



**FUSION
FOR
ENERGY**

BRINGING
THE **POWER**
OF THE **SUN**
TO **EARTH**

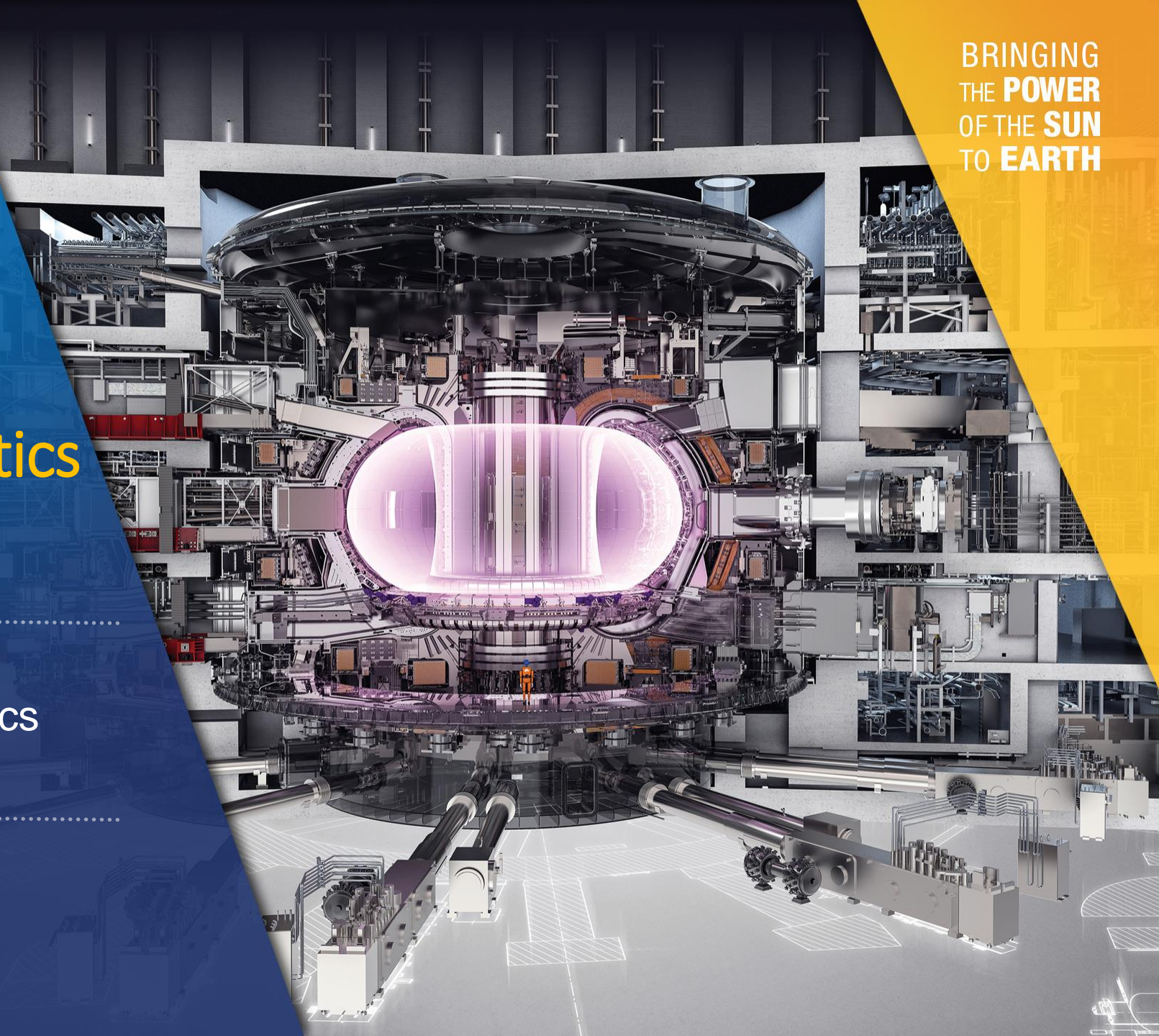
Fusion plasma diagnostics for ITER

Glenn Counsell

Programme Leader for Diagnostics

Fusion for Energy

5th October 2022

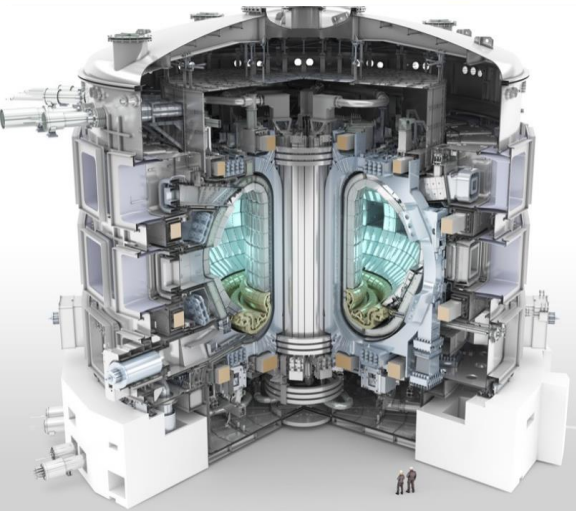


ITER - a next generation, magnetic confinement fusion device



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Big Science
Business
Forum
