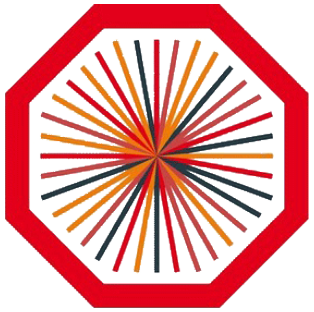
ALICE



Custom-made data cables

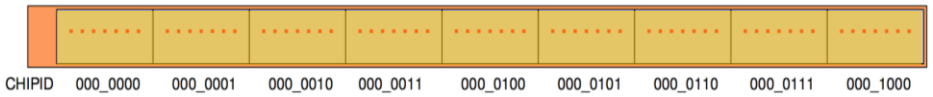
ITS Readout Electronic – **Production Readiness Review** – 13 Apr 2018 – CERN

Links – Data & control connections toward the sensors

Each readout unit is connected to a stave through copper cables (**8m long**), which carry both bidirectional control lines and unidirectional clock and data lines. Due to cavern installation regulations, data cables have been developed as an **halogen-free, custom made version of the commercial Samtec Firefly cables**.

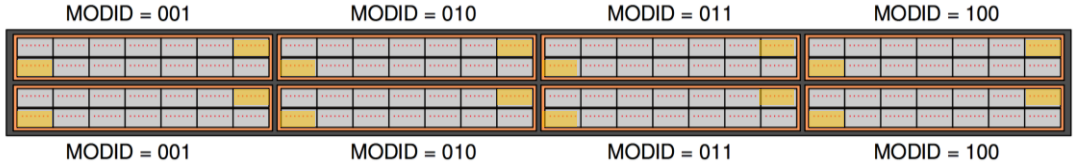
Inner Layers

9 data lines, 1 clock, 1 control



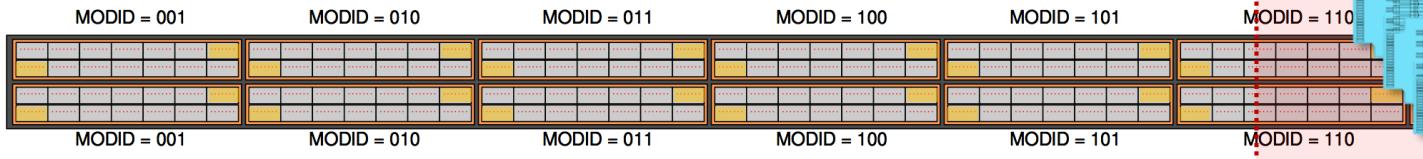
Middle Layers

(4+4+4+4) data, (1+1+1+1) clock, (1+1+1+1) control



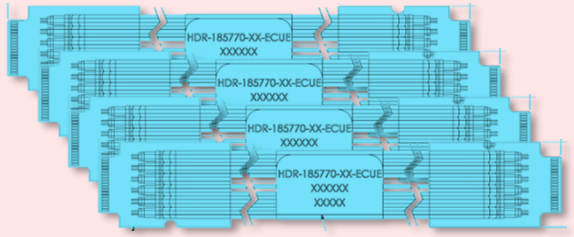
Outer Layers

(7+7+7+7) data, (1+1+1+1) clock, (1+1+1+1) control

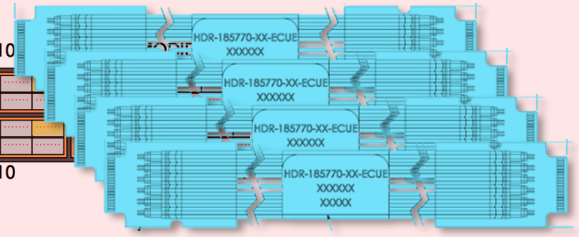


9 data pairs,
1.2 Gb/s each

