Fermilab Independent QA Assessment Report

Assessment Number & Title: 11-IA-QA-013 - CS Measuring & Test Equipment Assessment
Version: 01

Date(s) of Assessment: 08/15/11 – 08/17/11

Performing Organization: Office of Quality & Best Practices

Assessed Organization(s): Computing Sector (CS) including the following departments:

- Scientific Computing Division, Electronic Systems Engineering (ESE) Department
- Core Computing Division, Network and Virtual Services Department
- Core Computing Division, Facility Operations Department

Assessment Activities & Scope:

Implementation and effectiveness of controls for Measuring and Test Equipment (M&TE) relative to the requirements of Integrated Quality Assurance (IQA) were examined via interview, observation, and review of documents and records. These controls were examined across the CS organizations listed in the "Assessed Organization(s)" section of this report.

Scope Limitations:

The Electronic Systems Engineering department (ESE) draft procedure, "ESE Measurement and Calibration Program" (Rev. 1.0, 8/4/2011), was agreed by sector management to be outside the scope of this assessment.

Activities Reviewed Within this Assessment:

- Detector digital communication
- Optical data receipt and transmission
- Experimental support and hardware development
- Physics Research Equipment Pool (PREP)
- Copper and fiber networking
- PREP logistics

Description of the Implementation & Effectiveness of Observed Activities:

Measuring & Test Equipment:
The M&TE requirements of IQA chapter eight are not met and therefore not effectively implemented within the CS organizations assessed. Twelve individuals representing five groups in three departments within CS were interviewed in the course of this assessment. These organizations were selected based on their functions and the use of measuring and test equipment in the course of their operations.

In the course of the assessment, over two dozen instruments were identified with expired or no calibration status indicated. See Appendix 1 for nine examples. It was acknowledged by interviewees in all areas assessed that there have been past calibration programs which are no longer in effect and that these instruments are now used for reference only. With the exception of specific instruments referenced in this

report, no other instruments were observed with current calibration indicated within the assessed organizations.

As explained by interviewees, the primary mission of the ESE Department is to provide hardware and firmware technical and developmental support to projects for optical data detection, acquisition, and transmission. Within the Fast Timing, Control and Support Group, the Physics Research Equipment Pool (PREP) provides maintenance and repair services to other areas of the laboratory upon request. ESE Department personnel identified four instruments within the sector specified in the ESE draft calibration program document which require calibration. Their identification and status is:

- Tektronix Fluke model 5520A (S/N 7960020) multifunction calibrator used to calibrate electronic instrumentation across the laboratory and calibrated annually by Sypris Test & Measurement (File01). Although an expired calibration certificate was initially produced by interviewees the current certificate was obtained later from the vendor (File01) indicating NIST-traceable calibration and laboratory certification to ISO 9001, ISO 17025 and other standards.
- Glenbrook Technologies model 90C X-Ray system used for material inspection was within its calibration interval per affixed manufacturer's calibration label (File02). A quote for its upcoming calibration, due by 9/30/11 was also observed (File03).
- Tektronix model DSA 8200 oscilloscope has individual sampling modules which require calibration both in use beyond the calibration due dates of 01/20/2011 and 11/4/2009 per their last calibration certificates (File04).
- JDSU multi-application reflectometer platform has two variable optical attenuator modules used for measuring light intensity in fiber optic systems; one module within its calibration interval (File05) with next calibration due 10/20/2011, the other overdue for calibration as of 11/17/2010 (File06). Certificates for these instruments indicate, NIST-traceable past calibrations.

According to interviewees, PREP provides maintenance, repair or calibration of instrumentation such as data acquisition modules and M&TE for organizations within and outside Fermilab. Equipment requiring service or calibration is logged into a database, (EquipDB) for equipment tracking by the Facilities Support Group and queued for service within the MISJOB database interface (File07). Older data in the system may indicate past due calibrations (File08) and traceability of calibration instruments to M&TE which they were used to calibrate is no longer available. Instruments users' determine if and when calibrations are performed for both internal and external jobs.

Calibration is not performed as a matter of course on instruments available within the PREP inventory available for loan, as acknowledged by PREP interviewees. Ten of at least twenty oscilloscopes sampled had no indication of calibration status.

Information from other assessed organizations within Fermilab, raised questions about whether or not all PREP calibrations were NIST traceable.

- A "Calibration Report" issued by Equipment Support Services states in part " . . .It has been calibrated using measurement standards traceable to the National - Institute of Standards and Technology (NIST), or to NIST accepted intrinsic, standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration complies with MIL-STD-45662A and ANSI/NCSL Z540.1-1999 (R2002)."
- An explanation of ES&H calibration procedures (File09) cites NIST traceability of a PREP calibration and includes this report for reference.

- An Accelerator Division Calibration Report (File10) includes the MISJOB ticket requesting "Calibrate to NIST".
- CS staff indicated that requests for NIST-traceable calibrations are outsourced to external laboratories and that CS does not represent internal calibrations as being certified to NIST.

The Network Services Group is responsible for onsite and offsite network support for both copper and fiber systems and components. An interviewee provided a spreadsheet of their test equipment inventory, indicating four instruments requiring calibration (File011). It was explained that this information was only recently compiled and calibration has not been tracked. These four instruments were viewed by the assessment team and none were found to be currently calibrated.