2022



Tokamak complex – the heart of ITER



Under construction in France by a consortium of 35 nations

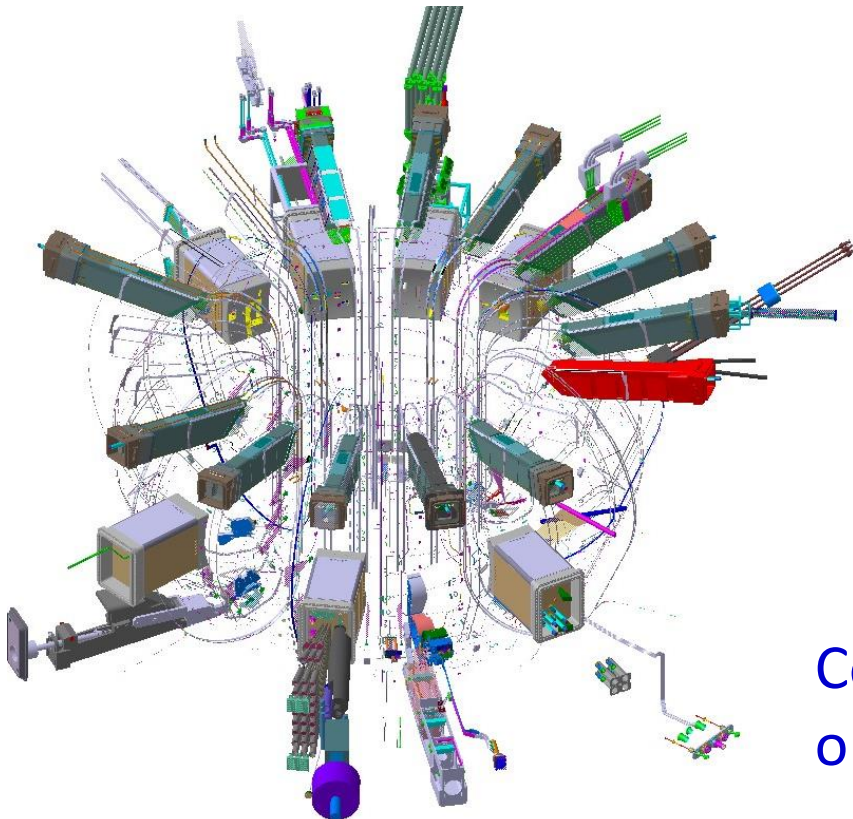
Aims at demonstrating the potential for fusion as a clean energy source

Fusion for Energy provides the in-kind contributions to ITER on behalf of EURATOM

Provide essential information to:

- protect ITER from damage
- allow the plasma to be controlled
- study and optimise the plasma

