



Updates on Materials Research Facility

Dr Amanda Quadling, Director of Materials Research

Materials Research for Suppliers



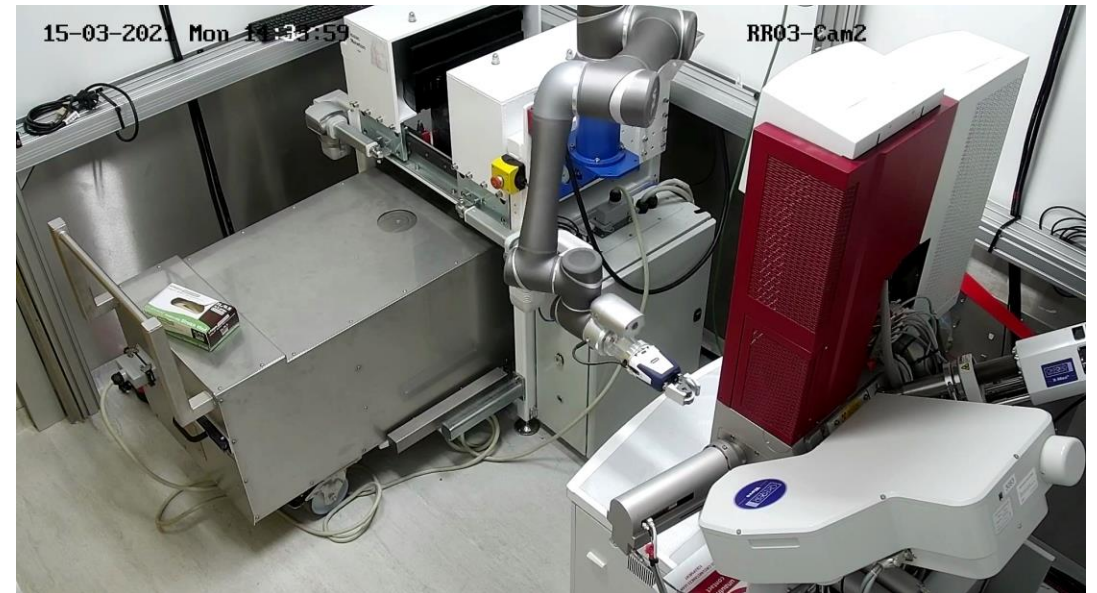
We generate engineering relevant data for materials for fusion powerplant design

The **MATERIALS RESEARCH FACILITY (MRF)** is a £50m, 4400 m² taxpayer investment on a **non licensed site for processing and analysis of irradiated materials.**

Voucher scheme access :

- National Nuclear User Facility (NNUF)
- The Henry Royce Institute
- Fusion Industry Programme (FIP)

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SUPPLY CHAIN SUPPORT – SUPERCONDUCTING MAGNET TAPES

UKAEA plans to create a testing facility for irradiated HTS tapes and tracks, offering:

- High magnetic fields of up to 20T
- Varying magnetic field angle
- Cryogenic temperatures of 10K to 20K
- Mechanical strain of up to ~1%

