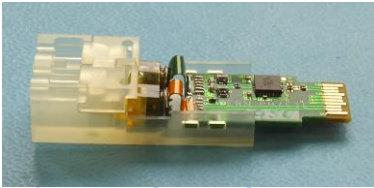


# Optical links for Upgrade

Summary of Sub-detector consultations  
Base line for 'general scheme'

Ken Wyllie - Laurent Roy - Niko Neufeld - Rainer Schwemmer

## Mini-meetings summary:

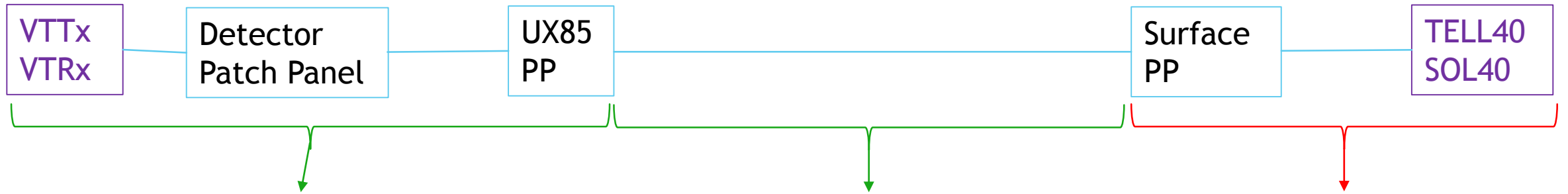


2 single Fibres

- Same 'general scheme' for all sub detectors  
(except Velo: no need 'Detector PP')



MPO 12 Fibres



### Detector side:

- VTTx/VTRx quantity well defined
- Detector Patch Panel location +/- well defined
- UX85 PP location well defined

### Long distance cables:

- 2 installation types still possible ('blowing + splice' or 'trunk')
- Surface PP location depend of Data Centre position (Decision ~ next summer)

### TELL40 - SOL40 side:

- Number of links used / MPO12 not clear for many sub detectors depend on the:



"occupancy" "Firmware optimisation" "MonteCarlos" "FPGA Bandwidth" ...

## Scenario 1: “ Full MPO ”

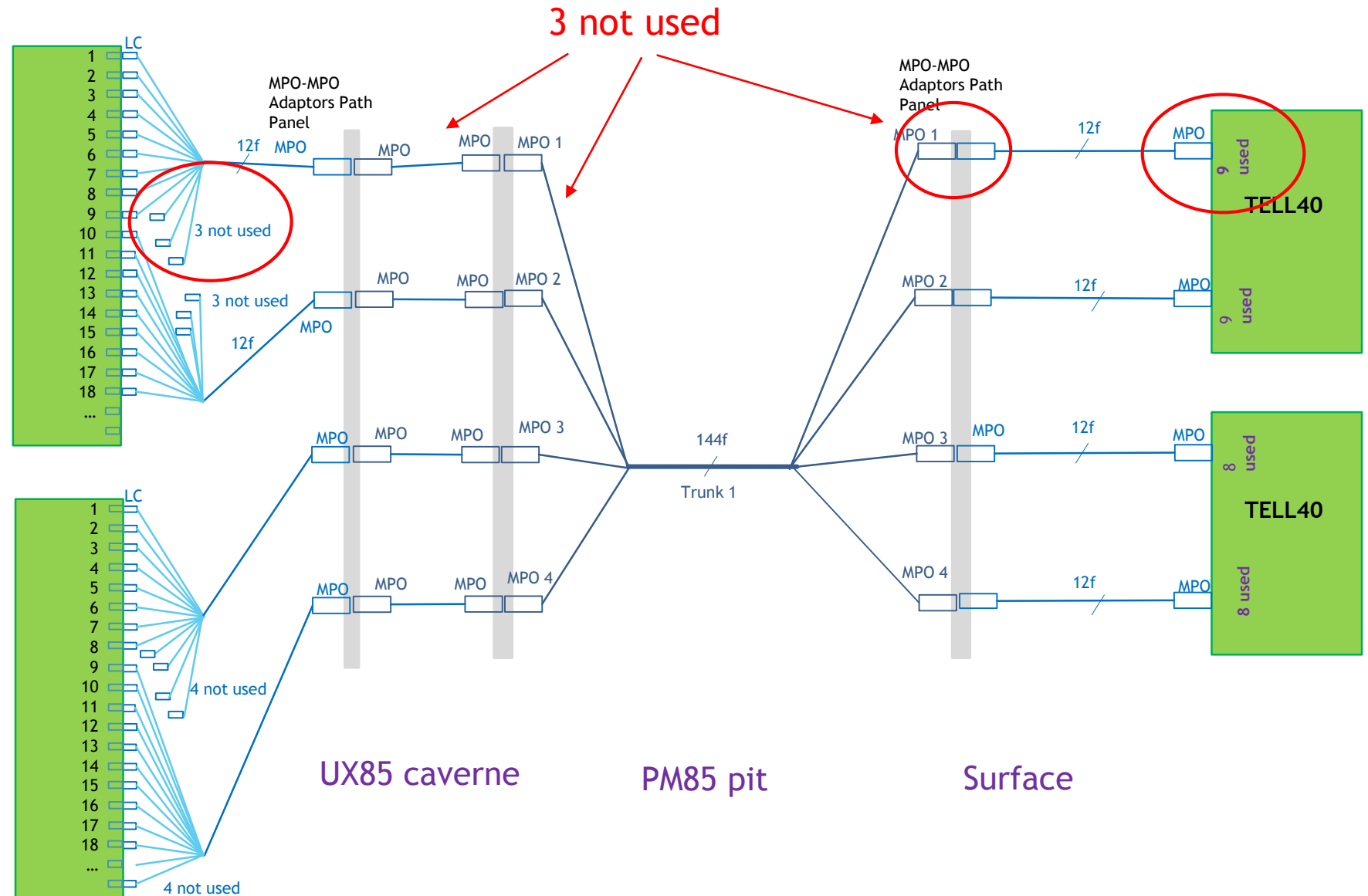
-Many ‘not used’ fibres installed from detector to the surface

