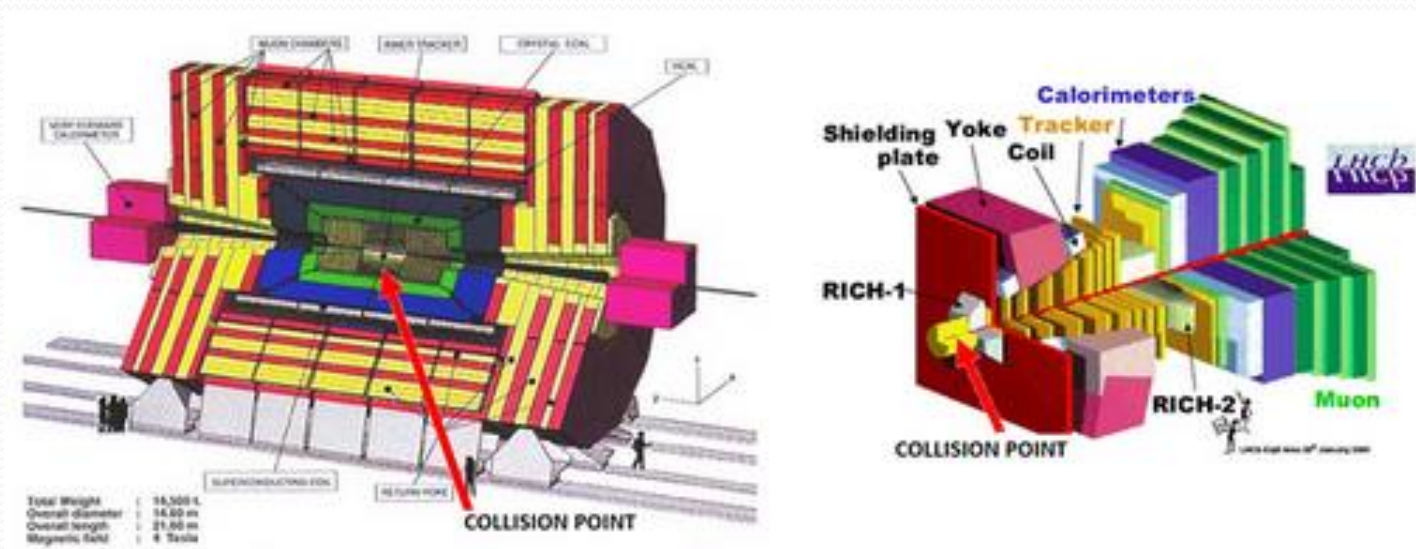


Установки за тестване на нови детектори в ЦЕРН – електронни системи за мониторинг и тестване

Георги Митев
Българска Академия на Науките
Институт за Ядрени Изследвания и Ядрена Енергетика



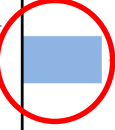

Развитие на детекторите в ЦЕРН

- Периодична поддръжка
- Ремонт и замяна на износени или остарели компоненти
- Надграждане на части от детектора



