Antonio Gilardi

Tutor: Pasquale Arpaia – co-Tutor: Roberto Corsini

XXXIII Cycle - I year presentation

Wake - field measurements on the CLIC strucutre in CLEAR

UNIVERSITÀ DEGLI STUDI DI NAPOLI
FEDERICO II

Background

About me:

- Bachelor degree in Electronic Engineering, 2015, Università degli Studi di Napoli Federico II

  «True time delay in optic fiber for PAA's with the use of Bragg gratings and piezoelectric devices»

- Master degree in Electronic Engineering, 2017, Università degli Studi di Napoli Federico II

  «Innovative way to damp the resonances into the CERN accelerators, using HOM couplers»

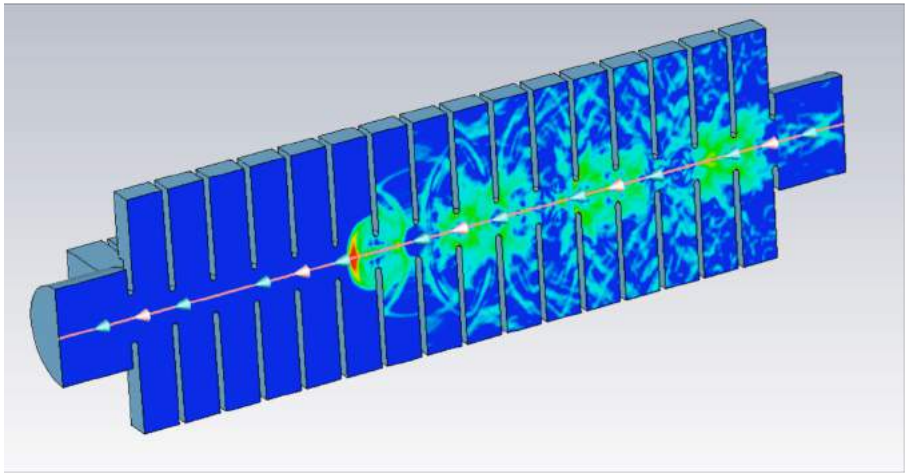
- PhD ITEE, XXXIII cycle, CERN PhD program

- Research Group:

Prof. Pasquale Arpaia (tutor), Roberto Corsini (co-Tutor), Kyrre Ness Sjobak

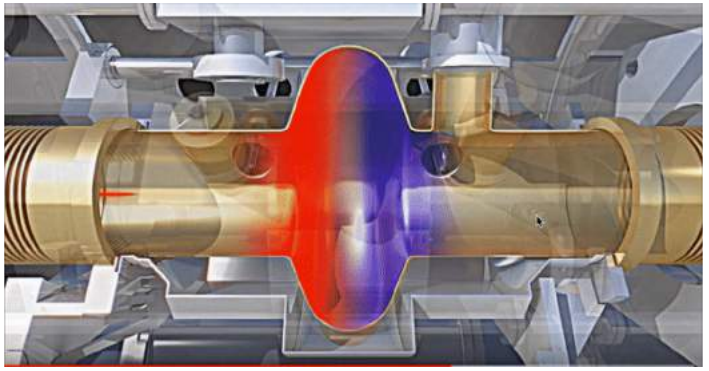
- Enlarged Reserch Group:

The problem



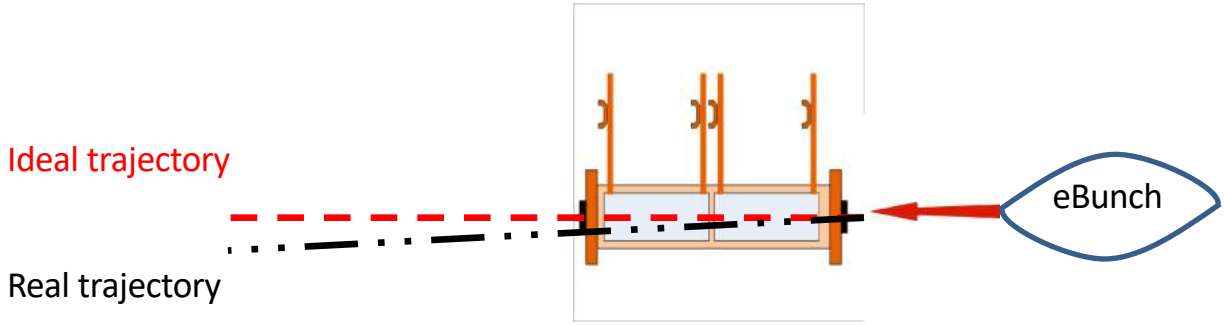
Well known effect, the WAKEFIELD

Accelerating structure how it work:



LHC → 20 MV/m

CLIC → 100 MV/m



Our goal is to estimate the transverse Wakefield kick in the CLIC accelerating structure

