Design of a very high-resolution imaging radar in W band for crowd monitoring: hardware and software issues

Keywords: *radar architecture, antenna design, mm wave frequency, signal radar processing*

The goal of this PhD thesis is to design very high-resolution imaging radar, which could be used for a wide range of monitoring issues. Among possible applications, we give a focus on the real-time monitoring of a flow of people crossing an access point (i.e. entrance of a public establishment, a concert hall, a stadium, …). The ultimate goal is to check whether dangerous objects could have been hidden under clothes. Nowadays, mm-wave scanners already installed in some airports and used during the checking before boarding, only control one person at a time with a protocol which is not compatible with the monitoring a flow of moving people. Optical cameras cannot perform this control and a systematic body check is not really feasible. Such a system requires the design of very high-resolution millimeter wave radar that does not exist yet.

To reach this goal, we propose to develop a radar working in millimeter-wave frequency range with at least 10 GHz bandwidth. Today, the reachable resolution with existing components and technologies is about 3 cm and corresponds to radar bandwidth of 5 GHz. A resolution close to 1 cm requires a bandwidth ranging from 10 to 15 GHz. As a result, designing radars with this resolution is already in itself a scientific and technological challenge. So, we shall get a disruptive radar architecture in comparison with the existing ones and mature existing components will be used for low cost purpose.

The PhD work will be divided into three steps:

Part I: Design of the radar architecture
Part II: Assess the performances of the radar's architecture obtained in part I.
Part III: Specific Antenna design for the radar.

More details will be provided during the interview of the candidate.

This PhD thesis project is the framework of a call of French government and the deadline to provide all information about the proposed candidate is April 26 th.

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