COMPASS-U

Basic design issues
Basic parameters of COMPASS-U

Basic dimensions and parameters:

- \( R = 0.84 \) m
- \( a = 0.28 \) m
- \( B_T = 5 \) T
- \( I_p = 2 \) MA
- \( P_{NBI} = 4-5 \) MW
- \( P_{ECRH} = 4 \) MW (170 GHZ) – later phase
- Flat-top pulse length: 1 – 5 sec
- Aspect ratio = 3.2
- Elongation = 1.7 – 1.9
- Triangularity = 0.4 – 0.6
- Plasma volume \( \sim 2 \) m\(^3\)

Metallic first wall device

High-temperature operation \( \sim 300^\circ \)C (maybe 500°C)

Single and double null geometry (possibly single and double snow-flake geometry upto 1 MA)

- Closed and well diagnosed high density divertors
- High power fluxes in the divertor (\( \lambda_q \sim 1 \) mm => \( \approx 15 \) MW/m\(^2\))
- Possibility to study physics of advanced modes (QH-mode, I-mode, EDA-mode, etc.)

High capability to address the key Plasma Exhaust Physics challenges

Design has to enable installation of Liquid Metal divertor technology (capillary porous system)

Energy and power requirements for COMPASS-U:

- TF coils: 70 MW, 130 MJ
- PF coils: <90 MW, <110 MJ
- Additional heating and reserves: 70 MW, 150 MJ (for later increase of additional heating)
- In total: 180-230 MW, 300-400 MJ
Single and double null configuration

- Horizontal ports DN150mm
- Inner ribs to hold limiters and magnetic diagnostics
- Closed divertors
- Large LFS ports 350 mm x 800 mm
- Vertical ports DN100mm

Dimensions:
- 100cm x 150cm
- 3cm gap
- 4cm gap
- 51cm gap
- 56cm
Details on divertor geometry

Inner leg

Outer leg
General view on vacuum vessel and ports

Top view on the vacuum vessel

Large ports enabling also tangential view
Cross-section of COMPASS-U

- Support structure
- Central solenoid
- Poloidal Field coils
- Toroidal Field coils
- Cryostat
- LFS ports

Dimensions: 4.3m
Single-null configuration

Double-null configuration
Top view on the vessel, coils and support structure

4.8m