

Low-power/ high-power SPACE qualified RADAR TWTs For earth observation

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ABSTRACT

Today's changing environment on earth needs many different possibilities to watch and predict events or to support the better understanding of earth conditions. One special application is the observation from space support by optical or radar. Both techniques have their strength and weakness and are linked to the size of the objects to be observed or situation to be predicted. In case of Radar application, the full frequency spectrum from several kHz up to 50 GHz or maybe in the future beyond are of interest.

Therefore the space radar applications is a very bounded segment, this market has enjoyed continuous growth over the recent years fuelled by the mentioned increasing field of applications, from scientific missions for earth observation and disaster warning (e.g. Tsunami detection, global warming effects, etc.) and to reconnaissance missions targeted at crisis areas around the world.

Traveling Wave Tubes (TWTs) have been used for a long time now for space radar applications in the field of earth observation, reconnaissance and altimetry. There are two main technologies for space radar systems: the first one is SSPA active array, the second one is direct radiative antenna fed by TWT amplifiers. Thales MIS has more than 30 years of experience of developing and supplying TWT amplifiers for space radar applications as part of commercial programs such as ERS, RADARSAT, CASSINI, ENVISAT, Oceansat, Fen Yun3, just to name a few, as well as for classified programs.

In essence, the space radar TWT amplifier technology is similar to the TWT technology used for satellite telecommunication applications. As such, it builds on the benefits of the continuous performance improvement that has been done over the course of time with telecommunication TWTs. Thales's MIS philosophy for low power radar TWTs is to use existing low power space telecommunication TWTs, combined with a gridded gun. For high power tubes, an interaction line from a ground TWT is combined with the space qualified components required for pulsed operation (gridded gun, collector, housing).

With market showing an, Thales MIS is currently running several studies, having building breadboards for medium power range TWTs between 2kW and 3kW in order to enlarge its portfolio and to be prepared for the increasing interest into such solutions.

Similar market interest is seen for low or medium power TWTs with the goal to extend the pulsed peak power up to 300W or beyond for different frequencies. Thales can apply the modular building blocks by using space qualified downlink TWTs from L- to Ka-band.

Thales MIS is prepared to support upcoming projects in the wide field of space radar applications. This paper aims at reporting about heritage projects and in-operations data from these missions and at presenting a view on Thales's MIS space radar TWT portfolio extension linked to the benefits of reflector antenna based space radar