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**Virtual acoustic environments for music performance, rehearsal,  
and recording**

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A comprehensive 24-channel sound field rendering system was built at McGill University's CIRMMT Centre to immerse scholar/performer Tom Beghin in virtual concert spaces where Haydn composed and performed his keyboard sonatas, or expected them to be performed. The virtual rooms were reconstructed from detailed measurements made in Haydn's historical rooms in Europe using a high-resolution 24bit/96kHz impulse-response measuring system. In an acoustically treated laboratory, 24 custom loudspeaker arrays were arranged on a surface of a hemisphere surrounding the performer. Multiple fast DSP engines convolved live signals with 24 impulse responses allowing the performer to rehearse and record in each room with low-latency virtual acoustics. This paper describes the details of system design, the method of measurement, and discusses various aspects of recording and performing in virtual acoustic environments. The method has also been tested in a large room during public performance by having virtual-room responses and high-definition photo images projected from the stage. Surround sound recordings of Haydn's complete solo keyboard music made in several virtual rooms and matched to specific historical instruments will be released in a collection of 13 commercial SA-CD's by the end of 2008.