

AN ON-DISH 430 MHZ INTERFEROMETER FOR RADAR
METEOR OBSERVATIONS AT ARECIBO.

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Radar meteor observations at Arecibo Observatory are characterized by excellent Doppler and range resolution but with only a dynamics-inferred indication of the meteoroid trajectory through the beam. The location of the meteoroid in the beam is in fact the largest unknown for typical events even though the beam is only 300 m in diameter in the meteor zone. The only viable solution to this dilemma is construction of a multi-element interferometer mounted on the carriage house that supports the 96-foot linefeed. The size and layout of the horn-feed in the Gregorian system precludes mounting additional feed horns there. To begin testing an interferometer system, a dual-linear, 4-element Yagi of exceptional mechanical stiffness and pattern appropriate to illuminating the dish with little vignetting was designed, constructed, and mounted near the paraxial surface for validation tests in early September 2004. The mount-point was 5.37 wavelengths up-hill and to the left of the center of the linefeed. The antenna was phased to yield the same circular polarization as the linefeed on receive and low-power was applied to the linefeed determining the isolation between the linefeed and the Yagi to be at least 58 dB. The antenna was then connected to a spare room-temperature receive system with just a limiter as protection against the nominal 2 MW transmitter power. This system yielded a system temperature of 120 K and, when calibrated using multiple scans of point radio source 3C286, was found to have a gain of -18 dB relative to the linefeed—about -10 dB is expected for an optimally situated point source. The nascent interferometer system was used to collect data for nearly 24 hours (11-12 September 2004) at about 0.5 MW peak-power with many coincident meteor events observed. We report on further calibrations of this system, the real-time data processing system that is being prepared, and the first single-axis meteoroid trajectory studies resulting from these recent observations.

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