

Frequency-Phase Modulated Thermal Wave Radar

Stepping beyond State-of-the-art Infrared Thermography

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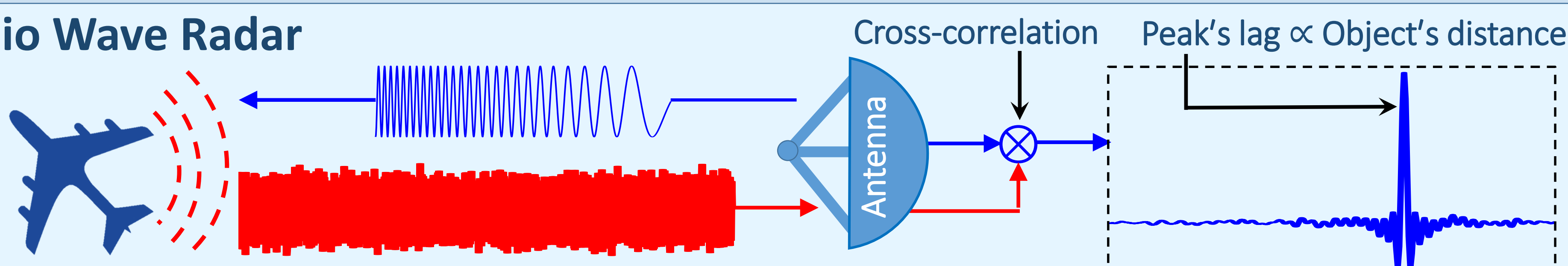
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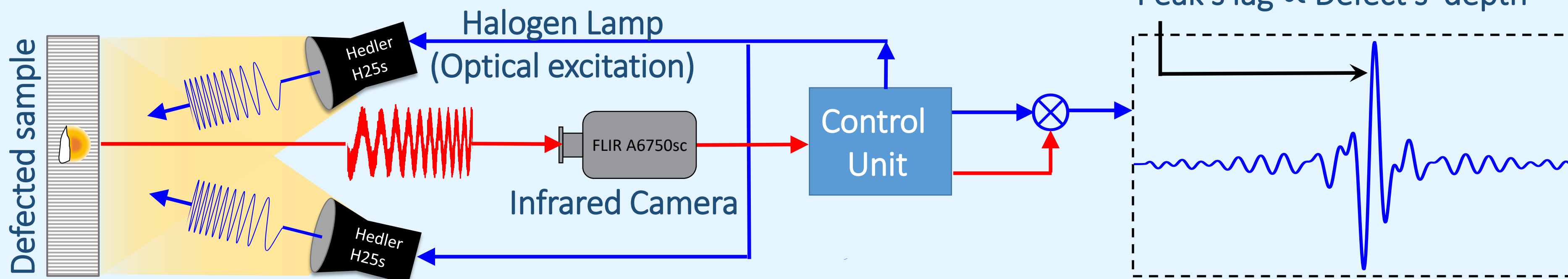
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Thermal wave radar is a state-of-the-art non-destructive testing method inspired by radio wave radar systems. The underlying principle of the technique is the application of a **modulated excitation waveform** by which the total energy of the response signal can be compressed in time-domain through **cross-correlation**. This leads to an **enhanced depth resolution and increased signal to noise ratio** in optical infrared thermography. Frequency sweep and Barker binary phase modulation are the two popular and widely researched excitation waveforms of the technique. In this research, a **novel frequency-phase modulated waveform** is introduced, which is designed for optimized performance of thermal wave radar.

