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Plasma Physics Education and Research Enabled by Pulsed Power*

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This presentation will retrace the author's ˜40-year journey to transform pulsed power machines into plasma physics experiments for the purpose of educating students in research. Early experiments on electron beam instabilities (ion-hose, beam-breakup-instability), relativistic gyrotrons, magnetrons and recent Recirculating Planar Magnetron (RPM) experiments utilized an Marx-Abramyan generator (MELBA). The Abramyan circuit flattened the voltage (up to -1MV +-7%) for critical physics experiments at 1-10 kA, over one-microsecond pulselength. A ceramic insulator upgrade permitted vacuum on the 10-7 Torr scale for cathode and surface electron emission studies.
During the past decade, experiments at UM have developed the (first in USA) 1MA, 100 kV, 200 ns, Linear Transformer Driver (LTD, originally constructed at IHCE, Russia) into a z-pinch experiment (MAIZE) that has been utilized to explore MHD instabilities in imploding and exploding liner-foil plasmas and x-ray generation from Planar-Wire-Arrays. In particular, growth rates and mitigation strategies have been characterized for the magneto-Rayleigh Taylor (MRT) Instability in planar and cylindrical foil-plasma geometries.

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