

SUBJECT:	Fermilab Assessment Manual	NUMBER:	3902
RESPONSIBILITY:	Quality Assurance Manager	REVISION:	000 B
APPROVED BY:	Head, Office of Quality and Best Practices	EFFECTIVE:	

FERMILAB INDEPENDENT ASSESSMENT REPORT FORM

Fermilab Independent Assessment Report
Assessment Number & Title: 09-IA-QA-003 AD7835 Assessment Version 001
Date(s) of Assessment: 12/01/09-01/29/10
Performing Organization: OQBP
Assessed Organization(s): Accelerator Division, Proton Source Department, Linac Group
<p>Report content</p> <p>This report contains the following sections:</p> <ul style="list-style-type: none"> • Assessment activities & scope • Scope limitations • AD activities concerning the movement & storage of the Burle Industries (Burle) 7835 power amplifier triode vacuum tube (7835) along with a brief description of routine tasks done • Description of the implementation of the 7835 activities • Conclusions • Findings, Observations, & Recommendations <p>Assessment activities & scope:</p> <p>Implementation & effectiveness of controls for 7835 movement and storage activities were examined via interview, document review and observations of standard work activities within the AD Proton Source Department, Linac Group. A flowchart of these activities was completed. These observations were evaluated against the requirements of Fermilab's Integrated Quality Assurance (IQA).</p> <p>Scope limitations:</p> <p>During the assessment it was determined that Fermilab owns the 7835 from point of shipment. Therefore the scope includes all activities in the handling, storage and inspection of the 7835 from point of receipt at Fermilab to installation into the socket of the Linac. Procedures with the return of the 7835s to the supplier (Burle Industries) for refurbishment were also included within the scope. Procurement activities were not within the scope of this assessment.</p> <p>General Background:</p> <p>The Burle Industries 7835 power tube is used in the Linac accelerator. Burle is the only supplier that makes the 7835, and it has been in production for over 40 years. While old technology, the 7835 is still used in a few DOE laboratories. There are five 7835s used in series for Linac operation. If any one of them loses efficiency, the Linac ceases to operate at optimum performance. As such, there are ideally two 7835s ready as "hot spares" already inserted into sockets for immediate replacement. Hot spares take about two hours to replace. The process of getting the 7835 ready for insertion into the socket and inserting it into the socket can take several days.</p>

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AD Proton Source Department activities reviewed within this assessment can be summarized as:

- Determination of need to refurbish or buy a new 7835 is done. Appropriate paperwork is completed. This can include shipping documents, PO, Purchase Requisition, move request. See steps 1-7 in the attached flowchart (File 1).
- Receipt, inspection, and storage of new or refurbished 7835 from supplier. See steps 8-15 in the attached flowchart (File 1).
- Uncrate, further inspection, assemble into socket, test and condition. See steps 16-19 in the attached flowchart (File 1)
- Determine test and conditioning results, store or return to supplier. See steps 20, 21, 22, 29, 30 in the attached flowchart (File 1)
- Install in Linac. See step 23 in the attached flowchart (File 1)
- Determine the cause of poor performance and disposition of 7835 based on diagnosis. See steps 24, 25, 26, 28, 31,32, 34, 36 in the attached flowchart (File 1)

Description of implementation and effectiveness of practices assessed:

Personnel Training and Qualification:

Formal ES&H training is documented and kept up-to-date via the ITNA (File 2). Personnel are initially qualified by formal job description (File 3), and additional requirements are documented in a “Group Guidelines Duties and Responsibilities” document that resides with line management (File 4). Further job specific training is accomplished in an informal mentor/apprentice system which occurs over a period of years. While there is no requirement for formalized training at Fermilab, the current practice of verbal training appears to be ineffective as evidenced by the need to contact personnel that have left the lab for process information. Minimum objective training criteria do not exist.

Quality Improvement:

Multiple levels of management communicated the importance of quality improvement. The assessment team observed both reactive and proactive quality activities. The observed practices have been in place for 30+ years and, while they could benefit from process improvement, given the current phase of the life cycle the process owners should weigh the benefits of the effort against the cost to implement prior to implementing change.

Documents and Records:

The Linac group keeps detailed records of 7835 performance and acceptance criteria on hard copy notebooks (File 5). Other 7835 data is available on line (www-ad.fnal.gov/proton/linacRFTube/). Multiple data sources may cause confusion as to prime source data.

Detailed procedure documents exist. Duplicate instructions for the same activities were observed (File 7, File 13). Documents presented did not have version control. No indication exists of which document is current.

Work Processes:

Shipping and Receiving:

BSS is responsible for inter building transportation of the 7835s between Warehouse 2 and AD. 7835s delivered to Warehouse 2 typically are placed on the shipping/receiving dock for a period of less than 36

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hours before either being delivered to AD for receipts from Burle, or shipping to Burle for returns. No special procedures are in place for the handling of the 7835s, however personnel are trained in their handling by standard practices in use for all material. Upon receipt, a quick inspection of the condition of the packing and accelerometers is done. 7835s are typically shipped to Burle via air freight. 7835s received from Burle are received via FEDEX. There is no documented evidence that the 7835s have ever been damaged in transit, either on site or between Fermilab and Burle.

Work Process Control:

Pre-installation handling, installation, and conditioning of the 7835s is documented via hard copy (File 7). Periodic ion pump tests (a form of vacuum test) are regularly done and records kept of the results in spreadsheet format (File 8). Individual tasks within the handling and storage activity at AD are assigned based upon work history and experience of the personnel involved.

