

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LG ELECTRONICS, INC.,
Petitioner,

v.

BROADCOM CORPORATION,
Patent Owner.

Case IPR2017-01544
Patent 7,342,967

DECLARATION OF IAIN RICHARDSON, PH.D.

I. BACKGROUND AND QUALIFICATIONS

1. I am qualified by education and experience to testify as an expert in the field of video encoding and decoding. Attached as Exhibit 1 is a copy of my curriculum vitae detailing my experience and education. Additionally, I provide the following overview of my background as it pertains to my qualifications for providing expert testimony in this matter.

2. I founded three companies specializing in video encoding and decoding technology: 4i2i Communications Ltd (Director, 1995-2000), Vcodex Ltd (Director, 2007-present) and OneCodec Ltd (Director, 2009-2015, merged with Vcodex Ltd, 2015).

3. In 1993, I took up a post as a Lecturer, then Reader, and eventually a Full Professor in the field of image and video compression in the School of Engineering at The Robert Gordon University and in 2009 was honored as an Honorary Professor with the Robert Gordon University, a position I maintain to this day. At The Robert Gordon University, I founded the video coding research laboratory in 2000 and led a team of researchers from 2000-2009.

4. I received the MEng in Electronic and Electrical Engineering from Heriot Watt University in 1990 and gained my PhD in Video Coding from the Robert Gordon University in 1999.

5. I am an experienced designer of video codecs in both software and

hardware. I have designed and implemented video compression codecs supporting video coding standards including Motion JPEG, H.261, H.263, MPEG-2 Video and H.264/AVC.

6. I am the author of four books and over 70 journal and conference papers on video coding, including two widely cited books on the H.264/MPEG-4 industry standards for video compression.

7. I am frequently invited to speak and consult on video coding technology by academic institutions and companies worldwide.

8. I am a contributing member of ISO/IEC JTC 1/SC 29/WG 11, a working group of ISO/IEC responsible for developing video compression standards and more commonly known as the Moving Picture Experts Group, MPEG.

9. I have attended meetings of MPEG and the corresponding ITU working group, known as the Video Coding Experts Group, VCEG.

II. LEGAL STANDARDS

10. I have been informed that if an independent claim is found valid, every claim that depends from the independent claim is also valid. I have also been informed that if an independent claim is found to be invalid, the claims which depend from it may still be found to be valid.

A. Anticipation

11. I understand that to be valid, a patent claim must be non-obvious and novel.

I also understand that a patent claim is not novel if it is anticipated by a single prior art reference – that is, a single prior art reference discloses each and every element of the claim either expressly or inherently. I also understand that a single reference cannot merely disclose each element of a claim to be found to anticipate. Rather, it must disclose all of the elements as arranged in the claim.

12. I further understand that for a reference to “inherently” disclose something, the missing descriptive matter must necessarily be present in the reference, not merely probably or possibly present, and that it would be so recognized by a person of ordinary skill. I understand that a prior art reference that discloses a genus does not inherently disclose all species within that broad category.

13. I understand that if an element of the claim is not disclosed by a prior art reference, then the claim is not anticipated by that reference.

14. I have been informed that a prior art reference that anticipates must enable one of ordinary skill in the art to make the claimed invention. The enablement cannot require undue experimentation.

B. Obviousness

15. I understand that a valid claim must not have been obvious to a person with ordinary skill in the art (“POSA”) at the time of the invention. A POSA is a hypothetical person who is presumed to know the relevant prior art. In determining whether a claim is obvious, the Board considers (1) the level of

ordinary skill in the pertinent art; (2) the scope and content of the prior art; (3) the differences between the claimed invention and the prior art; and (4) objective secondary considerations of non-obviousness, if any.

16. I have been informed that a patent composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. Rather, to establish obviousness, the cited references must be shown to disclose or suggest each claimed element, *and* it must be shown that it would have been obvious to combine the teachings in the references together to arrive at the claimed invention. There must be an articulated reason to combine the cited references to create the specific invention.

