ICFA Mini Workshop on Higher Order Modes in Superconducting Cavities (HOMSC2018)

Report of Contributions

https://indico.classe.cornell.edu/e/185

Contribution ID: **1** Type: **Oral presentation**

Higher Order Mode and Cavity Studies at the University of Rostock since HOMSC16

Wednesday, October 3, 2018 11:30 AM (30 minutes)

The characterization of higher order modes in chains of superconducting cavities with couplers is a challenging task that is typically accomplished using high-performance computers in combination with dedicated software packages. During the last years, an alternative approach has been developed at the University of Rostock. It is referred to as State-Space Concatenations (SSC) and allows for the determination of eigenmodes of cylindrically asymmetric cavity chains using desktop workstations instead of high-performance computers. SSC is based on model-order reduction approaches in combination with concatenation techniques. Since 2016, the scheme was used to characterize the cold string for the BESSY VSR project, which is currently in the design phase at Helmholtz-Zentrum Berlin. In addition to the pure application of SSC, the method is further developed to accurately compute the external quality factors in presence of open hollow waveguides. Furthermore, first attempts have been made to include surface losses into the formulation by using perturbation approaches.

Within the framework of CERN's future circular collider (FCC) study, a lepton collider is foreseen in order to make precise studies on the Z, W, H and ttbar particles. The Z-machine has ampere-class beam current with relatively low voltage and the ttbar has a beam current in the range of few milliamps and a total voltage of around 10.93 GV. A dedicated research is conducted to find suitable cavity designs and HOM couplers for different operating modes of FCC-ee.

Further, a normal conducting deflecting cavity is being designed to act as a beam separator for the ELBE accelerator at Helmholtz-Zentrum Dresden-Rossendorf. The basic design of the cavity is similar to the double quarter-wave crab cavity for CERN. Optimization of the cavity design led to a smaller cavity aperture, which would significantly reduce the total RF power requirement. However, it is expected that the reduction of the cavity aperture will have a strong effect on the wakefield generated by the electron bunches in the cavity. Simulations were carried out to know the wakefield effect on the cavity. The results from the study support our selection of the cavity aperture.

Primary author: Prof. VAN RIENEN, Ursula (University of Rostock)

Co-authors: HALLILINGAIAH, Gowrishankar (University of Rostock); HELLER, Johann (University of Rostock); ZADEH, Shahnam Gorgi (University of Rostock); FLISGEN, Thomas (Helmholtz-Zentrum Berlin)

Presenter: Prof. VAN RIENEN, Ursula (University of Rostock)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **2** Type: **Oral presentation**

Observations of Sub-Macropulse Electron-Beam Dynamics Correlated with Higher-Order Modes in TESLA-Type Cavities

Monday, October 1, 2018 1:00 PM (30 minutes)

We report the direct observations of sub-macropulse beam centroid oscillations correlated with higher order modes (HOMs) which were generated by off-axis electron beam steering in TESLA-type SCRF cavities. The experiments were performed at the Fermilab Accelerator Science and Technology (FAST) facility using its unique configuration of a photocathode rf gun injecting beam into two separated 9-cell cavities in series with corrector magnets and beam position monitors (BPMs) located before, between, and after them. Oscillations of ˜100 kHz in the vertical plane and ˜380 kHz in the horizontal plane with up to 600-μm amplitudes were observed in a 3-MHz micropulse repetition rate beam with charges of 100, 300, 500, and 1000 pC/b. However, the effects were much reduced at 100 pC/b. The measurements are based on HOM detector circuitry targeting the first and second dipole passbands, rf BPM bunch-by-bunch array data, imaging cameras, and a framing camera. Calculations reproduced the oscillation frequencies of the phenomena in the vertical case. In principle, these fundamental results may be scaled to cryomodule configurations of major accelerator facilities.

