# TTC 2019 - Vancouver

*WG1 List of abstracts*

## Session 3: Voltage and phase stability

**Title**: LLRF systems performance limiting factors during CW operation of high Ql cavities cryomodule
**Speaker**: Wojciech Cichalewski, TUL
**Co-authors:** Jacek Sekutowicz, Radoslaw Rybaniec, Julien Branlard, Andrzej Napieralski
**Abstract**: Since 2011 CMTB is hosting LLRF related studies dedicated to continuous wave and long pulse mode operation. During this period various 8-cavities cryomodules and various LLRF systems configurations have been tested. Current contribution summarizes main limiting factors encountered during high gradient CW operation of narrow bandwidth resonators. Issues with asymmetric cavity behavior due to Lorentz Force Detunig, microphonics, fundamental power couplers heating, nonlinear behavior of high power RF source and others will be addressed. Additionally, their influence on the multicavity system field regulation will be discussed.

**Title**: LLRF compensation and mitigation of two cavity instability
**Speaker**: Ramona Leewe, TRIUMF
**Abstract**: Within TRIUMF's e LINAC two TESLA type cavities are operated with a single klystron in CW. Vector sum control is applied for field stabilization and the resonance frequencies are individually tuned with a proportional feedback controller. First operational experiences showed that amplitude oscillations can start in both cavities, while the vector sum is perfectly stable. These instabilities occur at high operating fields and are driven by Lorentz force changes. Within this talk the effect of Lorentz force on a single cavity is analyzed (no tuning system). A stability analysis of the linearized system reveals stable and unstable operational areas. A deeper analysis shows the existence of a limit cycle within the system. Simulation results confirm the analytical results and the operational experiences.

**Title**: CEBAF C100 Fault Classification Based on Time Domain RF Signals
**Speake**: Tom Powers, JLAB
**Abstract**: In a CEBAF C100 cryomodule, when one cavity has a fault and the gradient is reduced quickly it will mechanically deform due to the Lorentz force effects. This deformation will cause perturbations in the adjacent cavities which, in turn, will cause a cascade of cavity faults that are difficult to understand without time domain data. In 2018 the software and hardware in the digital low level RF systems that are used with the C100 cryomodules, were configured such that a fault would trigger an acquisition process where waveform records of 17 of the RF signals for each of the 8 cavities within the cryomodule

are recorded for further analysis. This talk will describe the types of faults that we have been able to identify as well as some of the remedial actions taken to mitigate them.

**Title**: Experience with LCLS-II cavity and cryomodule tests at Fermilab
**Speaker**: Elvin Harms, FNAL
**Abstract**: Fourteen Fermilab-built cryomodules for LCLS-II have now been tested cold at Fermilab's cryomodule test stand, CMTS1. A summary of test results to date compared against performance criteria, operational experience, and upcoming plans will be shared.