

CLIC R&D proposals for ATF/2/3



CERN, KEK, LAPP, LAL, IFIC, CIEMAT

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with contributions from K. Artoos, M. Barnes,
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D. Schulte and A. Vorozhtsov



CLIC R&D proposals for ATF/2/3

- CLIC challenges are pushing technology in different areas of linear colliders
- Beam tests are a major aspect of the feasibility demonstration
- ATF facility (being half a collider!) represents a unique opportunity for the following topics:
 - **Ground motion orbit feed forward**
 - **Ultra-low beta***
 - **CLIC DR extraction kickers**

Warning

Technical details are not presented here!

**See talks by A. Vorozhtsov, Y. Renier and
M. Barnes next Friday**

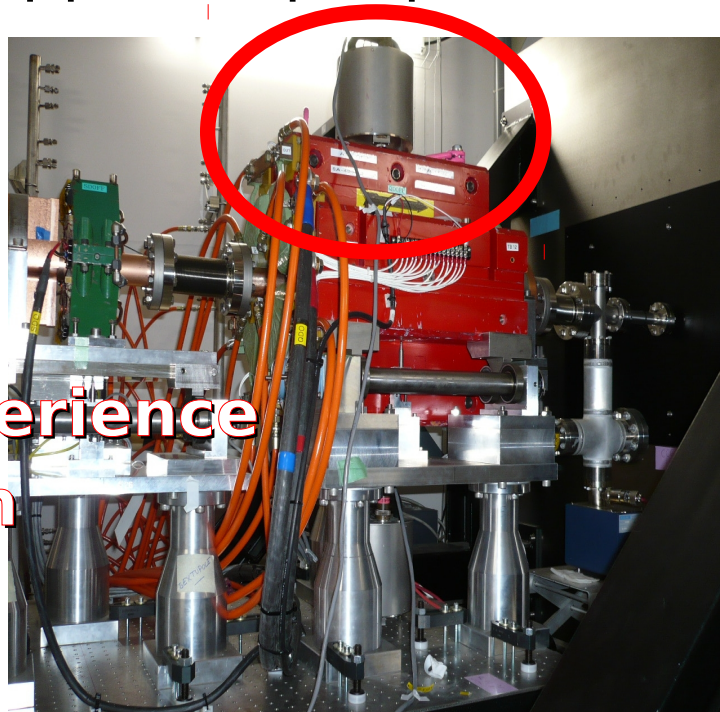
Ground Motion feed forward

- CLIC train repetition frequency is 50 Hz
- So no beam information during 0.02 s
- Daniel's idea: “Install GM sensors along the beamline to correct beam orbit based on GM”
- Labs involved: [CERN](#), [KEK](#), [LAL](#) and [LAPP](#)

LAPP already bought 15 Guralp sensors!

52000€ investment +
approx 3 people from LAPP
(A. Jeremie et al)

CERN is providing low noise
cables + approx 5 people.



Past experience
B. Bolzon



Courtesy: A. Jeremie

Ultra-low β^*

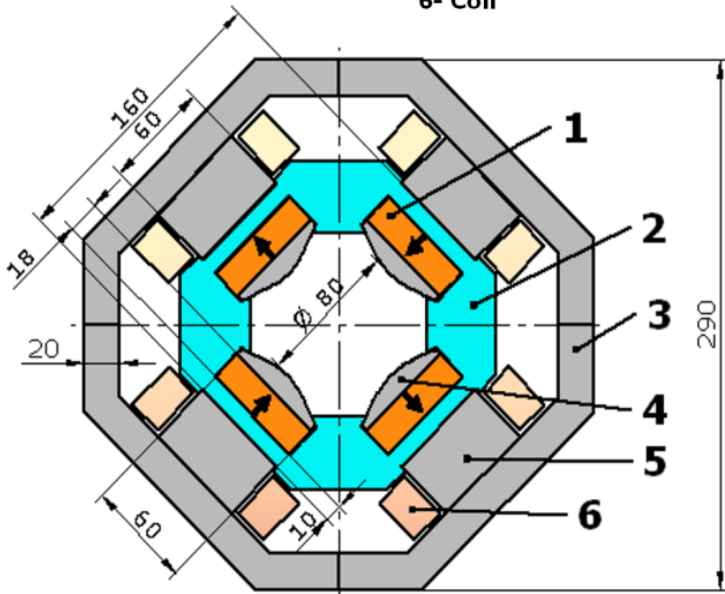
- Pushing the σ_y^* below the 37 nm is of interest for both CLIC and ILC
- Multipolar errors in FD already force an increase of β_x^* for the Nominal lattice
- Replacing FD quads with high accuracy magnets would allow nominal β_x^* for the Nominal lattice and reaching σ_y^* of 25 nm for the Ultra-low β^* lattice.
- Goal-1 has to be reached before Ultra-low β^* !

