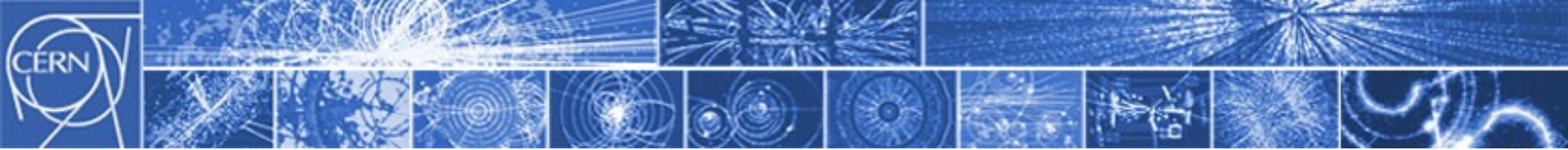




IEFC WORKSHOP 2011 – LHC INJECTORS AND EXPERIMENTAL FACILITIES
COMMITTEE 2011 WORKSHOP - 21-23 March 2011

EVOLUTION OF RADIATION MONITORING

G. SEGURA (HSE-SEE), D. PERRIN (HSE-RP)



Contents

- Introduction
- RAMSES II Light
- ARCON BRIDGE
- GROAC – General Renewal Of ARCON Controller



Introduction

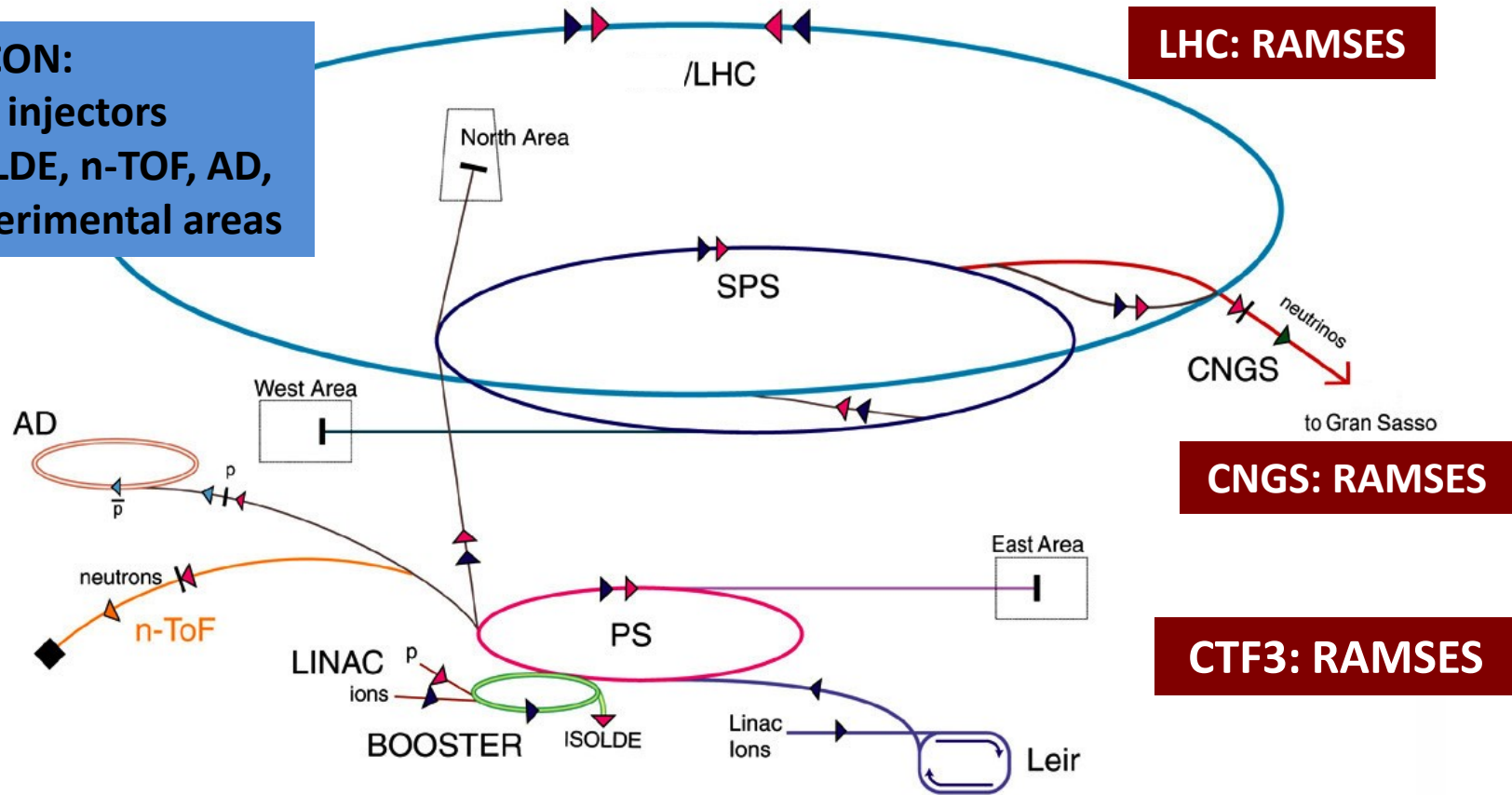
- ARCON - ARea CONtroller system developed at CERN for LEP and has been in use since 1988. Composed of approximately 380 monitors distributed by 14 controllers.
- RAMSES - RAdiation Monitoring System for the Environment and Safety designed for the LHC based on current industry standards and has been in use since 2007. Composed of approximately 450 Channels.



Monitoring systems for RP in 2010

2 systems: ARCON & RAMSES ~800 monitors

ARCON:
LHC injectors
ISOLDE, n-TOF, AD,
Experimental areas



LHC: RAMSES

CNGS: RAMSES

CTF3: RAMSES

- ▶ p (proton)
- ▶ ion
- ▶ neutron

- ▶ \bar{p} (antiproton)
- ▶ \bar{p} proton/antiproton conversion
- ▶ neutrino

- AD Antiproton Decelerator
- PS Proton Synchrotron
- SPS Super Proton Synchrotron

- LHC Large Hadron Collider
- n-ToF Neutron Time of Flight
- CNGS Cern Neutrinos Gran Sasso

