



# Update on of the Hollow e-lens and e-beam

Adriana Rossi

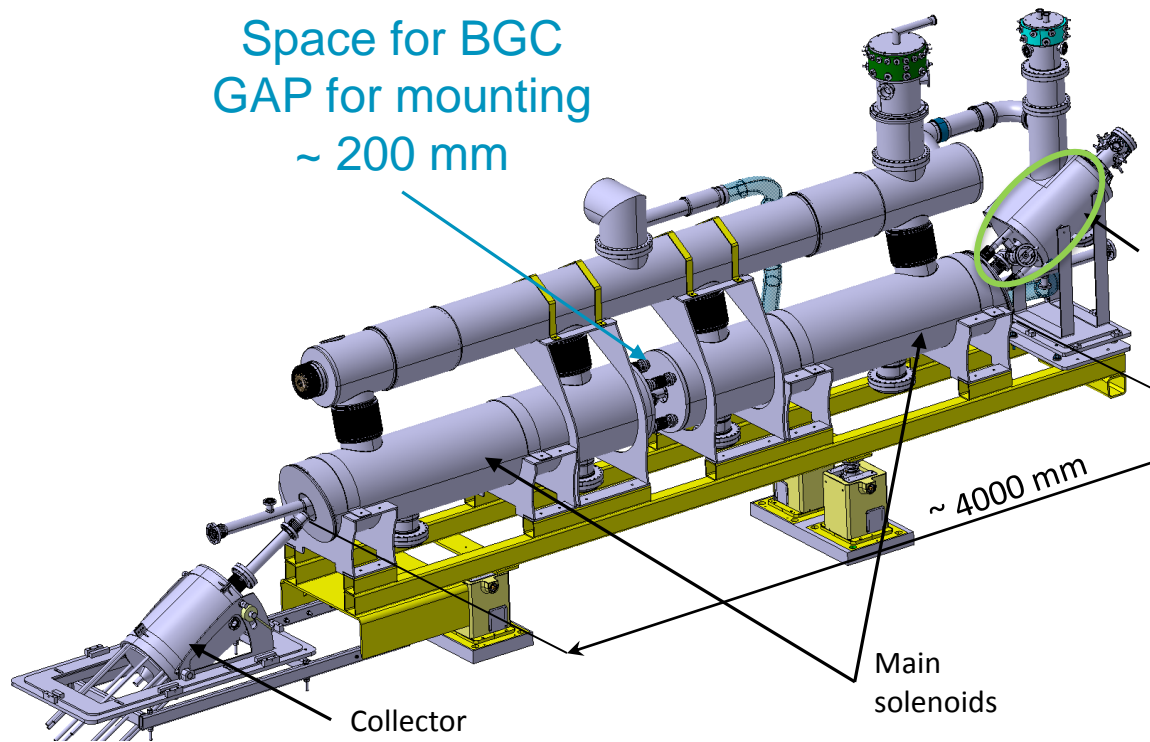
with contributions from D. Perini, G. Gobbi, BINP team, S. Sadovich



***BGC Collaboration Meeting – Liverpool – 13-14 June 2019***

# HEL 3D drawing

Space for BGC  
GAP for mounting  
~ 200 mm

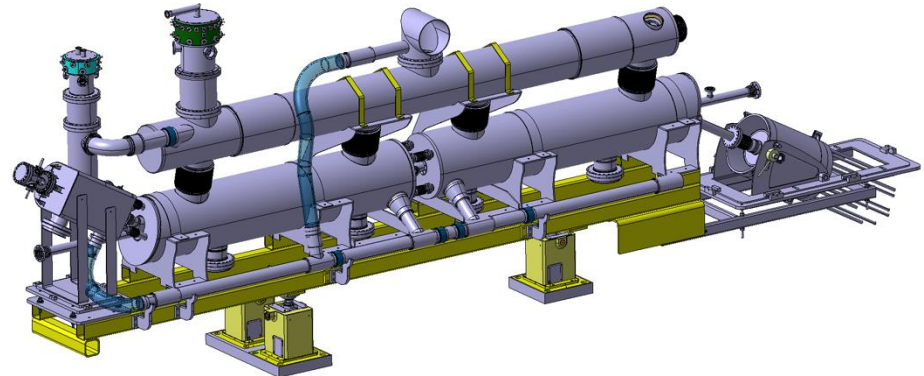
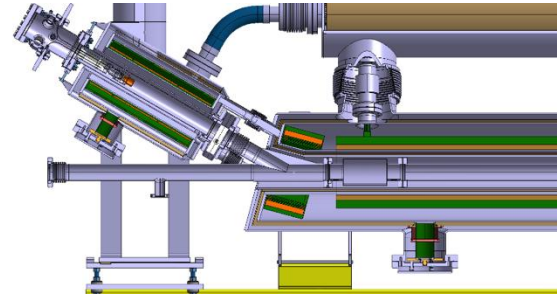
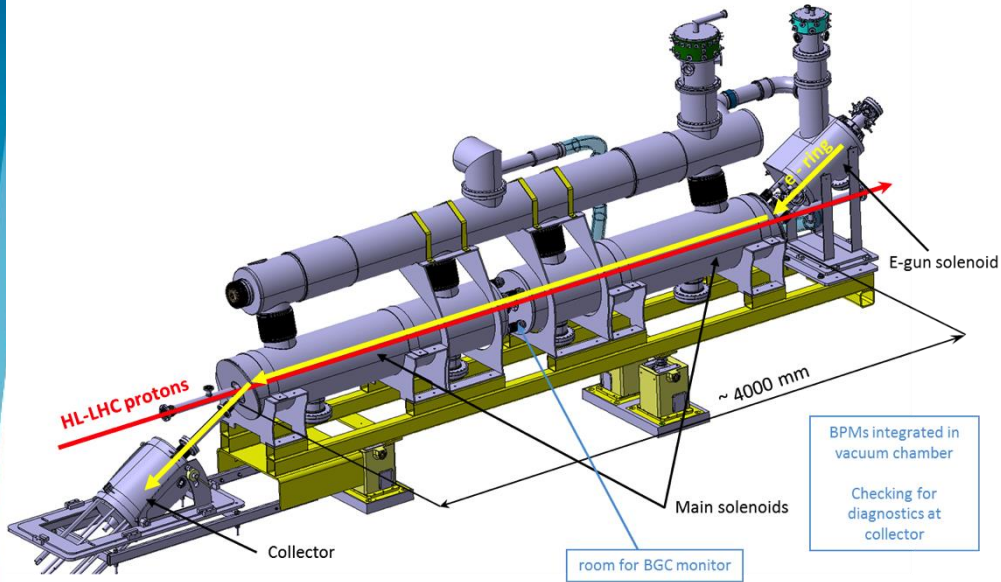


