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| **DUNE APA Final Check List Summary** | | | | | | | | | | | | | | | | | |
| **Section A. Properties** | | | | | | | | | | | | | | | | | |
| Frame PID Number | Input: D00300200001-00008-UK118 | | | | | | | APA PID Number | | | | Input: D00300100002-00008-UK106-01-00-00 | | | | | |
| APA Production Site | Select: Daresbury Laboratory | | CERN Test Date (optional) | | | | | | | Click or tap to enter a date. | | | | | | | |
| APA Tested at CERN? | Select: | | Departure Date from CERN (optional) | | | | | | | Click or tap to enter a date. | | | | | | | |
| Departure date from production site | Click or tap to enter a date. | | Arrival Date at Fermilab | | | | | | | Click or tap to enter a date. | | | | | | | |
| Arrival date at CERN (optional) | Click or tap to enter a date. | | Arrival Date at SURF | | | | | | | Click or tap to enter a date. | | | | | | | |
| APA Configuration (Top or Bottom) | Select: Top | | | | | | | | | | | | | | | | |
| Temperature Sensor 1 | Type: Standard/Frame | | PID#: STS 011 | | | | | | Select Position Number (1-18, F1, F2): F1 | | | | | |  | | |
| Temperature Sensor 2 | Type: Precision/Lar | | PID#: P48487 | | | | | | Select Position Number (1-18, F1, F2): 5 | | | | | |  | | |
| Temperature Sensor 3 | Type: Precision/Lar | | PID#: P48483 | | | | | | Select Position Number (1-18, F1, F2): 14 | | | | | |  | | |
| Temperature Sensor 4 | Type: Standard/Frame | | PID#: STS 012 | | | | | | Select Position Number (1-18, F1, F2): F2 | | | | | |  | | |
| Manufacturer of Wire | Select: | | | | | | | | | | | | | | | | |
| **Section B. Problematic Channels** | | | | | | | | | | | | | | | | | |
| Problematic Channel #1 | Wire layer and side Select: | Head board # - Pad #  Input: | | Offline Channel  Input: | | FEMB-ASIC-ASIC Channel  Input: | | | | Wire-Segment-Location (UV Plane only)  Select: | | | Problem-Type  Select: | Location Select: | | | NCR-Number and UUID  Input: |
| Problematic Channel #2 | Wire layer and side Select: | Head board # - Pad #  Input: | | Offline Channel  Input: | | FEMB-ASIC-ASIC Channel  Input: | | | | Wire-Segment-Location (UV Plane only)  Select: | | | Problem-Type  Select: | Location Select: | | | NCR-Number and UUID  Input: |
| Problematic Channel #3 | Wire layer and side Select: | Head board # - Pad #  Input: | | Offline Channel  Input: | | FEMB-ASIC-ASIC Channel  Input: | | | | Wire-Segment-Location (UV Plane only)  Select: | | | Problem-Type  Select: | Location Select: | | | NCR-Number and UUID  Input: |
| Problematic Channel #4 | Wire layer and side Select: | Head board # - Pad #  Input: | | Offline Channel  Input: | | FEMB-ASIC-ASIC Channel  Input: | | | | Wire-Segment-Location (UV Plane only)  Select: | | | Problem-Type  Select: | Location Select: | | | NCR-Number and UUID  Input: |
| **Section C. Other Non-Conformances (Non-Channel Specific)** | | | | | | | | | | | | | | | | | |
| Non-Conformance #1 | Description of NCR and how it affects performance: | | | | | | | | | | | | NCR-Type  Select: | Location Select: | | | NCR-Number  Input: |
| Non-Conformance #2 | Description of NCR and how it affects performance: | | | | | | | | | | | | NCR-Type  Select: | Location Select: | | | NCR-Number  Input: |
| **Section D. Tension Measurements (Attach Plots)** | | | | | | | | | | | | | | | | | |
| Location of Tension Measurement | Select: | | | | | | | | | | | | | | | | |
| Summary Tension Plots X-Layer | Minimum: // Mean: // Maximum: // RMS: | | | | | | | | | | | | | | | | |
| Summary Tension Plots G-Layer | Minimum: // Mean: // Maximum: // RMS: | | | | | | | | | | | | | | | | |
| Summary Tension Plots U-Layer | Minimum: // Mean: // Maximum: // RMS: | | | | | | | | | | | | | | | | |
| Summary Tension Plots V-Layer | Minimum: // Mean: // Maximum: // RMS: | | | | | | | | | | | | | | | | |
| Number of ~~re-tensioned and~~ replaced wires on each layer (factory only) | Input: | | | | | | | | | | | | | | | | |
| List of wires falling outside tension specifications | Input: | | | | | | | | | | | | | | | | |
| **Section E. Survey Measurements of frame** (Precision required 0.1 mm) | | | | | | | | | | | | | | | | | |
| **Refer to Survey Measurement Document** | Input EDMS Number: EDMS 2795808 | | | | | | | | | | | | | | | | |
| **Width** deviations of completed APA from the longitudinal axis ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 5) | Nominal dimension: 1150 mm  Deviation from nominal: min max | | | | | | | | | | | | | | | | |
| **Height** deviations of completed APA from the traversal axis ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 5) | Nominal dimension: 6085 mm  Deviation from nominal: min max | | | | | | | | | | | | | | | | |
| **Frame survey results** | See table at the end of the document | | | | | | | | | | | | | | | | |
