

Biennial Scientific Report 2013— 2015



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Editor-in-chief: Marcello Pavan
Scientific Editors: Greg Hackman, Reiner Kruecken, David Morrissey, Colin Morton
TRIUMF Editors: Melissa Baluk, Byron Jennings, Carla Rodrigo
Copy Editor/Proof Reader: Melva McLean

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For additional copies of this report or for more information, please contact:
Strategic Communications Office, TRIUMF
4004 Wesbrook Mall, Vancouver, BC V6T 2A3, Canada
Telephone: 604-222 1047
E-mail: communications@triumf.ca
Website: www.triumf.ca
Design and Layout: BurnKit, Inc., Vancouver

SAFETY, LICENSING, AND MANAGEMENT SYSTEMS

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SAFETY, LICENSING, AND MANAGEMENT SYSTEMS

6.1 — Safety and Licensing

6.2 — Quality Management System

6.3 — Project Management

6.1 SAFETY AND LICENSING

A. TRUDEL

Licensing Activities

TRIUMF obtained a Class II Operating License for the commissioning of the ARIEL electron linear accelerator (e-Linac) up to 30 MeV, and 1 kW to the tuning dump in the Electron Hall. The license application included a safety analysis report, a detailed commissioning plan, the human factors program plan for the control room design and operation, and an operator training plan. Commissioning is ongoing and with an eventual commission at 10 kW by the end of 2017.

Work is also ongoing in the design and development of the ARIEL target irradiation and handling systems that will be installed in the Target Hall. The license application will be updated to include photo-production of rare isotope beams on an ARIEL target proposed for mid-2018. TRIUMF also obtained a Class II Operating License for the commissioning of a neutron generator used to develop a well-logging tool.

Regulatory program activities in this period included six program-specific Canadian Nuclear Safety Commission inspections

for quality management systems, human and organizational performance, training, packaging and transport, and environmental protection. Progress highlights for regulatory programs include the following:

- Safety training for the period 2013–2015, which was spearheaded by TRIUMF's Training Implementation Panel. The following training has been implemented:

- Group training plans to ensure competency of staff for all mission-critical operations;
- Building access training to make sure workers are aware of the requirements for safe occupancy and egress in their onsite place of work;
- Basic radiation protection training to make sure that all workers are familiar with the regulatory requirements, and TRIUMF's policy for working solely with radiation;
- Exclusion area training to make sure workers are familiar with alarms and associated procedures for access and egress from exclusion areas;

Fire protection program improvements received significant attention when an outside contractor with expertise in NFPA-801 fire code for nuclear facilities was retained to complete the 2013–2014 biannual review for inspection testing and maintenance. The review also included a site inspection to assess the operational program. This very thorough review against NFPA-801 and Canadian Fire Code requirements revealed numerous minor as well as a few more significant nonconformities. In 2015, with the help of an outside contractor, TRIUMF satisfactorily addressed all non-compliances stemming from the review. Starting in 2016, regular annual program reviews will be carried out starting to identify areas for continual improvement and adherence to regulatory requirements.

TRIUMF undertook a risk assessment of its access control system and the associated procedures that provide in-depth defense for protection of personnel against prompt radiation hazards in exclusion areas. As a result of the assessment, improvements

in safeguards were made: the addition of automated voice-announcements in the larger and more complex exclusion areas; and the development of an online training module to address potential hazards and the importance of the thoroughness of the search in complex areas.

Ongoing efforts with the Radioactive Waste Management Program led to disposal of a backlog of nuclear ventilation filters and ion exchange resin material which had decayed to below the applicable clearance levels.

Also in 2015, TRIUMF's Environment, Health and Safety Group completed an internal review that was subject to scrutiny by an international panel of safety professionals from other accelerator laboratories and industry. Based on the findings from the reviews;

A strategic plan was developed with prioritized corrective actions to address gaps and areas for continual improvement in TRIUMF's safety program.

Some of the areas identified in the plan for additional staffing are: management safety, training, quality management, and computing.

