

Monolithically integrated 440 GHz doubler using Film-Diode (FD) technology

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This work presents results of a recently developed frequency doubler at 440 GHz. The doubler is realized using a balanced planar MMIC doubler approach with only one high breakdown-voltage varactor diode per arm. The diodes are connected in anti-series (DC) and are suspended on thick beamleads directly in the input waveguide. This approach allows a simple but very effective thermal coupling of the anode mesa through massive metallic beamleads to the WG-block, providing good heatsink for the dissipated power.

The doubler showed peak efficiency exceeding 21% and (simultaneously) an output power of nearly 12 mW at 440GHz. Of particular interest is the quality of the varactor, with near ideal breakdown voltage, very low RF series resistance and optimal doping density, allowing a simple, well-heatsunk 2-diode design to be used.

This power and efficiency represents European state-of-the-art performance in this frequency range and is comparable to the highest efficiency and power for a single device worldwide.