



Experience of the IPP Prague team with possible real-time network areas for JT60SA and ideas to implement

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Jan Mlynář – honorary leader and founding father of our RE team

Eva Macušová – RE experiments (COMPASS, JET, AUG, TCV), RMP expert, RMP and RE modeling, RE radial position control, Fiber-Bragg, neutron and HXR diagnostics design, HF waves diagnostics and effects on RE, ECRH physics and design for COMPASS-U

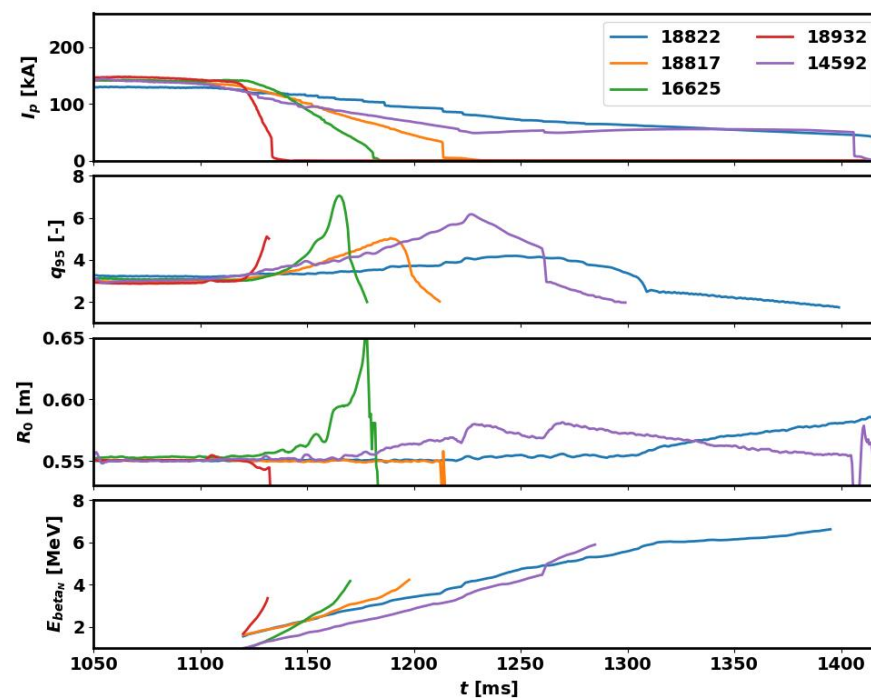
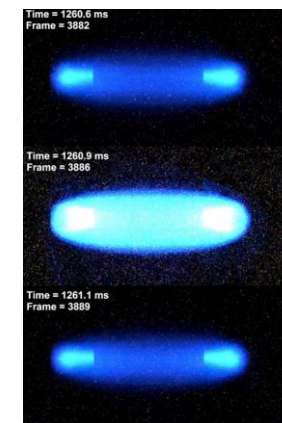
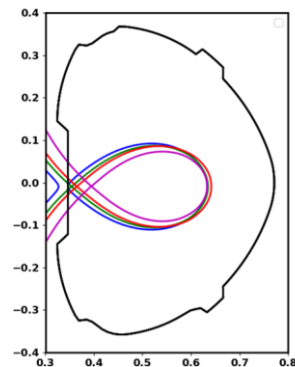
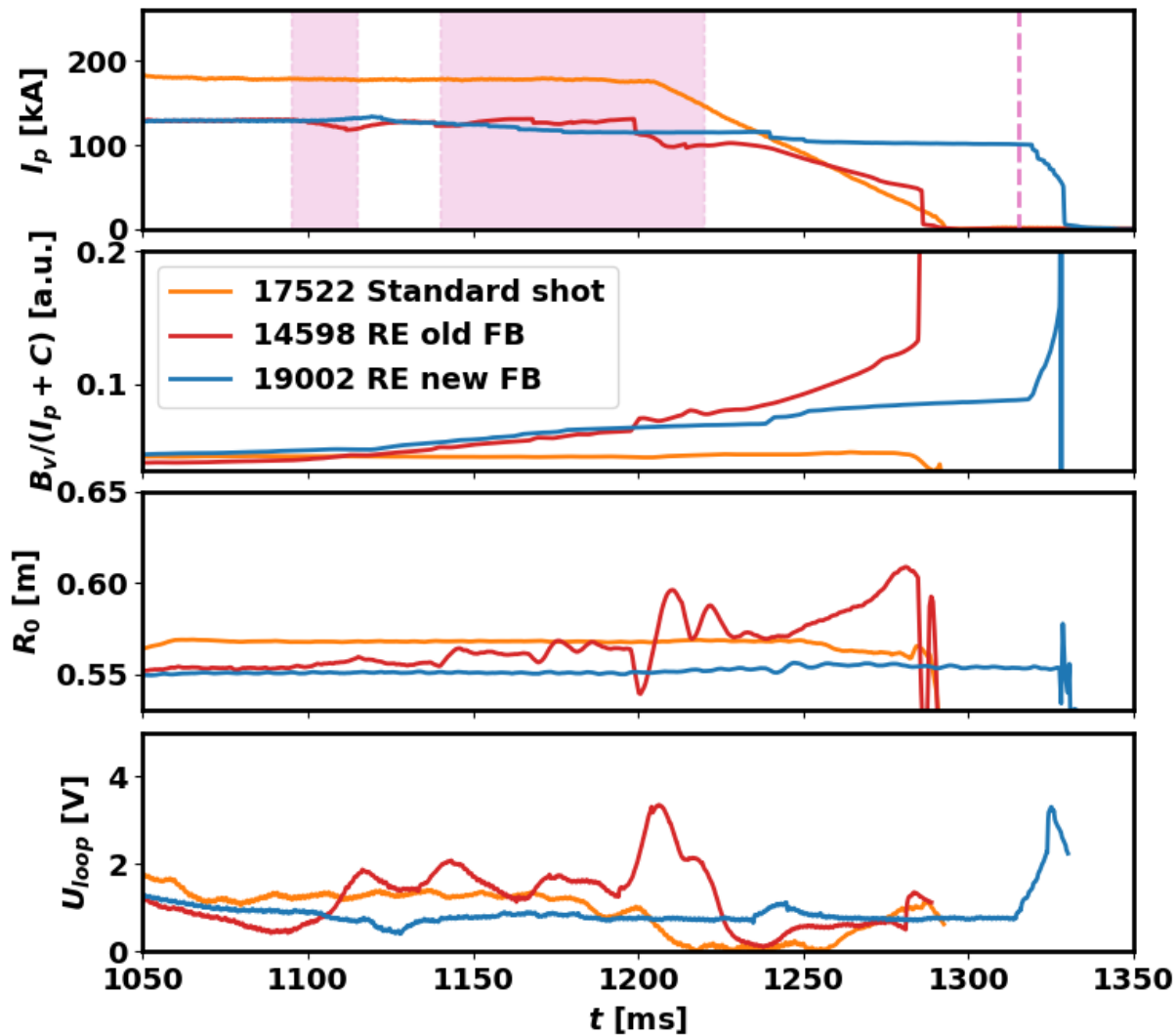
Andrea Casolari – RE experiments (COMPASS, AUG, TCV) theory and modelling, MHD expert, RE fraction diffusion model development, ECRH physics design for COMPASS-U,