- more patch cord
- more MPO adaptors in the different PP (space on the detectors)
- more long distance cables

-Extra single fibres with LC connectors to store detector side

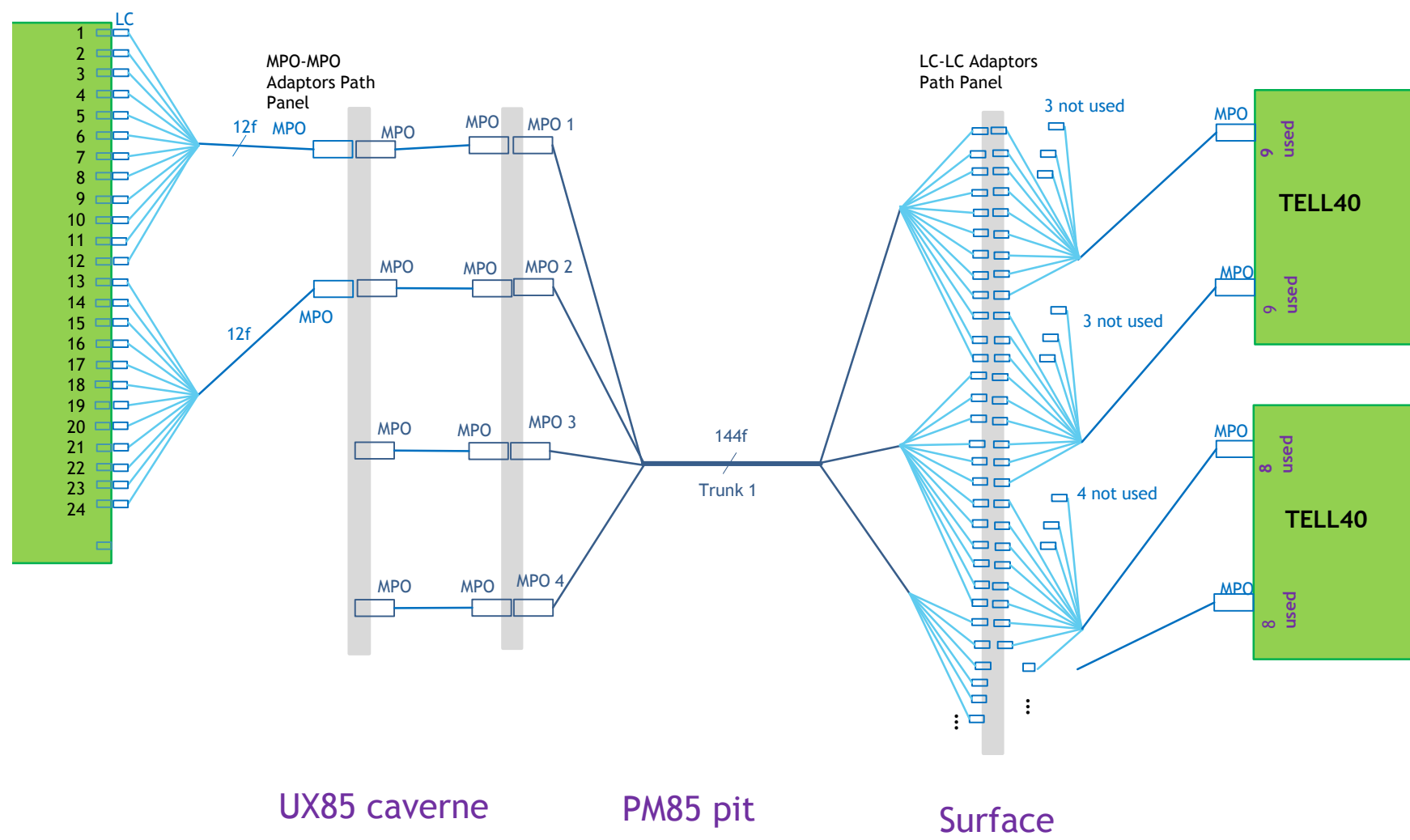
-‘not used’ fibres can not be considerate as fully spare