Conclusions:

The M&TE requirements found in IQA chapter eight are not met or effectively implemented within the applicable CS organizations assessed. Although a draft M&TE procedure exists within the ESE Department, it has not been implemented and two of the four instruments cited in this procedure were out of calibration. Records of calibration for one instrument within calibration could not be readily produced. There is no sector-wide policy or procedure for M&TE control and calibration in place for other departments using M&TE. Calibration records practices do not allow for reverse traceability in the event a problem is identified with reference equipment.

Findings:

1. The M&TE requirements found in IQA chapter eight are not met or effectively implemented within the applicable CS organizations assessed.

   IQA Section 8.5 - Control of Measuring and Test Equipment states that "The measuring and test equipment (M&TE) used for inspection and acceptance tests are identified, calibrated, maintained, and controlled commensurate with their intended use." Instruments requiring calibration are identified only in a draft ESE Department procedure, and two of four instruments cited in this procedure were out of calibration. Records of calibration for a third could not be readily produced. Current calibration status is not indicated, as numerous instruments have out-of-date or no calibration labeling. There are no procedures in place for calibration outside of the ESE Department. There are no requirements for NIST traceability of calibration standards or traceability of instruments to those which they were used to calibrate.

   A prior unresolved CAP, CD-04-14-2009-3 addresses the lack of an M&TE calibration program within ESE. This finding includes some of the same issues identified in the CAP but is addressed to the sector level.

Observations and Recommendations:

1. **Observation:** The ESE Department and Network Services Group have defined instrumentation requiring calibration, however the basis for the determination at the department or sector level is undefined.
   Recommendation: Sector or departmental management should consider establishing guidelines for determining calibration requirements, to include the nature of the measurements and the direct and indirect use of the data. This would allow greater consistency in defining calibration

requirements across departments and groups.

2. **Observation:** Calibration reports issued by the PREP group reference traceability of standards used to NIST, although ESE management does not intend to represent calibrations performed within the PREP area as NIST-traceable. It not clear if an external request for "calibration to NIST" is met with current methods.
   Recommendation: ESE should clarify the verbiage used in calibration reports for external organizations. The PREP service request form could be revised to allow the specification of calibration requirements by a requestor and state the traceability of calibrations performed by PREP.

3. **Observation:** Calibration status within ESE is not currently tracked within the PREP database. Older records reflect obsolete data regarding M&TE calibration.
   Recommendation: PREP should reinstate calibration tracking within the EQUIPDB/MISJOB system. Management should consider implementing the capability for upcoming/overdue calibration notification for internal and external M&TE.

Commendable Practices:

1. None

Persons Interviewed:
Chuck Andrews
Mark Bowden
Gustavo Cancelo
John Chramowicz
Bob Forster
Tim Kasza
Richard Kwarciany
Joy Miletic
Vince Pavlicek
Alan Prosser
Bob Tschirhart
Adam Walters

Documents Reviewed:

- ESE IQA policyV3-1.doc, revised 01/29/2011
- ESE_MTE_CalibrationProgram_V1_2.docx, revised 8/04/2011
- CAP CD-04-14-2009-3Rev 001A6.pdf

Attachments:

- File01 - Fluke 5520A Cert 110818.pdf
- File02 - X-Ray Cal Sticker.pdf
- File03 - X-Ray Cal Quote 110510.pdf
- File04 - Tektronix Oscilloscope Certificate.pdf
- File05 - JDSU Cert1.pdf

- File06 - JDSU Cert2.pdf
- File07 - MISJOB Fluke 5520A.pdf
- File08 - MISJOB cal_SQL.pdf
- File09 - ESH MTE Data for E14017 excerpt.pdf
- File10 - Cal Report AD Oscilloscope B013066.pdf
- File11 - Network Test Equipment Inventory.pdf

Standards, Regulations, and Other Program Requirements Applied:

The specific criteria applied to this assessment were:

1001 IQA section 5.4.2, Maintenance (relative to M&TE)
1001 IQA section 5.4.4, Calibration of Process Equipment
1001 IQA section 8.5, Control of Measuring &Test Equipment

Corrective Action Plans Issued:

CD-2011-10-03-01 The M&TE requirements found in IQA chapter eight are not met or effectively implemented within the applicable CS organizations assessed.

This CAP is related to a prior unresolved CAP, CD-04-14-2009-3.

Assessors' Names (asterisk indicates team leader):

- John Dawson – ES&H
- Kurt Mohr* - OQBP

Submitted by: Kurt Mohr **Date:** 10/03/11

Distribution (Distribute to assessed organizations' management, OQBP head, and other interested parties):

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Appendix 1: Computing Sector M&TE Identified as Out of Calibration Intervals or No Calibration Status

Description	Identification	Calibration Due
EXFO FTB-150	476772	07/15/11
Fluke 187	570676	09/09/09
Agilent 34401A	552804	09/08/09
Agilent 34401A	554199	09/08/09
Tektronix DSA8200 module 80E04	B023692	01/20/11
Tektronix DSA8200 module 80C12	B02157	11/04/09
DTX1800 cable analyzer	95998	N/A
DTX1800 cable analyzer	108305	N/A
JDSU Map Attenuator mVOAA2SSMM101MFP	2022	11/17/10