

# ALICE3-TOF

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**Update con the cost estimate and related matters  
for the Scoping Document**

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# Project time profile



- Needs to be updated to better allocate space for the assembly

# Total cost of production

Component	Description	Cost (MCHF)
<b>Sensors (monolithic)</b>	45 m <sup>2</sup> / 0.9 (overlap) / 0.5 (fill factor * yield) 110 m <sup>2</sup> , 1600 12" wafers * 2.5 kCHF / wafer	4,0
<b>Sensors (LGADs)</b>	LGADs: 50 m <sup>2</sup> * 220 kCHF / m <sup>2</sup> = 11 MCHF Readout: 1600 12" wafers * 1.5 kCHF / w. = 2.4 MCHF Small readout chips: ~0.5 MCHF Bump bonding ~2.2	15,6
<b>Module assembly</b>	8000 modules * 400 CHF / module	3,2
<b>Module integration</b>	Module on detector mounting	1,0
<b>Mechanics</b>		1,2
<b>Cooling</b>	Water cooling incl. piping	1,0
<b>Read-out</b>	2 kCHF * 640 twin-ax → 1300 kCHF (32 iTOF, 400 oTOF layers, 168 oTOF disks) 380 read-out units (5.1 kCHF) → 1900 kCHF 50 CRUs (6 kCHF) → 300 kCHF	3,5
<b>Power</b>	336 + 136 ch → 80 PSUs → 0.9 MCHF 2 * 472 cables → 1 MCHF	1,9
	PSUs (1), cables (0.6), power regulation (0.5), ...	
<b>Services</b>	Ventilation (0.5), DSS (0.5), DCS (0.5), ...	1,5
<b>Total</b>		<b>17,3</b>

- Cost of the production phase (not R&D) reviewed and updated [here](#)
- Items for which we do NOT have reviewed the costs yet:
  - Services (ventilation, DSS and DCS)
  - Mechanics
- Caveat: **here a surface of 45 m<sup>2</sup> is assumed** (as in the LoI) → if this increases (as in the new layout) the costs need to be updated

# Time profile of costs (production)

Production									
Monolithic 8" Production run	3600	Rescaled from ITS3 65 nm production (Lol ITS3)							
Monolithic 12" Production run	4000								
LGAD Production run	15600								
Mechanics	1200								
Cooling Plant	1000								
Readout	3500	Assuming a data transfer rate of 10 Gbps with IpGBT (to be checked: 7.68 Gbps). Cost of CRUs (6 kCHF) needs to be checked as well							
Power Distribution	1900								
Services (ventilation, DSS, DCS)	1500	From the Lol, needs to be checked with Upgrade Coo							
Module integration	1000								
Module assembly	3200								
<b>Sum</b>	<b>17300</b>								

- Readout constraint will follow from ALICE3-TC and DAQ:  
<https://indico.cern.ch/event/1267757/contributions/5353334/attachments/2644349/4578351/20230510ALICE3electronics.pdf>

# Time profile of costs (production)

	2023	2024	2025	2026	2027	2028
	Run 3			LS3		
<b>Production</b>						
Monolithic 8" Production run						
Monolithic 12" Production run						
LGAD Production run						
Mechanics						200
Cooling Plant						
Readout						
Power Distribution						
Services (ventilation, DSS, DCS)						
Module integration						
Module assembly						
<b>Sum</b>	0	0	0	0	0	200

	2029	2030	2031	2032	2033	2034	Sum
	Run 4				LS4		
		3600					3600
		4000					4000
		15600					15600
	1000						1200
	1000						1000
		3500					3500
		1900					1900
	1500						1500
			250	250	250	250	1000
			800	800	800	800	3200
	3500	9400	4200	0	0	0	17300

- Distribution follows the [timeline](#) of the project

# Time profile of costs (R&D)

	2023				2024				2025				2026				2027				2028			
	Run 3												LS3											
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<b>R&amp;D</b>																								
Engineering Run for Monolithic	ER0 (ARCADIA)				ER1				ER2				ER3				ER4				ER5			
Monolithic 8"					250				250				250				250							
Monolithic 12"					600				600				600				600				600			
Engineering Run for LGAD					ER1				ER2															
LGAD					50				50															
Sensor testing				30		30		30		30		30		30		30		30		30		30		30
Mechanics Prototyping																								
Cooling Plant																								150
Readout								50				50				50				50				200
Services (ventilation, DSS, DCS)																								
Module assembly																								
<b>Sum</b>	<b>0</b>				<b>960</b>				<b>1010</b>				<b>960</b>				<b>960</b>				<b>1060</b>			

2029				2030				2031				2032				2033				2034				Sum	Comments
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4																		
																						0			
																						1000			
																						3000			
																						0			
																						100			
																						300	Both for Monolithic and LGADs		
																						0			
																						150	Assuming synergy with tracker		
																						200	Assuming 4 prototypes of RU for an individual cost of 50 kCHF. R&D on twin-ax needs to be added		
																						200	From the Lol, needs to be checked with Upgrade Co		
																						0			
																						0			
																						<b>4950</b>			

- R&D costs that needs to be assessed:
  - Mechanics Prototyping
  - Module Assembly
  - Services (ventilation, DSS, DCS)



# Personnel and lab resources

- SD should include “Information on the **availability of the required appropriate human resources, technical infrastructure and laboratory capacity** in the collaboration to carry out the project with sufficient contingency.”
- For each subsystem and for the main elements of the Schedule (design, prototyping/testing, production/construction):
  - **required** personnel in terms of FTEs for technician, engineer, physicist
  - **required** lab spaces (clean rooms of various classes and sizes)
  - This should allow to make time profile of these resource requirements
- Then we need a table of expected personnel FTE and labs, per country in the subsystem. Maybe per institute for the largest clean rooms.