UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re: Inter Partes Review of:	:
U.S. Pat. No. 7,116,710	:
U.S. Pat. No. 7,421,032	:
U.S. Pat. No. 7,421,781	:
and U.S. Pat. No. 8,284,833	:
Inventor: Hui Jin, et al	: IPR No. Unassigned
Assignee: California Institute of Technology	

Common Title: **Serial Concatenation of Interleaved Convolutional Codes Forming Turbo-Like Codes**

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
Box 1450
Alexandria, Virginia 22313-1450

Submitted Electronically via the Patent Review Processing System

DECLARATION OF PAUL H. SIEGEL

Declaration of Paul H. Siegel

I, **Paul H. Siegel**, declare as follows:

1.   I am over the age of 18 and am legally competent to make this declaration. I make this declaration based upon my own personal knowledge.

2.   I am currently a Professor at the University of California, San Diego, in the Department of Electrical and Computer Engineering, the Jacobs School of Engineering, and the Center for Memory and Recording Research.

3.   I have been asked to provide a statement of certain facts related to work I did together with Henry D. Pfister relating to the serial concatenation of rate-1 codes through uniform random interleavers.

4.   Beginning in early 1999, I collaborated with Dr. Pfister, then a Ph.D student of mine, to show that improved error-correcting codes can be constructed from simple components, *e.g.*, by serially concatenating an arbitrary outer code of rate $r < 1$ and m identical rate-1 inner codes.

5.   The result of that collaboration was a presentation at the 1999 Allerton Conference on Communications, Control and Computing, in Allerton, Illinois ("1999 Allerton Conference") in September 1999. This conference was held September 22-24, 1999, and was open to the public for attendance. Any person who wanted to attend and was able to pay the attendance fee could

attend. The 1999 Allerton Conference was considered one of two primary conferences on the topic of iterative decoding during the time. The 1999 Allerton conference itself, as well as the proceedings that took place there, were publicized and generally known to those who were interested in topics relating to error-correcting codes and iterative decoding.

6.   At the 1999 Allerton Conference, I presented a series of slides relating to my work with Dr. Pfister on a class of codes based on serial concatenation of a rate-r code with $m \geq 1$, uniformly interleaved rate-1 codes. In these slides, I discussed an example of these codes, called a "Repeat-Accumulate-Accumulate" (or "RAA") code. An RAA code is is similar to an RA code (Divsalar, et al., Allerton '98) to which an additional accumulator has been added. I compared RAA codes to RA codes and concluded that the RAA codes were able to achieve a lower word-error-probability than the RA codes, demonstrating that the performance of RA codes could be improved by including an additional accumulator. This presentation was entitled "The Serial Concatenation of Rate-1 Codes Through Uniform Random Interleavers," and I presented it in the IIA: Coding Theory: Iterative Decoding and Turbo Codes Session on September 22, 1999, the first day of the conference. A true and accurate copy of the slides that I presented at the 1999 Allerton Conference is attached as Exhibit 1.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information or belief are believed to be true; and further 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.

Dated: _11/9/16_

Paul H. Siegel

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