Gun valve ( $\varnothing 40\text{mm}$ ) NOW  
between 2 gun solenoids.

Advantages:

- Better mechanical supported
- Higher B field = smaller e-beam at valve
- Gap gun-bnd distance can be shorter = higher B field and smaller e-beam in injection arm

# HEL 3D drawing

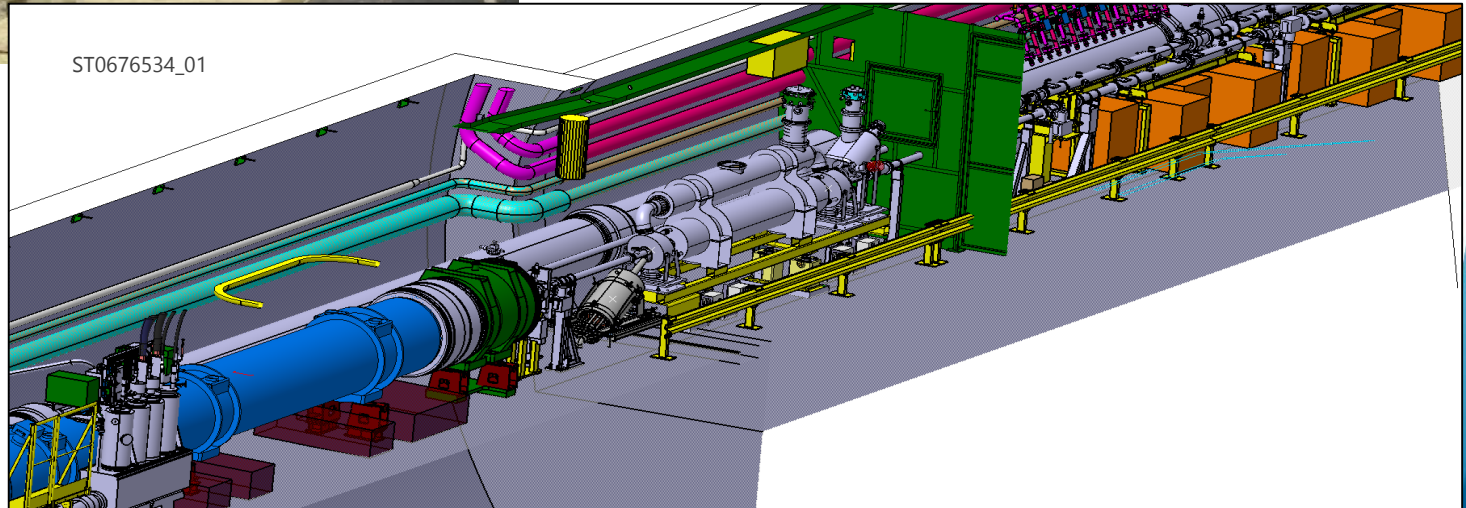


D. Perini, 8<sup>th</sup> HL-LHC Collaboration Meeting, CERN, 15-18 October 2018

# HEL integration in LHC

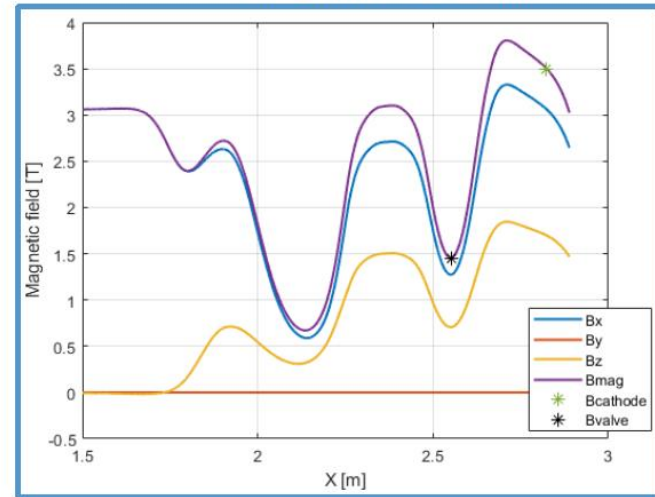
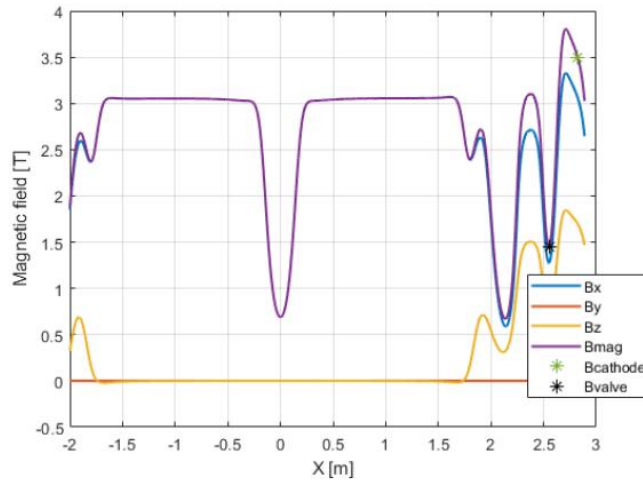
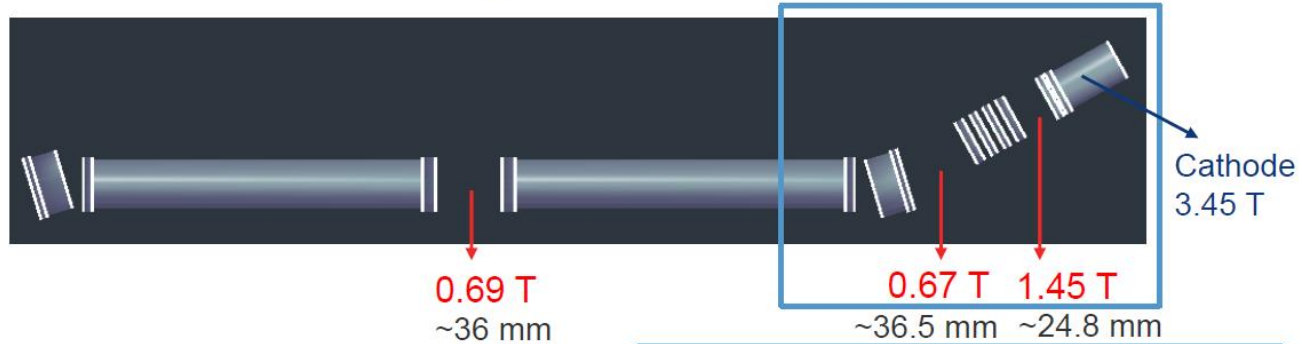


*M. Gonzalez de la Aleja, Paolo Fessia*



(450GeV proton energy)

