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Wake-fields measurements on the CLIC structure

# Wake-fields measurements on the CLIC structure

ANTONIO GILARDI

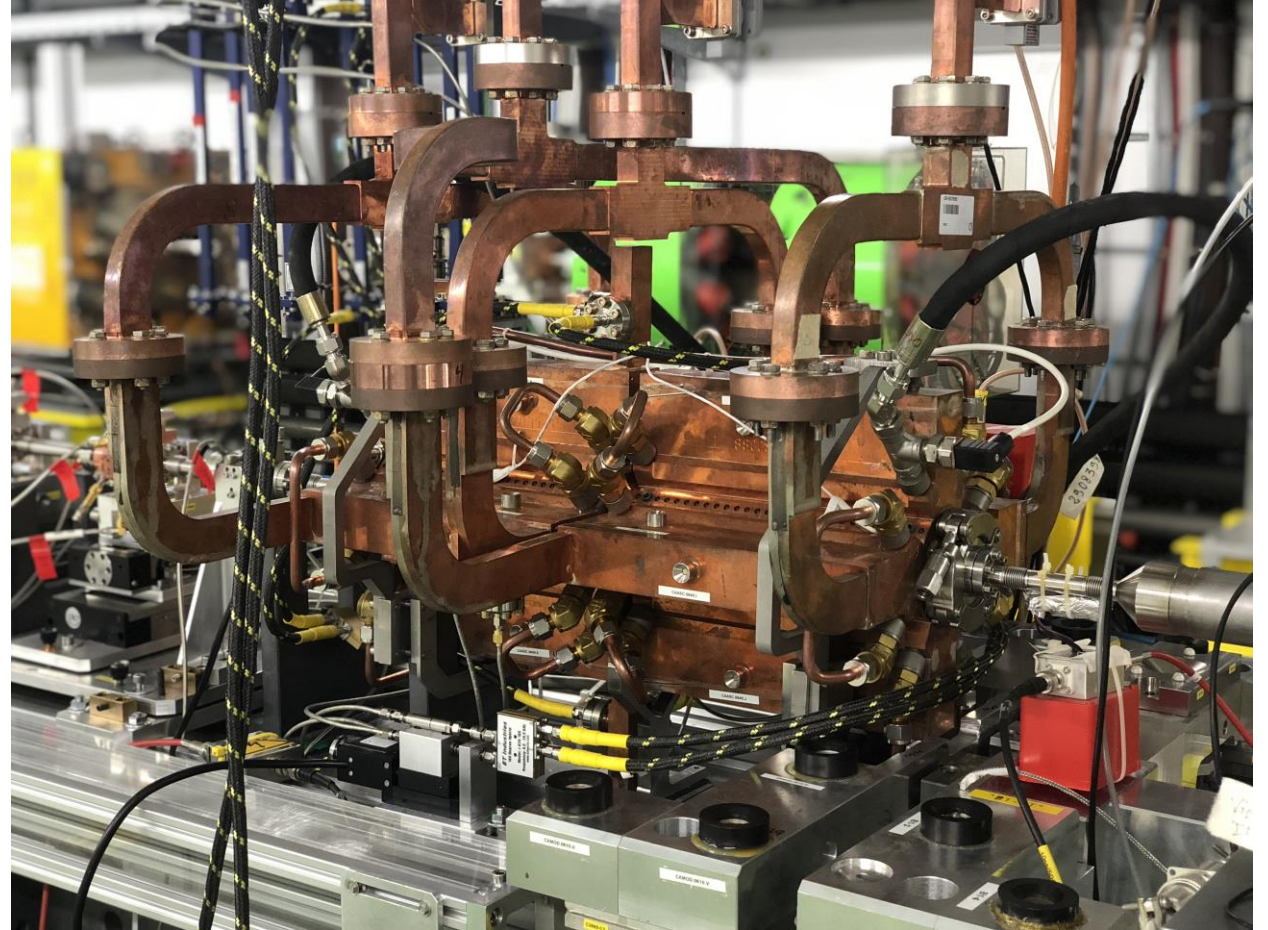
24-01-2018

Acknowledgment: *Kyrre Ness Sjobak – Roberto Corsini – Wilfrid Farabolini – Davide Gamba – Andrea Latina*



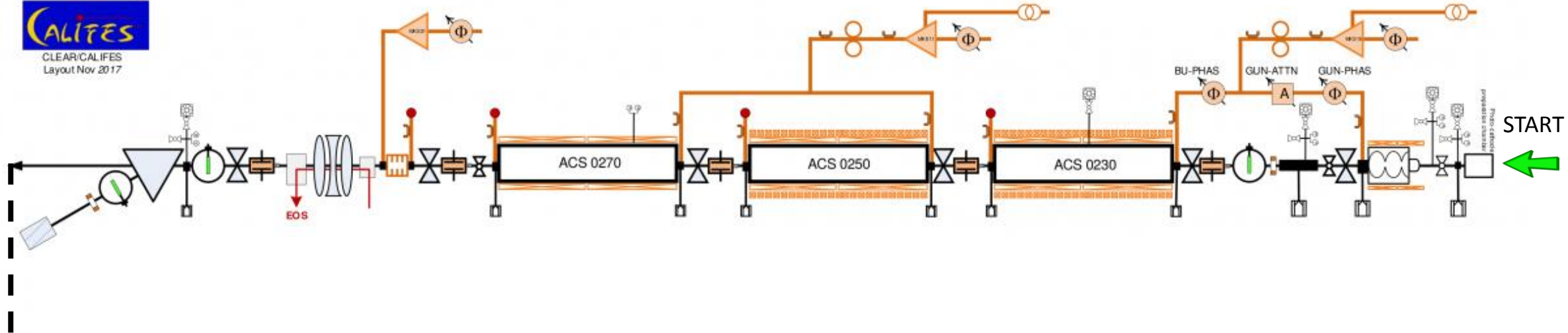
# OUTLINE:

- CLEAR layout
- Previous studies
- The proposed approach
- First experimental setup
- First preliminary results
- Experimental issues
- Second experimental setup
- Second preliminary results
- Conclusion

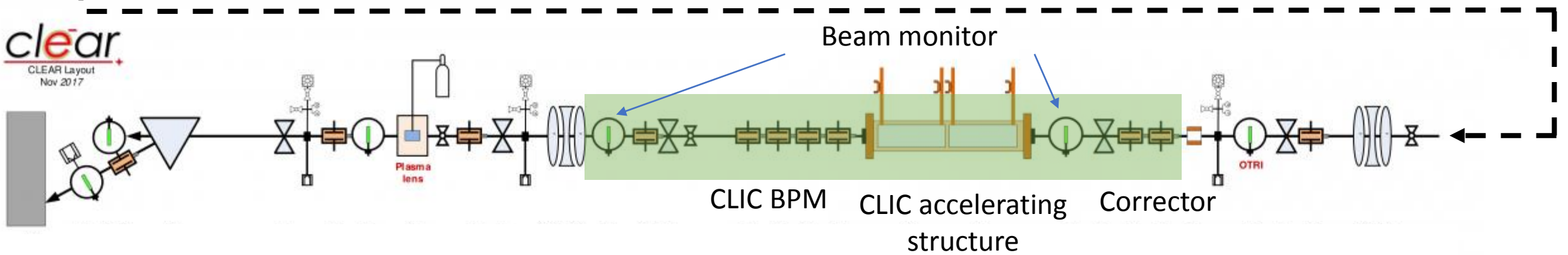


# CLEAR layout

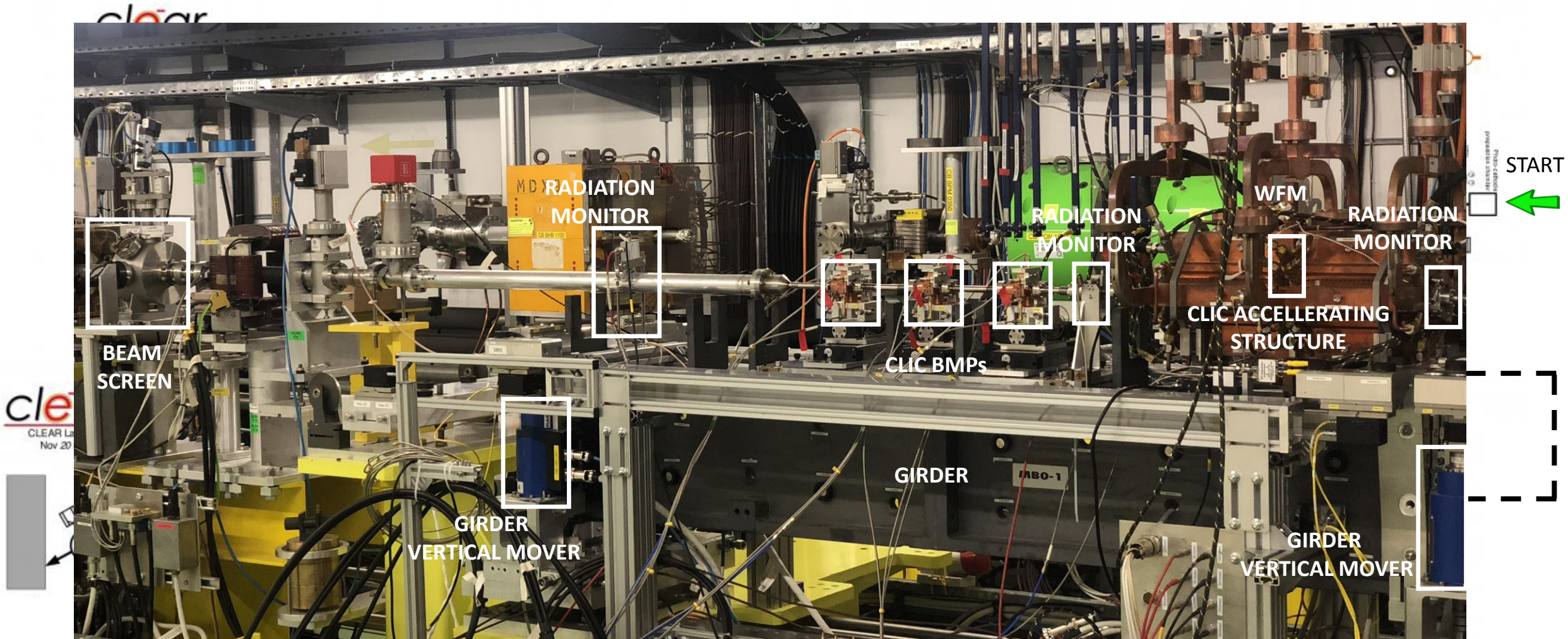
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Layout Nov 2017