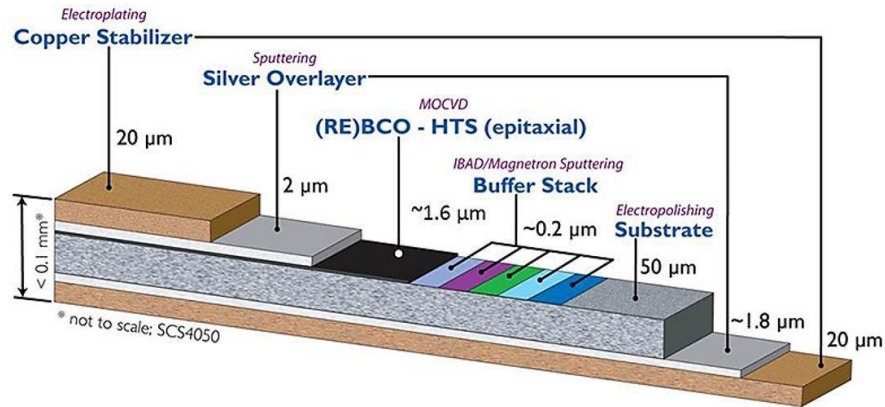
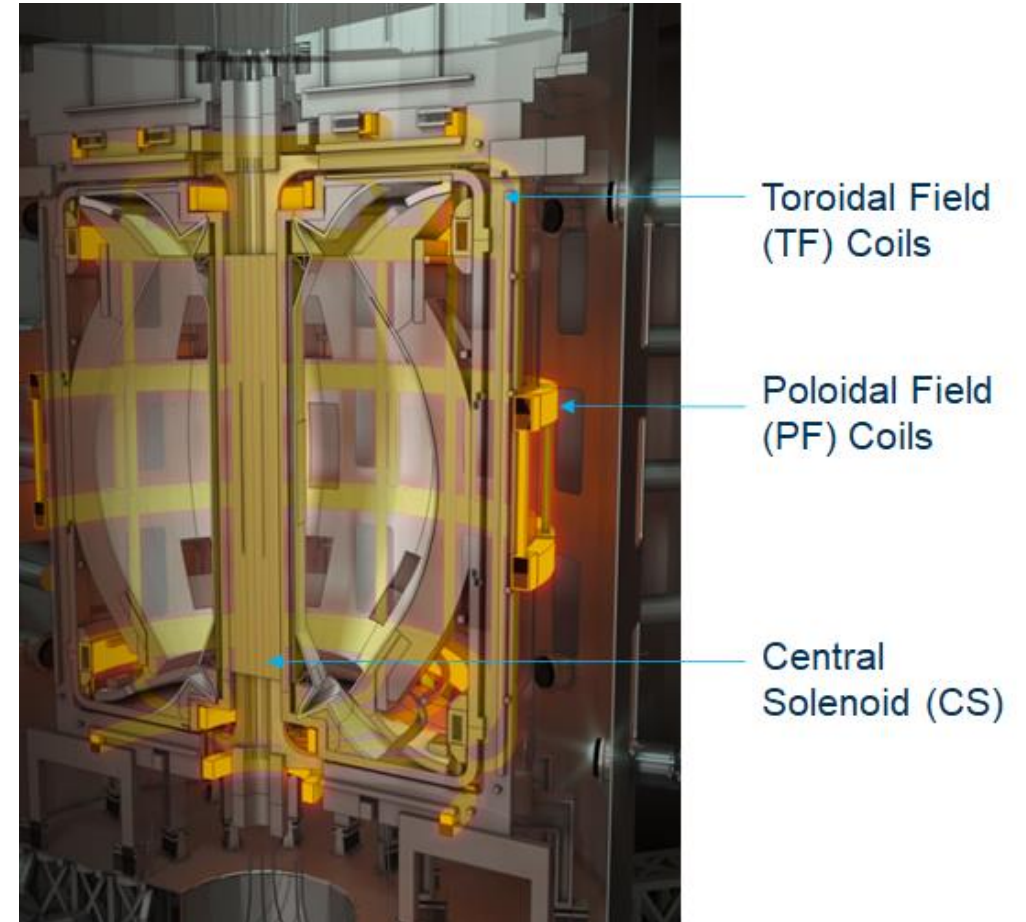