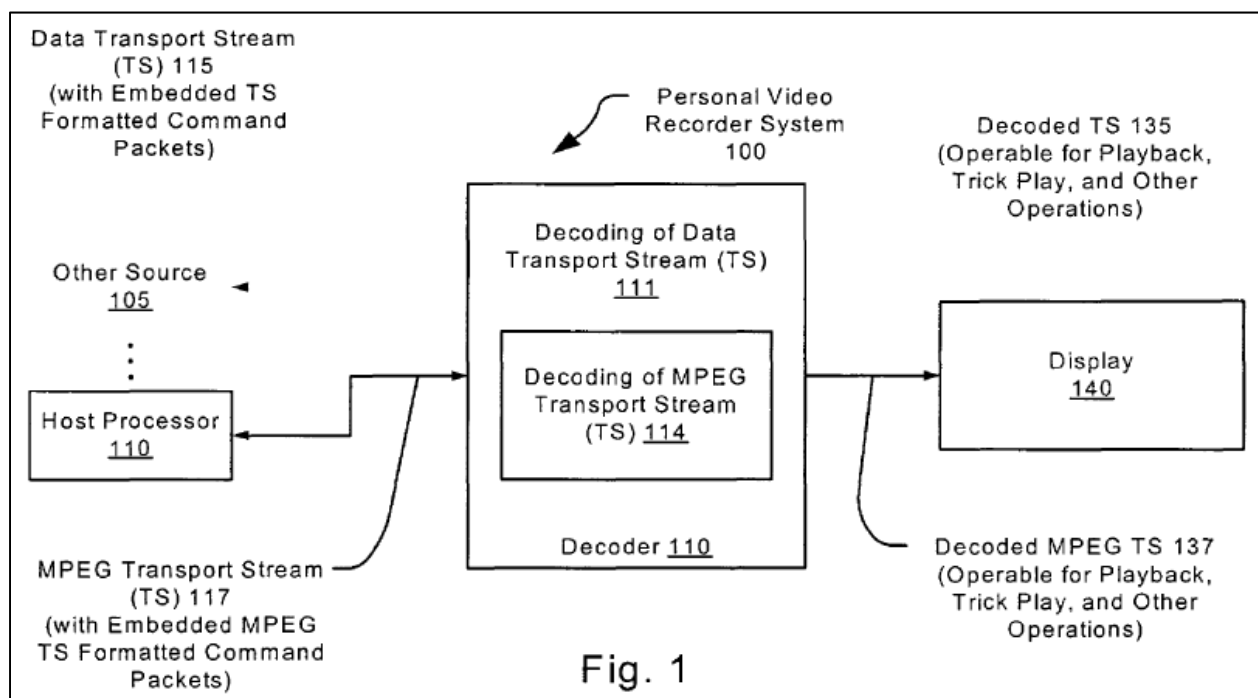
17. I have been further informed that the articulated reason to combine must stem from the nature of the problem to be solved and must be clear and particular, and it must be supported by actual evidence. The combined art must narrow the scope of the inventor's task to the point where it would have been obvious to try the claimed invention. If the claimed invention lies hidden in a multitude of other options suggested by the art, the invention is not obvious.

18. I have been informed that hindsight is forbidden in an obviousness analysis. Therefore, the reasons for combining or modifying a reference must be apparent at the time of the invention and apparent without the use of hindsight. A telltale sign of impermissible hindsight is the use of the invention to define the problem that the

invention solves.

III. THE '967 PATENT

19. The '967 patent generally relates to a system for displaying pictures that include, among other components, a host processor and a video decoder. As shown in Figure 1 below, the host processor transmits a data transport stream to a decoder and controls the playback (including trick playback) of the data. Ex. 1001, 3:45–50. The data transport stream is packetized, such that the stream is a series of transport packets. *Id.* at 4:23-24. The data transport stream also includes instructions for performing tasks such as trick play functionality. *Id.* at 5:7-13. Based on the instructions in the transport stream, the decoder then decodes the data transport stream. *Id.* at 3:53-57.



Id. at Figure 1.

20. In the '967 Patent's system, the instructions in the transport packets can command the system's video decoder to perform a specific decoding procedure for HITS streams. *Id.* at 5:7-13. The decoding procedure involves decoding slices above an I-slice and the I-slice but without decoding the slices below the I-slice. *Id.* at 5:37-7:12. The execution of the instructions causes the decoder to (1) select a picture comprising an intracoded slices, at least a slice above the intracoded slice, and at least a slice below the intracoded slice; (2) decode the intracoded slice and the slice above the intracoded slice; and (3) decode at least a portion of another picture after decoding the intracoded slice and the slice above the intracoded slices, without having decoded the slice below the intracoded slice. *Id.* at 5:7-13. The patent explains that by not "decoding the portion of the P-pictures below the intracoded slice advantageously reduces the processing required to build a clean reference picture." *Id.* at 3:8-10.

IV. THE LEVEL OF ORDINARY SKILL IN THE ART

21. A POSA at the time of the invention of the '967 patent would have had a Bachelor's Degree in Electrical Engineering, Computer Science, or a similar discipline, with one to two years of experience in this or a related field. The POSA would also have been familiar with software or hardware related to digital signal, image and video processing.

V. CLAIM CONSTRUCTION

22. I understand that in *inter partes* review, claims in an unexpired patent are given their “broadest reasonable construction in light of the specification of the patent in which it appears.” This is the broadest reasonable construction that a person of ordinary skill in the art would give the term in the context of the specification and its ordinary meaning in the art.

23. I have been told that the “construction cannot be divorced from the specification and the record evidence” and that “[a]bove all, the broadest reasonable interpretation must be reasonable in light of the claims and specification.”

A. “host processor”

24. The '967 Patent uses the term “host processor” in accordance with its plain and ordinary meaning and does not impose any special definition on the term. In my opinion, a person of ordinary skill in the art would have understood that a “host processor” is “a central processor responsible for the overall control of the system.” Ex. 2003, p. 5 (defining a “host processor” as “A processor that controls all or part of a user application network.”). Dr. Delp (LG’s expert) admitted that the term “host processor” was a common term to a POSA outside the context of the '967 Patent. Ex. 2005, 19:9-15. My understanding of the plain and ordinary meaning of the term “host processor” is consistent with its use in the '967 patent.

In its description of Figure 1, the '967 patent specification states that “The host processor 110 or the any other source 105 is the device *controlling* the playback (including trick play playback) of the data.” Ex. 1001, 3:47-50 (emphasis added). Further Figures of the '967 patent (e.g., Figures 2 and 3) demonstrate that a host processor (CPU 240 in Figure 2 and CPU 390 in Figure 3) has overall control of the system by controlling the flow of data throughout the system. *Id.* at Figures 2 and 3. The '967 Patent also explains that a host processor can control the system by inserting command packets into the transport stream. *Id.* at 7:37-43. Accordingly, the term “host processor” should be given its plain and ordinary meaning, which is “a central processor responsible for the overall control of the system.”

