
CERN

DGS/SEE Seminar on Fire Protection for Physics Research Facilities

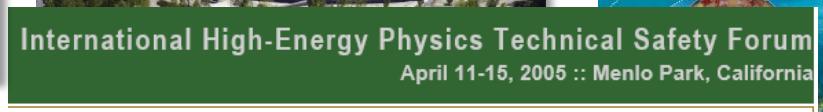
7 and 8 October 2015

CERN

Introduction
status and perspectives

S. La Mendola DGS/SEE/XP

ITSF: a time-tested forum for exchanges on safety

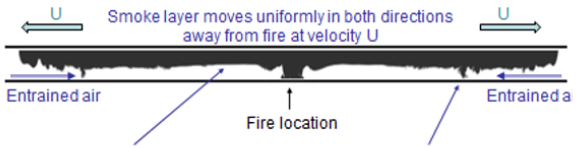


and safety professionals united in exchanging
uipment safety from a variety of high-energy
3 months. Previous fora have been held at the
he Fermi National Accelerator Laboratory

Fire safety challenges common to several labs

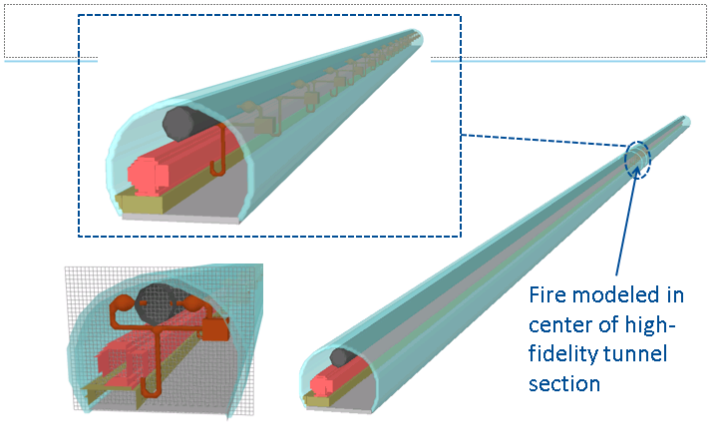
Tunnel Fire Dynamics

- Smoke movement in level, naturally ventilated tunnels



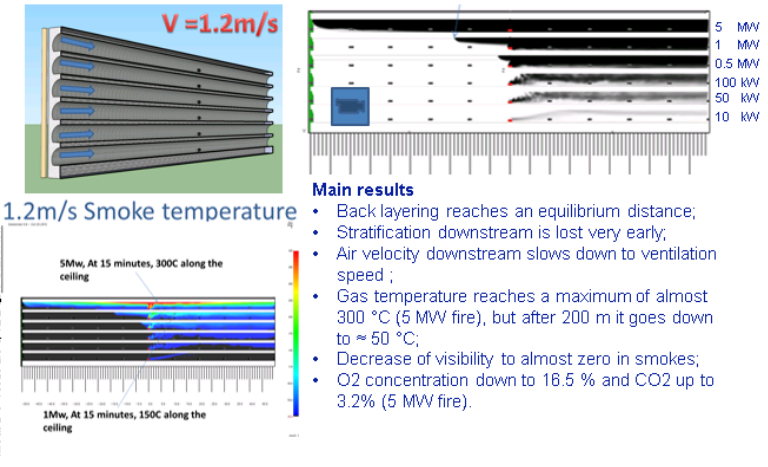
Near the fire, the smoke layer is hot (strong buoyancy) and remains close to the ceiling with little mixing.

As the smoke moves away from the fire, cooling occurs causing smoke to loose buoyancy. Descending smoke mixes with the entrained air and is drawn back towards the fire. This is referred to as "back-layering"



James Priest PhD Fermilab, Contributor James Niehoff 10/4/2015 Fermilab

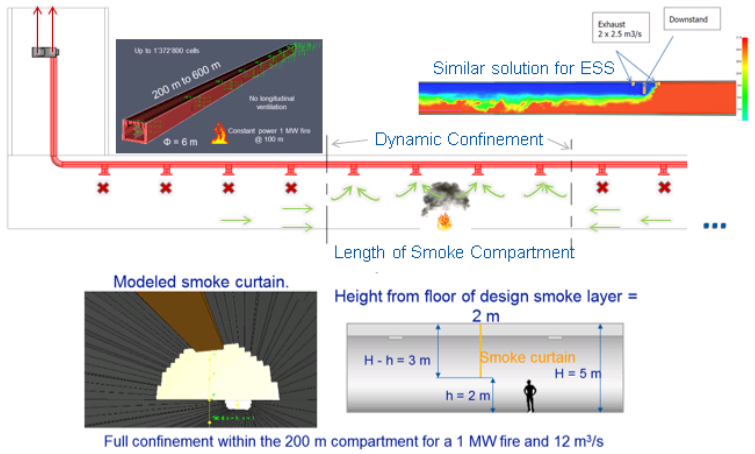
Characterization of fire hazard in tunnels



