128 Elements Switched Wideband Antenna for Land-Mine Detection Radar

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We have designed, made and measured a 7 m linear antenna operating between 2 and 4 GHz for land-mine detection radar application.

In 20013, Chile and France signed a co-operation agreement for the promotion and development of systems that help to get rid of the mines in the desert of North-Chile. The Electromagnetic (EM) Non-Destructive Evaluation (NDE) systems, like radars, have been intensively investigated for this application because they enable to scan the area without touching the land mines. Radars localize and identify the mines, and therefore enable a safe removal, but the problem remains challenging because in-flight radar have to compromise between the transporter carriage capacity and the high resolution requirements linked to the small size of the land mines. Therefore we have settled the design requirements to (7*7*7cm) resolution with a scan area of 4km2 per day for a carrier flying 10m below the ground. High resolution is implemented with SAR postprocessing.

We take advantage of the transporter's displacement for getting the resolution along the flight path, resolution in the other dimension being obtained with the large 1D antenna.

We go through design, fabrication and evaluation steps of the antenna. It consists of 128-switched elements of loaded Vivaldi type arranged in 16 sub-arrays. The feed of the antenna consists of a switching network that operates in three stages: 16*8 SP8T on the first one, 2*SP8T on the second, and 1*SP2T at the input. The switching network is embedded in a

metallic rail placed below the radiating elements. The rail is designed onpurpose for avoiding unwanted coupling and backward radiation between the radiating elements and the coupling network. Antenna is coated with a Teflon radome that also acts as air-tightness structure. We have first conducted the overall checking of the antenna.

Then, we have successfully detected a dielectric block placed on a metallic plate (assumed as severe environment). For this, we use a sub-array of 8 elements driven by the radar front-end that will be further used on board. We use a neutralization technique for the front-end calibration.