A review of the controlled work process resulted in the deployment of an application to standardize

site access for visitors and contractors to ensure that requirements for safety and orientation are addressed. It called for prohibited access to high-radiation areas by non-NEWs, additional QMS training for directors and project leaders, and initiation of a process to assess TRIUMF safety culture.

The operating performance for environment health and safety continued to do well in this period. The radiation dose to personnel, summarized in the table below, indicates excellent ongoing performance for dose management in all areas of operation at TRIUMF, with the total personnel dose continuing to decrease over the previous three-year average total site dose of 202 person-mSv. (see Table 1)

Environmental aspects of TRIUMF's operation continue to remain well below the regulatory limit of 0.05mSv/year dose to a member of the public. TRIUMF annual airborne releases were just below 0.01mSv/yr for the three-year period. This quantification takes into account a correction for the species composition of emissions and the correct release height of the exhaust point: two corrections that arose from studies completed by the Radiation Protection Group to better characterize the environmental impact of emissions.

Sump effluent releases continued to be less than 10^{-6} mSv/yr for this period. Lost-time injuries for TRIUMF averaged 7.2 days/100 person-years and continued to be better than that for BC Universities, the WorkSafe BC equivalent industry group. Environment, Health & Safety metrics were used to assess performance with respect to goals for this operating period.

Annual Dose	Total Site Dose (person-mSv)	Maximum NEW Dose (mSv)	Average NEW Dose (mSv)	Average non-NEW Dose (mSv)
2013	144.9	6.49	0.77	0.02
2014	147.3	6.32	0.72	0.02
2015	150.7	5.87	0.69	0.03

Table 1. Radiation Doses, 2013-2015.

