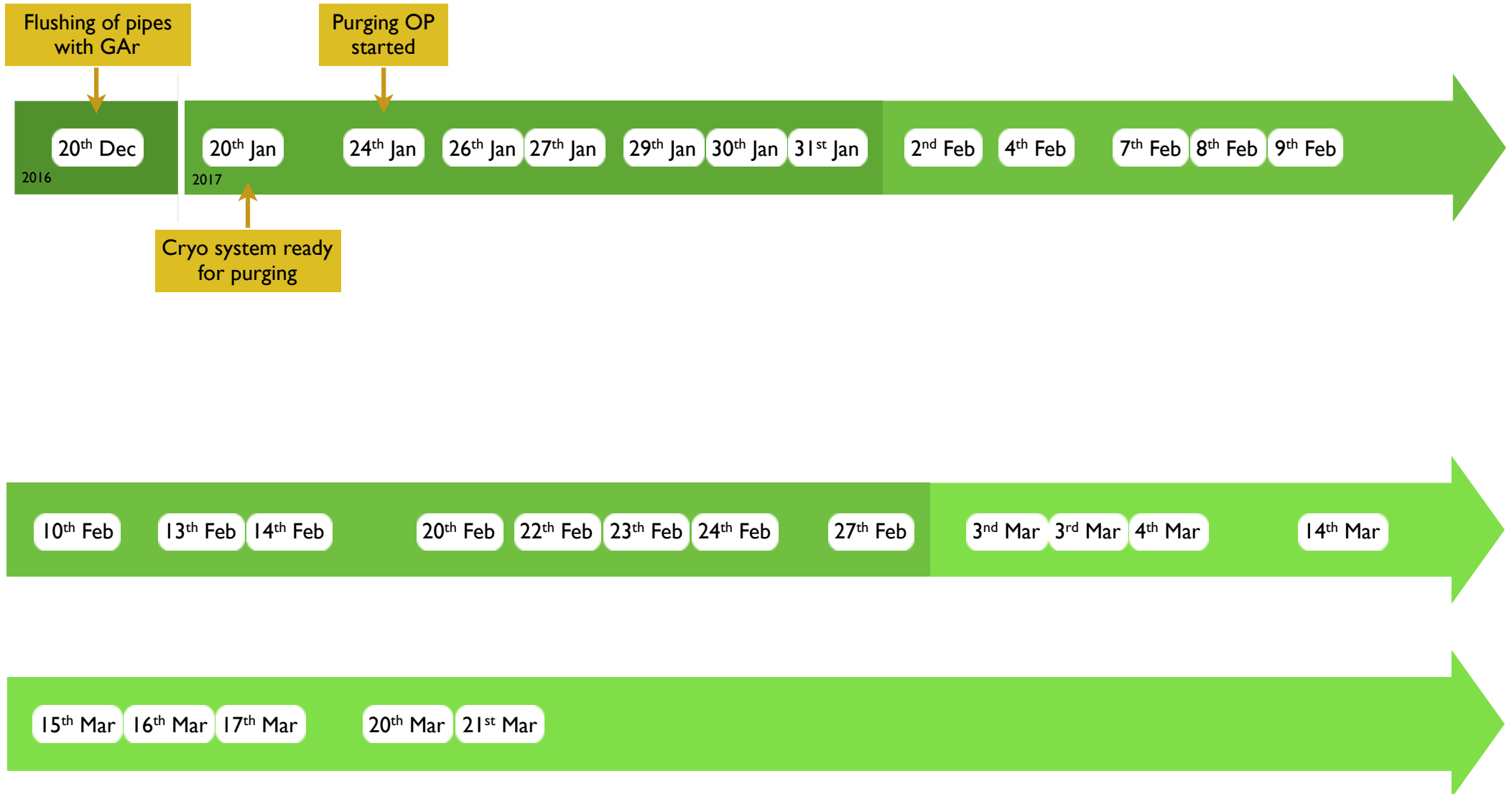


# Summary of $3 \times 1 \times 1$ operations

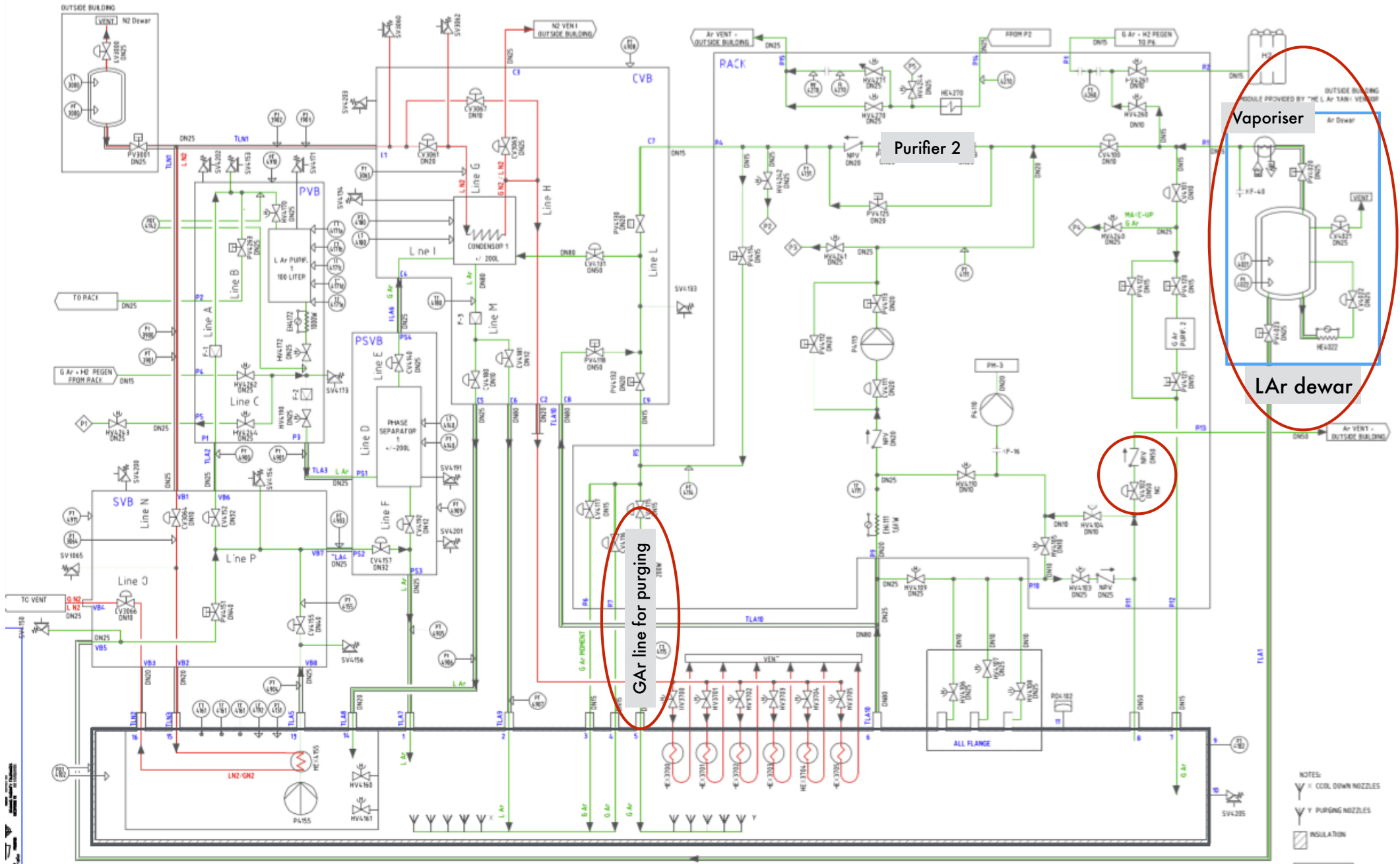
Laura Manenti  
and  
Laura Molina Bueno