**clear**  
CLEAR Layout  
Nov 2017



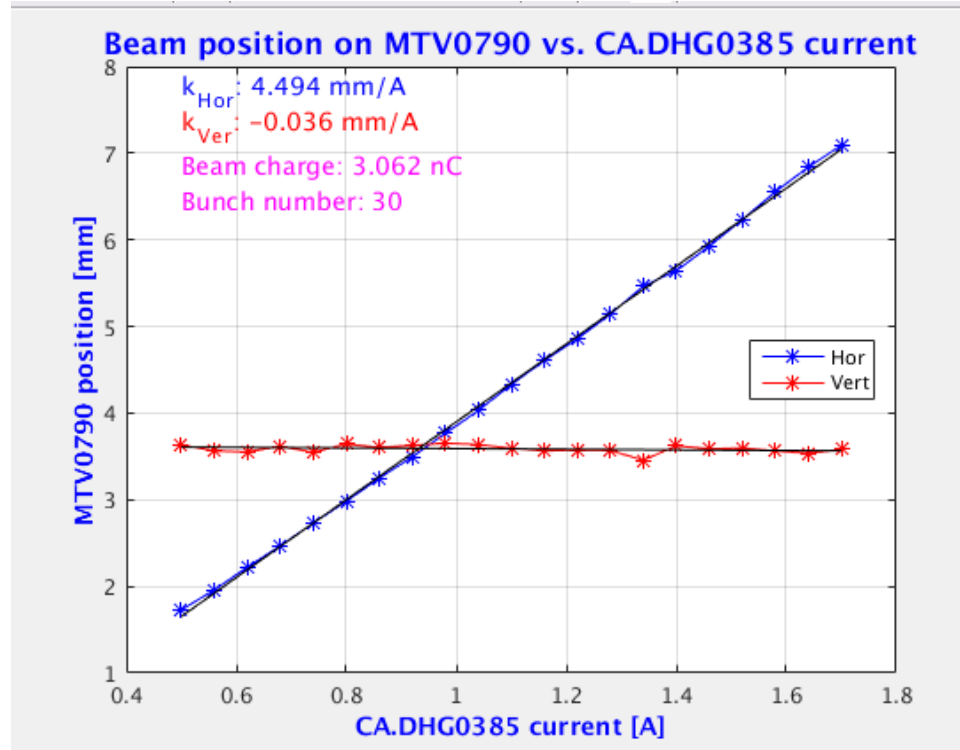
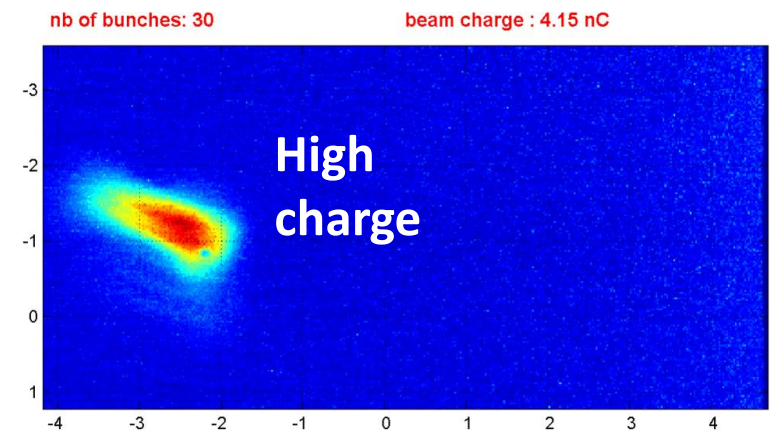
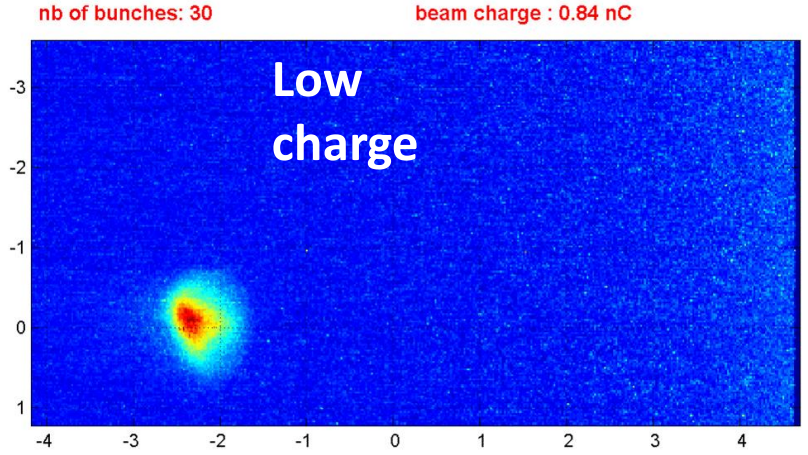
# CLEAR layout



