

# Year Setting Management (LSA) System

**2020**

Until end of 2020:

- LSA: code merge with CERN and code cleanup => done
- LSA/system: Performance tuning => 1st iteration done, ongoing
- LSA: support 2 chains in one pattern => done (example for application)
- Technical concept: BPC start indicator => done (implementation not done yet)

R15

For 12/2020:

- Support SIS-100 string test

R16

**2021**

Until end of 2021:

- Booster mode preparation: Integrate FG prep-time in preceding BP (10ms time optimization)
- LSA: Tagging & Restore of good LSA settings (including App)
- LSA: REST API for read access of parameters
- System: Update mechanism (notification for apps) on changes (simple version)

R17

R18

**2022**

Until end of 2022:

- LSA: Support for UNILAC
- LSA: Full support of multiple chains in one pattern
- LSA: Pre/Post in Patterns (automatic, full solution)
- LSA: REST API for read/write access of parameters (prototype)

R19

R20

**2023**

Until end of 2023:

- Chain skipping (prevent execution of BPC)
- LSA: REST API for read/write access (extension based on user feedback)
- LSA: Support of transactions
- LSA/system: support of "rectangle-type patterns" (nested chains)
- LSA: Change StorageRing -Pattern to SyncMode-Pattern (and return), (first step for "TV2 beamline problem")

R21

R22

**2024**

Until end of 2024:

- LSA: RBAC for LSA parameters integrated
- LSA/system: Support of "parallelogram-type patterns" (time shifted chains)

R23

R24

**2025**

Until end of 2025:

- Full solution for "TV2-Problem" (time-optimized solution)

R25

R26

# Year **System Services (RBAC, cmw, Sequencer, MiTSA)**

**2020**

Beamtime 2020:

- Sequencer: Prototype operation (no service)

R15

Release 16:

- RBAC: vertical test (proof of principle: RBAC server, FESA & App demonstrator class)
- RBAC: Start specification for RBAC
- Sequencer: Sequencer service prototype (based on Molr)

R16

- RFID authentication service prototype for RBAC and consoles
- MiTSA: Middle Tier Service Architecture framework: conceptual design and prototyping

**2021**

Beamtime 2021:

- Sequencer service (based on Molr), experimental operation

R17

Release 17:

- RBAC specification complete
- MiTSA (middle tier services framework): prototype implementation

R18

Release 18:

- RBAC: Engineering prototype for RBAC management
- Sequencer: Sequencer service in operation (including GUI)

**2022**

R19

R20

Release 20:

- Rollout RBAC into production system (group/id management & management tool)

**2023**

R21

R22

Release 22:

- LSA supports RBAC (restrict access to LSA parameters)

**2024**

R23

R24

**2025**

R25

R26

# Year Archiving Service (MARS) / Post Mortem Service

**2020**

Beam time 2020:

- MARS experimental operation (20 TB storage, base version)

R15 Release 15:

- SAT complete (in-kind project closed)
- MARS technical review meeting and definition of future development roadmap

R16 Release 16:

- MARS stores LSA context data

**2021**

Beam time 2021:

- MARS in productive operation (20 TB storage) including REST retrieval API
- 50 Hz data reduction algorithm mechanism (for UNILAC)

R17 Release 17:

- UNICOS vacuum system stores data by SILECS/PLC communication (valves, pressures)

R18 Release 18:

- MARS stores BLOBS (binary large objects, file based)
- Technical concept for UNICOS system integration (for all process variables)

**2022**

R19 Release 19:

- UNICOS system integration: UNICOS process variables stored in Archiving
- MARS Data Explorer: First version App (based on Grafana)

R20 Until end of 2022:

- Dynamic (rule-based) configuration of storage parameters based on accelerator & beam modes

**2023**

R21

R22

**2024**

Beam time 2024:

- Post Mortem data integrated in MARS (prototype operation)
- MARS extended to 100 TB (based on operation request)

R23

R24

**2025**

Beam time 2025:

- Post Mortem integration in MARS (full production)

R25

R26

# Year Machine Protection Systems

**2020**

Beam time 2020:

- SIS18 spill abort system: operational => done, needs to be commissioned in BT2021

R15 Release 16:

- FBAS feasibility test done (FBAS signals via WR network, critical technical decision)
- MASP monitors UNILAC devices (via CAP alarm mechanism)

R16 String test (12/2020):

- QD Trigger Matrix (SIS-100): hardware, device software, engineering/expert tool (prototype)
- DAQ for QD voltages (100 channels): prototype