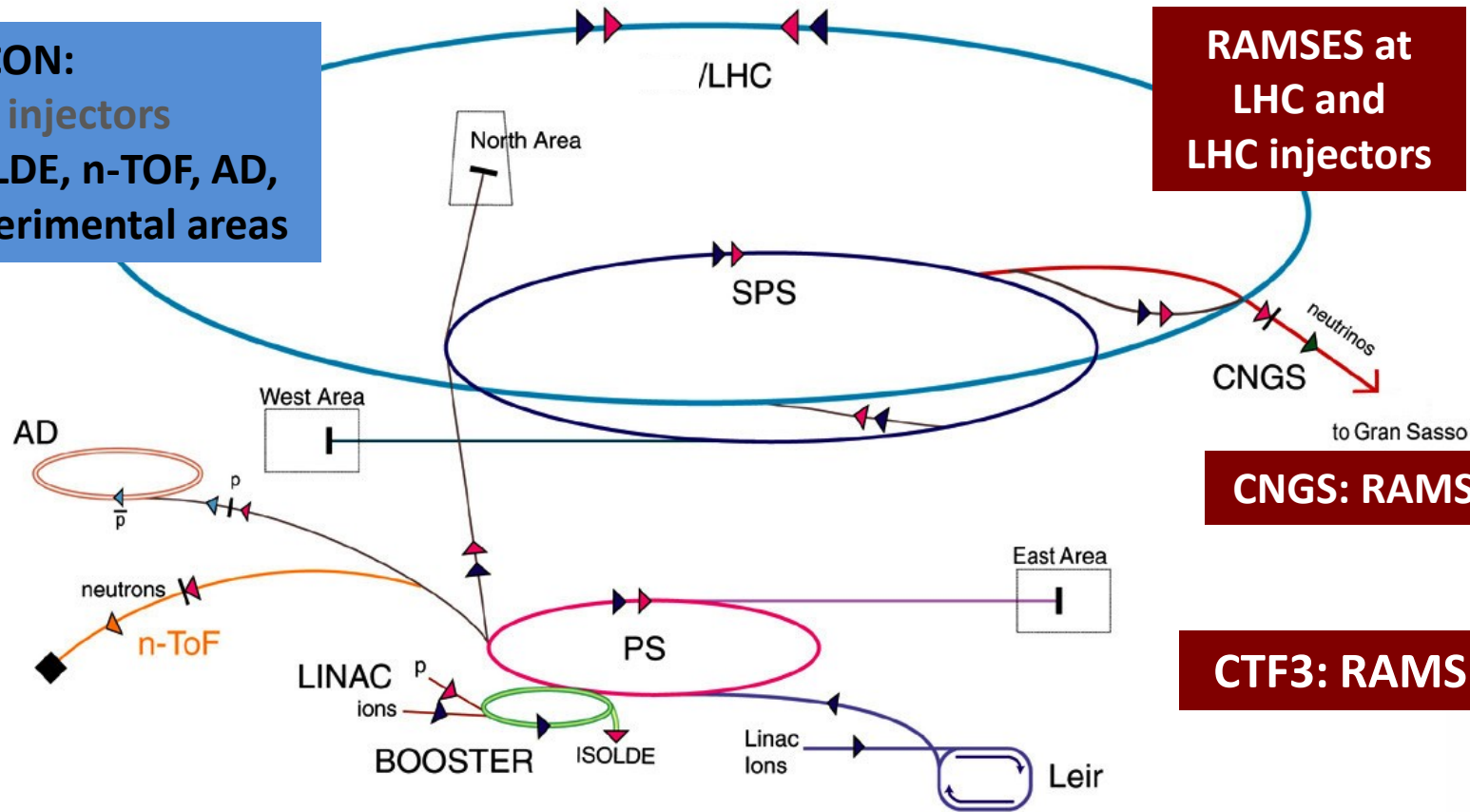


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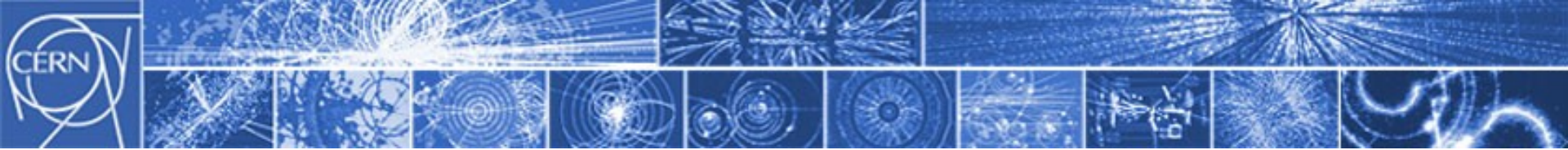
**RAMSES at
LHC and
LHC injectors**



CNGS: RAMSES

CTF3: RAMSES

- ▶ p (proton)
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RAMSES II Light

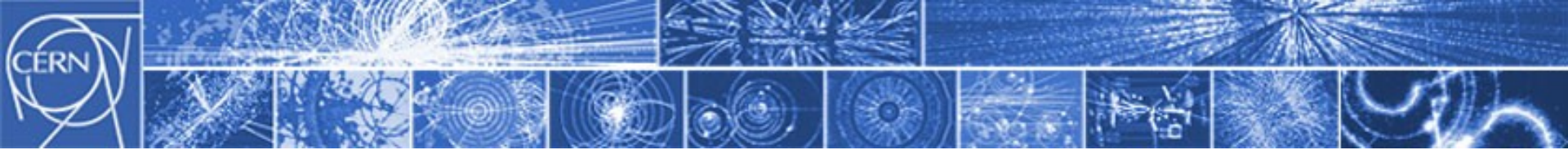


RAMSES II Light project

Made of **3 parts**:

- 1) Main part: Replacement and consolidation of critical ARCON monitors by RAMSES for the **entire injector chain of the LHC** (Linac2, Linac3, Booster, PS, SPS).
- 2) Second part: Instrumentation of **HiRadMat** and **consolidation of RAMSES at LHC** (machine + experiment).
- 3) Third part: Instrumentation of **Linac4**

Project duration: 01/2010 → 12/2012



RAMSES II Light project

Main part: Securing the LHC injector chain

- Installation finished and commissioned during short shutdown;
- All relevant installations for LHC operation now independent of ARCON
- Parallel operation of ARCON in 2011
- Hardware Interlock signals ready



