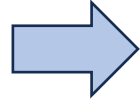


CERN Linear
Electron
Accelerator
for Research

R. Corsini
for the CLEAR
Team

The running cost of the new facility can be estimated at about 700 kCHF/year (including M to P), with the following distribution:

From the original [CLEAR proposal](#)



<i>Cost-item</i>	<i>kCHF/year</i>
RF (including M to P)	240
Vacuum	20
Power converters	10
Cabling, diagnostics, controls (including M to P)	70
Laser cathodes (including M to P)	110
Personnel for operation maintenance and installation support (M to P)	220
Contingency, travels, visitors support	30
Total	700

	2017	2018	2019	2020	2021	2022	2023
RF	340	253	175	56	87	109	92
Others*	30	97	82	79	48	64	92
Laser/cathodes	40	75	78	48	61	105	127
Personnel**	205	260	304	266	280	281	308
TOTAL	595	685	639	449	479	560	610

*Vacuum, power converters, cabling, diagnostics, controls, consumables...

** students/Associates/FSUs

N.B.: average yearly budget 2017 – 2023 = 574 kCHF.

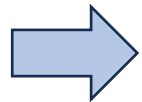
To be added, about 2 FTE/year fellow funding (~220 kCHF) ⇒ ~ 800 kCHF

- Initial request (and initial allocation):
 - 800 kCHF/year = about 650 kCHF/year “material” + 1.5 Fellow on average
- Allocation 2017-2023:
 - 750 – 790 kCHF/year

Medium-Term Plan for the period 2024-2028

- MTP (2023)

Figure 6: Scientific projects



Fact sheet	(in MCHF, 2023 prices, rounded off)	Revised 2023 Budget	2024	2025	2026	2027	2028	Total 2023-2028
	Scientific projects	320.4	346.9	325.3	295.4	227.5	174.5	1 690.0
21	HL-LHC upgrade	142.2	148.7	127.2	129.1	86.6	50.3	684.1
	Staff	40.9	38.7	36.5	34.9	29.8	17.4	198.2
	Materials	101.3	110.0	90.8	94.2	56.8	32.9	486.0
22	LHC detectors upgrades	71.0	67.4	55.1	47.7	37.8	30.6	309.7
	LHC detectors upgrades (Phase-1) and consolidation	1.2	3.2	1.0	2.1	2.2	2.2	11.8
	Staff	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	Materials	1.2	3.2	1.0	2.1	2.1	2.1	11.6
	LHC detectors upgrades (Phase-2) and R&D	69.8	64.2	54.1	45.6	35.7	28.5	297.9
	Staff	24.7	25.3	24.5	22.4	20.5	18.1	135.3
	Materials	45.2	38.9	29.7	23.3	15.2	10.4	162.6
23	Future colliders studies	27.9	36.4	35.2	23.9	23.7	33.8	180.8
	Linear collider	4.5	4.1	3.8	3.7	3.8	4.4	24.2
	Staff	1.6	1.8	1.9	2.1	2.1	2.1	11.6
	Materials	2.8	2.3	2.0	1.6	1.7	2.3	12.6
	Future Circular Collider	20.7	29.2	28.3	18.2	18.3	27.0	141.8
	Staff	9.4	10.2	9.9	9.3	8.4	8.5	55.6
	Materials	11.3	19.0	18.5	9.0	9.9	18.6	86.2
	Muon colliders	2.7	3.1	3.0	2.1	1.7	2.3	14.9
	Staff	1.2	1.2	1.2	1.1	1.0	1.0	6.7
	Materials	1.5	1.9	1.8	1.0	0.7	1.3	8.2
24	Accelerator technologies and R&D	32.9	47.2	49.0	43.5	48.3	32.7	253.6
	RF technologies R&D	4.2	9.2	13.7	9.0	14.7	4.4	55.2
	Staff	0.8	0.8	0.8	0.8	0.8	0.6	4.6
	Materials	3.4	8.4	12.9	8.2	13.9	3.8	50.6
	High field superconducting accelerator magnets R&D	17.2	23.2	23.1	25.3	25.1	22.4	136.2
	Staff	3.2	3.6	3.7	4.9	4.8	7.2	27.4
	Materials	14.0	19.7	19.4	20.3	20.2	15.1	108.8
	Proton-driven plasma wakefield acceleration (AWAKE)	5.4	9.2	7.4	5.3	4.7	2.1	34.1
	Staff	1.1	1.2	1.2	1.2	1.2	1.1	6.9
	Materials	4.3	8.1	6.2	4.1	3.4	1.0	27.1
	CERN Linear Electron Accelerator for Research (CLEAR)	1.5	1.6	1.6	1.6	1.5	1.3	9.2
	Staff	0.8	0.8	0.9	0.9	0.8	0.5	4.7
	Materials	0.7	0.8	0.8	0.8	0.8	0.8	4.5