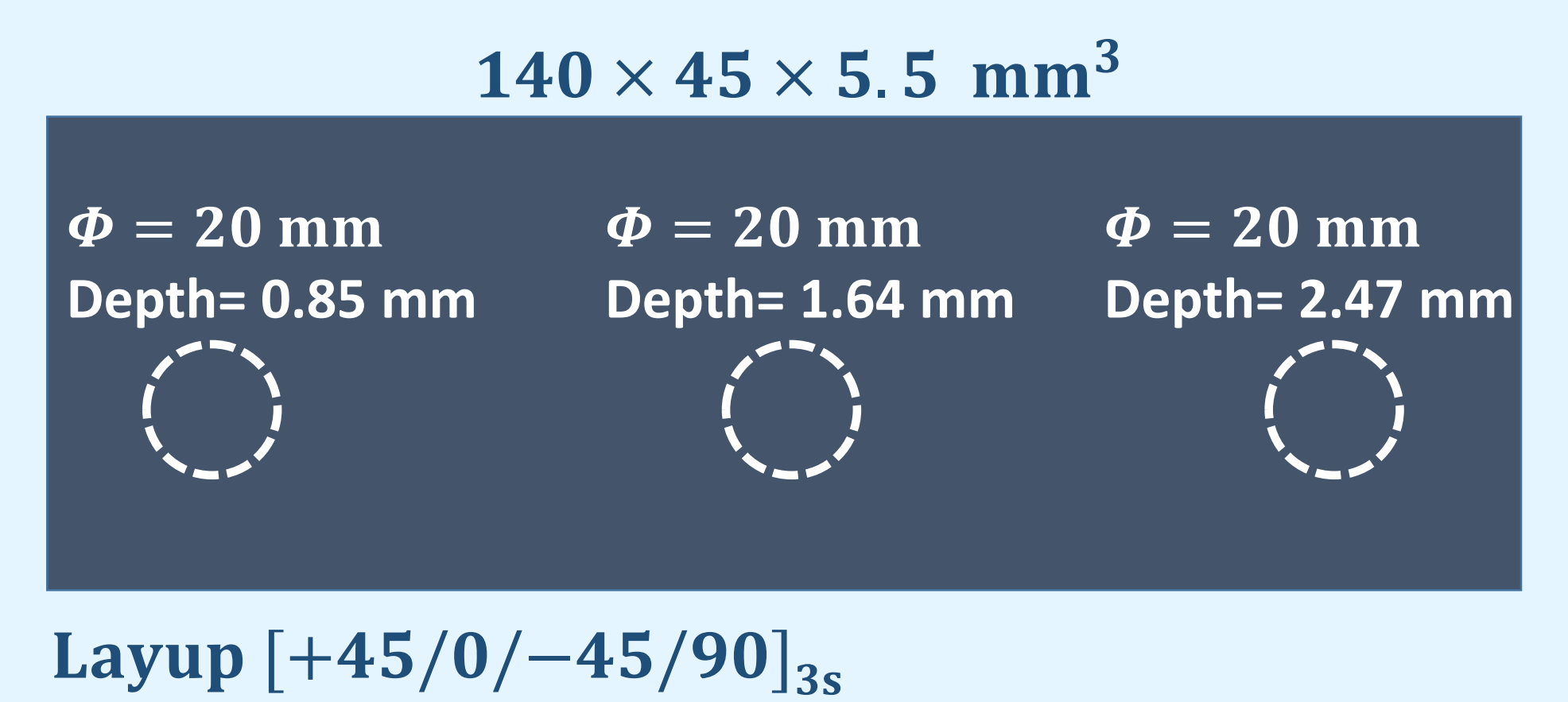
I. Radio Wave Radar



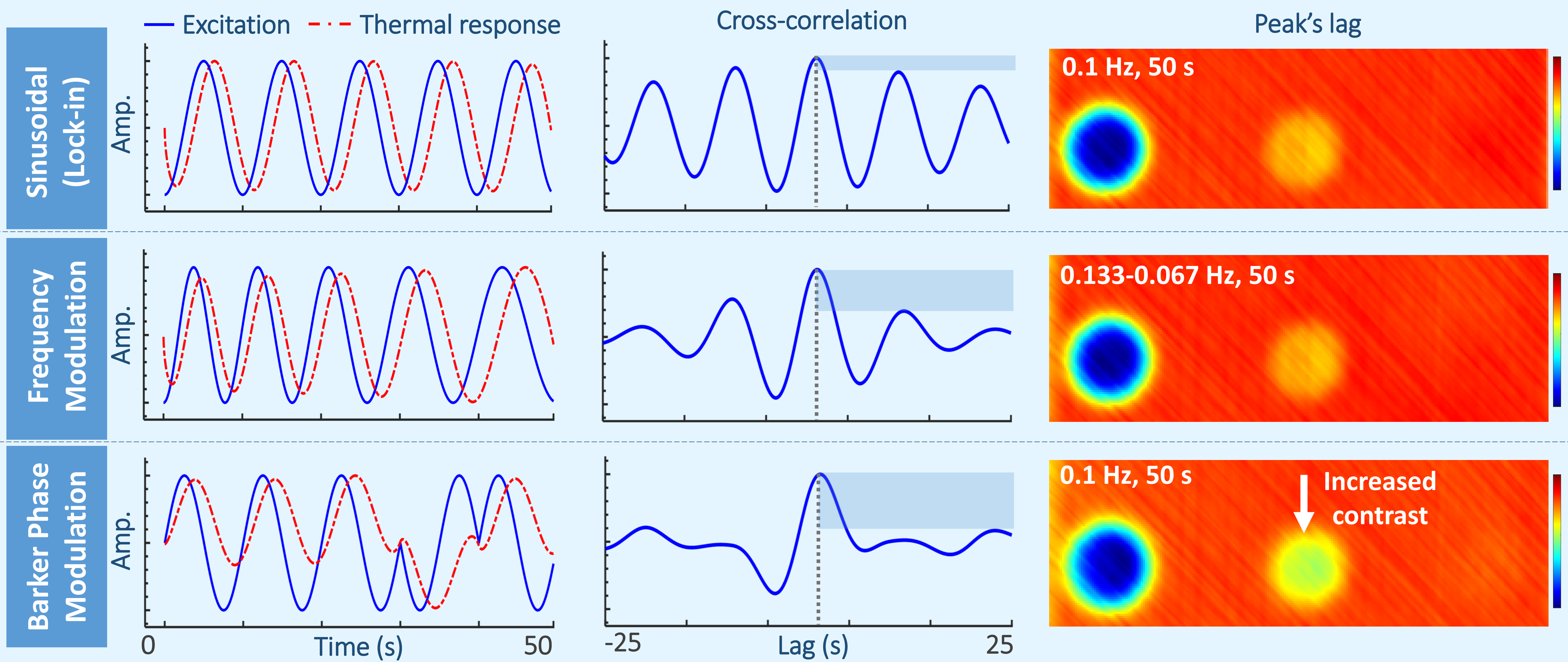
II. Thermal Wave Radar



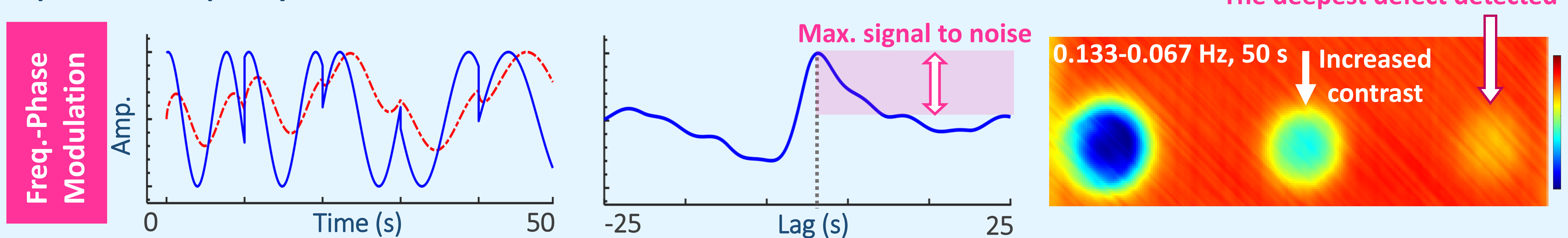
III. Defected CFRP Sample



IV. Conventional Waveforms



V. Optimized Frequency-Phase Modulated Waveform



VI. Prospects

➤ Improved frequency-phase modulation combinations

➤ Systematic optimization of the modulated waveform for specified test set-up

➤ Advanced post-processing for defect quantification

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