



A Safety Overview

HIE-ISOLDE project

Ana-Paula Bernardes EN-STI-RBS

HIE-ISOLDE workshop

Friday 29th of November 2013

General Safety → High Energy part

- Noise
- Magnetic Field
- Pressure Hazard
- Fire Safety
- Seismic
- Safety file
- ODH detection
- Conclusion

General Safety

- **Noise**
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Distance < 100m from CERN
Boundary and offices building

Cern boundary

Offices building

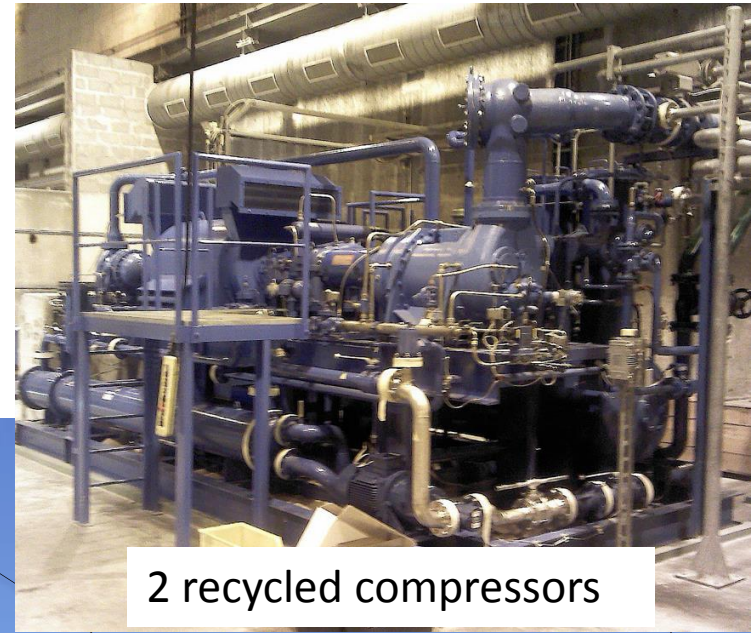
External Noise Sources:



Internal noise Sources:



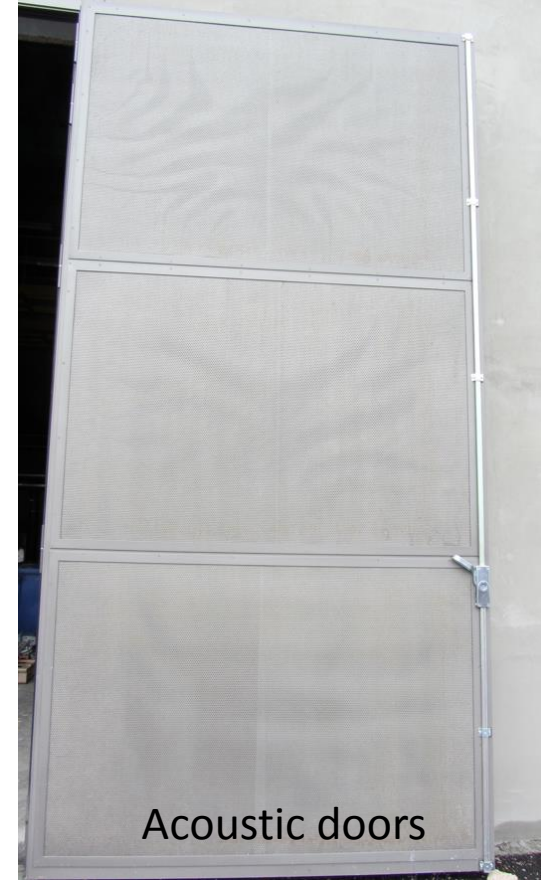
Ventilation units



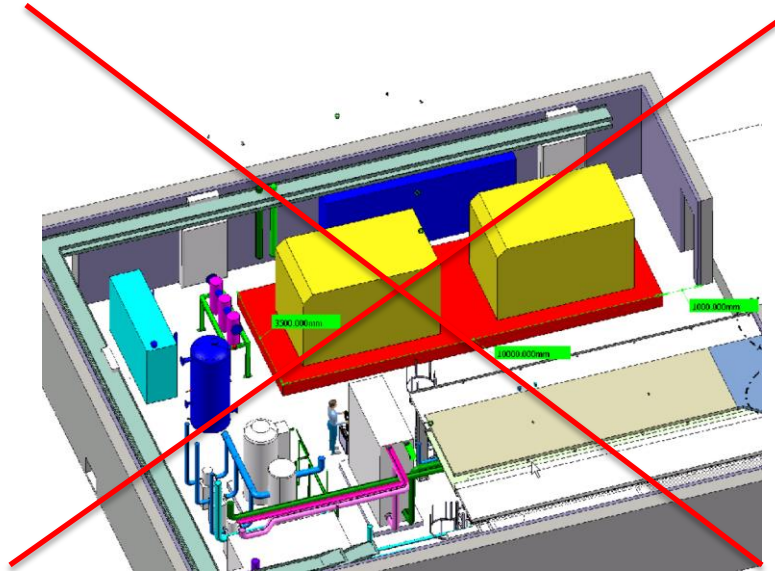
2 recycled compressors



Acoustic treatment for building 198:



Low noise Equipment:

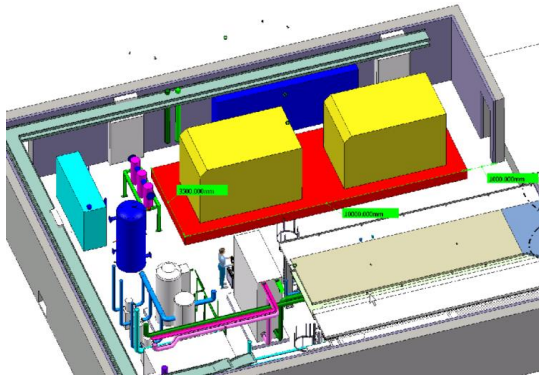


From January 2013

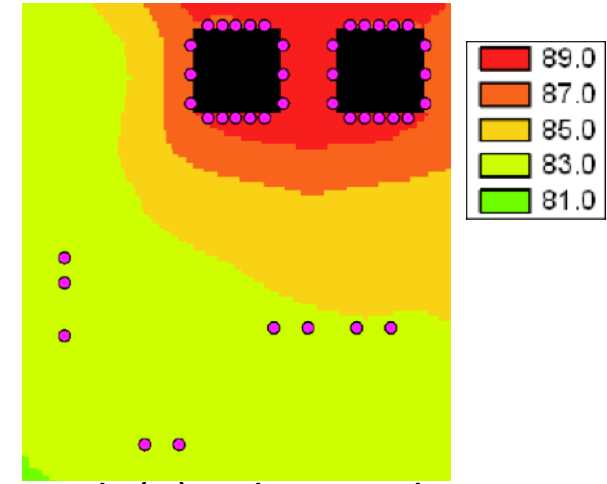
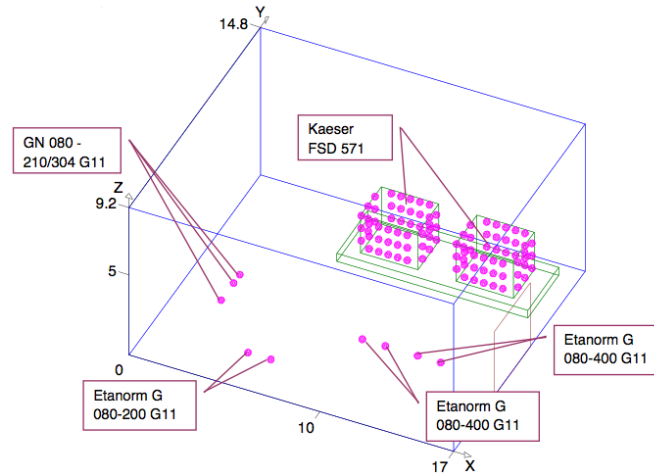


2 recycled compressors

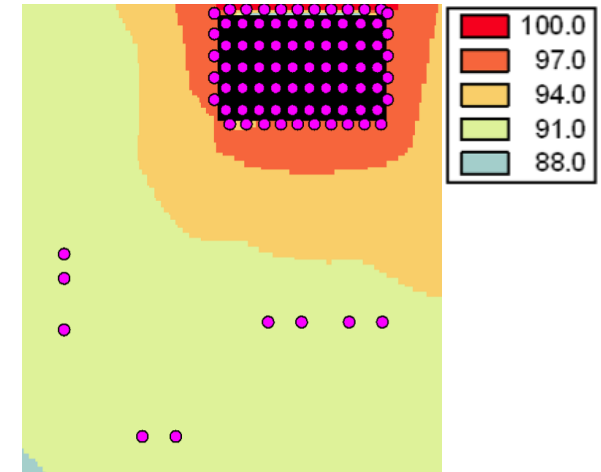
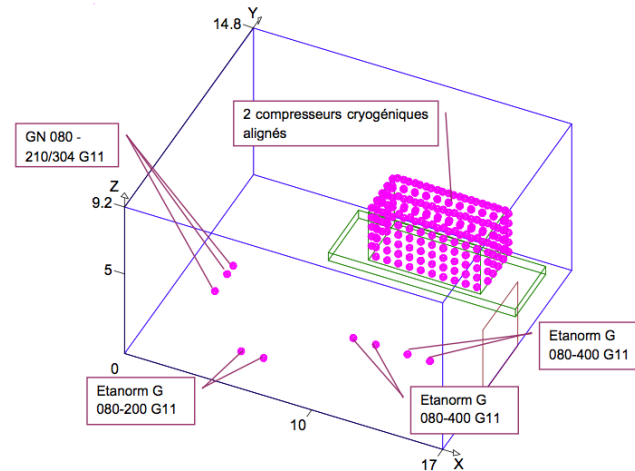
ALEPH compressors \approx 8 low noise compressors



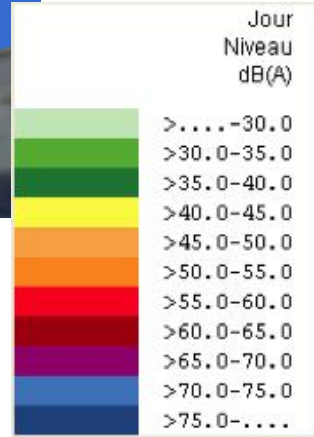
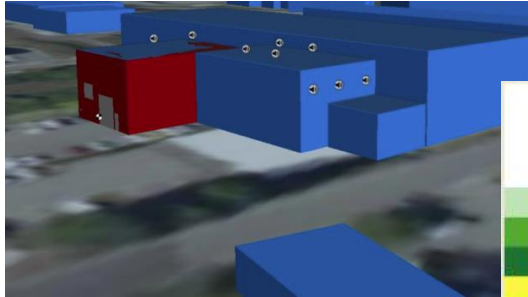
Acknowledgment S.Maridor



>85dB(A) only near the compressors



All building >85dB(A)



Cartographie acoustique à 1.50 m de hauteur



- Noise at CERN boundary complying with the legal value

- Noise at the level of windows office under acceptable tolerance

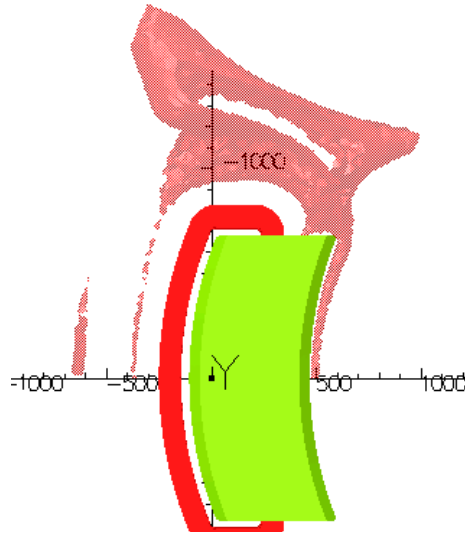
- Difference between simulation and reality will depend on building tightness

