

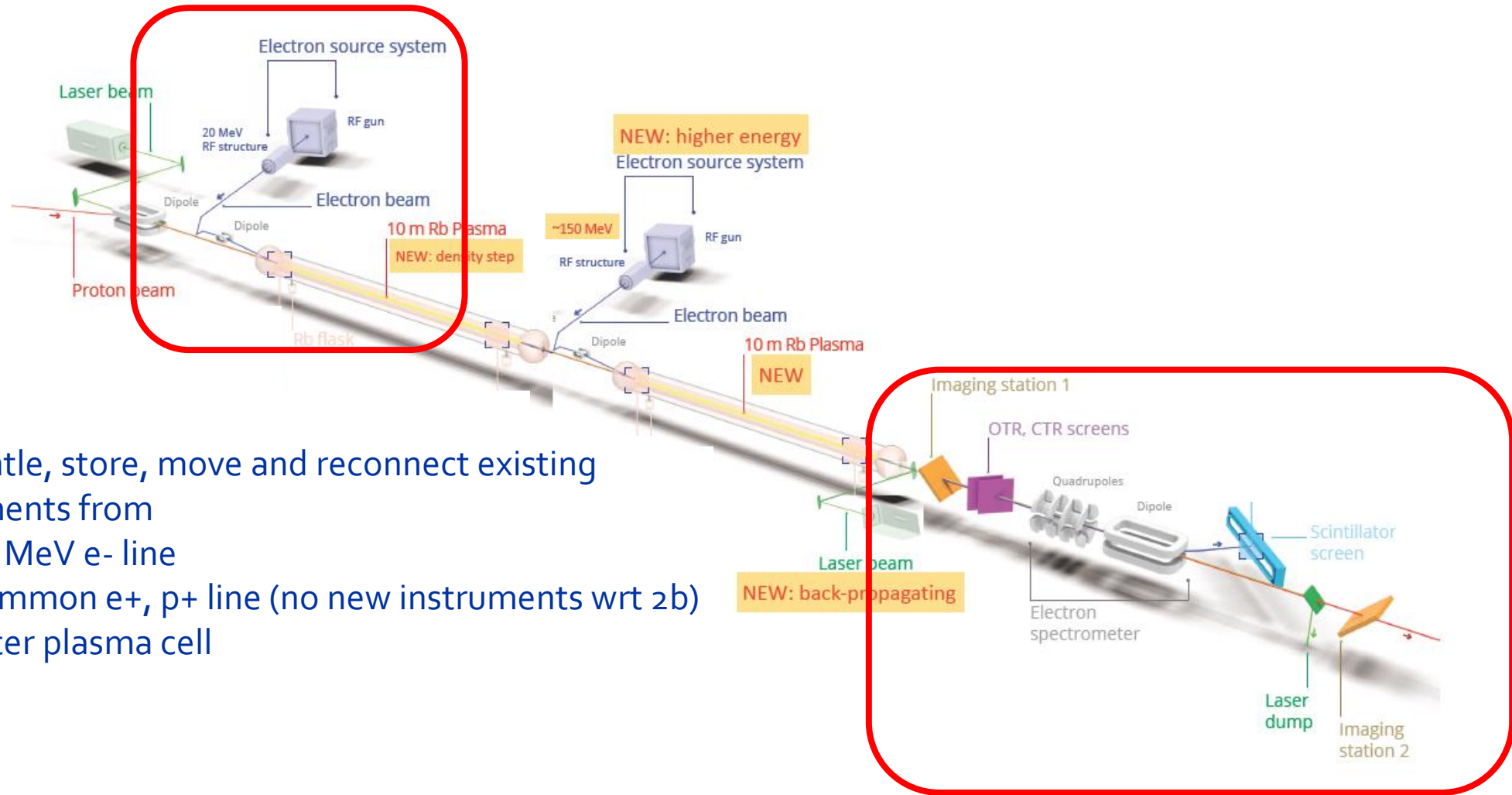


Beam Instrumentation for **AWAKE** run 2c

S. Mazzoni for the BI team

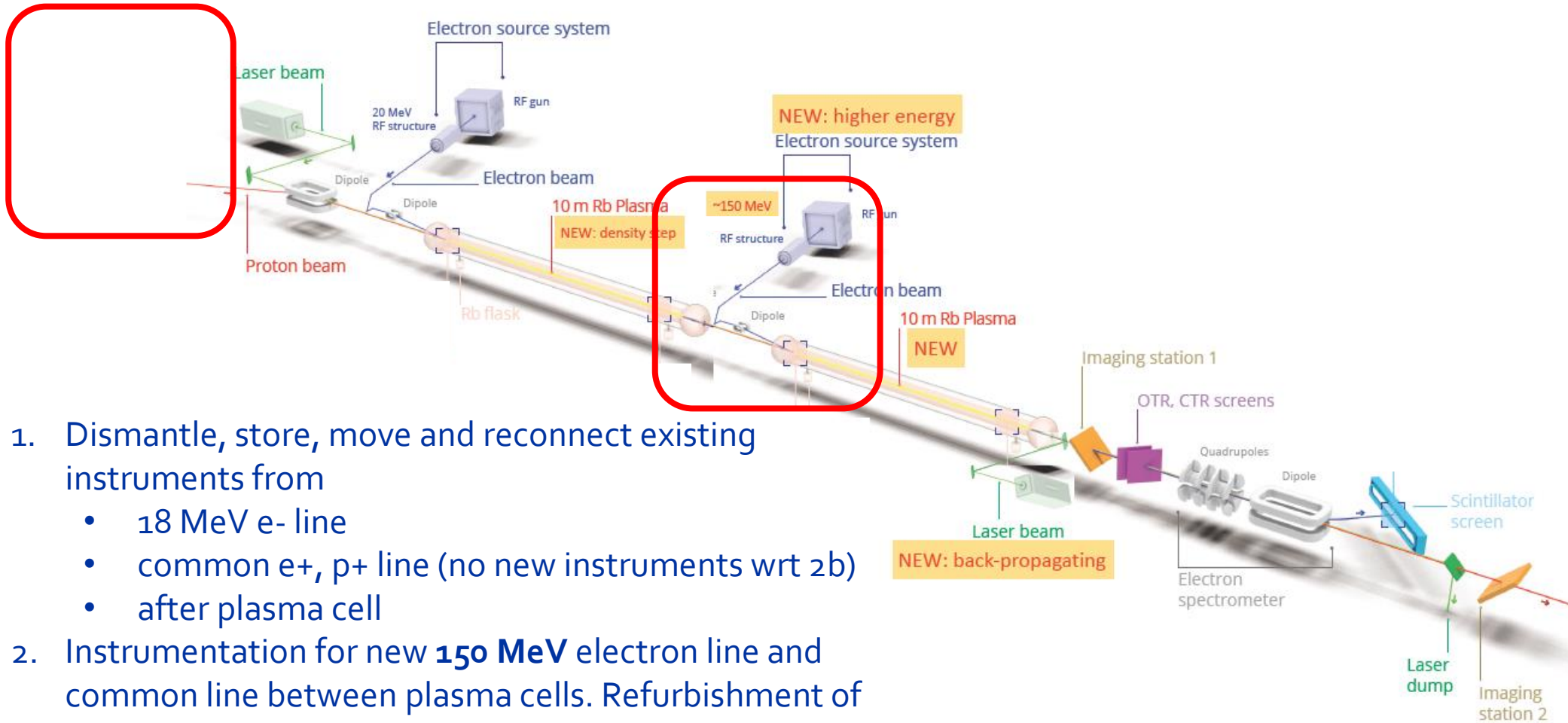
AWAKE run 2c kick off mtg, 16/7/2024

