

# CONDITIONING AND PROTECTION CIRCUITRY FOR EXTERNAL MODULATION OF A PREPROGRAMMED GYROTRON CATHODE VOLTAGE COMMAND WAVEFORM\*

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The modulating voltages applied to the DIII-D gyrotrons are controlled by reference signals which are synthesized by arbitrary waveform generators. These generators allow ECH operators to pre-program reference waveforms consisting of ramps, flat tops, and various modulation shapes. This capability is independent of the DIII-D central timing and waveform facilities, which provides the ECH operators operational flexibility. The waveform generators include an amplitude modulation input, providing a means to control the pre-programmed waveform externally. This input is being used to allow the DIII-D Plasma Control System (PCS) to control gyrotron power in response to selected feedback signals. As the PCS control signal could potentially modulate the gyrotrons beyond operational limits or otherwise in a manner leading to recalcitrant RF generation, the control signal is conditioned so that its affect upon the ECH pre-programmed reference waveform is limited by conditions set by the ECH operators. The design of the circuitry which restricts the range over which the PCS control signal may modulate the reference waveform will be discussed. Test and DIII-D experimental results demonstrating the utility and effectiveness of gyrotron power modulated by the PCS will be presented.

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