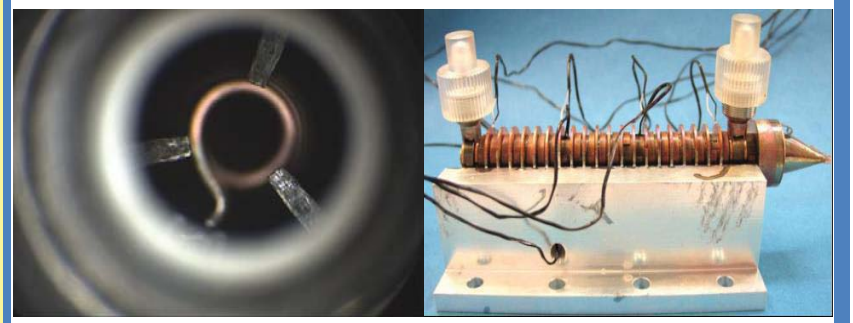
Activity Title:	***Diamond Supporting Rods for High Power Helix TWTs***		
Contract type	**TRP**	**Budget** *(k€)*	**300**
Company (-ies) *(including country)*	Thales Electron Devices (France-Germany)		
Team *(name of the participants in the project)*	Tiziana Barsotti TED France Mélanie Kauffmann TED France Pierre Lecuyer TED France Marc Lefèvre TED France Harald Seidel TED Germany		
(*) **Speaker (s)**	Harald Seidel	**Email**	Harald.Seidel@thalesgroup.com
Short Speaker Information *(experience and involvement in this project – maximum 60 words)*	Harald Seidel is working since 1988 at Thales Electron Devices in Ulm, - today as Senior Expert for cathodes and technology of travelling wave tubes for Space application. As head of the technology group, and lateron engineering department, he was deeply involved in the development and introduction of new processes and materials for microwave tubes.		
Summary of the activity *(maximum 400 words and 2 pictures)*	This project is focussed on the feasibility assessment to use diamond rods in the delay line section of high power tubes at TED. It includes the survey of existing technology, as well as the possibility of modifying it, in order to fit with the diamond properties. Furthermore, experimental verification had been demonstrated by material analyses of diamond rods, purchased from a reliable supplier. These rods underwent the necessary TED in house processes, in order to serve to the needs for a complete delay line. • In summary, feasibility was demonstrated by experimental verification of the theoretical assessment of the advantage by using diamond rods in the delay line section of a travelling wave tube. As a baseline for the study, a realistic test vehicle has been chosen, very similar to an actual built high power Ka-band TWT. From theory, for the helix support rods, two factors are important: the interface resistance between rods and helix/barrel and the shape of the rods' cross section. The performed analysis shows that the diamond rods are compatible to a system with BeO rods, only with minor geometrical corrections. Moreover, the thermal and RF analyses performed, confirm the possibility of using diamond rods for high power, high frequency TWT families. • Significant progress was made by the manufacturer in order to produce the required geometries for the test vehicle. Actually, two manufacturers were identified and selected for rods supply. Rods have been ordered and delivered by both of them. Based on the specification, the compliance of the received rods had been checked and found sufficient, except some dimensional weakness, especially on the rods from one supplier ("Sabertooth Effect"). • Prior the assembly of the test vehicle ("DC-tester"), the diamond rods had to be treated according to TED process rules. There are three different process steps that needed to be adapted: (i) Cleaning (thermally and chemically), (ii) Coating with an attenuation layer and (iii) assembling of the helix system. The feasibility of diamond rods for all three process steps could be demonstrated. • Finally, thermal tests were performed with the assembled DC-tester, with the following results: a) the expected benefit of the diamond rods in terms of temperature decrease could be verified. b) The achieved thermal impedance for the helix/barrel system represents a 35% reduction by use of diamond instead of BeO under the same conditions, which is a huge gain. 		

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