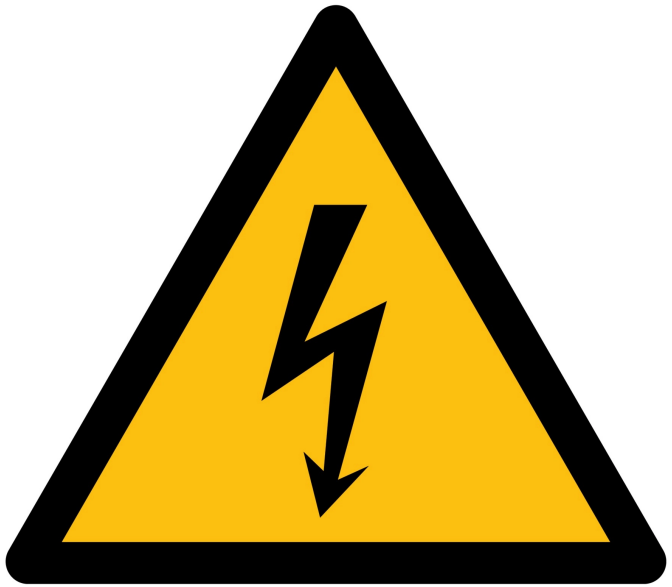
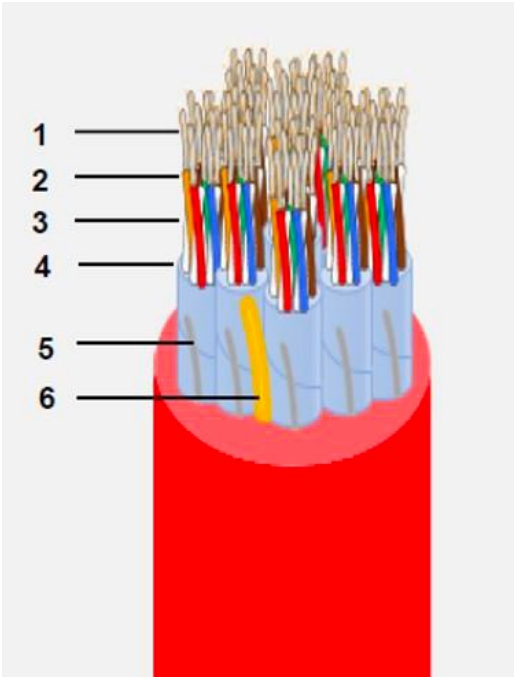
HGTD Cables and Connectors

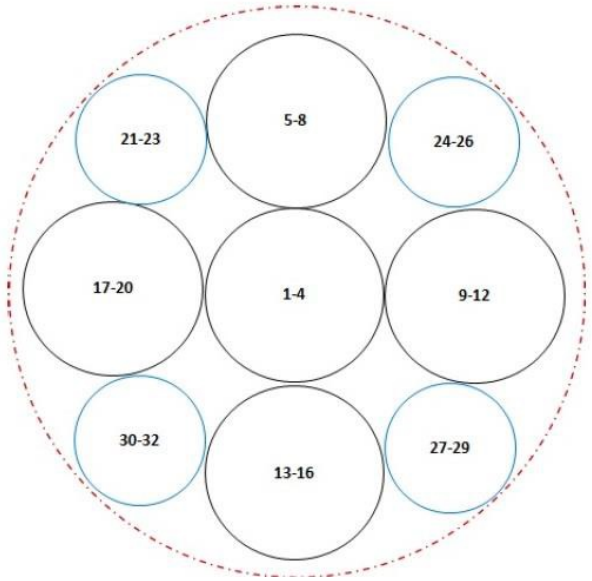


Ricardo Gonçalo (LIP/Univ. Coimbra)

Cables: from TileCal (General Cable)



- Last version not good in fire test – needed to change insulation thickness
- Two new prototypes are being produced – to be done this week or next
- Circular section, unlike last one
- Expected diameter 13.5– 14 mm



Connectors

REF:516-120-000-101 REF:516-056-000-301 REF:516-120-000-402 REF:516-056-000-402 REF:516-230-512 REF:516 230-556

- We have been using this one for Patch Panel development:
  - http://www.farnell.com/datasheets/2916873.pdf
  - Unit price (120 pins, small quant.): 53 € plug; 45 € pins; 26 € conector (old price)
  - Good mechanical stability
- Looks good for long-cable to Patch Panel conneciton

