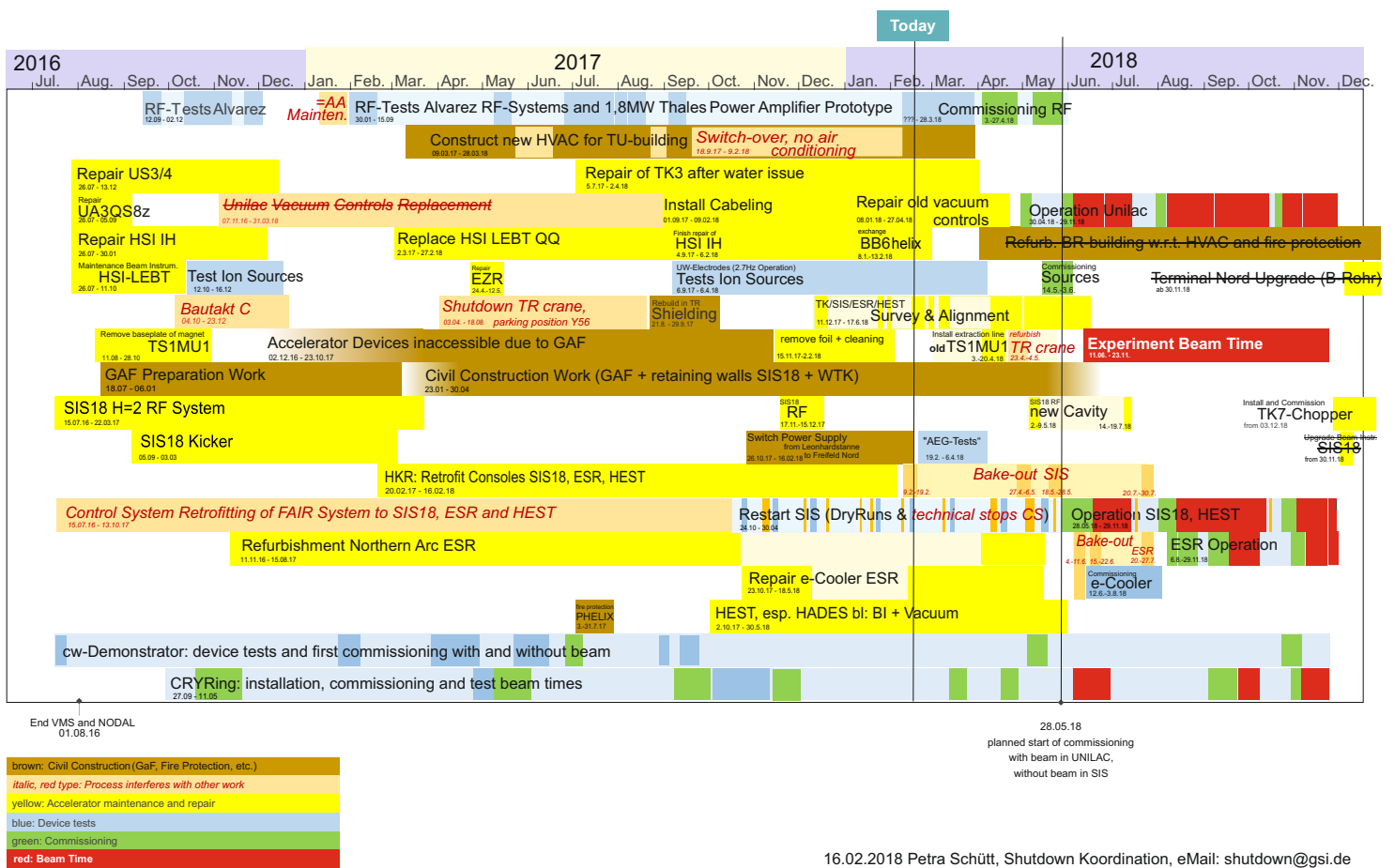
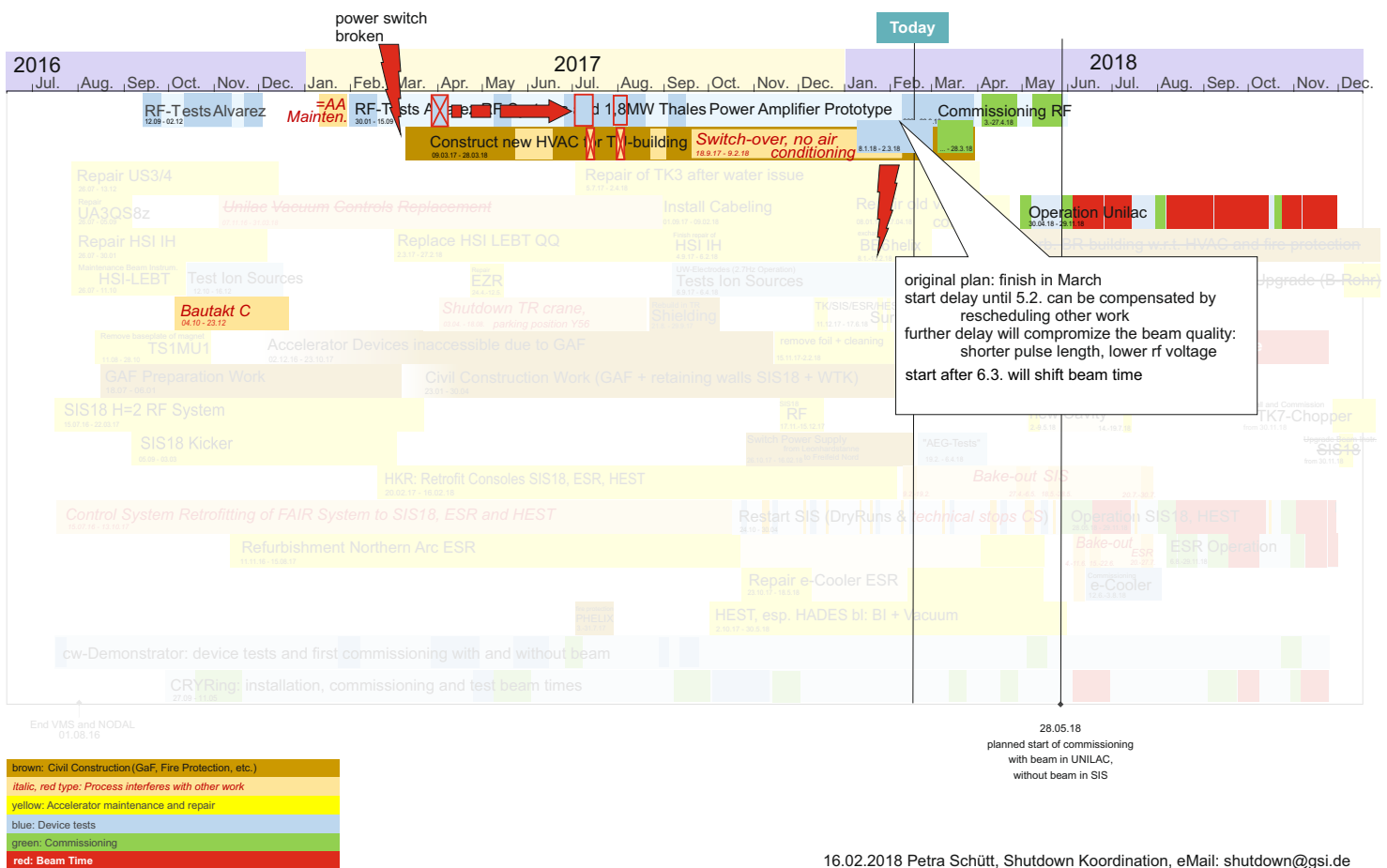


# Shutdown 2016-2018



16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# UNILAC RF and Air Cooling



