

# Status of the ITER Neutral Beam Test Facility and the first beam operations with the full-size prototype ion source

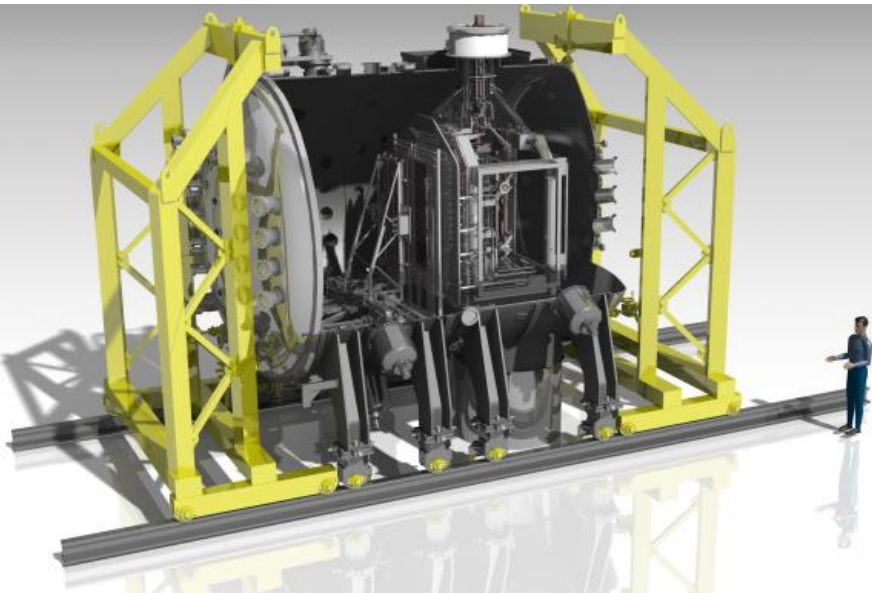
**G. Serianni** on behalf of NBTF team and

contributing staff of IO, F4E, QST, IPR, NIFS, IPP and other European institutions

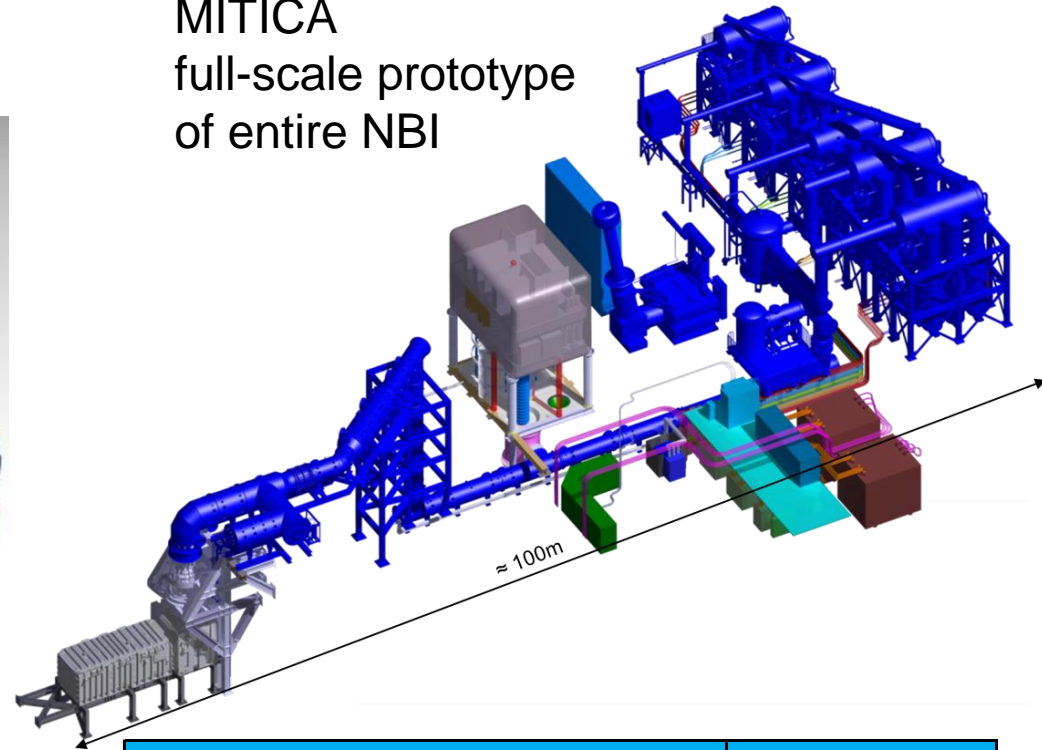
Consorzio RFX, Padova, Italy

**Contribution ID: 1099**

## SPIDER full-scale prototype of ion source



## MITICA full-scale prototype of entire NBI



	Unit	H	D
Beam energy	keV	100	100
Maximum Beam Source pressure	Pa	<0.3	<0.3
Uniformity	%	±10	±10
Extracted current density	A/m <sup>2</sup>	>355	>285
Beam on time	s	1000	3600
Co-extracted electron fraction (e <sup>-</sup> /H) and (e <sup>-</sup> /D)		<0.5	<1

Parameter	HNB	
	HH/HHe	DD/DT
Phase	HH/HHe	DD/DT
Species	H	D
Injected neutral beam power [MW]	16.5	16.5
Beam energy [keV]	870	1000
Accelerated current [A]	46	40
Beam uniformity [%]	>90	>90
Acceptable beamlet divergence [mrad]	3÷7	3÷7
Pulse length [s]	1000	3600

## ➤ MITICA

- Construction nearing completion; commissioning of plants well advanced. All injector mechanical components in procurement phase; to be delivered in 2022-2023
- 1MV power supply system successfully subjected to insulation tests up to 1.2MV for 1 hour
- Power integrated tests just started (delay by COVID-19) using modified organisational structure
- High voltage holding tests in vacuum planned using MITICA facility and electrostatic mock-up of Beam Source

## SPIDER

- Operating since ~3 years, producing interesting results
- In 2020, experimental plan delayed due to Covid-19. First Cs operations postponed to 2021
- RF-induced discharges on rear side of source
  - Cause: residual vessel pressure
  - Temporary solution: partial masking of grid apertures ⇒ operation possible
  - Final solution: increase pumping speed & capacity ⇒ long shutdown required
- Difficult RF control; limited RF power per generator
  - Solution: replacement of RF oscillators with solid-state amplifiers ⇒ long shutdown required
- Mid-2021, long shut down to improve source and plants to increase SPIDER performances