Expression of Interest to join DUNE-India

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IIT Madras

DUNE-India meeting@TIFR
6th June 2025

HEP group at IITM

- The group has three faculties: Prof. Jim Libby, Prof. Prabhat Pujahari, Prof. Prafulla Kumar Behera, Ipsita (HEP-PH) and Raghuveer (HEP-PH)
- The group is part of Belle/Belle II
- The group is also actively involved in the CMS experiment.
- The group was part of the INO experiment and made significant contribution to the detector R&D, detector simulation as well as to the development of DAQ system.
- The group had also involvement of faculties from electrical engineering who contributed to the DAQ system in INO
- I am proposing to join DUNE-India from IITM to continue neutrino physics research from IITM

What can IITM offer to DUNE

- The group has dedicated detector development laboratory and resource for the simulation.
- We contributed to RPC detector for INO
- We are contributing to phase-II upgrade of Silicon tracker and High granularity Calorimeter.
- We have dedicated silicon pixel characterization facility and X-ray irradiator for radiation hardness studies.
- We will contribute to the detector construction, simulation and commissioning.
- Physics simulation and data analysis.

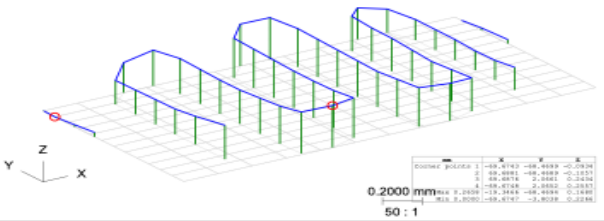
Q/C Measurements

Indian Institute of Technology Madras
Chennai-600036

Part name	**BasePlate, CMS HGCAL, Half Bottom Module**	Last 1 measurements	
Drawing number	F10179033	► Approval ≠ Blocked	
	CERN	Part ident	2
	Apr 2025	Time/Date	5/10/2025 6:41 PM
CMM Type	OI543	Run	All Characteristics
CMM No.	143123070304	Number measured values	27
Operator	Master	Number values: red	1
Text		Measurement Duration	00:00:01.0

Name	Measured value	Nominal value	+Tol	-Tol	Deviation	+/-
0.1mm Flatness	0.2658 mm	0.0000	0.1000	0.0000	0.2658	0.1658
Diameter3.05	3.0366 mm	3.0500	0.0250	-0.0250	-0.0134	
3.05 Slot Width	3.0582 mm	3.0500	0.0250	-0.0250	0.0082	
3.05 Slot Length	4.0607 mm	4.0500	0.0500	-0.0500	0.0107	
Distance65	65.0077 mm	65.0000	0.1000	-0.1000	0.0077	
Diameter3.4	3.3853 mm	3.4000	0.0500	-0.0500	-0.0147	
Distance13.68	13.6739 mm	13.6800	0.1000	-0.1000	-0.0061	
Distance10.18	10.2009 mm	10.1800	0.1000	-0.1000	0.0209	
Angle 120	120° 0' 17"	120° 0' 0"	1° 0' 0"	-1° 0' 0"	0° 0' 17"	
Angle 60	59° 59' 53"	60° 0' 0"	1° 0' 0"	-1° 0' 0"	-0° 0' 7"	
Diameter3.6_1	3.6709 mm	3.6000	0.1000	-0.1000	0.0709	
Distance73.82_1	73.8623 mm	73.8200	0.1000	-0.1000	0.0423	
Distance46.39	46.4161 mm	46.3900	0.1000	-0.1000	0.0261	
Diameter5.6	5.5753 mm	5.6000	0.1000	-0.1000	-0.0247	
Distance73.82_2	73.8690 mm	73.8200	0.1000	-0.1000	0.0490	
Distance48.39	48.4143 mm	48.3900	0.1000	-0.1000	0.0243	

Points 55
Filter type No Filter
Lc
upr
Vmess[mm/sec] 15.00
Probe radius 0.0000
Evaluation method Minimum Feature



IR4_02_ITM

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Q/C of plates Measurements

ZEISS CALYPSO
7.8.0801

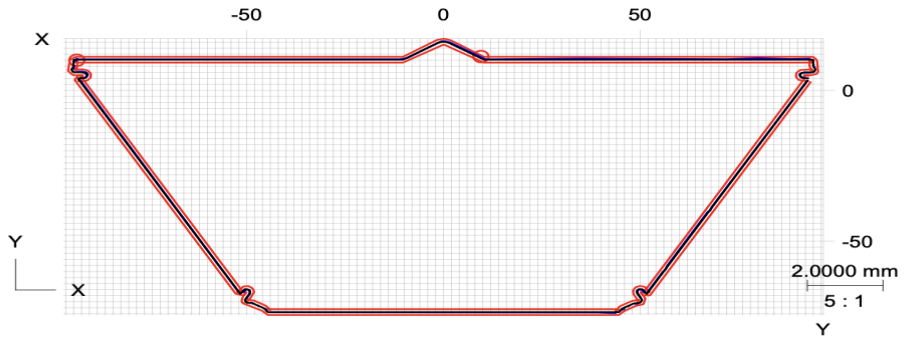
Part name	**Half Bottom BasePlateLineProfile**
Order number	1
Part ident	2
Operator	Master
Time/Date	5/10/2025 6:41 PM

