



LHC Machine Integration Studies

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May 6th, 2004

Y. Muttoni - J.P. Corso TS Workshop Archamps

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- ◆ **Contents**
- **LHC machine Integration**
- **ICL web site**
- **Installation non conformity**

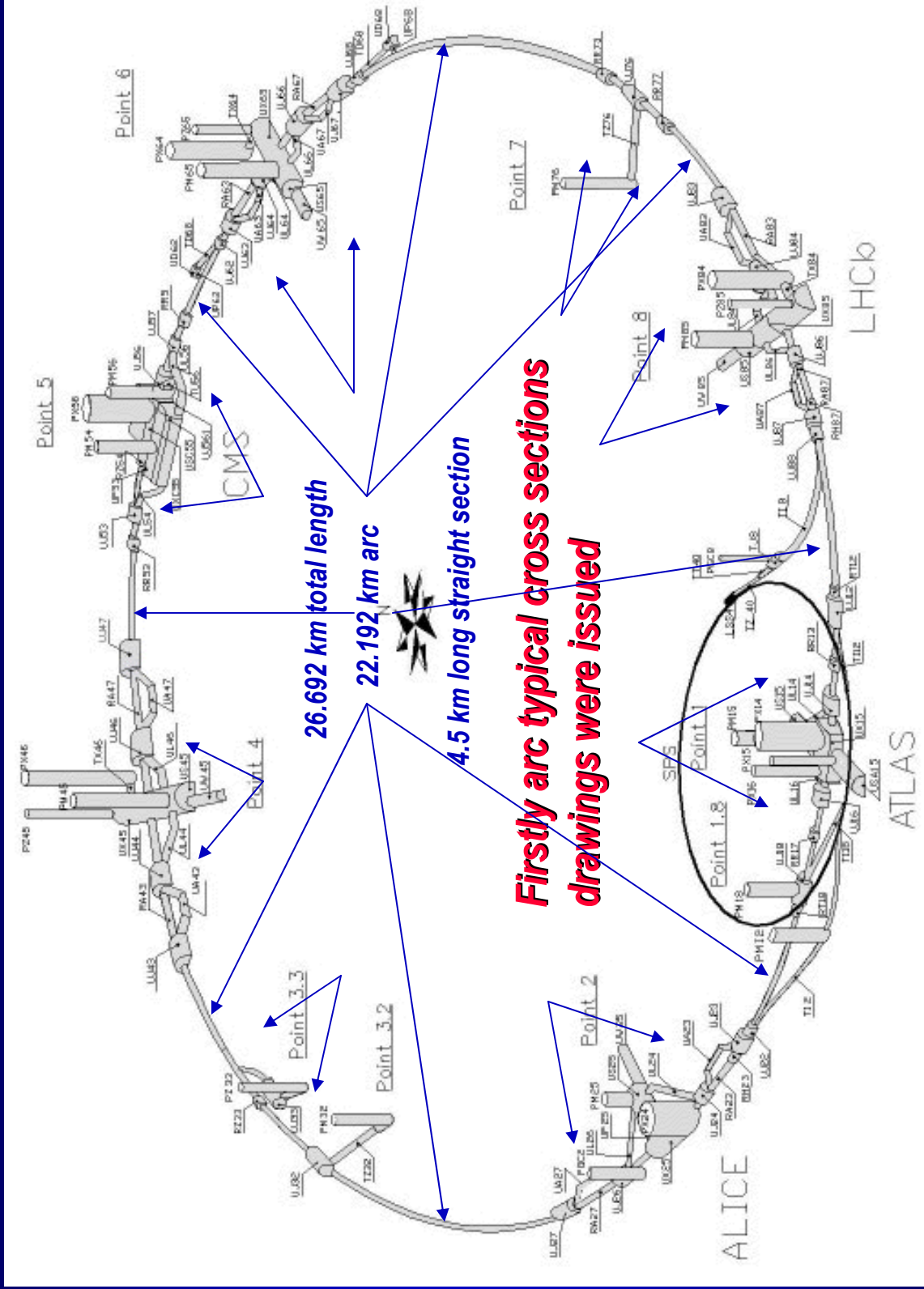


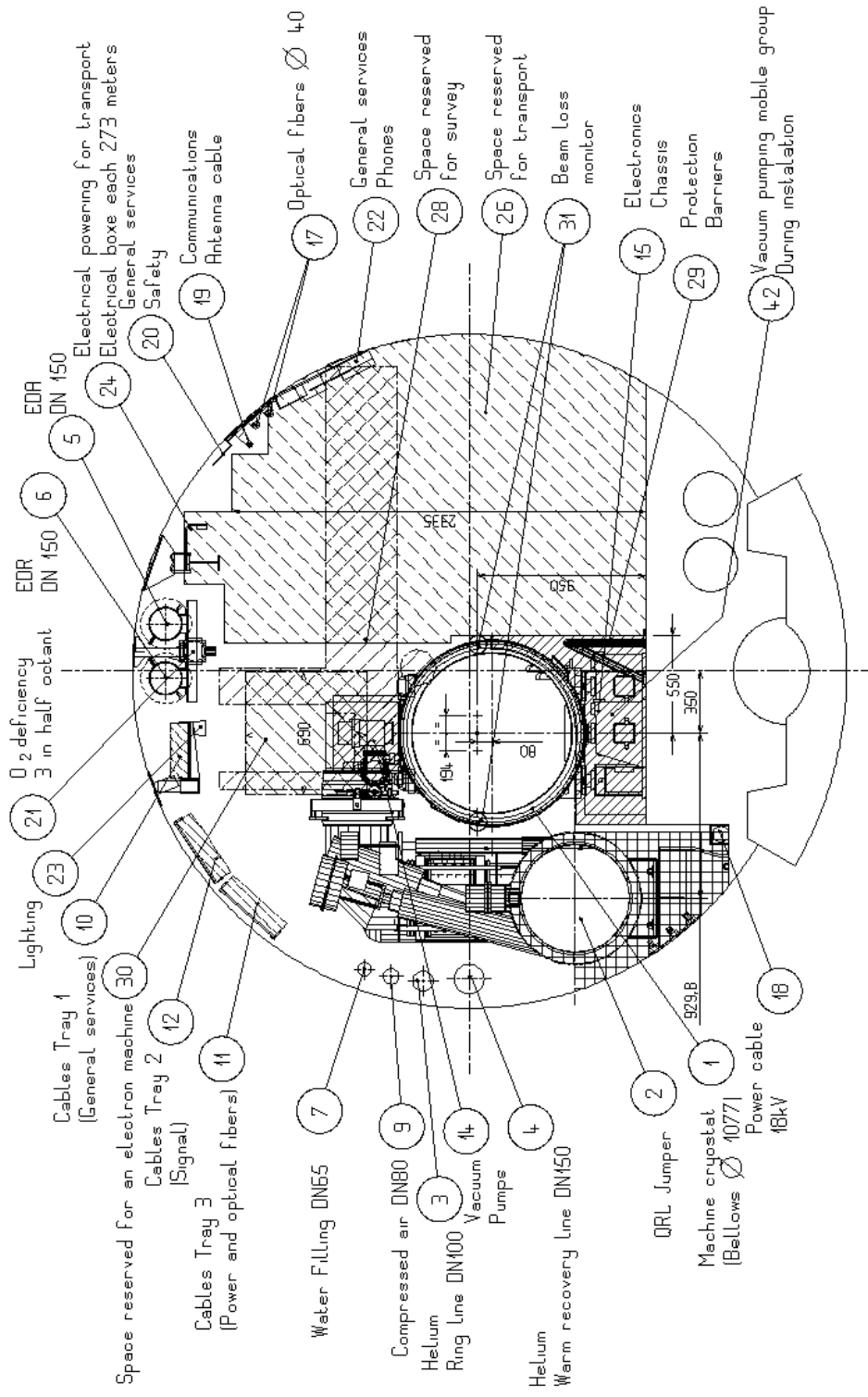
LHC underground caverns – 3D integration

- ◆ The first ICL meeting (LHC Integration Cell) was held during the middle of 1999 with a view to carrying out integration studies of the LHC machine and its services.
- ◆ In 2001 three working groups were created:
 - MIWG Machine integration working group
 - PSIWG Pits and services integration working group
 - PIWG Powering integration working group

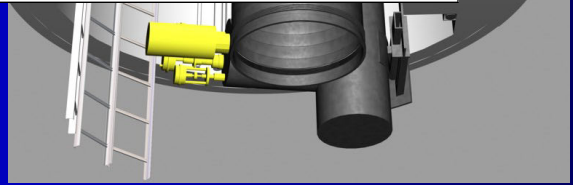
Today these three groups are under the responsibility of the IN (integration) section which is within the TS-IC group.

