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Development of ECE Radiometer System for Electron Temperature Profile and Fluctuation Measurement in Heliotron J

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An ECE radiometer system is being developed to measure electron temperature profile and fluctuation in Heliotron J. The traditional ECE part of this system includes 16 channels and can measure electron temperature profile from 58 GHz to 74 GHz. The correlation ECE part is composed of "CECE-RF" and "CECE-IF" systems, as shown in Fig. 1.[1] The CECE-RF side allows flexible

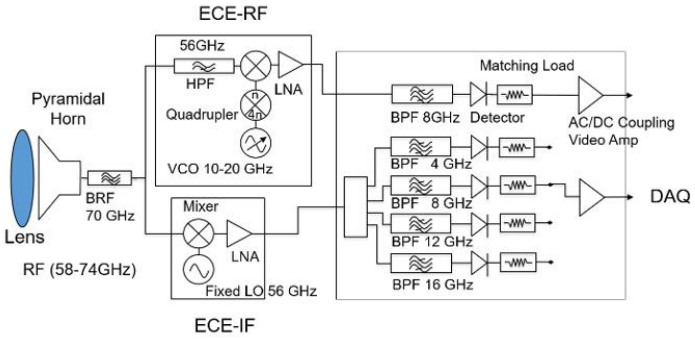

Fig. 1 Correlation ECE Radiometer System in Heliotron J

RF frequency, ranging from 56 GHz to 88 GHz, and the CECE-IF side has 4 frequency-fixed channels, corresponding to 60 GHz, 64 GHz, 68 GHz and 72 GHz. The frequency covers the core region to the edge one. The signals from these two sides share a same source of electron cyclotron emission and thus are possible to estimate electron temperature fluctuation through correlation analysis.

Figure 2 shows an example of CECE-RF and CECE-IF signals in an ECH plasma. The sampling rate of 1MHz allows the system to record electron

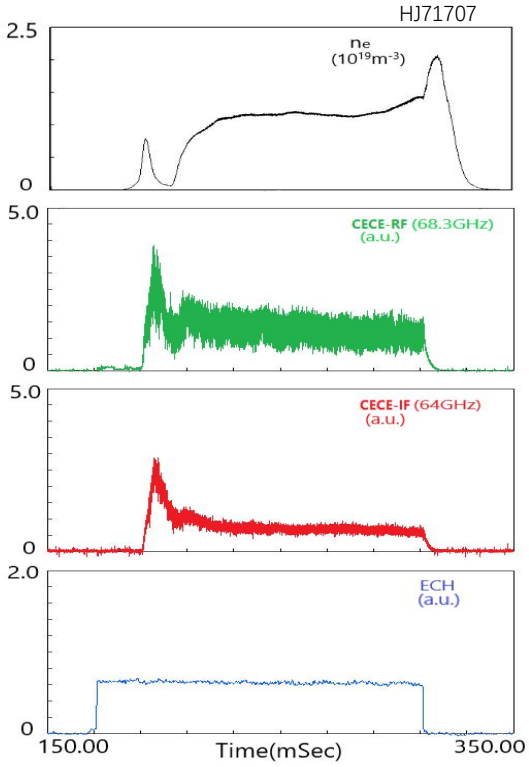

Fig. 2 (a) Electron Density. (b) IF Signal of C-ECE System. (c) RF Signal of C-ECE System. (d) ECH Power

temperature signal with high time resolution. Two ECE signals are measured in different positions in a frequency scan, which makes it possible to estimate the T_e fluctuation level and correlation length. The system is now being improved to obtain better S/N ratio and remove a noise coming from a 70 GHz gyrotron.

[1]G Weir, et al, to be published in EPJ Web of Conference