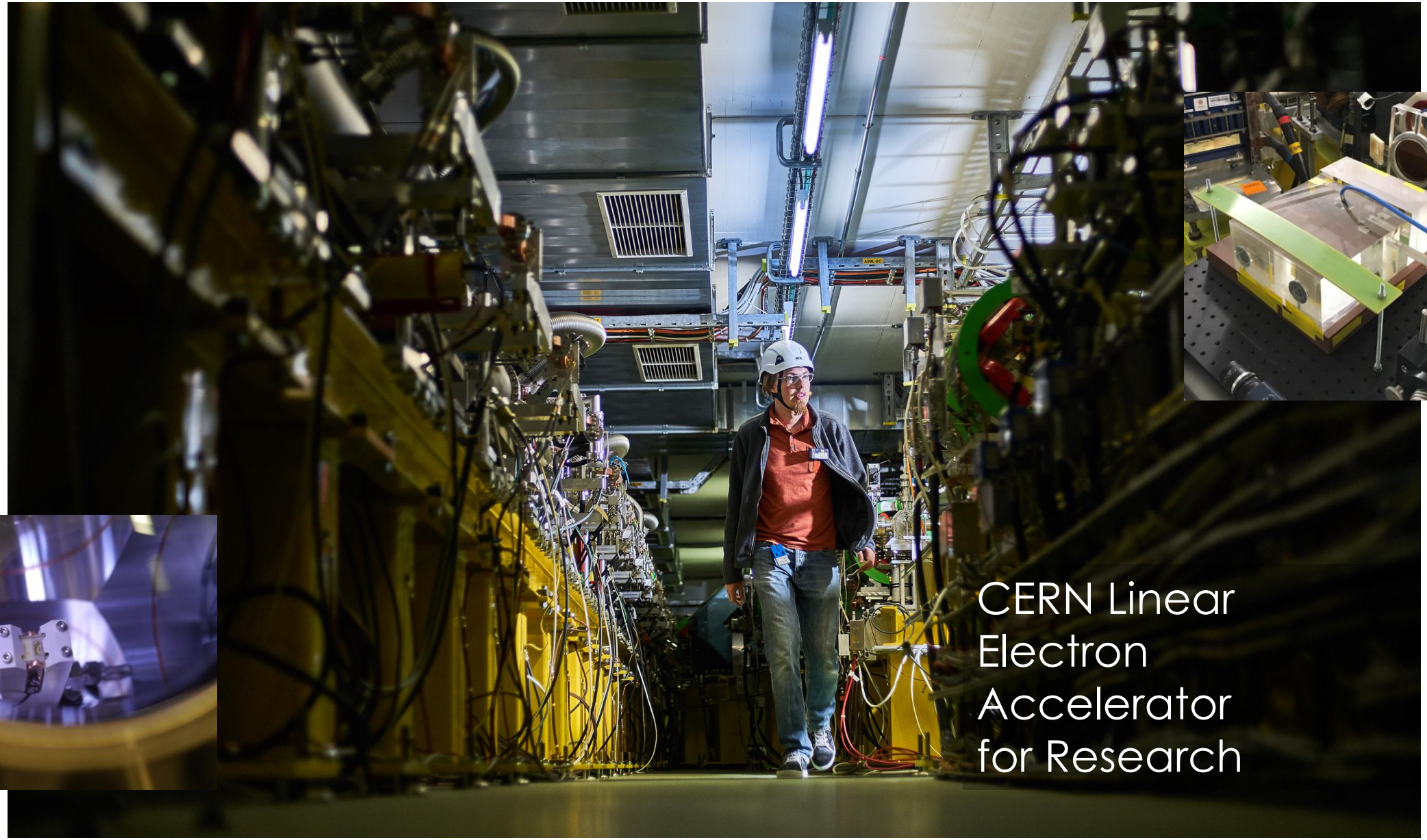
CLEAR future running, resources, consolidation and upgrades