25. In its institution decision, the Board construed the term “host processor” to mean “a device or element that delivers an incoming transport stream (i.e., a stream of packets) that may contain instructions for controlling the playback to a decoder device (such as any audio or visual decoding device or functionality).” Institution Decision at 10. However, this construction fails to account for the essential control aspect that distinguishes a “host processor” from a generic electronic component. The Board’s construction fails to take into account (i) the fact that a processor must *process* data and (ii) the fact that the processor is a “host” processor, meaning it exerts control over a system. When generally

discussing a “host processor,” Dr. Delp described a “processor” as “a device that processes, handles data.” Ex. 2005, 20:3-15. Dr. Delp also described a “host” processor as “the main processor.” *Id.* at 20:16-21:1. Prior to providing its proposed construction, the Board explicitly noted that the “host processor” must perform the function of “**controlling** the playback (including trick playback) of the data.” *Id.* (emphasis added). However, the Board’s proposed construction ignores the required control functionality. Accordingly, in my opinion the proposed plain and ordinary meaning should be adopted.

B. “instructions”

26. The ’967 Patent uses the term “instructions” in accordance with its plain and ordinary meaning and does not impose any special definition on the term. In the context of the ’967 Patent, it is my opinion that a person of ordinary skill in the art would have understood that “instructions” are “information or syntax that affects the operation of a video decoder.” Ex. 2004, p. 3 (defining “instructions” as “A pattern of digits which signifies to a computer that a particular operation is to be performed”) (emphasis added). My understanding of the plain and ordinary meaning of the term “instructions” is consistent with its use in the ’967 patent. Ex. 1001, 5:12-13, 7:32-36, claim 1.

27. The plain and ordinary meaning I propose is consistent with the Board’s construction for the term as provided in its institution decision –“commands that

specify playback functions to be performed, including trick play functionality.”

However, my proposed construction does not limit the term to “commands” and does not limit the instructions to “specify[ing] playback functions.” The use of the word “command” versus more general words such as “information or syntax” can imply that the instructions must *be* command packets, which is not supported by the ‘967 patent specification because the instructions are included *in* a command packet. *Id.* at 5:12-13. Furthermore, the use of the words “that specify playback functions” versus more general words such as “that affects the operation” unnecessarily limits the content of the instructions to specifying the playback function, whereas the ‘967 Patent specification states that the instructions simply alter the operation of the video decoder to perform different operations. *Id.* at 5:12-1, 6:55-7:12, claim 1. Accordingly, in my view the proposed plain and ordinary meaning of “instructions” should be adopted.

VI. THE ASSERTED PRIOR ART

A. Chen

28. Chen ‘677’s alleged invention is a system that receives “progressive I-slice refreshed MPEG data streams” and transcodes the streams to “I-frame based MPEG data streams.” Ex. 1004, ¶¶ [0012], [0027]. Chen ‘677 explains that the transcoding process operates as follows:

A progressive I-slice refreshed MPEG data stream having I -slices distributed over multiple P-frames is received by a television

appliance. The P-frames are decoded by the decoder to recover the I-slices which make up a complete I-frame. The recovered I-slices are assembled (e.g., by processor) into a complete I-frame. The complete I-frame is encoded at an encoder. A selected P-frame in the MPEG data stream is replaced with the encoded I-frame to provide an encoded I-frame based data stream. The I-frame based data stream is stored for trick play mode use.

Id. at ¶ [0012]. Accordingly, Chen '677's system simply reformats streams of one type (i.e., "progressive I-slice refreshed MPEG data stream") to another type (i.e., "I-frame based MPEG data streams").

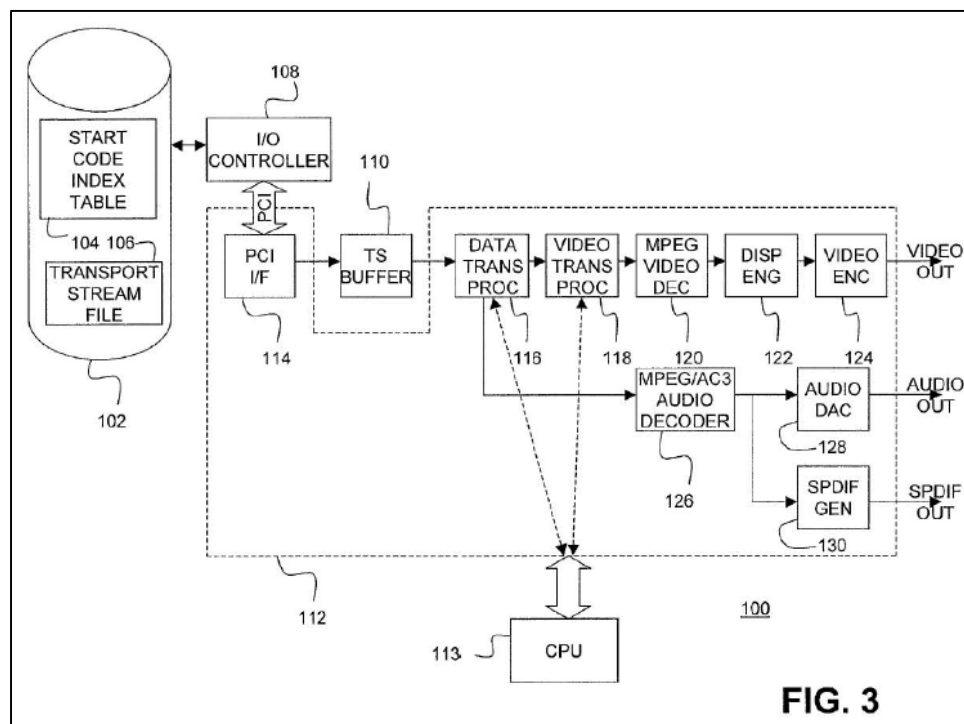
29. Chen '677 further explains that "The I-frame based data stream is stored for trick play mode use." *Id.* at ¶¶ [0012],[0027]. Thus, it is the "I-frame based MPEG data stream," not the "progressive I-slice refreshed MPEG data stream," that is decoded and played during trick play operations.

