PULsed POwer for Kicker Systems (PULPOKS) workshop 2023

Report of Contributions

https://indico.cern.ch/e/pulpoks23

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

Stripline kickers for top-up injection into PETRA IV

Tuesday, 25 April 2023 16:30 (30 minutes)

Presenter: LOISCH, Gregor

Session Classification: Afternoon session

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

Electrostatic Kicker at 37kHz and +/-10kV for Muons

Tuesday, 25 April 2023 12:00 (30 minutes)

Selection of single muons is needed for two experiments at PSI. Four +/- 5kV Switches in a bridge configuration provide a +/-10kV potential for switching muons at a 37kHz rate. A successful system was developed and in operation for 20 years. It relies on a flow of FC77 coolant directly on the transistors in the HV switch to remove ca. 1kW of heat. Unfortunately, the switches were destroyed by a water leak into the coolant. This presentation gives the detailed redesign of the replacement switches.

Presenter: GOUGH, Chris (Paul Scherrer Institut)

Session Classification: Morning session

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

A Double Dipole Kicker for ALBA II

Monday, 24 April 2023 12:30 (30 minutes)

Facing ALBA II upgrade needs, a novel pulsed magnet named Double Dipole Kicker (DDK) has been designed and it is being prototyped, with the aim to generate a multipole field for off-axis injection, whose proof-of-principle will be tested first at the ALBA storage ring. The resulting magnetic field is the superposition of two opposite dipoles, generated by four inner and four outer conductor rods. On-axis injection can as well be provided by switching off the inner rods, which create a pure dipole field. To maximize the kick efficiency and minimize disturbances on the stored beam inner and outer rods will be powered independently with two pulsed power supplies. In addition, a sophisticated coating layer will be applied to the ceramic surface in order to minimize the eddy current's effect while keeping the impedance optimized. Details of the DDK design and the status of the prototype will be presented.

Presenter: MUNOZ HORTA, Raquel

Session Classification: Morning session

Contribution ID: **27** Type: **not specified**

Optimization of beam impedance mitigation measured for HV reliability in an SPS injection kicker

Monday, 24 April 2023 17:00 (30 minutes)

The SPS injection kicker magnets (MKP) were developed in the 1970's, before beam induced power deposition in the ferrite yoke was considered an issue. These magnets are very lossy from a beam impedance perspective which limits SPS operation, e.g. with the higher intensity beams needed for HL-LHC. An upgraded design, with serigraphy applied to alumina U-chambers, has been developed to significantly reduce the broadband beam coupling impedance and thus the beam induced heating. During high voltage pulse testing there were electrical discharges associated with the serigraphy. We discuss the solutions implemented to mitigate the discharges while maintaining an adequately low beam-coupling impedance. The upgraded magnet has been installed in the SPS: the initial results of operation with beam are presented.

Presenter: BARNES, Mike (CERN)

Session Classification: Afternoon session

Contribution ID: **28** Type: **not specified**

Nanosecond Pulse Power Systems for TEM Kickers at SLAC

Tuesday, 25 April 2023 09:00 (30 minutes)

Presenter: KRASNYKH, Anatoly (SLAC)

Session Classification: Morning session

Contribution ID: **29** Type: **not specified**

Failure statistics and availability improvement of kicker systems at DESY

Monday, 24 April 2023 15:00 (30 minutes)

In the various circular and linear accelerators at DESY and European XFEL a total number of ca. 100 kicker systems is being operated.
In recent years, a failure monitoring has been introduced for these systems to systematically study reasons for system failures and track down failure sources.
In this talk we will discuss the failure statistics collected up to now and review the kicker availability at DESY.
We will also comment on our experience with radiation-induced failures of commercial semiconductor switches and how this could be mitigated.

Presenter: TEICHGRAEBER, Lukas (DESY)

Session Classification: Afternoon session

Contribution ID: **30** Type: **not specified**

New BESSY Booster Solid State Kicker Pulser Power Supplies

Tuesday, 25 April 2023 15:00 (30 minutes)

The BESSY booster kicker magnets have been powered with PFL type kicker pulsers since the BESSY II project was accomplished successfully. The kicker pulsers systems were realized with floating switch topologies applying CX 1154 thyratrons. After more than 25 years of operations the applied thyratron based kicker pulser units show wear and tear. The used pulser technology has obstacles for the operations of modern 4th generation light sources that should be overcome. The plan is to replace the existing technology with the help of solid-state Marx generator units. Therefore, a BESSY II booster kicker pulser renewal project has been launched.
The talk is about the basic idea of replacing the thyratron switch technology, wherever possible, will explain the experience with the existing equipment and tell about technological limitations in applying solid state switches. To conclude, the status of the project will be described.

