Services Cable Harness Loading

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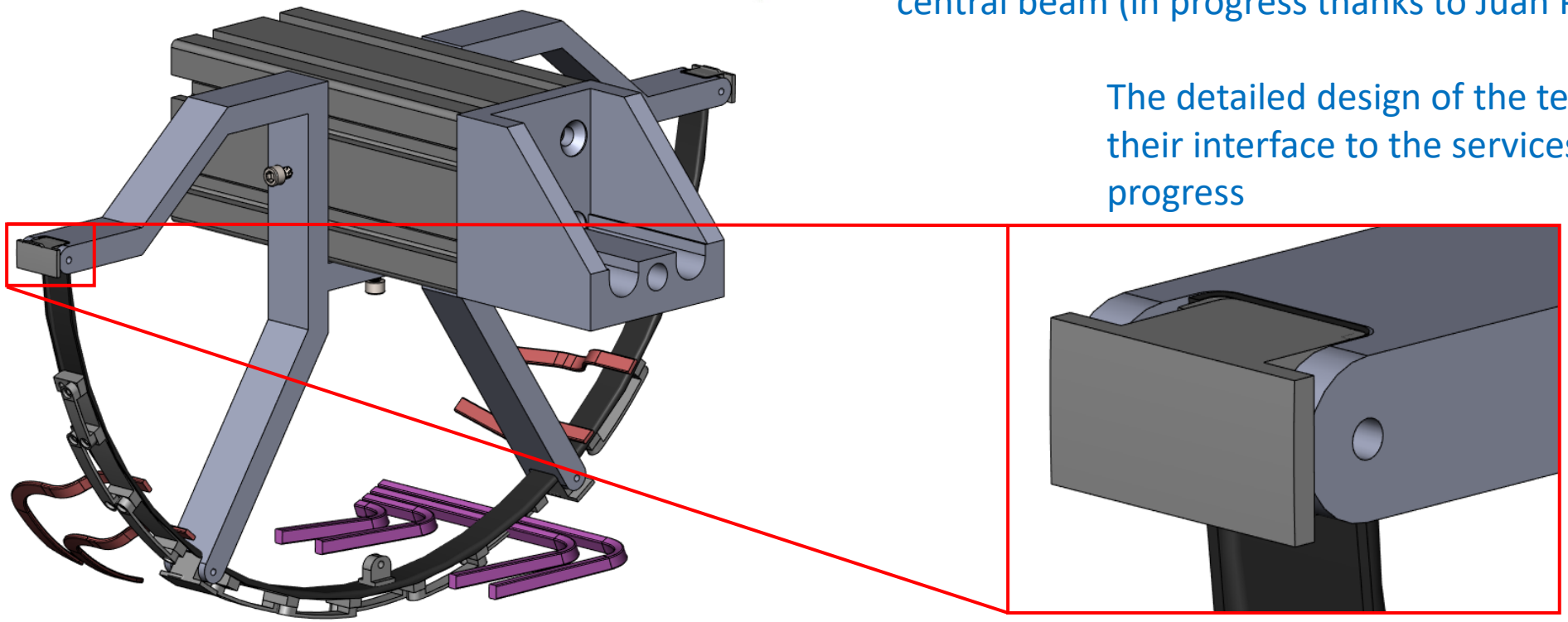
Cable Harness Assembly Tool

Cable harness assembly jig provides mounting positions for cable bundles. It can rotate so that each bundle can be placed in the most convenient position