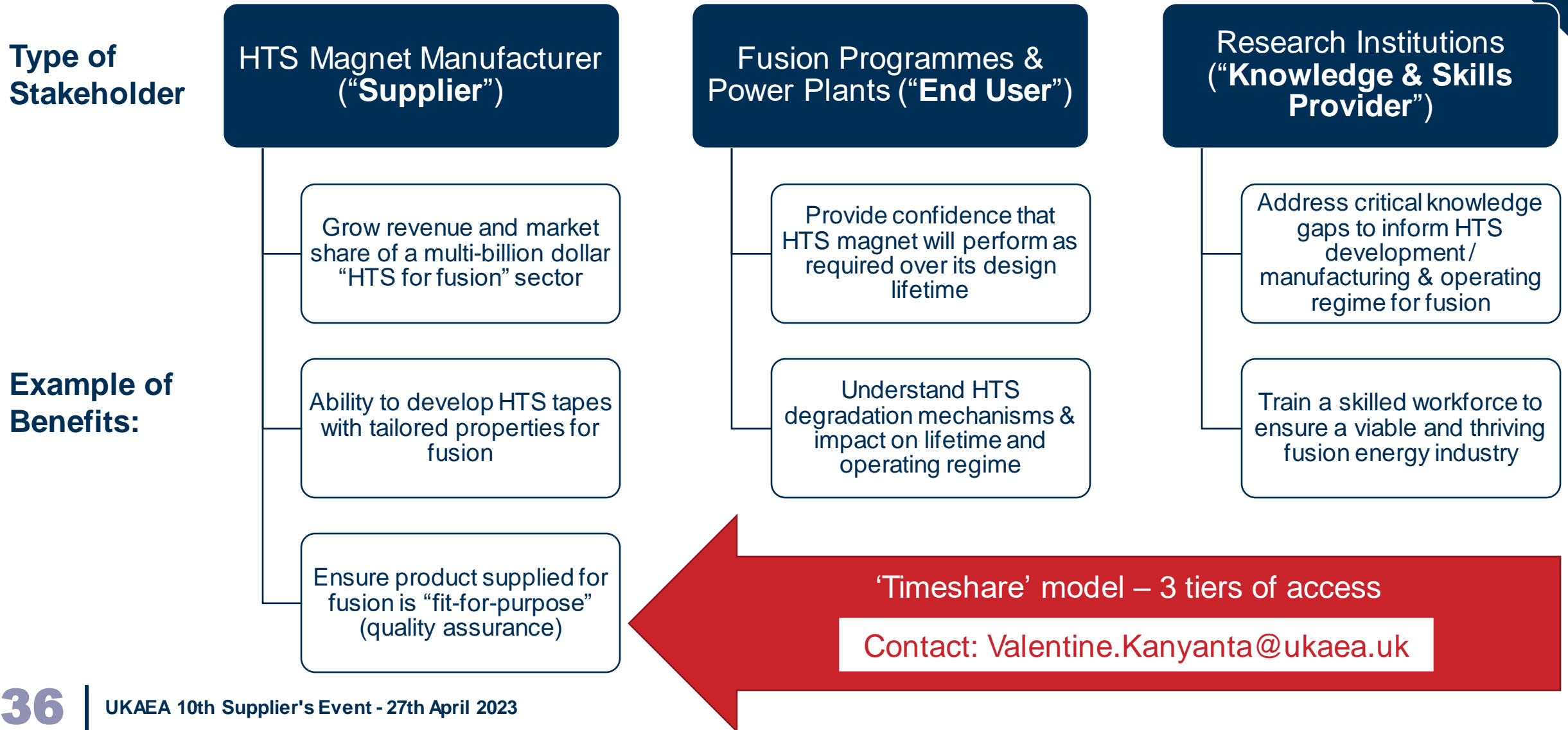
Figure 1 : SuperPower SCS40450 REBCO tape (<https://www.superpower-inc.com/>)



A typical commercial-scale magnetic confinement fusion machine will require in excess of 30,000km of HTS tape

Irradiated HTS Testing - Benefits

The facility will support suppliers, fusion programmes and research institutions.