Name	Measured value	Nominal value	+Tol	-Tol	Deviation	+/-
Diameter3.6_2	3.5996 mm	3.6000	0.1000	-0.1000	-0.0004	
Distance72.09	72.1894 mm	72.0900	0.1000	-0.1000	0.0994	
Distance49.39	49.4135 mm	49.3900	0.1000	-0.1000	0.0235	
Diameter2	1.9624 mm	2.0000	0.1000	-0.1000	-0.0376	
Distance66.74	66.7192 mm	66.7400	0.1000	-0.1000	-0.0208	
Distance50.08	50.0675 mm	50.0800	0.1000	-0.1000	-0.0125	
Distance73.47	73.4837 mm	73.4700	0.1000	-0.1000	0.0137	
Diameter5	5.0135 mm	5.0000	0.1000	-0.1000	0.0135	
Distance2.0	1.9837 mm	2.0000	0.1000	-0.1000	-0.0163	
2mm Slot Angle 60	60° 20' 28"	59° 41' 59"	1° 0' 0"	-1° 0' 0"	0° 38' 29"	
0.2mm Outer Profile	0.1648 mm	0.0000	0.2000	0.0000	0.1648	

Points	740
Filter type	No Filter
Lc	
Vmess[mm/sec]	
Probe radius	0.4015
Evaluation method	Nominal Vector Direction

Best Fit

	Translation	Rotation
X	0.0000	0° 0' 0"
Y	0.0000	0° 0' 0"
Z	0.0000	0° 0' 0"



Text

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What we learn from first Production

- Flatness variation will be categorized as we per recommendation tolerances. (Flatness variation> 0.4 (Not Usable)).
- New design have **surface profile tolerance** 0.2 mm. We have measured line profile (excluding corners) < 0.2mm.
- Other than this we don't see any difficulty.
- We have produced 12 plates and did the measurements.
- We will move to other parts and do the QC

Production plan

Cut deadline	Five	BLT	FHT	FLT	LLT	RLT	THT	TLT	# BP	# BP / month
1/1/2025	0	0	0	0	0	0	0	0	0	0
2/1/2025	0	0	0	4	0	0	0	0	4	4
2/1/2025	32	2	0	88	0	0	0	0	122	118
3/1/2025	62	13	0	197	0	0	0	17	289	167
4/1/2025	109	20	0	344	25	13	0	49	560	271
5/1/2025	153	34	35	674	26	26	3	89	1040	480
6/1/2025	201	55	109	1256	34	38	9	120	1822	782
7/1/2025	239	75	164	1701	40	51	15	151	2436	614
8/1/2025	288	92	230	2146	47	62	21	175	3061	625
9/1/2025	334	117	305	2955	55	77	27	214	4084	1023
10/1/2025	384	135	370	3629	62	87	34	240	4941	857
11/1/2025	429	165	485	4353	69	100	44	291	5936	995
12/1/2025	487	186	520	4820	69	108	47	331	6568	632
1/1/2026	549	215	624	5691	82	128	57	373	7719	1151
2/1/2026	599	239	693	6388	87	143	63	407	8619	900
3/1/2026	605	268	797	7249	88	158	72	453	9690	1071
4/1/2026	605	291	866	7951	88	164	79	479	10523	833
5/1/2026	605	315	970	8505	88	164	88	479	11214	691
6/1/2026	605	315	970	8505	88	164	88	479	11214	0

May 2025

June 2025

July 2025

August 2025

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Fabricated parts

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First batch is shipped to KIT

Cut deadline	Five	BLT	FHT	FLT	LLT	RLT	THT	TLT	# BP	# BP / month
1/1/2025	0	0	0	0	0	0	0	0	0	0
2/1/2025	20	13	0	48	0	0	0	17	4	4
2/1/2025	[illegible]	[illegible]	0	[illegible]	0	0	0	[illegible]	122	118
3/1/2025	62	13	0	197	0	0	0	17	289	167
4/1/2025	109	20	0	344	25	13	0	49	560	271
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5/1/2026	605	315	970	8505	88	164	88	479	11214	691
6/1/2026	605	315	970	8505	88	164	88	479	11214	0

What next

- Full report has been generated for each parts.
- We will send second batch ~100 base plates.
- We are learning to use DB (Thanks Jay and Ludivine). Two students will be in charge (Anusree Vijay and Ganapati Dash)
- In July: we are expecting to deliver 400 Ti base plates.
- August: 500 base plates.
- The rejection of base plate is high, due to bending in the sheet.
- We expect to ramp one we go through the initial phase of production (mostly learning curve)
- We will prepare the table for the delivery for the rest.