F19
Tearing Modes at low density

FTU Experimental Campaign 2019-C1-A

Wednesday 27/03/2019 (Early & Late)

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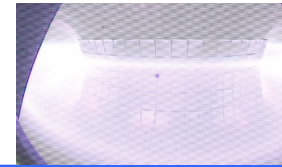
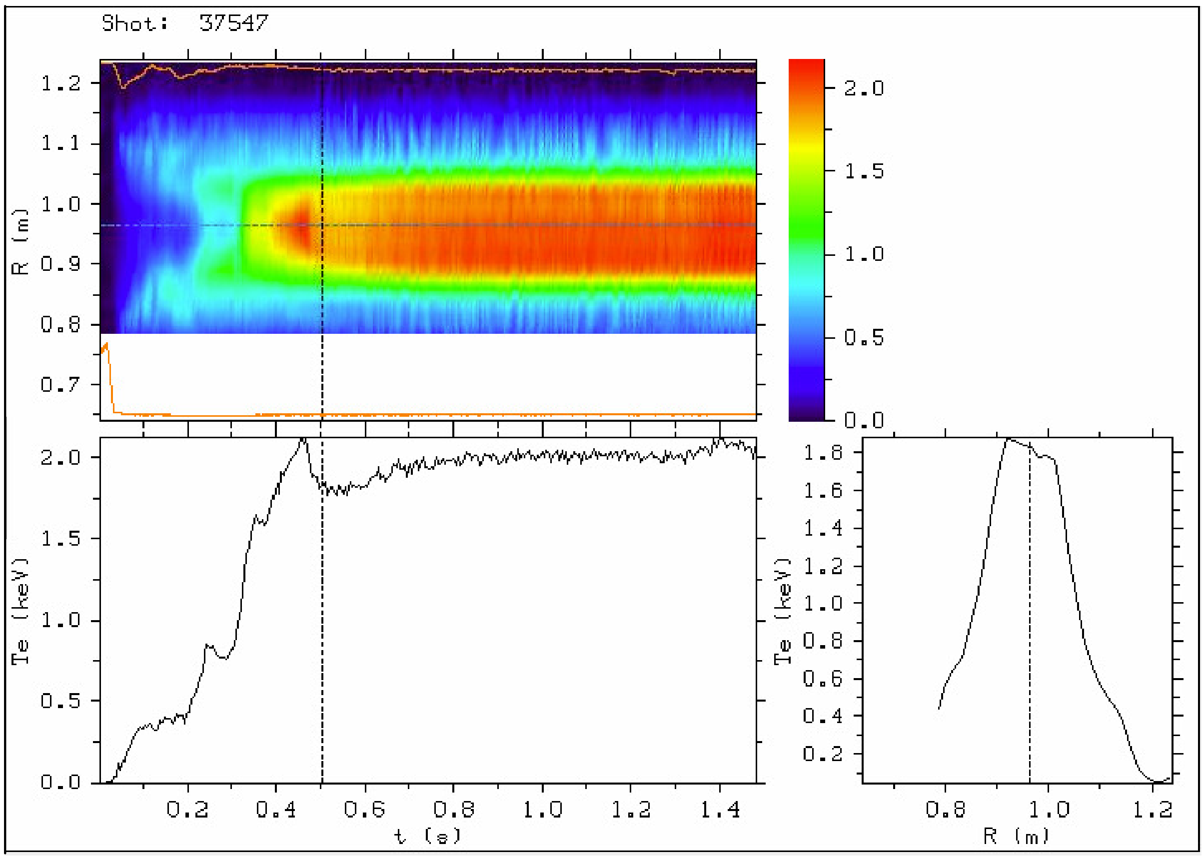
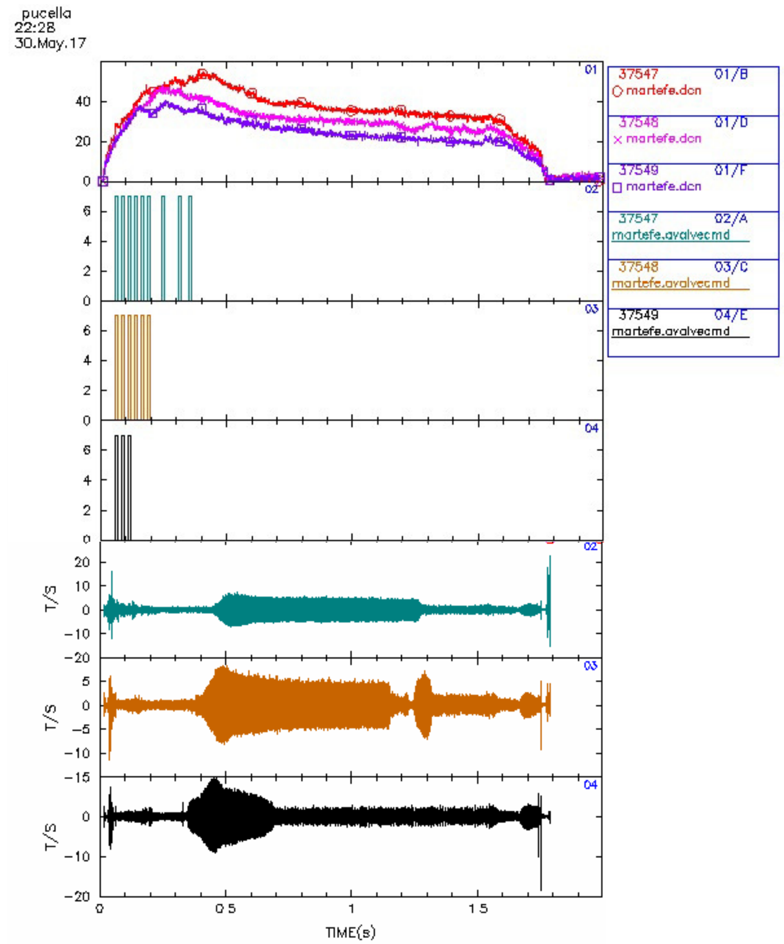
Background (1/2)