R. Corsini

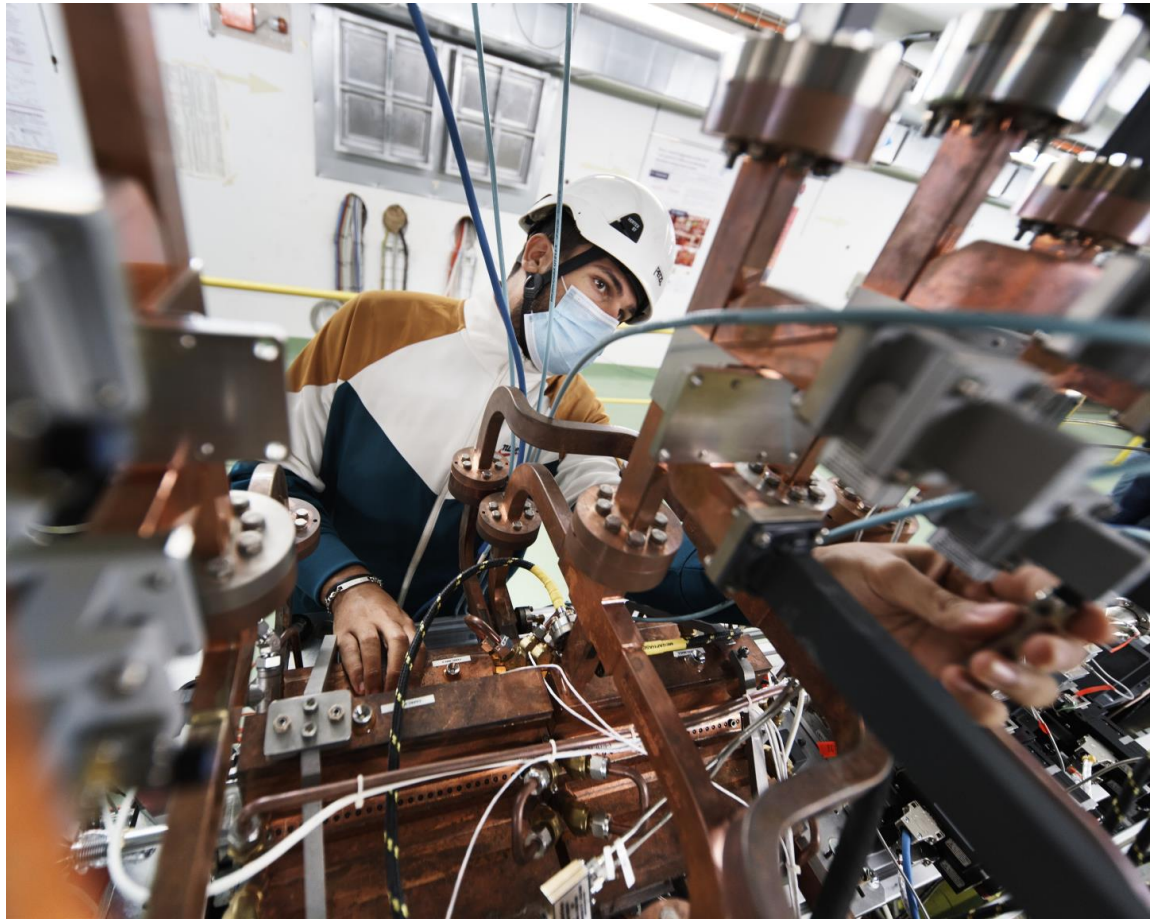
for the CLEAR Team



Outline

Update from last CLEAR review

- Resources, an update
- Outlook on future program
- Possible upgrades - consolidation
- Mode of operation in the next years
- Some worries…



Resources: material (from 1st Review)

From the original CLEAR proposal

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

Cost-item	*kCHF/year*
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

Actual expenses (kCHF)

	2017	2018
RF	340	253
Vacuum	18	16
Power Converters	2	1
Cabling, diags, controls	10	80
Laser/cathodes	40	75
Personnel	200	255
Travels, etc.	5	5
TOTAL	595	685

Resources: material update

From the original CLEAR proposal

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

Cost-item	*kCHF/year*
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

Actual expenses (kCHF)

	2019	2020
RF	175	56
Vacuum	15	8
Power Converters	0	0
Cabling, diags, controls	67	71
Laser/cathodes	78	48
Personnel	295	265
Travels, etc.	9	1
TOTAL	639	449

Resources: manpower (from 1st Review)

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:

Group/section	*FTE/year*
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	0.5
BE/BI	0.2
BE/OP	0
BE/RF	1.2
BE/CO	0.2
EN/STI	0.8
EN/CV	0.1
EN/SMM	0.1
TE/VSC	0.5
TE/EPC	0.1
TOTAL	3.4 (3.7)

From APT

Assumed

Apart from staff, CLEAR manpower is currently covered by 2.5 FTE/year for Fellows and about 3.5 FTE/year for students/PJAS/VISC/FSUs (cost included in material budget).

