

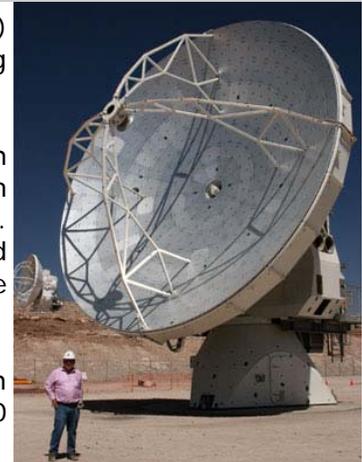


ECCOSORB® BSR-1/SS6M used as 140 GHz Waveguide Flange in ALMA Program

Scientists at the National Radio Astronomy Observatory (NRAO) contacted Emerson & Cuming Microwave Products to assist with solving an RF leakage problem in the ALMA Local Oscillator Subsystem.

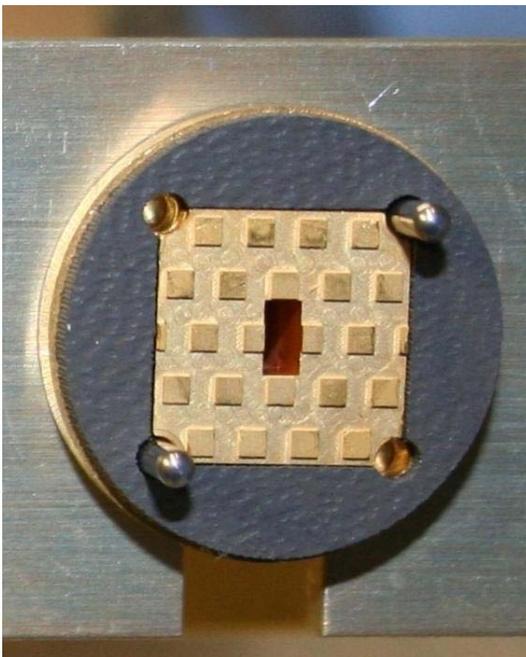
ALMA, the Atacama Large Millimeter Array is a single research instrument composed of up to 80 high-precision antennas, located on the Chajnantor plain of the Chilean Andes 5000m above sea level. ALMA will enable transformational research into the physics of the cold universe, regions that are optically dark but shine brightly in the millimeter portion of the electromagnetic spectrum.

Although ALMA itself will operate between 30-950 GHz, the signal path where the microwave absorber was used has a total range of 60-140 GHz (basically, the standard WR-8, -10, and -12 waveguide bands).



The Problem facing NRAO was that a photonic-grid machined into the waveguide flange made the interface tolerant of small gaps, cocking, and misalignment at the waveguide interface. This misalignment could have allowed for low-level RF leakage, causing interference between receivers on the same telescope. It also would have allowed dust incursion into the local oscillator components, which could do damage to the sensitive millimeter-wave components. Note: the photonic-grid did not actually cause any interference that NRAO could immediately measure. Lab tests on the joint itself indicated higher-than-desirable levels of leakage, while tests on the full-up receivers did not reveal any measurable interference.

The solution needed to be compressible to form a reliable seal without the use of screws to bolt the flanges together and still absorb RF up to 140 GHz. Engineers at Emerson & Cuming Microwave Products suggested ECCOSORB® BSR-1/SS6M, a silicone rubber sheet with a peel and stick adhesive (SS6M), due to its high-frequency performance and compressibility characteristics. The BSR-1/SS6M was supplied as round pre-cut parts and used as part of a millimeter-wave blind-mating system for the ALMA receivers. The absorber (shown at left in gray) sat within a machined recess around the waveguide flange forming both an RF and hermetic seal against the mating surface, which is flat.



Experienced engineers agree that it's economical to incorporate microwave absorber during the initial design phase against potential leakage, as compared to trying to solve costly last minute EMI problems on fully assembled equipment.

The National Radio Astronomy Observatory is a facility of the National Science Foundation operated under cooperative agreement by Associated Universities, Inc.

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