

Handling Frame

Pre-production

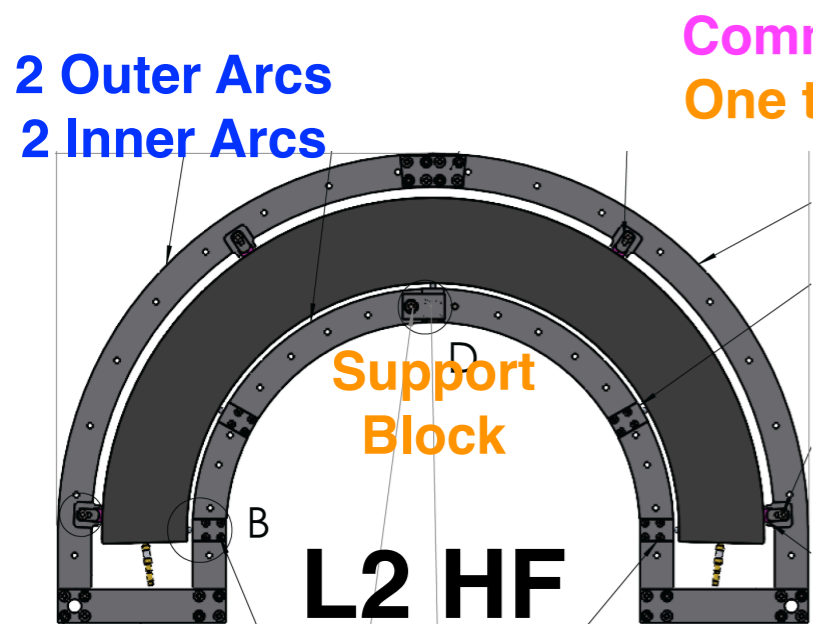
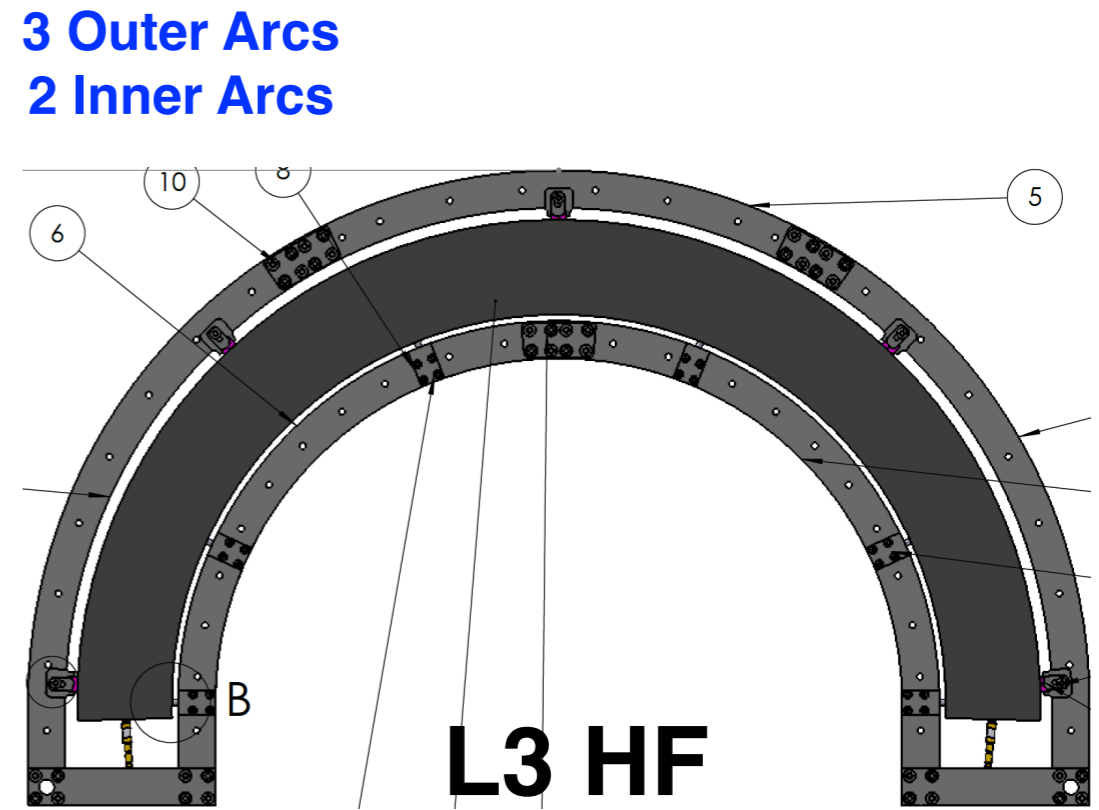
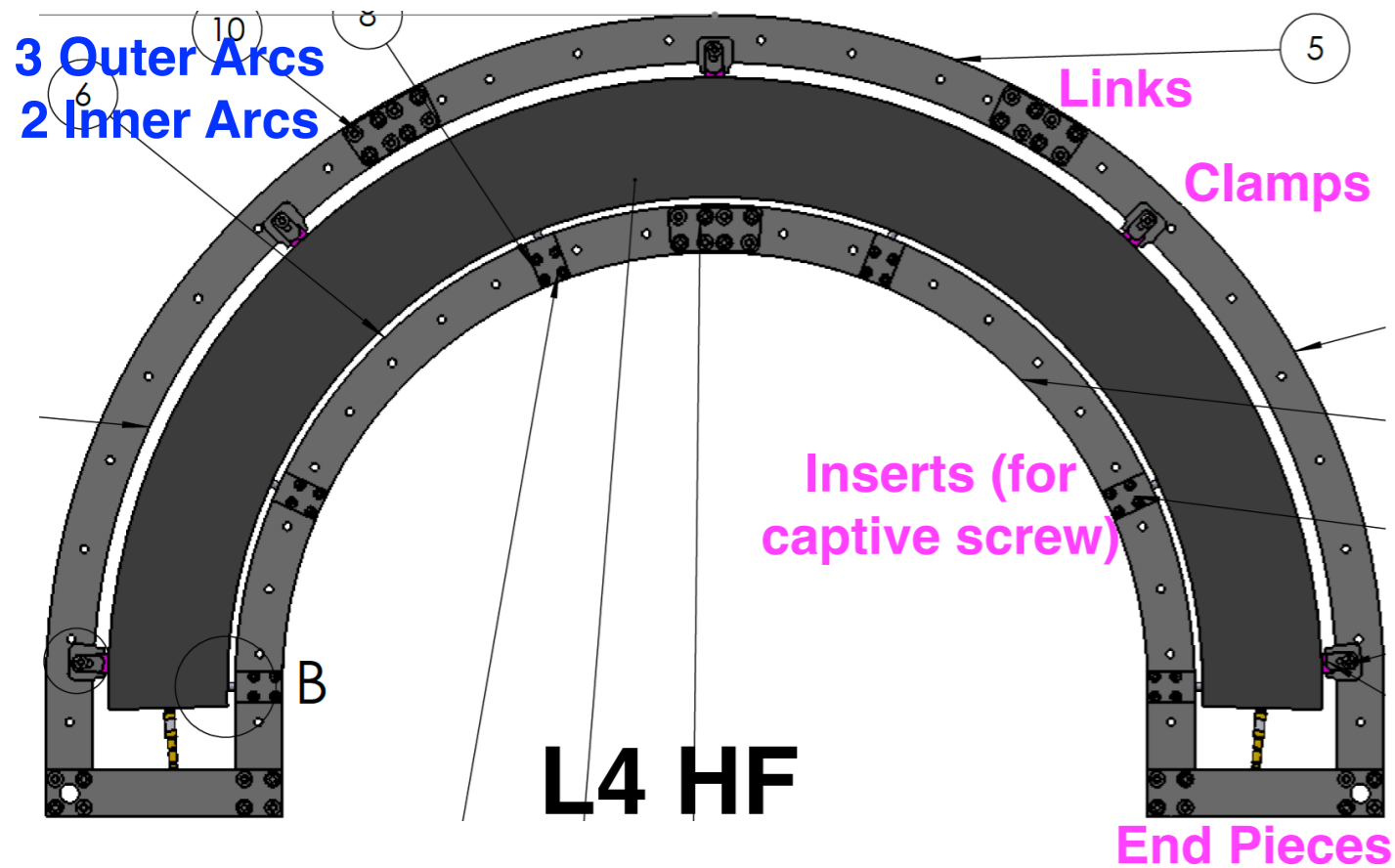
7-May-2024 Otranto