Resources: manpower update

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:

Group/section	*FTE/year*
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	0.6
SY/BI	0.15
BE/OP	0
SY/RF	1.25
BE/CSS	0.2
SY/STI	0.9
EN/CV	0
EN/SMM	0
TE/VSC	0.25
TE/EPC	0
TOTAL	3.35

From APT

Apart from staff, CLEAR manpower is currently covered by 0.5 FTE/year for Fellows and about 4 FTE/year for students/PJAS/VISC/FSUs (cost included in material budget).

CLEAR Material Budget in MTP

- Initial request (and initial allocation):
  - 800 kCHF/year = 700 kCHF/year "material" + 1 GET Fellow on average
- Present allocation:
  - 750 – 790 kCHF/year

Target figures M available on CERN_ROOT :

		2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	*Grand Total*
CERN_ROOT	CLR-OPE	752	791	791	791	791	791	791	791	791	791	**7,871**
	CERN_ROOT Total	**752**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**7,871**
	Grand Total	**752**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**791**	**7,871**

- Should be OK, leaving space for one fellow at all times – but tight.

Future program - 2021

2021 Beam Time Requests

Received

1.	Optical Beam Loss Monitor	B. Salvachua	SY/BI
2.	Gaseous real time dosimeter for FLASH	Y. Arnaud	PSC Grenoble/CNRS/IN2P3
3.	AWAKE Cherenkov BPM	E. Senes	SY/BI
4.	WakeFieldMonitors WF kicks	K. Sjobak	U. of Oslo
5.	Active Plasma Lens	K. Sjobak	U. of Oslo
6.	RaDFOS fiber optics dosimeter	F. Fienga	INFN, U. of Sannio, CNR
7.	Micro-Beam Position Monitor IRRAD	G. Pezzullo	EP/DT
8.	Radiation damage in SDRAMs	D. Söderstörm	U. of Jyväskylä
9.	Neutron Dump Experiment	R. Garcia Alia	SY/STI
10.	Dosimetry for medical and space applic.	V. Wyroll	CERN/U.Oldenburg/PTW
11.	Chromox screen test	H. Gjersdal	U. of Oslo
12.	Dosimetry - FLUKA neutron benchmark	M. Tisi	Helmholtz Zentrum München

Expected (extensions)

1.	EOS	S. Mazzoni	SY/BI
2.	CLIC Cavity BPMs	A. Lyapin	RHUL/CERN
3.	Cherenkov Plasmonics	T. Lefevre	SY/BI
4.	AWAKE screens in Rb	J. Pucek	
5.	Soft X-Ray Cherenkov	A. Kubankin	Belgorod
6.	CHUV FLASH	M.C. Vozenin	CHUV
7.	…		

New proposals under discussion

1.	scintillator detector for NA62	M. Zamkovsky	Charles U./CERN
2.	De Broglie internal clock	D. Dauvergne	LPSC-Grenoble
3.	HEPD-02 detector (CSES-02 satellite)	E. Ricci	U. of Trento

Main issue:

Access on site to external users (Covid-19 situation)