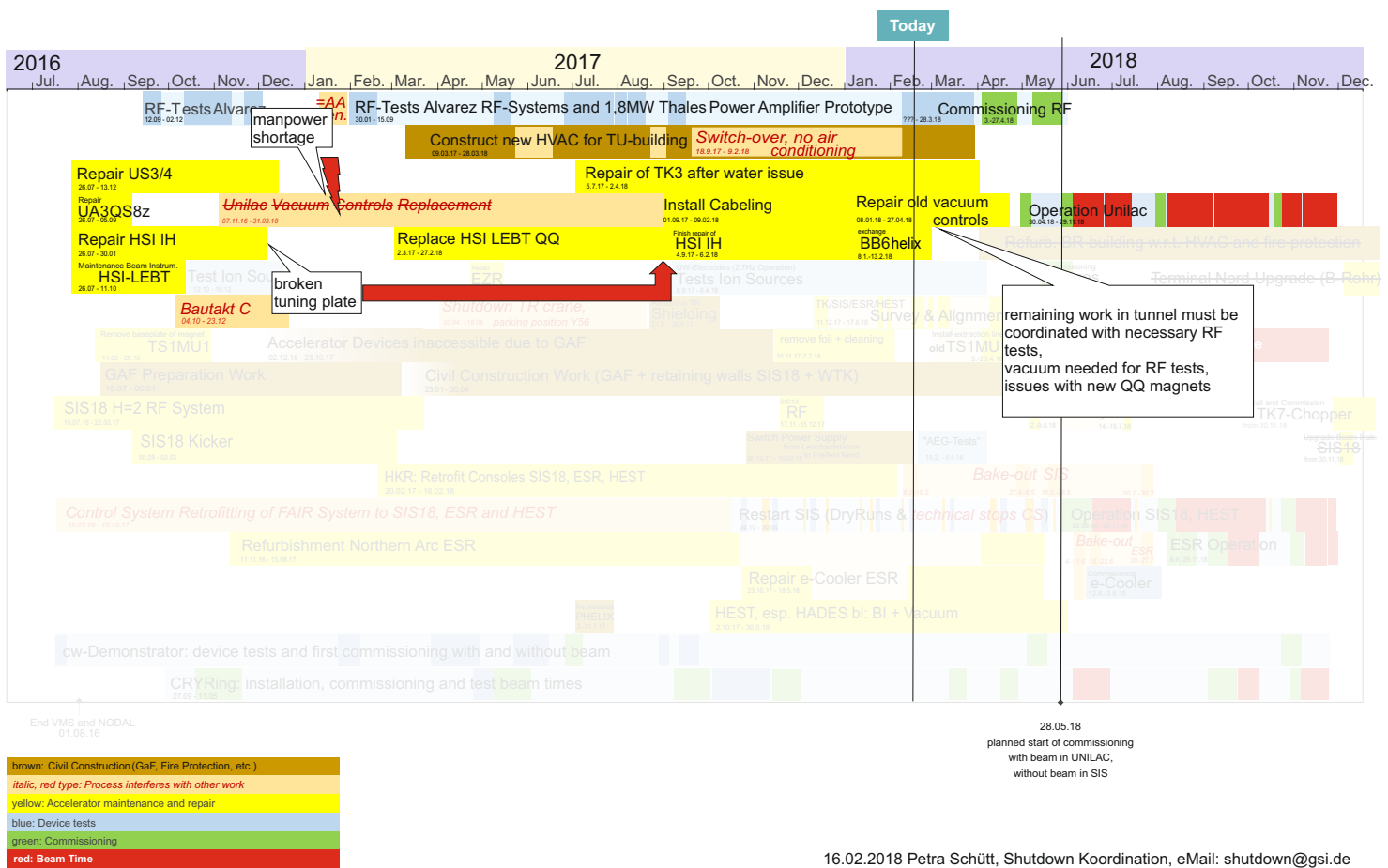
16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

#### UNILAC upgrades accomplished

- Back to full energy 11.4 MeV/u
  - full performance for SIS18 as in 2014
  - not less, but also not more!
- New rf-amplifiers for Alvarez tank #4 commissioned
  - new amplifier: promise of higher reliability, of teething troubles
  - restriction to 10 Hz, 1 ms beam pulses at 11.4 MeV/u (according to FAIR requirements, GF decision from 2013)
  - A3 amplifier, A1-3 high voltage PS renewed



# UNILAC Maintenance and upgrade



16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

#### UNILAC upgrades accomplished



- New quadrupole quartet (QQ) in front of HSI RFO
- Beam matching device between LEBT and first cavity
- Installed as first step towards new uranium source terminal and compact LEBT, no significant performance increase w.r.t. old QQ for the time being
- Problems with eddy currents in beam pipe
- 2018: Limitations for parallel operation of different beams from HSI expected: 4% loss of beam pulses from PKG (high duty users), no losses from high current source
- Review in March
- Mitigation measure for 2019:
  - Ceramic chamber

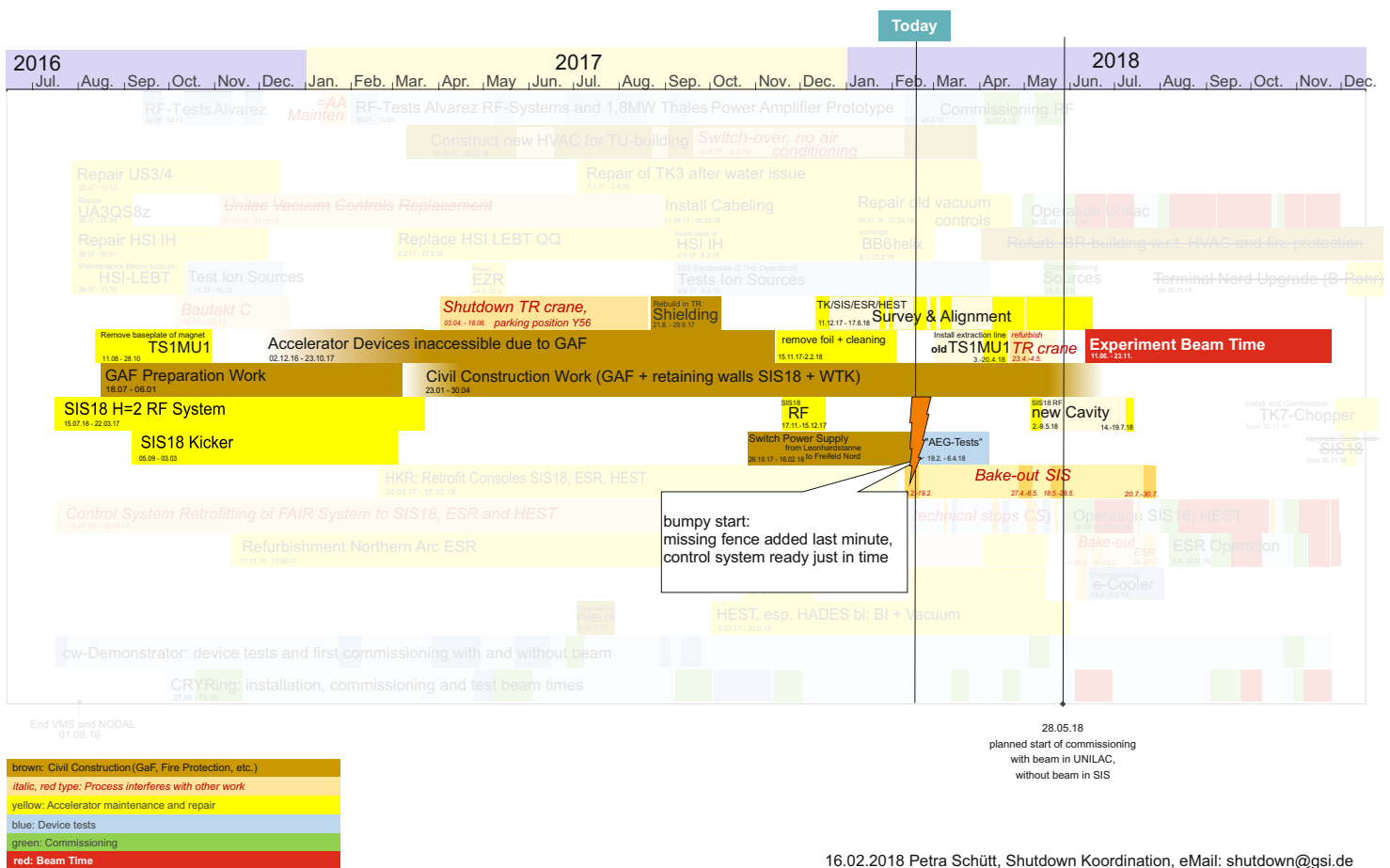


#### UNILAC maintenance and repairs

- HSI IH1: Defective inner tank triplet exchanged
- Buncher BB6: Original spiral with larger aperture back in place after repair
- TK3 refurbished after water incident
- TK realignment after GaF



# Power Connection



16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

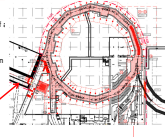
Link existing facility "GAF" – civil construction comprises:

- the shielding enhancement by means of :
  - table construction on top of the existing tunnel
  - other radiation protection measures e.g. steel plates before extraction system
  - low pressure generation in the tunnel (treatment possibly activated air) and fire protection
  - link to FAIR via new tunnel "101"

-Preparation for p-Linac "WTK":

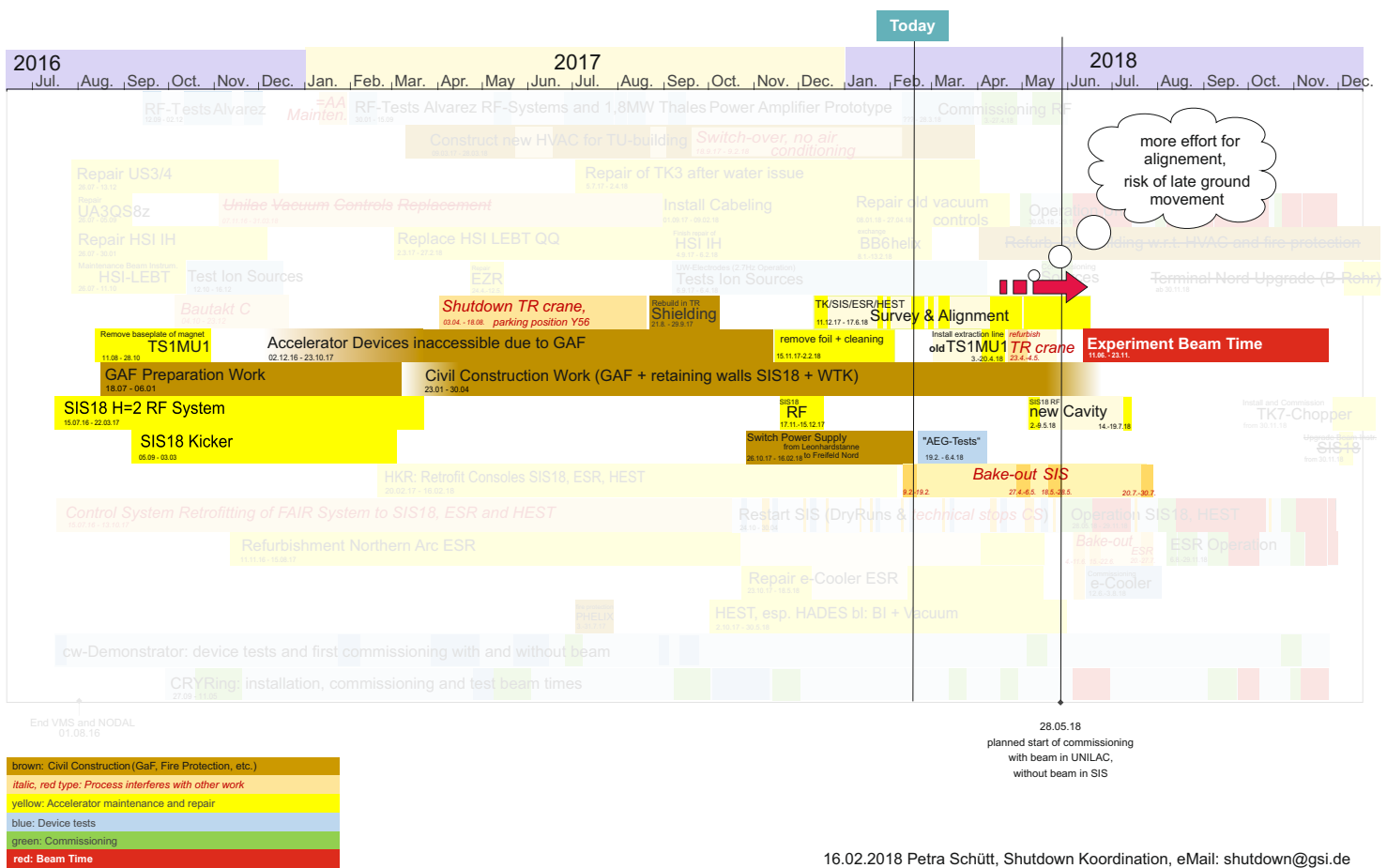
- p-Linac beam dump
- TK opening preparation, additional shielding
- "SIS18/TK influencing" foundation work.

