



Task SA-SE.CM.OP.03-T004-D001

Breakdown workflow adapted for modelling TPC

Progress meeting

D. Ricci, M.Mattei, L.Figini, L.E. diGrazia

06/06/2024



CREATE



Consiglio Nazionale delle Ricerche



This work has been carried out within the framework of the EUROfusion Consortium, funded by the European Union via the Euratom Research and Training Programme (Grant Agreement No 101052200 — EUROfusion). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

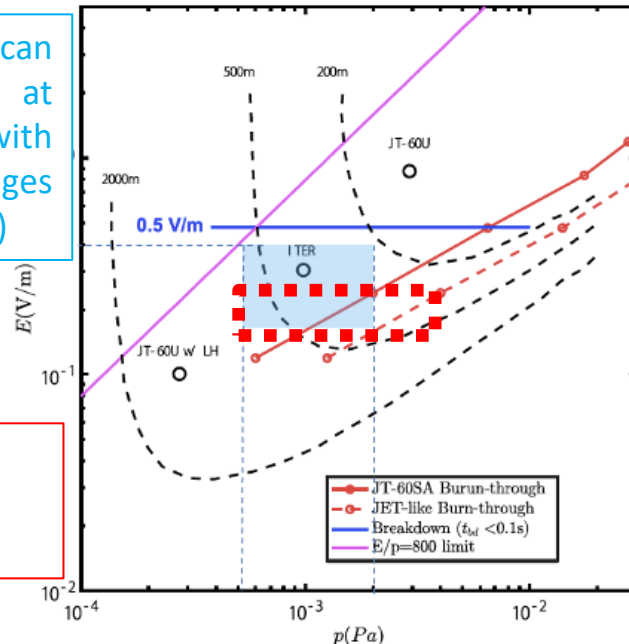


Breakdown workflow adapted to modelling TPC

Motivation: Study of the **TPC** as reliable method to enhance the pre-ionisation plasma quality in JT-60SA and expand the operational parameter space, instead of the conventional **FNC** (lesson learnt during IC)

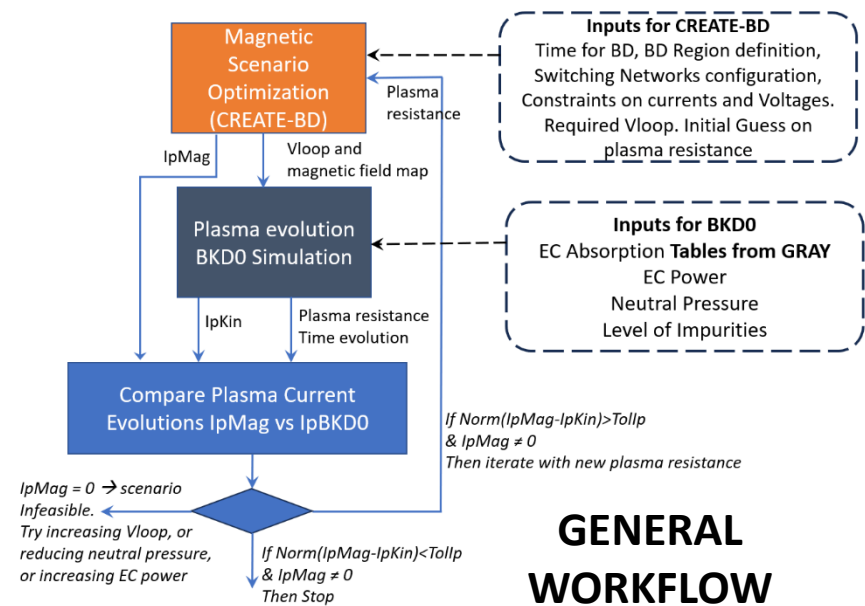
Status: Tool available to design breakdown and early rump-up in FNC, based on coupling of the CREATE-BD/BKDO/GRAY

H. Urano Reviews of Modern Plasma Physics (2022)

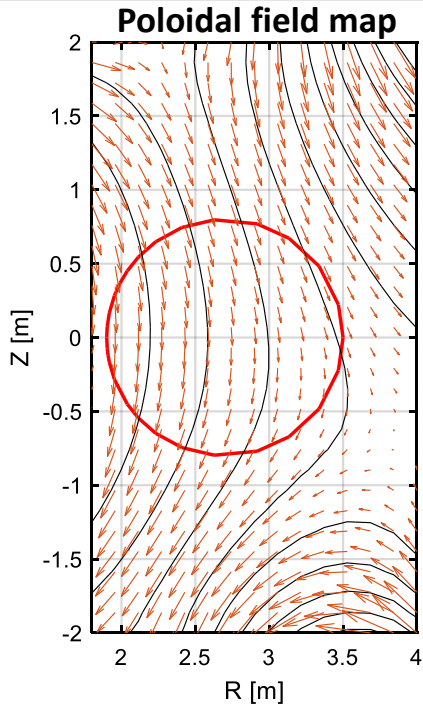


Parametric scan for JT-60SA at breakdown with limited voltages (Report 2023)