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Introduction

- Handling frames (HF) are designed by Liam.
- L2 and L3 HF are produced in Glasgow and L4 HF in Lecce
- HF must go to the HR building sites (Manchester and Genova)
- The bare HR after bus tape gluing and metrology is going to be supported by its own handling frame (HF) and placed in its own storage box and delivered to the four loading sites.
- After HR loading the HF is dressed with modules and PP0 protection shapes and placed in the storage box.
- During thermal cycle the HF captive screws and HF lugs screws must be relaxed and the HR should not fall down.
- After reception test at the integration sites the HF external arc is removed and the HR is handled only with the HF inner arc.
- After HR installation on the half-shell the HF inner arc is also removed

HF Liam design: AT2-IP-DF-0002



New features:

- M4 threaded holes in the middle of each modules (service holes)
- L2 HF inner arc divided in two inner arcs (to avoid weak point) with additional support block
- Clamps with-no button but the two extreme clumps (avoid stress for thermal cycling)

Handling frame costs

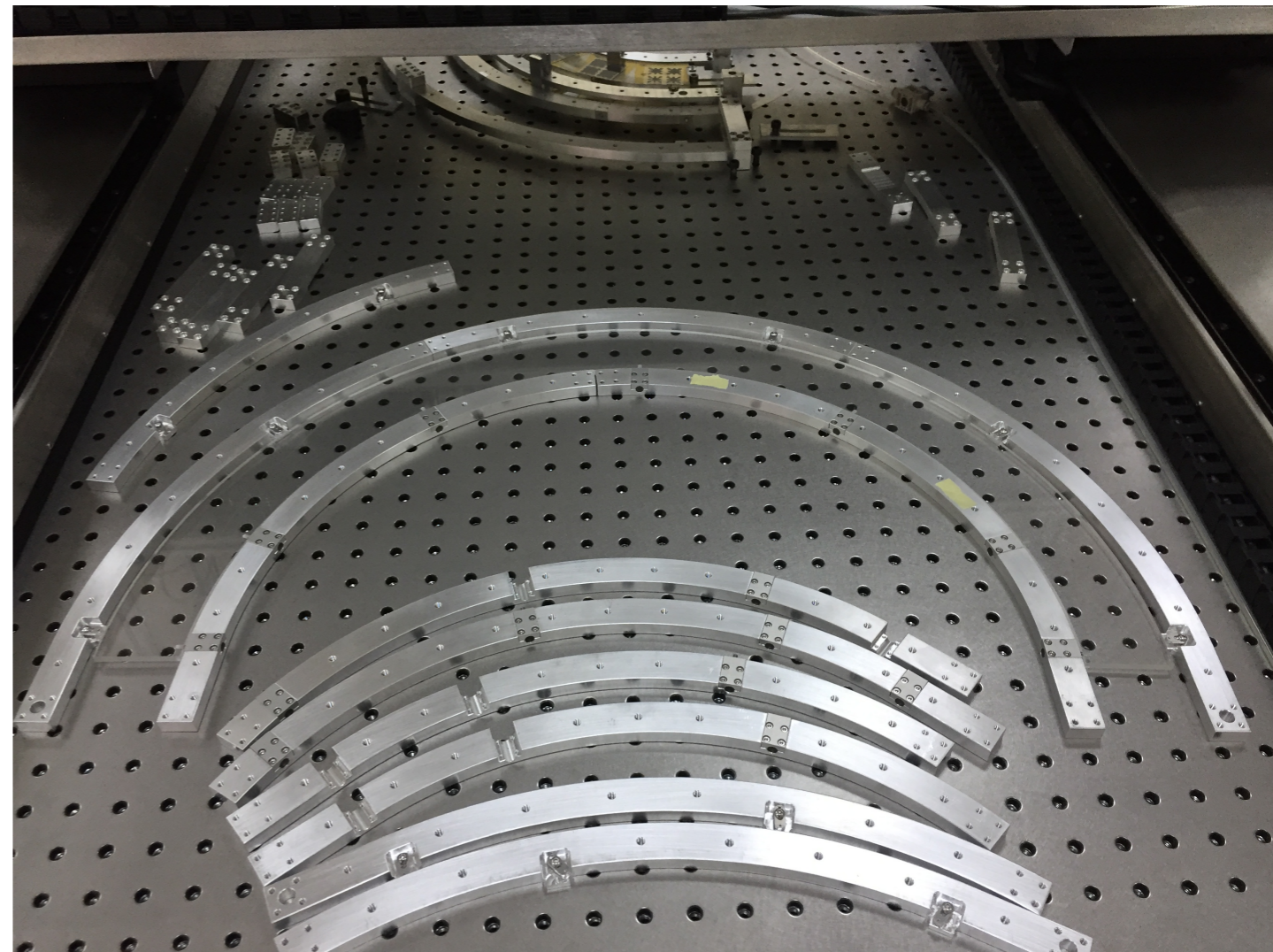
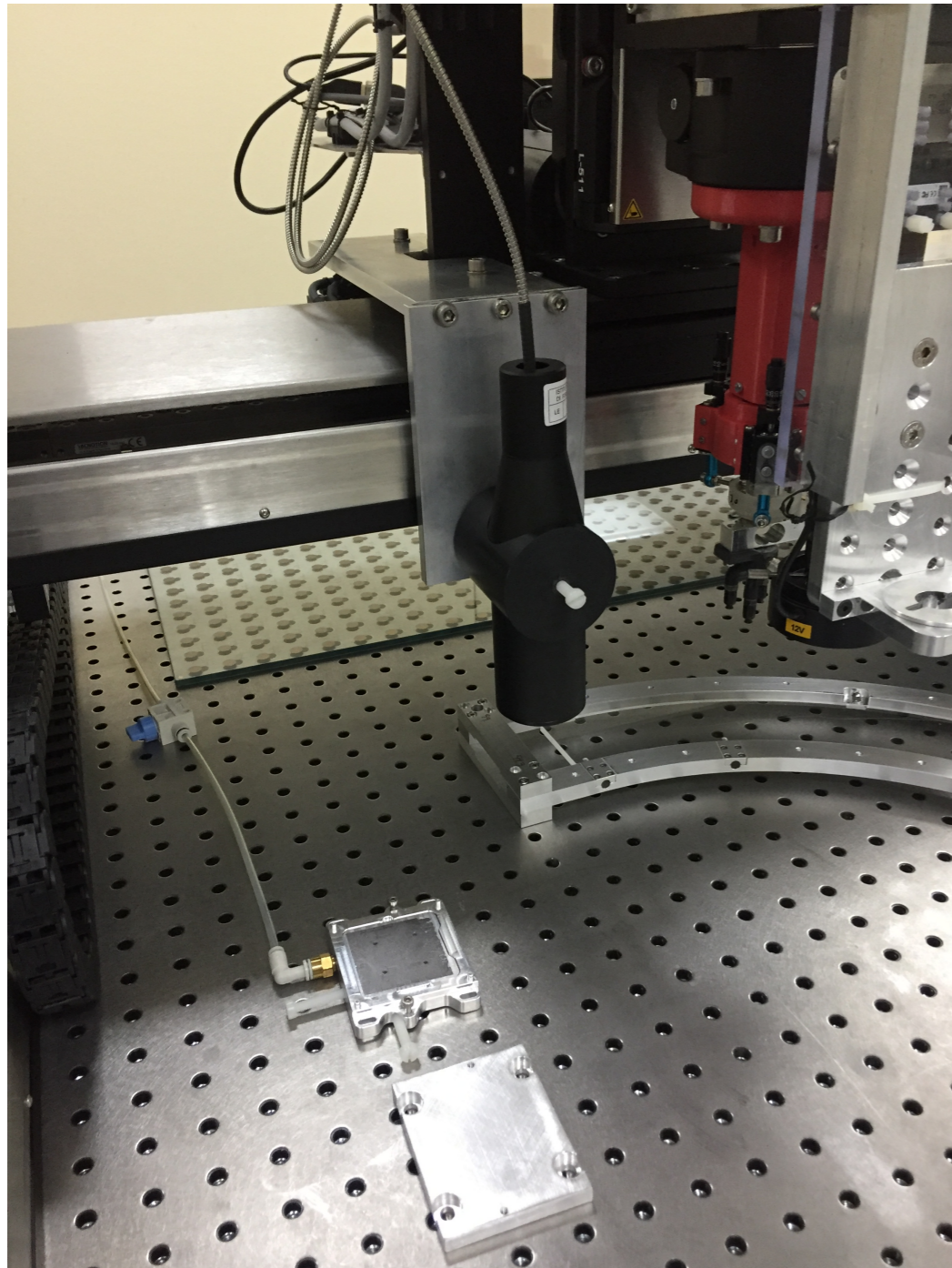
	HR/HS	HR pre	HR Tot	IN ARC	OUT ARC	END	LINK	INSERT	LUGS	Captive	M3x6	M2x6	M3x12	BLOCKS
L4	9	3	39	78	117	156	234	273	234	273	234	1092	1365	
L3	8	3	35	70	105	140	210	210	175	210	175	840	1400	
L2	11	6	50	50 x 2	100	200	100	250	200	250	200	1000	1200	50
TOT			124	198 + 50	222	496	544	733	609	733	609	2932	3965	50