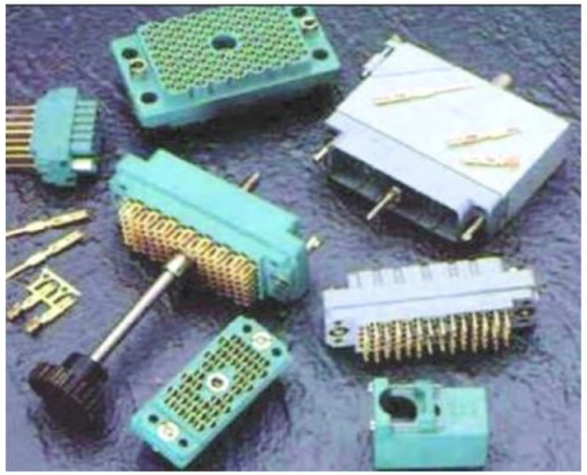
Specifications:

Insulator Material	Diallyl Phthalate, Thermoplastic Polyester or Polycarbonate UL 94V- 0
Color	Green or Grey
Contact Material	Copper Alloy
Contact Plating	Gold Plating over Nickel over entire contact
Current Rating	8.5 Amperes
Contact Resistance	10 milliohms maximum
Withstanding Voltage	2000 VAC rms at sea level
Insulation Resistance	5000 Megaohms minimum
Operating Temp	-40°C to +125°C (Diallyl Phthalate Only)
Operating Temp	-40°C to +105°C
Insertion & Withdrawal Force	2 to 16 Oz (0.56 to 4.45N) per contact position

EDAC

516 SERIES

RACK AND PANEL CONNECTOR (PLUG AND RECEPTACLE)

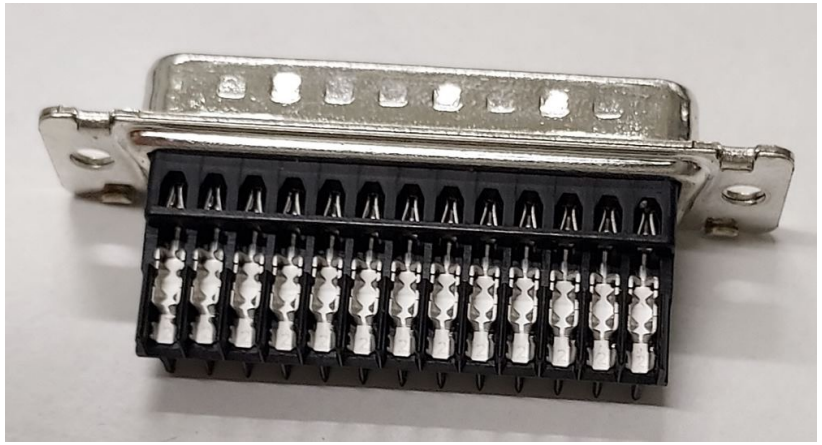


- **FEATURES:**
- **.150" (3.81mm) Contact Spacing x .130" (3.30mm) or .150" (3.81mm) Row Spacing with staggered Grid**
- **Plug and Receptacle in 20, 38, 56, 90 and 120 Contact Sizes**
- **Edacon Hermaphroditic Contact Mating Design**
- **Contact Termination Options include Crimp, P.C. Tail, Wire Hole and Wire Wrap**
- **Mating and Unmating Simplified with use of Actuating Screws**
- **Optional Covers with Side or Top Entry Cable Clamp in Plastic or Metal material Available for all Connector Sizes**
- **Versatile Metal Cover Design permits Assembly or Disassembly After Cabling is Complete plus Cable Entry Style Flexibility**
- **Actuating Screws, Locknuts, Polarizing Hardware, Covers and Contacts Suitable for either Plug or Receptacle**
- **Polarizing Hardware Adjustable for 288 Mating Combinations**
- **Tools Available for Contact Installation, Removal and Crimping and Polarizing Changes**
- **RoHS Compliant & UL Certified**

IDC Connectors – from Agostinho Gomes

CERN BE-EA Cabling Team suggested Insulation Displacement Crimping Connectors (IDC)