- Sufficient so far – but tight, especially for M to P to grant operation.

New beam line - Preliminary cost evaluation ~ 160 kCHF

- 42 kCHF are available from EURO-LABS funds

Consolidation (and improvement) of the laser system has also been approved. This requires about 100 kCHF over 2023-2024

Total to be funded from CLEAR operational budget in the period 2023 – 2024

⇒ About 110 kCHF per year

This is possible due to:

- 1) main consolidation/spares items until 2025 already covered, and
- 2) additional contributions to manpower (M to P) from external sources (DEFT, KT-CIPEA, Oxford U.)

- In the past years, a **campaign** was carried out to **consolidate equipment** and ensure we have enough spares at least **until end 2025**. In particular, the situation for the most expensive items (e.g., klystrons) is now OK, with some margin.
- Beyond 2025, a few systems need further consolidation. More expensive items:
 - Additional **klystrons** to cover until 2023
 - Consolidation of **low-level RF** and timing systems (also **manpower** needed)

These two items will be **covered in Steffen's talk later**

From the original [CLEAR proposal](#)

The personnel needed for maintenance and operation support is 3.7 FTE/year for staff, 1 FTE/year for fellows (two fellows at 50%) and about 3.5 FTE/year for students/PJAS/FSUs (cost included in material budget above). The rough distribution of staff resources among the CERN groups is as follows:

<i>Group/section</i>	<i>FTE/year</i>
BE/ABP	0.5
BE/BI	0.2
BE/OP	0.5
BE/RF	1
EN/STI	0.5
TE/EPC	0.5
TE/VSC	0.5
Total	3.7

Present Status:

Group	FTE/year
BE/ABP	1.45*
SY/BI	0.2
SY/RF	1.
BE/CO	0.2
EN/STI	0.8
TE/VSC	0.25
TOTAL	3.9

From APT

*0.8 (W. Farabolini) funded by DEFT/CLEAR material budget

Apart from staff, CLEAR manpower has been covered by ~ 2 FTE/year for Fellows and about 3 FTE/year for students/associates/FSUs (cost included in material budget).

The present situation of **technical support is adequate** – with the possible exception of **low-level RF** (see Steffen's talk).

Manpower for operation is marginal – but up to now we have managed

However:

- Might gain **efficiency** with **some more resources**
- Operation is for a large part covered by **temporary personnel**: fellows, associates and students (M to P) ⇒
 - Difficult to maintain a constant level
 - Issues with continuity, knowledge transfer, maintenance of tools...
 - Competition with budget for hardware, consumables,...
- Don't expect to need more manpower for **2nd beam line** but might need more to cover operation for users of **new injector in CTF2**. ⇒
 - Synergies with **AWAKE** ?

Main concern for longer term ⇒

- **Staff replacement** around **2027/2028**
(retirement of myself & Wilfrid extension + retirement)

Thanks for your attention!

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L. Wroe, E. Granados, M. Martinez, S. Curt, D. Gamba, ...*