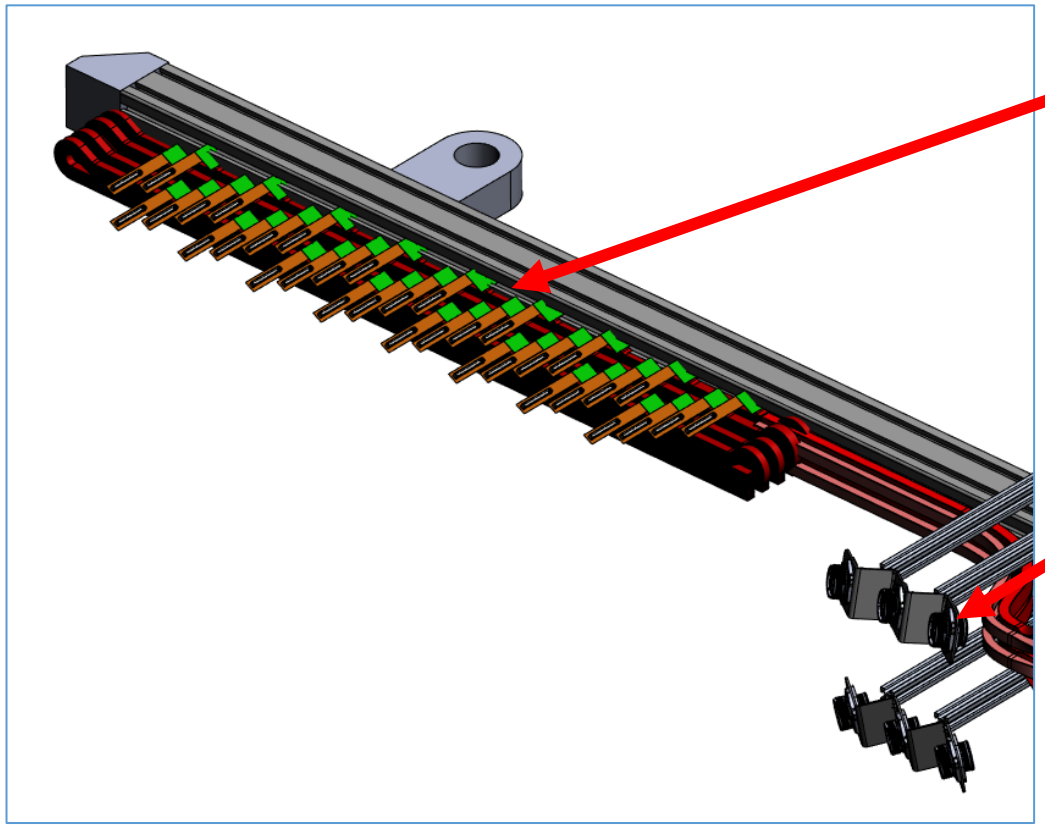
Mounting positions are set by alignment features along the central beam (in progress thanks to Juan Pablo)

The detailed design of the temporary supports and their interface to the services support rings is in progress



Foresee the possibility of adding position adjustment in R in order to have good contact for gluing

Cable Harness Assembly Tool



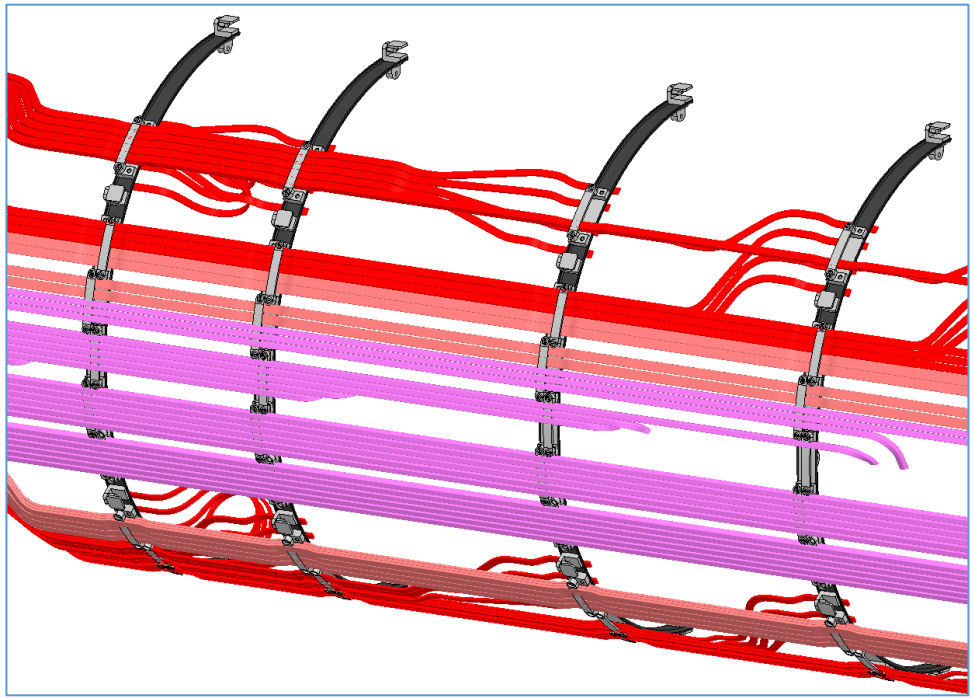
Folding of data cable bundles is designed in principle – needs design of actual support