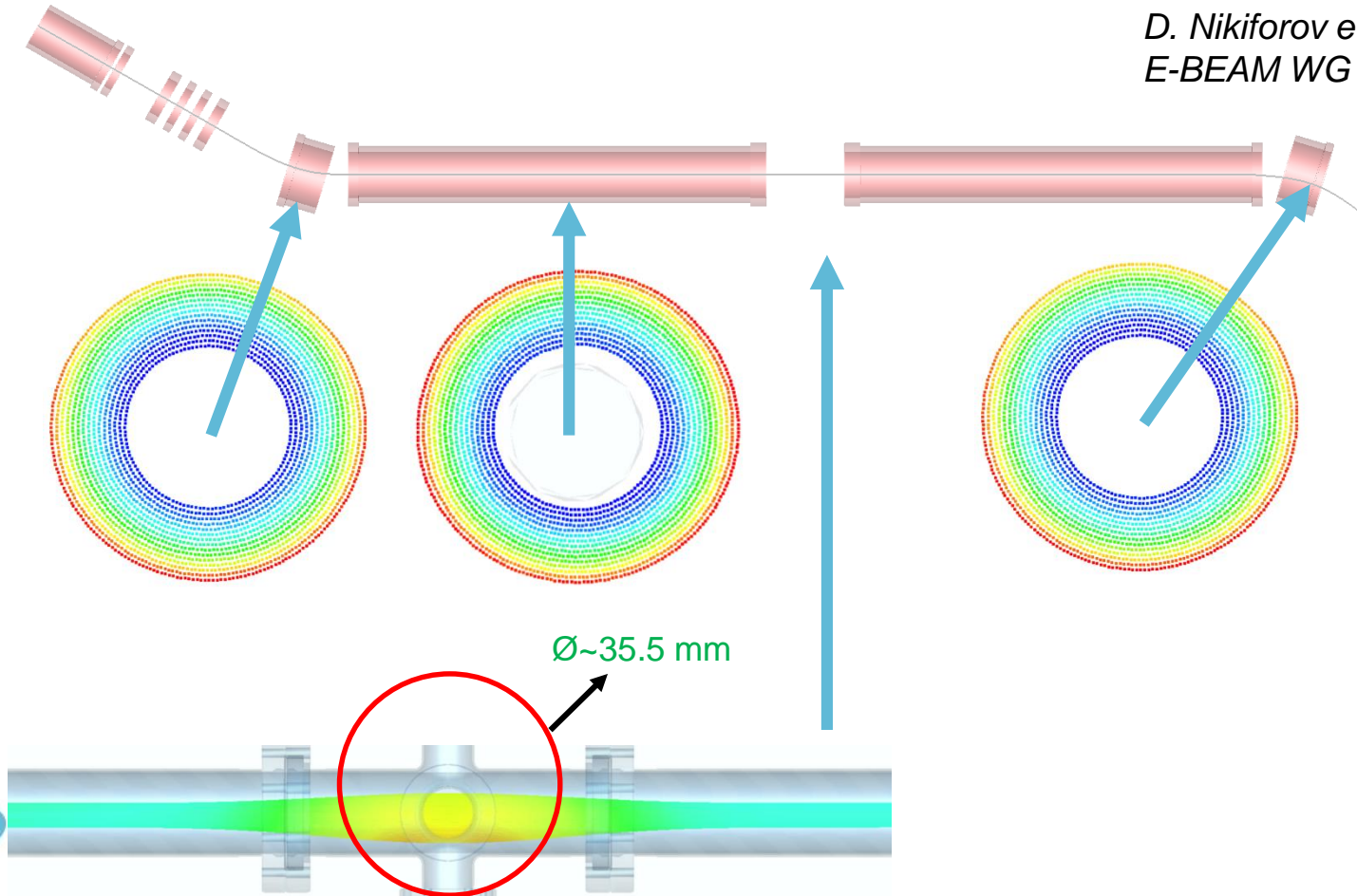
# HEL – New configuration @ Injection





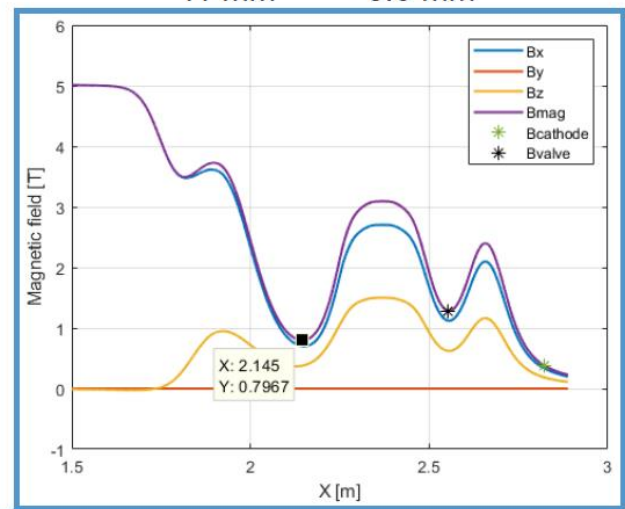
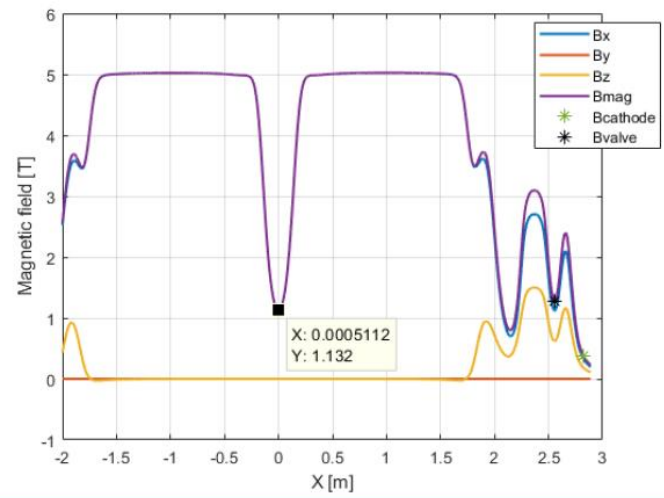
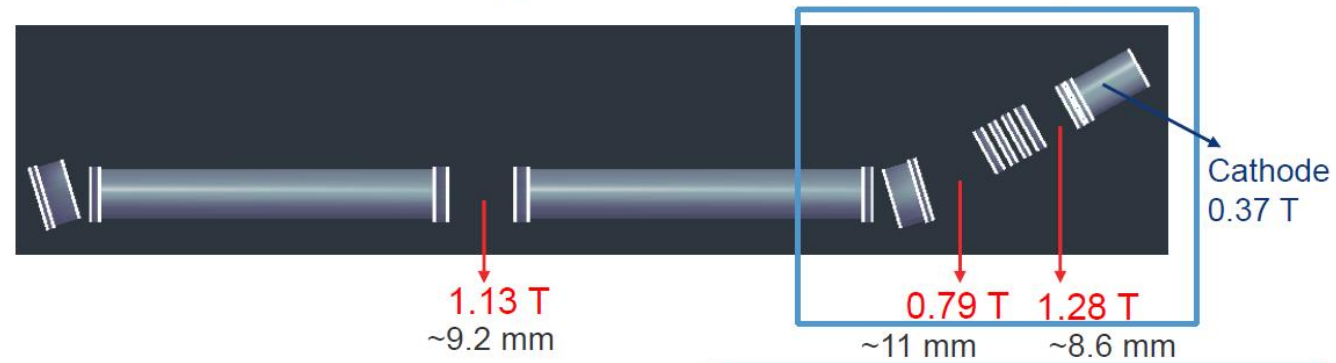
# Beam dynamic: Injection mode

