

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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APPLE INC.,  
Petitioner,

v.

CALIFORNIA INSTITUTE OF TECHNOLOGY,  
Patent Owner.

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Case IPR2017-00211  
Patent 7,116,710 B1

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Before KEN B. BARRETT, TREVOR M. JEFFERSON, and  
JOHN A. HUDALLA, *Administrative Patent Judges*.

JEFFERSON, *Administrative Patent Judge*.

DECISION

Denying Institution of *Inter Partes* Review  
35 U.S.C. § 314(a) and 37 C.F.R. § 42.108

## I. INTRODUCTION

Petitioner, Apple, Inc. (“Apple”), filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review of claims 1–8, 10–17, and 19–33 of U.S. Patent No. 7,116,710 B1 (Ex. 1101, “the ’710 patent”) pursuant to 35 U.S.C. §§ 311–319. Apple relies on the Declaration of James A. Davis, Ph.D. (Ex. 1106) with its Petition. Patent Owner, California Institute of Technology (“Caltech”), filed a Preliminary Response (Paper 16, “Prelim. Resp.”) to the Petition.

We have jurisdiction under 37 C.F.R. § 42.4(a) and 35 U.S.C. § 314, which provides that an *inter partes* review may not be instituted unless the information presented in the Petition “shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” After considering the Petition and associated evidence, we conclude that Apple has not demonstrated a reasonable likelihood that it would prevail in showing the unpatentability of the challenged claims of the ’710 patent.

### A. Related Proceedings

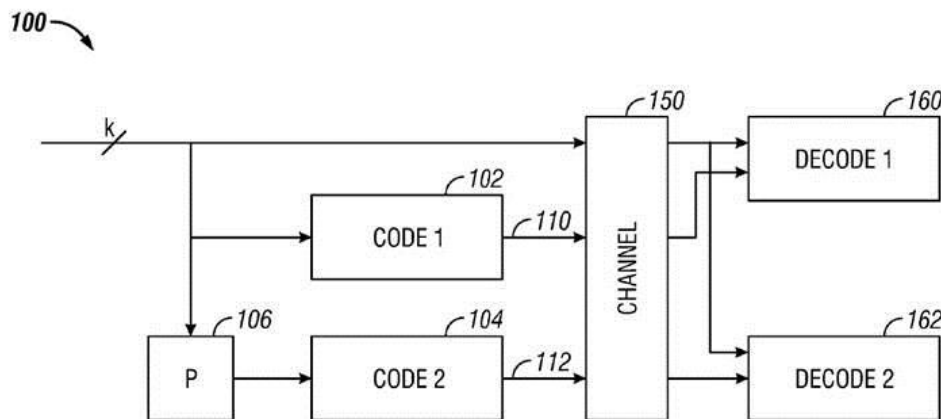
The parties indicate that the ’710 patent was involved in the following active case, *Cal. Inst. of Tech. v. Broadcom Ltd.*, No. 2:16-cv-03714 (C.D. Cal. filed May 26, 2016), and in concluded cases, *Cal. Inst. of Tech. v. Hughes Commc’ns, Inc.*, No. 2:15-cv-01108 (C.D. Cal. filed Feb. 17, 2015); and *Cal. Inst. of Tech. v. Hughes Commc’ns, Inc.*, 2:13-cv-07245 (C.D. Cal. filed Oct. 1, 2013). Pet. 3–4, Paper 8, 2–3.

The parties also identify co-pending cases IPR2017-00210 and IPR2017-00219, in which Apple has filed a petition for *inter partes* review

of the '710 patent. Pet. 3–4; Paper 8, 2–3. *Inter partes* review of the '710 patent was previously considered and denied in *Hughes Network Sys., LLC v. Cal. Inst. of Tech.*, IPR2015-00067 (PTAB April 27, 2015) (Paper 18) (“IPR2015-00067”) and *Hughes Network Sys., LLC v. Cal. Inst. of Tech.*, IPR2015-00068 (PTAB April 27, 2015) (“IPR2015-00068”). Finally, patents related to the '710 patent were challenged in IPR2015-00059, IPR2015-00060, IPR2015-00061, and IPR2015-00081. Pet. 3–4.

