CONCEPTUAL DESIGN OF X-BAND ACCELERATING STRUCTURE TD26 CC SIC

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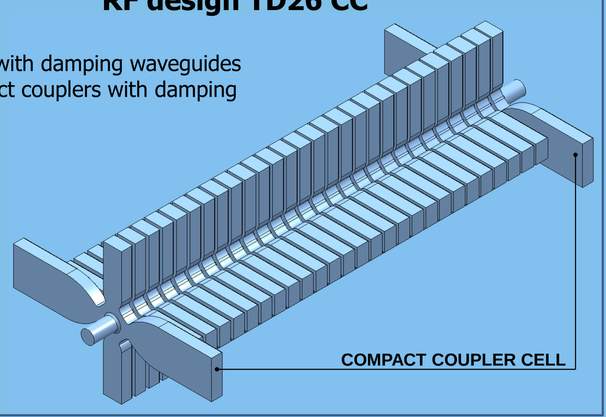
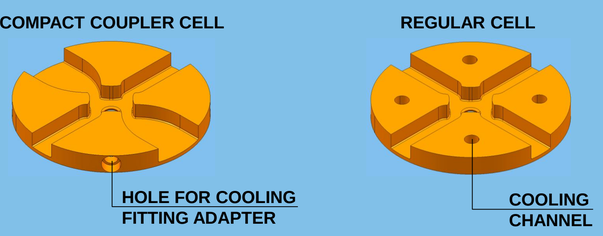
Abstract
Many accelerating structures have been tested over the past few years in the context of CLIC studies. Based on test results, the RF design of the structure has been refined. The basic cell geometry is quite similar to the Tapered Damped geometry, but differences are in the number of regular cells and in the coupler design. The coupler cell has two opposite waveguides for the WR90 waveguide connection and other two waveguides are used for damping as in the regular cells. The new compact coupler design results in the change of number of cells in the refined structure from 24 to 26. Accordingly, the new engineering design has been developed. The conceptual RF and engineering designs of the full structure with integrated sub-systems (vacuum, cooling, damping waveguide absorbers) are presented.

RF design TD26 CC

- 26 cells with damping waveguides
- 2 compact couplers with damping



Mechanical design of RF disks

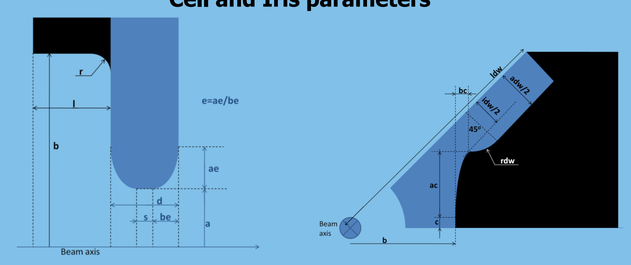


Required tolerances

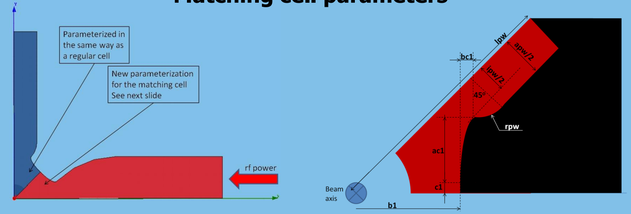
- Cell iris shape accuracy 0.005 mm
- Flatness accuracy 0.001 mm
- Cell shape roughness Ra 0.025