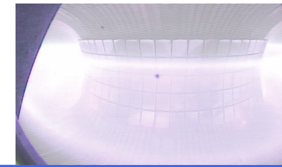


- In **ST-free low density pulses**, magnetic islands formed by **tearing instabilities** around the q = 2 surface can saturate at large amplitudes without the appearance of “limit cycles” and without provoking disruption, as occurs in the high density regime and in neon doped pulses.

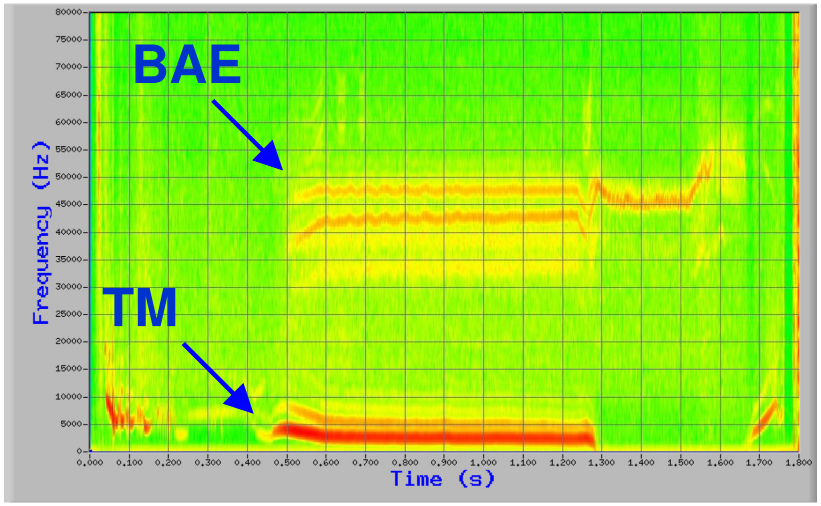


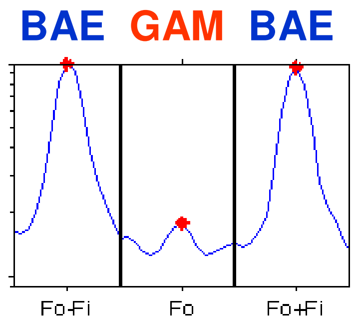


Background (2/2)



- Beta-induced Alfvén Eigenmodes (**BAE**) and Geodesic Acoustic Mode (**GAM**) are also observed in this scenario.

