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The MIDAS Experiment: A New Technique for the Detection of Extensive Air Showers

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Recent measurements suggest free electrons created in ultra-high energy cosmic ray extensive air showers (EAS) can interact with neutral air molecules producing Bremsstrahlung radiation in the microwave regime. The microwave radiation produced is expected to scale with the number of free electrons in the shower, which itself is a function of the energy of the primary particle and atmospheric depth. Using these properties a calorimetric measurement of the EAS is possible. This technique is analogous to fluorescence detection with the added benefit of a nearly 100% duty cycle and practically no atmospheric attenuation. The Microwave Detection of Air Showers (MIDAS) prototype is currently being developed at the University of Chicago. MIDAS consists of a 53 feed receiver operating in the 3.6 to 4.2 GHz band. The camera is deployed on a 4.5 meter parabolic reflector and is instrumented with high speed power detectors and autonomous FPGA trigger electronics. We present the current status of the MIDAS instrument and an outlook for future development.

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