

Case IPR2014-00809
Patent 7,265,792

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SILICON LABORATORIES, INC.
Petitioner

v.

CRESTA TECHNOLOGY CORPORATION
Patent Owner

Case IPR2014-00809
Patent 7,265,792

**DECLARATION OF ION E. OPRIS, PH.D.
REGARDING THE VALIDITY OF US PATENT NO. 7,265,792**

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DECLARATION OF ION E. OPRIS PH.D.

I, Ion E. Opris Ph.D., hereby declare, affirm and state the following:

I. INTRODUCTION

1. I have been retained by Cresta Technology Corporation for this *inter partes* review proceeding. I understand that this Declaration is being submitted along with a Patent Owner's Response to the Petition for *inter partes* review of US Patent No. 7,265,792 ("the '792 patent"). I opine only with respect to certain issues that are discussed in this declaration. By doing so, however, I do not necessarily agree with other positions taken by Silicon Laboratories, Inc. (the "Petitioner") that I do not address here.

II. RESOURCES CONSULTED

2. I have reviewed the '792 patent, including claims 1-17. I have also reviewed the Petition for Inter Partes Review (Paper No. 1) filed with the U.S. Patent and Trademark Office ("Office") by Petitioner on May 23, 2014. I have also reviewed the Thomson reference (Exhibit 1004), the Harris reference (Exhibit 1005), the Kerth reference (Exhibit 1011) and the Declaration of Douglas Holberg (Exhibit 1009). I have also reviewed the Board's decision to institute inter partes review in IPR2014-00728 (Paper No. 9, the "Decision") of October 24, 2014 and the Board's decision on the Motion to Correct Petition and to Modify Decision to Institute inter partes review in IPR2014-00697 (Paper 28) of November 26, 2014.

3. I understand that in this proceeding, the Board instituted review of the ‘792 patent on the following grounds:

(1) obviousness of claims 1, 2, 4, 10 and 11 over Thomson and Harris;

(2) obviousness of claims 5 and 6 over Thomson, Harris and Cirrus

Logic;

(3) obviousness of claims 7 and 12 over Thomson, Harris and Kerth;

(4) obviousness of claims 13-17 over Thomson, Harris, Kerth and

Oku;

(5) obviousness of claims 8 and 9 over Thomson, Harris, Kerth and

Cirrus Logic; and

(6) obviousness of claim 3 over Thomson, Harris and Gunter.

I have reviewed the exhibits and other documentation supporting the Petition that are relevant to the Decision.

III. BACKGROUND, QUALIFICATIONS AND COMPENSATION

4. I received a Ph.D. in Electrical Engineering from Stanford University, Stanford, CA in 1996. I also hold an M.S. in Electrical Engineering from Stanford University, Stanford, CA in 1996 and a Diploma of Engineer with highest honors from Bucharest Polytechnic Institute, Romania in 1986. My curriculum vitae is being submitted together with this report as Appendix A.

5. Since June 1996, I have been employed as an independent consultant at Opris Consulting designing analog, mixed-mode and ASIC IC devices, specializing in high performance analog to digital converters (pipelined and sigma-delta) and communications circuits (CMOS synthesizers, switched cap filters, and RF receivers).

6. I have completed over 100 design projects for extremely low power sensors read-out circuitry, ultrasonic imaging, audio/video interface products, CCD and CMOS light sensors, wired and RF data communications (DSL, Ethernet, RFID, Wi-Fi), MEMS accelerometers, gyroscopes, and MEMS based displays.

7. From April 2010 to October 2010, I was the Vice President of Product Design at MCube, Inc and from September 2009 to April 2010 I was also the Senior Director of IC Design responsible for the CMOS and MEMS design of MEMS base accelerometers and magnetic sensors.

8. From June 1994 to October 1997, I was a Principal Design Engineer at National Semiconductor Corp. responsible for system architecture and analog/digital circuit design for high speed/high resolution A/D converters, mixed-mode A/D, ASICs, and complex behavioral simulations. I released to production designs for a family of high performance 12-bit A/D converters.

9. From September 1990 to December 1995, I have also worked as a research assistant at Stanford University enrolled as a PhD candidate in Electrical

Engineering conducting research in the areas of analog to digital converters, analog nonlinear circuits and nonlinear control as well as low power/low noise amplifiers and continuous time filters for biological data acquisition.

10. From April 1989 to August 1990, I was a Design Engineer at Core International, Boca Raton, FL designing DMA adapters for tape drives, hard disk drives.

11. From 1991 to present, I have had various consulting jobs in hardware design/firmware with applications in RF data communication and spread spectrum technology.

12. Several projects with relevant experience in TV and data communication over RF include as follows. In mid. '80s I worked on a data communication systems in the 10.7 GHz band within a university research program. In early '90s I worked for Voyager Technologies Inc., on a security system with data communication in the unlicensed 928 MHz spread spectrum band. In late '90s I worked for BLSI, Inc., for an RFID system. Also in mid. to late '90s I worked for JPL, Pasadena, CA in a deep space communication program. In early '00s I developed a complex (I+Q) analog filter for Bluetooth application for Alameda Engineering Inc. In early '00s I was the principal designer for the analog section of the super video decoder developed by Trident Microsystems. In mid. to late

'00s I developed a family of video decoders for Miktam Technology Inc. and later for Pericom Inc.

13. I was ranked 2nd at the PhD Qualification Examination at Stanford University in January 1991 and awarded a School of Engineering Fellowship at Stanford University in 1990-1991.

14. I was ranked 1st in 1983, 1984, 1985, and 2nd in 1986 at the Romanian National Electronics Engineering contest. This is a highly competitive contest that is open to all undergraduate students in the country which tests both theoretical and practical skills.

15. I have been awarded over 58 US and international patents and I have authored over 30 technical papers.

Some relevant patents are:

- "High sensitivity RFID TAG integrated circuit", US 20070046369, May 2007.
- "Image processing method and analog front end", US Pat. No. 7,375,665, May 20, 2008.
- "High linearity gmC filter", US Pat. No. 7,760,012, July 20, 2010.
- "Signal Channel Balancing", US Pat. No. 7,986,923, July 26, 2011.
- "Multi-phase digital phase-locked loop device for pixel clock reconstruction", US Pat. No. 8,502,581, August 6, 2013.

16. I am being compensated for my time at my standard hourly rates in connection with this proceeding. My compensation is in no way contingent upon my performance or the outcome of this case.

IV. LEVEL OF ORDINARY SKILL IN THE ART

17. I have been informed by counsel that a person of ordinary skill in the art is a hypothetical person who is presumed to have known all of the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field. I have been informed by counsel that it is from the viewpoint of a person of ordinary skill in the art that issues, such as claim construction and obviousness, are determined.

18. In my opinion and based on my reading of the '792 patent, the field of the '792 patent is television receivers.

19. A person of ordinary skill in the art (POSITA) at the time of the inventions would have at least a Bachelor of Science degree in Electrical Engineering plus at least two years of professional experience in implementing receiver circuits for television applications or similar circuits.

A POSITA at the time of the invention of '792 patent would be familiar with: 1) fundamental RF circuit design concepts, e.g. heterodyne, superheterodyne, tuner, baseband, intermediate frequency, 2) fundamental RF television circuit design criteria, e.g. sensitivity, signal-to-noise ratio, linearity, 3) the required signal-to-noise ratio for an analog TV tuner, and 4) basic usage of the Cadence design platform (the most widespread RF integrated circuit design tool). A POSITA at the time of the invention of '792 patent would be to understand aliasing problems due to sampling and be able to explain how subsampling works in order to avoid anti-aliasing in RF television circuits.

20. The '792 patent has a filing date of July 1, 2004. I understand that the date of the document in Exhibit 2004 is 09/23/2010 and the date of the document in Exhibit 2005 is 08/18/2011. Exhibit 2008, page 6 shows 08/18/2011 as the date of update for the document in Exhibit 2005. Exhibits 2004 and 2005 show that at least 6 years after the time of the '792 invention, Petitioner recognized some of the same challenges faced by a POSITA in designing television receivers at the time of the '792 filing. The Petitioner recognized that designing television receivers must achieve clear TV broadcast reception that demand unique design requirements for television applications. Ex 2005, p4-5. The keys to achieving clear TV broadcast reception are sensitivity (the ability to have an ample video signal-to-noise ratio even with weak input signal to correctly receive the broadcast) and selectivity (the

ability to block or exclude content on nearby “blocker” channels). Ex. 2005, p4.

To achieve these two characteristics, the Petitioner states that a TV receiver must have a low noise figure, high RF front-end linearity and high quality RF front-end filtering. *Id.* Petitioner points out that in order to achieve high selectivity, a tuner needs both high linearity and high quality filtering in the RF front end. *Id.*

Because of these unique design requirements, in my opinion, a POSITA would have at least two years of professional experience in implementing receiver circuits for television applications or similar circuits.

21. My opinion regarding the level of ordinary skill in the art for the ‘792 patent is based on my review of the patent and relevant file history, as well as my knowledge of the level of skill of individuals in this field. In forming my opinions, I have also considered the educational background and work history of the named inventors, the nature of problems that the ‘792 patent was intended to solve, and the education level of active professionals in the field.

22. According to the description above, I possess at least the ordinary skill in the art and did so at the time of the inventions claimed in the ‘792 patent. I am familiar with the knowledge, experience, and creativity of such a person of ordinary skill in the art of the ‘792 patent during the relevant time period.