Primary authors: Dr LUMPKIN, Alex (Fermilab); Dr CARLSTEN, Bruce (LANL); Mr EDSTROM, Dean (Fermilab); Dr RUAN, Jinhao (Fernilab); Dr EDDY, Nathan (Fermilab); Dr NAPOLY, Olivier (CEA-Saclay); Mr PRIETO, Peter (Fermilab); Dr THURMAN-KEUP, Randy (Fermilab)

Presenter: Dr LUMPKIN, Alex (Fermilab)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **6** Type: **Oral presentation**

Status of High Order Modes Spectra Measurements in 1.3 GHz Cavities for LCLS-II

Monday, October 1, 2018 4:30 PM (30 minutes)

Production and testing of 1.3 GHz cryomodules for the LCLS-II project is ongoing at Fermilab. Each cryomodule is assembled of eight superconducting TESLA-shape elliptical cavities equipped with two High Order Mode (HOM) coupler ports. Measurement of the HOM spectrum is a part of the cavities incoming quality control inspection and the final cryomodule qualification cold test at the Cryomodule Test Facility (CMTF). In this paper we describe the procedure of HOM spectrum measurement and present the accumulated statistics of HOM frequencies and quality factors relevant to multiply cavity vendors.

Primary author: LUNIN, ANDREI (FNAL)

Co-authors: SUKHANOV, Alexander (Fermilab); SOLYAK, NIKOLAY (FNAL); KHABIBOULLINE, Timergali (FNAL); YAKOVLEV, VYACHESLAV (FNAL)

Presenter: LUNIN, ANDREI (FNAL)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **7** Type: **Oral presentation**

Update on HOM studies for PIPII SC linac

Tuesday, October 2, 2018 10:00 AM (30 minutes)

Proton Improvement Plan II (PIP-II) is currently being implemented at Fermilab. Main part of PIP-II is RF linac composed of 5 types of superconducting RF cavies, optimized for acceleration of H- ions in the velocity range from 0.1 to 0.9 of speed of light. Through study of high order modes in PIP-II linac had been performed for 2 mA continues wave operation mode and presented on previous HOMSC workshops. In this paper we update HOM studies in PIP-II linac. We take into account modifications of cavity design and consider pulsed mode of linac operation, as well as high current (up to 10 mA) regime.

Primary author: SUKHANOV, Alexander (Fermilab)

Co-authors: LUNIN, ANDREI (FNAL); SOLYAK, NIKOLAY (FNAL); KHABIBOULLINE, Timergali (FNAL); YAKOVLEV, VYACHESLAV (FNAL)

Presenter: SUKHANOV, Alexander (Fermilab)

Session Classification: Numerical simulation –Modeling Approaches and Tools

Contribution ID: **8** Type: **Oral presentation**

Q and R/Q measurements with modulated beam currents with beam from the Cornell ERL injector

Monday, October 1, 2018 1:30 PM (30 minutes)

A search for HOMs in Cornell's ERL main linac cavity installed in a Horizontal Test Cryomodule (HTC) has been carried out using a bunch charge modulation method, as part of the effort towards building an Energy Recovery Linac (ERL). The beam-based HOM measurements offer the significant advantage of being able to detect trapped modes invisible to both the RF pickup probes and HOM damping loads, and allow for measuring the R/Q of the modes. For each HOM detected during the search, measurements were taken to determine its nature (monopole, dipole, etc.), frequency, loaded quality factor and shunt impedance. A selection of the most notable modes found is presented and discussed.