Found IDC connectors from TE suited for solid copper wires: https://pt.farnell.com/amp-te-connectivity/1-745495-8/socket-idc-d-metal-25way/dp/1098474?CMP=GRHB-OCTOPART
https://www.farnell.com/datasheets/1639165.pdf

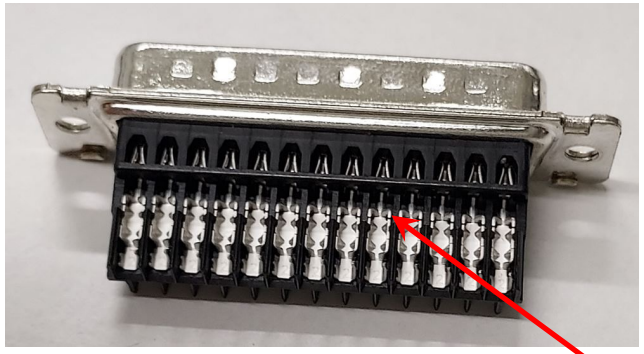


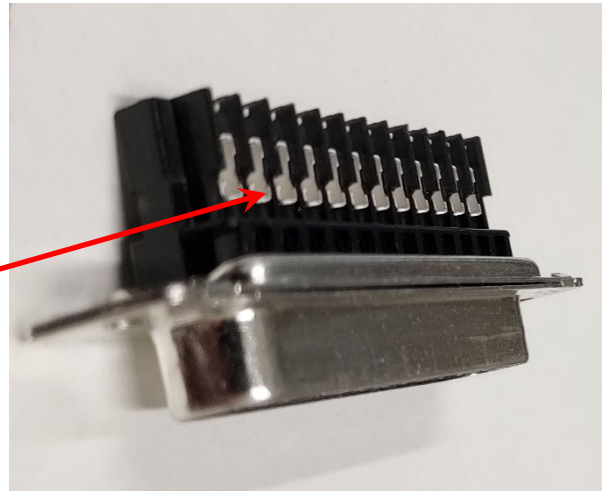
Tested the connectors

From the shelf their voltage limitation is low: sparks appear around 1.6 kV in any of the 2 rows, but not inter rows

Is it a problem? Neither for ground pins nor for HV pins (max voltage difference is 360 V), but it is a problem for pin 13 (drain wire) that has a neighbour at HV.