# Summary Dec 2016 - Mar 2017

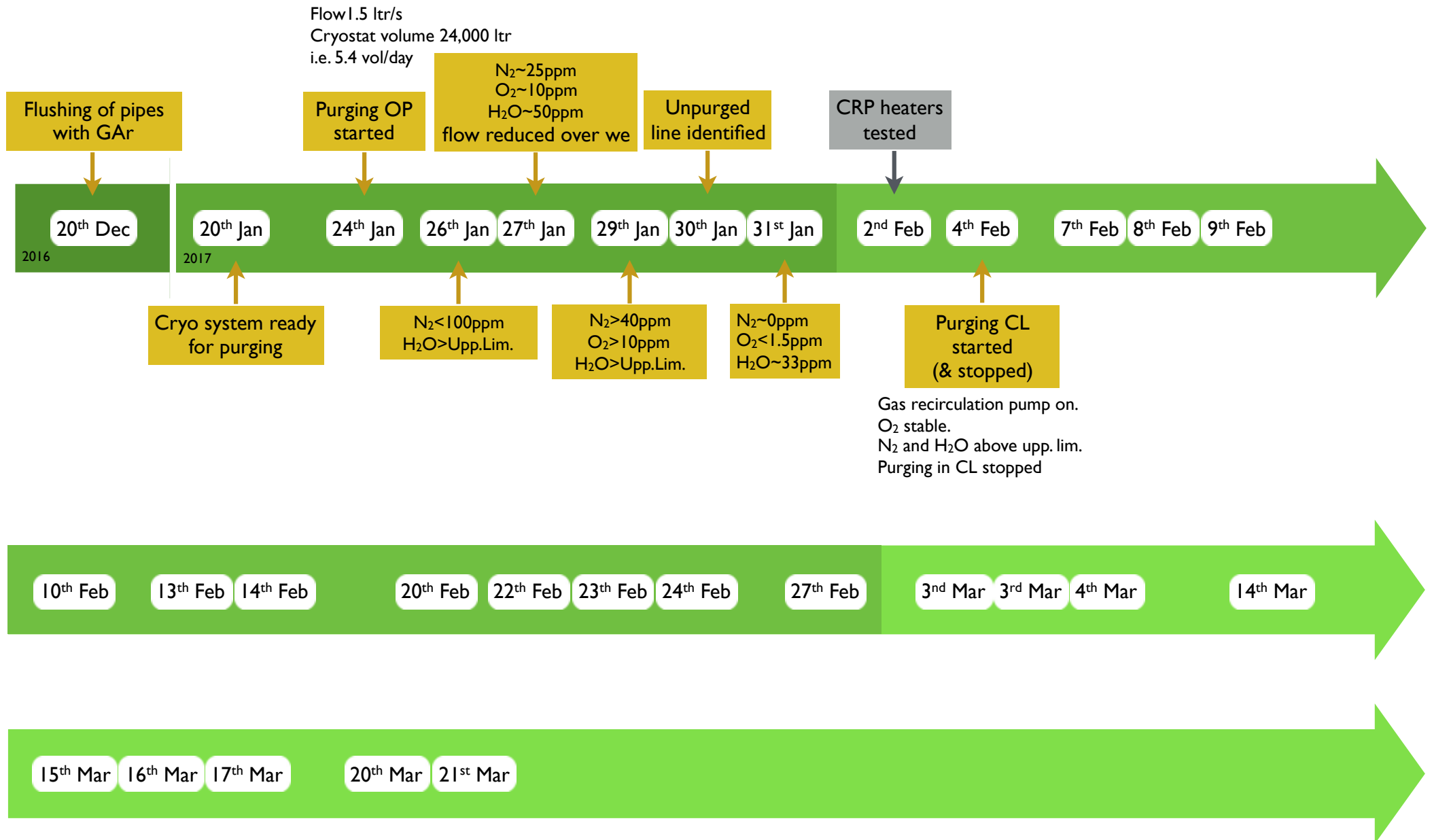
Flow 1.5 l/s  
Cryostat volume 24,000 l  
i.e. 5.4 vol/day



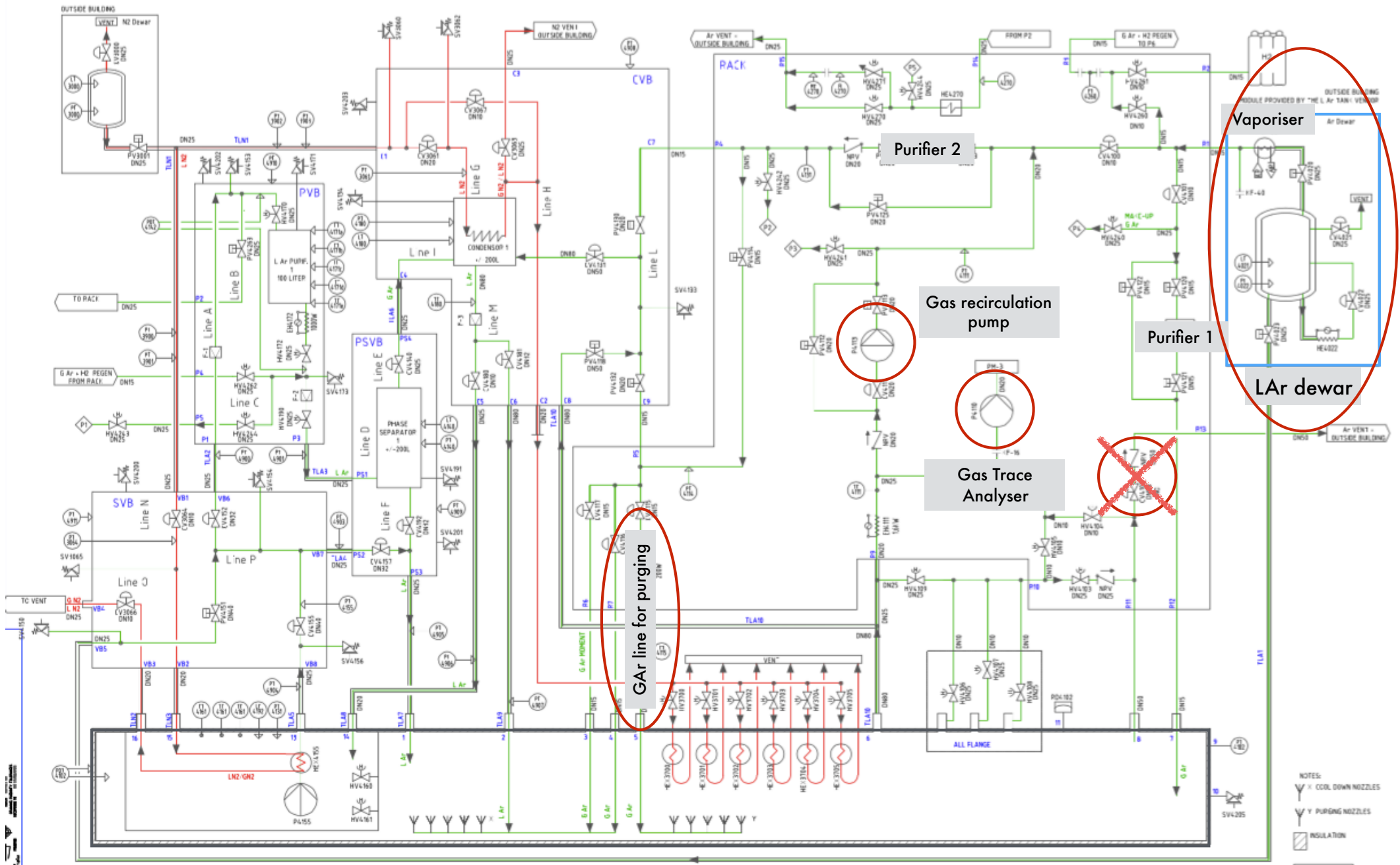
# P&ID (just a reminder)