Total cost= about 60 euro per arc
 $x (198+50+222)=28200$ euro

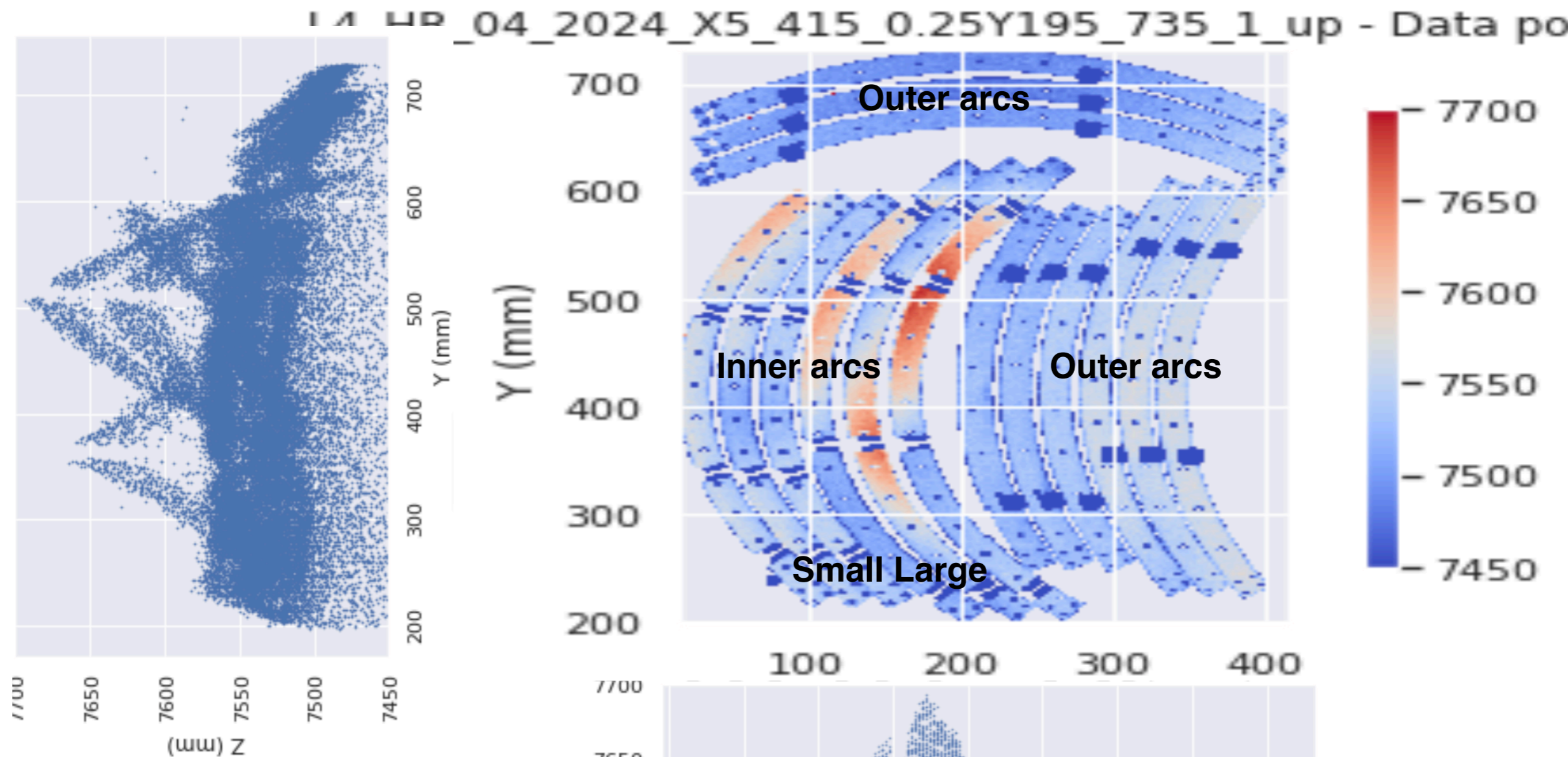
HF (pre-)production status in Lecce

- We built three L4 and on L2 in house (gook for back-up or refurbishing)
- We purchased all screws, end pieces, links, insert, clamps for all HF-L4
- We purchased arcs for three L4 using laminated aluminium
- NEW: We purchased arcs for three L4 using casted aluminium and after a discussion with the company to improve the manufacturing
- NEW: Liam sent to Lecce two final L2 HF and on L3 HF. This is very important to get experience with the first half ring topology (L2) and with all topology (also L3).

