

26th ESLS RF Workshop



Report of Contributions

Contribution ID: 1

Type: **not specified**

Status and developments of the ALBA RF system

Wednesday, November 8, 2023 12:00 PM (20 minutes)

ALBA is a 3rd generation synchrotron light source located in Barcelona, Spain and in operation since 2012. The storage ring RF system consists of six HOM-damped normal conducting cavities, fed with IOT based transmitters able to deliver up to 160 kW each. The booster counts with one 5-cell PETRA type cavity fed with a SSPA delivering up to 50 kW. This presentation aims to summarize the experience and statistics of the operation since the last RF meeting and also to present the developments done in the framework of the accelerator upgrade project to ALBA-II, including the active 3rd harmonic cavity commissioning.

Primary author: SOLANS, Pol (ALBA Synchrotron)**Presenter:** SOLANS, Pol (ALBA Synchrotron)**Track Classification:** 26th ESLS RF Workshop

Contribution ID: 2

Type: **not specified**

Overview and Status of the ASTRID2 RF systems

Wednesday, November 8, 2023 4:50 PM (20 minutes)

An overview and a status of the RF systems used at the ASTRID2 facility will be presented, including the new 3 GHz RF system for our Microtron. The talk will also include a report on our on-going efforts on improving the ASTRID2 beam stability and lifetime by optimizing the 3rd harmonic Landau cavity temperature and detuning.

Primary author: NIELSEN, Jørgen S. (Aarhus University, Department of Physics and Astronomy, ISA)

Presenter: NIELSEN, Jørgen S. (Aarhus University, Department of Physics and Astronomy, ISA)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 7

Type: **not specified**

Fabrication, Conditioning and Installation of the 1st S-band High Gradient Module for the Energy Upgrade of the FERMI Free Electron Laser Linac

Thursday, November 9, 2023 9:20 AM (20 minutes)

FERMI is the seeded free electron laser (FEL) user facility at Elettra laboratory in Trieste, operating in the VUV to soft X-rays spectral range. In order to extend the FEL spectral range to shorter wavelengths, an increase in the linear accelerator (linac) energy from 1.5 GeV to 2.0 GeV is required. This result will be achieved by replacing the present old sections with the newly designed accelerating sections which can work at high gradient with lower transverse wakefields. After the successful testing of a short prototype, 354 mm in length, of a new high-gradient (HG) section that sustained an accelerating gradient of 40 MV/m with a breakdown rate (BDR) of 8×10^{-8} bpp, two 3.0 m HG structures with the same design were built and installed at the FERMI linac. We report here the recent experience on the conditioning and installation of the first high gradient sections and the operation of the spherical pulse compressor prototype, conditioned up to 100 MW output power with a power amplification factor of 3.5.

Primary author: SHAFQAT, Nuaman (Elettra Sincrotrone, Trieste, Italy)

Presenter: SHAFQAT, Nuaman (Elettra Sincrotrone, Trieste, Italy)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 8

Type: **not specified**

RF Technology for SOLEIL II

Wednesday, November 8, 2023 11:00 AM (20 minutes)

SOLEIL II is currently advancing through the conceptual design phase. Within the realm of radio frequency (RF) activities, our focus has been on enhancing the High-Power RF Solid-State Amplifier, aiming to boost reliability and minimize energy consumption. To achieve this, we've successfully fabricated and tested a prototype of the amplifier at SOLEIL/Booster. In addition, we've developed and tested a compact Digital Low-Level RF (LLRF) system. Furthermore, our research extends to the impedance analysis of a 4th-order Normal Conductive (NC) passive cavity, similar in type to the ESRF design. This investigation promises to contribute valuable insights to our ongoing work.

Primary author: Dr ZHAO, Lu (Synchrotron SOLEIL)

Co-authors: Mr RIBEIRO, Fernand (Synchrotron SOLEIL); Mr DIOP, Massamba (Synchrotron SOLEIL); Mr MARCHAND, Patrick (Synchrotron SOLEIL); Mr SREEDHARAN, Rajesh (Synchrotron SOLEIL); Mr LOPES, Robert (Synchrotron SOLEIL)

Presenter: Dr ZHAO, Lu (Synchrotron SOLEIL)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 9

Type: **not specified**

HOM Dampers Design for the MAX IV 100 MHz RF Cavities

Thursday, November 9, 2023 10:50 AM (20 minutes)

This presentation describes the electromagnetic, thermal and mechanical design and RF characterization for the prototype HOM dampers for the MAX IV 100 MHz RF cavities. The dampers are of antenna type and aim to reduce the shunt impedance of all modes to below ~3 kOhms while keeping one of the modes basically unaffected in both frequency and quality factor so that it can be effectively dealt with by means of temperature tuning. The analysis shows it is important to consider the effect on the HOM damper efficiency of the characteristics of the transmission that connects the cavity to the high power circulator located between the RF transmitter and the cavity.