Primary author: Dr BARTNIK, Adam (Cornell University)

Co-authors: HALL, Daniel (Cornell U.); Prof. HOFFSTAETTER, Georg (Cornell University); Prof. LIEPE, Matthias (Cornell U.); Mr BILLING, Michael (CLASSE); Prof. EICHHORN, Ralf (CLASSE); VESHCHEREVICH, Vadim (Cornell University)

Presenter: Dr BARTNIK, Adam (Cornell University)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **9** Type: **Oral presentation**

HOM Damping in Accelerating Cavities with Large Number of Cells: Application to 44-Cell TWCs of CERN SPS

Wednesday, October 3, 2018 11:00 AM (30 minutes)

Extensive beam dynamic studies conducted in the framework of LIU (LHC Injectors Upgrade) project revealed a serious intensity limitation due to HOMs of the 200 MHz travelling wave cavities (TWCS) of SPS in the frequency range of 629-630 MHz. However, finding appropriate distributed damping scheme in cavities with large number of cells (like TWCs of SPS) usually accompanied with the following challenges: 1.each passband supports as many EM modes as the number of cells, 2. relatively low R/Qs can result in large beam coupling impedances due to the high Q of the cavity, and 3. The already rich nature of modes (in some cavities in addition to different TE and TM modes various type of hybrid modes can be supported) varies when other sources of perturbation (FPCs and other HOM damping scheme) are added to the multi-cell cavity. In this presentation, an approach for designing a distributed damping scheme for multi cell cavities will be presented. The effectiveness of the proposed damping scheme is examined through both simulations and measurement results on the 44 cell travelling wave cavities of CERN SPS.

Primary author: Dr NASRESFAHANI, Nasrin (Beams Department, RF Group, Beams and RF Studies Section)

Presenter: Dr NASRESFAHANI, Nasrin (Beams Department, RF Group, Beams and RF Studies Section)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **10** Type: **Oral presentation**

HOM absorbers, HOM heating, and current limits, including measurements for CBETA

Monday, October 1, 2018 4:00 PM (30 minutes)

The Cornell-BNL ERL Test Accelerator (CBETA) is a new multi-turn high current energy recovery linac currently under construction at Cornell University with a stated goal of 40 mA CW through the injector and 320 mA through the main linac. Higher Order Modes (HOMs) excited by the high current beam will be damped using beamline absorbers and the resulting energy will be converted to heat. In this talk, I will describe the design of these absorbers and their measured performance in both the SRF linacs. Finally, I will explain how the heating restricts the maximum injection current of CBETA to 40 mA.

Primary author: Mr BANERJEE, Nilanjan (Cornell University)

Co-authors: Prof. HOFFSTAETTER, Georg (Cornell University); Prof. LIEPE, Matthias (Cornell U.)

Presenter: Mr BANERJEE, Nilanjan (Cornell University)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **11** Type: **Oral presentation**

Beam breakup instability: theory, simulation, and consequences for CBETA

Monday, October 1, 2018 3:30 PM (30 minutes)

The Cornell Brookhaven Energy-Recovery-Linac (ERL) Test Accelerator (CBETA) is currently under construction at the Cornell University's Wilson Laboratory. The primary structures in CBETA for beam recirculation include the Main Linac Cryomodule (MLC) and the FFAG beamline. As the electron bunches pass through the MLC cavities, Higher Order Modes (HOMs) are excited. The recirculating bunches return to further excite HOMs, and this feedback loop can give rise to beam breakup instability (BBU). We will first explain how BBU effect is simulated using the tracking software Bmad, and check the agreement with the developed BBU theory. We then present the simulation results on how BBU limits the maximum achievable current of CBETA with different HOM spectra in the cavities. Lastly we investigate the potential ways to improve the threshold current of CBETA.

Primary author: LOU, William (Cornell University)

Co-author: Prof. HOFFSTAETTER, Georg (Cornell University)

Presenter: LOU, William (Cornell University)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **12** Type: **Oral presentation**

Propagating Eigenmode Simulations in SRF Multi-Cavity Crymodules Using ACE3P

Tuesday, October 2, 2018 9:30 AM (30 minutes)