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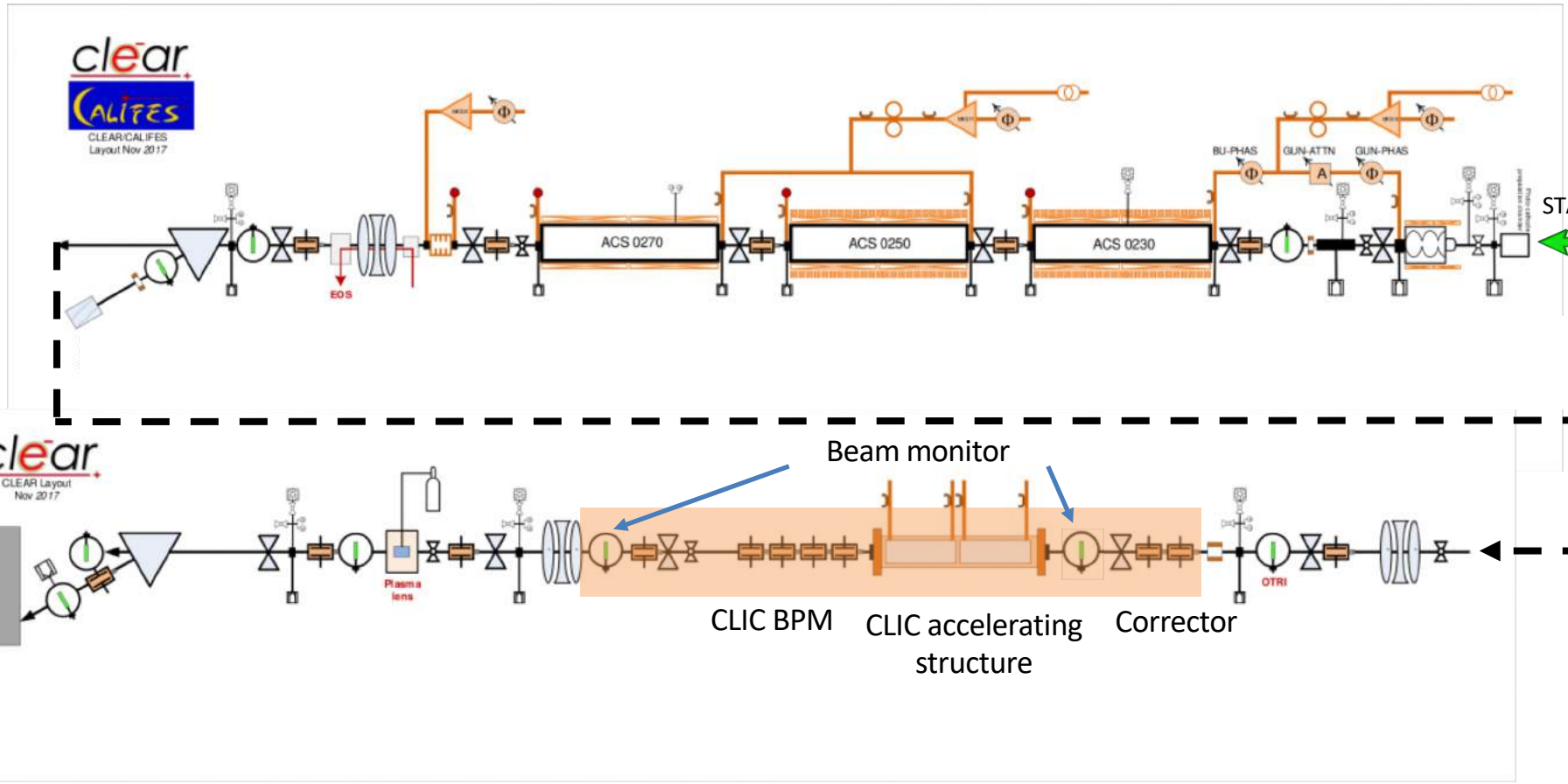
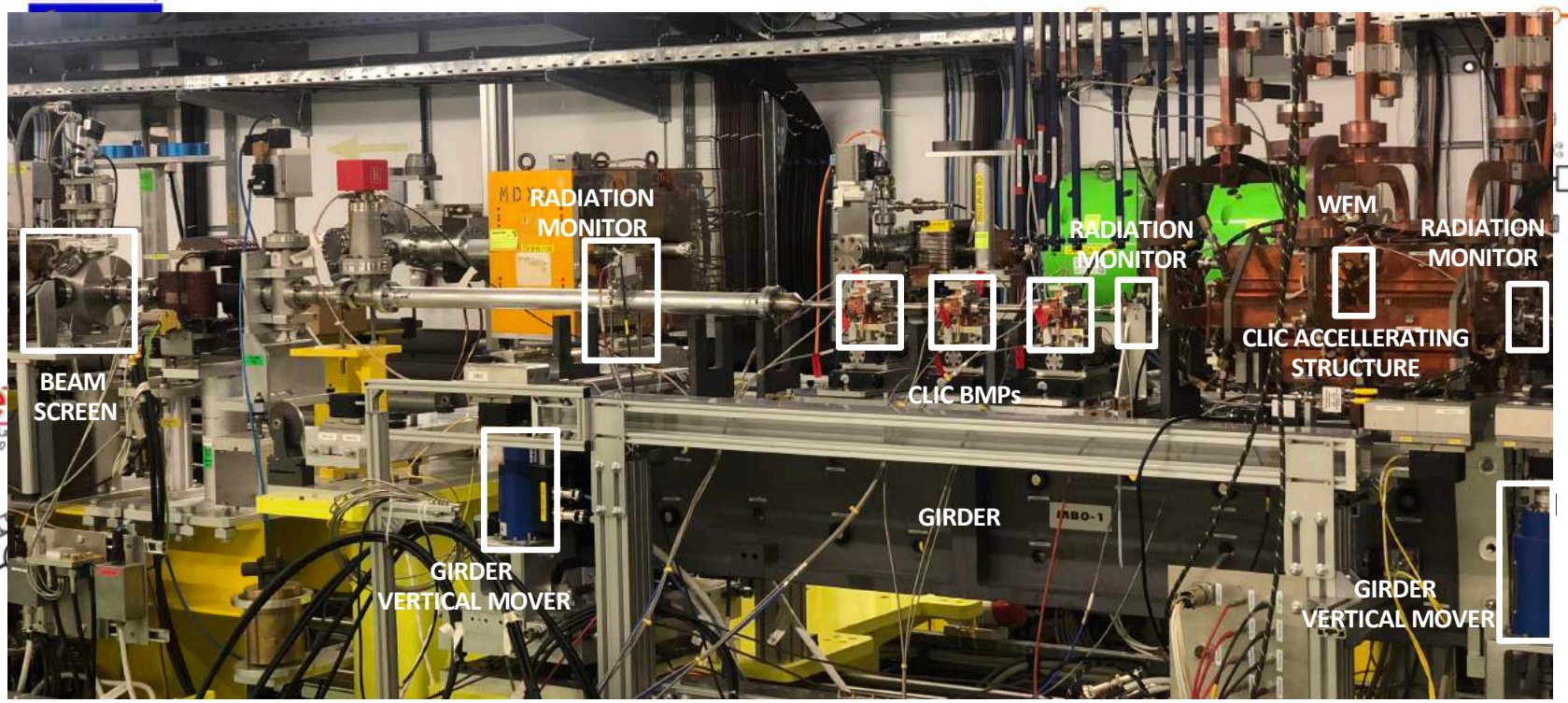
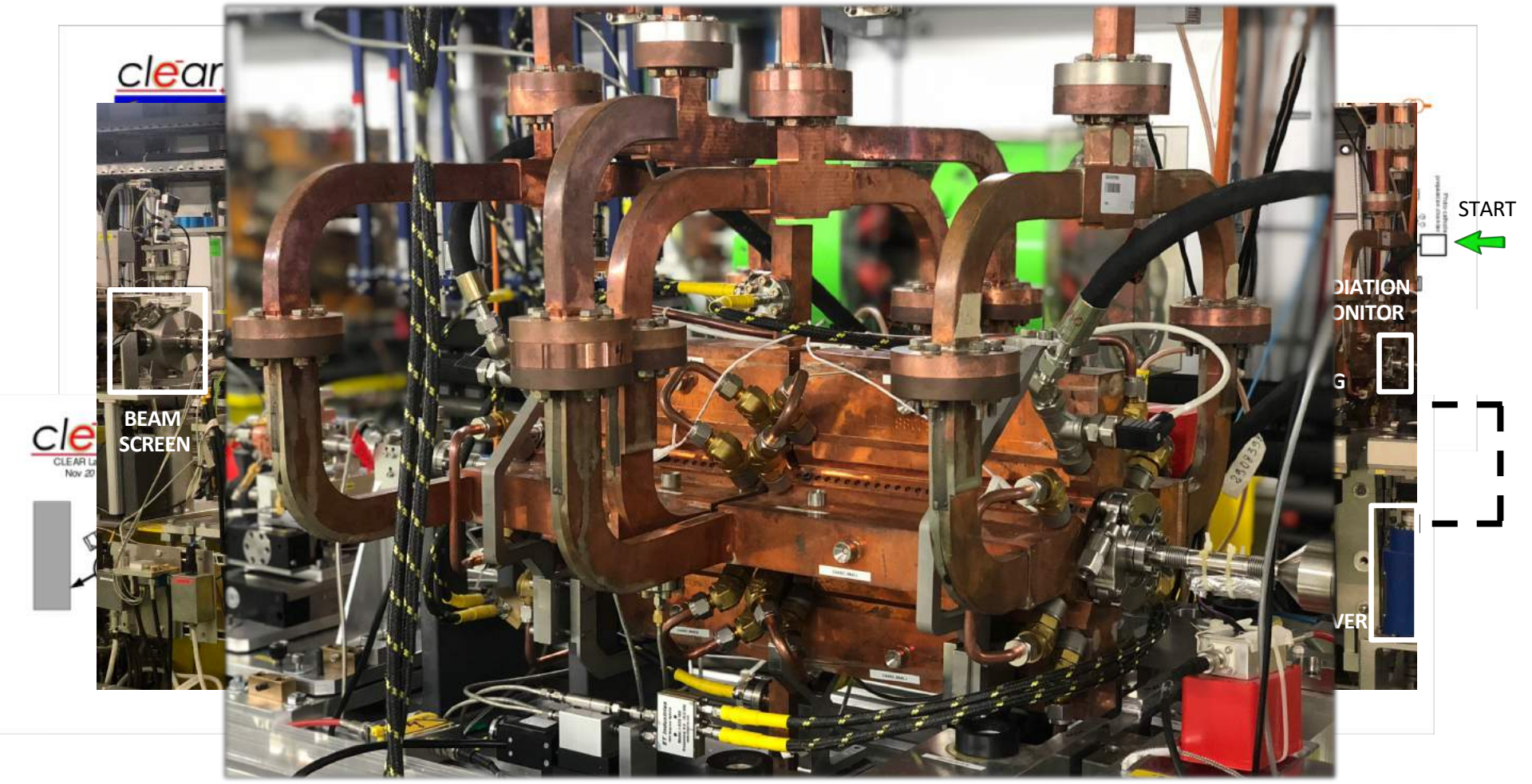
The problem


clear
CALIFES
CLEAR/CALIFES
Layout Nov 2017
ACS 0270
ACS 0250
ACS 0230
BU-PHAS
GUN-ATTN
GUN-PHAS
START
EOS
clear
CLEAR Layout
Nov 2017
Plasma lens
Beam monitor
CLIC BPM
CLIC accelerating structure
Corrector
OTRI

