

A large, detailed wireframe 3D model of a particle accelerator, likely a synchrotron, is centered on the slide. It shows a long, curved tunnel structure with various internal components and a smaller, more complex structure at the top right.

# Control System / Applications

## Operators Training

J.Fitzek  
10.04.2018

# Agenda

## ◆ Applications

- ❖ Basics
- ❖ Device-oriented Applications
- ❖ Scheduling and Settings Management
- ❖ Status Applications, Measurement & Feedback Applications
- ❖ Overview Fixed-Display Applications (Big Screens)
- ❖ Misc

## ◆ Outlook

# Agenda

## ◆ Applications

### ❖ Basics

#### ◆ Sequencer

### ❖ Device-oriented Applications

### ❖ Scheduling and Settings Management

### ❖ Status Applications, Measurement & Feedback Applications

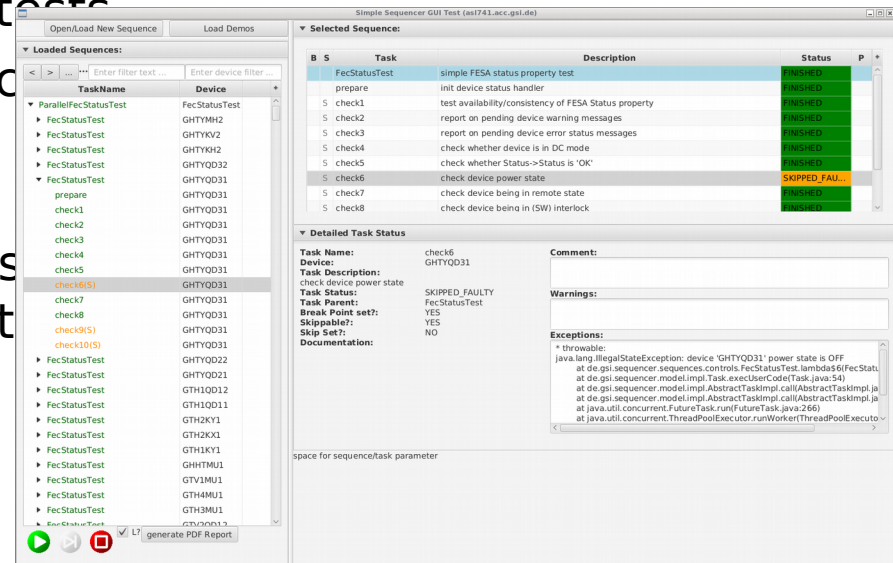
### ❖ Overview Fixed-Display Applications (Big Screens)

### ❖ Misc

## ◆ Outlook

# Sequencer

- ◆ Execute a bunch of tasks, can be combined to larger sub-sequences
- ◆ Saves a lot of manual work
- ◆ Helps with diagnosis and to clearly identify problems
- ◆ Range of Functionality:
  - ❖ Logging, protocol of executed tests
  - ❖ (semi-)automated test sequences (unit-style HW testing)
  - ❖ user-driven execution and configuration of test sequences (by non-Java equipment experts)



# Agenda

## ◆ Applications

### ❖ Basics

### ❖ Device-oriented Applications

- ◆ DeviceControl
- ◆ EquipState
- ◆ EquipMonitor

### ❖ Scheduling and Settings Management

### ❖ Status Applications, Measurement & Feedback Applications

### ❖ Overview Fixed-Display Applications (Big Screens)

### ❖ Misc

## ◆ Outlook

# Device Control

- ◆ Control on Device Level:  
Status, Set-Actual-Value comparison, Switch on / off, control drives

The screenshot displays the 'DeviceControl' software interface. At the top, it shows the context 'CRYRING' and the selected zone 'YRLE\_YRME\_2017Feb21\_IK.CL.YRLE.TRANSFER.INJECTION.1'. The selected acceleration zone is 'YRLE' with a value of  $^1\text{H}^{+3}$  0.01MeV/u.

The 'Gerätetabelle' (Device Table) is a grid with columns for 'Anwahlmodus', 'Gerätetyp', and several status columns (Y, R, T, 1, 2, 3, 1). The table lists devices like 'Gateventil', 'Faradaytasse', and 'Leuchttarget'.

The 'Geräteüberwachung' (Device Monitoring) section shows a comparison of 'Soll(Gerät)/Ist' (Setpoint/Actual) and a 'prozentuale Abweichung' (percentage deviation) of 0.1. A red bar indicates 'Aktuell liegen Abweichungen vor' (Current deviations exist). A list of 13 error codes is shown, including 'PowerFault', 'TempPS', 'B2OPS', 'SurOver', 'TempMagnet', 'B2OMagn', 'BNet', 'ELTAFault', 'T5Fault', 'Udi', 'BcCT', 'fault2Ground', 'BIS', and 'SurCtrl (F)'. The 'Gerätezustand' (Device Status) is set to 'Alle' (All).

