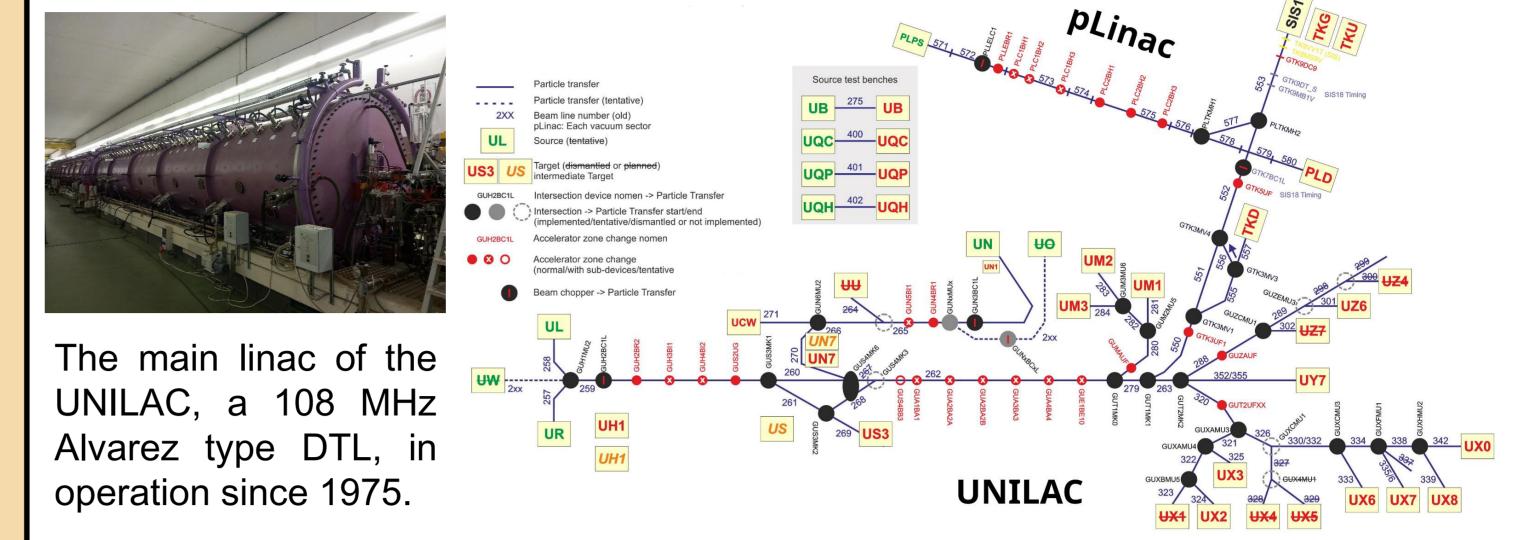
About the New Linear Accelerator Control System at GSI **GGJ** P. Gerhard*

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Abstract

The UNILAC is going to be the heavy ion injector linac for FAIR, currently under construction next to GSI, supported by a dedicated proton linac. The current linac control system dates back to the 1990s. It was initiated for SIS18 and ESR, which enlarged GSI at the time, and was retrofitted to the UNILAC. The linear decelerator HITRAP was added in the last decade, while an sc cw linac is under development. Today CRYRING, SIS18 and ESR are already operated by a new system based on the LHC Software Architecture LSA and other developments from CERN, as FAIR will be. In order to replace the outdated linac control system and simplify and unify future operation, a control system on the same basis is being developed for all GSI linacs.

Overview: UNILAC and pLinac



Schematic layout of the UNILAC and pLinac. The UNILAC is

-Alk

Recently the first data supply tests were performed during a dry run.