**2021**

R17 Release 17:

- BTM system: Prototype & experimental operation, simple GUI

R18 Release 18:

- Fast BLM system (SIS-100) prototype: hardware, device software, expert tool (prototype)
- All PLC-ILK collector stations produced (FAIR)

**2022**

R19 Beam time 2022:

- BTM system: operational (with GUI)
- MASP incorporates chain –specific interlocks

R20 Release 20:

- MASP specification complete (final version)
- FBAS SIS-100 & HEFT (fast beam abort system): technical concept ready and approved

**2023**

R21 Release 21:

- FBAS SIS-100 (fast beam abort system) prototype version

R22 Release 22:

- MASP full version (including HW trigger to FBAS), prototype version
- Magnet power permit / movable devices permit service, prototype version

**2024**

R23 Release 23:

- MASP full version in production
- FBAS SIS-100 & HEFT (fast beam abort system) ready for operation

R24

**2025**

R25

R26

# Year Data Acquisition & Post Mortem System

**2020**

R15

Release 16:

- Digitizer device class (continuous, triggered, sequence-based modes)
- DAQ from SCU-MIL FG devices (continuous mode)

R16

String Test (12/2020):

- DAQ from SCU-bus (FG & multiplexed) devices (ADDA/ACU) continuous mode
- DAQ for QD voltages (100 channels): prototype

**2021**

R17

Beam Time 2021:

- Digitizer rollout SIS-18 complete

R18

Release 18:

- Digitizer rollout ESR complete

Until end of 2021:

- Optimization of general DAQ features including triggered mode, data decimation
- Integration of SDR systems

**2022**

R19

Until end of 2022:

- Implementation of DAQ systems for 50 Hz (UNILAC operation)
- Integration of Post Mortem buffer functions in all DAQ systems (freeze upon Event, push/pull to Archive System)
- DAQ channel directory service for data streams

R20

**2023**

R21

R22

**2024**

R23

R24

FAIR Control Center Ready to be Commissioned

**2025**

R25

R26

# Year Supported Accelerator Modes (Booster, B2B)

**2020**

Beamtime 2020:

- Transfer SIS18-ESR-CRYRING (old system, but integrated in LSA)

R15

R16

**2021**

Mid-2021 (end of beam time):

- B2B: proof of principle MD experiment (SIS18-ESR-CRYRING, SIS18-FixedTarget, no system integration)

Release 18:

- Ready for SIS-18 booster mode Dry-run test (Proof of principle test: UNI-PZ, 10 ms FG prep time optimization)

R17

R18

**2022**

Beamtime 2022:

- Booster Mode machine experiment

Release 19:

- B2B: Technical concept complete and approved

Mid-2022 (end of beam time)

- Booster Mode machine experiment (technical follow up works completed)

R19

R20

**2023**

Beamtime 2023:

- Booster Mode: routine operation for machine experiments

Mid-2023:

- B2B: Existing machines SIS/ESR/CRYRING use new transfer system

R21

R22

**2024**

Release 23:

- B2B: Prototype system SIS18-SIS100 in Integration system, ready for installation

R23

R24

**2025**

Release 25:


- B2B ready for operation

R25

R26

# Year Timing System & Data Master

**2020**



Beam time:


- DM supports 4 Patterns per DM-Core (status quo)

R15

R16

- 10/2020: New Timing Release (improved monitoring, VLANS)

**2021**




R17

- Q1/2021: SCU4 design with Aria10 ready, pre-condition for PCIe-Aria10 board design)
- R17: Technical Concept Clustered Data Master, including Linac DM

R18

- R18: Dynamic loading of DM schedules (from host system)

**2022**



R19

- R19: Prototype Aria10-PCIe board available for testing

R20

- R20: New DM based on Aria10 (experimental operation, more patterns for users)
- R20: DM dynamic loading of schedules from fast internal memory (prototype)

**2023**

R21

R22

- R22: Clustered Data Master: Prototype
- R22: DM supports “rectangular-type patterns”
- R22: DM supports FESA-Transactions

**2024**

R23

R24

- R24: DM supports “parallelogram-type patterns”

**2025**

R25

R26

# Year FESA Framework: Front-End Control

**2020**

Until end of 2020:

- FESA: code consolidation and cleanup, move to git, optimize deployment & rollout

Release 16:

- Reference/actual value monitoring (multiplexed power supplies), signal to MASP (chain-specific)
- RBAC test device → RBAC
- First tests for transactions in FESA