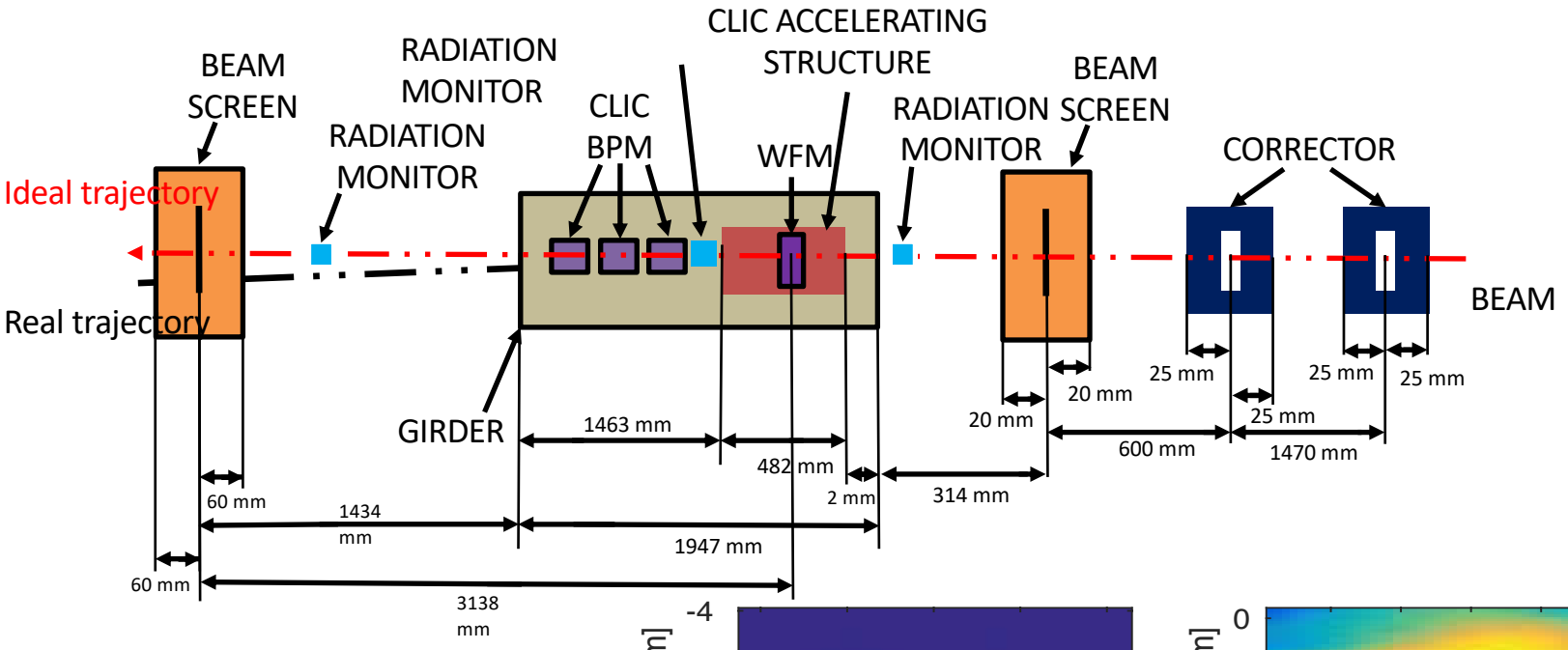
The problem


clear
RADIATION MONITOR
BEAM SCREEN
CLIC BMPs
RADIATION MONITOR
WFM
RADIATION MONITOR
START
CLIC ACCELLERATING STRUCTURE
GIRDER
GIRDER VERTICAL MOVER
GIRDER VERTICAL MOVER

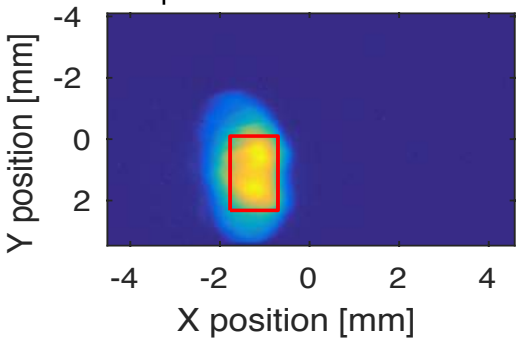
The problem

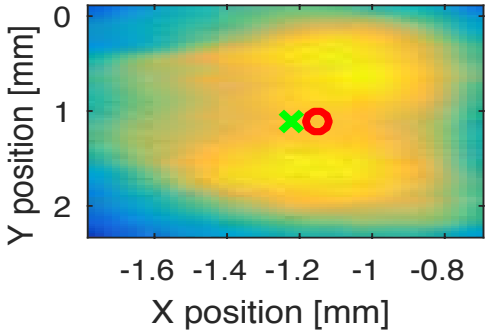


Research activity

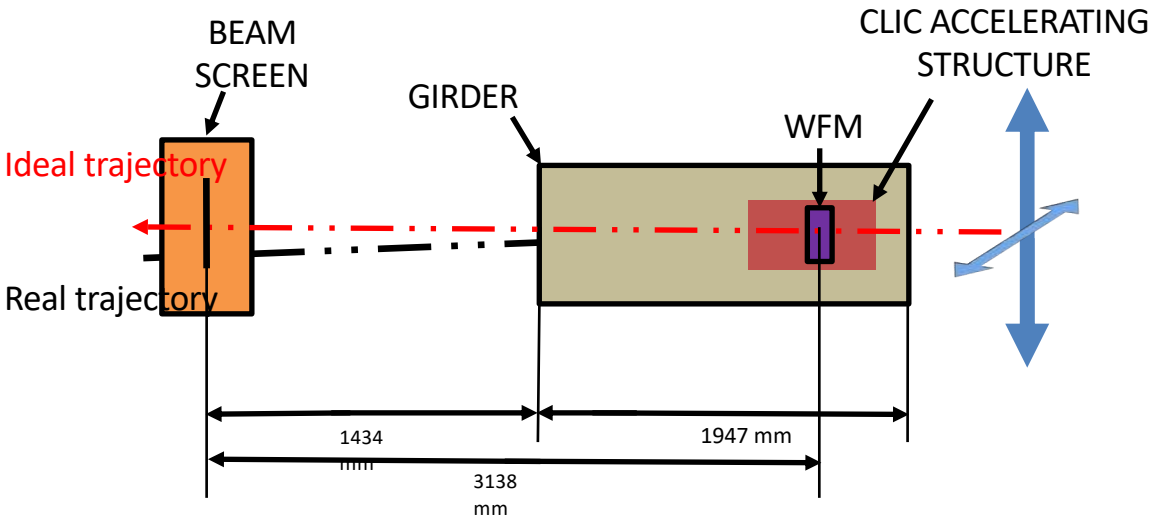


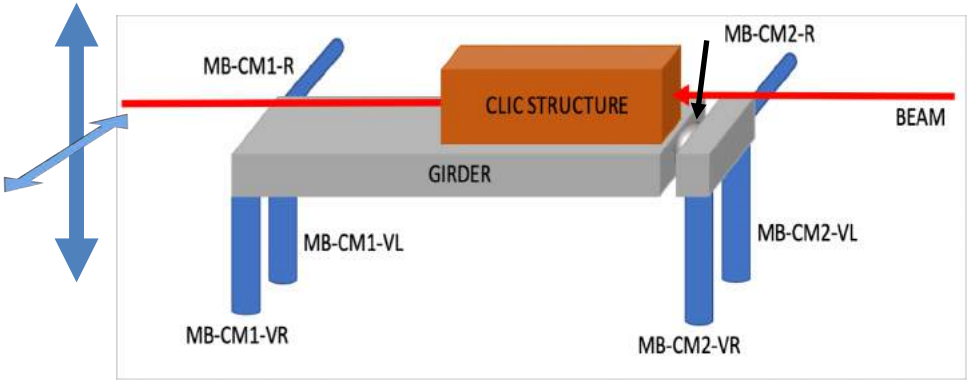
It is a beam-based method using a beam screen