### *B. The '710 Patent*

The '710 patent describes the serial concatenation of interleaved convolutional codes forming turbo-like codes. Ex. 1101, Title [54]. It explains some of the prior art with reference to its Fig. 1, reproduced below.



**FIG. 1**  
**(Prior Art)**

Figure 1 is a schematic diagram of a prior “turbo code” system. *Id.* at 2:14–15. The '710 patent specification describes Figure 1 as follows:

A standard turbo coder 100 is shown in FIG. 1. A block of  $k$  information bits is input directly to a first coder 102. A  $k$  bit interleaver 106 also receives the  $k$  bits and interleaves them prior to applying them to a second coder 104. The second coder produces an output that has more bits than its input, that

is, it is a coder with rate that is less than 1. The coders 102,104 are typically recursive convolutional coders.

Three different items are sent over the channel 150: the original  $k$  bits, first encoded bits 110, and second encoded bits 112. At the decoding end, two decoders are used: a first constituent decoder 160 and a second constituent decoder 162. Each receives both the original  $k$  bits, and one of the encoded portions 110, 112. Each decoder sends likelihood estimates of the decoded bits to the other decoders. The estimates are used to decode the uncoded information bits as corrupted by the noisy channel.

*Id.* at 1:38–53(emphasis omitted).

A coder 200, according to a first embodiment of the invention, is described with respect to Figure 2, reproduced below.

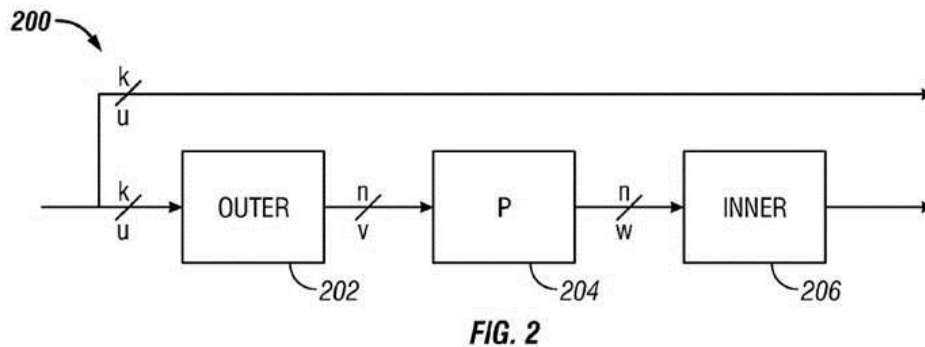


Figure 2 of the '710 patent is a schematic diagram of coder 200. *Id.* at 2:16–17.

The specification states that “coder 200 may include an outer coder 202, an interleaver 204, and inner coder 206.” *Id.* at 2:34–35. It further states as follows:

The outer coder 202 receives uncoded data. The data may be partitioned into blocks of fixed size, say  $k$  bits. The outer coder may be an  $(n,k)$  binary linear block coder, where  $n > k$ . The coder accepts as input a block  $u$  of  $k$  data bits and produces an output block  $v$  of  $n$  data bits. The mathematical

relationship between  $u$  and  $v$  is  $v=T_0u$ , where  $T_0$  is an  $n \times k$  matrix, and the rate<sup>[1]</sup> of the coder is  $k/n$ .

The rate of the coder may be irregular, that is, the value of  $T_0$  is not constant, and may differ for sub-blocks of bits in the data block. In an embodiment, the outer coder 202 is a repeater that repeats the  $k$  bits in a block a number of times  $q$  to produce a block with  $n$  bits, where  $n=qk$ . Since the repeater has an irregular output, different bits in the block may be repeated a different number of times. For example, a fraction of the bits in the block may be repeated two times, a fraction of bits may be repeated three times, and the remainder of bits may be repeated four times. These fractions define a degree sequence, or degree profile, of the code.

