CRYOGENICS OPERATIONS 2008

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Organized by CERN

Visits on Friday 26th September

S. Gardette

CRYOGENICS OPERATIONS 2008

Technical Visits

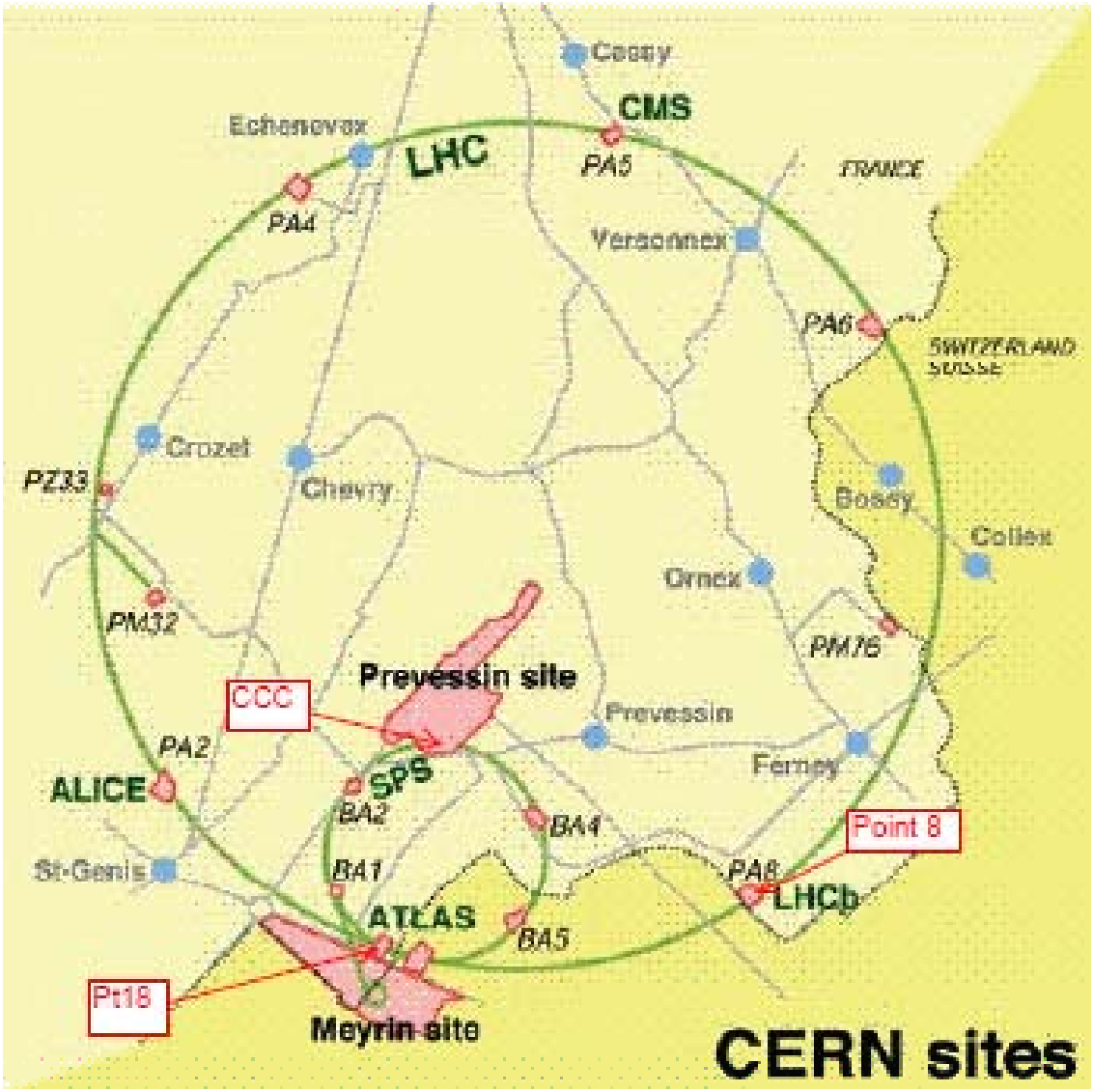
- **Visits will be held on Friday 26th September from 8:30 am to 12:00 pm.**