At the bottom, there is a row of device status icons for various YR devices, including YRT11CLV, YRT11D21R, YRT11D21L, YRT11D210, YRT11D21U, YRT11D22, YRT11KH1, YRT11KV1, YRT11T31H, and YRT11T31V. A status bar at the very bottom shows '1 von 31 Geräten gewählt' (1 of 31 devices selected) and buttons for 'Ein', 'Aus', 'Reset', 'Status', 'Diagnose', and 'Abstand'.

# Expert Tool: EquipState

- ◆ EquipState: Set/Read all properties of the devices (comparable to FESA Explorer, bit less „low-level“)
- ◆ Used for Dry Runs, Commissioning, Error diagnosis

The screenshot displays the EquipState GSI software interface. The top window shows a schematic of the CRYRING accelerator with components labeled: CRYRING\_COOLER, CRYRING\_RING, TYR1, YRME, YRLE, and YRS1. Below the schematic, there are several panels for device management and monitoring.

**Filtering on Particle Transfer: YRME**  
Context: YRLE\_YRME\_2017Feb21\_IK.C1.YRLE.TRANSFER.INJECTION.1, YRLE\_YRME\_2017Feb21\_IK.C1.YRME.TRANSFER.INJECTION.1

Device Type	HWName	Setting
YRT1KH2		
YRT1KH2		
YRT1QD61		OK
YRT1QD62		OK
YRT1QD71		OK
YRT1QD72		OK

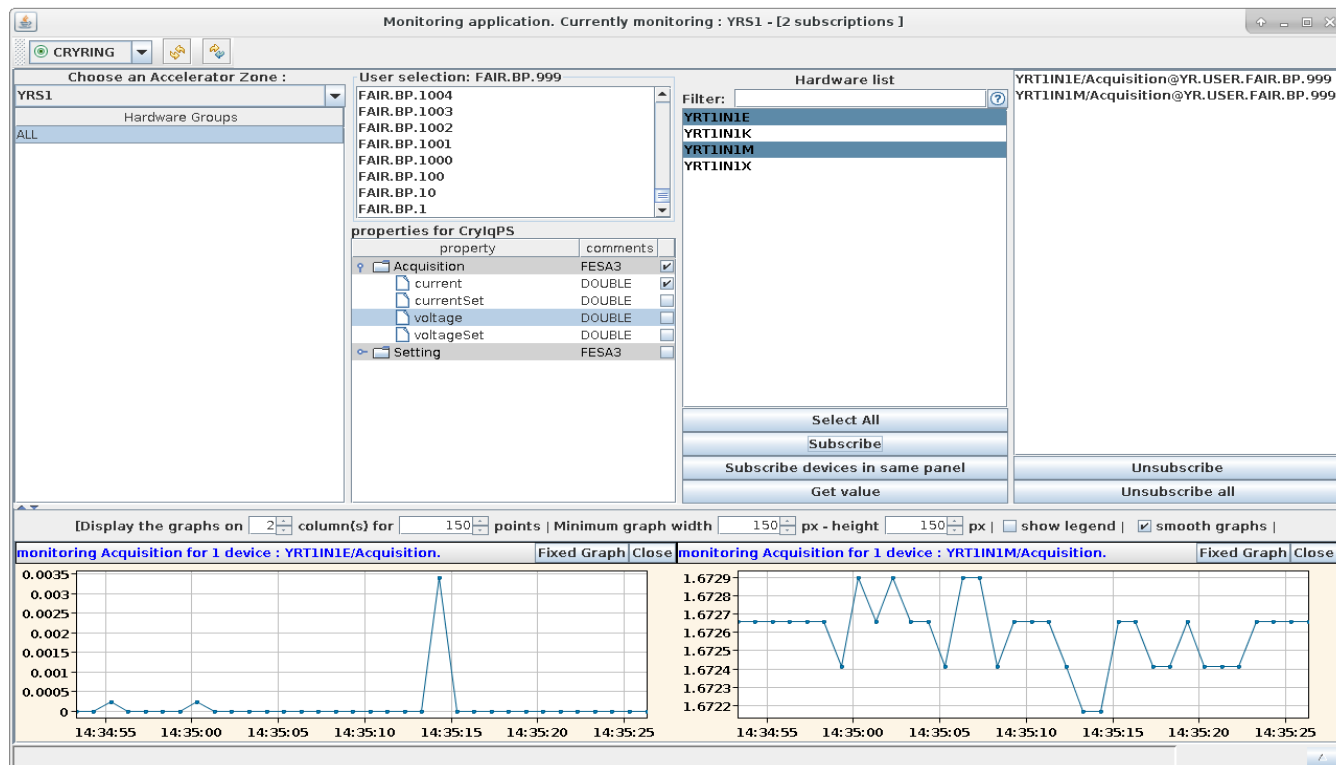
Parameter	Values
current	0.0
current_max	135.0
current_min	0.0
current_units	A