JT-60SA IC (p range to be confirmed)



GENERAL WORKFLOW

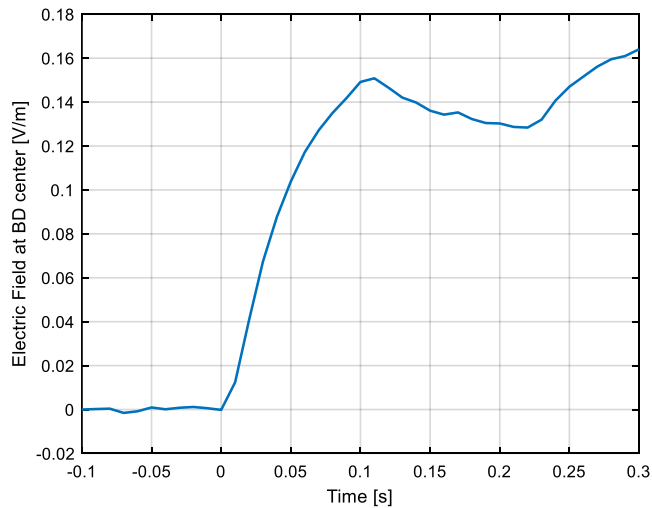
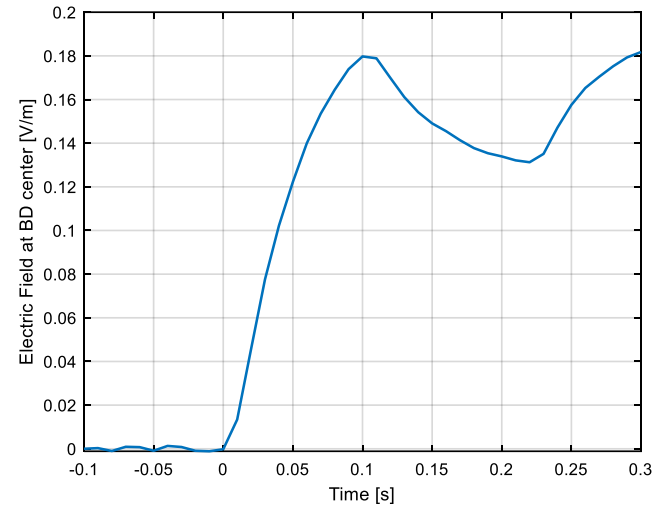


Example of magnetic configurations for TPC BD
Simulations made during the JT-60SA IC

Shot #613

$t_{BD} = 100 \text{ ms}$

Electric Field 0.18 V/m

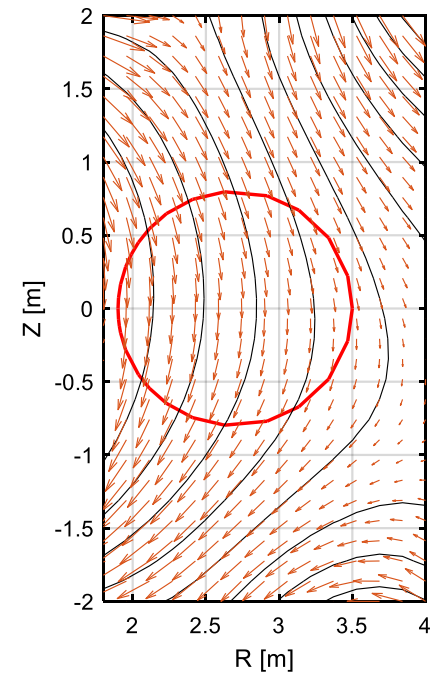


Poloidal field map

Shot #670

$t_{BD} = 90 \text{ ms}$

Electric Field 0.15 V/m





Plans for 2024:

- ❖ Magnetic Model for TPC/optimization (CREATE)
- ❖ Plasma Model for pre-ionization phase, extended version of [Farina NF 2018]: free electron: interaction with EC-wave, collisions and drift. (ISTP-CNR)
- ❖ Integration in the workflow (plasma volume estimation and input T_e/n_e to run simulations with better consistency) (CREATE/ISTP-CNR)

Resources:

- 3 pm ENEA (2pm CREATE 1 pm ISTP-CNR)