Damping Ring Tunnel Environment

Specifications of SR machine with similar beam sizes:
100 µm over 10 m per year
10 µm over 10 m per day
1 µm over 10 m per hour
The above are vertical; horizontal tolerances are 2 x looser

They interpreted this:
Tunnel temperature 21 deg +/- 0.1 deg C
This is the same as the input water temperature

(Soleil APD VIII.4.2)
Swiss Light Source

- Use average water temperature of 27 deg C as design air temperature
- Regulate to +/- 1degC using ‘low strength’ air conditioning
- Minimize tunnel power dissipation from ‘non-water’ sources (i.e. cables)
- 1A/mm^2 cable maximum current density- total dissipated power in ring 5KW
- Only bend cables in tunnel; other cables go in - then out --> penetrations are very closely spaced

NLC Damping Ring

- Cannot place power sources as close to loads
- Must run cables parallel to beamline between penetrations - presumably widely spaced
- Must use long, unspliced cable
- Cable losses are 200KW total; about 1/2 of which is in the tunnel (?)
- 20 times more power/meter dissipated in the tunnel than SLS
- Either: a) the heat source must be reduced or b) the heat must be removed
Heat removal from NLC DR tunnel

- Facilities Group - Please estimate the cost of removing 1 watt from the DR enclosure
- Magnet Group - Please check power dissipation (into air) in the tunnel
- Proposal:
  - Adopt the average water temperature as the reference
  - Develop ‘Plenum strategy’ for isolating cableway section of tunnel
  - The ‘Plenum’ is a secondary enclosure in the tunnel, separated with insulation from the beamline components and provided with its own cool air circulation
  - Reduce the beamline cable power dissipation to less than 10W/meter