

<b>Activity Title:</b>	<b>Q/V-Band Frequency Converter</b>		
<b>Contract type</b>	<b>Artes 5.1</b>	<b>Budget (k€)</b>	<b>750</b>
<b>Company (-ies) (including country)</b>	Thales Alenia Space Italia University of L'Aquila, Italia MEC srl, Italia Wave ATA srl, Italia		
<b>Team (name of the participants in the project)</b>	Daniela Apollonio, Andrea Suriani, Francesco Vitulli -Thales Alenia Space Italia Giorgio Leuzzi, Leonardo Pantoli - University of L'Aquila Francesco Scappaviva - MEC srl Tommaso Cavanna, Sergio Arena - Wave ATA srl		
<b>(*) Speaker (s)</b>	Francesco Vitulli	<b>Email</b>	francesco.vitulli@thalesaleniaspace.com
<b>Short Speaker Information (experience and involvement in this project – maximum 60 words)</b>	Francesco Vitulli is presently Head of the Advanced Study Unit within the Research & Development Division in Thales Alenia Space Italia, based in Rome. His research activity is focused on the development of advanced Equipment's and Functional Modules for future Satellite Communication Systems. For this project he has supervised the design development and the manufacturing of the Prototype unit.		
<b>Summary of the activity (maximum 400 words and 2 pictures)</b>	<p>In this activity the main objective has been to develop key components and a full Converter/Receiver prototype unit for future sub-system operating in Q/V band.</p> <p>The main task of the Receiver is to down-convert the band 47.2 to 50.2 GHz to the extended Ka band, 17.2 to 20.2 GHz, with a noise figure less than 3.5-4.0dB.</p> <p>The input section consists of a waveguide WR19 Isolator followed by a two-stage Low Noise Amplifier, which guarantee input matching and the best noise figure. Both items have been specifically designed and fabricated for this study by using state-of-art concepts and processes. The down conversion process is carried out by a MMIC Mixer having a sub-harmonic topology, which has been chosen to drive the LO input of the mixer at half frequency compared to a conventional mixer (15 GHz instead of 30 GHz), thus saving the use of a frequency doubler. The Mixer is a novel item as well, specifically designed for this project in MMIC form.</p> <p>The design of the LO generation section is taken from previously developed converters produced in Thales Alenia Space. As future customers are expected to request a phase noise performance out of the V-band converters similar to the one now featured by Ka-band converters, the design includes a Sampling Phase Lock Loop driven by a quartz oscillator, which is the best option for low phase noise. The reference signal is given by an OCXO (Ovenized quartz oscillator) at 100 MHz, featuring an EOL frequency stability of <math>\pm 3</math>ppm. The controlled oscillator of the phase lock loop is a VCDRO at 7.5 GHz (including a dielectric resonator) realized on ceramic with discrete components, which is locked to the 100 MHz reference signal multiplied by the sampling phase detector. The SPLL circuitry is implemented on a compact multilayer LTCC board for the sake of miniaturization. The LO section also includes a frequency doubler at 15 GHz, ceramic filter and buffer amplifier to drive the down conversion mixer.</p> <p>The output section at 20 GHz is identical to the one used in more conventional 30 to 20 GHz converters produced by Thales Alenia Space. It includes several stages in cascade: ceramic filter, flatness equalizer, variable attenuator for gain variation compensation in temperature, driver amplifiers and a final linear balanced amplifier, which drives the overall linearity of the receiver.</p>		

(\*) The speaker needs to do the registration through this website