# Previous studies (1/2)



## Scan corrector current and beam position on MTV

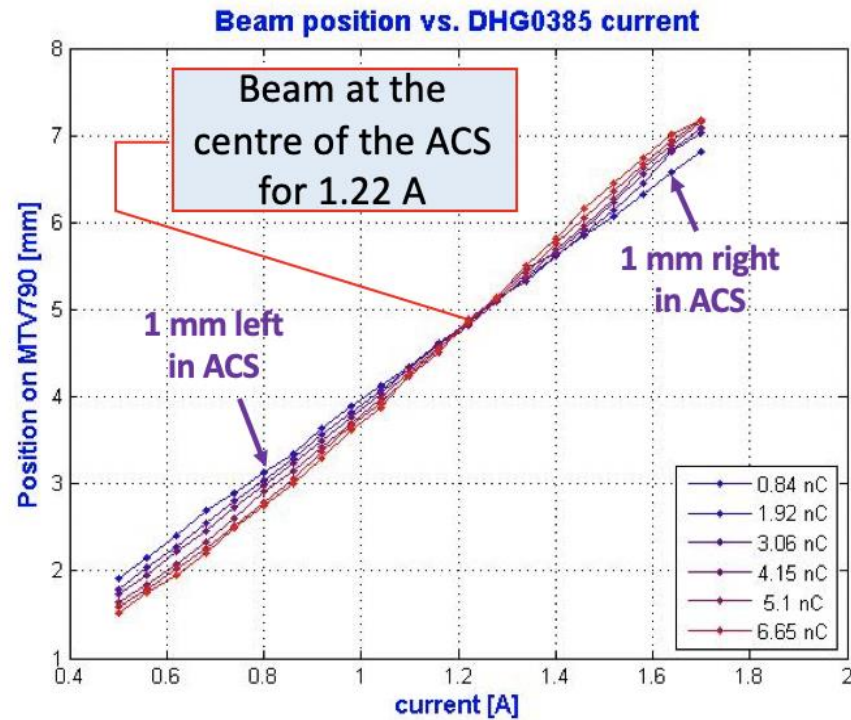


A position scan using corrector DHG0385 and slope fitting

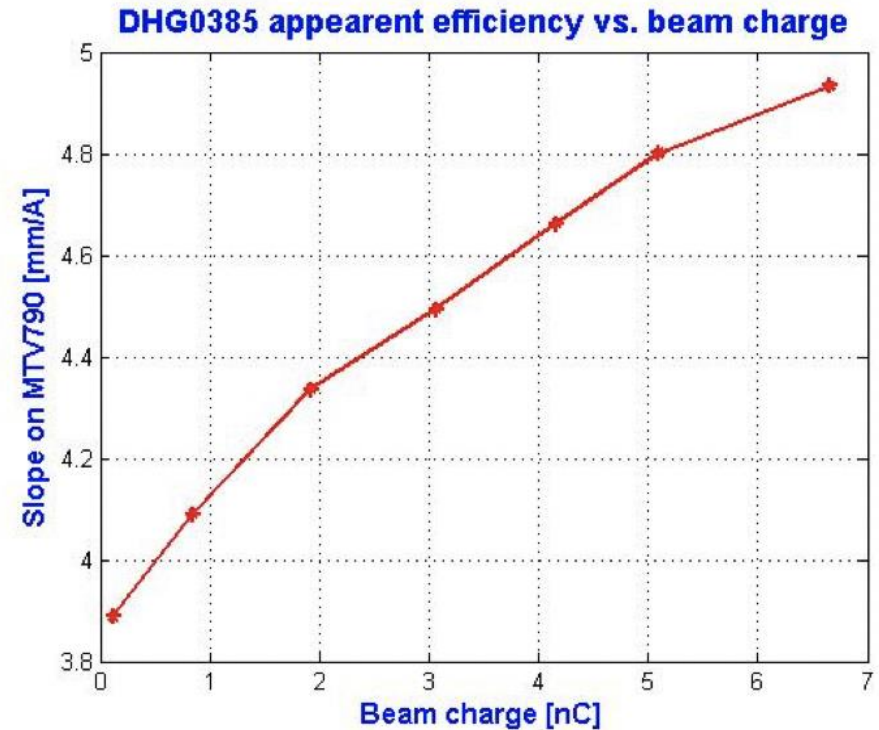
# Previous studies (2/2)



## Results for various beam charges and 30 bunches



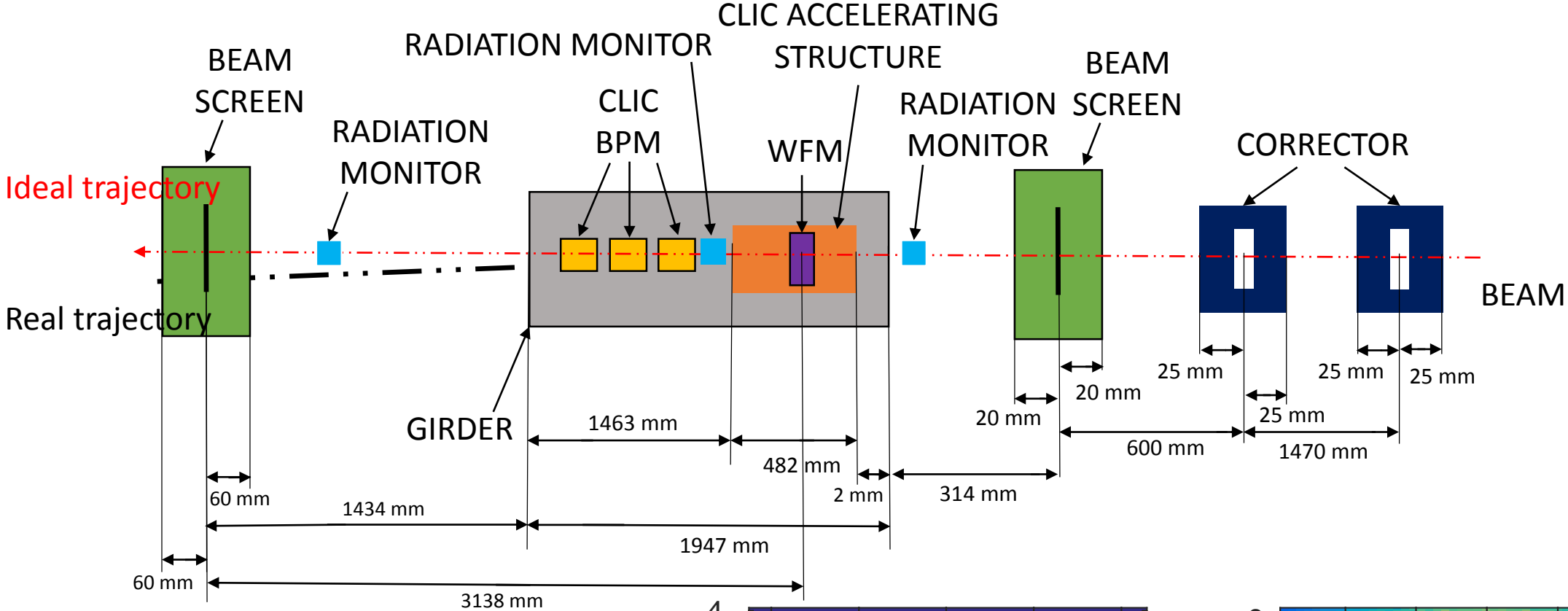
Position scan for 6 various beam charges and 30 bunches  
[CTF logbook 28-09-16 8:23]



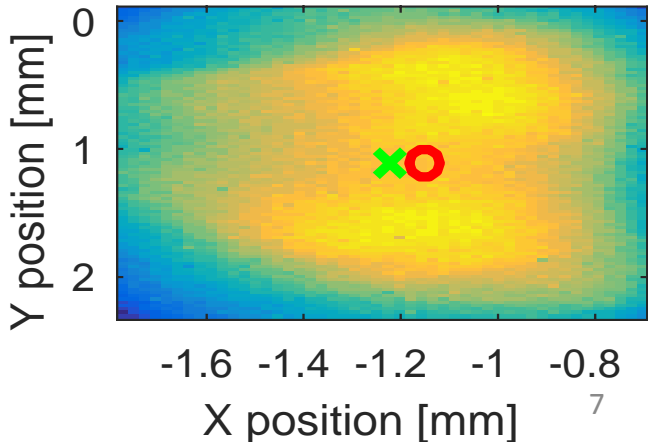
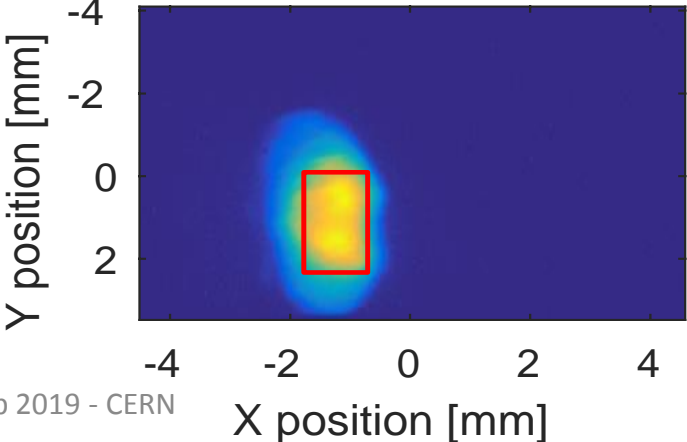
Slope evolution with beam charge for 30 bunches  
[CTF logbook 28-09-16 8:23]

Kick angles by the ACSs for beam offset 1 mm up to 0.094 mrad for beam charge 6.7 nC (30 bunches of 0.22 nC)

# The proposed approach (1/2)

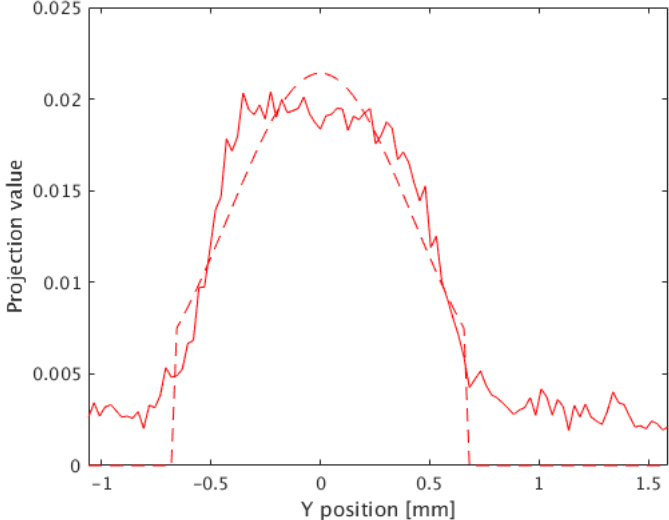
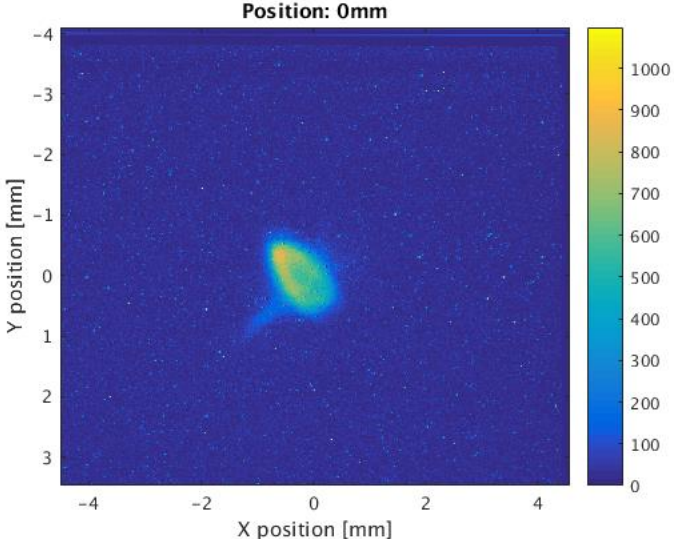