- **Three points of visits are :**
  - P18 : time of the visit = 60'

    Person in charge: Lionel Herblin – Elody Lussi
  - The **C**ern **C**ontrol **C**enter : time of the visit = 40'

    Person in charge: Sigrid Knoops
  - P8 : time of the visit = 30'

    Person in charge: Klaus Barth – Laura Stewart


Cessy
CMS
Echenevex
LHC
PA5
FRANCE
PA4
Versonnex
PA6
SWITZERLAND
Crozet
PZ33
Chevry
Bossey
Collex
Ornex
PM32
PM16
CCC
Prevessin site
Prevessin
PA2
Ferney
ALICE
SPS
BA2
BA4
Point 8
St-Genis
BA1
PA8
LHCb
ATLAS
BA5
Pt18
Meyrin site
CERN sites

Visit of Point 18

P18 – one of LHC cryogenic island

Liquid or gas storage
(3000 m3 – GHe at 2 MPa / 240 m3 – LHe /100 m3 – LN2)



4.5 K refrigerator
18 kW K cooling power
(4.5 MW electrical consumption)


1.8 K refrigeration unit
2.4 kW cooling power
(0.4 MW electrical consumption)


Surface
Underground


Interconnection cold box

Cryogenic transfer lines
(total length > 3.4 km)

Visit of SM18

SM18
cryogenic test facility for superconducting magnets

The main magnetic system of LHC consists of 1232 twin-aperture, high-field superconducting dipoles (plus 40 spare) and 480 twin-aperture, high-gradient superconducting quadrupoles (plus 10 spare) operating in pressurized super fluid helium below 1.9 K. All these magnets were tested in this hall (SM 18) before their final installation in the accelerator tunnel. Reception tests include complex procedures such as fast cool down and warm up, powering to nominal current and possible training, magnetic measurements in the apertures, leak tightness etc.
12 CFBs were used for LHC magnet series test. At full capacity 2 LHC magnets were tested per day.
In order to run these test benches a complete cryogenic infrastructure was necessary. This infrastructure consists of combined cryogenic and cooling/warming line, two cooling units (CWU), few types of heaters, circulating compressors, cold compressors, warm pumping units and helium supply buffered by the 25 000 l liquid helium Dewar.

COLD COMPRESSOR (CC)
The compressor pumps saturated helium at 3 K and at 10 mbar and compress it to 30 mbar.

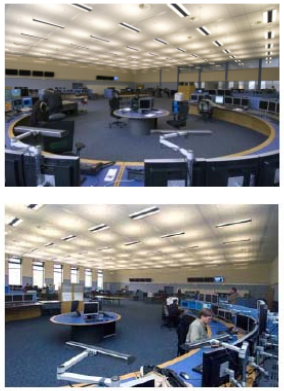
COOLING UNIT (CWU) and GHe HEATER
Maximum cooling power is 120 kW.
The warming up power is 200 kW.

TEST SEQUENCES
1) Installation of the magnet
2) Test of tightness and electrical test
3) Cool down to 1.9 K
4) Powering to nominal current
5) Warming up
6) Dismantling

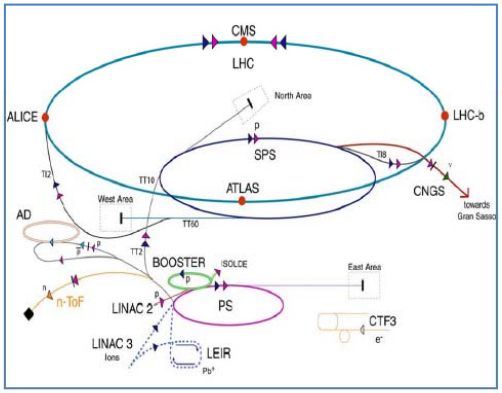
Visit of the CCC

CCC : The CERN Control Center

The CERN Control Centre (CCC), including 39 operating tables, came into operation at the beginning of 2006. It combines the control rooms of the Laboratory's eight accelerators as well as the operation of cryogenics and technical infrastructures.



