

Minutes of the infrastructure meeting of 9.1.2009

C.Youngman 9.1.2009

1 Present

WP73 (beamline): H.Sinn and A.Trapp

WP74 (diagnostics): J.Gruenert

WP76 (DAQ): C.Youngman.

MKK2 (water, air...): A.Block and F-R.Ullrich

MKK (power, cables...): J.Havlicek

2 Points raised

Input material:

- H.Sinn's 5.12.2008 summary of the water and power requirements
- Antje's excel spreadsheet summarizing the beamline components (Photon_Tunnel_components_atr20081202.xls)

Discussion before MKK and MKK2 people arrived.

Discussion of 5.12.2008 input note:

- Ion-pump rack heat load should be increased to 2kW (per rack). The 1kW is enough for 2 ion pump HV controllers (400W each) plus a network switch (~200W), but the racks should be tall enough for at least 3 crates and it makes sense to assume 2kW so that more sparsely occupied crates can be used – high power dissipation racks are not foreseen.
- Beam pipe height in the photon tunnel is 1.40m (10cm diameter). We assume that the all racks (for ion pump, beam line components and diagnostic instruments) will be located under the beam line – this appears to be the only space available. The height of a water cooled rack with side flow air circulation is estimated to be (bottom to top): 2U deflector + 2U heat exchanger (2kW) + 3x6U crate space + 6U airflow fan unit = 29U = 124cm (1U = 4.45cm). Note that this does not include the rack frame.
- Shielding of racks against radiation. In the photon beam lines little radiation is expected, in the tunnel sections including e-beam lines shielding may be required. We assume that the shielding issue can be addressed later, for now shielding is not considered.
- A program for defining rack requirements, finding commercial solutions (our height may not be a standard!), etc. needs to be started.
- For calculating the water cooling requirements it is implicitly assumed that all racks are water cooled.

Discussion after the arrival of MKK and MKK2.

Water related:

- The two documents were introduced to MKK and MKK2. As the result of discussion before the arrival of MKK and MKK2 some small modifications are needed for these documents. These updates would be made as soon as possible.
- Both PD and LA coordinate systems are shown on the spreadsheet.
- MKK2 applies no safety factor to the input cooling requirements received. The capacity of the water cooling is calculated based on a nominal flow speed of 1m/s in the distribution pipes. The flow speed can be increased by 50-80% if additional cooling capacity is required. The input cooling requirements should therefore be realistic (and tend to the high side.)
- The water cooling system requirements discussed are in addition to the e-beam (including undulator) system. The photon beam lines start immediately after each undulator. The vacuum pumps are distributed evenly over the entire photon beam line, the diagnostic and active beam line elements tend to be grouped together and are 100-200m away from the undulator, see spreadsheet.
- In tunnels and shafts where only photon beam lines exist water is supplied from XHEXP1. Elsewhere the water requirements of photon beam line elements are satisfied from the electron side water distribution system.
- MKK2 foresees 18 and 30°C water circuits in the tunnels; 18° for electronics and 30° for other cooling. 18° is produced by refrigerators and 30° by heat exchange to the atmosphere.
- The 30° water is ion-free (VE Vollentsalztemwasser) for cooling magnets, etc. where ions would cause shorts. The conductance of the 18° water is not controlled and is foreseen for use in electronics racks and pumps where conductance is not important. Ion-free water is highly aggressive and only copper, red brass and stainless steel piping and fittings can be used.
- The 30° temperature is larger than the manufacturer allowed input temperature of compressors foreseen for use in the photon beam lines. A possible solution would be to use 18° water everywhere, which is a question of money for increased pipe diameters and refrigeration. MKK2 will estimate the additional cost of an 18° only system so that a decision can be made.
- The ~100kW water cooling requirement of the photon beam lines is small compared to other users.
- It has been assumed that all heat producing systems of the photon beam lines (electronics, compressors, etc.) are water cooled. The 100W cooling capacity per meter of tunnel is not used.
- The 2005(?) estimated cost of the entire photon beam line water cooling system was ~3M€, including XHEXP1 increased this to 5-6M€.