**Console** | Running tasks

```
28.04.2017 14:41:26 - Result for device YRT1QD72 :  
current (double:1) -> 0.0  
current_max (double:1) -> 135.0  
current_units (String:1) -> A  
current_min (double:1) -> 0.0  
24.1.26 - Command BasicPS-Setting READ: completed
```

# EquipMonitor

- ◆ EquipMonitor: Subscribe to all properties of the devices
- ◆ Will be replaced in the future by the Archiving System GUI





# Agenda

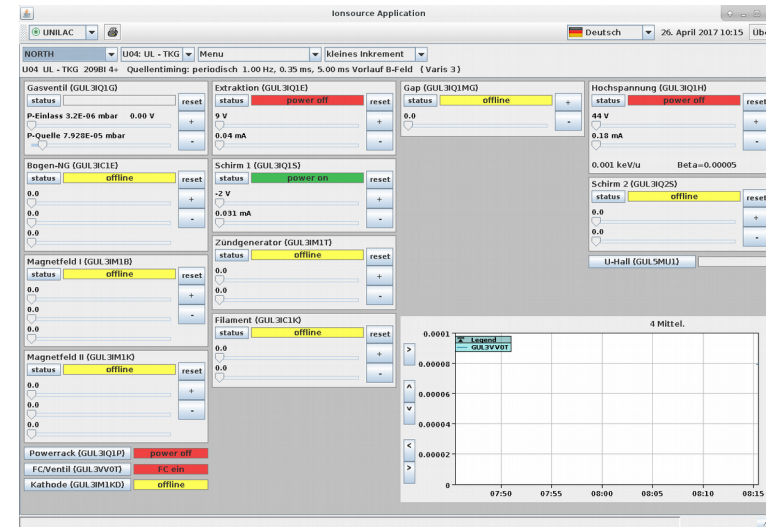
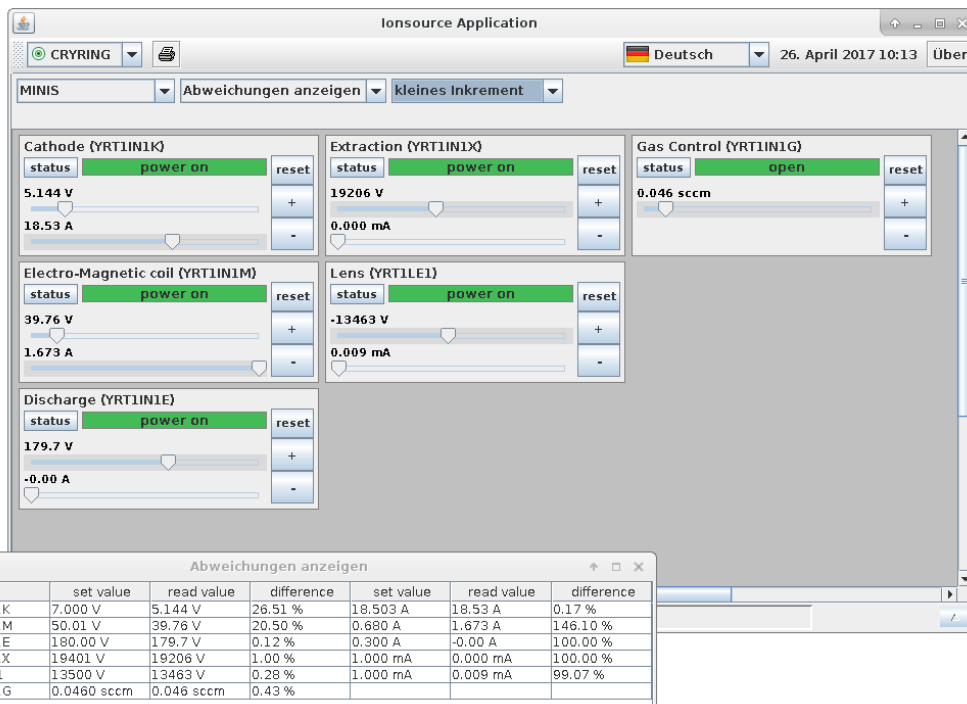
## ◆ Applications

