Activity Title:	*Development of a Software Tool for the Study of RF Breakdown for Realistic Scenarios: Multicarrier and Modulated Signals*		
Contract type	**TRP**	**Budget** *(k€)*	**60**
Company (-ies) *(including country)*	Val Space Consortium (Valencia, Spain)		
Team *(name of the participants in the project)*	Daniel González Iglesias, Benito Gimeno Martínez, Vicente Enrique Boria Esbert, David Argilés Ortiz		
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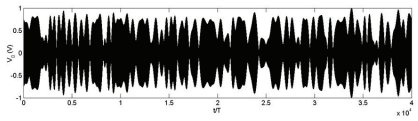
Short Speaker Information *(experience and involvement in this project – maximum 60 words)*	Daniel González Iglesias received the Licenciado degree in physics and the master's degree in advanced physics from the University of Valencia, Valencia, Spain, in 2010 and 2011, respectively, where he is currently pursuing the Ph.D. degree in physics. His current research interests include multipacting simulation of RF high-power passive components. Benito Gimeno received the Licenciado degree in physics and the Ph.D. degree from the University of Valencia, Valencia, Spain, in 1987 and 1992, respectively. He became a Full Professor at the University of Valencia in 2010. His current research interests include the electromagnetic analysis and design of microwave passive components and RF breakdown high-power effects. Vicente E. Boria received the Ph.D. degree in telecommunications engineering from the Universidad Politécnica de Valencia, Valencia, Spain, in 1997. He is currently a Full Professor with the Universidad Politécnica de Valencia. His current research interests include the electromagnetic analysis and design of microwave passive components and RF breakdown high-power effects.		
Summary of the activity *(maximum 400 words and 2 pictures)*	Multipactor breakdown is an electron avalanche-like discharge occurring in components operating under vacuum conditions and high-power RF electromagnetic fields. The phenomenon occurs when free electrons in the device get synchronized with the RF electric field, and impact against the metallic walls of the component with enough energy to release secondary electrons from the surface. The growth in the electron population in the device can lead to one or several discharges. These discharges have several negative effects that degrade the component performance. Thus, multipactor is revealed as a restrictive limitation to the power handling capabilities of many satellite RF and microwave devices. The main aim of this activity is to design and develop a multipactor simulation tool capable to predict the multipactor breakdown with digitally modulated RF signals. This developed multipactor simulation tool is able to handle with any arbitrary digital modulation, whenever the digitally modulated signal is provided as an external file. Two different topologies have been implemented: parallel-plate waveguide and coaxial line. The simulation code consists of 3D tracking of a set of effective electrons inside the device for a certain number of RF carrier periods, taking into account the possible emission of secondary electrons as a consequence of the electrons impact with the component walls. Then, the total cumulative electron population as a function of the time is presented as the main output of the software. If the final electron population is greater than the initial one, a multipactor discharge is expected to happen. The multipactor prediction tool has been employed to investigate the influence of the digital modulations on the multipactor RF power threshold with regard to the unmodulated scenario. Several different digital modulations have been treated in this work: Quadrature Phase Shift Keying (QPSK), Amplitude Phase Shift Keying (16-APSK and 32-APSK), and Quadrature Amplitude Modulation (16-QAM). Moreover it has been considered Galileo Navigation signals. For each of these modulation schemes it has been investigated the effect of the ratio between the symbol duration and the RF carrier period on the multipactor threshold. In order to validate the theoretical predictions obtained, several experimental test campaigns were carried out at the joint High Power RF Laboratory established between European Space Agency and Val Space Consortium (ESA-VSC) in Valencia. Experimental data show good agreement with the theoretical results thus validating our multipactor simulation algorithm.  		

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