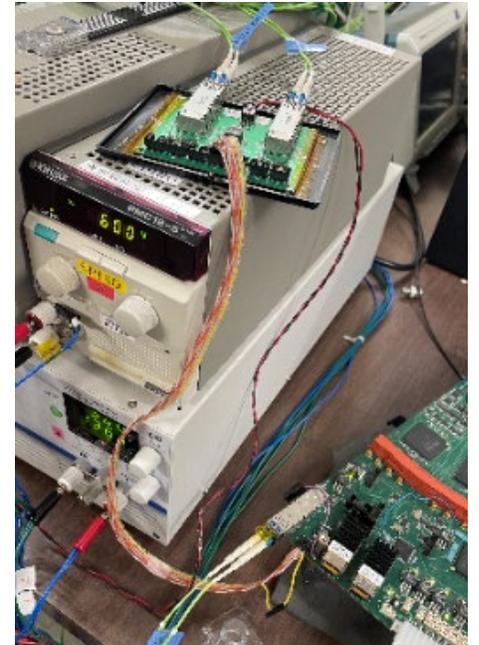


Clock cable

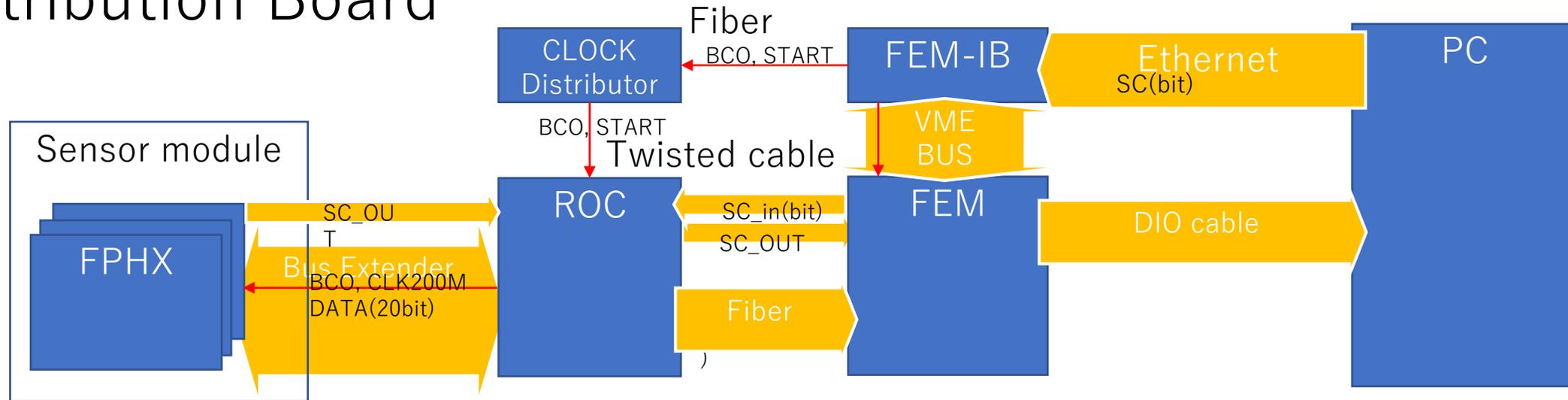
Takashi Hachiya
Nara WU and RIKEN BNL

Clock distribution board

- Clock distribution board, CDB, is the conversion board of the optical fiber to 8x metal lines.
 - FVTX used 4 CDB's for north-east, north-west, south-east, and south-west, respectively.
These CDB were placed in the rack at the top(bottom?) of the central magnet.
- At the readout review, Jin suggested to make new clock distribution board which have one optics input and one metal output to avoid noise by the ground loop since the metal clock cable is routed in / around the solenoid magnetic field.
 - The CDB should be placed as close as possible to the ROC to make the metal cable short.
- The jitter of the BCO can cause errors on the data transmission and signal processing at ROC and FPHX.
 - Very long clock cable makes additional distortion of the clock signal.



