X-RAY DIAGNOSTIC WITH A HIGH PHOTON COUNT RATE FOR MEASURING THE FAST DYNAMICS OF PLASMA BREMSSTRAHLUNG RADIATION SPECTRA ON THE FT-2 TOKAMAK

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To study the lower hybrid heating and plasma current drive regimes at the FT-2 tokamak, soft X-ray diagnostic were developed [1], which makes it possible to measure plasma emission spectra from an energy of 0.6 keV at high output photon count rate - up to $7 \cdot 10^6\ s^{-1}$. This makes it possible to reduce the spectrum measurement time by more than 10 times compared to the best commercial spectrometers, which plays an important role when working on devices with a short discharge duration, as well as in studying fast processes.

The diagnostic system consists of an AMPTEK FASTSDD silicon drift detector with a preamplifier, an AMPTEK PX-5 detector control and signal processing unit, a fast spectrometric shaping amplifier designed for measurements at high radiation fluxes [2], a fast ADC with a sampling rate of 250 MHz and 14-bit resolution and Gbit diagnostic local network. A software package was developed to manage the diagnostic, collect and process data. Gaussian filtering was used as a pulse filtering algorithm, which made it possible to reduce the dead time of the detector by an order of magnitude [3, 4]. The spectrometer is mounted on a movable table, which makes it possible to collect radiation along various chords passing between the center and periphery of the plasma column.

At present, using the new X-ray diagnostic on the FT-2 tokamak, measurements are being made of the dynamics of bremsstrahlung spectra with a high time resolution in the ohmic stage of the discharge. The possibility of measuring the electron temperature from the "thermal" part of the radiation spectrum is being studied.

References

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