

RICH Upgrade

Power/Cable/Fibre

LV Power

- On detector loads
 - Digital boards, FPGA, GBTX, VTTX, VTRX
 - Front-end, CLARO ASICs
- Main contribution is DBs
 - Estimate FPGA (K7) power using Xilinx tool
 - GBTX/VTTX/VTRX power from talks/datasheets
 - Still significant uncertainties
 - 14W per DB

Power loads (W)	RICH1	RICH2-ECH	RICH2-ECR
Digital boards	3360	1344	1344
CLARO	624	30	250
DCDC (assume ~70% eff.)	1000	400	500
Total	5000	1800	2100

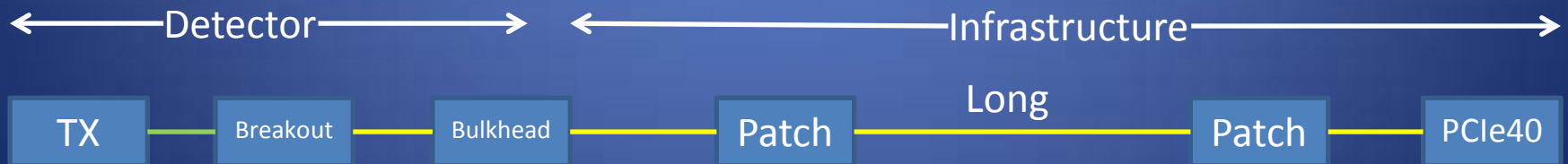
LV Power

- Power supplies
 - Re-use Maratons but extras needed
 - Keep photon-detector columns separate for powering may require increase in number of LV channels
 - Use a single raw voltage?
 - Safe power not required

Current load	RICH1	RICH2-ECH	RICH2-ECR
Digital boards	240	96	96
Load per DB (A)	8.5	8.5	8.5
Total (excl. DCDC)	2040	816	816
Present capacity	1440	960	960

Data/ECS Fibres

- Data are not zero suppressed therefore no advantage/requirement for load balancing at the fibre level
- Merge into 12-fibre ribbons on photon detector columns
- Maintain 12-way fibres all the way to PCIe40



Data/ECS fibres

- RICH1

- Two sides U&D
- Presently 28 MPO-12

- RICH2

- Two sides A&C
- Two modularities, ECH&ECR
- Presently 36 MPO-12

MPO-12 fibre ribbons - data	RICH1	RICH2-ECH	RICH2-ECR
Harness to feedthrough	120	32	48
Feedthrough to patch	120	32	48
Long distance	120	32	48
Patch to PCIe40	120	32	48

MPO-12 fibre ribbons - ECS	RICH1	RICH2-ECH	RICH2-ECR
Harness to feedthrough	48	16	16
Feedthrough to patch	48	16	16
Long distance	48	16	16
Patch to PCIe40	48	16	16

HV

- Powering unit is PDM (photon detector module, 16 MAPMT)
- Voltage up to 1.1kV, current up to 6mA per PDM
- CAEN & Iseg supplies under consideration. 1 crate appears sufficient per detector.
- Groups of channels share common floating ground at P/S. We want at least to keep grounds of different columns separated.
- Single (adjustable) voltage level for most of the detector. Power advantage to use split voltage in high occupancy region.

HV	RICH1	RICH2-ECH	RICH2-ECR
PDMs	120	96	48
Current (mA)	6	1.5	6
Maximum voltage	1.1	1.1	1.1

HV

- Existing cables not sufficient
- RICH1 requires 120 conductors for HV + 32 extra for split powering. Assume about 40 conductors for ground.
- RICH2 requires 144 conductors for HV. 48 conductors for ground assuming some sharing.
- Exploring use of multi-conductor (56-way) cables (CERN stores)
 - Patch panel to translate from multi-conductor cable to SHV termination at crate end.
 - Patch panel required at detector end.