Large systems, extending from the plasma to the control room

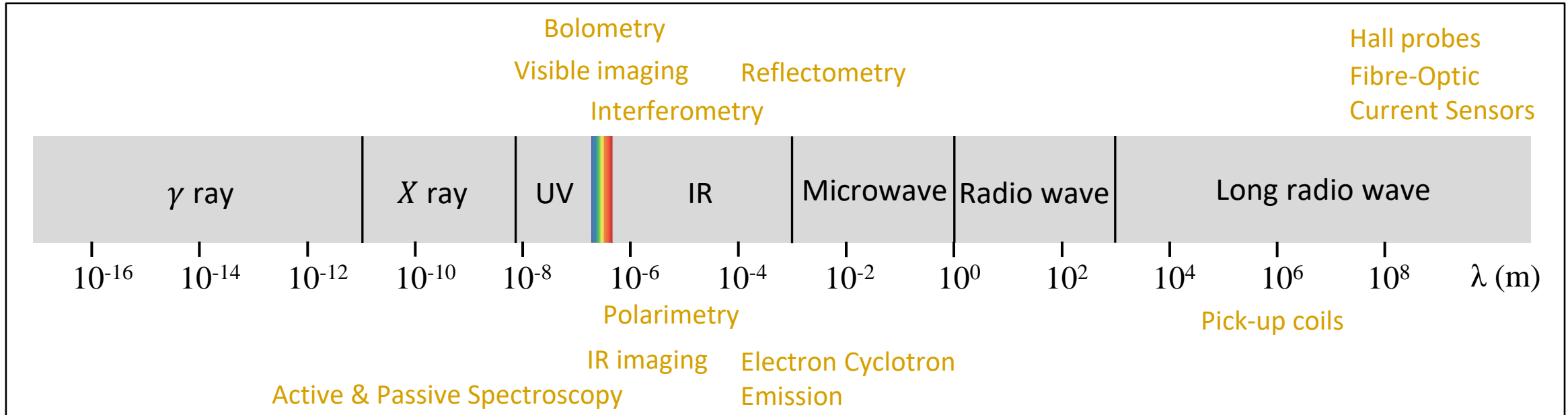


20m

Components mounted all around the vacuum vessel, on divertor cassettes, in port plugs and in ports