IDC Connectors fix using Araldite epoxy



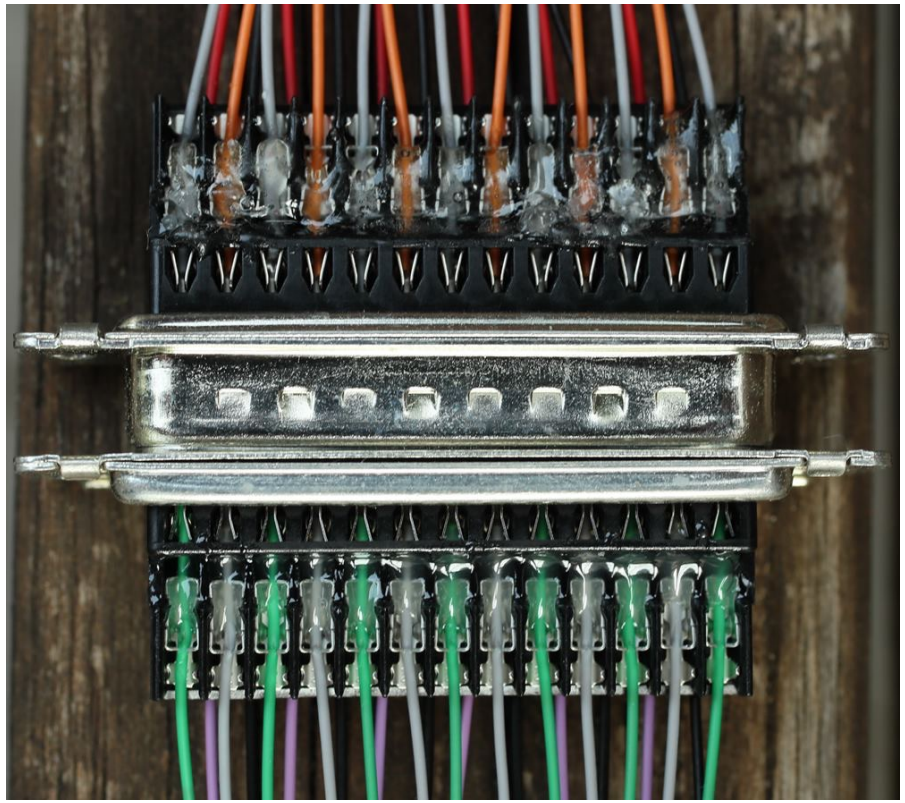


Weak point is a ~1 mm wide line where the pin to pin lateral insulation is cut/missing
Distance between sharp metallic contacts of the order of 0.5 mm, prone to generate sparks above 1.5 kV

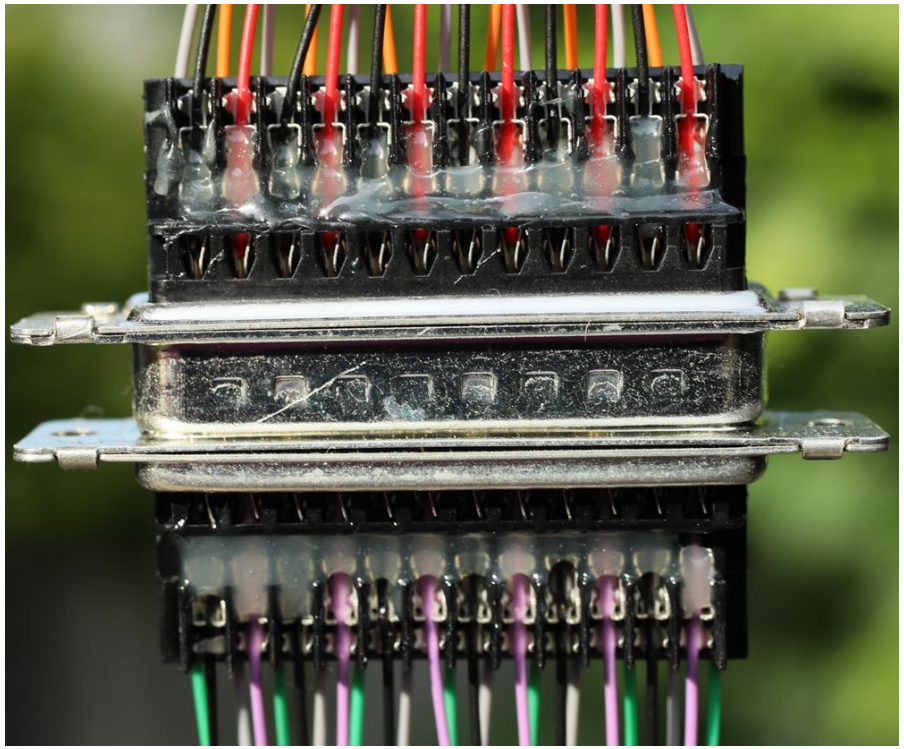
After insertion of the wires, covering the contacts with Araldite epoxy provides excellent insulation between adjacent pins

Limit for sparks in the connector jumps to ~2.7 kV

First test with a “slow” epoxy



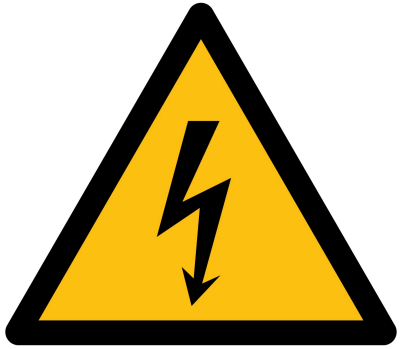
First test with a “5 min” fast araldite epoxy, only a thin transparent layer of epoxy