B. MacInnis

30. MacInnis explains that his "invention relates generally to the decoding and presentation of digital audio-video streams, and more particularly to a system and method for implementing 'trick modes' of personal video recording (PVR), such as, for example, fast forward play and reverse play at various speeds for digital audio-video streams." Ex. 1003, ¶ [0002].

31. MacInnis explains that in one embodiment, the CPU 113 implements the trick modes by controlling the data transport processor 116 and/or the video

transport processor 118. *Id.* at ¶ [0037]. MacInnis further explains that “a data transport driver (DTD) which preferably runs in the CPU 113, preferably is responsible for data flow of the stream to be played back through the data transport processor 116 and/or the video transport processor 118.” *Id.* at ¶ [0040]. MacInnis explains that the CPU can control the video transport processor 118 with command transport packets that are inserted into the transport stream. *Id.* The CPU’s control over the data transport processor 116 and the video transport processor 118 is illustrated in Figure 3 below:



Id. at Figure 3. MacInnis also states that the CPU’s DTD can use the command packets to send “various commands” to the video decoder 120, but does not expressly state what those commands are or how they affect the system. *Id.* at

¶ [0040].

32. MacInnis states that “[i]n other embodiments, various different software, hardware and/or firmware available to those skilled in the art may be used to provide commands to the data transport processor 116, the video transport processor 118 and/or the video decoder 120 to implement and control the trick modes.” *Id.* at ¶ [0040]. Throughout the rest of the specification, MacInnis then describe how the CPU 113 controls the video decoder 120 through software-based interactions known as application program interface (API) calls, not command packets. *Id.* at ¶¶ [0101], [0127], [0134], [0154], [0155], [0157], [0165].

33.

VII. THE CHEN-BASED GROUNDS (3-5) DO NOT RENDER THE CHALLENGED CLAIMS UNPATENTABLE

A. Chen does not anticipate claim 1

1. Chen ’677 does not disclose “instructions” that are executed to cause the claimed video decoding process

34. LG’s argument that Chen ’677 discloses “instructions” that are executed to cause the claimed video decoding process fails because (1) LG assume that the video stream causes the decoder to decode in a certain way that is dependent on the content of the video stream, which is not supported by Chen ’677, and (2) Chen ’677’s “progressive I-slice refreshed MPEG data stream” does not include “instructions” under either Broadcom’s or the Board’s construction of that term.

35. In its Petition, LG argues that: “Thus, because *Chen* ’677 discloses receiver

210 transmitting a compressed data stream to a decoder 220, and further teaches that the stream causes decoder 220 to decode it, *Chen* '677 discloses the claimed “plurality of instructions”” Petition at 56. However, LG points to no evidence that “the stream causes decoder 220 to decode it” as LG alleges.

36. There are a variety of methods that the *Chen* '677 system could use to cause the video decoder to start decoding and/or to carry out decoding in a certain way. For example, *Chen* [0042] envisages performing the algorithm(s) of the *Chen* invention ‘in a processor based MPEG-2 decoder chip’ or in ‘other implementations’. *Chen* envisages multiple algorithmic implementations and hence multiple ways in which an MPEG-2 decoder could be controlled to carry out the steps described in *Chen*. In my experience, control of a video decoder such as an MPEG-2 decoder could be carried out via a range of methods such as setting register values, performing a software function call via a software Application Programming Interface (API), and/or through an interface such as a USB or PCI interface. For example, an implementation of the *Chen* algorithms on a Personal Video Recorder (PVR) would likely require control of a video decoder to be initiated by a user interaction such as a request to start or stop recording or playback. Such a user interaction would, in my experience, cause a video decoder to carry out decoding in a certain way, via a software or hardware interface to a video decoder IC. In such an interaction, the stream would **not** simply ‘cause’ the

video decoder to ‘decode it’, rather a software or hardware interface call or signal would initiate or control the video decoder’s operation.

37. Chen refers to performing the Chen algorithm “in a processor based MPEG-2 decoder chip, such as the Broadcom RISC based decoder chips” (Chen [0042]).

Broadcom’s website, archived in April 2001

at https://web.archive.org/web/20010424013721fw_/http://www.broadcom.com:80/products/7031.html, lists Broadcom RISC based decoder chips including the BCM7031 MPEG-2 video decoder IC. In my experience, such an IC would be programmable and controllable via a software API using a Device Driver, i.e. operations such as starting, finishing and controlling decoding could be initiated externally via software function calls.

