Protection against accidental contacts with normal conducting magnets

Consolidation program for Transfert Line L4/PSB - PS - PSB

Olivier Crettiez
on behalf of TE-MSC-MNC
Overview of present situation
Recall

1. TE Department has undertaken a full inventory of its equipment, with regard to electrical hazards for electrical and non-electrical works in its vicinity.
2. A review of the situation of the active parts of all the normal conducting magnets in the CERN accelerator complex with respect to accidental contacts was completed early 2019,
   https://edms.cern.ch/file/2068726/0.1/Internal_Note_2019-02.docx

6. Level of protection provided by the covers
   We define five levels graded from a to e, from the highest protection to the lowest protection.
   - Level a: Full protection
   - Level b: High protection
   - Level c: Medium protection
   - Level d: Low protection
   - Level e: None – No protection

Protection level per number of magnets

Olivier Crettiez
Consolidation program

Mandate

1. A progressive consolidation program upgrading the present protections to conformity was established and is engaged during LS2 with the objective of being completed by December 2020
2. Priority is given to eliminate level category “e” magnets with best effort also on level category “d”
3. Work is coordinated by TE/MSC, in close collaboration with EN-MME and HSE

from problematic on site.. to study.. to design.. to archive..

to production.. to installation.. to conformity..

during LS2 by the end of 2020

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Consolidation program
Where?

1. All actions on level category “e” magnets within 2020
2. Best effort on level category “d” magnets within 2020
3. Implementation on level category “d” magnets in a second phase, not during LS2
4. Presentation focused on PS complex

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4
- PS Booster
- PS ring
- East Area
- North Area
- TT2

Actions on category “d” magnets not within 2020
- SPS, LHC
- TT10, TT40, TI2, TI8
Consolidation program

How?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

**Linac 4**
Consolidation March 2020
Estimated duration: 2 days

Example of uniform protection cover

**9 magnets, 3 families**

Actions on category “e” magnets within 2020
- PS Booster
- PS ring
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac 4, March 2020
- PS Booster
- PS ring
- East Area
- North Area
- TT2
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

**PS Booster**
Consolidation July 2020
Estimated duration 2 weeks

Actions on category “e” magnets within 2020
- PS Booster, July 2020
- PS ring
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4, March 2020
- PS Booster, July 2020
- PS ring
- East Area
- North Area
- TT2

ICL presentation December 2019, [https://indico.cern.ch/event/869036](https://indico.cern.ch/event/869036)
ECR under approval, EDMS 2274667

Few conflicts with BLM detectors – Collaborative overcome with the different groups

Protection against accidental contacts with normal conducting magnets

New additional covers

New protective drawers

125 magnets, 17 families
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

PS ring
Consolidation June 2020
Estimated duration 3 weeks

Actions on category “e” magnets within 2020
- PS Booster, July 2020
- PS ring, June 2020
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4, March 2020
- PS Booster, July 2020
- PS ring, June 2020
- East Area
- North Area
- TT2

Magnet Type 205, 206, 210
Magnet Type 401, 402, 403
404, 406, 407
409, 414
Main Units R, S, T, U

332 magnets, 16 families

Protection against accidental contacts with normal conducting magnets

Olivier Crettiez
Consolidation program
How and When?

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

East Area and TT2 Transfer line
Consolidation March 2020
Estimated duration 1 week

Actions on category “e” magnets within 2020
- PS Booster, July 2020
- PS ring, June 2020
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4, March 2020
- PS Booster, July 2020
- PS ring, June 2020
- East Area, March 2020
- North Area
- TT2, March 2020

72 magnets, 3 families
Consolidation program

Calendar

Compatibility shall be studied with the machine responsible and confirmed by the Facility Coordinator or BE-OP

<table>
<thead>
<tr>
<th>Machine</th>
<th>Installation schedule</th>
<th>Estimated duration</th>
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<tbody>
<tr>
<td>TT40</td>
<td>Completed</td>
<td>/</td>
</tr>
<tr>
<td>TI8</td>
<td>Completed</td>
<td>/</td>
</tr>
<tr>
<td>TI2</td>
<td>February 2020</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Linac4</td>
<td>March 2020</td>
<td>2 days</td>
</tr>
<tr>
<td>East Area</td>
<td>March 2020</td>
<td>1 week</td>
</tr>
<tr>
<td>TT2</td>
<td>March 2020</td>
<td>1 week</td>
</tr>
<tr>
<td>North Area</td>
<td>April 2020</td>
<td>1 day</td>
</tr>
<tr>
<td>PS ring</td>
<td>June 2020</td>
<td>3 weeks</td>
</tr>
<tr>
<td>PS Booster</td>
<td>July 2020</td>
<td>2 weeks</td>
</tr>
<tr>
<td>SPS</td>
<td>August 2020</td>
<td>1 day</td>
</tr>
<tr>
<td>AD</td>
<td>November 2020</td>
<td>4 weeks</td>
</tr>
</tbody>
</table>

Actions on category “e” magnets within 2020
- PS Booster, July 2020
- PS ring, June 2020
- AD
- SPS
- TT40
- TI8
- TI2

Actions on category “d” magnets within 2020
- Linac4, March 2020
- PS Booster, July 2020
- PS ring, June 2020
- East Area, March 2020
- North Area
- TT2, March 2020
Consolidation program

Calendar

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<tr>
<td>T18</td>
<td>Completed</td>
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<tr>
<td>T12</td>
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<tr>
<td>Linac4</td>
<td>March 2020</td>
<td>2 days</td>
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BE-OP proposal
W30 - Period 8 to 15
W31 - Period 16 to 7
Consolidation program

Monitoring

1. The studies and drawings are available and archived through CDD
2. All the magnets categories “e” and “d” part of the consolidation program and equipped with new protective covers are and will be inspected in the machines by HSE
3. The certification reports w.r.t. IP standards delivered by HSE are and will be registered and linked to the magnet documentation in Norma database
4. A dashboard to follow the progress of the consolidation program is accessible via the main site on TE electrical safety of accelerator equipment
Consolidation program
Collaborative solution

In case of work in proximity of a magnet, the risk of accidental contact with live conductors is removed by protective covers following EN 60529 (CEI 70-1) standards, with appropriate IP protection level.

PS Booster
Consolidation July 2020
Estimated duration 2 weeks

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Few conflicts with BLM detectors – Collaborative overcome with the different groups

Protection against accidental contacts with normal conducting magnets

125 magnets, 17 families
Consolidation program
Collaborative solution

Similar impact for several periods

1st proposal with intermediate plate positioned under BLM support

2nd proposal with BLM positioned on magnet cover

Periods 3, 4, 5, 6, 9, 10, 12, 13, 16

Few conflicts with BLM detectors – Collaborative overcome with the different groups

7 mm difference between proposals

Protection against accidental contacts with normal conducting magnets