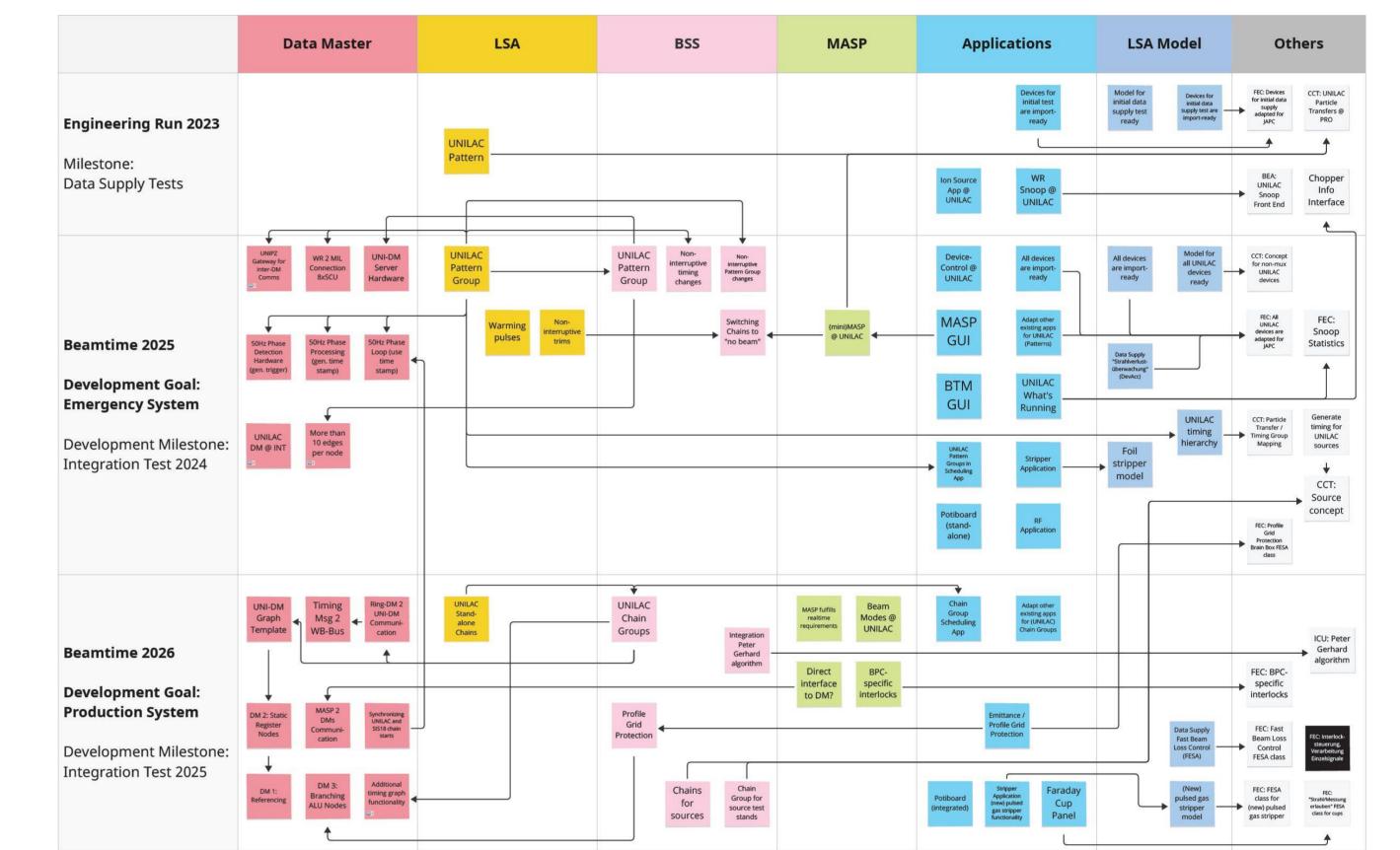
mapped to 44 particle transfers (=timing groups), each containing one or more accelerator zones.