Parametrization

Cell and Iris parameters



Matching cell parameters

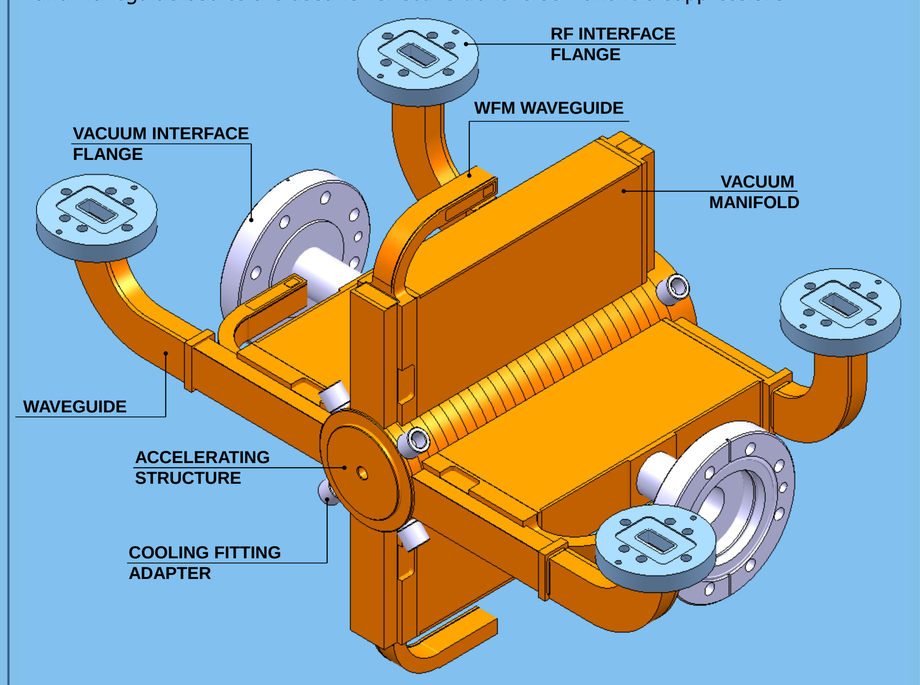


Parameter table

PartNumber Definition	a (mm)	d (mm)	b (mm)	c (mm)	l (mm)	eow (mm)	idw (mm)	adw (mm)	h (mm)	r (mm)	e (mm)	s (mm)	be (mm)	ae (mm)	bc (mm)	ac (mm)	D (mm)
1 Disk TD26_vg1.8_R05_CC	3.1192	1.6442	8.6154	0.6269	6.6749	3.3962	8.0000	11.0000	8.3320	0.5000	1.1670	0.1670	0.7399	0.8628	0.9178	3.1172	80.0000
2 Disk 2 TD26_vg1.8_R05_CC	3.0885	1.6185	8.6035	0.6208	6.7007	3.3885	8.0000	11.0000	8.3320	0.5000	1.1661	0.1644	0.7283	0.8486	0.9738	3.2996	80.0000
3 Disk 3 TD26_vg1.8_R05_CC	3.0577	1.5927	8.5917	0.6146	6.7264	3.3808	8.0000	11.0000	8.3320	0.5000	1.1651	0.1619	0.7167	0.8343	0.9746	3.2948	80.0000
4 Disk 4 TD26_vg1.8_R05_CC	3.0269	1.5669	8.5801	0.6085	6.7522	3.3731	8.0000	11.0000	8.3320	0.5000	1.1641	0.1593	0.7051	0.8201	0.9754	3.2902	80.0000
5 Disk 5 TD26_vg1.8_R05_CC	2.9962	1.5412	8.5687	0.6023	6.7780	3.3654	8.0000	11.0000	8.3320	0.5000	1.1631	0.1567	0.6935	0.8059	0.9764	3.2859	80.0000
6 Disk 6 TD26_vg1.8_R05_CC	2.9654	1.5154	8.5575	0.5962	6.8037	3.3577	8.0000	11.0000	8.3320	0.5000	1.1621	0.1541	0.6819	0.7917	0.9774	3.2819	80.0000
7 Disk 7 TD26_vg1.8_R05_CC	2.9346	1.4896	8.5465	0.5900	6.8295	3.3500	8.0000	11.0000	8.3320	0.5000	1.1610	0.1515	0.6703	0.7775	0.9786	3.2782	80.0000
8 Disk 8 TD26_vg1.8_R05_CC	2.9038	1.4638	8.5357	0.5838	6.8553	3.3423	8.0000	11.0000	8.3320	0.5000	1.1599	0.1490	0.6587	0.7633	0.9798	3.2749	80.0000
9 Disk 9 TD26_vg1.8_R05_CC	2.8731	1.4381	8.5251	0.5777	6.8810	3.3346	8.0000	11.0000	8.3320	0.5000	1.1588	0.1464	0.6471	0.7492	0.9811	3.2717	80.0000
10 Disk 10 TD26_vg1.8_R05_CC	2.8423	1.4123	8.5147	0.5715	6.9068	3.3269	8.0000	11.0000	8.3320	0.5000	1.1577	0.1438	0.6355	0.7350	0.9826	3.2689	80.0000
11 Disk 11 TD26_vg1.8_R05_CC	2.8115	1.3865	8.5045	0.5654	6.9326	3.3192	8.0000	11.0000	8.3320	0.5000	1.1565	0.1412	0.6239	0.7209	0.9841	3.2663	80.0000
12 Disk 12 TD26_vg1.8_R05_CC	2.7808	1.3608	8.4945	0.5592	6.9583	3.3115	8.0000	11.0000	8.3320	0.5000	1.1554	0.1387	0.6124	0.7068	0.9857	3.2641	80.0000
