Two-Beam Test Stand and TL2 Beamline

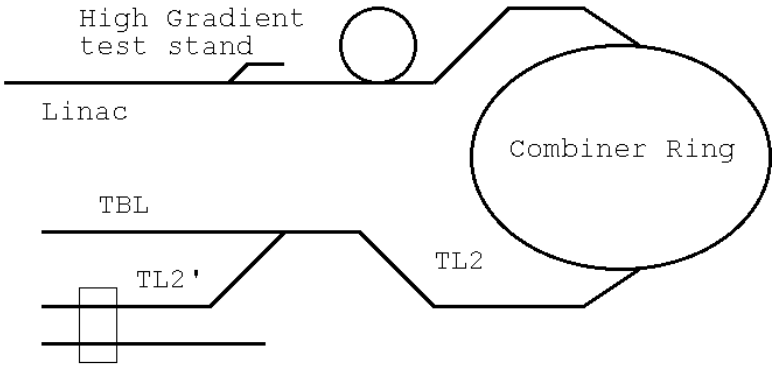
Volker Ziemann, Tord Ekelőf,
Arnaud Ferrari, Curt Ekstrőm,
and Őrjan Skeppstedt

Uppsala and Stockholm Universities
Sweden

Framework and History

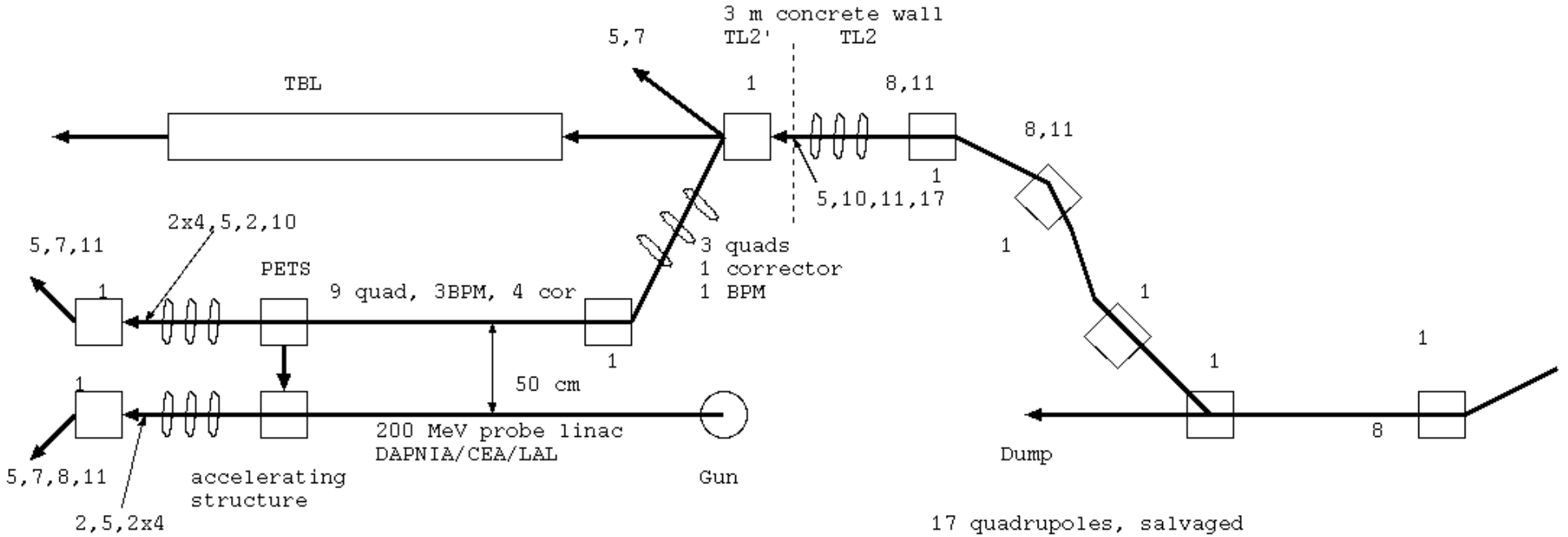
- Call for external participation in CTF3 by CERN-Director General Aymar this spring.
- Uppsala and Stockholm group led by Tord Ekelőf submitted an application to the Swedish Research Council (Vetenskapsrådet, VR) and to the Wallenberg Foundation.
- ...for TL2 beamline and the two-beam test stand.
- Volume of 26.6 MSeK (approx 3 M€)
- VR's decision will be made December 15.
- Visit to CERN in September to discuss technical matters and project scope.

