

Minutes of the SASE3 Variable Polarization project meeting

Date: 11.4.2019

Time: 9:00 – 13:30

Location: XHQ_E1.173 Schenefeld

Participants:

S. Karabekyan (UNSYS)
Mark Wünschel (UNSYS)
Norbert Meyners (MEA1)
D. Noelle (MXL)
D. Lipka (MDI)
F. Schmidt-Föhre (MDI)
T. Wohlenberg (MVS)
R. Mattusch (MKK2)
A. Koch (XPD)
J. Laksman (XPD)

J. Hauschild (MEA1)
M. Schlösser (MEA2)
J. Prenting (MEA2)
M. Yakopov (UNSYS)
T. Tschentscher (MB)
H. Sinn (DH Instrumentation)
G. Wellenreuther (PM)
N. Golubeva (MPY)
A. Violante (PM)

Minutes taken by: G. Wellenreuther, A. Violante

Agenda + Slides: <https://indico.desy.de/indico/event/22991>

S. Karabekyan: SASE3-VP project overview and production status of Apple-X undulators

The concept and the geometry of the apple undulator of PSI were presented. To create photons with variable polarization it is foreseen to operate the conventional undulator with a reverse taper, in order to create the proper micro-bunching while suppressing the linear-polarized radiation. Initially, 4 Apple-X undulators have been ordered and are to be installed, with space for 2 more undulators of the same type reserved. In this concept, due to the lack of space the β -function within the helical undulator is defined by the β -function in the conventional undulator.

The Capital Item (CI: 715008) as well as the Weiterberechnungskonto (WB: 37256301) for the project have been announced. The WB can be used for DESY e.biss orders.

RMattusch: Space above the undulator is required for infrastructure / cabling / piping.

DNölle: An up-to-date CAD-model is direly needed, showing the as-is state! SKarabekyan: This will be the responsibility of MWünschel and NKohlstrunk. MSchlösser: Laser-scanner data exists showing the current situation. HSinn: IPP is also working on this issue with the highest priority.

→ **MWünschel will follow up with IPP to ensure the migration of the SE-models is finished by Easter so the modelling in NX can continue after Easter.**

→ **Everybody is requested to tell MWünschen and NKohlstrunk until Easter the exact positions and dimension of any placeholders required for their installations.**

DLipka: There is a **PLC-rack right at the beginning of the Apple-X section**. 10 HUs are required for the BPMs. SKarabekyan: This has to be removed; the contents could potentially go above the undulators.

Collision with the pipe of the SLRS: Currently a cutout is foreseen to accommodate for the pipe of the SLRS. This cutout is weakening the undulator frame structure, which will heavily impact the deviation regarding the actual polarization from the target polarization. Furthermore, its redesign will take additional time. In the redesign, only a distance the undulator and SLRS-beam pipe is 5 cm foreseen. According to H. Sinn, the actual tunnel wall is bending farther away from the undulator.

Alignment of the Undulator: It is foreseen to implement the cam-movers from PSI, which allow to move the undulator by $\pm 3.5\text{mm}$ in vertical and horizontal directions.

→ **As a consequence, the FODO-length is at least 14.12m.**

Transport of the undulator (see also presentation by JHauschildt): The flatness of the tunnel floor should be sufficient for the transport vehicle from PSI, otherwise it can potentially be amended NMeyners: In our experience, using of air cushions creates lots of dust flying around.... And it is pointed out that space for a compressor might be a problem (the internal supply with compressed air is suited for control purpose only).

Production schedule: Commissioning of magnetic benches at PSI is planned for Oct\Nov 2019. The production of “our” UE90 is only coming after the PSI-UE38. In Nov. 2020 the last undulator will be ready for installation in the tunnel at XFEL. Shutdown is starting already by mid Nov 2020, so there is absolutely no time buffer! SKarabekyan suggests not implementing the cutout, as this would allow PSI to save 2 months of time. TTschentscher: We should not consider this to be a reliable time buffer. PSI has to keep their time schedule to be in time to start production in June 20.

→ **An installation in WS20/21 appears to be questionable.**

Starting from 2020 there are no short shutdowns, only summer and winter shutdowns. Should the installation of the undulators be postponed to the SS 2021 or the WS 21/22?

→ **More than 3 weeks are required to bring in the undulators and change the vacuum system, etc.), so we cannot install the undulators in SS2021.**

→ **The installation will most probably have to take place in WS20/21.**

N. Golubeva: Electron beam optics for SASE3 afterburner

Simulations with different electron beam transport and undulator configurations (4, 6 or 8 undulators) have been presented. FODO sections are discussed. Proposed length of FODO period is 14.368 m. Right now there is only one power supply for the quadrupoles of both sections. 2 power supplies make no sense, since the β -function are coupled anyway.

The design shown here does not consider restrictions due to the design of the vacuum or diagnostic system. As soon as the optics design is decided, the iteration with the other trades will follow.

→ **NGolubeva and WDecking are to propose finals positions regarding the electron-beam optics soonish.**

→ **Maximum number of undulators is 6 (1.5 FODO periods).** At the beginning only 4 will be installed.