- ❖ Basics
- ❖ Device-oriented Applications
- ❖ Scheduling and Settings Management
  - ◆ Ion Source Application
  - ◆ Scheduling Application
  - ◆ ParamModi
- ❖ Status Applications, Measurement & Feedback Applications
- ❖ Overview Fixed-Display Applications (Big Screens)
- ❖ Misc

## ◆ Outlook

# Ion Source Application

- ◆ Generic Ion Source Program for FAIR, used at CRYRING (operational) and Unilac North/South (first prototype)



# Scheduling Application

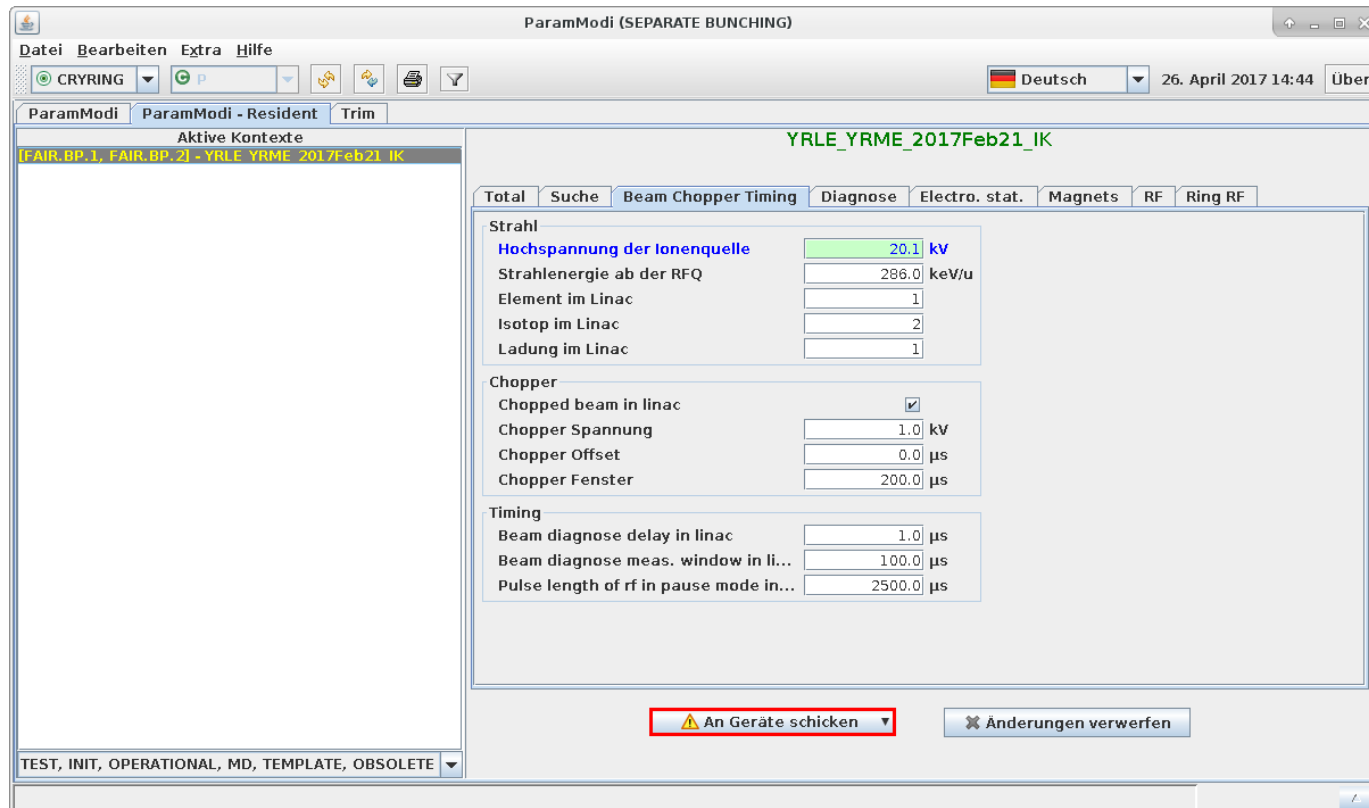
- ◆ Plan and execute patterns
- ◆ Comparable to the “Init” application

The screenshot displays the Scheduling Application interface, which is used for planning and executing patterns. The main window is titled "Schedule Planning" and features a toolbar with icons for Add, Remove, Duplicate, Edit, and Supply. The interface is divided into several sections:

- Available Patterns:** A grid of four pattern cards. Each card shows a pattern name, a repetition count of 1x, and a schematic diagram. The patterns are: SCRATCH\_HL\_SIS18\_RING\_20180325\_214505 (SIS18), TEST\_SL\_ESR\_AEG\_20180208 (ESR), RF\_test\_135kHz\_ik (CRYRING), and SCRATCH\_AW\_CRYRING\_COOLER\_20180219\_133658 (CRYRING).
- Scheduled patterns:** A section with a warning icon and the text "Schedule changed, re-supply required". It contains three GSI pattern cards: TEST\_RM\_SIS18\_FAST\_UNILAC\_20180329 (SIS18, Scheduled), TEST\_HH\_PATTERN\_1 (SIS18, Scheduled), and PATTERN\_FOR\_DRY\_RUN\_ONE\_TO\_HTP (HTP via TH, Added).
- Patterns to remove:** A section with one card: TEST\_HH\_PATTERN\_2 (SIS18, To be removed).
- Pattern Detail View:** A pop-up window for the selected pattern "PATTERN\_FOR\_DRY\_RUN\_ONE\_TO\_HTP". It shows a repetition count of 2, an "Activated" checkbox, and a "Pattern state" of "Finalized".
- Chain Detail View:** A pop-up window for the chain "PATTERN\_FOR\_DRY\_RUN\_ONE\_TO\_H TP.C1". It displays various parameters:
  - Beamline: View...
  - Created: October 12, 2017 10:53 AM
  - Length: 3592000  $\mu$ s
  - Beam Parameters:** Element: 18, Isotope: 40, Charge: 19.
  - Injection Energy: 11.4 MeV/u, Target Energy: 1650.0 MeV/u.
  - Timing:** Bunching Time: 32.0 ms, Extraction Time: 2000.0 ms, Ramping Speed: 3.0, 3.0 Tr/s.
  - Transferline:** Optic Name: SIS18\_TH\_HTP\_... (SIS18\_TH\_HTP\_STANDARD selected).
- Graph:** A plot showing energy (GeV/u) versus time (s). The energy starts at approximately 1.5 GeV/u and increases to about 3.592 GeV/u over a time interval of 0 to 3.592 seconds.

# ParamModi

- ◆ Central Application for trimming set values
- ◆ View the settings on all levels of the hierarchy (plus expert trim)



# Agenda

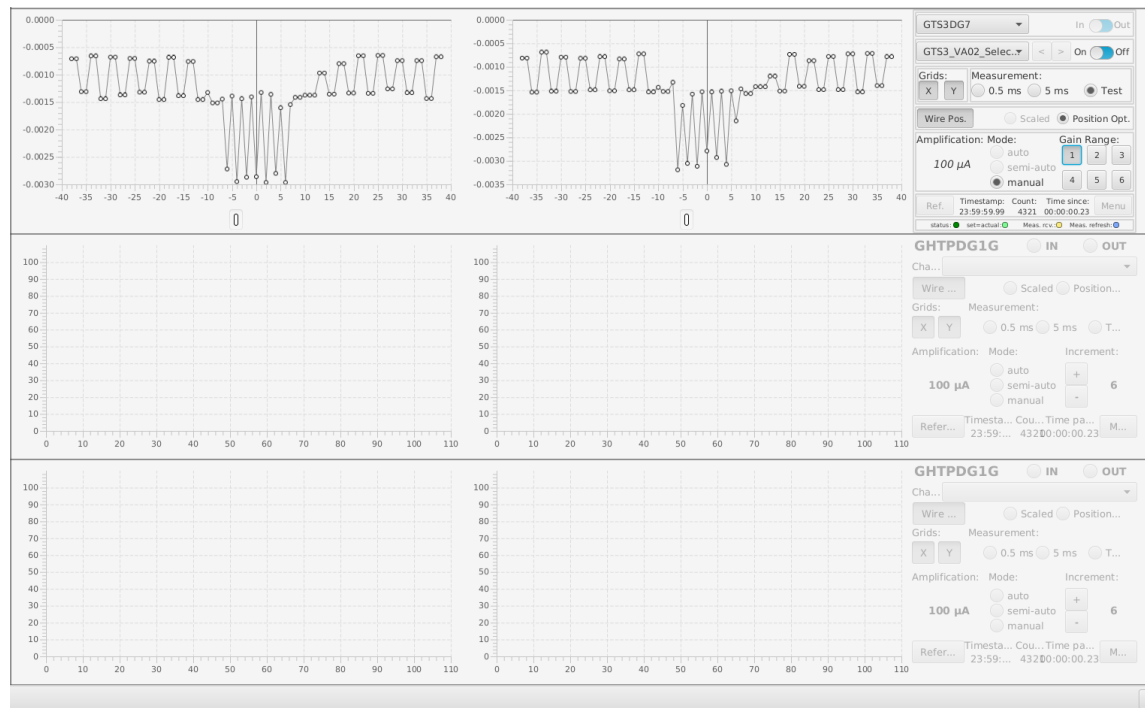
## ◆ Applications

- ❖ Basics
- ❖ Device-oriented Applications
- ❖ Scheduling and Settings Management
- ❖ Status Applications, Measurement & Feedback Applications
  - ◆ Profile Grid Application
  - ◆ MASP Application
- ❖ Overview Fixed-Display Applications (Big Screens)
- ❖ Misc