Clock Distribution Board



- We use a thin twisted flat cable (8 lines) at the test bench
 - 2 BCO (p/n), 2 START (p/n), 4 GND
 - Not good for noise
- Using 50cm cable at TB

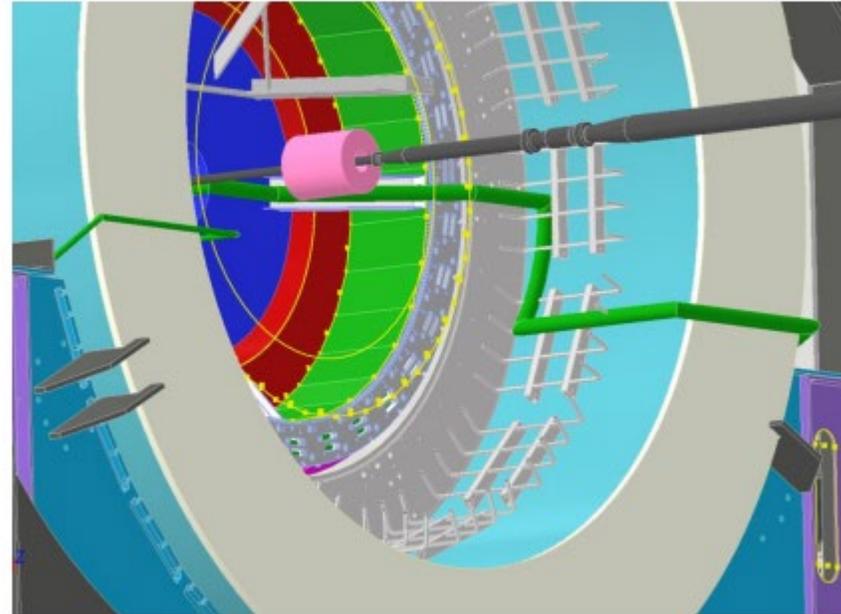
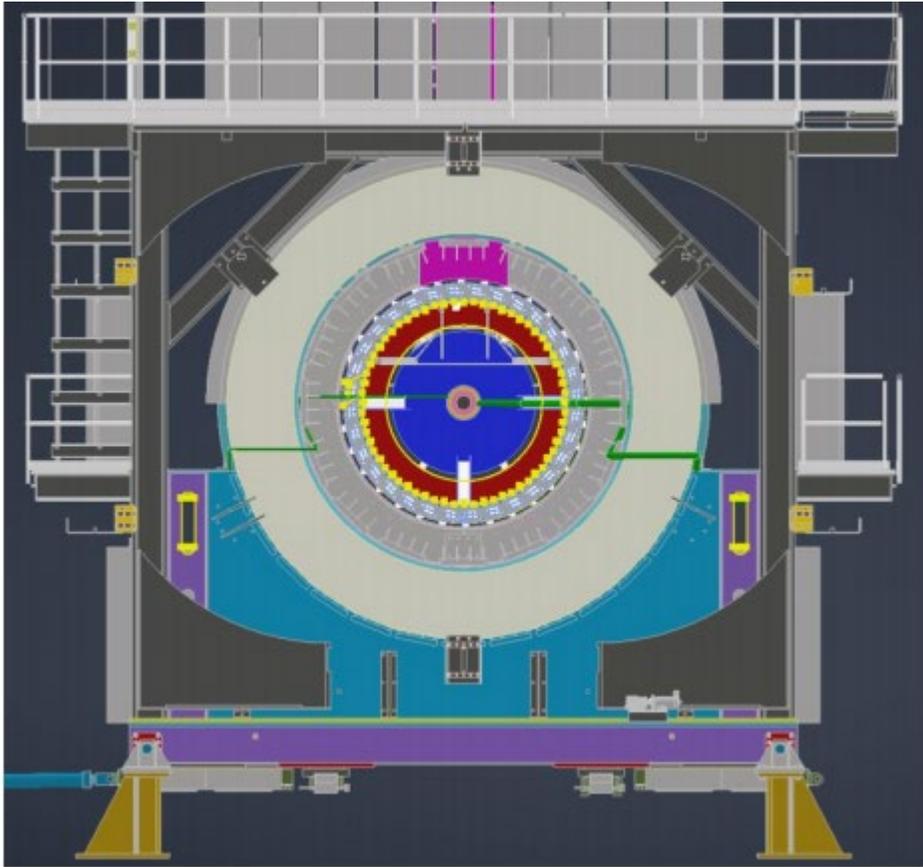


Clock distribution board

Expected cable length at IR

Roland Wimmer @ INTT RO review

- Currently 10m metal cable is planed from the rack to ROC. This is a big concern on both noise by ground loop and distortion by the length.