LHC underground caverns

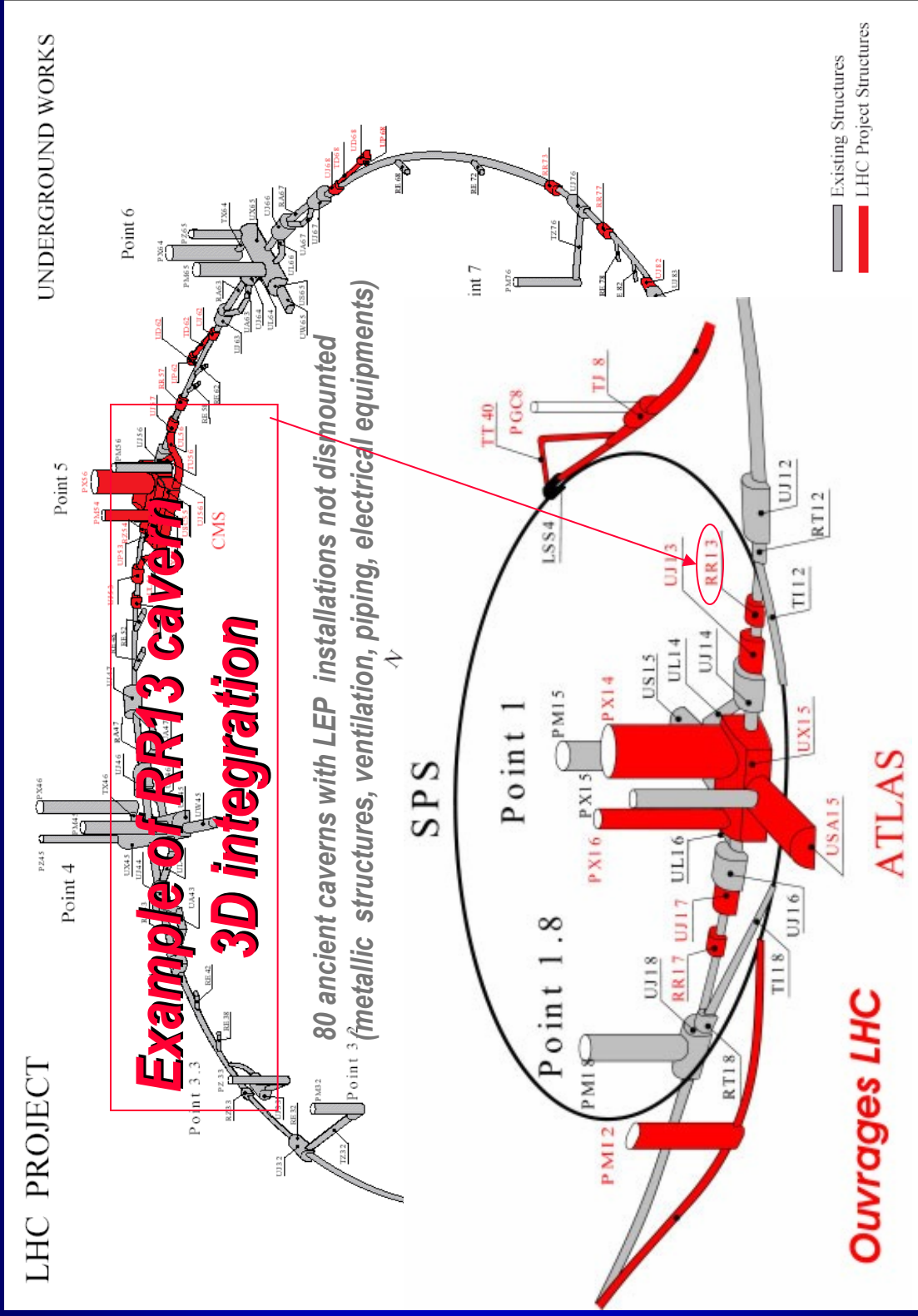


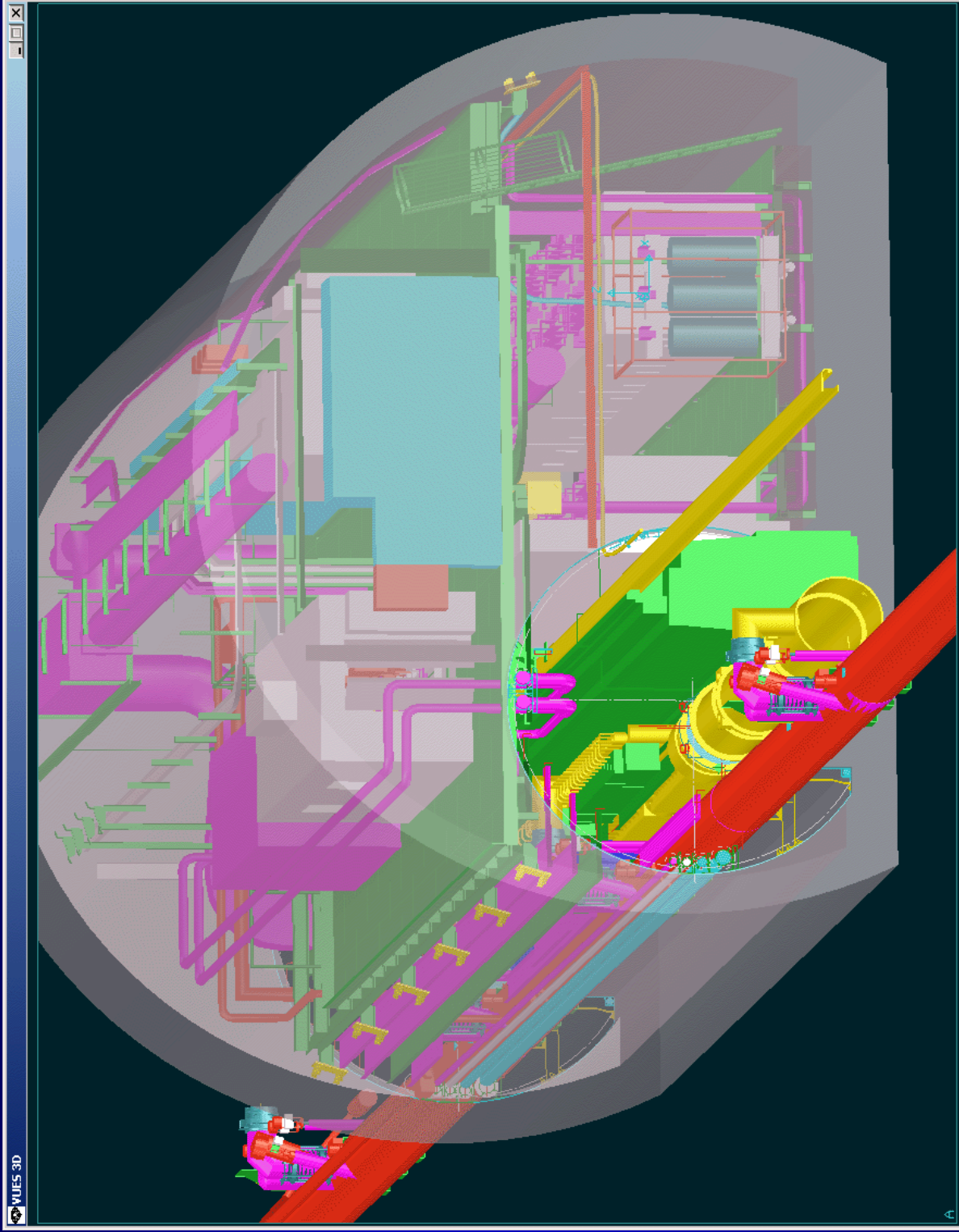


Tunnel LEP toward Tunnel LHC



LHC underground caverns – 3D integration







I.C.L. web site

- ◆ The ICL website was created with the objective of centralizing all the information necessary for the integrations, as well as to enable the largest amount of users to have access to those generated by the integrations.

http://lhc-div-miwig.web.cern.ch/lhc-div-miwig/Main_Pages/frame%20miwg_icl.htm



I.C.L. web site

Tableau de synthèse coupes types

- Plan non nécessaire
- Plan à modifier
- Plan à Réaliser

Tunnel	Coupes types std.	Coupes types std. Cryo Connexion	Coupes	1	2	3	4	5	6	7	8
R11	LHCLJ_0013	LHCLJ_0014 Cryo Connexion		RE11	R21	R31	R41	R51	R61	R71	R81
R12	LHCLJ_0013	LHCLJ_0014 Cryo Connexion		RE12	R22	R32	RE42	RE52	RE62	RE72	RE82
R12				RT12	T12	PM132	UJ43	R531	UP62	R741	UA83
R12				UJ12	UJ22	US32	RA43	RR53	UD62	RR73	UJ83
R12				R112	UJ23	TZ32	UA43	R532	TD62	R742	RA83
R12				R1131	RA23	RZ33	UJ43	UJ53	R622	R76	UP83
R12				R1132	UA23	RZ33	UJ44	UP53	UJ62	UJ76	UJ84
R12				UJ13	UP23	PZ33	UL44	UPS54	R623	SD7	UL84
R12				UJ14	RB24	US33	RB44	R541	UJ63	PM76	UP84
R12				RB14	UJ24	TZ33	SD4	RZ54	RA63	US76	PX84
R12				UL14	UL24	UP33	PZ45	R542	UP63	TZ76	RB84