General Safety

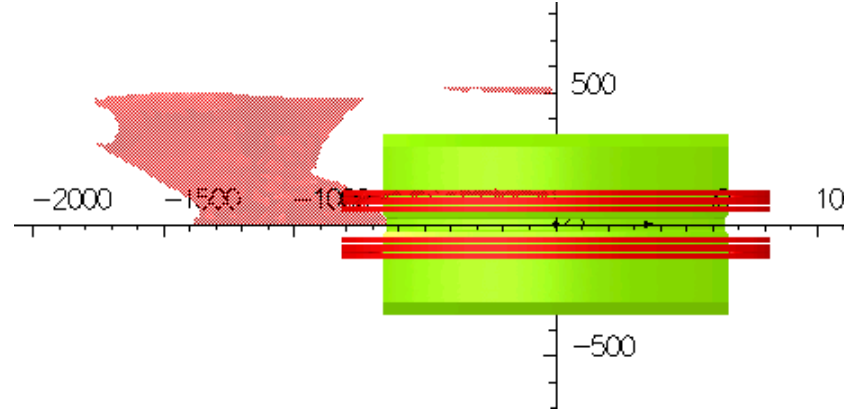
- Noise
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Stray field envelopes
(5 Gauss):

Envelope may be outside model



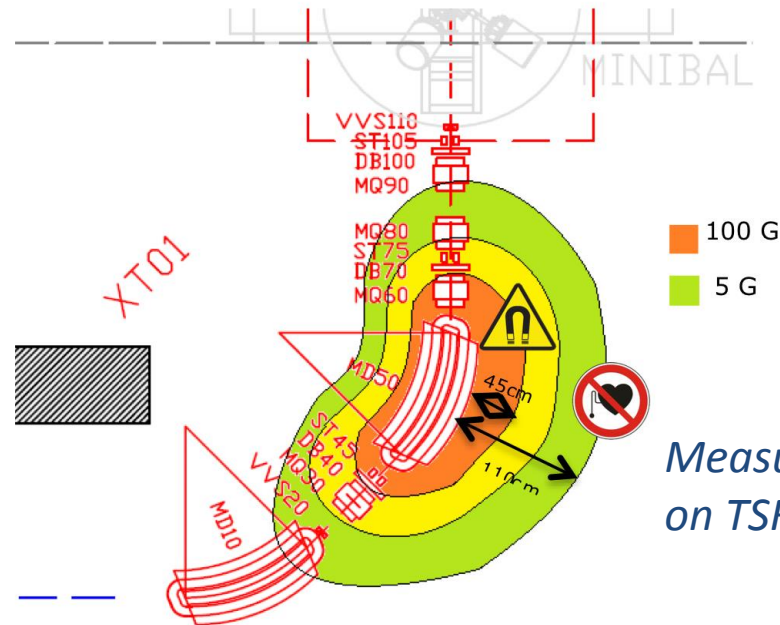
Acknowledgement J.Bauche (TE-MSC)



Stray field Measurements
(Schematic view):

5 Gauss → Limitation for Pacemaker owners

100 Gauss → Limitation for public



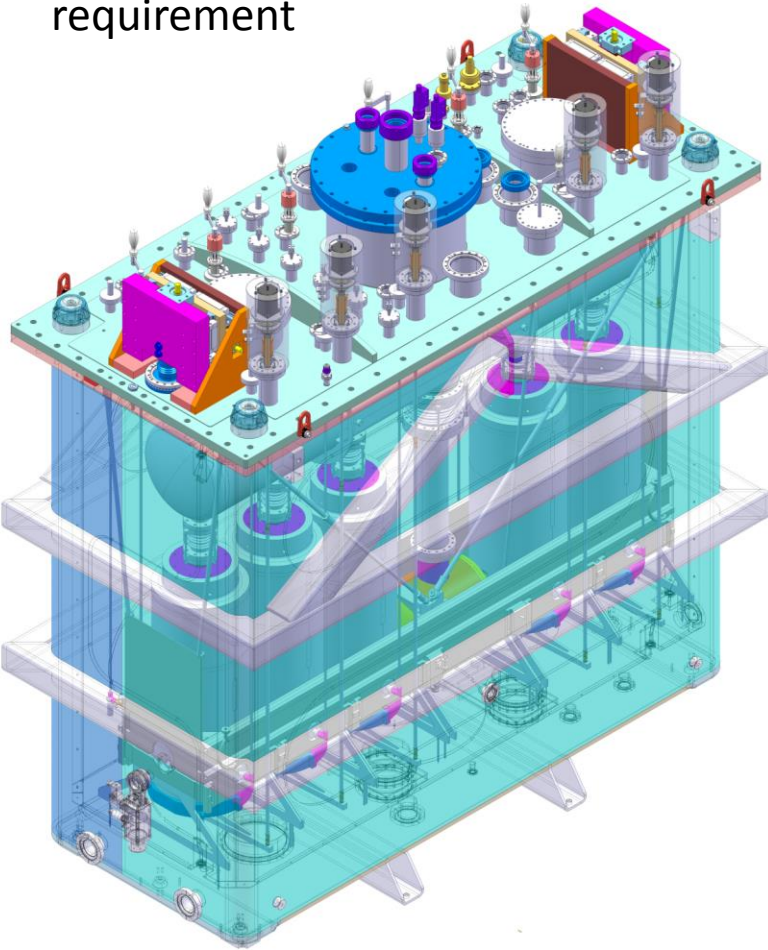
Measurements done on TSR Heidelberg

General Safety

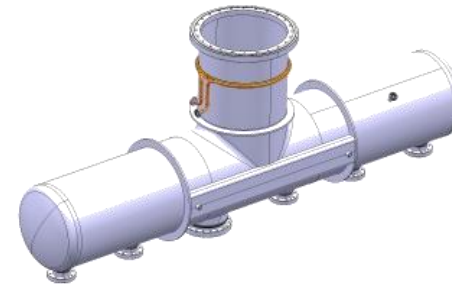
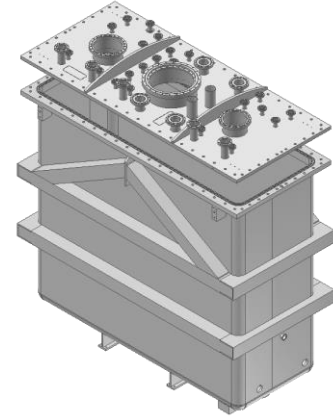
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The HIE-ISOLDE cryomodule has been classified as special equipment [EDMS 1227928](#) by HSE unit following CERN safety rules (GSI-M3)

→ HSE Unit shall verify the compliance of the equipment with the applicable safety requirement

