

The Allen Telescope Array is located at the Hat Creek Radio Observatory in northern California, about 20 miles north of Mt Lassen. It consists of 42 dishes, each one 6.1m diameter, configured with offset Gregorian optics having the secondary mirror below the overall optical axis. The feed pattern and antenna optics are matched so that any spillover is directed back to the sky. The array is owned and operated by a partnership between the SETI Institute in Mountain View, CA and SRI International, in Menlo Park, CA. It is used 50% of the time for SETI (search for extraterrestrial intelligence) observations and 50% of the time for tracking satellites and research services.

The current feeds are room temperature dual polarization Log Periodic Antennas with only the LNAs and a short segment of the input leads cooled to 70K. Because the input terminals of the feed are at the tip of the feed for all operating frequencies, each balanced linear polarization of the received signal must pass from each signal's active region along the backbone of the warm feed to the warm tip of the feed, and then onto microstrip and twin lead transmission inputs into a cooled vacuum dewar containing the low noise amplifier. The result is added noise at the input of the LNA from the room temperature structures.

The new Allen Telescope Array feeds, along with their LNAs and input cables, are now fully cooled to 70 K to provide a lower system temperature for the ATA. To enable the cooling, the feeds are contained in pyrex glass vacuum dome (which resembles a bell jar). In turn, the vacuum domes are capped by dielectric lenses which minimize the reflection of the incoming signals by the pyrex glass at the higher frequencies.

The new Cooled Log Periodic feeds operate over the band 0.9 to 15 GHz, four octaves. This exceptionally wide bandwidth and the large field of view of the 6.1m dishes enable significant observational flexibility and make this array a superb survey instrument. Total measured front end temperatures, including antenna spillover and atmospheric brightness, are now 30K – 40K over 0.9 -10.0 GHz, rising up to 40K – 60K over 10 -15 GHz. This is a large improvement in the sensitivity of each antenna. The lens thickness and offset from the pyrex dome are optimized for good wide-band transmission through the glass. Careful design of the cooling system to avoid thermal deformations and destructive vibration of the system has also been essential to achieving a successful design.

Several of the new feeds have been installed and are now operational on the ATA. Feed replacement on all 42 ATA antennas should be completed by the end of the year 2016. It is a pleasure to acknowledge the technical support of SRI during field-testing of the feeds, and the financial support and advice from Franklin Antonio in this new development for the ATA.