I have also reviewed the transcript of Dr. Holberg's examination. Dr. Holberg lacks ordinary skill in the art of the invention, and thus is not qualified to

provide an opinion on any issues in this IPR. Dr. Holberg admitted in his deposition that he lacks critical knowledge and experience of a person of ordinary skill, including: (1) Dr. Holberg has no experience in designing radio-frequency circuits in general or radio-frequency circuits for television applications: no RF IC experience at all (Ex. 2048, p24:6-8, p24:24-p25:2, p33:7-17); no RF experience while at Silicon Labs (Ex. 2048, p16:10-13); 2) Dr. Holberg lacks an understanding of some fundamental RF concepts: low-IF (Ex. 2048, p153:15-p154:14); superheterodyne (Ex. 2048, p25:8-9), tuner (Ex. 2048, p27:6-10), baseband (Ex. 2048, p28:8-13), and he incorrectly relates the definition of the unit of power “dBm” to a certain impedance (Ex. 2048, p59:2-5); 3) None of Dr. Holberg’s patents are directed to television receivers (Ex. 2048, p36:5-p39:1; Ex. 2049, p300:20-301:12); 5) Dr. Holberg is not familiar with fundamental RF television circuit design criteria, e.g. sensitivity, signal-to-noise ratio, linearity (Ex. 2048, p48:5-p51:20; p58:13-16); 6) Dr. Holberg is not familiar with fundamental RF integrated circuit design tools such as Cadence: Dr. Holberg did not know how to launch the Cadence tool or that the color of the wires are light blue (Ex. 2048, p65-p67); and 7) Dr. Holberg could not explain how subsampling works or how it is being used by the Thompson reference (Ex. 2048, p87-p101). Accordingly, a person skill in the art would not give any weight to Dr. Holberg's declaration, and neither should the Board.

V. RELEVANT LEGAL STANDARDS

23. I am not a lawyer and do not purport to offer legal opinions. In forming my opinions, however, I have been asked to apply certain standards regarding patent validity that have been provided to me by CrestaTech's counsel.

24. I understand that for purposes of this IPR the terms in the claims of the '792 patent are to be given their broadest reasonable interpretation in light of the specification of the '792 patent, as understood by one of ordinary skill in the art as of the earliest possible priority date of the '792 patent.

A. Anticipation

25. I have been informed that a patent claim is anticipated when a single piece of prior art describes all of the claim limitations either expressly or by inherent disclosure. I have been informed that a reference that does not expressly disclose a claim limitation may inherently disclose that limitation if the missing limitation is necessarily present in the reference. I have been informed that the disclosure must show that the natural result flowing from the operation of the system or method disclosed in the reference necessarily results in the performance of the claim limitations. Standards for anticipation that may be relevant are reproduced below as I understand them: (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the application for patent, (b) the

invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than a year prior to the date of the application for patent in the United States, and (c) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent.

26. I understand that when a party attacking the validity of patent relies on prior art which was specifically considered by the patent examiner during the prosecution of the application leading to the issuance of the patent, that party bears the burden of overcoming the deference due a qualified government agency official presumed to have performed his or her job.

B. Obviousness

27. It is my understanding that a claim is invalid for obviousness under 35 U.S.C. §103 if two or more prior art references in combination disclose, expressly or inherently, every claim limitation so as to render the claim, as a whole, obvious. In determining whether or not a patented invention would have been obvious, the following factors should be considered: (a) the scope and content of the prior art; (b) the differences between the prior art and the claims at issue; (c) the level of ordinary skill in the art; and (d) whatever “secondary considerations” may be present.

28. I understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. But multiple prior art references or elements may, in some circumstances, be combined to render a patent claim obvious. I understand that I should consider whether there is an “apparent reason” to combine the prior art references or elements in the way the patent claims. Requiring a reason for the prior art combination protects against the distortion caused by hindsight. Along the same lines, one cannot use the ‘792 patent as a blueprint to piece together the prior art in order to combine the right ones in the right way as to create the claimed invention. To determine whether such an “apparent reason” exists to combine the prior art references or elements in the way a patent claims, it will often be necessary to look to the interrelated teachings of multiple patents, to the effects of demands known to the design community or present in the marketplace, and to the background knowledge possessed by a person having ordinary skill in the art.

29. I also understand that when the prior art “teaches away” from combining prior art references or certain known elements, discovery of a successful means of combining them is less likely to be obvious. A prior art reference may be said to “teach away” from a patent when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the patent or

would be led in a direction divergent from the path that was taken by the patent. Additionally, a prior art reference may “teach away” from a claimed invention when substituting an element within that prior art reference for a claim element would render the claimed invention inoperable.

30. I understand that certain “secondary considerations” may be relevant in determining whether or not an invention would have been obvious, and that these secondary considerations may include commercial success of a product using the invention, if that commercial success is due to the invention; long-felt need for the invention; evidence of copying of the claimed invention; industry acceptance; the taking of licenses under the patents by others; initial skepticism; failure of others; and praise of the invention.

31. I am also informed that a mere assertion, without explanation, that a claim fails under 35 U.S.C. §§ 101, 102, 103, or 112 is insufficient to overcome the strong presumption in favor of a patent’s validity. 35 U.S.C. § 282.

VI. BACKGROUND OF THE INVENTION

32. Unlike AM/FM radio stations which employ fairly uniform worldwide standards as to their technical parameters—such as frequency range and bandwidth of each radio station’s signal—television stations in different countries tend to have different technical parameters. More than a dozen different analog television formats have existed in different countries, as well as numerous different digital

formats. Most of these formats are incompatible with each other. Even the two most popular analog TV formats, NTSC in the U.S. and PAL/SECAM in Europe, were incompatible with each other, with NTSC having 525 horizontal lines refreshed at 59.94 times/sec, while PAL/SECAM had 625 lines refreshed at 50 lines/sec.

33. Until recent years, this has been a problem for television receiver manufacturers because those manufacturers have historically been forced to build and distribute numerous different versions of televisions receivers—one for each format—depending on where the television receiver was intended to be used and the applicable transmission standard. As a result, end-users paid higher costs for televisions because the television manufacturers could not take advantage of the economics of scale that could be afforded by a single universal receiver.

34. As a result, there was a need in the industry for a universal television receiver that had the following characteristics: small, relatively inexpensive, and reliable so as to be accepted by manufacturers of television sets around the world. A universal television receiver also had to have good performance. Unlike AM/FM radios where interference can be an occasional nuisance, television interference can cause the picture to be unacceptably poor.

35. Television receivers have unique characteristics. First, the bandwidths of television signals are often a thousand times wider than audio signals’

bandwidths (~6 MHz vs. 5kHz). This means that the data rates that have to be processed are substantially higher, which translates to higher power consumption. Second, the RF frequency range of televisions spans a very wide range (from a few tens of MHz to a few hundred MHz).

36. As a result, the television industry needed a receiver system design that would take into account all of the mutually conflicting requirements of various transmission standards for television signals, technological and operational constraints, and deliver the necessary performance.

37. Such a design would have to overcome legacy technological barriers. For example, there was a near-universal custom of having a fixed IF center frequency. The benefit of standardization of a fixed IF was more than offset by the benefit of a software-configurable IF value which could be adjusted in different local environments to help mitigate interference from strong local interferers. These benefits are reflected in the '792 patent, in fact, which states that “[t]he value of the IF in an integrated tuner is a matter of design choice.” Ex. 1001 at 5:10-12.

38. Since the RF frequencies of many television stations are too high for one to digitize the signals at RF in a cost-effective manner, the signals must be “downconverted” to a lower intermediate frequency (IF) at which those signals can be easily and economically digitized. Also, frequency-selective filtering of signals

is much easier to implement at lower frequencies than at higher frequencies; if, for example, one wanted to receive a signal occupying the 100-106 MHz band and to filter out a signal at, say, 106.1 MHz, one would have needed to create a filter at around 100 MHz that would be accurate to roughly within 0.1MHz, i.e. to within 0.1%. If, however, that same signal was first downconverted to occupy the “intermediate frequency” between 4 and 10 MHz (still keeping its 6 MHz bandwidth), then the interfering signal would also move down to 10.1 MHz and filtering that out would require a filter with an accuracy of only approx. 1% accuracy instead of 0.1% accuracy. This downconversion has almost always been implemented with “mixers” of various kinds, all of which basically perform the mathematical function of multiplying the input RF signal with a locally generated one inside the receiver. The output is a signal at the difference between those two input signals. The output also includes an unwanted signal at the sum of the two input signal frequencies. This unwanted signal, often called an “image” can be filtered out. If one were to use analog technology, filtering the image out traditionally required using a bulky and relatively expensive physical filter. A universal television tuner, therefore, would need to employ an alternative approach to avoid duplicating bulky components such as SAW filters.

39. There are numerous different approaches to the process of downconversion (e.g. single vs. double or triple conversion, super heterodynes vs.

direct conversion, simple vs. double-balanced mixers, etc.), each with its own pluses and minuses, and each intended to achieve the same result: shift the bandwidth of the signal to a lower frequency range which is called an IF signal.

40. The term “intermediate” in IF does not imply that the IF is lower or higher in frequency than the input RF frequency. In double-and triple conversion receivers, for example, there are IF values that can have any value whatsoever. Indeed a value of zero for the last IF is as valid as any other numerical value. Such IF is often called “zero IF” and the associated receiver a direct conversion receiver. The term “intermediate” does not refers to a frequency that is intermediate in numerical value; rather, it refers to a signal that is intermediate in the sequence of frequencies that the input RF signal takes and has a frequency different from the input RF signal.