Techniques and sensors span the E-M spectrum



and 'Particle-based' Diagnostics



Collimated neutron detectors
Micro-fission chambers
Alpha particle detectors

Diagnostic Pressure Gauges
Residual Gas Analysers
Langmuir probes

and more

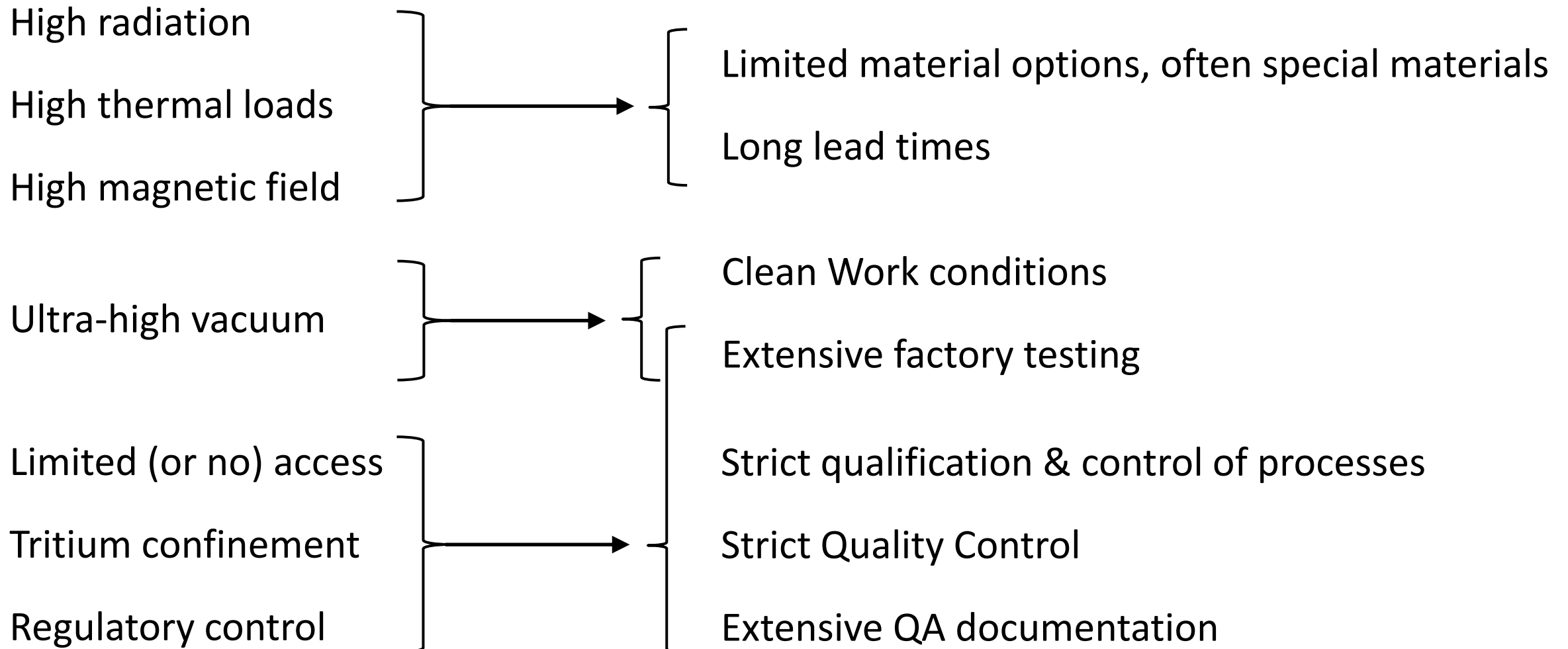


'Dust' collectors and analysers
Thermocouples

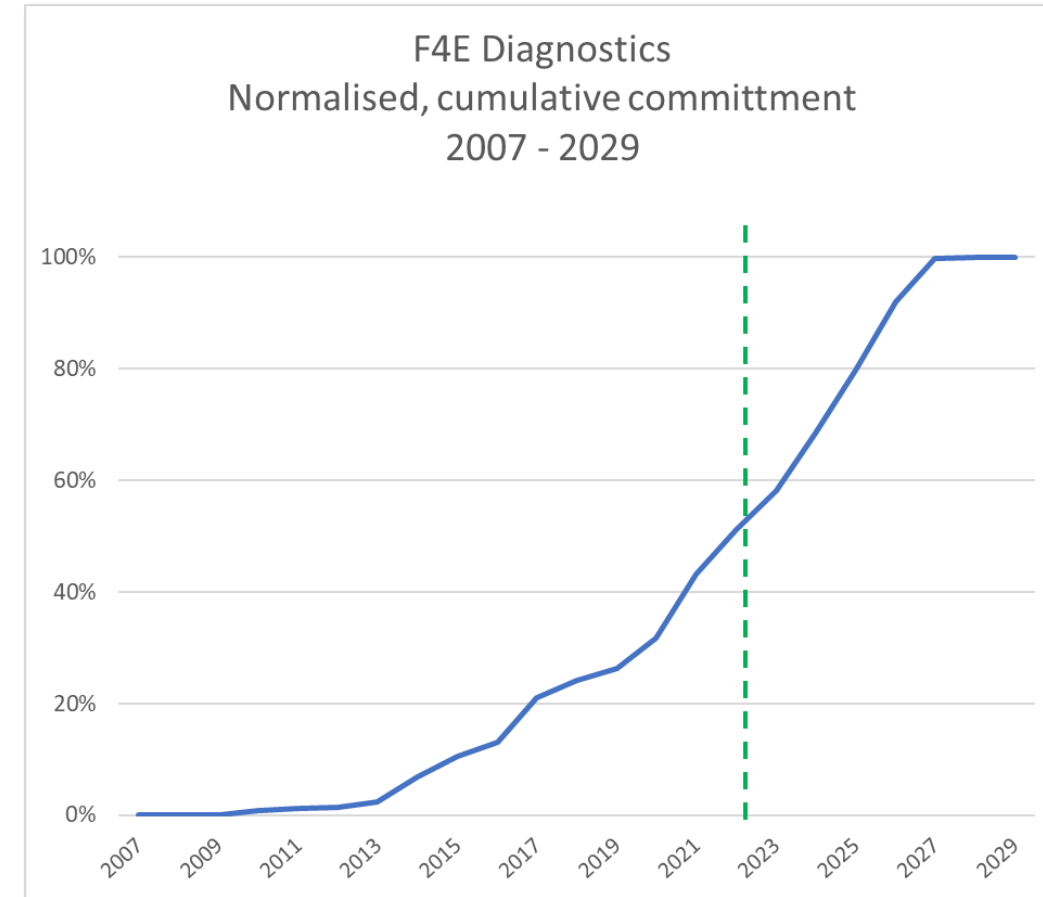
Current Shunts
Activation systems

ITER environment

Challenge

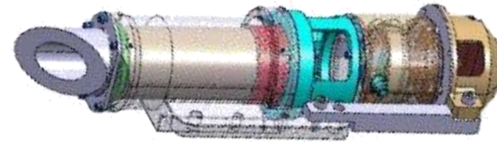
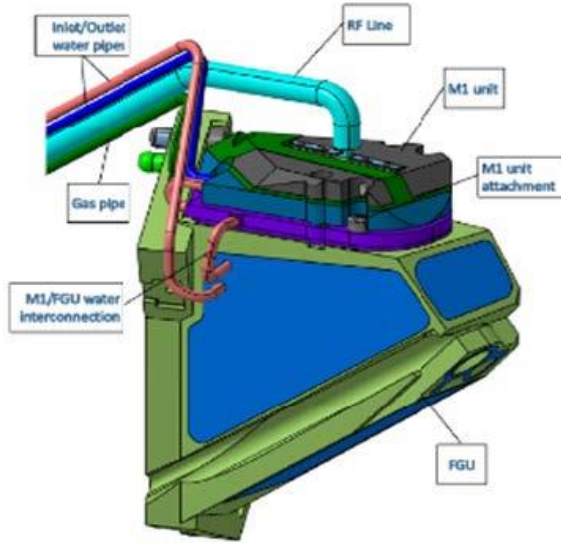


- F4E is responsible for 25% of the ITER Diagnostics
- Two manufacturing framework contracts still to be signed
- Specific contracts for 10 – 30 M€ per year over the period 2023 – 2027
- Wide scope, including many specialist components and technologies
