**Peak Power Enhancement in Time-Reversal Based Short Pulse Beamforming**

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In this presentation, we investigate an approach to enhance the peak power of beam-steered, ultra-wideband (UWB) pulses using a technique known as one-bit time-reversal (OBTR). Using a radiating structure consisting of small apertures backed by a reverberating cavity, OBTR is applied to generate a peak power enhanced, short pulse at each aperture. Each pulse contains the corresponding time-delay for beamforming at a desired steering angle.

In a previous work we demonstrated the ability to steer short, UWB pulses using a single-antenna system. (S. K. Hong, V. Mendez, W. S. Wall and R. Liao IEEE Antennas Wireless Propag. Lett, 13, 794-797, 2014). This approach uses apertures backed by a small reverberating cavity to create a single-antenna beamformer. This beamforming is achieved, first by recording the individual impulse response (IR) between each aperture and the feed in the reverberating cavity. Secondly, a relative time-delay is applied to the each of the time-reversed IRs. Finally, all of the delayed, time-reversed IRs are combined and retransmitted through the feed within the reverberating cavity, forming short pulses at each of the apertures in the cavity and allowing beam-steered short pulses to form in the far field.

Here we employ the same single-antenna beamformer for steering of UWB pulses. The OBTR technique is used instead of normal time-reversal to enhance the peak power of the output pulse. OBTR increases the energy content of the IRs time domain waveform while preserving the time delay profile (A. Derode, A. Tourin, and M. Fink, Journal of Applied Physics 85, 6343, 1999). As with normal TR, short pulses form at each of the apertures, however due to the increase energy content of the waveform, each pulse has an enhanced peak power. This in turn enhances the peak power of the beam-steered short pulses formed in the far field.