41. Any signal to be transmitted via radio (and sometimes via cable or fiber optic line) has to be “modulated”, meaning that the “carrier” radio signal that would carry the signal to be transmitted would have to be modified by that signal in a manner that could be reversed on the receiving end. This is so because the information-carrying signal (e.g. the TV signal coming out of a video camera) cannot be transmitted efficiently without the aid of the “carrier” –hence its name. The reversal of that process is called demodulation. Strictly speaking, any alternating current on a conductor, regardless of its frequency, is radiated and

constitutes a “radio frequency”; this is the reason why signals as low as, say, 60Hz, the powerline frequency in the US, radiate everywhere and interfere with sensitive equipment such as medical EKG machines. As such, the term “RF” is emphatically not a property of signals above or below any numerical frequency value; instead, it is the term used to designate signals that propagate through the air (or space); once those signals are received by an antenna and are downconverted to an IF, as discussed above, they are referred to as Intermediate Frequency signals, regardless of the numerical value of that intermediate frequency.

42. Decoding refers to a different process. The information carrying signal to be transmitted usually has to be encoded for such incidental purposes as: (a) preventing unauthorized interceptors from receiving it (e.g. in the case of pay-television signals), (b) adding “forward error correction coding” to it in order to make that signal more resistant to degradation due to noise and interference, (c) reducing the signal’s bandwidth, and (d) recovery of hidden signals in what was transmitted, such as closed captioning, stock prices, etc. Decoding of TV signals is well suited for digital processing after the received TV signal has been downconverted.

43. In addition to all of the foregoing, a universal receiver would also have to meet some ancillary requirements as well: it should function both as a stand-alone device (for set-top applications where the end user wants to use it in

conjunction with a legacy TV receiver, whether analog or digital), and it should also be easy to integrate with numerous different manufacturers products that include all of the functions of a TV minus the receiver.

44. Meeting all of these requirements was a very complex task as evidenced from the fact that, despite the long-felt need shown above, no such product was created until after the '792 patent. The complexity of the task can be appreciated by realizing that the expertise that was required for such a development had to include specialized disciplines such as:

- (a) mixed-mode circuit expertise, to include analog-to-digital converters and digital-to-analog converters,

- (b) digital circuit expertise, to include digital filtering,

- (c) analog RF expertise to design the RF front end using minimum size and cost components. Such expertise rarely exists within the same individuals who have the digital expertise,

- (d) large scale integrated (LSI) chip design and manufacture. As every experienced chip designer knows, what works when spread all over a breadboard does not work when shrunk into a chip unless the designer has the specialized know-how to have prevented problems associated with cross-talk, spurs, intermodulations, and similar issues,

- (e) foundry operation,

(f) CAD expertise,

(g) and experience in integrating hybrid microcircuits, including analog, digital and RF circuitry.

45. Drawing on the experience of its inventors, the ‘792 patent taught a universal television tuner that solved many of the problems outlined above. Xceive and then CrestaTech created the commercial products that met this long felt need and were the first integrated silicon TV tuners to be adopted by a Tier 1 manufacturer, LG Electronics.

VII. CLAIM CONSTRUCTION

46. I understand that the Board has put forward the following constructions:

Claim Term	Board’s Construction
“RF signals”	“We construe “RF signals” as signals having a frequency between 10 kHz and 100 GHz.” InstDec. p7.
“format”	“[W]e construe “format” such that analog and digital signals are examples of distinct formats.” InstDec. p8.
“baseband signal”	“[W]e construe “baseband signal” as a signal without transmission modulation.” InstDec. p9.
“signal processor”	“[W]e construe “signal processor” as a digital module that processes signals in the digital domain. InstDec. p9.

I respectfully disagree with the Board's construction of the "input RF signals". Moreover, I would like to provide claim constructions for "frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to intermediate frequency signal", "the input RF signals encoding information in one of a plurality of television signal formats", and "a signal processor for processing ... in accordance with the television signal format ... the signal processor applies one of a plurality of finite impulse response filters ... each of the plurality of finite impulse response filters corresponding to a format".

A. "input RF signals"

47. I understand that the Decision states that "We construe "RF signals" as signals having a frequency between 10 kHz and 100 GHz." InstDec. p7. I respectfully disagree with this interpretation because it is at odds with the facts.

48. RF usually refers to a signal which can radiate from an antenna. There is no extrinsic lower limit below which a signal will not radiate from an antenna. For example, a signal of 60 hertz from the lights in the room radiates quite a bit as well. If one were to place a receiver in the same room with the lights, one would hear a characteristic noise in the background, which is the 60 hertz signal coming through. The US Navy, for example used to communicate with its submarines with transmitters at about 3 or 4 kHz. The frequency upper limit for the radio

frequency spectrum is where the reception is mostly performed using photonic devices; that limit is currently attained in the hundreds of GHz to THz range.

49. By way of example, terrestrial TV frequencies have a range from about 50 MHz to about 860 MHz for UHF TV. Satellite TV on the other hand, has higher frequencies, starting from the low GHz range.

50. Turning now to the '792 patent, in column 1, lines 35-38, it is disclosed that the receiver receives the incoming signal and converts the incoming radio frequency (RF) signal to an intermediate frequency (IF) signal. Ex. 1001, 1:35-38. There, the Board relies upon '792 patent's abbreviation for "radio frequency." The '792 patent's use of "RF" for "radio frequency" is not a definition for "input RF signals." In addition, the usage of the language in the context of the complete sentence conveys that incoming RF signal is external to the receiver and is provided to the input of the receiver. This is further confirmed by Figure 1 that shows the RF signal as an external input signal for "input RF signals." Nothing in the '792 patent provides any basis that the input RF signal should be construed to be any signal having a radio frequency.

51. Moreover, the Board is dissecting the claim term by not addressing that the complete claim limitation which is recited as "input RF signal" must be construed in light of the specification. By relying solely on the frequency range of radio frequency spectrum, the Board is not addressing the complete limitation

“input RF signal” in the light of the ‘792 patent specification. When construing the claim language, the entire limitation, “input RF signals,” must be construed in light of the specification.

52. In column 1, lines 34-38, the ‘792 patent explains the conventional television receiver shown in Figure 1 includes two main components and then states that the first component of the television receiver receives an incoming signal and converts the incoming radio frequency (RF) signal to an intermediate frequency (IF) signal. Ex. 1001, 1:34-38. In column 4, lines 49-50, the ‘792 patent, referring to Figure 1, states that the “receiver 100 includes a frequency conversion circuit 110 (or tuner circuit 110).” Ex. 1001, 4:49-50. In column 4, lines 52-57, the ‘792 patent states the “[f]requency conversion circuit receives input RF signal ... [and] operates to convert the input RF signal to an intermediate frequency (IF) signal”. Ex. 1001, 4:52-57.

53. Turning to Figure 1, the figure shows the “incoming RF signal” as an “RFIN” being inputted into Terminal 102 of the frequency conversion circuit 110. In column 4, lines 51-55, the ‘792 patent discloses the invented television receiver shown in Figure 1 and explains that on input terminal 102, “the input RF signals can be received from terrestrial broadcast or on cable line transmissions.” Ex. 1001, 4:51-55.

54. Accordingly, the ‘792 patent provides the basis under the broadest reasonable in light of the specification standard for the claim limitation, “input RF signals.” The ‘792 patent provides the ordinary and meaning as well as the clear usage of the claim limitation as an external signal to the frequency conversion circuit, as not being processed by the frequency conversion circuit and a signal that has been provided by a medium of propagation (e.g. atmosphere, cable, etc.) Accordingly, “input RF signals” should be construed in accordance with its ordinary and customary meaning and the clear usage of the term within the intrinsic evidence, as a signal that is an incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing by the frequency conversion circuit. This construction is consistent with the ‘792 patent claims. The ‘792 patent claim 1 recites “a frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to intermediate frequency signal having an intermediate frequency (IF)...”. The ‘792 patent claim 29 depending from claim 1 recites “the input RF signals comprise RF signals received from terrestrial broadcast, an RF signal received from satellite broadcast, and an RF signal received from cable transmission.”

B. “a frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to an intermediate frequency signal”

55. In my opinion, the construction of “frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to intermediate frequency signal” under the broadest reasonable interpretation in light of the specification standard is that the claim limitation requires a frequency conversion circuit receiving a transmitted RF signal that has not been further processed or converted. The ‘792 patent provides the basis under the broadest reasonable interpretation in light of the specification standard for the claim limitation. In that, the ‘792 patent provides the ordinary and customary meaning as well as the clear usage of the claim limitation as the frequency conversion circuit receives external signals that have not been processed by the frequency conversion circuit comprised of signals that have been provided by a medium of propagation (e.g. atmosphere, cable, etc.).

56. Accordingly, “frequency conversion circuit for receiving an input RF signal” should be construed in accordance with its ordinary and customary meaning and the clear usage of the term within the intrinsic evidence as a frequency conversion circuit that receives an incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing.

C. “the input RF signals encoding information in one of a plurality of formats”

57. In my opinion, the construction of “said input RF signals encoding information in **one** of a plurality of formats” under the broadest reasonable interpretation in light of the specification standard is that the claim limitation requires receiving **one** format RF signal at a time.