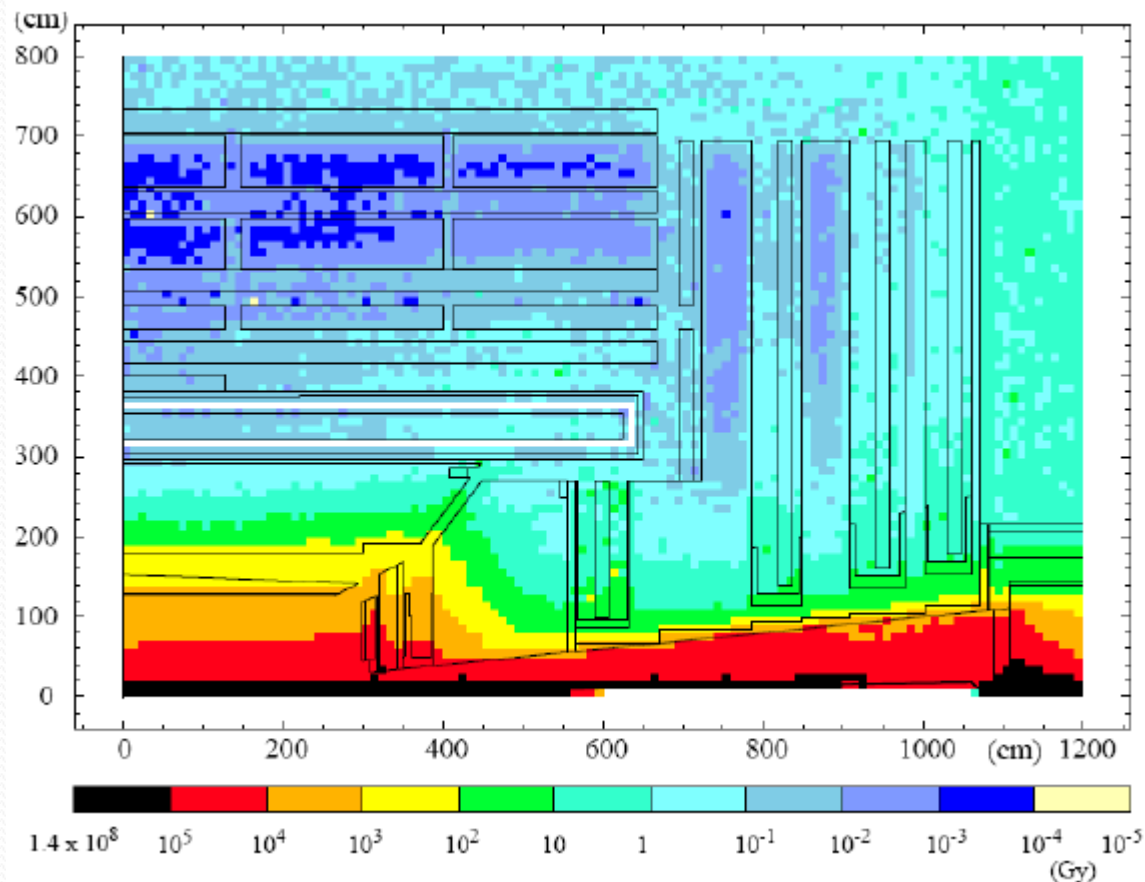
Работен план на LHC



2009	LHC Start-up	0.9 TeV		
2010	Run1	7-8 TeV	$6 \cdot 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$ 50 ns	 25 fb ⁻¹
2011				
2012				
2013	LS1	Accelerator and detector upgrades in view of nominal luminosity		
2014				
2015	Run2	13-14 TeV	$1 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ 25 ns	 75-100 fb ⁻¹
2016				
2017				
2018	LS2	Upgrade to ultimate design luminosity; Several detector upgrades		
2019	Run3	14 TeV	$2 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ 25 ns	 ~350 fb ⁻¹
2020				
2021				
2022				
2023	LS3	Interaction region, Crab cavities; Several detector upgrades		
2024				
2025				
...		14 TeV	$5 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ 25 ns	 ~3000 fb ⁻¹
2035?				

Разпределение на радиоактивната доза в CMS

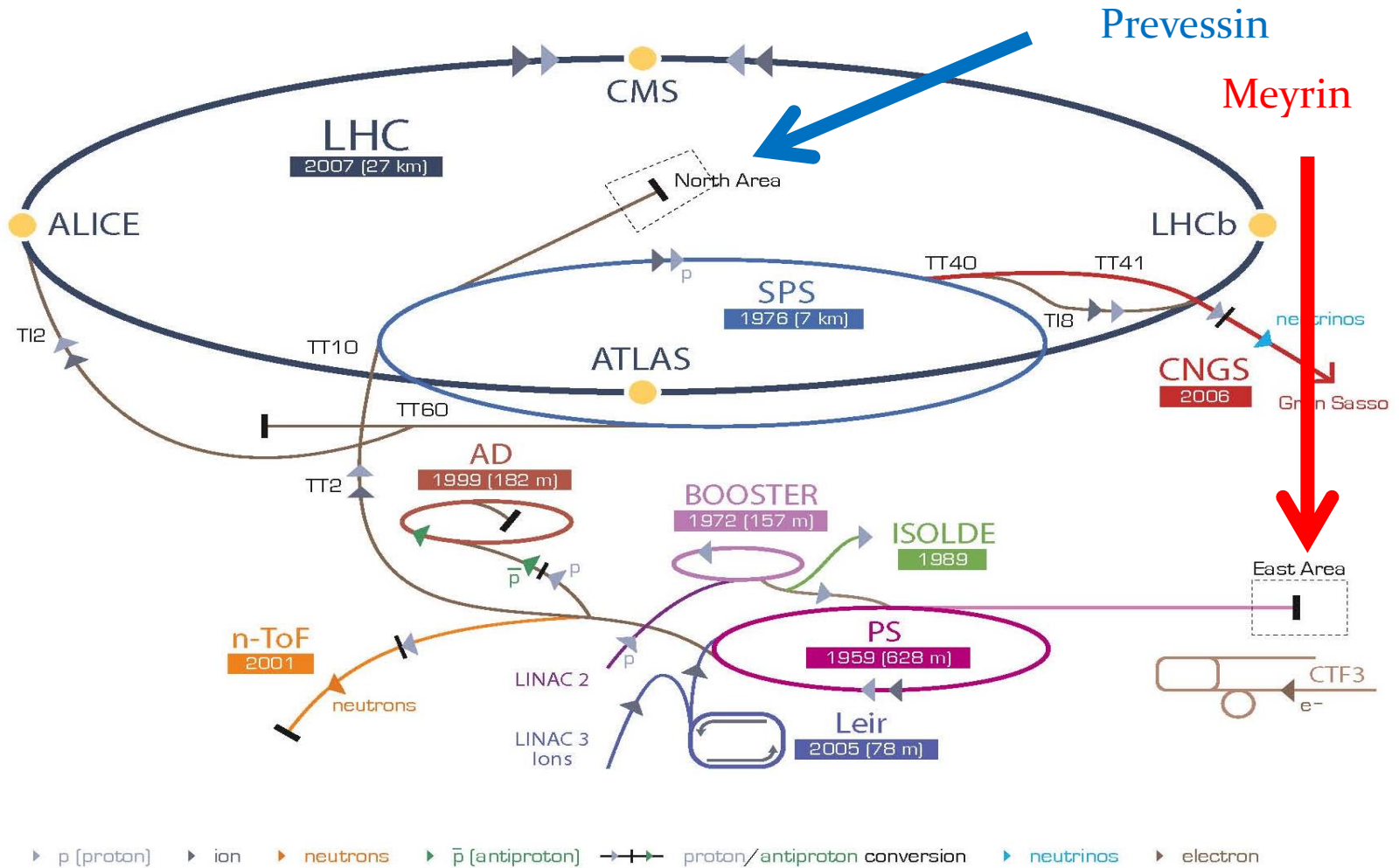
- Голяма разлика в радиационното натоварване на различните под-детектори
- Необходимост от добро разбиране на работните параметри