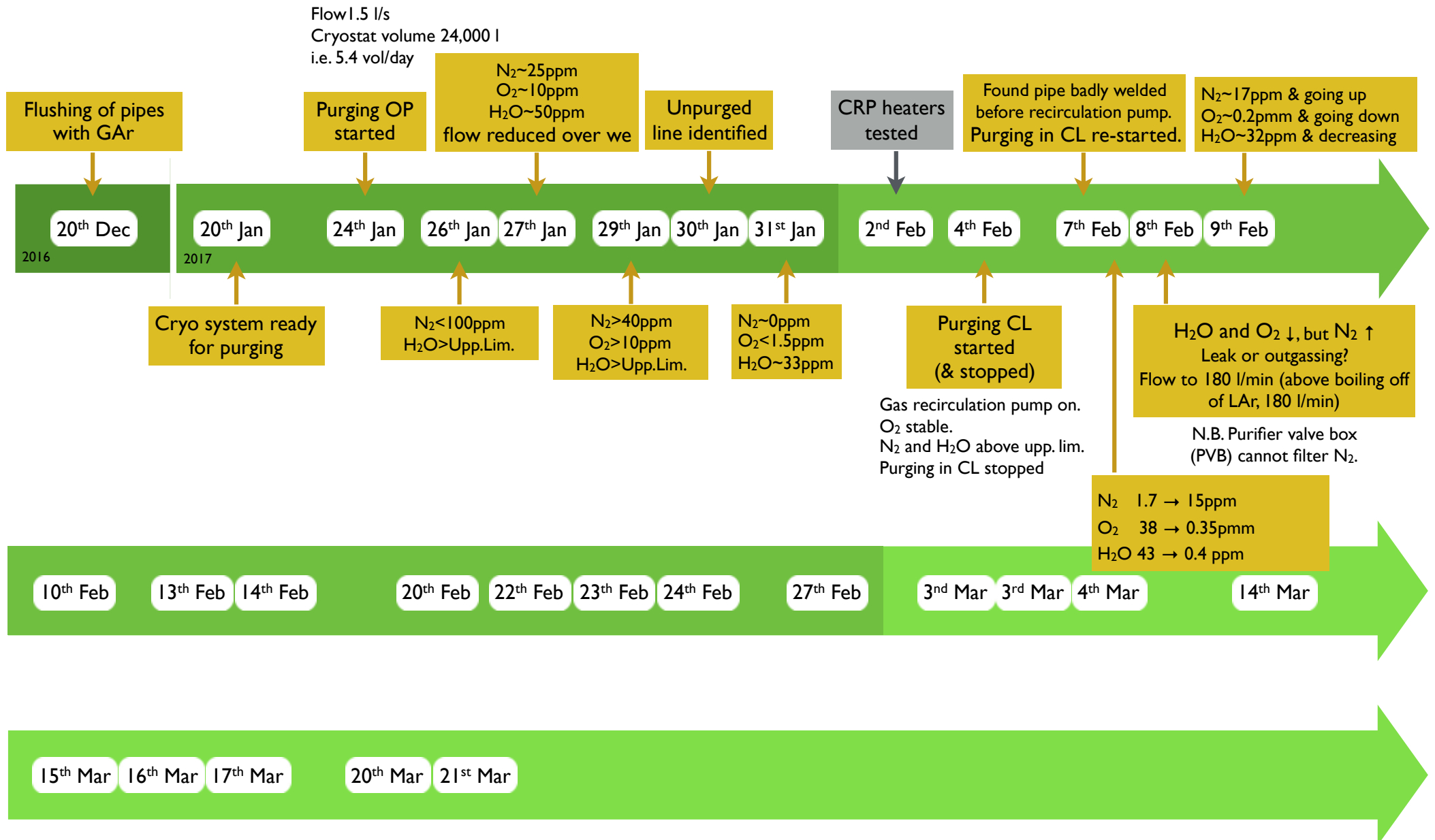
# Summary Dec 2016 - Mar 2017



# P&ID (just a reminder)

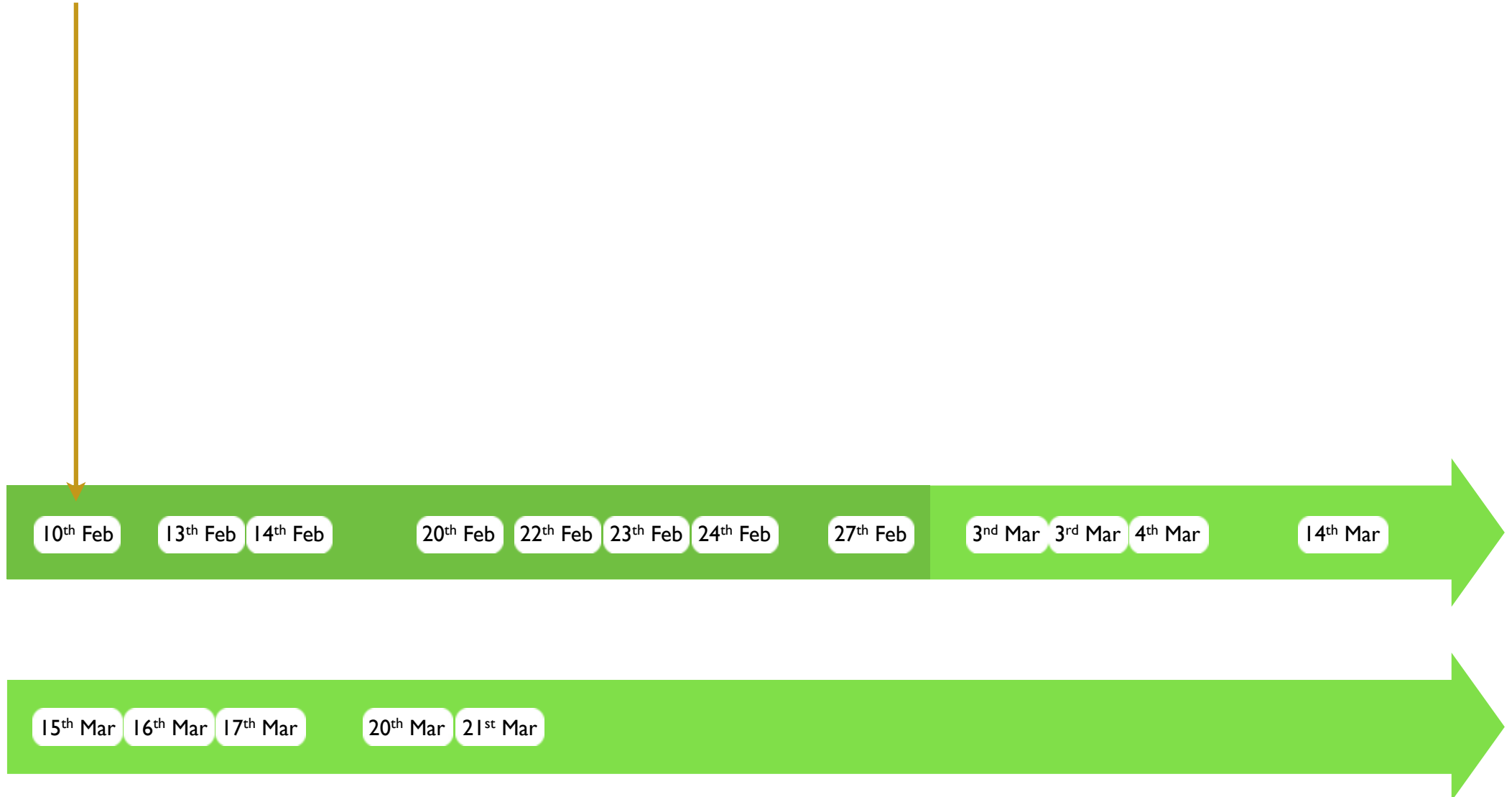


# Summary Dec 2016 - Mar 2017

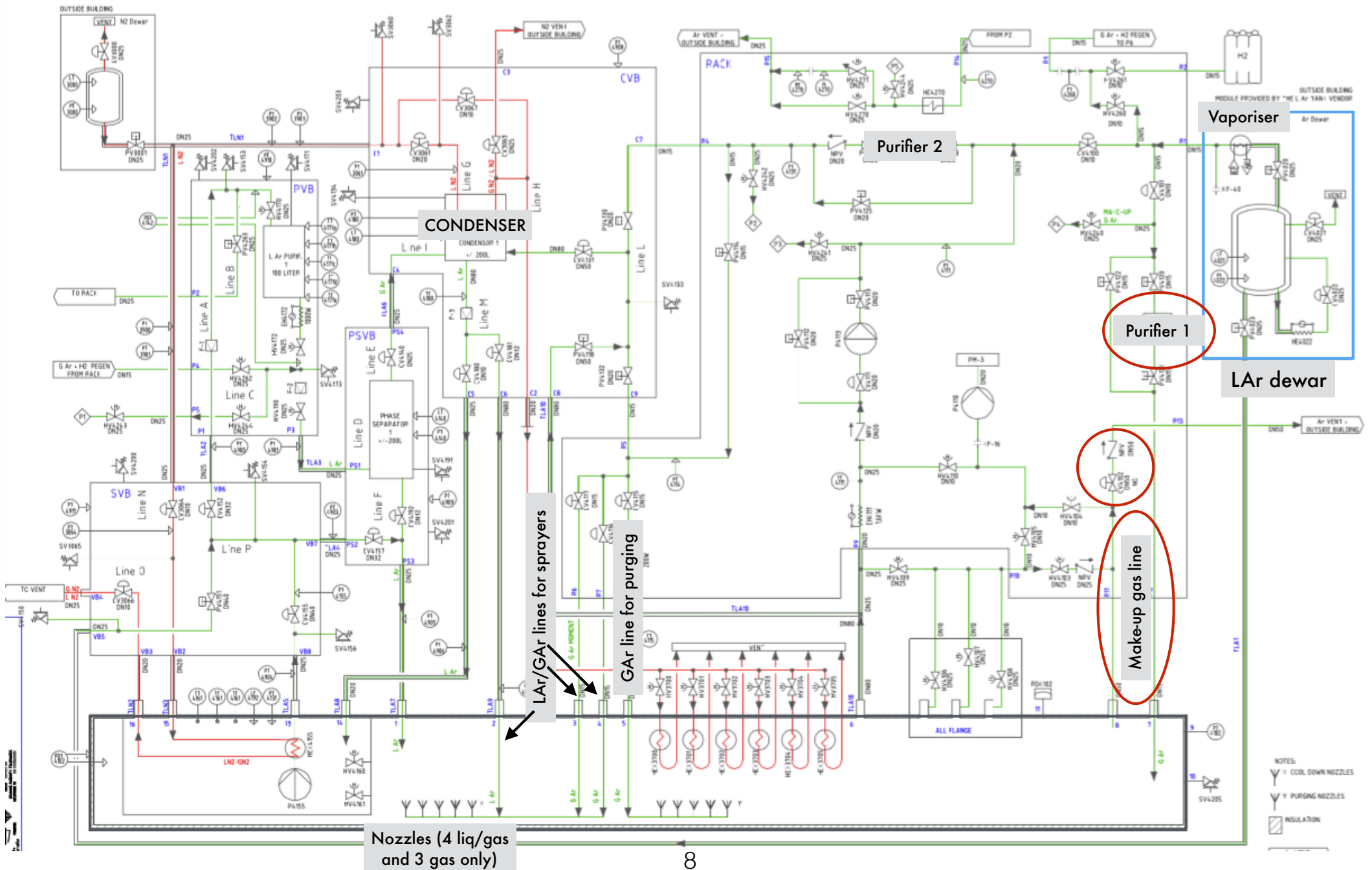


# Summary Dec 2016 - Mar 2017

- GAr injected through  
make-up gas lines  
- Venting valve open



# P&ID (just a reminder)





# Summary Dec 2016 - Mar 2017

- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25pmm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas lines.

Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm

20% argon in condenser.  
From condenser to phase-separator  
and then to cryostat.  
N<sub>2</sub> and O<sub>2</sub> constant as diluted by  
pure GAr.

PMTs synchronised with  
CRTs trigger. Data in GAr  
was subsequently acquired.

10<sup>th</sup> Feb

13<sup>th</sup> Feb

14<sup>th</sup> Feb

20<sup>th</sup> Feb

22<sup>th</sup> Feb

23<sup>th</sup> Feb

24<sup>th</sup> Feb