38. None of the many possible methods for starting the video decoder or carrying out decoding in different ways are discussed in Chen ’677, in LG’s Petition, or Dr. Delp’s expert declaration. Accordingly, LG has not identified instructions that cause the claimed video decoding process.

39. Even if “the stream causes decoder 220 to decode it” as LG alleges, the stream does not contain “instructions” as construed by Broadcom or the Board. The Chen ’677 system identified in LG’s petition performs the same transcoding process on every progressive I-slice refreshed MPEG data stream that enters the system and, therefore, does not disclose “instructions” under Broadcom’s

construction. Broadcom's proposed construction states that instructions are "information or syntax that *affects* the operation of a video decoder." LG has not identified anything in the video stream that affects the operation of the video decoder. Petition at 55-57. Chen '677 explains that "The P-frames are decoded at decoder 220 to recover the I-slices which make up a complete I-frame." Ex. 1004, ¶ [0027]. Nothing in the progressive I-slice refreshed MPEG data stream affects this operation or causes it to change in any way dependent on the content of the progressive I-slice refreshed MPEG data stream. The Chen '677 system operates in an identical manner regardless of the playback mode. That is, the Chen '677 video decoder operates in the same way regardless of (for example) whether the stream is required to be stored for future trick mode operations or whether the stream is required to be played back at normal speed. The Chen '677 system simply "*enable[s]* trick play modes on a television appliance," it does not perform different operations for trick mode operations. Ex. 1004, ¶ [0012]. Accordingly, LG has not identified any "instructions" that cause the claimed video decoding process.

40. Additionally, the Chen '677 system identified in LG's petition does not disclose "instructions" under the Board's construction because the incoming progressive I-slice refreshed MPEG data stream does not contain commands that specify playback functions to be performed. In its institution decision, the Board

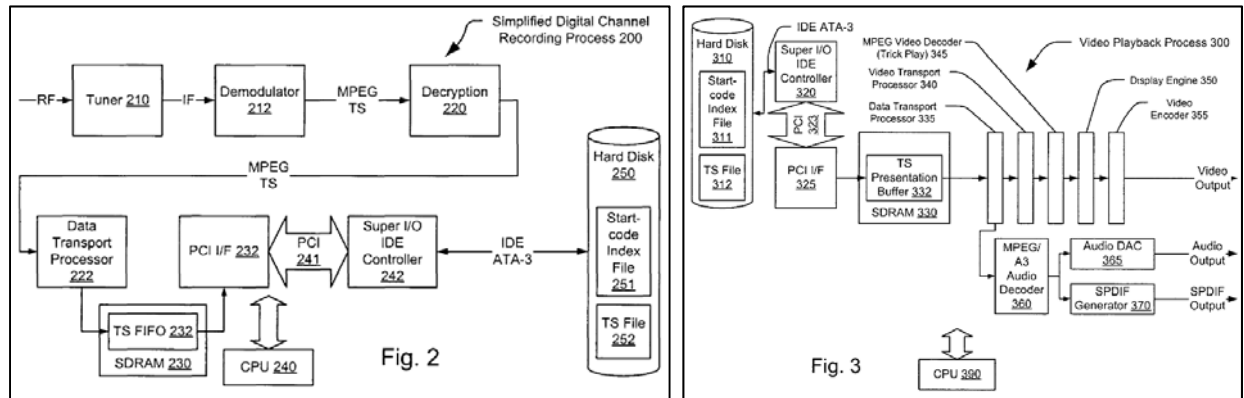
stated that “we determine on this record that Chen ’677 meets this limitation, for Chen ’677’s data stream contains commands that specify trick play functions to be performed.” Institution Decision at 16 citing Ex. 1004 ¶ [0027]. However, in Chen ’677’s system the incoming “progressive I-slice refreshed MPEG data streams” do not disclose any commands that specify playback functions, or indeed any commands at all. Ex. 1004, ¶¶ [0025]-[0027]. As I discussed above, Chen ’677’s system simply “*enable[s]* trick play modes on a television appliance” by transcoding “progressive I-slice refreshed MPEG data streams” to “I-frame based MPEG data streams,” such that the “I-frame based data stream” may be “stored for trick play mode use” *Id.* at ¶ [0012]. Chen ’677 provides no discussion of “commands that specify playback functions.” Chen ’677 does not describe how the video is played back on a display, let alone how trick play playback operations are implemented using the “I-frame based MPEG data streams.” Accordingly, LG has not identified any “instructions” that cause the claimed video decoding process.

41. Accordingly, claim 1 is not unpatentable as being anticipated by Chen ’677 because Chen ’677 fails to disclose “instructions” that are executed to cause the claimed video decoding process.