RAMSES II Light project

Main part: Instrumentation for LHC injector chain

Done

**Linac2 → 3 AMF, 2 UA;
Linac3 → 3 XRM, 3 UA;**

**PS Booster → 3 AMF, 2 UA, 1 VMS;
PS → 18 AMF, 11 UA, 6 PMS, 1 VMS;**

**SPS BA1 → 1 PMS, 1 VMS;
SPS BA3 → 1 VMS;
SPS BA4 → 2 AMF, 4 UA;
SPS BA5 → 1 AMF, 1 UA;
SPS BA5 → 1 AMF, 1 UA, 1 VMS;**

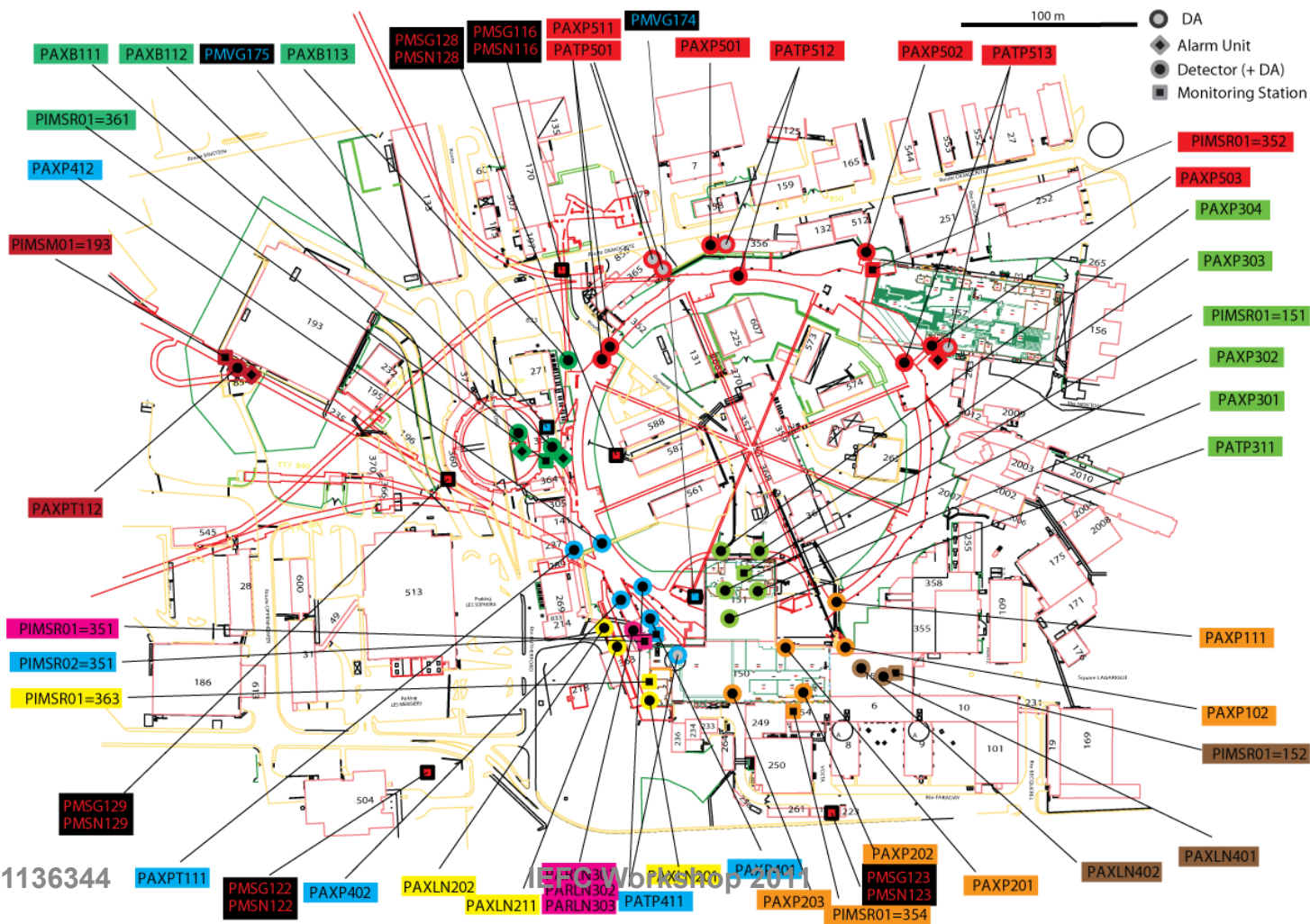
All instrumentation commissioned





RAMSES II Light project

i.e. Instrumentation PS complex





RAMSES II Light project

Second part: HiRadMat and consolidation of
RAMSES at LHC

In progress

HiRadMat → 8 IAM, 1 AGM, 2 AMF, 3 UA, 1 VMS, 1 PMS, 1 HFM;

LHC-4 → 1 VMS;

LHC-6 → 1 VMS;

ATLAS → 4 IAM;

CMS → 4 IAM;

LHCb → 3 IAM, 1 AMF;

