



Activity Title:	Converters and Local Oscillators for Flexible Payloads		
Contract type	Artes 5.1	Budget (k€)	1500
Company (-ies) (including country)	Thales Alenia Space Italia		
Team (name of the participants in the project)	Alessandro Barigelli, Antonino Massari, Maria Celeste Russo, Andrea Suriani, Francesco Vitulli		
(*) Speaker (s)	Francesco Vitulli	Email	francesco.vitulli@thalesaleniaspace.com
Short Speaker Information (experience and involvement in this project – maximum 60 words)	<p>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.</p>		
Summary of the activity (maximum 400 words and 2 pictures)	<p>This project has been aimed both at the fabrication of a full engineering model of a flexible frequency converter, conceived for flexible telecommunication payload and at the fabrication of European state-of-art large band VCO MMICs performing low phase noise. All critical items have been bread-boarded and individually tested. A full engineering model of the converter has been manufactured, assembled and the tested, including the DC-DC converter and the TM/TC I/F circuit.</p> <p>The main advantages over conventional converter units used for telecommunication system are frequency flexibility and low phase noise performances. In fact, the realised converter is able to convert any frequency in the range 12.75 to 14.50 GHz to any frequency in the range 10.70 to 12.75 GHz, and it is based on the phase noise cancellation concept, implemented by using a double conversion scheme.</p> <p>The LO1 and LO2 signals are generated in the unit by two separated PLLs, which only differ in the VCO MMIC operating frequency. The frequency generation is based on the integer-N synthesis approach. In order to achieve a phase noise comparable to the one of a single-conversion scheme, noise cancellation is needed and, as a consequence, the coherence between the two conversion LOs signals shall be realized. In this way, their phase noises can be coherently summed and then cancelled. In the designed converter, the PLLs coherence is guaranteed within the loop bandwidth because they share the same OCXO, as a reference signal. Therefore, within the loop bandwidth the phase noise of LO1 signal is partially cancelled by the one of LO2. For offset frequencies higher than the loop bandwidth, the overall phase noise is expected to be given by the summation of the one of the two VCOs.</p> <p>The noise cancellation occurs in the RF Chain Hybrid Module of the unit, where the phase of LO1 signal is inverted by the second mixers, while the phase of LO2 signal is not. Each frequency in the range from 12.75 GHz to 14.50 GHz (Fin) is converted in a frequency in the range from 10.70 GHz to 12.75 GHz (Fout). The input signal is down converted to a fix intermediate frequency (3.7GHz) and filtered by using a compact microstrip channel filter having a bandwidth of 1 GHz. The RF chain provides gain of 30 dB and a C/3IM=45dBc for two carriers at -25 dBm each.</p>		
	 		

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