HF arcs maps with Gantry and chromatic confocal pen

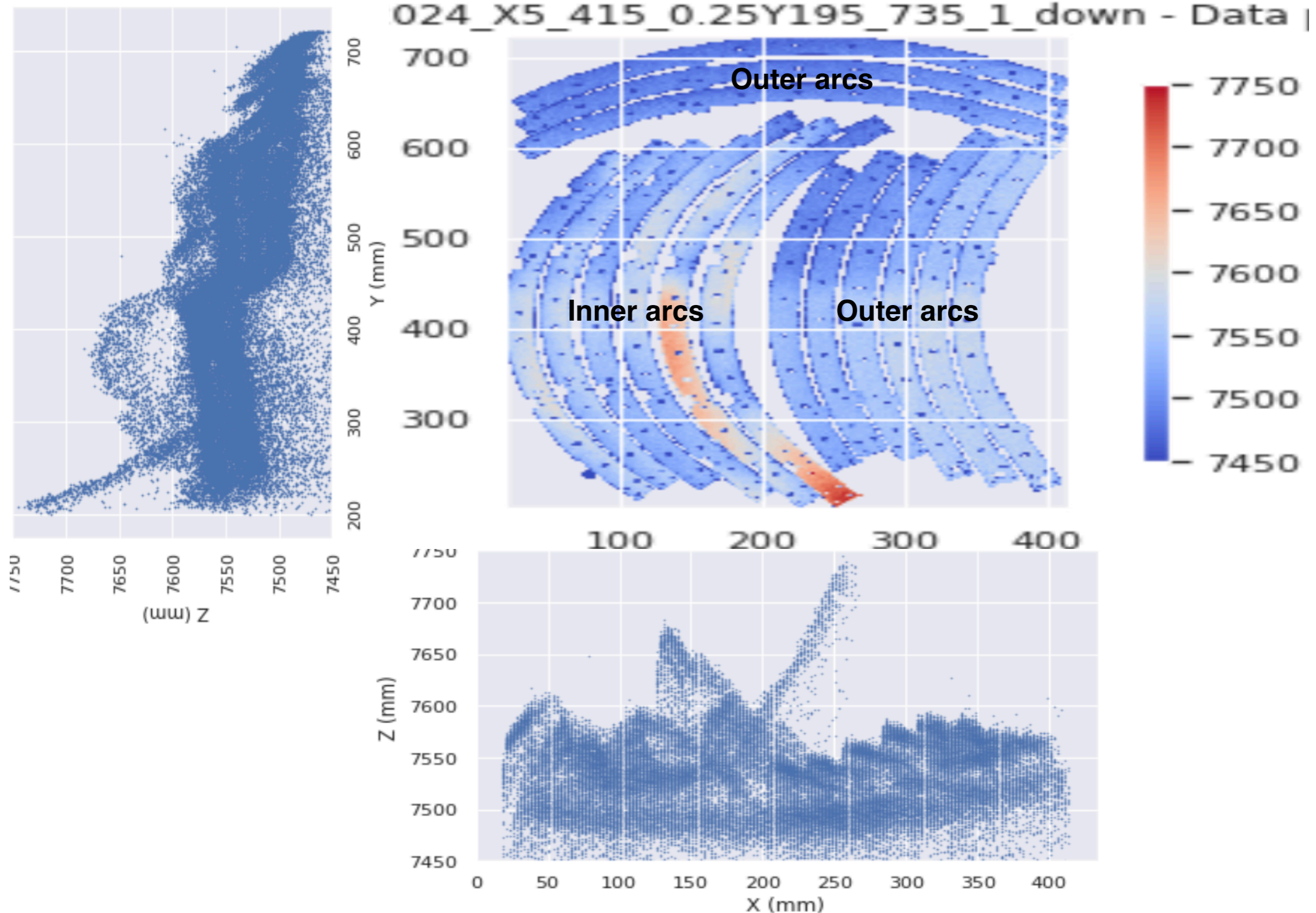


Front-side z map of new HF L4 arcs



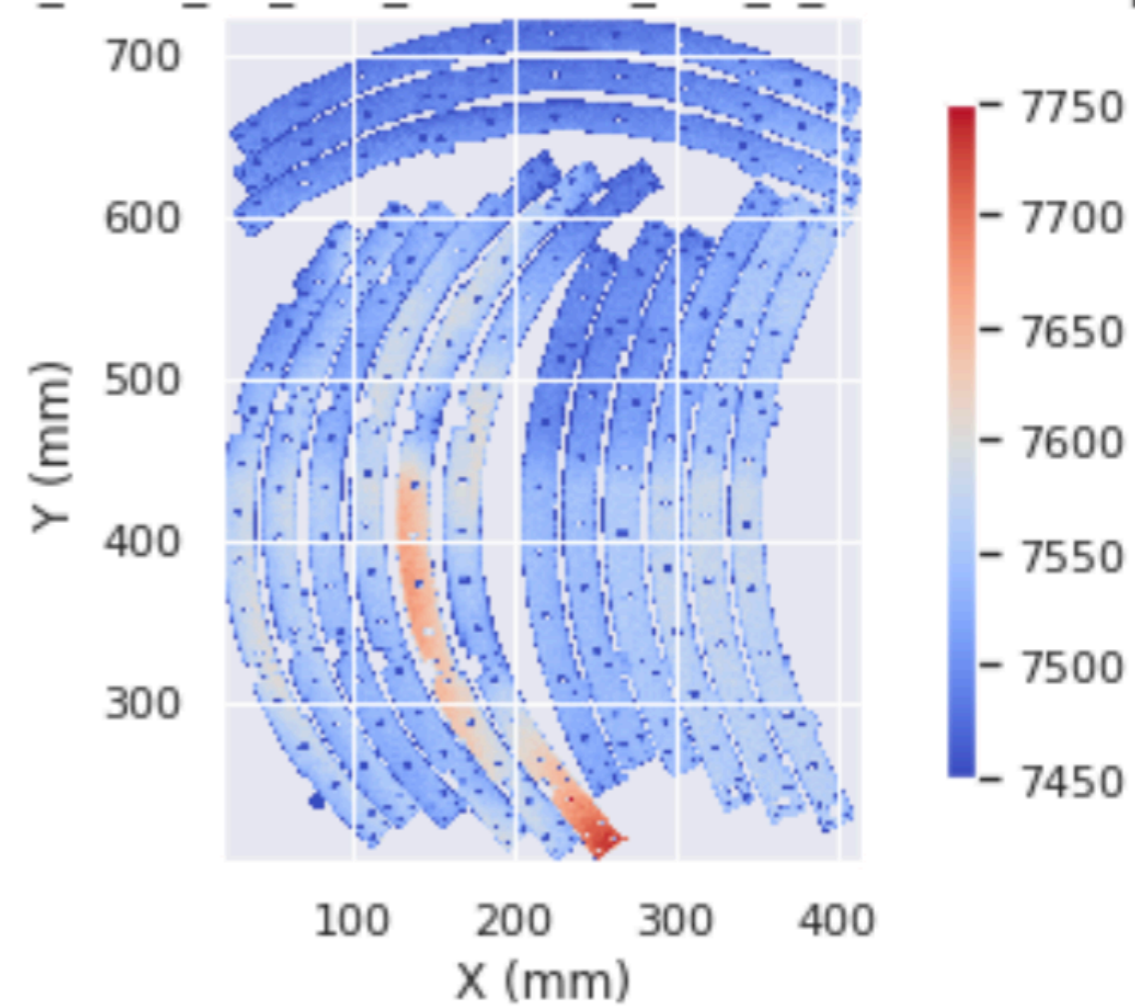
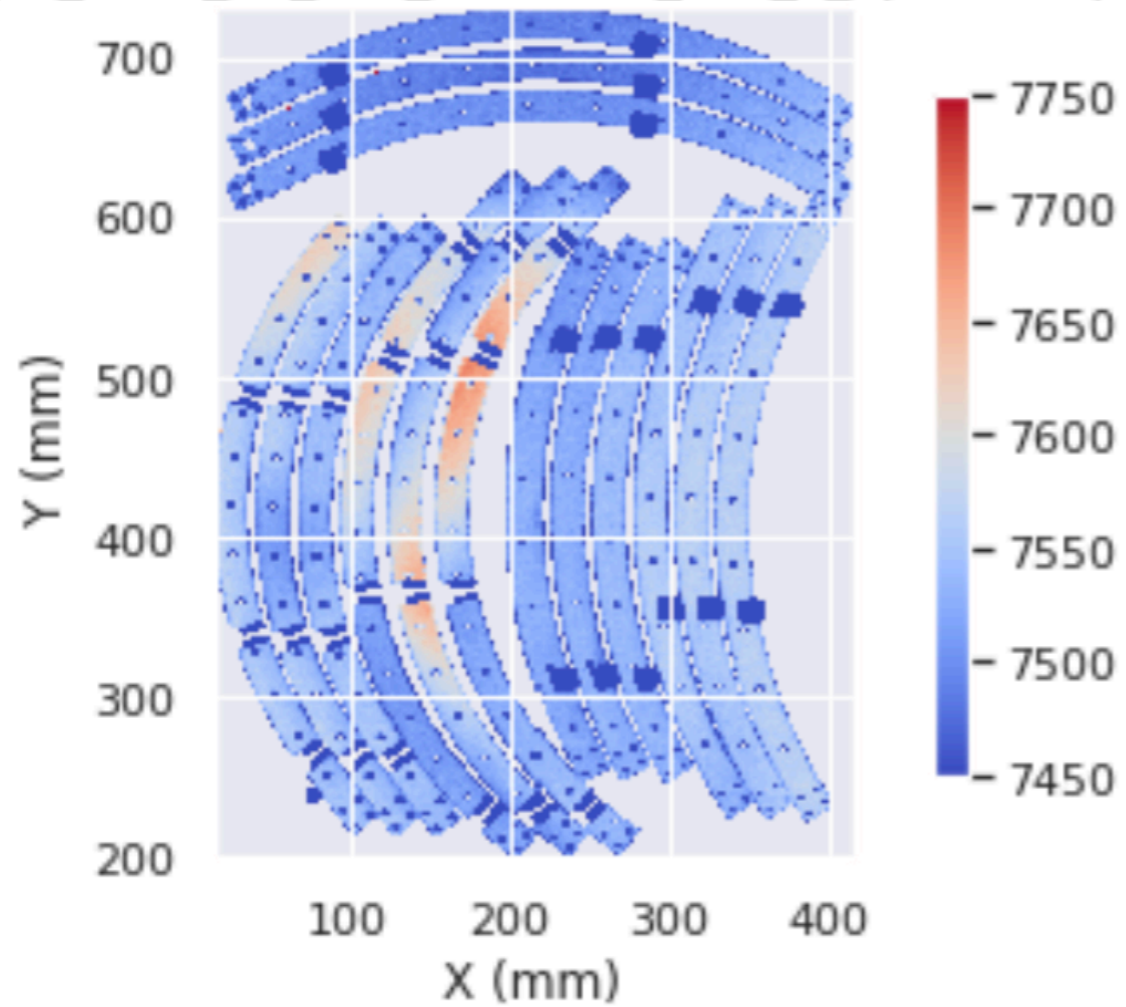
- Outer arcs very good: 50 μm max deviation
- Small inner arcs very good: 50 μm max deviation
- 2 out of 3 large inner arcs not bed: 100 μm max deviation
- Worse large inner arcs: 175 μm max deviation

