

Consolidation of East Area and North Area

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with the input from the groups/IEFC presentations



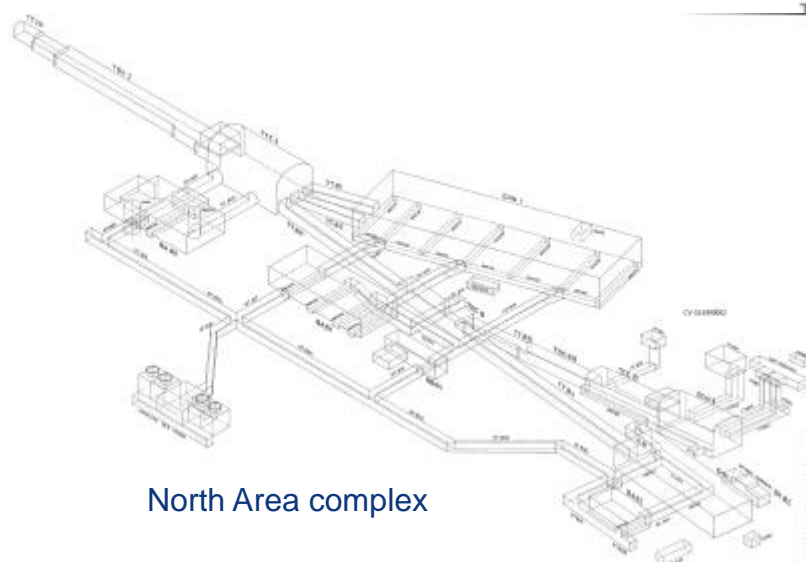
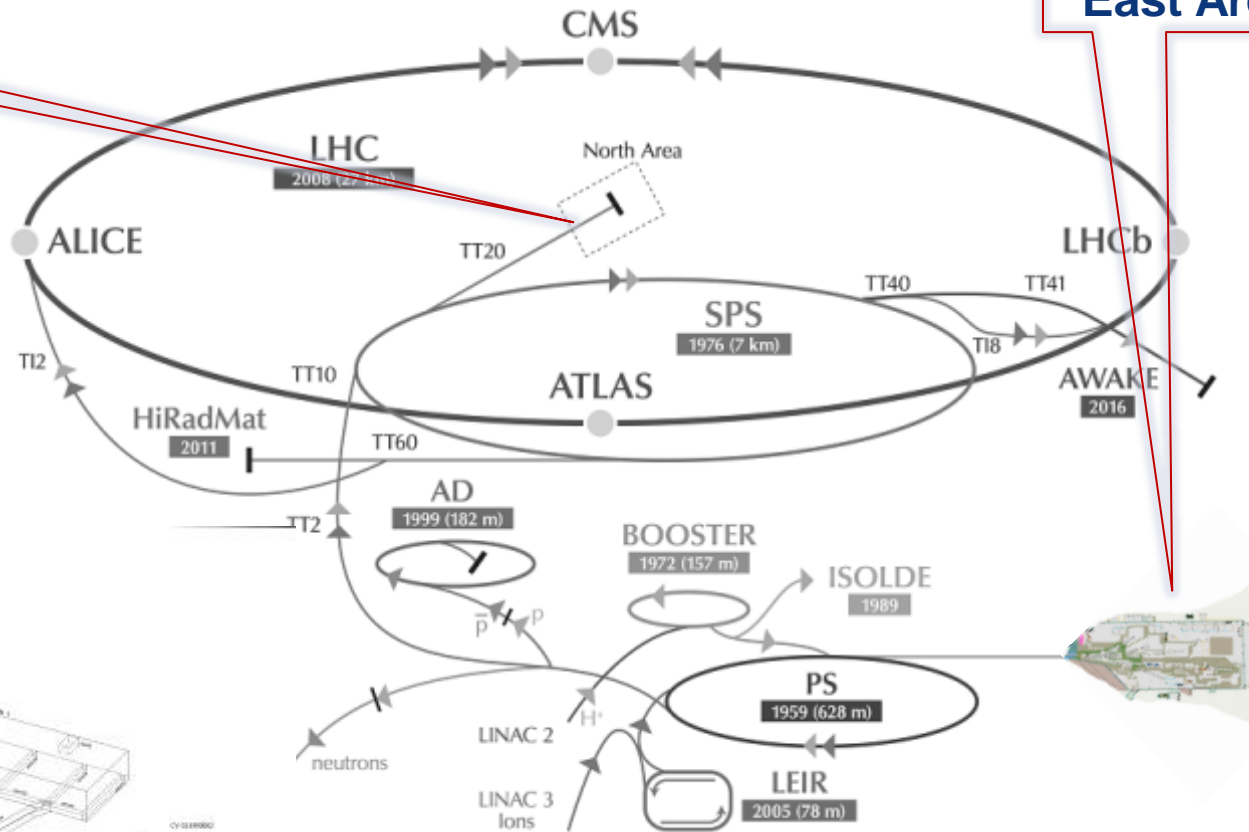
East Area and North Area