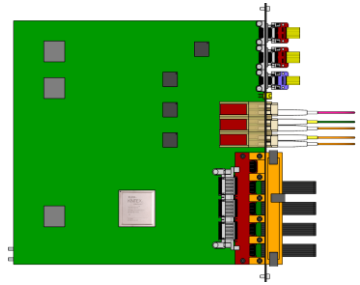
16 data pairs,
400 Mb/s each



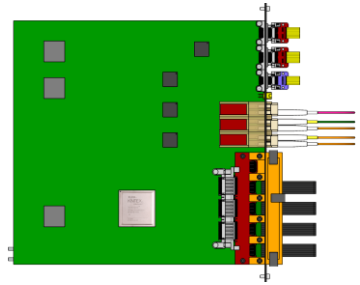
28 data pairs,
400 Mb/s each



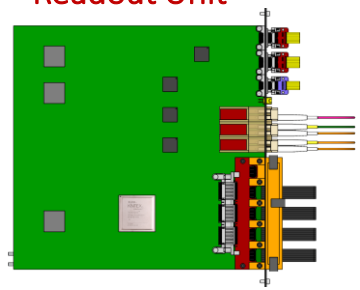
Readout Unit



Readout Unit



Readout Unit



Links – Cables perform as expected

Cables and connectors have been specced to meet or surpass performance of the standard Samtec Firefly cables, which are used for debugging and lab testing of the sensors.

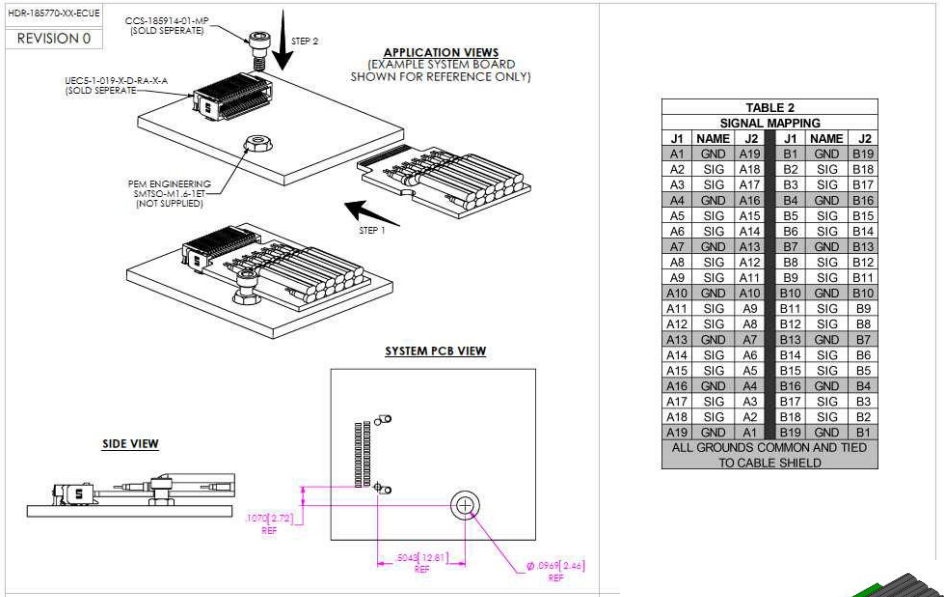


TABLE 2
SIGNAL MAPPING

J1	NAME	J2	J1	NAME	J2
A1	GND	A19	B1	GND	B19
A2	SIG	A18	B2	SIG	B18
A3	SIG	A17	B3	SIG	B17
A4	GND	A16	B4	GND	B16
A5	SIG	A15	B5	SIG	B15
A6	SIG	A14	B6	SIG	B14
A7	GND	A13	B7	GND	B13
A8	SIG	A12	B8	SIG	B12
A9	SIG	A11	B9	SIG	B11
A10	GND	A10	B10	GND	B10
A11	SIG	A9	B11	SIG	B9
A12	SIG	A8	B12	SIG	B8
A13	GND	A7	B13	GND	B7
A14	SIG	A6	B14	SIG	B6
A15	SIG	A5	B15	SIG	B5
A16	GND	A4	B16	GND	B4
A17	SIG	A3	B17	SIG	B3
A18	SIG	A2	B18	SIG	B2
A19	GND	A1	B19	GND	B1