*D. Nikiforov et al.  
E-BEAM WG 29.05.2019*



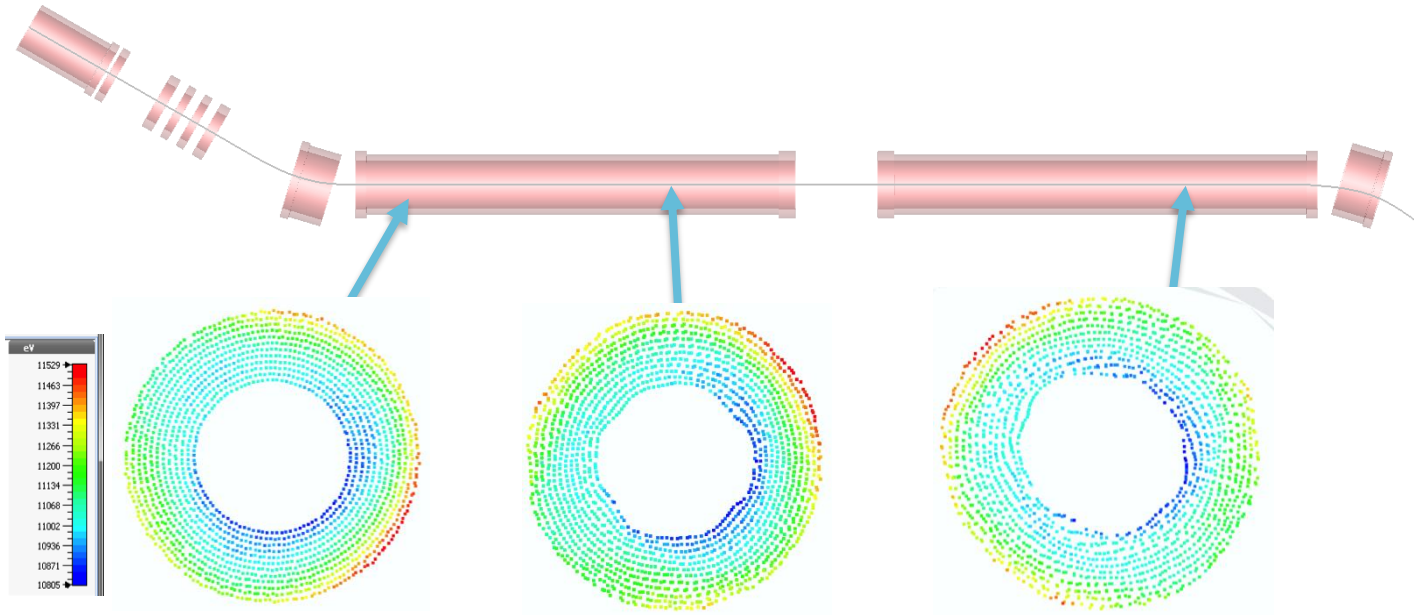
(7TeV proton energy)