Beam instruments for Run 2c



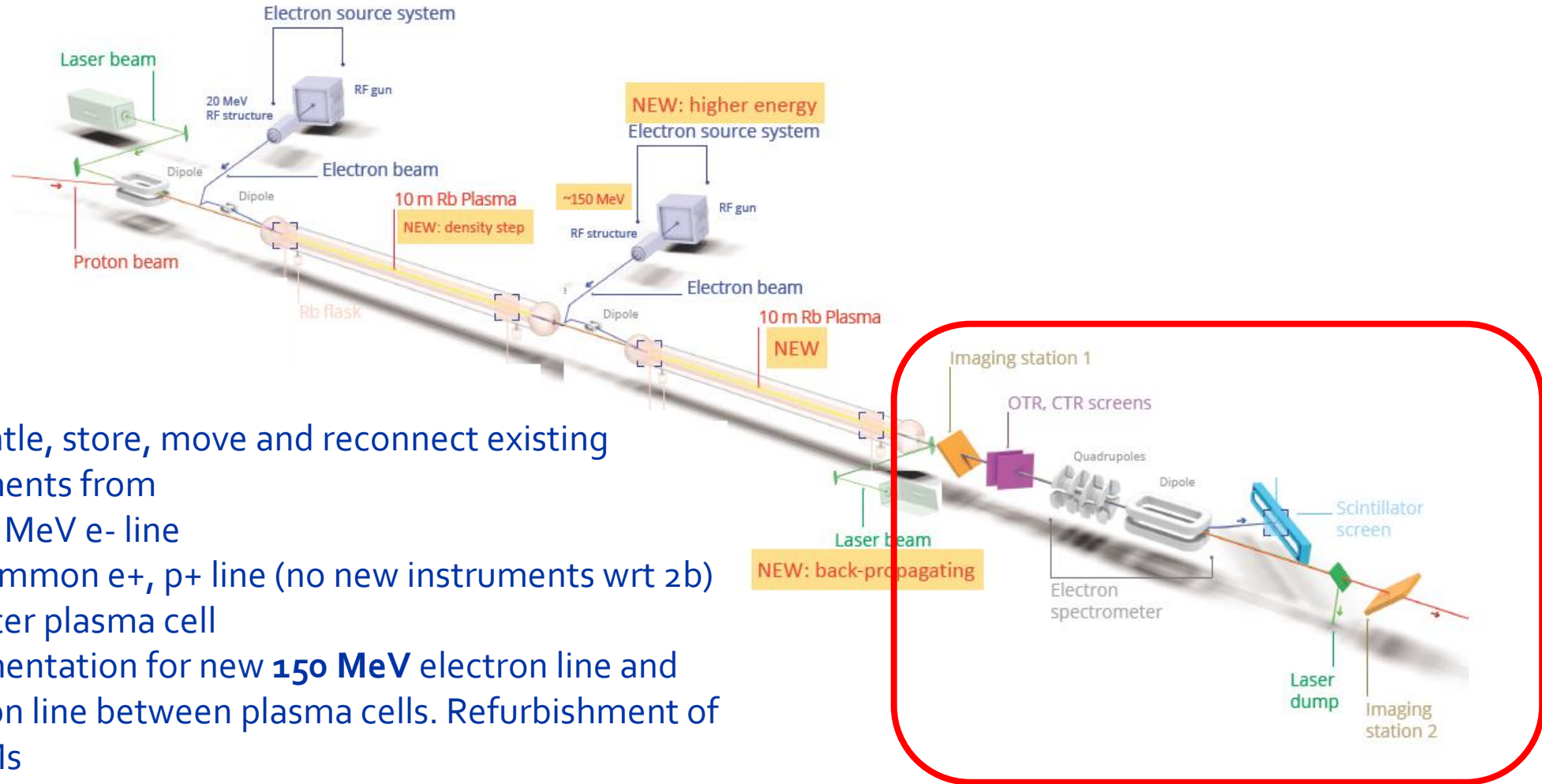
1. Dismantle, store, move and reconnect existing instruments from
 - 18 MeV e- line
 - common e+, p+ line (no new instruments wrt 2b)
 - after plasma cell

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2. Instrumentation for new **150 MeV** electron line and common line between plasma cells. Refurbishment of p+ BPMs

