



INTEGRATED MODELLING OF REACTIONS BETWEEN ENERGETIC PARTICLES AND METAL WALL IMPURITIES IN TOKAMAK PLASMAS

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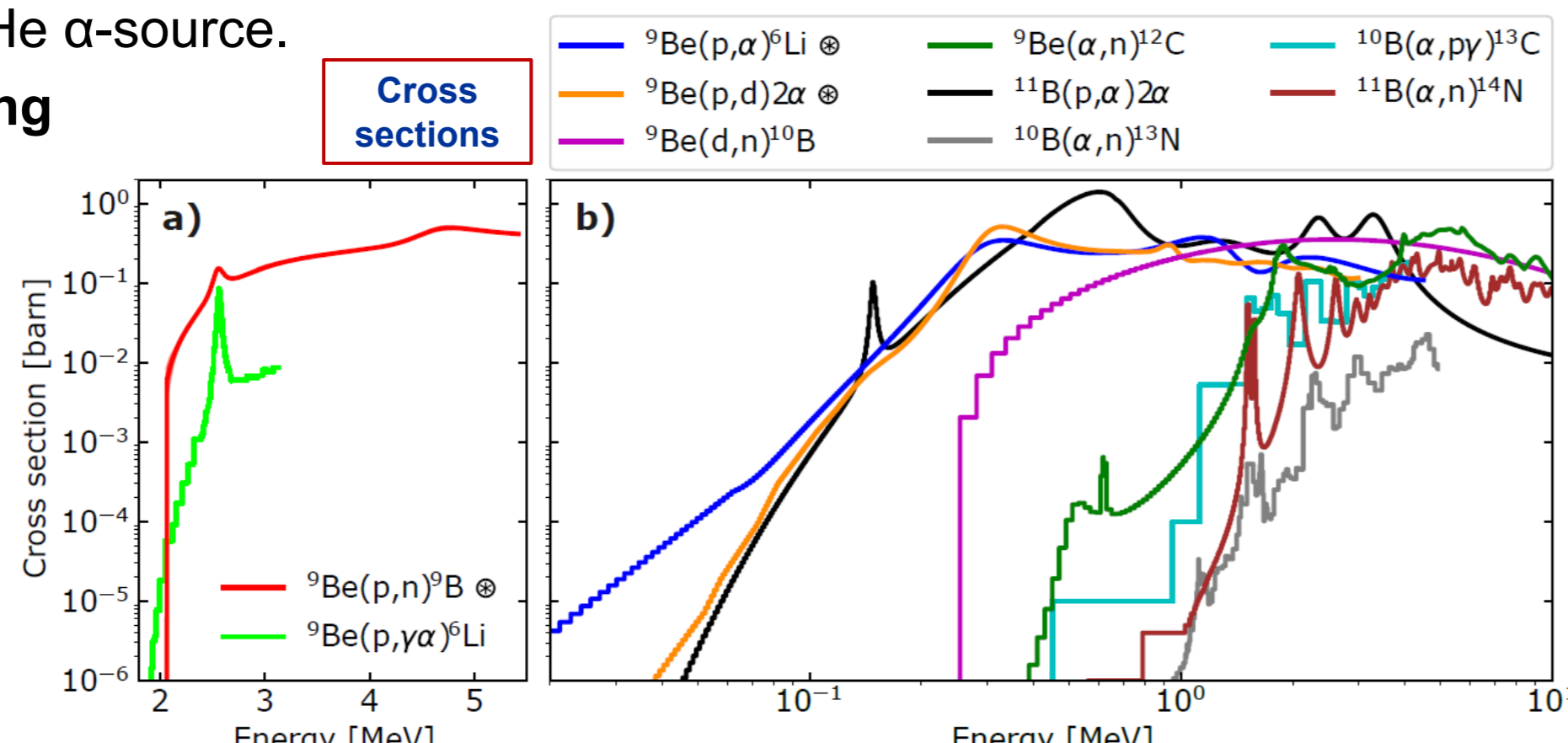
Highlights: discharges with steady-state fusion performance dominated by p-⁹Be fusion have been developed at JET in He and D. The fusion drive and neutron emission is modelled with a TRANSP/JETTO-LOCUST-DRESS-MCNP code chain. Total neutron rates are validated against fission chambers. The tool can be used to study alphas and radiation sources via p-¹¹B fusion in early phases of ITER operation.