since 1964
4 beam lines – 0.3 km

North Area

Operational since 1978
6 beam lines – 5.5 km

East Area

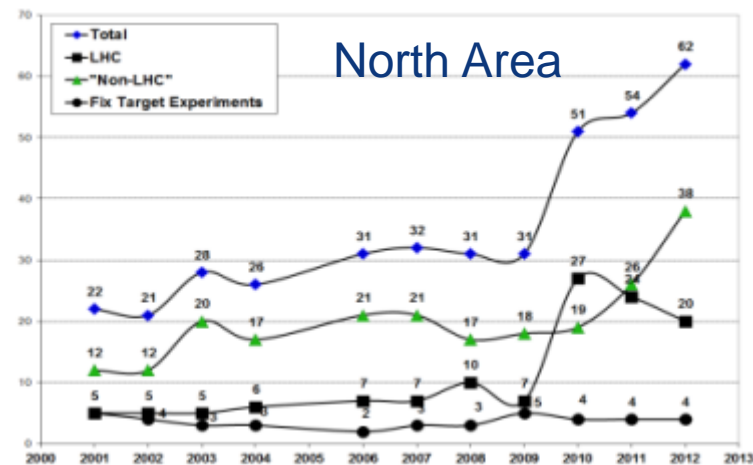


North Area complex

Most pieces date from original installation.

More than hundred beam time slots/year

East Area	2012
Experiments	1
Test beams	48



Secondary beam areas provide highly flexible beam lines

- In the energy range GeV to 100 GeV/charge
- Hadrons (protons, pions, kaons ...), leptons (electrons, muons), ions (primary and fragments)

reliable and stable operation required for optimum use of the injector chain and experimental areas

- Frequent change of beam tunes: every couple of hours
- Change of user configurations on a weekly basis
- All beam lines run in parallel

Systems/Groups

Infrastructure

- Civil engineering (GS-SE)
- Electrical infrastructure (EN-EL)
- Cooling and ventilation (EN-CV)
- Heavy handling (EN-HE)
- Safety systems of general infrastructure (GS-ASE)
- SBA infrastructure (EN-MEF)
- Cryogenics (TE-CRG)
- Pulsed network (EN/EL)

Beam related items

- Warm magnets (TE-MSC)
- Power converters (TE-EPC)
- Machine protection (TE-MPE)
- Intercepting devices (EN-STI)
- SBA beam elements (EN-MEF)
- Instrumentation (BE-BI)
- Radiation protection (DGS-RP)
- Controls (BE-CO)

Impact at distance

Valuable contributions of MME, ICE, ABP, RF, BTS, VSC are not detailed.

Consolidation should take into account future upgrades/changes, e.g. :

- EHN1 extension
- Power saving/delestage
- Comply with updated safety rules

Color coding of priority

considering impact on operation including safety

- Required to effectively operate the machine,
not approved ☒
- Required to effectively operate the machine,
approved ☑
- Lower priority
- Not in consolidation budget (other)

Infrastructure



Infrastructure (1)

STRUCTURAL

- Building structures
 - Particularly roofs, weakest being the **EHN1 roof** (2.2 MCHF), **others** (1.5 MCHF)
- **EHN1 internal structures** (1 MCHF)
 - Refurbish counting rooms
 - Raised floor: common tile size out of standard (500 mm ↔ 600 mm)
 - Conformity of staircases
- **Remove permanent work places: work shop, control rooms**
- **Parking space**
 - several ten users with cars during 24/7 operation
 - partially taken by new buildings (e.g. truck garage, temporary buildings)

Comply with updated safety rules

Infrastructure (2)