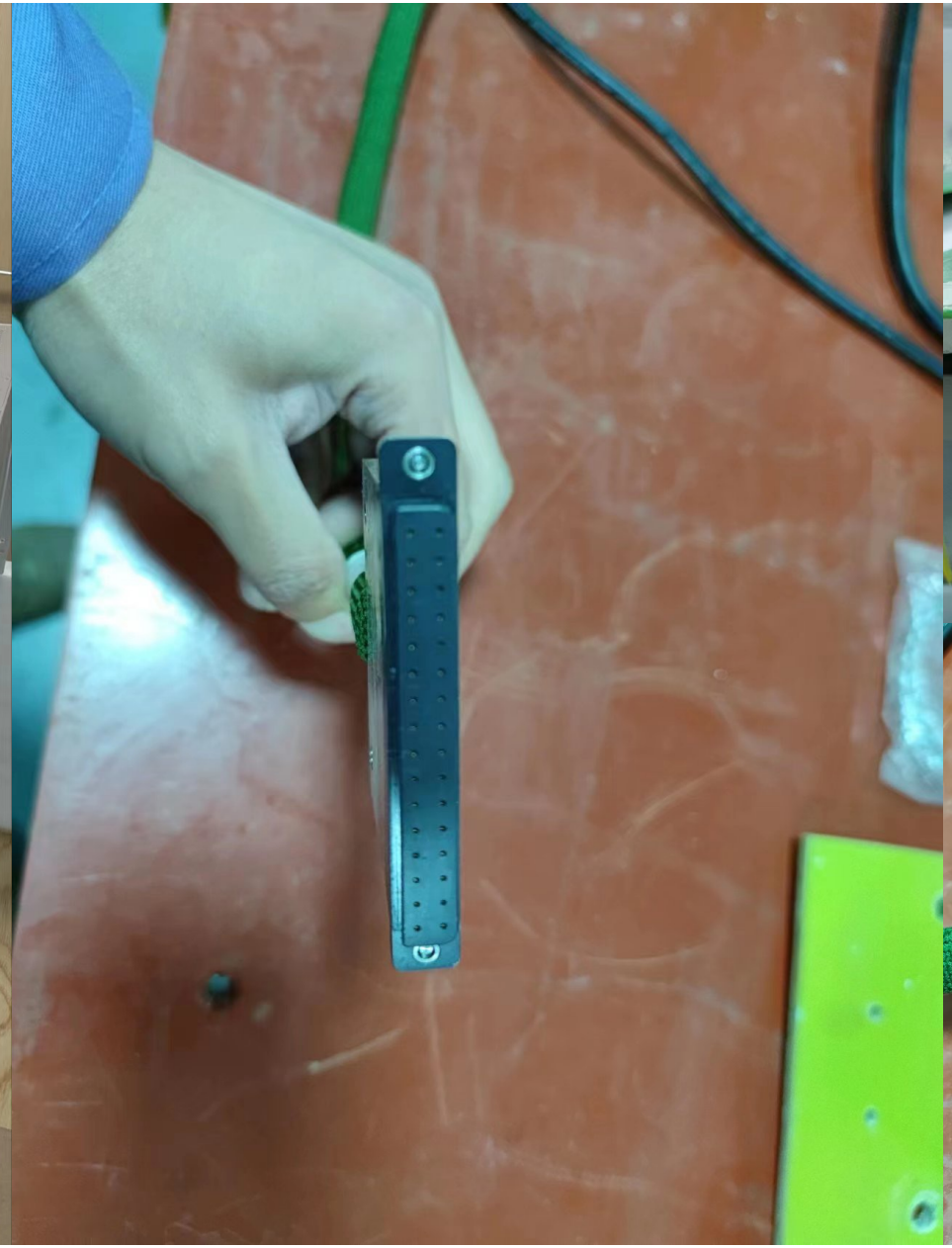
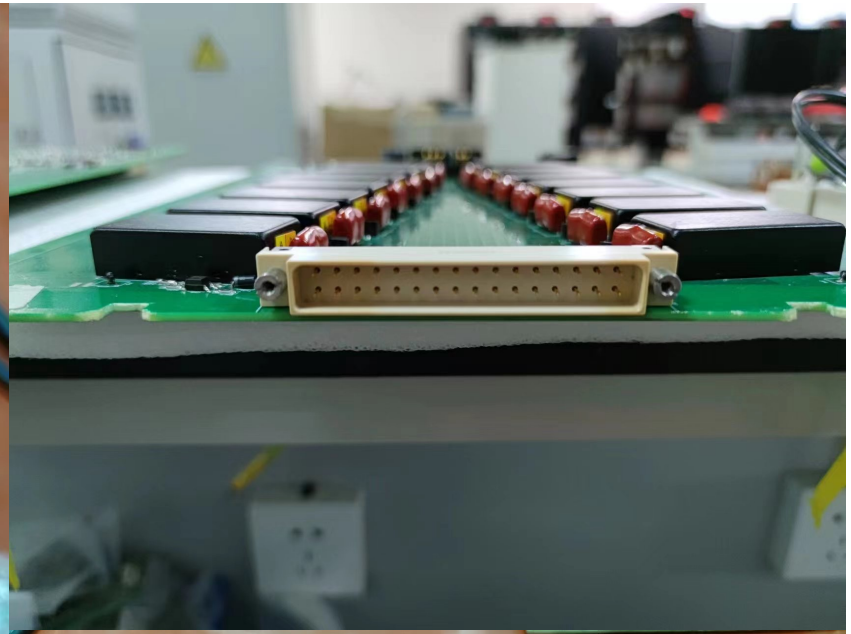
