

# Patent Owner Caltech's Oral Argument May 8, 2018

Apple, Inc. v. California Institute of Technology.  
Case No. IPR2017-00700

# Instituted Grounds: Pat. No. 7,421,032

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## IPR2017-00700

Ground	Claims	Basis	Prior Art
1	11, 12, 14-16	103	Ping, MacKay, Divsalar
2	13	103	Ping, MacKay, Divsalar, Luby97

## IPR2017-00701

Ground	Claims	Basis	Prior Art
1	1, 4-10	103	Ping, MacKay, Divsalar, Luby97

## IPR2017-00728

Ground	Claims	Basis	Prior Art
1	18-23	103	Ping, MacKay, Divsalar, Luby97

# Caltech's Groundbreaking Invention

## IRA codes solved a decades-old problem

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- ▶ Gallager introduced LDPC codes in 1963, but they required complex quadratic encoding that prevented their adoption for decades. (MM ¶¶181-182, 194.)

range of trade-offs between performance and decoding complexity. One major criticism concerning LDPC codes has been their apparent high *encoding* complexity. Whereas turbo codes can be encoded in linear time, a straightforward encoder implementation for a LDPC code has complexity quadratic in the block length. Several authors have addressed this issue:

Richardson 2001 (EX2011) at 2 (emphasis added)

While semiconductor technology has progressed to an extent where the implementation of LDPC codes has become possible, many practical issues still remain. First and foremost, there is a need to reduce complexity without sacrificing performance.

Kim 2006 (EX2010) at 1 (emphasis added)

# IRA codes solved a decades-old problem

186. Despite the fact that LDPC codes had been known in the art since the 1960s, prior to the invention of IRA codes no one in the art had devised a way to achieve near-Shannon limit communications with low complexity encoding and decoding. Use of LDPC codes had been particularly hindered by encoding complexity that discouraged their use in practical applications.

187. The invention of IRA codes provided a solution to the long-standing shortcomings of LDPC codes and error correcting codes in general. IRA codes allow near-Shannon limit communications with low complexity encoding and decoding. As a result, the IRA codes, encoders, decoders, and methods disclosed and claimed in the '032 patent have been widely praised by the industry.

MM ¶¶ 186, 187

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