It is a beam-based method using a beam screen

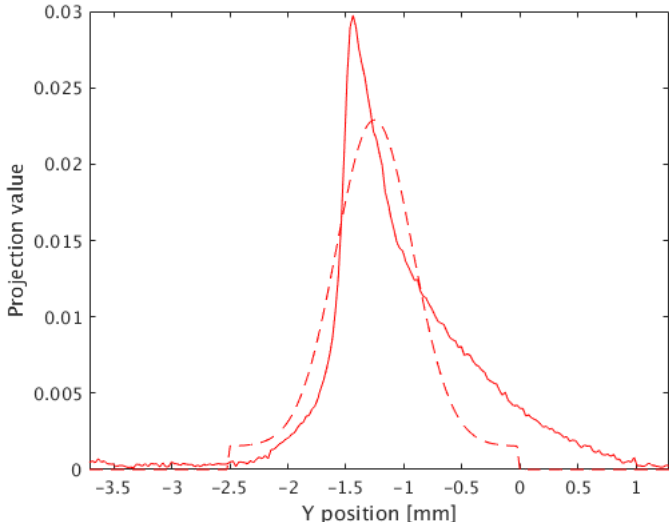
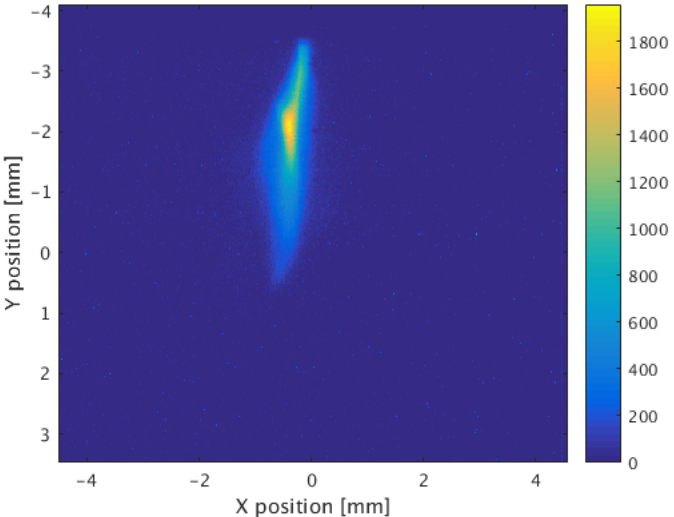