Design for placement and support of termination boards is also needed

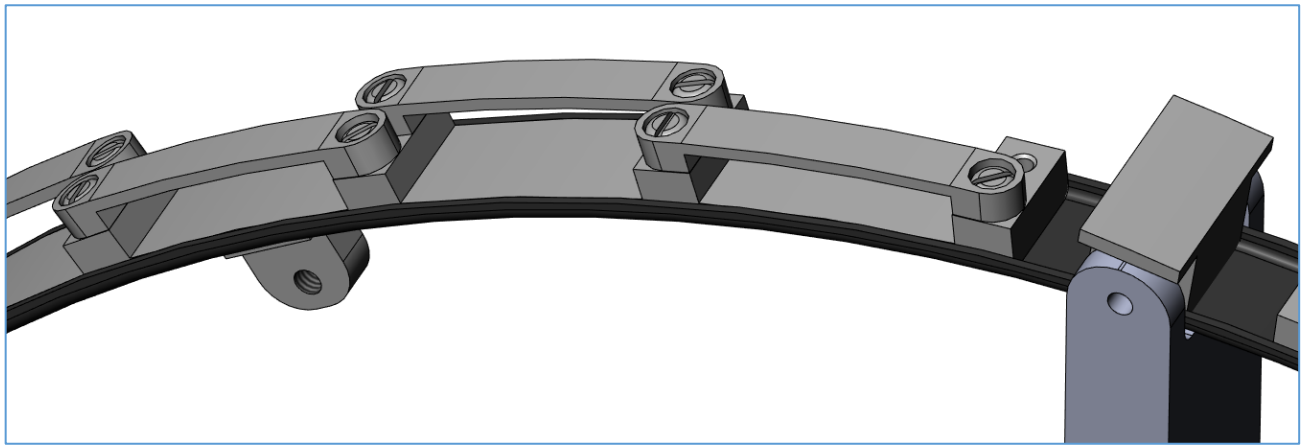
Design of PP1 connector support needs to be developed further – positions are agreed in principle

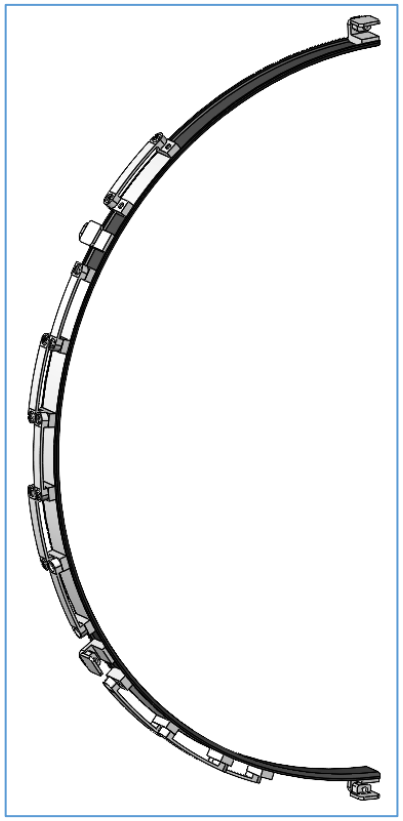
Also need to include additional PP1 connectors for environmental monitoring connections

Services Support Ring



We need to understand the precision or adjustments required in order to get a good bond to the half shell



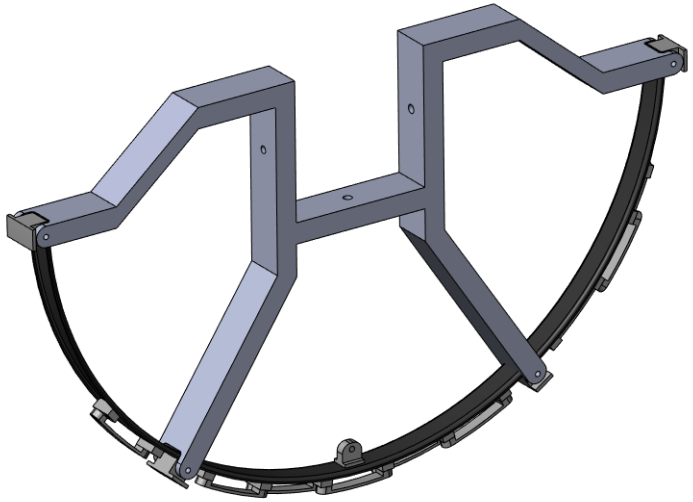


Support rings will be made from carbon fibre, with mounting/clamping hardware made from radiation-hard plastic