## ◆ Outlook

# Profile Grid Application

- ◆ Remake of the existing Profile Grid Application
- ◆ More tests during the upcoming Dry Run #7



# MASP Application – Facility Status

- ◆ Displays information of the MASP (Master Accelerator Status Processor), display the status of the whole machine:
  - ❖ Clear indication of current problems, e.g. Interlocks

The screenshot displays the MASP application interface, titled "Status und Diagnose der Anlage (StaDA) Prototyp". The interface is divided into several sections:

- Table of Device Status:** A table with columns: Devices, Status, Emitter, FSMask, PT, and Last Change. The "Status" column is color-coded: red for "false" and green for "true".
- Schematic Diagram:** A 3D schematic of the accelerator facility, with various components highlighted in red to indicate a problem or interlock.
- Summary Table:** A table with columns: UNILAC, POST\_MORTEM, RECOVERY, NO\_BEAM, PILOT\_BEAM, INTENSITY\_RAMP..., ADJUST, STABLE\_BEAMS, and Actual BM. The "Actual BM" column shows "No Beam".
- Control Panel:** A section for the active device (GTH40D31) with buttons for "P. Off", "P. On", "Reset", "Init", and "Get".

Devices	Status	Emitter	FSMask	PT	Last Change
TEST	false	UNKNOWN		TEST_PT	5-Apr-2018 15:13:24
ZKS_NE1	false	HW_INTERL...		SIS18_RING	5-Apr-2018 15:13:24
ZKS_NE2	false	HW_INTERL...		ESR_RING	5-Apr-2018 15:13:24
ZKS_NE3	false	HW_INTERL...		GTS3MU1_TO_HHD	5-Apr-2018 15:13:24
ZKS_NE4	false	HW_INTERL...		GTS3MU1_TO_GHFSMU1	5-Apr-2018 15:13:24
ZKS_NE6	false	HW_INTERL...		GHHTMU1_TO_HHT	5-Apr-2018 15:13:24
ZKS_NE7	false	HW_INTERL...		GHFSMU1_TO_HFS	5-Apr-2018 15:13:24
ZKS_NE8	false	HW_INTERL...		GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:24
ZKS_NE9	false	HW_INTERL...		GHTDMU1_TO_HTC	5-Apr-2018 15:13:24
ZKS_NE10	false	HW_INTERL...		GTV2MU3_TO_HTA	5-Apr-2018 15:13:24
ZKS_NE11	false	HW_INTERL...		CVRING_RING	5-Apr-2018 15:13:24
ZKS_NE12	false	HW_INTERL...		GTH4MU1_TO_HTM	5-Apr-2018 15:13:24
ZKS_NE13	false	HW_INTERL...		GTP1MU1_TO_HADE5	5-Apr-2018 15:13:24
ZKS_NE14	false	HW_INTERL...		SIS18_RING	5-Apr-2018 15:13:24
GTV2MU3	false	FESA		GTV2MU2_TO_GTV2MU3	5-Apr-2018 15:13:24
GTH4MU2	false	FESA		GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:24
GTH40D31	false	FESA		GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:24
GTH40D31.POWER_ON	false	FESA	false	GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:22
GTH40D31.INTERLCK	false	FESA	false	GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:22
GTH40D31.REMOTE	false	FESA	false	GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:22
GTH40D31.OP_READY	false	FESA	false	GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:22
GTH40D31.MOD_RDY	true	FESA	false	GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:22
GTH40D32	false	FESA		GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:24
GTV1MU1	false	FESA		GTH4MU2_TO_GTV1MU1	5-Apr-2018 15:13:24
GTH30D11	false	FESA		GTH3MU1_TO_GTS7MU1	5-Apr-2018 15:13:24
GTH30D12	false	FESA		GTH3MU1_TO_GTS7MU1	5-Apr-2018 15:13:24
GTH3KY1	false	FESA		GTH3MU1_TO_GTS7MU1	5-Apr-2018 15:13:24
GTH3MK1	false	FESA		GTH3MU1_TO_GTS7MU1	5-Apr-2018 15:13:24
GTH3HV1T	false	HW_INTERL...		GTH3MU1_TO_GTS7MU1	5-Apr-2018 15:13:24
GTH4V2T	false	HW_INTERL...		GTH4MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1KY1	false	FESA		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1QD11	false	FESA		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1QD12	false	FESA		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1KY2	false	FESA		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1V1T	false	HW_INTERL...		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GTP1V2T	false	HW_INTERL...		GTP1MU1_TO_GTH4MU2	5-Apr-2018 15:13:24
GS12MU3I	false	FESA		PLTKMH2_TO_SIS18	5-Apr-2018 15:13:24
GS06MU_E	false	UNKNOWN		SIS18_RING	5-Apr-2018 15:13:24
GS01MU1A	false	FESA		SIS18_RING	5-Apr-2018 15:13:24
GS01MU2A	false	UNKNOWN		SIS18_RING	5-Apr-2018 15:13:24
GS01VV1T	false	HW_INTERL...		SIS18_RING	5-Apr-2018 15:13:24