**2021**

Until end of 2021:

- Ramped FESA devices: modification for booster mode (10 ms prep-time move to preceding BP)
- Evaluate transactions in FESA: tests

**2022**

R19

R20

**2023**

R21

R22

**2024**

R23

R24

**2025**

R25

R26



<b>Year</b>	<b>General Developments for UNICOS Controls</b>
<b>2020</b>	<ul style="list-style-type: none"> <li>• Tests and Development with WinCC OA V3.16 different SPs at CentOS LINUX Server in order to prepare changeover</li> <li>• Restrictions of ULC UX client allows not the full usage for main control room operators</li> <li>• Test and Development for usage of Ind. Ethernet / PROFINET with UNICOS based systems</li> <li>• Development of tools for better usage of Git for S7 projects</li> <li>• Development of simulator tools for testing of PLC based programs</li> <li>• Development of basics for EPLAN and specfile generator</li> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> <li>• Close frame contract for cabinet manufacturing (Vacuum, Bake Out, Insulation Vacuum, Cryo)</li> </ul>
<b>2021</b>	<ul style="list-style-type: none"> <li>• Development of client concept for main operators with WinCC OA LINUX server</li> <li>• Changeover to CentOS LINUX server</li> <li>• Conceptual design and start development for UNICOS to long term archiver interface</li> <li>• Extension of UNICOS object-related user rights</li> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> </ul>
<b>2022</b>	<ul style="list-style-type: none"> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> <li>• Finalization of development and start of tests for UNICOS to long term archiver interface</li> <li>• Further development of the WinCC OA SCADA system</li> </ul>
<b>2023</b>	<ul style="list-style-type: none"> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> <li>• Set long term archiver operational</li> <li>• Further development of the WinCC OA SCADA system</li> </ul>
<b>2024</b>	<ul style="list-style-type: none"> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> <li>• Further development of the WinCC OA SCADA system</li> </ul>
<b>2025</b>	<ul style="list-style-type: none"> <li>• Migration of the systems to new UNICOS/WinCC OA/TIA portal releases</li> <li>• Further development of the WinCC OA SCADA system</li> </ul>

Year	<b>Vacuum Controls (UNICOS)</b>
<b>2020</b>	<p>Beam time 2020:</p> <ul style="list-style-type: none"> <li>• UNILAC vacuum controls in UNICOS (production)</li> </ul> <p>Cryring + HESR BO:</p> <ul style="list-style-type: none"> <li>• Flexible heat group assignment for each channel</li> <li>• Change from S7-300 to S7-1500</li> <li>• Development of HESR BO with mobile PLC cabinets and HCS heater system</li> <li>• Integration of add. vacuum sector for source etc. into Cryring</li> </ul> <p>SIS18/UNILAC/FAIR:</p> <ul style="list-style-type: none"> <li>• Development of new structure for easy change of controller to pump/gauge configuration during runtime</li> <li>• Development of new drivers for 4UHV, MG15, TPG500 controller</li> <li>• Integration of MG15 measurement with new structure into SIS18</li> <li>• Integration of add. turbo pumps and update for small bug fixes of UNILAC</li> </ul> <p>FAIR projects:</p> <ul style="list-style-type: none"> <li>• Start development of BO and beamline vacuum EPLAN generator incl. customization of the schematic macros</li> <li>• Training of Inkind partners for usage and further development of EPLAN generator</li> <li>• Support for detailed specifications of vacuum tenders</li> </ul>
<b>2021</b>	<p>FAIR projects, incl. tests at prototype systems Cryring/SIS18/UNILAC:</p> <ul style="list-style-type: none"> <li>• Support for detailed specifications of vacuum tenders</li> <li>• Proceed EPLAN generator development incl. FAT/SAT</li> <li>• Procurement of Vacuum controller and bake out cabinets and terminal boxes</li> <li>• Supervision of Inkind partner for EPLAN, specfile generator, driver etc. developments</li> <li>• Integration and test of new structure at UNILAC and probably Cryring vacuum control system, exchange of 4UHV firmware version</li> <li>• Start development of flexible integration of mobile pumpstations and NEG systems</li> </ul> <ul style="list-style-type: none"> <li>• Operate Valves from central control system (via FESA/SILECS interface)</li> <li>• Pressure readings from each vac. section is stored in MARS (via FESA/SILECS interface)</li> </ul>
<b>2022</b>	<p>FAIR projects:</p> <ul style="list-style-type: none"> <li>• EPLAN generation for HEBT 1-2, manufacturing/FAT/SAT/delivery of cabinets</li> <li>• EPLAN generation for SIS100, manufacturing/FAT/SAT of cabinets</li> <li>• Supervision of Inkind partner for SW+HW developments</li> <li>• Preparation of on-site Installation works</li> </ul>
<b>2023</b>	<p>FAIR projects:</p> <ul style="list-style-type: none"> <li>• Delivery of SIS100 cabinets</li> <li>• EPLAN generation for SFRS, manufacturing/FAT/SAT/delivery of cabinets</li> <li>• EPLAN generation for HEBT3-5, manufacturing/FAT/SAT/delivery of cabinets</li> <li>• Supervision of Inkind partner for SW+HW developments</li> <li>• Delivery and usage for testing and commissioning of first vacuum SW version for HEBT1-2/SIS100</li> <li>• On-site Installation and supervision, signal-tests of HEBT1-2/SIS100 incl. Bake Out</li> </ul>
<b>2024</b>	<p>FAIR projects:</p> <ul style="list-style-type: none"> <li>• EPLAN generation for pBar, pLINAC, CR, HESR, manufacturing/FAT/SAT/delivery of cabinets</li> <li>• Delivery and usage for testing and commissioning of first vacuum SW version for SFRS/HEBT3-5</li> <li>• On-site Installation and supervision, signal-tests of SFRS/HEBT3-5/pBar/pLINAC/CR/HESR incl. Bake Out</li> </ul>
<b>2025</b>	<ul style="list-style-type: none"> <li>• Commissioning and Operational Support of all vacuum and bake out systems</li> </ul>