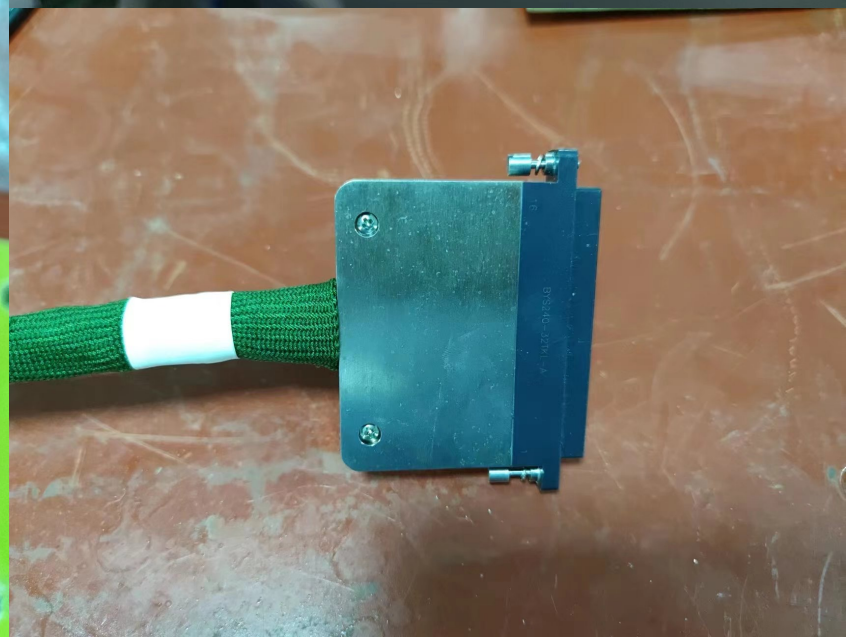