Установки за облъчване в ЦЕРН

Facility	Location	Particle Type	Energy / Momentum	Intensity	Beam Spot	Beam structure	Availability
IRRAD	PS East Area (T8)	p ⁺	24 GeV/c	~1-3×10 ¹⁰ p/cm ² /s	12×12mm ² (FWHM)	1-3 spill/CPS (30s) spill = 0.4s	May-November (PS operation)
CHARM	PS East Area (T8)	mixed-field (24 GeV/c p ⁺)	n ⁰ (thermal - HE) + HEH >100MeV	Lateral: 10 ⁷ -10 ¹⁰ HEH/cm ² /h Long.: 10 ⁸ -10 ¹¹ HEH/cm ² /h TID: 0.01-100 Gy/h	secondary environment from target	1-3 spill/CPS (30s) spill = 0.4s	May-November (PS operation)
GIF⁺⁺	SPS North Area (H4)	γ + μ	0.662 MeV + 100 GeV μ	14TBq (~1Gy/h at 1m.) + 10 ⁴ particles/spill	panoramic (±37°) + 100×100mm ²	Continuous + spills/SPS cycle	all year + 6-8 weeks/year (SPS operation)
CC60	Preveessin Site	γ	1.17 MeV, 1.33 MeV	10TBq (~3Gy/h at 1m.)	standard	continuous	all year
CERF	SPS North Area (H6)	mixed-field (120 GeV/c HEH)	n ⁰ (< 10-100 MeV) + HEH	max: 10 ⁸ particles/spill (on the target)	tertiary environment from target	spills/SPS cycle (few sec. spill)	few weeks/year (SPS operation)
HiRadMat	SPS West Area (TT60)	p ⁺ or HI	440 GeV or 173GeV/u	3×10 ⁹ to 1.7×10 ¹¹ (p ⁺)	~1 mm ²	1 pulse/ SPS cycle pulse = 7.2μs	May-November (SPS operation)

CERN Accelerator Complex



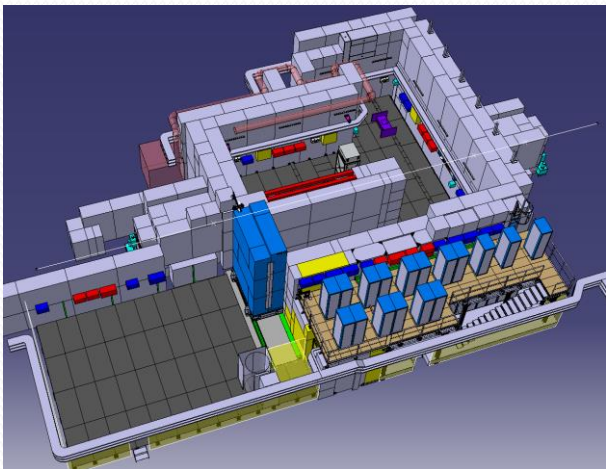
LHC Large Hadron Collider SPS Super Proton Synchrotron PS Proton Synchrotron

AD Antiproton Decelerator CTF3 Clic Test Facility CNGS Cern Neutrinos to Gran Sasso ISOLDE Isotope Separator OnLine DEvice

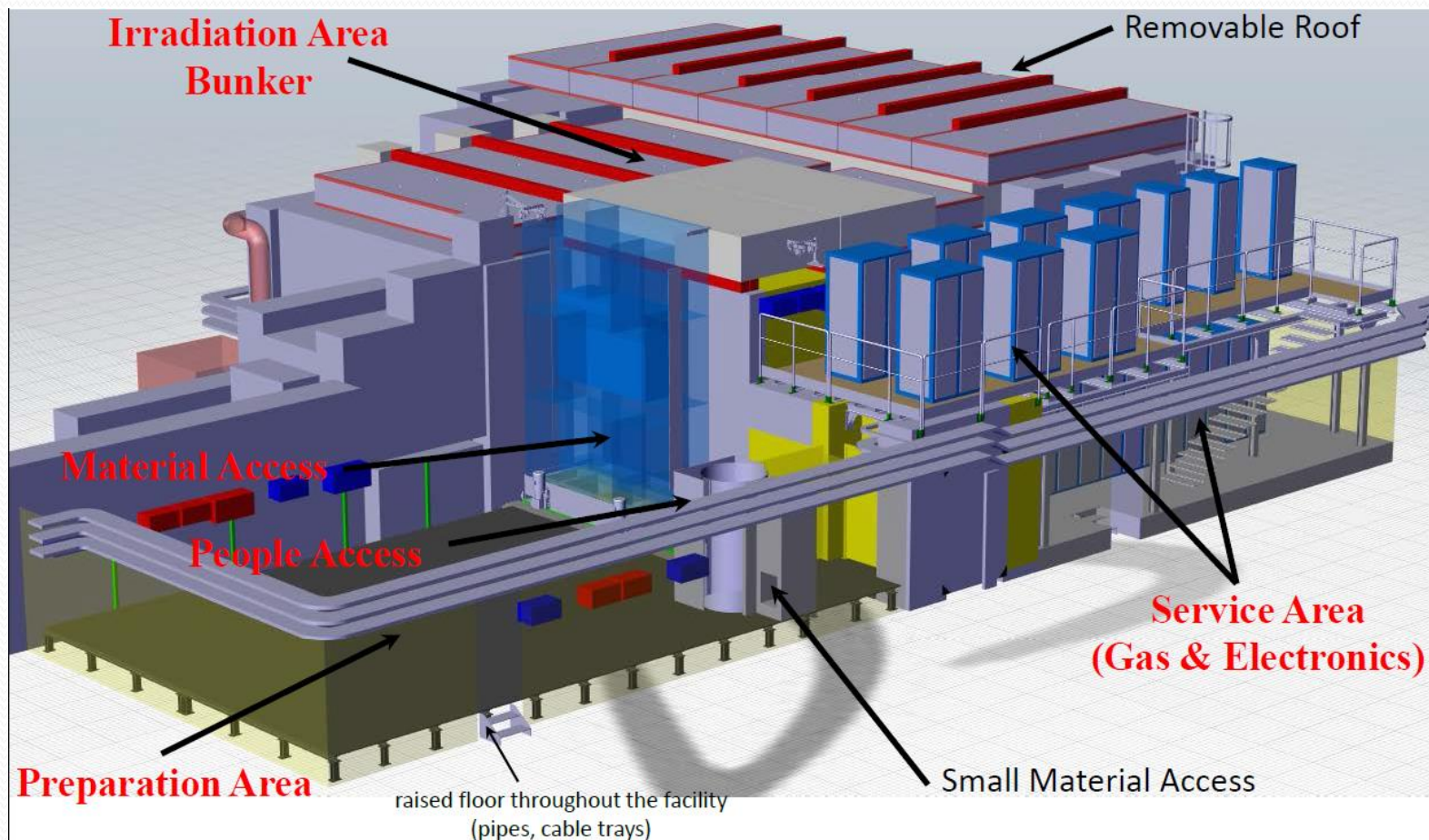
LEIR Low Energy Ion Ring LINAC LINEar ACcelerator n-ToF Neutrons Time Of Flight