**Will finish in May, normal shutdown work and testing has started. No show stopper yet.**






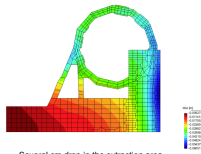
# Survey & Alignment



16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

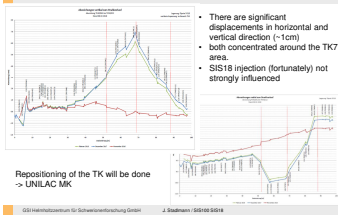
**FAIR** Influence by FAIR and GAF construction. 

- (Old) prediction of ground movement caused by FAIR construction ground water handling measures.
- The actual measures are different and we have first measured data now.

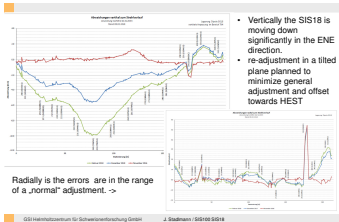


Several cm drop in the extraction area and HEST predicted.

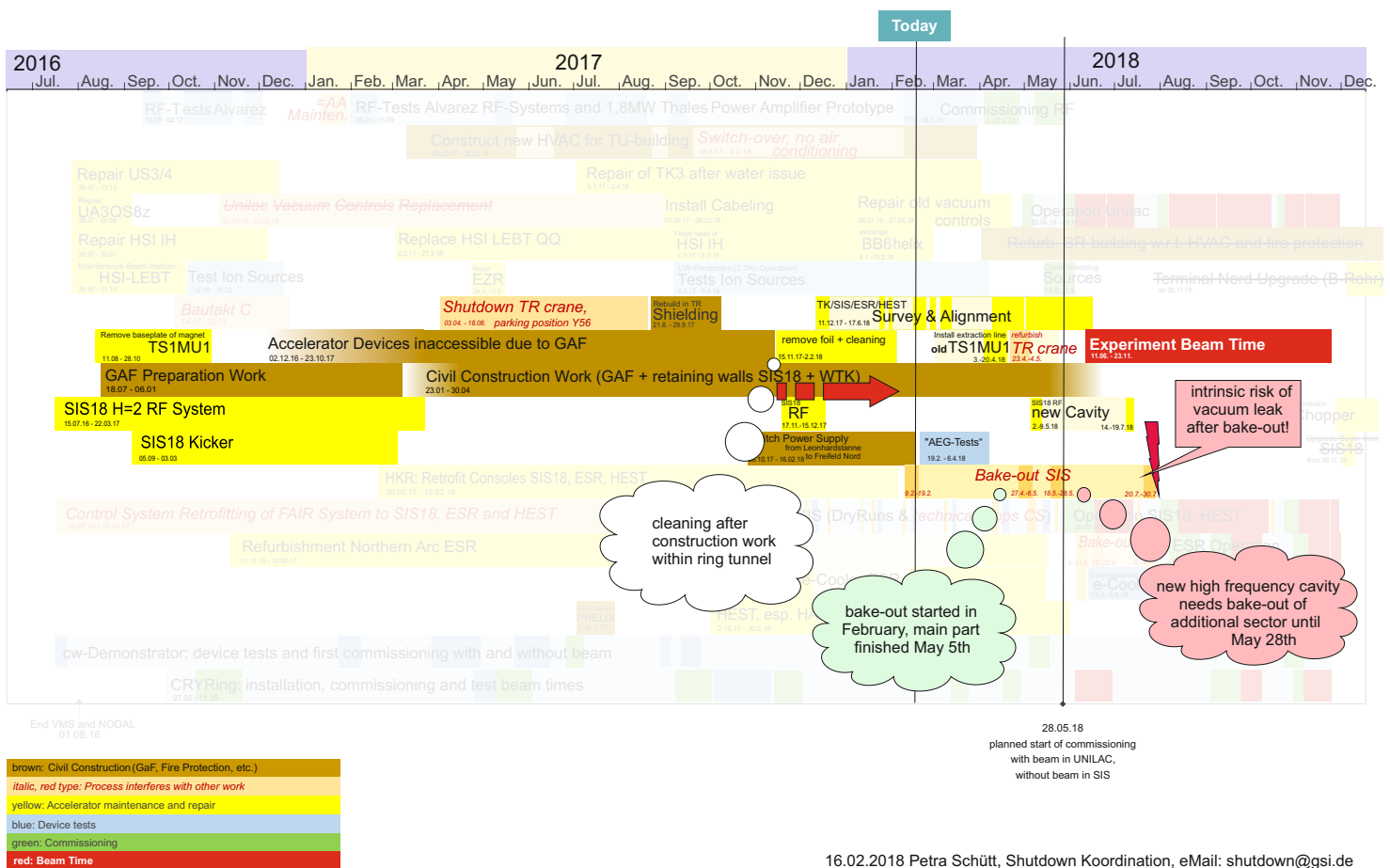
**FAIR** Transfer channel movement measured **ESI**



- There are significant displacements in horizontal and vertical direction (~1cm)
- both concentrated around the TK7 area.
- SISE18 injection (fortunately) not strongly influenced



# SIS upgrade and repair





Dedicated to intermediate charge state heavy ion operation and FAIR booster operation



Three new MA Accelerator cavities installed (50 MV, h=2)

Replacement of main dipole power converter completed (15 T, 50 MW)