R12				UX15	PX24	UP33	PM45	UL54	UA63	RR71	TX84
R12				US15	RPX24	R34	US45	ULS55	UJ64	RR77	SD8
R12				SD1	SD2	R36	UW45	UJ561	PX64	R772	PZ85
R12				PM15	PM25	R37	UX45	UL56	RB64	R78	PM85
R12				RB16	UX25	R38	RUX45	UXC55	TX64	RE78	US85
R12				UJ16	US25	RE38	UJ46	R561	UL64	R79	UW85
R12				UJ17	RB26	R39	UP46	UJ56	UP64		UX85 cryo
R12				R1171	UJ26	UJ26	RB46	R562	UW65		007 D1
R12				R1172	UJ27	UJ27	TX46	UJ57	UX65		018 D1
R12				R18	UA27	PM54	PX46	R571	RUX65		
R12				R19	RA27	SD5	UP47	SD5	PZ65		
R12				UJ18	UJ27	PM56	UA47	PM56	US65		
R12				PM18	R28	PX56	RA47	UX56	UL66		
R12				RT18	RE28	TU56	UJ47	UJ56	RB66		
R12				R18	R29	UP55	R48	UP55	UJ66		
R12				RE18		UP56	RE48	UP56	RA67		
R12				R19		UP56	R49	UP56	UA67		
R12						R572		R572	UP67		
R12						R58		R58	UJ67		
R12						RE58		RE58	R81		
R12						R59		R59	UJ68		
R12									R682		
R12									TD68		
R12									UD68		
R12									UP68		
R12									R683		
R12									RE68		
R12									R69		
R21	LHCLJ_0013	LHCLJ_0014 Cryo Connexion									
R22	LHCLJ_0013	LHCLJ_0014 Cryo Connexion									
T12											
RA23	LHCLJ_0024	LHCLJ_0023 Cryo Connexion									
RB24											
RB26											
RA27	LHCLJ_0024	LHCLJ_0023 Cryo Connexion									
R28	LHCLJ_0027	LHCLJ_0028 Cryo Connexion									
R29	LHCLJ_0013	LHCLJ_0014 Cryo Connexion									



