

SiD Services

- The purpose of this exercise is to make a first estimate of the cable plant and other connections to SiD.
- Assumptions:
 - This is preliminary.
 - The detectors are self shielded, and there is free access to the collision hall during operation.
 - The SiD footprint is $\sim 12 \times 12 \text{ m}^2$
 - SiD is instrumented with pulse power electronics, active for $\sim 5 \text{ ms/s}$.
 - Platforms for many services can be located on the sides of SiD, assuming fringe fields are ok. A platform of \sim full footprint can be either on top or beside SiD, depending on hall optimization.
 - Requirements for collision hall ventilation are not considered. SiD will remove most heat by chilled water and LCW.

Electronics

- Assumptions:
 - Front ends (amplification through digitization) are on detector elements. Estimates are based on the KPiX chip, which is expected to have an average power consumption of 20 mW for 1024 channels.
 - Estimates include power supply and distribution system efficiencies, including cable losses.
 - Level 1 concentrators collect digital data cables and include DC-DC power conditioning for the front ends. These concentrators are inside SiD.
 - Level 2 concentrators collect data from level 1 concentrators. Level 2 concentrators are located on the exterior of SiD. Data compression occurs in level 1 or 2.
 - Event Building occurs in racks on the platform. Power supplies will be in racks on the platform.
 - Racks will be closed and cooled by chilled water.
 - 20 racks are estimated to be generous for everything. There is room for ~70 racks.

Electronics

System	Power (Kw)	Chilled Water (lpm)
VXD	5	76 *
Trkr	1	15
EMCal	5	38
HCal	1	8
Muons	0.1	-
DAQ	50	76
HV	20	30
Totals	82	273

* Power estimate is a WAG. Cooling may be done at a much lower temperature by an LN system.

Solenoid Power

- Assumptions:
 - ~200 KW supply - charging time of ~4 hours
 - Dump resistor (pressurized water load) on detector (cylinder ~2 m D x 3m high).
 - ~15 KW solenoid leads
- Utilities:
 - 250 KW @ 480 VAC
 - ~10 KW UPS
 - ~275 lpm LCW

Solenoid Cooling

- Assumptions:
 - QDO is not understood, and may radically change this concept.
 - May want common liquifier for solenoid and quads.
 - Liquifier is located in hall, off detector.
 - Compressors are remote to avoid vibration.
 - Liquifier - detector connection is by flexible quadraxial line.
- Connection is ~10 cm OD.

Miscellaneous

- On Detector lighting (fluorescent??, LED??) 5 KW
- Transport power (doors, detector) 100 KW, 75 lpm water.

Totals

Utility	Mode	Estimate	Provide	N conduits@ Diameter
AC Power	480 VAC 3φ	430 KW	750 KW	3@10 cm
UPS Power	480 VAC 3φ	15 KW	30 KW	1@5 cm
LCW		350 lpm	500 lpm	2@10 cm
Chilled Water		244 lpm	500 lpm	2@10 cm
Instrument Air	~1 MPa	~100 lpm	~200 lpm	2@5 cm
Fiber Optics	72 fiber cables	3	5	5@1 cm
Helium	Quadraxial flex			1@10 cm
Total				~0.1 m ²

Summary

- There will probably be other services - not yet thought of - for SiD, but they are unlikely to add significantly to the cross sectional area of the cable plant.
- All services so far envisioned can be flexible.
- SiD will return most of its power to chilled water and LCW systems, and relatively little to the HVAC.
- There is not yet a concept for QDO cryogenics, and this may add "stuff".
- It appears that the SiD services could connect overhead without difficulty.