Development of the new control systems for JINR e⁻ linac accelerator test bench

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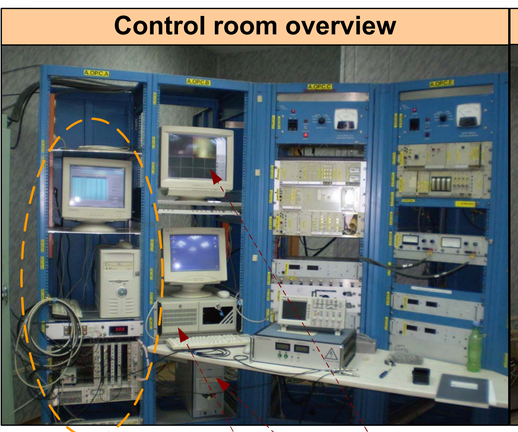
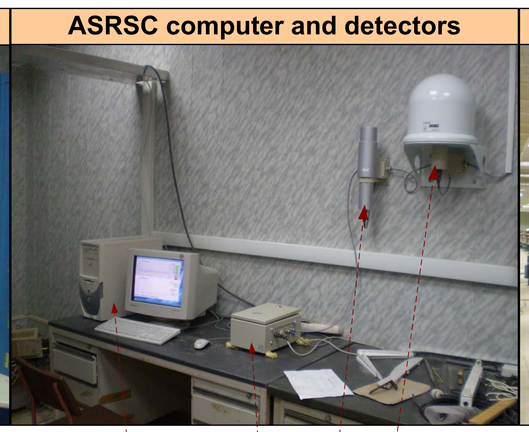
Abstract

Due to Joint Institute for Nuclear Research participation in ILC collaboration, e-linac accelerator test-bench is being created in Laboratory of high energy physics of JINR. The bench is designed for several goals: accelerating structures and diagnostics testing, photoinjector prototype creation and investigation, radiation resistance studies of different materials etc. In addition, several proposals of FEL creation on the basis of the e-linac exist. Current setup, results of the test-bench control systems evolution since 2009 and future plans are presented. The most important updates include radiation control system calibration, verification and installation and an upgrade of the video control system.