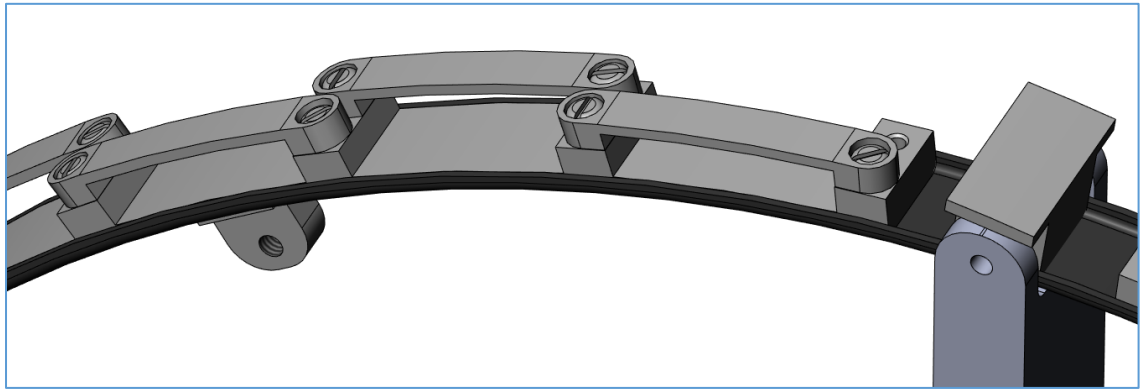
They are part of the harness assembly tool, but they are transferred into the half shell and will remain in the end cap

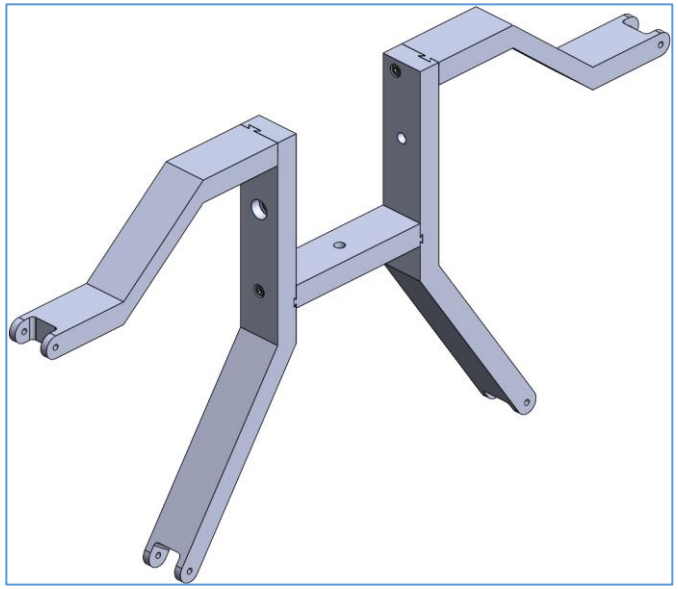
Baseline design has changed since what is shown here – cables will simply be guided by the support ring, not clamped. This requires a removable locking method to hold the cables in during harness production and transport

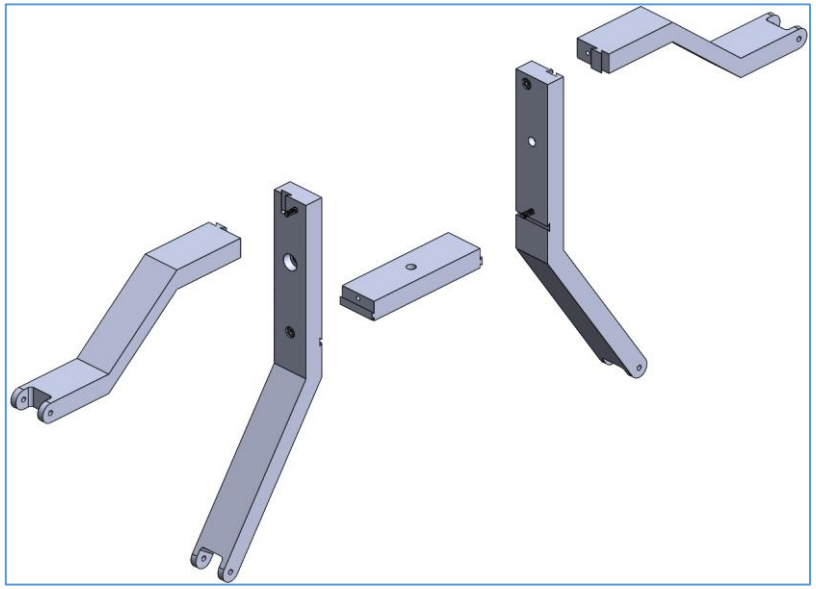
Temporary Mounting Support for the Services Support Ring



Actual design of clamps needs to be finished – will require variants to account for different thicknesses of bundles