Araldite epoxy, thick layers after 2 applications

As a bonus, the epoxy strengthens the wire connections

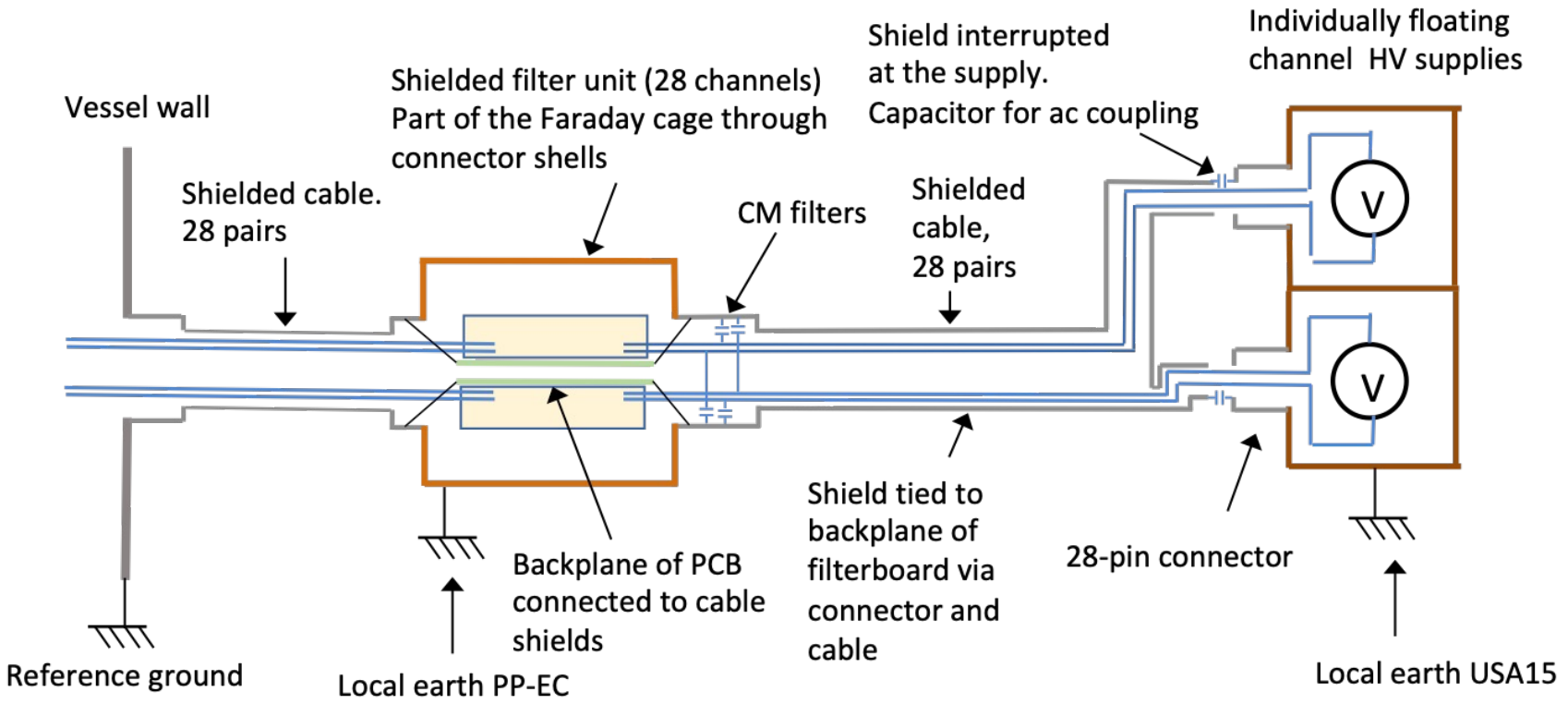
Bonus slides




Fullde
VOLTAGE RANGE 220V~
FREQUENCY 50HZ
INPUT CURRENT 7.5A MAX
CAUTION
Before any operation read technical manual.
Refer servicing to qualified personnel only.
AC INPUT 220V
USB
RJ45