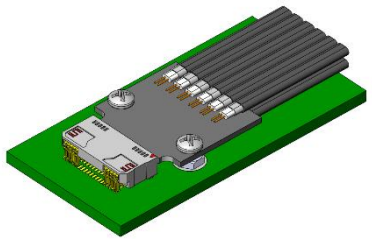
ALL GROUNDS COMMON AND TIED TO CABLE SHIELD

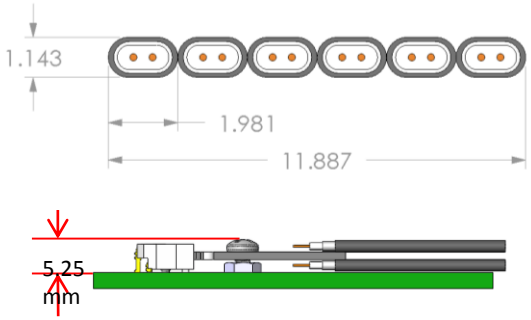
CRITICAL DIMENSION INSPECTION INSTRUCTION TABLE

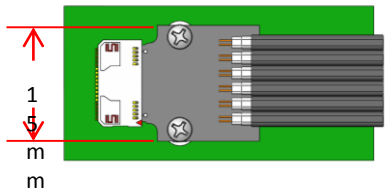
ASSEMBLY	IN-PROCESS
OPERATION	INSPECTION
PREP CABLE	C3, C4
E-TEST	C1, C2

TABLE 3
NET LIST

TYPE	NETS	POINTS
POINT TO POINT	24	48
GND	1	28

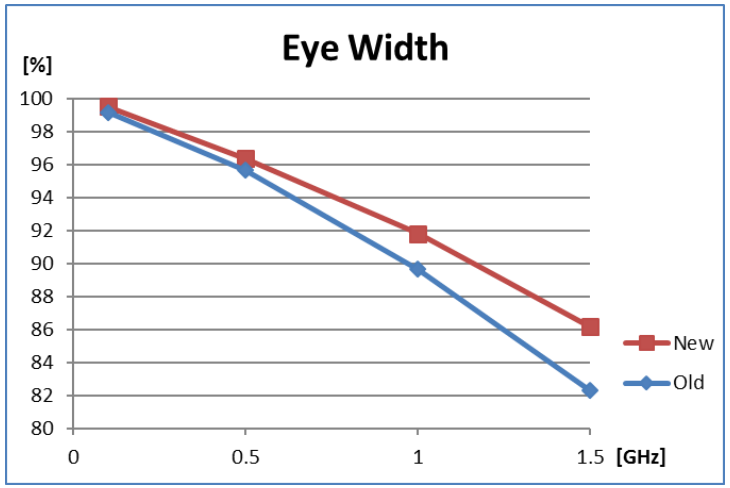


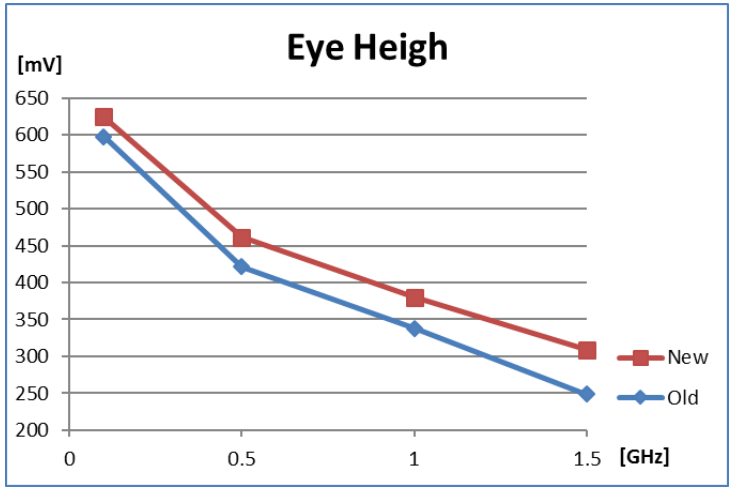




Cable electrical specifications (exceed Samtec Twinax)	
Impedance	100 Ω ± 5%
Insertion loss	< 0.3 dB/m @ 1 GHz
Return loss	-30 dB @ 1 GHz for a 10 m cable
Within pair skew	< 2.5 – 5.0 ps/m
Pair to pair skew	< 50 ps/m