 - ⇒ SMEs can participate in bidding consortia or as sub-contractors for future frameworks
 - ⇒ opportunities also remain as sub-contractors in already-signed frameworks

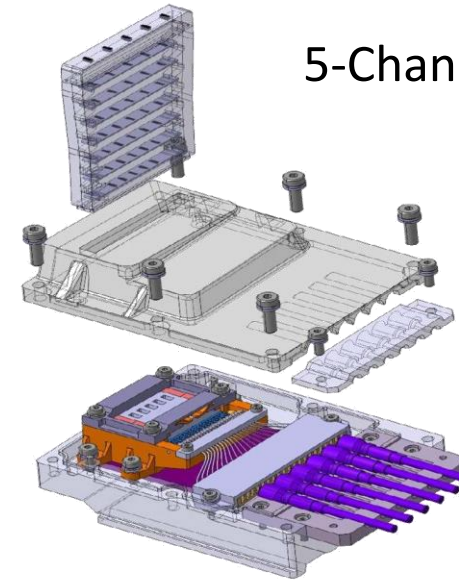


50% of budget committed; 80% of which for design contracts

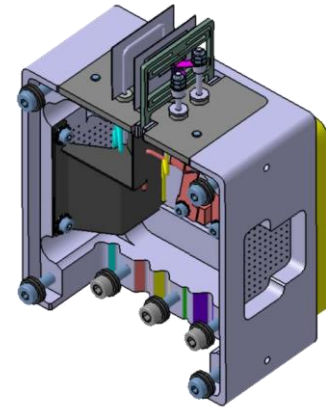
RNC in-plug n-detector modules



CXRS water-cooled, electrically isolated, Rh coated first mirror unit

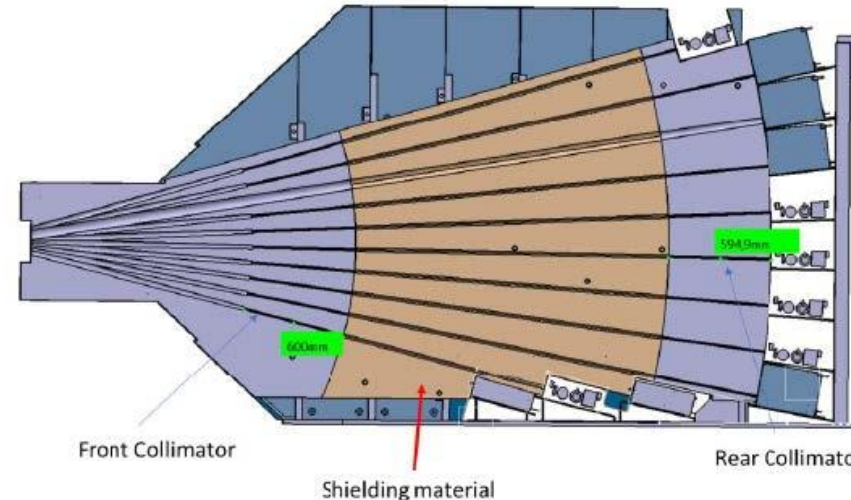


5-Channel Bolometer



Diagnostic Pressure Gauge

RNC 17t ex-port n-detector and shielding



5 Diagnostic systems

50 – 80 main components or assemblies

- manufacture to build-to-print specifications,
- supply of COTS or customised items
- calibration of sensors in dedicated facilities,
- factory acceptance testing,
- cleaning, packing and shipping.

