DEVELOPMENT OF A DIPLEXER BASED ON DIELECTRIC BEAM SPLITTERS

O. D'Arcangelo[1], E. Alessi[1], W. Bin[1], A. Bruschi[1], A. Moro[1], V. Muzzini[1]

[1] *Istituto di Fisica del Plasma "Piero Caldirola", CNR, via Cozzi 53 Milano, Italy*

Corresponding author: ocleto@ifp.cnr.it

The increasing request of available power and flexibility in using it for the next generation fusion devices, like ITER, stimulated the interest in switching-combining systems [1]. These devices, based on resonating loops or interferometers, are able to combine the power coming from different sources or to divide it between multiple transmission lines with a switching velocity of a few ms (mechanical path tuning) or even less (frequency tuning of the sources). Thanks to these characteristics, the use of switchers/combiners turns out to be very flexible and efficient for electron cyclotron heating and its applications, like, for instance, NTM stabilization. A new quasi-optical version of diplexer is under development at IFP-CNR. It is based on a resonating system coupling two transmission lines using two or three beam splitters (figure1).

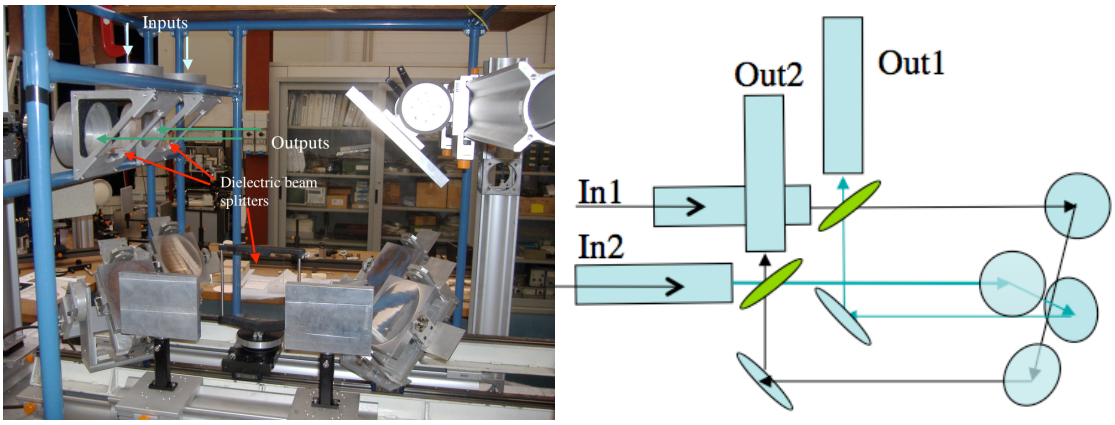

Figure 1: The diplexer combiner developed at IFP-CNR

The system, after a careful alignment, has been tested at low power, using only one of the two available inputs. The use of beam splitters makes the performance to be strongly depending on input polarization. This design has been studied and optimized for the specific insertion on the FTU Tokamak transmission lines. Different polarizations have been investigated and, in the one required for injection in FTU, a very efficient channels separation was achieved.
The theoretical predictions on the efficiency in channels separation were tested as a function of the frequency while a first indication on the real power losses of the system was obtained at fixed frequency by measuring the beam patterns coming out from the two outputs. Preliminary results confirm theoretical predictions and losses seem to be at an acceptable level, provided that the alignment is very accurate. Some improvements of this device are foreseen in the next future, like new focusing mirrors and optimization of the beam waist, to further reduce losses. Present work describes the system realization together with the low power tests performed at IFP/CNR.

[1] Kasparek, W; Petelin, M; Erckmann, V, et al. "High-power microwave diplexers for advanced ECRH systems", Fus. Eng. Des., Vol. 84, Issue: 2-6, Pages: 1002-1005, (2009)