ELENA Safety and Radio Protection

- ELENA TDR : Chapter 6;
- Safety Files in preparation;
- Descriptive, Demonstrative (Risk Analysis);
- Operational, Record (Experience, Monitoring);
- AD EDMS 1295203/1;
- ELENA EDMS 1313189 (Draft);
- Supported by EN Dep. (Ch. Alanzeau, J. Pedersen);
- Supervised by HSE Unit.

CERN
CH1211 Geneva 23
Switzerland

EDMS NO.	REV.	VALIDITY
0000000	0.0	DRAFT

REFERENCE
XXXX

EN Engineering Department

Date : 2012-12-11

SAFETY DOCUMENTATION – DESCRIPTIVE PART

The Extra Low ENergy Antiproton Ring, in the Antiproton Decelerator Facility

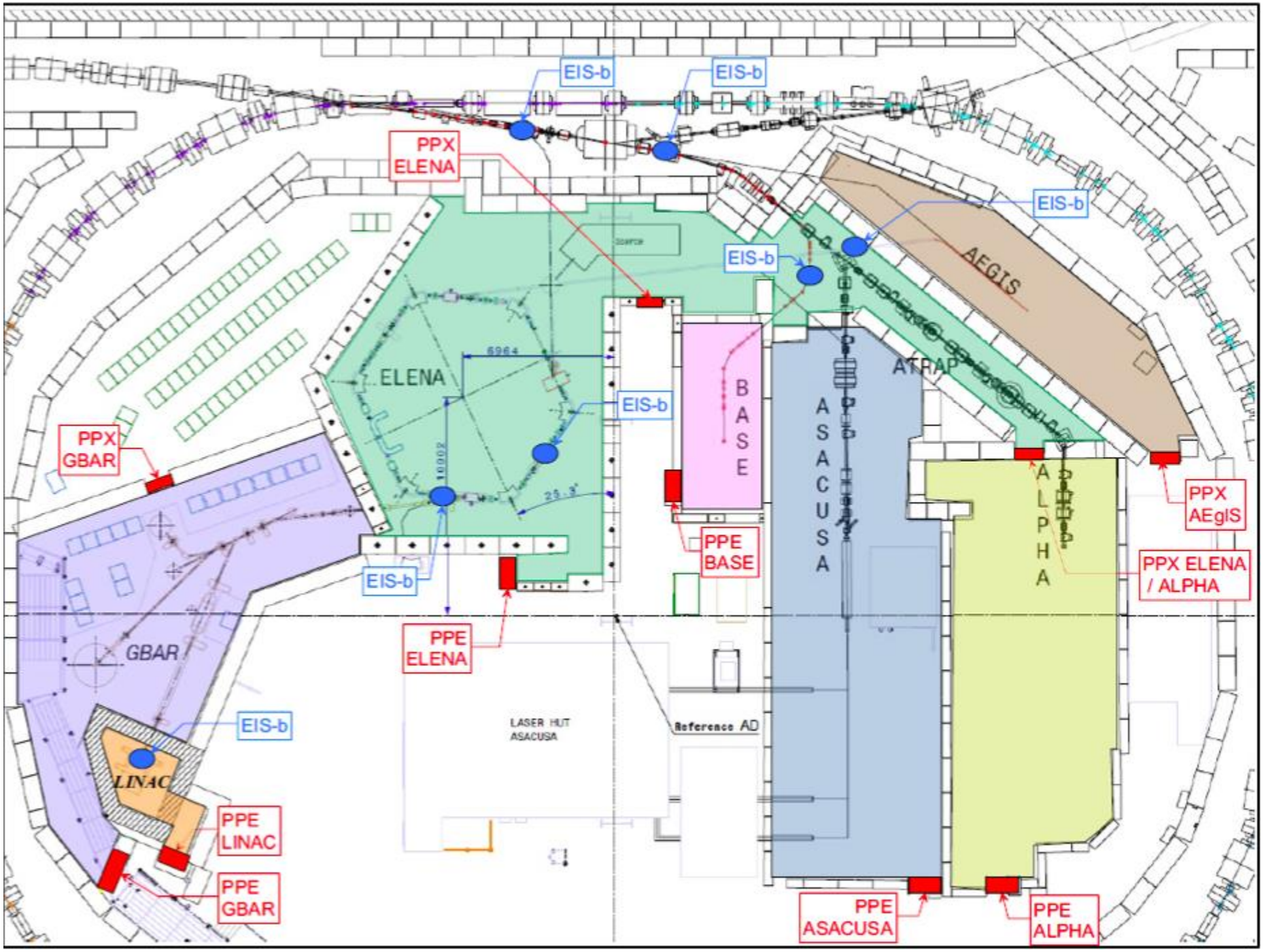
ELENA

Project lifecycle and general description of the facility, infrastructures, machine and vicinity

DOCUMENT PREPARED BY:	DOCUMENT CHECKED BY:	DOCUMENT APPROVED BY:
C. ALANZEAU H. BREUKER	S. MAURY T. ERIKSSON B. LEFORT F. BUTIN DGS/RP DGS/SEE ... J. PEDERSEN	C. CARLI

ELENA and its Experiments