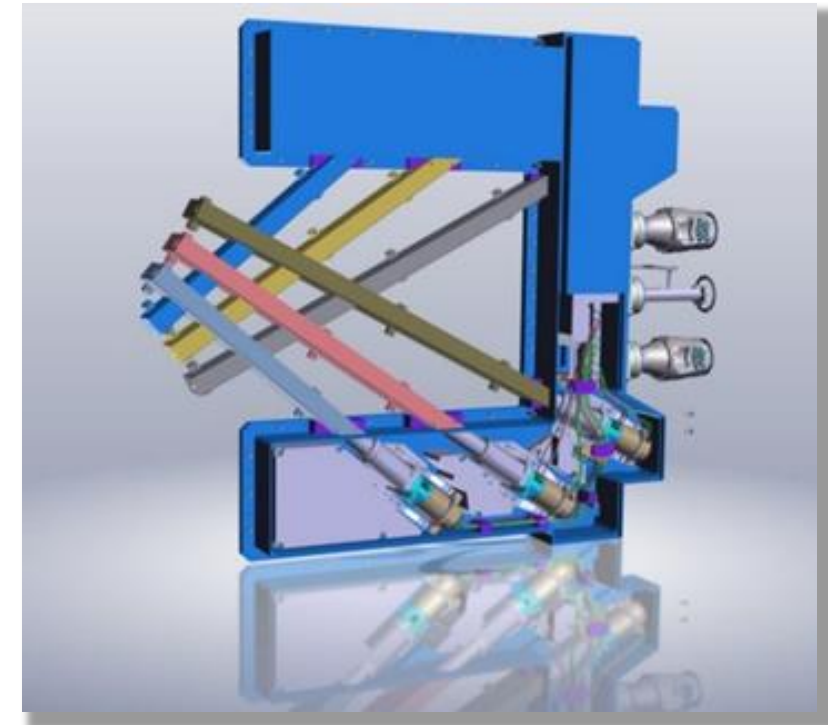
- Call for Expression of Interest
 - Publication expected 17th October;
 - Information day late October or early November
- Multiple frameworks to be awarded, with re-opening of competition for specific contracts
- Call will award both framework (**range D**) and 1st specific contract (**range B**); for in-plug subsystem on Radial Neutron Camera
- See Fusion for Energy Industry Portal for more information:
https://industryportal.f4e.europa.eu/IP_PAGES/ehome.aspx

