# Logistics of LHC cryodipoles: From simulation to storage management

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# Logistics of LHC cryodipoles:
# From simulation to storage management

- Objects concerned
- Cryodipoles' workflow
- Simulation
- Transport means
- Storage areas
- Risks
- Conclusion

# Objects concerned

- ~ 1250 cryodipoles
  - ➔ From their cold masses arrival to their installation

- 1 cryodipole =
  - 35'000 kg
  - ~ 17m long

  **FRAGILE**

- Cryodipole production at CERN:
  - ➔ 4 main contract types concerned:
    - Cold masses production, Cryostating, Tests, Final preparation

# Cryo-dipoles workflow

Cold masses reception and storage: WP01
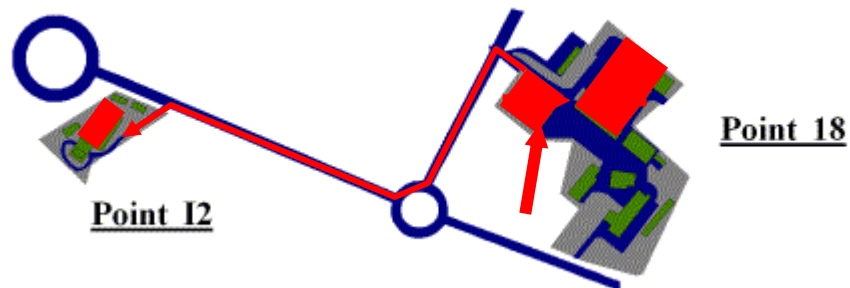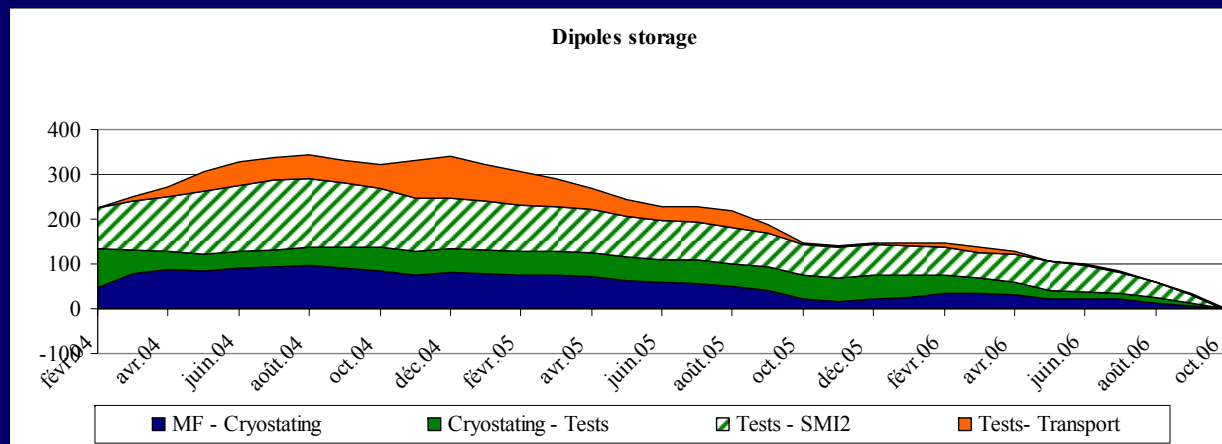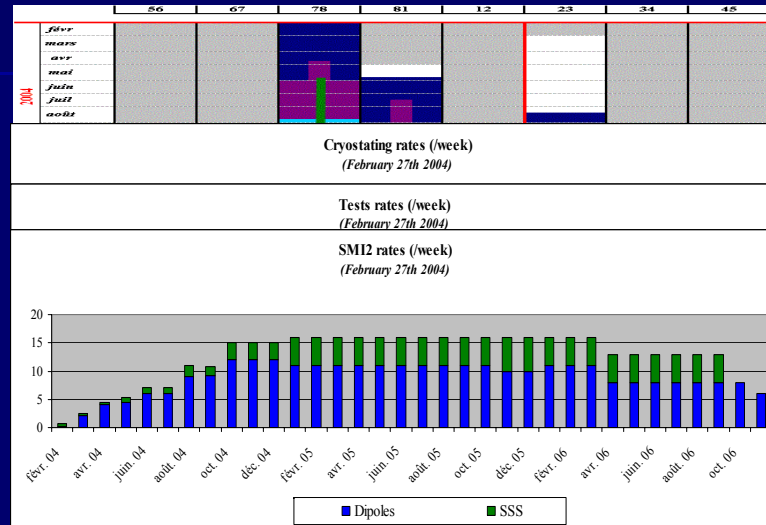
Cryostating and ...

