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P3.072 The JET Upgraded Toroidal Alfvén Eigenmode Active Diagnostic System

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The Alfvén Eigenmode Active Diagnostic system (AEAD) has undergone a major upgrade and redesign to provide a state of the art excitation and real-time detection system for JET.

The new system consists of individual 4kW amplifiers for each of the six antennas, allowing for increased current, separate excitation and real time control of relative phasing between antenna currents. The amplifiers have a frequency range of 10-1000 kHz, divided into various frequency bands by external matching filters. Due to the varying transmission line impedance throughout the frequency range, the amplifiers were designed with high resilience to reflected power with Voltage Standing Wave Ratio $VSWR \gg 10:1$.

The existing signal generator and control electronics associated with amplifier control have been replaced with a digital control system incorporating a National Instruments PXI express platform and Field Programmable Gate Array (FPGA) modules for frequency, gain and phase control with a frequency and phase resolution of less than 1 kHz and 1 degree respectively. Complementing the digital control system is the Protection and Control System, which utilizes Field Programmable Analog Arrays (FPAA) and an array of electronic devices to monitor and control the AEAD.

New capabilities such as independent antenna current/phase control, allow for improved excitation control, better definition of antenna spectrum combined with enhanced system reliability. These capabilities will be enhanced by newly installed and calibrated magnetic probes on JET allowing accurate synchronous detection of AEs. This contribution will review the new AEAD system, including legacy parts of system still in use, its unique capabilities and improvements over the previous diagnostic system.

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