

HTPD 2018



Contribution ID : 176

Type : not specified

4.1 A multiplexer-based Q-band multi-channel microwave Doppler backscattering reflectometer on the HL-2A tokamak

Monday, 16 April 2018 20:30 (120)

Doppler backward scattering (DBS) reflectometer has proven to be a powerful technique to study the physics of L-H transition, plasma transport, GAM, and zonal flows through measurements of the perpendicular velocity of density fluctuations, and the radial electric field in plasmas. In this work, a Q-band 8-channel DBS reflectometer system based upon a low insertion loss multiplexer-based feedback loop microwave source, and quadrature demodulation have been designed, tested in the laboratory, installed and operated on the HL-2A tokamak. The SSB phase noise of the multiplexer-based feedback loop microwave source has a better SSB phase noise especially at high offset frequency ($f > 100$ kHz), compared with that of a typical commercial synthesizer. The 8 working frequency components of the new DBS reflectometer systems are 34 - 48 GHz with a frequency interval of 2 GHz, and the power variation of all frequency components is < 4 dB. They are developed to measure the localized intermediate wavenumber ($k_{\perp\rho} \sim 1-2$, $k_{\perp} \sim 2-10$ cm⁻¹) density fluctuations and the poloidal rotation velocity profile of turbulence. Details of the system design, laboratory tests, ray tracing estimation, and initial plasma results illustrate the capabilities of the multiplexer-based DBS reflectometers.

Primary author(s) : SHI, Zhongbing (Southwestern Institute of Physics)

Presenter(s) : SHI, Zhongbing (Southwestern Institute of Physics)

Session Classification : Session #4, Monday Night Poster Session