... on: WP08a

Beam screen installation: WP08b – WP09

**Installation**

*« Just in time » scheme*



Point I2    Point 18

# Cryo-dipoles workflow

## On site reality

**Installation**

**Point I2**

**Point 18**

# Simulation

# Simulation
## *Comparison between simulation and reality*

**Cryodipoles**
**Number to be stored**

1 month delay

Legend: Simulation — Observation
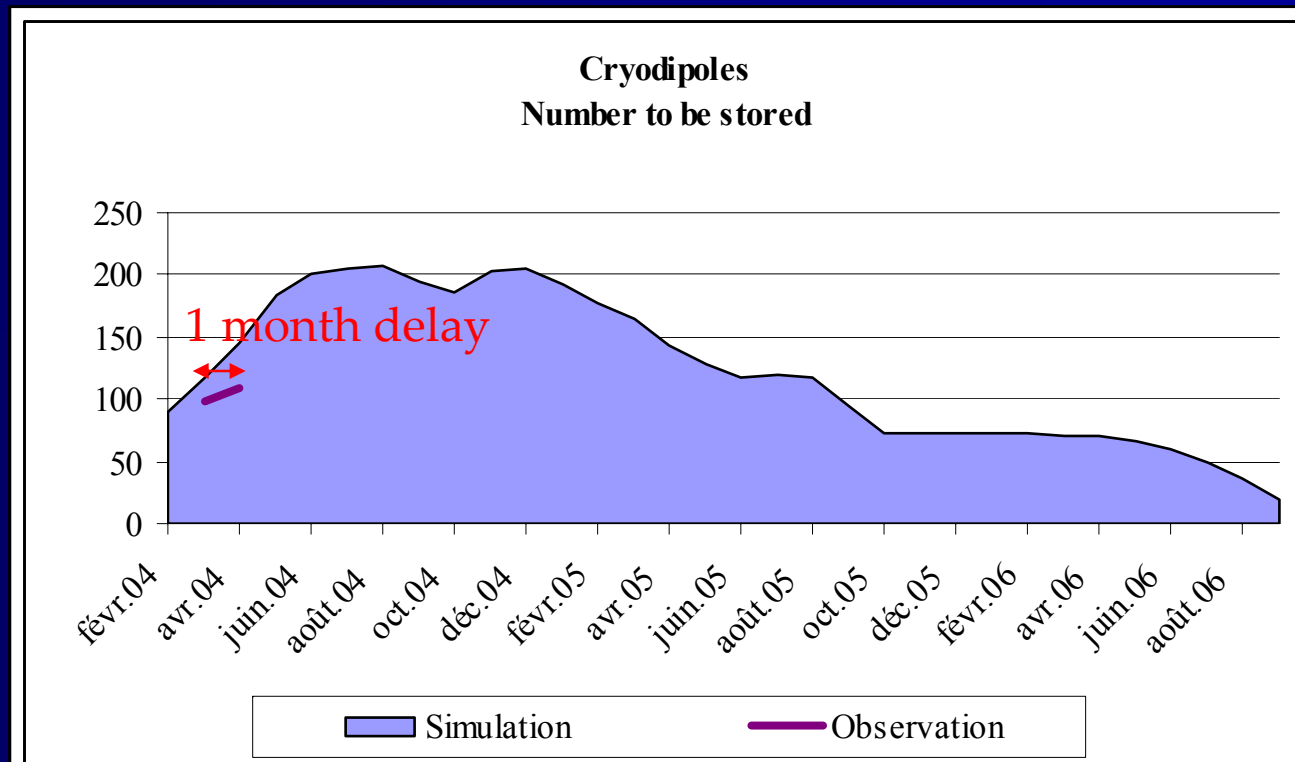
# Transport and handling means

# Storage areas



Gentner road

**1027**

Site

~ 23 cryodipoles
~ 35 cold masses
~ 240 cryostats

~ 100 cryodipoles
~ 30 cold masses

**Pt 19**

Point I2

Point 18

~ 200 cryodipoles

# Storage areas
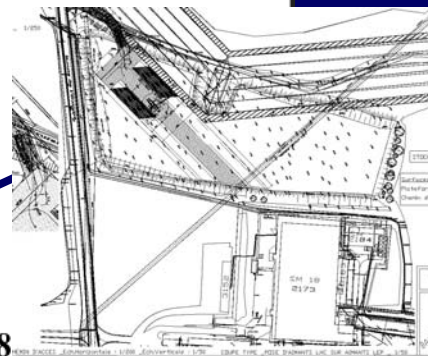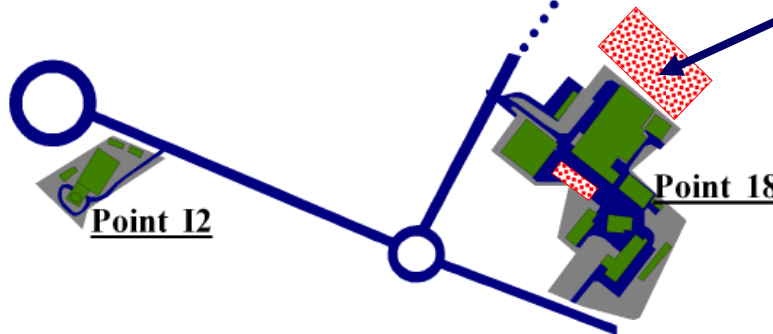
http://lhc-dipcoor.web.cern.ch/LHC-dipcoor/Ground-logistics.xls