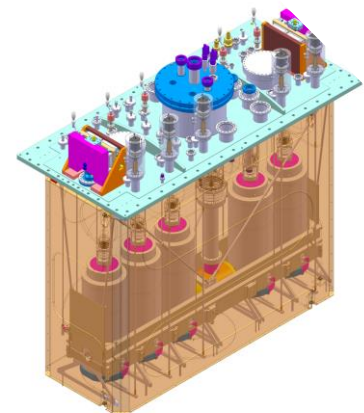


Vacuum insulated vessel
PS <1.5 bar

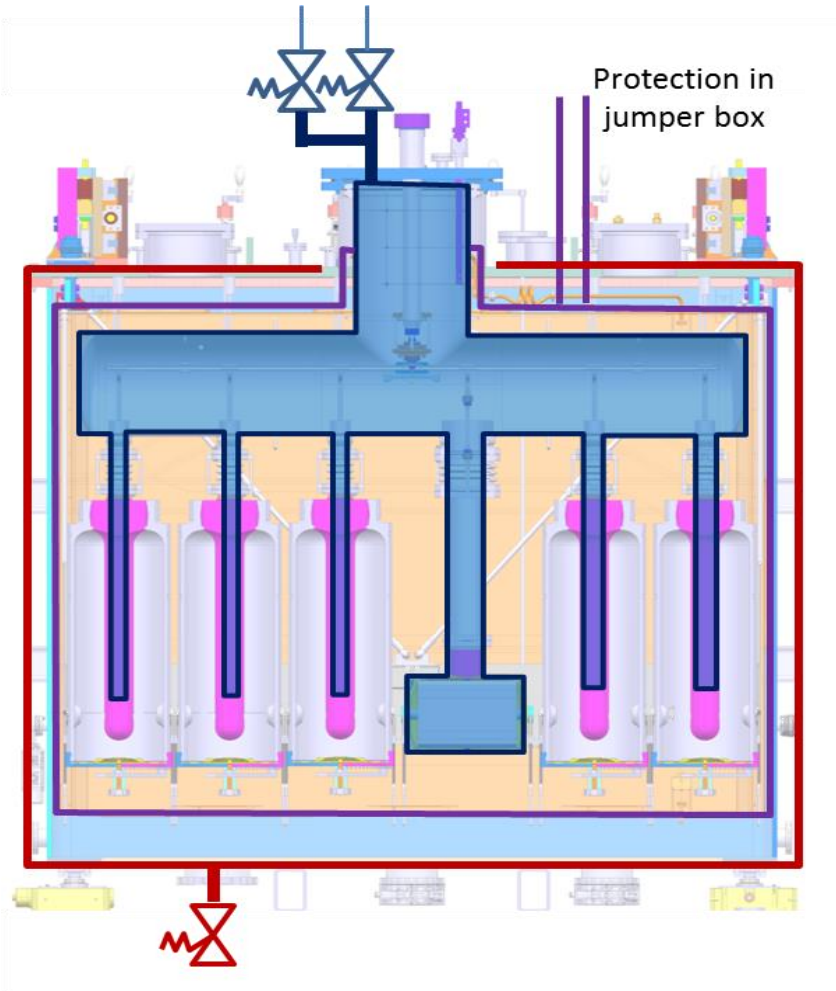


LHe vessel PS 4.5 bar

Design pressure GHe
parts PN 16 bar



Safety relief pressure devices sizing approved:



CERN
CH1211 Geneva 23
Switzerland



EDMS NO.	REV.	VALIDITY
1289883	0.2	DRAFT

REFERENCE
HIE-ACSV-EN-0001

Date : 2013-09-09

Safety valve sizing

Sizing of the safety relief pressure devices protecting the HIE-Isolde cryomodule from over pressure

Abstract:

Following CERN rules and the EN97/23/EC directive, two independent relief pressure devices, sized considering a vacuum break are installed on the helium volume (set pressure 3.5bara ; relief area 25cm²) and one relief pressure device, sized considering the rupture of the biggest bellows of the He circuit is installed on the vacuum vessel (set pressure 1.5bara ; relief area 217cm²). The document presents the study and the calculations.



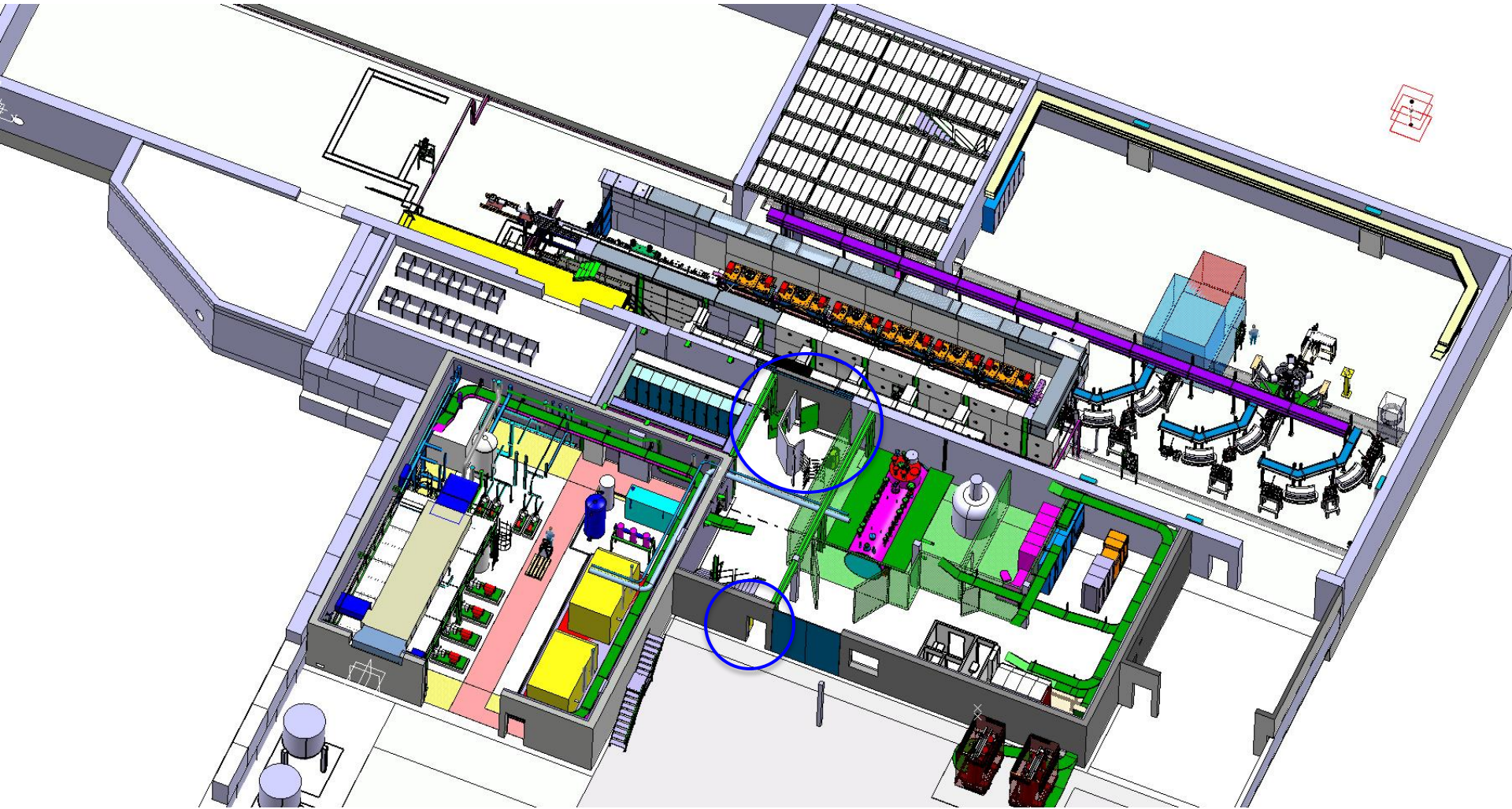
Up-date on going following HIE-ISOLDE safety Review held the 5th of November 2013