Back-side z map of new HF L4 arcs

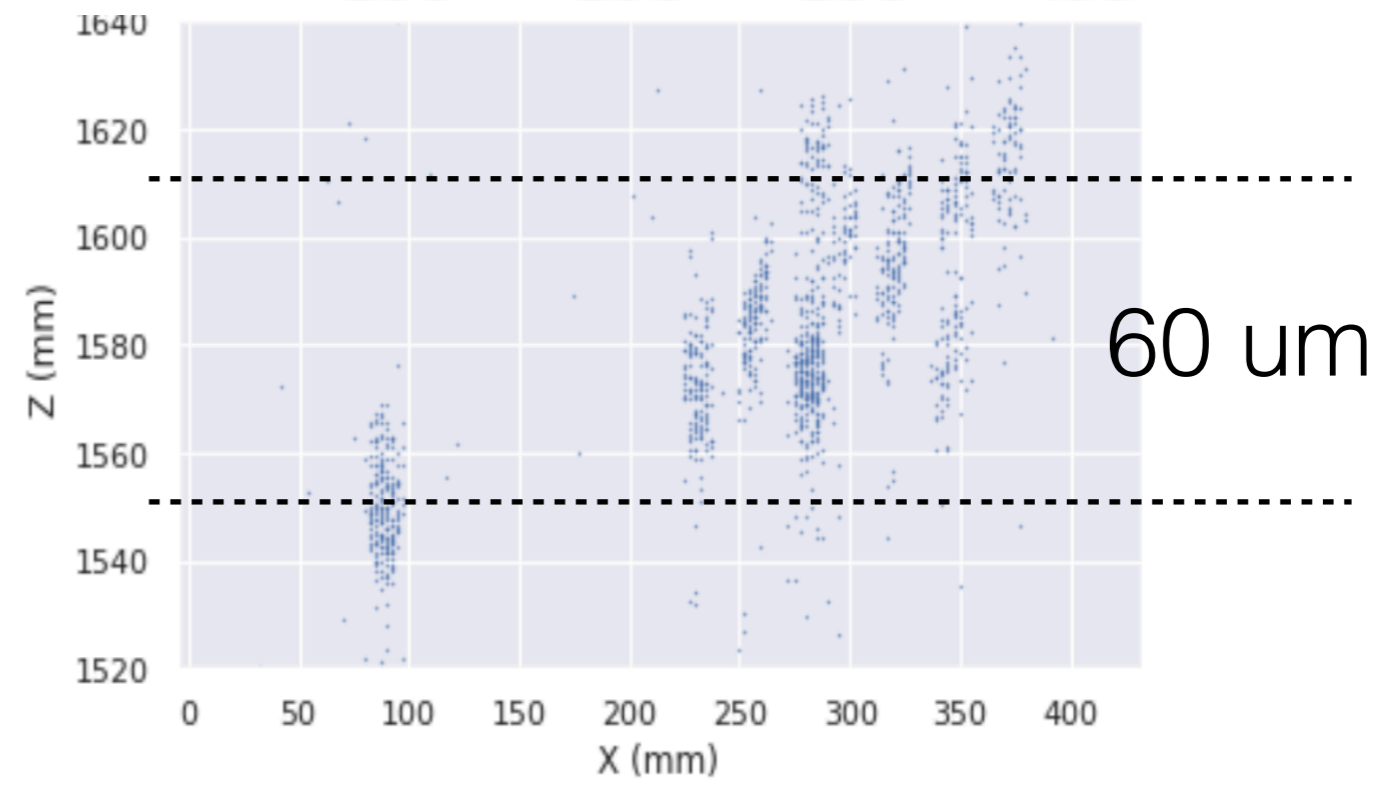
