Ground 2A “a switch configured to... sub-sample and transfer energy”

Estabrook transfers energy from the IRF

- No claim requirement that switch transfer energy **exclusively** from first EM signal
- More energy transferred when the IRF is in phase with ILO

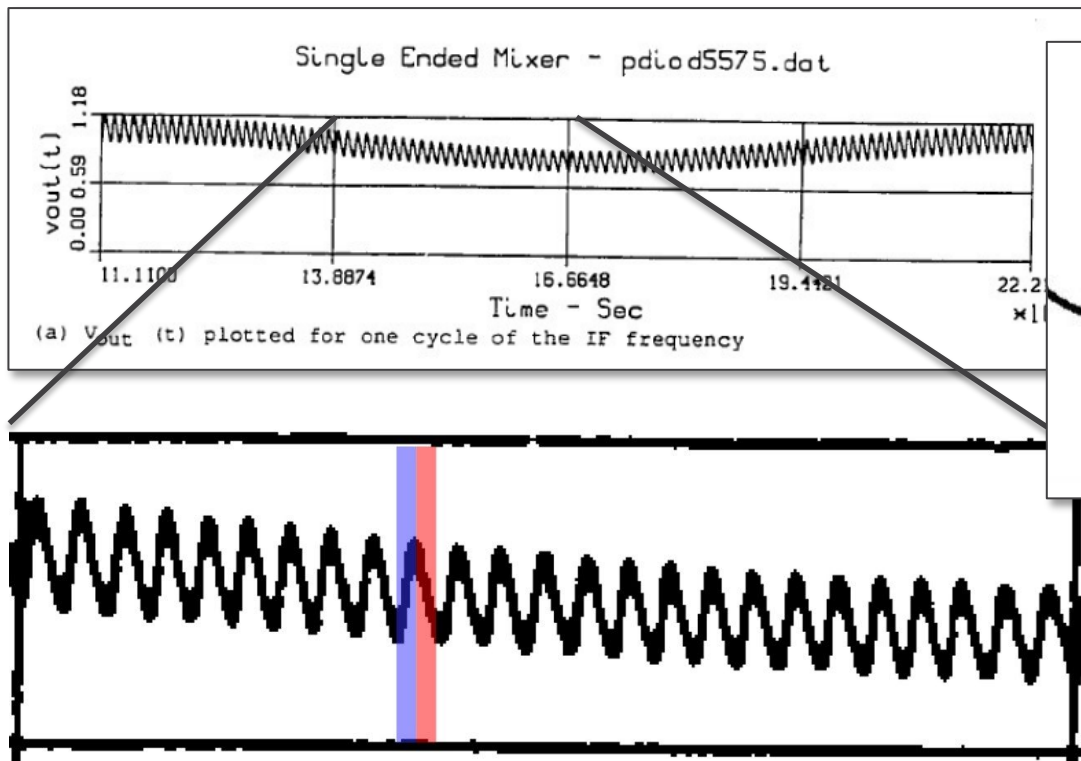


EX1005, Figs.
16(b)-(c) overlaid

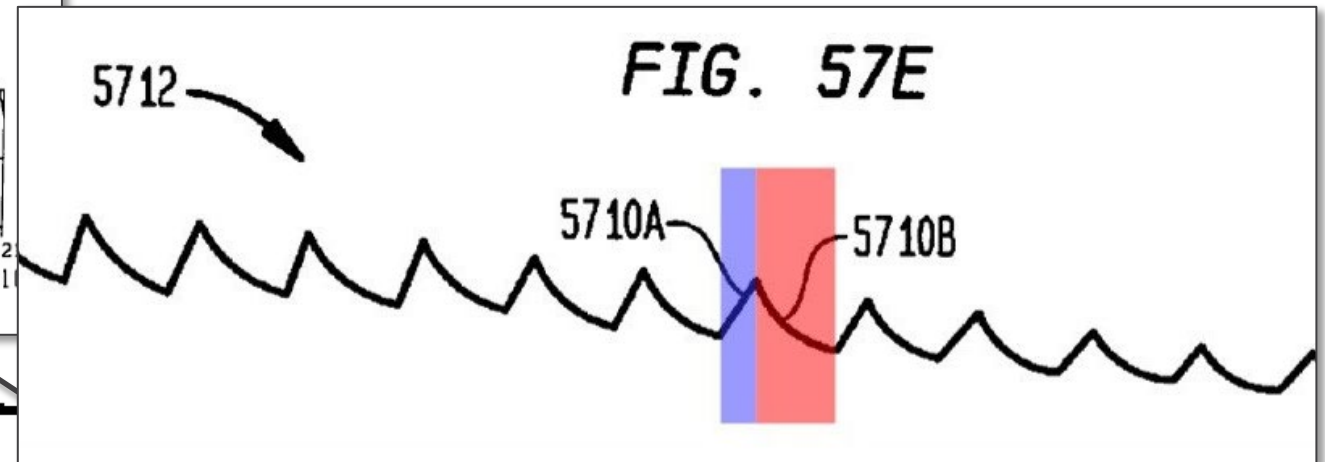
EX1005, Fig.
16(b)-(c) (p. 71)

Ground 2A “a switch configured to... sub-sample and transfer energy”

Estabrook-Thesis’s down-converted waveforms are similar to embodiments taught by ‘686/’551 Patents



EX1005, Fig. 16(a) (p. 71)



