

A detailed wireframe model of the HADES beam line is shown in the background. It features a large, oval-shaped ring structure with multiple internal components, and a smaller, more complex structure at the top right. The entire model is rendered in a light gray wireframe style.

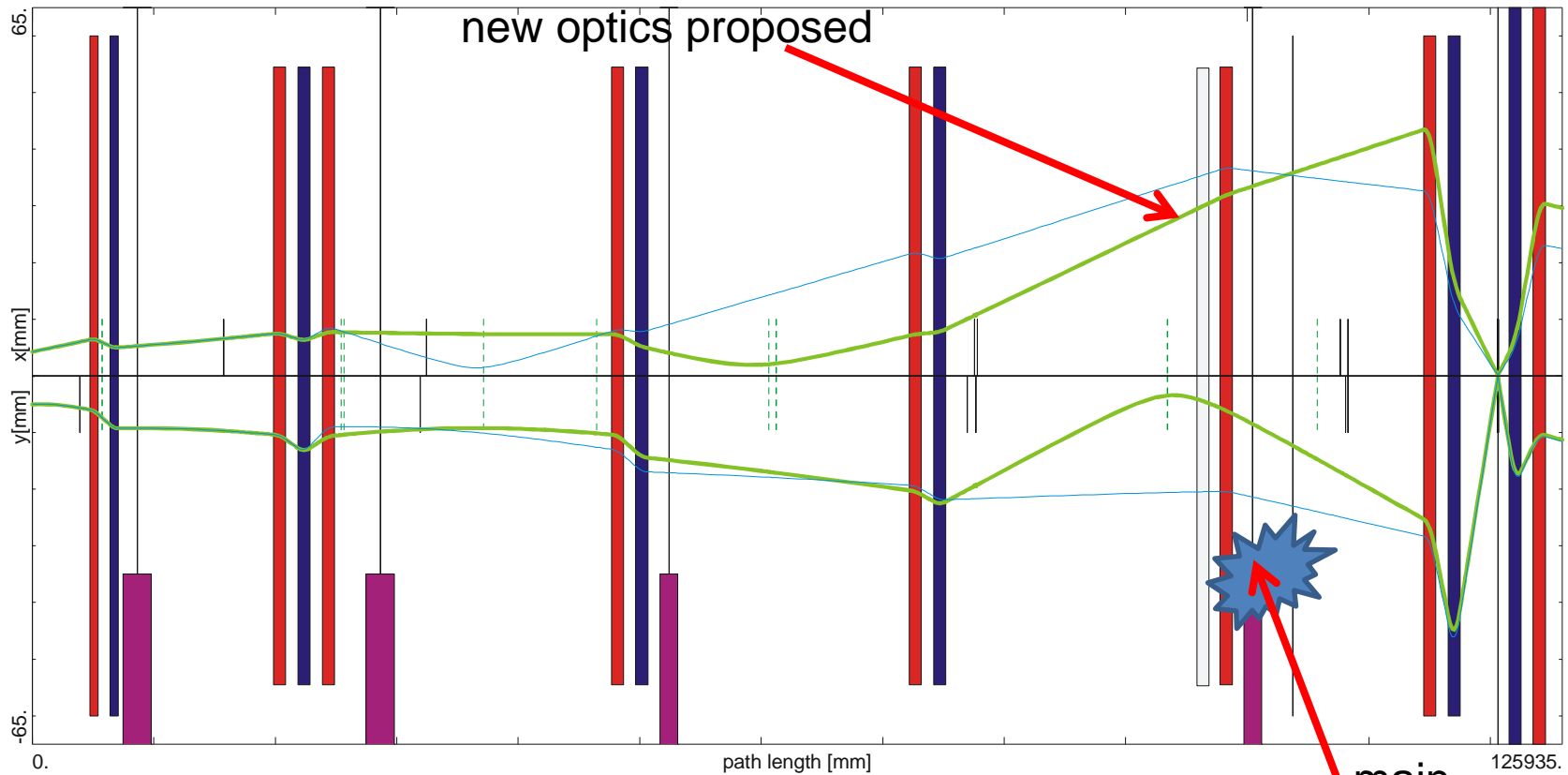
# Progress on HADES beam line works

GSI Machine Meeting, March 28<sup>th</sup>, 2017  
Mariusz Sapinski

# Outlook

- Introduction
- Optics changes – magnet test with high current
- Changes to vacuum chambers
  - TH2DKA
  - star-shaped chambers in HADQD11 and 12
  - TH3MU1 chamber?
  - aperture increase of chambers inside TH2QD21 and 22
- Beam instrumentation
  - BLM system
  - Halo Monitors
  - Transmission monitors (SEMs)
- LSA
- Documentation
- Responsibilities