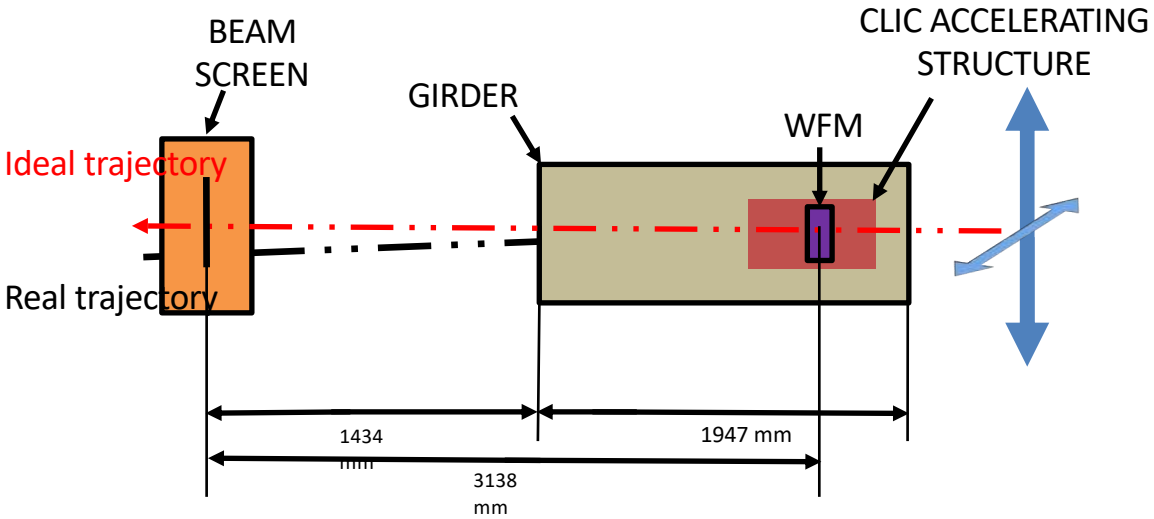
The proposed approach

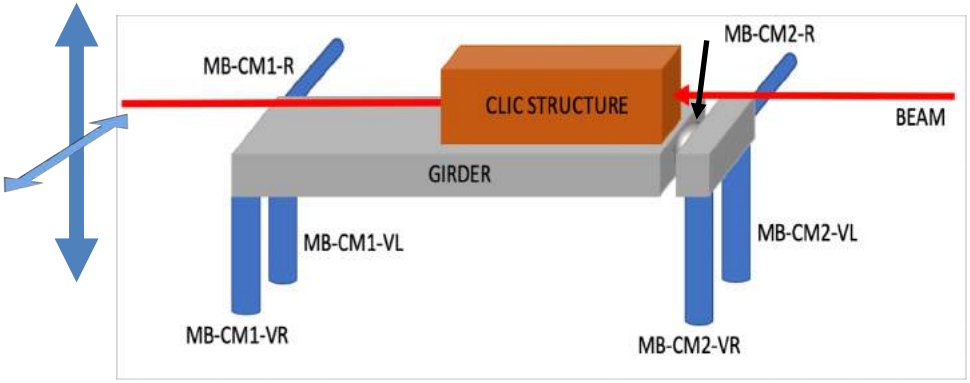


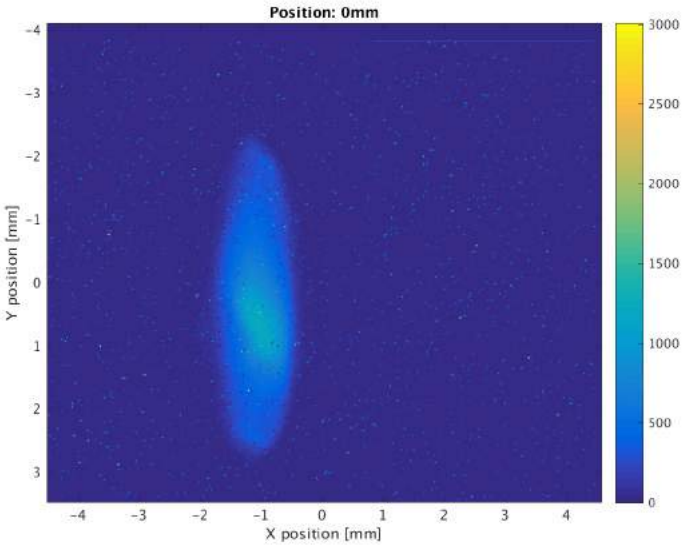


MOVE THE STRUCTURE

The proposed approach

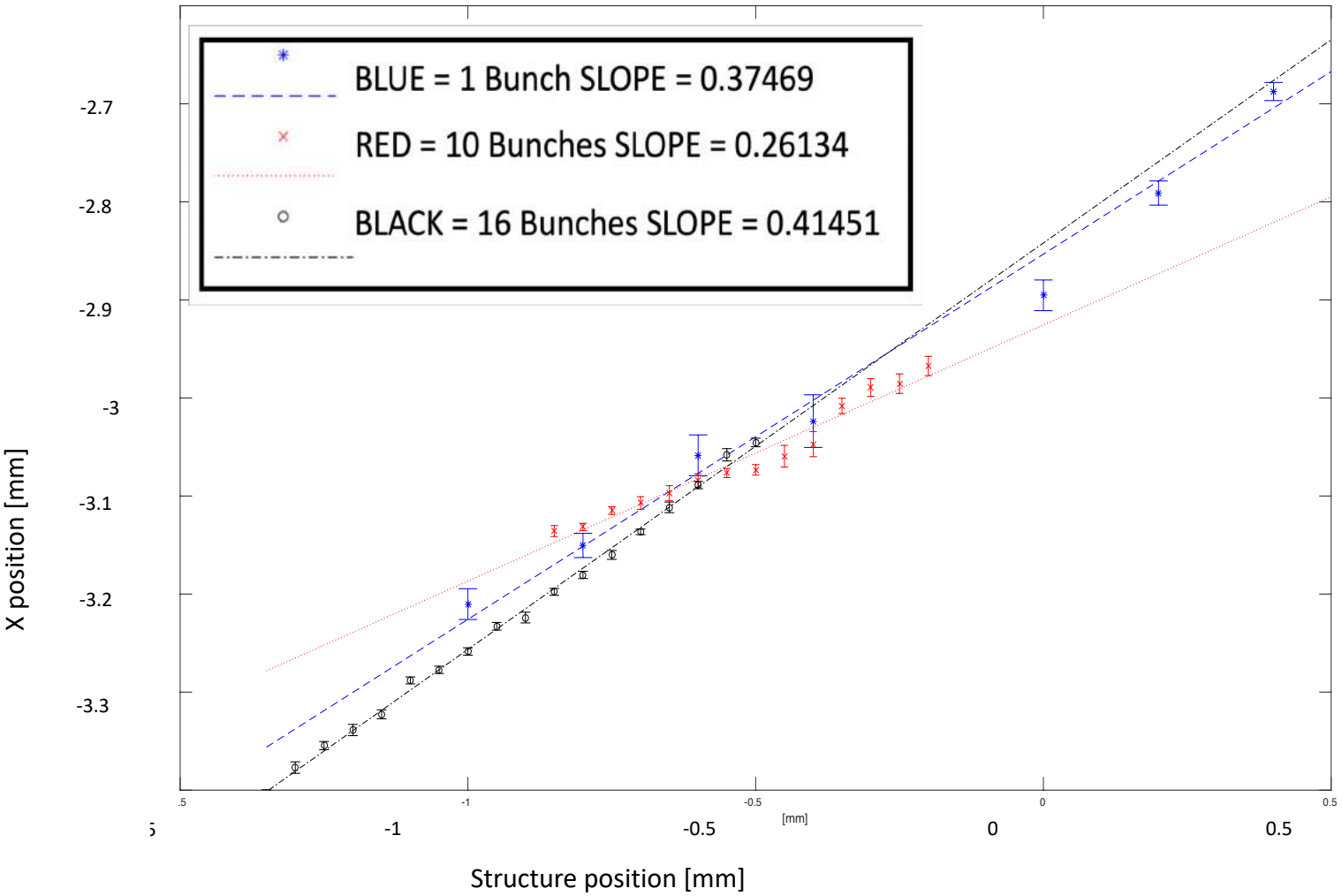




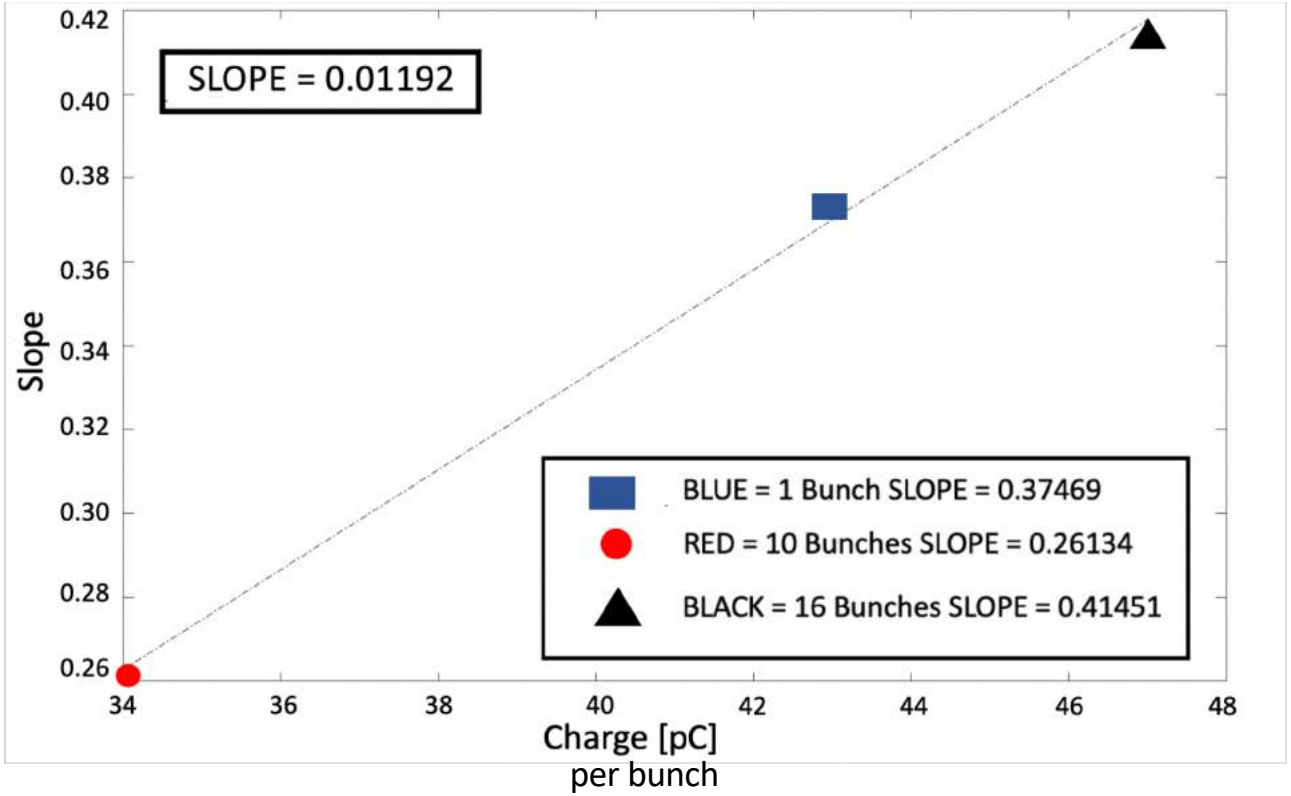


MOVE THE STRUCTURE

Average beam position



By changing the number of bunches it is possible to observe a linear dependence with the bunch charge



The plot indicates that the contribution is dominated by a short rage wake

Experimental issues → Only horizontal scan performed

Some products

Conferences:

I2MTC 2018 – IEEE International Instrumentation & Measurement Technology Conference:
"Experimental analysis for the optimal choice of High-order Modes couplers design parameters for resonance damping"
P. Arpaia, O. E. Berrig, L. De Vito and A. Gilardi

Publications under review:

Title :"Reducing parasitic resonances in particle accelerators components by broadband Higher Order Mode couplers"
P. Arpaia, O.E. Berrig, L. De Vito and A. Gilardi

Technical Report:

The Compact Linear Collider (CLIC) Project Implementation Plan
The Compact Linear Collider (CLIC) 2018 summary report
The Compact Linear e+e− Collider (CLIC): Physics Potential
The Compact Linear e+e− Collider (CLIC): Accelerator and Detector
CLIC Group

Technical Report under review:

Test and calibration of the CLIC structure girder mover in CLEAR
CLEAR Group

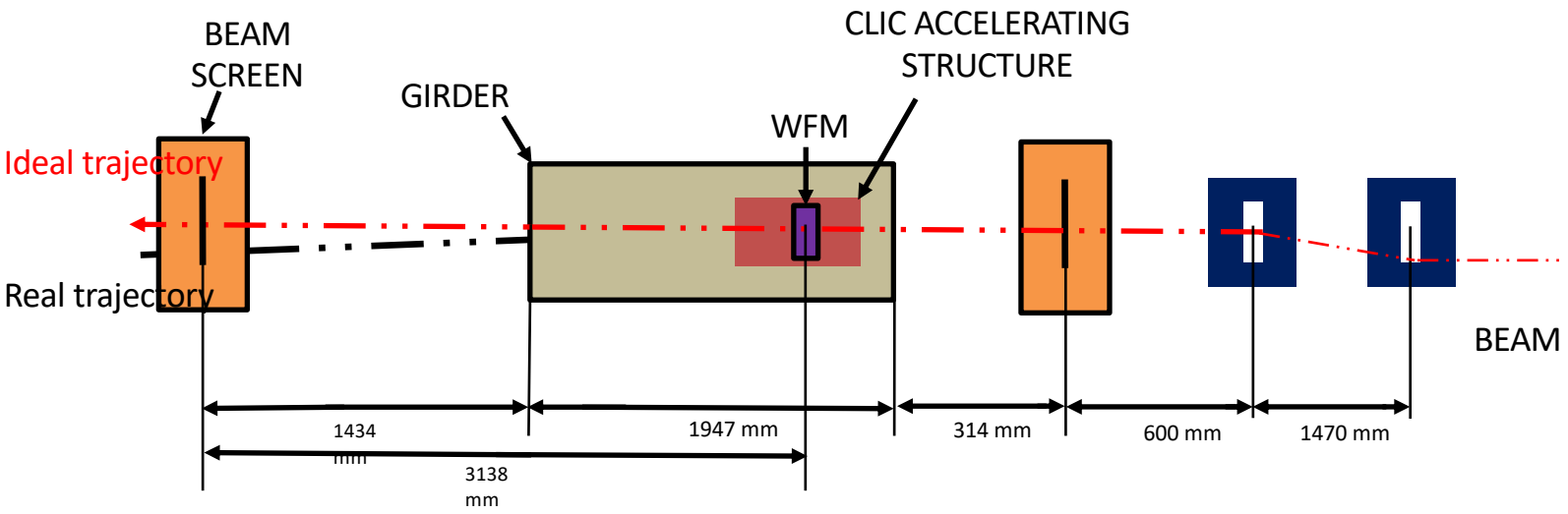
My plan

	Credits year 1								Credits year 2							
		1	2	3	4	5	6			1	2	3	4	5	6	
	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary
Modules	18	14	14	0	0	4	0	**32**	0	0	0	0	0	0	0	**0**
Seminars	13	5	5	0	0	0	1	**11**	8	4	0	4	0	0	0	**8**
Research	34	0	0	6	6	6	7	**25**	54	9	9	9	9	9	9	**54**
	65	19	19	6	6	10	8	**68**	62	13	9	13	9	9	9	**62**

Suggested plan

	Credits year 1								Credits year 2							
		1	2	3	4	5	6			1	2	3	4	5	6	
	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary	Estimated	bimonth	bimonth	bimonth	bimonth	bimonth	bimonth	Summary
Modules	18							**0**	9							**0**
Seminars	13	3	3			6		**12**	6	3	3		3		6	**15**
Research	34	7	7	7	7	9	7	**44**	42	7	7	7	7	7	7	**42**
	65	10	10	7	7	15	7	**56**	57	10	10	7	10	7	13	**57**

Future



Install a deflector in the beam line

From the Wakefield simulations we expect $V_\perp$ = 115 V /(pC m mm), while from the old measurement we got $V_\perp$ = 85 V /(pC m mm), which are not inconsistent, taking into account an uncertainty on the bunch length and longitudinal charge distribution

We are presently analyzing the new measurements. Preliminary evaluations give values of $V_\perp$ which are internally consistent, but are consistently larger then the above ones.