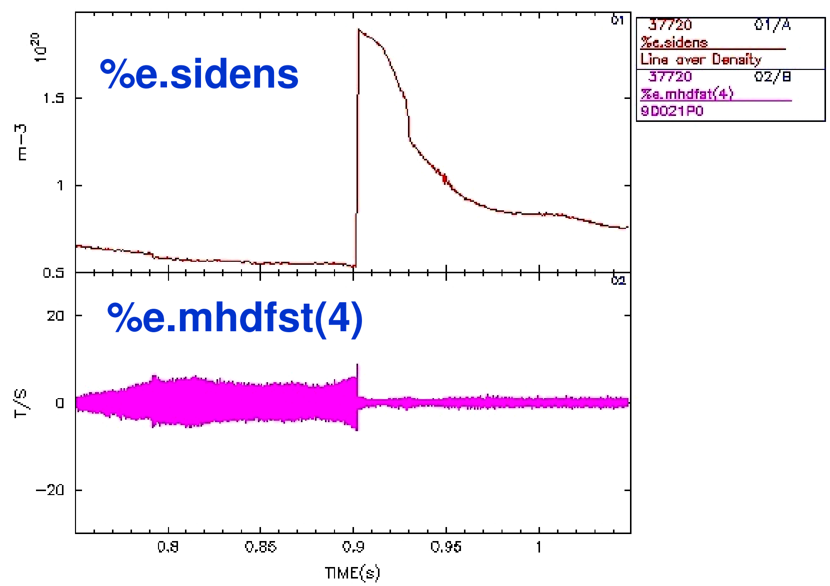




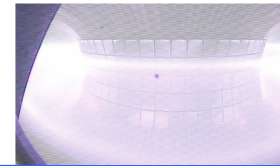
Integrated power

Bi-coherence analysis

- A fast MHD stabilization has been observed after a pellet injection. The stabilization time is not compatible with the resistive diffusion time.



Goals & Strategy



Goals

The main aims of this experiment are :

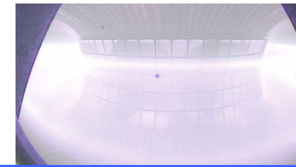
- to see if a transition to a limit cycle behavior (**F01**) is observed with neon injection;
- to see if forced reconnection processes are induced by pellet injection (**F21**).

In addition, this scenario could represent a good target for other experiments, e.g. “Collective Thomson Scattering” (**F07**) and “TM stabilization by EC sweeping” (**F17**).

Strategy

- The first pulses will be dedicated to the optimization of the target at **6.0 T** / **500 kA**, with low values for the pre-filling gas (to avoid the ST activity) and a “manual” gas programming to obtain a decreasing value for the central line-averaged density.
- A **neon gas puff** will be pre-programmed in the time window corresponding to the presence of a high amplitude magnetic island to see if a transition to a limit cycle behavior is observed.
- A **pellet** will be injected in presence of a magnetic island to se if forced reconnection processes are induced, possibly providing a new MHD stabilization strategy.

Requirements



Machine

Toroidal magnetic field BT (T):	5.3	**6.0**	7.2
Plasma current Ip (MA):	0.45	**0.50**	0.60
Electron density ne (10^{20} m^{-3})	**0.2 – 0.6**		

Diagnostics

Electron density and temperature profiles, Dα

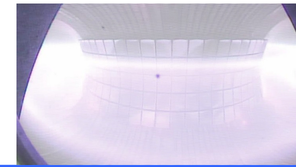
Mirnov coils, Soft-X tomography

ECpfast adjustment, Neon injection, Pellet injection

Modeling

JETTO, MARS (offline)

Pulse Plan



1.	**6.0 T / 500 kA / ne20: 0.55 -> 0.40** (pre-programmed manual gas) -> TM ?
2-3.	Repeat 1, changing ne ramp-down (0.45 -> 0.30, 0.35 -> 0.20) -> TM ?
4.	Repeat 1, 2 or 3 with **Ne injection** (ΔV=90 V, Δp=9 mbar) in presence of TM
5.	Recovery pulse in case of disruption
6-9.	Repeat 4, changing ΔV, Δp (6, 3 mbar), or t_{inj} in presence of TM
10.	Repeat 4, at constant ne20, without TM
11-12.	Repeat 4 (with TM) with **pellet injection** (M=1, 2), without Ne injection
13.	Repeat 10 (without TM) with pellet injection (M=1), without Ne injection

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