UWB Stripline Slot Antenna

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The Ultra Wide-Band (UWB) technology development is imminent, in particular for indoor high data rate wireless communication systems. One of the key issues of its deployment remains the design of antennas able to work from 3.1 to 10.6 GHz with very short pulses to convey information. Nowadays more and more structures are presented, which are compact, cheap, omnidirectional and give the required impedance matching. However their radiation patterns are not stable in the band or their transient responses not always well suited for UWB applications. In this paper, we present a new design drifted from a wide slot antenna (X. Qing, M. Y. W. Chia and X. Wu, IEEE APS URSI, July 2003): the stripline slot antenna offering a better radiation pattern bi-directionality and bandwidth of 130 %.

The stripline slot antenna is a square antenna, with a side: a = 42 mm that is 0.9λ at the central frequency f_c = 6.5 GHz. Two wide rectangular slots have been realized on two ground planes in the front and in the back of the stripline structure. The feed is fork-like. The wide band properties of the structure are mainly due to the linked use of this fork and the wide slot. In measure, the stripline slot antenna covers the UWB band: 2.8 – 13.6 GHz that is a 130 % fractional bandwidth. Then, the use of 2D diagrams (gain versus frequency) allows to efficiently characterise the antenna radiation. It gives the normalized gain curve at a frequency (vertical reading) and the stability in terms of radiation over the whole band (horizontal reading), figure 1. The stripline slot antenna offers stability versus frequency but its radiation bandwidth is only from 3 to 10 GHz.

To study the time domain antenna behavior, less classical parameters have to be analyzed. First, the phase linearity versus frequency indicates the low pulse distortion direction. The use of 2D diagrams (phase versus frequency) shows that the stripline slot antenna is low dispersive from 3.5 GHz to 10 GHz. To validate this result, we measured the pulse received after a stripline slot antennas UWB link. This waveform is compared with the pulse shape before the transmitted antenna. The measures are realised in time domain in several directions in E-plane. As shown in figure2, the pulse main beam does not change and its magnitude stays higher that the ripples magnitudes in line of sight. So this antenna can be used with short pulses and is a good candidate for UWB applications. More details and results will be given during the conference.

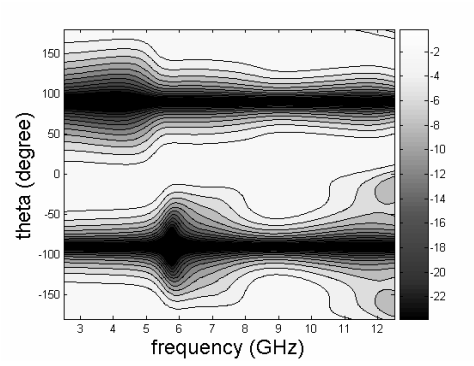

Figure 1: E-plane 2D radiation patterns diagrams.

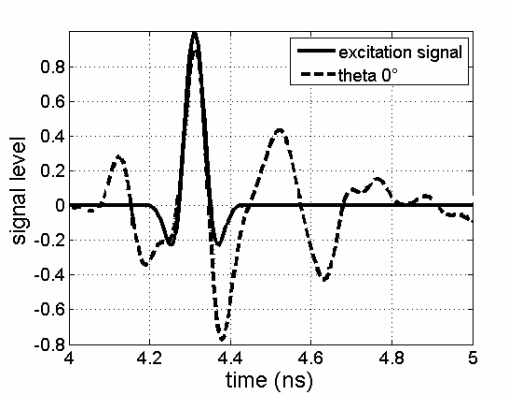

Figure 2: Measured pulse received compared with the excitation signal.