LSA based new control system and data supply for operation

SIS18-SIS100 IPM magnet system delivered

Bipolar dipole magnet for the link to tunnel 101

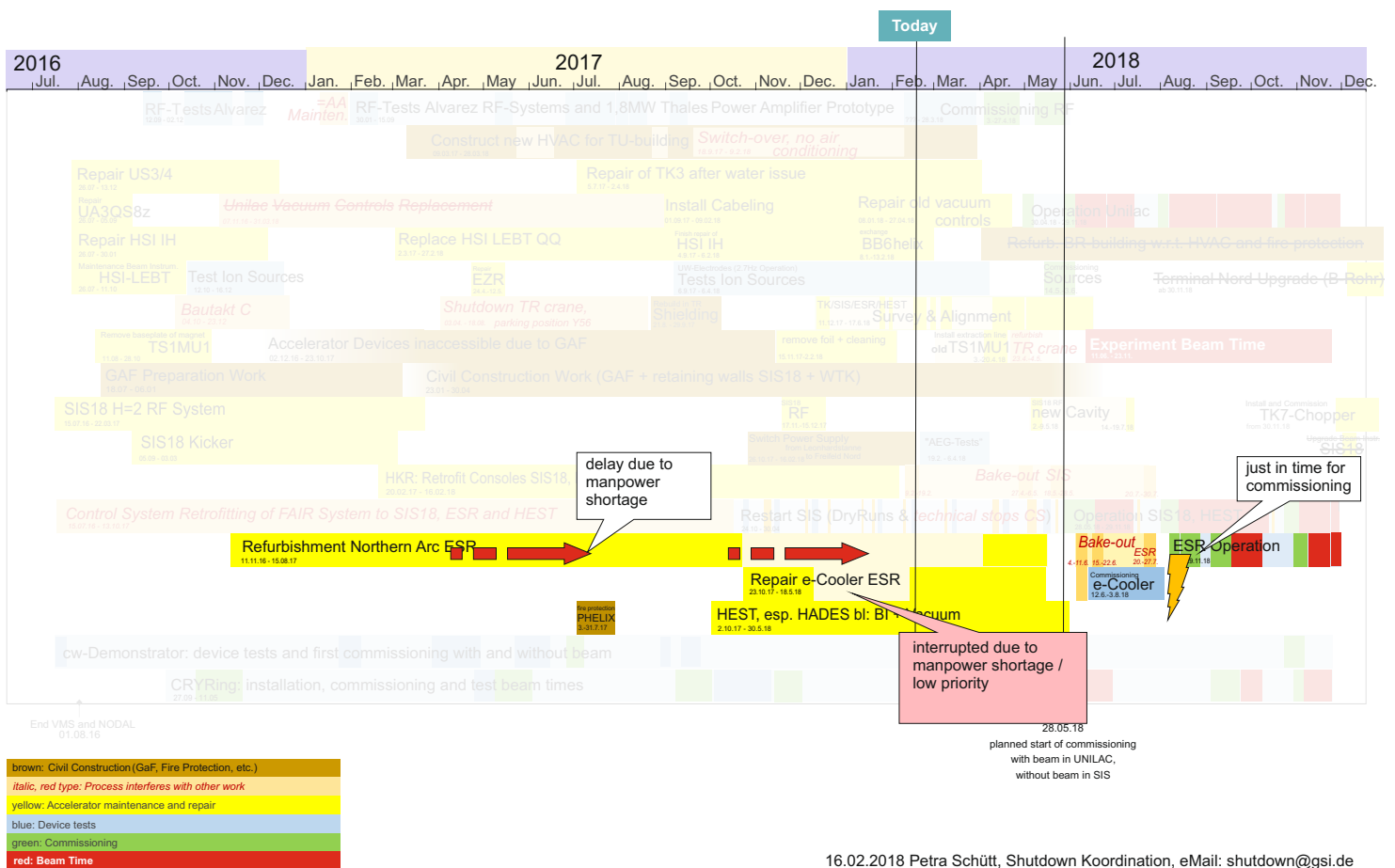


- Open measures today are:
  - New pulse power connection: Minor problem on Wednesday during "power on": Foreseen to be solved till Monday.
  - Upgrade of main power supply: All work finished. Testing will start as soon as the PFC is up and running.
  - H<sub>2</sub> cavities: All three cavities installed, will be put to operation and tested during the 2018 run.
  - IPM Magnets: Magnet testing done, some complaint vs manufacturer ongoing. Will be installed in next shutdown.
  - TS1MU1, new branching magnet towards FAIR: Magnet delivered but vacuum chamber missing. The old magnet will be used for the 2018 beamtime. The new magnet will be installed after 2018 run.
  - Control system and data supply: New control system and timing system is tested during dry runs and successfully operated the Crying. New data supply has already been tested feeding the old control system. Longer startup time scheduled in 2018.



- Most of the measures have been completed before the 2018 run.
- Some final measures will be done after the 2018 run
- The originally planned SIS18 upgrade roadmap has been completed
- Future upgrades (Upgrade II) beyond 2018 are needed and planned to reach the full FAIR booster performance (shielding, feedbacks, spill control, operating procedures, hardware upgrades)

# ESR Vacuum Refurbishment



16.02.2018 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

## ESR Shutdown Activities 2016-2018

repair of vacuum chamber in one dipole magnet (bellow)

installation of barrier bucket rf system in May 2018

possibility of installation of second Schottky resonator (UHV compatibility?)

modification of laser diagnostics chamber in target section

plans for modification of internal target gas inlet

repair of electron cooler drift tubes was postponed due to the presence of hazardous material, doubts about time schedule for the repair

modernization of main control room, console for experiments disappeared

modernization of beam diagnostics and stochastic cooling system

modernization of control system hardware (SCUs for SEs)

preparation of new software and timing system (relevant for experiments)

## ESR Shutdown Activities 2016-2018

Main Control Room has changed  
ESR experiment console disappeared



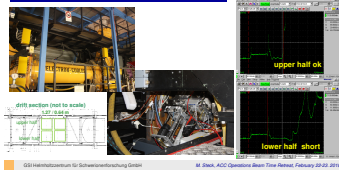
ESR measurement equipment rearranged  
(half of old consoles houses  
measurement equipment)



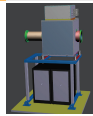
## Repair of Electron Cooler Drift Tubes

drift tubes are needed for experiments which need a fast variation of the electron energy, mainly dielectronic recombination

the performance of cooling is not compromised



## New ESR Barrier Bucket Cavity

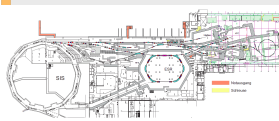


- tasks: 1) accumulation in combination with cooling  
2) bunching of the beam for fast extraction at low energy

**Technical Parameters**  
frequency 0.25 - 5 MHz  
maximum voltage 1 kV  
rf power (at 5 MHz) 850 W  
air cooling  
two gaps  
eight magnetic alloy rings

**Installation in the ESR  
in May 2016**

HEST



- About 500 meters of beam lines, ~140 magnets
  - From SIS18 to Cave A, C, M, ESR, HADES, CryRing, HFS, HTD, HHT and beam dump (HHD)
  - From ESR to Cave C, Cryring
- MC M. Szpiniek  
STV P. Schmitt  
deputy for both:  
S. Romann

#### Hardware changes



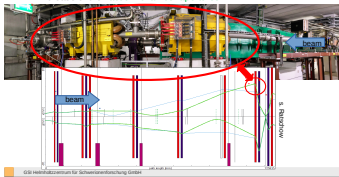
- HADES beamline:
    - Increase of the vacuum chamber apertures to accommodate optics with higher beta function before focusing on target
    - Instrumentation: Beam Loss Monitors, halo monitors and SEM foils for intensity measurements (see presentation of M. Schwickert yesterday)
    - Remark: there will be no high-intensity beam in 2018 and 2019 (PAC decision December 2017) – some of these measures will be needed only in 2020, but are being implemented now.
  - mCBM – see presentation C. Sturm after lunch
  - Vacuum – pressure gauges maintenance and upgrade, upgrade of ion getter pump controllers, exchange of roughing pumps, modifications to HADES beamline (due to new vacuum chambers).
- On track for 2018 beam time (mCBM vacuum chamber delayed)