Partially commissioned



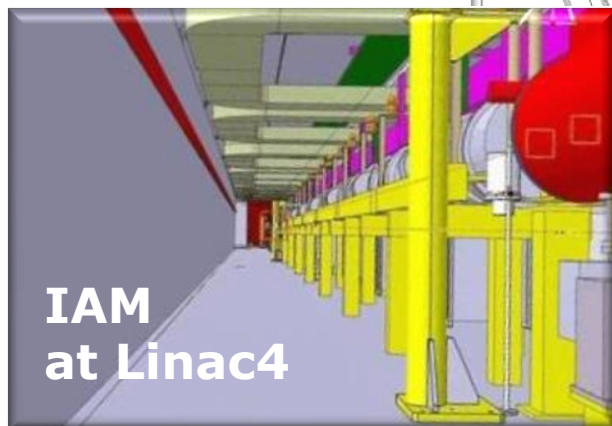


RAMSES II Light project

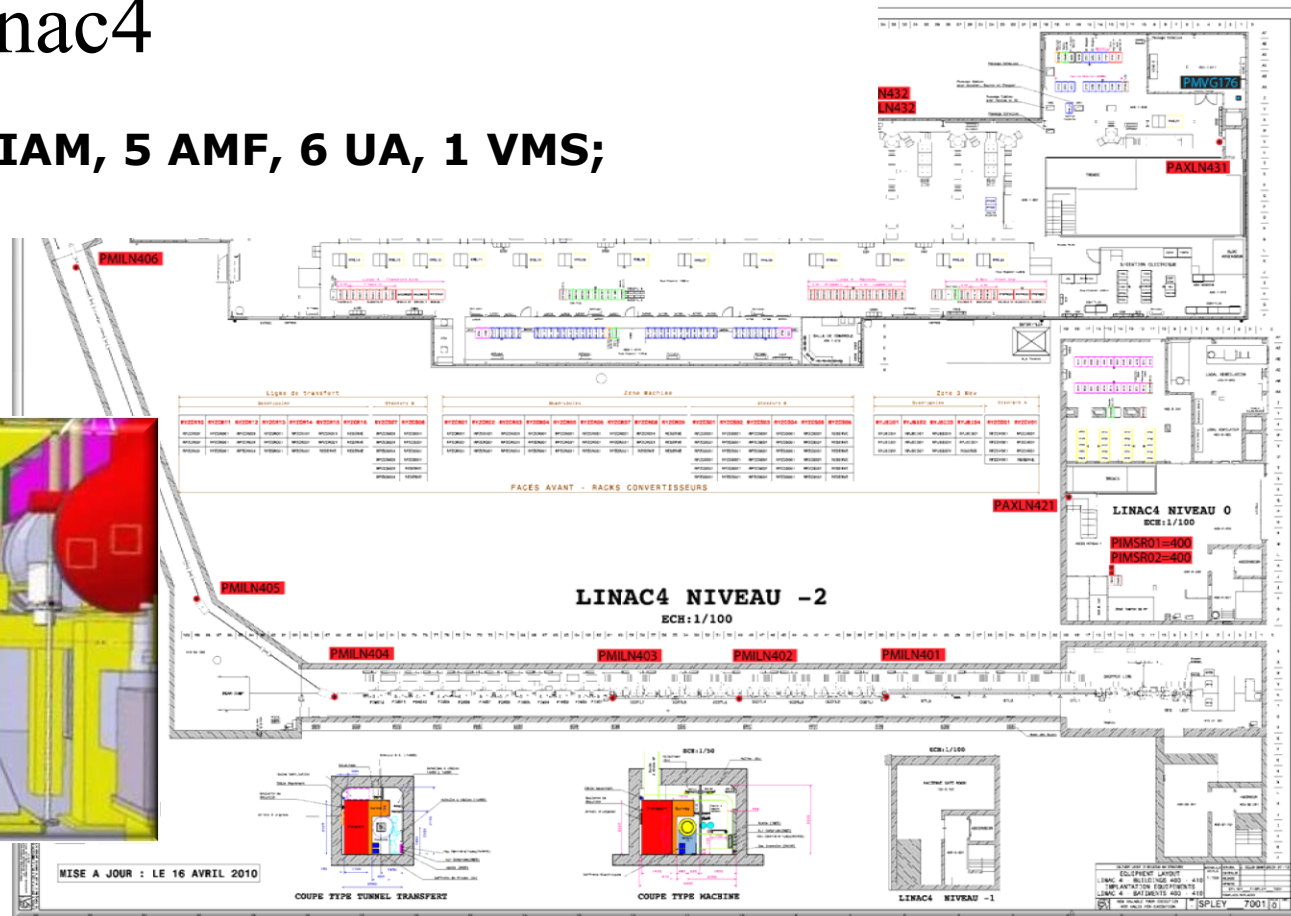
Third part: Linac4

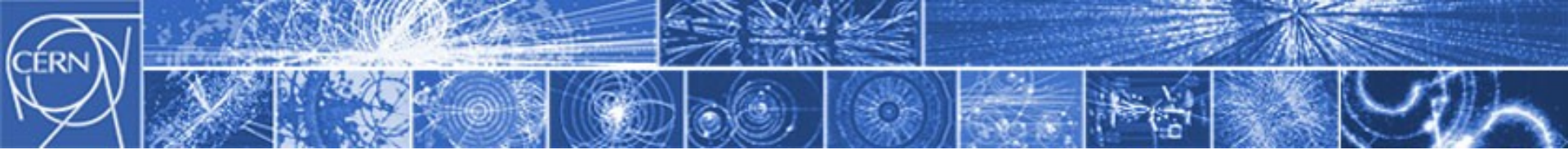
Linac4 → 6 IAM, 5 AMF, 6 UA, 1 VMS;

To be scheduled



IAM at Linac4





ARCON BRIDGE



ARCON Supervision

RADMAIN

- Monitoring
- Logging (Visualization)

PS Graph and Map

- Monitoring
- Logging (Visualization)
- interlocks]

XRP2, Plot

- Survey
- Visualization



RAMSES Configuration

PS - CTF3
Stray radiation [Level 1]

Alarms not ack: 16
Filter applied: Yes

18/03/11 19:17:18
User: sgustavo

Workstation ID: 37
Hostname: TS1_2

ch1	ch2	ch3	ch4	ch5	ch6	ch7	ch8
CH Name : PAXCT411							
Dose Rate : F 0.000 μSv/h							
Mean DR : F 0.278 μSv/h							
Timestamp : 18/03/11 19:16:59							
Device Type : AMF							
Meas. Sampling Time : 1.2 s							
Alarm Threshold : 10 μSv/h							
High Alarm Th. : 20 μSv/h							
Alarm Sampling Time : 60.0 s							
Alarm Hysteresis : 10 %							
Calibration factor : 1.13E-07 A or cs / Sv/h							
Correction factor : 2.83							
Channel status							
<input checked="" type="checkbox"/> Channel OK	<input checked="" type="checkbox"/> DA Type						
<input checked="" type="checkbox"/> Prim. UA	<input checked="" type="checkbox"/> DA Power						
<input checked="" type="checkbox"/> Sec. UA	<input checked="" type="checkbox"/> Parameters						
<input checked="" type="checkbox"/> Alarm	<input checked="" type="checkbox"/> CRC Param.						
<input checked="" type="checkbox"/> High Alarm	<input checked="" type="checkbox"/> Sensor						
<input checked="" type="checkbox"/> Acknow.	<input checked="" type="checkbox"/> Sensor Cnx.						
	<input checked="" type="checkbox"/> UA Trans.						
	<input checked="" type="checkbox"/> DA Com.						
Channel mode							
<input checked="" type="radio"/> Measure	<input type="radio"/> Maint.	<input type="radio"/> Simu.					
<input type="radio"/> Off	<input type="radio"/> Test						
Primary UA status							
<input checked="" type="radio"/> Normal	<input type="radio"/> H Alm	<input type="radio"/> Alm					
<input type="radio"/> Off / Fault	<input type="radio"/> H Alm Test	<input type="radio"/> Alm Test					
Secondary UA status							
<input type="radio"/> Normal	<input type="radio"/> H Alm	<input type="radio"/> Alm					
<input checked="" type="radio"/> Off / Fault	<input type="radio"/> H Alm Test	<input type="radio"/> Alm Test					
Trd...	His...	Cmd...	Param...				