‘551 Patent (EX1008), Fig. 57E

Ground 2A “protocol/standard” elements

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

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

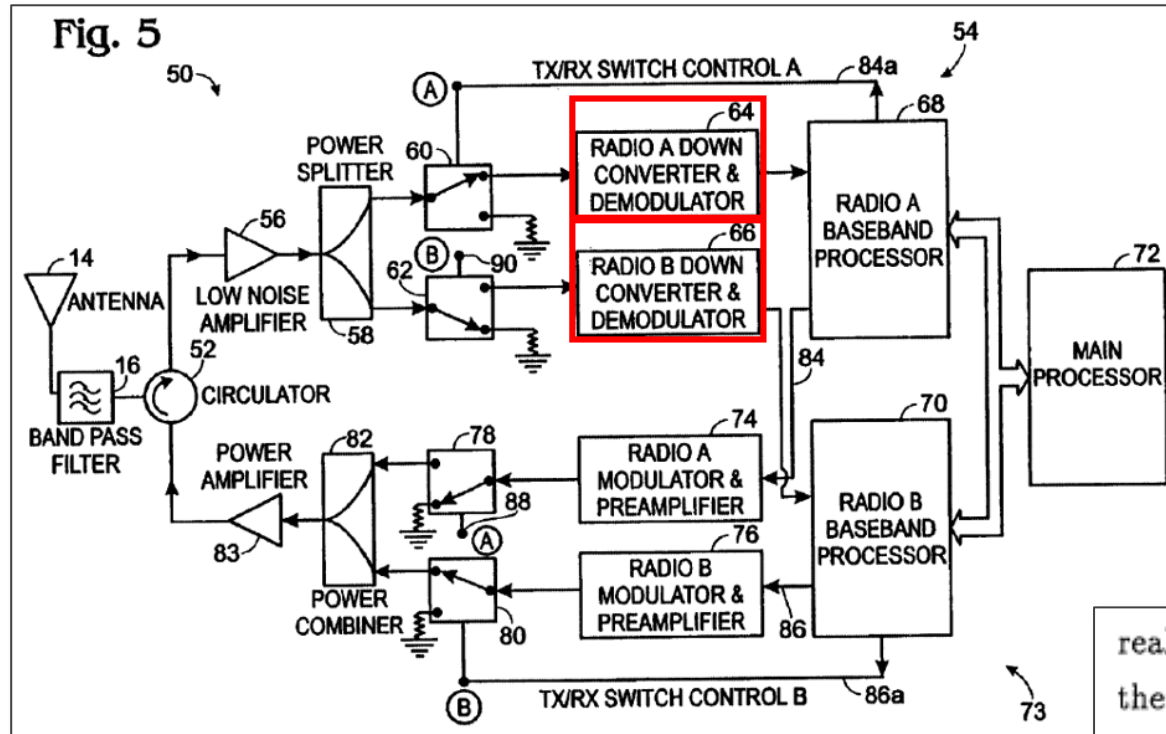
[FTM-1.1] a switch [FTM-1.2] configured to operate according to an energy transfer signal, [FTM-1.3] and to sub-sample and transfer energy from a first electromagnetic (EM) signal, and

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

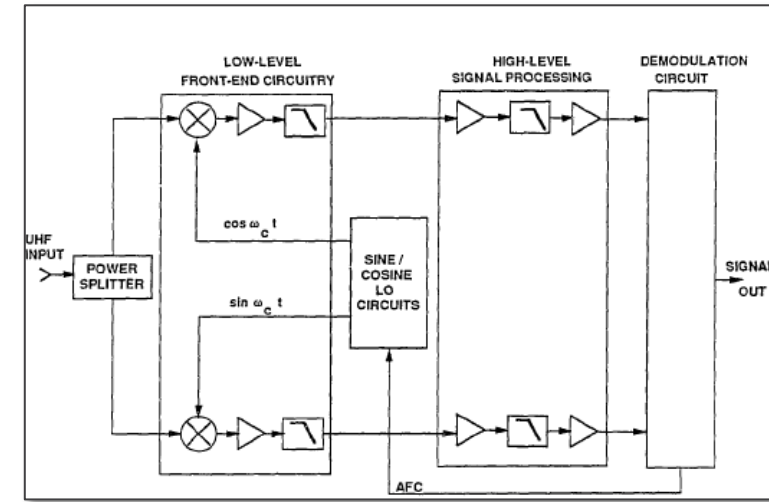
[2](2) operating a first transceiver in conformance with **a first protocol/standard combination** using **a first standard/protocol sub-module**; and

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

Ground 2A motivation to combine: Young requires a down-converter, which is provided by Estabrook-Thesis



Young (EX1003), Fig. 5



EX1005, Fig. 1

realized using standard processing techniques. If the signal is in a digital format, the high level signal processing circuits described above can be replaced by analog to digital converters (A/D) and digital signal processing circuits that will demodulate and decode the signal. The low-level front-end circuits then act to downconvert the signal to DC where A/D conversion can be reliably and cheaply performed and to set the receiver's signal-to-noise ratio.

EX1005 at 26

Ground 2A “protocol/standard” elements

- No dispute that Young teaches “protocol/standard” elements: Radios A and B send and receive using different protocols (e.g. Bluetooth, IEEE 802.11)
 - Young (EX1003), Fig. 5, Abstract, 1:8-12, 1:29-43, 2:65-67, 10:31-37;

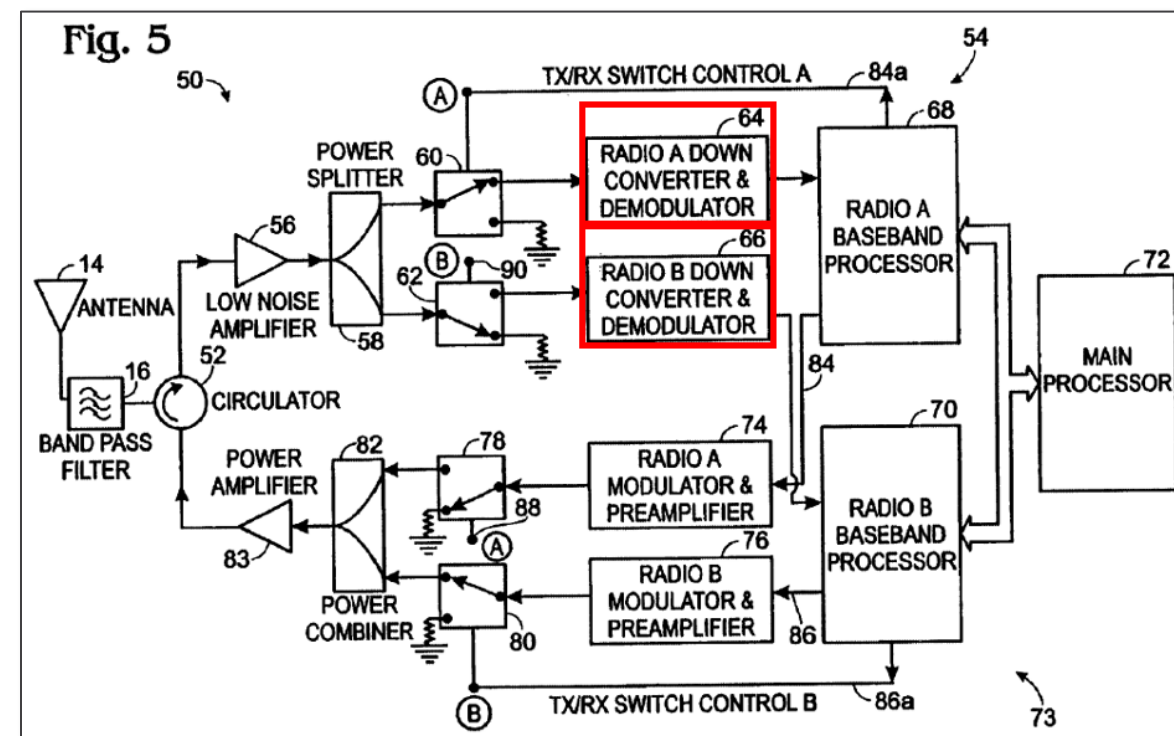
(57) ABSTRACT

A dual mode RF radio includes a first transceiver operating under a first transmitter/receiver protocol, and having a first receiver portion and a first transmitter portion therein; and a second transceiver operating under a second transmitter/receiver protocol, and having a second receiver portion and a second transmitter portion therein; wherein both transmitter/receiver protocols are spread spectrum protocols; a shared

FIELD OF THE INVENTION

This invention relates to short range wireless communications technologies, such as HomeRF, 802.11 FHSS, and Bluetooth™, and specifically to a method and apparatus to provide a non-desensitizing, non-interfering dual transceiver device for use in such technologies.