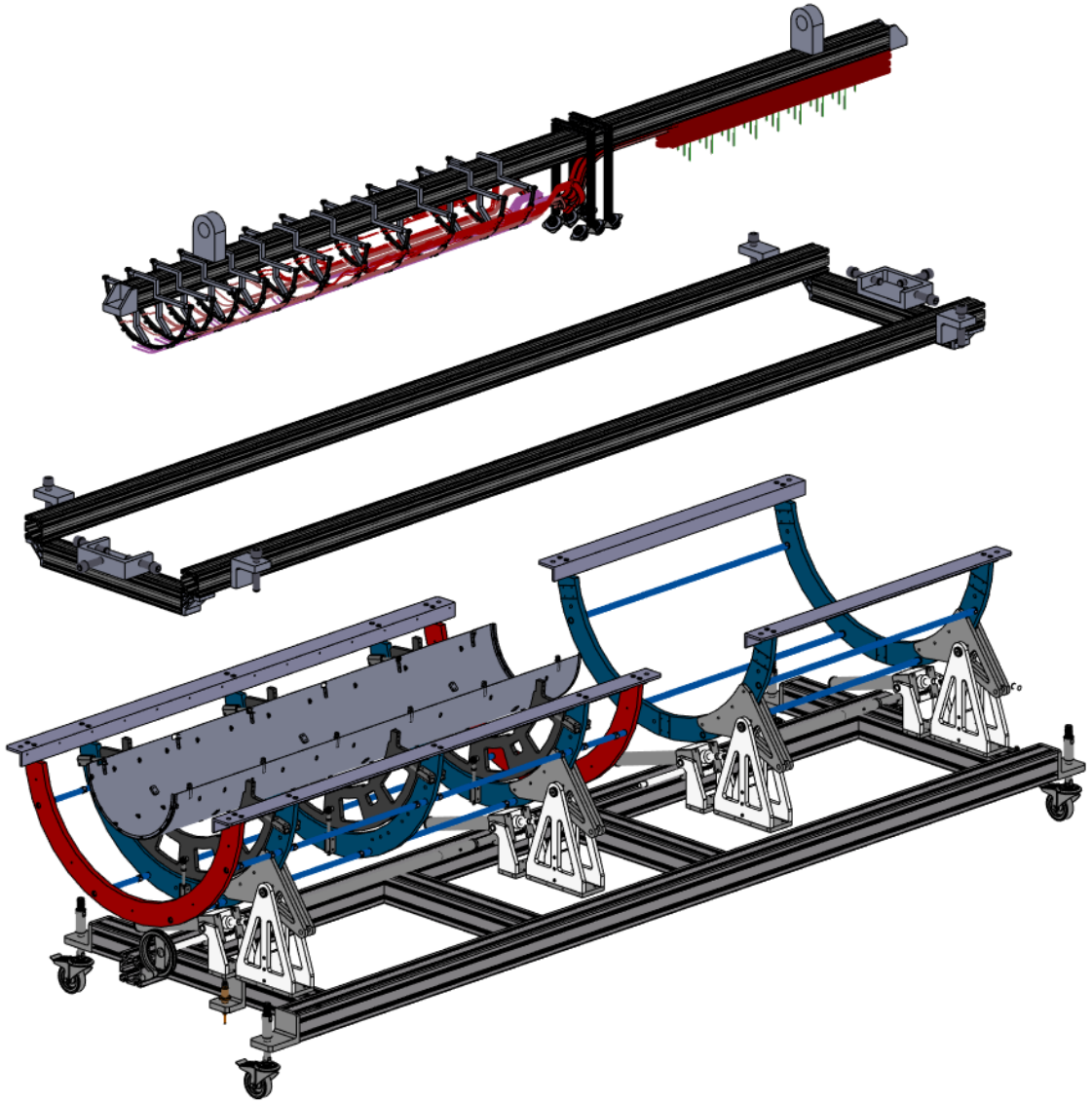


Design of the support strut has progressed (thanks to Juan Pablo)

Still requires finalisation of design, and some rounds of testing

Support struts will also need features for parking power and data connectors during assembly