27<sup>th</sup> Feb

3<sup>rd</sup> Mar

3<sup>rd</sup> Mar

4<sup>th</sup> Mar

14<sup>th</sup> Mar

15<sup>th</sup> Mar

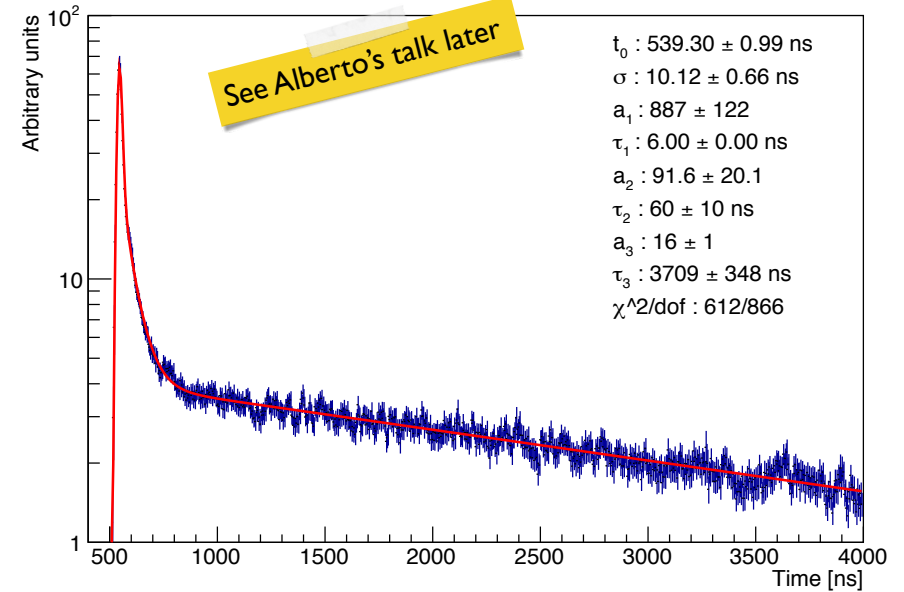
16<sup>th</sup> Mar

17<sup>th</sup> Mar

20<sup>th</sup> Mar

21<sup>st</sup> Mar

Scintillation time in GAr (1000 mBar, 215 K)



# Summary Dec 2016 - Mar 2017

- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas lines.

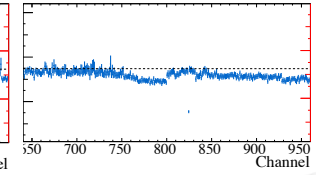
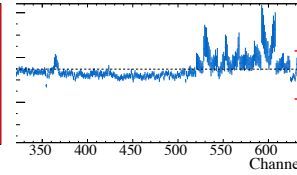
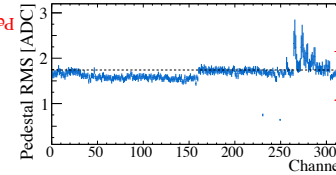
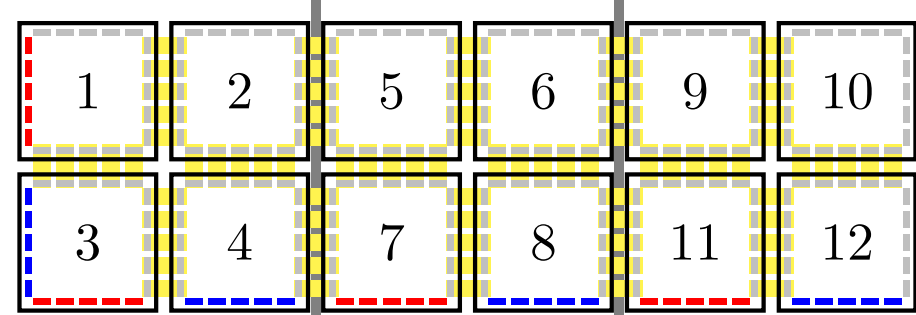
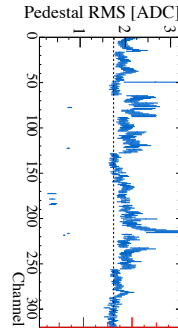
Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm

20% argon in condenser.  
From condenser to phase-separator  
and then to cryostat.  
N<sub>2</sub> and O<sub>2</sub> constant as diluted by  
pure GAr.

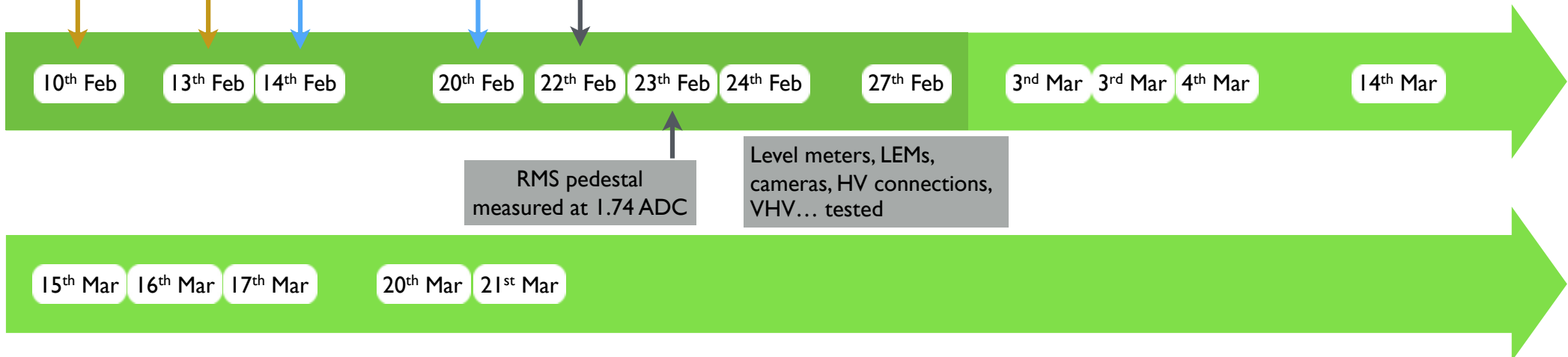
PMTs synchronised with  
CRTs trigger. Data in GAr  
was subsequently acquired.