The new CCC



CERN accelerator complex

In a crucial development for the success of the LHC, CERN has recently build a Control Centre (CCC) for the operation of all its beams and accelerators previously distributed in several dedicated control rooms. Bringing the operators together is an important step in streamlining operations because the performance of the LHC will depend critically on the rest of the CERN accelerator complex, as well as its technical and cryogenic services. All individual control rooms have been merged into one. The new centre is spacious, with a blue colour scheme, large windows along the whole of one side and numerous monitoring screens. The Centre is manned 24h/24h during the whole year and even shutdown periods for the monitoring of the technical infrastructures. During peak operation periods, there may be up to 13 operators working on any one shift in the room, not counting the many experts responsible for assisting them. The Centre, therefore, has 39 consoles (each with 3 control screens and 3 monitoring displays) for four different areas (the LHC, the SPS, the PS complex and the technical infrastructure). Seven consoles for the cryogenic system will be distributed between the LHC area and that for the technical infrastructure to allow remote monitoring and control of all cryogenic plants around the 27-km ring.

Visit of Point 8

CAST – CERN Axion Solar Telescope

The CERN Axion Solar Telescope (CAST) aims to shed light on a 30 year old riddle of particle physics by detecting axions originating from the 15 million degree plasma in the Sun's core.

The conversion efficiency for axions increases as the square of the product of the transverse magnetic field component and its length. This makes a 9 tesla, 10 m LHC prototype dipole magnet with two straight beam pipes ideal for the task, giving a conversion efficiency exceeding that of the two earlier telescopes by a factor of almost 100. CAST's LHC magnet is mounted on a platform with ± 8° vertical movement, allowing for observation of the Sun for 1.5 h at both sunrise and sunset. The horizontal range of ± 40° encompasses nearly the full azimuthal movement of the Sun during the year. The time the Sun is not reachable is devoted to background measurements. At both ends of the magnet, three different detectors are searching for X-rays coming from axion conversions in the magnet when it is pointing to the Sun. As X-ray detectors CAST utilizes: an X-ray mirror telescope in combination with a CCD camera, a MICROMEGAS, a TPC

The X-ray focusing system and Micromegas are looking for sunrise axions, while the TPC is occupying both bores on the other end and is waiting for sunset axions.

The operation of the CAST experiment is foreseen to go in two phases: Phase I (completed!): during 2003 and 2004 the experiment operated with vacuum inside the magnet pipes and explored axion mass range up to 0.02 eV. 2003 data have been analyzed. Phase II (running): in order to extend CAST sensitivity to higher axion rest masses, magnet pipes are filled with a gas (in 2005-2006 with ^{4}He and in 2007 and on with ^{3}He).

CAST is making an important step in solar axion searches:
the sensitivity of the experiment is comparable with the limit imposed by astrophisical considerations,
in Phase II, CAST is able to enter into the region which is especially favoured by axion models, for the first time for a laboratory experiment.

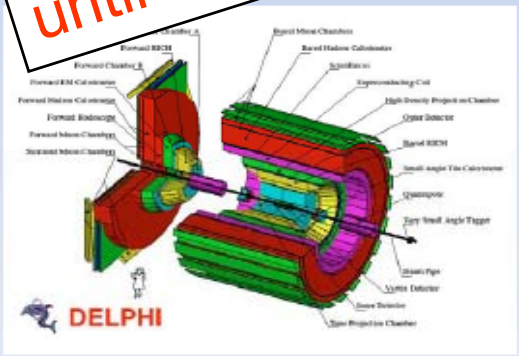
Visit of Point 8

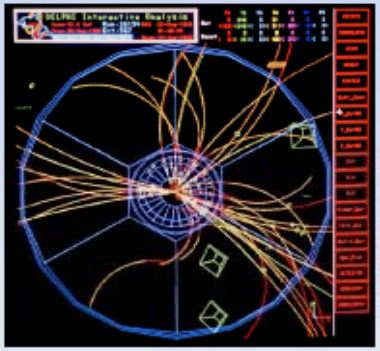
DELPHI

Experiment Detector with Lepton, Photon and Hadron Identification

The operation of the LEP collider at CERN started in August 1989 opening a new chapter in the history of particle physics. With a circumference of 27 km, LEP is the largest accelerator yet buil
stopped in november 2000, but the analysis of data i
with the possibility of discovering new physics
DELPHI was an advanced detector. A
and 'granularity', it has the aging
Cherenkov techni the various
secondary vanced silicon detector
pr cipally in order to detect very
rapolating the tracks back towards the
esign and construction of the DELPHI detector
, data have been taken every year for 12 years.