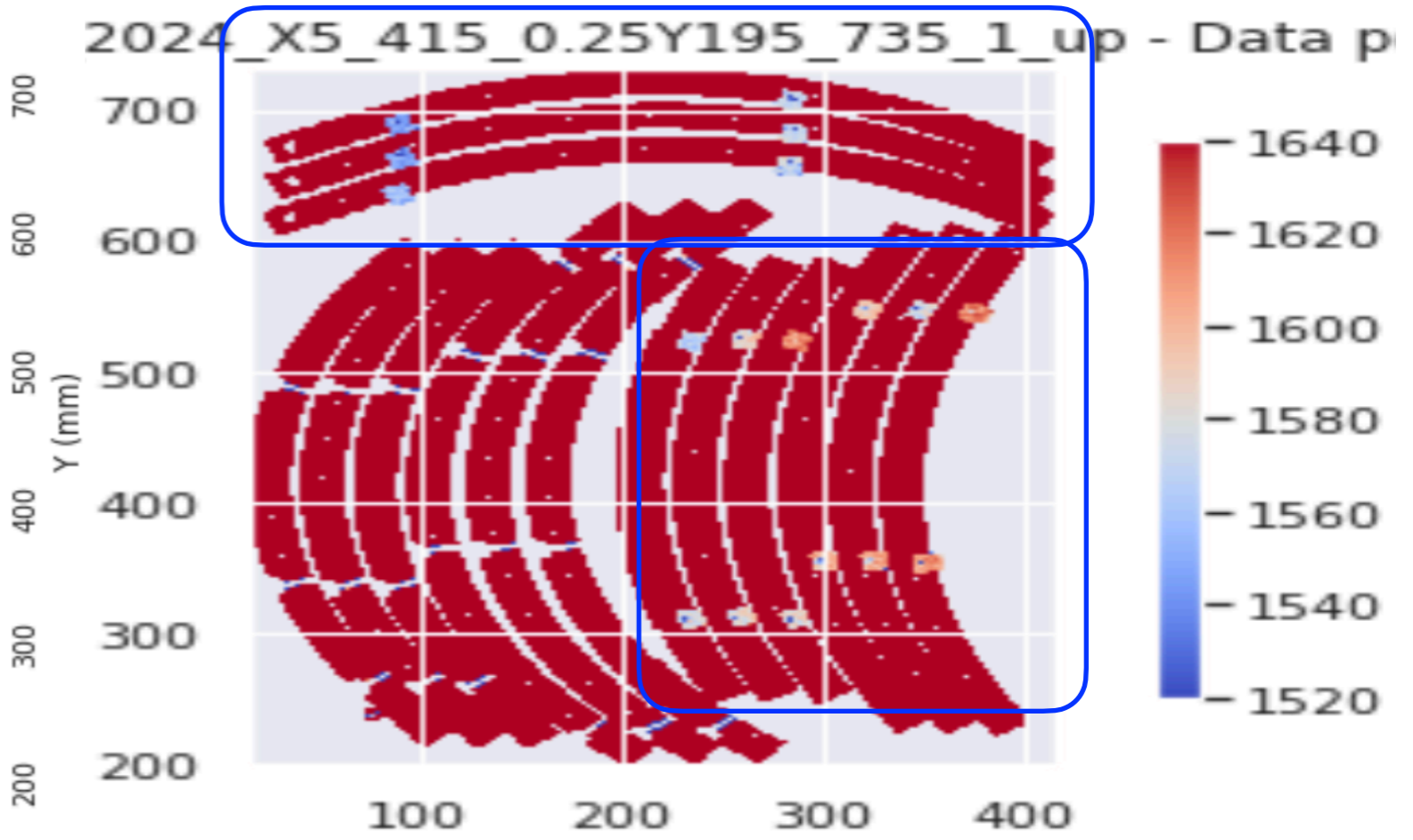
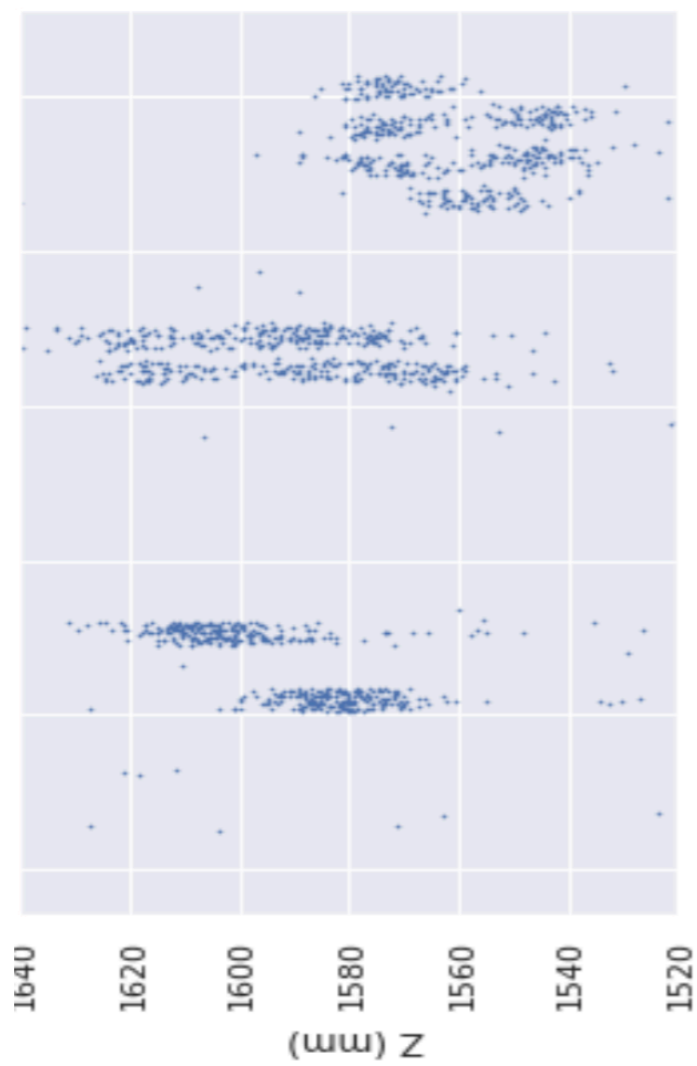


