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Toward a Wideband and High-Isolation Power Limiter

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Power limiters are critical elements in radars and other systems that may be subject to high input power. High-performing limiters are important since they are at the front end of the signal chain; put simply the ultimate goal of a limiter is to provide sufficient isolation across a wide bandwidth with the smallest possible loss, high linearity, short response time, and high power handling.

Plasma presents an interesting platform to develop such limiters, especially for high-power applications. Plasma forms through the gas breakdown which means that in the pre-breakdown state, it is not present, leading to high linearity advantages. Once breakdown occurs, the gas conductivity increases significantly and this is leverageable to a power limiting effect. Additionally, plasma tolerates high power and temperature, and is therefore able to extend the operational range of a limiter.

In this talk, a novel circuit design for a wideband high-power limiter is discussed. A two-stage topology is utilized by cascading a coplanar-waveguide plasma limiter as the quick-responder primary protection and a commercial RF MEMS switch to complement the required isolation. In our preliminary measurements, maximum insertion loss of 0.5 dB, return loss better than 14 dB, power handling more than 50 W, and limiting isolation greater than 24 dB were achieved over the 1–3 GHz frequency bandwidth. Relaxation and response times of the proposed limiter are on the order of microseconds.

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