For safety reasons, cavern access is suspended until further notice.





Visit of Point 8

LHC Cryogenics

LHC superconducting magnets are sited in 1.9 K baths of superfluid helium at atmospheric pressure. These baths are cooled by low-pressure saturated superfluid helium flowing in heat-exchanger tubes distributed along the string of magnets.
The cooling of the LHC is produced by eight large cryogenic plants – one per sector - installed in five cryogenic islands. Each plant is able to produce up to 600 kW at 80 K with LN2 precooling, up to an equivalent capacity of 18 kW at 4.5 K as well as up to 2.4 kW at
The cooling of the huge sector mass of 4600 tons from
temperature down to 1.9 K and the filling of the
15 tons of helium mainly in superfluid state
weeks and consume 1250 tons of liq

For safety reasons, cavern access is suspended until further notice.

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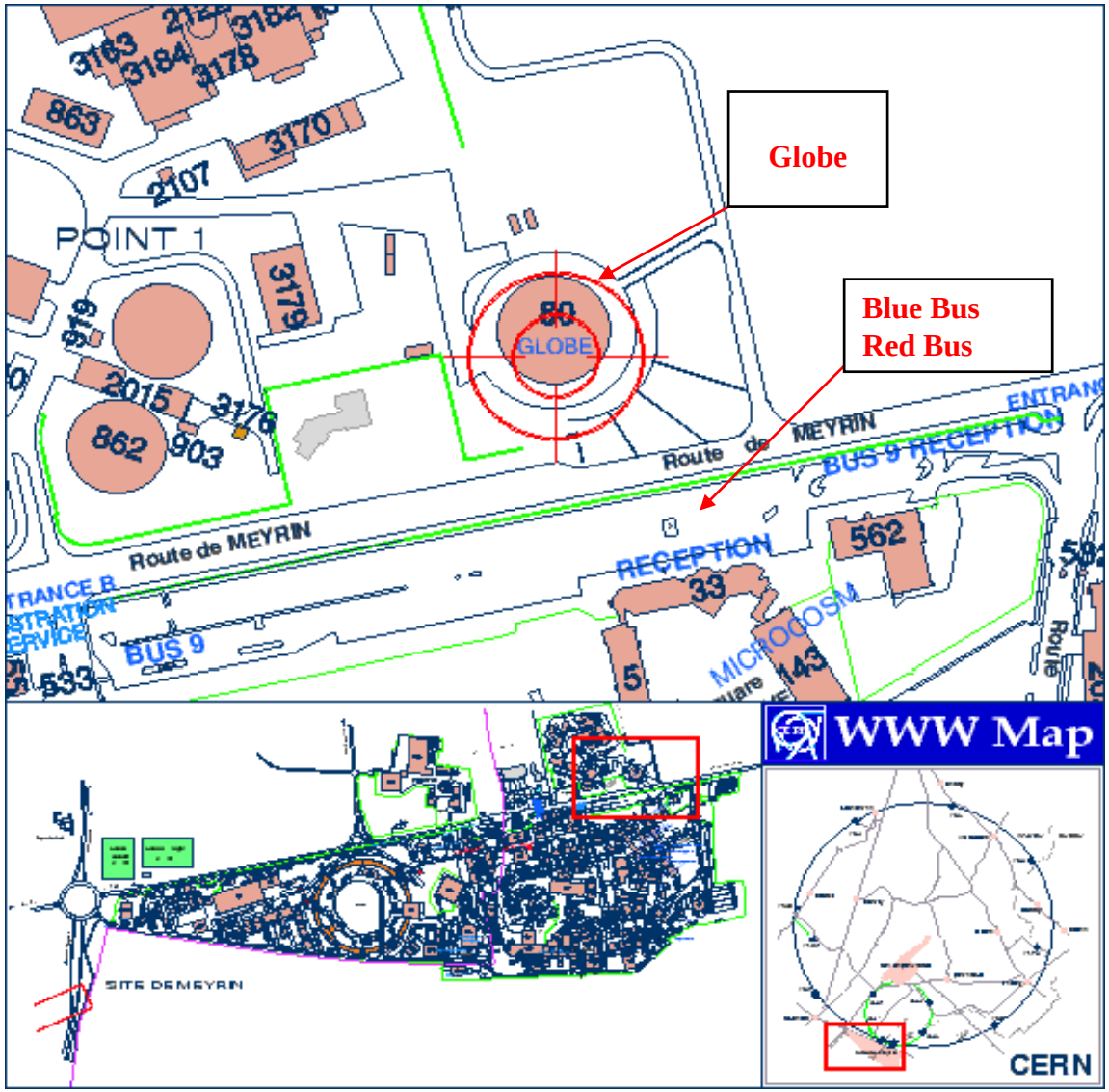
	8 participants + 1 bus shepherd (Serge Claudet)		13 participants + 1 bus shepherd (Johan Bremer)
8:30am	Departure Building 33	8:30am	Departure Building 33
08:30-08:40	Bus Transfer from Bldg. 33 to PT18 (10')	08:30-08:40	Bus Transfer from Bldg. 33 to CCC (20')
08:40-08:50	Visit Pt 18 during 1h00	08:40-08:50	
08:50-09:00		08:50-09:00	Visit CCC during 20 min.
09:00-09:10		09:00-09:10	
09:10-09:20		09:10-09:20	coffee break 20 min.
09:20-09:30		09:20-09:30	
09:30-09:40		09:30-09:40	Bus Transfer from CCC to Pt 8 (20')
09:40-09:50	Bus Transfer from PT18 to CCC (20')	09:40-09:50	
09:50-10:00		09:50-10:00	Visit Pt 8 during 1h00
10:00-10:10	Visit CCC during 20 min.	10:00-10:10	
10:10-10:20		10:10-10:20	