Primary author: O. CAIAFA DUARTE, Henrique (MAX IV Laboratory)

Presenter: O. CAIAFA DUARTE, Henrique (MAX IV Laboratory)

Track Classification: 26th ESLS RF Workshop

Contribution ID: **10**Type: **not specified**

Operation and Upgrade of the SLS RF Systems

Wednesday, November 8, 2023 10:20 AM (20 minutes)

On 30th of September, “dark-time” started for the SLS 2.0 upgrade. Unfortunately, the machine availability of the last year was one of the worst since start of SLS operation. Several outages were caused by water-leaks and by the cryo-system of the Super-3HC.

Disassembly of the SLS RF-systems started while procurement of the new components for SLS 2.0 reaches in its final phase. Testing and power conditioning of the first new 500MHz cavity was done and achieved up to 600kVcw in the test-stand.

Primary author: STINGELIN, Lukas (Paul Scherrer institut)

Presenter: STINGELIN, Lukas (Paul Scherrer institut)

Track Classification: 26th ESLS RF Workshop

Contribution ID: **11**

Type: **not specified**

Status Report BESSY+MLS

Wednesday, November 8, 2023 11:40 AM (20 minutes)

- Metrology Light Source (MLS): Migration from IOT to SSA (Cryoelectra)
- Cyberattack on HZB in June 2023
- 1.5 GHz Cavities and SSA Transmitters

Primary author: SCHRIEFER, Bernhard (Helmholtz Zentrum Berlin)

Presenter: SCHRIEFER, Bernhard (Helmholtz Zentrum Berlin)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 12

Type: **not specified**

Development of a Single Mode Cavity for the Third Harmonic RF-System of PETRA IV

Thursday, November 9, 2023 9:40 AM (20 minutes)

PETRA IV will use the BESSY HOM damped cavities for the fundamental 500 MHz RF system. In order to reduce the negative effects of Touschek and intrabeam scattering on the lifetime and emittance of the electron bunches, third harmonic cavities will be installed. They elongate the bunches and thus reduce their charge density. One possible candidate for a third harmonic cavity is the 1.5 GHz ALBA HOM damped cavity which is mainly a 500 MHz HOM damped BESSY cavity scaled down by a factor of three. This cavity has, in active operation at BESSYII, successfully extended bunches at low beam currents. The resonator is expensive to build due to its complexity and the many independent cooling water circuits. The many independent cooling water circuits require complex water manifolds with all necessary flow and pressure meters. In PETRA IV, 24 of these cavities are required. Therefore, it is reasonable to look for an alternative cavity design. It should:

- Have a simple cavity design that is easy to fabricate.
- Have few cooling circuits.
- Have a higher HOM damping efficiency compared to the ALBA cavity.
- Have an adjustable coupling factor from zero to five.

An interesting candidate among the few single-mode structures is the “Shintake cavity”, named after its inventor. We have optimized the cavity design and have worked out the permissible mechanical tolerances to fulfill the electrical requirements using CST Microwave Studio. Results and are presented.

Primary author: Dr HÜLSMANN, Peter (DESY)

Presenter: Dr HÜLSMANN, Peter (DESY)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 13

Type: **not specified**

PETRA IV activities @ DESY

Wednesday, November 8, 2023 11:20 AM (20 minutes)

PETRA III is to be upgraded to a next-generation synchrotron radiation source (PETRA IV). In addition to extensive infrastructure construction activities, the RF systems will also be rebuilt in a new RF building.

The booster (DESY II) will as well be rebuilt in the old DESY synchrotron tunnel. This means that we will say goodbye to klystrons and the majority of multicell cavities and switch to semiconductor amplifiers and HOM-damped cavities.

In addition to the 500 MHz fundamental system, a third harmonic system will also be needed. This is a report about the construction activities, experiences with a 500 MHz prototype system (SSA, HOM-damped cavity as well as LLRF system).

Primary author: ONKEN, Rüdiger (DESY - MHFe)

Presenter: ONKEN, Rüdiger (DESY - MHFe)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 15

Type: **not specified**

Welcoming Address

Wednesday, November 8, 2023 9:00 AM (10 minutes)

Presenter: FRANCIOSI, Alfonso

Track Classification: 26th ESLS RF Workshop

Contribution ID: **16**

Type: **not specified**

General Informations for the Workshop

Wednesday, November 8, 2023 9:10 AM (20 minutes)

Presenter: PASOTTI, Cristina

Track Classification: 26th ESLS RF Workshop

Contribution ID: 17

Type: **not specified**

Elettra 2.0 project

Wednesday, November 8, 2023 9:30 AM (30 minutes)

Presenter: KARANTZOULIS, Emanuel

Track Classification: 26th ESLS RF Workshop

Contribution ID: **18**Type: **not specified**

Status of the ESRF-EBS 352 MHz RF system

Wednesday, November 8, 2023 10:00 AM (20 minutes)

The first high energy 4th generation low emittance ring, the Extremely Brilliant Source EBS, is in user operation since August 2020. The existing SSA and klystron transmitters were kept to power the 13 new mono-cell HOM damped EBS cavities. Ten new 110 kW SSAs have recently been ordered from JEMA-France to replace the more than 30 years old klystron transmitters until end 2026 and the site preparation for their installation is in good progress. The design of normal conducting 4th harmonic RF cavities has also evolved and is now close to being finalized. The implementation of an active 4th harmonic RF system at the ESRF is scheduled after completion of the 352 MHz SSA project.