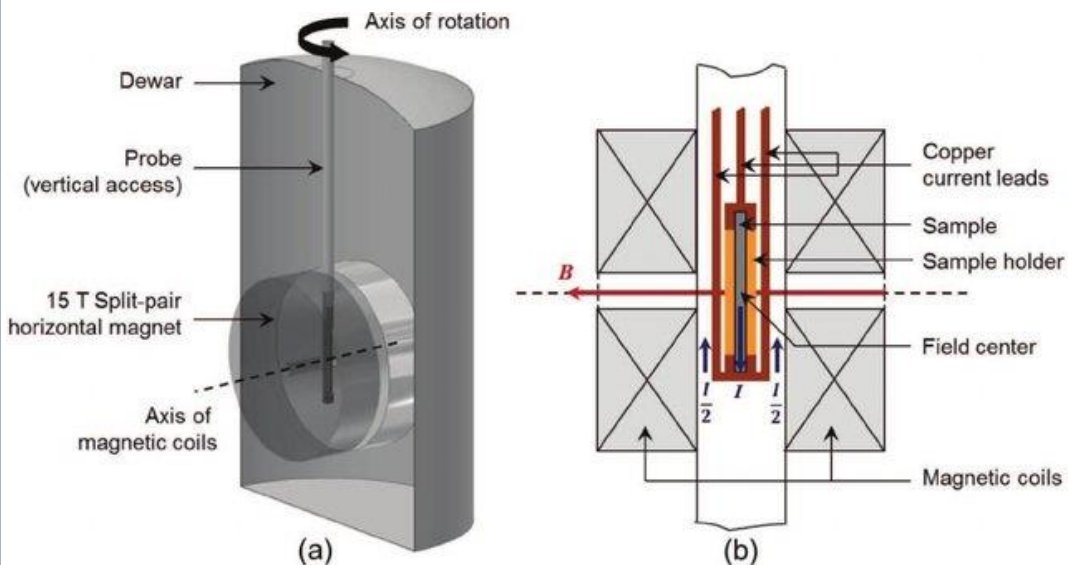


Irradiated HTS Testing - Key Components

Magnet

- 20 T on-sample
- Split-pair preferred
- Cryogen free preferred

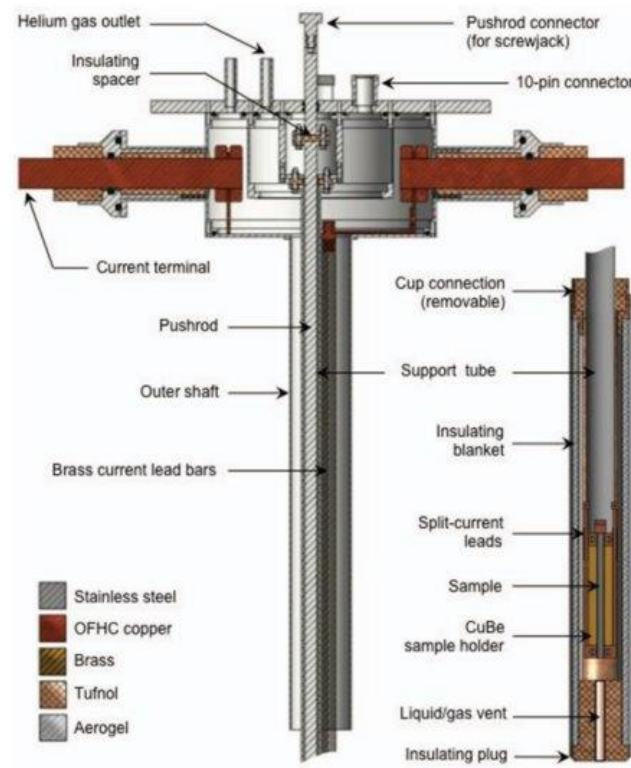
Responses to our prior information notice indicate that industry can deliver this



P Sunwong et al. 2014, Rev. Sci. Instr. 85 065111

Probe - probe will have:

- Strain to 1% tension
- Samples perpendicular and parallel to field
- 1 kA power supply
- Sample cooled to 20 K (non LHe)



P Sunwong et al. 2014, Rev. Sci. Instr. 85 065111

Active Sample Mounting

- Ability to mount active samples – drawing on extensive MRF experience
- Inside “clean room” with active ventilation
- Active sample storage with total inventory of 100 GBq Co-60 equivalent