G. Wellenreuther: Translation of the AC & associated modification of tunnel infrastructure

GWellenreuther reported about the scope of work associated with the shift of the precision climatization device. It does not make sense to move the PKG even more further than the rack @ ca. 2981m. The AC will be above this rack. It was pointed out that the access to the rack has to be reviewed, because there is very little space, and access is sometimes required from the back side (but seldom).

DNölle: Does it make sense to even extend the PKG for the Apple-X undulators in SASE3? There is no easy answer to this, but undulator group would rather like to have it.

DNölle points out that the infrastructure extension is not there in his view and it is a huge effort to have it. GW and Suren say that the infrastructure is there and the air tight enclosure will be installed by the company. 150kEuro is the total shift cost.

→ **The overall effort should be reviewed in a follow-up-meeting.**

It was pointed out, that both the SLRS as well as the electron beam pipe should not be even touched by translation of the PKG. A protection box (dust tight and you can stand on it) for the machine vacuum system over the hole length for displacement of the PKG has been requested to be mounted before the company works there. Special care has to be taken to protect the vacuum system, since damaged chamber cannot be replaced in short time.

J. Prenting: Alignment accuracy in long straight sections

JPrenting explained that the SRLS was devised to overcome systematic errors regarding surveying, in order to achieve the required initial tolerances. In SASE1 the deviation was around ± 1.5 mm. SASE3 similar results. SLRS is needed since without it these misalignments cannot be detected otherwise.

There was an extended discussion about whether or not the SLRS is still required, since now the beam position is known, mission accomplished so to say...

For the system to be operational after shortening, MEA2 would need some days to modify the HW in the shutdown plus some weeks for the calibration later. New end-box could be placed in between the last conventional undulator in SASE3 and the tunnel wall.

→ **Further discussions and a decision about the SLRS in SASE3 are to be taken on a separate meeting.**

F. Schmidt-Föhre: DosiMon RadFet system requirements to the SASE3-VP Project

To measure of the integrated dose in the vicinity of the undulators, shielding will be used. A small rack (diagnostics) is colliding with the undulators, it has to be removed. Space has to be found for the diagnostics racks anyway since these are not taken into account in the current racks planning.

→ **New positions have to be discussed with SKarabekyan.**

Measures of radiation measurements are needed. But it is very difficult to do that with the new undulators because of space limitation. This has to be discussed offline since it is too specific. The structure of these dosimeters is shown and requirements like holders are explained. In 1 year everything should be ready and synchronized with the Undulators arriving in 2020.

→ Details will be agreed with SKarabekyan.

- It was agreed the RadFets are important, but not critical – one could install and operate the new undulators without them.
- It should also be discussed and decided whether to put a collimator in front of the new undulators, to shield further against SR.

T. Wohlenberg: The vacuum system for the Helical afterburner in SASE3

The vacuum chamber is not done by DESY, but a part of the undulator by PSI. Checking after the shipping is mandatory. PSI should also mount the chamber. The components also have to comply to the DESY vacuum rules, or management has to override these rules!

- **The scope of work from PSI and DESY should be reviewed and agreed by all partners.**
- **It should also be discussed and decided, whether cooling should be foreseen.**
- **Access for searching procedure has to be discussed with D3, in particular because the space behind the 2nd and 3rd undulator will not be accessible after the installation.**
- **Because behind the racks only 35cm space is left, all connections should be put to the front of the rack!**

DNölle: General remark: This project is NOT within the operation budget. The project is to be charged. Can we have a resource loaded schedule? GWellenreuther: First, work packages have to be defined. Then work package leaders have to indicate what do they need, in terms of investment, time and manpower (=more budget). Based on this, we will provide a timeplan, and to allocate the budget.

D. Lipka: Requirements and Status of the BPM and BLM systems for the SASE3-VP Project

The BPM electronics (MBUs) need 2 x 3 HU within 20 m distance to the BPMs. Rack positions with water cooling need to be found. The rack @ 2943m with the content of a 9 HU μ TCA crate and a 3 HU MBU needs to be removed but still in the vicinity ± 10 m.

- **Racks positions have to be finalized ASAP.**

J. Laksman: Non-invasive and pulse-resolved polarization diagnostics

PES operation was explained, has been already installed.

J. Hauschildt: Transportation possibilities at DESY

J. Hauschildt explained a more conventional way (=without using air cushions) of moving the undulators into their position. He expressed confidence that with enough information provided in time they can even put 18t undulators into their position. Having the cam-mover system would actually be beneficial.

S. Karabekyan: Final remarks / Next steps

SKarabekyan expressed his intention, to have meetings both regarding the SLRS-system (in 1-2 months), and also **more regular project meetings** to ensure constant planning progress.

RMattusch asked for a decision regarding the materials of the motors / the vacuum chamber, since the choice of the material has a lot of consequences...

→ **most probably, the material of choice will be Aluminum.**

RMattusch would also like to have the order of installation defined early on. Unfortunately, the mock-up tunnel has been teared down.

→ **XTD8 should be used as an alternative.**

Post meeting note

DNölle: The afterburner project is not part of the operation agreement. Therefore, DESY will charge XFEL for extra manpower. A resource loaded schedule for the entire project, not only the undulator part, is needed in order to get reliable time schedule and budget planning. Project coordination must include also all work needed in the tunnels.