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## FTP/1-3Rb: Progress on the Development of High Power Long Pulse Gyrotron and Related Technologies

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In the development of a higher power dual-frequency gyrotron, a high order mode gyrotron, which permits to select the oscillation at 170GHz or 137GHz, has been fabricated and tested. Short pulse experiments (0.5ms) were performed with 1.3MW power output at more than 30% of the oscillation efficiency for both frequencies. In long pulse experiments, 760 kW/46%/60 s at 170GHz and 540 kW/42%/20 s at 137 GHz are achieved. It is the first time long pulse experiments with the dual-frequency gyrotron/triode electron gun. Since the RF beam direction from the output window is designed to be almost the same for both frequencies, good power couplings to the transmission line, which are 96% for 170GHz and 94% for 137GHz, are obtained by using a pair of identical phase correcting mirrors. Pulse extension is underway aiming for >1MW at CW operation. A 5kHz full power modulation experiment was performed using the 170 GHz gyrotron of TE<sub>31,8</sub> mode oscillation. The 5kHz full power modulation was achieved with the full beam modulation by employing a fast voltage switching between the anode and cathode of the triode type electron gun. This satisfies the requirement of ITER. For further improvement, an advanced anode power supply system is proposed to reduce the oscillation period of adjacent mode at the start-up phase of each pulse.

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