Why are we studying this?

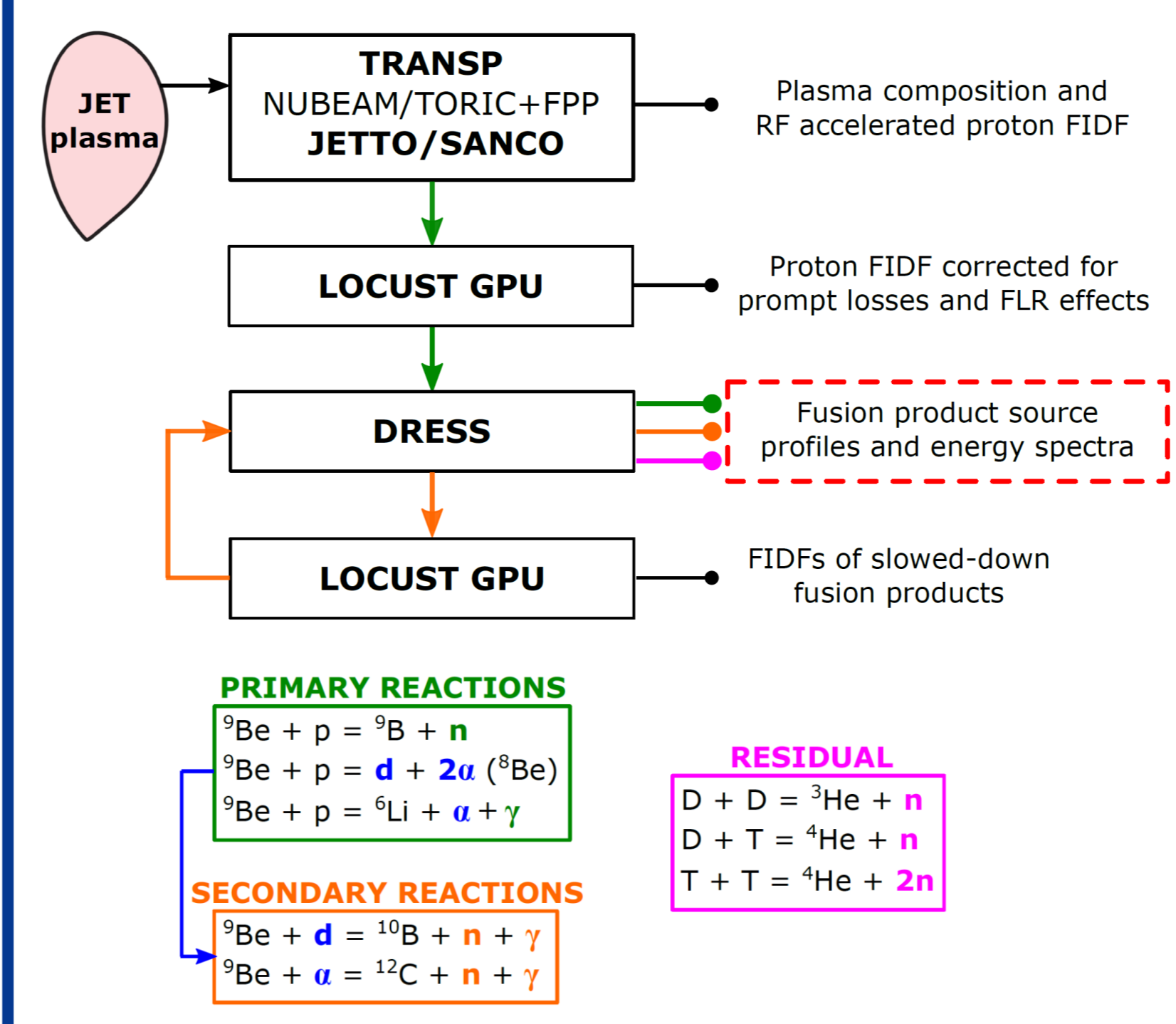
To better understand how to experimentally trigger and sustain fusion reactions between plasma impurities and energetic ions in tokamaks, and to validate our ability to accurately model and predict them:

- D-T alternative for producing burning plasma relevant fusion alphas, with advantages:
 - Can be performed in early phases of tokamak operation, e.g. ITER SRO, to study alpha confinement and transport, well ahead of D-T operation.
 - Emission of ionizing radiation, such as neutrons and gammas, much lower than D-T (safety issue), yet large enough to be used for diagnostics commissioning.
 - Impurities intrinsically present due to a metal wall, or wall conditioning, as opposed to D-³He α -source.

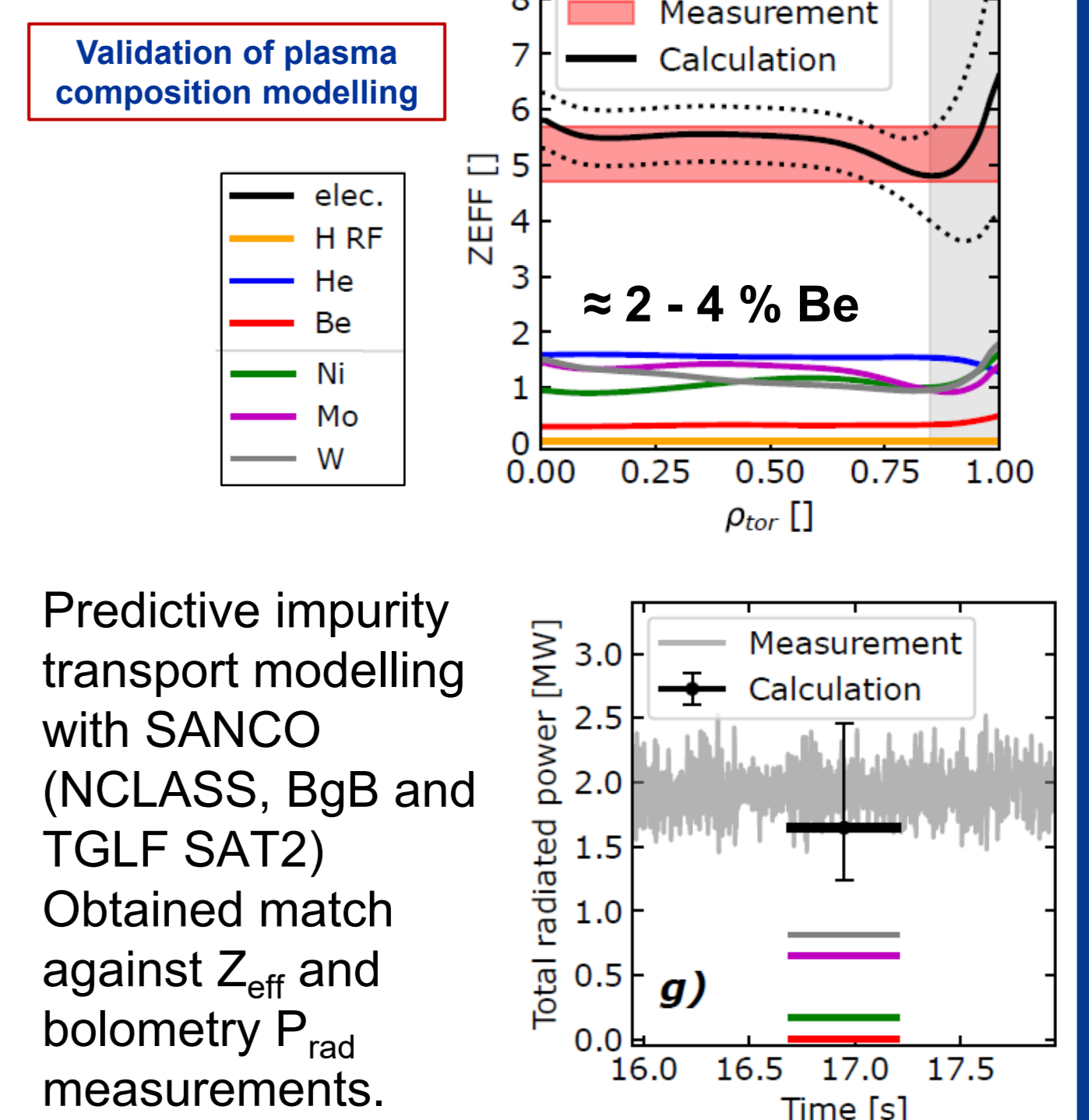
- Improve integrated modelling capability for non-standard fusion reactions and fast ion distribution functions.
- Provide input for forward modelling, e.g. neutronics, energetic particles, MHD.
- Validate cross-sections of non-standard fusion reactions.