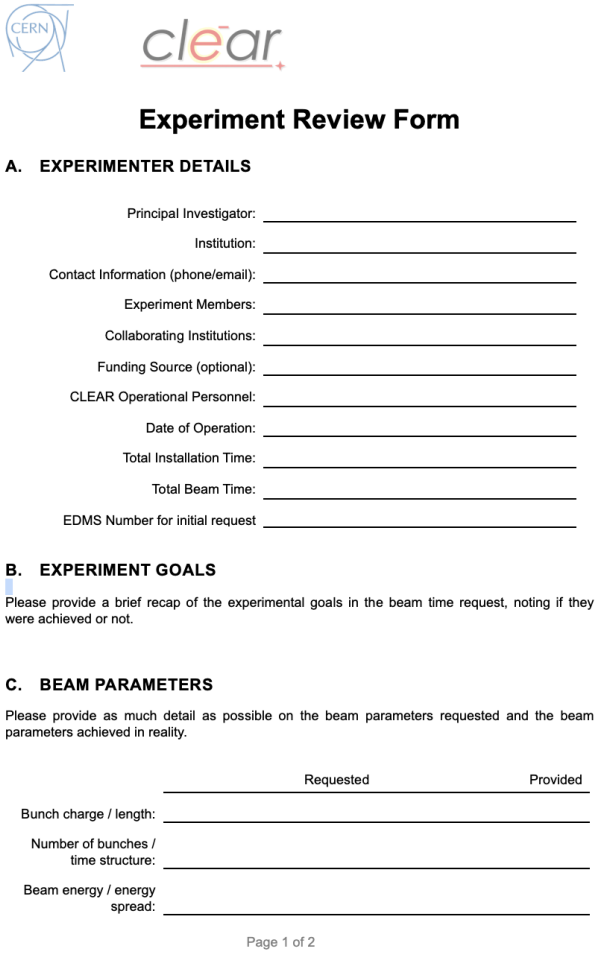
We started discussing with external partners (e.g., CHUV) on the possibility to organize exp. material delivery and remotely supervised installation and data taking.

Interesting to extend scope and parameter range (low intensities)

Operation Mode – new approval procedure and follow-up

- We are putting in place a new approval procedure through EDMS (Gerry's talk)
  - Should help to keep track of requests in an easier way
  - Will provide easier access to documentation, and better tracking
  - Ensures all stakeholders are informed

- We have also prepared a new follow-up form for users, to be filled-up after an experiment has taken place



Experiment Review Form

A. EXPERIMENTER DETAILS

Principal Investigator: _____

Institution: _____

Contact Information (phone/email): _____

Experiment Members: _____

Collaborating Institutions: _____

Funding Source (optional): _____

CLEAR Operational Personnel: _____

Date of Operation: _____

Total Installation Time: _____

Total Beam Time: _____

EDMS Number for initial request _____

B. EXPERIMENT GOALS

Please provide a brief recap of the experimental goals in the beam time request, noting if they were achieved or not.

C. BEAM PARAMETERS

Please provide as much detail as possible on the beam parameters requested and the beam parameters achieved in reality.

	Requested	Provided
Bunch charge / length:		
Number of bunches / time structure:		
Beam energy / energy spread:		

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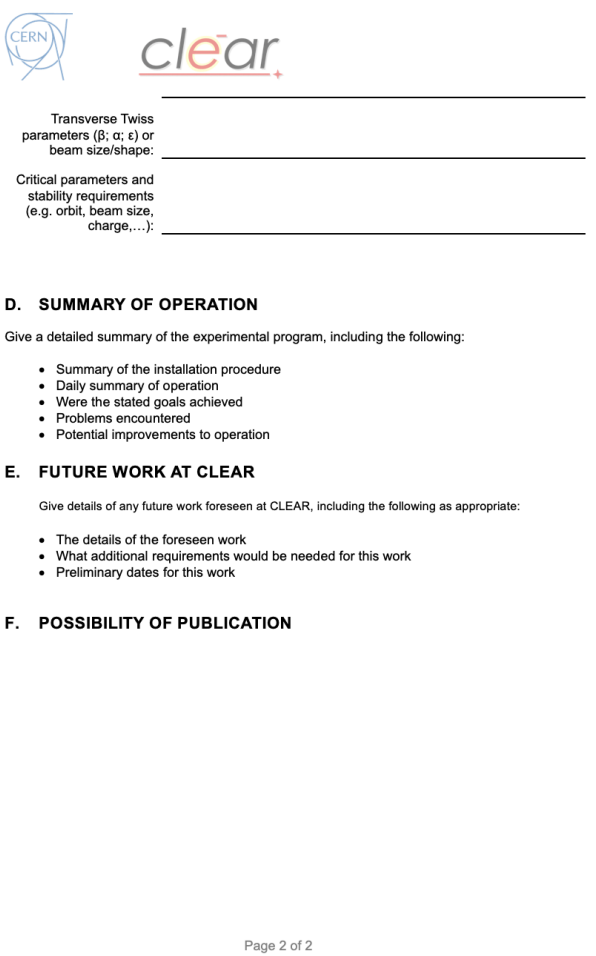