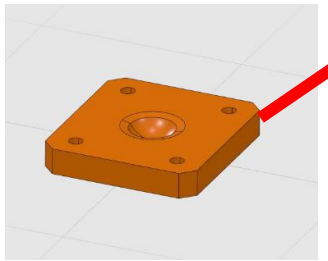
Cable Harness Integration

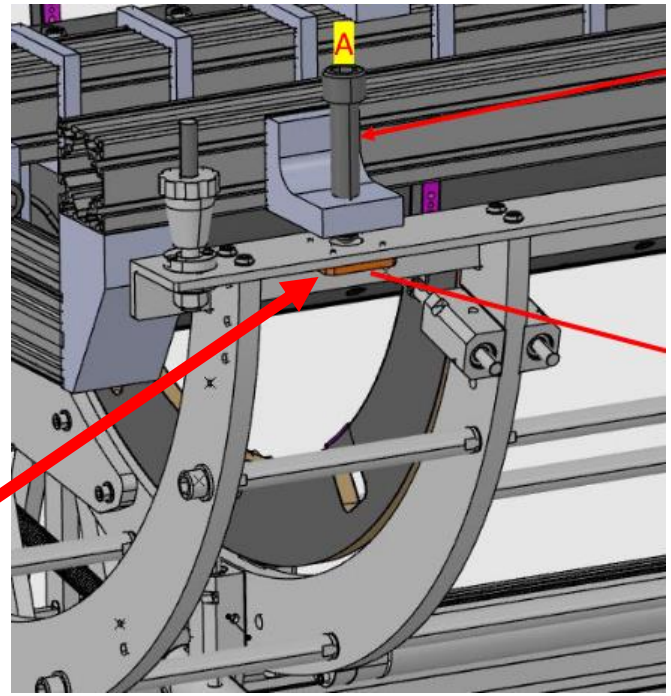


Cable harness – constructed and shipped from Edinburgh

Insertion Cradle – Stored at integration site, holds the cable harness during integration. Position of cable harness can be adjusted using screws

Rotating Assembly Tool – Insertion cradle + cables harness are placed on side rails. Cradle is lowered into position vertically by corner screws. The interface with the cradle has been agreed with Frascati