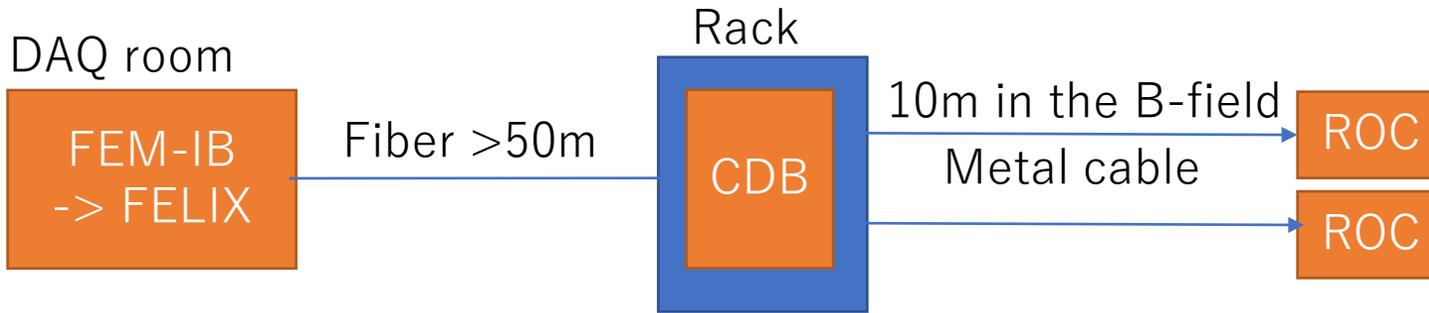


Slow Control South	0.010430837	8	in^2	ROC	Rack 1E2	10m	
Clock North	0.243473918	8	in^2	ROC	ROC	10m	6 each side, Each ROC has one clock cable
Clock South	0.243473918	8	in^2	ROC	ROC	10m	
Clock North	0.004114709	2	in^2	ROC	Rack 1E2	10m	1 duplex fiber cable for 6 ROCs, 1 duplex from clock board to patch panel rack, 2 each side, 24 / 6 = 4
Clock South	0.004114709	2	in^2	ROC	Rack 1E2	10m	
Clock North	0.000608685	2	in^2	ROC	Rack 1E2	10m	Each clock board serves 6 ROCs, 2 each side
Clock South	0.000608685	2	in^2	ROC	Rack 1E2	10m	