Transverse Twiss parameters (β; α; ε) or beam size/shape: _____

Critical parameters and stability requirements (e.g. orbit, beam size, charge,…): _____

D. SUMMARY OF OPERATION

Give a detailed summary of the experimental program, including the following:

- Summary of the installation procedure
- Daily summary of operation
- Were the stated goals achieved
- Problems encountered
- Potential improvements to operation

E. FUTURE WORK AT CLEAR

Give details of any future work foreseen at CLEAR, including the following as appropriate:

- The details of the foreseen work
- What additional requirements would be needed for this work
- Preliminary dates for this work

F. POSSIBILITY OF PUBLICATION

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Future program – main trends for next years

- Main themes:
  - VHEE/FLASH activities – very active, essential for CERN-CHUV FLASH collaboration
  - Beam Diagnostics R&D – not just for CLIC/AWAKE
  - Irradiation – extensive program outlined by Andrea
  - Future accelerators – now CLIC (ILC) and AWAKE (see Steinar's and Edda's talks)
    - continuation of Plasma Cell activities, possibly toward acceleration tests? (potential collaboration with SPARC – INFN/LNF)
    - Extend to FCC-ee?
- Some activities not fully followed-up at present
  - THz power generation & use
  - Impedance measurements with beam
- Keep opportunities for other users from CERN and outside…

Future program – something more on VHEE/FLASH

- Main points of present/future program on VHEE/FLASH
  - Demonstrate FLASH sparing effect at high energies (> 50 MeV)
  - Develop real time dosimetry at high doses
  - Precise dose deposition studies for VHEE (e.g., nonuniformities…)
  - Focusing and steering for VHEE and VHEE/FLASH
  - Understand influence of beam time structure on FLASH effect
  - Understand dependence from energy on FLASH effect
  - Fractioning with VHEE/FLASH
  - Clarify biological mechanisms (DNA, oxygen depletion)
  - Comparison with proton and gamma FLASH
  - Complement CERN-CHUV collaboration on future FLASH facility

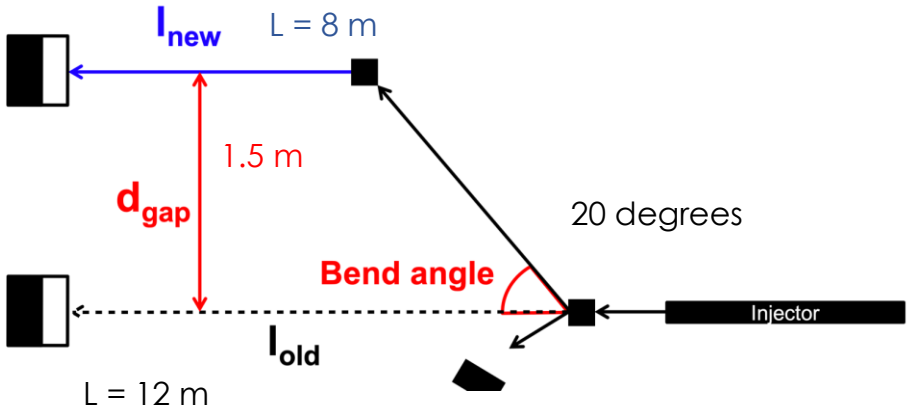
Future program – transnational access

- Discussion ongoing with M. Vretenar to include CLEAR in the next EU call for TransNational Access (TNA) funds
- Aim: 350 kEuros over 4 years
- Mainly support for visitors – possibly including operation support by collaborators
- CERN does not charge beam time, but some potential for improvements of beam lines
- Include potential access for external users to X-Boxes, or S-band testing