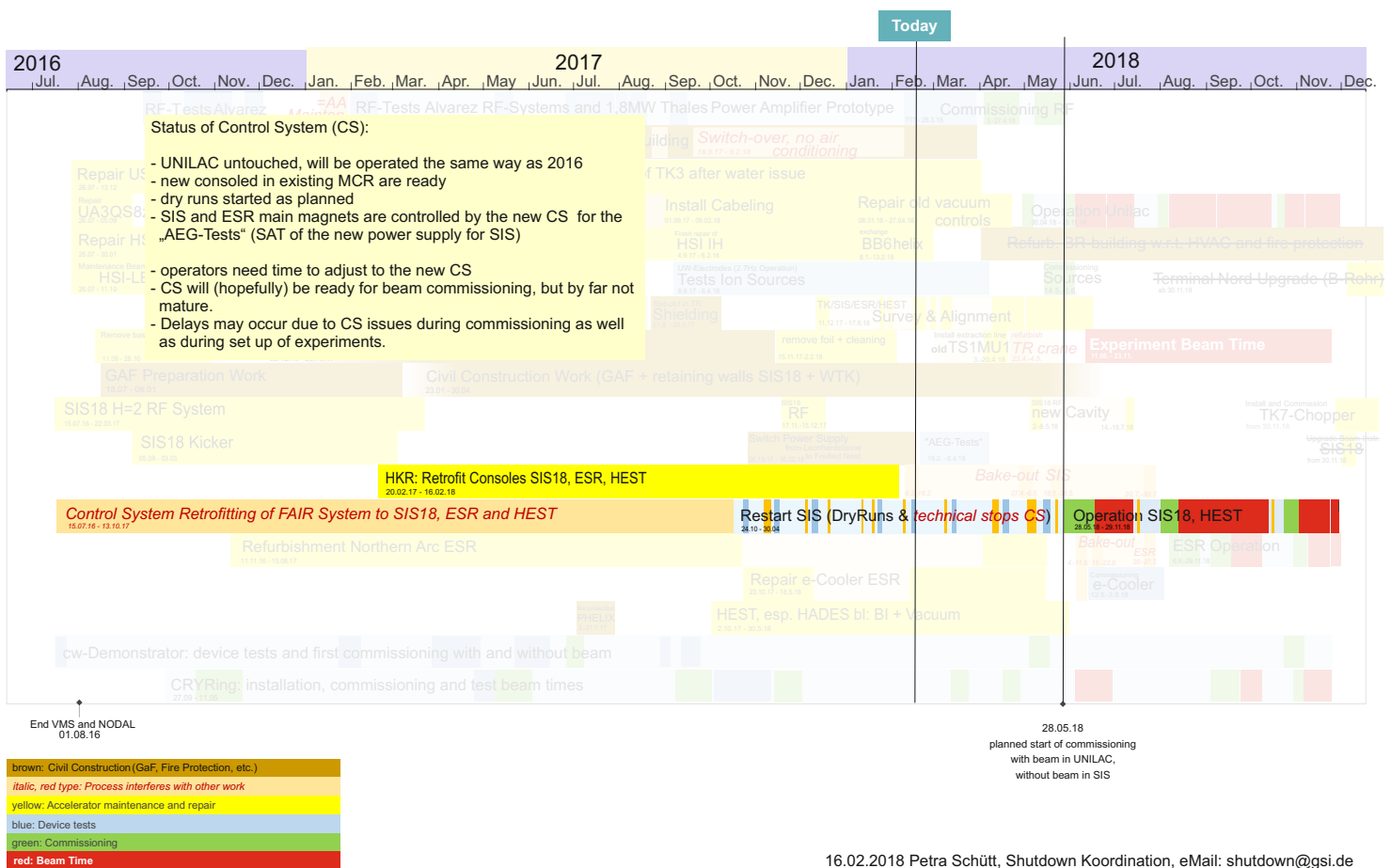
Hardware changes - examples



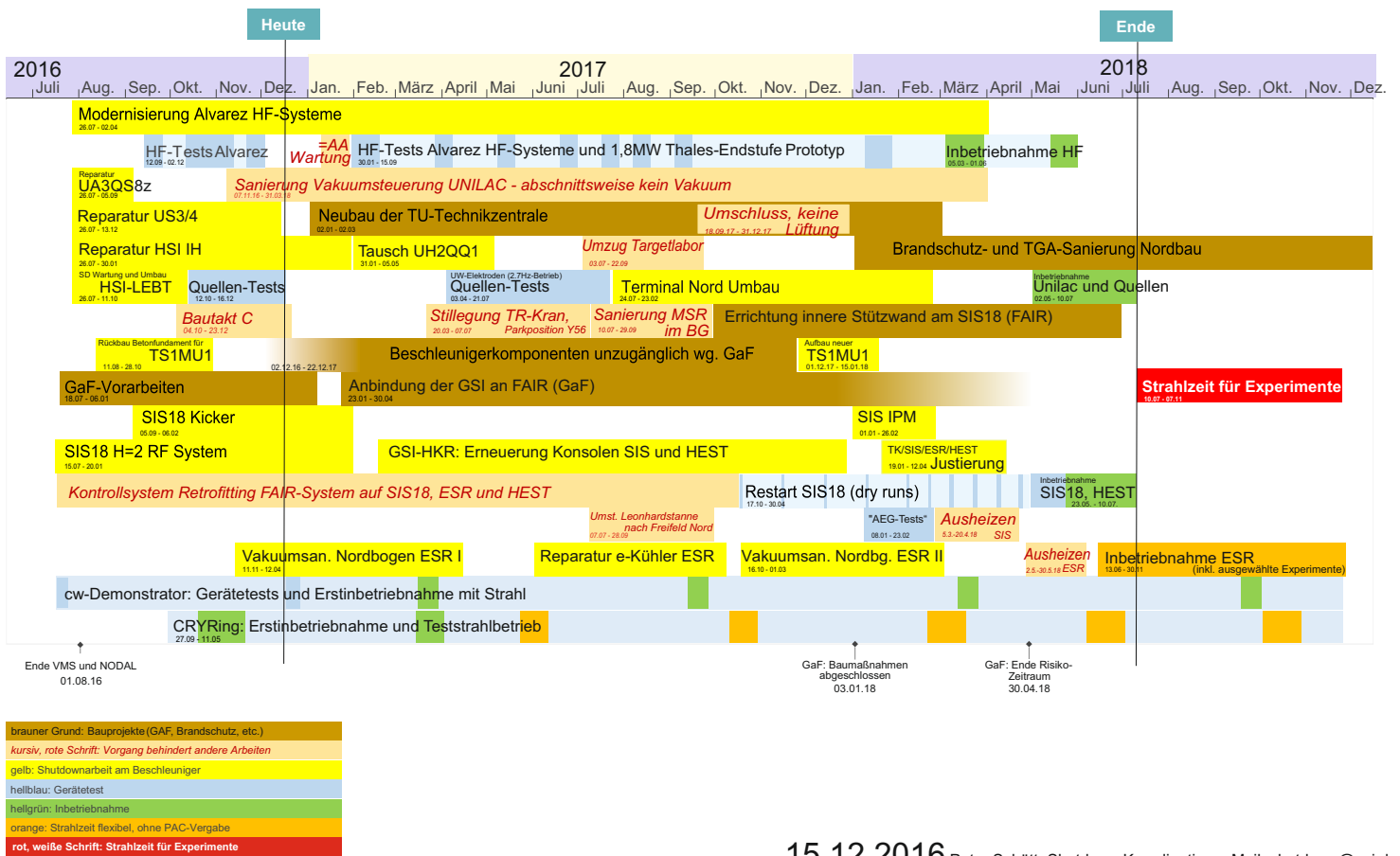
- HADES beamline:
  - Increase of the vacuum chamber apertures



# Control System Retrofitting

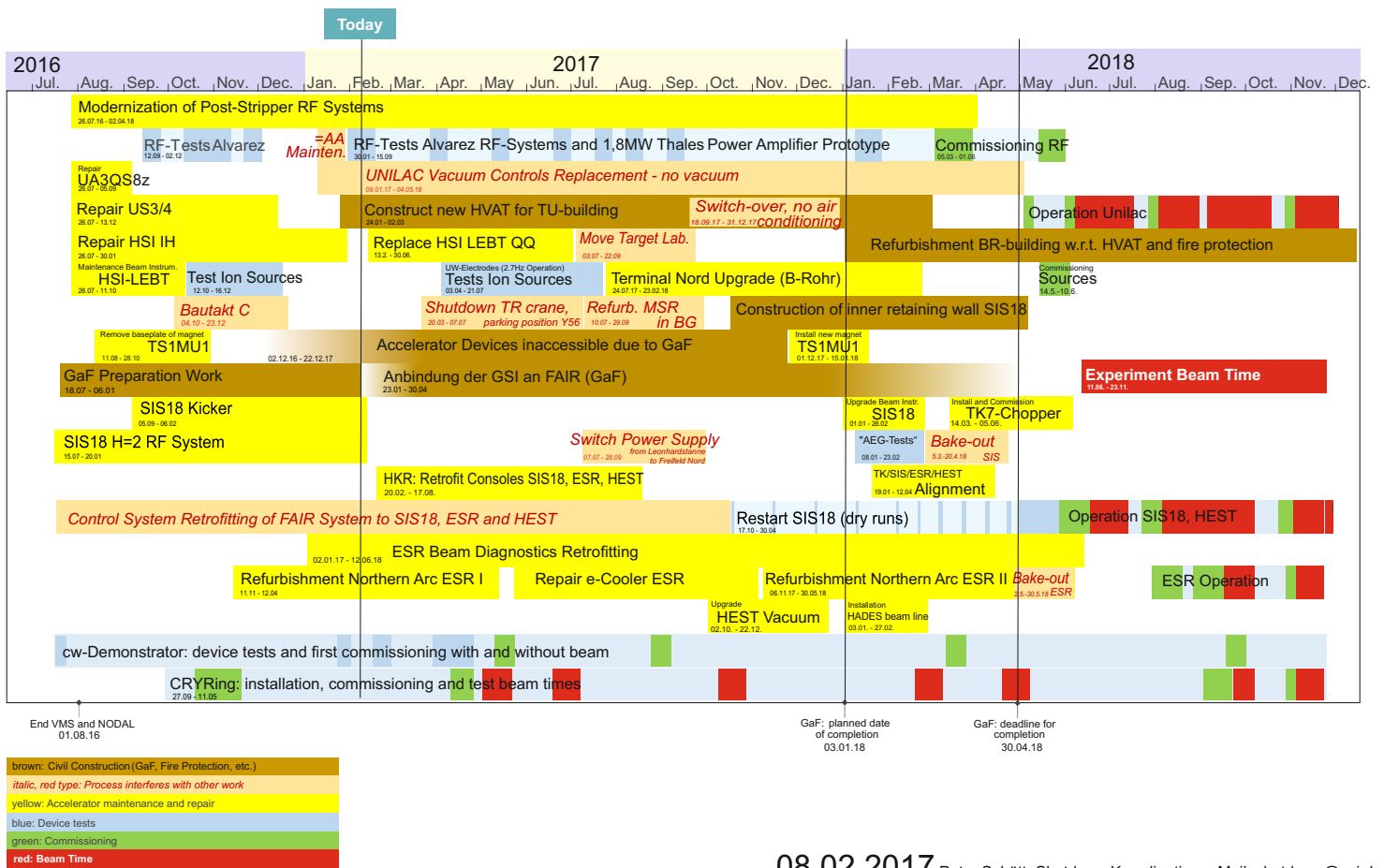


# Shutdown 2016-2018



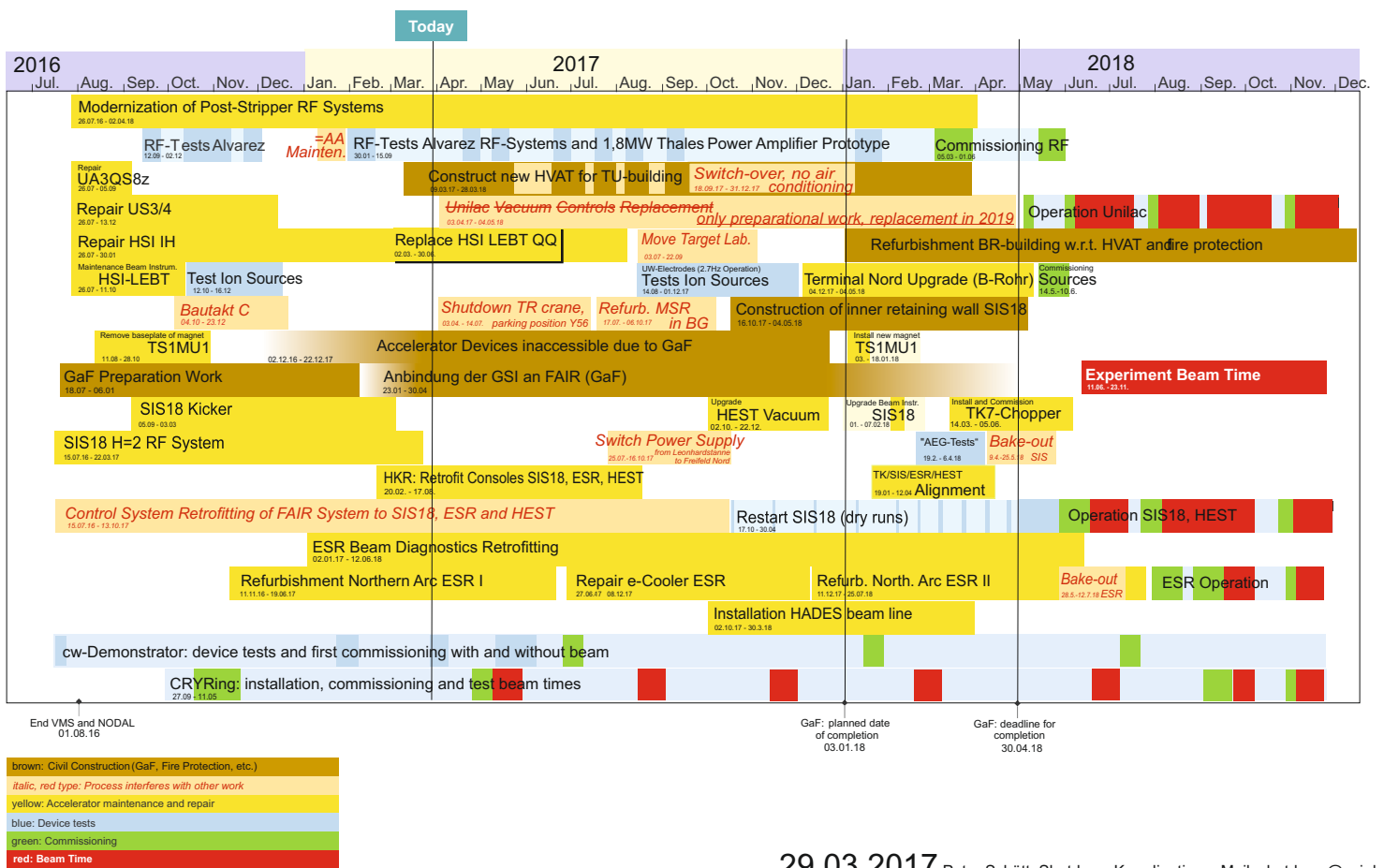
15.12.2016 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



