

FMCW compact reflectometer using DDS signal generation

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A prototype of a compact coherent fast frequency sweeping RF back-end is being developed at IPFN-IST using commercial Monolithic Microwave Integrated Circuits (MMIC). On this work we present the usability of this concept of compact reflectometry associated with a Direct Digital Synthesis (DDS) source.

Flexibility is one of the design goals for the back-end prototype, so that it can easily match the required frequency range. The backend alone covers the NATO J-Band (10 GHz to 20 GHz) and is designed to drive external full band frequency multipliers, resulting in an ultra-wideband coverage of up to 140 GHz.

FMCW radar precision is strongly dependent on the probing source linearity. DDS nowadays plays an important role in signal generation in many fields of applications for communication systems as well as in radar technology. Modern DDSs are fully integrated, low-cost, single chip solutions that only need an external clock source for generating sinusoidal output signals up to several gigahertz. The DDS benefits from the totally digital generation of the output signal, which allows full control of the signal's frequency and phase, both with very high precision and resolution. Recent implementations feature automatic sweeping capability, thus allowing the DDS to generate very linear and agile frequency chirps, assuming a high quality and constant frequency reference clock source. We propose to implement a DDS signal generation solution with the capability of a full band sweep in 1 μ s. On the receiver side the IF and reference signals will be digitised allowing the use of high flexible data processing technics. Input/output signals will allow the synchronization of several systems.