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Gyrotron amplifiers for plasma heating ADRIAN CROSS, COLIN WHYTE, WENLONG HE, ALAN YOUNG, CRAIG ROBERTSON, KEVIN RONALD, ALAN PHELPS, University of Strathclyde, BEAMS AND PLASMAS, DEPARTMENT OF PHYSICS TEAM — In the non-neutral, relativistic plasma Cyclotron Resonance Maser (CRM) instability, electrons gyrating in a uniform magnetic field interact with electromagnetic radiation. The action of the electric field of the radiation is to accelerate some electrons and decelerate others, depending on their location in the orbital phase. The accelerated electrons increase in momentum, gyro-radius and relativistic mass, and therefore drop in frequency and retard in phase. The opposite is true for decelerating electrons resulting in the formation of a phase bunch. If the gyrofrequency of the beam is slightly less than the wave frequency then the bunches move naturally into decelerating phase and reinforce the wave. This type of interaction has hitherto been successfully exploited in gyrotron oscillators. The research to be presented has built upon the fundamental breakthrough that occurred in gyro-amplifiers where the gain mechanism of the successful gyrotron oscillator has been exploited effectively in a Gyrotron Travelling Wave amplifier, Gyro-TWA. The design, construction and operation of a Gyro-TWA experiment will be presented. The amplifier achieved a peak power of 1.3MW, a saturated gain of 35dB in the frequency range of 8.4GHz to 10.2GHz with an efficiency of 30%.

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