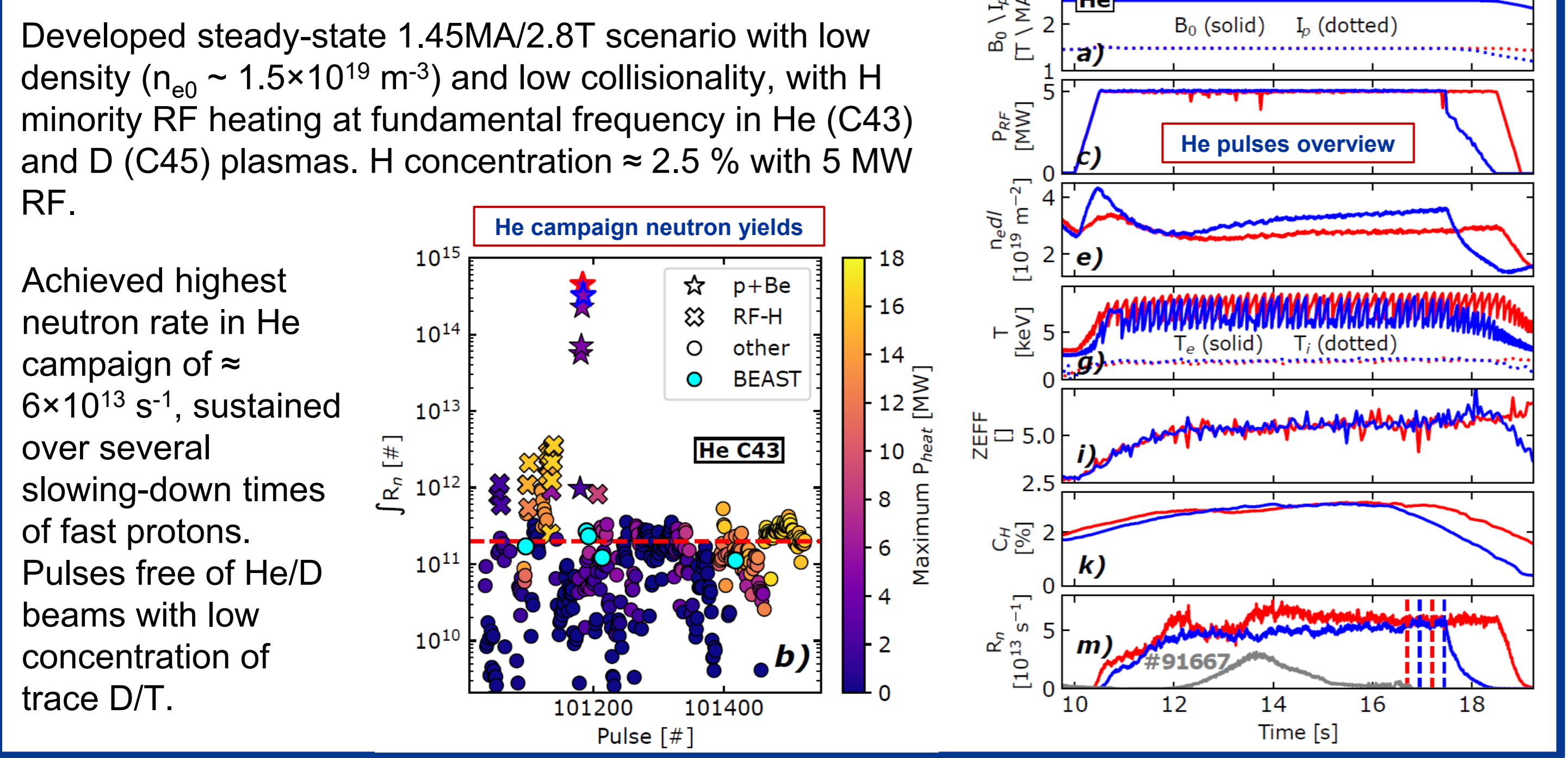
Modelling workflow



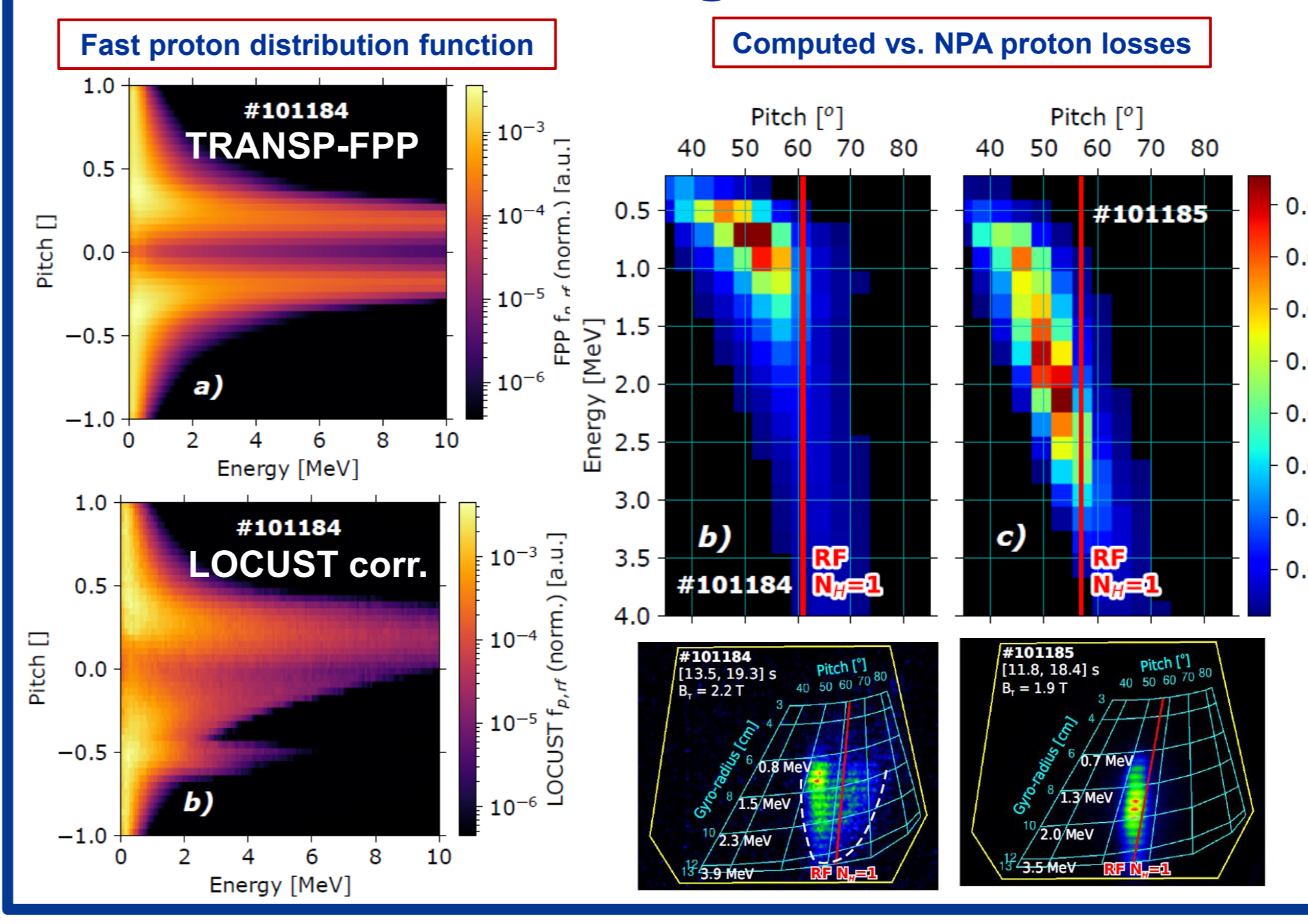