Abstract: The 1.3GHz 9-cell TESLA cavity has been adopted for the Linac of European X-ray free electron laser (XFEL) and SLAC Linac Coherent Light Source II (LCLS-II). In contrast to the operating modes of the cavities, the beam induced high-order-modes (HOM) will be harmful to the beam quality if they are trapped inside the cavities if not sufficiently damped. The trapped modes below the beampipe cutoff, which are damped by the HOM couplers equipped on each cavity, have been well investigated numerically and experimentally using one cavity assuming shorted beampipe ends for XFEL and LCLS-II 1.3GHz linac. It is desirable that the modes above the beampipe cutoff propagate through the cavities to the absorbers installed on the beampipe walls at each cryomodule (CM) ends. Simulating the propagating modes is essential for XFEL and LCLS-II machines and requires to be performed in a whole CM, which is computational challenging in terms of its problem size and complexity. Recently a nonlinear eigensolver that can properly handle the boundary condition for propagating modes is implemented in the Omega3P module of the 3D parallel simulation suite ACE3P. It allows the first-ever direct calculation of propagating eigenmodes in the CM. In this paper, we will present the propagating trapped dipole mode simulations in 1.3GHz TESLA 8-cavity CMs. Simulation results are validated against measurements.

Primary author: XIAO, Liling (SLAC)

Co-authors: NG, Cho-Kuen (SLAC); GE, Lixin (SLAC); LI, Zenghai (SLAC)

Presenter: XIAO, Liling (SLAC)

Session Classification: Numerical simulation –Modeling Approaches and Tools

Contribution ID: **13** Type: **Oral presentation**

BESSY VSR project overview

Monday, October 1, 2018 11:00 AM (30 minutes)

HZB is pursuing a superconducting upgrade of the BESSY II synchrotron ring in order to allow the machine to simultaneously store both long (15ps) and short (1.7ps) bunches. To achieve this goal higher harmonic cavities (1.5GHz and 1.75GHz) to the 500MHz normal conducting cavities operated in BESSY must be installed. In standard BESSY VSR operation a 300mA beam will be combined with a 20MV/m. Therefore the selection of the proper cavity technology and the implementation of high efficient HOM damping structures becomes a key aspect on the success of the project.

Primary author: Dr VELEZ, ADOLFO (HZB G-ISRF)

Co-authors: Dr TSAKANIAN, Andranik (HZB); Dr NEUMANN, Axel (HZB); Dr GLOCK, Hans.W. (HZB)

Presenter: Dr VELEZ, ADOLFO (HZB G-ISRF)

Session Classification: High-Current Accelerators and HOM Damping Requirements

Contribution ID: **15** Type: **Oral presentation**

Overview of CBETA and the role of HOMs

Monday, October 1, 2018 11:30 AM (30 minutes)

CBETA, the Cornell-BNL ERL Test Accelerator that is currently being constructed at Cornell University combines several forefront accelerator components to a prototyping facility for the Electron-Ion Collider, the US'next large particle accelerator project. CBETA uses a high-brightness photo-emitter electron source and a high power SRF linac to inject a CW electron beam into a 4-turn ERL. The SRF linac in the ERL loop is optimized for large beam current but little coupler power, and the return loop is constructed with an Fixed Field Alternating-Gradient (FFA) lattice of permanent Halbach magnets, which allows to store the 4 beam energies simultaneously in one return loop.

Because the ERL linac uses the deceleration of the beam as a power source for new bunches, the current is not limited by the power provided to the ERL linac. The new current limits are entirely due to HOMs: heating and the Beam-Break-Up (BBU) instability. Care is therefore taken that HOM absorption is well controlled and that HOMs are not driving beam instabilities.

Primary author: Prof. HOFFSTAETTER, Georg (Cornell University)

Presenter: Prof. HOFFSTAETTER, Georg (Cornell University)

Session Classification: High-Current Accelerators and HOM Damping Requirements

Contribution ID: **16** Type: **Oral presentation**

SRF cavity design and HOM damping for eRHIC e-storage ring

Tuesday, October 2, 2018 11:00 AM (30 minutes)

The RF system of eRHIC e- storage ring has to satisfy wide range of scenarios of eRHIC operation. This presentation will present the considerations and design of the fundamental and high harmonic SRF cavities for the storage ring. And the HOM damping scheme for these cavities will be discussed as well.