A Item range 300 000 – 2 000 000 EUR

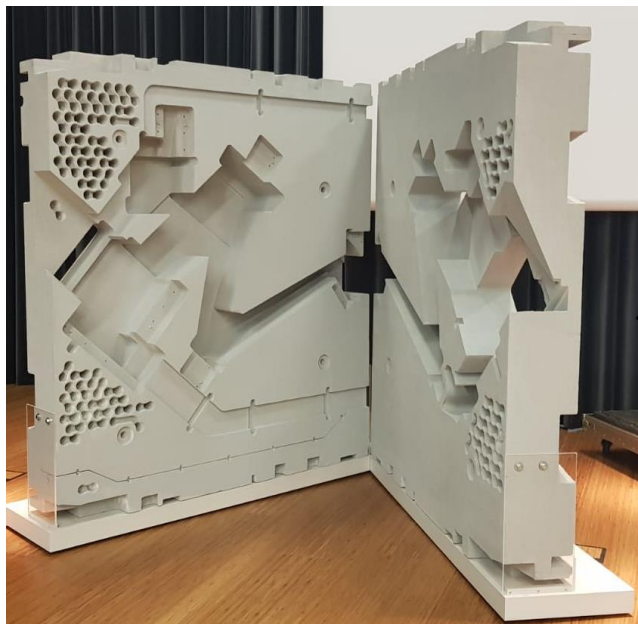
B Item range 1 500 000 – 5 000 000 EUR

C Item range 4 000 000 – 12 000 000 EUR

D Item range above 10 000 000 EUR



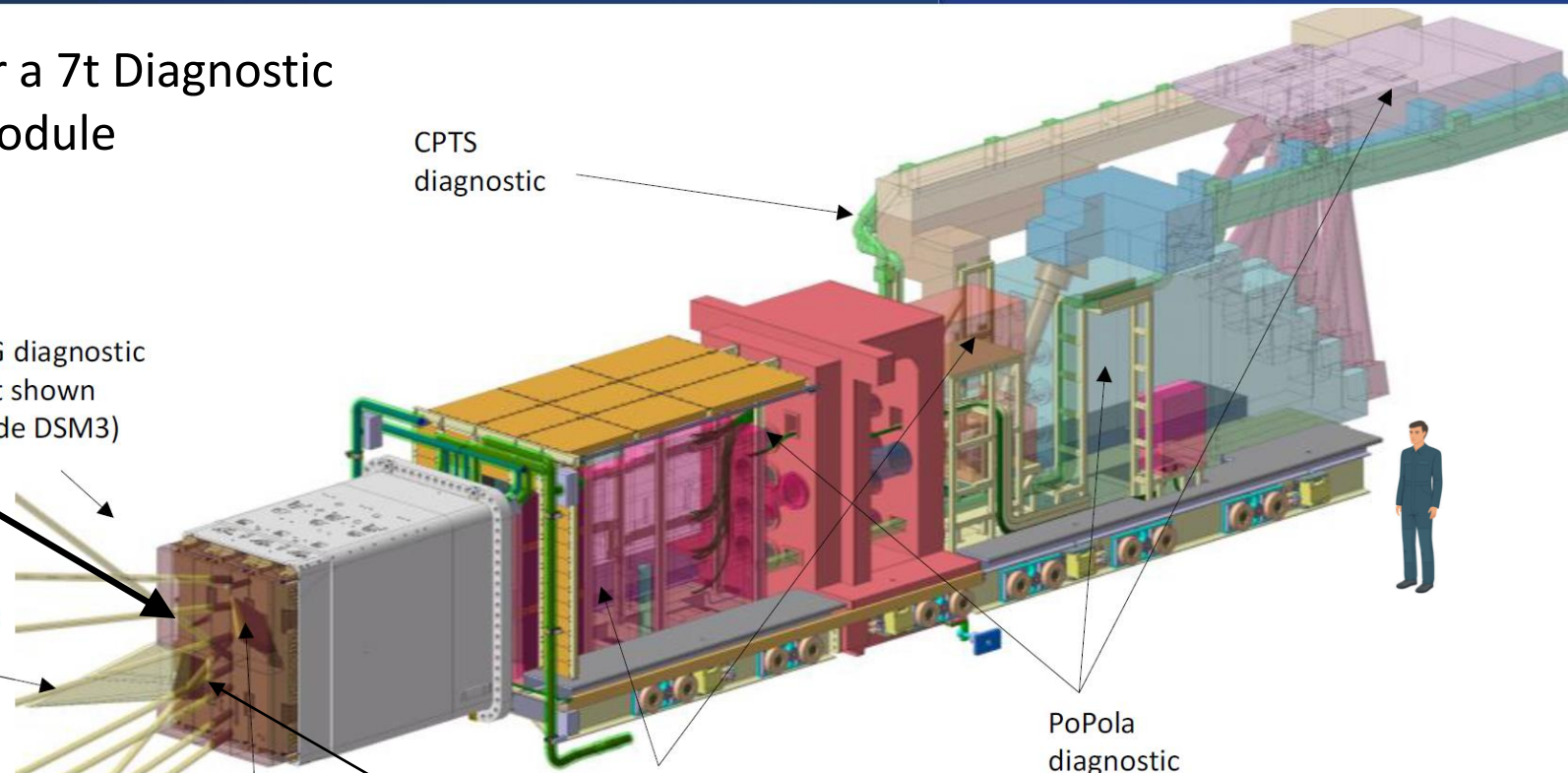
In-plug subsystem of Radial Neutron Camera



Mock-up for a 7t Diagnostic Shielding Module

DPG diagnostic
(not shown
inside DSM3)

CPTS diagnostic
(DSM3)