# HEL – New configuration @ flat top



# Beam dynamic: Flat top

*D. Nikiforov et al.  
E-BEAM WG 29.05.2019*

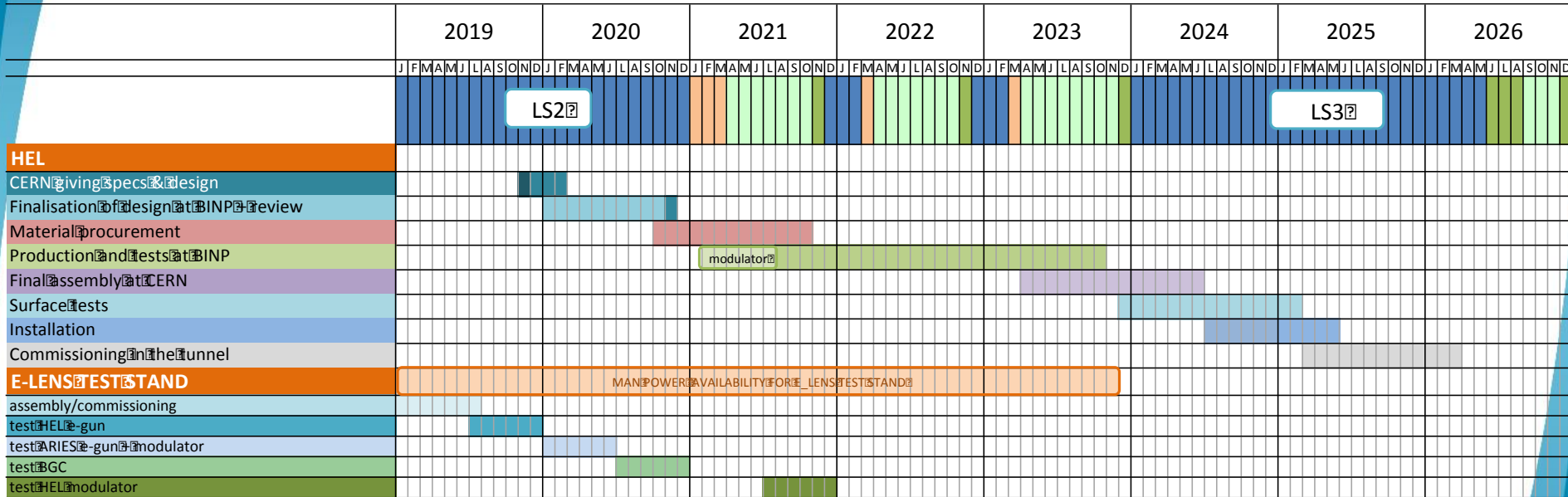




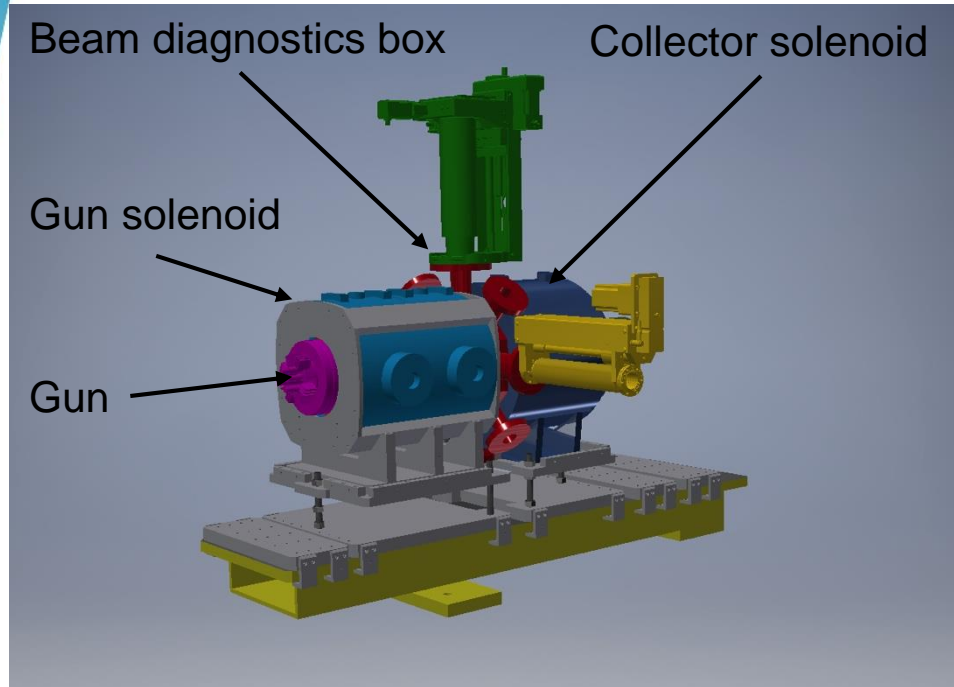
# Summary

- Design of HEL close to final
- HEL will be operated during whole proton fill cycle
- e-beam at BGC with new magnetic configuration
