

‘Introduction to Fast Pulsed Magnets at BESSY II
and MLS synchrotron light sources @ HZB’



O. Dressler - PULPOKS workshop, 12-13 March 2018,
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The storage ring BESSY II is a third generation synchrotron light source in Berlin, Germany. BESSY II provides extremely brilliant photon pulses ranging from the long wave terahertz region to hard X rays. Users can choose the energy range and the polarization of the radiation. The forty six beam holes at the undulator, wiggler, and dipole sources offer users a many-faceted mix of beam holes and measuring sites with outstanding energy resolution. The combination of brilliance and photon pulses makes BESSY II the ideal microscope for space and time, allowing resolutions down to femtoseconds and picometers.

The profile of BESSY II is defined to a great degree by the users, now over 2500 in number. An important role is played by the scientists at the HZB, but also the institutional users like the Max Planck Society, the Federal Institute for Materials Research and Testing, and collaborating research groups. Consequently, as a result of the activities by the Physical Technical Institute PTB, BESSY II is the European radiation standard for the calibration of light sources and detectors.

http://www.helmholtz-berlin.de/quellen/bessy/index_en.html

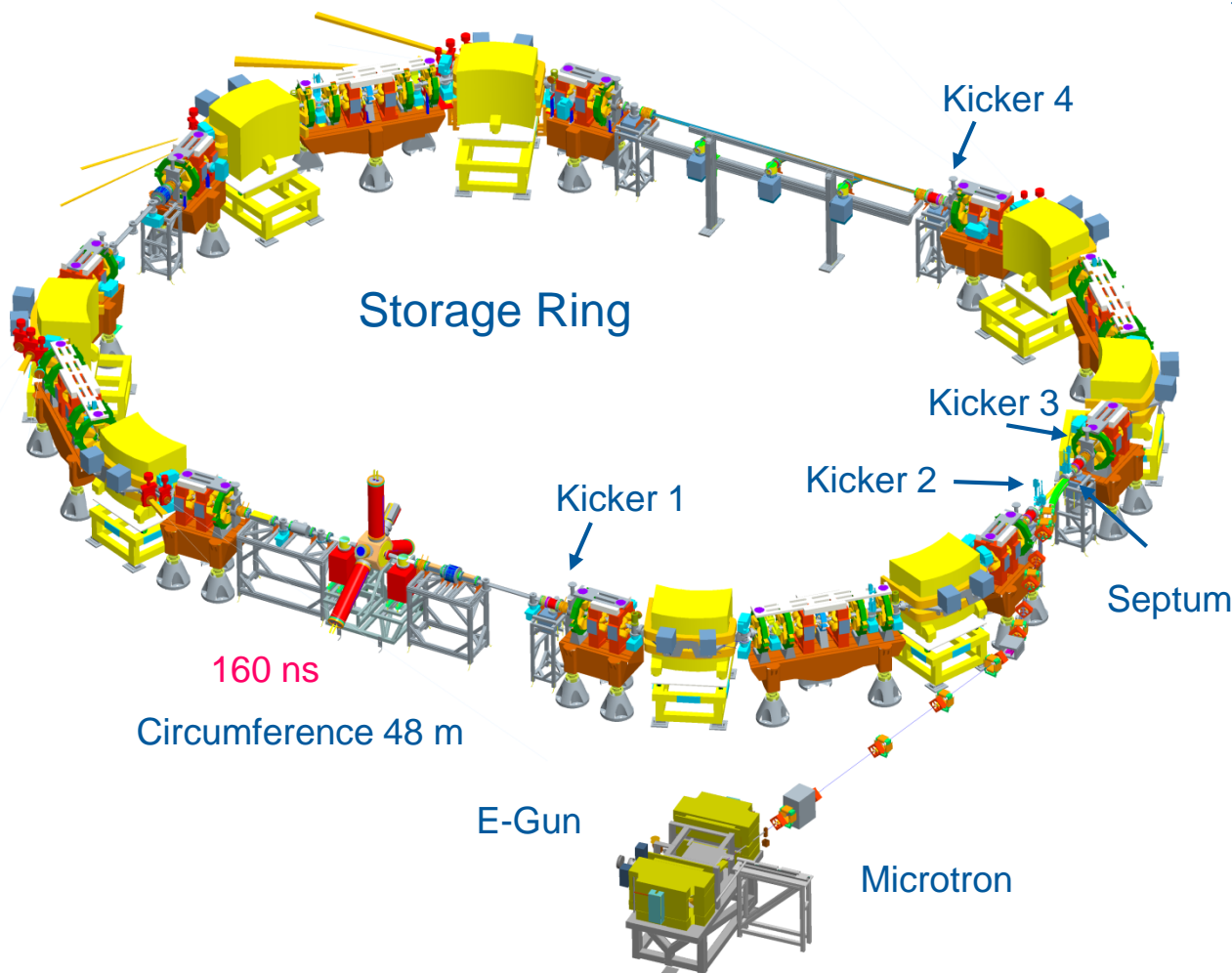
A dedicated low-energy storage ring for metrology with synchrotron radiation.



