

Test and Measurement Instrumentation for Transparent Urban Structure

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Summary

The instrumentations will aid the Center for Advanced Communication (CAC) at Villanova University in conducting research in urban sensing and transparent urban structures funded by the Department of Defense (DOD). The ability to “see” targets behind obstacles such as walls, doors and other visually opaque materials has become a powerful tool for a variety of both military and civilian applications. Therefore, there is an urgent need to provide high quality indoor imaging and to improve detection and classification of animate and inanimate objects behind walls. To gain insights into phenomenology and establish bounds on imaging system performance, it is important to acquire measurements capabilities of small translation, oscillation, and vibration motions that are acoustically, mechanically, or self-induced. These capabilities will allow fusion of RF and Acoustic sensing technologies, leading to enhanced motion signature profiling and target characterizations. The proposed instrumentations are a wideband signal simulation system and a laser vibrometer. This equipment provides a platform to generate real-time wideband radar signals for high-resolution radar imaging, measure acoustic signal penetrations through different types of walls, and sense the vibration of weapon, cache, and targets of interest behind walls. As such, it offers the means to verify innovative approaches and to develop optimum solutions to complex problems underlying indoor imaging and leading to reliable source separation, characterization, and localization.