Young (EX1003), Abstract, 1:8-12



Young (EX1003), Fig. 5

Federal Circuit law does not require showing bodily incorporation



“The test for obviousness is **not whether the features of a secondary reference may be bodily incorporated** into the structure of the primary reference.”

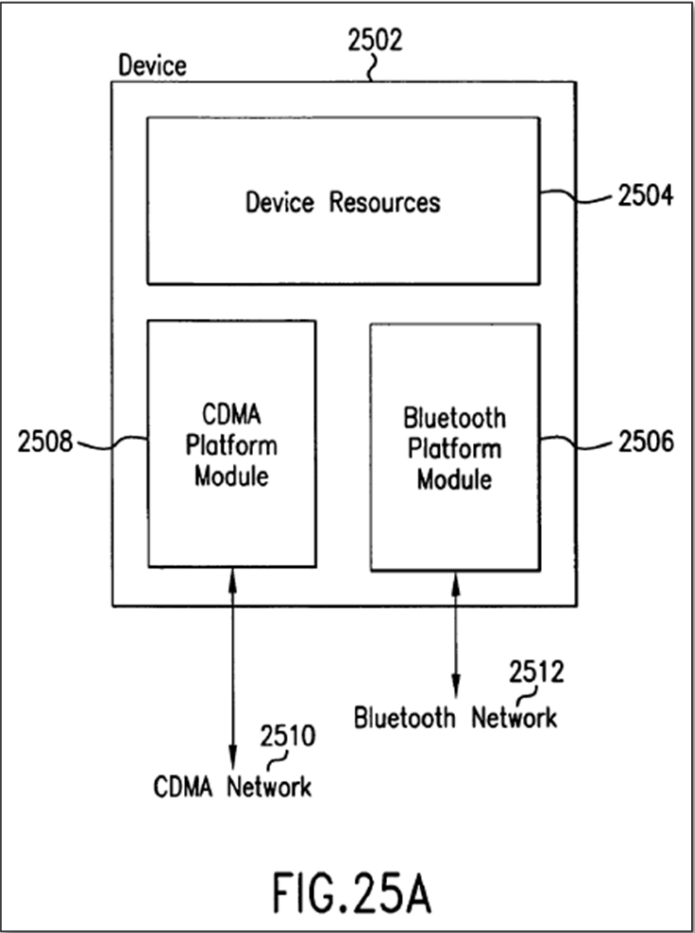
Allied Erecting & Dismantling, LLC, 825 F.3d at 1381, quoting *In re Keller*, 642 F.2d at 425

“The question is whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole... **whether one prior art reference can be incorporated into another is basically irrelevant**”

Uber Techs., 957 F.3d at 1341 (Fed. Cir. 2020), quoting *In re Etter*, 756 F.2d at 859

'686 Patent doesn't show standards compliance under PO's argument in the POR

Feature alleged by ParkerVision to be missing	Taught by '686 Patent spec for:	
	Bluetooth	IEEE 802.11
Sensitivity	X	X
Image rejection	X	X
Error correction	X	X
Protocol-specific modulation	X	X
Automatic gain control	X	X
Interference tolerance	X	X
Dynamic range	X	X



'686 Patent, Fig. 25A

Ground 2B- Young, Estabrook-1988, Estabrook-1989

Ground 2B issues are similar to Ground 2A

- Estabrook-1988 and Estabrook-1989 are chapters of Estabrook-Thesis published as IEEE articles (EX1019, ¶¶ 8-13)
- Ground 2B was presented in Petition as contingency for challenge to public availability of Estabrook-Thesis, but that wasn't disputed (Petition at 91)
- Substantive disputes are identical between Grounds 2A, 2B (PO Response at 89, Reply at 32)

ParkerVision's New Sur-Reply Arguments

New arguments in sur-reply are improper



Patent Trial and Appeal Board
Consolidated Trial Practice Guide
November 2019

Generally, a reply or sur-reply may only respond to arguments raised in the preceding brief. 37 C.F.R. § 42.23, except as noted above. “Respond,” in the context of 37 C.F.R. § 42.23(b), does not mean proceed in a new direction with a new approach as compared to the positions taken in a prior filing. While replies and sur-replies can help crystalize issues for decision, a reply or sur-reply that raises a new issue or belatedly presents evidence may not be considered. The Board is not required to attempt to sort proper from improper portions of the reply or sur-reply.

New arguments raised in PO sur-reply

- “Pulses are the type of signals that have apertures” (Sur-reply 3)
 - See *also* Sur-reply 30: “a sine-wave does not have apertures”
- POSITA wouldn’t look for radar applications to combine with Nevo (Sur-reply 10-13)
 - PO Response argued (at 61) that Avitabile wouldn’t ***meet standard requirements of*** a Bluetooth or Wi-Fi system
 - ***Motivation to combine*** arguments (at 62-64) in POR didn’t mention radar
- Two new motivation to combine arguments regarding Ground 2A
 - Estabrook wouldn’t work in “simultaneous dual mode” configuration (Sur-reply 13)
 - Different operating frequencies (Sur-reply 13-14)

Response to new sur-reply arguments (if considered)

- “A sine-wave does not have apertures” (Sur-reply 30)
- “Aperture” is not a claim term
 - Petition, Larson declaration repeatedly equated “aperture” with “on” time of sampling cycle, including for Estabrook. See Petition 24, 74, 79; EX1002, ¶¶ 254, 256, 368. No rebuttal evidence cited in PO Response, including Ricketts declaration
 - ParkerVision agreed to construe “aperture” as “a period of time during which the claimed switch is in its closed (on) state” in related litigation for a related patent.

