



IMAGING MOSS TOMOGRAPHIC SYSTEM FOR H-1NF

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A tomographic diagnostic utilising the Modulated Optical Solid-State spectrometer (MOSS) is planned for the H-1NF stellarator at the ANU. It is designed to create two-dimensional temperature or velocity maps of a poloidal cross-section of the high temperature plasma of H-1NF.

The introduction of the MOSS spectrometer¹ has enabled the development of several diagnostics to be used on the H-1NF stellarator. The MOSS spectrometer allows calculations of the plasma temperature and bulk velocity based on a line-integrated measurement of light emitted from electronic transitions within the plasma. A tomographic system utilising a rotatable multi-view ring apparatus and spatial multiplexing through a MOSS spectrometer is currently being developed.

The ring apparatus is placed inside the H-1NF vessel and encircles the plasma (see Figure 1). Multiple line-of-sight views collect light through a poloidal cross-section of the plasma (see Figure 2) and the emitted light is coupled into large core optical fibres. The transmitted light, via the optical fibre bundle, is then imaged through a large aperture MOSS spectrometer and onto another optical fibre array. Each fibre is then fed into a photomultiplier tube for signal detection.

Characterisation of the properties of the lithium niobate (LiNbO_3) crystal used for modulation in the MOSS spectrometer is being undertaken to account for ray divergence in the imaging system.

Tomographic techniques enable the construction of a temperature or velocity map of the poloidal cross-section. Rotating the ring apparatus to a new viewing position for the next pulse of plasma should allow an accurate picture to be built up based on the reproducibility of the plasma pulses.

It is expected that initial testing of the system will begin in May when H-1NF begins operations at 0.5 Tesla field strength.

¹MOSS Spectrometer Applications in Plasma Diagnostics, J. Howard. Accepted for publication Rev. Sci. Instrum. (1999)

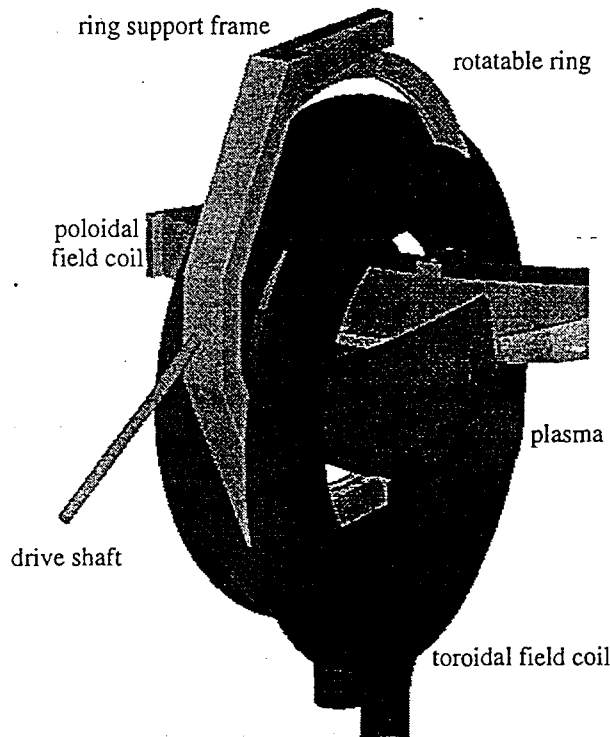


Figure 1: Rotatable Ring Apparatus inside H-1NF

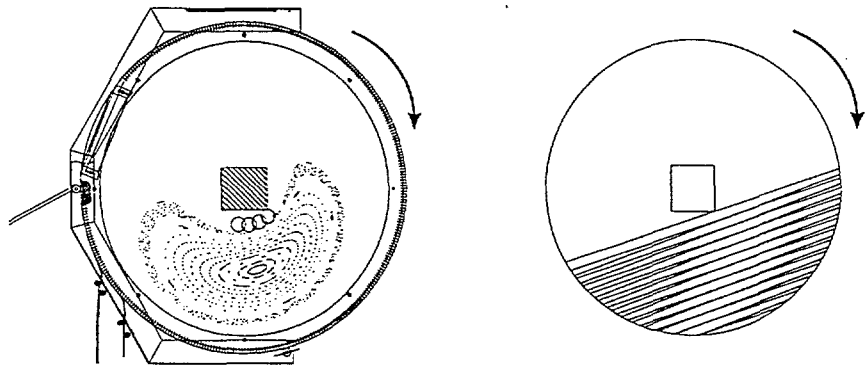


Figure 2: Rotatable Ring around Plasma and Schematic of Views through Plasma