<http://www.ptb.de/mls/index.html>

The Physikalisch-Technische Bundesanstalt (PTB), Germany's national metrology institute, is using synchrotron radiation for metrology and related applications for research and industry. In this context, PTB extends its activities with a new storage ring, the Metrology Light Source (MLS), designed and built to meet dedicated demands for metrology. The MLS is located in the vicinity of the BESSY II storage ring facility in Berlin-Adlershof (Germany) and started user operation in spring 2008. At its beamlines, the MLS offers capabilities for precision measurements and calibrations in the spectral range from the far infrared / THz to the extreme ultraviolet (EUV), thus complementing the activities of PTB at BESSY II, which cover the short-wavelength spectral ranges from the EUV to the X-ray range. At both facilities, PTB offers metrological services to customers and cooperation partners, from routine calibrations to customized metrological solutions and metrology oriented research.



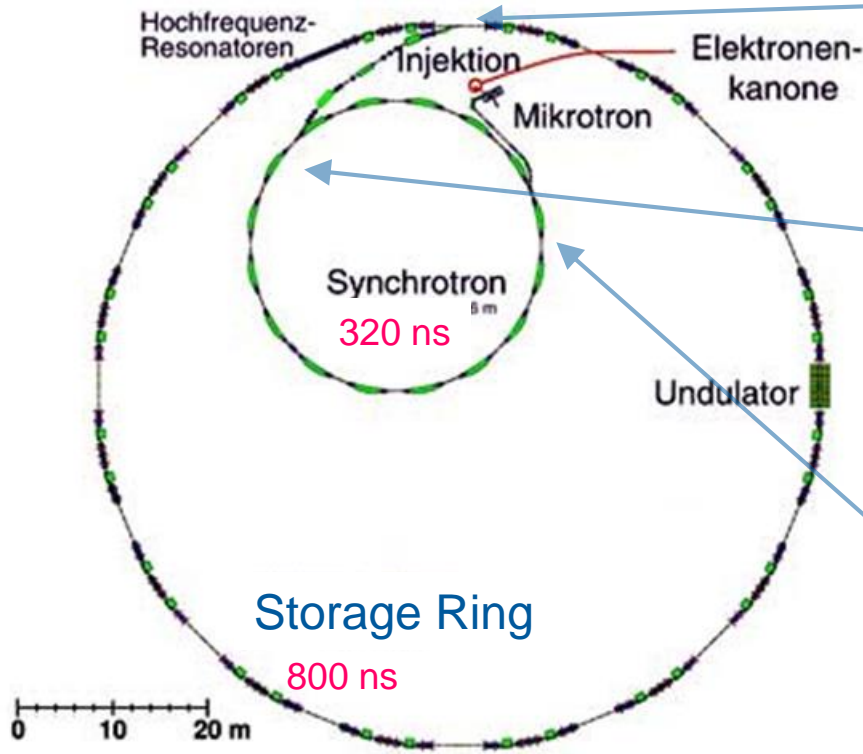


Injection elements:

- 4 Kicker systems (200V, 150A, 2.3 μ s, half-sine)
- 1 Septum system (150V, 1700A, 110 μ s, half-sine)

(\hat{I} - Peak current
 U_L - Charging voltage
 τ - Pulse length
 all nominal values)

Needs every 6 hours a dedicated injection procedure to refill for user operations.