- if need install ‘splitting cassette’ afterward
- additional break point
- space for cassette to foreseen in the rack



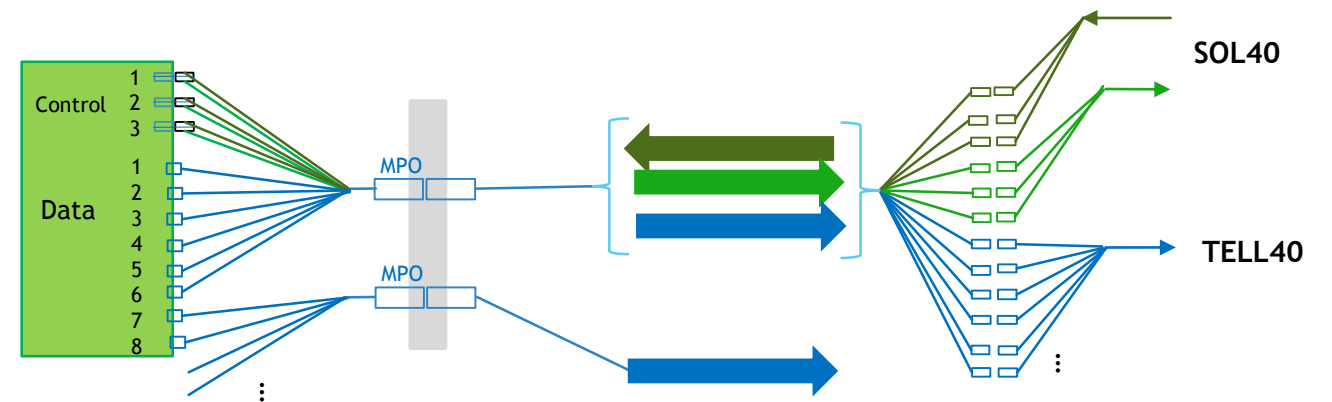
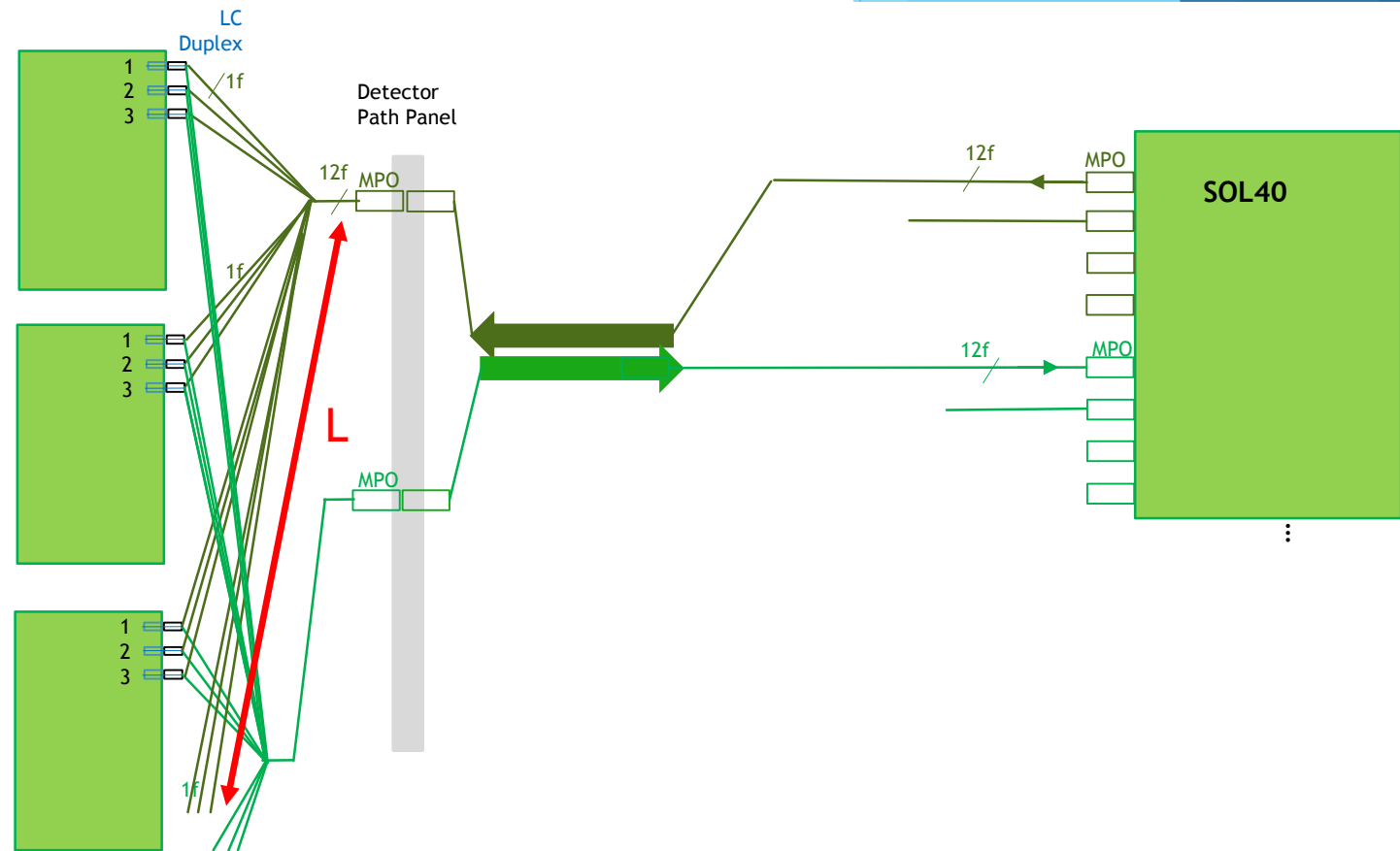
# Scenario 2: “ LC on surface ”

- Number of fibres optimized  
→ Reduce quantity of Patch cord, patch panel, long distance cable (cost)
- Possibility to mix Control and Data fibres in the same 12 ribbon
- Flexibility with patching on the surface (always accessible)  
→ Possibility to change the number of fibres send to the TELL40 or SOL40 /MPO12
- More space need on the surface in patch panel room (3 times space need for MPO PP)
- Rigorous connection need for initial installation



# TFC + Control:

- 1 MPO/ type of transmission  
→ Could be a problem if distance between the 12 VTRx long...
- Data and Control mixed  
→ reduce the total length of single fibre part (save space)  
→ Avoid spaghettis inside the 'large' detectors



