

Dual Polarized, S&X Band Monopulse Feed for Tracking LEO Satellites

A dual polarized S/X Band feed has been designed and developed to cater for data reception from remote sensing satellites, which adopts frequency re-use for data transmission. The development of feed has enhanced the data rate capability of ground station, which is essential to acquire high resolution imagery data from future missions. The feed comprises of S and X band radiating elements, polarizer, comparator for extracting Sum and Difference signals (AZ &EL). Instead of using conventional radiating elements such as four horns, five horns or multimode horn, dielectric rod radiating elements with high aperture efficiency, rotationally symmetric beams with low side lobe levels have been used. The feed is a single channel mono pulse tracking feed which provides high tracking accuracy to auto track the satellites in X-Band and S-band. The dual polarized feed is capable of tracking in four modes, such as X-RHCP, X-LHCP, S-RHCP and S-LHCP, providing enormous flexibility to the ground station as it has the capability of switching to either of these modes. The feed system has been integrated with a reflector of 7.5 m diameter in Cassegrain configuration and the system is made functional at National Remote Sensing Centre, ISRO to receive data from Low Earth Orbiting Earth Observation Satellites. The antenna & feed system provides a high G/T to receive data through LHCP and RHCP signals simultaneously. The dual polarized feed designed for frequency re-use facilitates high data rate signal reception, which otherwise is impossible, due to limited bandwidth available in X-Band signal reception.



Integrated X-band feed assembly



X-band radiating element

Salient features:

- The feed, designed for mono pulse tracking, provides high tracking accuracy in X-band. The criticality of the tracking in X-band with very narrow beam width has been achieved.
- It is a composite feed, which performs tracking and receiving data in S&X-band. S-band feed contains circular helices and X-band contains dielectric rods.
- This dual polarized feed is capable of tracking in four modes, such as X-RHCP, X-LHCP, S-RHCP and S-LHCP. This provides the user great amount of flexibility as it has the capability of operating in either of these modes which one is receiving more signal strength or according to user's choice.
- Instead of using conventional four horns or five horns as feed element, here dielectric rod radiating elements with high aperture efficiency, rotationally symmetric beams with low side lobe levels, have been used.
- A septum polarizer is designed to separate LHCP and RHCP component and produce linear polarized signal for the for comparator output. Septum polarizer exhibits good return loss and isolation between two ports, which receive orthogonal polarized components.
- S-band elements are composed of 20 turn tapered helix wound on a nylon former. Total eight helices are used four for RHCP and four for LHCP and capable of tracking in both orthogonal polarized mode.

Application:

The feed system has been integrated with a reflector of 7.5 m diameter in Cassegrain configuration and the system is made functional at National Remote Sensing Centre, ISRO to receive data from Low Earth Orbiting Earth Observation Satellites. The antenna & feed system provides a high G/T to receive data through LHCP and RHCP signals simultaneously.

Technology Transfer from NRSC/ISRO

NRSC/ISRO is willing to transfer the knowhow of this technique to academics/industries that deal with natural resource assessment from satellite data. Interested individuals/party (s) may write to the address given below stating the end use of the technology or diversification of the existing technology, if any.

Director

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