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9.2 Using Integrated Data Analysis to Extend Measurement Capability

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The analysis approach often called “integrated data analysis” (IDA) provides a means to exploit all information present in multiple streams of raw data to produce the best estimate of a plasma parameter. This contrasts with the typical approach in which information (data) from a single diagnostic is used to measure a given parameter, e.g., visible bremsstrahlung→Zeff or Thomson scattering (TS)→Te. Data from a given diagnostic usually contains information on many parameters. For example, a TS diagnostic is sensitive to bremsstrahlung and line emission in addition to Te. This “background” light is typically subtracted off, but can be used to improve knowledge of Zeff. IDA encourages explicit awareness of such information and provides the quantitative framework to exploit it. As an example, IDA enabled measurement of Zeff on MST, as no single diagnostic provided a robust measurement. As we enter the burning plasma era, application of IDA may be critical to measurement of certain parameters, as diagnostic access in the harsh fusion environment will be extremely limited. This material is based upon work supported by the U.S. Department of Energy Office of Science, Office of Fusion Energy Sciences program under Award Numbers DE-SC0015474 and DE-FC02-05ER54814.

Primary author(s) : REUSCH, Lisa M. (Dept. of Physics, University of Wisconsin - Madison)

Presenter(s) : REUSCH, Lisa M. (Dept. of Physics, University of Wisconsin - Madison)

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