RMS pedestal  
measured at 1.74 ADC

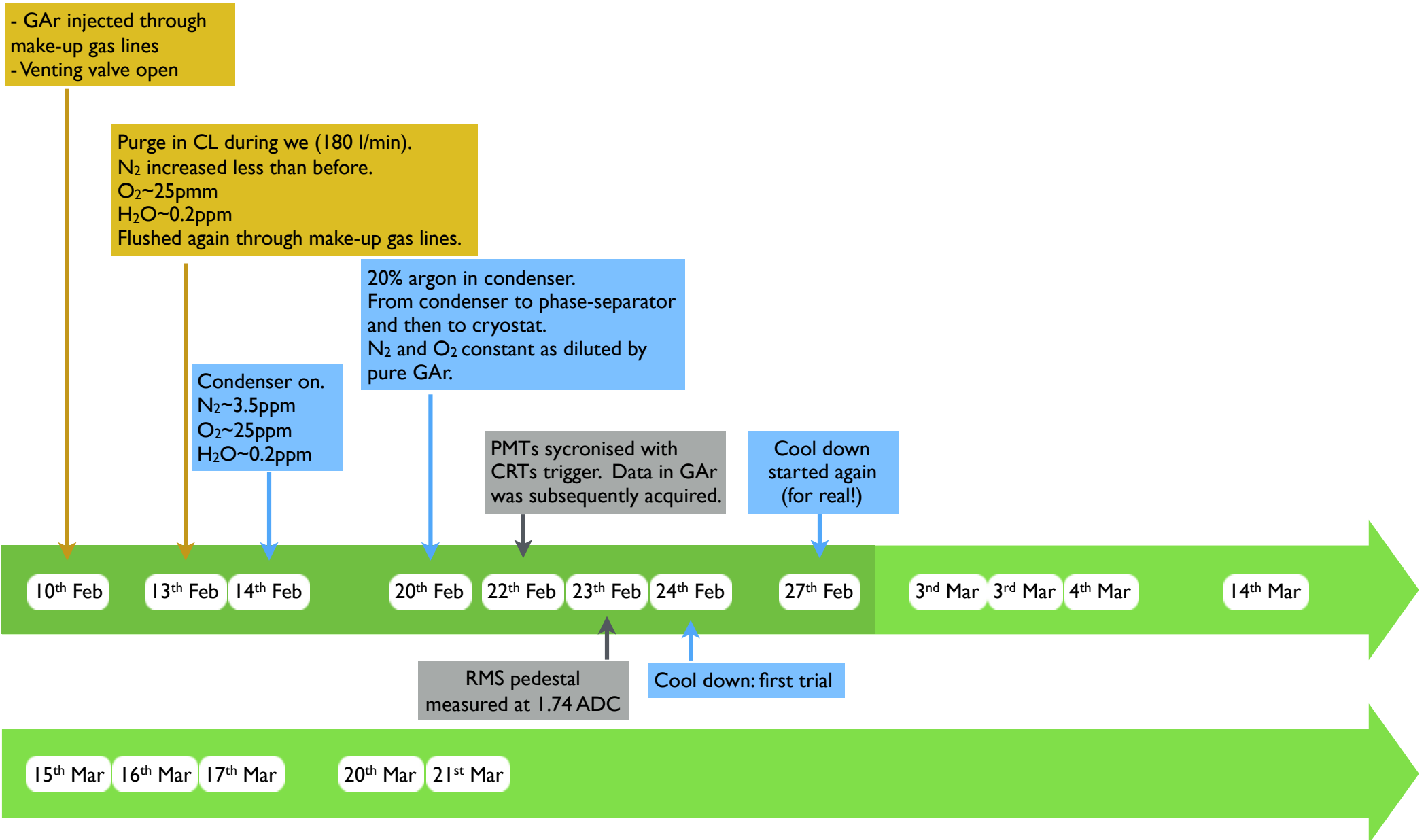
Level meters, LEMs,  
cameras, HV connections,  
VHV... tested



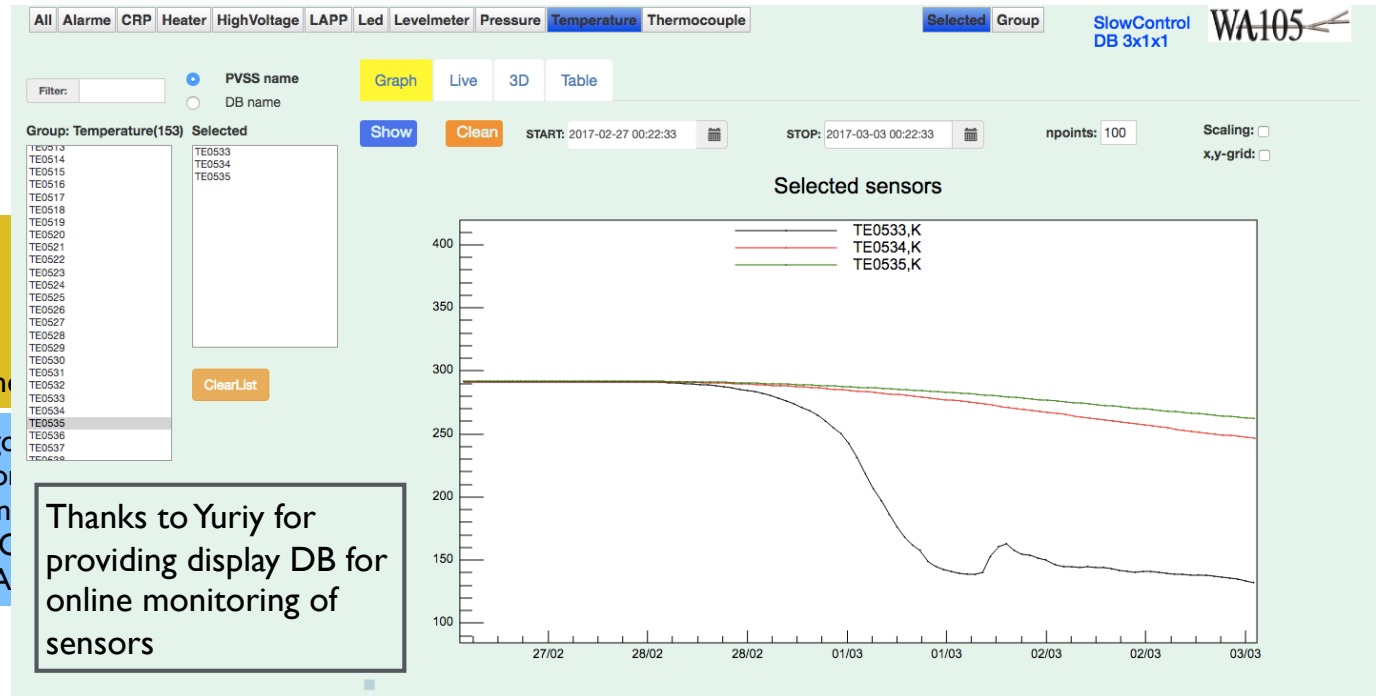
See Laura Z.'s talk later



# Summary Dec 2016 - Mar 2017



# Summary Dec 2016 - Mar 2017



- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas line

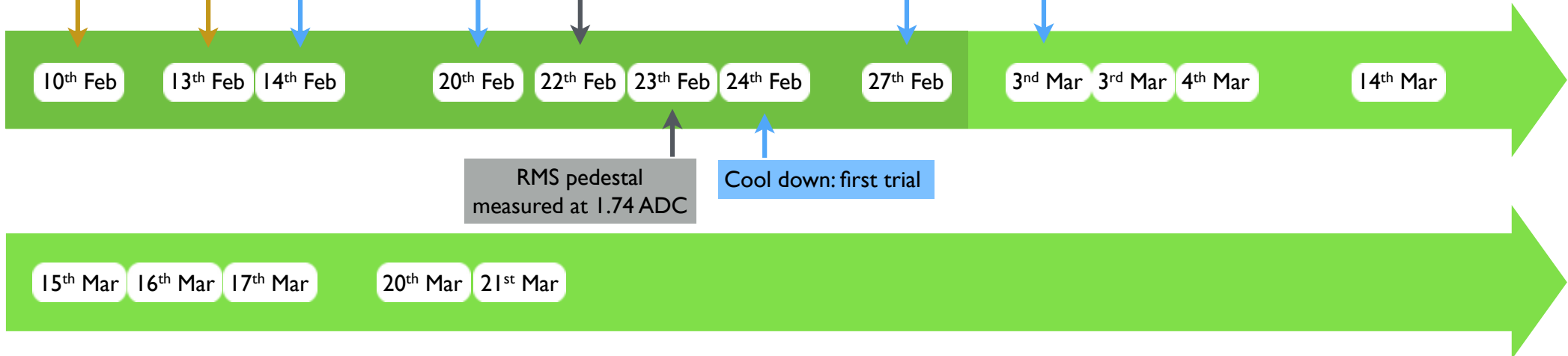
20% argon  
From coil  
and then  
N<sub>2</sub> and O<sub>2</sub>  
pure GAr

Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~0.2ppm  
H<sub>2</sub>O~25ppm

Thanks to Yuriy for providing display DB for online monitoring of sensors

CRTs trigger. Data in GAr was subsequently acquired.

started again (for real!)