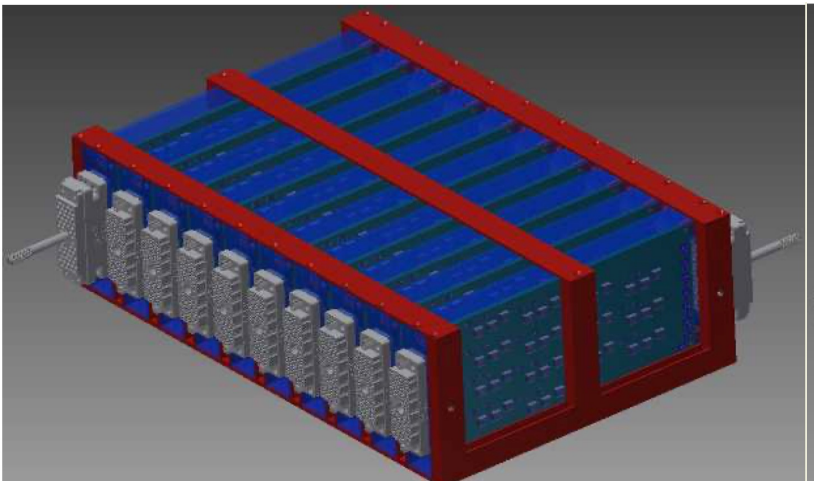
Patch Panel Grounding & Shielding

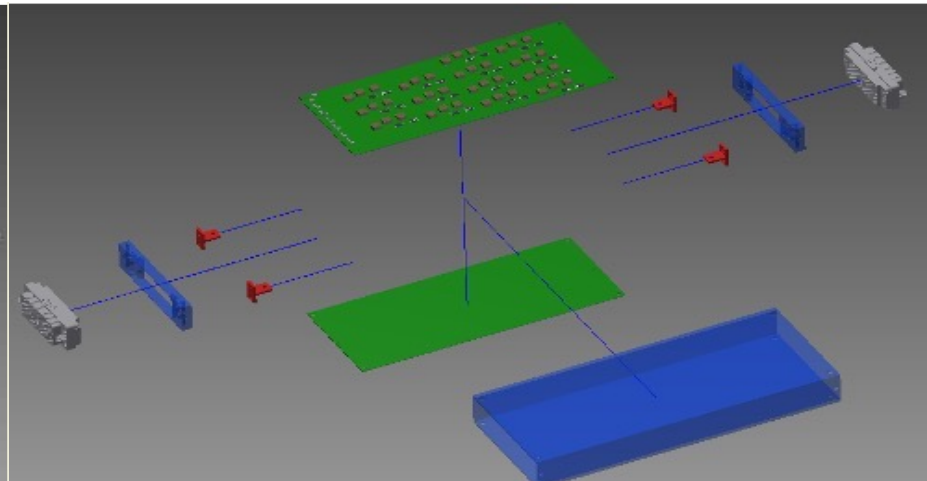
- Use filter module boxes as continuation of vessel Faraday cage
  - Also DC connecttion of filter boards backplane to cage
- DC connection of Faraday cage to local TileCal earth
  - DC current not as bad as HF AC noise
- Move common-mode filter capacitors to filter input instead of output
  - Filter common mode current at input

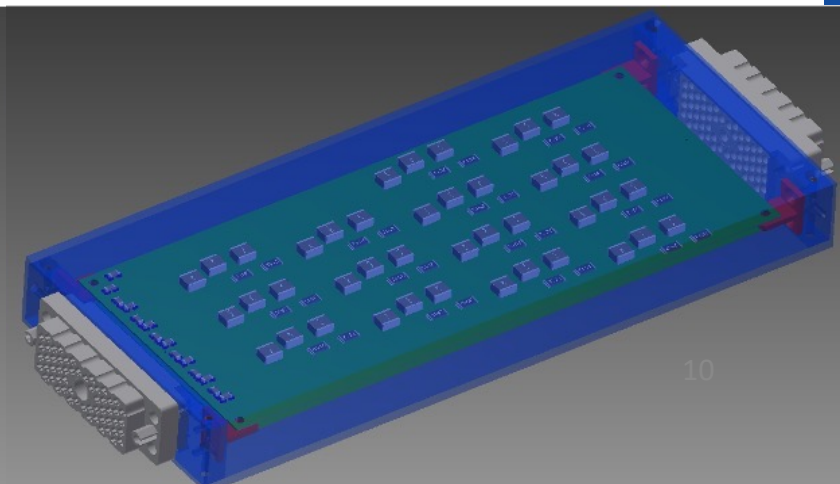


Patch Panel Units Design

- A modular design is proposed for the patch panels
- Individual modules are aluminium boxes containing two filter boards and connectors
  - Provide mechanical support and insulate each pair of boards within separate Faraday cage
  - Easy to construct, handle and access for maintenance
  - 14 RC-RC low-pass filters in each filter board
  - Means one 56-wire cable connected to each module: = 28 HV channels = 14 channels x 2 boards
  - Routing of individual HV channels through wires connecting cables to each filter board







Old prototype

DIMENSIONAL CHARACTERISTICS

SAP Code	Cable	Approx. Diameter (mm)	Max. Diameter (mm)	Approx. Weight (kg/km)	Min. Bending Radius (mm)
60105926	32x2x0,4	15,5	16,5	235	15D

ELECTRICAL AND TRANSMISSON CHARACTERISTICS

Conductor diameter	(mm)	0,4
Max. conductor loop resistance	(Ω/km)	150
Max. Resistance unbalance	%	≤ 2
Min. insulation resistance at 500 V d.c. after 1 min. @ 20 °C	(MΩ.km)	10.000
Average mutual capacitance	nF/km	≤ 55
Individual mutual capacitance	nF/km	≤ 64
Max. unbalance capacitance between two pairs		
pair-pair	pF/km	145
pair-ground average maximum	pF/km	574
individual maximum	pF/km	2.625
Test voltage, 3 sec. | conductor/conductor	Vcc	2.500
| Core/screen	Vcc	5.000