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Thanks for your attention

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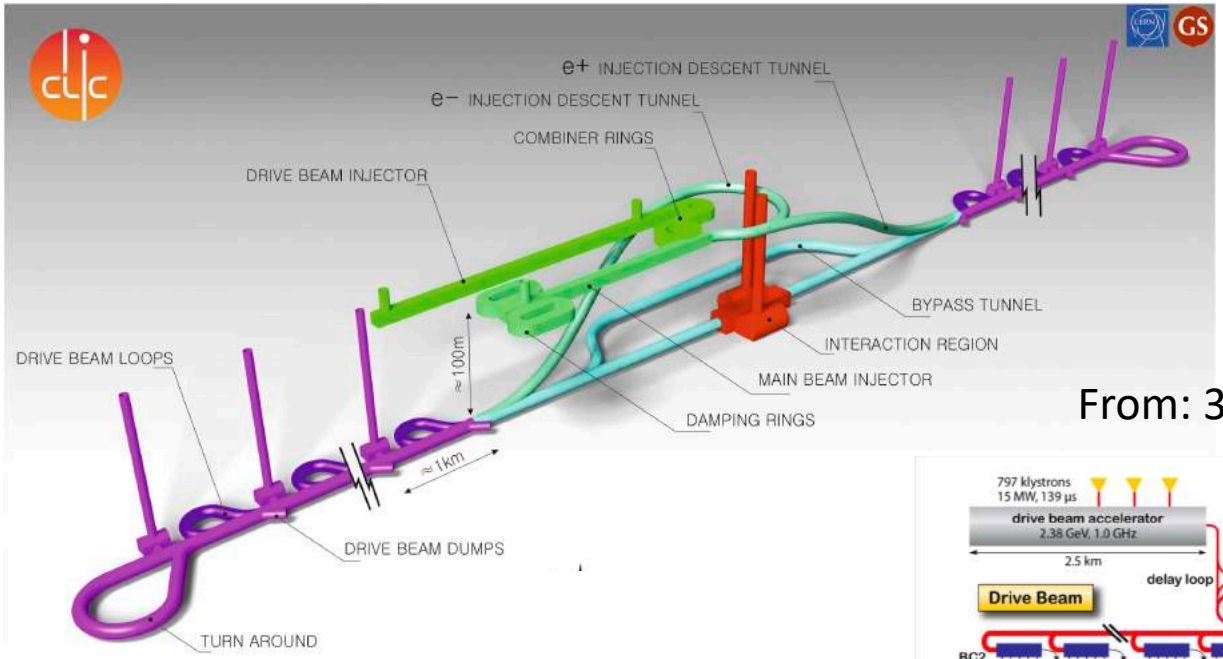
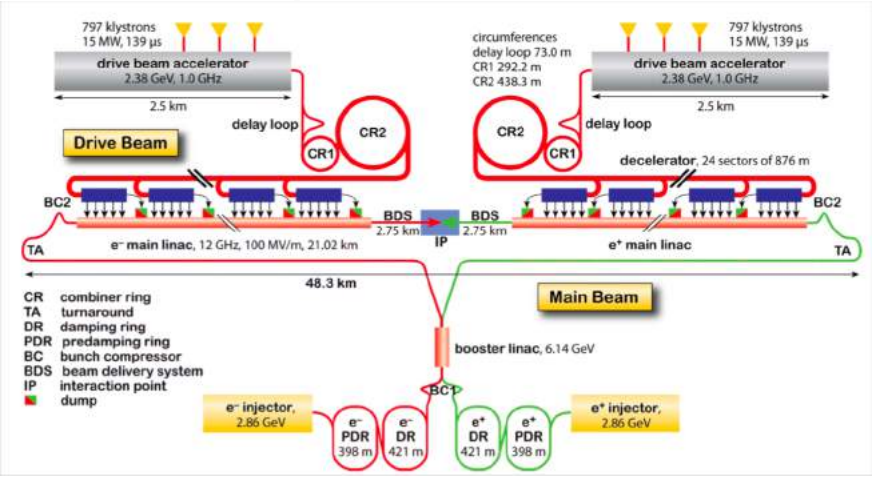
Backup slides

