

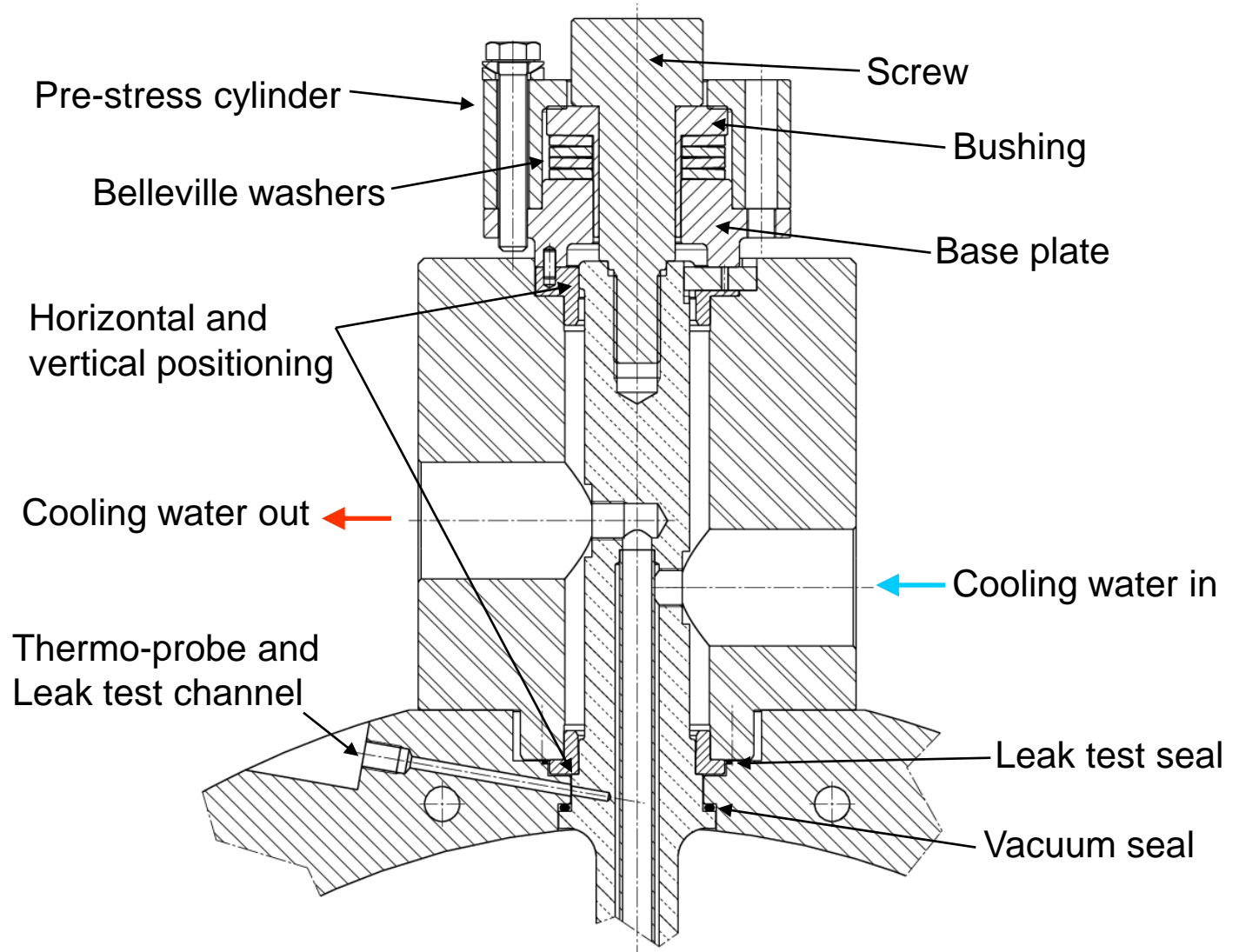
Linac4 Drift Tube Linac

A Puzzle of a Thousand Pieces

Suitbert Ramberger, CERN, AB-RF-LR

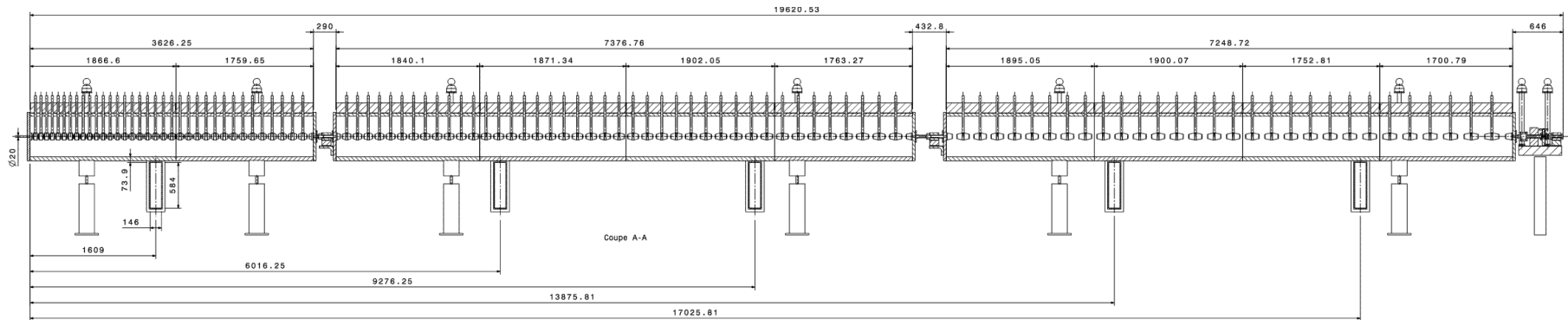
Acknowledgement: Pierre Bourquin, Yves Cuvet, Alessandro Dallocchio,
Jean-Michel Giguet, José Monteiro, Monique Dupont, Mark Jones

