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Bayesian modeling of JET Li-BES for edge electron density profiles using Gaussian processes SEHYUN KWAK, Korea Adv Inst of Sci Tech , JAKOB SVENSSON, Max-Planck-Institut fr Plasmaphysik, MATHIAS BRIX, Culham Centre for Fusion Energy, YOUNG-CHUL GHIM, Korea Adv Inst of Sci Tech, JET CONTRIBUTORS COLLABORATION[1] — A Bayesian model for the JET lithium beam emission spectroscopy (Li-BES) system has been developed to infer edge electron density profiles. The 26 spatial channels measure emission profiles with ˜15 ms temporal resolution and ˜1 cm spatial resolution. The lithium I (2p-2s) line radiation in an emission spectrum is calculated using a multi-state model, which expresses collisions between the neutral lithium beam atoms and the plasma particles as a set of differential equations. The emission spectrum is described in the model including photon and electronic noise, spectral line shapes, interference filter curves, and relative calibrations. This spectral modeling gets rid of the need of separate background measurements for calculating the intensity of the line radiation. Gaussian processes are applied to model both emission spectrum and edge electron density profile, and the electron temperature to calculate all the rate coefficients is obtained from the JET high resolution Thomson scattering (HRTS) system. The posterior distributions of the edge electron density profile are explored via the numerical technique and the Markov chain Monte Carlo (MCMC) samplings.

[1]See the Appendix of F. Romanelli et al., Proceedings of the 25th IAEA Fusion Energy Conference 2014, Saint Petersburg, Russia

Sehyun Kwak
Korea Adv Inst of Sci
Tech

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