Extract from safety valve sizing: EDMS [1289883](#)

Acknowledgment Y.Leclercq TE/MS

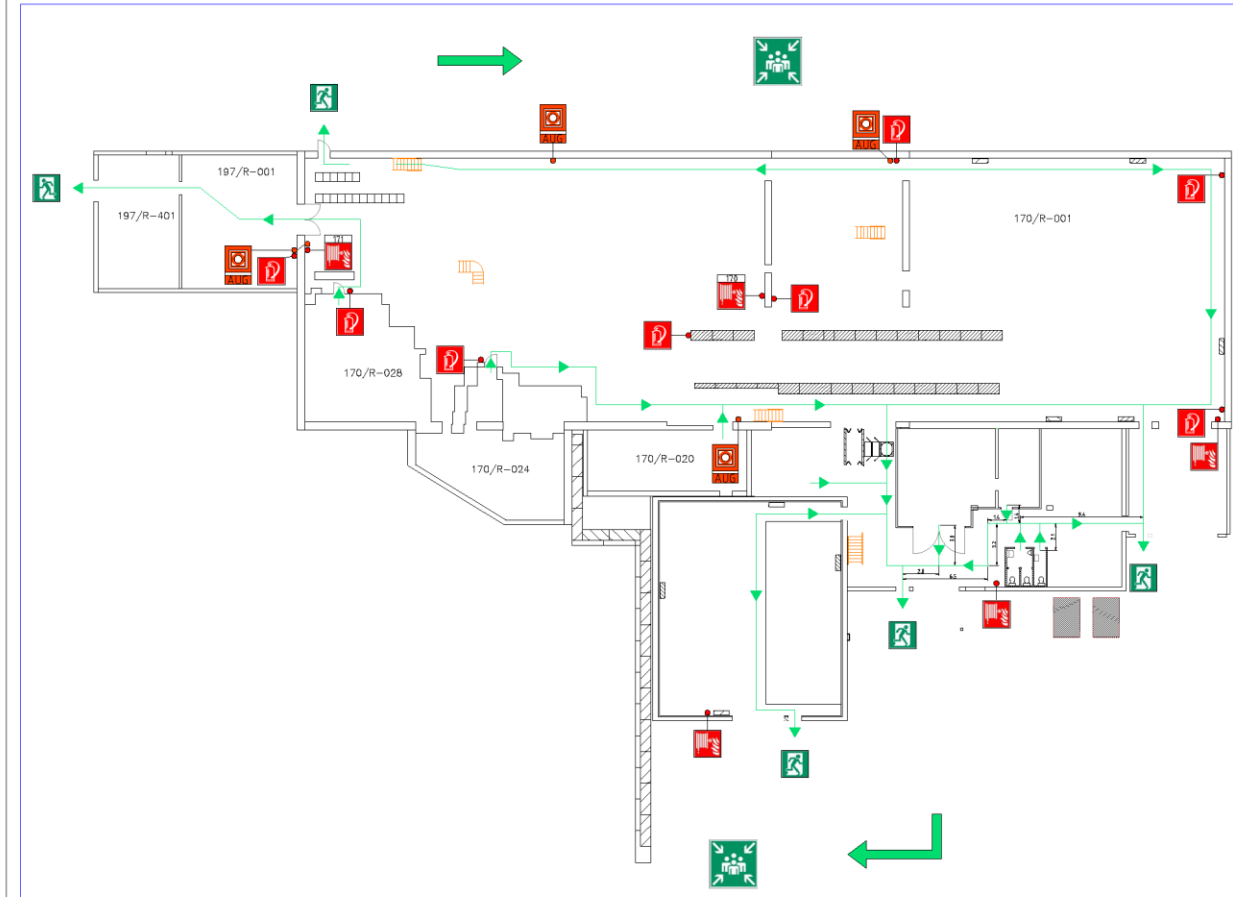
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3 buildings interconnected for escape routes, fire detection, evacuation point of view

EVACUATION PLAN / PLAN D'EVACUATION ISOLDE Building 170 / ISOLDE Bâtiment 170



FIRE / FEU

CALL APPELEZ 74444

Set off the alarm
Déclenchez l'alarme

Start fighting the fire without taking undue risks
Commencez à combattre le feu sans prendre de risques

EVACUATION ALARM SIRENE D'EVACUATION

Secure your workstation without taking undue risks

Sécurisez votre poste de travail sans prendre de risques

Leave the building following the signs
Sortez du bâtiment en suivant le balisage

Go to the meeting point
Allez au point de rassemblement

ACCIDENT

CALL APPELEZ 74444

General emergency stop / Arrêt d'urgence général

Alarm trigger mechanism / Déclenchement manuel d'alarme

Andrea SPANG

Escape routes defined from the beginning of the project – 1m20 pathway – Seen with HSE