D. “a signal processor for processing ... in accordance with the television signal format ... the signal processor applies one of a plurality of finite impulse response filters ... each of the plurality of finite impulse response filters corresponding to a format a signal processor for processing... said format”

58. In my opinion, the construction of “a signal processor for processing ... in accordance with the television signal format ... the signal processor applies one of a plurality of finite impulse response filters ... each of the plurality of finite impulse response filters corresponding to a format” under the broadest reasonable in light of the specification standard is that the claim limitation requires that the signal processor processes only one format RF signal and not process a plurality of formats in parallel. This construction is consistent with ‘792 patent claims. Looking at the ‘792 patent claim 1, I see that it recites the claim term, ‘the television signal format” that is referring to the claim term “one of a plurality of television signal formats”, recited earlier in the claim. Also, the ‘792 patent claim

1 recites “the signal processor applies one of a plurality of finite impulse response filters... each of the plurality of finite impulse response filters corresponding to a format.” This is consistent with the ‘792 patent specification that discloses that when the input RF signal is an analog format, the DSP 131 only operates to process the signal according to analog format processing and when the input RF signal is a digital format the DSP 131 only operates to process the signal according to digital format processing. Ex. 1001, 6:24-48.

E. “baseband signals”

59. I understand that the Board construes “baseband signal” as a signal without transmission modulation. The Authoritative Dictionary of IEEE Standard Terms defines “baseband signaling” as “[t]he transmission of a signal at its original frequency, that is, not changed by modulation. *Note:* It can be an analog or a digital signal.” Ex 3001, p87.

VIII. GROUND 1: SYSTEM CLAIMS 1, 2, 4, 10 AND 11 ARE NOT OBVIOUS OVER THOMSON AND HARRIS

60. I see that Thomson is a five-page European patent application, EP 0 696 854, with a filing date of July 29, 1995 and a date of publication of February 14, 1996, that discloses a receiver for satellite television signals. Considerable amount of analog circuitry exist between the IF and the A/D converter (SAW filter, mixer, and amplifier); in contrast, in the '792 patent only an anti-aliasing filter is required.

The tasks of the SAW filter are performed in '792 in the digital domain. Saliently to the '792 patent, Thomson does not disclose a frequency conversion circuit for receiving input RF signals and converting them to IF signals, an anti-aliasing filter, a signal processor for processing in accordance with one format, and a plurality of demodulators, each generating video and audio baseband signals.

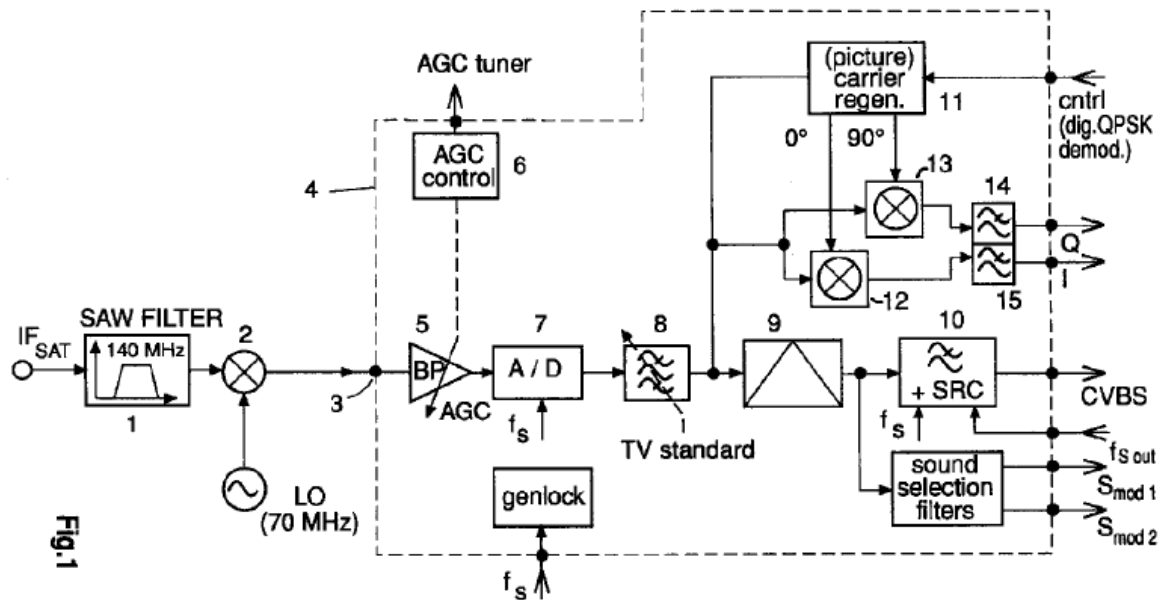
In my opinion, Thomson is not relevant to the '792 invention. Thomson's invention pertains only to satellite TV. It does not, and it cannot, relate to terrestrial or cable TV. The reason is the fundamental difference between the transmissions via satellite and via air or cable. Modulations, frequencies, and bandwidths are fundamentally different and reciprocally incompatible. While '792 does not specifically exclude satellite TV from its claims, the specification as a whole (including the standards recited, Ex. 1001, 5:25-29; description of prior art; references cited etc.) points out to terrestrial and cable TV only.

Claims 1, 2, 5 and 16

61. The first element of claim 1 of the '792 patent recites the following: a frequency conversion circuit for receiving an input RF signal and for converting the input RF signals to an immediate frequency signal having an intermediate frequency (IF), the input RF signal encoding information in one of a plurality of television signal formats.

62. In my opinion, Thomson does not teach a frequency conversion circuit for receiving input RF signals. To the contrary, Thomson describes an apparatus that receives input IF signals. Thomson does not teach a frequency conversion circuit for receiving an input RF signal and for converting the input RF signal to an intermediate frequency signal having an intermediate frequency (IF), the input RF signal encoding information in one of a plurality of television signal formats. The ‘792 patent claim 1 requires this limitation, under the plain meaning construction of the “frequency conversion circuit” claim limitation. Moreover, “input RF signal” should be construed in accordance with its ordinary and customary meaning and the clear usage of the term within the intrinsic evidence as a signal that is an incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing by the frequency conversion circuit.

63. In my opinion, Thomson has no frequency conversion circuit for receiving an input RF and only teaches an apparatus for receiving IF input. Thomson’s Figure 1 shows only an IF input into the SAW Filter 1. Thomson teaches: “In Figure 1, the incoming IF signal which may come from an outdoor station is fed to SAW (surface acoustic wave) filter 1.” Ex 1004, 2:30-32.



Id. at Fig. 1. The input to the Thomson apparatus is an IF_{sat} signal that has already undergone two down conversions by undisclosed components.

64. In my opinion, the IF_{sat} signal is not the input RF signal anticipated by Thomson, because RF is what comes out of the medium of propagation, not what comes out of a down conversion. In the Thomson patent, Thomson is very clearly teaching about an IF signal which has been down converted. Accordingly, the input signal to the Thomson apparatus is not an input RF signal as claimed in the ‘792 patent, because the input signal has already been down-converted to an IF.

65. I understand that the Board reads the claimed “input RF signals” on the Thomson IF_{sat} signal. InstDec. p9-10. In my opinion however, the term “input RF signals”, construed in accordance with its ordinary and customary meaning and the clear usage of the term within the intrinsic evidence of the ‘792 patent, is an

incoming signal that comes out of the medium of propagation and is external to the frequency conversion circuit without any processing by the frequency conversion circuit and does not read on the Thomson IF_{sat} signal. As pointed out above, input to the Thomson receiver is an IF_{sat} signal that has already undergone down conversions by undisclosed components. In my opinion, this is not the input RF signal anticipated by Thomson, because RF is what comes out of the medium of propagation, not what comes out of a down conversion. In the Thomson patent, Thomson is very clearly teaching about an IF signal which has been down converted. Thomson' Figure 1 shows only an IF_{sat} signal inputted into the SAW Filter 1. Accordingly, the input signal to the Thomson apparatus is not an input RF signal as claimed in the '792 patent, because the input signal has already been down-converted to an IF signal.

66. I understand that Petitioner argues that Thomson teaches a receiver that receives the RF signal from an "outdoor unit" that feeds the IF Sat signal to circuitry depicted in Figure 1. Pet. p14. Thomson does not expressly teach the circuitry of the outdoor station or the circuitry located elsewhere that receives RF signals and converts them to generate the IF signals.

67. I find no testimony or evidence of Petitioners' expert, Dr. Holberg, in his declaration suggesting that a person of ordinary skill in the art would be able to

implement the Thomson receiver if it is understood to include the “outdoor unit” that down-converts the satellite signal to IF.

68. In addition, the outdoor station does not necessarily have to be a frequency conversion circuit for receiving input RF signals and for converting said input RF signals to intermediate signals for the Thomson IF signal receiver. In my opinion, the outdoor station may generate the Thomson IF input signal by a variety of sources including a signal generator.

69. In my opinion, Thomson does not teach receiving an “input RF signal encoding information in one of a plurality of television signal formats,” under the Board’s construction of the claim limitations “input RF signal” and “format.” I understand that claim 1 of the ‘792 patent requires receiving an input RF signal in one of a plurality of television signal formats. Since Thomson teaches receiving IF inputs, Thomson does not teach “input RF signal encoding information in one of a plurality of television signal formats” as set forth in claim 1. Thomson does not teach converting RF signals to an intermediate frequency, as recited in this limitation, since Thomson teaches receiving IF input.