OPERATIONAL/PROCEDURAL

- **Heavy handling** (2 MCHF)
 - Cranes (up to 70 tons capacity) et al. (trucks, fork lifts, transpalette) are essential for the daily installation/operation (not only repairs).
- **Access restrictions to underground galleries** (400 kCHF)
- **Lock system of control huts and fenced areas for storage** (40 kCHF)
- Documentation
 - **Safety folder** (300 kCHF)
 - **drawing model** (150 kCHF)
- **Removing widower material (left overs, semi-permanent storage)**
- **Removing obsolete cabling** (a few hundred kChF)

Infrastructure (3)

SUPPLIES

Gas storage and distribution

- Renovation (1.5 MCHF)

Demineralised water supply (2 MCHF)

Ventilation (5 MCHF)

- Ventilations of BA80-82, caverns and transfer tunnels
- Replace NA62 ventilation

Chilled water piping continuously replaced until 2017 (2 MCHF)

Cryogenics:

EHN1: 0.8 MCHF

NA62: 0.2 MCHF

Controls North Area: 0.7 MCHF

storage: 0.5 MCHF

Electric infrastructure

Replace old installations achieving a reliable operation minimising the safety hazard

- Worn out cables
- outdated equipment
- PLC systems, AUG, 48V

HV network for North Area (3.9 MCHF)

LV consolidation (5.9 MCHF)

Take into account the future requests of additional installations.

General safety

Requires safety documentation for coherent approach

- Common approach to safety alarm systems of general infrastructure
 - Gas detection (flammable)
 - ODH detection
 - Fire/smoke detection
 - Alarms
- Access safety systems

2.0 MCHF

Beam related items



NC magnets

	# converters	Age
East Area	50	~50 years
North Area	420	~35 years

- Provide easier access (East Area)
- Refurbish magnets (East Area)
- consolidation of the interlock wiring (North Area), 450 kCHF
- Replace magnets with solid yoke by laminated ones (North Area)

- Establish IPx conformity: protective covers

- Zero-field detection system (safety element) to be replaced

- define responsibility for DC cabling from power converters to magnets

- Machine Interlock Systems
 - WIC: 1300 kCHF
 - BIS not foreseen, but possible

Power converters

- At the present stage, the reliability of the power converters is just acceptable.
- High age suggest further degradation to be expected.

	# converters	Age	Budget
East Area	30	~50 years	4 MCHF
North Area	270	~35 years	20 MCHF

- At least 5 years lead-time to installation.

Beam instrumentation

Essential for beam operation like the experiments

- TBIU/TBID renovation (North Area): 0.2 MCHF)
- Consolidation of electronics (500kCHF)
- Consolidation of MWPC (profile chambers): 200 kCHF

SBA beam elements

- Vacuum (750 kCHF)
 - Controls and hardware: shared responsibility between TE-VSC, EN-ICE and EN-MEF
- Lifting and scanning tables (350 kCHF)
- Mechanics of the beam instrumentation (0.3 MCHF)
- Remove obsolete cabling (few 0.1 MCHF)
- EHN1 already free from ring network (LAN)

shared responsibility between STI and MEF:

- Intercepting devices
 - North Area:
 - Mechanics (MEF, 1 MCHF)
 - Controls (STI)
 - East Area:
 - Replace 2-jaw collimators (East) 0.8 MCHF
 - controls (STI)
- TCC2/TDC2 consolidation completed in 2013/14 (2 MCHF)

Controls

- Beam control software (CESAR)
- Public Address

Radiation Protection

- Radiation monitoring
 - East Area
 - North Area (1.5 MCHF)