Use the same 'root': separation on the surface PP

## 2 techniques for long distance installation available for LC on the surface

1) 144 fibres Trunk pre-connectorized in factory  
with at the ends: 12 MPO12 and 144 LC is technically possible

→ Instead of having 12 MPO- 12MPO trunk + splitting cassette MPO-12LC  
(more expensive + 1 more break point)

2) Blowing in pipes 144 fibres 'micro cable' with 12 MPO12 already pre connectorized

splice 144 pigtails LC after blowing

→ Same as prototype already installed

-> research best prices on going

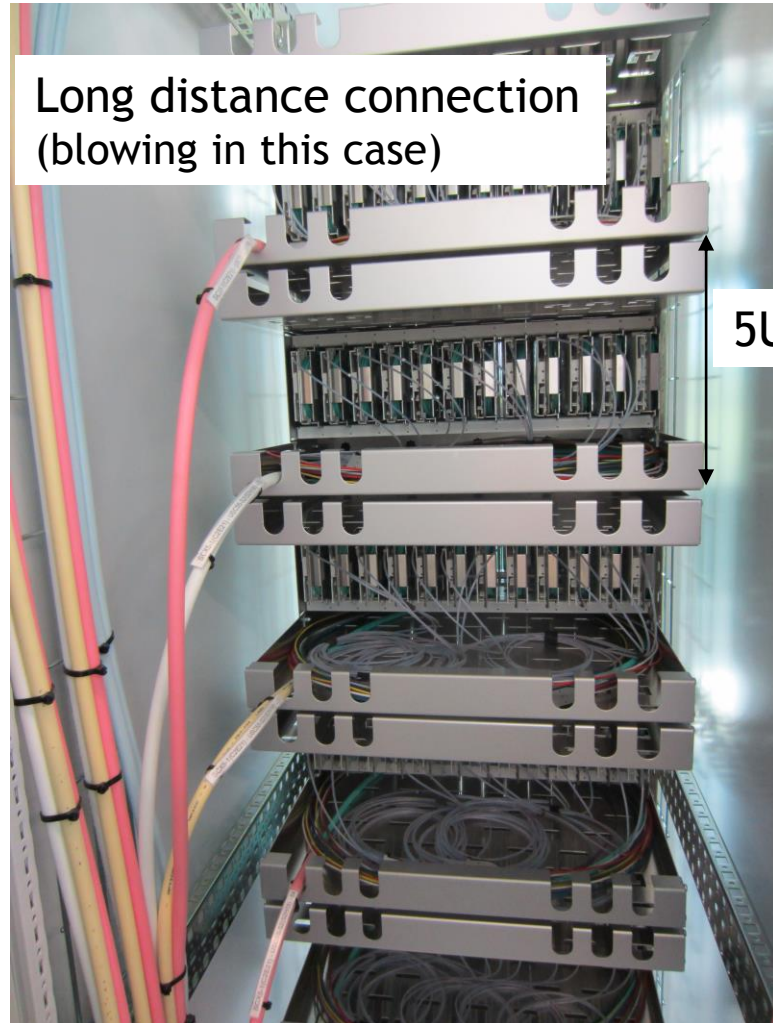
## Patch Panel with single connectors example (CMS):

- Possibility to have 288 single connectors in 3U
- At least 2 U must be added for cable management + Space to store extra length
- A false floor for long distance cable + enough space above racks for patch cords