Main Control Room Modernization



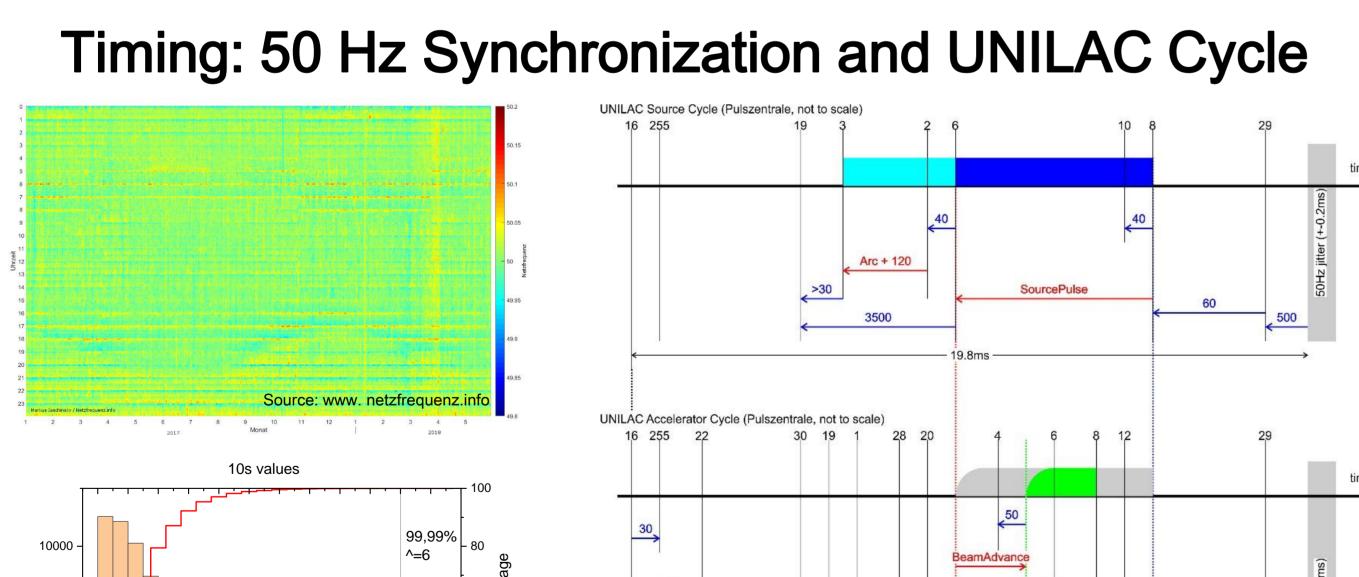


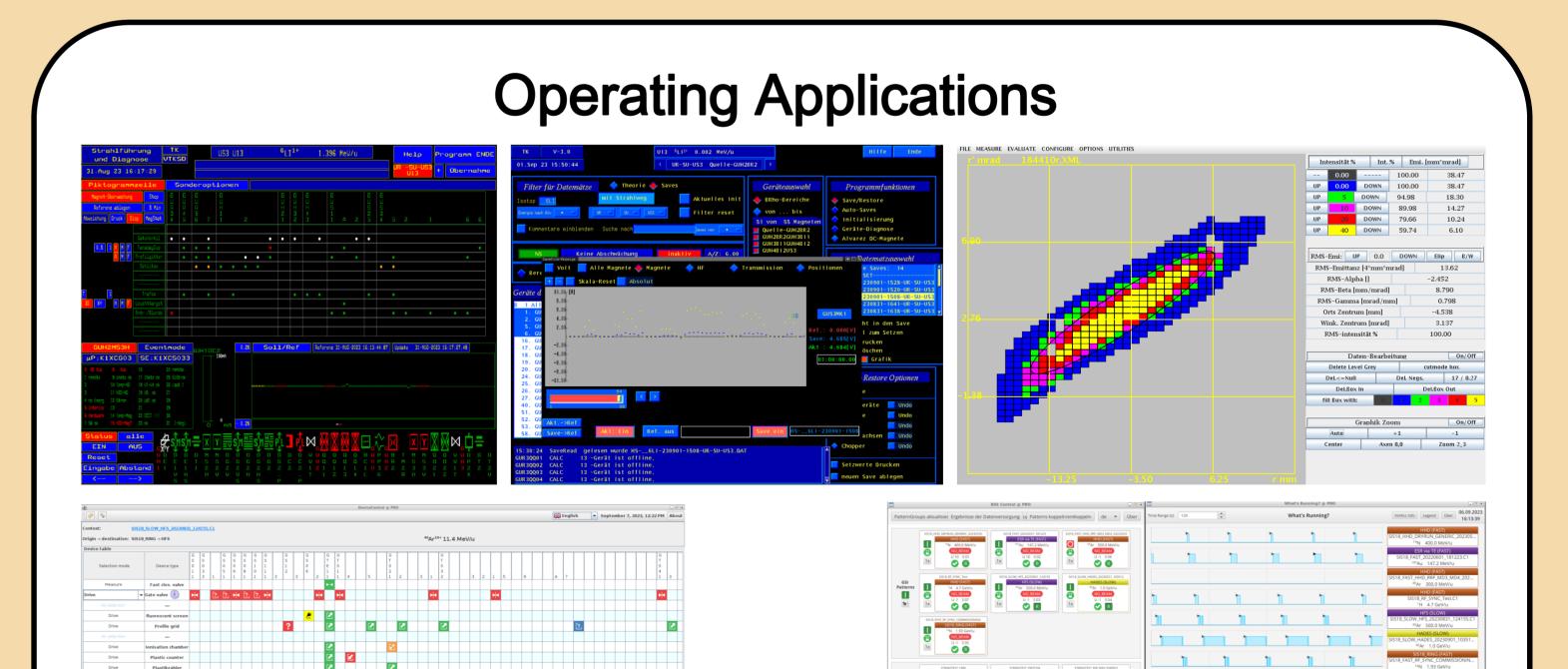
Migration Strategy Roadmap

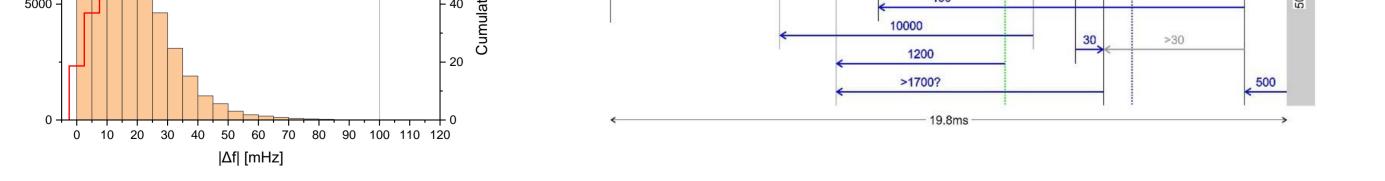


Overview of the UNILAC domain in the current main control room (top), details (bottom, from left): oscilloscopes and beam position monitor; fixed timing interface, pointer instruments; configurable timing interface, legacy consoles; video monitors, numerical display, cup control panel; beam request lights, SEM grid protection switches, interlock and beam loss indicators.

Overview of the major milestones for the migration of the UNILAC to the new control system. The development efforts are categorized by the main building blocks of the control system (columns). Interdependencies are indicated by arrows. The vertical order renders the timeline, with the major steps *Engineering Run 2023* as the first test with beam, and the *Beamtimes 2025* and *2026*, with the (intermediate) development goals *Emergency* and *Production System*, respectively.