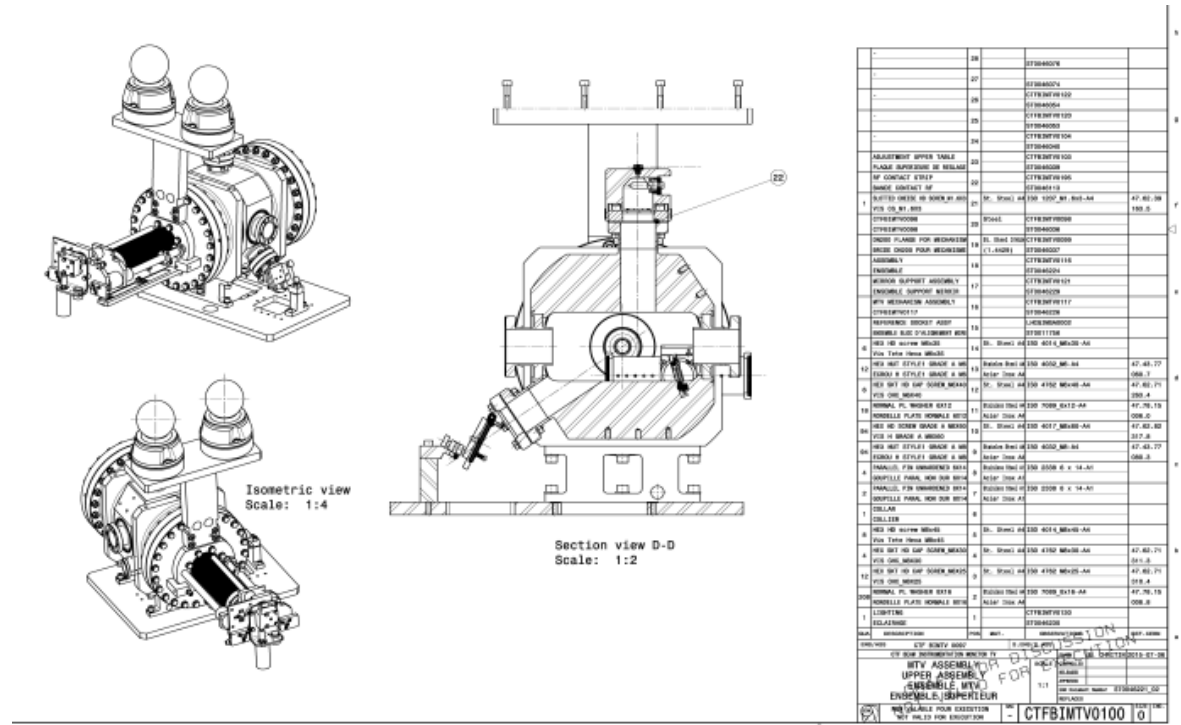
Beam instruments for Run 2c



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2. Instrumentation for new **150 MeV** electron line and common line between plasma cells. Refurbishment of p+ BPMs
3. Instrumentation for post acceleration diagnostics

New instrumentation for 150 MeV line: BTVs

- 3+4 BTVs for new e- line gun and dogleg respectively. 1 BTV in gun with intensified camera
- present requirement for beam size: resolution up to 1 um (can be achieved with very small field of view of typically 2 mm and OTR PSF technique – not a standard BTV).
- New design based on existing BTV design



New instrumentation for 150 MeV line: BPMs

- 3+12 BPMs for new e- line gun and dogleg respectively.
- present requirement 10 um resolution provided that BTVs have 1 um resolution
- **Present plan: replicate TRIUMF stripline BPMs**
 - existing design, <10 um resolution
 - two design exist; 40 and 60 mm aperture. Need to agree on what goes where
 - One acquisition system for all BPM systems: Based on HL-LHC system

Refurbishment of p+ BPMs

- **20 BPMs installed in SPS extraction line.** Electronics is a prototype version of ALPS system (SPS)
- For Run 2c: **refurbishment of acquisition electronics with HL-LHC type:**
 - improvement of resolution from 70 μm to (expected) 20 μm
 - adopt a standard CERN system

BLMs

- present BLMs need to be refurbished. Additional ones due to longer p+ line
- Estimated is between 12-15 new systems.

Contribution from Institutes

- Collaboration from institutes is **needed** !
- 200 fs Bunch length monitor
 - coherent ChDR – Manchester (PhD of C. Davut), RHUL (P. Karataev). First results from CLEAR tests in 2022
 - coherent TR / SR imaging – Liverpool
 - EOSD – CERN
- Emittance monitor
 - betatron radiation – Manchester
 - OTR based - DMD or microlens array-based. Ongoing tests
 - spectrometer – UCL

	what	total	2022	2023	2024	2025	2026	2027	Total	Total 2024-2027
Run 2a +2b										
material	completion of ChBPM	50	35	15					50	
	completion of HF BPM	50	35	15					50	
	proton bunch centroid demonstrator	30	15	15					30	
	fixed costs	60	30	30					60	
personnel	Junior fellow	120	60	60					120	
Run 2c										
	spending profile		0	0.1	0.3	0.3	0.2	0.1	1	
	e line BTVs	244.5			0		122.25	122.25	244.5	886.5
	e line BTV cables	36			0	0	0	36	36	
	e line BPM body	150			0	75	75	0	150	
	e line BPM electronics	408			0	163.2	81.6	163.2	408	
	e line BPM cables	48			0	0	0	48	48	
	BCT	19			0	0	0	19	19	
	BLMs	252			0	0	126	126	252	
	existing e line BPM electronics	288			0	115.2	57.6	115.2	288	
	p+BPM R&D	100		33	0	33	33	33	132	
	p+ BPM production	480			0	192	96	192	480	
	fixed costs	120	0	0	30	30	30	30	120	
	personnel	Fellow in PM section	720	120	120	120	120	120	120	720
Origin tech in ML		160	0	0	0	0	80	80	160	
Fellow in BP section		600		120	120	120	120	120	600	
Origin Tech in BP section		160	0	0	0	80	80	0	160	
QUEST in SW section		240					120	120		
	total per year Run 2ab: material		115	75	0	0	0	0	190	
	total per year Run 2ab: personnel		60	60	0	0	0	0	120	
	Total Run 2ab		175	135	0	0	0	0	310	
	total per year Run 2c: material		0	33	30	608.4	621.5	884.7	2177.6	
	total per year Run 2c: personnel		120	240	240	320	400	320	1640	
	Total run 2c		120	273	270	928.4	1021.5	1204.7	3817.6	3425
	Total material per year		115	108	30	608.4	621.5	884.7	2367.6	2144.6
	Total personnel per year		180	300	240	320	400	320	1760	1280
	TOTAL PER YEAR		295	408	270	928.4	1021.5	1204.7	4127.6	3424.6
	With carry over 2024 (811kCHF)				541.7	628.4	779.8	1204.7		
						GRAND TOTAL	4127.6 kCHF			
						GRAND TOTAL 202	3424.6 kCHF			