RAMSES

▪ Monitoring

RAMSES

▪ Monitoring: Alarms – System faults

RAMSES

▪ Configuration



CERN Control Centre

Subscriptions to dp:RAMSES/LHC/PABE1291

Name	Type	Value
Name	string	PABE1291
Timestamp	string	2011-03-08 15:20:00.000
MOR	double	0.15141347587108612
DIR	double	1.95029258593928
ALARM	bool	false
MODE_MEASURE	bool	true
HIGH_ALARM	bool	false
Unit	string	USsh

LHC accelerator

Point 1: Surface
Point 1: ATLAS
Point 1.2
Point 1.8
Point 2: ALICE
Point 3
Point 4
Point 5: CMS
Point 6

Date	Time	Event	Type	Zone	Equipment	Description
17:02:11	09:54:07	Alarm off - not ack.	System Fault	SM1	ARC-ON SM1 B	ME not responding
17:02:11	09:54:07	Alarm off - not ack.	System Fault	SM2	ARC-ON SM2 B	ME not responding
17:02:11	09:54:07	Alarm off - not ack.	System Fault	SM3	ARC-ON SM3 B	ME not responding

ARCON Map and Graph

PS ACCELERATOR COMPLEX

EDMS 1136344

RAMSES

Stray radiation (level 0)
Stray radiation (level 1)
Induced activity
monitors

IEFC Workshop 2011

ARCON RADMAIN

Monitor last 72 hours ...