Summary report

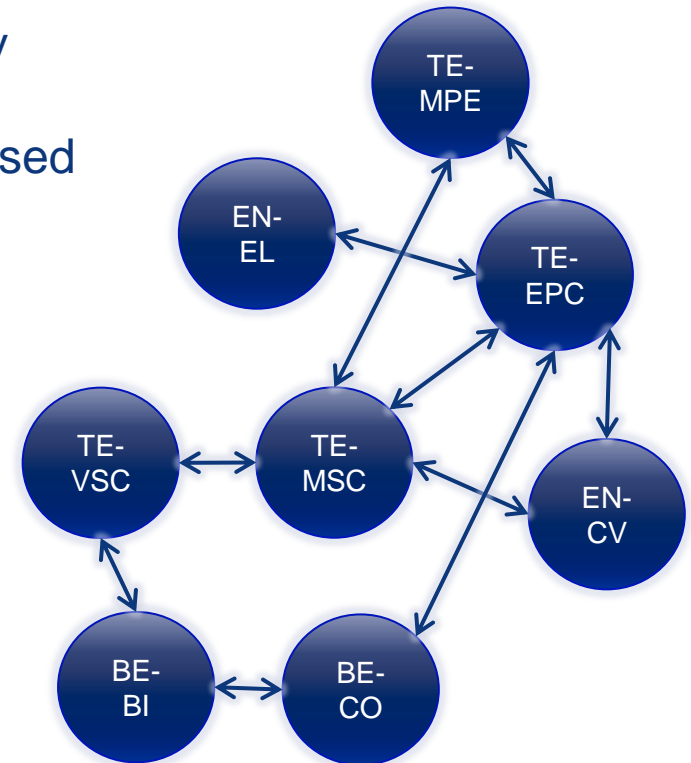
- Including a risk assessment and budgeting