TL2 and Two-Beam Test Stand



Two-beam test stand

Numbers mean diagnostic equipment, explained on next slide



most things 150 degree bakable

17 quadrupoles, salvaged
Beam pipe (Al), INFN
Steerers, Spain
2 to 3 sextupoles
(taken care of by other means)

Bill of Material
The Meaning of the Numbers

		TL2	TL2'
1	Dipoles (50 kCHF) [0.611 Tm, 43.8 mm gap, 35°] Power supplies (6 kW single, 12 kW string of 4)	5+1	4
2	Quadrupoles, salvaged or from Scanditronix@8 kCHF/quad	[17]	18
3	Steering correctors	[5]	5
4	Beam Position Monitors	5	6+2
5	Screens (OTR)	1	-
6	Sextupoles (can be salvaged from EPA)	[2-3]	-
7	Segmented beam dump	-	3
8	Synchrotron Light Viewport	?	1 or 2
9	Pumping [12 ion pumps, 2 turbo, 6 gauges]		
10	Wall current monitor	1	1
11	Optical beam line	1	3
12	Rest gas Analyzer (probably borrowed)		1
13	Al-beam pipe, bellows (shielded), pump ports	(INFN)	?
14	Collimators		
15	Beam Loss Monitors		
16	Valves		
17	RF Pickup		
18	Girder		

Transfer Line TL2

- Original design by C. Biscari, INFN
- Operate between 150 and 300 MeV
- Re-compress bunches (2.5 → 0.4 mm)
- Tunable R_{56} with $0 < R_{56} < 0.3$ m
- Need moderate T_{566} and T_{ij6} (sextupoles).
- High current (35 A) requires low impedance vacuum chamber and shielded bellows.
- Heavily instrumented (BPM, OTR screens, spectrometers and segmented dumps, synchrotron light viewports)

TL2' and Two-Beam Teststand

- Similar to the High-power-test stand in the linac.
- TL2' was “forgotten”, but contains a lot of additional hardware (four bends, 12 quads, 5 cor, 7 BPM, 30 m beam pipe, pumps, valves, ...) and beam optics design.
- Testing and extensively diagnosing/characterizing the drive beam and the power transfer from the PETS to the accelerating-structure.
- Need 2 m space in the drive- and 1.5 m in the probe- beam line.
- Diagnostics (see H. Braun et.al. CTF-Note-062)
  - RF-kicks during RF breakdown and due to misalignment (Fast BPM)
  - Beam position, energy, and size (BPM, Spectrometer, OTR-screens)
  - RF signals within a pulse train (I-Q-mixer+fast ADC)
  - Fluorescense during RF breakdown (photo-tubes)
  - Dark currents (faraday cups)
  - Rest Gas, Vacuum, Temperatures
- Analysis needs to be automated and used during processing

Required Personnel Profile

- We applied for three position for four years...
- PhD student or PostDoc to develop DAQ software for the high-gradient test stand and transfer know-how to TBTS, work on beam optics and participate in operation of CTF3.
- Engineer, responsible for ordering components, verification, installation and alignment
- Physicist as project coordinator to pick up everything not covered by the other two.
- ...and a lot of help from y'all.

Miscellaneous

- Many existing quads and maybe sextupoles could possibly be reused, bends are designed (by CERN), steerers (Spain?) and some power supplies (Finland?) .
- New quads to be made by Scanditronix.
- Diagnostics, and especially BPMs are a large cost factor (~ 2 MSeK)
- Requested hardware funds ~ 3+5+5+0.92 MSeK
- Submitted application to the Swedish Strategic Research Foundation in September 2004 for new common significant infrastructure for CTF3, XFEL, and FAIR.

Summary

- Plan to participate in the build-up the high gradient test stand.
- Transfer that know-how to the **Two-Beam test stand** and build it.
- Optimize and build the transfer lines **TL2 and TL2'.**
- We're waiting for the decision from VR and Wallenberg Foundation.