13 Disk 13 TD26_vg1.8_R05_CC	2.7500	1.3350	8.4848	0.5531	6.9841	3.3038	8.0000	11.0000	8.3320	0.5000	1.1542	0.1361	0.6008	0.6926	0.9874	3.2623	80.0000
14 Disk 14 TD26_vg1.8_R05_CC	2.7192	1.3092	8.4753	0.5469	7.0099	3.2962	8.0000	11.0000	8.3320	0.5000	1.1529	0.1335	0.5891	0.6785	0.9893	3.2608	80.0000
15 Disk 15 TD26_vg1.8_R05_CC	2.6885	1.2835	8.4659	0.5408	7.0357	3.2885	8.0000	11.0000	8.3320	0.5000	1.1517	0.1309	0.5776	0.6644	0.9911	3.2594	80.0000
16 Disk 16 TD26_vg1.8_R05_CC	2.6577	1.2577	8.4567	0.5346	7.0614	3.2808	8.0000	11.0000	8.3320	0.5000	1.1504	0.1284	0.5660	0.6503	0.9932	3.2584	80.0000
17 Disk 17 TD26_vg1.8_R05_CC	2.6269	1.2319	8.4477	0.5285	7.0872	3.2731	8.0000	11.0000	8.3320	0.5000	1.1491	0.1258	0.5544	0.6363	0.9953	3.2576	80.0000
18 Disk 18 TD26_vg1.8_R05_CC	2.5962	1.2062	8.4388	0.5223	7.1130	3.2654	8.0000	11.0000	8.3320	0.5000	1.1477	0.1232	0.5428	0.6222	0.9975	3.2571	80.0000
19 Disk 19 TD26_vg1.8_R05_CC	2.5654	1.1804	8.4301	0.5162	7.1387	3.2577	8.0000	11.0000	8.3320	0.5000	1.1464	0.1206	0.5312	0.6082	0.9997	3.2568	80.0000
20 Disk 20 TD26_vg1.8_R05_CC	2.5346	1.1546	8.4215	0.5100	7.1645	3.2500	8.0000	11.0000	8.3320	0.5000	1.1450	0.1180	0.5196	0.5941	1.0021	3.2567	80.0000
21 Disk 21 TD26_vg1.8_R05_CC	2.5038	1.1288	8.4132	0.5038	7.1903	3.2423	8.0000	11.0000	8.3320	0.5000	1.1435	0.1155	0.5080	0.5801	1.0046	3.2571	80.0000
22 Disk 22 TD26_vg1.8_R05_CC	2.4731	1.1031	8.4050	0.4977	7.2160	3.2346	8.0000	11.0000	8.3320	0.5000	1.1420	0.1129	0.4964	0.5662	1.0071	3.2575	80.0000
23 Disk 23 TD26_vg1.8_R05_CC	2.4423	1.0773	8.3970	0.4915	7.2418	3.2269	8.0000	11.0000	8.3320	0.5000	1.1405	0.1103	0.4848	0.5522	1.0098	3.2584	80.0000
24 Disk 24 TD26_vg1.8_R05_CC	2.4115	1.0515	8.3892	0.4854	7.2676	3.2192	8.0000	11.0000	8.3320	0.5000	1.1390	0.1077	0.4732	0.5382	1.0125	3.2594	80.0000
25 Disk 25 TD26_vg1.8_R05_CC	2.3808	1.0258	8.3816	0.4792	7.2933	3.2115	8.0000	11.0000	8.3320	0.5000	1.1374	0.1052	0.4616	0.5243	1.0154	3.2609	80.0000
26 Disk 26 TD26_vg1.8_R05_CC	2.3500	1.0000	8.3742	0.4731	7.3191	3.2038	8.0000	11.0000	8.3320	0.5000	1.1357	0.1026	0.4500	0.5103	1.0184	3.2626	80.0000