UNILAC	POST_MORTEM	RECOVERY	NO_BEAM	PILOT_BEAM	INTENSITY_RAMP...	ADJUST	STABLE_BEAMS	Actual BM
CRYRING	false	false	false	false	false	false	false	No Beam
	false	false	false	false	false	false	false	No Beam

# Agenda

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- ❖ Basics
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- ❖ Scheduling and Settings Management
- ❖ Status Applications, Measurement & Feedback Applications
- ❖ Overview Fixed-Display Applications (Big Screens)
  - ◆ FCC Overview (“Page 1”)
- ❖ Misc

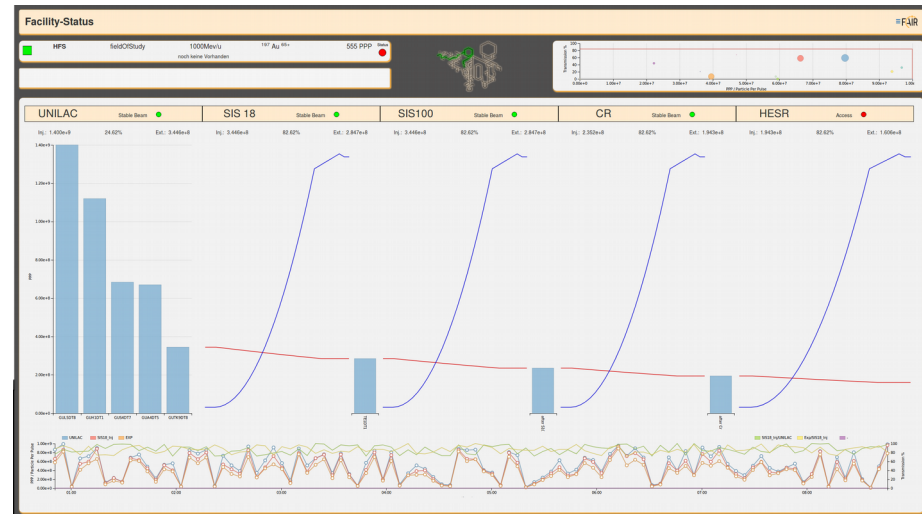
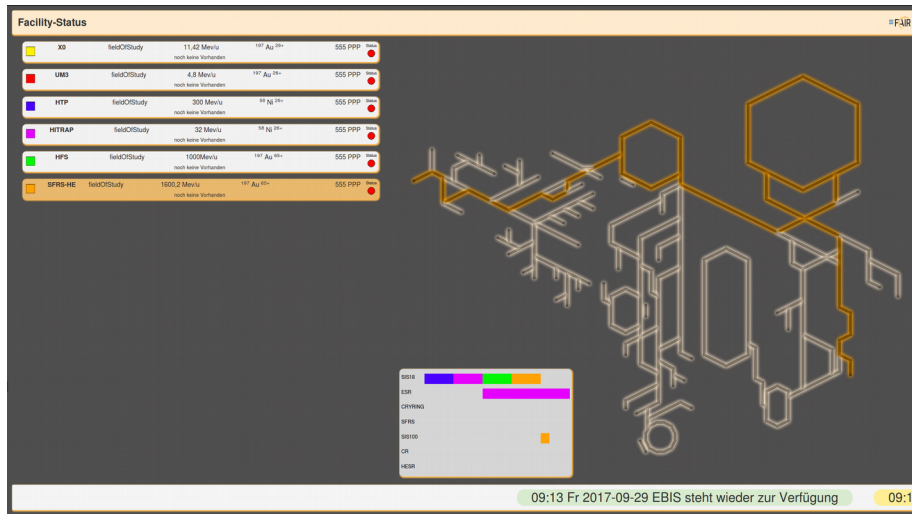
## ◆ Outlook



# FCC Overview Application, "Page 1"

## ◆ HKR / FCC Overview Application

- ❖ Which beams are running?
- ❖ What is their status?
- ❖ Transmission, history
- ❖ => fixed / detailed version for the control room, short (possibly rotating) version for the canteen



