DATA ACQUISITION AND CONTROL SYSTEM PROJECT FOR ACTIVE SPECTROSCOPY DIAGNOSTIC

1Kudryavtsev A.V., 1Nagornyi N.V., 1Fedorov V.A., 2Tugarinov S.N., 2Lopatko V.B.

1National Research Nuclear University MEPhI, Moscow, Russia, info@mephi.ru
2Institution «Project Center ITER», Moscow, Russia, support@iterrf.ru

Diagnostic “Active Spectroscopy” is being development in the framework of the ITER project and provides the registration of radiation spectra synchronously with the operation of the diagnostic beam and the subsequent calculation of physical parameters.

The light generated by the plasma when interacting with a diagnostic beam is collected by an optical collector (system of mirrors, optics, optical fibers) and recorded by special high-resolution spectrometers. Each spectrometer contains three diffraction gratings, with which three spectral ranges are distinguished from the light signal. The spectral profile of plasma radiation in the corresponding spectral range is reproduced at the output of each of the three channels of the spectrometer. Registration of radiation spectra in spectrometers is performed using CCD cameras.

To support the main function of registering radiation spectra during plasma pulses, the diagnostic also uses additional equipment: the first mirror shutter subsystem, the first mirror cleaning subsystem, the fiber bundle positioning subsystem, etc.

The report presents various concepts of the data acquisition and diagnostic management system “Active Spectroscopy” and substantiates the selected technical solutions, presents the structural and functional diagrams of the system. A software model that simulates the flow of data from the spectrometer camera output is demonstrated, and the results of modeling the data transmission flows from the spectrometers cameras to the data acquisition subsystem are presented. In this report describes the mock-up of the fiber bundle positioning subsystem and control software. The results of magnetic field tests of the stepper motor mock-up for the optical elements remote control subsystem and testing procedure are given. The features of software development in accordance with the concept of the international organization ITER are discussed, and a description of the state machine and draft of the diagnostics management interface are presented.