6.2 QUALITY MANAGEMENT SYSTEM

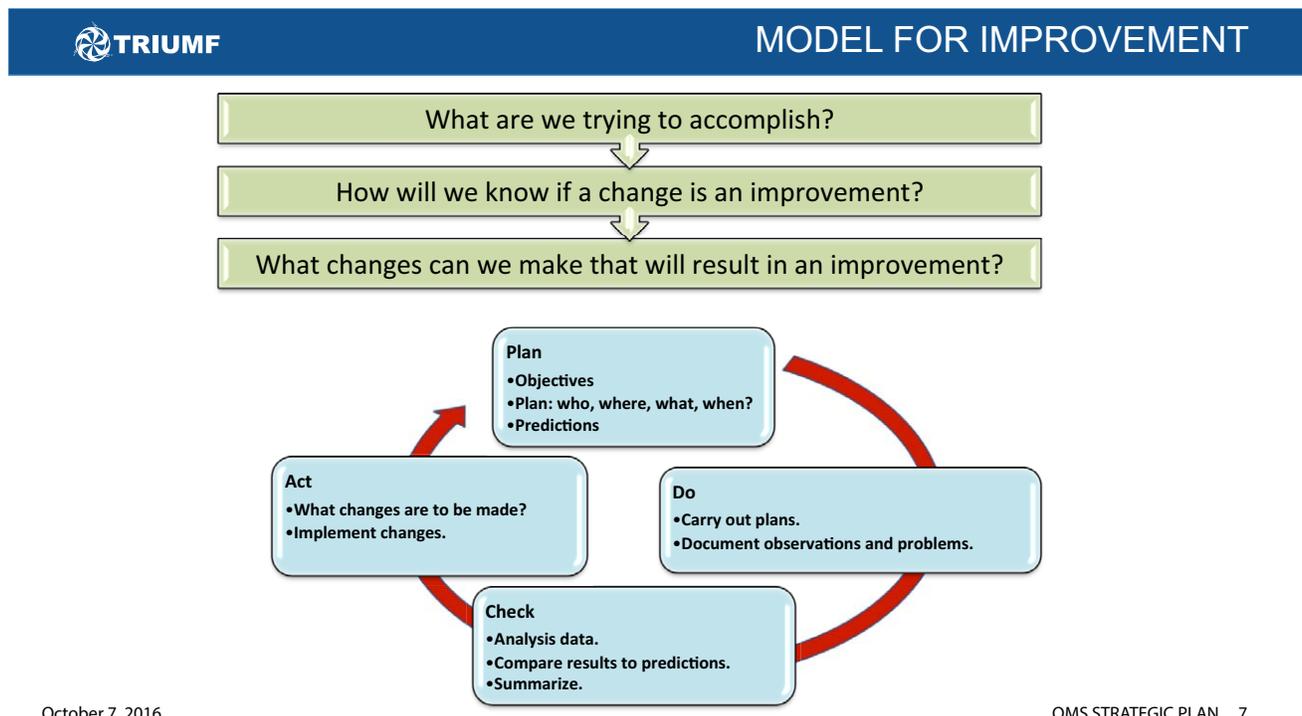
P. BAQUERO

The QMS Panel is responsible for implementing the Quality Management System at TRIUMF. It is chaired by the Engineering Division Associate Lab Director and includes representatives from each division as well as the QMS Leader. Previously, QA and Training were the responsibility of one person, in 2015 a full-time QMS leader position was created to devote additional resources to both areas.

TSOP-02 Nonconformity Reporting and Resolution is a key component of identifying areas for continual improvement of TRIUMF processes. The TapRoot® committee carries out root cause analyses (RCA) and documents findings in a report that includes recommendations for corrective actions assigned to appropriate divisions for completion. Tracking and ensuring timely completion of corrective actions has been a strong

focus over the last several years (see Figure 1). Some other changes which have been made to improve the NCR process include:

- The addition of a section to the RCA template to capture the method of verification for the effectiveness of the corrective action;
- Inclusion into TSOP-02 of non-conformities associated with safety inspections;
- Addition of a review panel to streamline non-conformities that require a full root cause analysis; and
- Testing for a new web application for reporting and resolving nonconformities. This began in 2014 and updates were made in 2015.



October 7, 2016

QMS STRATEGIC PLAN 7

Figure 1. QMS Model for Improvement

Internal audits are part of TSOP-09 Quality Program Assessment and are an important tool in assessing implementation of TRIUMF’s processes. Several internal audits were completed in each of the reporting years, and the following represent important areas that resulted in improvements.

An internal audit of training plans was carried out with a focus on how the identification of non-routine tasks is ensured. As a result, various training plans were updated, most notably (i) for the Solid Target Facility training plan to include responses to target failures, and (ii) development of a training plan for the TRIUMF Emergency Preparedness Plan.

The internal audit of the process for tracking and training of visitors led to the release of a specification for a new web application for tracking the onboarding process and training records for visitors.

The internal audit of the site access card system resulted in the deactivation of the access card for any worker who has not completed the basic site safety orientation. A priority for the new QMS leader hired in September 2015 has been to review all TSOPs and complete a gap analysis with the CSA standard N286-12 Management System Requirements for Nuclear Facilities.



6.3 PROJECT MANAGEMENT

R. KRUECKEN

TRIUMF continues to maintain a laboratory-wide Level 2 work breakdown structure (WBS) under the rubric of the Commitment List. The Commitment List details all the projects and ongoing operational commitments that TRIUMF is working on (WBS Level 2) and groups them into programs (WBS Level 1).

Through the different phases, projects follow a gateway process from initiation through planning and execution to closing of the project. During 2013–2015, a number of new projects were initiated. Noteworthy are several multi-institutional projects that were submitted to the 2015 Canada Foundation for Innovation (CFI) competition. These projects

underwent Gate 1 reviews as well as status reviews to assess the realism of project planning and budgeting in advance of the proposal submission.

The successful projects with TRIUMF involvement are the ATLAS detector upgrade project, the ALPHA-gravity proposal, as well as the proposal to outfit GRIFFIN with BGO anti-Compton shields.

The preparation process for the CFI competition revealed the need for further improvements of the gateway process, and a revision of the Project Management TSOP-15 is under consideration to account for these.





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