Presenter: DRESSLER, Olaf (Helmholtz-Zentrum Berlin)

Session Classification: Afternoon session

Contribution ID: **31** Type: **not specified**

Design of a new Multipole Injection Kicker (MIK)

Tuesday, 25 April 2023 14:30 (30 minutes)

Top-Up injection in the new SOLEIL II storage ring is planned to use an off-axis on-momentum betatron scheme. The final kick on the injected beam into the small dynamic aperture is given by a non linear kicker or MIK. To ensure the quality and transparency of the injection, the peak magnetic field generated by the MIK must be located at 3.5 mm from the stored beam axis while the zero-field region around the stored beam should be of octupolar type. The MAXIV type MIK developed by SOLEIL in the previous years could not be reused as placing the peak field at 3.5 mm by shrinking the 8-conductor design would lead to a roughly 1 mm aperture for the beams, impracticable for use in a storage ring. Therefore, the SOLEIL pulsed magnet team had to design a new MIK topology from scratch to achieve the required magnetic field distribution, while providing a sufficient aperture for the beams. The presentation focuses on the challenges that were met in defining new suitable topologies, pulsed operation in vacuum, mechanical & thermal design of the magnet as well as the titanium coating effects on the pulsed magnetic field distribution.

Presenter: ALEXANDRE, Patrick (Soleil)

Session Classification: Afternoon session

Contribution ID: **32** Type: **not specified**

A High-Voltage Nanosecond Opening Switch Based on TVS Diodes

Tuesday, 25 April 2023 09:30 (30 minutes)

Presenter: GUSEV, Anton

Session Classification: Morning session

Contribution ID: **33** Type: **not specified**

A 2.5kA modulator for the European XFEL injector

Tuesday, 25 April 2023 10:00 (30 minutes)

Presenter: KAHL, Joachim (DESY)

Session Classification: Morning session

Contribution ID: **35** Type: **not specified**

A stacked MOsFET-switch for distribution of bunch trains at 4.5 MHz

Monday, 24 April 2023 16:30 (30 minutes)

Presenter: Mr TEICHGRAEBER, Lukas (DESY)

Session Classification: Afternoon session

Contribution ID: **36** Type: **not specified**

Status of the SIS100 kicker magnet systems

Monday, 24 April 2023 12:00 (30 minutes)

Presenter: PETZENHAUSER, Isfried (GSI Helmholtzzentrum fuer Schwerionenforschung)

Session Classification: Morning session

Contribution ID: **37** Type: **not specified**

Development work on Pulsed 35kV Electrostatic Chopper with 10ns Rise Times

Monday, 24 April 2023 11:30 (30 minutes)

This presentation will give an overview of the development work at ISIS neutron and muon source, STFC on the Super MuSR project. This project is an upgrade to the existing MuSR instrument at ISIS, which will lead to an improved time resolution and counting rate. An emphasis will be placed on the electrostatic chopper which will produce a ±35kV voltage reversal within 10ns, flipping the electric field on the beam. Topics of discussion: testing of prototype pulse power supplies and design work on the coax line and vacuum feedthroughs.

Presenter: MARTIN, Maliq (ISIS neutron and muon source, STFC)

Session Classification: Morning session

Contribution ID: **38** Type: **not specified**

Pulse Current Analysis at BESSY II

Monday, 24 April 2023 14:30 (30 minutes)

At BESSY II fast pulsed magnets are used for injection and extraction processes. Originally, pulse current measurement systems for all pulsed elements were set up in the framework of BESSY II top-up operation to show that the required level of voltage stability was achieved. Now it is essential for stable user operation at high average injection efficiencies of about 98 %. A model based on a simplified replacement circuit diagram was applied. The implementation of this pulse current analysis program in the BESSY II control system now enables online data evaluation of physical parameters of pulsed elements as well as higher statistical quality of phenomenological quantities during continuous BESSY II user operation.

Presenter: GORA, Anny (Helmholtz-Zentrum Berlin HZB)

Session Classification: Afternoon session

Contribution ID: **39** Type: **not specified**

Development of fast kicker prototype for SLS 2.0 advanced injection schemes

Tuesday, 25 April 2023 16:00 (30 minutes)

Swiss Light Source plans an upgrade to turn its existing Storage Ring (SR) into a modern diffraction limited light source (SLS 2.0). A 4-kicker bump scheme with new thick and thin septum will ensure the conventional injection in the smaller aperture of the new SR. To reduce further the perturbation of the stored beam during top-up, two new injection schemes are developed: "Fast"and "Super-fast". The "Fast"injection should be able to ensure single-bunch off-axis injection affecting only 10 to 20 SR bunches (SR bunch spacing is 2 ns) in so called Aperture Sharing (AS) mode. The "Super-fast"one should utilize single-bunch off-axis injection affecting only one SR bunch (AS mode) or, in the future, on-axis injection between two SR bunches. To realize these injection schemes an extremely fast kicker system is required to provide deflection duration of about 30 ns for the "Fast" scheme and less than 2 ns for the "Super-fast"one. For practical reasons we decided to design a stripline kicker capable of 2 ns second deflection duration, given that if this is achieved, the same kicker can produce longer deflection durations when excited with longer electrical pulses. To prove the concept a prototype stripline kicker is being designed. We will present the status of its development and will discuss some of the critical aspects of such design.

Presenter: Dr PARALIEV, Martin (Paul Scherrer Institute)

Session Classification: Afternoon session

Contribution ID: **40** Type: **not specified**

A Solid State Marx Generator for driving kicker magnets

Tuesday, 25 April 2023 12:30 (30 minutes)

Presenter: SACK, Martin (KIT Karlsruhe)

Session Classification: Morning session