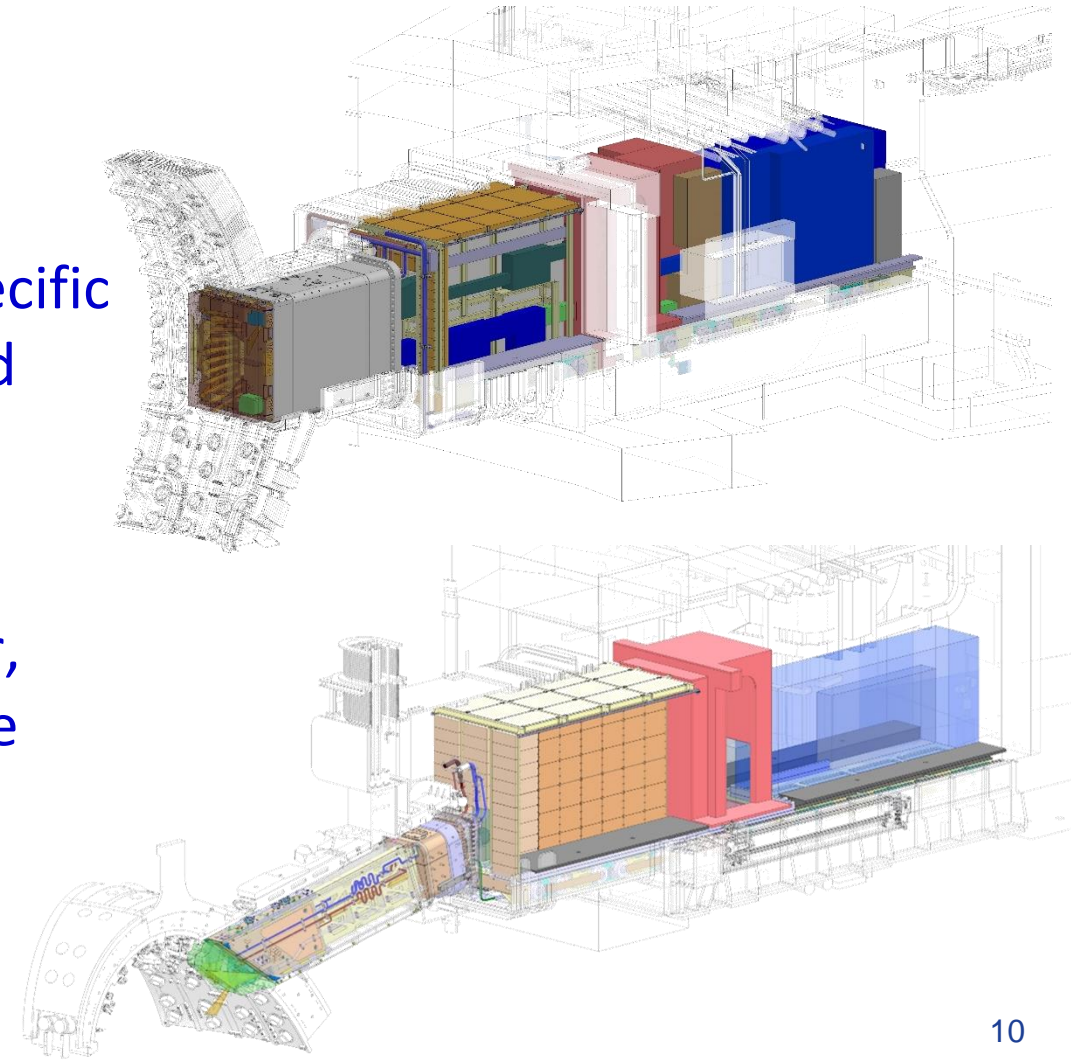


Port Engineering for 6 ports

- manufacture of port structures
- manufacture of vacuum, gas and electrical feedthroughs
- integration of 14 diagnostic sub-systems
- Assembly of port plugs, interspace and port cell structures
- Extensive testing in (free issue) test facility

- Call for Expression of Interest
 - Launch expected Q3 2022;
- Single framework to be awarded to one supplier
- Call will award both framework (range D) and 1st specific contract (range D); for procurement of materials and tooling, and port engineering of one upper and one equatorial port
- Contact your ILO and/or F4E Market Analysis Officer, Mehdi Daval (mehdi.daval@f4e.europa.eu) for more information

A	Item range 300 000 – 2 000 000 EUR	B	Item range 1 500 000 – 5 000 000 EUR
C	Item range 4 000 000 – 12 000 000 EUR	D	Item range above 10 000 000 EUR





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**Thank you for your
attention**

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