UNEXPECTED FAILURES AND THEIR CONSEQUENCES DURING BEAM TIME

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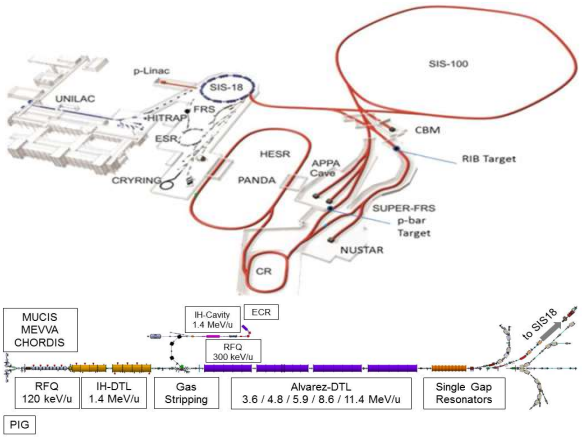
Abstract

The GSI Helmholtz Center for Heavy Ion Research is known for its parallel operation, in which up to 8 experiments are simultaneously supplied with beams from up to 4 different ion sources. The beamtime blocks of the last few years were about 6 months long and packed with weekly changing experiments and intensities. During the beam times at GSI, there are always unexpected failures of devices, cavities or experiments. As a consequence, beam schedules are changed at short notice, experiments are postponed or alternative beams are offered. This causes a significant additional effort for the operators. Larger failures and their effects of the last beamtime are shown in this poster.



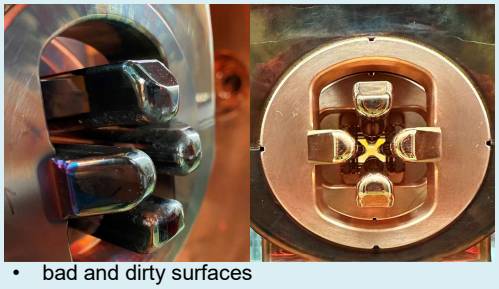
GSI/FAIR Facility

Existing facility (blue):

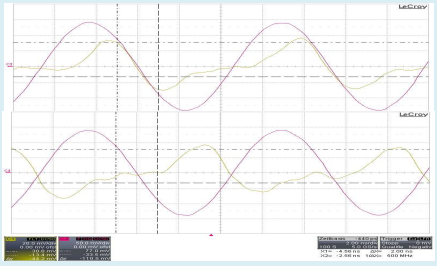
- UNILAC (UNIversal Liner ACcelerator)
  - three ion sources
  - high current injector (HSI)
  - high charge injector (HLI)
- synchrotron SIS18
- ESR (electron storage ring)
- cryring

Future facility (red):

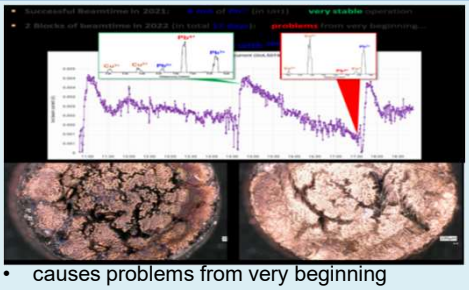
- p-linac injector (proton linac)
- synchrotron SIS100
- HESR (Antiproton Ring)
- CR (experimental and storage ring)
- Super FRS (fragment seperator)



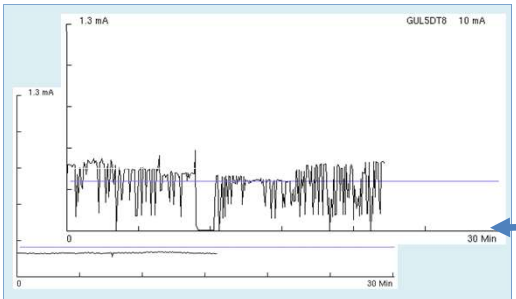
- bad and dirty surfaces
- many electrical flashovers
- short vacuum collapse
- RF system must be reset (up to 40 times per shift)
- in the case of heavy ions, a operator must take care of it permanently



- RF phase axis is not constantly monitored
- the beam partially disappears completely
- often the errors are not easy to find
- complex timing system but few experts



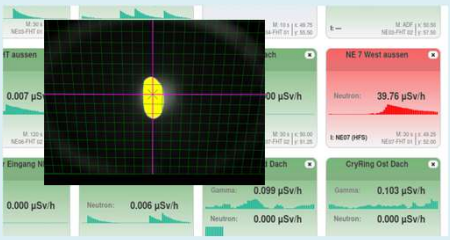
- causes problems from very beginning
- desired charge state is hardly available after a few hours
- very frequent change of cathodes
- different burning behavior of the cathodes
- In most cases, a readjustment of the ion source area is necessary



- burning behavior is depends on type of ion
- High current requirements are more difficult
- stable beam for experiments not possible
- constant monitoring and adjustment of the ion source

- aging of the machine
- jumping RF phase axis
- bad cathode quality
- parallel operation
- detect protons
- uneven burning of the ion source
- destroyed grids
- weather events
- inexperienced on-call participants
- real time errors
- failure of the single resonators

- parallel setting disrupt ongoing experiments
- adding/removing a pattern changes the position of the beam
- many experiments require high rigidity and low energy. power supplies are not designed for this
- frequent change of experiments
- sometimes up to 5 experiments start on the same day



- Detect high energy protons
- Beam diagnostics is designed for heavy ions
- high beam intensities are necessary for fluorescence screens
- high proton intensities often cause bio rems when adjusting
- careful and slow adjustment is absolutely necessary
- bio rems can cause longer failures

- grids were destroyed during a high-current campaign
- control system error for the profile grid protection
- inaccurate beam position in the settings
- Beam adjustment are more difficult
- significantly longer adjustment times are necessary

- cooling water is not sufficient
- when it is hot, the cooling water is not sufficiently cooled down
- causes failures in power supplies and accelerator systems
- additional fans and opening the roof windows during the night are necessary
- Windows must be closed by operators when it rains.
- power outages due to lightning strikes
- very critical for vacuum systems