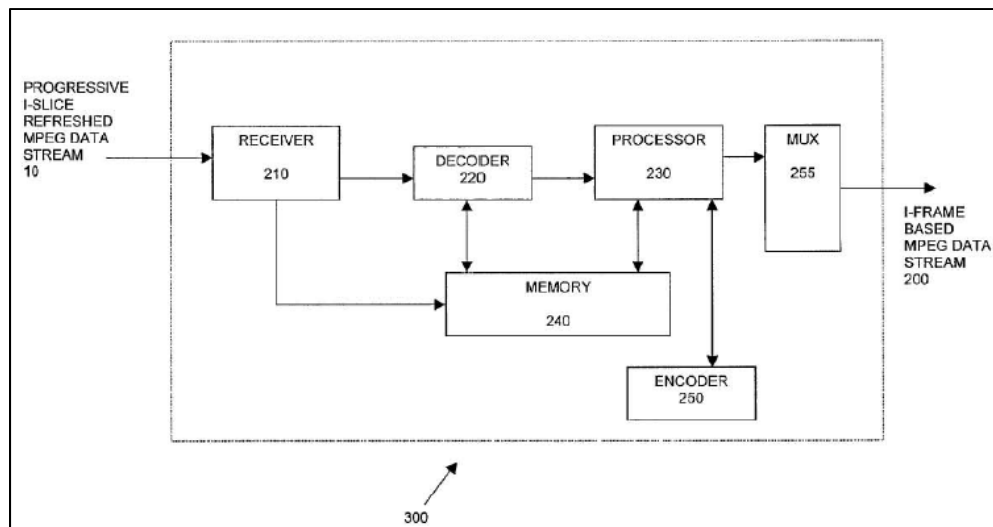
2. Chen ’677 does not disclose a “host processor”

42. Chen ’677 does not disclose a “host processor” under Broadcom’s

construction because the receiver 210 is not “a central processor responsible for the overall control of the system.” As shown in Figures 2 and 3 below, the ’967 Patent’s system includes a central processor responsible for the overall control of the system, such as CPU 240 and processor/CPU 390.



Ex. 1001, Figures 2, 3. Whereas Chen ’677’s system does not include a central processor responsible for the overall control of the system, as shown in Figure 3 below.



Ex. 1004, Figure 3. Chen ’677 *does not describe* the receiver 210 as a “processor”

but *does describe* another component, “processor 230,” as a “processor.” *Id.* at ¶ [0027], Figure 3. This shows that Chen ’677 does not even consider the receiver 210 a “processor” based on a plain and ordinary meaning of that word. As Figure 3 of Chen ’677 shows, the receiver 210 only moves the progressive I-slice refreshed MPEG data stream data to the decoder 220 and/or memory 240. The receiver does not provide any control over the system. Furthermore, the Processor 230 component identified in Chen ’677 is sited **after** the video decoder 220, and hence cannot provide the claimed functionality of transmitting transport packets providing a plurality of instructions **to** a video decoder for executing the plurality of instructions. Accordingly, LG has not identified a “host processor” in Chen ’677.

43. Accordingly, claim 1 is not unpatentable as being anticipated by Chen ’677 because Chen ’677 fails to disclose a host processor.

B. Chen does not anticipate claims 2-5

44. As I discussed above, claim 1 is not anticipated by Chen. Claims 2-5 depend from claim 1 and, therefore, are not unpatentable as being anticipated by Chen because claim 1 is not anticipated by Chen.

C. Chen alone and the combination of Chen and ISO 13818-2 do not render obvious claims 1-5

45. LG’s obviousness arguments presented as Ground 4 and Ground 5 do not address the deficiencies in Chen ’677 that I discussed above. Nothing in LG’s

proposed combination of Chen '677 and ISO 13818-2 addresses the deficiencies that I discussed above. Accordingly, based on LG's failure to explain how Chen '677 discloses either "instructions" that are executed to cause the claimed video decoding process or a "host processor," the Board should find that Chen alone and the combination of Chen and ISO 13818-2 does not render unpatentable claim 1-5 of the '967 Patent.

VIII. THE MACINNIS-BASED GROUNDS (1-2) DO NOT RENDER THE CHALLENGED CLAIMS UNPATENTABLE

A. MacInnis does not anticipate claim 1

46. LG's Petition fails establish unpatentability of claim 1 by a preponderance of the evidence because it does not explain how MacInnis expressly or inherently discloses "transport packets providing a plurality of instructions ... wherein execution of the instructions by the video decoder comprises causing ..." the video decoding process claimed in claim 1. Notably, claim 1 requires a video decoder that executes "instructions" that are provided by transport packets. As I discuss in detail below, the MacInnis citations relied on by LG and the Board in its institution decision do not expressly or inherently disclose (1) that transport packets with instructions are executed by the video decoder or (2) that the instructions cause the video decoder to perform the claimed decoding process. Also, to the extent MacInnis describes any communications between the host processor and the video decoder, such communications are described as being carried out by software-

based communications known as application program interface (API) calls, not by command packets in a transport stream.

1. MacInnis does not expressly or inherently disclose that the video decoder executes “command transport packets” that cause the video decoder to perform the claimed decoding process

47. LG’s citations to MacInnis’s discussion of “command transport packets” do not expressly or inherently disclose “transport packets providing a plurality of instructions ... wherein execution of the instructions by the video decoder comprises causing ...” the video decoding process claimed in claim 1. Petition at 25-29. LG primary relies on ¶ [0040], which states that the CPU’s data transport driver (DTD) “inserts a command transport packet containing various commands to the video transport processor 118 and the video decoder 120.” Ex. 1003, ¶ [0040]. MacInnis does not expressly state what the “commands” are except to state that “[t]he inserted transport packet preferably contains command fields for controlling the data flow of the MPEG video stream during play back” *Id.* However, MacInnis explains that commands for controlling the data flow are sent to the data transport processor 116 and/or the video transport processor 118 only and not to the video decoder 120. *Id.* (“data transport driver (DTD) which preferably runs in the CPU 113, preferably is responsible for data flow of the stream to be played back through the data transport processor 116 and/or the video transport processor 118.”); *id.* at ¶ [0037] (“The CPU 113 may control the data

transport processor 116 and/or the video transport processor 118 to implement trick modes (e.g., pause, fast forward, slow forward, rewind, fast reverse, slow reverse, skip).”) Accordingly, MacInnis does not expressly state what, if any, commands are sent to the video decoder 120.

