



Multi-channel single fiber ROF signal transport system architecture of uGMRT

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This paper discusses about the DWDM based bi-directional RF over fiber link for carrying broadband radio astronomy signal from remote antennas of GMRT array without any frequency translation to central processing station located at the central array. The RF over fiber optic system bring in the noise like radio astronomy signal directly from the frontend over two wavelengths carried on single fiber, each wavelength bring in one polarization of the frontend signal. A third wavelength is used to support the legacy system of GMRT bring in the down converted radio astronomy signals from remote antennas. The single fiber optic cable is further loaded with 1310nm signal from central electronics building to the remote antenna carrying LO reference and telemetry signals for the legacy system and this wavelength is transmitted in the reverse direction using bidirectional WDM system along with the DWDM system carrying broadband signal for uGMRT. The fiber optic system support 50 MHz to 2GHz band with dynamic range of 65 dB and can support a fiber distance of 80 km. The optical transmitter uses cooled DFB laser with a RIN -155 dBm/Hz and the receiver uses PIN photodiode with 20 dB trans-impedance amplifier and the system is limited by thermal noise. The DWDM Multiplexer and De-multiplexer is a four channel 200GHz spaced module with adjacent channel isolation of 40dB.

The uGMRT have installed 90 DWDM based single fiber ROF links connecting 30 antennas to the central electronics building. These ROF system architecture is unique in nature and have used all the available technology for easy upgrade of GMRT and system is designed and built in house at lower cost.

References

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