<b>Year</b>	<b>Cryogenic and Insulation Vacuum Controls (UNICOS)</b>
<b>2020</b>	<ul style="list-style-type: none"> <li>• EPLAN generator development for SIS100 Sector-, Endbox-, Feedbox-Cabinets</li> <li>• EPLAN Macro development for typical diagrams (power supply, power distribution, PLC configuration, temp. measurements, valve control, level measurement and heater control)</li> <li>• Preparation of String Test (SW+HW)</li> <li>• Delivery of Desy Kryo-IO-System</li> <li>• SW development for flexible usage of CERN magnet testing facility for the different Multiplet- and Dipoltypes</li> <li>• Preparation of Test of ET200SP HART Modules and PDM Software for FAIR valve control at the TCF20 prototype system</li> </ul>
<b>2021</b>	<ul style="list-style-type: none"> <li>• EPLAN generator development for Distribution System Cabinets</li> <li>• EPLAN Macro development for typical diagrams (level measurements and other open issues)</li> <li>• Procurement of SIS100 cabinets and DB4 via frame contract</li> <li>• Clarification of interfaces to other systems</li> <li>• Continuation of the functional analysis SIS100</li> <li>• Support of CERN magnet testing</li> <li>• SW commissioning of String Test</li> <li>• Development of Insulation Vacuum SW + HW</li> <li>• Start Procurement of Insulation Vacuum cabinets via frame contract</li> </ul>
<b>2022</b>	<ul style="list-style-type: none"> <li>• EPLAN generator development for SFRS/CBM Cabinets</li> <li>• Finalization of EPLAN Macro development</li> <li>• Procurement of SFRS and DB2/BB2 and CBM cabinets via frame contract</li> <li>• Start of the functional analysis Distribution System and SFRS</li> <li>• Support of CERN magnet testing</li> <li>• SW development for SIS100 based on functional analysis</li> <li>• Development of specfile generator for SIS100/DB4</li> <li>• Start Installation and commissioning of SIS100/DB4/INV cabinets</li> <li>• Procurement of Insulation Vacuum cabinets via frame contract</li> </ul>
<b>2023</b>	<ul style="list-style-type: none"> <li>• Support of CERN magnet testing</li> <li>• SW development for SFRS based on functional analysis</li> <li>• Development of specfile generator for SFRS/DS/CBM</li> <li>• Start Installation and commissioning of CBM/DS/SFRS/INV cabinets</li> <li>• Commissioning of SIS100/CBM/SFRS/DS/INV</li> </ul>
<b>2024</b>	<ul style="list-style-type: none"> <li>• Commissioning of SIS100/CBM/SFRS/DS/INV</li> </ul>
<b>2025</b>	<ul style="list-style-type: none"> <li>• Commissioning and Operational Support of SIS100/CBM/SFRS/DS/INV</li> </ul>