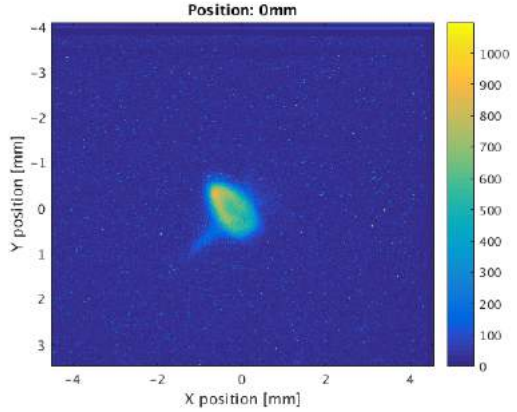
Background – CLIC

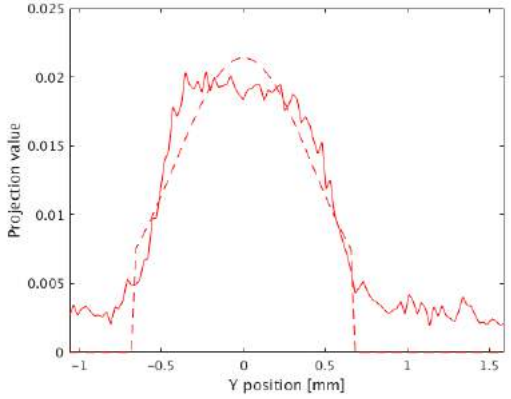


From: 380 GeV – 1.4TeV – To 3TeV

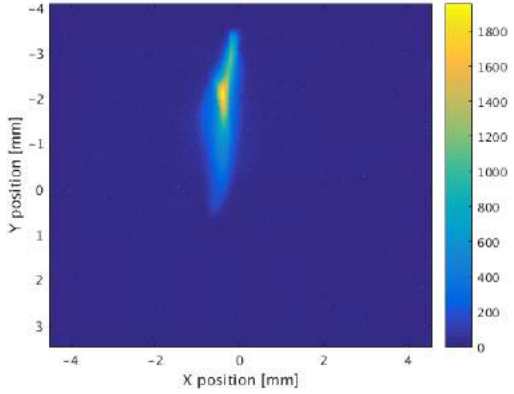


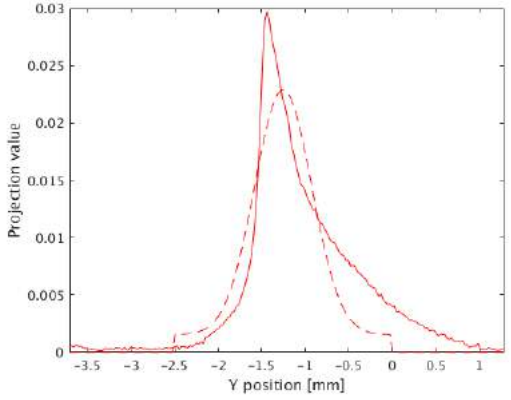
Gaussian beam



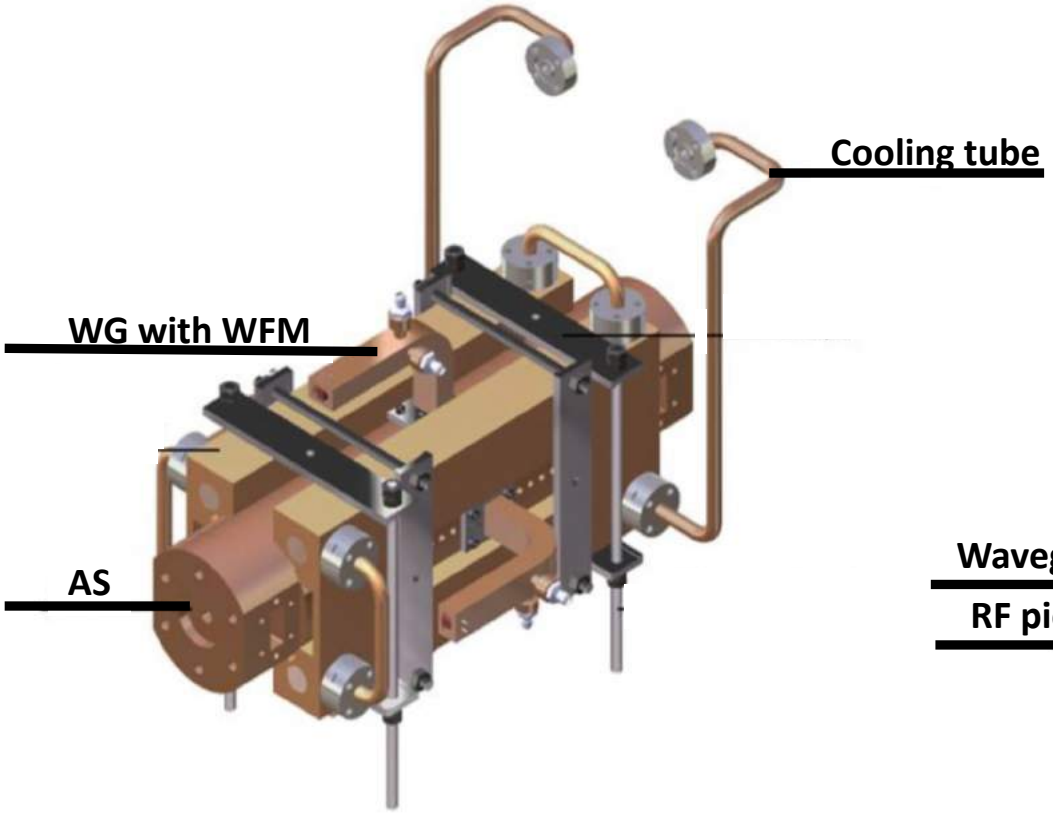


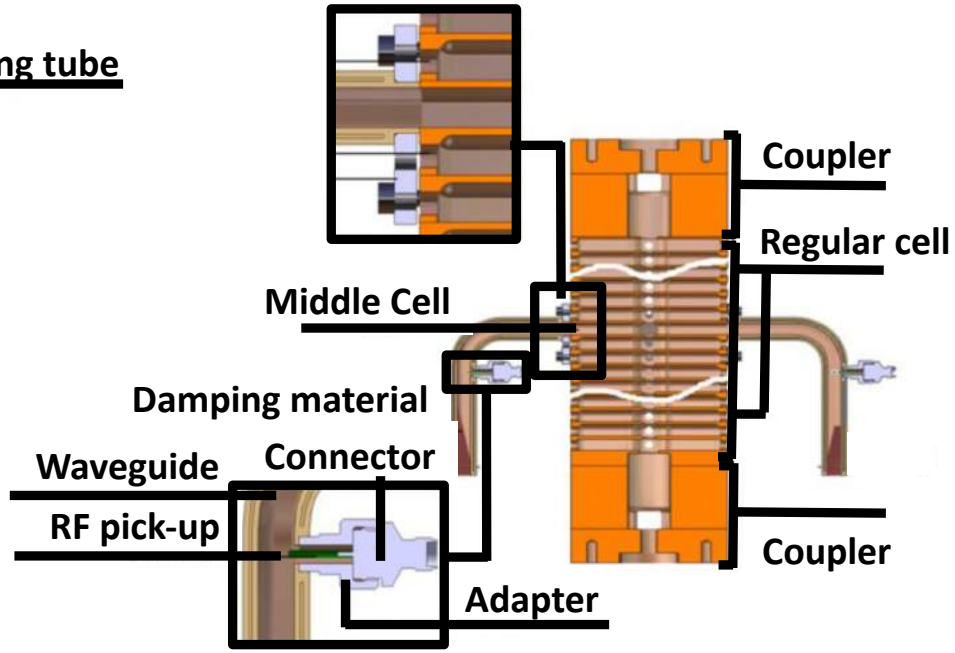
Not Gaussian beam





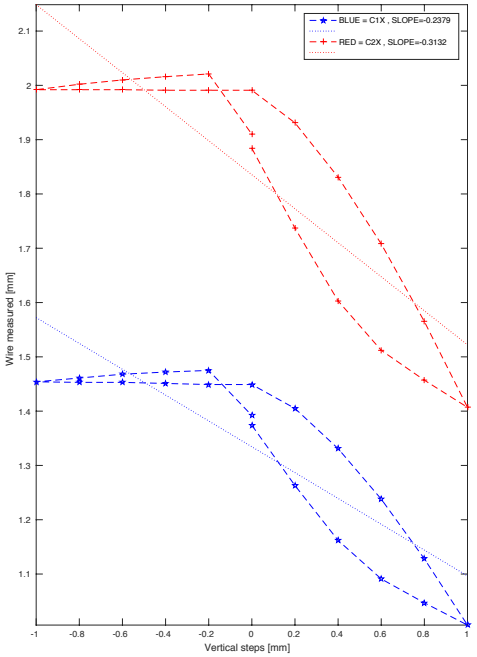
Wake Field Monitor



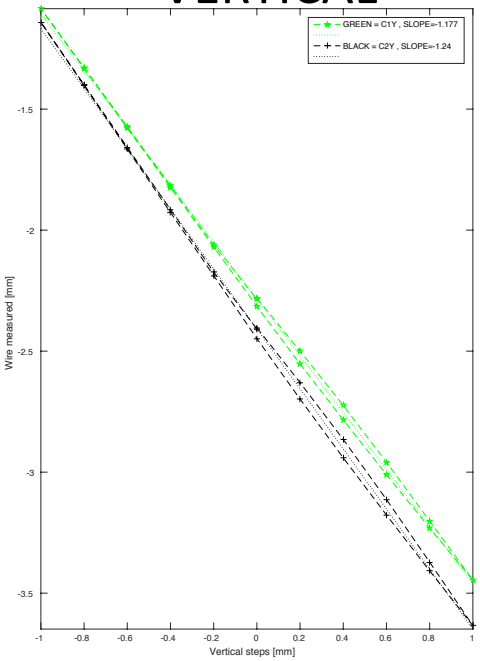


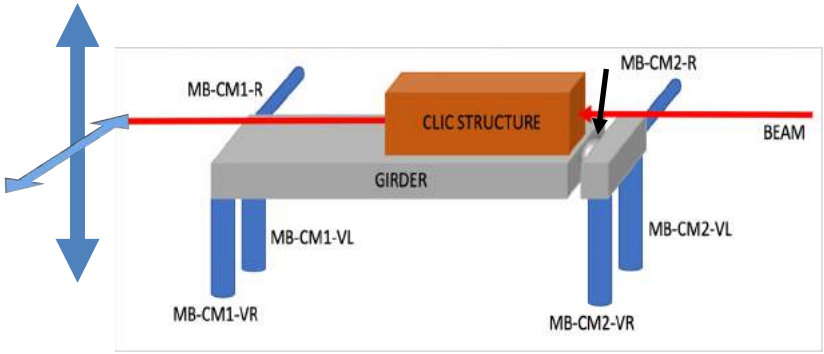
Experimental issues

