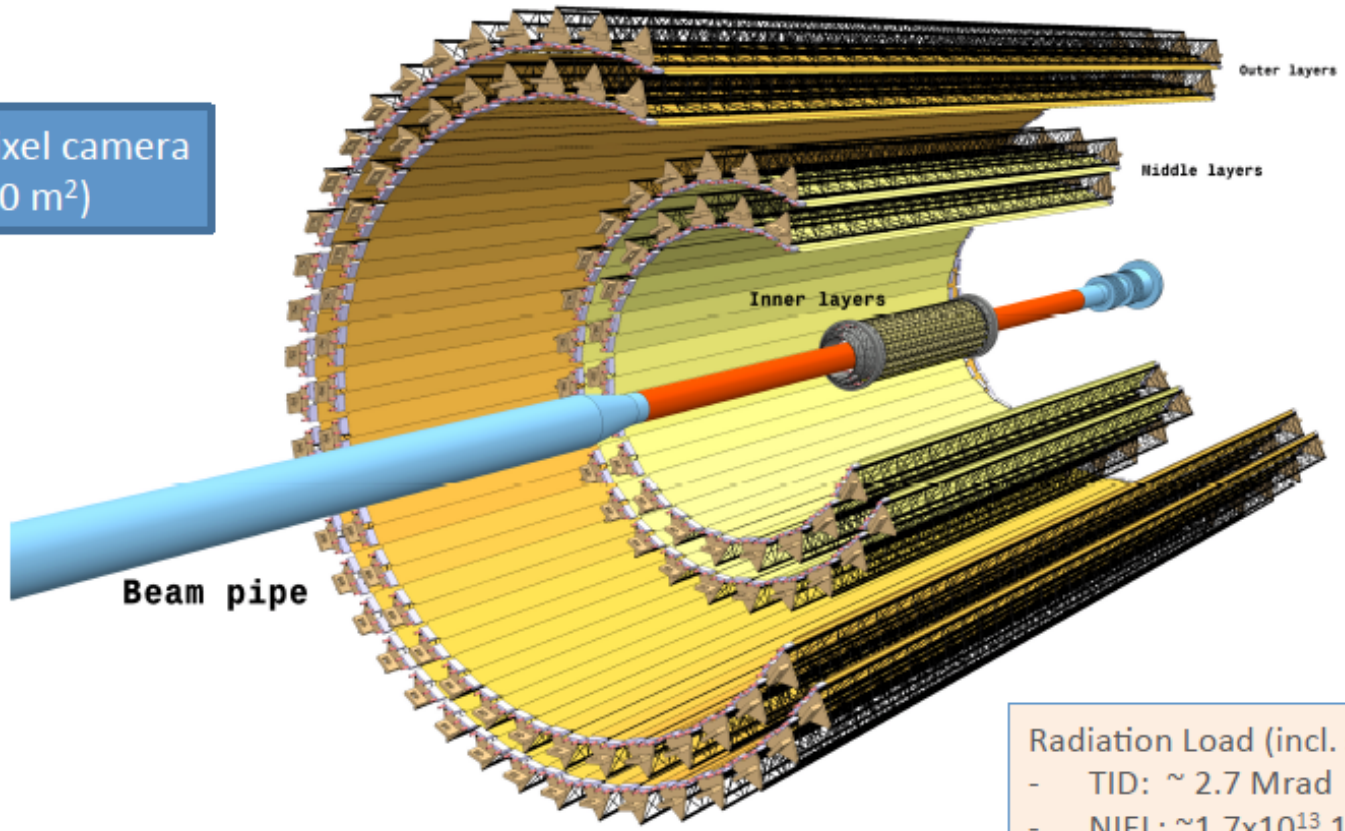
New ITS Layout

A Large Ion Collider Experiment

ALICE

12.5 G-pixel camera
(~10 m²)



Radiation Load (incl. safety factor 10)
- TID: ~ 2.7 Mrad
- NIEL: ~1.7×10^{13} 1MeV n_{eq} / cm^2

7-layer barrel geometry based on CMOS Sensors

r coverage: 23 – 400 mm

η coverage: $|\eta| \leq 1.22$
for tracks from 90% most luminous region

3 Inner Barrel layers (**IB**)

4 Outer Barrel layers (**OB**)

Material /layer : 0.3% X_0 (IB), 1% X_0 (OB)