Patch cord  
extra length storage

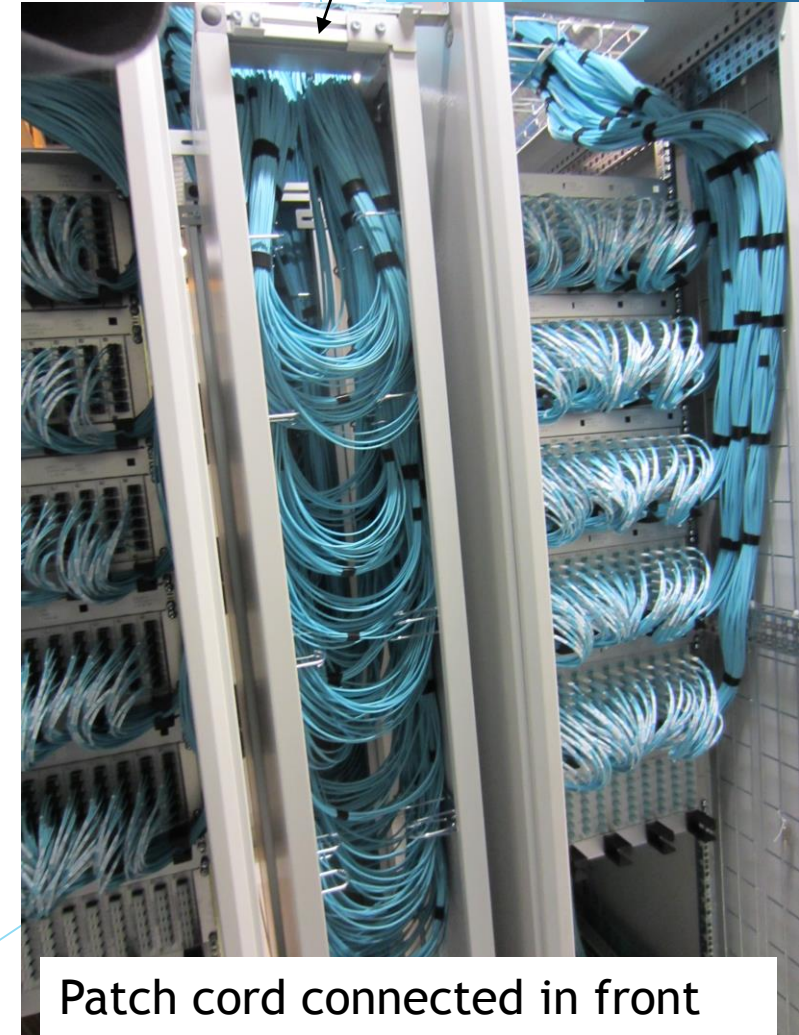


47U racks  
Patch cords not yet installed



Long distance connection  
(blowing in this case)