HORIZONTAL



VERTICAL



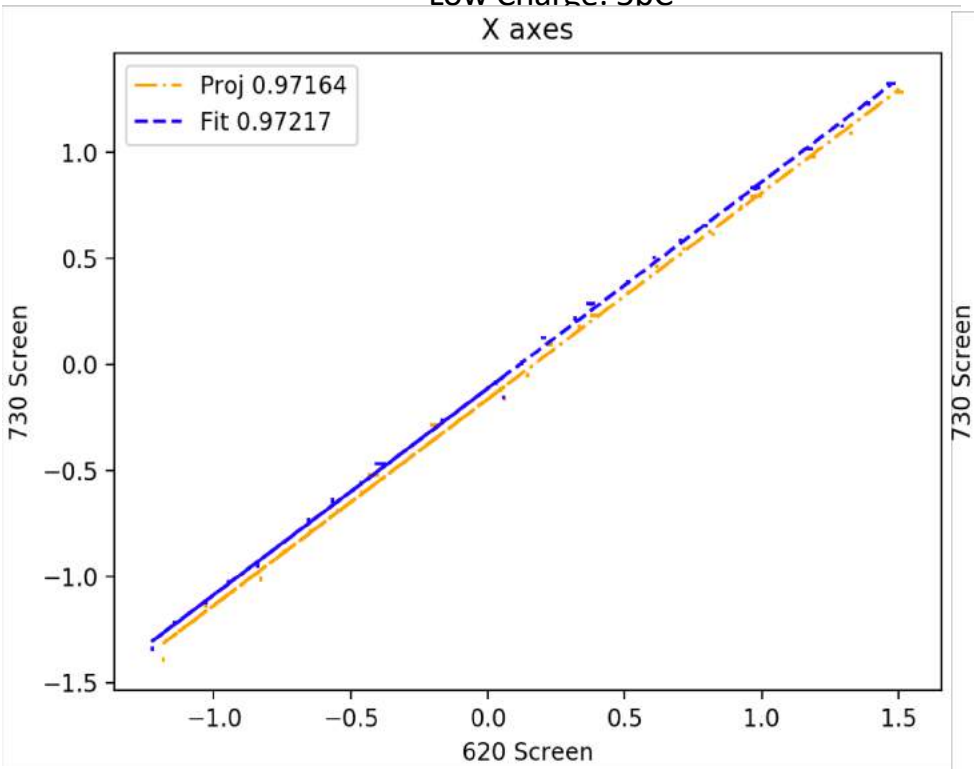


- All the preliminary scans were done to understand the limitation of the method
  - The main limitation comes from a mechanical constraint while limiting the aperture.

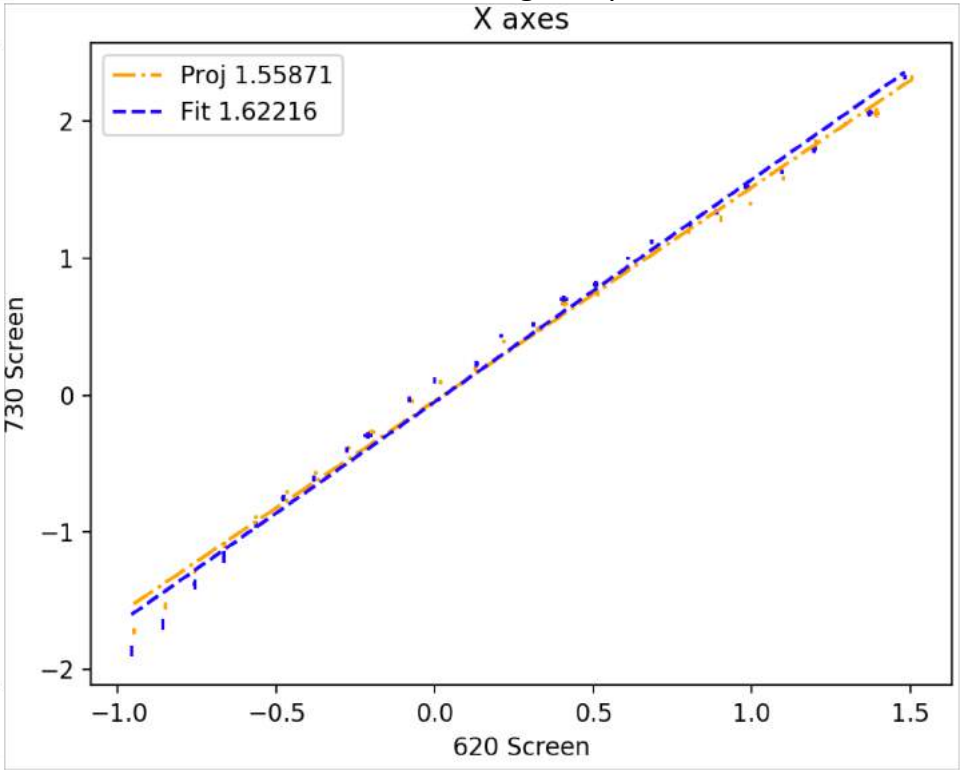
Second preliminary results (1/2)

HORIZONTAL - 1 bunch

Low Charge: 5pC



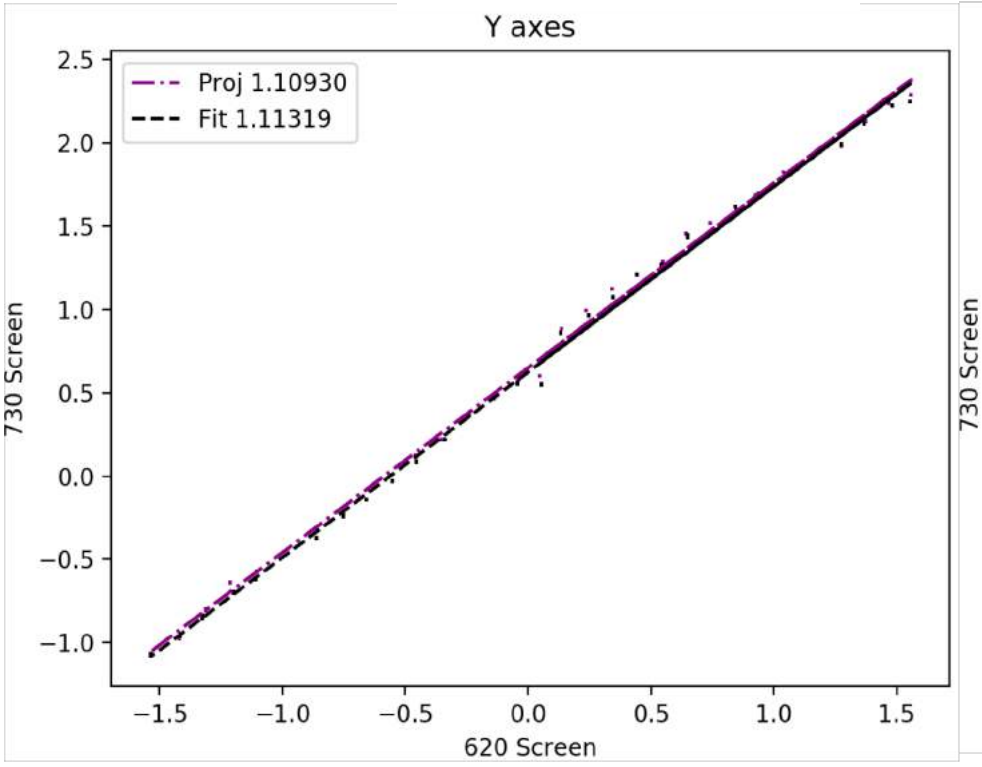
Medium Charge: 50pC



Second preliminary results (2/2)

VERTICAL - 1 bunch

Low Charge: 5pC



Medium Charge: 50pC