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Coherent Multiband Splicing for Wideband Channel Characterization

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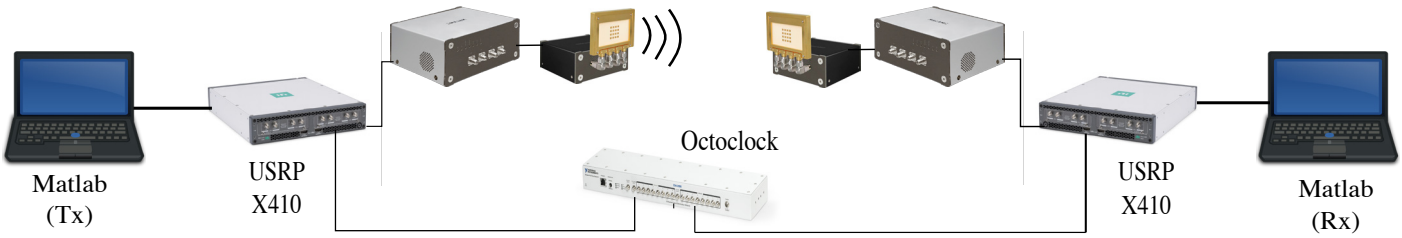
Can the existing cost-effective and energy-efficient infrastructure be used to support JCAS in the mmWave frequency band by increasing the effective bandwidth without modifying the sampling rate?



The setup operates at 28 GHz and it consists of two X410 USRPs, two BBox Lite frontends, and one UD Box 5G. The transmitted signal is generated via Matlab, using the IEEE 802.11be standard. The OFDM waveform spans a bandwidth of 320 MHz. The receiver captures the signal with a sampling rate of 500 MS/s. The frequency response is computed from the EHT-LTF field of the received frames. An Octoclock is used to synchronize the clocks of the transmitter and receiver.

KEY FINDINGS

In principle, the radio system comprising of the transmitter and receiver hops at different center frequencies to perform narrow-band measurements in time domain. The estimated channel frequency responses (CFRs) from each narrow-band measurement are then concatenated in the frequency domain to generate a wider bandwidth and a high-resolution channel impulse response (CIR).

In our latest survey paper, we studied the state of the art in coherent multiband splicing and identified open research questions. For beginners in the field, this review serves as a guide to the most relevant literature, enabling them to quickly catch up with the current achievements. For experts, we highlight open research questions that require further investigation.

Furthermore, we have developed a two-stage algorithm technique, which have shown promising preliminary results, even when only half of the spectrum is available. These results were obtained in a controlled environment without considering the issue of hardware distortions. Nevertheless, the phase offset due to the hardware distortions is crucial and needs to be estimated and compensated before concatenating the raw data from different center frequencies. Addressing this challenge defines our next step.

Sigrid Dimce and Falko Dressler, "Survey on Coherent Multiband Splicing Techniques for Wideband Channel Characterization," IET Communications, October 2024.

Sigrid Dimce, Anatolij Zubow and Falko Dressler, "mmSplicer: Toward Experimental Multiband Channel Splicing at mmWave Frequencies," Proceedings of 43rd IEEE International Conference on Computer Communications (INFOCOM 2024), Poster Session, Vancouver, Canada, May 2024. Best Poster Award