# The proposed approach (2/2)

### Gaussian beam



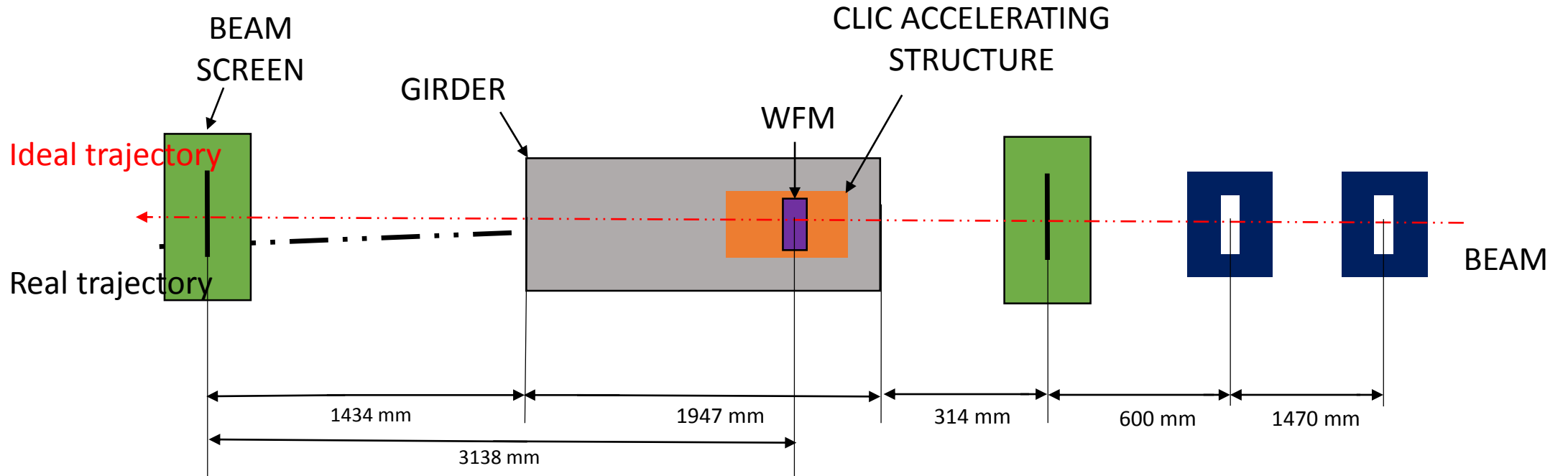
### Not Gaussian beam





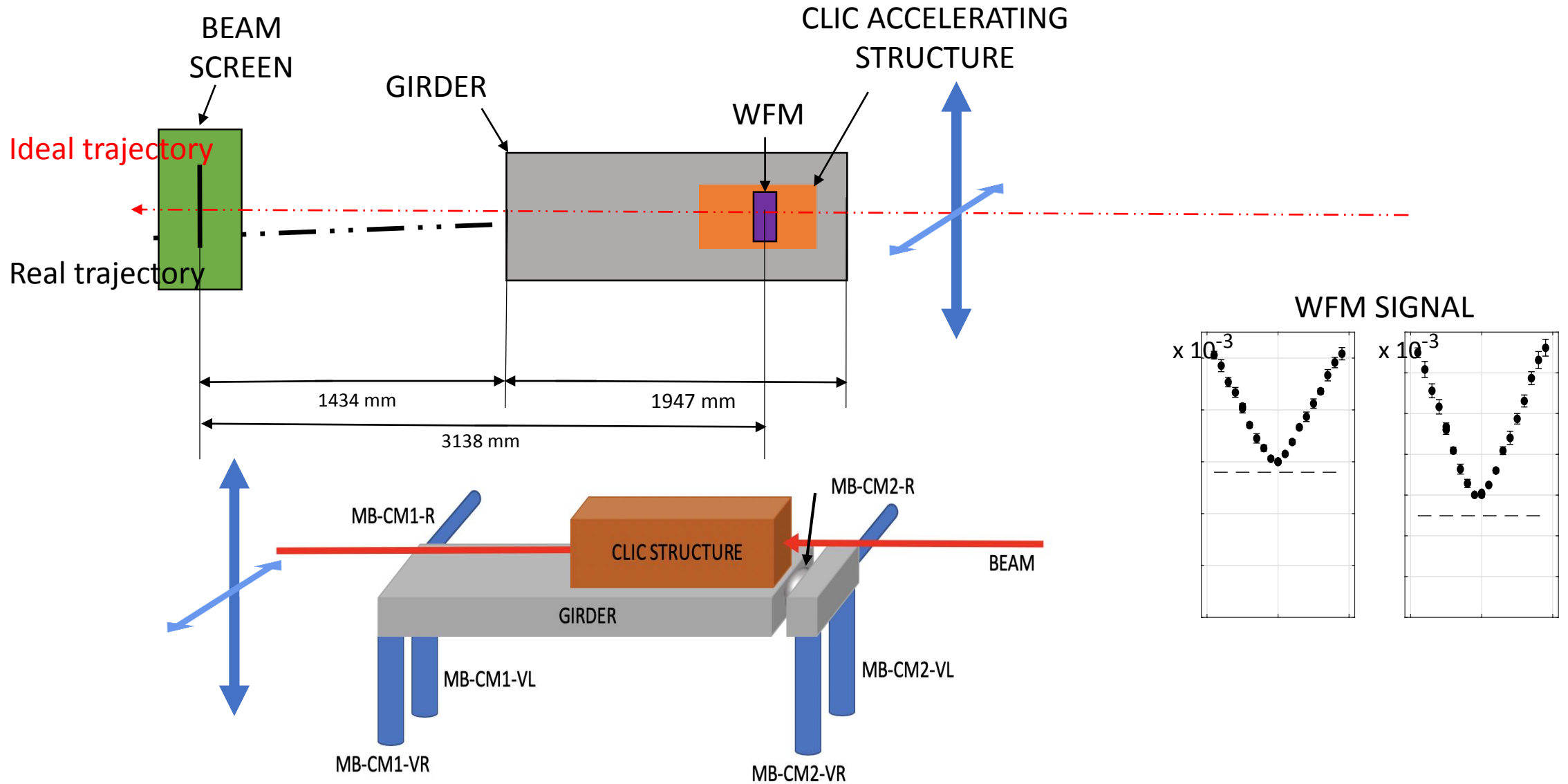


# First experimental setup (2/3)



ACTIVE DEVICES ONLY

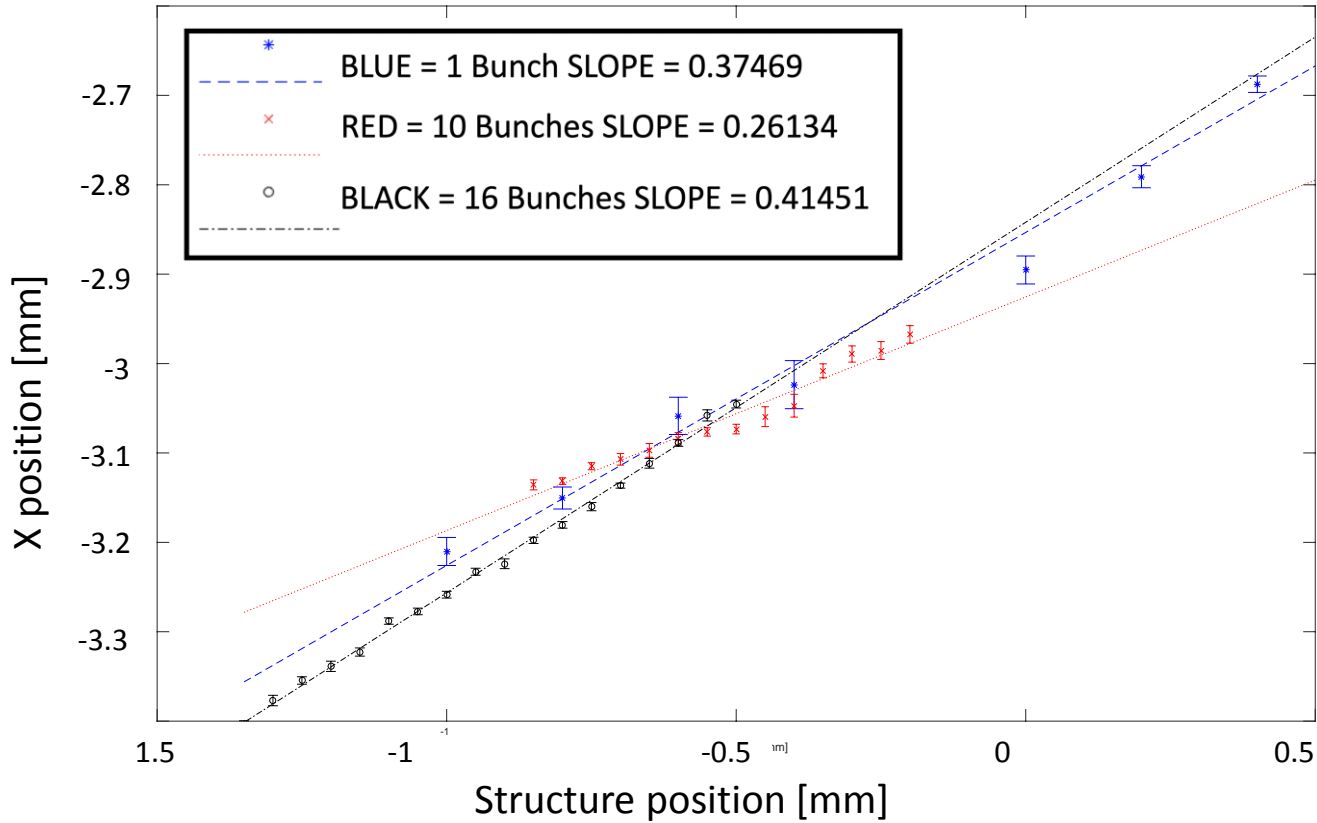
# First experimental setup (3/3)