Primary author: Dr XU, Wencan (bnl)

Presenter: Dr XU, Wencan (bnl)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **17** Type: **Oral presentation**

HOM damping requirements for high-current option of FCCee

Monday, October 1, 2018 9:45 AM (30 minutes)

The beam induced power losses and longitudinal coupled-bunch instabilities due to high order modes (HOM) in superconducting radio frequency (RF) cavities can impose significant limitations for the high-current synchrotrons. They strongly depend on the both cavity geometry and filling schemes used in the operation. For the beam stability, the considered HOMs should be damped below a certain value, while overdamping can cause higher power losses due to overlap of several high-amplitude beam spectral lines with the HOMs. To overcome these issues, recommendations for the cavity design and the machine operation are given using the developed systematic approach. This analysis was applied to the 400 MHz single-cell RF cavities proposed for the high-current option of the future circular electron-positron collider (FCCee).

Primary author: Dr KARPOV, Ivan (CERN)

Co-authors: Dr SHAPOSHNIKOVA, Elena (CERN); Dr CALAGA, Rama (CERN)

Presenter: Dr KARPOV, Ivan (CERN)

Session Classification: High-Current Accelerators and HOM Damping Requirements

Contribution ID: **18** Type: **Oral presentation**

HOM damping schemes for the FCC-ee cavities

Wednesday, October 3, 2018 9:30 AM (30 minutes)

An e^+e^- collider is foreseen in the design of future circular collider (FCC-ee) to make precise measurements of the properties of the Z, W, H bosons and the top quark ($t\bar{t}$). The two limiting cases from the SRF point of view are the Z operation which is characterized by low voltage and high beam current (1.39 A) and the $t\bar{t}$ operation which requires a high voltage of around 10.9 GV and has a relatively low beam current. In this presentation a single-cell cavity design is proposed for the Z-pole with the main focus on HOM-related aspects of the cavity. Moreover, a multi-cell cavity with minimal surface losses is designed for the W, H and $t\bar{t}$. A higher order mode damping scheme is proposed in each case to reduce the longitudinal and transverse impedance of the cavities below the impedance stability thresholds.

Primary author: Mr GORGI ZADEH, Shahnam (Universität Rostock)

Co-authors: CALAGA, Rama (CERN); Prof. VAN RIENEN, Ursula (University of Rostock)

Presenter: Mr GORGI ZADEH, Shahnam (Universität Rostock)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **19** Type: **Oral presentation**

Design of the BESSY VSR waveguide damped cavities and ancillary components for the cold string

Tuesday, October 2, 2018 1:00 PM (45 minutes)

The BESSY Variable pulse length Storage Ring (VSR) project is a future upgrade of the 3rd generation BESSY II light source. The key feature of the project is the simultaneous storage of long (ca. 15 ps) and short (ca. 1.7 ps) electron bunches under "standard"user optics. This challenging goal requires installation of SRF higher harmonic cavities of the fundamental 500 MHz at two different frequencies. Therefore, four new SRF cavities (2 x1.5 GHz and 2 x 1.75 GHz) have been designed. These cavities will operate in CW mode at high gradients of 20 MV/m. The combination of these factors with a high beam current (Ib = 300 mA) make the cavity design a challenging goal, since stable operation must be ensured. Thus, special attention was paid to the damping of HOMs excited by the beam that may otherwise lead to coupled bunch instabilities. The multi-cell SRF cavity integration into the existing storage ring requires also HOM spectrum control during the cavity design phase to ensure the off-resonance condition with circulating beam. The design aspects and challenges of those SRF cavities for storage ring application will be presented.
The HOM power levels for different cavity arrangements in the SRF module will be discussed. A dedicated spectral weighting technique for calculation of RF power propagation due to the HOMs excited by the circulating beam in SRF cavities will be introduced. This evaluation procedure is used for the calculation of the expected HOM powers (broadband) to be absorbed in the RF loads and of the efficiency of HOM dampers in terms of power flow balance between fundamental coupler, HOM waveguides and beam pipes. The four SRF cavities in the BESSY VSR module will be linked by bellows, which will be equipped with inner coaxial shielding pipes to prevent both parasitic fundamental mode losses and beam-induced heating. The central bellow will also act as a collimator for synchrotron radiation generated in the closest upstream dipole magnet. Additional bellows at the module's ends are needed to connect with the warm BESSY beam pipe. Outside the module the beam pipe cross section transitions will be located, which will be equipped with toroidal HOM absorbing elements. The recent design considerations and specifications for all those components will be discussed. The HOM power levels for complete cold string with warm elements outside the SRF module will be presented as well.