Gamma Irradiation Facility ++

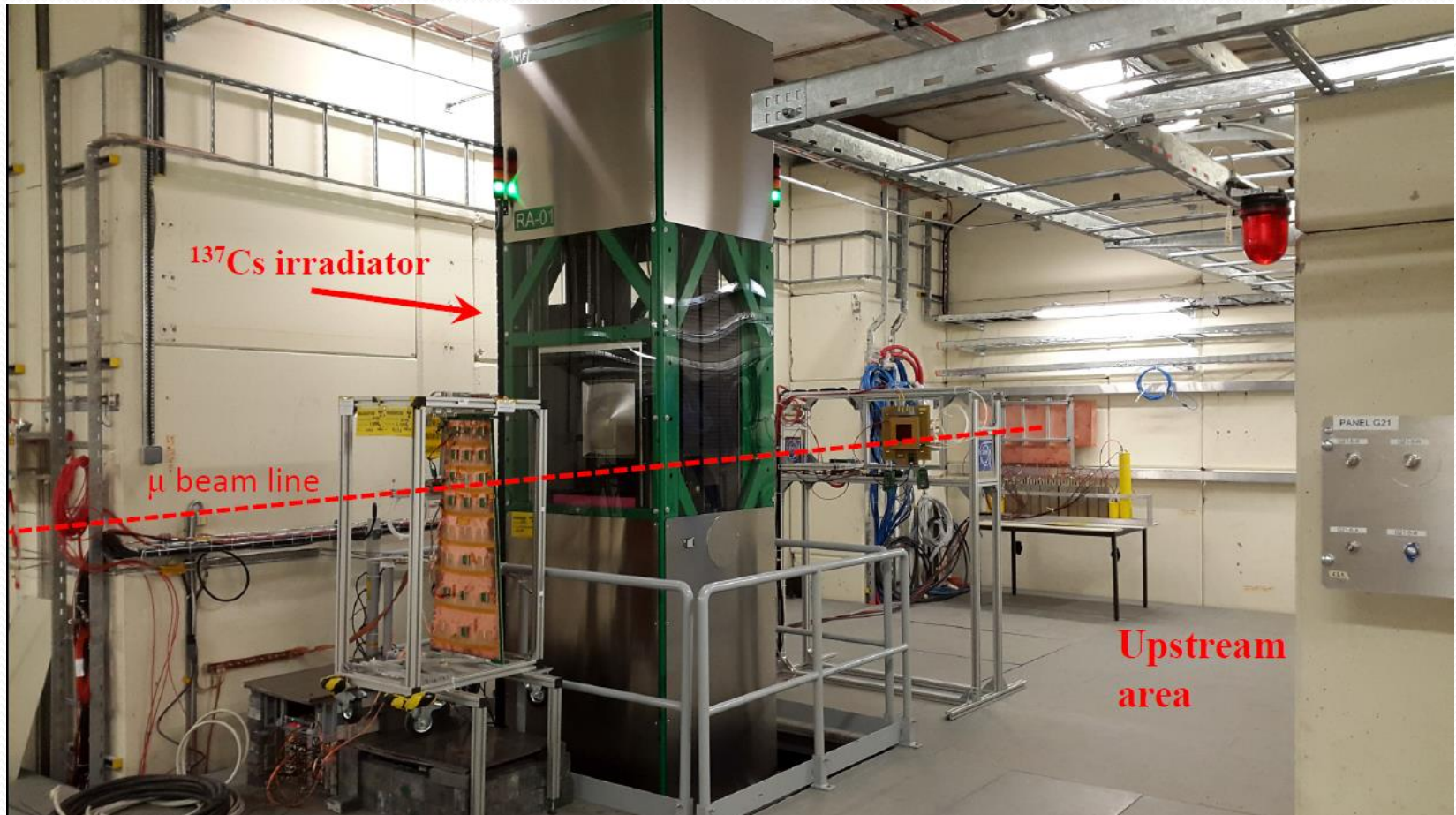
- Високо-активен източник на γ -лъчи (14 ТВq)
- Частици от SPS
- Удобна инфраструктура за работни газове
- Унифицирана система за контрол, наблюдение и събиране на данни