SR Injection:

- 2 x 2 Kicker systems (15kV, 4.3kA, 5.5 μ s, half-sine)
- 2 Septa systems (1.5kV, 9kA, 45 μ s (60 μ s), half-sine)
- 1 Non-linear kicker (12kV, 2kA, 1.3 μ s, half-sine)

Booster Extraction:

- 2 Kicker systems (25kV, 500A, 350ns, square)
- 2 Septa systems (600V, 9kA, 250 μ s, half-sine)
- 3 Bumper systems (200V, 3kA, 250 μ s, half-sine)

Booster Injection:

- 1 Kicker system (12.5kV, 122.5A, 350ns, square)
- 1 Septum system (120V, 2kA, 120 μ s, half-sine)

SR Diagnostics:

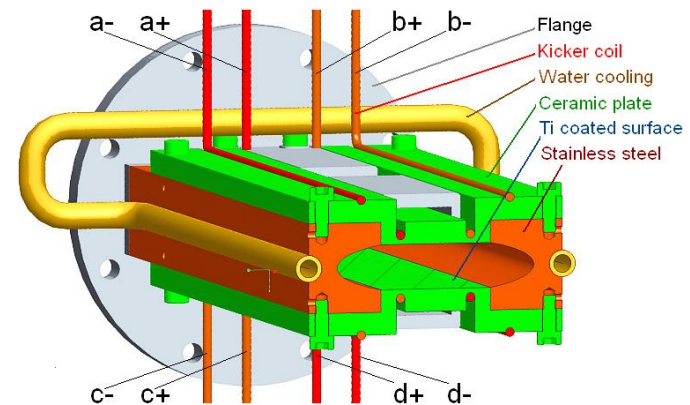
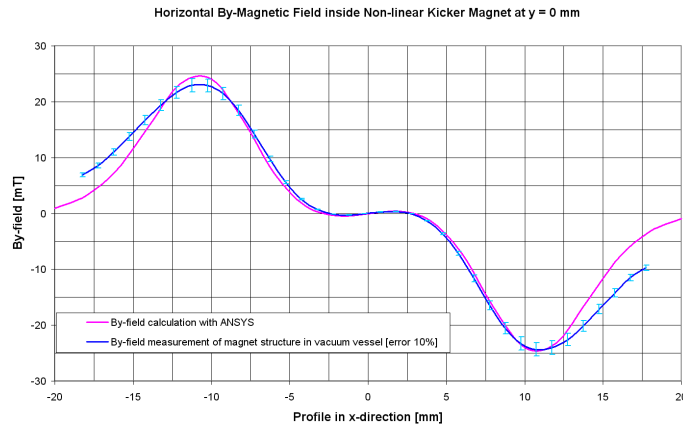
- 2 Diagnostic kickers (15kV, 4kA, 1.6 μ s, half-sine)

Usually operated 24/7 in top-up-injection mode, where single shot injection efficiencies above 90% are required.

(all nominal values)

SR Injection:

- Non-linear kicker storage ring injection – kicker magnet and its power supply



Booster Injection and Extraction:

- Kicker pulser refurbishment, intention to replace the PFL type floating thyatron switch based kicker pulsers in the BESSY booster synchrotron.

In general, refurbishments of existing pulser systems to improve technical availability, stability and reliability for the introduction of the Variable pulse length Storage Ring, BESSY VSR.

→ [A. Jankowiak et al, "The BESSY VSR Project for Short X-Ray Pulse Production", Proc.IPAC2016, Busan, Korea, p.2833](#)