Main results

- Back layering reaches an equilibrium distance;
- Stratification downstream is lost very early;
- Air velocity downstream slows down to ventilation speed ;
- Gas temperature reaches a maximum of almost 300 °C (5 MW fire), but after 200 m it goes down to ≈ 50 °C;
- Decrease of visibility to almost zero in smokes;
- O2 concentration down to 16.5 % and CO2 up to 3.2% (5 MW fire).

Ongoing research – Smoke extraction system for FCC study



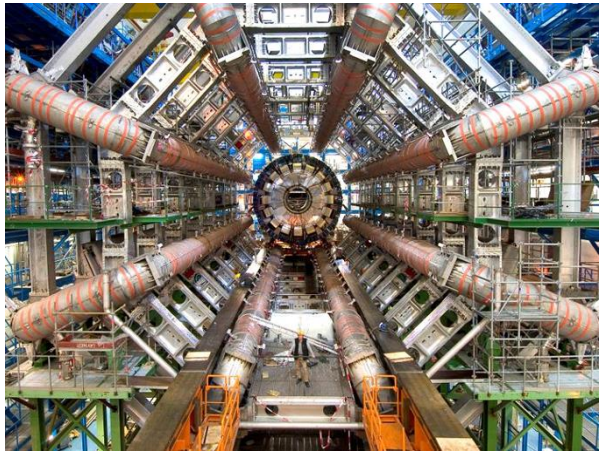
Full confinement within the 200 m compartment for a 1 MW fire and 12 m³/s

21/01/2015 S. La Mendola DGS/SEE/XP 18

Why fire safety can be a ground for a common effort?

Fire safety objectives for ordinary surface buildings are reached through compliance with prescriptive compulsory rules.

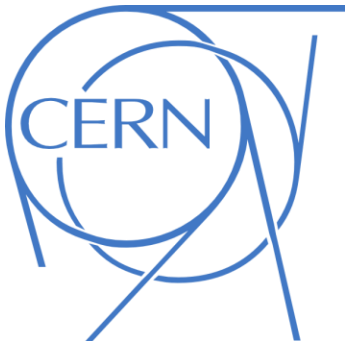
For underground facilities, the objectives are validated thanks to performance-based fire risk assessments.



Workshop in Lund, a first concrete step to collaboration

Workshop on Fire Protection at Research Facilities

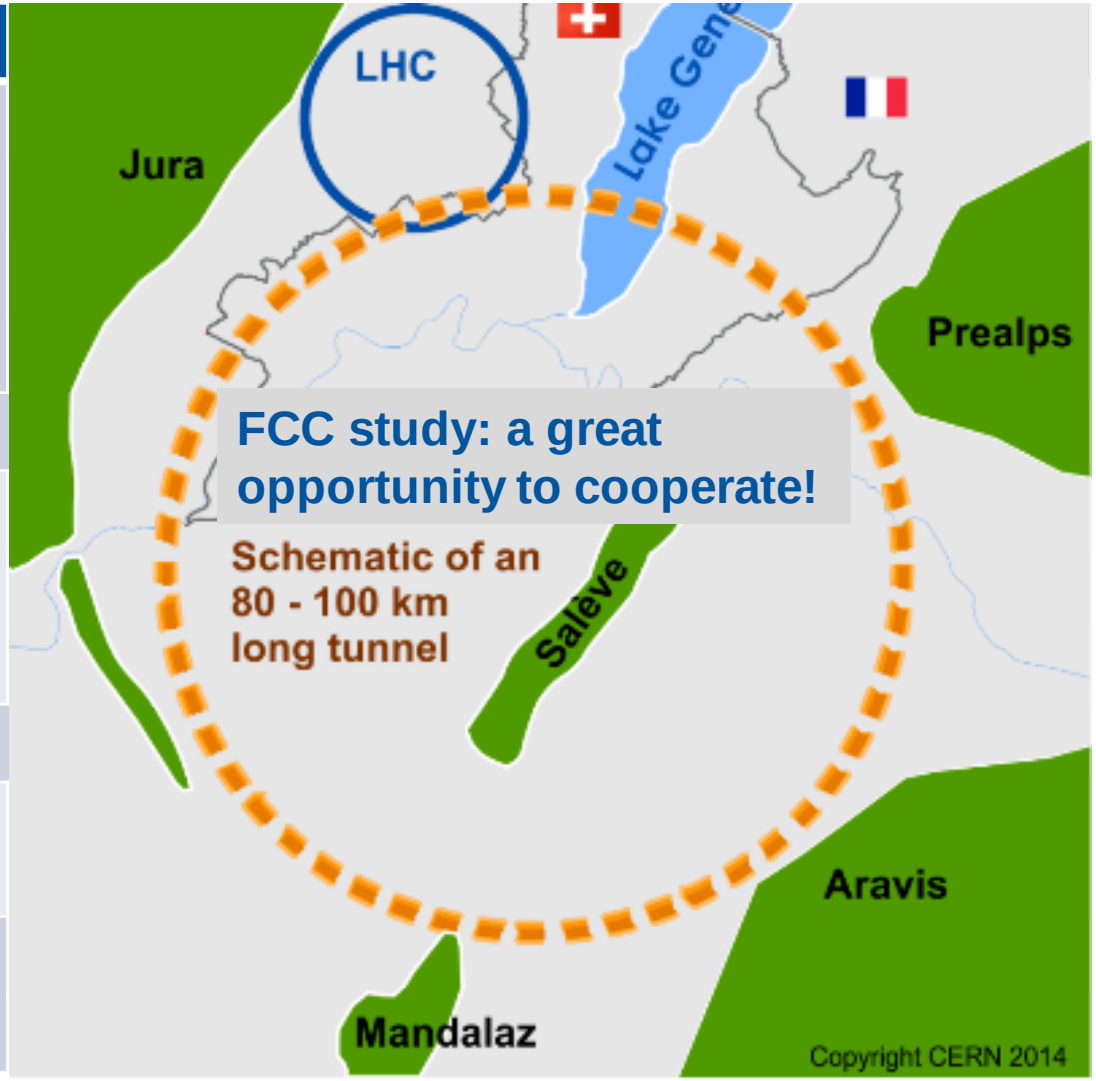
21-22 January 2015
Tunavägen 24
Europe/Stockholm timezone