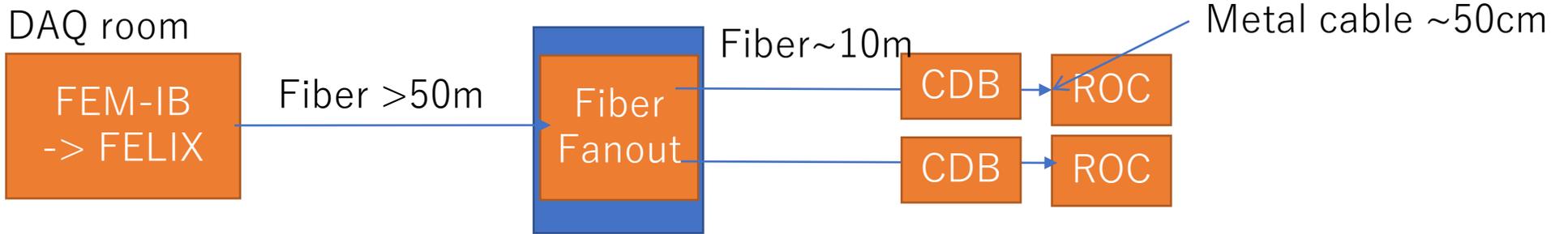
Clock distribution board

Summary : CDB location at IR

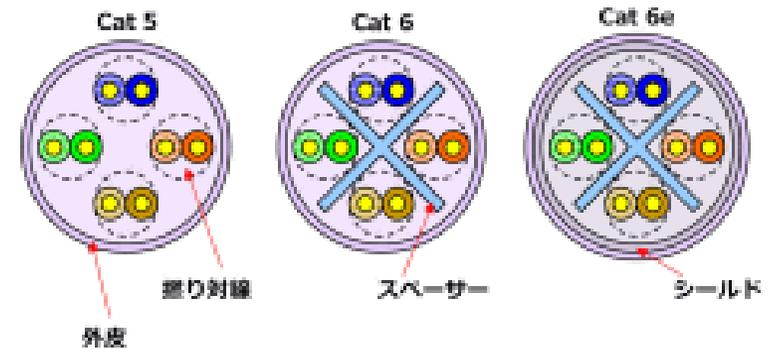
Current Plan



New idea



- CDB needs to be considered
 - One CDB for one ROC to avoid ground loop in B-field.
 - As close as possible to the ROC to make the BCO jitter smaller
- less jitter cable should be used for BCO metal cable
 - CAT6A ethernet cable which is shielded, good for upto 500MHz
 - Ethernet cable has 4 twisted pairs wrapped into the single line.
 - Consistent with our BCO cable



Clock distribution board

CAT	Speed	grade	
5	100MHz	100Base-TX	Twisted pairs
6	250MHz	1000Base-TX	separated
6A	500MHz	10GBase-T	shielded

Cable Routing Overview (ICD_042)



Type	Cross-sectional Area	Cable Quantity	Units	Endpoint1	Endpoint2	Cable Length	Notes
HV North	0.262951831	112	in^2	INTT Ladder	Rack 2W3	8.8m	Connection is at HDI end, 112 cables each side, from ladder to Local Power/Rack at IR
HV South	0.262951831	112	in^2	INTT Ladder	Rack 2W1	8.8m	
Total North HV	0.262951831	112	in^2	INTT Ladder	Rack 2W3	8.8m	
Total South HV	0.262951831	112	in^2	INTT Ladder	Rack 2W1	8.8m	
LV North	0.754184807	8	in^2	ROC	Rack 2W3	8.8m	Each ROC needs one LV cable, 1 cables x 16 ROCs = 16 cables, 8 cables each side
LV South	0.754184807	8	in^2	ROC	Rack 2W1	8.8m	
LV Chips North	5.273645055	32	in^2	ROC	Rack 2W3	8.8m	4 cables x 16 ROCs = 32 cables
LV Chips South	5.273645055	32	in^2	ROC	Rack 2W1	8.8m	
Total North LV	6.027829862	40	in^2	ROC	Rack 2W3	8.8m	
Total South LV	6.027829862	40	in^2	ROC	Rack 2W1	8.8m	
Signals North	0.525903662	32	in^2	ROC	Rack 1E2	10m	Connection is at ROC, 4 cables x 16 ROCs = 64 cables, From the ROC to Patch Panel
Signals South	0.525903662	32	in^2	ROC	Rack 1E2	10m	
Slow Control North	0.016458837	8	in^2	ROC	Rack 1E2	10m	1 duplex x 16 ROCs = 16, 6 each side, From the ROC to patch panel
Slow Control South	0.016458837	8	in^2	ROC	Rack 1E2	10m	
Clock North	0.243473918	8	in^2	ROC	ROC	10m	6 each side, Each ROC has one clock cable
Clock South	0.243473918	8	in^2	ROC	ROC	10m	
Clock North	0.004114709	2	in^2	ROC	Rack 1E2	10m	1 duplex fiber cable for 6 ROCs, 1 duplex from clock board to patch panel rack, 2 each side, 24 / 6 = 4
Clock South	0.004114709	2	in^2	ROC	Rack 1E2	10m	
Clock North	0.000608685	2	in^2	ROC	Rack 1E2	10m	Each clock board serves 6 ROCs, 2 each side
Clock South	0.000608685	2	in^2	ROC	Rack 1E2	10m	
Thermocouples North	0.262951831	56	in^2	INTT Ladder	Rack 2W3	10m	One cable from HDI end to readout board at IR, 112 cables each side
Thermocouples South	0.262951831	56	in^2	INTT Ladder	Rack 2W1	10m	
Total North Signal	1.053511641	108	in^2	Detector		10m	
Total South Signal	1.053511641	108	in^2	Detector		10m	
Total North	7.344293335	260	in^2				
Total South	7.344293335	260	in^2				

Clock distribution board