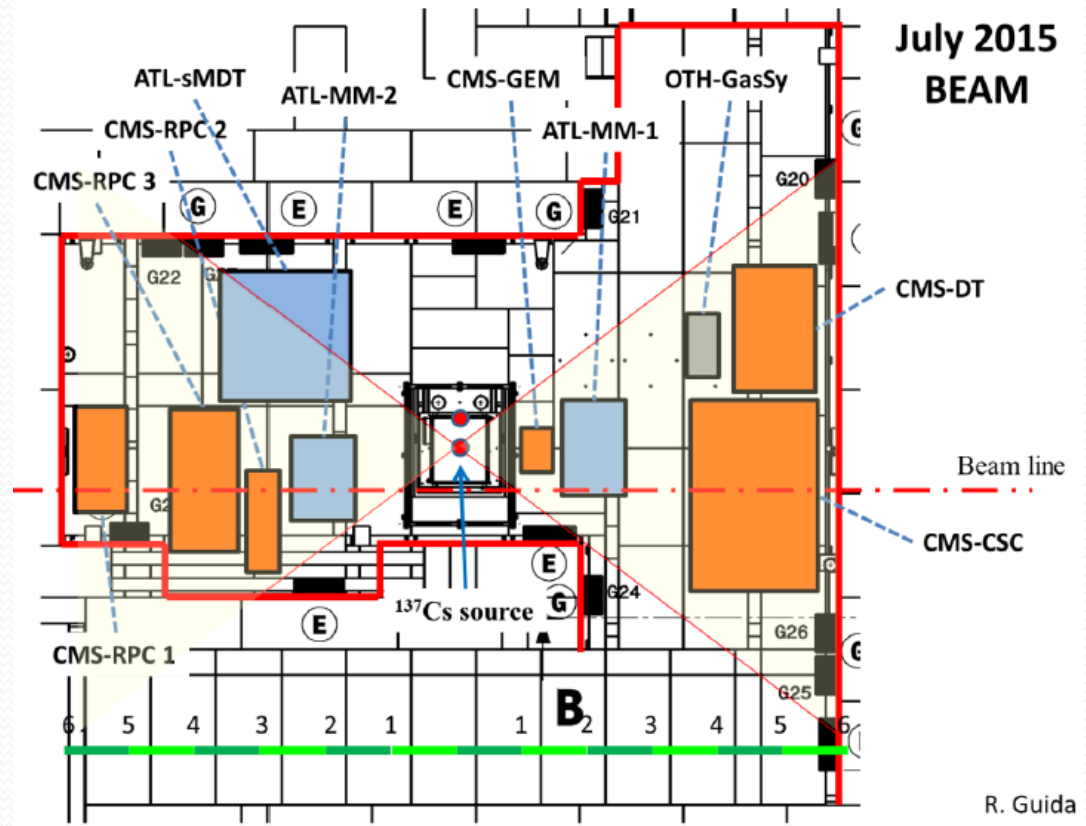
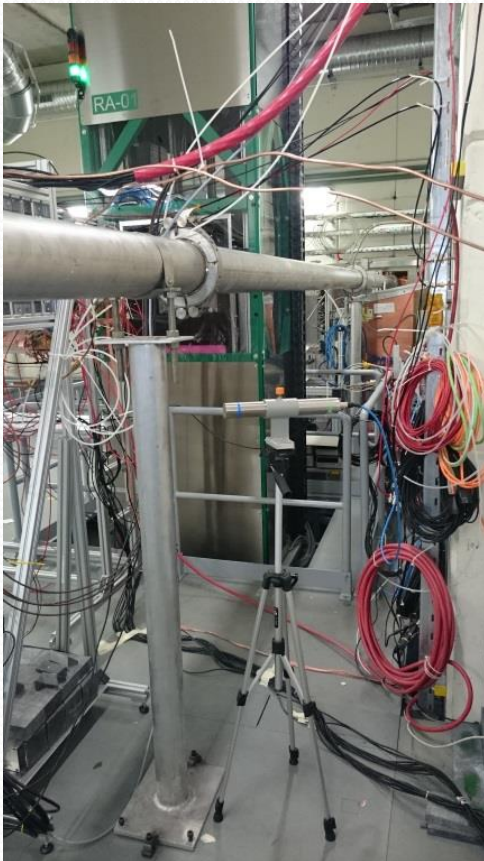
Структура на GIF++



