

Reflectometry on Alcator C-Mod: Status and future upgrades

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The reflectometer system currently installed on the Alcator C-Mod tokamak is an amplitude modulated (AM) reflectometer working in O-mode [1]. It consists of five channels with center frequencies 50, 60, 75, 88 and 110 GHz. These frequencies correspond to densities in the range between $0.31 \times 10^{20} \text{ m}^{-3}$ and $1.5 \times 10^{20} \text{ m}^{-3}$.

Four of the channels use the traditional phase detection scheme for AM reflectometry, i.e. measuring the phase difference between the upper (USB) and lower (LSB) sidebands of the AM waves. This is not ideal for fluctuation measurements, since it reduces the sensitivity by subtracting correlated fluctuations in the USB and LSB signals. The 88 GHz channel has therefore been upgraded to separate and measure the USB and LSB signals independently [2].

The focus of the reflectometry system has shifted from profile measurements towards fluctuation studies. The proposed upgrades to the reflectometer are the following:

1. Add two high frequency channels to the system: 130 and 140 GHz, corresponding to densities of $2.1 \times 10^{20} \text{ m}^{-3}$ and $2.4 \times 10^{20} \text{ m}^{-3}$. This will enable the investigation of internal transport barrier turbulence dynamics.
2. Upgrade the 50, 60, 75 and 110 GHz channels to measure the USB and LSB signals separately.
3. Move data acquisition from CAMAC to compact PCI modules.

The first experimental Alcator C-Mod campaign of 2003 has now begun (April 2003) and will continue until July 2003. The plan is for point 1 to be completed by June 2003, allowing us to make first high frequency measurements before the summer shutdown.

References

- [1] P. Stek, Ph.D. thesis, Massachusetts Institute of Technology (1997)
Y. Lin, Ph.D. thesis, Massachusetts Institute of Technology (2001)
- [2] Y. Lin, J. Irby, P. Stek *et al.*, Rev. Sci. Instrum. **70**, 1078 (1999)