# improvement 2: decrease beam size in TH3MU1 (I)



- emittance  $1 \times 4 \text{ (mm} \cdot \text{mrad)}^2$
- beam spot at target ca.  $0.23 \times 0.3 \text{ (mm)}^2$  (radius)
- green: alternative focusing scheme, blue: 2014 focusing scheme
- where is the catch?

# my personal ranking of the improvements

- improvement 1: new chamber for TH3MU1
  - **nice to have.** does not do any harm
- improvement 2: higher gradient for HADQD12
  - **absolutely necessary.** will solve the initial conflict between beam loss in TH3MU1 and small beam spot size at target
- improvement 3: star shaped chambers for HADQD11 and HADQD12
  - **recommended.** upgrades focusing system beyond current possibilities
- improvement 4: non heatable beam pipes for TH2QD2x
  - **recommended.** easy to build (standard round chamber)
  - could chambers of HADQD11 and HADQD12 be reused?
  - **will allow to better exploit the possibilities of improvement 3**
- additionally a beam diagnostics upgrade is foreseen
- **WITH THESE UPGRADES IMPLEMENTED, THE BEAM LINE WILL BE IMHO WELL PREPARED FOR FUTURE HADES PION BEAM TIMES**

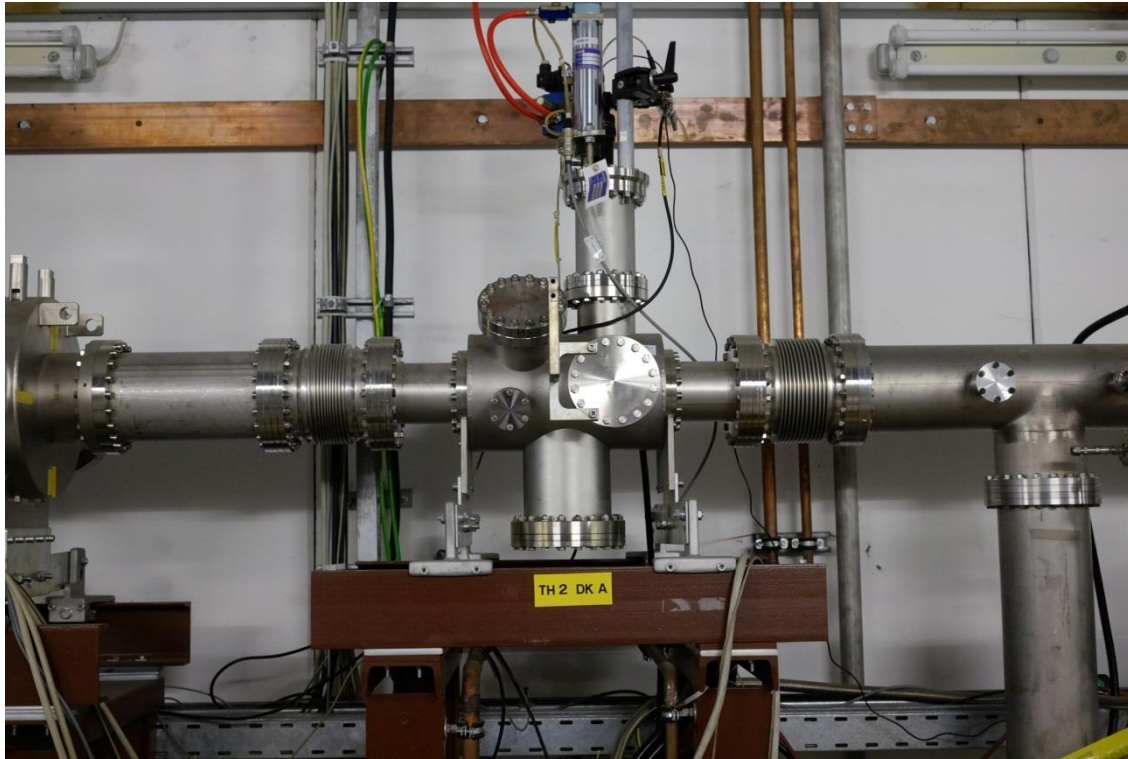
# Optics changes – magnet test with high current



- Test done on December 5<sup>th</sup>, 2016.
- Before test magnet current was limited to 271 A (10 T/m).
- During test: table operation with current 280 A (10.33 T/m) –  
**enough for the new optics.**
- Tested also with 295 A for several hours – large safety margin.