ATF3 FD quadrupoles design (CERN)

QF1 and QD0 need to be different to match constraints. Estimated total cost of 94 kCHF.

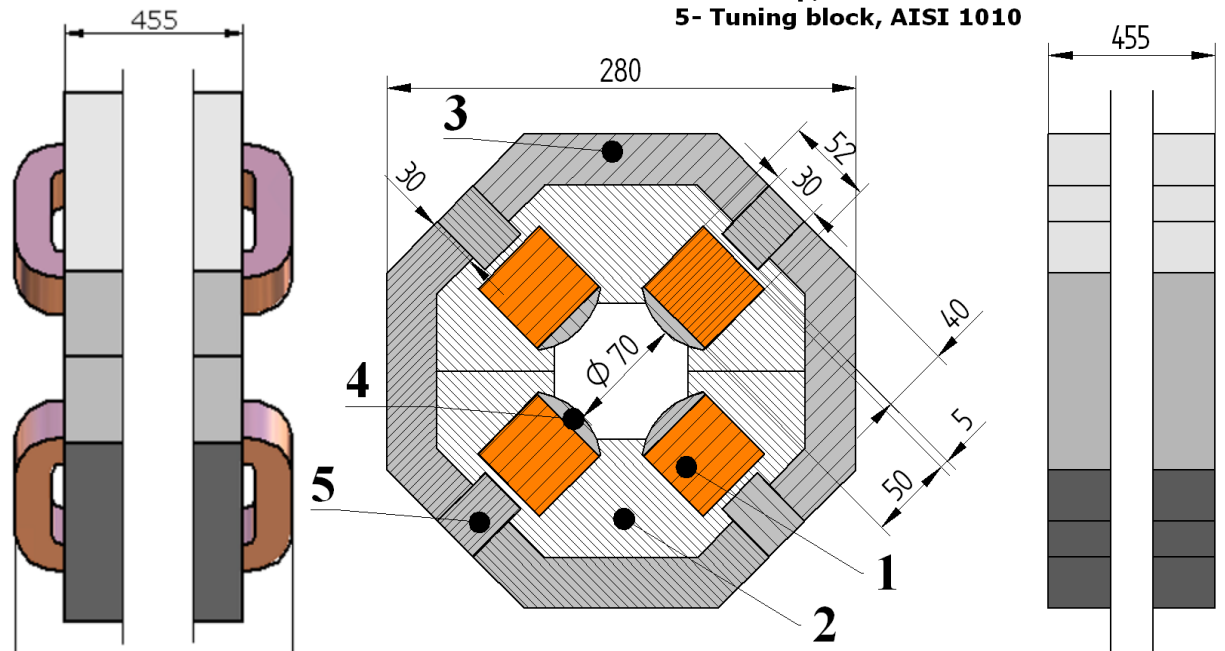
QF1 magnet for ATF3

- 1- P.M. Block, Sm₂Co₁₇
- 2- Aluminium core
- 3- Return Yoke, AISI 1010
- 4- Pole Tip, AISI 1010
- 5- Pole, AISI 1010
- 6- Coil



QD0 magnet for ATF3

- 1- P.M. Block, Sm₂Co₁₇
- 2- Aluminium core
- 3- Return Yoke, AISI 1010
- 4- Pole Tip, AISI 1010
- 5- Tuning block, AISI 1010