  - ~ **36 mm** at beginning of cycle
  - ~ **9.2 mm** at collision energy (flat top)
  - Shape should stay constant for same HEL parameters

# draft planning (please do not quote it)



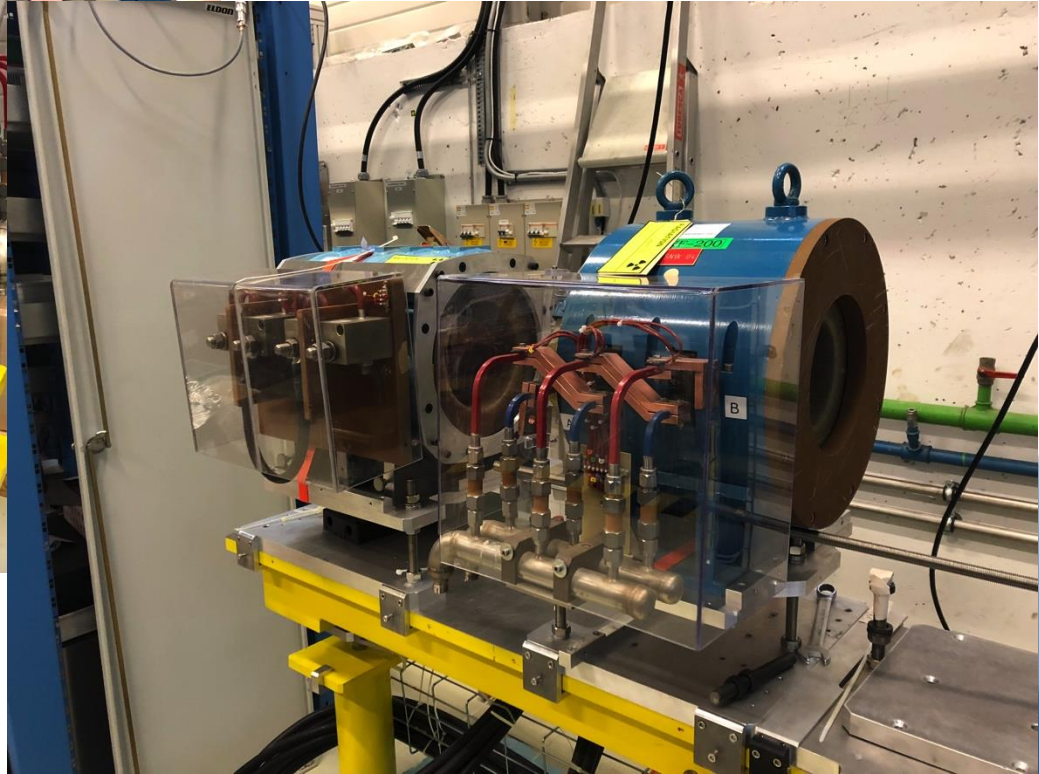
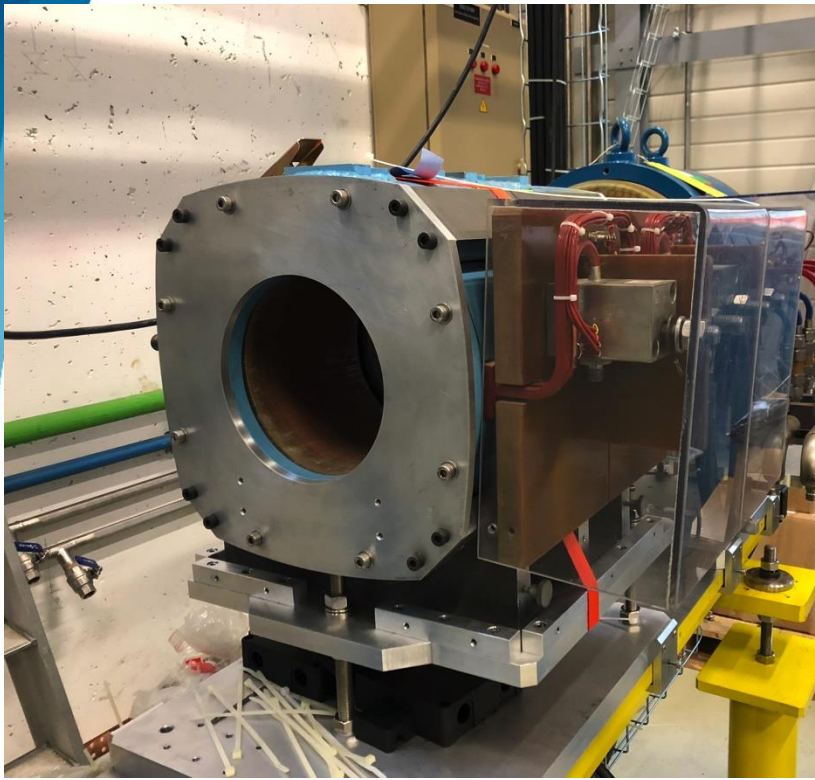
# E-Lens Test Stand: stage 1