Accelerating structure TD26 CC SIC

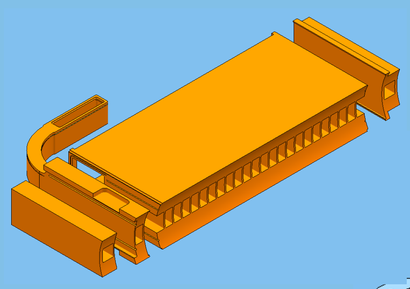
The engineering design of presented AS is based on the refined design of CLIC main linac AS [1]. The regular cell geometry is quite similar to the Tapered Damped (TDS)[2,3] geometry but with several differences, including the number of cells and design of the coupler cells. The body of accelerating structure is formed by high-precision copper disks joint by means of diffusion bonding. The structure is equipped with four vacuum manifolds and four Wakefield Monitor (WFM) waveguides. The SiC absorbers[4] into the manifold and waveguide bodies are used for effective transverse wakefield suppression.



Assembly procedure of TD26 CC SiC

Pre-assembly of manifolds

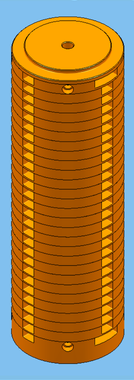
- Vacuum brazing of manifolds

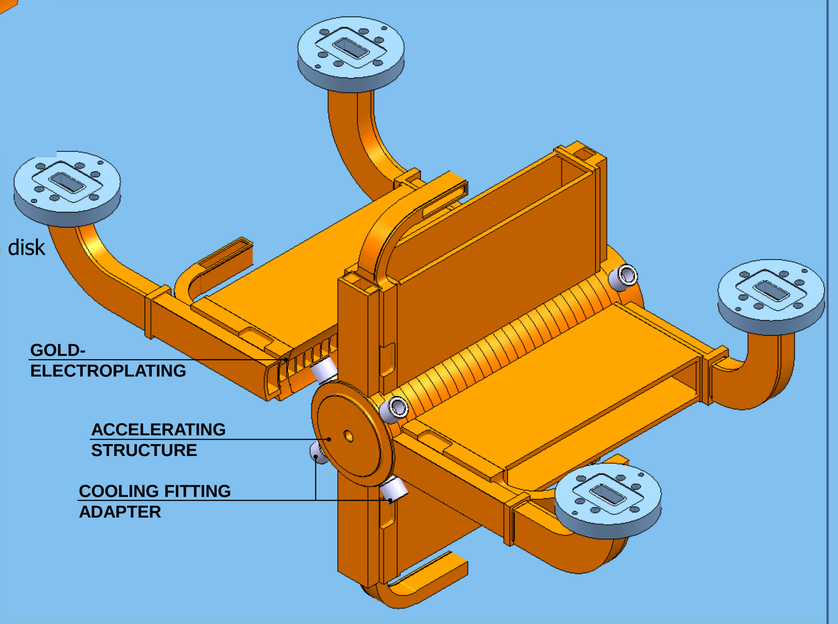


- Vacuum brazing of manifolds and bonded disk stack by means of Gold-electroplating
- Vacuum brazing of cooling fitting adapters
- Insertion and fixation of damping materials
- EBW of manifold cover
- TIG welding of vacuum flanges

