

# **EHF SOLID STATE POWER AMPLIFIER DESIGN FOR EXTENDED MISSION LIFE**



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## **ABSTRACT**

Recent developments at LNR have demonstrated practical solid state power amplifier (SSPA) configurations capable of generating 20 watts pf CW RF power with a 5% bandwidth at 20 GHz. The driving force behind these developments is the need for a reliable, cost effective SSPA deployment on spacecraft, consistent with a ten year and greater mission life. The operational life of the SSPA will be described in terms of (1) minimum acceptable output power, (2) system redundancy and (3) SSPA active device lifetime.

The singular and combined effects of the defined categories on the SSPA operational life are examined. More specifically, the various aspects of a power backoff capability of the modular power amplifier design as they relate to system reliability are discussed and graphically demonstrated.

The availability of gallium arsenide impact ionization avalanche transit time (IMPATT) diodes with proven performance and reliability has been responsible for the development and manufacture of high power, reliable solid state amplifiers from X-band to Q-band.

Based on preliminary accelerated life test data of unscreened devices and a 1dB power reduction, an IMPATT diode reliability of < 50 FITs is projected, substantially exceeding a ten year mission life.

IMPATT diode characteristics, and reliability design considerations and performance of power amplifiers at 20 GHz will be described.