Power and cable related:

- Cables (power and control) running from the racks to instruments on the beam line will have short lengths $\leq 10\text{m}$.
- HV and control cables from ion-pump racks to pumps will be $\leq 45\text{m}$. This is a typical length driven at FS-BT installations.

- UPS power. If needed, i.e. for computers with hard disks, would be done locally within the rack with a standalone UPS. We think there is no requirement for a general purpose UPS power line in the tunnel. UPS.
- UPSs will be used in XHEXP1 for large network switch and other systems, but these are not the subject of the current discussion.
- It has been assumed that the photon beam line power requirements are satisfied from power cables originating in XHEXP1 which run along the tunnels towards the DESY site. Is this realistic in terms of voltage drop on the cables and cable cross-section? MKK will evaluate whether the XHEXP1 only solution is viable. For the calculation each rack should be assumed to receive 3-phases and have five 16A single phase users (3 crates, fans, and spare), the rack positions will be supplied in the updated input documents.
- We would like to be able to switch off and on all racks with a switch from a central location in XHEXP1. This switch should be controllable via computer (safety requirements?) Switching on and off individual crates and detector elements is also required. Rack on/off control – check with electron beam line groups what is foreseen, and how this interfaces to the software control system. Do racks with the required functionality exist, and can we use them?
- It is assumed that all control cables originate in XHEXP1. The number of cables needed appears to be rather small: a small number of fibres for network switches located in the ion-pump racks and other electronics racks, possibly control cables for on/off rack power switching (discussed above), etc. A rough estimate per beam line would be 20-30 fibres plus a similar number of copper cables for rack control.
- The requirement of connecting XHEXP1 with DESY-IT for large volume data archiving will require fibres to be laid along the SASE1 cable trays. With today's technology 100-200 fibres are needed, in 2013 this should be ≤ 20 . An allocation of fibres in the XS1 to DESY route has been requested.
- Mechanical supports for fibres and radiation protection will be discussed at a meeting with the IT network group on Monday.
- Three (AC power, control, and dump power cables) cable trays are foreseen in each photon tunnel. By the end of 2009 all users of the cable trays should have submitted their requirements, which will allow the width of the cable tray to be specified. It is necessary to have the final allocation understood and specified at this time. Foreseen are 500mm trays, but 900mm trays can be used.

N₂ and compressed air related:

- There will be no N₂ line in the tunnels. (v.Schroeder, Krause...)
- Where needed N₂ can be provided with bottles, where the purity is in any case better.
- A compressed air line exists (Guteklasse 2?). The air will always contain traces of hydrocarbon. The air is used for controlling valves. Used air is simply exhausted into the tunnel, there is no exhaust line.

XHEXP1 racks close to the tunnel:

- These racks are intended for use as end points for the network fibres (and other control cables) heading into the tunnels.
- MKK2 have a booster pump installations in the balcony immediately above the end point rack allocation.
- They would like to swap floors with us, this should be possible (check height available, access stairway (?), cable routing to and from cable trays, etc.) and a decision will be made after checking with Herr Dost.
- There may be a contention between photon beam line components (shutters...) and the pipes coming from the booster pumps.

3 Conclusions

Actions list:

- Update 5.12.2009 note.
- Update spreadsheet
 - Need ZLA positions of racks - for MKK2 it is important to know exactly which racks are in which tunnel/shaft section as water is supplied to, e.g., XTD2 and XTD9 water from different sides, XS1 and XHEXP1, respectively.
- Confirmation of end point floor swap with MKK2
- Resolve potential contention between shutters and water pipes at the tunnel/XHEXP1 boundary.
- MKK2 will, using the updated information, evaluate the 18° only water solution.
- MKK will evaluate whether sourcing all power at XHEXP1 is possible.
- The fibre allocation requirement in the tunnel cable trays have to be evaluated, including input from IT. Also check the requirements for radio networks in the tunnels and shafts.
- Need to start looking for racks which can satisfy our requirements.