| **Position deviation for Head tube connection interfaces holes** from the longitudinal axis:  -for upper APA: yoke connection.  -for bottom APA: assembly actuator and field cage support connection.  ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 6) | HT hole #1  Nominal: 575mm  Deviation: | | | | HT hole #2  Nominal: 575mm  Deviation: | | | | | | HT hole #3  Nominal: 575mm  Deviation: | | | | HT hole #4  Nominal: 575mm  Deviation: | | |
| **Position deviations** **of link nut plate holes** that support linkages used to support bottom APAs (Reference dimension from external foot tube surface up to center on nut plate hole). ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 7) | Nut plate Left side:  Nominal: 256.1mm  Deviation: | | | | | | | | | | Nut plate Right side:  Nominal: 256.1mm  Deviation: | | | | | | |
| **Position deviation for Foot tube vertical alignment pins holes** from the longitudinal axis.  ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 4) | Alignment hole Left side  Nominal: 575mm  Deviation: | | | | | | | | | | Alignment hole Right side  Nominal: 575mm  Deviation: | | | | | | |
| Confirmation of each bolt type and appropriate installation, measurement of each preload | Type of bolt 8757A360:  M10-1.50 x 20 SHCS MODIFIED A2-70 SS SILVER PLATED | | | | YES  NO | | | | | | Type of bolt 8760090:  M12-1.75 x 40 SHCS A2-70 SS SILVER PLATED | | | | YES  NO | | |
| QTY:72 | | | | YES  NO | | | | | | QTY: 16 | | | | YES  NO | | |
| Torque: 28.5Nm  Range of deviation | | | | YES  NO | | | | | | Torque: 51.5Nm  Range of deviation | | | | YES  NO | | |
| **Section F. Survey Measurements of Completed APA** (Precision required 0.1 mm) | | | | | | | | | | | | | | | | | |
| **Refer to Survey Measurement Document** | Input EDMS Number: EDMS | | | | | | | | | | | | | | | | |
| Conduit and side tube PD holes alignment (visual inspection)  ([EDMS: 2816926,](https://edms.cern.ch/document/2816926/1) Figure 8) | YES  NO | | | | | | | | | | | | | | | | |
| **Section G. Compliance Summaries** |  | | | | | | | | | | | | | | | | |
| Frame check boxes indicating all certification (EN1090 compliance, use of certified welders, weld-procedure qualifications, and material test reports) have been checked and uploaded to EDMS/HWDB | Check Frame Certifications:  EN1090 Exc2 Compliance  Certified Welders  Weld-procedure Qualifications  Welds Compliance  Material Test Reports  Other on EDMS | | | | | | Certification  verified by:  EDMS number: | | | Input: G.M  EDMS 2795808 | | | | Date: | | 31 August 2022 | |
| Board check boxes indicating all certification (Geometry compliance and material test reports) have been checked and uploaded to EDMS/HWDB | Check Board Certifications:  Geometry Compliance with Drawings  Material Test Reports | | | | | | Certification  verified by: | | | Input: G.M | | | | Date: | | 20 April 2023 | |
| Conduit check boxes indicating all certification (Geometry compliance with drawings, use of certified welders, weld-procedure qualifications, and material test reports) have been checked and uploaded to EDMS/HWDB | Check Conduit Certifications:  Geometry Compliance with Drawings  Certified Welders  Material Test Reports | | | | | | Certification  verified by: | | | Input: | | | | Date: | | Click or tap to enter a date. | |
| Wire check boxes indicating all certification (Project requirements compliance and material test reports) have been checked and uploaded to EDMS/HWDB | Check Wire Certifications:  Project Requirements Compliance  Material Test Reports | | | | | | Certification  verified by: | | | Input: | | | | Date: | | Click or tap to enter a date. | |
| Mesh Panels check boxes indicating all certification (Geometry compliance, welds compliance and material test reports) have been checked and uploaded to EDMS/HWDB | Check Mesh Panels Certifications:  Geometry Compliance with Drawings  Certified Welders  Material Test Reports | | | | | | Certification  verified by: | | | Input: G.M | | | | Date: | | 20 April 2023 | |
| Report completed by: | Input: G.M | | | | | | | Date: | | 20 April 2023 | | | | | | | |

Frame survey results:

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| --- | --- | --- | --- |
| Measurement | Tolerance | Data | Unit |
| Cross corner deviation | 2.0 (1.0 target) | 0.6 | mm |
| Straightness of left side | 1.5 (1.0 target) | 0.2 | mm |
| Straightness of right side | 1.5 (1.0 target) | 1.1 | mm |
| Overall flatness | 11.0 | 3.2 | mm |
| Overall bow | 11.0 | 1.8 | mm |
| Overall twist | 1.0 | 0.08 | mm/m |
| Twist zone 1 | 1.0 | 0.42 | mm/m |
| Twist zone 2 | 1.0 | 0.49 | mm/m |
| Twist zone 3 | 1.0 | 0.35 | mm/m |
| Twist zone 4 | 1.0 | 0.21 | mm/m |
| Twist zone 5 | 1.0 | 0.49 | mm/m |
| Fold Foot tube | 1.2 | -0.1 | mm |
| Fold Rib 1 | 1.2 | -0.3 | mm |
| Fold Rib 2 | 1.2 | -0.6 | mm |
| Fold Rib 3 | 1.2 | -0.02 | mm |
| Fold Rib 4 | 1.2 | 0.5 | mm |
| Fold Head tube | 1.2 | 0.7 | mm |