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RADAR Systems – Technology and Challenges

During the last decade, numerous developments have not only improved and matured technology and signal processing methods of RADAR systems, but also paved the road for many new applications besides its traditional domains in defence and space. The rapid progress in performance of highly integrated electronic components (digital, analogue or mixed-signal) has enabled several trends such as miniaturisation and cost reduction of sensor devices, a migration to higher frequencies in the millimetre and Terahertz domain, or real-time execution of mathematically complex signal and array processing methods. On the other hand, the electromagnetic spectrum is a scarce and strongly controlled resource that is proving to be increasingly valuable. Radar devices must be able to handle more signal bandwidth with greater receiver sensitivity and are competing with an increasing number of other systems for communication, navigation, or wireless connectivity. In this environment, it is necessary to understand the different requirements and find strategies of a co-existence without performance degradation.

The presentation gives an overview of recent developments at Fraunhofer FHR and application examples such as airborne and ground based surveillance, Digital Beam Forming AESA systems, or Cognitive Radar Architecture.