XFEL Tunnel Ventilation and Air Conditioning





BESSY ventilation concept



BESSY I - History



- 1979 BESSY GmbH was founded
- 1982 BESSY operated until 1999 the electron storage ring facility BESSY I in Berlin-Wilmersdorf
- 1999 BESSY I was cut back and 30 Beamlines were reconstructed at BESSY II



BESSY II - History





- March 1993 the project team BESSY II starts work in Adlershof
- 4. July 1994 Groundbreaking ceremony on the construction site for BESSY II
- 13. Dec. 1995 Topping-out ceremony for the new building
- 07. April 1997 Commencement of operation of the synchrotron



BESSY II - Commisioning



- 23. June 1997 First acceleration of an electron beam in the synchrotron up to 1.9 GeV
- 22. April 1998 First storage of an elctron beam in the storage ring and detection of synchrotron radiation
- 16. July 1998 First production of "undulator" light
- 4. Sept. 1998 Inauguration ceremony for the high brilliance synchrotron radiation source BESSY II



BESSY II - Operation



- Oct. 1998 First scientific experiment
 - Jan. 1999 Official start of user-dedicated operation
 - Jan. 2000 Admission to the Leibnitz-Association
 - Dec. 2001 Inauguration of the BESSY extension office

BESSY II – Helmholtz-Zentrum Berlin





- Jan. 2009 the Helmholtz-Zentrum Berlin (HZB) was foundet by merging the former Hahn-Meitner Institut (HMI) and BESSY
- the Helmholtz-Zentrum Berlin now operates two scientific large scale facilities for investigating the structure and function of matter
- the research reactor BER II for experiments with neutrons and the synchrotron radiation source BESSY II, producing ultrabright photon beams ranging from Terahertz to hard-Xrays
- HZB can offer the whole range of instruments for neutron and synchrotron radiation within one labroratory structure

für Materialien und Energie









BESSY II - Parameters

0.9-1.9 GeV Electron energy Ring circumference 240 m 6x10⁻⁹ Emittance • dipoles, quadrupoles, sextupoles 32/144/122 Straight sections 16 • Beam lines: dipole max 40 • Beam lines: wigglers, undulators max 30 • wave length shifters ca 10²³ Brilliance •



BESSY II

top view



section



section

The different areas of the BESSY facility

Experimental hall Storage ring tunnel Synchrotron tunnel Technical area



Experimental hall



top view

section





section

Description:

Experimental area to accommodate different test rigs, test setups, test houses etc. .

Cooling:

Volume ca. 60000 m³ 2 air conditioners work:

two air changes pressure of max. 10 Pa relative humidity of 30 to 50% hall temperature of 24 °C (average of two temperature sensors in different heights) Cooling capacity 500 kW Heat capacity 800 kW Supply air 17 °C to 20 °C Outlet air 26 °C to 29 °C



Storagering tunnel









section

Description:

- 1. closed ring-shaped tunnel to carry all necessary mechanical and electrical components for the storage of the electron beam
- 2. Radiation protection

Cooling:

- Volume ca. 4000 m³
- The cooling is done with serveral circulating cooling device:
 - →3 circulating cooling device lead the storagering tunnel 26 ° C
 - →5 circulating cooling device limited the ring temperature to 26 ° C
 - → heated air passes through a labyrinth of radiation protection in to the technology sector
 - → relative humidity of 30 to 50% (because the supply air is from the experimental hall)
 - → desired ring temperature of 26 ° C, which is not the absolut value important but the stability
 - ➔ Cooling capacity is around 160 kW



Technical area









Description:

- in the equipment room are:
- the air conditioning systems, pumping stations, water treatment,
- water distribution, compressed air distribution, heat distributor, cooling water distribution,
- housed helium compressor

Cooling:

The dissipation of heat from the storage ring tunnel and the pumps, the He-compressor and other heat sources from the technical area is through the roof fans.



Synchrotron tunnel

section





- 1. closed ring-shaped tunnel to carry all necessary mechanical and electrical components for the acceleration of the electron beam
- 2. Radiation Protection

Cooling:

For cooling Synchrotron tunnel were 8 circulating cooling device with 15 kW planned and installed. But it was result that stable temperatures without circulating cooling device were possible. Very thick concrete walls and almost the same introduced electric heat load, result a nearly constant temperature by 24 ° C.

The necessary fresh air is supplied from the main air conditioning of the experimental hall.. The outlet air passes through radiation protection in the experimental hall back.

BESSY II – special solutions of ventilating (MLS)





- Willy Wien Labarotory, the metrology light source (MLS) of the PTB (Physikalisch-Technische Bundesanstalt)
- Dedicated to metrological and technological applications from the far-infrared to the extreme UV
- MLS is a primary source standart for calculable synchrotron radiation
- For the ventilating of the experimental-hall works 2 ventilating systems parallel
- 5 temperature sensors make an average value for the setting up of the supply air
- by difference air-pressure sensors and frequence controlled ventilators is an inside pressure of 10 Pa in the experimental-hall established

für Materialien und Energie



BESSY II – special solutions of ventilating - metrology light source -







- with variable discharge units is air directed down or sidewards
- that happens due to temperature of supply air and the set point
- from ground to a high of 3 meters it`s a temperatur of 22.5 ℃ with differences of +/- 0.2K



BESSY II – special solutions on ventilating - ebeam writer hutch -





- Requirements for high temperature accuracy +/- 0.1K
- Temperature adaption by filter fan units
- Master-slave controlling (Temperature sensors)
- Temperatur monitoring by high accuracy data logger
- Veriteq logger temperature and humidity logger
- Temperature uncertainty 0.03K
- Humidity uncertainty 0.6%

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...thank you for your attention.