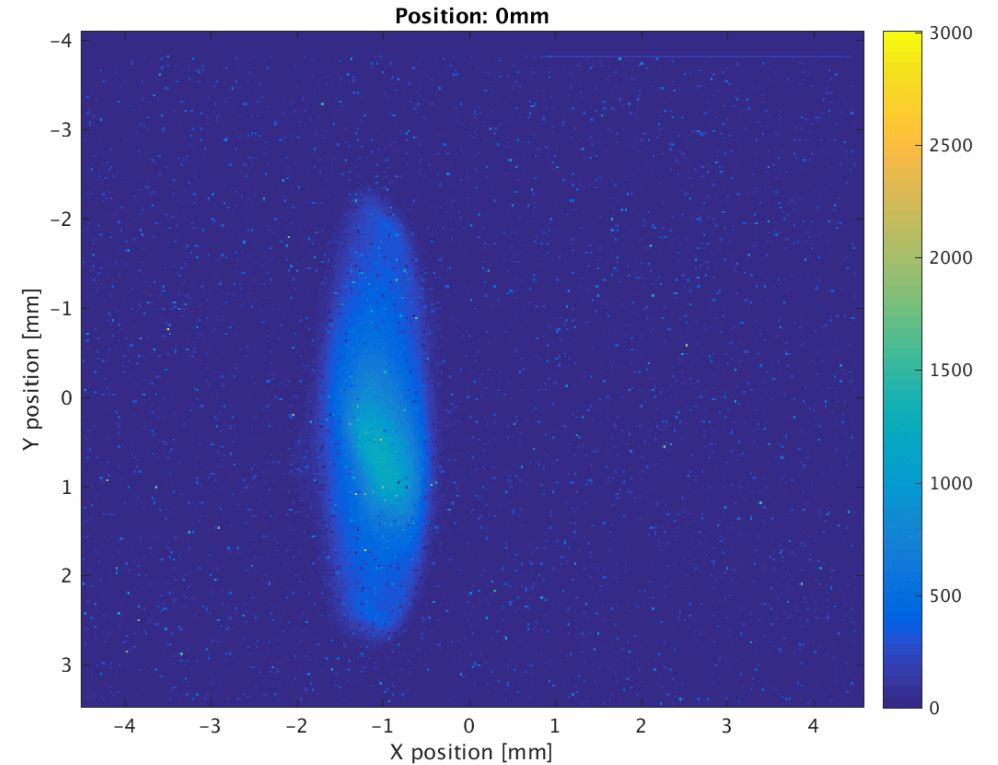
MOVE THE STRUCTURE

# First preliminary results (1/2)

Average beam position

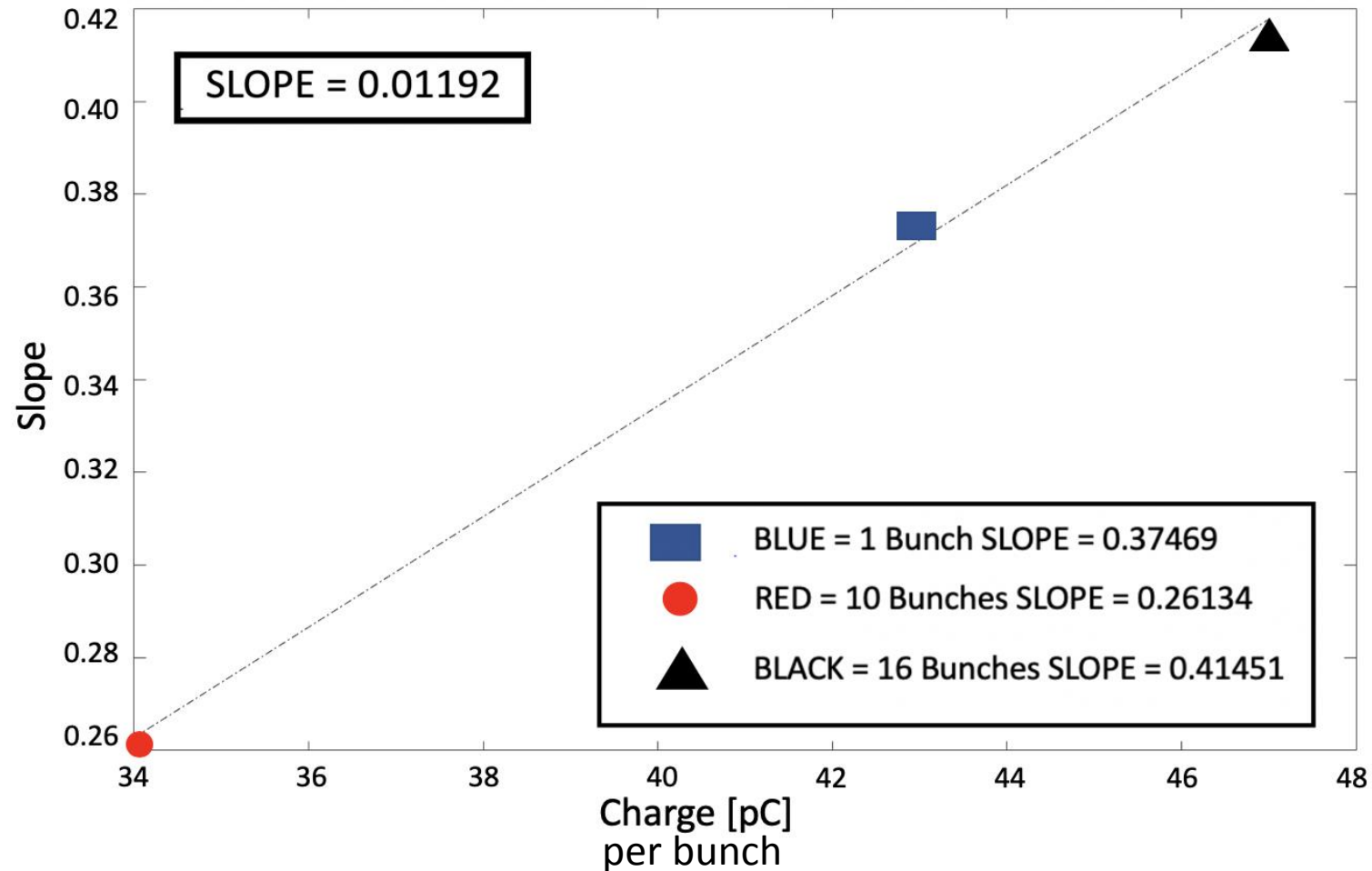


**FIT**



# First preliminary results (2/2)

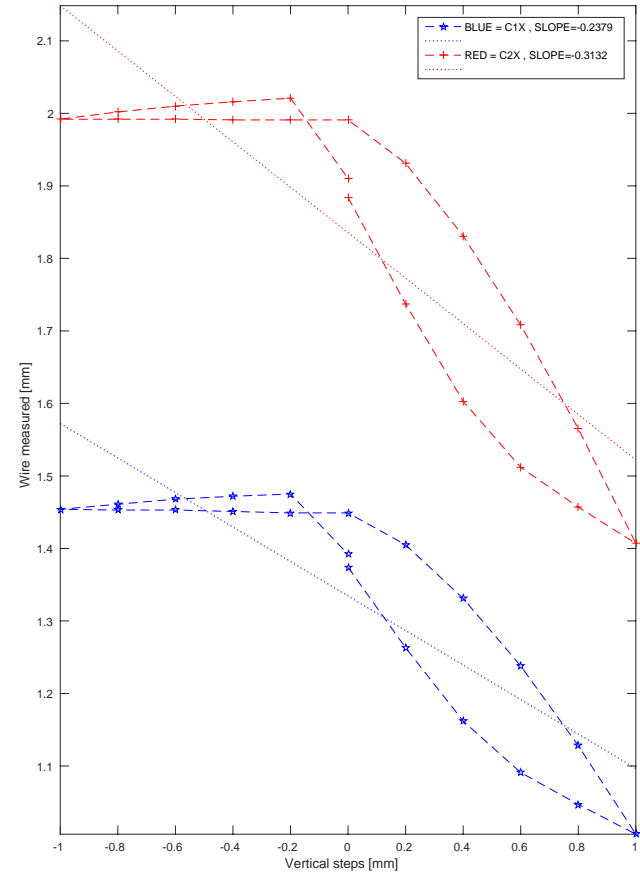
By changing the number of bunches it is possible to observe a linear dependence with the bunch charge



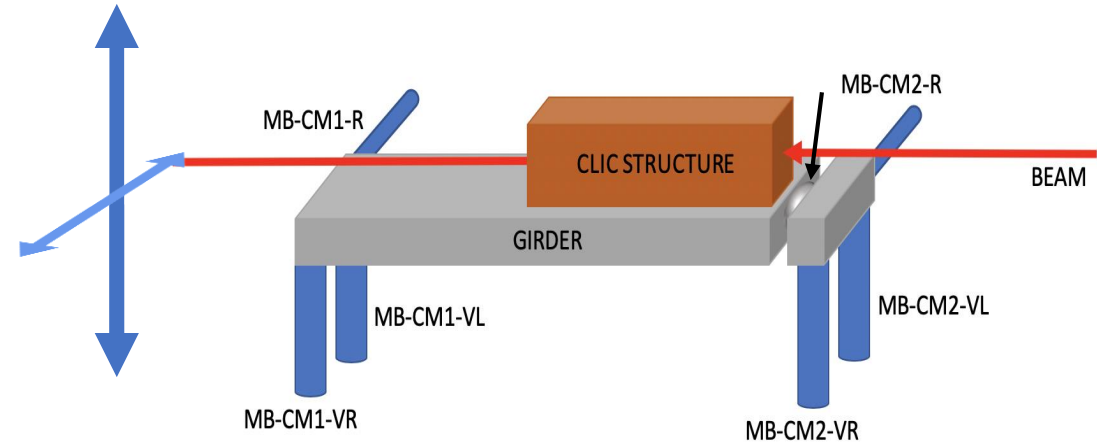
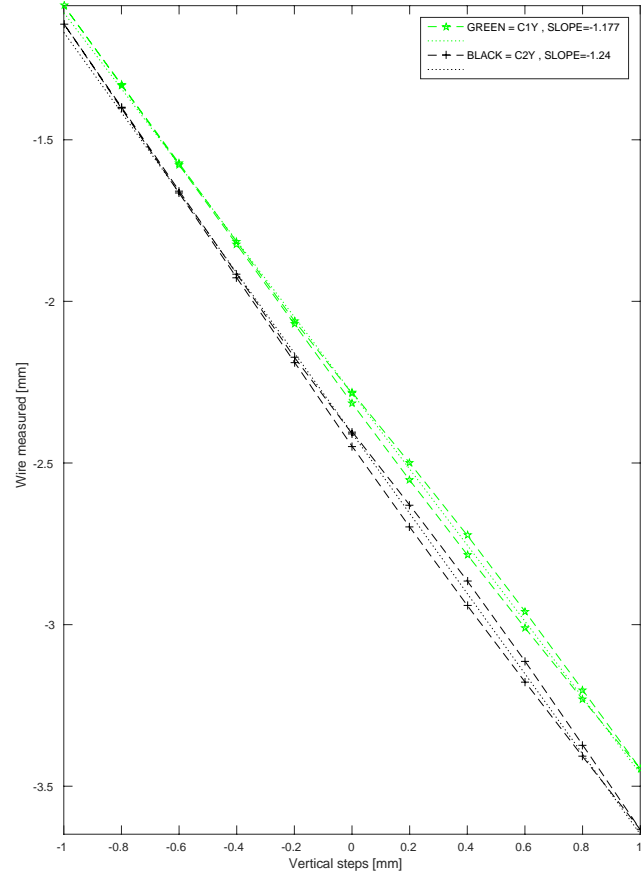
The plot indicates that the contribution is dominated by a short range wake

# Experimental issues

## HORIZONTAL

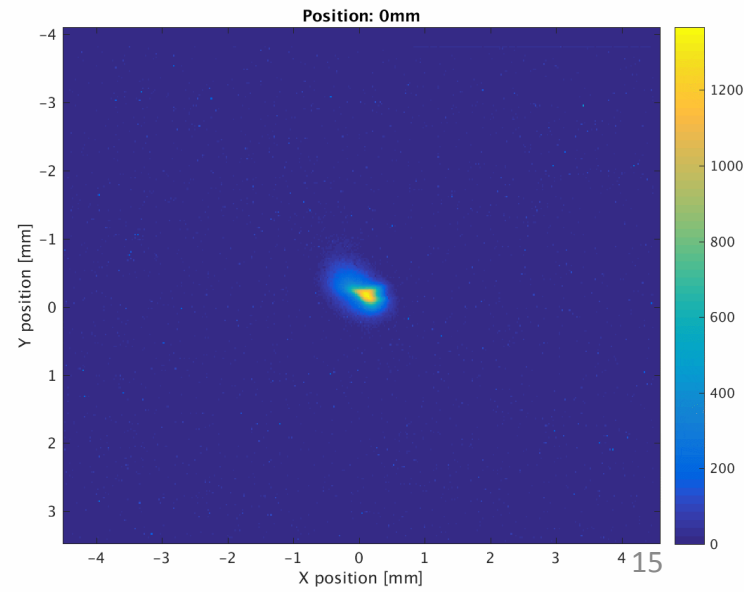
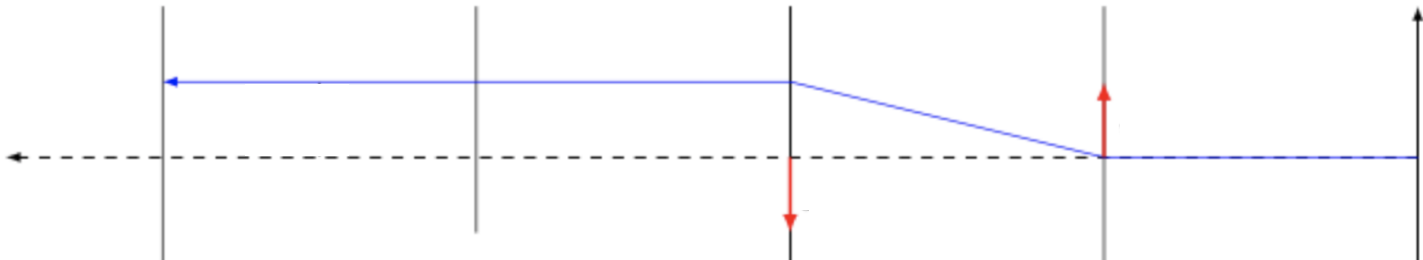
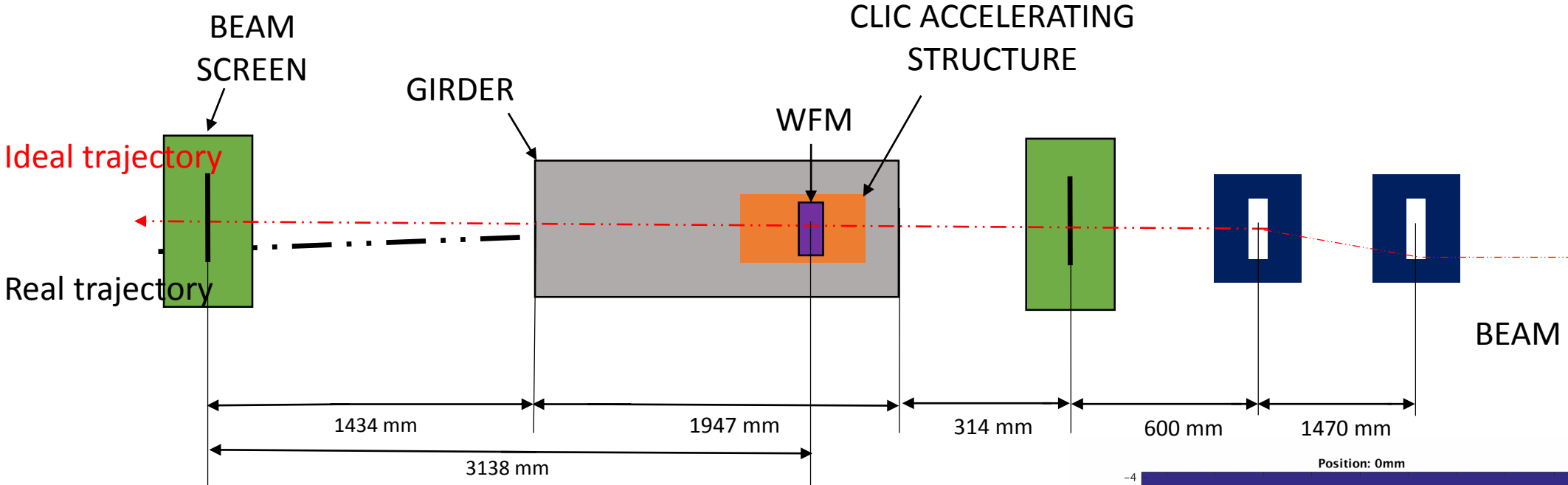


