THE UPDATE

ISSUE 6 • SEPTEMBER 2020

DOSIMETRICS GMBH NEWSLETTER

TABLE OF CONTENTS

What's new?

Dear customers, partners & interested clients,

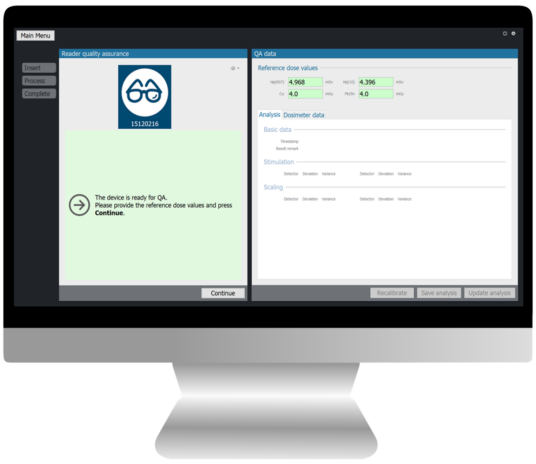
We hope this newsletter finds you safe and healthy. Amidst the current global situation, we are remaining healthy within our team. We have some important and interesting updates for you. We hope you enjoy reading the September edition of *The Update*.

All our best,

The Dosimetrics Team

MAINTENANCE PLAN OPTIONS

Our maintenance plans provide options to ensure exclusive support and upkeep of the BeOSL System. As every monitoring service is different, various plans are available to ensure that the user's needs for support services are met. The following modules are currently available:



- **Basic Module** (Article No. 3009):
  The Basic Module provides premium IT and Customer Service Support. This is also a required module to purchase in order to have any of the additional maintenance module options.

- **Module A: Preventative Maintenance** (Article No. 3010):
  This module includes one scheduled on-site visit with one of our engineers to the operating premises of the user per calendar year. It also includes a 10% discount on spare parts.

- **Module B: Loan Device** (Article No. 3031):
  In the event that a device breaks or needs a repair, Module B provides the user with a loaner device. The loaner shipment is prepared and sent within a few days.

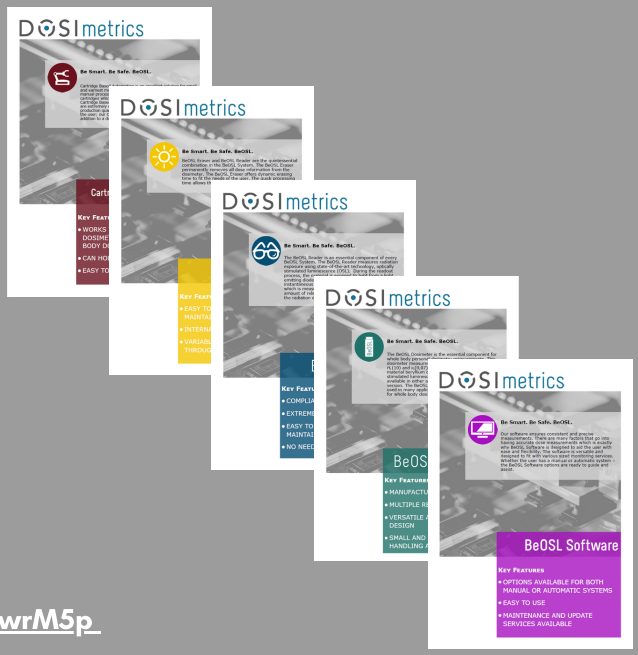
- **Module S: Software** (Article No. 3011)
  This module offers the user the most up-to-date software updates and upgrades. The software updates can be installed either remotely or with an optional in-person visit from one of our IT Specialists.

Each module can be modified to fit exactly to what is needed for each individual customer. For more information about our maintenance plans, please contact **sales@dosimetrics.de**.

NEW! MARKETING MATERIALS

We have new and revised flyers available to be downloaded. These flyers feature:

- Software (NEW)
- BeOSL Reader
- BeOSL Eraser
- BeOSL Dosimeter
- Cartridge Based Automation



These flyers along with all of our current marketing materials can be downloaded here:

https://service.dosimetrics.de/index.php/s/J2wpTKgnPkwrM5p
password: BeOSL@2020

FEATURED CUSTOMER: EXTREME LIGHT INFRASTRUCTURE – NUCLEAR PHYSICS (ELI-NP)

In this issue of *The Update*, we are featuring one of our Romanian customers, a research center, Extreme Light Infrastructure – Nuclear Physics (ELI-NP). We had the pleasure to interview, Dr. Radu A. Vasilache (of Canberra Packard SRL) who works directly with the ELI-NP team.

Could you give us a brief overview of the history of ELI-NP Research Center and its specializations?

ELI-NP is one of the most prestigious research infrastructures in the world due to its unique state-of-the-art equipment. Implemented by the "Horia Hulubei" National Institute for Nuclear Physics and Engineering (IFIN-HH), ELI-NP has been designated by the NuPECC as a major facility in the Nuclear Physics Long Range Plan.

The ELI-NP will operate two unique beam-producing machines:

- A very high intensity, ultra-short pulse laser system, with two 10 PW laser arms, able to reach, focused, intensities of 10^{23} W/cm^2 and electrical fields up to 10^{15} V/m.
- A system producing γ radiation by scattering of light photons on high energy electrons, with tunable energy of the photons up to 19.5 MeV, spectral density above 10^3 ph/s/eV and ~0.5 % relative bandwidth.