# Changes to vacuum chambers – TH2DKA

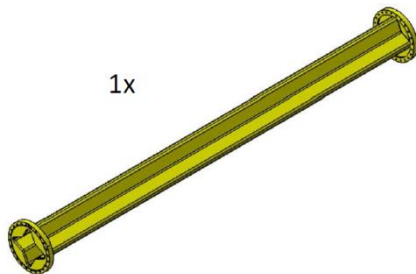


- Aperture limitation – losses.
- BI removed the chamber.
- Larger-aperture chamber is in production.
- End of mechanical works expected mid-April.
- Similar aperture limitation is in TH2DK3, it will also be replaced.

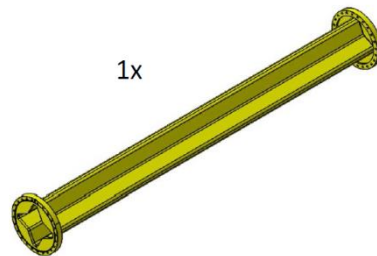
# Changes to vacuum chambers – HADQD11/12



- Critical change for new optics.
- Design slowed down by thinking what to do with 5 vacuum ports and foil separating HADES and HEST vacuums.
- Design finished, approval process to be completed this week.
- Vertical and horizontal aperture increase from 60 to >90 mm.
- Expected delivery – September the latest, montage – to be discussed.



1x



1x

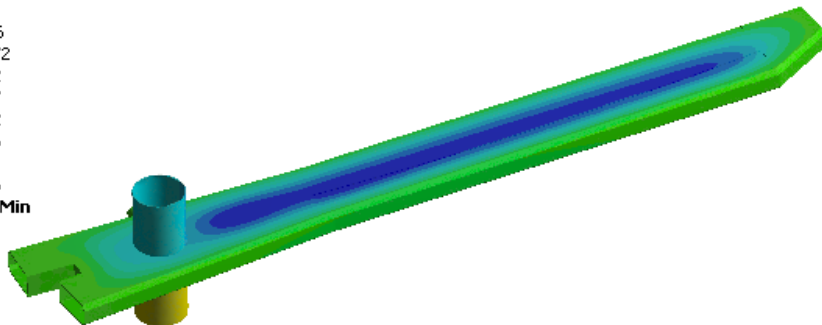
VC-1033284-A-000\_-Sternkammer  
- 2x VC-1033243-P-000\_-CF-Flansch DN200

VC-1033245-A-000\_-Sternkammer  
- 2x VC-1033243-P-000\_-CF-Flansch DN200

# Changes to vacuum chambers – TH3MU1



0,96 Max  
0,82  
0,67  
0,52  
0,37  
0,22  
0,076  
-0,072  
-0,22  
-0,37  
-0,52  
-0,66  
-0,81  
-0,96  
-1,1 Min



- FEM study finished.
- Change not critical for new optics.
- Important if new optics does not work (but there is no reason why it should not).
- For the moment pending.