70. I see that the second element of claim 1 of the ‘792 patent recites the following: “input RF signal encoding information in one of a plurality of television signal formats” and “a signal processor for processing ... in accordance with the television signal format”. The plain and ordinary construction of the claim

language provides that the signal processor only processes the intermediate signals in accordance with **one** television signal format.

71. In my opinion, Petitioner has failed to show that Thomson teaches or discloses this element. Thomson does not teach a signal processor for processing said digitized signals in accordance with one format of said input RF signals and generating digital output signals indicative of information encoded in said input RF signals. Although Thomson teaches adjusting to provide minimum remainder of adjacent channel signals, Petitioner contends that the bandpass-filter 8 shown in Figure 1 is an adaptive filter, and thereby is a signal processor. Pet. p15-16. Petitioner then argues that it is known in the art that an adaptive filter is a filter which can change its characteristics by changing its filter coefficients citing to paragraph 48 of the Holberg's declaration. Pet. p17.

72. Thomson does not teach a signal processor that processes in accordance with **one** format instead of processing in accordance with a plurality of formats. The totality of what the Thomson reference says about bandpass filter 8 is as follows: "The following bandpass filter 8 (see Fig. 2g) with an adaptively controlled bandwidth selects the designed signal with a minimal remainder of the adjacent channel signals." Ex. 1004, 3:16-19. Thomson is silent as to the apparatus through which the filter 8 adapts itself. For this reason, bandpass filter 8 is not a

signal processor because it cannot fulfill, as shown in Fig. 1, the “adaptive” function.

73. I understand that Petitioner argues next that the bandpass-filter 8 shown in Figure 1 processes said digitized signals in accordance with one format of said input RF signals and generates digital output signals indicative of information encoded in said input RF signals. Pet. p17-18. Petitioner contends the Thomson bandpass filter 8 executes one filter function if the RF input signal is an analog TV format, as indicated by the status of the TV standard input and another filter function if it is a digital TV format. Pet. p18-19.

74. In my opinion, nothing in Thomson discloses that the Thomson bandpass filter 8 processes in accordance with the TV standard of the signal. Holberg claims that the words “TVstandard” on Figure 1 indicate that the bandpass filter is processing in accordance with format. This is far from clear or convincing, in light of the total absence of any support for the same in the specification.

75. Moreover, nothing in Thomson discloses that the bandpass filter 8 processes the digitized signals intermediate signals accordance with **one** format of said input RF signals and generates digital output signals indicative of information encoded in said input RF signals. In my opinion, Thomson does not disclose that bandpass filter 8 processes only in accordance with the one analog format when the Thomson apparatus receives an analog format RF signal. Nor does Thomson

disclose that bandpass filter 8 processes only in accordance with the one digital format when the Thomson apparatus receives a digital format RF signal.

76. In my opinion, Thomson discloses two parallel paths for processing, one for analog format processing and the other for digital television format processing after the Thomson bandpass filter 8. Thus, Thomson does not process only in accordance with one format, but instead processes in accordance with both analog and digital formats in parallel. In particular, Thomson shows the demodulating process as a two parallel path processing, one for analog format and the other for digital format (digital format processing path that outputs Q and I) and analog format processing path that outputs CVBS, S_{mod1} and S_{mod2}). Ex1004, Figure 1. In my opinion, nothing in Thomson discloses that the Thomson bandpass filter 8 processes only the digitized signals intermediate signals in accordance with **one** digital television signal format of said input RF signals. To the contrary, Thomson suggests that same parallel path processing, one for analog format processing and the other for digital television processing. In my experience, a bank of parallel bandpass filters, each processing the signal accordance to a different format (e.g. analog format or digital format) in a parallel processing path, was at the time of the invention, the conventional means to provide a multi-format bandpass filter. Thus, a POSITA reading the Thomson reference would have been taught that the Thomson bandpass filter 8 processes in accordance with a plurality of formats by

having an analog format circuit and a digital format circuit in parallel where the output of the analog format circuit feeds the parallel analog format processed signals to the parallel analog format demodulating circuits that provides the analog format output and the output of the analog format circuit feeds the parallel digital format processed signal to the parallel digital format demodulating circuit that provides the digital format output.

77. In my opinion, the Petitioner has not provided any evidence that it was known at the time of the '792 patent invention how to implement and enable a bandpass filter to process in accordance with one format of the input RF signal. In view of the scant disclosure and of the Thomson Figure 1 showing the two parallel analog and digital paths, a POSITA would have concluded that Thomson is disclosing that Thomson bandpass filter 8 includes two parallel circuits, one for analog television IF signals and one for digital television IF signals. Even so, the Thomson bandpass filter 8 still does not read on the claimed signal processor because Thomson would be processing in accordance with at least **two** formats and not in accordance with **one** format.

78. In my opinion, Thomson does not inherently disclose that the bandpass filter 8 processes the digitized signals intermediate signals in accordance with **one** format of said input RF signals and generates digital output signals indicative of information encoded in said input RF signals. Because the bandpass filter 8 can

process in accordance with at least **two** formats, the missing element is not necessarily present that the Thomson bandpass filter 8 processes the digitized signals intermediate signals in accordance with **one** format of said input RF signals.

79. The third element of claim 1 of the '792 patent recites the following: "the signal processor applies one of a plurality of finite impulse response filters... each of the plurality of finite impulse response filters corresponding to a format." Petitioner admits that Thomson does not disclose the use of FIR filter, but relies on the Harris reference for teaching of FIR filters. Pet. p19-21.

80. I understand that Petitioner does not rely on the Harris reference other than for implementing the functions of bandpass filter 8 of Thomson with the Harris DDF processor. Pet. p16-21. Petitioner proposes that it would have been obvious to one of ordinary skill in the art to modify Thomson by substituting the Thomson' bandpass filter 8 with the Harris digital decimation filter (DDF) processor. Pet. p20. In my opinion, even if a POSITA would have reason to make this modification, the resulting combination fails to teach all the limitations as claimed. As I explained above, Thomson does not teach or suggest a frequency conversion circuit which converts RF signals. Also, the Petitioner proposed modification of the Thomson's bandpass filter 8 having parallel circuits for each format would have not resulted in a signal processor for processing in accordance

with one television signal format, but instead a bandpass filter for processing in accordance with more than one format where each parallel circuit incorporates FIR filters.

81. In my opinion, the Harris DDF or Harris DDF in combination with a microprocessor interface does not provide a basis that it would have been obvious to a POSITA to bridge the Thomson gap for the following reasons: a) the Harris DDF is a low pass filter not a bandpass filter; b) the Harris DDF is not a signal processor used as an adaptive filter; c) the Harris DDF cannot be made adaptive by the Harris microprocessor interface; and d) Harris is a cellular phone application and as a result Petitioner's proposed substitution of the Thomson bandpass filter 8 with the Harris DDF would not have obtained predictable results.

82. In my opinion, the Harris DDF is a low pass filter not a bandpass filter. Harris states that output of the A/D converter feeds a down converter and the down converter is comprised of two HSP43220 Digital Decimating Filters (DDFs). Ex. 1005, p4, 2:3rd full par. Harris states: "The quadrature components of the NCOM output are each filtered by the DDFs which implement a low pass filter." Ex. 1005, p4, 2:5th par. Harris Figure 4 shows a Top level block diagram of the Harris HSP43220 DDF. Ex. 1005, Fig. 4. In my opinion, looking at the HSP 43220 datasheet, (Ex 2050, p1.) the Harris HSP43220 DDF is not a bandpass filter but instead "a linear phase low pass decimation filter which is optimized for filtering

narrow band signals. In my opinion, the Harris DDF low pass filter is not suitable to function as a bandpass filter because the Harris DDF low pass filter functions to filter from zero to a cutoff frequency. Ex. 2007, p16. Therefore, the HarrisDDF low pass filter is not suitable for substituting the Thomson bandpass filter 8 that must function to filter for a single frequency band, neither of the cutoff frequencies being zero or infinite. Ex. 2007, p9. Furthermore, even when preceded by Harris' HSP45116, the Harris DDF cannot be combined with Thomson for two reasons: 1) the HSP45116 is limited to a maximum of 33Msps input data sampling rate; and 2) Harris does not provide an apparatus to upconvert to the original frequency location the signal downconverted by the HSP45116. In conclusion, a low pass filter such as the HSP43220 DDF cannot be used instead of the Thomson's bandpass filter 8.

83. The Harris DDF is not a signal processor used as an adaptive filter. In my opinion, the Harris DDF is not a signal processor because the DDF does not have an Arithmetic Logic Unit. In my opinion, the coefficients are stored on the DDF chip prior to operation. In operation, the DDF is hard-wired to function as a filter. There is no provision for adaptively changing the coefficients during the operation of filtering. Ex. 2050, figs. 1, 2 and 3. The coefficients of the HSP 43220 filter are fixed once they are loaded. "The coefficients are loaded into the Coefficient RAM over the control bus (C_BUS)." Ex. 2050, p9. They are not

generated inside of the HSP 43220, and the HSP 43220 does not provide any type of information about the signal which would help some external apparatus adapt the coefficients of the filter or the number thereof. In my opinion, in order for the HSP 43220 to be functional, its coefficients must be pre-set by the external world.

