

# Photonic Time Stretch Channelizer for Broadband Microwave Spectrum Sensing

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**Abstract**— Microwave spectrum sensing is of critical importance in wireless communications, radars and electronic warfare. Measuring high-frequency and broadband RF signals in a high-speed and high-resolution while low-cost manner is challenging. Photonically assisted techniques have shown superior performance over their electronic counterpart. Particularly, optical spectral channelizer based technique has attracted great interest as it enables low-cost spectrum measurement for multi-tone microwave signals. One difficulty of this technique is its relatively poor measurement resolution, limited by the channel spacing.

Based on photonic time-stretch technique, which mirrors the spectrum shape of a largely chirped optical pulse to its temporal waveform, here we propose to use an optical channelizer to equivalently sample the modulated optical pulse. Since no high-speed photodetector is required, system cost is greatly reduced. More importantly, the method features greatly improved measurement resolution, which is more than two orders of magnitude higher than the channel spacing. The technique was verified by experimental demonstrations. Means to further improve the measurement resolution and operational bandwidth will be discussed as well.

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