Item control:

Individual 7835s are given unique serial numbers (File 9). When a 7835 is rebuilt, an “R” suffix is added to the serial number that is indexed each time a 7835 is rebuilt (File 9). A typical maximum of 9 rebuilds are allowed before a 7835 is sent back to Burle for salvage. Operational status of any 7835 is determined by referencing a database available on line (www-ad.fnal.gov/proton/linacRFTube/). Individual 7835s are stored in the packing containers in multiple locations throughout AD.

Work environment:

Work environment is generally clean. It was stated verbally several times that a hazard analysis has not been done for specific activities pertaining to the storage and handling of the 7835s.

Inspection and Acceptance Testing:

Inspection procedures are documented (File 6) and records are retained (File 5). Units are stored in multiple locations with mixed stock of conditioned/unconditioned 7835s and are not obviously marked to prevent inadvertent use. Detailed records of 7835 performance and acceptance criteria are on hard copy notebooks (File 5). It is necessary to consult these notebooks to determine the fitness for use of individual units. Tools used for evaluation of acceptance (micrometers, gas pressure gauges) were not contained in a calibration system.

Assessments:

Regular management assessments via informal walkthroughs are held and results are discussed immediately with the responsible person or in the Linac Group Meeting (File 10). Product/process performance assessments are also conducted to track historical life of the 7835 (File 11).

Conclusions:

There is a displayed competence in handling the 7835s throughout the combined BSS and AD organizations. This competence is, however, based on historical knowledge passed on verbally.

Existing AD documentation is not revision controlled and multiple copies of procedures are not defined as primary or secondary sources of information. Training is based on an informal mentor/apprentice system without objectively defined proofs of competency as milestones of the training. The results of the lack of objective proofs result in a potential difference in practices through varying levels of process information passed on by verbal instruction.

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Because the process is not documented AD employees are sometimes compelled to interview former employees to seek process information. The availability of the former employees for interviews is not guaranteed. At this time there is not an emphasis to capture knowledge via documentation.

Findings:

1. A document management system is not used for the AD 7835 movement, shipping and storage procedures to provide document control. This is required in Paragraph 4.3 of the Fermilab Integrated Quality Assurance Manual. "Controls include activities such as preparation, review, approval, distribution, usage, availability, revision, and disposal of documents."

Observations:

1. Incomplete process documentation was observed. Some documentation regarding movement, shipping, and storage of the AD 7835 exists, but some process gaps exist. The attached flowchart (File 1) has references to process steps with documentation.
2. A structured method to obtain information from past employees of AD could be helpful.
3. Tools used for acceptance testing of the AD 7835 were not contained within a calibration system.
4. A Hazard Analysis has not been completed for the AD 7835 installation.
5. There was no evidence that verbal task specific training in the movement, shipping, and storage at AD for the 7835 was consistent.
6. Linac operations continue to be reliable using 30+ year old technology and evolved procedures. 7835 handling and storage procedures are an important factor in this performance.

Recommendations:

1. Review current documentation for completeness and continuity.
2. Create a procedure to identify knowledge gaps and interview past employees.
3. Consider the applicability of calibration requirements using a graded approach to the activities during the AD 7835 movement, shipping, and storage process.
4. Consult AD SSO to determine the need of a Hazard Analysis on the AD 7835 installation process.
5. Provide evidence of consistency and competency for training of the tasks that are communicated verbally.

Names of Person Interviewed:

Accelerator Division

Fernanda Garcia
Trevor Butler
Kenneth Hartman
Lawrence Allen
Brian Stanzil

Business Services Section

George Davidson
Brian Niesman
Al Elste
Tom Smith

Number and Title of Documents Reviewed:

File 1 7835 flow A07

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<p>File 2 ITNA File 3 WDRS Job Desc File 4 Organization Scheme File 5 Conditioning Log File 6 Inspection Procedures File 7 Processing Procedure File 8 Vacuum History File 9 Tube Inventory File 10 Linac-Meeting Presentation File 11 Product Assessment File 12 Burle Procedures File 13 Conditioning Chkfst and Gas Test</p>
<p>Standards, Regulations, and Other Program Requirements Applied:</p> <p>Fermilab Integrated Quality Assurance Manual 1001 Rev 000.2 B17 Chapter 2 Training and Qualification Chapter 3 Quality Improvement Chapter 4 Documents and Records Chapter 5 Work Processes Chapter 8 Inspection and Acceptance Testing Chapter 9 Assessments</p>
<p>Describe or List Any Other Assessment Methods Used:</p> <p>Interviews Physical Observations Document Review</p>
<p>Corrective Action Plans Issued:</p> <p>AD-2010-01-29 CAP issued as a result of this assessment</p>
<p>Assessors' Names (Asterisk indicates Lead):</p> <p>Frank Cesarano Tom Gehrke* John Martzel Susan Rahimpour</p>
<p>Submitted by:</p>
<p>Approved by:</p> <p>_____</p> <p>Name & Title</p> <p>_____</p> <p>Date</p>
<p>Distribution (Distribute to assessed organizations' management, OQBP head, and any other interested parties.):</p>

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Fernanda Garcia
 Bill Pellico
 Roger Dixon
 Paul Czarapata
 Don Rohde

Attachments:

- File 1 7835 flow A07
- File 2 ITNA
- File 3 WDRS Job Desc
- File 4 Organization Scheme
- File 5 Conditioning Log
- File 6 Inspection Procedures
- File 7 Processing Procedure
- File 8 Vacuum History
- File 9 Tube Inventory
- File 10 Linac-Meeting Presentation
- File 11 Product Assessment
- File 12 Burle Procedures
- File 13 Conditioning Chklst and Gas Test