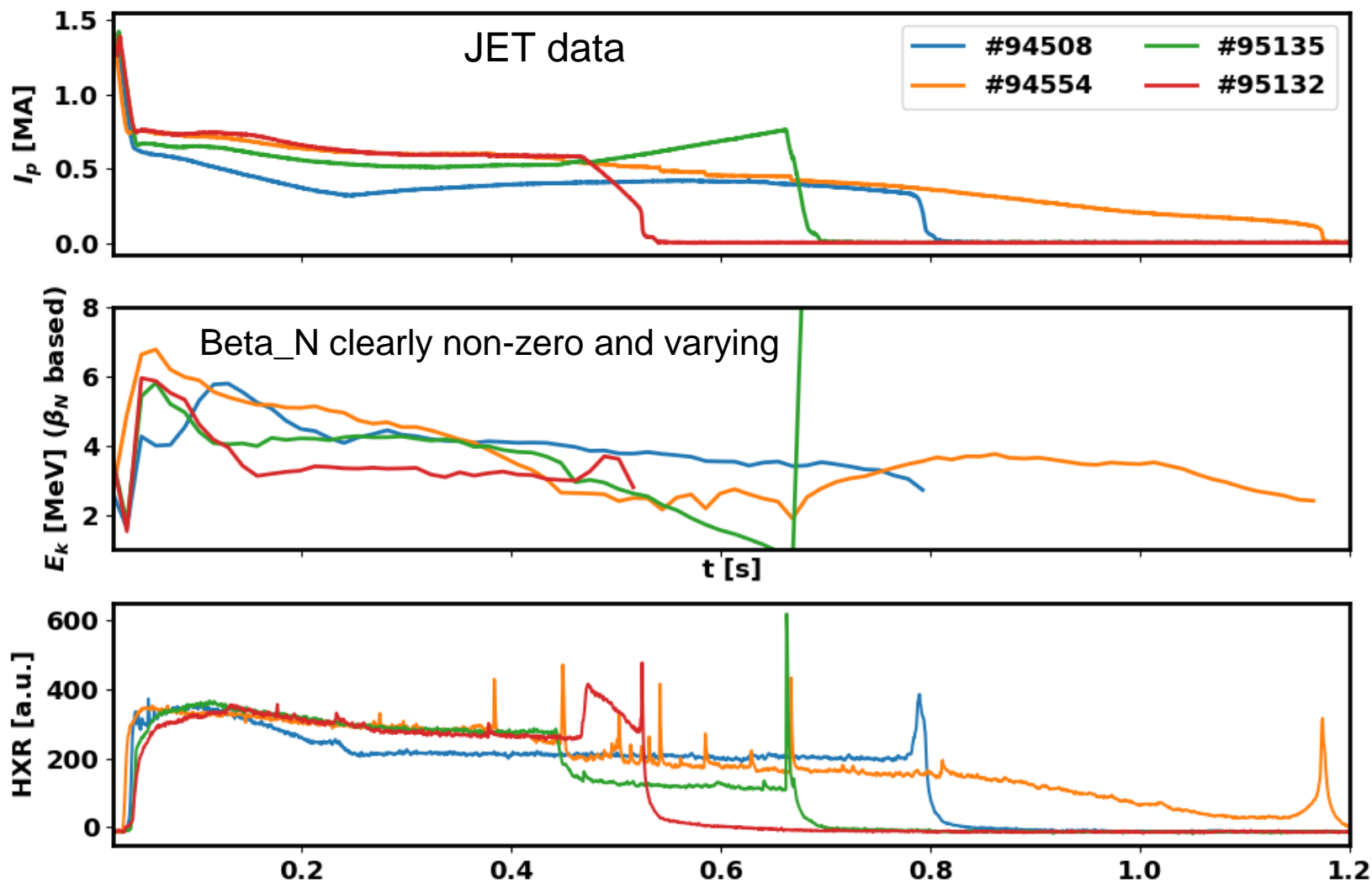
Ondřej Ficker – RE experiments (COMPASS, JET, AUG, TCV), DC and trainee PDO at JET, tomography (srx, bolometers, neutrons), HXR and neutron diagnostics, breakdown physics, tokamak design (support structure performance analysis, etc.)