→ Will keep exploring possibilities of external funding – e.g., for VHEE/FLASH

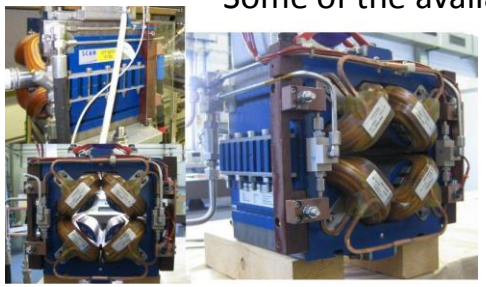
Upgrades – dog-leg beam line

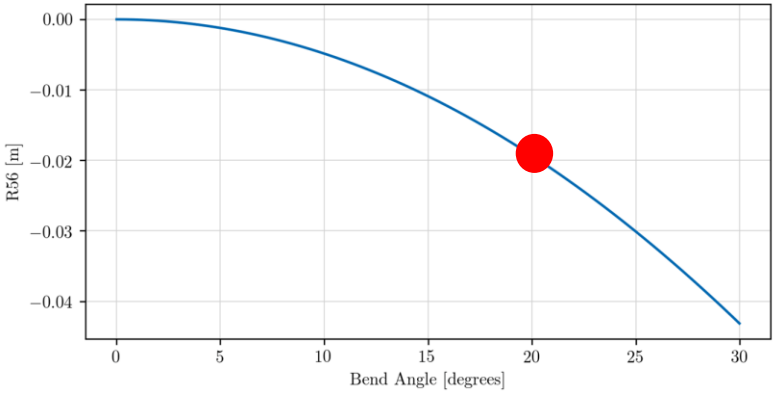
We recently restarted studies on an additional dog-leg beam line (L. Dyks)



MDX Magnet

Some of the available quads





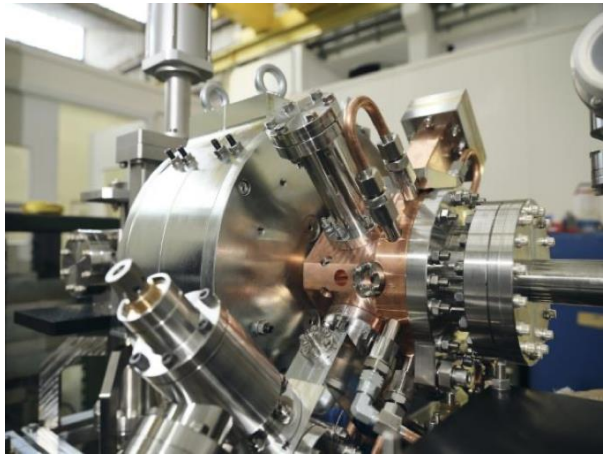
- Converging on a simple achromat solution, branching off at VESPER location, angle ~ 20 deg
- Should preserve bunch length or allow for moderate compression (sub-ps bunches as a requirement)
- Re-use CTF3 dipole and quads, existing power supplies…
- If a solution is found, we will produce a precise costing

Upgrades – new source

- Described in Edda's talk

- Commissioned in CTF2 area from 2021 to 2022
- Eventually moved to AWAKE for second run in 2026

- Two options for CLEAR:
  - Move after commissioning to CLEAR, use in 2023-2025
  - Use after commissioning in CTF2 as independent beamline



- Resources in CLIC/AWAKE – CLEAR resources will eventually cover operation and move to CLEAR

AWAKE 150 MeV									
Schedule	2020	2021	2022	2023	2024	2025	2026	2027	2028
Final design									
Mechanical design/Integration									
Procurement									
Installation									
Commissioning									
Start experiments									

CTF2 prototype/CLEAR 60 MeV							
Schedule	2020	2021	2022	2023	2024	2025	2026
Final design							
Mechanical design							
Procurement							
Installation							
Commissioning							
Start experiments in CTF2							
Move to CLEAR							
Exp in CEAR							

Installation in CLEAR

A few considerations on consolidation needs

- Laser: main consolidation carried out – should explore potential for an higher rep rate option (interest for FLASH experiment)
- Vacuum – most of the needed consolidation has been already carried out
- Controls – some done in past years – what remains is still to be evaluated
- Modulator/Klystrons – we have a few spares, but not enough for 5 years
  – issue: distribute corresponding spending evenly

Future mode of operation and some worries

- Keep operation mode similar to the present one > maintain operation flexibility
- While having a more formal beam time allocation process (to cope with more requests?)
  - Risk of loading too much the operation team.
  - If not able to satisfy all requests > need scientific evaluation.
  - Periodic review by Scientific Committee?
  - Keep reserve beam time available for pre-approval tests?

> suggestions welcome

- Small operation team, made-up by not permanent staff > risk to fall under the critical mass and/or loose continuity.
- Some vulnerable point in technical support expertise (e.g., cathode production and, to a lower extent, laser.)
- Ensure continuity for retiring staff > e.g., Experimental Safety Officer…
- Technical support is now adequate, but only marginally

Thanks for your attention!