48. LG then assumes without any supporting evidence in MacInnis that these “various commands” control the video decoder 120 and cause the video decoder to perform the decoding process that is claimed in claim 1. Petition at 29. MacInnis describes the decoder’s trick mode operations in Section III “Normal/Slow/Fast Forward” (¶ [0072]) and Section IV “Reverse” (¶ [0105]). Nowhere in these sections does MacInnis state that any video decoder operations are caused by the video decoder executing instructions from a command packet. *See* Ex. 1003, ¶¶ [0072]-[0134]. In fact, as I discuss in more detail below, MacInnis refers to API calls as controlling the video decoder’s operations, not command packets.

49. LG also argues, under their heading “Construction II,” that the video stream itself is the claimed “instructions.” Petition at 27-28. However, LG never argues or explains how these “instructions” cause the video decoder to perform the claimed decoding process. Petition at 29. Instead, LG only argues that the “command fields in transport packets” are the alleged “instructions” that cause the video decoder to perform the claimed decoding process. Accordingly, whether the video stream itself is the alleged “instructions” is a moot point because LG does

not argue or explain how these instructions cause the video decoder to perform the claimed decoding process.

50. Furthermore, LG's citations to ¶ [0040] in combination with ¶ [0043] are improper because MacInnis explicitly refers to the embodiment in ¶ [0040] as distinct from the embodiments in ¶ [0043]. Specifically, MacInnis states that ¶ [0040] is "an embodiment according to the present invention" and directly after discussing this embodiment states that ¶ [0043] is related to "other embodiments." It is improper to pick and choose teachings from different embodiments, even if from the same reference, to establish anticipation. "[T]he hallmark of anticipation is prior invention, the prior art reference--in order to anticipate under 35 U.S.C. § 102--must not only disclose all elements of the claim within the four corners of the document, but must also disclose those elements arranged as in the claim." *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008) (internal quotations removed). Even if ¶ [0043] were to be considered the same embodiment as the embodiment as described in ¶ [0040], ¶ [0043] only vaguely refers to "command transport packets" and does not expressly or inherently disclose "transport packets providing a plurality of instructions ... wherein execution of the instructions by the video decoder comprises causing ..." the video decoding process claimed in claim 1: "These other embodiments may or may not use command transport packets to effect command and control", ¶ [0043].

51. Accordingly, claim 1 is not unpatentable as being anticipated by MacInnis because MacInnis does not expressly or inherently disclose “transport packets providing a plurality of instructions ... wherein execution of the instructions by the video decoder comprises causing ...” the video decoding process claimed in claim 1.

2. MacInnis explains that the host processor controls the video decoder through API calls and not instructions in transport packets

52. Rather than executing instructions via command packets, MacInnis explains that “The preferred means to control the decoder is for the host to tell the decoder, via an API call, to start decoding” Ex. 1004, ¶ [0154]. Directly after MacInnis describes the specific embodiment that includes “command transport packets,” MacInnis explains that “In *other embodiments*, various different software, hardware and/or firmware available to those skilled in the art may be used to provide commands to the data transport processor 116, the video transport processor 118 and/or the video decoder 120 to implement and control the trick modes.” Ex. 1003, ¶ [0043] (emphasis added). MacInnis then repeatedly describes the host as communicating and controlling the video decoder via API calls. *Id.* at ¶¶ [0101], [0127], [0134], [0154], [0155], [0157], [0165].

53. Specifically, MacInnis explains that both fast forwarding and reverse trick mode operations in the video decoder are caused by API calls from the host. LG

points to ¶ [0095] and ¶ [0111] of MacInnis as describing the claimed decoding process where the decoder performs “decoding at least a portion of another picture after decoding the at least one slice above the intracoded slice and the intracode slice without having decoding the at least one slice below the intracoded slice.” Petition at 37-38. These paragraphs in MacInnis describe fast-forward (¶ [0095]) and reverse (¶ [0111]) operations in the video decoder. Ex. 1003, ¶ [0089] (the header for the section containing ¶ [0095]) and ¶ [0108] (the header for the section containing ¶ [0111]). However, MacInnis explains that the host controls the video decoder’s fast forward operations through API calls and not instructions in command packets: “In this case of fast forward with skipping... the host preferably tells the decoder, via an API call” *Id.* at ¶ [0157]. Similarly, MacInnis explains that the host controls the video decoder’s reverse operations through API calls and not instructions in command packets: “The host may command the decoder to do this [reverse play] via an API call.” *Id.* at ¶ [0165].

54. Accordingly, claim 1 is not unpatentable as being anticipated by MacInnis because MacInnis discloses that API calls from the host processor to the video decoder control the video decoder’s operations. MacInnis does not disclose “transport packets providing a plurality of instructions ... wherein execution of the instructions by the video decoder comprises causing ...” the video decoding process claimed in claim 1.

B. The combination of MacInnis and ISO 13818-2 does not render obvious claim 4

55. LG's obviousness argument presented as Ground 2 does not address the deficiencies in MacInnis that I discussed above and nothing in the proposed combination of MacInnis and ISO 13818-2 addresses these deficiencies.

Accordingly, based on LG's failure to explain how MacInnis discloses "wherein execution of the instructions by the video decoder comprises causing," the Board should find that the combination of MacInnis and ISO 13818-2 does not render unpatentable claim 4 of the '967 Patent.