Assembly

- Diffusion bonding of high precision disk

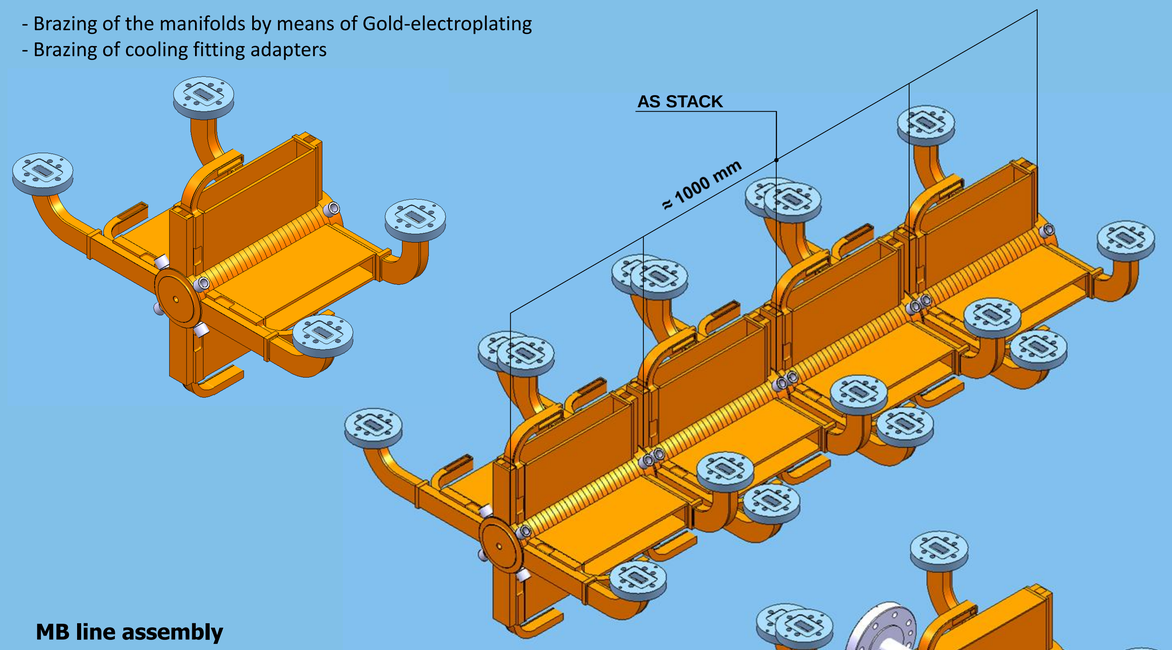




Towards to the CLIC Module

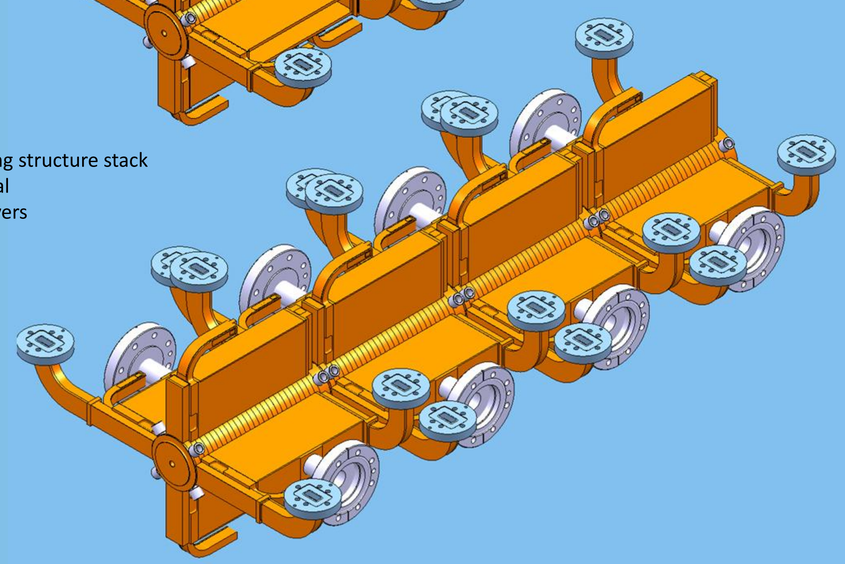
Pre-assembly of AS

- Brazing of the manifolds by means of Gold-electroplating
- Brazing of cooling fitting adapters