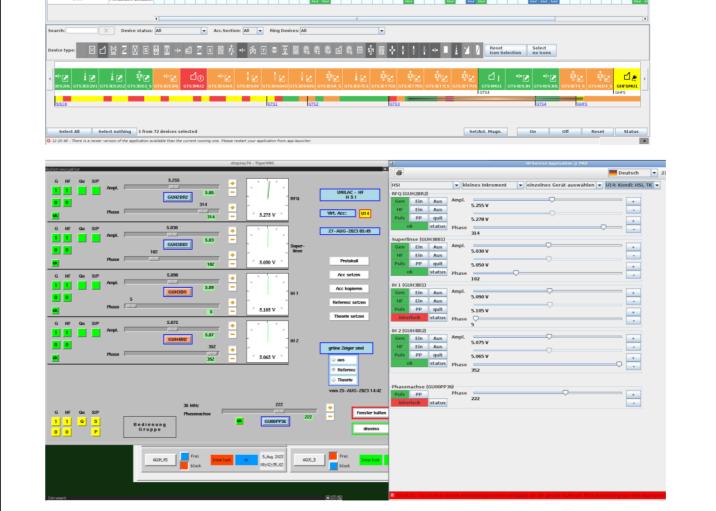






Left: The linac rf operates tube amplifiers in the high power stages. The tube cathodes are heated by ac current. To preserve constant amplification conditions, the pulsed operation of the linac has to be synchronized to the 50 Hz electrical grid. This has consequences for the synchronization of the FAIR facility to the UNILAC. The map (top) shows the variation of the grid frequency, the graph (bottom) shows the corresponding frequency statistics.

Right: The diagrams show the timing event sequences for the ion sources (top) and the accelerator (bottom). The cycle length is limited to 19.8 ms to enable synchronization with the grid.



ESILE ERVEL SUBJECT STORE FRANCE IN	List M.I. (rev)				5/5100, RING (FAST) 57RINGTEST, PROTON, CL H 27,6 GeV/u 55I00, RING (KO) 57RINGTEST, RIS, MAX, ENRERGY, CL 278/U 5/5100, RING (FAST) 5/5100, RING (FAST) 5/5100, RING (FAST)
ESR Patterns Pa			11111	11111 11111	238U 2.7 GeV/u YRT1MH2 (FAST) ESR_EXP22_05_Au78_150-30-10_CRYR 197Au 10.0 MeV/u
Cryring Patterns U 20x Cryting, p. rjector Virit Mr2 ² H 10,0 keV/U CODEM 20x	CVWBid, down, 2017, 10, av proper, bat VVE (#A) VVE (#	129 -90	-60 Time (s)	-39	VR11MH2 CRYRING_D_injector.C1 2H 10.0 keV/u VRE (FAST) CRYRING_demo_2023_02_esr_prepos 2 ²¹⁸ U 4.0 MeV/u
mModi - Resident ParamModi - Exp itexte	oert	UR US3 2023	30830 122041.C1		Deutsch 🔹 31. August 2023, 16:18
CRVRING_D_injector CRVRING_demo_2023_02_esr_prepost_fa ESR_EXP22_05_Au78_150-30-10_CRVRINC			-		
SIS18_FAST_20220601_181223 SIS18_FAST_HHD_202211_TK9_BUMPER_1	Strahlparameter	RF amplitude		RF phase	
SIS18 FAST_HHD_RRF_MD3_MD4_202206 SIS18_HHD_DRYRUN_GENERIC_20230530	Partikel 6Li Ladung 1	GUH2BR2 Amplitude GUH3BB1 Amplitude	0.121 V	GUH2BR2 Phase	323.0 deg
	Energie ab GUH2BR2 0.12 MeV/u	GUH3BB1 Amplitude	0.1346 V 0.143 V	GUH3BB1 Phase GUH3BI1 Phase	189.0 deg
SIS18_RF_SYNC_Test					
SIS18_RF_SYNC_Test SIS18_SLOW_HFS_20230831_124155 STRINGTEST_CBM STRINGTEST_PROTON	Energie ab GUH3B11 0.743 MeV/u Energie ab GUH3B12 1.396 MeV/u	GUH4BI2 Amplitude	0.1397 V	GUH4BI2 Phase	233.0 deg

TUPDP018

Overview of operating applications (clockwise from top left): SD*, IBHS*, ProEmi, BSS control & What's running, ParamModi, RF*, Device Control *: Legacy control system, RF: left legacy, right new control system



