Triband (S, X, Ka) Antenna dual circularly polarized Monopulse feed for LEO satellite Auto tracking and Data reception.

Introduction:

High-resolution satellite data containing more volume of information is need of the hour, but at the same time it causes a huge surge in satellite data rate. This calls for transmission and reception of huge data in a short period of satellite pass, increasing the data rate by many folds. To transmit/ receive such high-speed data, large bandwidth antennas with single/dual/multi-band operation is the fundamental requirement. To avoid spectral crowding in X-band, transmission at Ka-band is solution to enable high-resolution high data rate transmission. So, we have S/X/Ka Tri-band feed is indigenously designed and developed inhouse to cater multiband data reception from single antenna system.

Salient Features:

Novel features of proposed system:

- Frequency bands supported-
 - S, X and Ka band simultaneous RHCP and LHCP.
- Monopulse Auto tracking Capability:
 - S band RHCP & LHCP
 - X band RHCP & LHCP
 - Ka band RHCP & LHCP (switchable in feed)
- G/T achieved:
 - S band: 17.0 dB/deg K
 - X band: 31.5 dB/deg K
 - Ka band: 34.5 dB/deg K
- Multiband composite feed in a single cassegrain plane.
- Ka band TE21 Monopulse auto tracking for LEO satellites.

Description:

The S/X/Ka Tri-band feed is indigenously designed and developed in-house. This tri-band feed configuration comprises of multimode Ka-

band dielectric rod, 2×2 square array of dielectric rods for X and S-band. The developed and realized tri-band feed is very compact, cost effective and gives state of art performance in terms of optimum illumination of sub-reflector with symmetric low cross-polarized radiation pattern. The designed feed is fabricated, assembled, tested at CATF and integrated in 7.5m cassegrain antenna system at IMGEOS, NRSC, Shadnagar. This will be useful in receiving data in all the three bands from remote sensing LEO satellites.Multimode Monopulse for Ka-band and Multi-element Monopulse in X & S-band is a novel approach to achieve a highly efficient multiband composite feed. Tri Band antenna system will be advantageous in receiving data from Remote Sensing Satellites in S, X and Ka bands satellites single antenna system. Multi-element Monopulse in S-band and X-band is achieved with square array of optimally designed dielectric rods.



Figure 1 Fabricated S/X/Ka Triband Feed



Figure 2 Fabricated Ka band Components

Major components of the feed:

The proposed Integrated Triband feed design configuration is consisting of i) multimode dielectric rod as Ka band feed element, ii) Kaband TE21 mode coupler; iii) Ka-band tracking network; iv) 2x2 dielectric rod array for X band; v) X-band MPC special waveguide; vi) X-band phase matched Auto Track network; vii) 2x2 dielectric rod array for S-band viii) S-band phase matched Auto Track network and viii) required RF uplink/downlink subsystems.



Figure 1 Testing of fabricated S/X/Ka Triband Feed at CATF Facility



Figure 2 Triband Feed installed in 7.5m Antenna

Technology Transfer from NRSC/ISRO :

NRSC/ISRO is willing to offer the knowhow of this technology to suitable entrepreneurs / industries in India. Capable manufacturing industries interested in acquiring this knowhow may write with details of their present activities, requirements and plans for implementation, infrastructure and technical expertise available with them, their own market assessment, if any, and plans for diversification to the address given below:

Contact Address:

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