## VERTICAL



- 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.

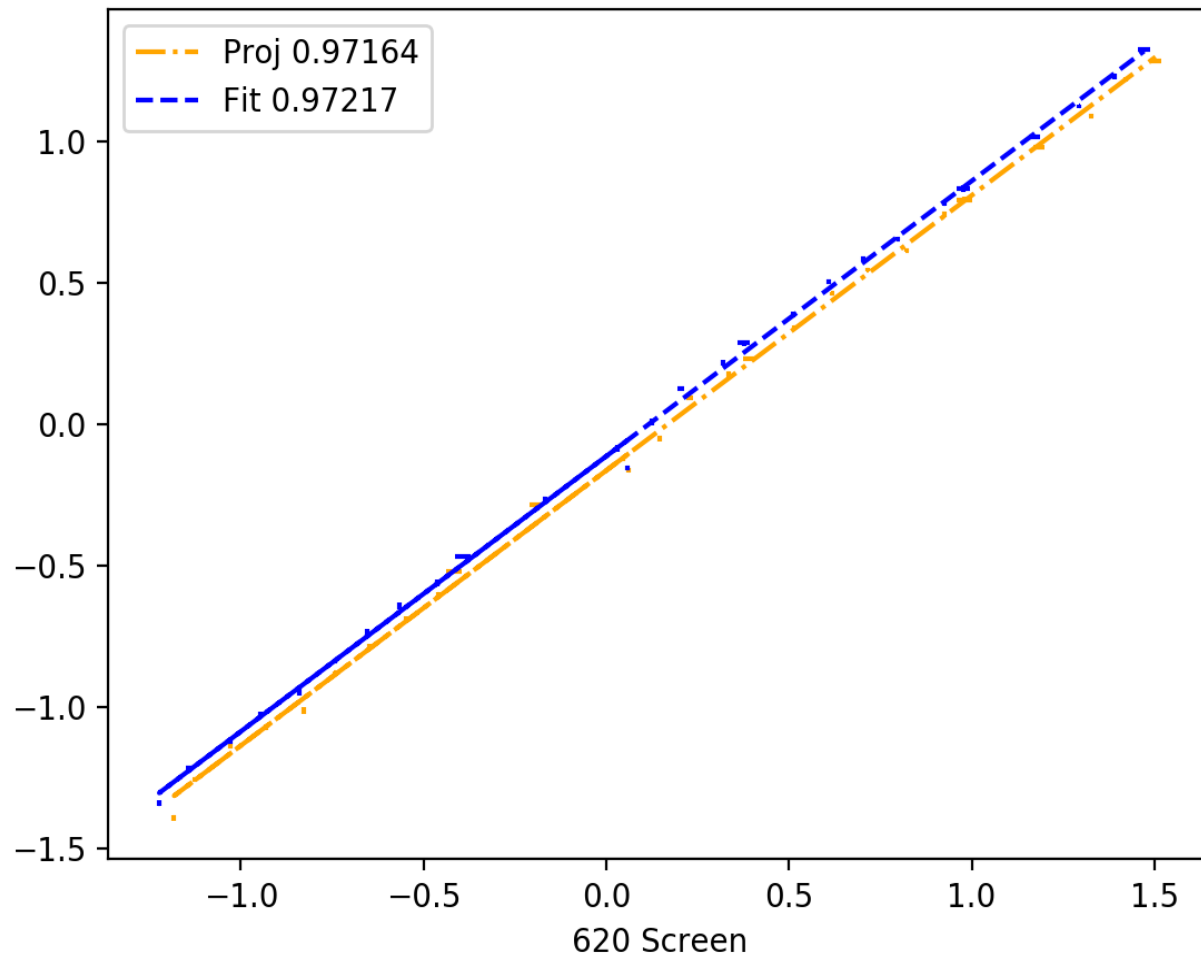
# Second experimental setup



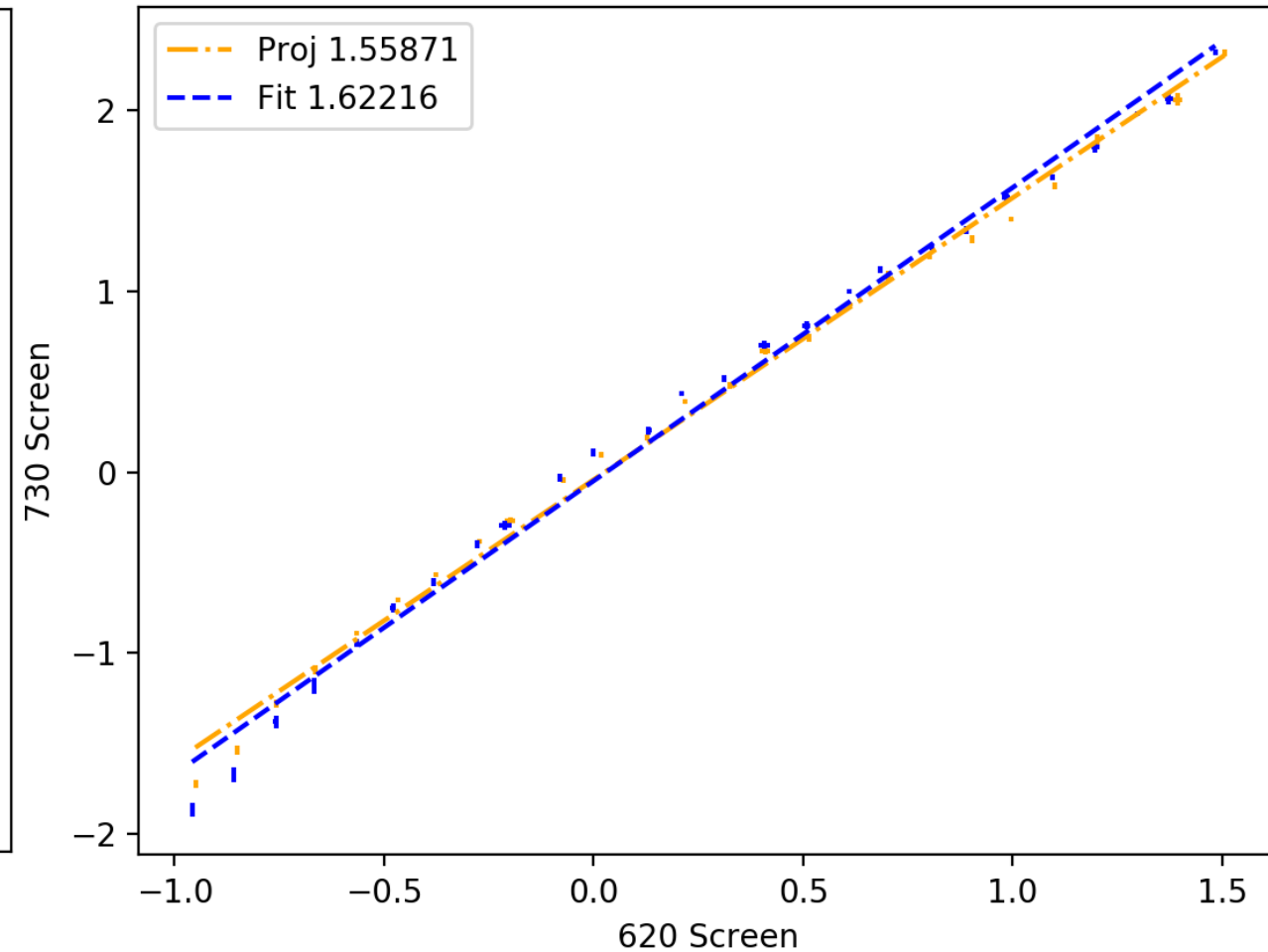
# Second preliminary results (1/2)