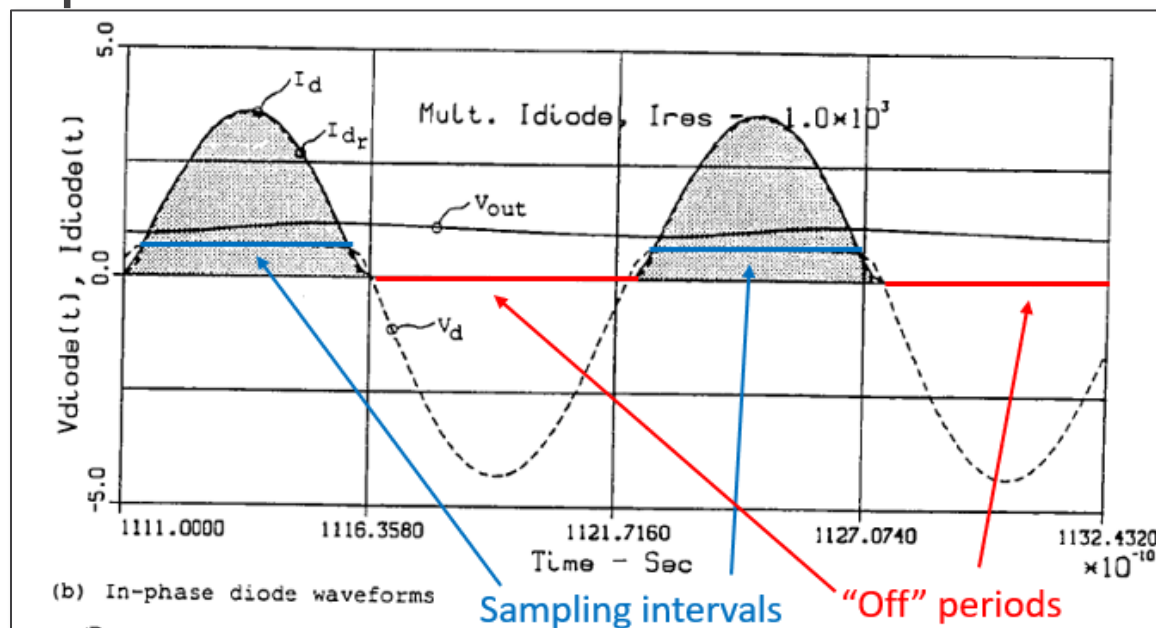
c. Agreed upon claim constructions	
The parties agree on the constructions for the following claim terms and phrases found in the '528 Patent:	
'528 Patent Phrase	Agreed Upon Construction
switch	"an electronic device for opening and closing a circuit"
sampling aperture	"a period of time during which the claimed switch is in its closed (on) state, thereby reducing a continuous-time signal to a discrete-time signal"

EX1050, 28

Response to new sur-reply arguments (if considered)

“a sine-wave does not have apertures” (Sur-reply 30) (cont’d)

- Estabrook’s 50% duty cycle (sampling interval) is a non-negligible aperture



EX1005, Fig. 16(b)
(p. 71)

Response to new sur-reply arguments (if considered)

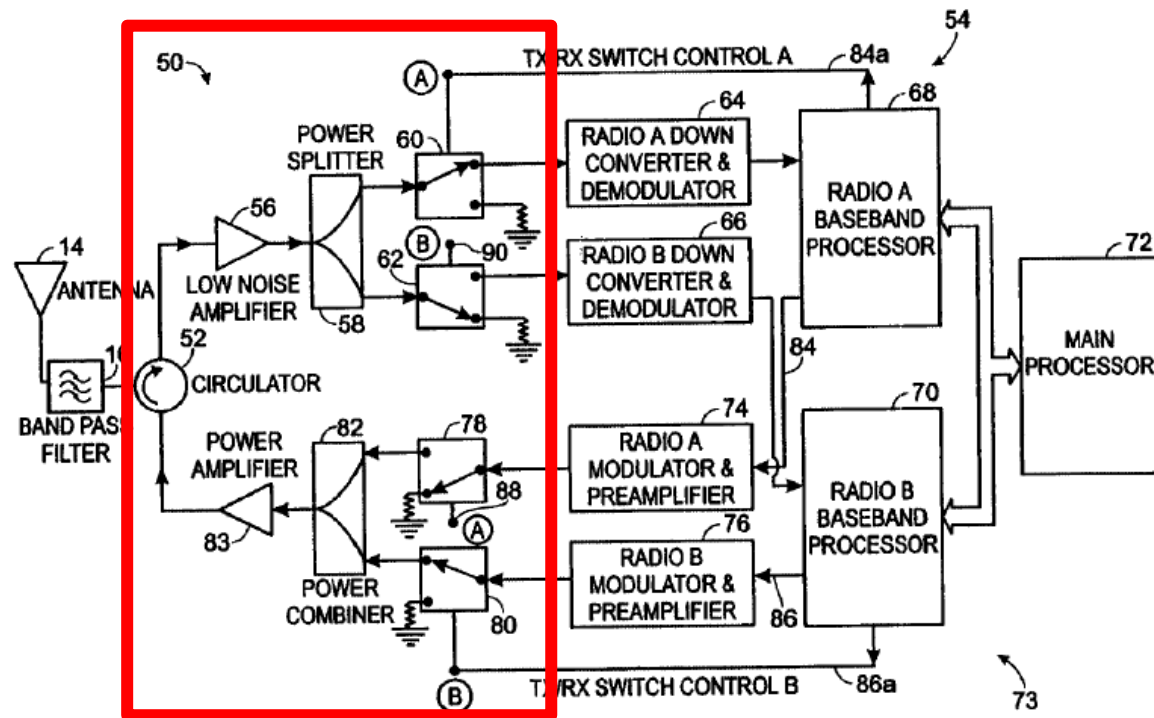
Sur-reply 11: POSITA would not “look specifically to radar-related art— like Avitable — to implement a down-converter in Nevo’s *consumer* wireless applications” (emphasis in original)

- Analogous art includes art “not within the field of the inventor’s endeavor” if “reasonably pertinent to the particular problem with which the inventor is involved. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004)
- Avitable is in the same art field or is analogous. The problem addressed by “frequency translation module” in claims and “down-conversion section” in Nevo is converting a modulated signal from a high frequency to a lower one. Avitable is reasonably pertinent to this problem. Petition at 25-26

Response to new sur-reply arguments (if considered)

Sur-reply at 13: Estabrook wouldn't work in "simultaneous dual mode" configuration

- Young itself teaches the solutions for "simultaneous" operation, including isolation mechanisms (Abstract, Fig. 5, 6:51-55), standard software algorithms (10:20-30)
- Type of down-conversion (e.g. use of Estabrook circuit) irrelevant to this issue



Response to new sur-reply arguments (if considered)

Sur-reply 13-14: Estabrook-Thesis teaches different operating frequency than Young

- Response: POSITA would have known how to modify circuit to meet different operating frequencies
- Frequency translation circuit examples in '686 patent (and '551 Patent) are all in the same input frequency range (~900 MHz) as Estabrook-Thesis
 - '686 Patent, Figs. 53, 55, 57, 11:39-48, 12:1-67, 16:14-18, 27:65-28:2, 29:43-47
 - '551 Patent Figs. 4, 11
 - References to Bluetooth, Wi-Fi do not explain how to modify circuits for these frequencies; assumes a POSITA would know how to do so

Backup slides

Not all disputes apply to all grounds

PO Argument	Whether dispute applies to	
	Ground 1 (Nevo + Avitabile)	Grounds 2A/2B (Young + Estabrook)
2 nd EM signal not “generated from” stored energy	Yes	No
Radar embodiment	Yes	No
“sample-and-hold” vs. “energy transfer system”	Yes	No
Control signal not a “pulse”	No	Yes
Control signal, inputs combined at diode input	No	Yes
Frequencies incompatible with 2.4 GHz standard (first raised in sur-reply)	No	Yes
Down-converter wouldn’t meet standards	Yes	Yes