| Récapitulatif stockage | | | | | Update 27-Apr-2004 | | |
|---|---|---|---|---|---|---|---|
| | | | | | **Charge admissible** tonnes / m^2 | | |
| **CM** | **Capacité** | **Remplissage** | **Taux** | **Reste** | route | terrain | |
| 890 Gentner | 40 | 34 | 85% | 6 | 30 | spécial | |
| 1027 transit | 30 | 30 | 100% | 0 | 20 | | |
| BA718 | 25 | 7 | 28% | 18 | 20 | 10 | |
| BA7 | 25 | 0 | 0% | 25 | 20 | | |
| **Total** | **120** | **71** | **59%** | **49** | | | |
| **CD** | **Capacité** | **Remplissage** | **Taux** | **Reste** | | | |
| 1027 transit | 95 | 82 | 86% | 13 | 20 | | |
| 1026 tourets | 4 | 5 | 125% | -1 | 10 | | |
| 893 Gentner | 23 | 23 | 100% | 0 | 30 | 10 | |
| BA7 | 15 | 14 | 93% | 1 | 20 | | |
| point 19 | 196 | 0 | 0% | 196 | 20 | | |
| Total | 333 | 124 | 37% | 209 | | | |
| Hors point 19 | **137** | **124** | **91%** | **13** | | | |
| Point 18 | | | | | 20 | | |

# Risks and consequences
## *Installation delay*
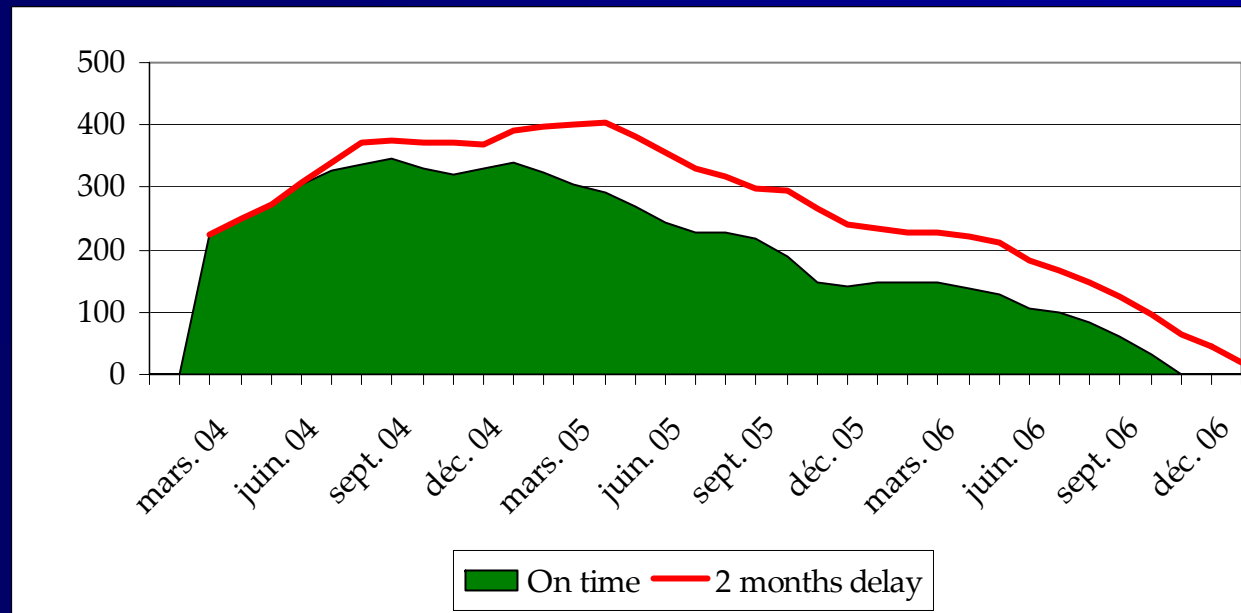
# Risks and consequences
*Transport means failure*

# *Transport means failure*

- Nobody was injured.
- Cryodipole 2081 to be decryostated.
- Mobile crane and trailer Nicolas damaged.
- Operations blocked by SC for 4 days.
- Systematic checks of the soil stability of the storage zones and larger load spreading plates.

- Multiplication of handlings of fragile 40 tons objects in zones not designed for that!

# Risks and consequences
## *Transport means failure*



▪A weak point in the logistics chain!



- **Breakdown of the two ROCLAs**
  - Welds around the pivoting axis broken on the whole circumference