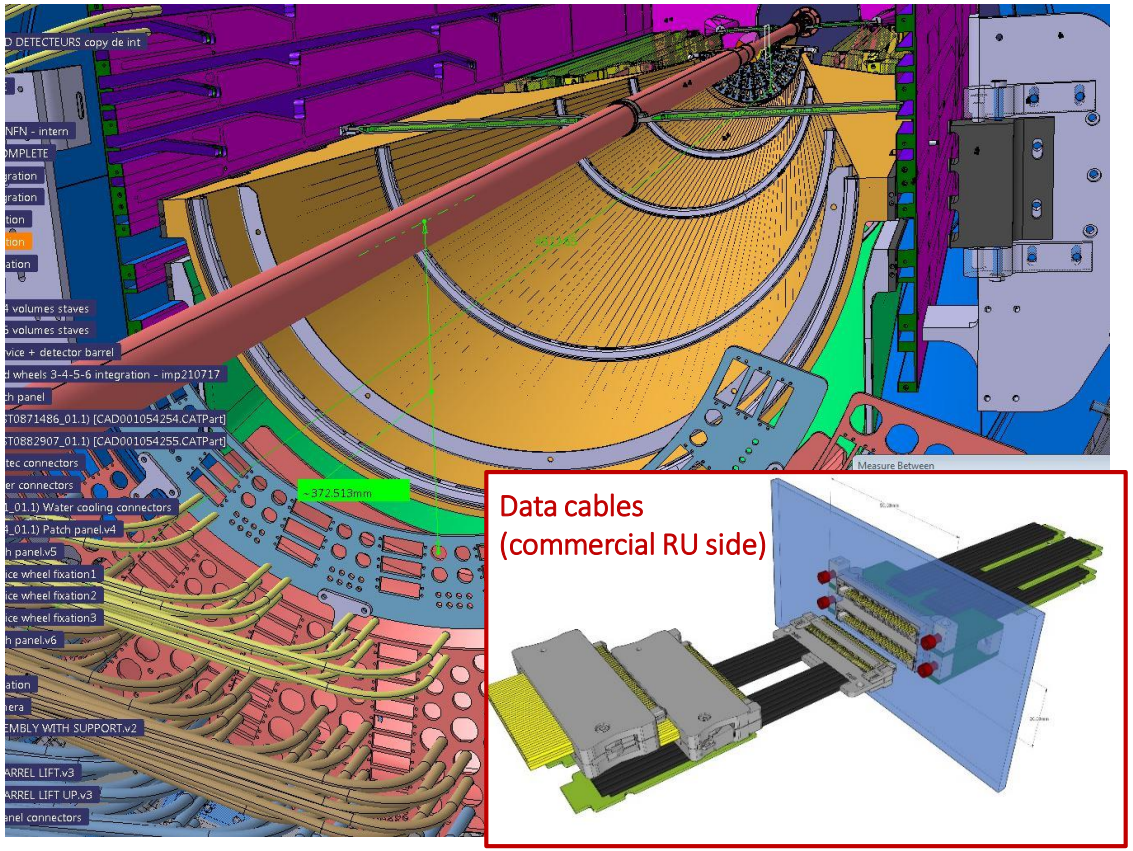
- Measurement using 1.5 GHz PRBS generator and 2.5 GHz Agilent oscilloscope.
- Test setup with only raw cable (without connectors and test boards) soldered to special SMA connectors. Same measurement conditions for both cables.