Both sides z map of new HF L4 arcs

L4_HR_04_2024_X5_415_0.25Y195_735_1_up - Data p(L4_HR_04_2024_X5_415_0.25Y195_735_1_down - Data p



Mounting lugs z map of new HF L4 arcs



- Mounting lugs z heigh very good: max deviation 60 um.
- Gantry baseplate planarity can not be subtracted during loading.

Handling frame phases

- Assembled around a template
- Sent to HR assembly sites
- HR placed in the HF by adapting the HF to the HR by unscrewing and screwing lugs and captive screws
- HR+HF sent to the loading sites
- Loading sites place the HR+HF on Gantry.
- Measuring HR planarity with respect to quad module placing tool
- Adjust HR planarity: by captive screw, by calibrated shimmed, ...
- After loading on both sides th HR+HF is placed on the Power Pig Tail Soldering tool.
- After Power Pig Tails soldering the data PP0 and PP0 supports are placed on the HR+HF.
- The HR+HF are placed in the support structure and in the storage box
- The HR+HF are QC and thermal cycled (with all screws relaxed and placed horizontally).
- The HR+HF are sent to the integration sites in the support structure and storage box inside a pelicase.
- After the reception test the HF outer arcs are removed from the HR
- The HR is installed in the half shell with the HF inner arcs and PP0 supports

Conclusions

- Follow-up with factory to improve on handling frame arcs productions
- Handling frame from casted aluminum
- Half ring planarity due to outer arcs
- Handling frame is involved in different phases of the half ring steps.

Real half rings needed to really asses the goodness of L4 handling frame