IX. CONCLUSION

56. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

57. Executed on this 16th day of March 2018 in Aberdeen, Scotland.

A handwritten signature in blue ink, reading "Iain E. Richardson", with a long horizontal flourish extending to the right.

Dated: March 16, 2018

Iain Richardson, Ph.D

EXHIBIT 1

CURRICULUM VITAE

Iain E Richardson

Internationally known expert on video compression standards including H.264 and HEVC. Author of four widely cited books on video and image coding, experienced expert witness in US and international patent litigation cases.

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Personal Profile

An international expert on compression coding, I am the author of four books and over 70 journal and conference papers on video compression, including two widely cited books on the H.264 / MPEG-4 standards. I regularly advise companies on video compression and streaming technology, video coding patents and technology acquisitions. I have acted as an expert witness in multiple US and EU patent litigation cases. I have given expert testimony in San Diego, New York, Washington DC and The Hague and regularly give invited lectures on video compression coding, including at the Smithsonian Institution and the US Patent and Trademark Office.

I have made an internationally significant contribution to research in the field of image and video compression. This is the essential technology for applications such as digital television, internet video streaming and video on mobile phones. My research has addressed the growing challenge faced by industry, namely how to support sophisticated video compression on an increasing range of devices and platforms. I am a member of British Standards Institute expert group IST/37, the committee which represents the UK in ISO/IEC MPEG standardisation.

I invented and commercialised Beamshare, a novel technology for rapid and secure sharing and streaming of video and other media. Beamshare is now in use in industries such as Search and Rescue and broadcast video production.

I am based in the UK and travel several times a year to the US.

Qualifications

M.Eng. (1990), Heriot-Watt University, Edinburgh, UK
Ph.D. (1999), Robert Gordon University, Aberdeen, UK

Employment experience

2006 - present	Managing Director, Vcodex Ltd, Aberdeen, UK
2009 – 2015	Managing Director, Onecodec Ltd, Aberdeen, UK
1993 - 2010	Full Professor, School of Engineering, The Robert Gordon University
1995 - 2000	Director, 4i2i Communications Ltd
1990 - 1993	Digital Signal Processor Designer, GEC Ltd, Edinburgh

Expert witness and intellectual property experience

An experienced expert witness in patent litigation cases, I have testified at deposition and trial in:

1. United States District Court (Southern District of California) Case No. 05cv1958 B(BLM), San Diego, USA, 2006-2007 (Video compression, H.264)
2. United States International Trade Commission Investigation 337-TA-724, Washington DC, 2011 (Graphics compression)
3. United States District Court (Southern District of California) Case No. 3:10-cv-02618, San Diego, USA, 2012 (Video compression, MPEG-2 and H.264)
4. United States International Trade Commission Investigation 337-TA-837, Washington DC, 2013 (Data / video compression, H.264)

I have testified at deposition in:

5. United States District Court (Southern District of California) Case no. 09 CV 0278-H (CAB), USA, 2011 (Video compression, MPEG-2 and H.264)
6. United States International Trade Commission Investigation 337-TA-885, New York City, 2013 (Video compression)
7. Patent Trial and Appeal Board, Inter Partes Review IPR2015-00302, Washington DC, 2015 (Data and video compression)
8. Patent Trial and Appeal Board, Inter Partes Review IPR2015-01089, Washington DC, 2016 (Data and video compression)
9. United States District Court (Northern District of California) Case no. 3:15-CV-04525-EMC, USA, 2016 (Video compression)
10. United States District Court (Central District of California) Case no. 8:16-cv-1052, USA, 2017 (Video compression)
11. Patent Trial and Appeal Board, Inter Partes Review IPR2016-01362, Washington DC, 2017 (Video communications)

I have been engaged by a number of US and EU law firms to provide patent portfolio analysis and expert witness services, including:

- Finnegan, Henderson, Farabow, Garrett & Dunner, LLP
- Cooley LLP
- Young Basile Hanlon & MacFarlane P.C.
- Quinn Emanuel Urquhart & Sullivan, LLP
- Kilpatrick Townsend & Stockton LLP

- Polsinelli P.C.
- Hogan Lovells LLP
- Sterne Kessler Goldstein and Fox PLLC

Publications

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2. I. Richardson, "Video compression codecs: a survival guide", IASA Journal No. 47, January 2017.
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Patents / Patent Applications Include

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3. Iain Richardson, Selective perceptual masking via downsampling in the spatial and temporal domains using intrinsic images for use in data compression, US 20140269943 A1
4. Iain Richardson and Sampath Kannangara, Encoder control apparatus and method, WO 2007066101 A2
5. Iain Richardson and Sampath Kannangara, Video quality measurement, EP 1585348 A1
6. Iain Richardson and Maja Bystrom, Systems and methods for encoding and decoding, US8995534
7. Iain Richardson and Maja Bystrom, Systems and methods for encoding, transmitting and decoding, US 20120069911 A1
8. Iain Richardson and Maja Bystrom, Systems and methods for encoding, sharing, and decoding of multimedia, US 20130188739 A1
9. Iain Richardson and Maja Bystrom, Systems and methods for encoding and decoding, US 9154797
10. Casey Smith, Iain Richardson and Abharana Bhat, Selective perceptual masking via scale separation in the spatial and temporal domains using intrinsic images for use in data compression, US 8897378