“Adjust and Assemble”



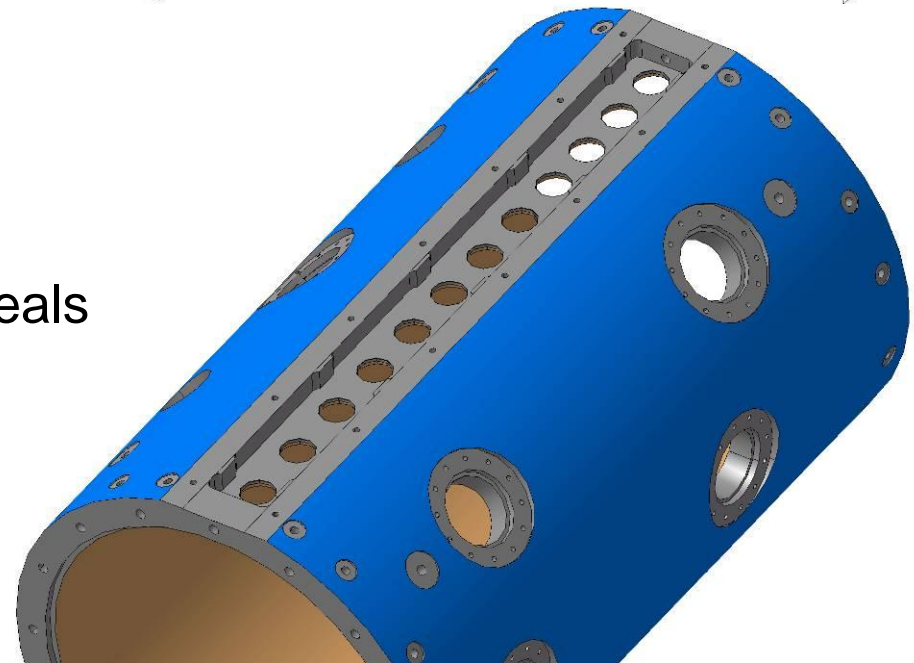
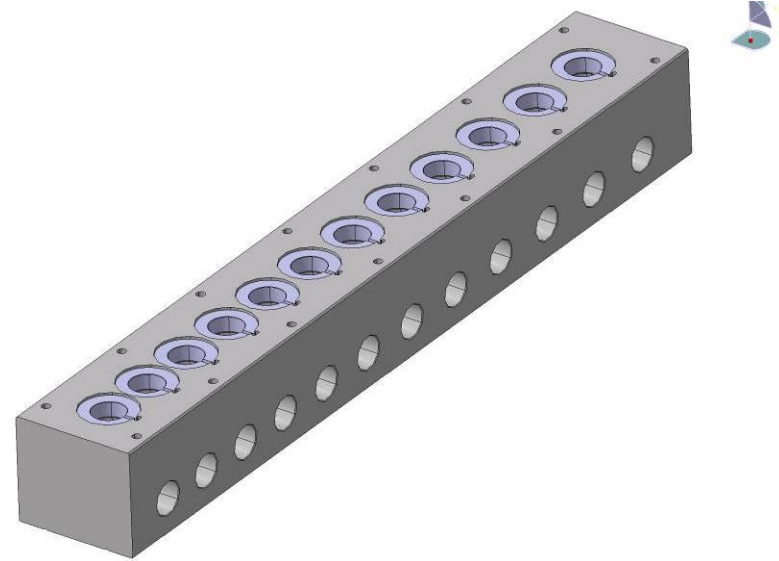
Adjust and Assemble:

- No need for bellows or rubber seals.
- Reliable design.
- No adjustment mechanism.
- Straightforward segment assembly.
- Tight machining tolerances.
- Re-machining stages



Tank Segment Assembly:

