DEELS - Diagnostics Experts of European Light Sources

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Virtual Event

Book of Abstracts

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Results & experience with the 320 BPMs during the ESRF-EBS storage ring commissioning

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We will show the results obtained with the 320 BPMs since the start of commissioning from end November till now,
in terms of performance like stability, resolution, reliability,
and for their different operation modes and required functioning.
The preparation & calibration work done before the first beam injection will also be described and be compared with the final obtained results i.e. the minimization of initial offsets or inconsistent readings right from the very first injection.
Results of beam-based-alignment will be presented, as well as the characteristics of the global EBS beam stability, with and without orbit correction.
A few unexpected or surprising features will also be highlighted.

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Tracking Frequency Reference Phase Changes at Point of use based on BPM Measurements.

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Multibunch Feedback systems in Diamond use the RF reference signal to sample the BPM signals. Uncertain reference phase variations due to upstream adjustments to the RF system previously necessitated regular manual realignment of the sampling phase. Locking the sampling phase to the measured beam phase has been investigated to improve the stability and robustness of the system and remove the dependence on absolute RF phase. Significant improvements have been achieved using a Beam Locked Loop architecture based on an IQ modulator and cartesian feedback to phase align the local 500MHz reference signal to the BPM RF frequency component under closed loop digital control with remote management via EPICS. The system has been successfully deployed on the storage ring at Diamond and has been operating live since October 2019. Live data captured from the operational storage ring demonstrates the ability to tolerate a wide variation in beam phase whilst maintaining accurate beam sampling and robust acquisition of the reference phase over the operating range of beam currents and fill patterns.

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Development of an amplifier for XAPDs for bunch purity measurements

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Bunch purity measurements are widely based on the technique of Time Correlated Single Photon Counting using an X-ray Avalanche Photo Diode (XAPD) as fast detector. XAPDs are advantageous because their dark count contribution can strongly be reduced by choosing an appropriate discriminator threshold in the counting system (see e.g. G.Rehm, DEELS 2014). There exist commercial systems based on 5x5 and 10x10mmˆ2 windowless APDs, using a pre-amplifier design which was developed some years ago at ESRF. However, the experience from PETRA III shows that bunch purity measurements with these large area detectors may be hampered by X-ray fluorescence caused by scattered background (see e.g. G.Kube, DEELS 2014). In order to reduce this background, in the future it is planned to use XAPDs with a smaller round active area with a diameter of 3mm. Hence and additionally driven by the interest from user's side, the development of a dedicated fast but low cost XAPD pre-amplifier system was initiated. This presentation introduces the current status of the amplifier design.

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CIEL: Current Injection Efficiency and Lifetime

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We will introduce a new acquisition system for storage ring beam current monitor.
It is based on the co-developped PandBox electronics, associated with a 24 bits 128kS/s ADC.
It offers the possibility of fast, triggered captures to measure injected current even during bursted injections.
We'll show the results of the first tests and the integration of this new measure.

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Testing challenges for new BPM electronics

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Longterm performance is one of the most important properties of the beam position electronics. Stability is not measured in micrometers over few hours anymore but over several days. The new BPM module was tested using "well known" testing setup but test results revealed unexplained drifts. Performance requirements, hardware implementation, optimization and testing cycles and results are presented in this talk.

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Challenges of the beam diagnostic system at cSTART

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In the cSTART project, KIT (Karlsruhe Institute for Technology) will build a very large acceptance compact storage ring (VLA-cSR) aiming to demonstrate and examine the injection and the storage of a laser wakefield accelerated (LWFA) beam. As for the first operation phase, FLUTE (Ferninfrarot Linac- und Test-Experiment) will be used as an injector to the storage ring delivering an electron beam at 50 MeV energy. A design of the storage ring has been under development with a DBA-FDF lattice having the optical elements very close to each other, making insertion of beam diagnostics very challenging. Given the small ring circumference of 44 m, the revolution frequency of single electron bunches and the repetition rates of its diagnostics are very high in the order of 6.8 MHz, which require very fast electronics. Moreover, to be able to measure signals from bunch currents ranging between 20 pC to 1 nC, very sensitive beam diagnostics and with high dynamic range are required. Meanwhile, ideas of a preliminary beam diagnostic system are being considered and discussed. In this presentation, we will report on these ideas and appreciate suggestions and comments from the community present.

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An interactive Tool to BPM design

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A software tool to design and simulate stripline BPM for FERMI is presented. Developed in a LabVIEW environment, it's now under review to handle button BPM and different transverse profiles for the next ELETTRA 2 project. The first results are then compared to the one from BpmLab

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Fast Beam Based Alignment Using AC Corrector Excitations

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Standard quadrupole beam-based alignment (BBA) techniques rely on orbit data and on the sequential variation of quadrupole and corrector magnets (CM). This results in time consuming measurements of the order of several hours. Fast (10 kHz) beam position monitors (BPM) and CMs with ac power supplies are routinely used in modern synchrotron light sources to drive fast orbit feedback systems. In this paper we show how they can be employed to reduce the time for the BBA to several minutes only, ensuring the same level of accuracy and precision. Moreover, conversely to the standard BBA, the new procedure accounts automatically for any level of betatron coupling, BPM roll and OCM tilt. In the case of the ALBA 3rd generation light source, the time for a complete measurement dropped from 5 hours to 10 minutes, a reduction by a factor 30. As further extension of this novel approach, an even faster skew quadrupole BBA was demonstrated in ALBA for the first time, taking advantage of the additional ac modulation of the skew quadrupole field. Results from this fully ac measurement are compared with those obtained via dc scan of the skew quadrupole.

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DEELS2020 WELCOME

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Introduction to DEELS 2020 virtual workshop

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DEELS 2020 CONCLUSIONS

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