The infrastructure will provide a new European laboratory addressing a broad range of scientific research areas, from frontier fundamental physics, new nuclear physics and astrophysics to applications in nuclear materials, radioactive waste management, material science and life sciences.

ELI-NP will allow, in the several areas available, experiments based on the ultra short, high power laser pulses, experiments based on the high intensity γ beam, and also experiments in which both types of radiation may be used.

The high power lasers allow for intensities in tightly focused pulses of up to, and beyond, 10^{23} W/cm^2. At this laser intensity, theory and particle-in-cell simulations predict a high conversion of laser power into a flash of gamma rays generated mainly via nonlinear Thomson scattering, in net contraposition with the radiation generate at laser intensities below 10^{21} W/cm^2 which are fundamentally bremsstrahlung dominated and strongly dependent on the target material.

In ion acceleration, the high power laser pulse allows for the production of ion beams 10^{15} times denser than those achieved with classical acceleration. The cascaded fission-fusion reaction mechanism can then be used to produce very neutron-rich heavy nuclei for the first time. These nuclei allow to investigate the N=126 waiting point of the r-process in nucleosynthesis, bringing significant contributions to one of the fundamental problems of astrophysics – the production of the heavy elements beyond iron in the universe. According to a recent report by the National Research Council of the National Academy of Science (USA), the origin of the heaviest elements remains one of the eleven greatest unanswered questions of modern physics.

Lowering the target thickness, we will go across different acceleration regimes, from Target Normal Sheath Acceleration (TNSA) to Radiation Pressure Acceleration (RPA). This along with laser intensity tuning will allow to investigate the scaling laws of those mechanisms up to the unprecedented laser intensity of 10^{23} W/cm^2 where we should see some QED effects coming into play.

Other research areas of interest are the study of quantum radiation reaction created by plasma

Continued on Page 4

electrons accelerated to GeV energies, and the production of electron-positron pairs in huge abundance and highly energetic gamma-rays emerging from the laser pulse interaction with electrons.

Applications are also envisaged for the unique laser pulses generated at ELI-NP: the degradation of materials used in building the next generation of particle accelerators and fusion or fission reactors or the interaction of biological systems with a multi-component ion and photon radiation pattern spanning over a wide range of energies (relevant for improving biologic radio-protection in space missions, and potentially for radiotherapy and diagnostics of cancers).

How does ELI-NP Research Center use the BeOSL System?

The BeOSL System is used for integrative dosimetric measurements of photon and electron radiation, both for personnel dosimetry and for area dosimetric measurements. We believe that the integrative measurements are the best solution for personnel monitoring, as the radiation pulses are very short and there is a high probability that electronic dosemeters will not be able to measure with good enough accuracy the doses resulting from such short pulses. The BeOSL system has been identified by us as having a corresponding energy response and we are looking forward to check the response of the dosemeters at the high energies expected here at ELI.

What are the future plans for ELI-NP Research Center?

ELI-NP will develop towards two main directions: fundamental research, as described in the first answer, will make use of the unprecedented beam intensities that can be obtained at ELI-NP to push the frontiers of nuclear and particle physics.

The second direction is the applicative research and here the possibilities are also wide (and these are only a very few of them):

- Radiobiology experiments will broaden the knowledge on how living systems react to the interaction with various types of radiation, especially at very high dose rates. Combined with the experiments made at other facilities, at various dose rates and dose levels, we should be able to have a much clearer picture on the various dose - effect responses and this alone will significantly improve all types of radiation therapy techniques.
- The same high intensity beams can be used for accelerated studies on the degradation of materials used in building the next generation of particle accelerators and fusion or fission reactors.
- Developing new types of detectors suitable for this extreme type of beams, together with studies on the response of the existing detectors at very high energies is another type of study that could have an impact, among other things, on the design of the detectors for FLASH radiotherapy techniques.

Is there any other relevant information that you'd like to share with us and other Dosimetrics users?

One of the main differences between ELI-NP and other facilities that use OSL dosimetry is the mixture of different radiation qualities covering very wide energies (from a few keV to hundreds of MeV). This means that our lab will have, as a task, to study in detail the response of the BeOSL dosemeters to such extreme conditions. We hope to come back soon enough with detailed experimental information about the behaviour of BeOSL dosemeters in the radiation environment from ELI-NP.

To learn more about ELI-NP, visit their website: **https://www.eli-np.ro/**

NOT THE AUTUMN 2020, WE WERE PLANNING...

This is a recent photo of the nearly empty Theresienwiese, the official Oktoberfest grounds. Photo credit: Stepstone.

2020 has affected all of us in so many different ways. We hope that you, your family and team are staying healthy. If 2020 had gone as planned, we would have loved to have you join us for Oktoberfest and especially our User Group Meeting this fall.

For now, we will patiently wait for 2021 and cross our fingers (or *die Daumen drücken* as we say in German which means "press our thumbs") for good luck that we can meet you all next year.

7TH YEAR ANNIVERSARY

Cheers to **7 years**!

We recently celebrated our 7th anniversary. We thank you for your continued support, we could not have done it without all of you.

We are very much looking forward to what the future will bring!

WANT TO KNOW MORE? FOLLOW US!

Dosimetrics GmbH
Otto-Hahn-Ring 6
81739 München, Germany
www.dosimetrics.de
info@dosimetrics.de