Milestones – ALPIDE, IB & OB Staves

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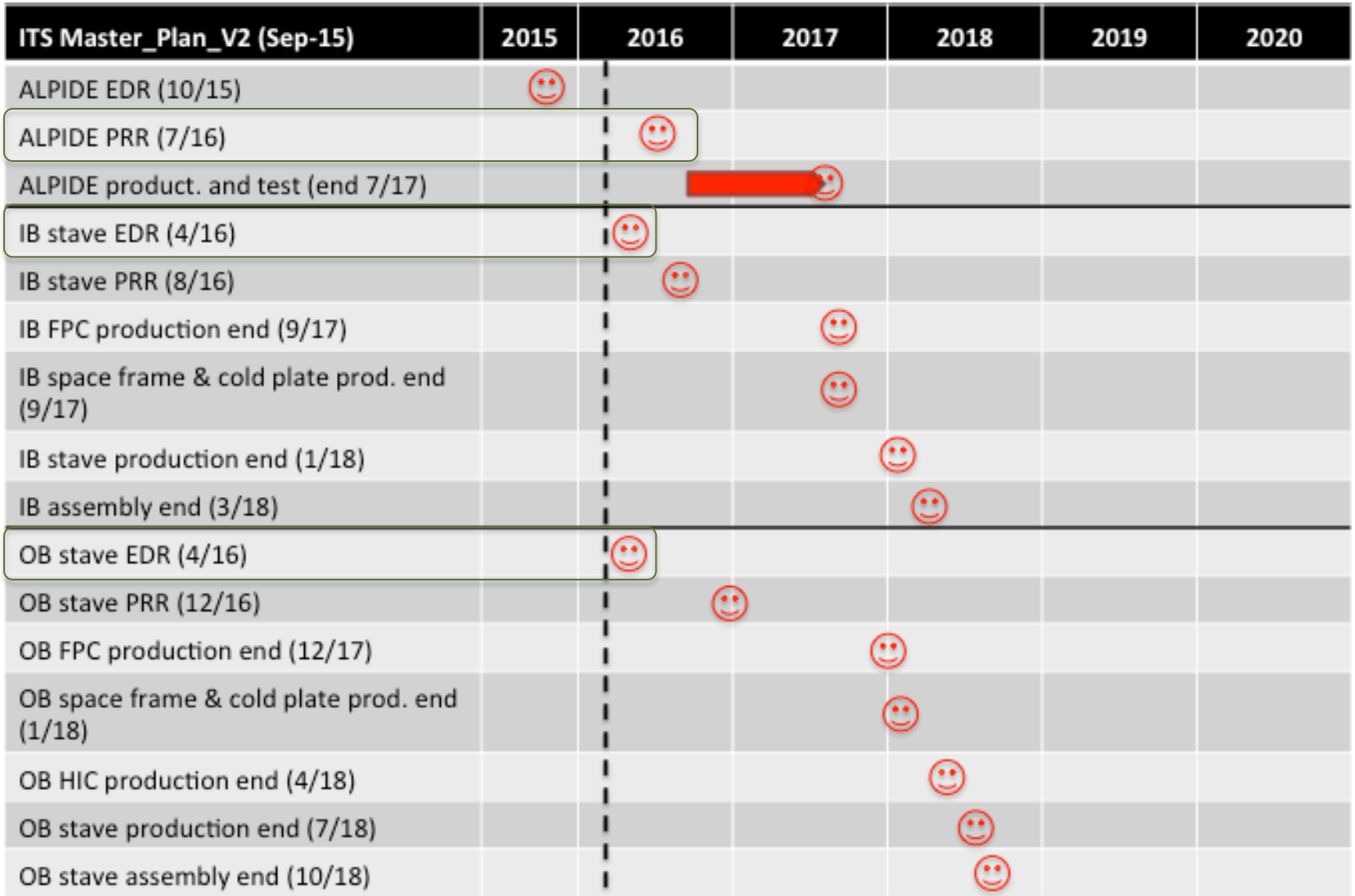


Cost breakdown

ALICE

Activity	Material Costs	Manpower Costs	TOTAL COST / ITEM
1. Pixel Chip	4847	170	5017
1.1 CMOS Wafers	3611		3611
1.2 Thinning & Dicing	800		800
1.3 Series test	436	170	606
2 Inner Barrel	296	262	558
2.1 FPC (construction and test)	23	13	36
2.2 HIC (assembly and test)	250	150	400
2.3 SF & Cold Plate (constr. and test)	3	43	46
2.4 Stave assembly & test	20	56	76
3 Outer Barrel HIC	1447	1118	2565
3.1 FPC (construction and test)	247	88	335
3.2 HIC (assembly and test)	1200	1030	2230
4 Middle Layers Staves	142	322	464
4.1 Powerbus cables	70	3	73
4.2 SF & Cold Plate (constr. and test)	42	113	155
4.3 Stave assembly & test	30	206	236
5 Outer Layers Staves	284	896	1180
5.1 Powerbus cables	127	33	160
5.2 SF & Cold Plate (constr. and test)	97	245	342
5.3 Stave assembly & test	60	618	678