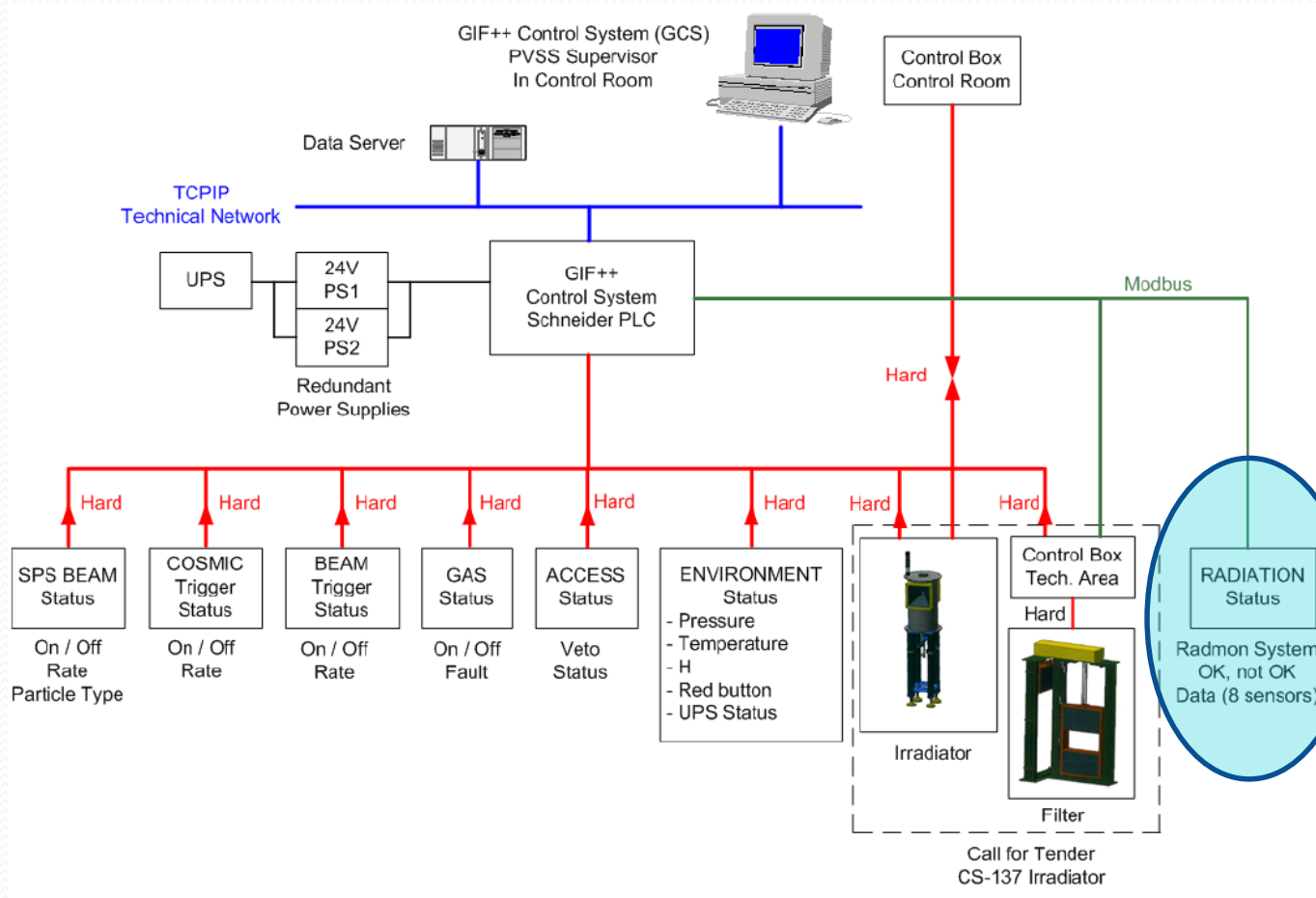
Зона за облъчване



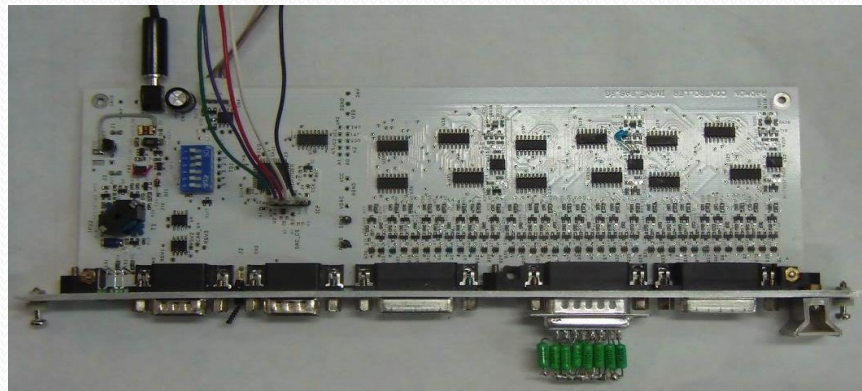
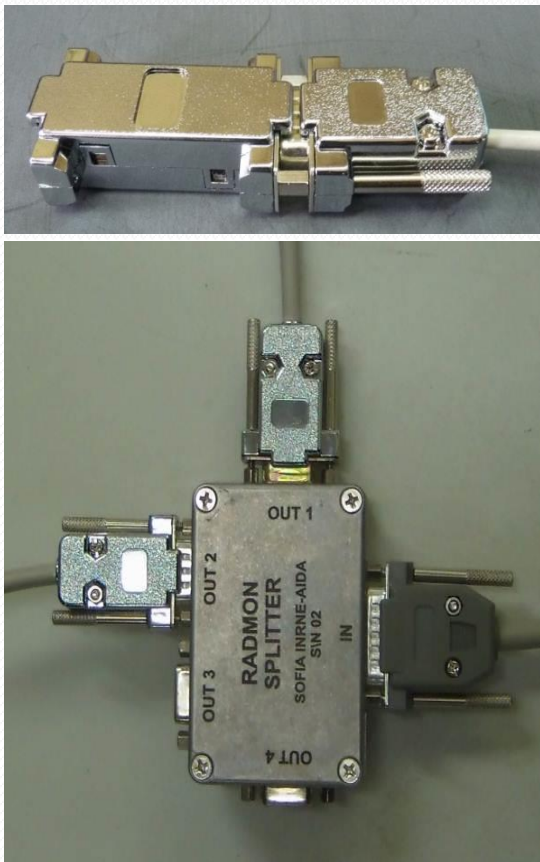
Планиране на пространството и времето за тестване



