

OVERVIEW OF THALES CATHODE TECHNOLOGY AND NEW DEVELOPMENTS

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ABSTRACT

Thermionic cathodes are a key element for space travelling wave tubes, as it is the only wear out component for such a device. The requested lifetime for a typical space TWT is 15 years of operational life and a design life of 22 years which directly translates to the required lifetime of the cathodes used. Thales as one of the major suppliers for space TWT's has several decades of experience in manufacturing, testing, characterisation, modelling of cathodes and in predicting their lifetime based on mathematical modelling techniques [1, 2].

Two types cathodes are used in Thales space TWT's, the M-type and the MM-type both as equivalent alternative technologies. This talk will give an overview of the two cathode technologies currently used and will highlight their corresponding applications.

The need for higher current densities in combination with a long lifetime in recent TWT development, in particular in Q-band, drives a permanent improvement of cathode technology, models and operating conditions at Thales. Building on the very positive on-orbit experience with the M-type cathode up to 2.5 A/cm^2 we show in this presentation that this cathode can safely operate at 4 A/cm^2 for a space mission with a lifetime exceeding 15 years provided that its operating temperature is adequately adjusted (see contribution of J. Demory to this conference). In parallel Thales is pursuing the development of an improved MM-type cathode doped with chromium (so-called MMC-type) targeting a qualification at 5 A/cm^2 .

References

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- [2] J. M. Roquais, F. Poret, R. le Doze, J. L. Ricaud, A. Monterrin, A. Steinbrunn, "Ba depletion study on impregnated cathodes and lifetime prediction", in Proceedings of IVESC 2002 in Saratov, Russia, Applied Surface Science, Vol. 215, (2003) pp. 5 -17