The inner coder 206 may be a linear rate-1 coder, which means that the  $n$ -bit output block  $x$  can be written as  $x=T_1w$ , where  $T_1$  is a nonsingular  $n \times n$  matrix. The inner coder 210 can have a rate that is close to 1, e.g., within 50%, more preferably 10% and perhaps even more preferably within 1% of 1.

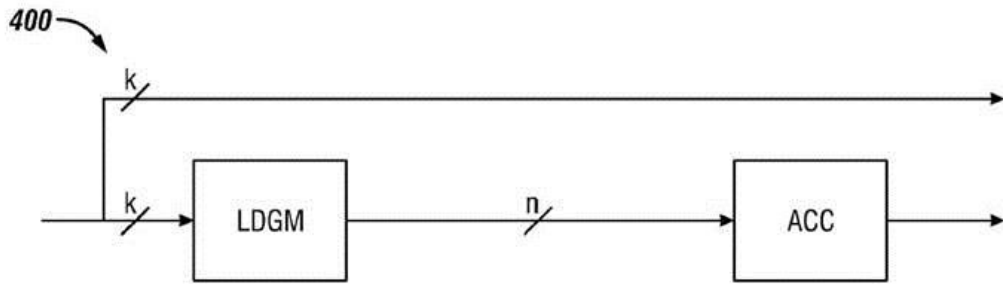
*Id.* at 2:41–64 (emphasis omitted). Codes characterized by a regular repeat of message bits into a resulting codeword are referred to as “regular repeat,” whereas codes characterized by irregular repeat of message bits into a resulting codeword are referred to as “irregular repeat.” The second (“inner”) encoder 206 performs an “accumulate” function. Thus, the two-step encoding process illustrated in Figure 2, including a first encoding (“outer encoding”) followed by a second encoding (“inner encoding”), results in either a “regular repeat accumulate” (“RRA”) code or an “irregular

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<sup>1</sup> The “rate” of an encoder refers to the ratio of the number of input bits to the number of resulting encoded output bits related to those input bits. *See* Pet. 9.

repeat accumulate (“IRA”) code, depending upon whether the repetition in the first encoding is regular or irregular.

Figure 4 of the '710 patent, reproduced below, shows an alternative embodiment in which the first encoding is carried out by a low density generator matrix.



**FIG. 4**

Figure 4 of the '710 patent is a schematic of an irregular repeat and accumulate coder using a low density generator matrix (LDGM)<sup>2</sup> coder. *Id.* at 2:20–21, 3:24–25, 3:51–54. The LDGM coder “performs an irregular repeat of the k bits in the block, as shown in FIG. 4.” *Id.* LDGM codes are a special class of low density parity check codes that allow for less encoding and decoding complexity. LDGM codes are systematic linear codes generated by a “sparse” generator matrix. No interleaver (as in the Figure 2 embodiment) is required in the Figure 4 embodiment because the LDGM provides scrambling otherwise provided by the interleaver.

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<sup>2</sup> A “generator” matrix (typically referred to by “G”) is used to create (generate) codewords. A parity check matrix (typically referred to by “H”) is used to decode a received message.

*C. Illustrative Claims*

Apple challenges claims 1–8, 10–17, and 19–33 of the '710 patent, of which claims 1, 11, 15, and 25 are independent. Pet. 22. Claims 1 and 3 are illustrative of the claims at issue and are reproduced below:

1. A method of encoding a signal, comprising:
  - obtaining a block of data in the signal to be encoded;
  - partitioning said data block into a plurality of sub-blocks, each sub-block including a plurality of data elements;
  - first encoding the data block to form a first encoded data block, said first encoding including repeating the data elements in different sub-blocks a different number of times;
  - interleaving the repeated data elements in the first encoded data block; and
  - second encoding said first encoded data block using an encoder that has a rate close to one.
3. The method of claim 1, wherein said first encoding is carried out by a first coder with a variable rate less than one, and said second encoding is carried out by a second coder with a rate substantially close to one.

