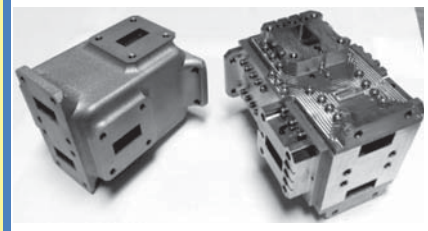
Activity Title:	***Advanced Butler Matrices with Integrated Filter Functions***		
Contract type	**NPI**	**Budget** *(k€)*	**66**
Company (-ies) *(including country)*	University of Birmingham (UK); Airbus Defence and Space (UK)		
Team *(name of the participants in the project)*	Vittorio Tornielli di Crestvolant, Uni Birmingham Michael J. Lancaster, Uni Birmingham (UK) Petronilo Martin Iglesias, ESA/ESTEC Paul Booth, Airbus Defence and Space (UK)		
(*) **Speaker (s)**	Vittorio Tornielli di Crestvolant	**Email**	vittorio.tornielli@tesat.de
Short Speaker Information *(experience and involvement in this project – maximum 60 words)*	Vittorio Tornielli di Crestvolant was the PhD student who conducted the investigation partly at the University of Birmingham (UK), at ESTEC in Noordwijk (NL) and at Airbus Defence and Space in Stevenage (UK). He graduated in Laurea Triennale in Telecommunications Engineering (Master) from Politecnico di Milano in 2010 and completed the PhD in 2015. In September 2015 he joined Tesat-Spacecom in the engineering group of the passive products department.		
Summary of the activity *(maximum 400 words and 2 pictures)*	This activity presents a novel synthesis technique for Butler matrices that include filter transfer functions through a circuit based only on resonators. The Butler matrix is the fundamental building block to split and recombine the signals in Multi-port Power Amplifiers, where multiple inputs are delivered to a bank of amplifiers sharing them, and later recombined through an output network. However, to suppress spurious frequencies generated by the amplifiers or to provide near-band rejection in order not to interfere with other transmission/receiving bands, separate filtering is often required. Here, the traditional properties of the Butler matrix are included together with filtering selectivity into one single device based only on coupled resonators. An analytical synthesis procedure of the coupling matrix is presented here for the first time. The proposed solution has shown significant advantages in terms of size reduction compared to the traditional baseline consisting of a Butler matrix plus a bank of band-pass filters. Based on the technique proposed, three prototypes are designed and manufactured: a 180° hybrid coupler based on resonators and two versions of a 4x4 Butler matrix with filtering, built with additive manufacturing and with milling. Experimental measurements are in good agreement with simulations and theoretical expectations.  		

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