LUND
UNIVERSITY

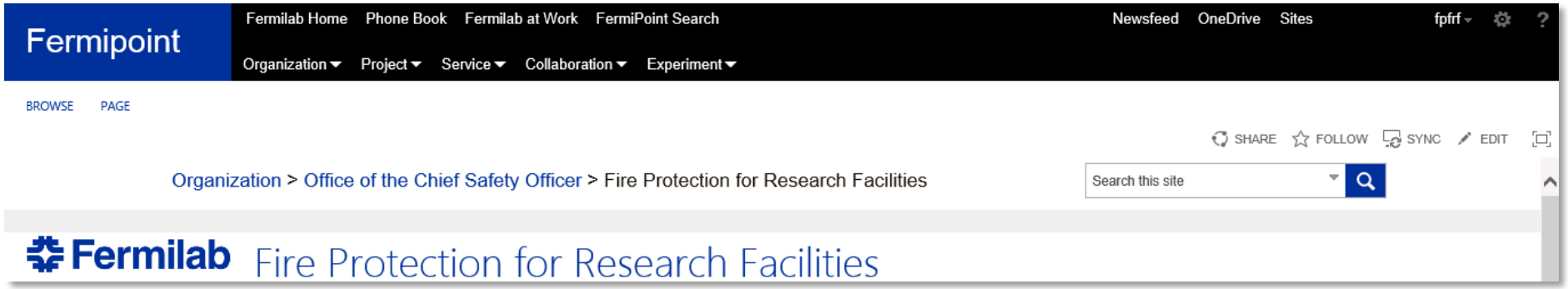
Workshop in Lund: collaboration topics

Main topic
Hazard characterization
Passive fire protection
Active fire protection systems
Intervention of rescue teams
Life safety in underground facilities
Fire risk methodologies and tools