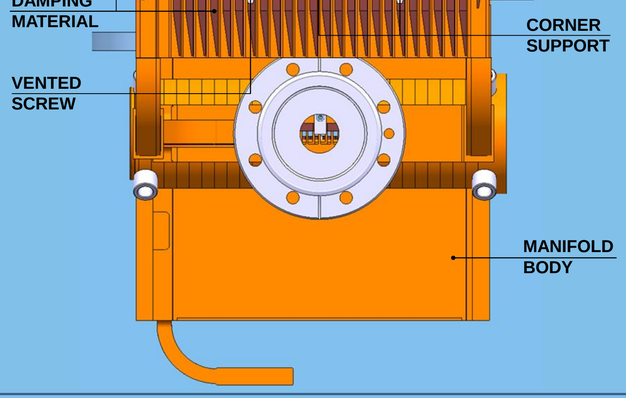
MB line assembly

- Brazing of prepared accelerating structure stack
- Installation of damping material
- Welding (EBW) of manifold covers



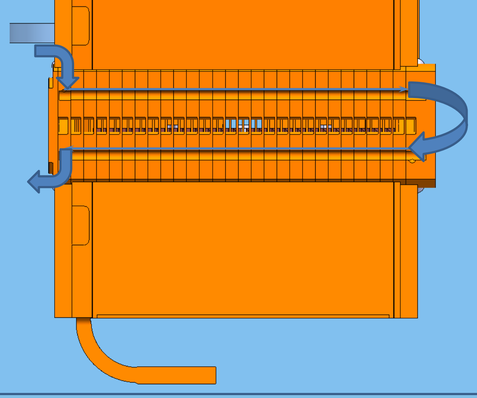
Installation of damping material

- Damping material is installed into manifold body and WFM waveguide
- The fixation is provided by corner supports screwed to the manifold body

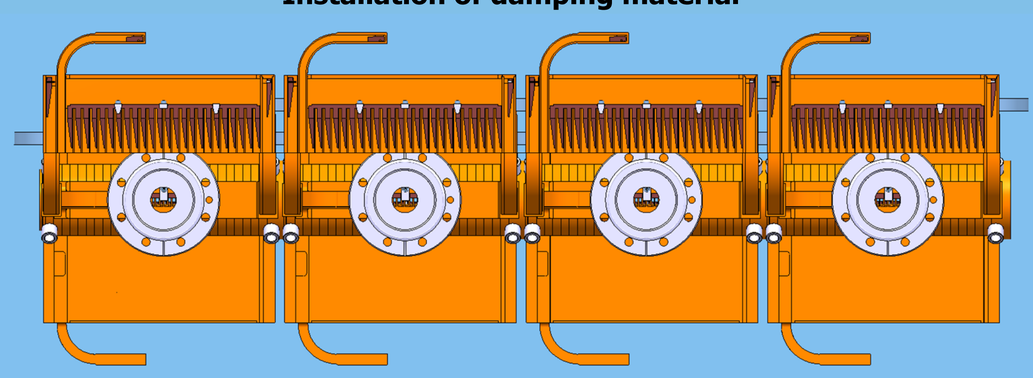


Cooling channels

- Internal cooling channels are made directly into the copper disks
- Cooling fitting adapters are used for connection of cooling tubes



Installation of damping material



CONCLUSION

The conceptual design of X-band accelerating structure TD26 CC SiC has been presented. The RF design has made consistent with manufacturing constraints and with requirements for integration of the accelerating structure in the CLIC two-beam module[5]. The supposed assembly procedure for the MB line has been shown.

ACKNOWLEDGMENT

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REFERENCES

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