I.C.L. web site

LHC - Intégration - RR13 - Christophe BAULT - Yvon MUTTONI

C:\Documents and Settings\muttoni\Local Settings\Temporary Internet Files\Content.IE5\PU3Q315U\RR13\U\wrl

File Edit View Tools Window Help

Folder Contents

LAYOUT POINT 1

Plans de layout et coupes types Point 1

- [LHCLSS_0017](#) AH ●● LAYOUT OF DISP. SUPPRESSOR - IR1 LEFT, CELLS C8 L1 TO C11 L1
- [LHCLSS_0018](#) AH ●● LAYOUT OF DISP. SUPPRESSOR - IR1 RIGHT, CELLS C8 R1 TO C11 R1
- [LHCLJG0001](#) AF ●● QRL SCHEMATIC LAYOUT - POINT 1 - LEFT SIDE
- [LHCLJG0002](#) AC ●● QRL SCHEMATIC LAYOUT - POINT 1 - RIGHT SIDE
- [LHCF31000002](#) AE ●● LHC-POINT 1 - UNDERGROUND STANDARDS CE VIEW
- [LHCU99900016](#) ●● LHC TUNNEL, POINT 1 TO POINT 4 - AIRFLOW VENTILATION SECTORS LIMITS
- [LHCLJG_0003](#) AA ●● SCHEMATIC LAYOUT - POINT 1
- [LHCLSX_0001](#) AH ●● LAYOUT OF LSS - IR1 LEFT, CELLS C11 L1 TO C7 L1
- [LHCLSX_0002](#) AH ●● LAYOUT OF LSS - IR1 RIGHT, CELLS C11 R1 TO C7 R1
- [LHCF32000001](#) AC ●● FLUID DISTRIBUTION SCHEME - SECTOR 1.2
- [LHCF33000002](#) AD ●● FLUID DISTRIBUTION SCHEME - SECTOR 8.1
- [LHEM_1001](#) AF ●● S/STATION SE18 - 18KV, 3.3KV, LV SINGLE LINE DIAGRAM
- [LHCU31900012](#) AB ●● IT-2659/ST/LHC - ATLAS - 3199
- [LHCLJG00004](#) AA ●● QRL & UNDERGROUND CAVERNS - POINT 1 LEFT - RE12 & RR13
- [LHCLJG00005](#) ●● QRL & UNDERGROUND CAVERNS - POINT 1 LEFT - U112
- [LHCLJG00006](#) ●● QRL & UNDERGROUND CAVERNS - POINT 1 LEFT - RT12
- [LHCLJG00007](#) ●● QRL & UNDERGROUND CAVERNS - POINT 1 LEFT - U113 & U114

Workview visualisation
3D model

Integration approbation

RR13

Tableau RR13

Etudes d'intégration RR13

Etude implantation pot romain

Reference Plans COD

17-0	LHCEY	1024C
	LHCEBF	1020
	LHCEBL	1020
	LHCEB	1010
	LHCEE	1013
	LHCEE	1021
	LHCENV	1019
	LHCU3000004	
	LHCU34100004	
	LHCU31820063	
	LHCJRR130005	
	DIFFERS	
	LHCLSX_00001H	

User: MUTTONI

ion document for RR13
the Bault, Yvon Muttoni
Preserving Parameters
2003-06-26

en arguments

o candle | Notify | Become Owner

RR13

C:BAULT le 26/02/2004

May 6th, 2004

Y. Muttoni - J.P. Corso TS Workshop Archamps

Integration and Installation

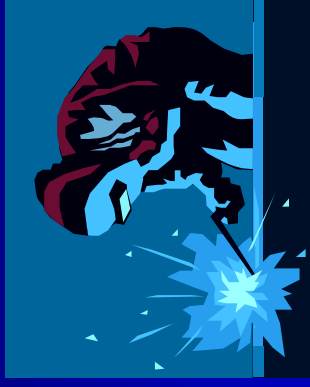
Study phase



3D models



Installation drawings



Installation



Installation verification





Integration and Installation: Non-conformities (INC)

Installation non-conformity?