84. Moreover, I believe that the Harris DDF cannot be made adaptive by the Harris microprocessor interface as argued by Petition. Pet. p37. Harris states: “the DDF can be rapidly reconfigured via a standard microprocessor interface.” Ex. 1005, p5, 2:2ndpar. However, this single sentence does not mean that the microprocessor interface can be used to make the Harris DDF adaptive. In my opinion, there is no mechanism through which the microprocessor interface or the Harris HSP43220 DDF would somehow extract information from the incoming signal, and "adapt" the coefficients of the filter accordingly. I believe that the sole purpose of the microprocessor interface is to preload the coefficients into the Harris DDF control register shown in Figure 5 (Ex. 2050, Fig. 5 and p9-10) and cannot be used to load the coefficient during the operation of the Harris DDF while maintaining uninterrupted, proper filter operation.

85. In my opinion, Harris is a cellular phone application and as a result, Petitioner’s proposed substitution of the Thomson bandpass filter 8 with the Harris DDF would not have obtained predictable results. Harris only discloses cellular telephones, mobile radio and wireless LAN as example for applications for the

Harris receiver. Ex. 1005, p1, 2:8-10. Harris is completely silent about television receivers. Based on my years of experience and expertise, I believe it is extremely challenging to design television digital receivers as compared to a cellular system for several reasons. First, consumers demand a much higher quality of the television reception for television viewing than for the reception for cellular phones. This requires more accurate channel filtering in that a high sensitivity (meaning an ample video signal-to-noise ratio even with weak input signals) and a high selectivity (meaning high RF front-end linearity and high-quality RF front end filtering). Ex 2005, p4. Exhibits 2004 and 2005 show that at least 7 years after the time of the '792 invention, Petitioner recognized some of the same challenges faced by a POSITA in designing television receivers at the time of the '792 filing. Mr. Eric Garlepp, the Petitioner's senior product manager recognized that designing television receivers must achieve clear TV broadcast reception that demand unique design requirements for television applications. Ex 2004, p4-5. The keys to achieving clear TV broadcast reception are sensitivity (the ability to have an ample video signal-to-noise ratio even with weak input signal to correctly receive the broadcast) and selectivity (the ability to block or exclude content on nearby "blocker" channels). Ex. 2005, p4. To achieve these two characteristics, the Petitioner states that a TV receiver must have a low noise figure, high RF front-end linearity and high quality RF front-end filtering. *Id.* Petitioner points out that

in order to achieve high selectivity, a tuner needs both high linearity and high quality filtering in the RF front end. *Id.* In my opinion, the above mentioned heightened television receiver design requirements would not be compatible with a substitution of the Thomson bandpass filter 8 with the Harris DDF and, as result, the proposed substitution would not have any expectation of success or yielded predictable results.

86. In my opinion, there are other reasons that Petitioner's proposed substitution of the Thomson bandpass filter 8 with the Harris DDF would not have obtained predictable results. First, television RF signals have extremely large bandwidth compared to the cellular phone RF single bandwidth. This requires the channel filter to process a much larger bandwidth signal than the filter for the cellular phone receivers. In fact, Thomson discloses that the bandwidth of the twice down-converted IF signal as having a bandwidth of 27 MHz. Ex. 1004, gist of invention, 2:6 and Fig. 2a-c. In contrast, Harris discloses that the bandwidth of the down-converted IF signal as having a bandwidth in the range of 10 kHz. Ex. 1005, p6, 1:14-36. In my opinion, the Harris channel filter could not be a simple substitute for the Thomson bandpass filter 8 with predictable results because the Harris channel filter would be inadequate to filter the Thomson television IF signal because the Thomson television IF signal is many orders of magnitude of greater

bandwidth. Moreover, I believe that Harris provides no guidance to a POSITA to bridge this gap.

87. Second, in my opinion, television filtering requires an extremely large sampling rate compared to the cellular phone filtering sampling rate. In fact, Thomson discloses that the twice down-converted IF signal is sampled at a rate of 100 MHz. Ex. 1004, 3:6 and Fig. 2f. In contrast, Harris discloses that the down-converted IF signal is sampled at a rate of up to 33 MSPS. 1005, p4, 2:31-47 and p5, 1:1-4. In my opinion, 33 MSPS is a sample rate of 33 MHz. In my opinion, the Harris channel filter could not be a simple substitute for the Thomson bandpass filter 8 because the Harris channel filter has an inadequate sample rate to filter the Thomson television IF signal.

88. In my opinion, neither Thomson nor Harris provides any reason for a POSITA to substitute the Thomson bandpass filter 8 with the Harris DDF processor because there would not have been any reasonable expectation of success at the time of the invention. The Harris reference is not a bandpass filter but a low pass filter and would not have worked for its intended purpose. As shown above there are the heightened TV design requirements that are not required by the Harris cell phone receiver design. In addition, Thomson expressly teaches a much larger bandwidth requirements and extremely larger sampling rate requirements than the Harris design. In my opinion, the Thomson bandwidth and

sampling rate requirements would have pointed a POSITA away from using the Harris design.

89. Thus, in my opinion, the evidence shows that not only a POSITA would not have a reasonable expectation of success by substituting the Thomson bandpass filter 8 with the Harris DDF, but that Harris would not have worked for the intended Thomson purpose. In summary, I believe that a POSITA would not have a reason to use the Harris DDF processor as a substitute for the Thomson bandpass filter 8.

90. I understand that the Petitioner argues that Thomson describes in 3:16-18 and Fig. 2g an adaptive filter that has a filter function that corresponds to a unique frequency range of each format. Petitioner further argues that it would be an obvious design choice to implement the Harris processor for the Thomson's bandpass filter 8. Pet. p18. In my opinion, Harris does not address the unique design requirements of television receivers. Nothing in Harris' disclosure suggests that Harris' finite impulse response filters are suitable for television receiver applications. In view of the heightened TV design requirements (video signal-to-noise ratio, high RF front-end linearity and high-quality RF front end filtering) as well as Thomson's teaching of the bandwidth requirements and extremely large sampling rate, I believe that a POSITA would not have had a reason to use the Harris finite impulse response filters as a substitute for the Thomson bandpass

filter 8 in order to obtain the television receiver as required by '792 patent claim 1.

91. The last element of Claim 1 is “a signal output circuit”. In my opinion, this limitation means a circuit which conditions the already processed signal to the desired characteristics of the output. As such, a signal output circuit can comprise blocks such as a serializer, a data convertor (A/D or D/A), an amplifier, a filter, a voltage level translator, a buffer with a desired output impedance. This interpretation is supported by '792 Fig. 2, which shows a variety of signal output circuits. But a signal output circuit cannot comprise core signal processing blocks, such as a demodulator. Holberg argues (Ex. 1009, paragraph 29) that the analog TV demodulator (element 9 from Thomson) and the apparatus for digital TV processing (elements 12, 13 from Thomson) are the signal output circuit. I disagree, for the reason stated above.

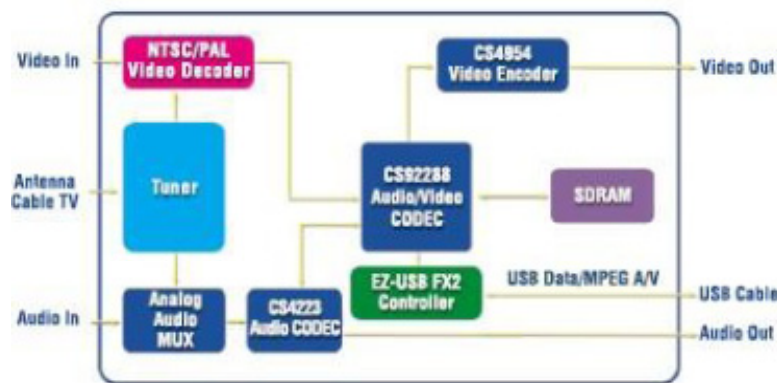
IX. GROUND 2: CLAIMS 5 AND 6 ARE NOT OBVIOUS OVER THOMSON, HARRIS AND CIRRUS LOGIC

92. I understand that Petitioner cites column 1:52 to column 2:3 of '792 patent as evidence for the statement: “Merely designing a decoder circuit to process video and audio signals according to a known analog television format was well known in the prior art so processing (or decoding) the data in known analog audio and video television formats (such as PAL/NTSC/SECAM) was within the

skill of the POSITA.” Pet. p31-32. In my opinion, ‘792 patent did not make such a statement or admission. To the contrary, column 1:52 to column 2:3 only address demodulators and not decoders for decoding the output of the demodulators. The ‘792 patent merely pointed out that the “conventional television receiver includes a demodulator for converting IF signals to video and audio baseband signals.” Ex. 1001, 1:52-54. In addition, ‘792 patent further pointed out that “demodulator is typically a dedicated component and designed specifically for a predetermined television signal format and a predetermined television standard.” Ex. 1001, 1:59-62. In column 1:52 to column 2:3 of the ‘792 patent, in my opinion, there is no admission that it is known in the prior art to provide a first decoder circuit to decode the video baseband signal provided by the signal output circuit or to provide a second decoder circuit to decode the audio baseband signal provided by the signal output circuit as required by ‘792 patent claim 5.

93. In my opinion, Thomson does not teach or suggest the use of a first and second decoder as recited in ‘792 patent claim 5. Thomson discloses outputting signals CVBS from low pass filter 10 and outputting S_{mod1} and S_{mod2} from sound selection filters. Ex. 1004, Fig. 1 and 2:37-39. Thomson is silent on any further processing of these signals and does not teach or suggest the use of a first and second decoder as recited in ‘792 patent claim 5.