Control room overview

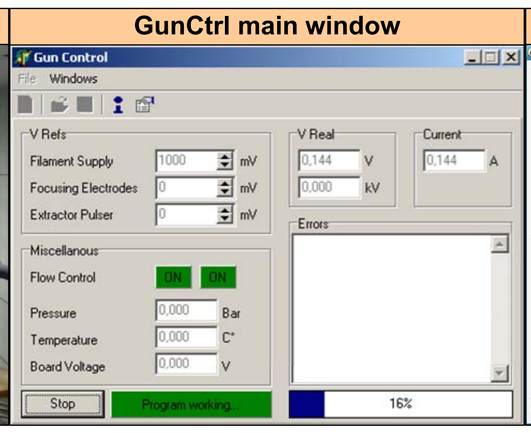


ASRSC computer and detectors

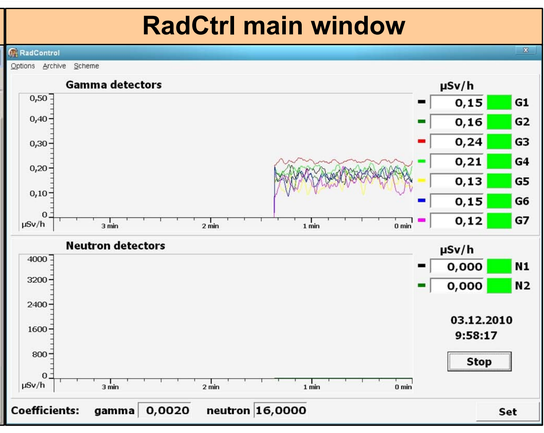


Linac accelerator test-bench overview

GunCtrl main window

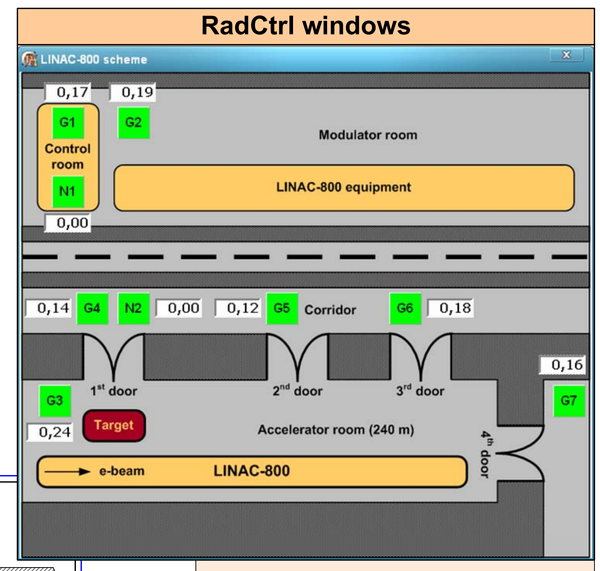


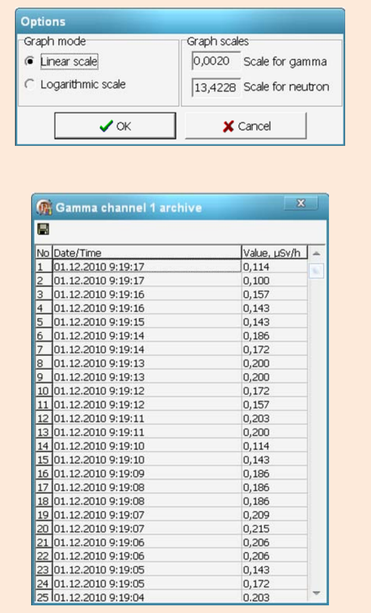
RadCtrl main window



BDS-1M-63x63 gamma detector (“γ“ at scheme) parameters	
Energy registration range, MeV	0.016 - 5
Operating temperature range, °C	+5 to +40
Protection class	IP54

RadCtrl windows





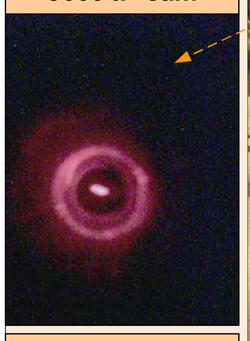
Video and Analog Control System

ASRSC detectors

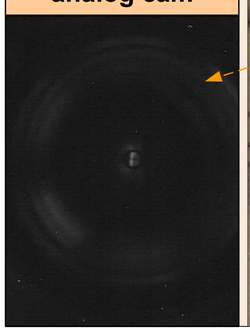
Scheme legend

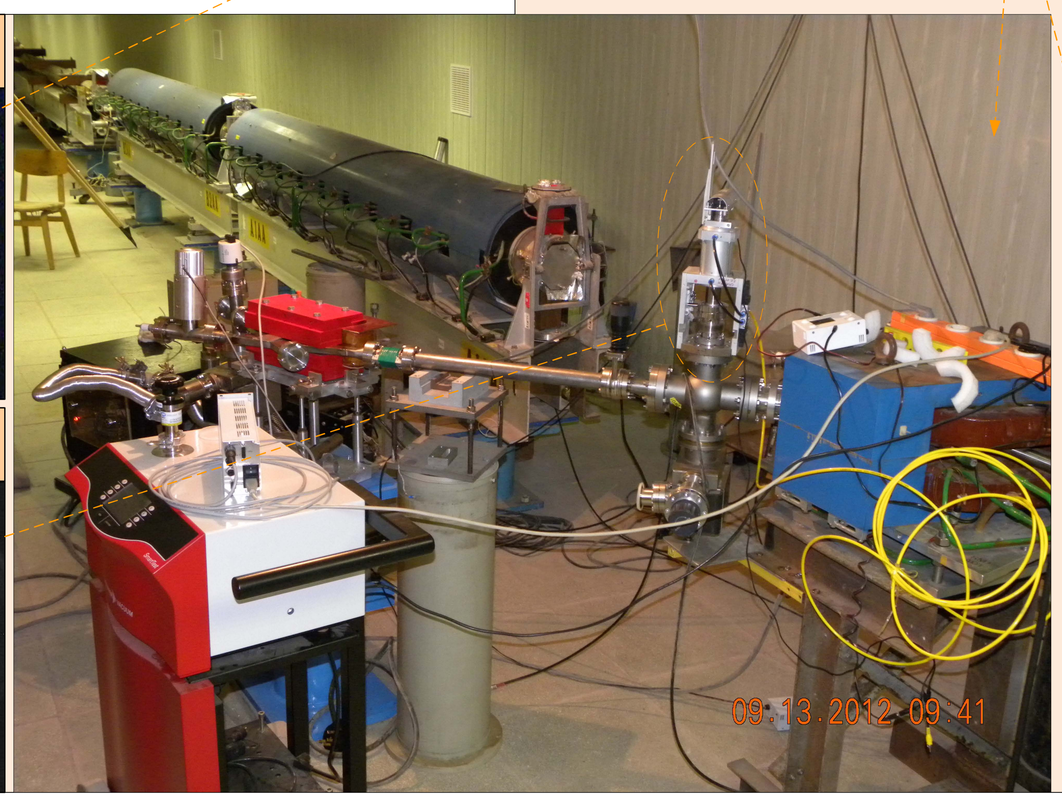
- beam viewer
- steerers (v, h)
- collimators (W) W – water cooling
- solenoids
- accelerating section with load and collimator (LS1 A0BB)
- phaseshifter (φ)
- MV, FV - manual valve, - fast valve
- IP - ion pump