S	Est	Prog	Status	Wkt No	Total K€	Building	Work or spend Unit description	Comments	Probability of fail	Impact on safety	Impact on env	Impact on rad	Impact on cost	Impact on time	Impact on quality	Impact on other	Budget	2011	2014	2015	2016	2017	2018	2019	2020	2021			
155	EN	EN-CV	Not approved	CV 54	50	BAR1	Revision of motor pumps		4																				
156	EN	EN-CV	Not approved	CV 55	50	BAR2	Revision of motor pumps		4																				
157	EN	EN-CV	Not approved	CV 56	75	NA	Consolidation of the ramp-pumps		4																				
158	EN	EN-CV	Not approved	CV 57	200	TOC2/TOC	RR2 new control													200									
159	EN	EN-CV	Not approved	CV 58	250	TOC2/TOC	New air duct (extraction)													250									
160	EN	EN-HE	Not approved	HE 01	60	RR7 (ENR1)	Crane PR-0179 replacement		3	1	1	1	1	3															
161	EN	EN-HE	Not approved	HE 02	300	RR7 (ENR1)	Crane PR-0534 reworking		3	3	3	3	1	9															
162	EN	EN-HE	Not approved	HE 03	275	RR8 (TOC2)	Crane PR-0537 reworking	Renown in	4	2	3	2	1	12															
163	EN	EN-HE	Not approved	HE 04	300	RR7 (ENR1)	Crane PR-0538 reworking		3	2	3	3	1	9															
164	EN	EN-HE	Not approved	HE 05	300	RR8 (ENR1)	Crane PR-0539 replacement		3	2	3	3	1	9															
165	EN	EN-HE	Not approved	HE 06	20	RR8 (TOC2)	Crane PR-0544 replacement		3	2	2	1	1	6															
166	EN	EN-HE	Not approved	HE 07	100	RR8 (ENR1)	Crane PR-0545 replacement		3	2	2	2	1	6															
167	EN	EN-HE	Not approved	HE 08	35	RR7 (ENR1)	Crane PR-0550 replacement		3	2	2	1	1	6															
168	EN	EN-HE	Not approved	HE 09	20	RR7 (ENR1)	Crane PR-0552 replacement		3	1	2	1	1	6															
169	EN	EN-HE	Not approved	HE 10	300	RR3 (TOC2)	Crane PR-0561 reworking		3	2	2	3	1	9															
170	EN	EN-HE	Not approved	HE 11	50	TOC2/TOC	TIM TOC2 (variable technical inspection module)																						
171	EN	EN-MEP	Not approved	MEP 01	50	TOC2/TOC	General safety systems																						
172	EN	EN-MEP	Not approved	MEP 02	75	RR7 (ENR1)	Lifting table hydraulic systems for beam dumps		3	2	1	1	1	6															
173	EN	EN-MEP	Not approved	MEP 03	100	BeamLines	Full renovation of all coolers in SBA (incl spares)		3	2	1	1	1	6															
174	EN	EN-MEP	Not approved	MEP 04	750	BeamLines	Beam vacuum in SBA	From the 20	3	2	1	1	1	6															
175	EN	EN-MEP	Not approved	MEP 05	750	BeamLines	Beam obstacles in SBA	From the 20	3	2	1	1	1	6															
176	EN	EN-MEP	Not approved	GS 01	200	RD7	Renovation of gas system in building		3	2	1	1	1	6															
177	EN	EN-MEP	Not approved	GS 02	200	RD8 (RD8L1)	Renovation of gas system in building		3	2	1	1	1	6															
178	EN	EN-MEP	Not approved	GS 03	200	RD8 (RD8L1)	Renovation of gas system in building		3	2	1	1	1	6															
179	EN	EN-MEP	Not approved	GS 04	200	RD8 (RD8L1)	Renovation of gas system in building		3	2	1	1	1	6															
180	EN	EN-MEP	Not approved	GS 05	400	RR7 (ENR1)	Renovation of gas networks		2	2	1	1	1	4															
181	EN	EN-MEP	Not approved	GS 06	200	RR8 (ENR1)	Renovation of gas networks		2	2	1	1	1	4															
182	EN	EN-MEP	Not approved	GS 07	200	BCN3	Renovation of gas networks		2	2	1	1	1	4															
183	EN	EN-IT	Not approved	IT1 01	200	TOC2/TOC	Production target upgrade																						
184	EN	EN-IT	Not approved	IT1 02	400	TOC2	Colimator		3	2	2	2	2	6															
185	EN	EN-IT	Not approved	IT1 03	400	TOC2	Spine collimator		1	1	2	2	2	2															
186	TE	TE-MSC	Not approved	MSC 01	250	TOC2/TOC	Vacuum chambers replacement + new ion pumps																						
187	BE	BE-IT	Not approved	IT 01	250	TOC2	Replace the 6 TRSA/TRE for TRS	Radon zones																					
188	TE	TE-MSC	Not approved	MSC 01		BARD	Modification Rack cable clamp rail		4	1	3	1	5	18															
189	TE	TE-MSC	Not approved	MSC 02	180	BARD	Renovation Rack interlock		1	1	3	2	1	8															
190	TE	TE-MSC	Not approved	MSC 03	220	BARD1	Renovation Rack interlock		1	1	3	2	1	8															
191	TE	TE-MSC	Not approved	MSC 04	60	BARD2	Renovation Rack interlock		1	1	3	2	1	8															
192	TE	TE-MSC	Not approved	MSC 05	9	TOC2	Replacement Electrovalve		2	1	1	1	1	6															
193	TE	TE-MSC	Not approved	MSC 06	9	TTB1	Replacement Electrovalve		2	1	1	1	1	6															
194	TE	TE-MSC	Not approved	MSC 07	9	TTB2	Replacement Electrovalve		2	1	1	1	1	6															
195	TE	TE-MSC	Not approved	MSC 08	9	TTB3	Replacement Electrovalve		2	1	1	1	1	6															
196	TE	TE-MSC	Not approved	MSC 09	9	TTB4	Replacement Electrovalve		2	1	1	1	1	6															
197	TE	TE-MSC	Not approved	MSC 10	9	TTB5	Replacement Electrovalve		2	1	1	1	1	6															
198	TE	TE-MSC	Not approved	MSC 11	10	ENR1	Replacement Electrovalve		2	1	1	1	1	6															
199	TE	TE-MSC	Not approved	MSC 12	4	ENR2	Replacement Electrovalve		2	1	1	1	1	6															
200	TE	TE-MSC	Not approved	MSC 13	10	TOC/BCN3	Replacement Electrovalve		2	1	1	1	1	6															
201	TE	TE-MSC	Not approved	MSC 14	9	TOC2	Replacement Air return		2	1	1	1	1	6															
202	TE	TE-MSC	Not approved	MSC 15	9	TTB1	Replacement Air return		2	1	1	1	1	6															

- Written report on consolidation and renovation analysis for East and North area is due by end of this year.

Coordinated consolidation for linked system

- Power converters
 - Require consolidation maintaining reliability
- NC magnets
 - Partially operated in DC mode, swap to pulsed
- Electrical network
 - Adapt layout to changed consumption
- Machine protection system
 - In parallel with PC consolidation
- Demineralised water
 - Adapt layout to changed consumption



- With these systems being directly linked it suggests an overall project coordination.

Final remarks

- About 100 MCHF in total
- A large fraction is directly related to power converter/magnet systems
 - require a long lead-time until installation
- Successfully consolidated high priority items in TCC2/TDC2.
- After all consolidation, the Experimental Areas should remain as attractive for researchers as they are today.