Precession

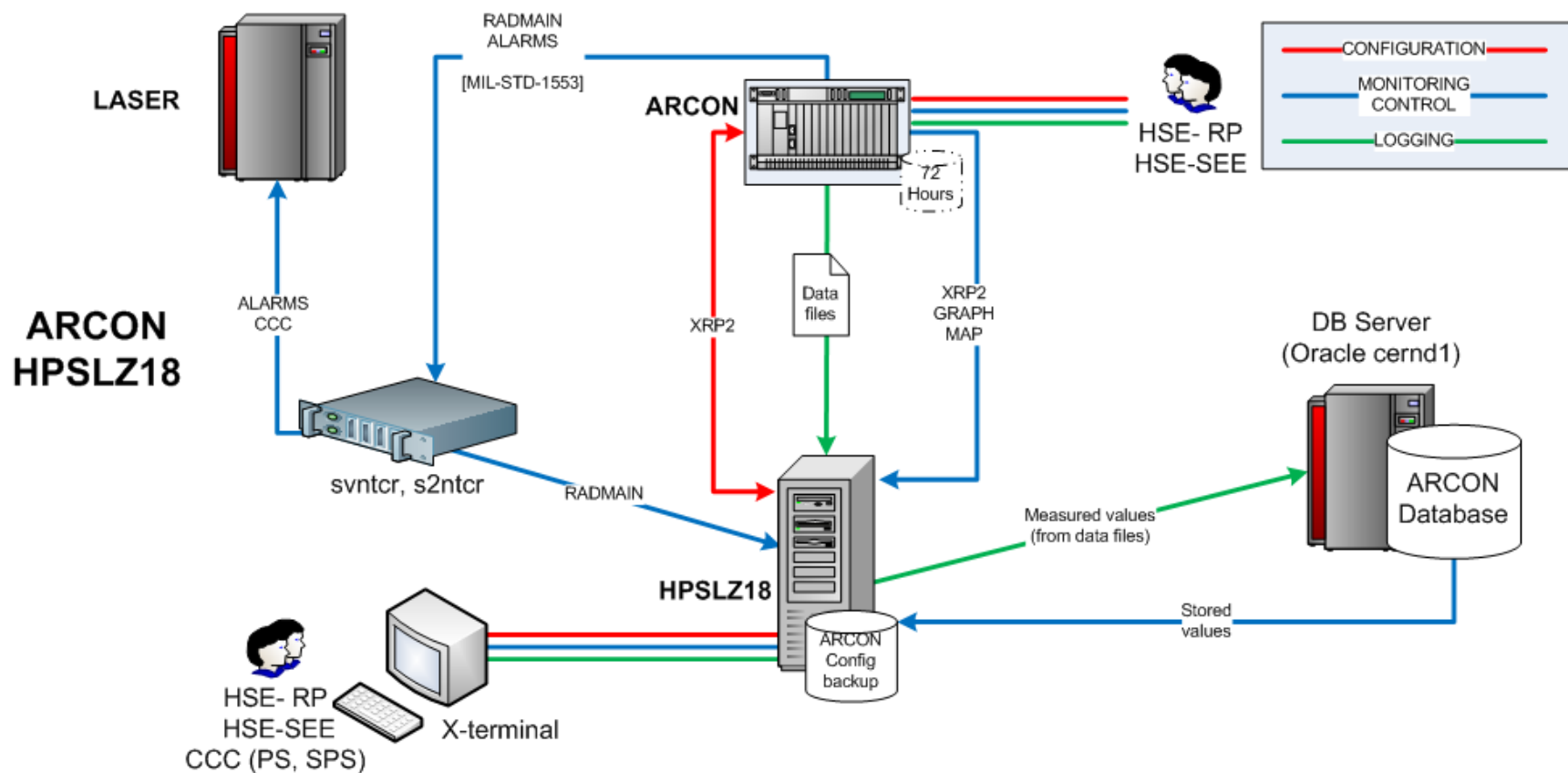
Min Max V 15:07:39 2011

RAMSES

Surface B44
ECK4
TT41 / TAG41 / T18
TT40
TCC4 / CNG5

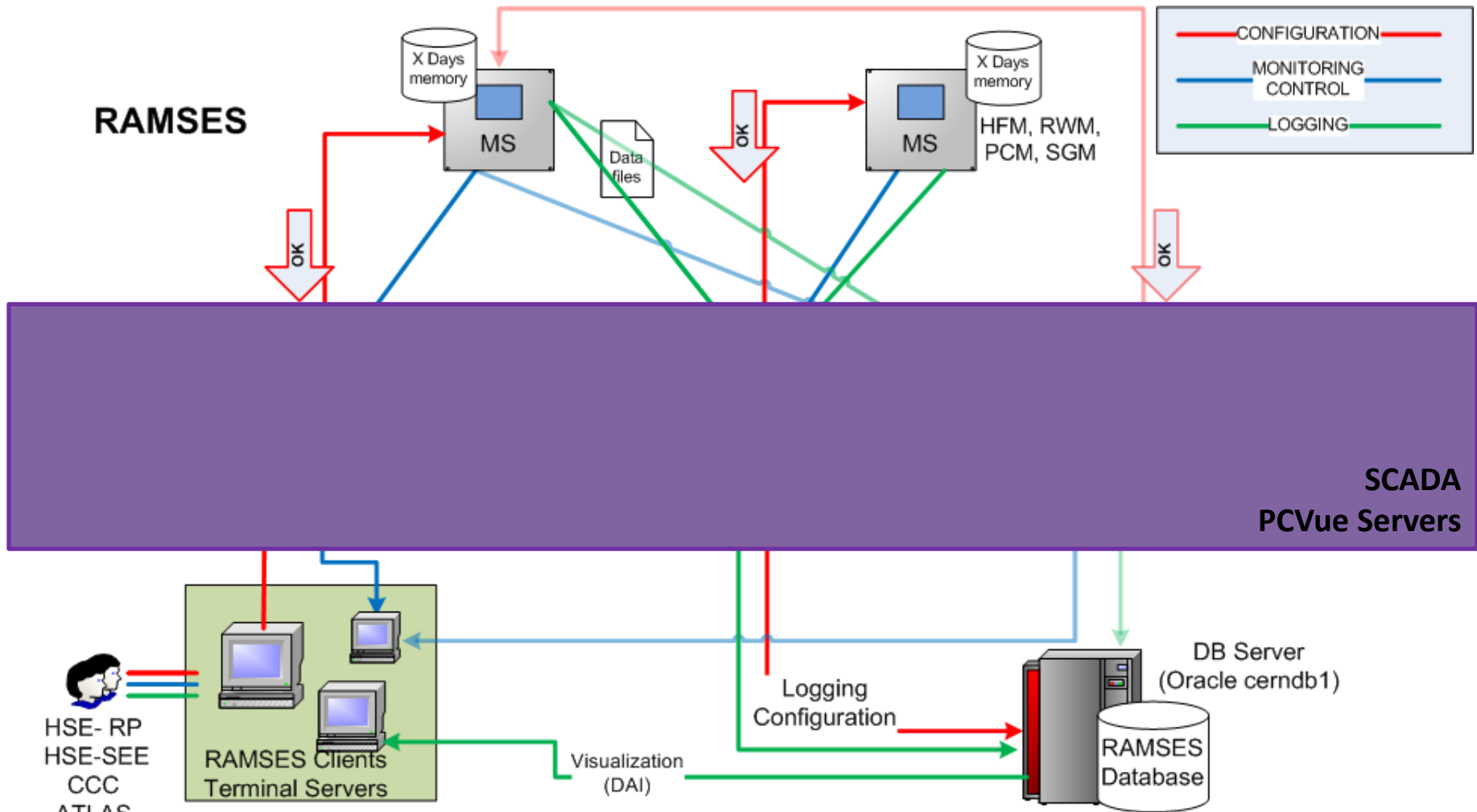


ARCON Architecture





RAMSES Architecture





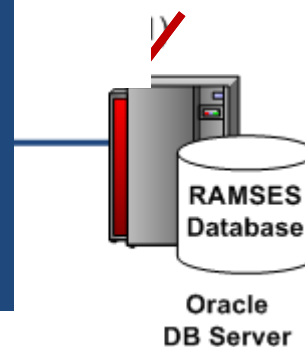
BRIDGE – Why?

- Integrated with RAMSES:
 - A single system to monitor all accelerators and experiments

**RAMSES
Servers**

- Redundant

**Bridge
Servers**



Logging of:

- hourly values
- 15s values
- Events
- Database storage of configurations

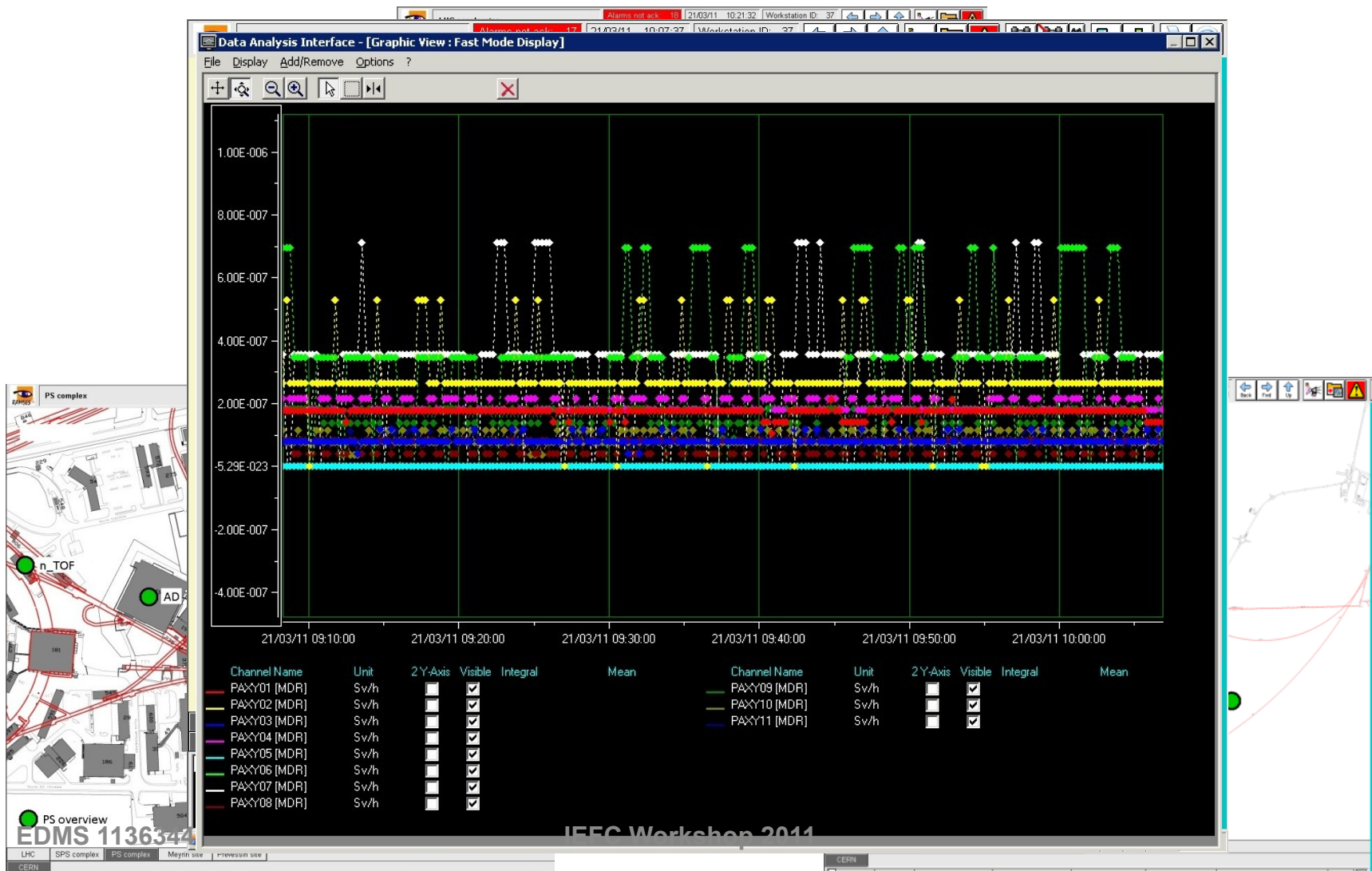


BRIDGE Architecture





ARCON-RAMSES-BRIDGE Supervision





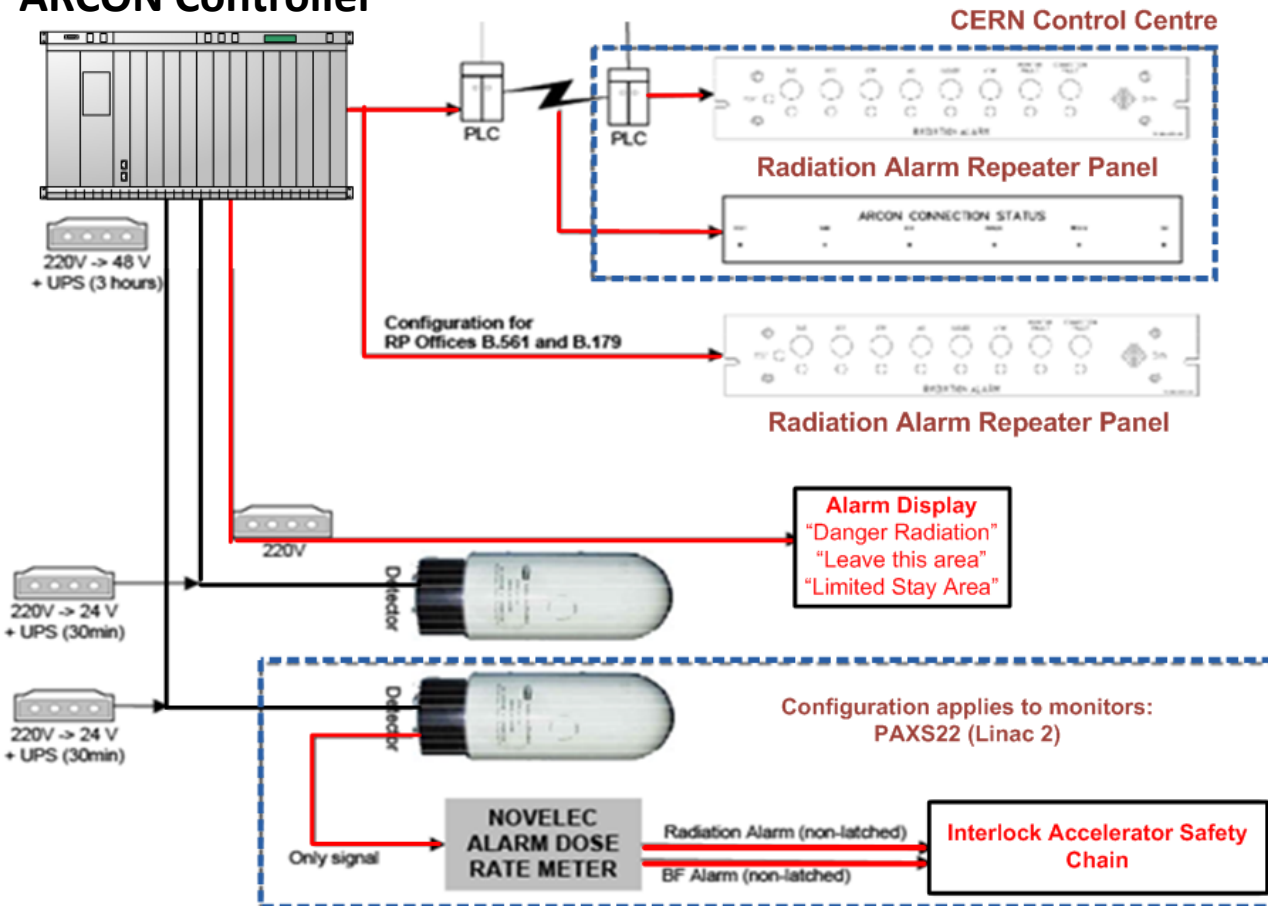
GROAC

General Renewal of ARCON Controller



ARCON Controller and devices

ARCON Controller



VME Frontend

- PEP VM40, PEP VLAN
- Microware OS9 v3.0
- CERN software (non standard BE/CO)