Dr. Ricketts' "simulations" of Estabrook are irrelevant

- Dr. Ricketts simulated only the down-converter, not the entire receiver
- Dr. Ricketts' simulations did not represent correct criteria for Bluetooth interference standards (Bit Error Rate (BER) with defined signal + interfering inputs)

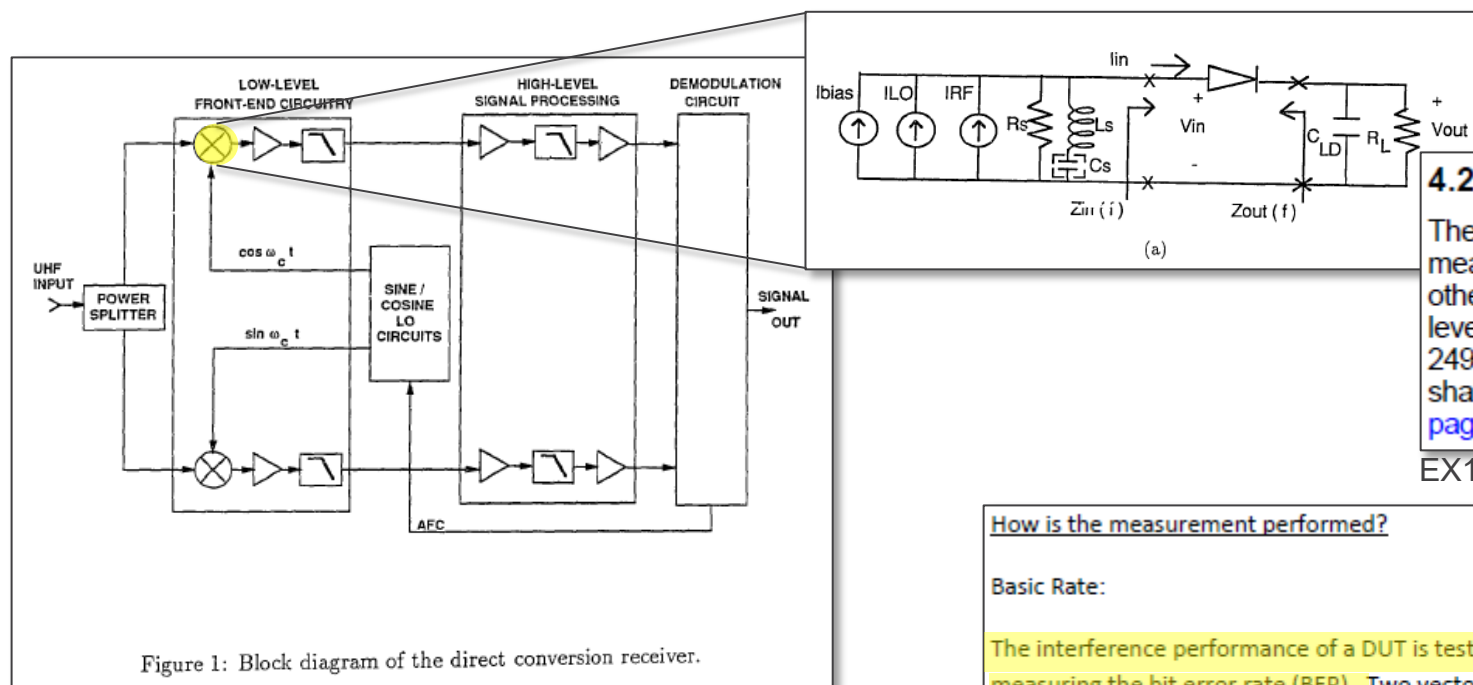


Figure 1: Block diagram of the direct conversion receiver.

EX1005, Figs. 1(p. 25),
13(a) (p. 60)

4.2 INTERFERENCE PERFORMANCE

The interference performance on Co-channel and adjacent 1 MHz and 2 MHz are measured with the wanted signal 10 dB over the reference sensitivity level. On all other frequencies the wanted signal shall be 3 dB over the reference sensitivity level. Should the frequency of an interfering signal lie outside of the band 2400-2497 MHz, the out-of-band blocking specification (see [Section 4.3 on page 25](#)) shall apply. The interfering signal shall be Bluetooth-modulated (see [section 4.8 on page 27](#)). The BER shall be $\leq 0.1\%$. The signal to interference ratio shall be:

EX1055 (Bluetooth Spec. v1.0B, 1999) at 24

How is the measurement performed?

Basic Rate:

The interference performance of a DUT is tested by coupling a signal of interest with an interfering signal and measuring the bit error rate (BER). Two vector signal generators are used to generate the wanted signal and the interfering signal. These signals are combined and sent to the DUT. A schematic of the hardware setup is shown in Figure 49.

EX1056 (Intro to Bluetooth Receiver Testing) at 86

Dr. Ricketts Couldn't Answer Whether he had Checked the Bluetooth Specification for his Simulations

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

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

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

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

Response to PO's attempt to fix lack of disclosure in '686 patent using sur-reply/ Larson deposition

PO's contradictory arguments:

- prior art has to meet exact requirements in standards (POR 60-64, 77-85)
- but it's enough for the '686 patent itself to describe something that generally relates in some way to a general communications principle that's also implicated in Bluetooth/Wi-Fi (Sur-reply 18-21)

Things PO said were missing from prior art that are also missing from '686 patent and its sur-reply laundry list still fails to show:

- Meeting actual sensitivity/interference/dynamic range standards, as opposed to simply having generic features that somehow relate
- Image rejection
- Automatic gain control
- Error correction
- Protocol-specific modulation

Response to PO's attempt to fix lack of disclosure in '686 patent using sur-reply/ Larson deposition

Example of sur-reply characterization vs. actual testimony:

- Sur-reply at 20: "Larson admits that these formulas can cover Wi-Fi/Bluetooth frequencies"
- Patent Citation ('686 Patent, 11:38-12:67, e.g. 11:39-47):

For example, to down-convert a 901 MHZ input signal to a 1 MHZ IF signal, the frequency of the control signal 2006 would be calculated as follows:

$$\frac{(Freq_{input}-Freq_{IF})}{n}=Freq_{control}(901\text{ MHZ}-1\text{ MHZ})/n=900/n$$

For n=0.5, 1, 2, 3, 4, etc., the frequency of the control signal 2006 would be substantially equal to 1.8 GHz, 900 MHZ, 450 MHZ, 300 MHZ, 225 MHZ, etc.

