Status of the Installation Chapter

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Installation Chapter

• Two main components:
  ➪ Installation sequence (Peter)
  ➪ QA/QC (Roxanne)
3.5.4 Quality Control in Integration and Installation

- All the active detector components will be shipped to the Integration Facility for integration between the different parts and for testing. It is at that location that we will have the most time to perform tests and this step will be critical for ensuring high performance of the integrated APAs.

Table 3.6 shows a summary of all the quality control tests that will be performed at the IF. The exact time scale of the APAs still needs to be finalised based on information from the production sites and on installation schedule. The APAs. The current time scale of the APAs still needs to be finalised based on information from the production sites and on installation schedule.

<table>
<thead>
<tr>
<th>Test to perform</th>
<th>Number of wires/channels</th>
<th>Acceptable values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Inspection</td>
<td>All</td>
<td>All intact</td>
</tr>
<tr>
<td>Wire tension</td>
<td>XXX, sample</td>
<td>±2N</td>
</tr>
<tr>
<td>Wire continuity</td>
<td>All</td>
<td>Perfect</td>
</tr>
<tr>
<td>Electronics</td>
<td>All</td>
<td>±10</td>
</tr>
<tr>
<td>Quality control</td>
<td>All</td>
<td>All intact</td>
</tr>
<tr>
<td>Wire</td>
<td>All</td>
<td>±10</td>
</tr>
<tr>
<td>Visual Inspection</td>
<td>All</td>
<td>All intact</td>
</tr>
</tbody>
</table>

Table 3.6: Tests underground in the storage/unpacking area.

- The APAs will be unpacked in the storage area underground (see Figure 3.12). Space in this area is very limited and only visual inspection will be performed during unpacking. If clear defects are visible, the APA will be returned to the IF for further investigation.

- Once the electronics is installed by the Electronics consortium, serious testing of the APA readout will be performed to ensure that the full connected APA is fully operational. The details of these tests still need to be developed to allow efficient assessment of the integrated APAs.

- In order to ensure fully operational APAs in the far detector, a series of tests has been developed along the APA installation steps. Major testing will be performed at the Integration Facility. Visual inspection will be done at every step of APA handling (in the underground storage area, after unpacking and in the TCO after housing). Some minimal testing will be performed in the TCO after APA pairs are linked and cabled and finally an extensive testing campaign will be performed in the fully integrated APAs once positioned at their final location in the cryostat. At each of these testing steps, the requirement of less than 1% of dead or non-operative channels will be respected.

Figure 3.12: A schematic of the layout for the storage and unpacking area underground.

Figure 3.14: A schematic of a full APA-CPA-APA-CPA-APA wall installed in the cryostat.
QA/QC section: What’s missing

• Only clear fail criteria mentioned (less than 1% channel dead). What about tension relation to this?

• Details of the tests to be performed.
  • Tension tests Ok
  • Continuity tests OK
  • Electronics integration tests (vague)
  • Noise tests (not described)
  • Cabling connections tests OK
  • Final tests with full readout (very vague)

• Time estimates not developed yet
Installation section

3.5 Integration and Installation (7 pages)

In this section, the full installation sequence will be detailed from the arrival of the APAs at the Integration Facility (IF) all the way to the final positioning and integration inside the cryostat.

After APA has left the production site, they will be shipped to the IF for integration. Once the APA crate is received and all components are unpacked and loaded in the cage by the sling, the APA will be lowered into the underground location where they will be picked up and stored in the waiting area. They then will be removed from the crate, lowered into the TCO, and moved to the underground location where they will be placed in the cage by the crane and moved down to the underground location where they will be picked up and stored in the waiting area. Once final tests have been performed, the APA is lowered down in the TCO. Some cables will likely need to be installed here, and the APA will be secured inside the cryostat, while the second APA will be lowered in the TCO. The two APAs will need final cabling and connection between the two. May be some quick testing before the two linked APAs are moved to final location.

3.5.1 Transport and Handling

This section will describe the cranes used for transport of the APA (both for international shipping and for shipping between IF and underground, which may be different). The APA frame feature for handling should have been described in section 3.4.2, where it says anchoring. The APA will have been inserted in the crate at the production site and shipped to the IF.

A description of the handling at IF is required. We need cranes to get the APAs out of the crate and moved them to a temporary holder for integration and testing. Once this is completed, the APA will be moved to the crate (or to different crates) for the transport underground. Those crates will be loaded on a truck, driven to the mine, transported to the cage, secured on the sling under the cage, lowered down, picked up (probably rotation of 180°) and moved to the underground storage area. There, they will be linked out of the crate and moved down the TCO. Once final tests have been performed, APAs will be moved to their final location.

List of figures will be:
- Drawing of the APA frame for shipping (two different if required)
- Drawing of the IF holder for the APA integration and testing
- Drawing of the APA crates will be attached under the cage
- Drawing of the storage area and the cranes and holder for APAs
- Drawing of the system to move the APAs down the TCO and inside the cryostat

3.5.2 Integration with Photon Detectors and TPC Electronics

For the photon detector system (PDS). The current idea is to integrate them at the production site. This is clearly the easiest since the frames are available with no want. However, it is possible that this will need to be done at the IF. Detailed plans of the PDS integration are required.

List of figures for the PDS will be:
- Drawing of the PDS frame integrated in the APA
- Potential drawings of the sequence of PDS installation and connections

3.5.3 Installation in the cryostat

A detailed description of the installation sequence once the APAs are underground is required.

After the APA is out of the crate and supported, test describe in refsec:fdsp-apa-install-calib will be performed. Then the APA is lowered down in the TCO. Some cables will likely need to be installed here, and the APA will be secured inside the cryostat, while the second APA will be lowered in the TCO. The two APAs will need final cabling and connection between the two. May be some quick testing before the two linked APAs are moved to final location.

List of figures for the installation in the cryostat will be:
- Drawing of the sequence from the underground storage to TCO
- Drawing of the cable installation required
- Drawing of the link/connection between the two APAs

Figures will take a lot of space. Need more
Peter has the list, he just needs to put it in (next couple of days)
Installation section: What’s missing

• This is in quite good shape thanks also to the Installation group

• Details on some components still need to be worked out:
  • APA connection
  • Cabling (quite good shape) but need alternative still
  • Transport boxes

• Draft will be available by the end of this week

• Chapter will probably be around 10 pages (instead of 7 pages).