Jaroslav Čeřovský - RE experiments (COMPASS, AUG, TCV, Golem), modelling, HXR diagnostics, visible spectroscopy diagnostics for COMPASS-U, solid state pellet injector design and operation, NBI operator

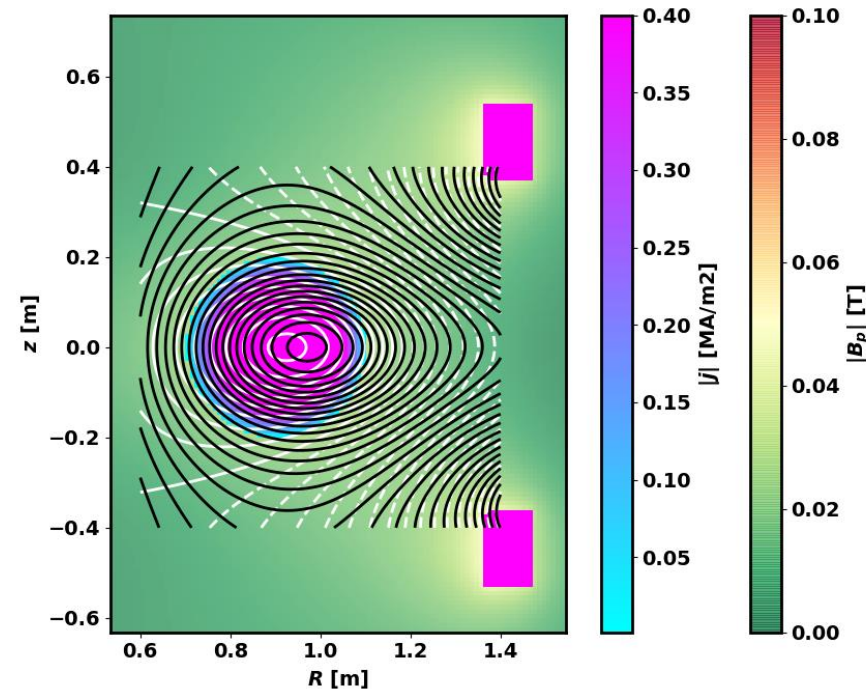
Jakub Čaloud – RE experiments (COMPASS), Calorimeter and Fiber-Bragg diagnostics, modelling

- RE control based on betatron effects
 - Modifications in real time equilibrium solver – connects energy with radial position [Ficker et al, 2019 NF] and beta normalised
- RE control based on HXR analysis and synchrotron radiation
 - Profile (-> new benign mitigation recipe (Reux et al., Bandaru et al.))
 - Energy – real time simplified signal processing of diagnostics data
 - Effect of various actuators (ECRH and other waves EFCC, pellet injection, etc.)
- RE termination with controlled heat fluxes
 - Limiter heat fluxes vs position?
- Power exhaust control – generally extensive experience with IR camera data and probes
 - Strike point sweeping/splitting
 - Detachment control (probes/seeding gas injection) – IPP staff involved, tested on COMPASS (M Komm)
- Position/radiation/neutron yield/impurities
 - Real-time tomography – some experience in past (V Loffelmann)
- Breakdown and ECRH heating related control
 - Topics that the team members will probably be solving at COMPASS-U