# Summary Dec 2016 - Mar 2017

- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25pmm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas lines.

20% argon in condenser.  
From condenser to phase-separator  
and then to cryostat.  
N<sub>2</sub> and O<sub>2</sub> constant as diluted by  
pure GAr.

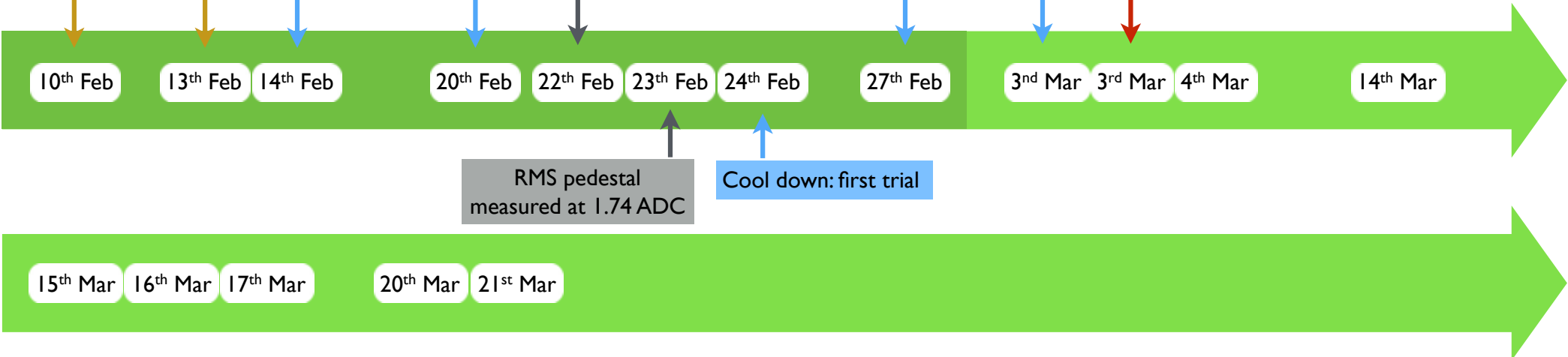
Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm

PMTs synchronised with  
CRTs trigger. Data in GAr  
was subsequently acquired.

Cool down  
started again  
(for real!)

Realised wrong type of  
nozzles was installed  
(5.3 l/h instead of 15 l/h)

Ice seen on  
outer structure



# Su

- GAr injected through make-up gas lines
- Venting valve open

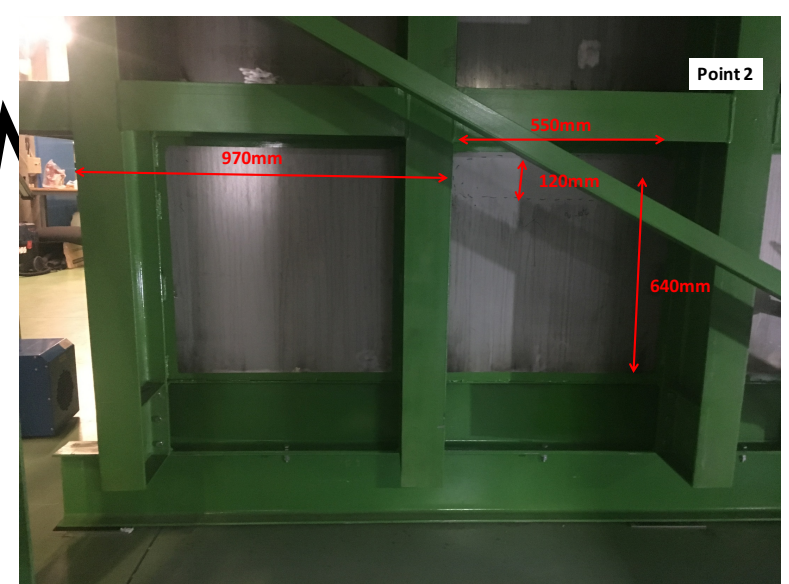
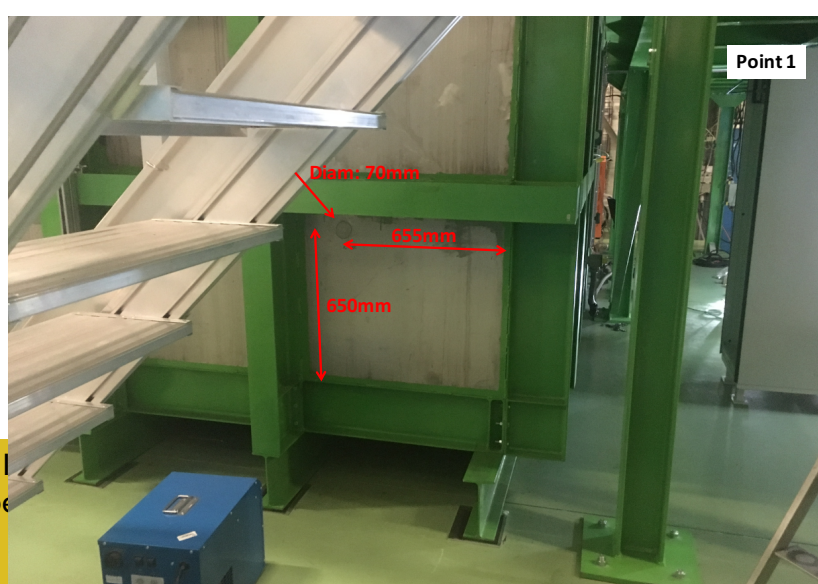
Purge in CL during we (L  
 N<sub>2</sub> increased less than be  
 O<sub>2</sub>~25ppm  
 H<sub>2</sub>O~0.2ppm  
 Flushed again through make-up gas lines.

Condenser on.  
 N<sub>2</sub>~3.5ppm  
 O<sub>2</sub>~25ppm  
 H<sub>2</sub>O~0.2ppm

20% argon in condenser.  
 From condenser to phase-s  
 and then to cryostat.  
 N<sub>2</sub> and O<sub>2</sub> constant as dilu  
 pure GAr.

