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5P28 - Sustaining High Power RF Signal Generation in a Positive Feedback Network

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RF signal continuity from a nonlinear transmission line (NLTL) requires continuous supply of input signal, which may not be feasible in all practical applications. We have constructed a closed-loop setup that can sustainably generate RF signals from the NLTL using a single input pulse for a significant amount of time. An LDMOS based 1.5 kW (continuous) rated power amplifier, RF transformers used at the matching networks of the amplifier, 1200 V rated reverse biased Schottky diode based 16-section NLTL, and a pulse generator circuit designed in half-bridge configuration construct our closed-loop setup. The pulse generator can produce 150 ns pulses at full width at half maximum (FWHM) with rise and fall times less than 10 ns. In our test setup, the amplifier is excited by the output of the NLTL, and the amplifier signal is connected back to the input of the NLTL. The biggest strength of our design is the flexibility to change the NLTL length to change the frequency and the amplitude of the output signal. We have generated a continuous sequence of RF pulses with a voltage modulation depth (VMD) of 64 V and pulse width of about 4.5 ns at FWHM from a single 250 mV input pulse. The RF pulses generated in the NLTL circulate in the closed loop and sustain for a significant amount of time. Incorporating the in-house pulse generator in the closed loop setup, we have generated sustaining RF pulses with VMD close to 170 V, pulse width and rise time close to 6 ns at FWHM and 2 ns respectively from a single input pulse. This corresponds to a peak pulsed RF signal power of 2.17 kW across a 50- Ω resistive load. This work was supported by the Office of Naval Research under award no. N00014-17-1-3016.

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