Primary author: JACOB, Jörn (ESRF)**Presenter:** JACOB, Jörn (ESRF)**Track Classification:** 26th ESLS RF Workshop

Contribution ID: 25

Type: **not specified**

Studies on transient beam loading generated by the superconductive harmonic cavity

Wednesday, November 8, 2023 1:50 PM (20 minutes)

A simulator of longitudinal dynamics based on an analytical frequency domain model was developed to evaluate the transient beam loading in the Elettra 2.0 storage ring. Experiments have been carried out in the present Elettra machine to characterize the harmonic cavity and to compare the simulator with the real machine.

Primary authors: LONZA, Marco (Elettra Sincrotrone Trieste); Mr CLEVA, Stefano (Elettra Sincrotrone Trieste)

Presenter: LONZA, Marco (Elettra Sincrotrone Trieste)

Track Classification: 26th ESLS RF Workshop

Contribution ID: **30**

Type: **not specified**

FERMI: present status and future upgrades

Thursday, November 9, 2023 9:00 AM (20 minutes)

Presenter: PENCO, Giuseppe

Track Classification: 26th ESLS RF Workshop

Contribution ID: 37

Type: **not specified**

Closing remarks

Thursday, November 9, 2023 11:50 AM (10 minutes)

Presenter: PASOTTI, Cristina (Elettra-Sincrotrone Trieste S.C.p.A.)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 39

Type: **not specified**

Upgrades of RF amplifiers towards Elettra 2.0

Thursday, November 9, 2023 11:30 AM (20 minutes)

The end of the project *Solid State at Elettra (SSatE)* marked the completion of the transition from the original RF klystron and IOT amplifiers to cutting-edge solid-state ones, and represents a significant milestone towards Elettra 2.0.

The new amplifiers deliver up to 130 kW to the RF cavity, improving the beam quality while, at the same time, ensuring efficiency, robustness and redundancy.

Primary author: PASOTTI, Cristina (Elettra Sincrotrone Trieste S.C.p.A.)

Co-authors: CUTTIN, Alessandro (Elettra Sincrotrone Trieste); BORTOLOSSI, Luca (Elettra-Sincrotrone Trieste S.C.p.A.); RINALDI, Mauro (Elettra-Sincrotrone Trieste S.C.p.A.)

Presenter: CUTTIN, Alessandro (Elettra Sincrotrone Trieste)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 41

Type: **not specified**

Cavity fixing and RF power conditioning

Thursday, November 9, 2023 11:10 AM (20 minutes)

Presenter: MOCHIHASHI, Akira (Karlsruhe Institute of Technology)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 43

Type: **not specified**

Compact linear accelerator FLUTE: status update

Wednesday, November 8, 2023 4:30 PM (20 minutes)

FLUTE (Ferninfrarot Linac- Und Test-Experiment) at KIT, developed and operated by KIT-IBPT, serves as an accelerator test facility for a variety of accelerator studies, delivering coherent radiation in the form of ultra-short, very intense light pulses spanning the terahertz and far-infrared spectral range and beyond. It will also serve as an injector for a compact Very Large Acceptance Storage Ring (VLA-cSR) being realised at KIT as part of the cSTART (compact SStorage Ring for Accelerator Research and Technology) project. In order to achieve the acceleration of electrons in the RF photoinjector and linac with high stability, an upgrade of the RF system has been carried out, which provides more stable RF performance than before. This paper reports on the design and commissioning status of the RF system including the new RF photoinjector.

Primary author: MALYGIN, Anton (Karlsruhe Institute of Technology)

Presenter: MALYGIN, Anton (Karlsruhe Institute of Technology)

Track Classification: 26th ESLS RF Workshop

Contribution ID: 44

Type: **not specified**

Diamond RF System - Present Status and DII Upgrade

Thursday, November 9, 2023 10:00 AM (20 minutes)

A look at the Present Diamond RF system, status and faults followed by a brief look at the DII upgrade.

Primary author: Mr MARTEN, Peter (Diamond Light Source Ltd.)

Presenter: Mr MARTEN, Peter (Diamond Light Source Ltd.)

Track Classification: 26th ESLS RF Workshop