PMTs synchron  
 CRTs trigger  
 was subsequ

RMS pedestal  
 measured at 1.74 ADC



10<sup>th</sup> Feb

13<sup>th</sup> Feb

14<sup>th</sup> Feb

20<sup>th</sup> Feb

22<sup>th</sup> Feb

23<sup>th</sup> Feb

14<sup>th</sup> Mar

15<sup>th</sup> Mar

16<sup>th</sup> Mar

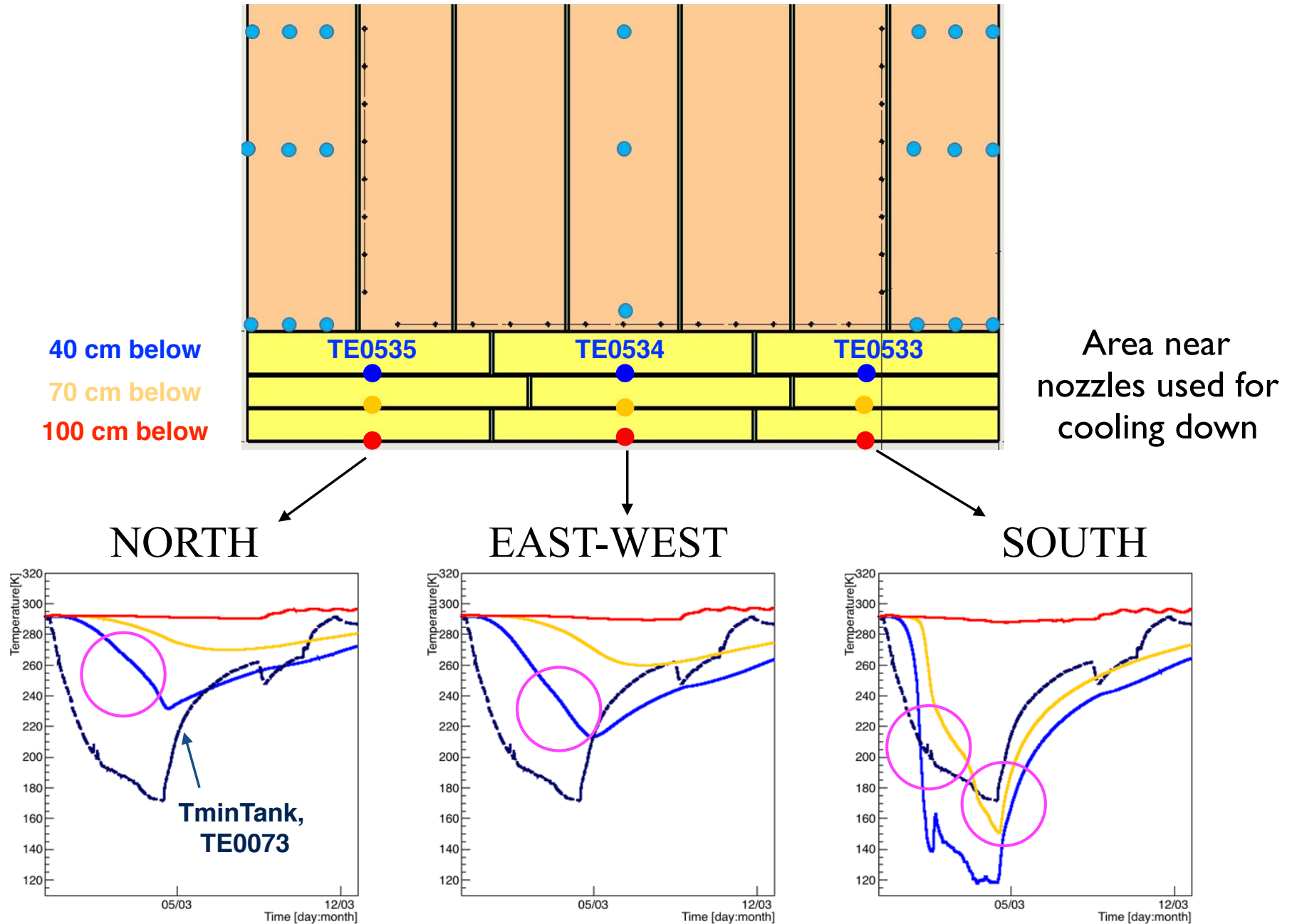
17<sup>th</sup> Mar

20<sup>th</sup> Mar

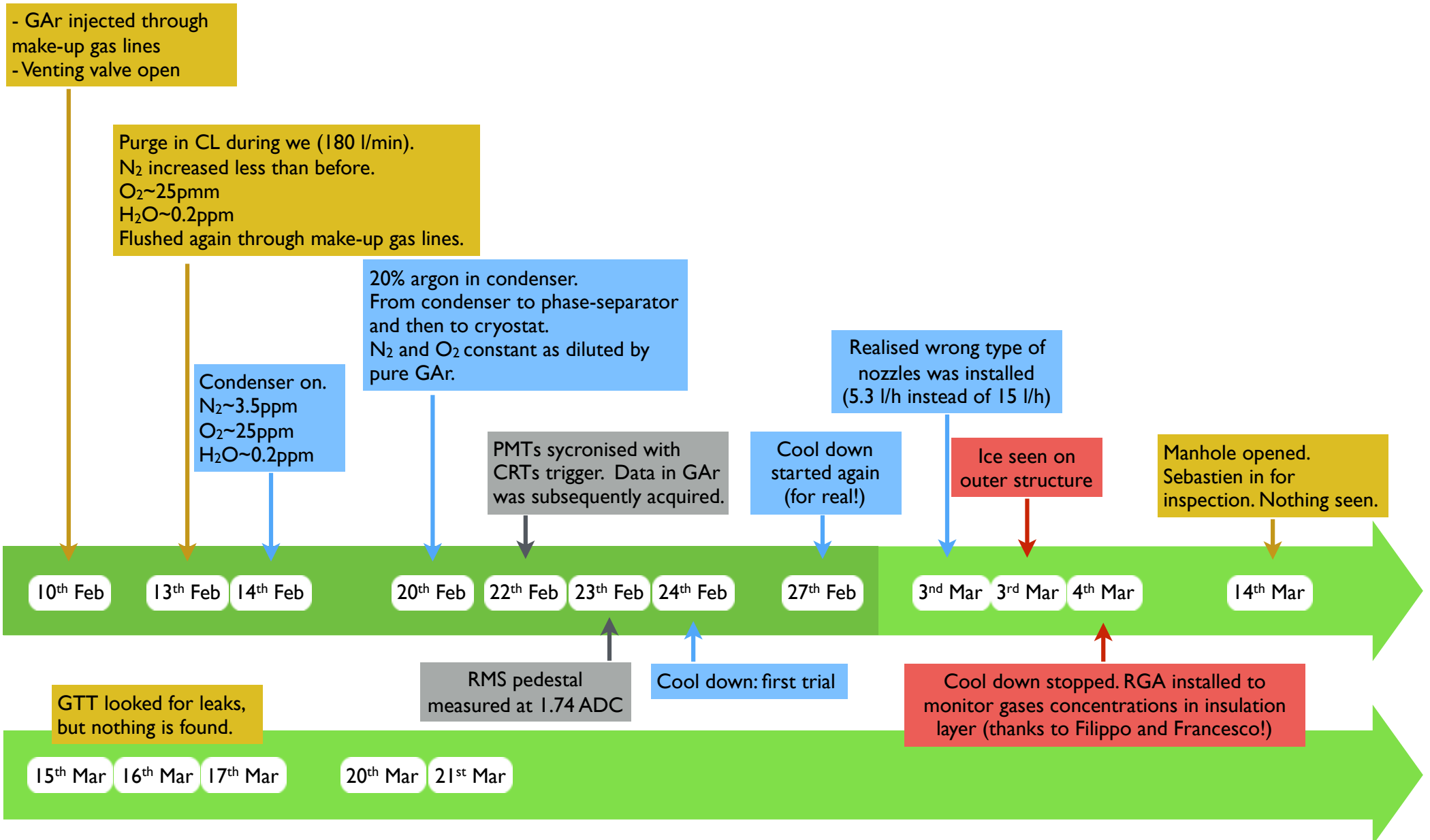
21<sup>st</sup> Mar



# Temperature sensors



# Summary Dec 2016 - Mar 2017





# Summary Dec 2016 - Mar 2017

- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25pmm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas lines.

Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm

20% argon in condenser.  
From condenser to phase-separator  
and then to cryostat.  
N<sub>2</sub> and O<sub>2</sub> constant as diluted by  
pure GAr.

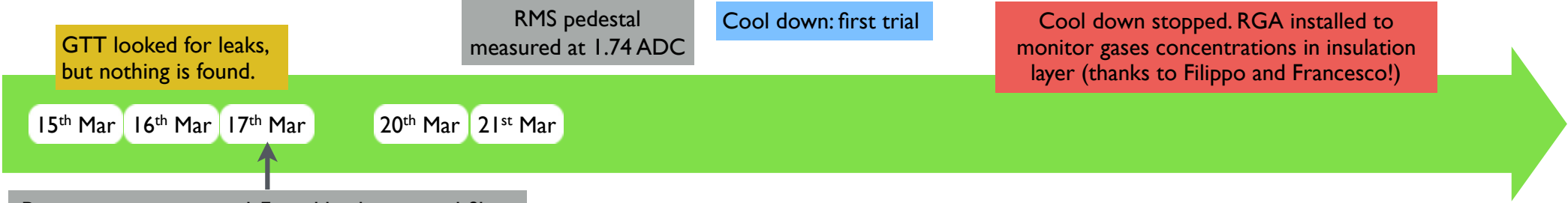
PMTs synchronised with  
CRTs trigger. Data in GAr  
was subsequently acquired.

Cool down  
started again  
(for real!)

Realised wrong type of  
nozzles was installed  
(5.3 l/h instead of 15 l/h)

Ice seen on  
outer structure

Manhole opened.  
Sebastien in for  
inspection. Nothing seen.