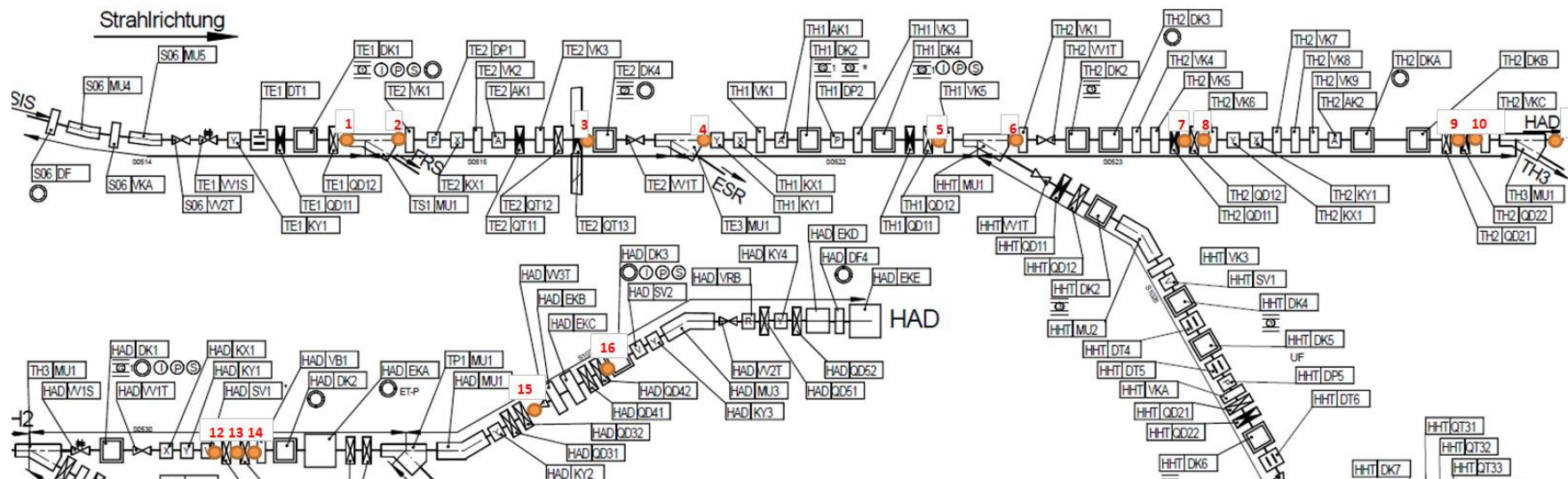
# Changes to vacuum chambers – TH2QD21/22



- These chambers are never baked.
- Increase aperture by exchange to normal-diameter chambers.
- Chamber from HADQD11 can be reused.
- Second chamber found in storage.
- Installation together with new chambers in HADQD11/12.