10:20-10:30	coffee break 20 min.	10:20-10:30	Bus Transfer from Pt 8 to Pt 18 (20')
10:30-10:40		10:30-10:40	
10:40-10:50	Bus Transfer from CCC to Pt 8 (20')	10:40-10:50	Visit Pt 18 during 1h00
10:50-11:00		10:50-11:00	
11:00-11:10	Visit Pt 8 during 1h00	11:00-11:10	
11:10-11:20		11:10-11:20	
11:20-11:30		11:20-11:30	
11:30-11:40	Bus Transfer from Pt 8 to Bldg. 33 (20')	11:30-11:40	
11:40-11:50		11:40-11:50	Bus Transfer from Pt 18 to Bldg. 33 (10')

BUS 1 (BLUE IDENTIFICATION)

BUS 2 (RED IDENTIFICATION)



Participants will meet in the car park in front of building 33 on Friday at 8:20 am

- Departure at 8:30 am – Buses are distinct by colors signs (blue-red) – See your sticker on your badge to identify your bus.

Recommendations

- We will meet at 8:20 am in the car park in front of building 33.
- Departure of the buses at 8:30.
- The visits will take place on French and Swiss territories, so don't forget your passport and your visa (if applicable).
- Your colour sticker on your badge corresponds to the colour of your bus (blue identification and red identification).

Recommendations (2)

- No change of group will be accepted (the lists are already given to Swiss and French authorities).
- Please stay with the same group during the visits.
- For safety reasons, open shoes are not authorized.
- Please respect the schedule.

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Recommendations (3)

- The persons in charge of the buses will come with you during the visits. You can ask them questions.
- Persons in charge of the buses are:

  Nicolas Delruelle : 0041764873264

  Johan Bremer : 0041764870553
- In case of problem, the secretariat can answer your questions. (0041764875452)

"Enjoy your"