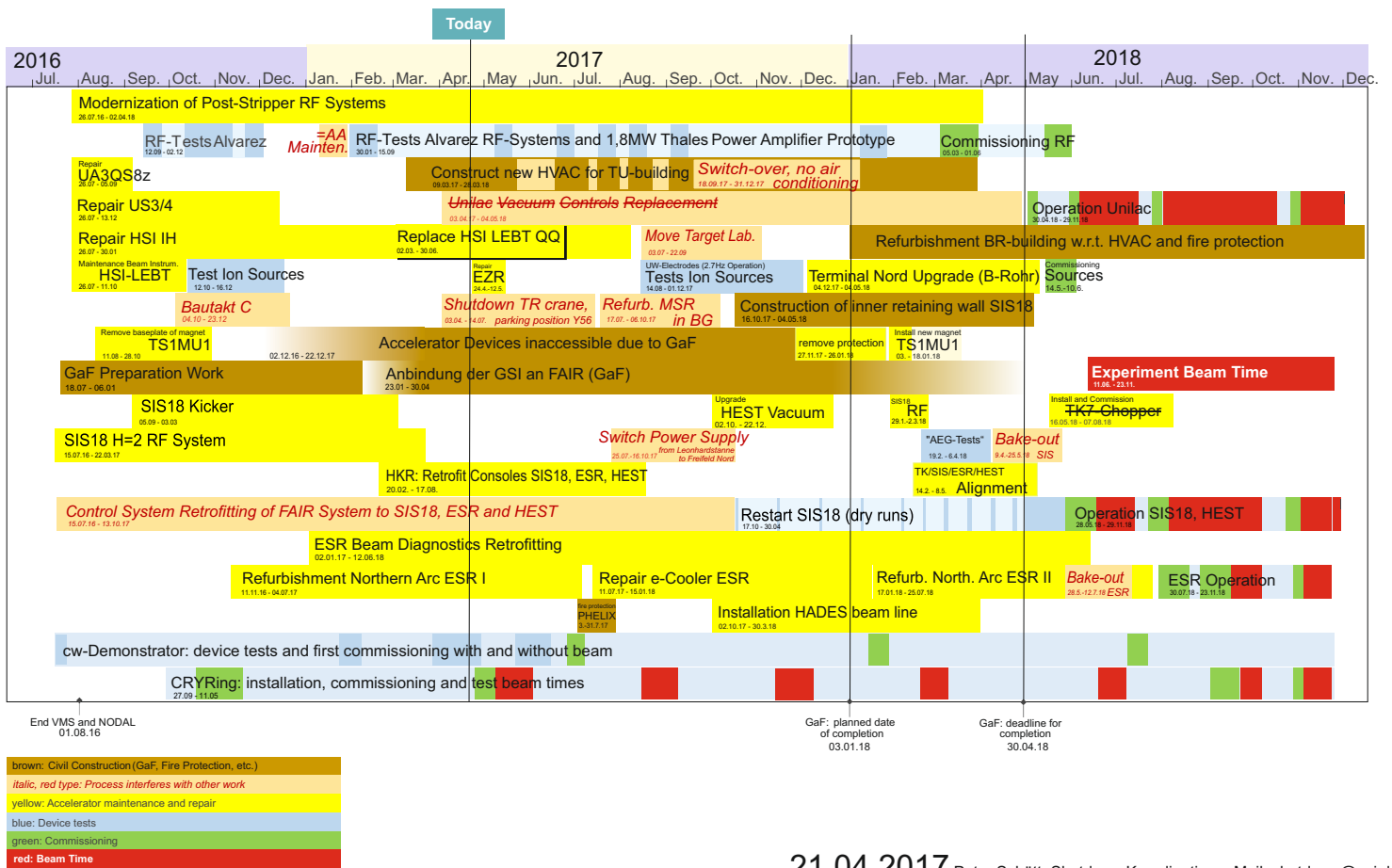
08.02.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



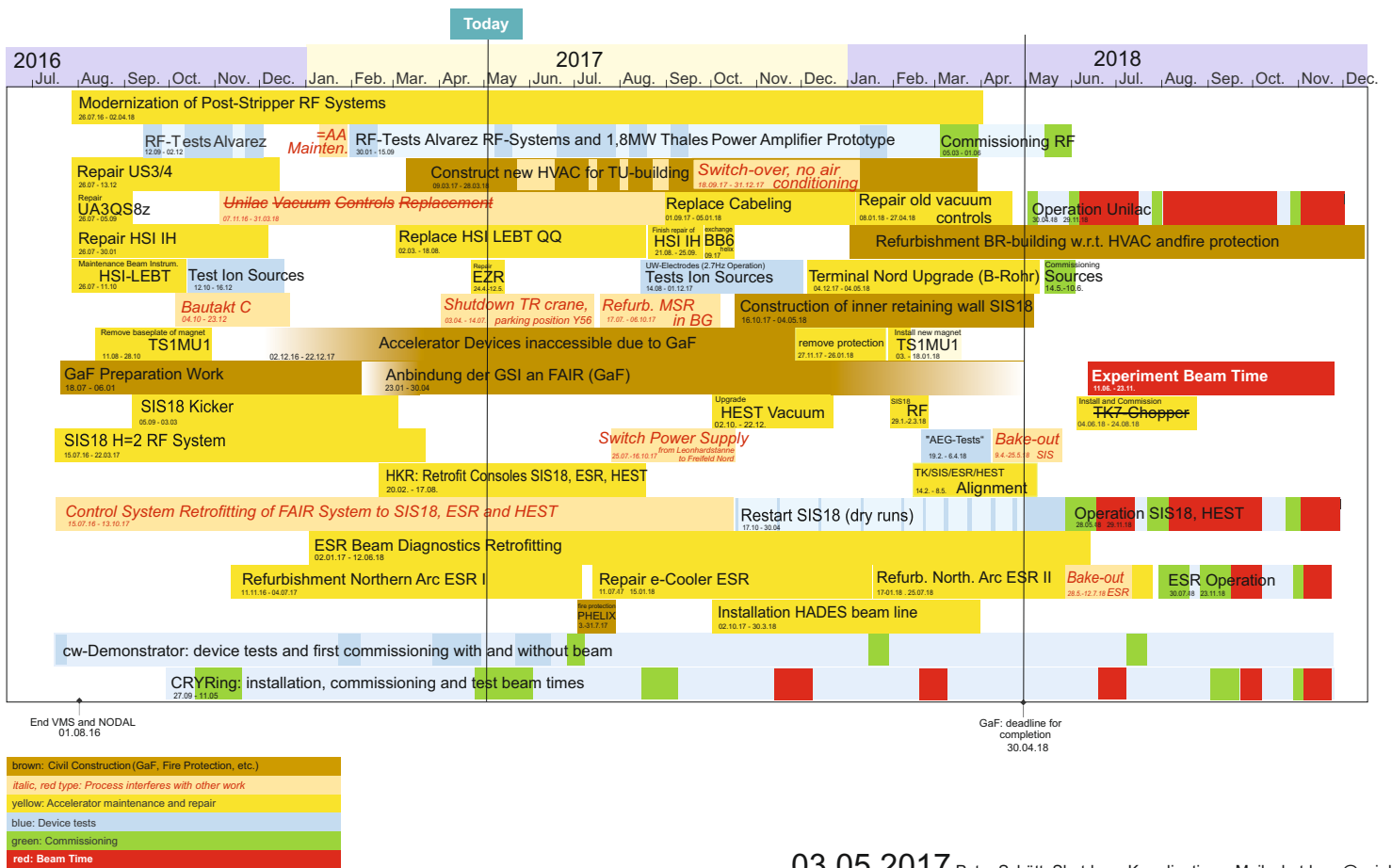
29.03.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