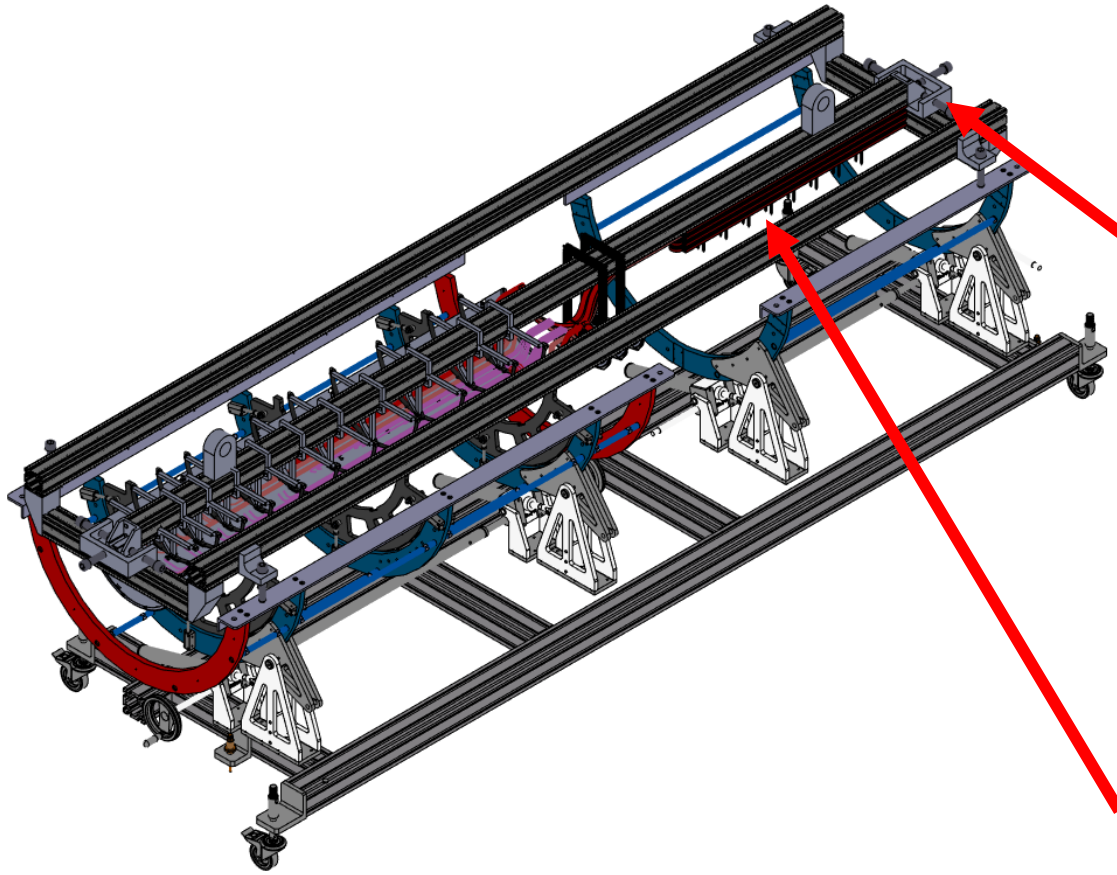




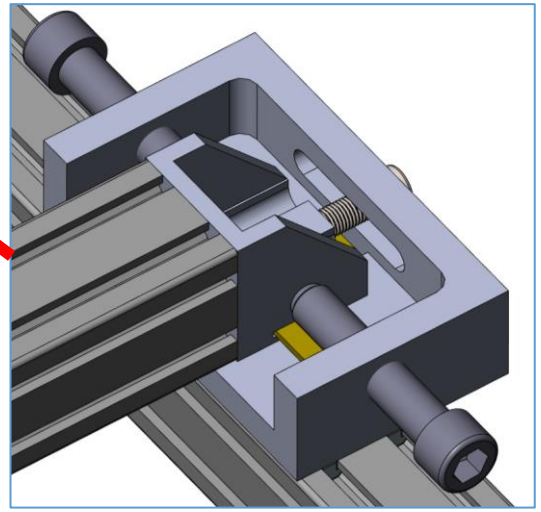
Cradle interface (A. Croce, S. Tomassini)

Cable Harness Integration

The position of the cable harness is adjustable on the cradle (designs from Jon Webster) – the plate at either end can slide on a low-friction interface

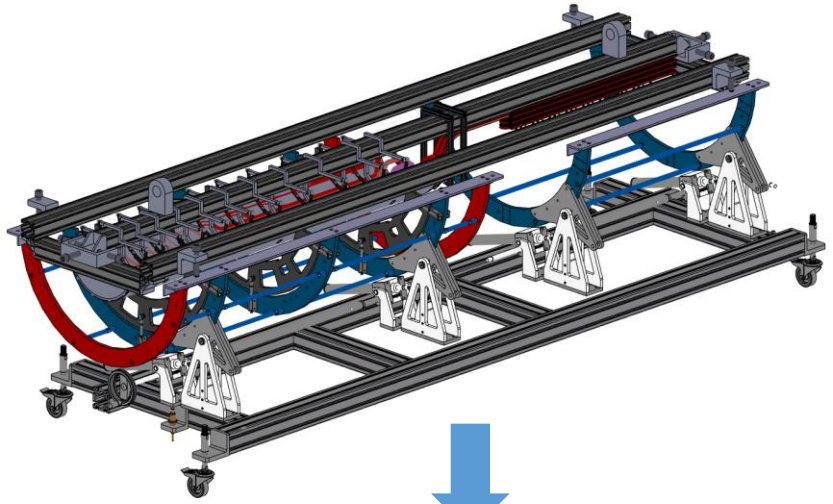


Horizontal position is adjusted by screws

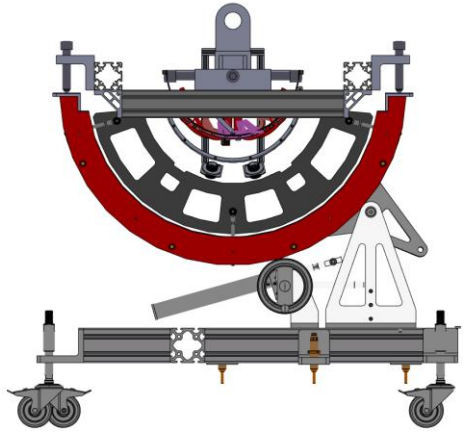


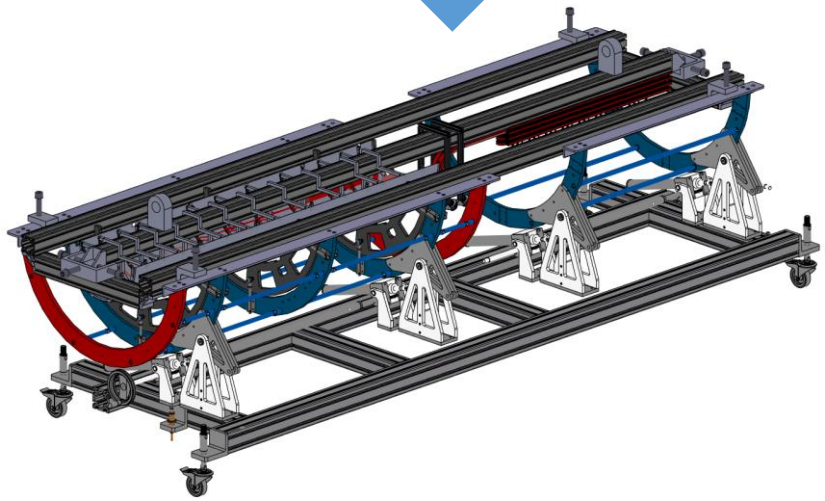
Support of cables and transfer to integration tooling needs to be designed