- Hexagonal Machine (30 m) inside the AD Hall to further decelerate the pbar Beam;
- Every 100 sec 3*10**7 pbar in 4 bunches at a spacing of 1 microsec (E = 100 keV);
- Run up to 4 Experiments simultaneously;
- ALPHA, ASACUSA, ATRAP, AEgIS (setting up), Gbar (new), BASE (new);
- AD Operation in 2012 : Switching between 4 Experiments (every 8 hours; 1 Exp. on hold for 1 week; day to night switch during weekends).


EIS-b
EIS-b
PPX ELENA
EIS-b
EIS-b
AEGIS
ELENA
6964
EIS-b
BASE
ATRAP
ASACUSA
ALPHA
PPX GBAR
PPX AEgIS
PPE BASE
PPX ELENA / ALPHA
EIS-b
PPE ELENA
GBAR
LASER HUT ASACUSA
Reference AD
EIS-b
LINAC
PPE LINAC
PPE GBAR
PPE ASACUSA
PPE ALPHA

General Safety

- The construction, commissioning, operation and eventual dismantling of ELENA will obey the standard CERN safety rules and regulations applicable at any point in time during the lifecycle of the project and the facility.

Safety Provisions for TDR

- 1) General Safety
- 2) Radiation Safety Aspects
- 3) Interlock Systems (EIS)