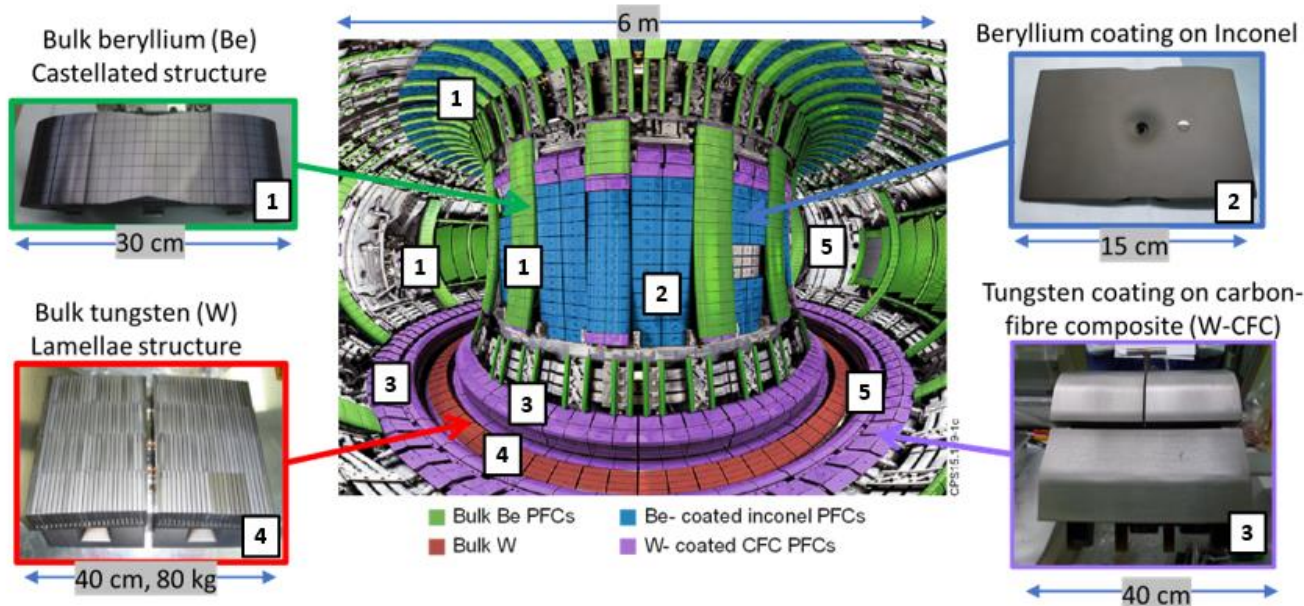
<https://www.lerpax.com/en/products/shielded-inclined-viewing-window/>

SUPPLY CHAIN SUPPORT – MATERIALS DECOMMISSIONING EXPERIENCE

Contact: Valentine.Kanyanta@ukaea.uk

UKAEA plans to remove a sequence of first wall JET materials in the first 36 months post operation, using state of the art robotics:

- Opportunity to understand degree of activation and tritiation of first wall
- Opportunity to understand impact of bake out and similar for detritiation
- Opportunity to understand waste prediction data, dust production and more



Typical first wall (plasma facing) materials in JET

Location in Figure 1	Component type	Plasma facing component (tile) material	Assembly component materials
Main chamber			
1	Limiter tiles: Inner wall, outer wall, upper dump plate	Beryllium	Carrier and fasteners (7 kg/assembly) Inconel alloys
		Beryllium (2 kg/tile)	-
2	Recessed Inner Wall Cladding	8 µm beryllium coating on Inconel substrate (2 kg/tile)	-
Divertor			
3	Divertor tiles: Inner, outer, base	12-25 µm Tungsten/ 4 µm Molybdenum coating on Carbon Fibre Composite	Carbon fibre composite Inconel alloys Nimonic alloys (20 kg/assembly)
		12-25 µm Tungsten/ 4 µm Molybdenum coating on Carbon Fibre Composite (2 kg/tile)	-
4	Tile 5	Tungsten stack	Inconel alloys Nimonic alloys (56 kg/assembly) (60 kg/assembly)
		Tungsten lamella (200 g/lamella)	-
Other			
5	Mirror samples	Stainless steel	N/A
Various	Remote divertor and recessed main chamber locations	Molybdenum	N/A
3 & 4	Dust collection	Various mixed sources	N/A

* Highest concentration on one divertor "tile 1" type

Typical components and materials. Indicative activities at the end of 2025 - 2 years after the end of JET operations - are up to 0.5 TBq of tritium on a plasma facing component. Activities for assemblies with multiple components are or the order 0.05 GBq from activation products.

For more information

Visit our Materials Research Facility Booth