HORIZONTAL - 1 bunch

Low Charge: 5pC  
X axes



Medium Charge: 50pC  
X axes



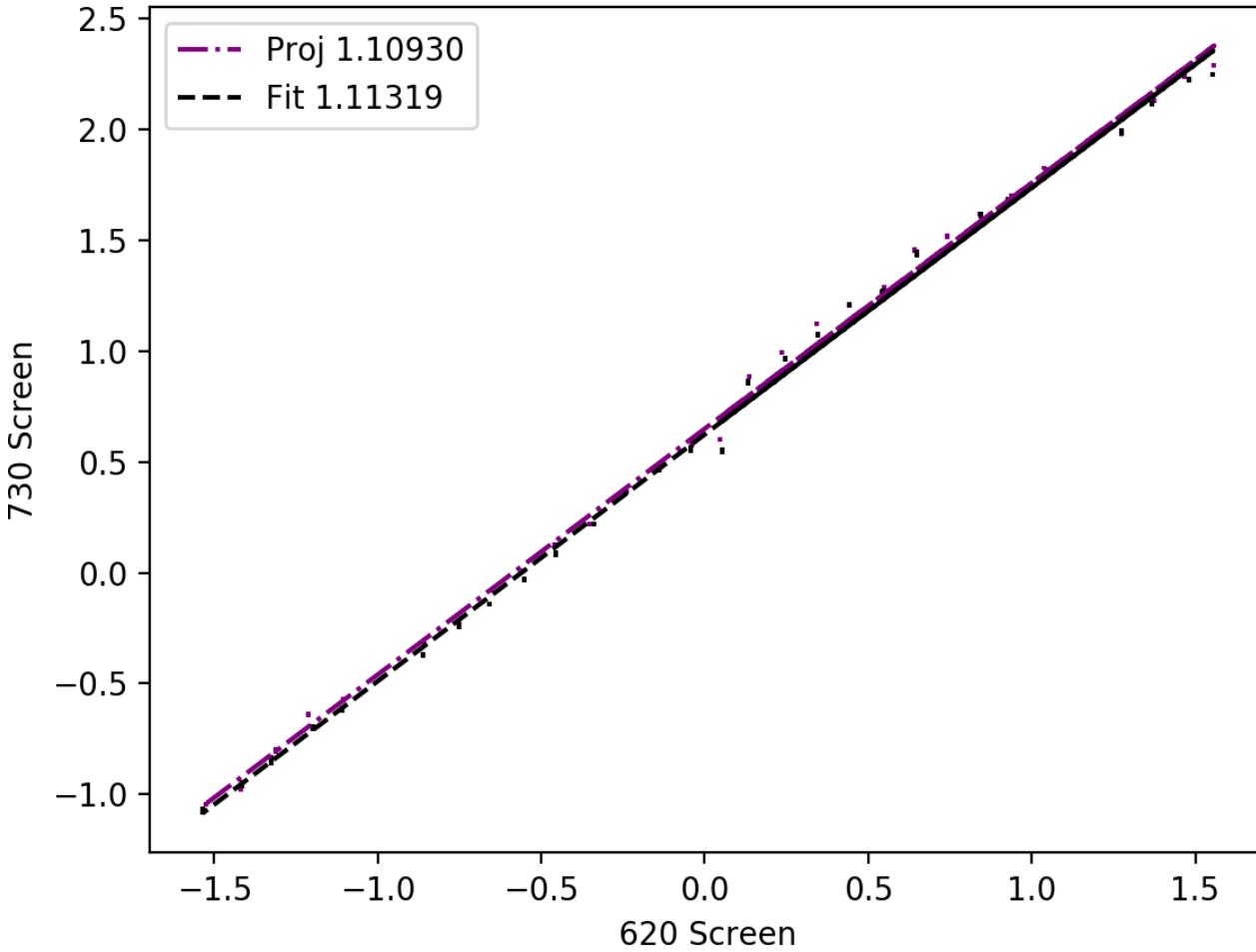


# Second preliminary results (2/2)

VERTICAL - 1 bunch

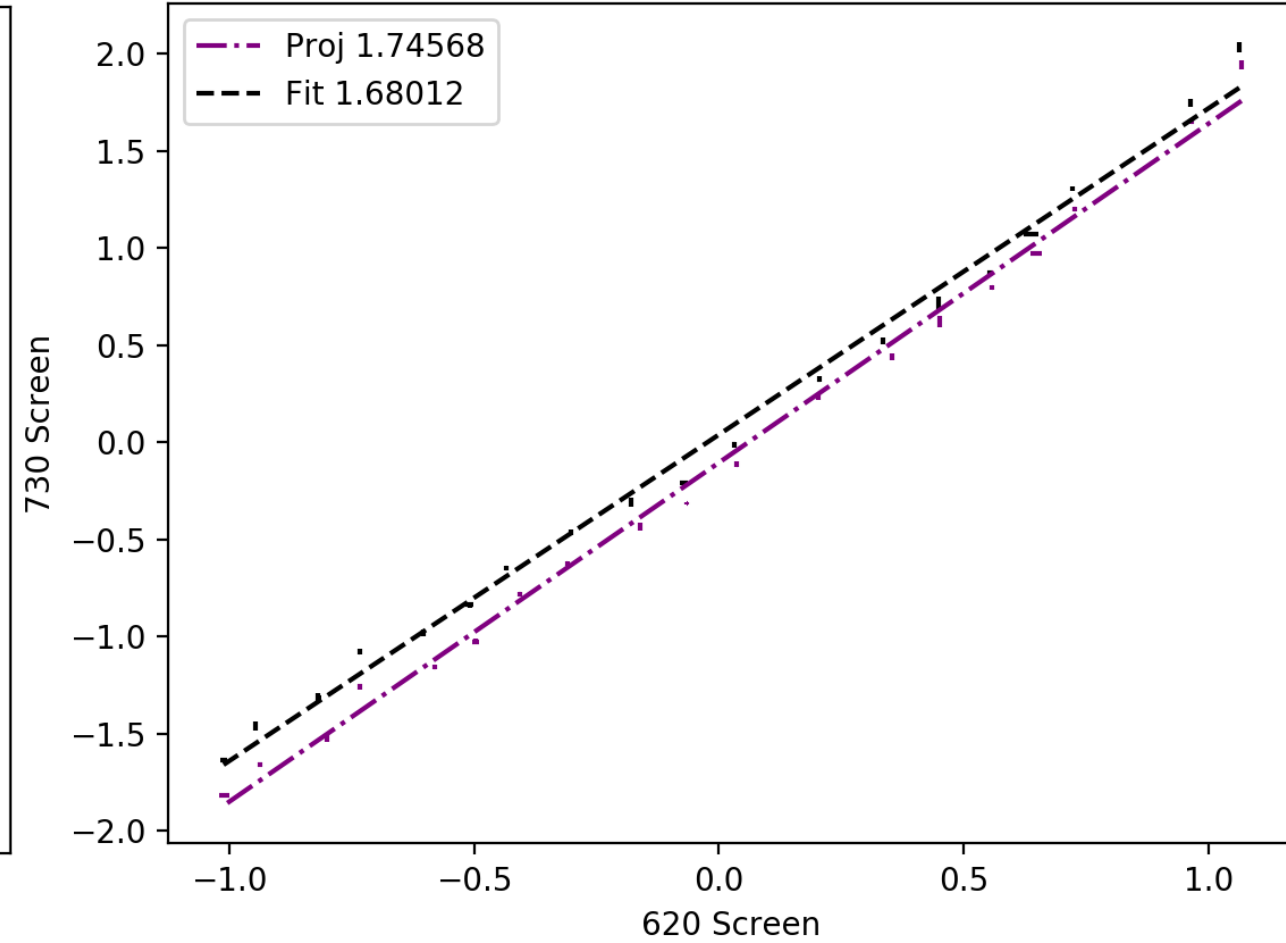
Low Charge: 5pC

Y axes



Medium Charge: 50pC

Y axes



# Conclusion and future development

The method has shown promising results.

As a next step, we would like to use the method as well to establish the electric center of the accelerating structure and compare with the wake-field monitor.

The mechanical constraint of the first setup has been solved, and other scans done by moving the girder are going to be performed, and compared with the bump method.

In the future, we are also considering to install a deflector to investigate directly the effect of the transverse kick within a bunch.

From the Wakefield simulations we expect  $V_{\perp} = 115 \text{ V}/(\text{pC m mm})$ , while from the old measurement we got  $V_{\perp} = 85 \text{ V}/(\text{pC m mm})$ , 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 than the above ones.

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# Thanks for your attention

# Backup slides

# Wake Field Monitor