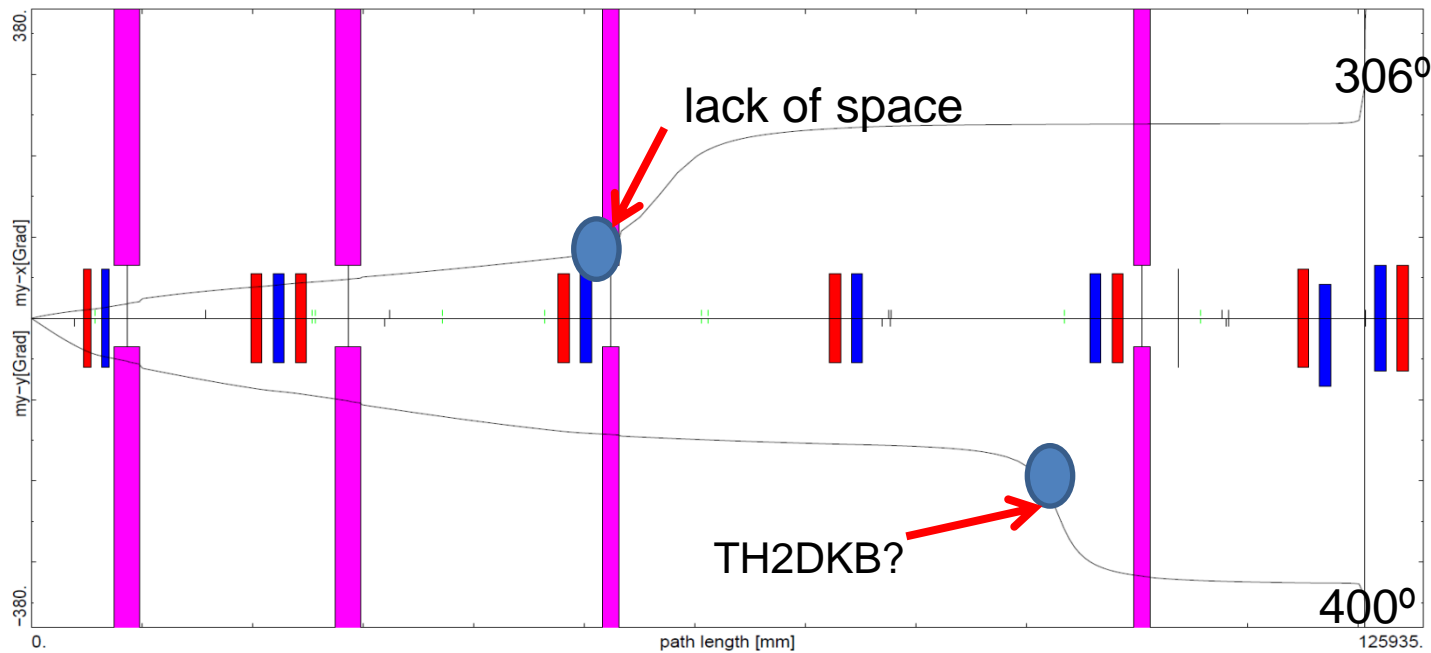
# Instrumentation-BLM system

- Locations of 16 BLMs agreed (with HADES).
- B. Walasek-Hoehne coordinating from BI side.
- FLUKA simulations to optimize positions started.
- Some electronics already acquired, final installation – beginning 2018.



# Instrumentation-Halo monitor

- 4 scintillators to measure beam halo/beam size – move from Cave M beamline.
- Preferably to be installed with  $\Delta\mu=180^\circ$  wrt. target.
- Project responsible from BI: Christiane Andre.
- We have official OK from Cave-M liason.
- S. Ratschow proposed locations, evaluation still ongoing.



SC\_P: 18.08.2009 – SIS bis HTC via Pionentarget



- 

- 
- HELMHOLTZ  
GEMEINSCHAFT



# Control system-LSA

- Working with Bernd Schlei who is setting up the LSA hierarchy.
- His requirement – provide CSV files containing twiss and magnet strength information.
- Ongoing, concerns about MIRKO twiss and sequence files.

## CSV File Format for **OPTIC\_STRENGTHS** Table

```
OPTIC_STRENGTHS ; <OPTIC_NAME>  
DEVICE_NAME; STRENGTH_L  
<DEVICE#1> ; <KNL#1> ..  
.  
.  
<DEVICE#n> ; <KNL#n>
```

## CSV File Format for **TWISS\_OUTPUTS** Table

```
TWISS_OUTPUTS ; <OPTIC_NAME>  
ELEMENT_NAME;TYPE;S;BETX;ALFX;DX;DPX;MUX;BETY;ALFY;DY;DPY;MUY;X;PX;Y;PY; ➔  
➔ HKICK;VKICK;K0L;K1L;K2L;K3L;K4L;K5L;K1SL;K2SL;K3SL;<OPT_COLS>  
<ELEMENT#1> ; <> ; <> ; <> ; .... ;<> ; <> ; <> ;<> ;<> ; <> ; <> ; <> ; <> ; <> ; <OPT_VALS#1>  
.  
.  
<ELEMENT#n> ; <> ; <> ; <> ; .... ;<> ; <> ; <> ;<> ;<> ; <> ; <> ; <> ; <> ; <> ; <OPT_VALS#n>
```