General Safety

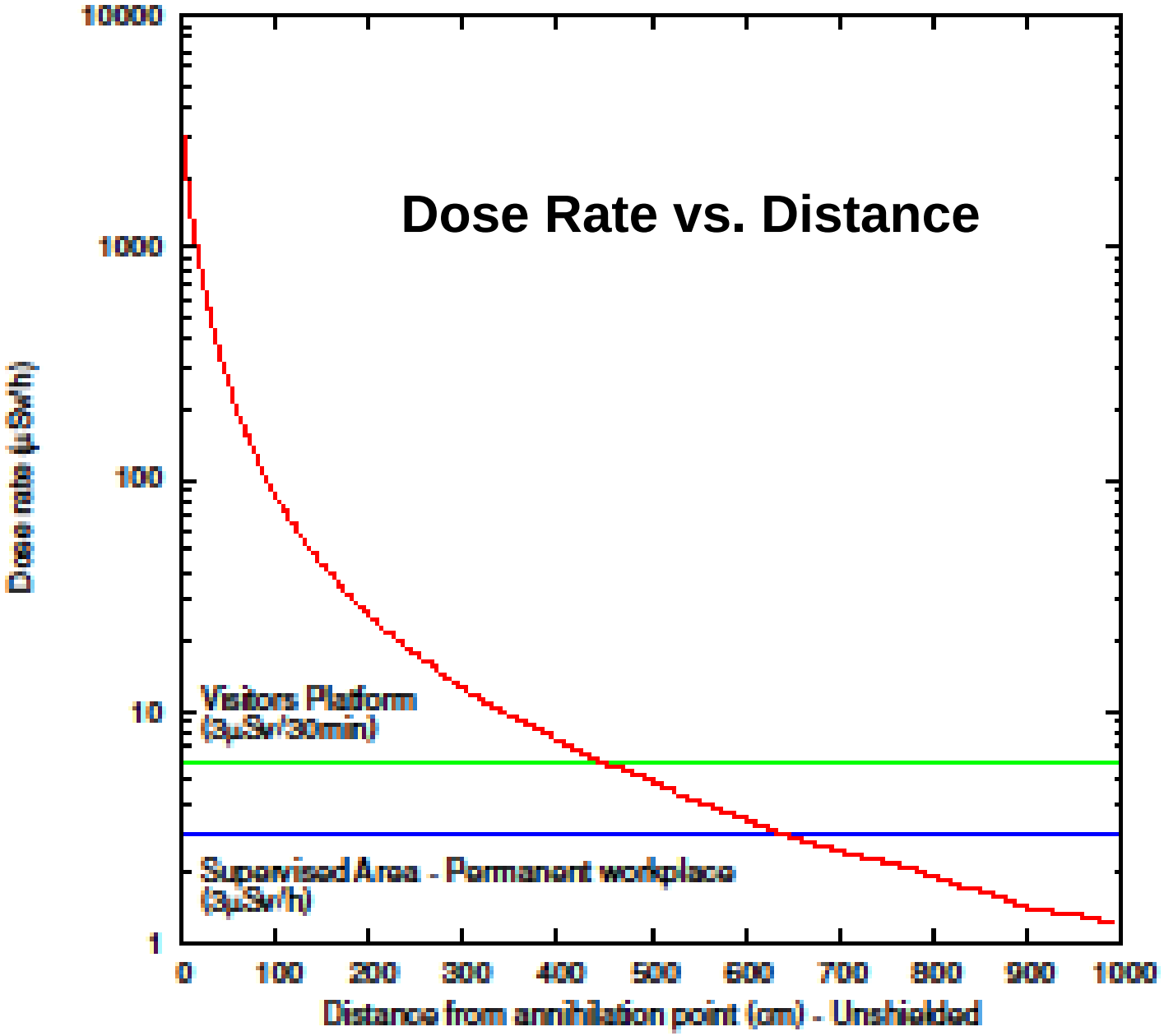
- Power supply and electrical distribution (Code C1 (EDMS 335725) Electrical Safety Code);
- Vacuum system (Code D2 (EDMS 335727) Safety Code for pressure vessels and pressurized pipelines);
- Magnets NORMA / EDMS database;
- Radiofrequency equipments;
- Beam instrumentation;
- Compressed air supply;
- Handling devices and operations (Code D1 (EDMS 335726) Safety Code for Lifting Equipment);