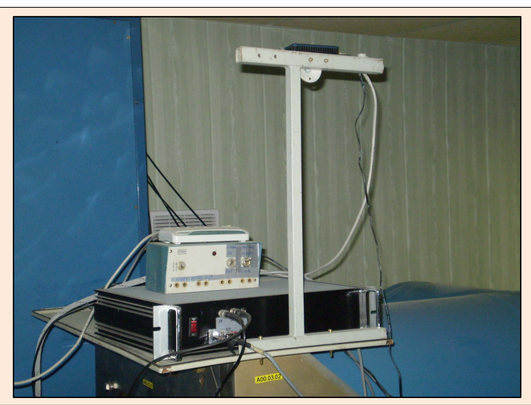
Beam at Aviosys 9000 IP-cam



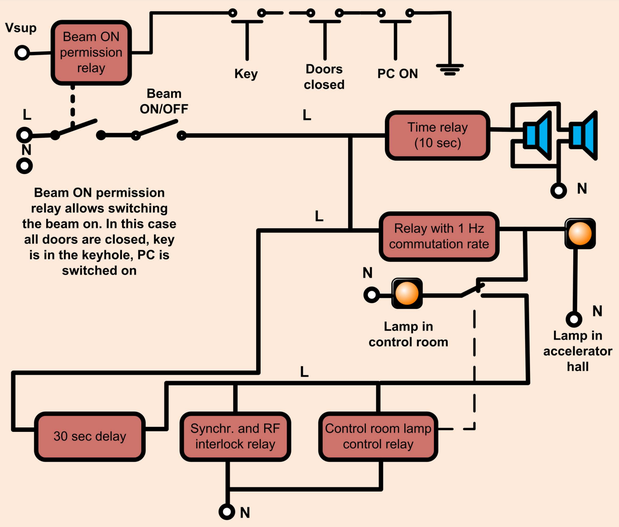
Beam at SK-2005 analog cam







Interlock and signalization system scheme



AT1123 parameters	
Measurement range of ambient radiaton dose equivalent	
Continuous radiation	50 nSv/h – 10 Sv/h
Impulse radiation	0.1 uSv/h – 10 Sv/h
Energy range	**15 keV – 10 MeV**
Minimum duration of impulse radiation (for impulse dose rate 1.3 Sv/Sec)	**10 ns**
Limit of intrinsic relative measurement error, %	
Continuous radiation	±15%
Impulse radiation	±30%
Protection class	**IP54**

UDBN-01-01 neutron detector (“n” at scheme) parameters	
MED measurement range, uSv/h	0.1 - 10^4
Energy registration range, MeV	0.025 - 14
Limit of intrinsic MED relative measurement error, %	±30
Protection class	IP65

Test-bench accelerator parameters	
Maximum electron energy, MeV	800
Pulse duration, us	1 - 10
Pulse repetition rate, Hz	3 - 10
Pulse current, mA	40

IR undulator