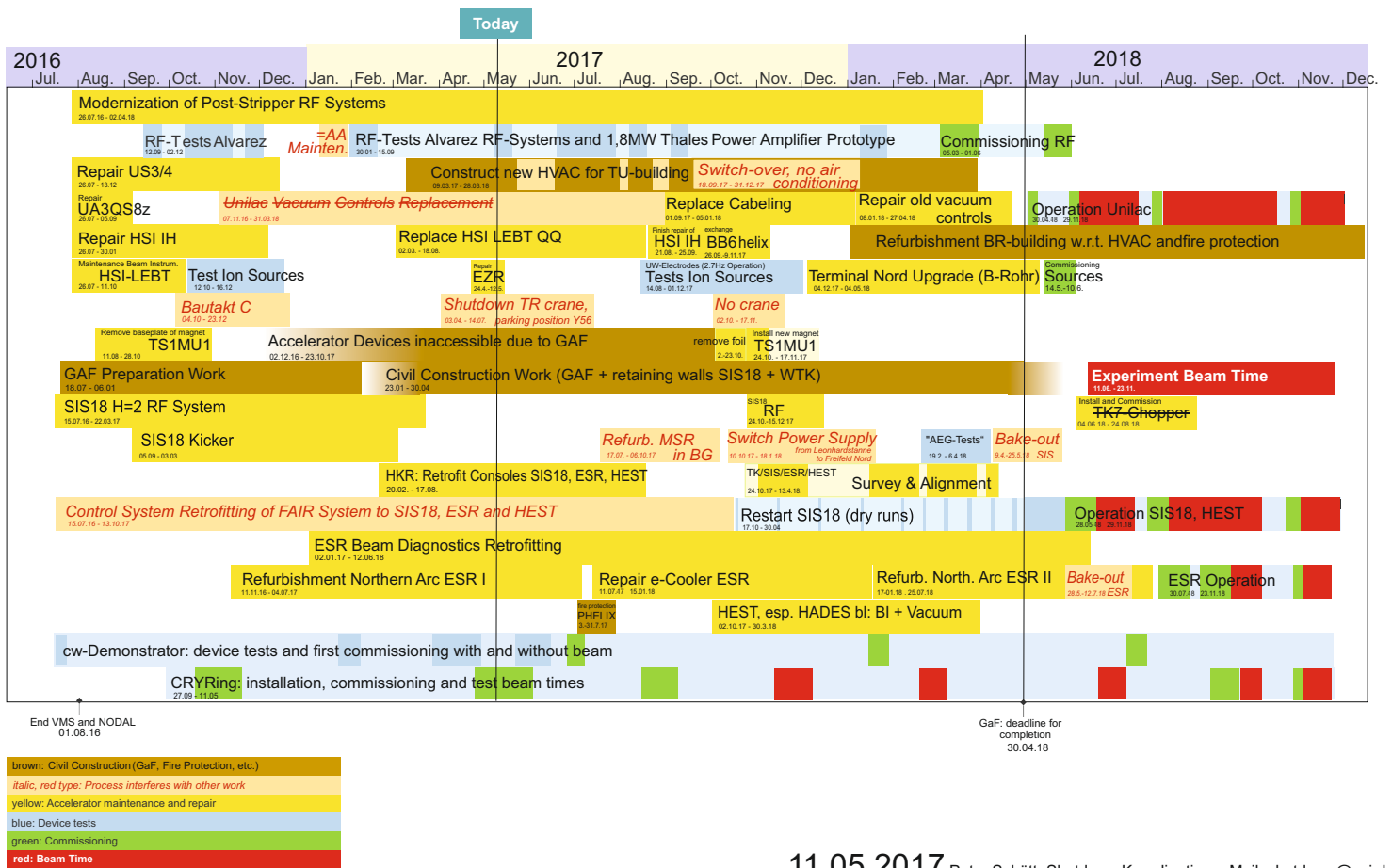
21.04.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