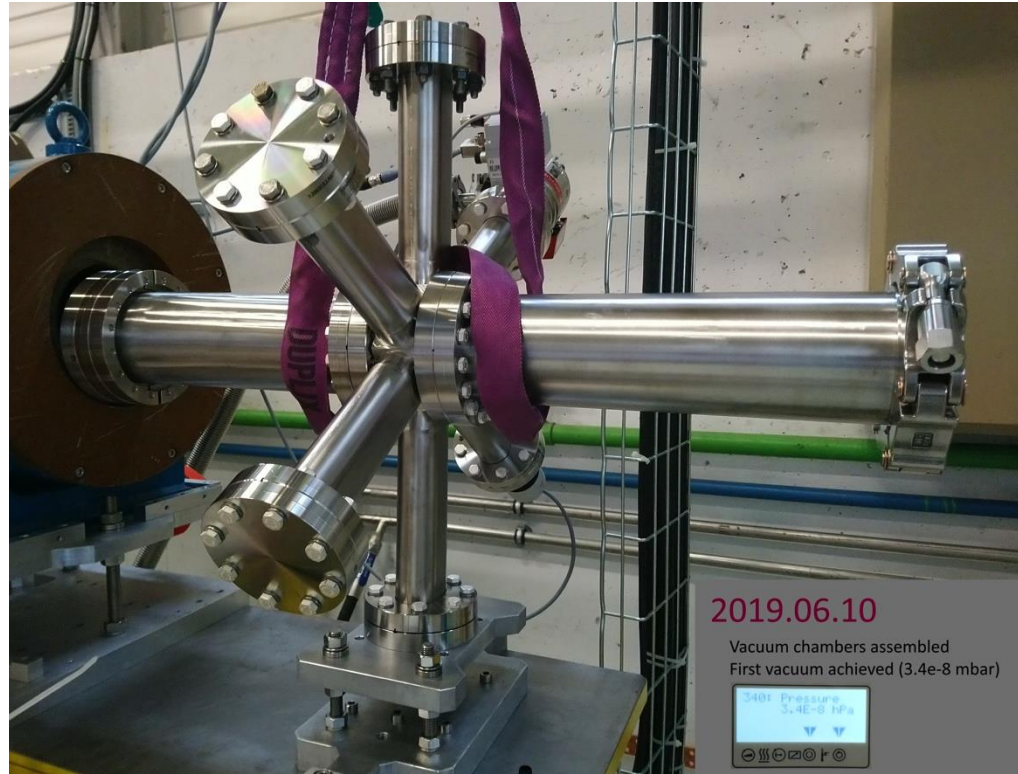
Purpose of first stage:

- Preparation:
  - Commissioning hardware (magnets, vacuum, HV system, control, etc.)
  - Safety and technical aspects of operation
  - Commissioning diagnostic procedures (current, profile, position)
- Measurements:
  - Electron gun tests: characterization
  - Electron gun: anode modular
  - BGC