Measurement electronics developed at CERN

- Counter boards
- Input/Output status boards

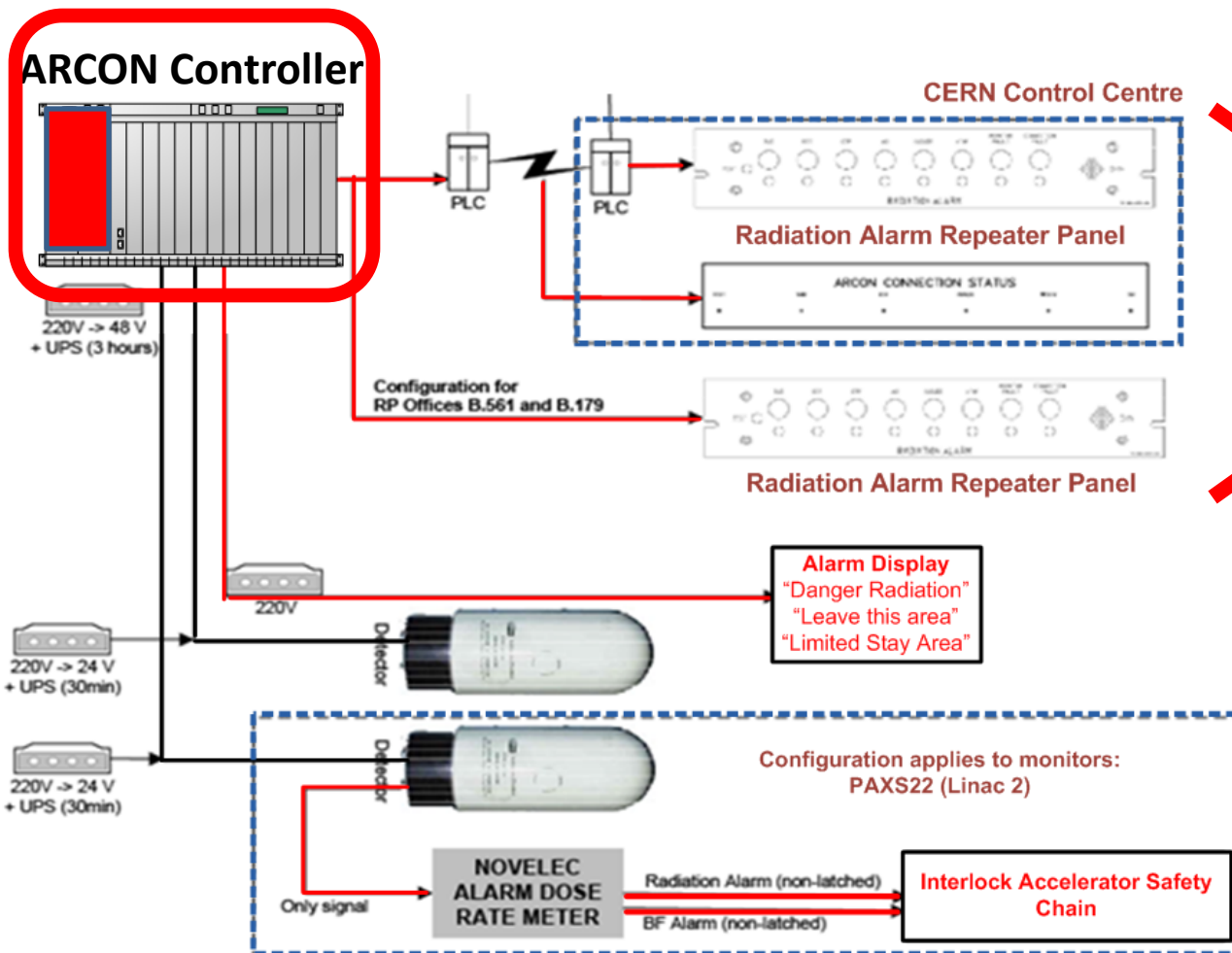


ARCON Frontend

- Control electronics
 - obsolete, end-of-life,
 - very limited number of spare parts
 - procurement of spares difficult/impossible
 - no support from provider
- Control Software
 - Known bugs in OS not patched (OS not supported)
 - Difficulty to add functionality due to high charge of CPU
- Measurement electronics
 - Not an issue: developed at CERN, supported by HSE-RP-IL



GROAC – General Renewal Of ARCON Controller



VME Frontend

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- PEP VME
- Microware OS9 v3.0
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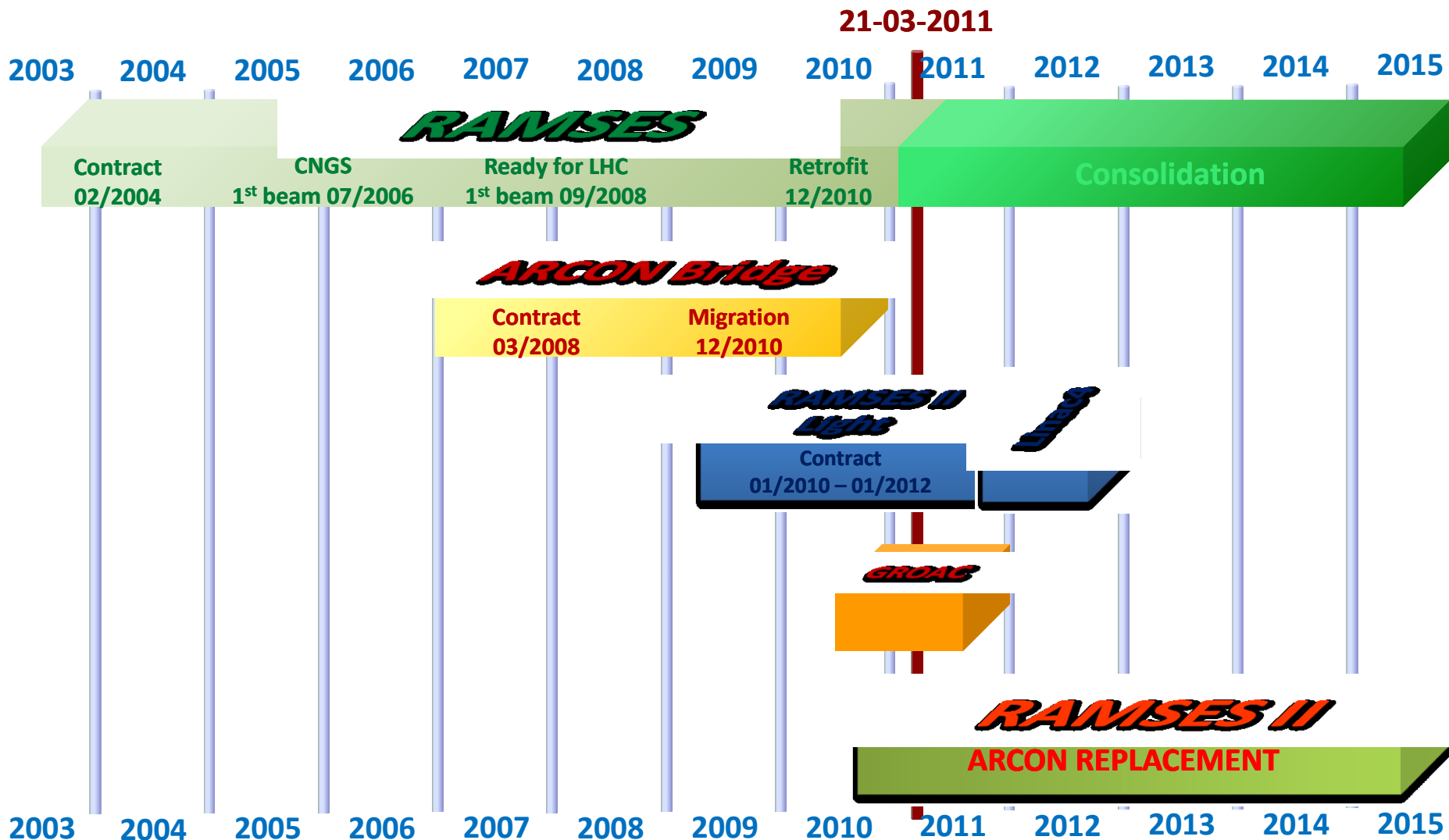


GROAC Project

GROAC assures the operation of ARCONs for a few years until RAMSES II project will upgrade radiation monitors and measurement electronics

GROAC is a new Radiation Protection frontend

- based on BE/CO standards
 - Control electronics: MEN A20, timing
 - FESA based control software (gate to SCADA – PVSS)
- reusing of ARCON measurement electronics and devices
 - Counter boards, Status boards
 - ARCON monitors, alarm repeaters
 - BRIDGE - RAMSES supervision





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External Systems