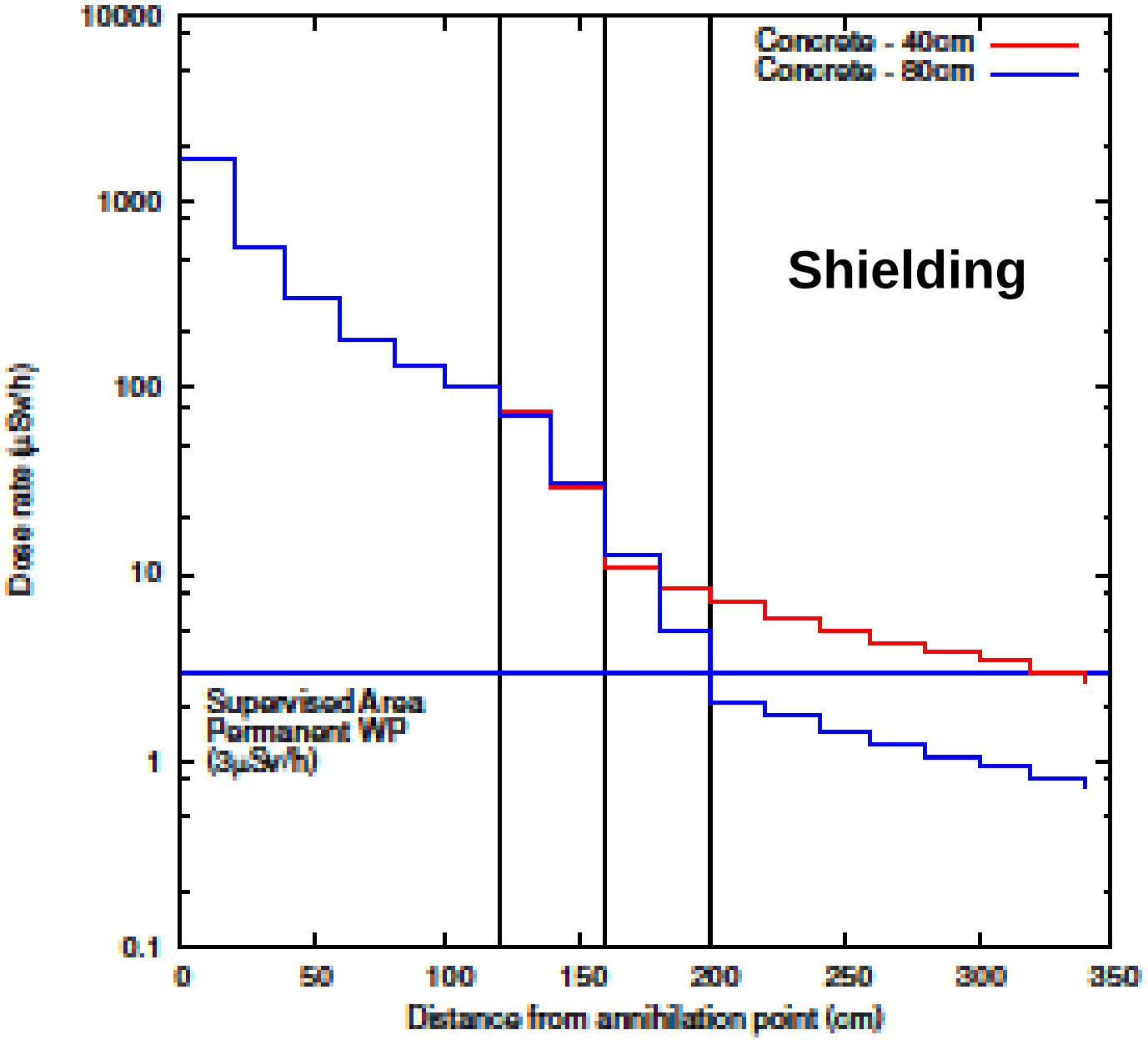
General Safety continued

- Passageways, footbridges and platforms (Secondary Beam Areas (EDMS 1204546 and 1204549) Rules for Access in PS secondary beam areas);
- Emergency devices (alarms and evacuation);
- Fire protection system (Code I (EDMS 335728));
- Structure of the construction and its impact on the AD hall;
- Control room for ELENA (inside present AD control room;
- People at work (Personal Protective Equipment);
- Other generalities on HSE aspects (waste handling, environmental issues, foreseeable events).

Radiation Safety Aspects

- Supervised Secondary Beam Area with Controlled Access;
- FLUKA Simulation by R. Froeschl / RP (EDMS 1278215 in preparation);
- Concrete Shielding around ELENA (0.8 x 2.4 m);
- Less than 3 micro Sievert / hour any point;
- No Access to exp. Area during Operation;
- Radiation Monitor (IG5 Chamber for fast Neutrons (connected to RAMSES));
- ALARA (avoid permanent Workplaces);
- Buffer Zone for radiological characterization, traceability.

