



LHC Injectors Upgrade

Implications of the 2020/21 Christmas shutdown - update

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Many thanks to

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Contents

- **The Christmas story (well – you know...)**
- **Change in the Plot**
- **Last Christmases: restart 2013 - CV**
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Beams required

- **SPS (from week 3/2021) (from K.Li's presentation)**

- LHCIndiv (1.2e11)
- MTE low intensity (core only, 5e11, 2 μ s) after 2 days
- MTE low int (5e12, 10 μ s) after 1 week
- LHCProbe after 2 weeks
- MTE full beam after 3 weeks
- Multi-bunch beams (12b, 24, 36, 48, 72) after 4 weeks
 - Standard 25ns or BCMS (not big difference for the PS RF)

=> 2 critical beams

NTOF from week 14/2021 (5/4/21)

- **NTOF from week 3/2021 (new target, assume intensity ramp-up later)**
- **AD from week 12/2021 (RF side should follow other beams)**
- **EAST from week 18/2021**





Conclusion

- **Christmas shutdown needs to be incorporated as well as possible**
 - Reduces effective time
- **'Arrêt d'Urgence' tests during shutdown will have effect on the restart**
- **Yearly CO maintenance required**

- **Proposal:**

- Incorporate the 4 CO days into the shutdown
- Use the 'Arrêt d'Urgence' tests during shutdown

An unforeseen change in the Xmas story:

- **No 'Arrêt d'Urgence' tests scheduled during shutdown**
- **Planned for L4, PSB et PS on week-end 23/24.5.2020**



CV – Water cooling

- **When primary circuit stopped >24h => complete draining + mechanical cleaning (strict procedure)**
- **If entire installation is stopped**
 - Need **one week** before Christmas for draining everything
 - Need **one week** for restart in Jan
- **=> Need to keep circuits running**
 - CV piquet
 - Subset of **power converters** need to be **kept running as a load** to avoid freezing
 - => **Supervision** (possibly TI) + **TE-EPC piquet** service



CV – Water cooling

- When primary circuit stopped >24h => complete draining + mechanical cleaning (strict procedure)

- If entire installation

TI section meeting 13/12/2012: Consignes de Noël
 Jesper est en train de mettre en place le **classeur de Noël**. Pour l'instant, il n'y a pas beaucoup de consignes spéciales. Nous n'avons pas encore la consigne, mais PSB et PS vont nous demander de vérifier l'état de quelques alimentations sur les machines. Pour pouvoir redémarrer rapidement en janvier, nous allons laisser tourner les circuits d'eau sur les injecteurs. Pour éviter le gel, on laissera des charges sur les circuits. Ce sont ces charges qui ont besoin d'être supervisés. Les instructions vont arriver très bientôt...

... kept running as a load to avoid freezing

... (possibly TI) + TE-EPC piquet service

4. Status of the circuits during XMAS break 2012/13

S. Deval

Machine	Circuits	Status	Rem :
LEIR - LINAC	FDED-00049	Running	Source of the linac 3 running
PS	Main magnet FDED-00032	Stopped and drained	Difficult to keep it loaded
PS	Central building FDED-00050	Running	Load from EPC
PS	POPS FTEB-00046	Stopped and drained	Difficult to keep it loaded
PS + Linac	Chilled water PS F\$FSEG-00355	Running	Linac 3 running
PSB	Booster + TT2 FDED-00065	Running	Load from EPC
PSB	Chilled water Booster F\$FSEG-00361	Running	Loaded with the ventilation
SPS	SPS ring FQSTR-00003	Running	Cryo machine sector 1-2
North area	NA - FQSTR-0002	Running	Cryo north area



CV – Running and Maintenance

- **Need to determine the loads needed for different circuits**
- **POPS**
 - Water refills were required in the past
 - => difficult to keep running
 - Possibly fixed now, to be confirmed
- **CV – Maintenance**
 - Cooling circuits running from Jan/March 2020 already
 - Ventilation also from Feb/May/June 2020
- **Some maintenance needed over the 2020/21 run => ITS planning**
 - CV proposal: 1 in 2020, 3 in 2021



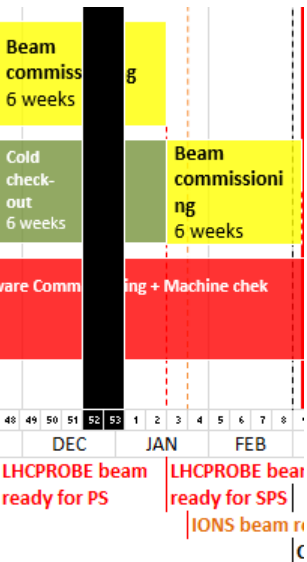
New Version of the Nativity Play

- **ITS beginning of first week of Jan 2021**
- **Fri 18/12/2020:** Stop POPS cooling + draining + shock water treatment
 - ½ day should be sufficient, rest of maintenance during Xmas stop
- **Mon 4/01/2021:** Restart cooling, CO update, repairs + maintenance
- **Wed 6/01/2021:** Restart equipment (with possible individual CO fixes)
- **Fri 8/01/2021:** hopefully back to normal running