- ❖ **Disrespect of technical specification**
- ❖ **Lack of space limiting future installations**

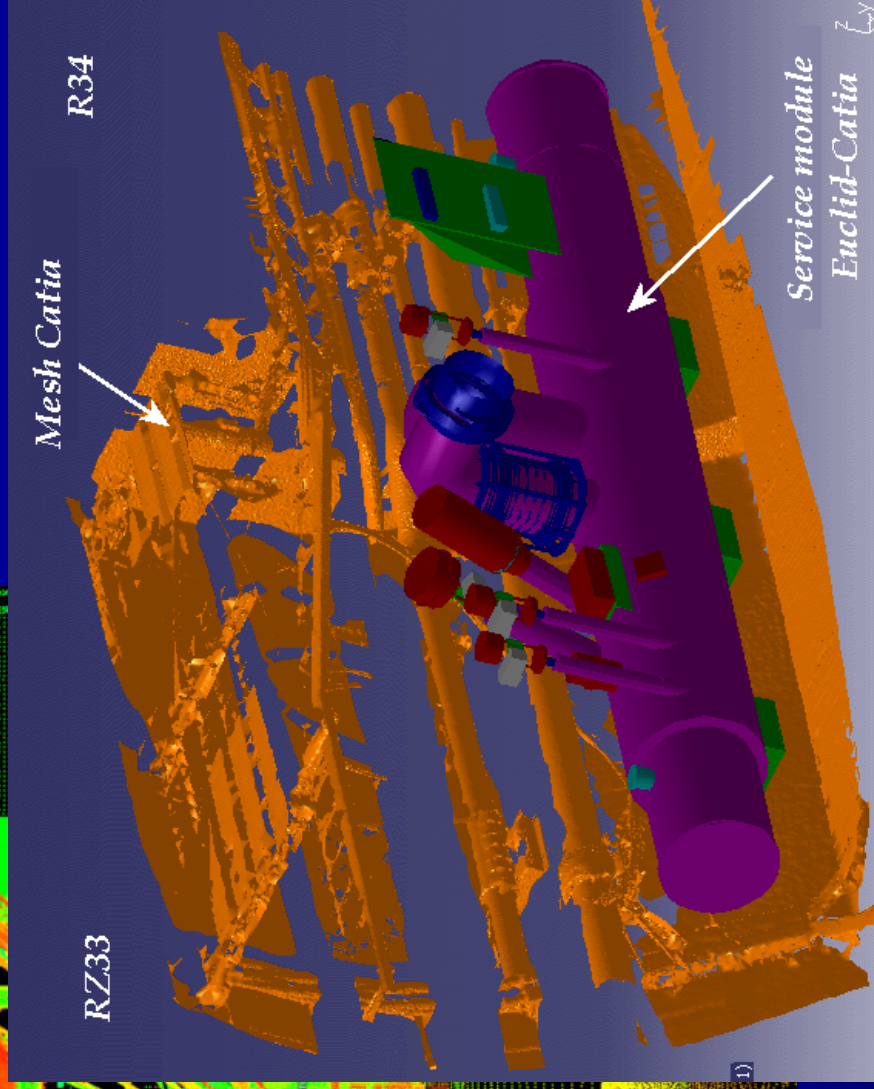
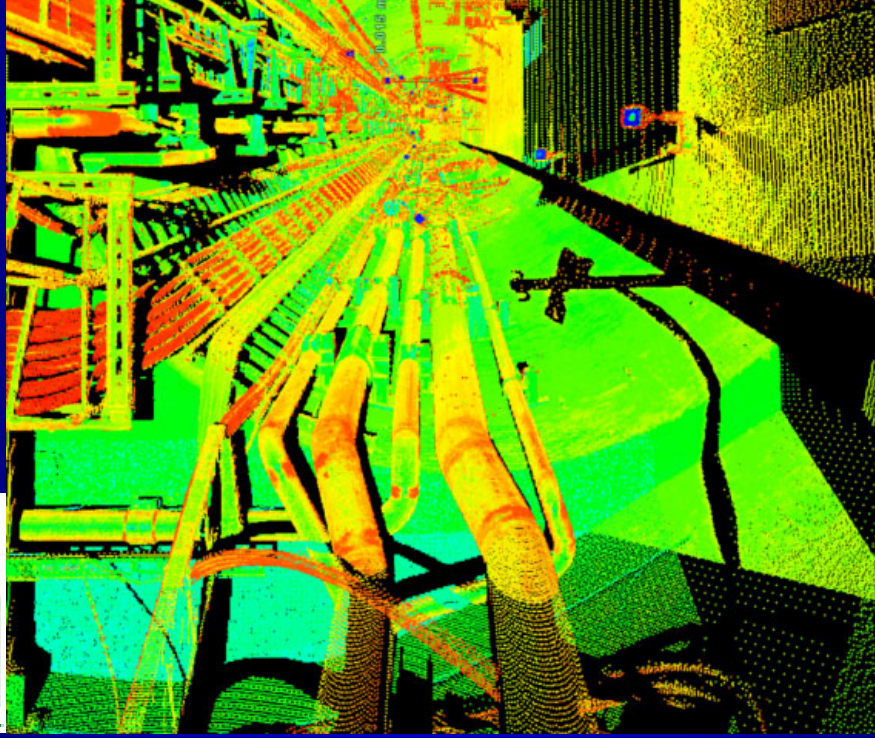
At the beginning of 2004, the IN Section was asked to follow-up these non-conformities.



