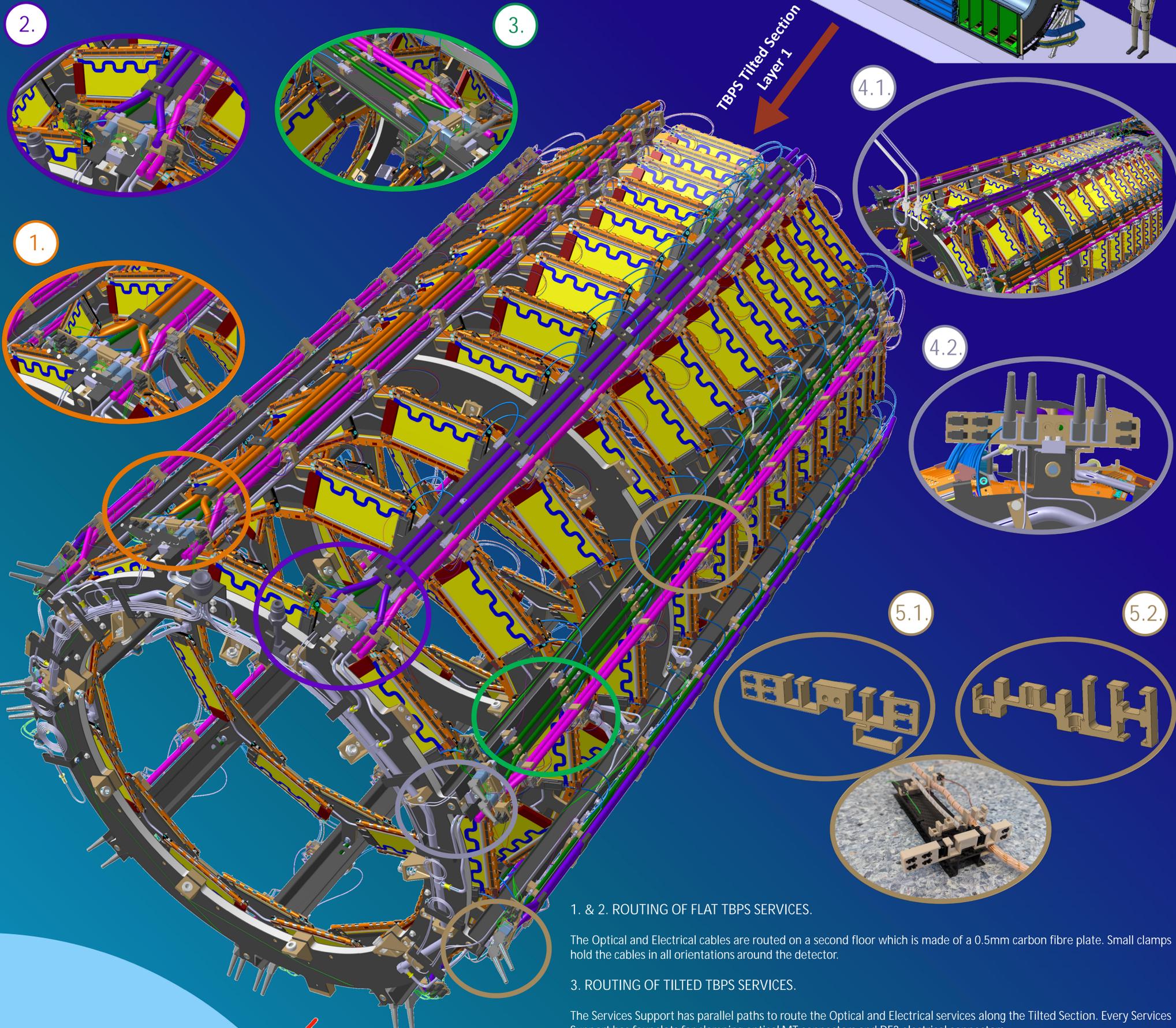
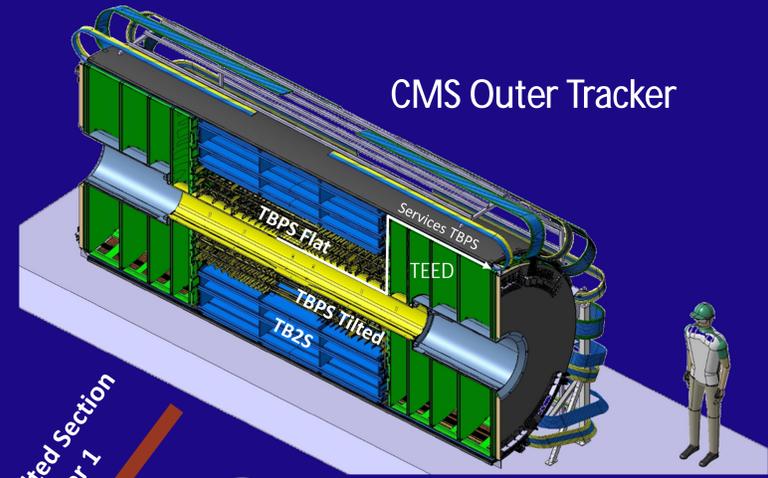


THE CHALLENGE

SERVICES ROUTING IN THE NEW CMS TRACKER GEOMETRY

The Tracker Barrel with PS-modules (TBPS) is one of the subdetectors of the new CMS Phase-2 Tracker. It will have 2872 Pixel-Strip (PS) modules on three concentric layers. In the Flat section the modules are on straight Planks while in the Tilted section they are on tilted Planks. A particular difficulty is the routing of the cooling, electrical and optical services of the TBPS. The services need to reach all modules, fit in small spaces (27mm radially), be compatible with the detector assembly sequence and be constrained reliably. Services routing and supporting have been designed and fully modelled in 3D to fulfil these requirements, still keeping the mass as low as possible. High precision custom-designed guides and clamps are necessary for the routing.



1. & 2. ROUTING OF FLAT TBPS SERVICES.

The Optical and Electrical cables are routed on a second floor which is made of a 0.5mm carbon fibre plate. Small clamps hold the cables in all orientations around the detector.

3. ROUTING OF TILTED TBPS SERVICES.

The Services Support has parallel paths to route the Optical and Electrical services along the Tilted Section. Every Services Support has four slots for clamping optical MT connectors and DF3 electrical connectors.

4. COOLING SERVICES.

4.1. The Flat Section tubes are held by two PEEK clamps attached to the interconnection ring. The clamps of the Flat Section pipes are 3D printed in PEEK.

4.2. The Tilted Section inlet and outlet tubes are routed inside beam C profiles.

5. SERVICES PATCH PANEL & SERVICES SUPPORT.

5.1. In the Services Patch Panel, attachment of the MT-MPO adapter needs to be secured with a drop of glue. Openings on the top of the panel hold the Electrical cables from the Flat Section.

5.2. The Services Support is made of PEEK. The selection of this material is to combine low-mass, radiation hardness as well suitable elasticity. The friction clamping of the electrical connections is achieved with tolerances of 50 microns obtained by precise waterjet cutting. Tiny 0.4mm radius lips allow necessary clamping of the MT connectors.