



Feasibility Study of the Optimized Septum Polarizer for L-Band Radio Astronomy (uGMRT)

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In the present uGMRT (upgrade Giant Meterwave Radio Telescope) L-band feed comprises a Corrugated horn with an Orthomode Transducer (OMT) for observing the linear polarized signals (V-vertical, H-horizontal) [1]. The ISM (interstellar medium) properties, Magnetars, and fast radio bursts (0.7-4 GHz) are the new areas of astronomy where circular polarization is required [2]. Also, in the linear polarization observation (V and H) every instance its V and H have changed due to the earth and source moving needs a complicated digital algorithm to solve this issue [3]. Introducing a quadrature hybrid in between feed and LNA (low noise amplifier) for linear to circular polarization will increase the receiver temperature and degrade the sensitivity of the front-end receiver (sky temperature is nearly 3K at the L-band) [3].

To overcome the problem mentioned above and observe new sources we are proposing a septum polarizer that works as OMT but instead of linear it will produce circular polarization (without the introduction of any extra loss) [4]. The septum polarizer is a passive component placed after the feed (before the LNA) which can separate two circular polarizations on its output port. Due to insertion loss, it will improve the receiver's sensitivity [5]. In the present work, we are designing a septum polarizer that will work in 1000 MHz-1700 MHz with an insertion loss of 0.1 dB, and a 1 dB axial ratio of 45 % of its central frequency. The isolation between the two ports is nearly 30 dB. The simulation is carried out in Ansys HFSS-2023 R2 and results are cross-verified by other simulation software FEKO 2023. Both simulations are very well matched with each other. This septum polarizer may be used in uGMRT and other allied fields. This document describes the obligatory format for URSI Extended Abstracts. The simplest approach is to replace the template's text with your own.

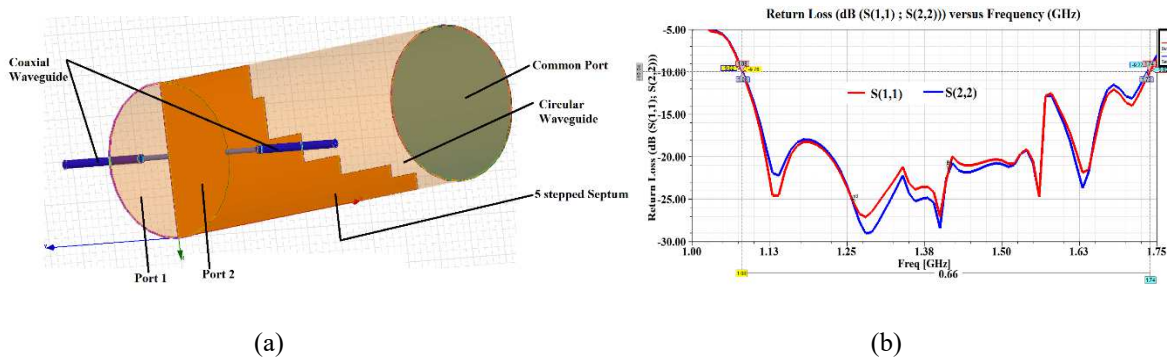


Figure.1. (a) Septum polarizer with circular waveguide and (b) Return loss response of the proposed L band feed (corrugated feed) with septum.

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