- Segment preparations (4 weeks):
 - Metrology
 - Vacuum Test of RF port
 - Cleaning and Copper-Plating
- Segment Assembly (3 weeks):
 - Assembly Girder on Vessel
 - Installation of Drift Tubes
 - Laser Tracker Metrology
 - Assembly w/ Plugs w/ Test-Seals
 - Closure with Test-Covers
 - Vacuum and Leak Test



		Survey				
		Center calculated				
No point		X (horiz)	Y (long)	Z (vert)	Y (yaw)	Z (roll)
1		0.015	0.000	-0.002	0.000E+00	-1.655E-04
2		-0.035	0.142	0.016	1.407E-03	-1.200E-03
3		0.041	0.063	-0.007	4.244E-04	6.210E-05
4		-0.018	0.029	-0.003	1.283E-03	-4.037E-04
5		0.008	0.001	-0.021	-1.604E-03	-6.621E-04
6		-0.066	0.057	0.003	-8.483E-04	-2.472E-03
7		0.050	0.042	0.016	5.487E-04	-8.283E-05
8		0.042	0.075	0.005	-1.180E-03	1.553E-04
9		-0.056	0.136	-0.025	5.074E-04	-7.145E-04
10		0.026	0.108	0.033	-2.589E-04	1.118E-03
11		-0.007	0.146	-0.008	5.488E-04	-6.006E-04
12		-0.002	0.074	-0.007	-9.841E-04	1.968E-04

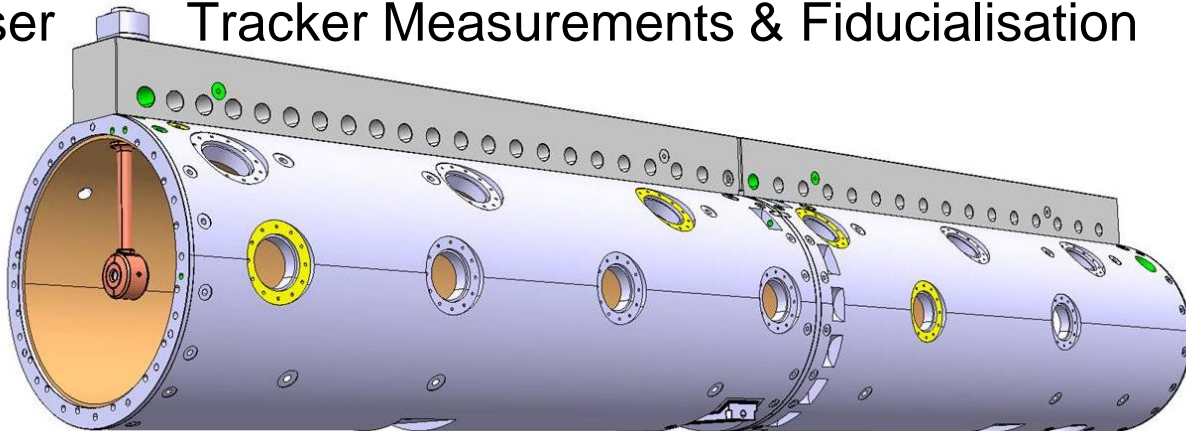
AVG	0.000	0.073	0.000	-1.292E-05	-3.975E-04
STDEV	0.038	0.052	0.016	9.717E-04	8.781E-04
MID	-0.008	0.073	0.004	-9.806E-05	-6.770E-04
MAXMIN/2	0.058	0.073	0.029	1.506E-03	1.795E-03
MAXABS	0.066	0.146	0.033	1.604E-03	2.472E-03

Required tolerances

- $< \pm 0.1$ mm
- $< \pm 3$ mrad

Tank Assembly:

- Segment Connection (7 weeks):
 - Assembly of Segments w/ Nominal Spacers
 - Laser Tracker Measurement of Tank on Supports
 - Machining of Spacers & Cleaning
 - Replacement of Spacers & Seals
 - Assembly with temporary End-Covers, Intertank Area, RF loop
 - Vacuum and Leak Test
 - Open temporary End-Covers + some PC blanks
 - Laser Tracker Measurements & Fiducialisation



Tank Assembly:

- Tuning (7 weeks):
 - Installation of Oversized End-Covers (ECs), PUs, short PCs
 - Measurement Bead-Pull (BP) & Spectrum
 - Machining final ECs + Copper Plating
 - Installation of T-Coupler and Adjustment
 - Tuning of Tuners with BP & Spectrum
 - Mount final ECs
 - Measurement BP & Spectrum
 - Machining of Tuners & Cleaning
 - Installation of Tuners

Tank Assembly:

- Installation Preparations (6 weeks):
 - Adjustment of T-Coupler
 - Measurement BP & Spectrum
 - Re-machining of PCs
 - Measurement BP & Spectrum
 - De-installation of T-Coupler
 - Installation of RF Plate
 - Measurement BP & Spectrum
 - Vacuum Test
 - Installation of Water Connections & Interlocks
 - Pressure, Flow & Interlock tests
 - Final Transport

Assembly Schedule: September 2011 – March 2013