Cable Harness Integration Tool

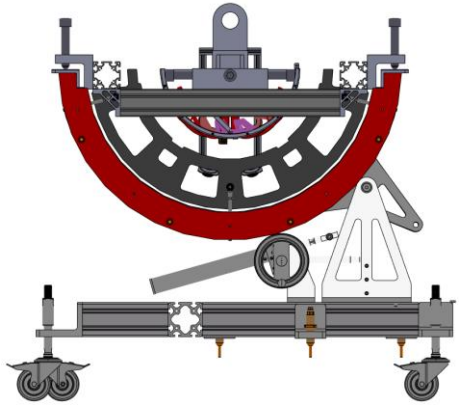


Cradle mounted on rotating tool





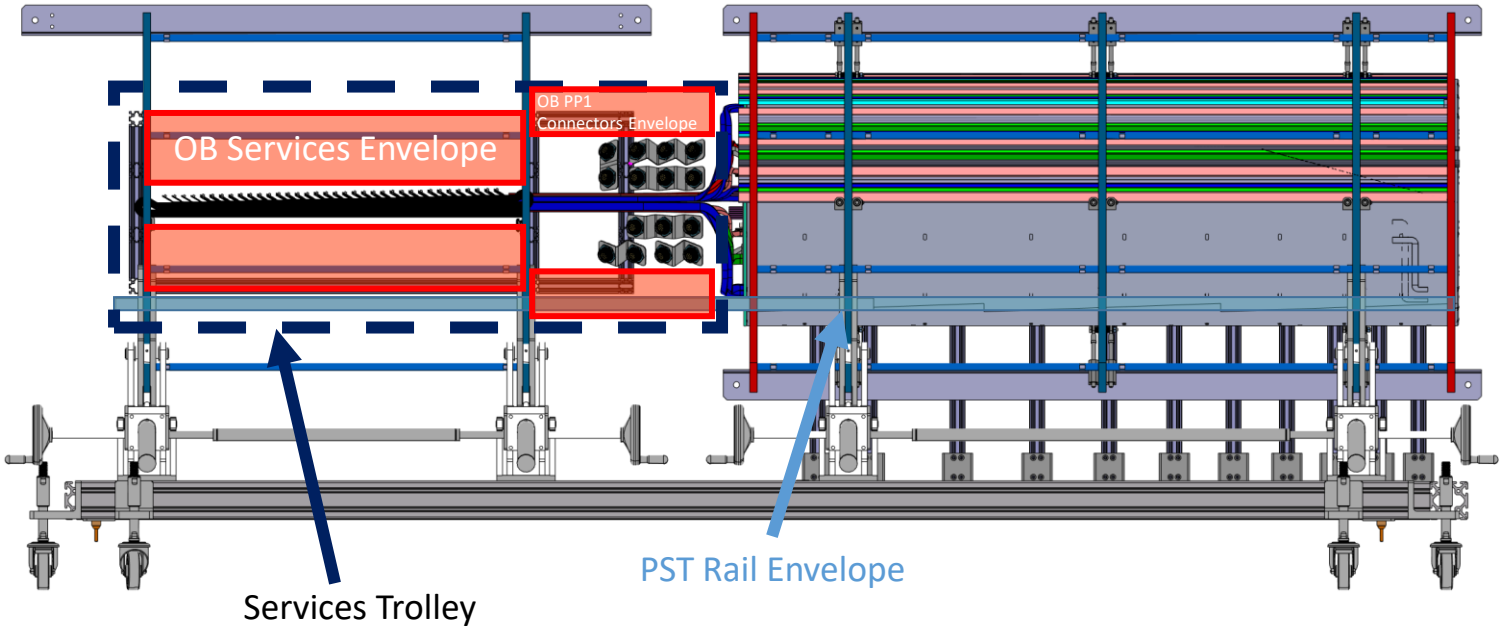
Harness lowered into position and services support rings glued in place



Central beam can be lifted out while the support ring mounts remain to help position the connectors until the half rings are installed – need to ensure no collision with the half ring install tool

How to position/hold the connectors while the half-rings are integrated needs serious consideration, as does the procedure for making the electrical connections after installing HRs – this is done deep in the shell

Services Trolley



Support trolley interfaces with integration tooling

Supports EC and OB services during integration – division of space agreed in principle. Routing and folding of OB services needs to be added to model

Need to confirm that connectors will be available for testing throughout integration

Need to test unfolding procedure

Data PP0 Connection-Module Connection

Vacuum pickup tool can be used with a guide to either push or pull the connector into the socket