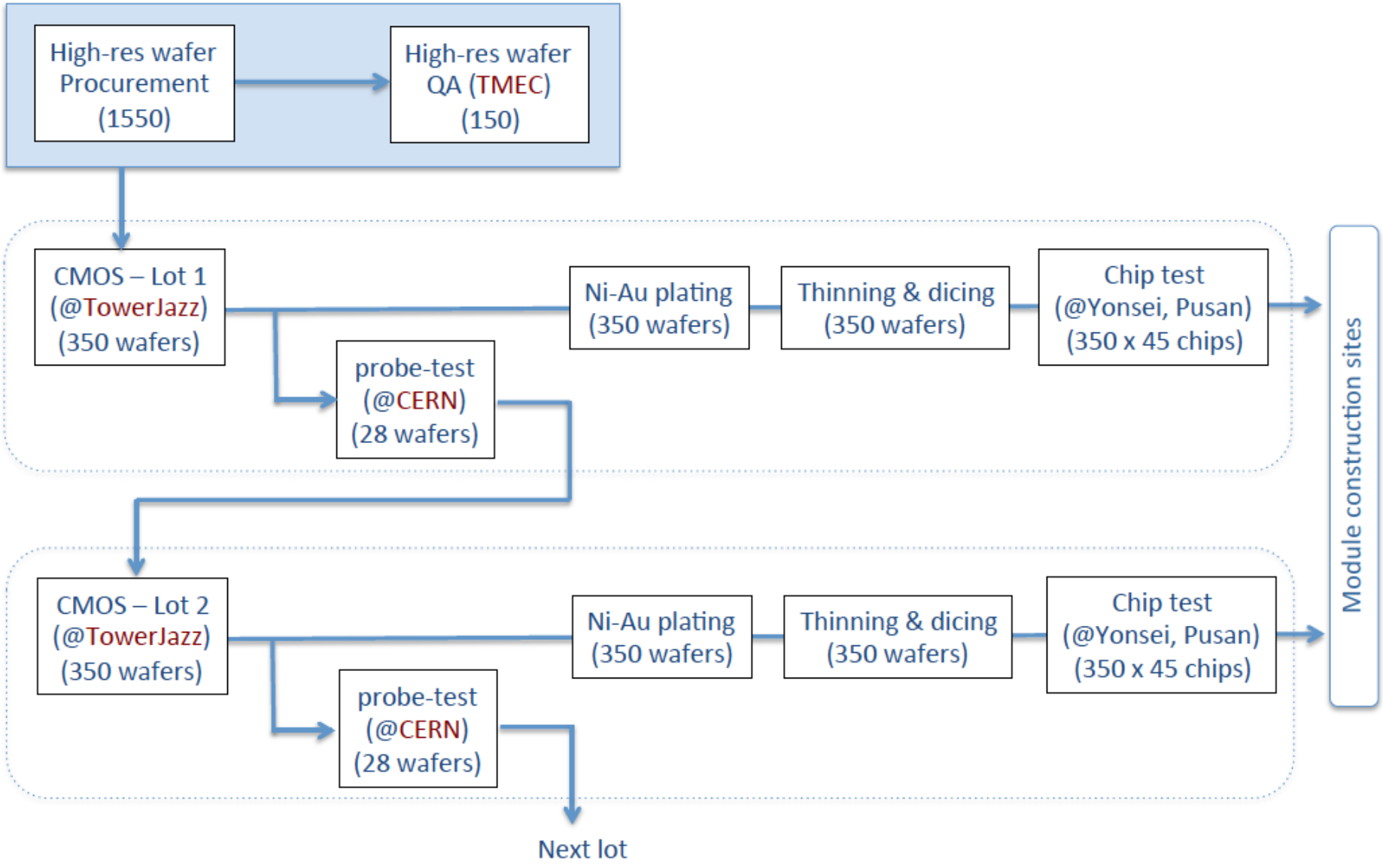
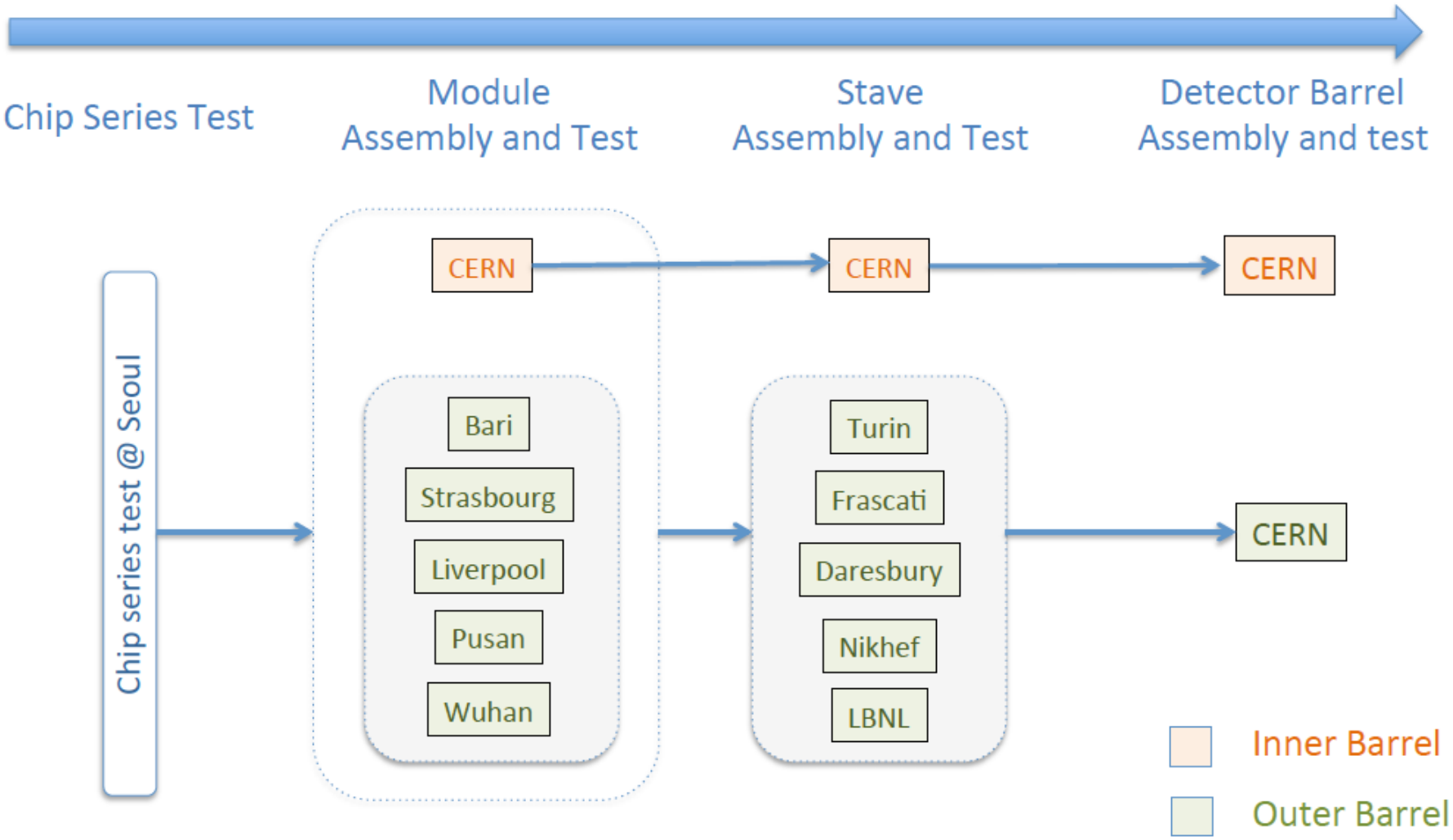
Cost breakdown