Primary author: Dr TSAKANIAN, Andranik (Helmholtz-Zentrum Berlin)

Co-author: Dr VELEZ, ADOLFO (HZB G-ISRF)

Presenter: Dr TSAKANIAN, Andranik (Helmholtz-Zentrum Berlin)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **20** Type: **Oral presentation**

HL-LHC DWQ HOM coupler design and SPS measurements

Tuesday, October 2, 2018 11:30 AM (30 minutes)

The Double Quarter Wave (DQW) crab cavity will be installed as part of the High-Luminosity LHC (HL-LHC) upgrade. Proof-of-principle tests are currently on-going in CERN's Super Proton Synchrotron (SPS). For the tests, the DQW has three on-cell coaxial HOM couplers per cavity. Currently, due to SPS space constraints, the HOM coupler is not optimal and a re-design is necessary for HL-LHC. This presentation outlines the coupler re-design, incorporating lessons learnt from manufacture, cold tests and tests in the SPS.

Primary author: Mr MITCHELL, James (CERN)

Presenter: Mr MITCHELL, James (CERN)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **22** Type: **Oral presentation**

HOM Beam Based Diagnostics at FAST

Monday, October 1, 2018 2:00 PM (30 minutes)

Superconducting RF cavities are high quality symmetric resonators that support many different modes of oscillation, with high precision signals and unsurpassable dynamic range. Owing to their approximate axial symmetry, modes can be identified according to their monopole, dipole and quadrupole nature. Higher Order Modes (HOM) excited by bunched beams in SRF cavities hence coupled respectively to the charge, position and size of the beam.
HOM-based diagnostics have already been used in various SRF accelerators like FLASH at DESY and FAST at Fermilab. However, the complete exploitation of their full potential in beam diagnostics and beam based tuning has not been realized, for instance in achieving minimal transverse wake kicks and transverse beam size measurement, in a non-invasive fashion.
We would like to explore and identify physics and engineering challenges in implementing HOM diagnostics using fully relativistic electron bunches through CM2 SRF cavities at FAST.

Primary author: Dr NAPOLY, Olivier (FNAL)

Presenter: Dr NAPOLY, Olivier (FNAL)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **23** Type: **not specified**

Introduction and Logistics

Monday, October 1, 2018 9:30 AM (15 minutes)

Presenter: Prof. LIEPE, Matthias (Cornell U.)

Contribution ID: **24** Type: **not specified**

Closing Remarks

Wednesday, October 3, 2018 12:00 PM (15 minutes)

Presenter: Prof. LIEPE, Matthias (Cornell U.)

Contribution ID: **25** Type: **not specified**

Hot-Topic Discussion: Which directions should future HOM R&D focus on, i.e. where is rapid progress needed?