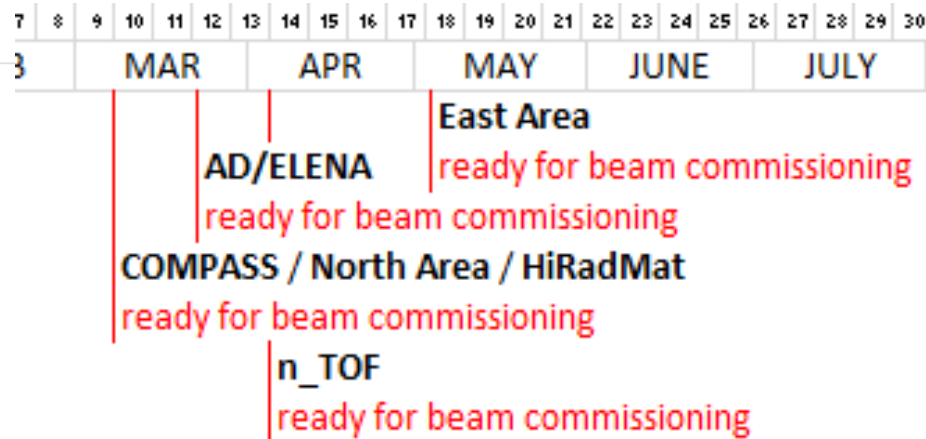
- **=> PS commissioning reduced from 6 to 5 weeks**
- **Do we need to extend it, also in view of later LHC restart?**



Overall commission schedule



- First beam to be delivered: North Area in week 10/2021
- Extending PS standalone commissioning would shorten SPS time
- => keep present (5+ weeks) for PS with higher risk of delay in case of a bigger problem



- Two beams in week 3/2021
 - LHCIndiv (1.2e11)
 - MTE core, low intensity
- More time later to finalize set up for other and LHC beams
- Review readiness dates





Conclusion

- **Christmas shutdown needs to be incorporated as well as possible**
 - Reduces effective time
- **'Arrêt d'Urgence' tests not scheduled during shutdown**
- **Yearly CO maintenance required**
- **CV needs to be kept running but maintenance required at some point**
- **Proposal:**
 - Incorporate the 4 CO days in the schedule
 - Use the first 2 days for **ITS** and eventual equipment fixes
 - Restart with available CO on 6-7/01/2021
- **All this is open for further discussion...**



Additional Slides





START UP PLAN FOR A QUICK RESTART AFTER THE XMAS BREAK

Engineering
Department



IEFC 19 october 2012

2. Aspects linked to the drainage of the primary circuits

- When the primary circuit is stopped for more than 24h, it is mandatory to drain it completely.
- If the primary circuit is drained, then a mechanical cleaning of the cooling tower is needed.
- No way to simplify or shorten the stop and start procedure (preliminary shock water treatment, analyse before draining and before the restart etc..). → important work in a very short time.
- To be able to clean the cooling towers, CV will need to stop the circuits shortly after the 17th of December.

3. CV costs and environnement

CV Costs

Stopped and drained

- Manpower for the operation (~500 hours)
- Water (~100 m3)
- Chemical for the shock treatment
- Chemical to treat after refill
- Water analysis

~40
kCHF

Running

- Manpower for additional rounds (~70 hours)
- Electricity (~350 MWh)
- Normal water and chemical consumption

~30
kCHF

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Environnement

- Drinking water consumption
- Release of higher amount of treated water
- Chemical for the shock treatment

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- Electricity consumption

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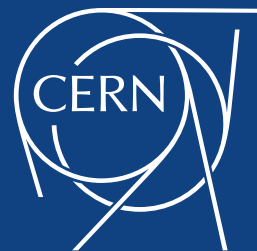
5. Follow up and start up plan

- CV will intensify the rounds during the closure especially if the weather is cold.
- On Monday January 7th , CV will restart :
 - PS : FDED-00032 PS Magnet
 - POPS: FTEB-00046
- POPS will be fully operational on Tuesday.

6. February 2012: a good example



- Extremely cold and windy weather
- All the primary circuits were running with a reduced load.
- Large amount of problems on drinking and fire hydrant circuits but the primary circuits had well resisted
- POPS start up was delayed because the filling circuit was frozen → corrective work achieved.



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