5U



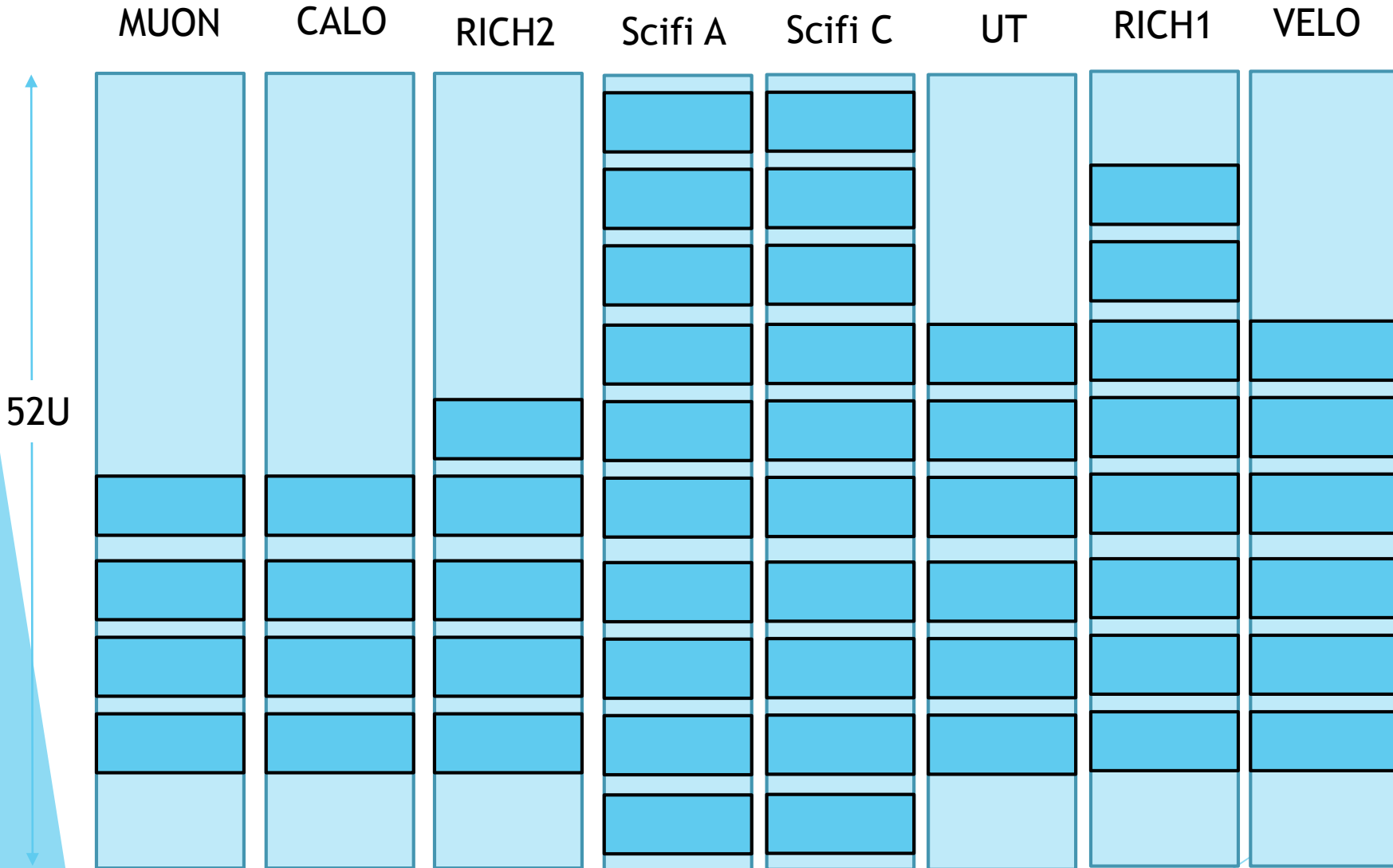
Patch cord connected in front

## Space estimate for PP Racks on the surface with single LC connectors

PP 3U (288 fo = 2 cables)

+2U Space for cable management

-> 8 racks





# Quantities comparison / Scenario 'Full MPO' or 'LC PP on the surface'

Without ANY Spare (add 10%?)

13 trunk 144fo less with scenario 2 (with LC)

Total LHCb cost:  
 .Fan-Out 10m both sides  
 .Long distance cables+Installation  
 .PatchPannel

~15% cheaper with scenario 2

(based on EL contract prices, without any spare in both scenario)

Scenario 1	FAN-OUT 12LC-1MPO quantity	Total '12links' need from UX	TRUNK 144fo	Total MPO adaptors	Plates 6 MPO in Patch panel	PatchPanel 4U (10 slots)	FAN-OUT 12LC-1MPO quantity	Plates 12 LC (splicing protection)	MPO-MPO PatchCord Surface
VELO	66	132	12	264	48	6			132
UT	168	169	15	360	60	8			170
RICH1	176	0	15	536	60	6			176
RICH2	120	0	10	360	20	2			120
Scifi	576	1152	48	1728	192	20			576
CALO	87	24	8	192	32	4			110
MUON	80	56	8	272	32	4			80
TOTAL Quantity:	1273	1533	116	3712	444	50	0	0	1364
Scenario 2	FAN-OUT 12LC-1MPO quantity	Total '12links' need from UX	TRUNK 144fo	Total MPO adaptors	Plates 6 MPO in Patch panel	PatchPanel 4U (10 slots)	FAN-OUT 12LC-1MPO quantity	Plates 12 LC (splicing protection)	MPO-MPO PatchCord Surface
VELO	57	8	11	132	22	17	130	130	
UT	124	125	11	132	22	16	134	134	
RICH1	176	176	15	356	15	20	176	176	
RICH2	120	120	10	240	10	13	120	120	
Scifi	480	480	40	960	80	56	480	480	
CALO	87	24	8	99	18	12	94	84	0
MUON	80	80	8	176	16	12	87	96	
TOTAL Quantity:	1124	1013	103	2095	183	146	1221	1220	0

Rk: table 2 not optimized by regrouping TFC + Control with Data

## CONCLUSION

**Scenario with LC Patch Panel on the surface will be the Base Line for DATA and for TFC+Control**

If needed TFC+Control can be mixed with DATA in the Patch Cord detector side

**→ an EDMS document / sub detector will be established**

-equipment quantities detailed

-connections detector side -> TELL40 +SOL40 detailed

(thanks in advance for your collaboration)