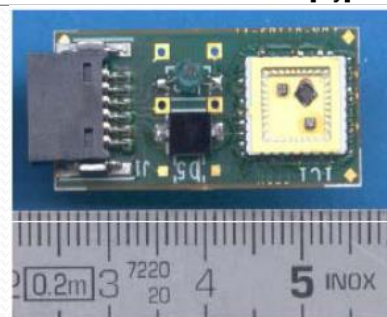
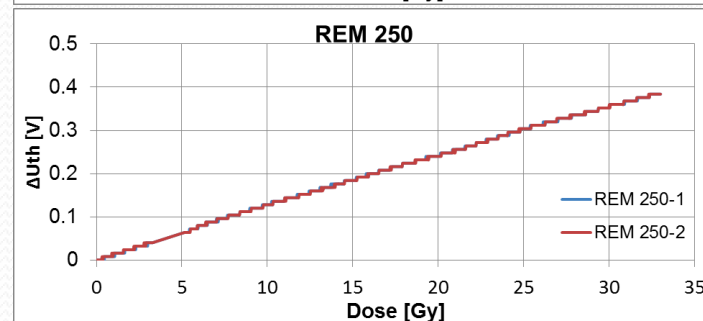
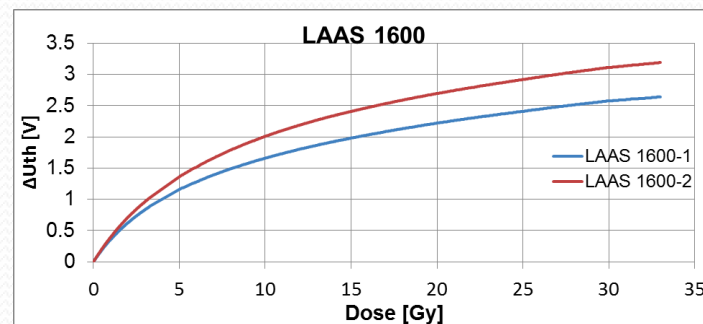
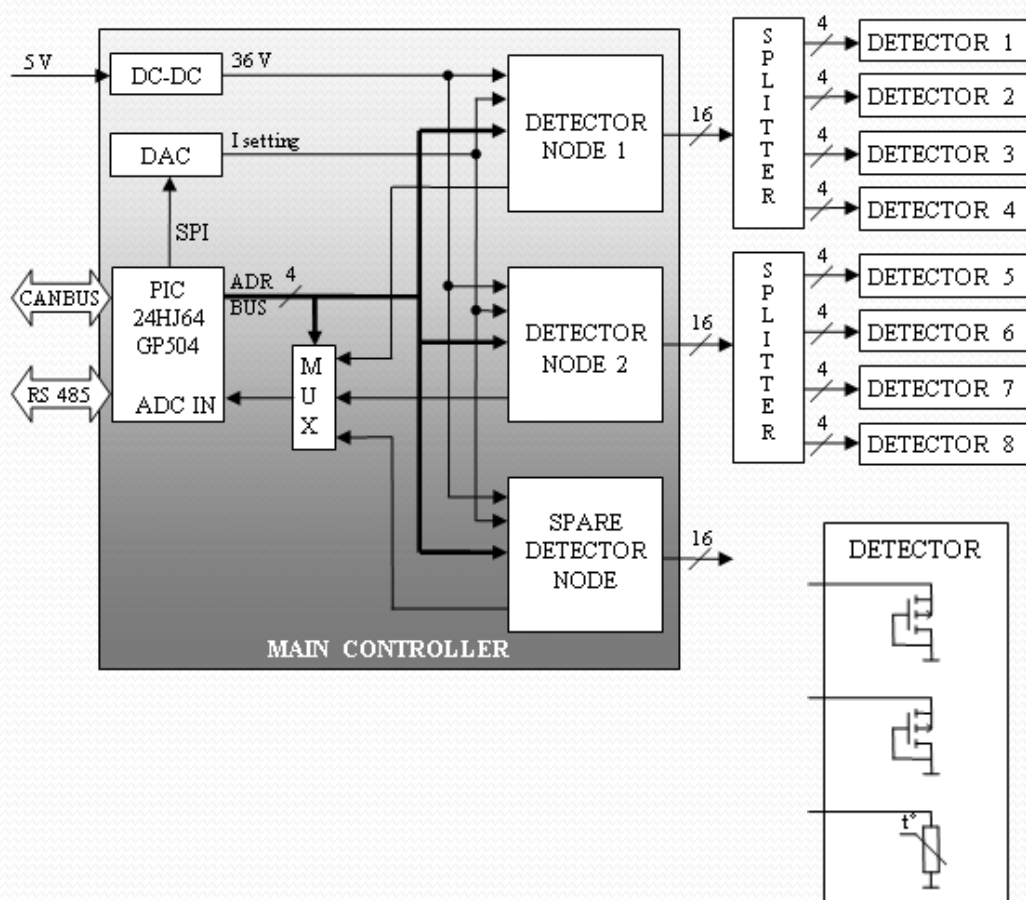
Контролна система на GIF++