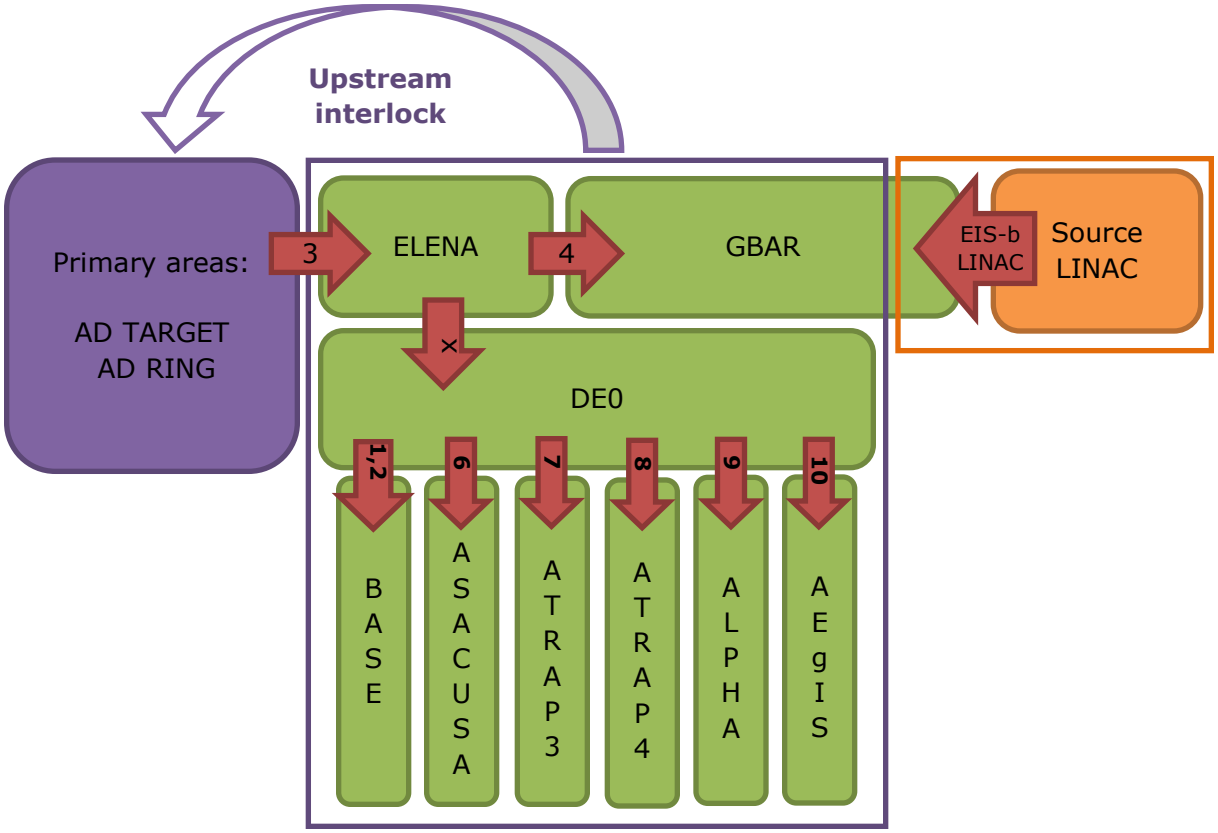

Dose Rate vs. Distance
Dose rate (μSv/h)
10000
1000
100
10
1
Visitors Platform
(3μSv/30min)
Supervised Area - Permanent workplace
(3μSv/h)
0
100
200
300
400
500
600
700
800
900
1000
Distance from annihilation point (cm) - Unshielded