Courtesy: A. Vorozhtsov & M. Modena

CLIC DR ext. kicker specifications

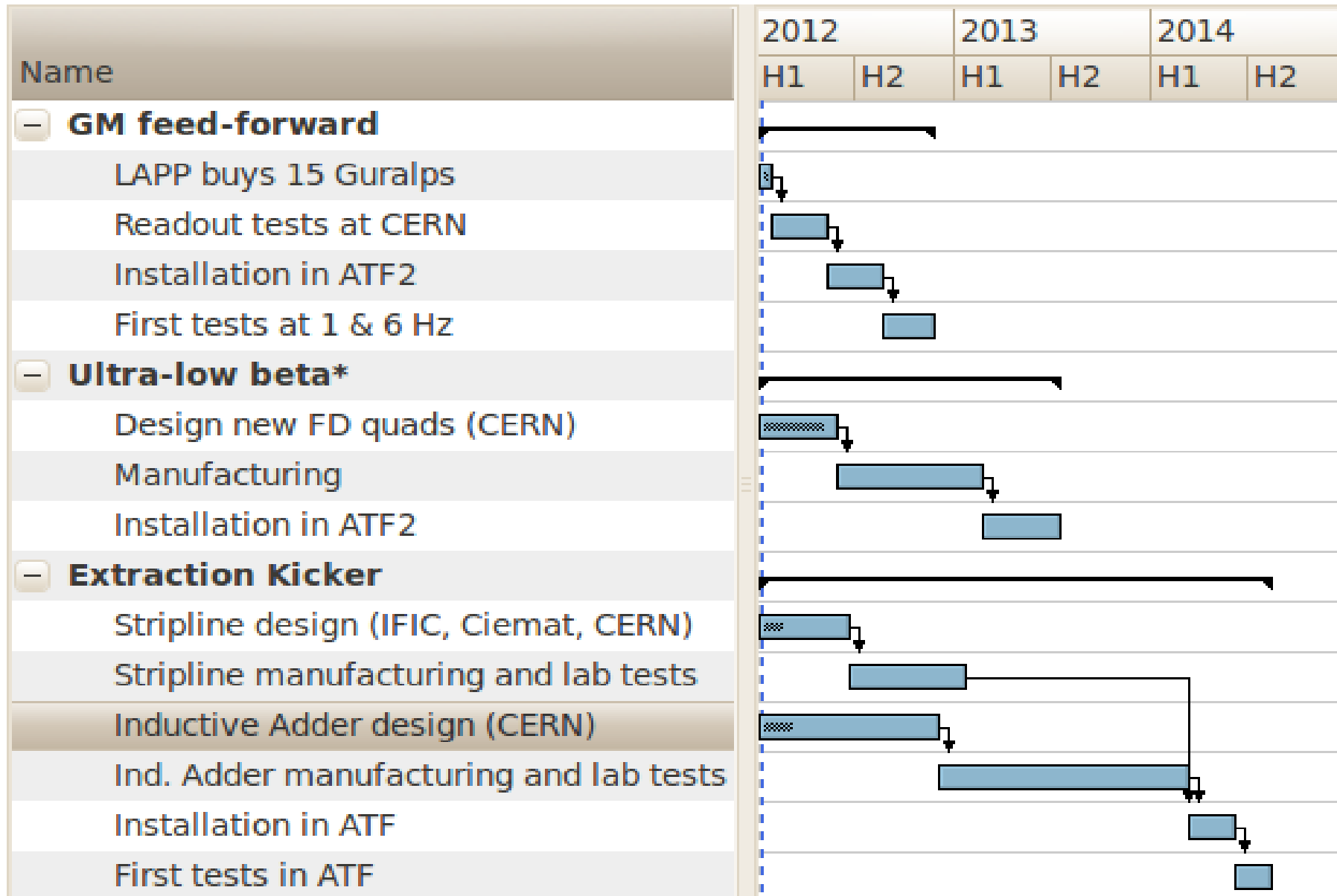
	CLIC Pre Damping Ring	CLIC Damping Ring	ATF	ILC	DAΦNE
Beam energy (GeV)	2.86	2.86	1.3	5	0.51
Total kick deflection angle (mrad)	2.0	1.5	3	0.7	5
Aperture (mm)	~40	20	11	24 (tapered)	54.8 (tapered)
Effective length (m)	2*1.7	1.7	2*0.6	20*0.32=~6.4	0.94
Field rise time (ns)	700	1000	~5	3	~5
Field fall time (ns)	700	1000	~5	3	~5
Pulse flattop duration (ns)	~160	~160	NA	NA	NA
Input pulse duration (ns)			~6	5.9	5.3
Flattop reproducibility	±1x10⁻⁴	±1x10⁻⁴	1x10 ⁻³	1x10 ⁻³	
Flattop stability [inc. droop], per Kicker SYSTEM	(Inj.) ±2x10 ⁻² (Ext.) ±2x10⁻³	(Inj.) ±2x10 ⁻³ (Ext.) ±2x10⁻⁴	NA	1x10 ⁻⁴ 1x10 ⁻⁴	
Field inhomogeneity (%) [CLIC: 3.5mm radius] • [CLIC: 1mm radius]	±0.1 (Inj.) ±0.1 (Ext.)	±0.1 (Inj.) ±0.01(Ext.)	±??	±??	±3 (x=±27mm @y=0) ±10 (y=±10mm @x=0)
Repetition rate (Hz)	50	50	3M burst	5 (3M burst)	50
Pulse voltage per Stripline (kV)	±17	±12.5	±10	±5	±45
Stripline pulse current [50 Ω load] (A)	±340	±250	±200	±100	±900
Longitudinal beam coupling impedance (Ω)		< 0.05*n			
Transverse beam coupling impedance (kΩ/m)		< 200			

Courtesy: M. Barnes

CLIC DR extraction kicker for ATF

- CLIC DR extraction kickers are challenging in field stability, homogeneity and low impedance
- A solution based on Striplines driven by an Inductive adder has been adopted
- Current kicker parameters are not OK for ATF
- However a new compatible design might be possible
- Labs: CERN, CIEMAT and IFIC

Time line until installation and/or first tests



KEK plans

- **Manpower and hardware** are currently being invested assuming continuation of ATF/2.
- To take next steps, like manufacturing of quads, it is **mandatory to know the ATF/2/3 future**.
- Of course, endorsement and review of the proposals by the TB should also follow.