

Two-Color Millimeter-Wave Interferometer

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1. Objective

Two-color millimeter-wave interferometer is used for the measurement of line-integrated electron density on the horizontal mid-plane.

2. Apparatus

2.1. Specification

To overcome the effects of the change in the transmission path length (~ 100 m) during long pulse plasma, two color interferometry at 285 GHz and 140 GHz is applied. For combining two different frequency sources and reducing the internal losses of the standard waveguide components in high frequency region low-loss quasi-optical circuits were applied.

(1) 1mm interferometer

frequency band : 285/284 GHz

objects : line integral electron density on the horizontal mid-plane

frequency response : 1MHz

(2) 2 mm Interferometer

frequency band : 140/139 GHz

objects : line integral electron density on the horizontal mid-plane

frequency response : 1MHz

2.2. Drawing of device

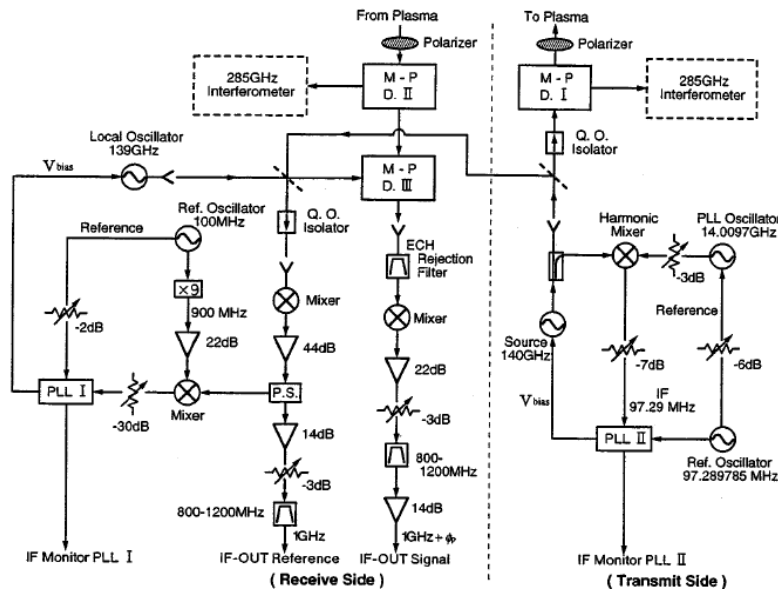


Fig. 1. Block diagram of a two color interferometer with the quasi-optical system.

A 140 GHz channel is only shown in the diagram

2.3. Arrangement

- Installation port: 3-O and 3-I port
- Field of view: Horizontal cross section (see Fig.2)

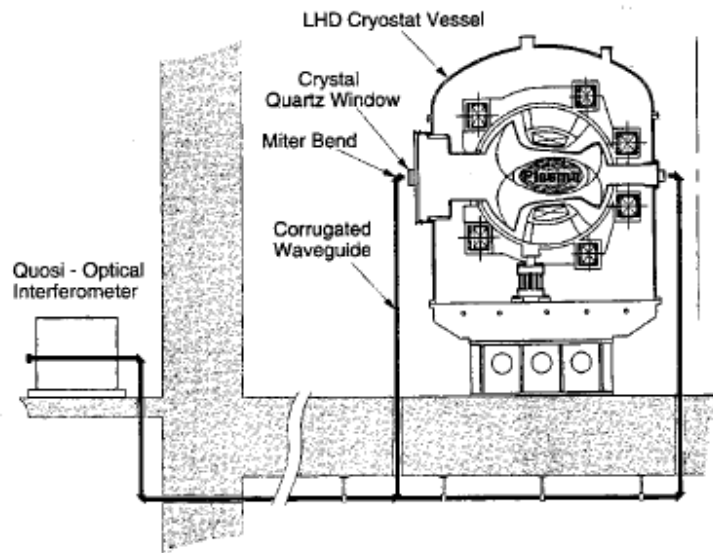


Fig. 2. 3-O and 3-I ports millimeter-wave interferometer arrangement

3. Operational requirement

- no special requirement

4. Available data by “Retrieve”

4.1 Kaiseki-data server

- “mmw_nel” : Line-integrated electron density of two-color interferometer is registered just after the plasma discharge.
- “mmw” : Line-integrated electron density is registered after showing on the main display in the control room by the experimental operator.

5. Remarks

References

- [1] K. Kawahata et al., “A two color millimeter-wave interferometer for the measurement of line integral electron density on large helical device”, Rev. Sci. Instrum. Vol. 70, No.1 (1999) pp.695-698.
- [2] T. Akiyama et al., “Interferometer Systems on LHD”, Fusion Science and Technology, Vol. 58, No. 1 (2010) pp.352-363.