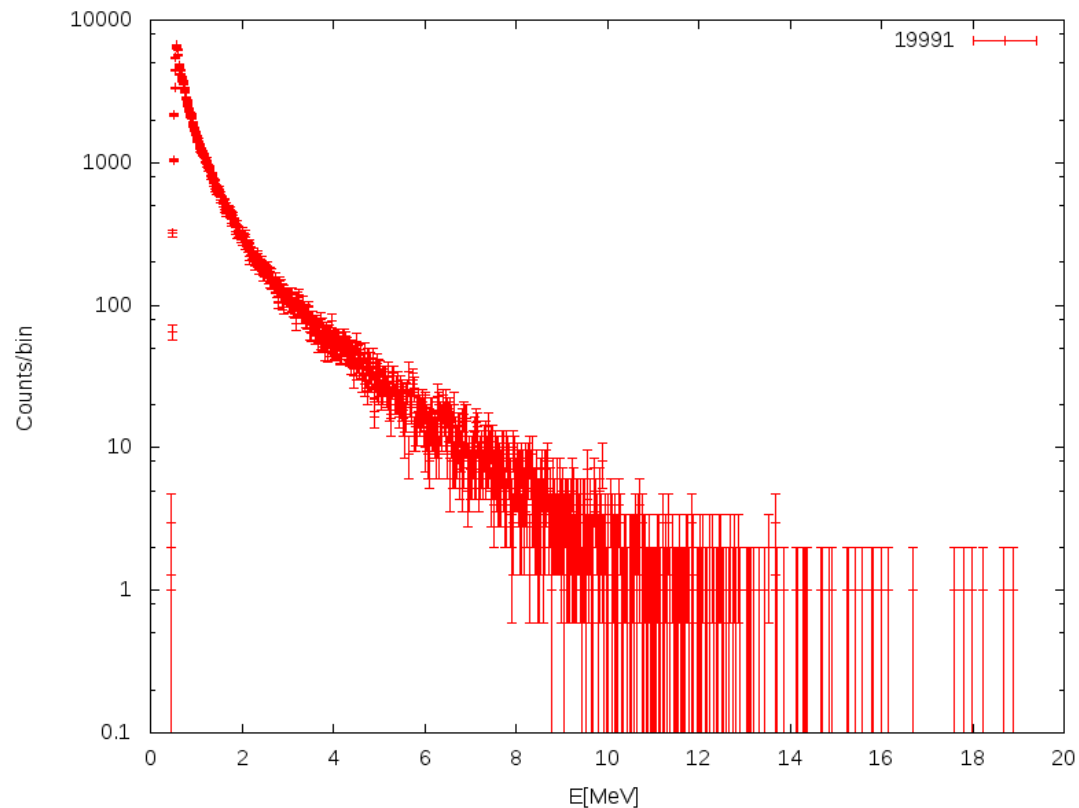
COMPASS – U geometry



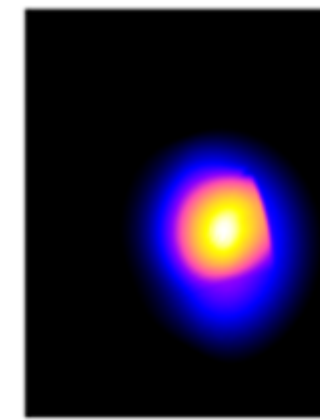
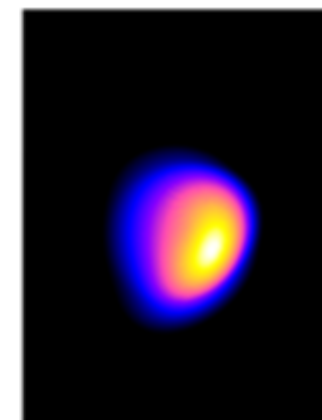
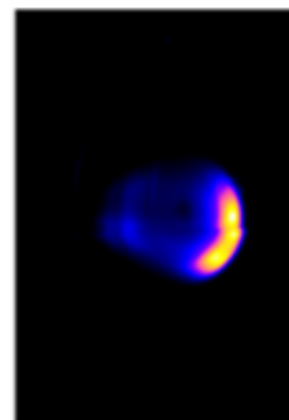
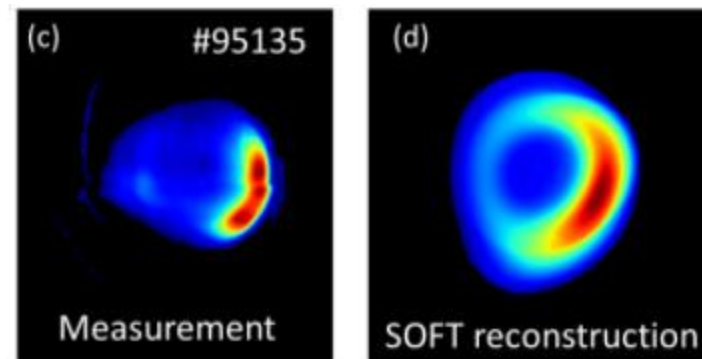
White curves – Psi surfaces
Black curves – RE drift surfaces for 15 MeV

Series of papers about betatron Equilibrium from Mannerheim et al. in ~1984

COMPASS HXR spectra



JET SR measurement and SOFT modeling



Parabolic profiles with different energy and pitch angle distribution – far from observed pattern

- [COMPASS nitrogen detachment](#) (video) – control proposed as probes vs nitrogen injection valve control (M Komm, I Khodunov)
- Real time tomography inversion (linearised) implemented in FPGA by Viktor Loffelmann under supervision of J. Mlynář (project currently on hold)
 - multiple possible applications – impurity control, radiation peaking, etc.
- MHD mode analysis and different roles of RMP/EFCC