Staying in touch: Monthly video conferences

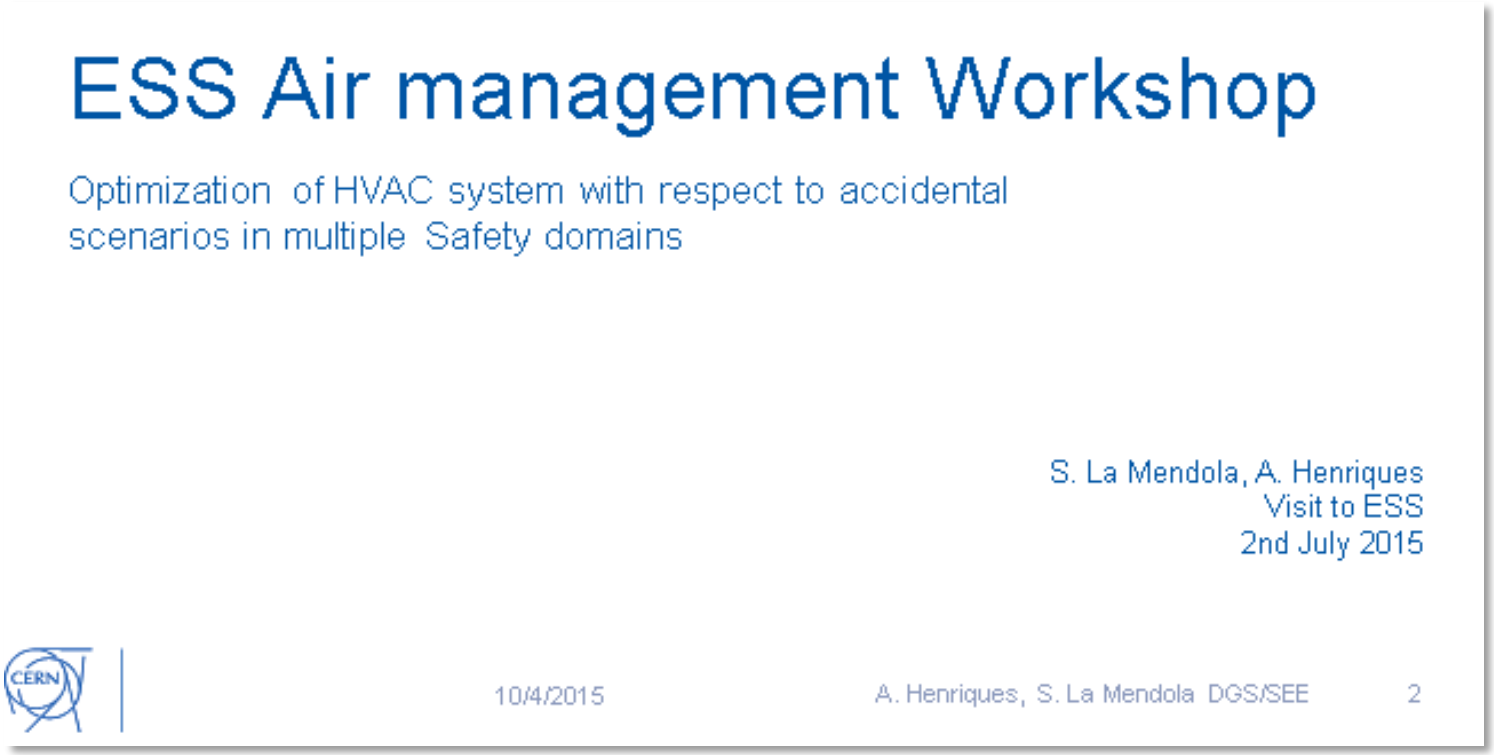
- **Organizational and technical issues are discussed.**
- **A Fermipoint site is now available to exchange information .**
- **Deliverables for FCC study are being discussed as well.**



The network keeps growing

- **PhD student from the university of Wuppertal/Jülich Research Center at CERN**
- **Collaboration agreements with Freie Universität of Berlin, Magdeburg (OVGU) and Lund (for HL-LHC)**

Another milestone: Workshop on air management at ESS



ESS Air management Workshop

Optimization of HVAC system with respect to accidental scenarios in multiple Safety domains

S. La Mendola, A. Henriques
Visit to ESS
2nd July 2015

10/4/2015 A. Henriques, S. La Mendola DGS/SEE 2

Fire protection: workshop at CERN

- **It marks a milestone in the collaboration road map (summary, current situation and next steps);**
- **It includes the following topics:**

Day 1	**General (introduction of participants, current challenges and ongoing activities);**
	Air management (smoke extraction) in radioactive facilities
	Intervention strategies of fire brigade teams
	Fixed extinguishing systems
Day 2	**Burning behavior of electric cables**
	Computational fire simulations
	Performance-based structural fire design
	Evacuation simulations
	Draft standards for mine safety

Next steps: collaboration on FCC

- **Participating institutes sign a Memorandum of Understanding;**
- **Deliverables are defined in an Institute Agreement;**
- **4 IAs have been drafted on evacuation simulations, fire simulations, design fires, smoke extraction system, etc.**
- **All documents (incl. MoUs) should now be signed.**

What's next

A workshop on fire safety is expected to be included in ITSF 2016: opportunity to present the first advancements;

- Signature of collaboration (MoUs, IAs) agreements and start of activities;
- Participants remain in close contact via video conferencing or similar and share information through Fermipoint;
- A workshop on fire safety is expected to be included in ITSF 2016: opportunity to present the first advancements;
- New participants can join the network;

Questions?

Thank you for your attention!