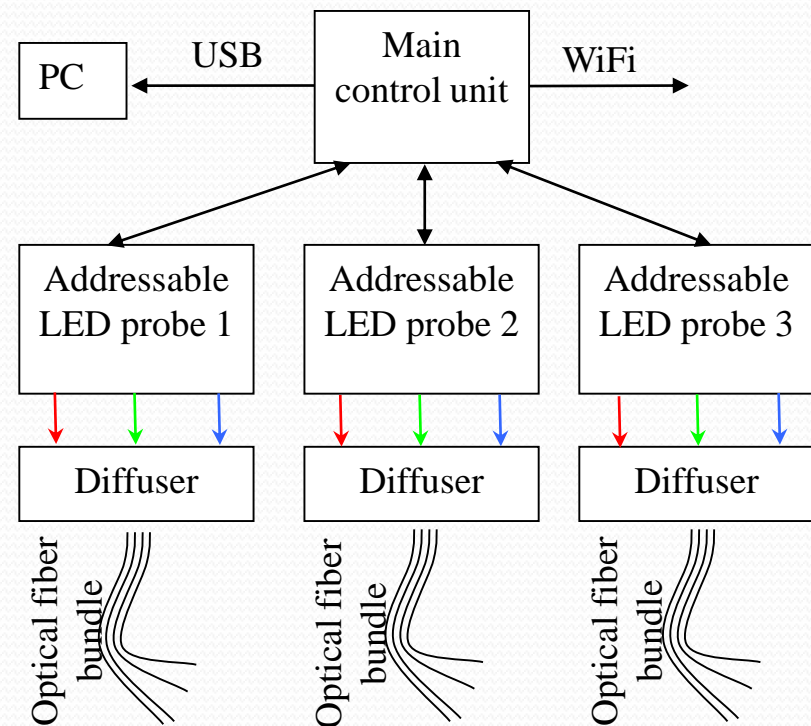
Система RADMON



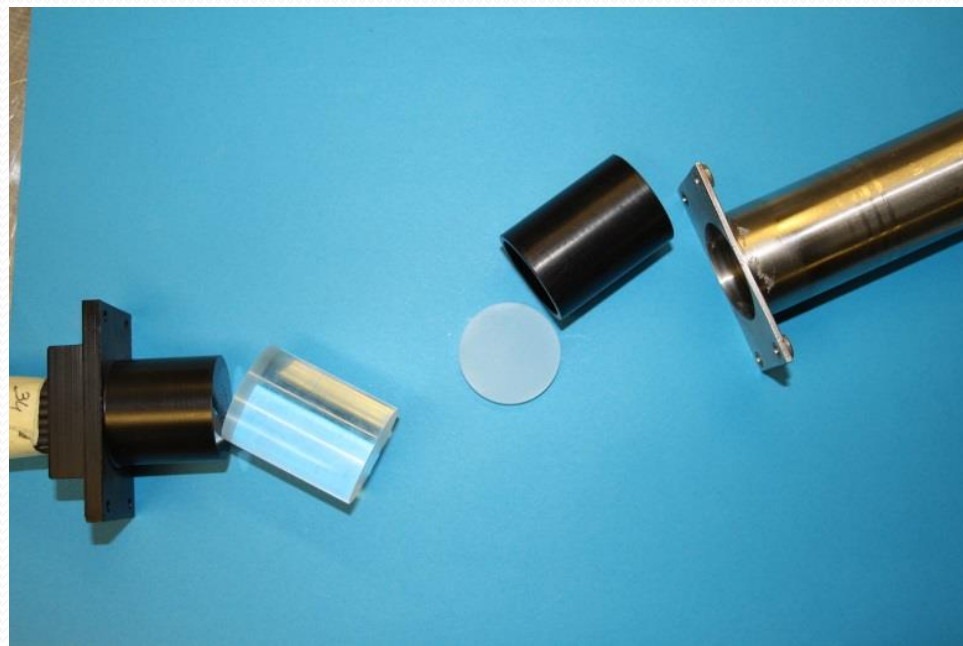
Блокова схема на RADMON



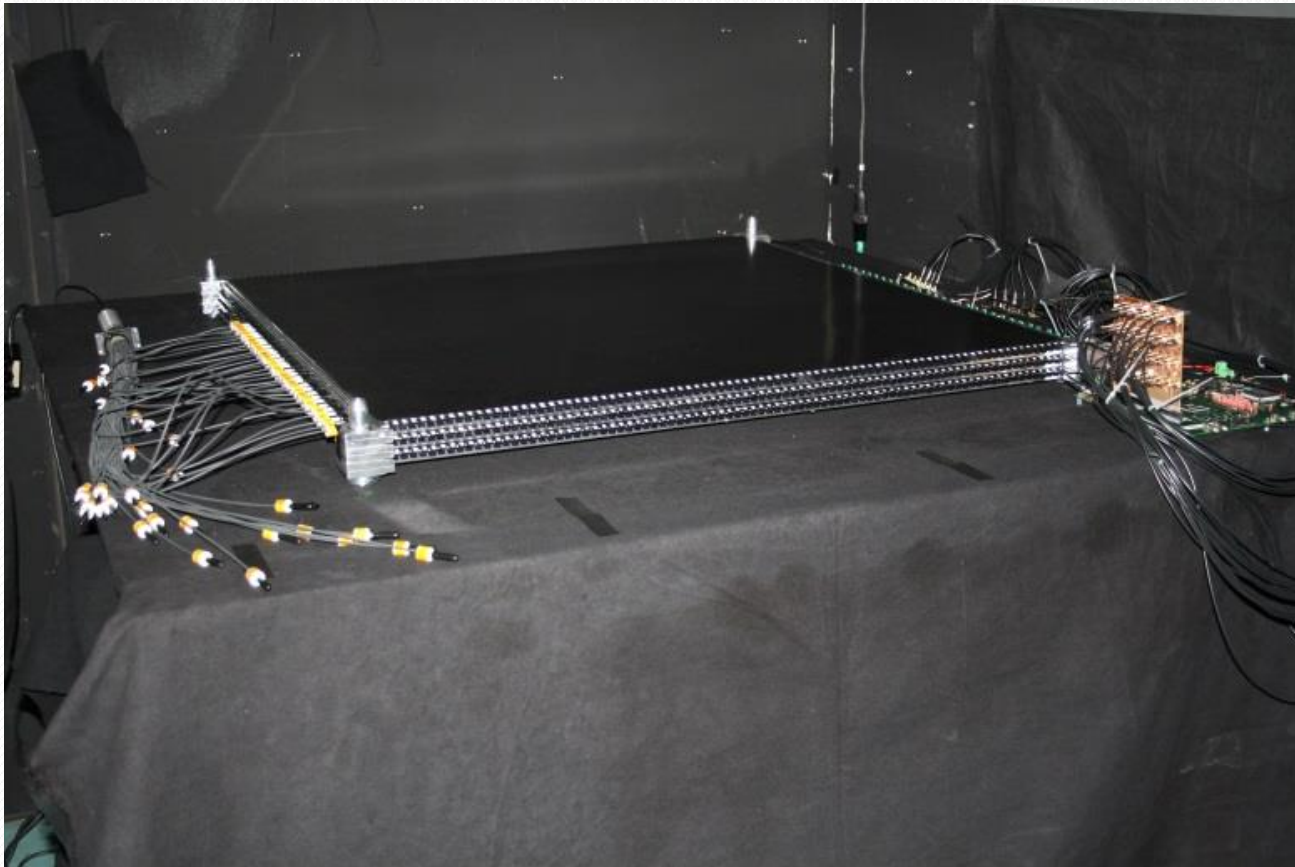
Система за краткотрайни тестови светлинни импулси



Сноп с оптични влакна



Тест на сцинтилаторни модули в “тъмна” стая



Благодаря ви за
вниманието !