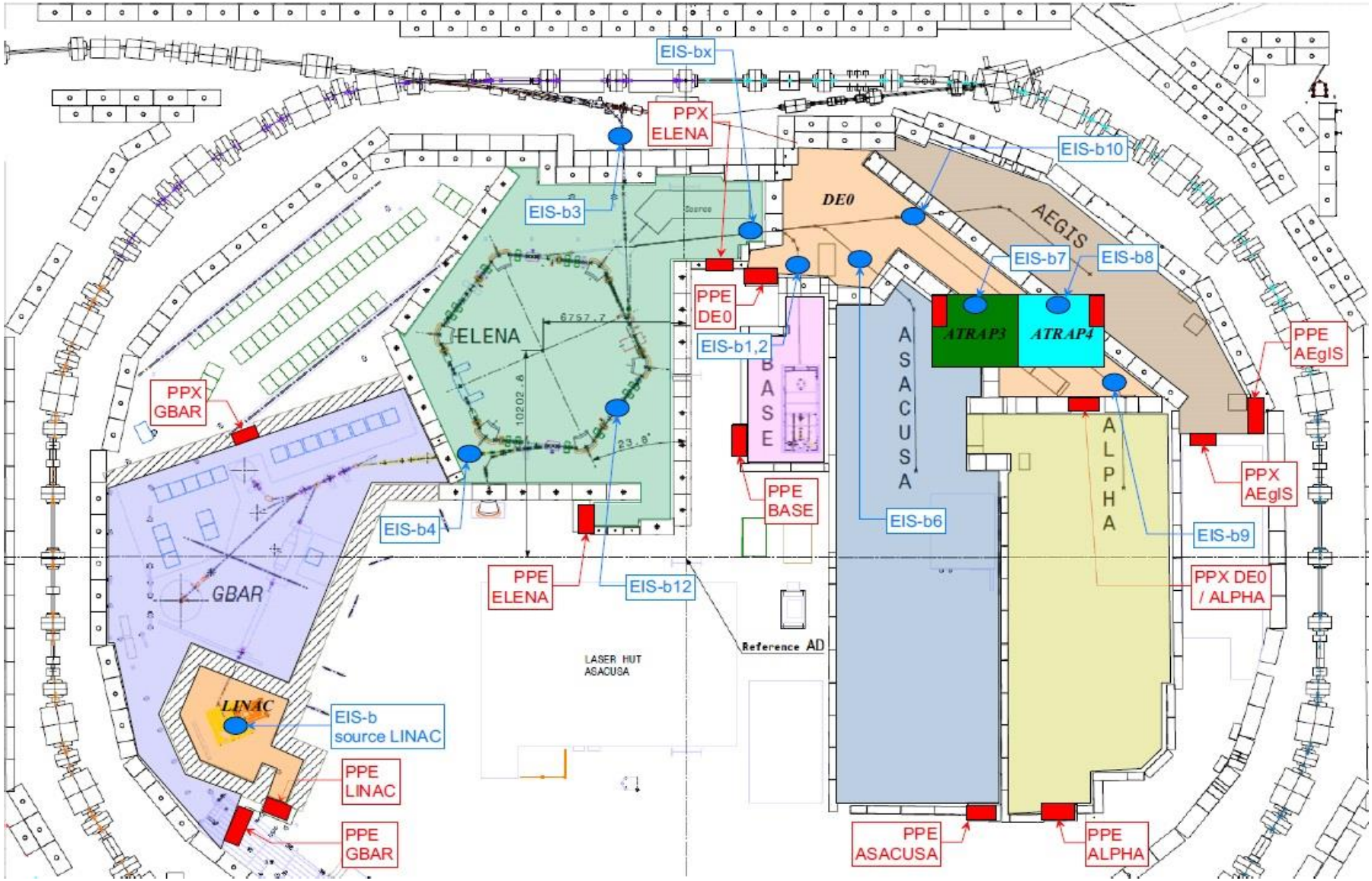

Concrete - 40cm
Concrete - 80cm
Shielding
Supervised Area
Permanent WP
(3μSv/h)
Dose rate (μSv/h)
Distance from annihilation point (cm)
10000
1000
100
10
1
0.1
0
50
100
150
200
250
300
350

Interlock Systems (EIS)

- ELENA and exp. Areas secondary beam zones;
- One EIS (Element Important de Securite) per zone sufficient;
- 2 Options considered “fail-safe” :
- Modified Vacuum Valves as Stopper with 5 mm Stainless Steel (can also be dump);
- Veto on Power Supply Magnet;
- Circulating Beam inside ELENA can be stopped (BTV under study / design).

Design of Access & Interlocks by F. Butin and Team





Layout of AD / ELENA Experimental Areas

Horst Breuker Review Oct 15
2013

Experimental area name	EIS-access		EIS-beam protecting the area
	PPE	PPX	
ELENA	1	1	2
GBAR	1	1	2
LINAC	1	0	1
DE0	1	1	1
BASE	1	0	1
ASACUSA	1	0	1
ATRAP3	1	0	1
ATRAP4	1	0	1
ALPHA	1	1	1
AEgIS	1	1	1

Interlocked Elements;
PPE : Personal Protection Entry;
PPX : Personal Protection eXit.

Outlook

- ELENA Safety File :
- We got started and made some progress but more work is needed;
- To understand specific subsystem safety issues we will contact the work package leaders;
- Thanks for your attention !