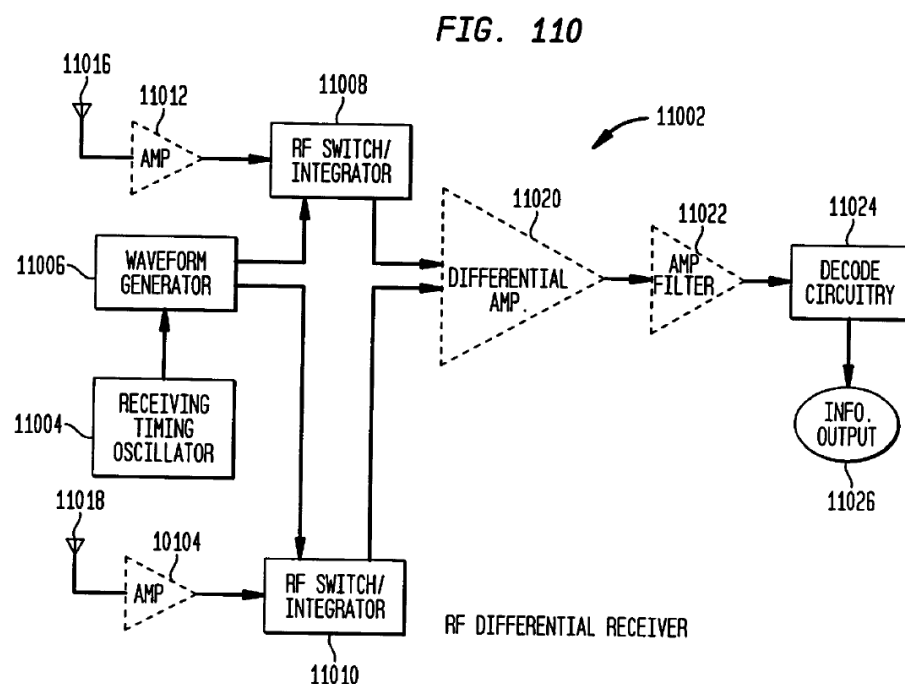
Testimony omitted from cite: EX2013, 43:9-19:

9 Q Right. And they're -- that column and
10 line number is teaching frequencies that fall
11 within the WiFi and Bluetooth standards. Correct?
14 A Well, no, actually. The -- I think
15 they're referring to a 900 megahertz input,
16 roughly. And Bluetooth is a 2.4. And WiFi is at,
17 you know, 2.4 and 5. And so I think these are
18 certainly not Bluetooth frequencies, and I don't
19 think they're WiFi frequencies either.

PO's New Specification Excerpts Are Inapposite

PO Assertion: "...the '551 patent provides capacitor values to use (e.g. 18 pF) and teaches using an amplifier/filtering stage after a switch/capacitor to provide *"additional receiver sensitivity, bandwidth control, or signal conditioning."* Sur-Reply 18-19.

Patent excerpts cited:



EX1008, Fig. 110

In an energy transfer environment, the storage module, illustrated in FIG. 82 as a storage capacitance 8208, preferably has the capacity to handle the power being transferred, and to allow it to accept a non-negligible amount of power during a non-negligible aperture period. This allows the storage capacitance 8208 to store energy transferred from the input EM signal 8204, without substantial concern for accurately reproducing the original, unaffected voltage level of the input EM signal 8204. For example, in an embodiment, the storage capacitance 8208 has a value in the range of 18 pF. Other suitable capacitance values and storage modules can be used.

EX1008, 67:14-24

An optional Amplifier/Filter stage or stages 10104 and 10112 may be included to provide additional receiver sensitivity, bandwidth control or signal conditioning for the Decode Circuitry 10114. Choosing an appropriate time base

EX1008, 113:56-58

PO's New Specification Excerpts Are Inapposite

PO Assertion: "...the '551 teaches the use of differential input/output configurations and pulse signals designed to avoid *interference*." Sur-reply 19.

Patent excerpts cited:

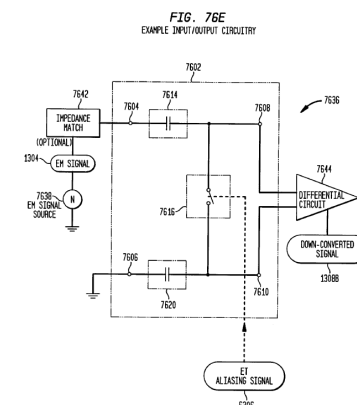
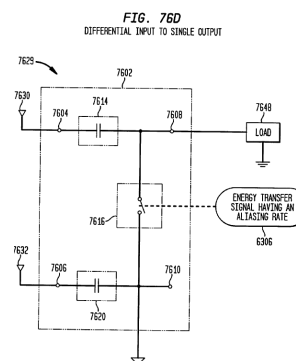
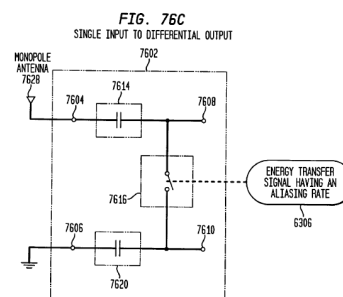
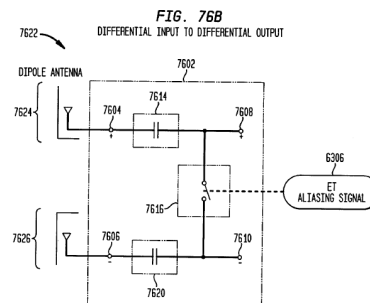
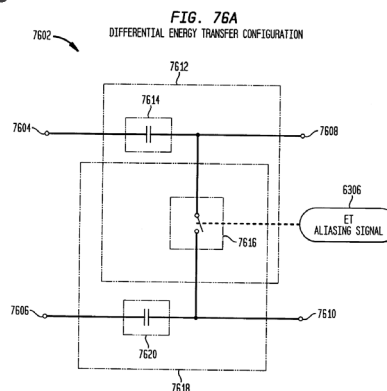
5.2 Differential Implementations

The invention can be implemented in a variety of differential configurations. Differential configurations are useful for reducing common mode noise. This can be very useful in receiver systems where common mode interference can be caused by intentional or unintentional radiators such as cellular phones, CB radios, electrical appliances etc. Differ-

EX1008, 103:1-7

FIGS. 106–109 illustrate different pulse output signals **10602** and **10802** and their respective frequency domain at **10702** and **10902**. As can be seen from FIGS. 106 and 107, the half-cycle signal **10602** generates a spectrum less subject to interference than the single cycle of FIG. 99 and the 10-cycle pulse of FIG. 108. The various outputs determine