Integration and Installation: Non-conformities (INC)

- ◆ **Pre-reception of each service carried out with project engineer and the users.**
- ◆ **Integration checking:**
 - Inside the machine, with ICL site preloaded on laptop.
 - In the design office, the laser scan of already installed equipment (cloud of points supplied by TS-SU) is checked against the theoretical 3D models of future systems.

Integration and Installation: Non-conformities (INC)



Integration and Installation: Non-conformities (INC)

Study phase



3D models



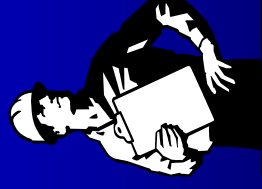
Installation drawings



Installation



Installation verification



I.N.C. creation





Installation Nonconformity Report

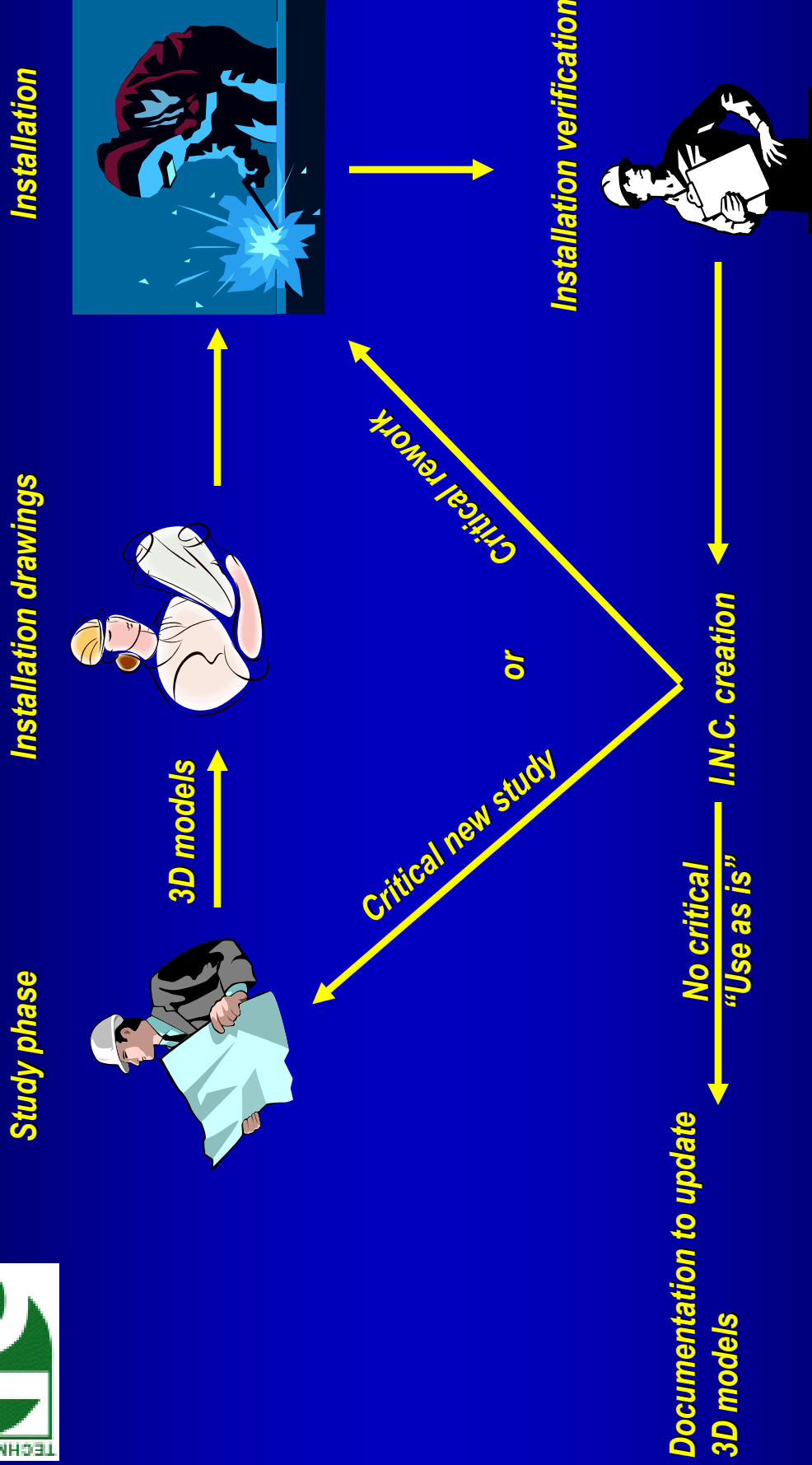
1	IDENTIFICATION OF THE EQUIPMENT(S) or SERVICE(S) Equipment(s) or service(s)	Part ID
Charpente		
2	LOCATION OF THE EQUIPMENT(S) or SERVICE(S) Building - Cavern - Tunnel	Exact location - D cum
RR13		
3	OTHER IDENTIFICATION	
Identified by: Y. Muttoni - J.P. Corso Date: 10.12.2004		
Project engineer: D. Parchet Test procedure no:		
Contractor: Contract no:		
4	FOUND DURING WHAT ACTIVITY	
<input checked="" type="checkbox"/> Incoming inspection <input type="checkbox"/> Final inspection		
<input type="checkbox"/> In-process inspection <input type="checkbox"/> Other:		
5	DESCRIPTION OF NONCONFORMITY (use continuation page if necessary)	
Poteau installé dans la zone transport		
6	IMPORTANCE	
<input type="checkbox"/> Non critical <input checked="" type="checkbox"/> Critical		
7	DISPOSITION	
<input type="checkbox"/> Use-as-is <input type="checkbox"/> Repair <input type="checkbox"/> Reject <input checked="" type="checkbox"/> Rework <input type="checkbox"/> Return to supplier		
Description of proposed action (use continuation page if necessary)		