Plasma



Experiment



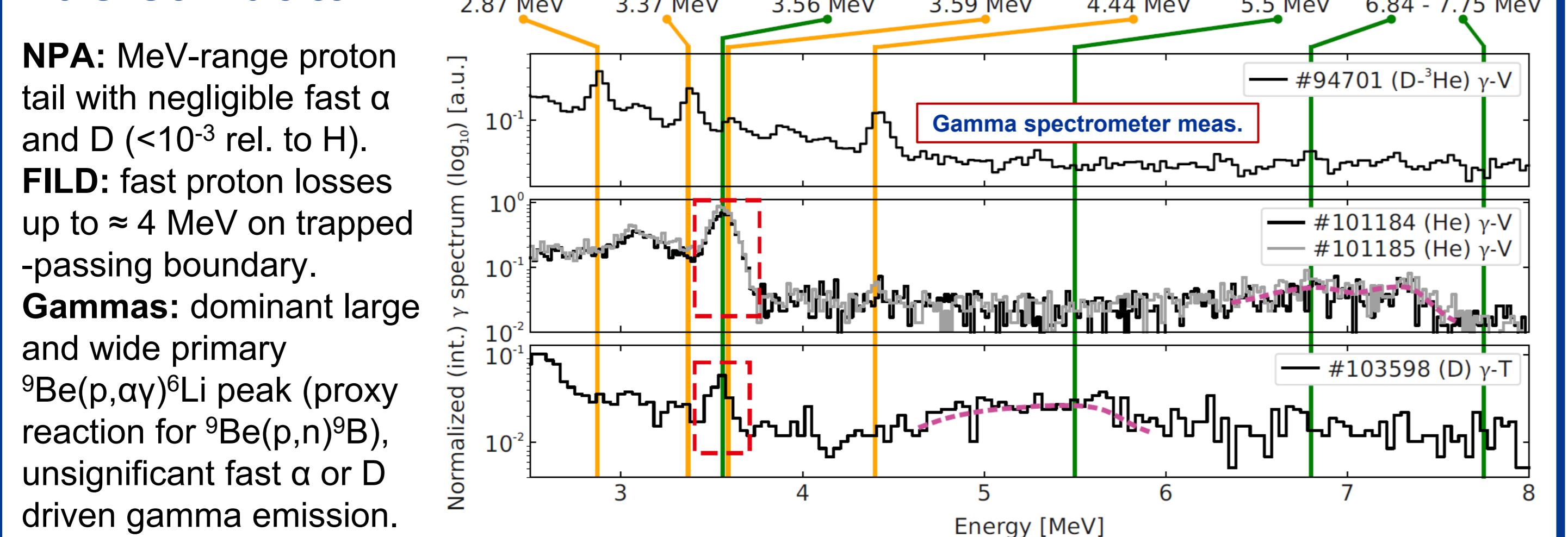
LOCUST orbit tracking



DRESS kinematics



Nuclear data



p+Be fusion chain neutrons