94. I understand that the Petitioner relies on USP-DVR-20 Reference Design shown in Cirrus Logic data sheet for a DVD recorder based upon processor CS98200 (Ex. 1015) for teaching first decoder circuit to decode the video baseband signals for providing video display signals corresponding to the analog television format and second decoder to decode the audio baseband signals for providing audio signals corresponding to the analog television format as recited in ‘792 patent claim 5. Pet. p31-33. USP-DVR-20 Reference Design is shown below:



Petitioner points to the components of the USB-DVR 2.0 complete reference design. In particular Petitioner points to chip CS92288, chip CS4223 and chip CS4954/5 chip and provides Cirrus Logic data sheet for CS4223/4 (Ex. 1016) and Cirrus Logic data sheet for CS4954/5 (Ex. 1017). Pet.p32-33.

95. The USB DVR-2.0 is a complete reference design that makes it easy to capture, edit, view and store audio, video and television signals on Microsoft Windows-based personal computers. Ex. 1015, p1. The intended purpose of the USB DVR-2.0 is for editing and storing on a personal computer, not the ‘792

patent purpose to provide a television receiver receiving the digital output signals from a signal processor wherein providing a first decoder circuit to decode the video baseband signals for providing video display signals corresponding to the analog television format and a second decoder to decode the audio baseband signals for providing audio signals corresponding to the analog television format as recited in '792 patent claim 5. In my opinion, a POSITA would not have any reason to tear apart the USB DVR-2.0 reference design and then somehow redesign and reconfigure chip CS92288, chip CS4223 and chip CS4954/5 to combine with the Thomson apparatus to obtain the '792 patent claim. Not only would a POSITA not have any reason to tear apart the USB DVR-2.0 reference design and then redesign and reconfigure chip CS982288, chipCS4223/4 and chipCS4954/5 devices, a POSITA would have not a reasonable expectation for success that these chips would work to provide the first and second decoders. The proposed Petitioner's modification could not be a matter of design choice of using the components USP-DVR-20 Reference Design because USP-DVR-20 Reference Design is for an entirely different purpose than the Thomson apparatus. Moreover, neither the USP-DVR-20 Reference Design (Ex. 1015), Cirrus Logic data sheet for CS4223/4 (Ex. 1016), nor Cirrus Logic data sheet for CS4954/5 (Ex. 1017) provides any guidance to a POSITA to bridge this gap.

96. I understand that the Petitioner states: “the ‘792 patent admits that that television receivers capable of receiving multiple different standards such NTSC, PAL and SECAM were ‘widely adopted’ in the art” citing column 1:20-24. In my opinion, the ‘792 patent did not make such a statement or admission. To the contrary, in column 1:20-24, the ‘792 patent only states that these standards, (NTSC, PAL and SECAM) are used as analog transmission standards. The ‘792 patent did not admit that there are television receivers capable of receiving different standard transmissions. In fact, the ‘792 patent states “[b]ecause the different television formats and different television standards are incompatible, television receivers are traditionally made specifically for analog or digital format and for a specific standard.” Ex. 1001, 1:27-30. Moreover, the ‘792 patent states that a “television receiver for providing dual-format reception is desired.” Ex. 1001, 2:21-22. Petitioner states “[b]ecause television receivers supporting NTSC, PAL and SECAM are not novel, the combinations of Thomson and Harris in further in view of Cirrus Logic or, in the alternative, Thomson and TI App Note in further in view of Cirrus Logic renders claim 6 obvious.” Pet. p35. However, the fact that there is: a television receiver that supports NTSC standard, a television receiver that supports PAL standard and a television receiver that supports SECAM standard does not establish that a television receiver that supports all three standards (NTSC, PAL and SECAM) is not novel or is obvious.

Holberg implies that it would be obvious to add the analog TV sound decoder CS42233 to the outputs of the Thomson apparatus (Ex. 1004, paragraph 44). In fact, a POSITA would not have a reason to make such a combination. Thomson outputs for analog TV two sound signals (Smod1, Smod2), while CS42233 accepts only one input (SDIN) (also Ex. 1004, paragraph 44). There is no indication how the two outputs from Thomson can be connected to the single input from CS42233.

X. GROUND 3: CLAIMS 7 AND 12 ARE NOT OBVIOUS OVER THOMSON, HARRIS AND KERTH

97. I understand that ‘792 patent claim 7 recites “the first output signal and the second output signal being differential output signals corresponding to a digital television format.” I understand that ‘792 patent discloses that Figure 1 is a schematic diagram of a dual-format television receiver that includes “a third output terminal 106 for providing a third output signal for television signals transmitted in the digital format.” Ex. 1001, 3:63-64. I understand that “[T]hird output terminal 106 is a differential output terminal ... [and] therefore includes two signal ports providing differential signals ... [that] includes two signals.” Ex. 1001, 4:10-16.

98. I understand that Petitioner relies on Kerth to read on ‘792 patent claim 7 limitation, “the first output signal and the second output signal being differential output signals corresponding to a digital television format.” Pet. p36. The only teaching in Kerth that the Petitioner points to for this claim limitation is Kerth’s

Figure 8 and column 16:16-18. Pet. p36. There, I understand that Kerth states: “The notation ‘(diff.)’ adjacent to signal lines or reference numerals in FIG. 8 denotes the use of differential lines to propagate the annotated signals.” Ex. 1011, 16:8-16.

99. In my opinion, the Kerth statement is directed to interference reduction techniques and not to the problem the ‘792 patent is solving, namely, providing a television receiver for providing television reception for a plurality of television signal formats. Turning to paragraph 49 of the Holberg declaration, I find little support by Holberg’s repetitive statement found in the petition because the petition ignores the fact that a POSITA would not have looked to use the Kerth circuitry because the circuitry is used for an entirely different purpose and would not have an expectation of success because the Kerth circuitry is being used for the purpose of reducing interference in cell phone applications (see Exhibit 1011, 2:2-9) and not solving the problem of designing a television receiver for television reception for a plurality of television signal formats.

100. In addition, a POSITA would not have an expectation of success when combining Kerth and Thomson. This is so because of the sampling rate. In Thomson, a 100 MHz D/A converter clock is required. The Kerth apparatus is dedicated to contemporaneous cellular telephony standards, such as GSM or EDGE. Those standards have a data bit rate of maximum a few hundreds of kHz.

We have therefore more than two orders of magnitude between the requirements of Kerth and those of Thomson. Finally, another reason against combining Thomson and Kerth is related to the fact that the inputs of Kerth's D/A converter are on chip and have no external connections. A POSITA wouldn't therefore be able to connect to the D/A converter inputs.

101. I understand that the Petitioner argues that a differential output solution would have been a simple and obvious design choice. Pet. p37. For support of this argument, Petitioner relies on paragraph 50 of the Holberg declaration. *Id.* Holberg states that “[i]n the analog realm, there are only two options for output circuits – single ended or differential ended.” Ex. 1009, ¶50. This argument is fallacious because it ignores that signals can be categorized according to a myriad other criteria (voltage level, analog v. digital, output impedance etc.). The fact that the inventors of '792 recited a limitation using the criterion “single-ended vs. differential”, and not other criterion among the many others, is not obvious. Holberg states “[a]s explained in Kerth, circuits with differential outputs have improved common mode rejection over single-ended outputs.” *Id.* Holberg does not provide a citation from Kerth for support for this statement but cites to Ex. 1025, p1. *Id.* Ex. 1025, p1, is an article by Redmond, *et al.*

102. The Redmond article is directed to a dual-core baseband processor IC for cellular phone applications which is a different problem than the '792 patent

solved. There are heightened TV design requirements (video signal-to-noise ratio, high RF front-end linearity and high-quality RF front end filtering) that are not required by cell phone receiver design. Because of these heightened TV design requirements, a POSITA would not have an expectation of success of using the Kerth's circuits in the Thomson apparatus as proposed by the Petitioner.

103. It is my opinion, a POSITA would not have a reason to provide a first output signal and a second output signal corresponding to digital output signals, the first output signal and the second output signal being differential output signals corresponding to a digital television format as required by '792 patent claim 7.

XI. GROUND 4: CLAIMS 13 – 17 ARE NOT OBVIOUS OVER THOMSON, HARRIS, KERTH AND OKU

104. I understand that Petitioner relies on the Oku reference inserting a first digital-to-analog converter between the bandpass filter 8 of Thomson and the demodulators of Thomson. Pet. p38. Petitioner relies on the Oku reference inserting a second digital-to-analog converter between the bandpass filter 8 of Thomson and the demodulators of Thomson.

105. In my opinion, Thomson is concerned with the problem of processing analog signals using FM-demodulation and processing digital signals using QPSK-demodulation. Ex. 1004, 1:34-39. Thomson does not use a digital-to-analog converter coupled between the signal processor and a demodulator as required by '792 patent claim 13. Thomson's objective is to provide FM-modulation and

QPSK-modulation using a common A/D converter. Ex. 1004, 1:29-33. These Thomson teachings of minimizing the number of electronic components would have led a POSITA away from using another digital-to-analog converter. In my opinion, the minimizing of the number of electronic component would have in fact deterred a POSITA in making the Petitioner's proposed modification. In addition, a POSITA would have no expectation of success by inputting an analog signal to Thomson's satellite analog TV demodulator and to elements 12 and 13, which only accepts digital signals and are processing in the digital domain.