Extract from "Escape routes and fire fighting equipment": EDMS [1189202](#)

Acknowledgment A.Spang EN/STI

Building 198:

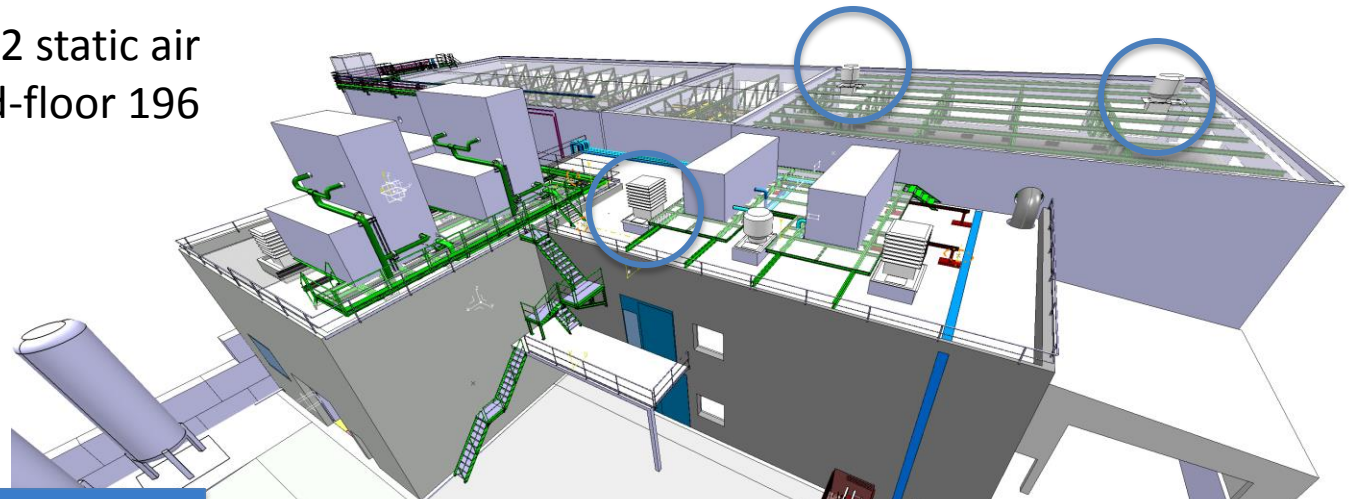
Fire detection + Fire alarm

No smoke extraction only 2 static air extraction (surface ground-floor 196 m²)

Building 170:

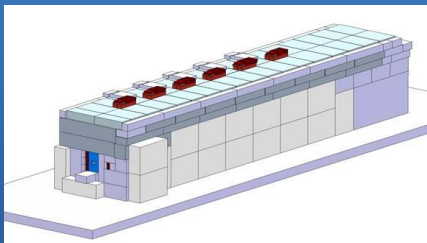
Fire detection + Fire Alarm + Fire extraction possible by Fire-brigade

2 smoke extraction (400°C – 2 hours)



Tunnel

Fire detection + Fire alarm



Building 199:

Fire detection + Fire Alarm + Fire extraction possible by Fire-brigade

1 smoke extraction (400°C – 2 hours)
(surface – 1 floor- surface ground floor 252 m²)

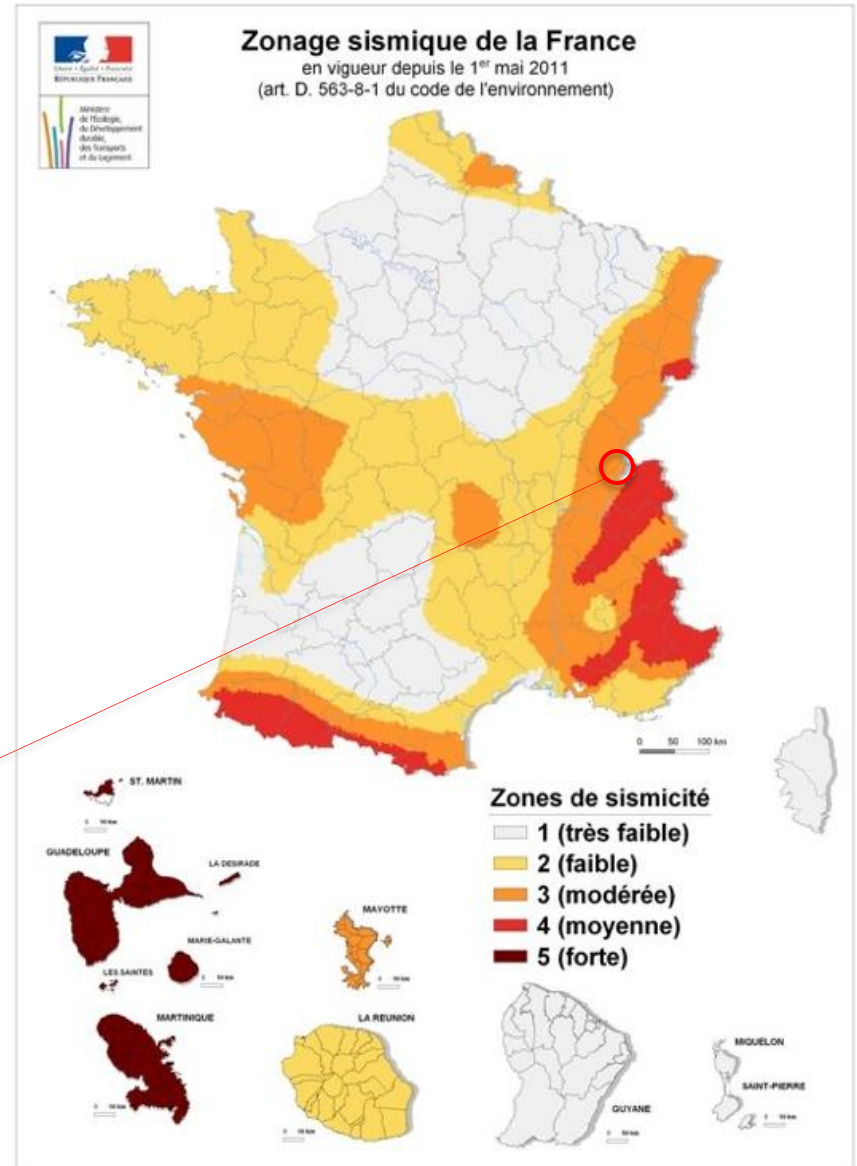
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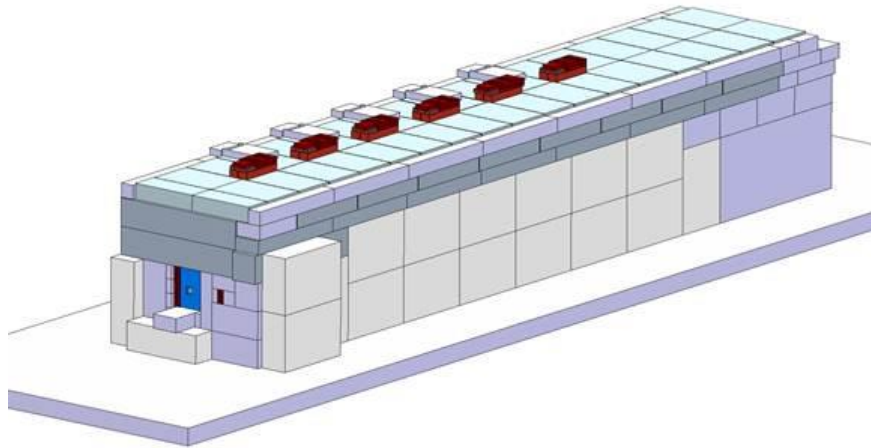
Infrastructure and sensitive equipment shall be designed following CERN Seismic Safety rules:

The French territory is divided in five seismic zones from very low seismicity (seismic zone 1) to strong seismicity (seismic zone 5) – [EDMS 1158454](#)

CERN is classified as seismic zone 3
– Moderate seismic Hazard



HIE-ISOLDE tunnel – Concrete blocks piling structure



- zone de sismicité 3 $a_{gd} = 1.1 \text{ (m/s}^2\text{)}$ (selon arrêté françç
- catégorie d'importance/
classe d'ouvrages II/CO I $\gamma_i = 1.0 \text{ (-)}$ (selon arrêté français/SIA
- classe de sol de fondation E $S = 1.80 \text{ (-)}$ (selon arrêté français)

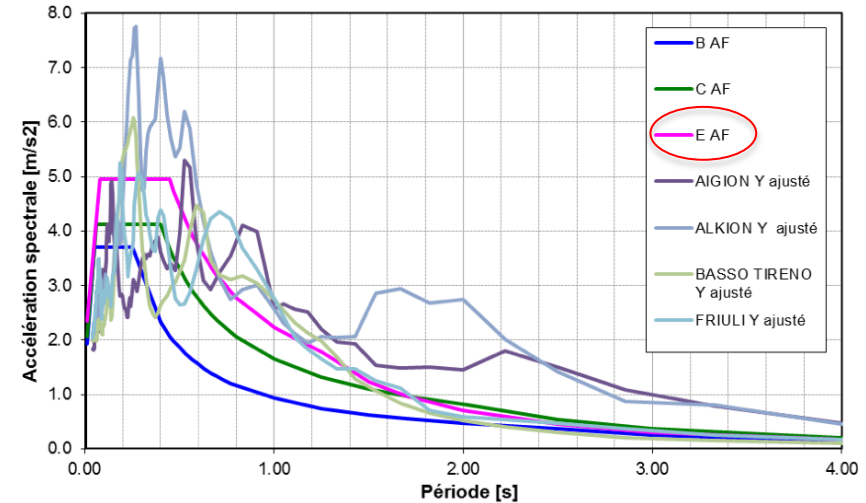
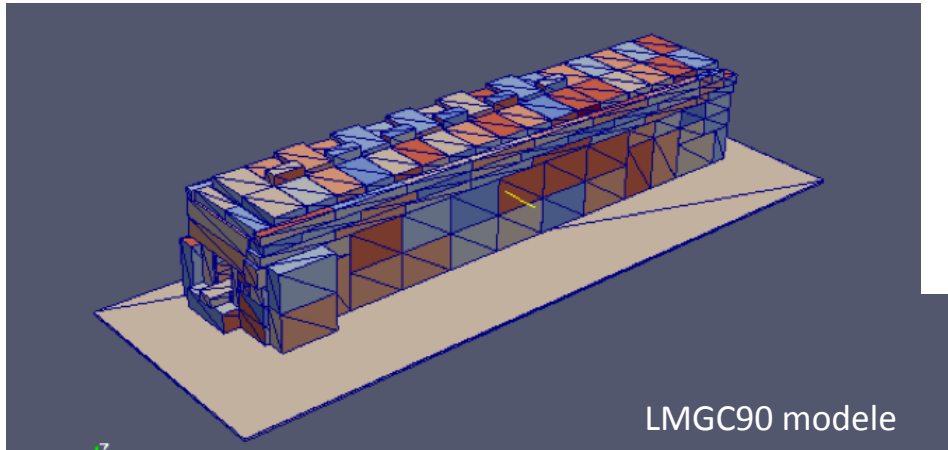
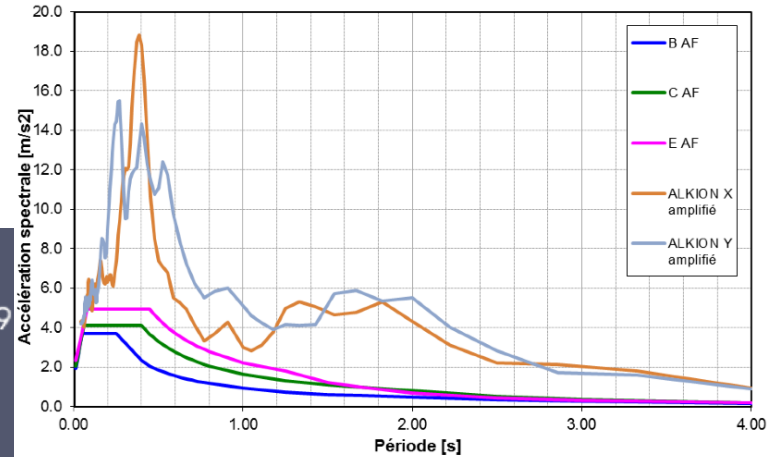