Ex. 1101, 7:14–25, 7:28–31.

*D. The Alleged Grounds of Unpatentability*

The information presented in the Petition sets forth the grounds of unpatentability of claims 1–8, 10–17, and 19–33 of the '710 patent as follows (*see* Pet. 37–76):

Reference(s)	Basis	Claim(s) Challenged
Frey Slides <sup>3</sup>	§ 102(a)	1 and 3
Frey Slides and Divsalar <sup>4</sup>	§ 103(a)	1–8 and 11–14
Frey Slides, Divsalar, and Luby97 <sup>5</sup>	§ 103(a)	15–17, 19–22, and 24–33
Frey Slides, Divsalar, and Pfister Slides <sup>6</sup>	§ 103(a)	10
Frey Slides, Divsalar, Luby97, and Pfister Slides	§ 103(a)	23

## II. ANALYSIS

### A. Printed Publication Prior Art

Caltech contends that Apple has not established that the Frey Slides and Pfister Slides are prior art printed publications. Prelim. Resp. 7–15. We address each of these issues below.

#### 1. Frey Slides (Ex. 1113) & Pfister Slides (Ex 1105)

Apple asserts that the Frey Slides were presented at an Allerton Conference but otherwise makes few arguments establishing the Frey Slides

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<sup>3</sup> Brendan J. Frey and David J.C. MacKay, *Irregular Turbo-Like Codes*, Presentation at Allerton Conference, September 1999 (Ex.1113, “Frey Slides”).

<sup>4</sup> Dariush Divsalar, et al., *Coding Theorems for “Turbo-Like” Codes*, PROCEEDINGS OF THE THIRTY-SIXTH ANNUAL ALLERTON CONFERENCE ON COMMUNICATION, CONTROL, AND COMPUTING, Sept. 23–25, 1998, at 201–209 (Ex. 1103, “Divsalar”).

<sup>5</sup> Luby, M. et al., *Practical Loss-Resilient Codes*, PROCEEDINGS OF THE TWENTY-NINTH ANNUAL ACM SYMPOSIUM ON THEORY OF COMPUTING, May 4–6, 1997, at 150–159 (Ex. 1111, “Luby97”).

<sup>6</sup> Pfister, H., et al, *The Serial Concatenation of Rate-1 Codes Through Uniform Random Interleavers*, Presentation at Allerton Conference, Sept. 22–24, 1999 (Ex. 1105, “Pfister Slides”).



as a prior art printed publication. Pet. 29. Apple’s entire statement on the Frey Slides reads as follows:

The Frey Slides (Ex. 1113) were presented by Brendan Frey at the Allerton Conference in September, 1999. The Frey Slides contain the material upon which the Frey paper, published in the Allerton 1999 conference proceedings, is based. (*See* Ex. 1117, p. 36). (Ex. 1106, ¶71.)

Pet. 29. Apple relies on an unsworn expert report produced by Dr. Brendan Frey (Ex. 1117) produced in related district court litigation to support its contention that the Frey Slides are a printed publication.

Caltech argues that Apple’s petition “lacks the requisite explanation and supporting evidence that the Frey Slides are prior art of any type . . . available to serve as a basis of challenge in an *inter partes* review.” Prelim. Resp. 7. We agree.

Under 35 U.S.C. § 311(b), IPR challenges are limited to patents and printed publications. We look to the underlying facts to make a legal determination as to whether a reference is a printed publication. *Suffolk Techs., LLC v. AOL Inc.*, 752 F.3d 1358, 1364 (Fed. Cir. 2014). The determination of whether a given reference qualifies as a prior art “printed publication” involves a case-by-case inquiry into the facts and circumstances surrounding its disclosure to members of the public. *In re Klopfenstein*, 380 F.3d 1345, 1350 (Fed. Cir. 2004). The key inquiry is whether the reference was made “sufficiently accessible to the public interested in the art” before the critical date. *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989); *In re Wyer*, 655 F.2d 221, 226 (CCPA 1981). “A given reference is ‘publicly accessible’ upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons

interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.” *Bruckelmyer v. Ground Heaters, Inc.*, 445 F.3d 1374, 1378 (Fed. Cir. 2006) (citation omitted). With respect to slide presentations, Federal Circuit case law and a prior opinion from our Board have found that the mere presentation of slides at a professional conference is not *per se* a prior art printed publication. *Klopfenstein*, 380 F.3d at 1349 n.4; *Temporal Power Ltd. v. Beacon Power, LLC*, Case IPR2015-00146, slip op. at 8–11 (PTAB April 27, 2015) (Paper 10).

We agree with Caltech that the expert report of Dr. Frey from a prior related district court litigation is insufficient evidence to establish whether the Frey Slides are a printed publication. *See* Prelim. Resp. 8. The portion of the report cited by Apple merely states that Dr. Frey “prepared the Frey Slides . . . in collaboration with David MacKay and presented them at the Allerton Conference in September, 1999.” Ex. 1117, 38 (¶ 114); Pet. 29. Neither Apple nor the Frey report provide any details about the presentation or address issues relevant to determining if the slides are a prior art printed publication. *See, e.g., Klopfenstein*, 380 F.3d at 1349–50.

At best, Apple establishes only that a presentation took place; Apple fails to provide sufficient evidence or argument regarding the ease with which the audience attending the Frey Slides presentation could access the slides before, during or after the presentation. *See, e.g., Klopfenstein*, 380 F.3d at 1350 (addressing slide presentation); *Temporal Power Ltd.*, IPR2015-00146 at 8–11. Although we give the unsworn report of Dr. Frey little to no weight, even if we fully considered Dr. Frey’s report, Apple’s petition is devoid of any information or argument supporting whether the Frey Slides presented in support of the petition (Ex. 1113) are the same

slides discussed in Dr. Frey's unsworn report, which does not include a copy of the full presentation. *See* Pet. 29; Ex. 1117, 38–39. On the record before us, Apple's evidence is insufficient to establish whether the Frey Slides qualify as a printed publication.

Apple's evidence and argument regarding the prior art printed publication status of the Pfister Slides (Ex. 1105) is also insufficient. *See* Pet. 36; Prelim. Resp. 13–15. Apple contends that Paul Siegel presented the Pfister Slides at the Allerton Conference in September 1999, relying on a declaration from Mr. Siegel that does not support whether the Pfister Slides are a printed publication. Pet. 36 (citing Declaration of Paul Siegel, Ex. 1120, 3). Mr. Siegel's declaration in its entirety does not address the factors cited in *In re Klopfenstein* as to whether the slides in question qualify as a printed publication. *See* Ex. 1120. As such, Apple makes no attempt to explain the manner in which the Pfister Slides were published or how the Pfister Slides were made accessible to the relevant public.

Based on the foregoing, Apple fails to meet the burden imposed under § 314(a) to establish in its Petition a reasonable likelihood of success, which includes making a threshold showing that the Frey Slides and Pfister Slides are prior art printed publications. We find that Apple has not demonstrated a likelihood of showing that the grounds based on the Frey Slides and Pfister Slides render the challenged claims unpatentable.

Because each of the grounds asserted in the present case rely on the Frey Slides (and two of those grounds also rely on the Pfister Slides), we find that Apple has failed to demonstrate reasonable likelihood that it would prevail in showing the unpatentability of the challenged claims of the

'710 patent based on the Frey Slides or the Pfister Slides. Accordingly, we do not institute trial on any of the grounds asserted in Apple's petition.

### III. CONCLUSION

For the foregoing reasons, we are not persuaded that Petitioner has met its burden of showing a reasonable likelihood of prevailing in demonstrating that claims 1–8, 10–17, and 19–33 of the '710 patent are unpatentable.

### IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314, an *inter partes* review is hereby denied as to all grounds raised in the Petition for the reasons stated above and no trial is instituted.

IPR2017-00211  
Patent 7,116,710 B1

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