

# Accelerator Reliability Workshop 2019 (2019加速器可靠性国际研讨会)

Sunday, November 10, 2019 - Friday, November 15, 2019

Guangzhou SYSU Kaifeng Hotel

## Scientific Program

The technical program will feature renowned international experts, with over 100 talks and posters anticipated, covering aspects of Reliability Methodologies, Performance Tracking, Maintenance, Reliability Before Design, Fault Investigation Optimizing Availability, Machine Learning Tutorial, How to Recover from Downtime, Software, Accelerator System, Innovations in Accelerator Automation and Robotics and Big Data and Machine Learning. We will also share experiences, both achievements and challenges so that we can learn from each other.

## ARW Opening Session

Welcome & introduction to accelerator reliability workshop.

## Methodology

We all have methods, rules and hypotheses in place to drive safety, maintenance, installation, construction, etc., but what methods, rules and hypotheses are in place to drive reliability and availability? What is providing the direction to ensure higher performance? Inclusion of all types of accelerator platforms.

## Performance Tracking and Panel Discussion

Performance as related to "reliability and availability", not "beam" performance. All machines consist of technical equipment and operators who exploit this equipment for their final users. Links between these are crucial to achieve high availability, as higher availability comes from a higher MTBF and a shorter MTTR. A lower MTTR comes by effectively managing repairs, A higher MTBF comes in part from designing more reliable equipment, based on operational needs and past experience.

## Reliability Before Design

Reliability and availability requirements are taken in consideration long before the design will start. Knowing how to calculate reliability is important, but knowing how to achieve reliability is equally, if not more, important. Reliability practices must begin early in the design process and must be well integrated into the overall product development cycle.

## Optimizing Availability

Even the most reliable system will not be productive without availability. How are your reliable systems working in concert to ensure the best availability?

## Fault Investigation

The session aims for presentations of different methods and tools used to systematically (and automatically) examine fault conditions: from detection, through analysis and on to recovery, e.g. resuming beam operation or patient treatment. The presentations can be

interactive by presenting the tools "in action".

## Machine Learning Tutorial

Machine Learning (ML) is a subfield of artificial intelligence. The term applies broadly to a collection of computational algorithms and techniques that train data-driven models to perform some task, such as classification, regression or anomaly detection, in lieu of statistical approaches. Although ML has already been applied in some instances to particle accelerators, the recent advances (e.g. deep learning) and heightened interest in the community indicate that it will be an increasingly valuable tool to meet new demands for beam energy, brightness and stability. The intent of this tutorial is to provide an introduction to how problems in accelerator science and operation (in particular accelerator reliability) can be tackled using ML-based techniques, and how these can provide a significant benefit over a standard approach. In addition to the tutorial, a related talk exploring the application of ML techniques will be presented.

## Maintenance

Predictive, preventive and corrective maintenance criteria to improve reliability and maximize maintenance effectiveness. Strategy for maintenance periods; number per year, duration, commissioning periods. Is there a different philosophy depending on machine type; Therapy, Light Sources, Spallation Sources, etc.

## Safety Culture, Human Factors and Managerial Decisions — was “How to recover from downtime”

Whatever the reasons of a stop and its duration, the recovering contains several kinds of difficulties. Obviously, in the cases of prepared or well-known situations, the natural steps (lock-out, tests, validation etc), often already documented, can be easily managed.

## Accelerator System

Accelerator systems and subsystems often need to be modified to improve performance, reliability and availability. Upgrades can be done incrementally or all at once. Each method has its advantages and disadvantages.

## Software Tools for Reliability — was just “Software”

Production output, fault tracking, reliability and availability are some of the metrics used to assess facility performance. What software tools are being used at your facility to track and analyze metrics. Are your software tools developed in-house or commercial products? Process examples and live demonstrations are encouraged.

## New Trends, Big Data, Machine Learning — was “Innovations in Accelerator Automation and Robotics — J. Brower” and “Big Data and Machine Learning — D. Newhart”

Innovation in automation and robotics is a progressive part of increasing productivity in the particle accelerator community. From handling, repetitive tasks to reducing stress and increasing safety for the workforce, we look to see where and how the accelerator industry is utilising this technology including in-house development. Using Big Data analytics to discover useful otherwise hidden patterns to incorporate data-driven decisions for facilities. Applying Machine learning techniques to model, explore and implement your data set.