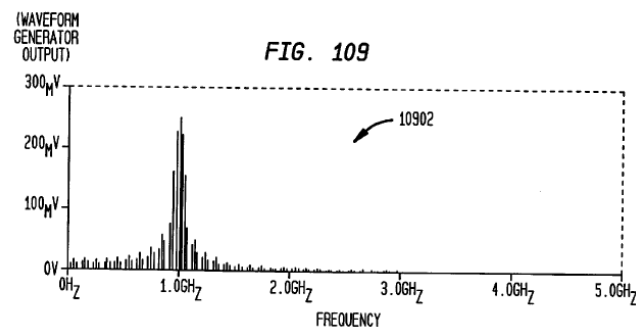
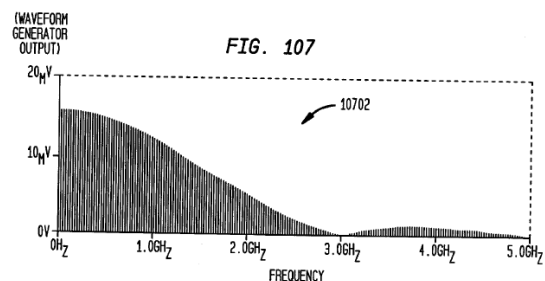
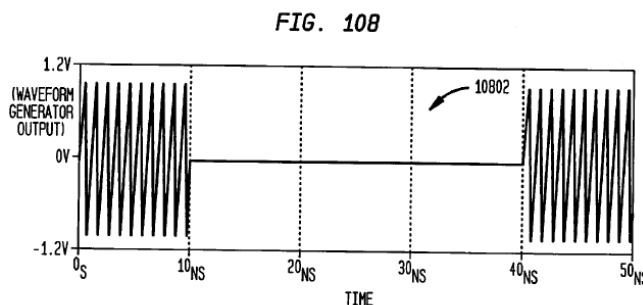
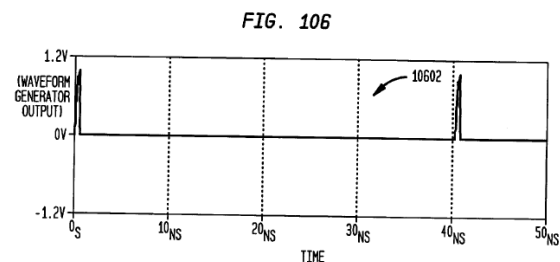
EX1008, 114:1-6



PO's New Specification Excerpts Are Inapposite

PO Assertion: "...the '551 teaches the use of differential input/output configurations and pulse signals designed to avoid *interference*." Sur-reply 19.

Patent excerpts cited:



EX1008, Figs. 106-109

PO's New Specification Excerpts Are Inapposite

PO Assertion: “.... the '686 patent provides *formulas* for calculating the frequency of the control signal based on the frequency of the input signal.” Sur-reply 20.

Patent excerpts cited: '686 Patent, 11:38-12:67, e.g. 11:39-47

For example, to directly down-convert a 900 MHz input signal to a demodulated baseband signal (i.e., zero IF), the frequency of the control signal **2006** would be calculated as follows:

$$(Freq_{input}-Freq_{IF})/n=Freq_{control}(900\text{ MHz}-0\text{ MHz})/n=900\text{ MHz}/n$$

For $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** should be substantially equal to 1.8 GHz, 900 MHz, 450 MHz, 300 MHz, 225 MHz, etc.

Exemplary time domain and frequency domain drawings, illustrating direct down-conversion of analog and digital AM and PM signals to demodulated baseband signals, and exemplary methods and systems thereof, are disclosed in the co-pending U.S. patent application entitled “Method and System for Down-converting Electromagnetic Signals,” Ser. No. 09/176,022, issued as U.S. Pat. No. 6,061,551.

Alternatively, to down-convert an input FM signal to a non-FM signal, a frequency within the FM bandwidth must be down-converted to baseband (i.e., zero IF). As an example, to down-convert a frequency shift keying (FSK) signal (a subset of FM) to a phase shift keying (PSK) signal (a subset of PM), the mid-point between a lower frequency F_1 and an upper frequency F_2 (that is, $(F_1+F_2)/2$) of the FSK signal is down-converted to zero IF. For example, to down-convert an FSK signal having F_1 equal to 899 MHz and F_2 equal to 901 MHz, to a PSK signal, the aliasing rate of the control signal **2006** would be calculated as follows:

$$\begin{aligned}\text{Frequency of the input} &= (F_1 + F_2) / 2 \\ &= (899\text{ MHz} + 901\text{ MHz}) / 2 \\ &= 900\text{ MHz}\end{aligned}$$

Frequency of the down-converted signal=0 (i.e., baseband)

$$(Freq_{input}-Freq_{IF})/n=Freq_{control}(900\text{ MHz}-0\text{ MHz})/n=900\text{ MHz}/n$$

For $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** should be substantially equal to 1.8 GHz, 900 MHz, 450 MHz, 300 MHz, 225 MHz, etc. The frequency of the down-converted PSK signal is substantially equal to one half the difference between the lower frequency F_1 and the upper frequency F_2 .

As another example, to down-convert a FSK signal to an amplitude shift keying (ASK) signal (a subset of AM), either the lower frequency F_1 or the upper frequency F_2 of the FSK signal is down-converted to zero IF. For example, to down-convert an FSK signal having F_1 equal to 900 MHz and F_2 equal to 901 MHz, to an ASK signal, the aliasing rate of the control signal **2006** should be substantially equal to:

$$\begin{aligned}(900\text{ MHz}-0\text{ MHz})/n &= 900\text{ MHz}/n, \text{ or} \\ (901\text{ MHz}-0\text{ MHz})/n &= 901\text{ MHz}/n.\end{aligned}$$

For the former case of 900 MHz/ n , and for $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** should be substantially equal to 1.8 GHz, 900 MHz, 450 MHz, 300 MHz, 225 MHz, etc. For the latter case of 901 MHz/ n , and for $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** should be substantially equal to 1.802 GHz, 901 MHz, 450.5 MHz, 300.333 MHz, 225.25 MHz, etc. The frequency of the down-converted AM signal is substantially equal to the difference between the lower frequency F_1 and the upper frequency F_2 (i.e., 1 MHz).

For example, to down-convert a 901 MHz input signal to a 1 MHz IF signal, the frequency of the control signal **2006** would be calculated as follows:

$$(Freq_{input}-Freq_{IF})/n=Freq_{control}(901\text{ MHz}-1\text{ MHz})/n=900\text{ MHz}/n$$

For $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** would be substantially equal to 1.8 GHz, 900 MHz, 450 MHz, 300 MHz, 225 MHz, etc.

For example, to down-convert a 901 MHz input signal to a 1 MHz IF signal, the frequency of the control signal **2006** would be calculated as follows:

$$(Freq_{input}-Freq_{IF})/n=Freq_{control}(901\text{ MHz}-1\text{ MHz})/n=900\text{ MHz}/n$$

For $n=0.5, 1, 2, 3, 4$, etc., the frequency of the control signal **2006** would be substantially equal to 1.8 GHz, 900 MHz, 450 MHz, 300 MHz, 225 MHz, etc.

Exemplary time domain and frequency domain drawings, illustrating down-conversion of analog and digital AM, PM and FM signals to IF signals, and exemplary methods and systems thereof, are disclosed in co-pending U.S. patent application entitled “Method and System for Down-converting Electromagnetic Signals,” Ser. No. 09/176,022, issued as U.S. Pat. No. 6,061,551.