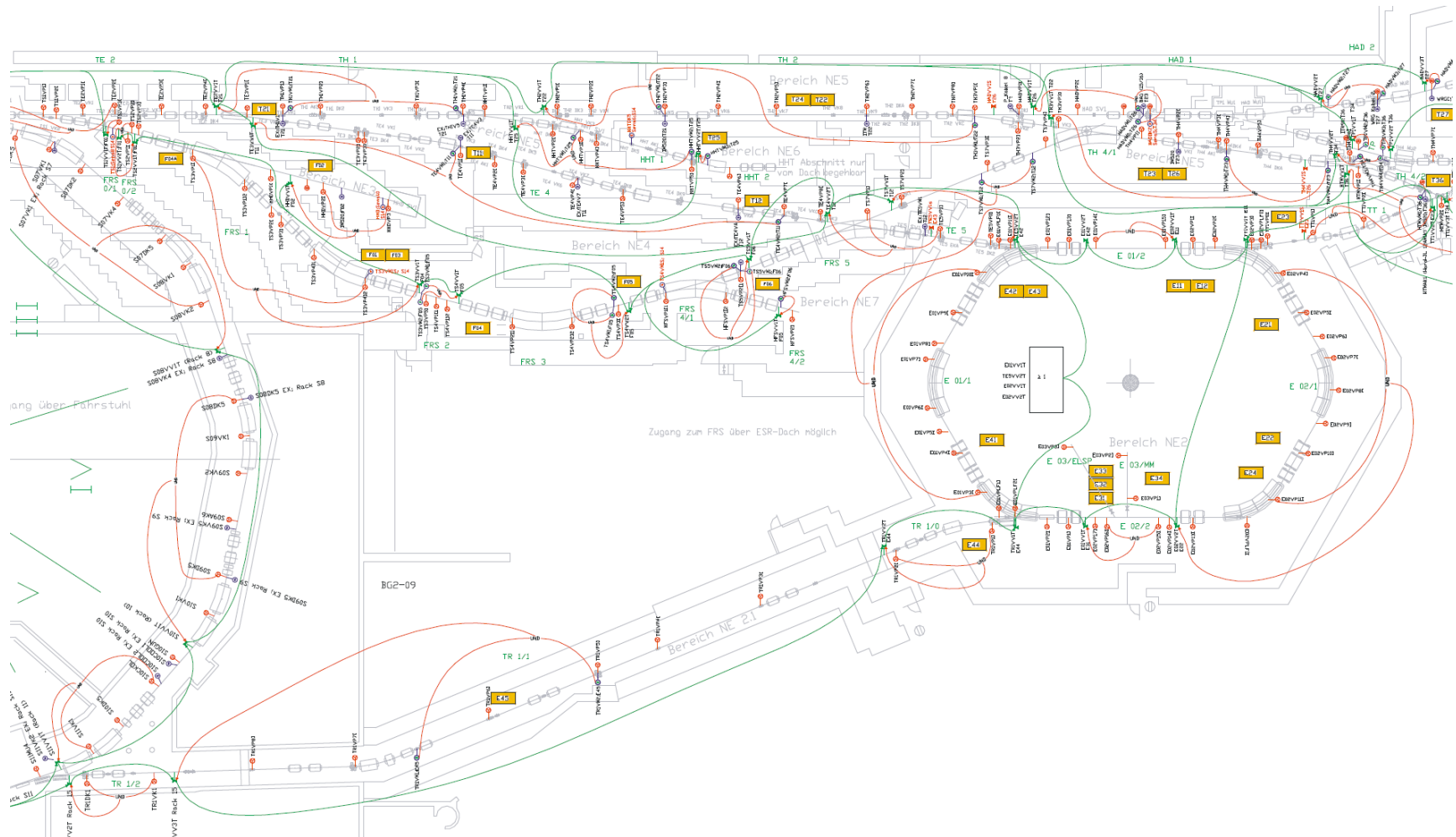
# Documentation

- for the moment:
  - an unofficial webpage (not TYPO3) - <http://web-docs.gsi.de/~sapinski/HEST/>
  - catalogue with all documents on windows file server
  - partly organized printed documentation
- next:
  - TYPO3 webpage
  - IPAC paper about HADES beamline upgrade
- important: synchronization of information
  - MIRKO/Oper DB/LSA/Layout (Katie model)/Component DB/reality
  - not really started yet – how other machines do it? Common approach?

# Responsibilities

- Define where responsibility of MK ends and those of experiment starts
  - list of experiment liason person defined
  - definition of responsibilities is often not easy,  
for instance DKs and magnets can be in experimental zones
- Proposal (based on drawing on next page):
  - SIS-18 MK responsibility end: S06VV2T – last element belonging to SIS-18 (?)
  - HHD – whole line under HEST MK?
  - Cave-M: HTMVV2T (?)
  - HADES: HADV3T (?)
  - Cave C: HTC2V2TT33 (?)
  - CryRing: HTBVV2T (?)
  - comments? ideas?

# Responsibilities



partial drawing (up to date?)



# Acknowledgements

Many thanks for help and support from Technology Laboratory,  
Mechanical Integration, Mechanical Design, Gross Montage, BI,  
Power Converters, Vacuum, Shutdown Planning, Carl, and others!

**Thank you for your attention!**

# Spare slides