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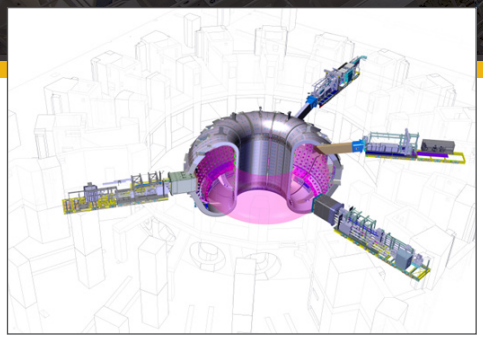
Port Integration

Port openings at ITER. Image: ITER Organization



Upper port 11, upper port 14, equatorial port 3 and equatorial port 9 are in US ITER scope. Image: US ITER

U.S. Contribution

US ITER will provide design, fabrication, assembly, and testing of four port plugs, specifically the upper ports (U11, U14), and equatorial ports (E3, E9), as well as support for the integration of 18 tenant diagnostics into these ports and eight associated supporting structures in the ports.

Overview

Port integration for four port plugs requires integration of the associated tenant diagnostic and functional systems that will be installed near the tokamak. These ports will house diagnostics delivered by US ITER as well systems delivered by the ITER Organization, the European Union, India, Japan, Korea, and Russia. The scope includes design of the port plug, interspace support structure and port cell support structure, which are in parallel with tenants and are followed by analysis to validate the design.

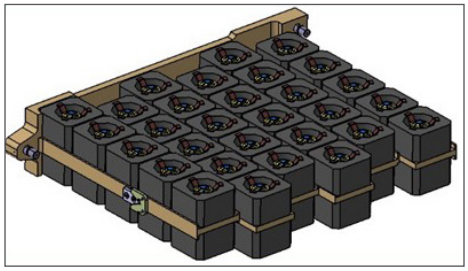
The port plug structures will be fabricated by the ITER Organization with a common design and then delivered to each port integrator. US ITER will receive port plug structures in a specialized facility capable of handling large loads. Tenant components will be delivered to the same facility for assembly into the diagnostic shielding modules. After assembly and functional testing in a clean work area, radiation shielding will be added for the diagnostic shield modules. Up to 36,000 shielding blocks are needed per port. Fully assembled, each port will weigh up to forty-eight metric tonnes.

In addition, each port will have two structures that will house diagnostic and system support equipment and cabling outside of vacuum confinement (ex-vessel: the interspace support structures and the port cell support structures). Both structures will be placed on the cask docking station rail system during maintenance via the cask transfer system.

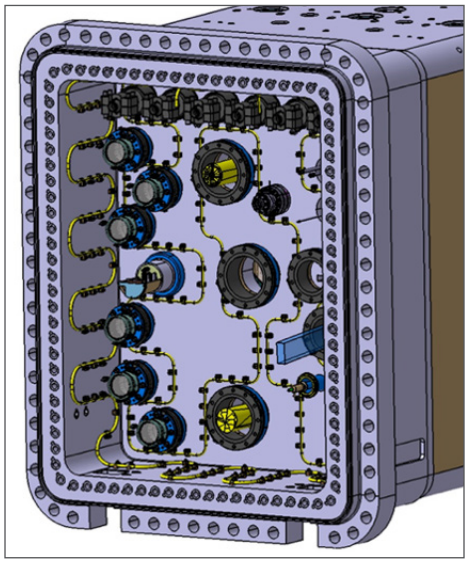
Status

US ITER's port integration scope is now in final design, with the exception of equatorial port E3, which is in preliminary design.

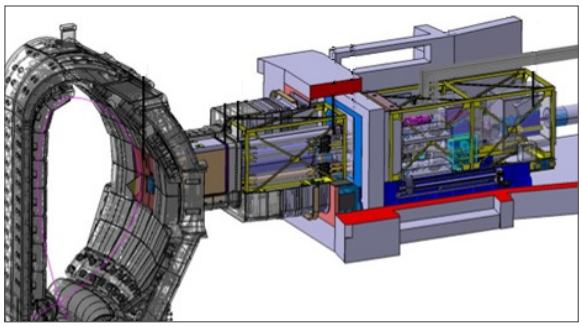
Port Integration



Shielding trays with approximately 36,000 shielding blocks are part of each port. Image: US ITER



Closure plate of equatorial port plug with vacuum-confined feed through connections. Image: US ITER



Each port plug is inserted into the assigned tokamak port; to the right is the port interspace and port cell. Photo: US ITER

Technical Description

Upper Port Plug:
Total mass up to 25 t

Equatorial Port Plug:
Total mass up to 48 t

Interspace Support Structure:
Weighs up to 60 t
6,000 mm x 2,296 mm

Port Cell Support Structure:
Weighs up to 80 t
8,000 mm x 2,296 mm

Diagnostic Systems

Upper Port 11:
Glow Discharge (ITER Organization)
Neutron Activation System (ITER Korea)
Micro Fission Chamber (ITER Japan)
Upper Wide Angle Viewing System (US ITER)

Upper Port 14:
Glow Discharge (ITER Organization)
Disruption Mitigation System (ITER Organization)
Upper Wide Angle Viewing System (US ITER)
Port Plug Mechanical Instrumentation (ITER Organization)

Equatorial Port 3:
Glow Discharge (ITER Organization)
Motional Stark Effect (US ITER)
Core Imaging X-Ray Spectrometer Edge (ITER Russia)
Core Imaging X-Ray Spectrometer Pedestal (ITER India)
Toroidal Interferometer Polarimeter (US ITER)
Wide Angle Viewing System (EU Fusion for Energy)
Diploidal Interferometer Polarimeter (ITER Organization)

Equatorial Port 9:
Wide Angle Viewing System (EU Fusion for Energy)
Electron Cyclotron Emission Front End (US ITER)
Electron Cyclotron Emission Transmission Line (ITER India)
Toroidal Interferometer Polarimeter (US ITER)

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