03.05.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

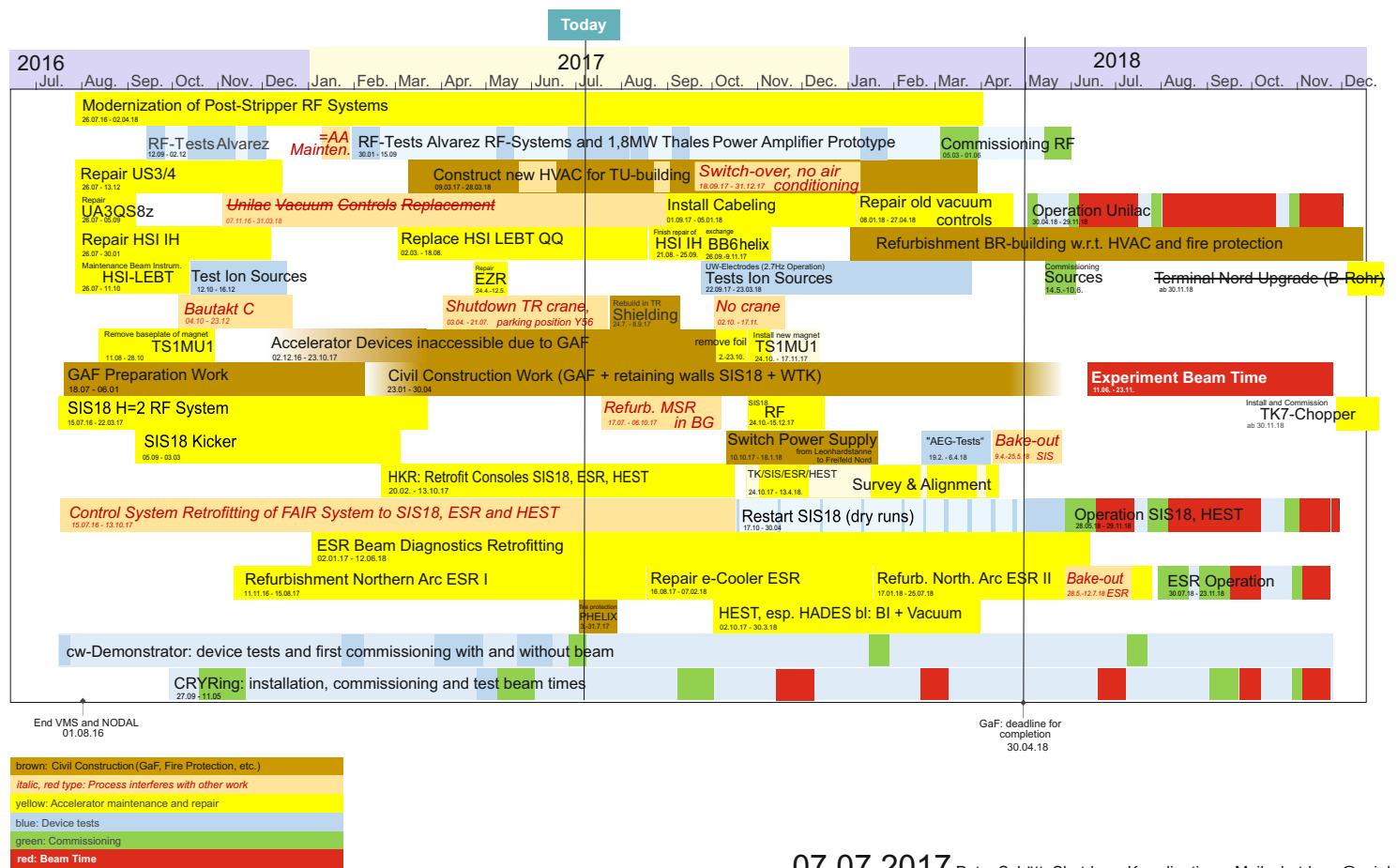
# Shutdown 2016-2018



11.05.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

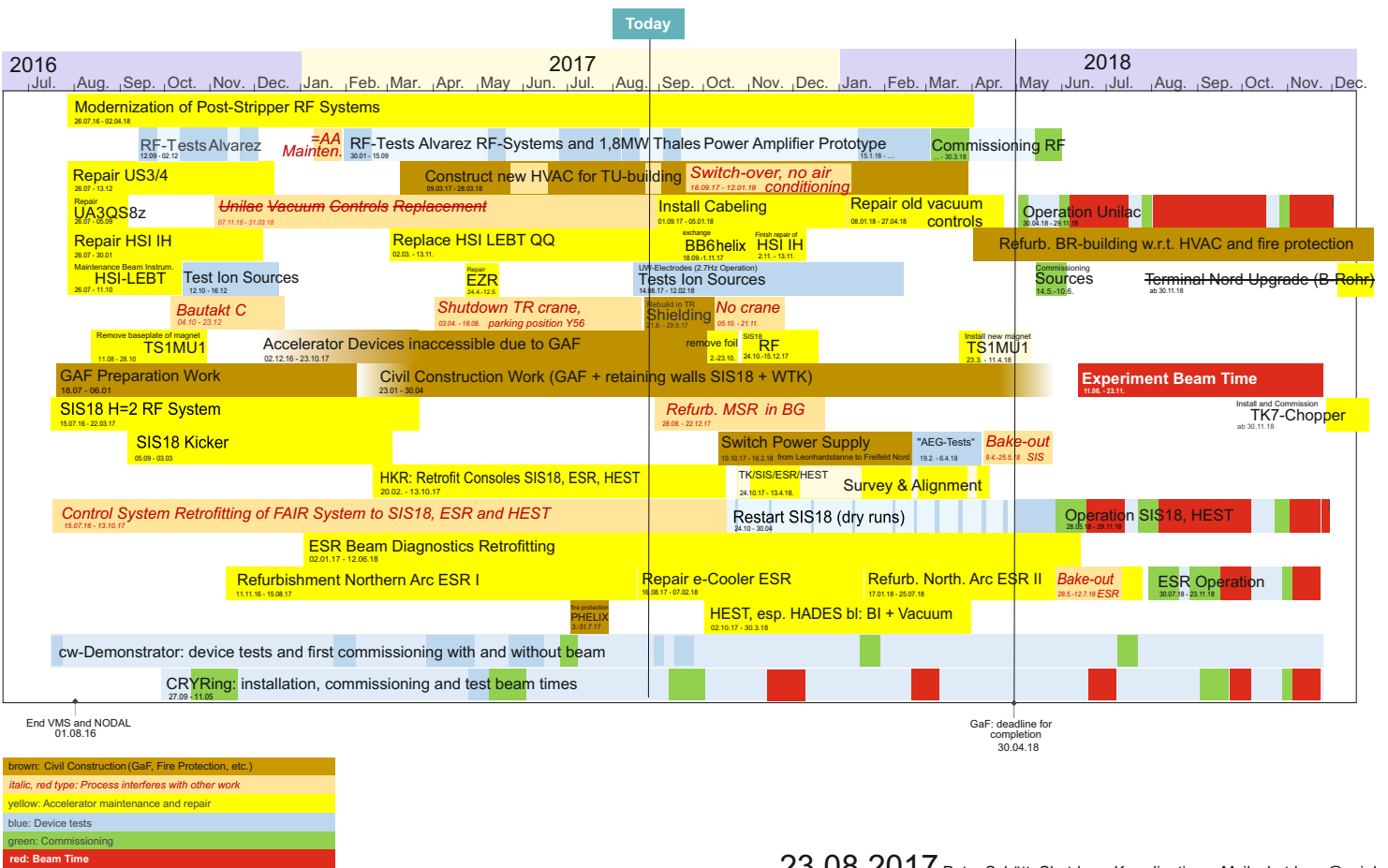


# Shutdown 2016-2018



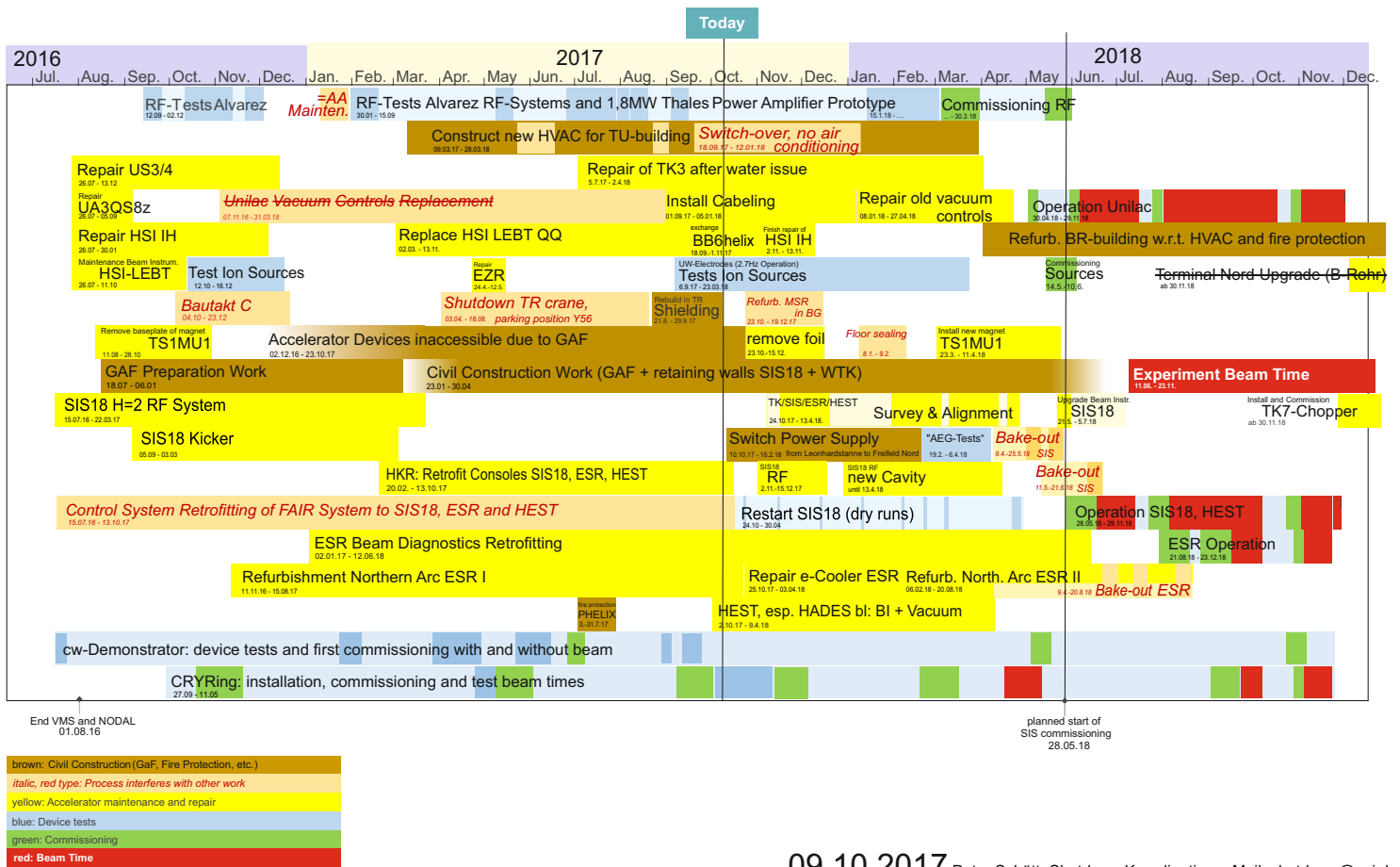
07.07.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



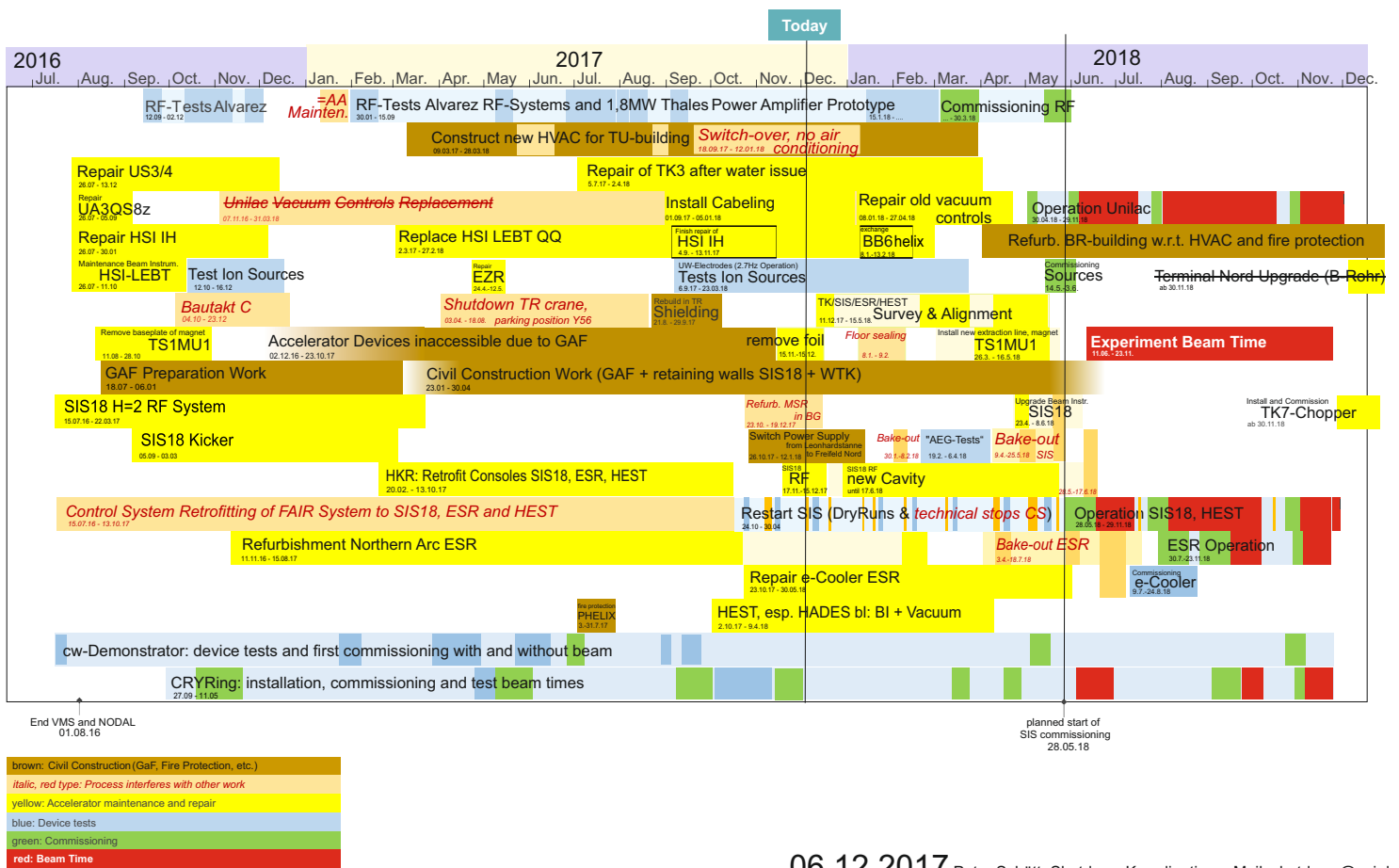
23.08.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



09.10.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018



06.12.2017 Petra Schütt, Shutdown Koordination, eMail: shutdown@gsi.de

# Shutdown 2016-2018