# Agenda

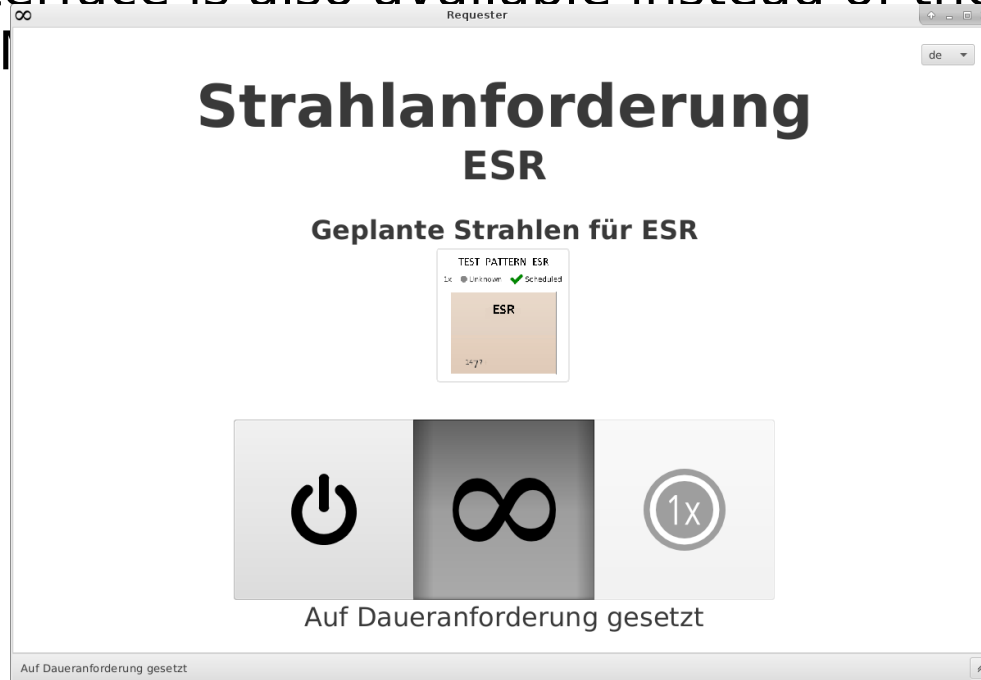
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- ❖ Misc
  - ◆ Requester Application

## ◆ Outlook

# Requester Application

- ◆ Replacement of the old “Anforderungseinheit”
- ◆ Requests are now handled in Software by the Request Processor
- ◆ A REST interface is also available instead of the Application (e.g. Cavel)



# Agenda

## ◆ Applications

- ❖ Basics
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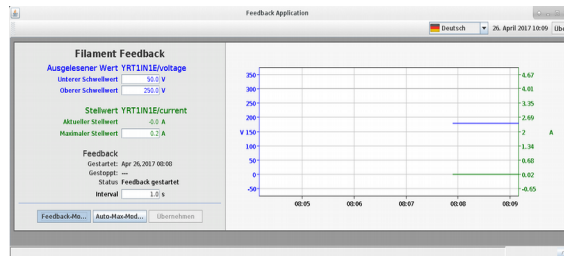
## ◆ Outlook

# More upcoming applications

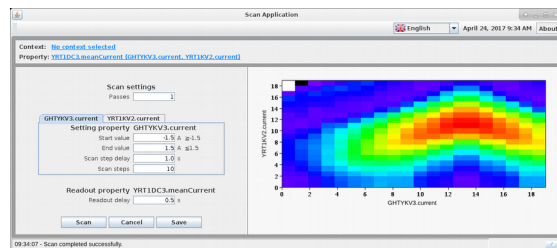
- ◆ Status Applications, Measurement & Feedback Applications
  - ❖ Schedule Control: display+control execution status of current patterns/chains (beamtime)
  - ❖ Digitization of Analog Signals GUI (beamtime)
  - ❖ Beam-based feedbacks together with machine physicists (summer 2018)
    - ◆ LSA-based Orbit Feedback (proof-of-concept during beamtime 2016)
    - ◆ LSA-based Macro-Spill & Harmonics Control (proof-of-concept 2016)
  - ❖ Beam Transmission Monitoring Application (later)
- ◆ Overview Fixed-Display Applications (Big Screens)
  - ❖ Single Machine Status Info (beamtime)
  - ❖ Facility Status Overview: light-weight version of the MASP application (planned)

# Machine-specific applications as prototype

- ◆ Applications so far only used for Crying
  - ❖ Feedback Application for Crying Ion Source



- ❖ Scan Application



=> collect ideas for a more generic application that can be used at other places too

# Questions?

Please also come to see us during the Dry Runs (=> contact Mariusz)