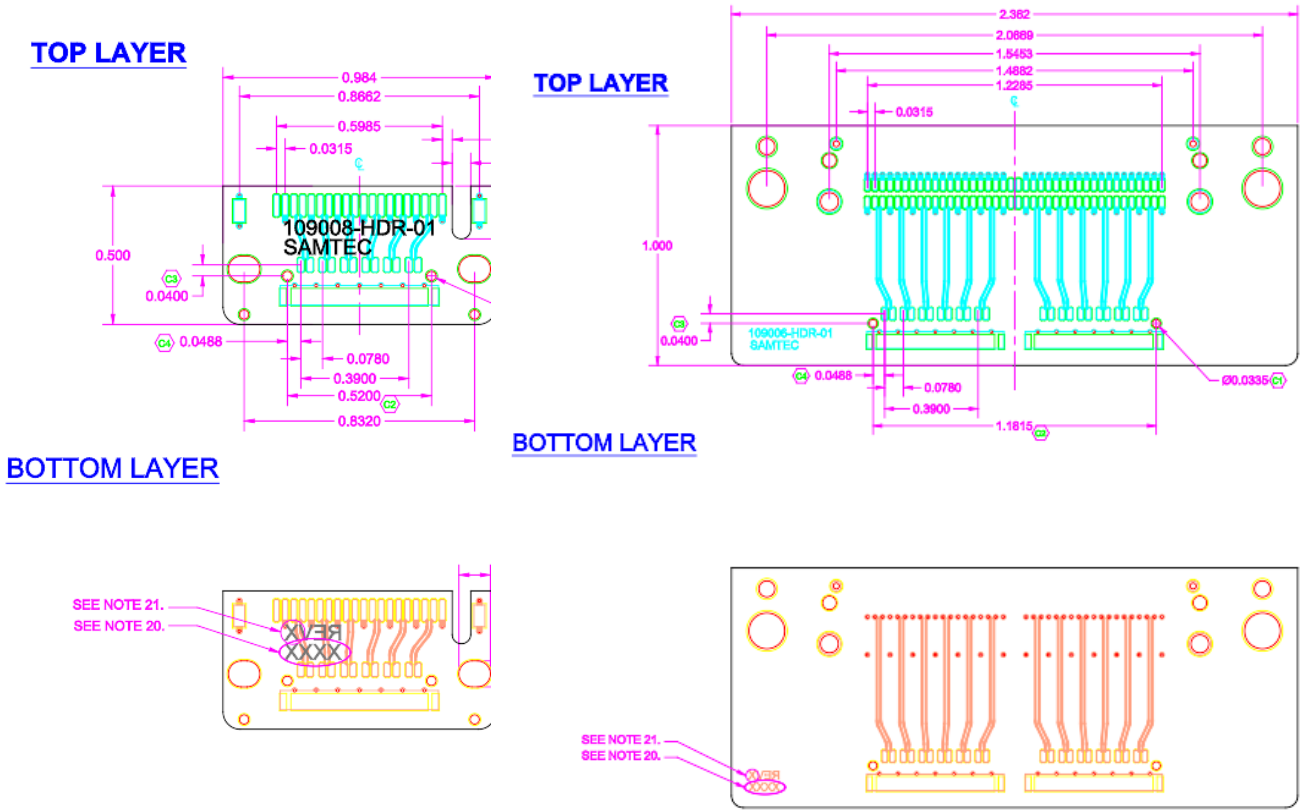




Links – Data connection improved cables

To simplify general layout and installation procedures a patch panel (PP2) has been inserted between the racks of the readout/power electronics (PP1) and end of the wheels (EW). Cables for power/bias/data on both side of PP2 have been finalized and **prototypes are being produced right now**.





- Cables are compatible with the design of the End weels and with the Connectors on the Readout Unit.
- Two type of connectors will be tested for the Readout Unit side, the commercially available one being the preferred option.

Links – Data connection to the RU side

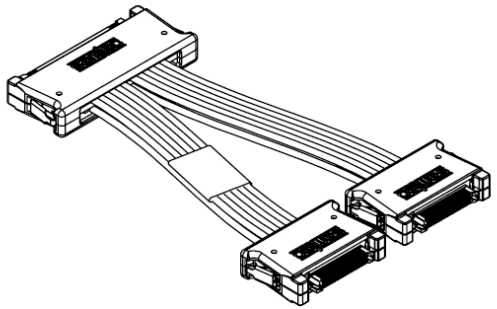
REVISION

0	RS	J LAMBERT
12/5/2017		ECN-315019
ISSUE FOR REVIEW		
1	RS	J LAMBERT
2/9/2018		ECN-319537
BOM: ADD PCB-109007 AND PCB-109008 DETAILS; TBL2: UPDATE PINOUT; RELEASE FOR LIMITED PRODUCTION		

RELEASED FOR LIMITED PRODUCTION

USE FOR QUOTING, PRELIMINARY DESIGN, INITIAL BUILDS AND INFORMATIONAL PURPOSES ONLY

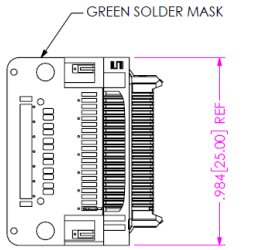
THIS PRODUCT MANUFACTURED WITH LEAD-FREE PROCESSING

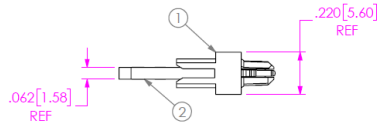


NOTES:
1. **PCB AND CONFIGURATION NOT STANDARD.**
2. Ⓒ REPRESENTS A CRITICAL DIMENSION.
3. PARTS TO BE PROCESSED PER SAMTEC WORKMANSHIP GUIDELIN
4. ALL ASSEMBLIES TO BE 100% ELECTRICALLY TESTED. (C1-D-ET, C2-D-ET)
5. ALL ASSEMBLIES TO BE 100% HI-POT TESTED AT 300V.
6. ITEM 4 TO BE CENTERED ON ITEM 3 AS SHOWN. ITEM 3 TO CONT

THIS PRODUCT MANUFACTURED WITH LEAD-FREE PROCESSING

J2
SUB-HDR-203194-02





1

SUB-HDR-203194-01 BOM			
ITEM NO.	PART NUMBER	QUANTITY	MATERIAL
1	ERM8-020-01-S-D-E-EM2-B	1	TERMINAL
2	PCB-109008-HDR-02	1	PCB

Links – Data connection to the end wheels side