DESCRIPTION OF THE NONCONFORMITY (continuation page)

DESCRIPTION OF PROPOSED ACTION (continuation page)

Integration and Installation: Non-conformities (INC)





Integration and Installation: Non-conformities (INC)

Registration in M.T.F. to follow-up status INC

MTF (Manufacturing Tool Follow-up) Equipment Management Folder

Home | Help | EDMS site | News | Login

User: MUTTONI

Search : [Equipment](#) | [Location](#) | [Slot](#)

Custom Report

Created on Tuesday, 2004-4-27 for MUTTONI

NCRs on locations

Report on NCRs

Showing only NCR with status different than "Closed" and "Cancelled".

Location	NGR document	Doc title	Doc keywords	NGR status	Document description
RR13	▶ 455408 (ver. 1)	INC Electricite RR13	use as is	Initiated	Cable 18kV: descente sur transfo non conforme au modèle 3D (voir photo 1).
RR13	▶ 450990 (ver. 1)	INC Tuyauterie RR13	critical	Initiated	Tuyauteries eau déminéralisée au-dessus des amenées de courant DFBA, empêchant le câblage de celles-ci. T.
RR13	▶ 450991 (ver. 1)	INC Tuyauterie RR13	critical	Initiated	Piquage + vannes eau refroidissement dans le volume réservé aux racks.
RR13	▶ 450992 (ver. 1)	INC Electricité RR13	critical	Initiated	A vérifier si la gaine de ventilation ne masque pas l'éclairage.
RR13	▶ 450993 (ver. 1)	INC Génie civil RR13	critical	Initiated	Purges génie civil non présentes dans modèle 3D. A vérifier interférence éventuelle avec la gaine de ventilation.
RR13	▶ 450994 (ver. 1)	INC Electricité	use as is	Initiated	Coffret non présent dans modèle 3D (voir photo 1). Echelle au-dessus transfo non présente dans modèle 3D (v
RR13	▶ 450995 (ver. 1)	INC Electricité	use as is	Initiated	Présence d'interrupteurs + petite échelle à câbles, non présents dans modèle 3D.
RR13	▶ 450996 (ver. 1)	INC Transport	use as is	Initiated	Monorail présentant un décalage entre RI131-132 et RR13. Ce décalage (environ 100mm vers extérieur machine

CERN - European Organization for Nuclear Research

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Who

Activity

Report

EDMS

Integration and Installation Non-conformities (INC)

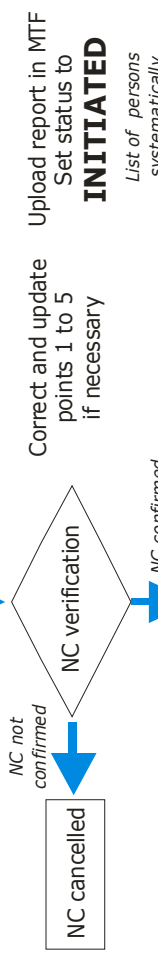
Originator

INC coordinator

NC detected

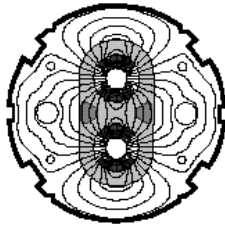
Fill-in INC report

Create document
Doc type: Report
Activity: Non conformity



RED

CERN
CH-1211 Geneva 23
Switzerland



the
Large Hadron Collider
project

LHC Project Document No.
LHC-PM-QA-612.00 rev 1.0

CERN Div./Group or Supplier/Contractor Document No.
-

EDMS Document No.
449754

Date: 2004-03-033

Quality Assurance Instruction

INSTALLATION NON CONFORMITIES REPORTING



GREEN ACTION UNDERWAY

INC on instructions of Project Engineer

May 6th, 2004

Corrective and preventive actions completed

Fill-in point 11

Change status to **CLOSED**

GREY



Many thanks for your attention...