EARTH OBSERVATION SYMPOSIUM (B1)
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EUROPEAN C-BAND KLYSTRON DESIGN AND CURRENT DEVELOPMENT STATUS

Abstract

A C-band klystron development is presently running at Finmeccanica based on an ESA TRP contract, targeting a Synthetic Aperture Radar (SAR) instruments that are essential for Earth Observation application.

Previous studies have demonstrated the klystron to be the best technology for an High Power Amplifier (HPA) where a narrow bandwidth is required, due to its higher efficiency and flexibility.

Nevertheless, the development of a new vacuum tube is needed in order to develop a space high power amplifier and achieve the required challenging performances.

The main characteristic and design driving requirements are: • Carrier frequency: 5.3 GHz • Transmitted Peak Power: 1.6 kW Pp 2.95 kW • Duty cycle: 1

The peak power and the duty cycle will be set at a defined value but a change of the peak power output/duty cycle must be taken into account even at a later stage of the design phase. The choice of a klystron as vacuum tube for the power amplifier allows to get the required flexibility, since the RF peak power can be changed in the whole specified range acting on the cathode voltage while keeping good efficiency performances.

The running development is grounded on the Finmeccanica know how and heritage in space projects as well as in the design and manufacturing of vacuum tubes for military airborne fighter environment. The klystron baseline design relies on the same technologies as all other TWTs and klystrons produced by Finmeccanica, i.e.: • metal ceramic technology • metal matrix cathode • coupled cavities technology • focusing with SmCo magnets • integrated pole piece structure • depressed collectors

The paper presents the design features of the klystron, with particular emphasis on the main critical parameters (RF performances, potential multipaction issues and thermal control issues), how the base technologies are well suited to a space application and which improvements are anyhow required to cope with the space requirements.

The development plan includes two breadboards of the klystron aimed to verify the RF performances at low duty cycle and an elegant breadboard (EBB) fully representative of the klystron design. The test

results on these models are presented; they demonstrate the capability of the design to meet the target requirements.

The development plan includes a dedicated cathode life test for verification of the extended lifetime requirements. The results obtained so far are presented as well.