106. I understand that the '792 patent claim 13 limitation, "the first and second output terminals provide signals indicative of video **and** audio information", requires that the first output terminal provide signals indicative of video **and** audio information and the second output terminal provide signals indicative of video **and** audio information. This is consistent with the '792 patent disclosure that shows a first terminal 104 providing video and audio information signals and a second terminal 106 providing video and audio information signals. Ex. 1001, Fig. 1 and 3:55-63. Moreover, the claim recites the first and second output terminals as a group where the terminal provides two signals. Further, the claim recites the third terminal as a separate group where the terminal only provides one signal. As shown in Figure 4, Oku teaches the first driving circuit 17 provides a first output terminal having only a video information signal and Oku

teaches the second driving circuit 22 provides a second output terminal having only an audio information signal. Ex. 1018, Fig. 4. Neither Oku's output terminal of driving circuit 17 nor Oku's output terminal of driving circuit 22 reads on "the first and second output terminals provide signals indicative of video **and** audio information" as recited in '792 patent claim.

107. I understand that in the institution decision, the Board acknowledges that Oku fails to teach "the first and second output terminals provide signals indicative of video **and** audio information", but relies on Kerth to show first and second outputs terminal pointing to Ex. 1011, 14:58-15:7. InstDec. p22. I respectfully point out that the combination is improper, since it attempts to combine a given apparatus (the DACs from Oku having a number of outputs) with a number of outputs from Kerth, wherein the two numbers of outputs are different. Indeed, each of the DACs from Oku has a single-ended output. The Petitioner is trying to avoid this incompatibility by stating vaguely that the "teachings" of Oku and Kerth are combined (Pet p39), instead of pointing out the exact elements which are to be combined. Furthermore, it cannot be argued in the alternative (and the Petitioner does not attempt to do so) that the DACs from Kerth are combined with the drivers from Oku, because, as stated above, the DACs from Kerth have a bandwidth of hundreds of kHz at the most, which is insufficient for the video outputs (in the range of tens of MHz).

XII. GROUND 5: CLAIM 8 AND 9 NOT OBVIOUS OVER THOMSON, HARRIS KERTHAND CIRRUS LOGIC

108. I understand that 792 patent claims 8 and 9 are dependent on claim 7 which is dependent on claim 1 and thereby include all of the limitations of claim 1. Above, I have pointed out that the combination of Thomson and Harris does not teach or suggest the ‘792 patent claim limitations and Thomson and Harris are not combinable. Also, I have pointed out above that the combination of Thomson, Harris and Cirrus Logic does not teach or suggest the ‘792 patent claim limitations and that Thomson, Harris and Cirrus Logic are not combinable. Finally, I have pointed out above that the combination of Thomson, Harris and Kerth does not teach or suggest the ‘792 patent claim limitations and that Thomson, Harris and Kerth are not combinable.

XIII. GROUND 6: CLAIM 3 IS NOT OBVIOUS OVER THOMSON, HARRIS AND GUNTER

109. I understand that Petitioner contends that a POSITA “would have been motivated to reduce the combination of Thomson and Harris onto a single monolithic IC...” Pet. p30. Petitioner further states that “Gunter discloses frequency conversions of television signals from RF to baseband that can be implemented on a monolithic IC.” Pet. p29. Petitioner only relies on Gunter for evidence that it was desirable to integrate television receiver functions. Pet. p29-31. Petitioner states a “person of ordinary skill in the art would have considered

many engineering and design factors, including time, space and monetary considerations”, citing Holberg declaration, paragraph 42.

110. The ‘792 patent eliminates the SAW filter, an analog component, “the TV receiver of the present invention can be readily integrated in one integrated circuit. Ex. 1001, 3:32-37. Petitioner proposes that it would have been obvious to one of ordinary skill in the art to modify Thomson by incorporating the FIR filters of Harris into the Thomson’s bandpass filter 8. Pet. p20. Petitioner’s sole modification of Thomson is to modify the Thomson’s bandpass filter, thereby Petitioner’s proposed combination of Thomson and Harris includes Thomson’s analog SAW filter 1. Ex. 1004, Fig. 1 and 2:30-32. SAW filters are bulky analog devices that employ an electro-acoustic transducer that converts the electrical signal into a sound that is propagated through an elastic material to an electro-acoustic transducer that converts the sound to an electrical signal. At the time of the ‘792 patent invention, it was not possible to integrate a SAW filter on a monolithic integrated circuit. Typically, a SAW filter has a quality factor of tens of thousands; it is impossible to build an equivalent filtering characteristic using conventional methods a POSITA would have known, such as gm-C filters, or op-amp based filters. On the other hand, replacing the SAW filter with a filter having a much lower quality factor would result in insufficient filtering, and therefore the Thomson apparatus would fail to work. In my opinion, a POSITA would have

been faced with the same barriers that the '792 patent inventors faced with attempts to integrate a receiver that employ the SAW filter analog components onto a monolithic integrated circuit, and thereby a POSITA would not have a reasonable expectation of success

XIV. CONCLUSION

For the forgoing reasons, it is my opinion that the Petitioner has failed to satisfy the Petitioner's burden of proof and claims 1-17 are not unpatentable under the grounds asserted in the inter partes review.

I further declare that all statements made herein are of my own knowledge and are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment or both pursuant to 18 U.S.C. §1001 and that willful false statements or the like may jeopardize the validity of the patent or any patent issuing thereon.

Respectfully submitted

Signed in San Jose, California on January 9, 2015

/Ion E. Opris/

Ion E. Opris, Ph.D.

APPENDIX A

Ion E. Opris
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Strong background in analog and digital circuitry design and analysis, solid state device physics, and math. Extensive hands-on experience in analog and mixed-mode IC design, telecommunication systems, high frequency (RF) circuits, distributed amplifiers, phase-locked loops, and spread spectrum techniques, and MEMS interfaces.

EXPERIENCE

Opris Consulting

2198 Lark Hills Ct, San Jose, CA 95138

06/96 - present

An independent consulting firm for analog, mixed-mode and ASIC IC design. Specializing in high performance A/D converters (pipelined and sigma-delta) and communications circuits (CMOS synthesizers, switched cap filters, and RF receivers). Completed over 100 design projects for extremely low power sensors read-out circuitry, ultrasonic imaging, audio/video interface products, CCD and CMOS light sensors, wired and RF data communications (DSL, Ethernet, WI-FI, RFID), MEMS accelerometers, gyroscopes, and MEMS based displays.

MCube, Inc.

2750 Sand Hill Rd., Menlo Park, CA 94025

Sr. Director of IC Design

09/09 - 04/10

VP of Product Design

04/10 - 10/10

- responsible for the CMOS and MEMS design of a family of MEMS based accelerometers and magnetic sensors.

National Semiconductor Corp.

2900 Semiconductor Drive, Santa Clara, CA 95052

Principal Engineer

06/94 - 10/97

- responsible for system architecture and analog/digital circuit design for high speed/high resolution A/D converters; mixed-mode A/D, ASICs, and complex behavioral simulations;

- design of low power/high performance voltage references;
- released to production a family of high performance 12-bit A/D converters up to 20 MS/s.

Stanford University
Stanford, CA 94305
Research Assistant
12/95

09/90 -

- enrolled in a PhD program in Electrical Engineering. Areas of research:
 - analog/digital circuits for smart sensors applications;
 - low power A/D converters;
 - analog nonlinear circuits, and nonlinear control;
 - low power/low noise amplifiers and continuous time filters for biological data acquisition.

Core International
6500 E. Rogers Circle, Boca Raton, FL 33487
Design Engineer

04/89 - 08/90

- designed, built and tested DMA adapters (both slaves and masters) for tape drives, hard disk drives, and floppy drives, used in PC's with ISA and MicroChannel Architecture;
- evaluated a chip set for high speed interfaces on MicroChannel Architecture, and used it for a high performance hard drive adapter.

IAMSAT, Bucharest, Romania

10/86 - 10/88

Manufacturing and Service Company for Automation and Telecommunication
Research Engineer (on joint program with the Bucharest Polytechnic Institute)

- designed, built and evaluated the performances of low wattage switching power supplies;
- designed a driver/modulator for an IMPATT diode oscillator.
- designed the analog part of the servo system for a large capacity disk drive (removable media); built testing equipment; tested and evaluated the prototypes.

OTHER

1991 - present Various consulting jobs in hardware design /firmware with applications in RF data communication and spread spectrum technology. Hardware/firmware development for hand-held computing devices using touch screen technology and written character recognition.

1983 - 1986 Joined an university research team for data communication in the 10.7 GHz band.

ACADEMIC ACCOMPLISHMENTS

Ranked 2nd at the PhD Qualification Examination at Stanford University, January 1991. Awarded a School of Engineering Fellowship at Stanford University in 1990-1991. Ranked 1st in 1983, 1984, 1985, and 2nd in 1986 at the Romanian National Electronic Engineering contest. This highly competitive contest, open to all undergraduate students in the country, tests both theoretical and practical skills.

EDUCATION

PhD in Electrical Engineering, 1996, Stanford University, Stanford, CA.

Thesis: "Analog Rank Extractors and Sorting Networks."

Master of Science in Electrical Engineering, 1991, Stanford University, Stanford, CA.

Diploma of Engineer, 1986, Bucharest Polytechnic Institute, Romania, highest honors.

Major: Electronics and Telecommunications.

PERSONAL DATA

Enjoy outdoor sports, ski, tennis, soccer, skeet shooting.

Moderately fluent in French, basic knowledge of German.

PATENTS

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