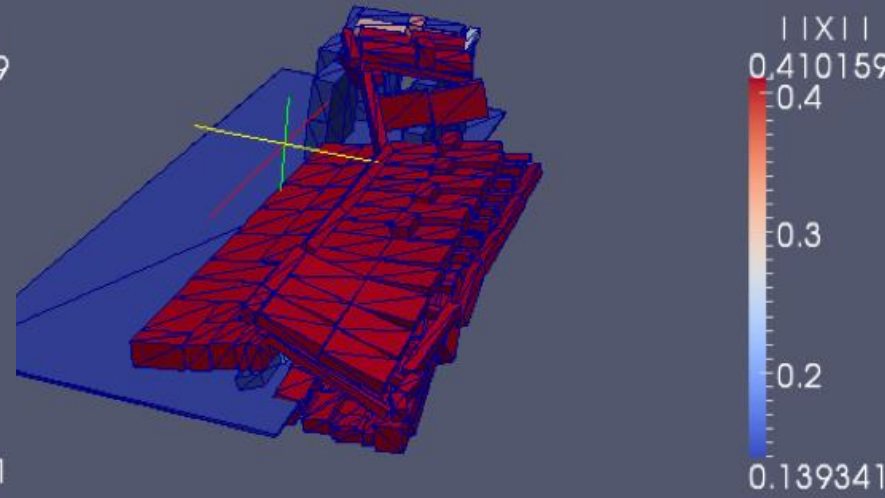
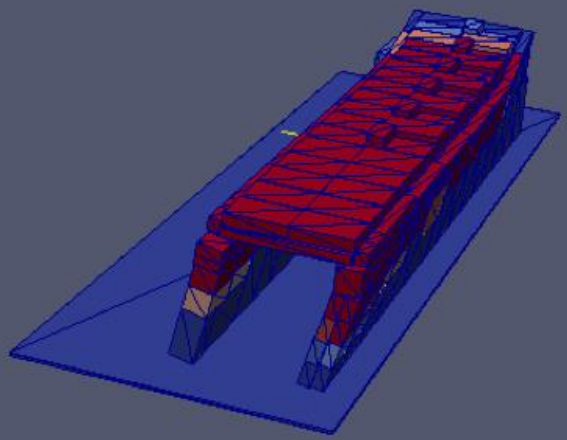
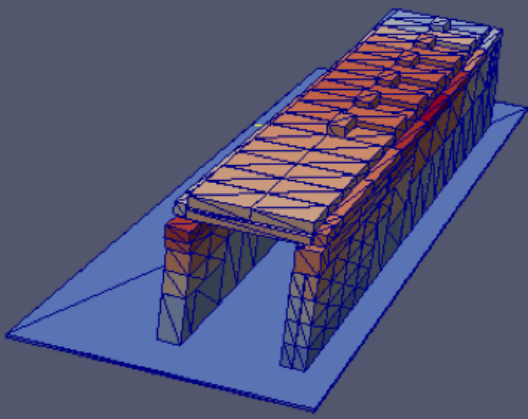
Figure 3 : Spectres de réponse élastiques selon l'arrêté français (AF) du 22 octobre 2010 pour des classes de sol B, C, E et spectres de réponse des séismes enregistrés, ajustés.

→ Minor change on the structure for a seismic type E (few millimeters of move without any impact on the tunnel stability)

→ Study demonstrated that we have a Factor 2 as Safety margin for the stability of the tunnel in case of seismic event



Spectres de réponse élastiques selon l'arrêté français (AF) du 22 octobre 2010 pour des classes de sol B, C, E et spectres de réponse des deux composantes horizontales, du séisme enregistré "Alkion F" amplifié 2 fois.



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HIE-ISOLDE safety file:

- ✓ Descriptive part of HIE-ISOLDE safety file → **Approved by the CSAP** (Complex Safety Advisory Panels)
- ✓ Demonstrative part: well advanced

CERN
CH-1211 Geneva 23
Switzerland

EDMS NO. **000000** REV. **0.0** VALIDITY **DRAFT**

REFERENCE **XXXX**

Date : 201x-xx-xx

SAFETY FILE – DEMONSTRATIVE PART

HIE-ISOLDE safety file

ABSTRACT:

The aim of this document is to provide an inventory of the hazards related to the HIE-ISOLDE facility as well as the assessments of the risks caused by these hazards. The mitigation measures that are taken are exposed too.

This document is not exhaustive and is intended to evolve throughout the life of the installation.

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CERN
CH-1211 Geneva 23
Switzerland

EDMS NO. **1258062** REV. **0.0** VALIDITY **DRAFT**

REFERENCE

EN Engineering Department

Date: 2013-01-24

SAFETY FILE – DESCRIPTIVE PART

HIE-ISOLDE safety file

ABSTRACT:

The aim of this document is to provide a description of the HIE-ISOLDE project which can be separated in four main parts:

- HIE-LINAC (B. 170)
- High Energy Beam Transfer Line - HEBT (B. 170)
- HIE-ISOLDE Compressor building (B. 198)
- HIE-ISOLDE Cold Box building (B.199)

This document is not exhaustive and is intended to evolve throughout the life of the installation.

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DOCUMENT SENT FOR INFORMATION TO:

Acknowledgement: L.Mora Valejo
EDMS [1258062](#)

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Many Safety aspects integrated from the beginning of the project

- Noise:

Acoustic study performed and up-dated all along the project

- Magnetic Field:

Impact on personal limited

- Pressure Hazard:

Safety relief pressure devices designed and validated by HSE

- Fire Safety:

Escape routes, fire detection, fire extraction defined and partially validated by HSE

- Seismic:

Tunnel seismic study performed under official validation

- Safety file

Descriptive part approbation process nearly finished, Demonstrative part on going

- ODH detection defined and approved

→ Radioprotection see presentation S.Giron

→ Cryogenic hazard see presentation from D.Phan

- EN/HDO : Y.KADI
- BE/ABP : F.WENANDER
- BE/OP : R.STEERENBERG, E.SIESLING, D.VOULOT
- BE/RF : M.FRASER
- GS/SE : D.PARCHET, E.PEREZ-DUENAS
- EN/CV : M.BATTISTIN, G.CAMPLONE, E.DA RIVA, P.PEPINSTER, A.POLATO
- TE/CRG : S.CLAUDET, N.DELRUELLE
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- TRIUMF : J.MILDENBERGER, A.TRUDEL

Thank you very much for your attention