Activity	Material Costs	Manpower Costs	TOTAL COST / ITEM
6 Inner Barrel Global Assembly	70	156	227
6.1 End-Wheels (E-W)	4	30	34
6.2 Assembly of Staves on E-W	16	12	28
6.3 Cylindrical Structural Shell	1	10	11
6.4 Detector Half-Barrels	6	7	13
6.5 Service Half-Barrels	36	84	120
6.6 Detector + Service Half-Barrels	7	14	21
7 Outer Barrel Global Assembly	135	407	542
7.1 ML End-Wheels	13	50	63
7.2 ML Assembly of Staves on E-W	10	21	31
7.3 OL End-Wheels	23	59	82
7.4 OL Assembly of Staves on E-W	12	32	44
7.5 Conycal Structural Shell	8	62	70
7.6 Cylindrical Structural Shell	20	55	75
7.7 Detector Half-Barrels	7	13	20
7.8 Service Half-Barrels	36	85	121
7.9 Detector + Service Half-Barrels	7	30	37
8 Integration in ALICE	91	262	354
8.1 Cage	61	153	215
8.2 Installation Tooling	30	109	139

Cost breakdown

Activity	Material Costs	Manpower Costs	TOTAL COST / ITEM
9 Readout Electronics	715	50	765
9.1 Data e-Links	82	50	132
9.2 Patch-panels	20		20
9.3 Readout Unit	469		469
9.4 Optical Links	144		144
10 Power distribution	1149	50	1199
10.1 Power Supplies	750		750
10.2 Power Distribution	242	50	292
10.3 Power Regulation	157		157
11. DCS	150		150
12. Cooling	620	0	620
12.1 Water Cooling Plant	470		470
12.2 Ventilation Humidity Plant	150		150
GRAND TOTAL	9947	3693	13640

Pixel chip production flow chart



Module and Stave production flow chart