Tuesday, October 2, 2018 3:15 PM (1h 30m)

Presenters: JENSEN, Erk (CERN); Prof. VAN RIENEN, Ursula (University of Rostock)

Contribution ID: **26** Type: **Oral presentation**

HOM Based Beam Diagnostics in TESLA Superconducting Cavities at FLASH

Monday, October 1, 2018 2:30 PM (30 minutes)

FLASH is a free-electron laser driven by a superconducting linac at DESY in Hamburg. It is able to generate high-brilliance XUV and soft X-ray pulses. Many accelerating cavities are equipped with HOMBPMs (Higher Order Mode based Beam Position Monitors) to align the beam and monitor the transverse beam position. We applied an efficient measurement and signal analysis with various data process methods to determine the transverse beam position. By fitting the HOM signals with a genetic algorithm, we implemented a new HOMBPM calibration procedure and obtained reliable beam prediction positions over a long time. A stable RMS error of about 0.2 mm by using the spectra of signals and 0.15 mm by using this new method over two months has been observed. For a FEL facility, the accelerating RF fields in SC cavities must be controlled precisely. A new type of beam phase determination technique based on beam-excited HOMs in cavities has been implemented. We measured the long term beam phase in cavity 1, module 1. Besides, some preliminary results of cavity tilt measurement will be presented.

Primary author: Mr WEI, Junhao (DESY)

Co-authors: Mrs NICOLETA, Baboi (DESY); Mr SHI, Liangliang (PSI)

Presenter: Mr WEI, Junhao (DESY)

Session Classification: HOM Measurements, Beam Effects, and Diagnostics

Contribution ID: **27** Type: **Oral presentation**

BESSY VSR and bERLinpro HOM loads development

Tuesday, October 2, 2018 1:45 PM (30 minutes)

Two accelerator projects at Helmholtz-Zentrum Berlin (HZB), bERLinPro and BESSY-VSR (Variable pulse length Storage Ring) upgrade, need to design three variants of SRF cavities, 1.3GHz cavities for bERLinPro and 1.5GHz/1.75GHz cavities for BESSY-VSR. These cavities have adopted waveguide HOM dampers in their design, with a few tens of watts HOM power in each load for bERLinPro cavities and a few hundred watts for BESSY-VSR cavities. Jlab is collaborating with HZB designing and prototyping HOM loads for these cavities. In this presentation, we will report on the integrated RF-thermal-mechanical design as well as the latest fabrication and testing results of these loads.

Primary author: GUO, Jiquan (JLAB)

Presenter: GUO, Jiquan (JLAB)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **28** Type: **Oral presentation**

JLEIC HOM damping study

Wednesday, October 3, 2018 10:00 AM (30 minutes)

The JLab Electron-Ion Collider (JLEIC) proposed by Jefferson Lab is a high luminosity collider consists of a few high current sub-complexes, including a 3-12 GeV electron collider ring with up to 3 A beam current, a 20-100 GeV ion collider ring of up to 1 A, and a 20-55 MeV circulation bunched electron cooler ring with up to 1.5 A. Beam induced HOM problems are prevalent in the RF systems of all these accelerator sub-complexes. In this talk, we will present our preliminary HOM damping study in these RF systems.

Primary author: GUO, Jiquan (JLAB)

Presenter: GUO, Jiquan (JLAB)

Session Classification: Design of SRF Cavities and HOM Damping Schemes

Contribution ID: **29** Type: **Oral presentation**

SRF above 1.3 GHz: Motivation and Implications for Higher Order Modes

Tuesday, October 2, 2018 2:15 PM (30 minutes)

Recent research into impurity-doped niobium and Nb3Sn have pushed towards unprecedentedly high quality factors and low cryogenic power consumption for SRF accelerators. These open the way to high frequency cavities (above the 1.3 GHz standard in contemporary SRF projects such as EXFEL and LCLS-II) which could significantly decrease costs for new accelerator facilities. In this talk we provide some background on these novel surface treatments, give motivation for the move to higher frequency, and raise some points of discussion for the impacts on higher order mode consideration.

Primary author: MANISCALCO, James

Presenter: MANISCALCO, James

Session Classification: Design of SRF Cavities and HOM Damping Schemes