Contribution ID: **89** Type: **not specified**

Gyrotron-based High Gradient THz Accelerator Test Facility

Monday, 19 April 2021 10:15 (30 minutes)

Particle accelerators at sub-terahertz frequencies would require high-power sources in this frequency range for testing, conditioning and driving the accelerators. Gyrotrons have major advantages for the application to acceleration, especially high average power capability and high wall plug efficiency. Reliable testing and conditioning of high gradient accelerating structures requires power in the range of few hundred kilowatts in short pulses of a few nanoseconds or less. At MIT we have built a dedicated setup for testing high gradient accelerator structures at 110 GHz using a megawatt power pulsed gyrotron source. This gyrotron is capable of producing up to 1.2 MW in pulses of 3 microseconds. The microwave power from the gyrotron is coupled into a low loss overmoded corrugated waveguide to transmit the power to a separate test bench where the accelerator structure is tested. The microsecond long pulses from the gyrotron are shortened to generate nanosecond timescale pulses using a laser driven semiconductor switch. We recently tested a SLAC accelerating structure operating in a TM01 mode at 110 GHz demonstrating an acceleration gradient of 230 MV/m at 570 kW of microwave power in 10 ns long pulses from the gyrotron. For future applications, the gyrotron pulses could be produced with high efficiency either by using a pulse compressor to produce the nanosecond scale pulses or by forcing the gyrotron to produce a self-modulated train of nanosecond pulses with a rep rate of few tens of MHz.

Presenter: JAWLA, Sudheer (MIT)

Session Classification: Session 1