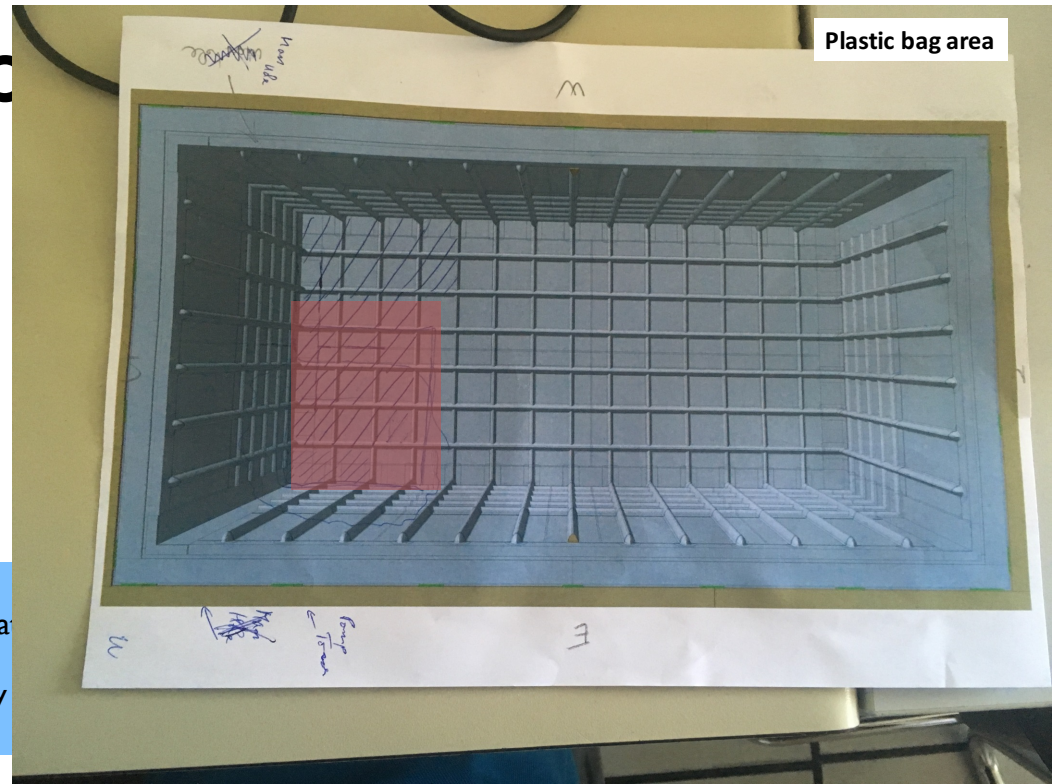


Purity monitor removed. Found broken optical fibre.  
Test ongoing. Reinstallation on Thursday.

Fibre now repaired. Small  
setup prepared to test PrM  
outside cryostat.



# Summary Dec



- GAr injected through make-up gas lines  
- Venting valve open

Purge in CL during we (180 l/min).  
N<sub>2</sub> increased less than before.  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm  
Flushed again through make-up gas lines.

20% argon in condenser.  
From condenser to phase-separation and then to cryostat.  
N<sub>2</sub> and O<sub>2</sub> constant as diluted by pure GAr.

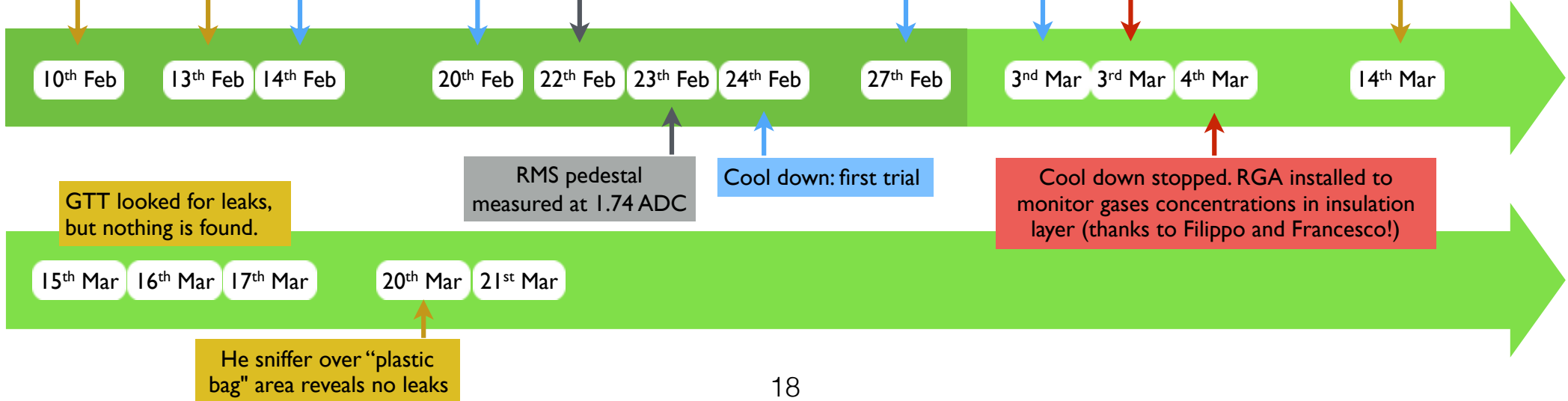
Condenser on.  
N<sub>2</sub>~3.5ppm  
O<sub>2</sub>~25ppm  
H<sub>2</sub>O~0.2ppm

PMTs synchronised with CRTs trigger. Data in GAr was subsequently acquired.

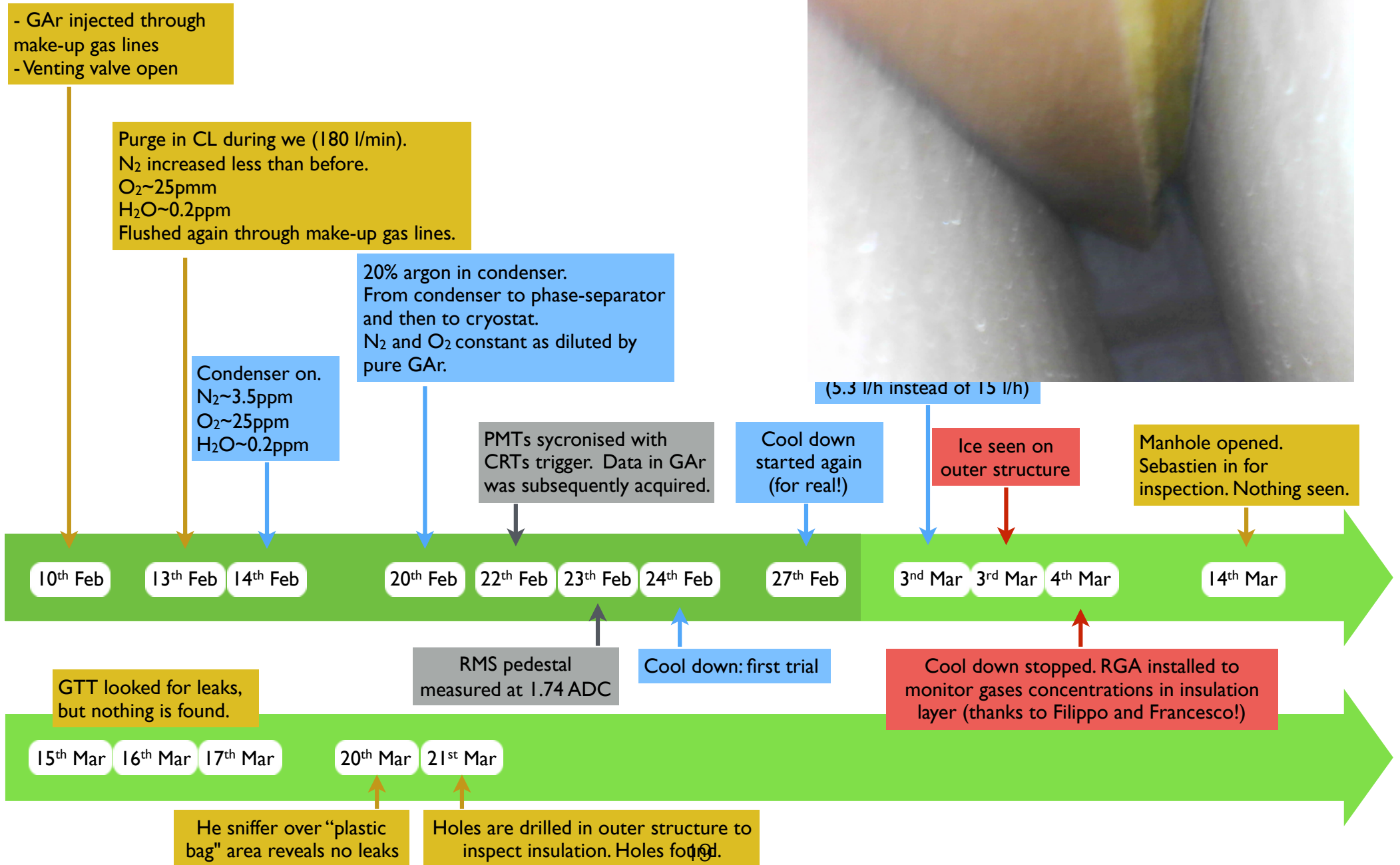
Cool down started again (for real!)

Ice seen on outer structure

Manhole opened. Sebastien in for inspection. Nothing seen.



# Summary Dec 2016 - Mar 2017



# Plan

- We need to investigate for no leaks at cold (make sure we had ice outside because of gaps in the insulation, i.e. thermal bridge between membrane and external wall)
- More temperature sensors have been installed on the membrane (thanks Cosimo!)
- One of the cameras is now pointing towards the nozzles (thanks Thierry!)
- Purity monitor to be put back on Thursday
- Close manhole on Friday and start purging in open loop
- Meanwhile GTT will repair the insulation

# SOUTH