Alternatively, when the aliasing rate of the control signal **2006** is substantially equal to the frequency of the input signal **2004**, or substantially equal to a harmonic or sub-harmonic thereof, input signal **2004** is directly down-converted to a demodulated baseband signal. This is because, without modulation, the under-sampling pulses occur at the same point of subsequent cycles of the input signal **2004**. As a result, the under-samples form a constant output baseband signal. If the input signal **2004** includes lower frequency changes, such as amplitude, frequency, phase, etc., or any combination thereof, the charge stored during associated under-samples reflects the lower frequency changes, resulting in similar changes on the demodulated baseband signal.

PO's New Specification Excerpts Are Inapposite

PO Assertion: “.... the patent also explains how to achieve *frequency selectivity* before down-conversion using the apparent filter of the patented receiver.” Sur-reply 20.

Patent excerpts cited: '686 Patent, 27:17-24,
27:62-28:2

FIG. 17 is a conceptual block diagram of a UDF module 1702 according to an embodiment of the present invention. The UDF module 1702 performs at least frequency translation and frequency selectivity. 20

The effect achieved by the UDF module 1702 is to perform the frequency selectivity operation prior to the performance of the frequency translation operation. Thus, the UDF module 1702 effectively performs input filtering.

'686 Patent, 27:17-24

The UDF module 1702 of the present invention includes a number of advantages. For example, high selectivity at high frequencies is realizable using the UDF module 1702. This feature of the invention is evident by the high Q factors that are attainable. For example, and without limitation, the UDF 65 module 1702 can be designed with a filter center frequency f_c on the order of 900 MHz, and a filter bandwidth on the order of 50 KHz. This represents a Q of 18,000 (Q is equal to the center frequency divided by the bandwidth).

'686 Patent, 27:62-28:2

PO's New Specification Excerpts Are Inapposite

PO Assertion: “.... the patent discloses the use of “tank circuitry to *improve [down]conversion efficiency*” and input impedance matching to *filter out unwanted signals and maximize power/energy transfer and improve efficiency.*” Sur-reply 20-21.

Patent excerpts cited: '686 Patent, 15:20-23, 16:25-28, 16:30-32, 21:32-33, 21:40-43, Fig. 60A

is 2K ohm and the desired load to be driven is 50 ohms). An additional benefit of impedance matching is that filtering of unwanted signals can also be accomplished with the same components.

'686 Patent, 15:20-23

25 tank2 with little attenuation. The effect of tank1 and tank2 is to further separate the input and output signals from the same node thereby producing a more stable input and output impedance. Capacitors 6018 and 6040 act to store the 50 MHz output signal energy between energy transfer pulses.

30 Further energy transfer optimization is provided by placing an inductor 6010 in series with a storage capacitor 6012 as shown. In the illustrated example, the series resonant frequency of this circuit arrangement is approximately 1 GHz.

'686 Patent, 16:25-33

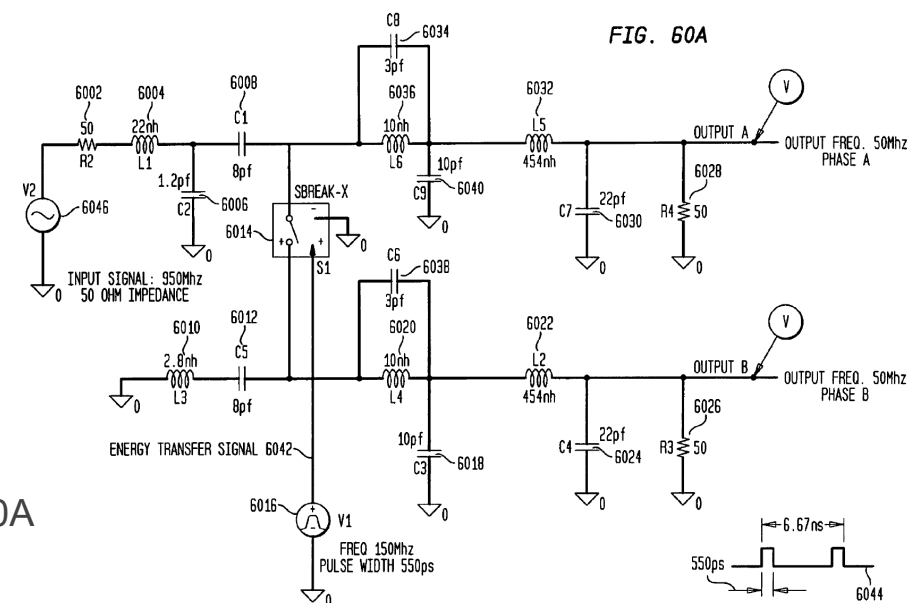
101.1 MHz clock. The circuit has additional tank circuitry to improve conversion efficiency.

'686 Patent, 21:32-33

FIG. 57 is a schematic diagram of an exemplary circuit to down-convert a 915 MHz signal to a 5 MHz signal using a 101.1 MHz clock. The circuit has switch bypass circuitry to improve conversion efficiency.

'686 Patent, 21:40-43

'686 Patent, Fig. 60A



Dr. Larson's deposition testimony cited in sur-reply describes general principles of wireless communication systems

Q And bandwidth control relates to WiFi or Bluetooth. Right?

A Yeah, it would -- it would relate to any communication system at all. WiFi and Bluetooth are great examples.

EX2013, 14:22-15:5

Q And signal conditioning also relates to WiFi and Bluetooth standards. Correct?

A Yeah. And once again, you know, any communications, any wireless communication systems will have signal conditioning. Bluetooth and WiFi are examples.

EX2013, 16:15-22

Q In the context of WiFi and Bluetooth, what is sensitivity?

A Yeah, sensitivity in a -- in a WiFi and Bluetooth is just the received signal level at the input that achieves the desired performance specification, which is usually a bit error rate performance.

EX2013, 56:15-22

Q In the context of WiFi and Bluetooth, what is distortion?

A Well, distortion is another wireless concept that is universal for all wireless systems. It's important for all wireless systems. And basically distortion is -- you know, it's almost self-explanatory. It's an error or a distortion of the input signal.

EX2013, 64:10-18

Q And what does high selectivity at high frequencies mean in the context of the '686 patent?

A Well, you know, like any wireless system, this is describing a very, very standard requirement that's, you know, been known for decades. That for high frequencies like in wireless systems, you want them to have high selectivity, you want them to accept the desired frequencies and reject the undesired frequencies.

Q Right. And that's applicable also to WiFi and Bluetooth standards. Correct?

A Yes, this is well known to be applicable. The high selectivity at high frequencies is very, very well known and applicable to WiFi and Bluetooth, among a million others.

EX2013, 48:7-49:2

Relationship between ParkerVision patents cited in papers