# E-Lens Test Stand



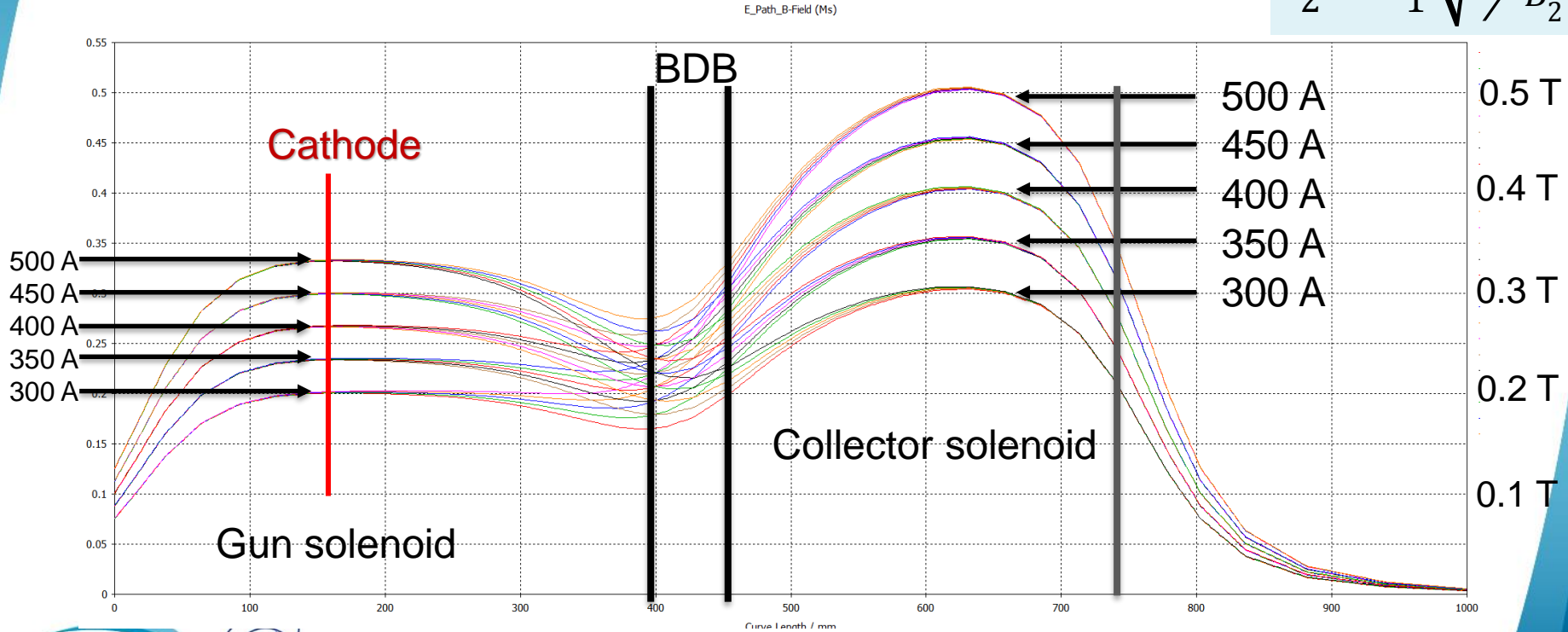
# E-Lens Test Stand





# Magnetic field along Z axis for different currents in the solenoids

$$r_2 = r_1 \sqrt{\frac{B_1}{B_2}}$$



# Rough planning for the E-Lens Test Stand

- By end of Aug. '19: system closed and commissioned
- Up to end of '19: HEL e-gun characterization
- Up to Apr.-May '20: ARIES e-gun and modulator measurements
- For the test stand to receive the BGC, we need to know (expected input @ review of E-Lens Test Stand on 25<sup>th</sup> June )
  - **BGC design and size of interaction chamber to calculate the magnetic field required + supports and any other infrastructure/mechanics**
  - Tests you envisage
  - Minimum electron current required (which determines in turn the collector we need to have). At present 5E-5A, with 5A x 10us/s
- In order to host the BGC, we are likely to have to implement some changes to the test stand layout → towards June 2020, provided that we have enough time to prepare all bits and pieces plus possibly an additional magnet, and that the collector required is ready.

**Subject:** BGC at test stand

**Date:** Wednesday 10 April 2019 16 h 27 min 01 s Central European Summer Time

**From:** Adriana Rossi

**To:** Gerhard Schneider, Raymond Veness

**CC:** Sergey Sadovich, Peter Forck

Dear Gerhard and Ray

I had a brief chat with Peter Forck about the tests of the BGC at the E-Lens Test Stand and realised that we need to know from Cockcroft what is the minimum current they need for the tests.

At present, in fact, we are going to use a low duty cycle (~10usec per second pulses), to reduce power on the collector and to be able to use the YAG screen. This means that the actual current at the test stand is not 5 A, but 5E-5 A !!

We may need to combine BGC tests with the tests of the HEL collectors, which will be able to withstand high power. We will see.

Note that the gun will be fully characterised before the tests of the BGC and the e-beam profile will not be affected by the duty cycle. Once the BGC is mounted, we will be able to perform measurements with the YAG screen at low duty cycle, then repeat the measurements at higher duty cycle for the BGC.

Also, we already have had a first meeting on the integration of the BGC in the E-Lens Test Stand, which allowed us to see open questions.

Can we have a second one soon, maybe even at your standard BGC meeting?

In preparation to that, I would like to estimate the magnetic field at the BGC on the test stand to have an idea of the e-beam size we will have there: can we assume a volume similar to the one in the drawings shown by Johanna for a version she is designing for the HEL?

Can we discuss tests at the test stand at the annual meeting?



***Thank you***

