MERIT:
Nitrogen gas exhaust to TT10

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http://cern.ch/proj-hiptarget

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Overview

- Purpose
  - From cryogenics system within MERIT
  - Ventilate/purge N2 gas at ambient temperature
  - 200 liter LN2/30 min $\Rightarrow$ 250 m^3 N2 /hour
    - Compare with TT10 ventilation power of 27000 m^3/hour
- Layout TT2 to TT10
- Major issues (open questions)
  - Where to run the pipe in TT10?
  - Access
  - Schedule

Release of activated nitrogen

MEMORANDUM

To: A. Fabich, AB-ATB

cc: Ch. Hill, RSO AB, P. Cennini, DSO AB, P. Carbonez, SC-RP

From: Th. Otto, M. Silari, SC-RP

Conc.: Release of N_2 from nTOF 11

The experiment nTOF 11 envisages to irradiate a mercury jet target in a liquid nitrogen cooled solenoid with 100 pulses of protons from the PS. The liquid nitrogen in the cryostat will be activated during the irradiation, evaporated and released to the environment.
Via this pathway, a total release from the experiment of 37 GBq of short-lived beta-emitters (^{11}C, ^{13}N...) shall not be exceeded. This figure presents 1% of the emissions from the operation of other accelerators and experiments on the Meyrin site.
The activation of liquid nitrogen in the cryostat by the proton pulse has been estimated by a Monte-Carlo calculation. After a waiting time of 60 s after the proton pulse, an activity of 33 MBq/l would be released to the environment. Longer waiting times would further reduce this figure.
The baseline scenario of nTOF 11 foresees to drain the cryostat from liquid nitrogen before the proton pulse. A residual of not more than 1 litre of N_2 would remain in the cryostat. In this scenario, a total of 3.3 GBq of short-lived beta-emitters would be released during the 100 proton pulses. The baseline scenario is feasible from the viewpoint of radioactive releases.
An alternative scenario, where 120 litres of N_2 remain in the cryostat before the proton pulse, are activated and released, is not compatible with the ceiling on releases.

One modification is required to the baseline scenario: the activated N_2 gas shall be released via a filtered and monitored stack, either by the n-TOF target area ventilation, or, if this is unavailable at the time of the experiment, via transfer tunnel TT10.

- NO release of activated LN2 directly to atmosphere
- Release of activated nitrogen to TT10
  - See memo EDMS 697857
- Minimize activated LN2
  - Remove LN2 previous to beam extraction
  - <1 liter remaining in cryostat

Release of N2 gas to TT10 (ventilation)

Adrian Fabich

From: Gunnar LINDELL [Gunnar.Lindell@cern.ch]
Sent: Tuesday, September 06, 2005 11:39
To: Adrian Fabich
Cc: Ilias Efthymiopoulos
Subject: Re: MERIT: Cryogenics exhaust to TT10

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Thank you for this summery Adrien!
I agree with it's content.
I would just like to add that we will have to define the area where portable O2 meters
and Biocells will be imposed in the event of nitrogen spillage.
All the best
Gunnar
On Sep 6, 2005, at 11:16, Adrian Fabich wrote:

> Salut Gunnar,
> I try to summarize. If you have comments, please respond.
> Adrian
>
> 6.Sept. 2005 G.Lindell, A.Fabich
> flow: N2 gas at ambient temperature, LN2 200 l euqivalent every 30
> minutes
>
> GL appriciated the direct piping to the ventilation exit in TT10 (No
> drift of N2 in TT10)
>     An interlock signal from the TT10 ventilation has to be provided to
> the MERIT experiment
>          option: causing an automatic interlock on the dewar outlet During
> MERIT operation all TT10 access has to be with a portable oxygen meter
> (on top of standard euqipement)
>     including training of people
>     -> see with A.Spinks
>          ask him also, wether ventilation failure interlocks SPS run The
> installation of a permanent oxygen meter costs 10-15kChF (contact
> David Hay)
>
> FH should implement an automatic outlet shutter for unexpected large
> flows from the dewar to prevent total spillage (6000L)
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SC/GS-27.06.2005/GL

Comments from CERN's Safety Commission concerning:

nTOF 11 / TT2A
CRYOGENIC INSTALLATIONS

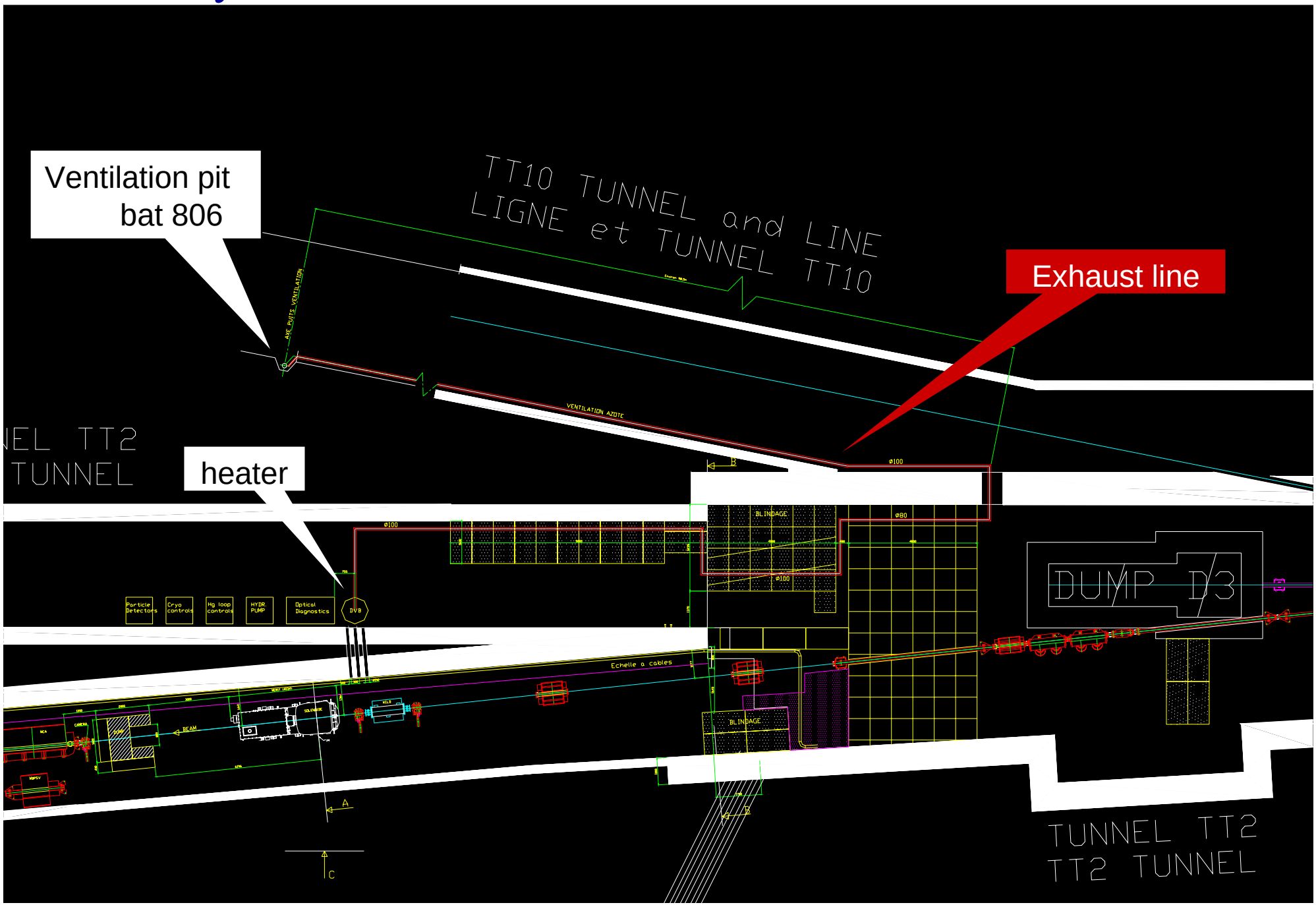
- Supply of LN2 from a 6000 liters dewar installed outside between building 559 and 506.
- LN2 transfer line from the dewar to the magnet in TT2A.
- The magnet will contain 200 liters of LN2.
- Before each proton pulse, some 200 liters of LN2 from the target will be released during 30 minutes.
- 0.7 liters of activated LN2 will be released in the TT10 tunnel at each proton pulse.
- There will be a total of 100 proton pulses during a period of 1 month.

1. The 200 liters of LN2 (140 Nm^3 in gaseous form) shall not be released in the underground. Not even in TT10 where there is ventilation. In the event of ventilation failure, there is an ODH. Risk=probability*gravity

   The N2 shall be vented to the atmosphere at surface level, where no one can get hurt by cold or by ODH. The vent line shall be marked (fluid being used and person to contact in the event of questions from the fire brigade or other).
2. Concerning ODH, the 0.7 liters of activated LN2 can be released in TT10. The N2 shall not represent a risk of cold burns.
3. Please show that there will not be more than 0.7 liters of LN2 released at each proton pulse.
4. No liquid air is allowed to drop from the cryogenic installations. SC/GS will do an inspection to check that this and other points of safety have been implemented.
5. It shall be compulsory to wear portable O2 meter with audible and visual alarm of minimum 18% of O_2 in the underground area. Potential risks are the 200 liters of LN2 in the magnet in TT2A and the 6000 liters of LN2 at the surface. The dewar of 6000 liters is connected to the magnet via a transfer line which goes through TT10 to TT2A.
6. It shall be compulsory to have an oxygen mask in the underground area, ready to be used in the event of an ODH.
7. A safety zone has to be created in the different tunnels connected to TT10 where portable O_2 meter and oxygen mask is compulsory. The zone shall be clearly marked. To be defined by nTOF 11 and SC/GS – visit the area, looking at maps and coordination with other users in the tunnel.

- Still to be inserted as safety memo into EDMS
- From point of view of ODH safety possible

Layout


Ventilation pit
bat 806
TT10 TUNNEL and LINE
LIGNE et TUNNEL TT10
Exhaust line
VENTILATION AZOTE
heater
Particle Detectors
Cryo controls
Hg loop controls
HYDR PUMP
Optical Diagnostics
DVB
BLINDAGE
DUMP D3
Echelle a cables
BEAM
TUNNEL TT2
TT2 TUNNEL

Pipe in TT10? (1)

Pipe in TT10? (2)

Access

2 weeks of installation before 24th February 2006

- Access
  - Material delivery via BA1 and TT10 to PPG10061
    - 1 day
  - Installation within TT10 (SPS)
    - 2 days
  - Installation within TT10 (PS)/TT2
    - 4 days
  - Installation within TT2
    - 2 days
- Need to pass through PPG10061 during 2 days