

# PMTs installation and cabling

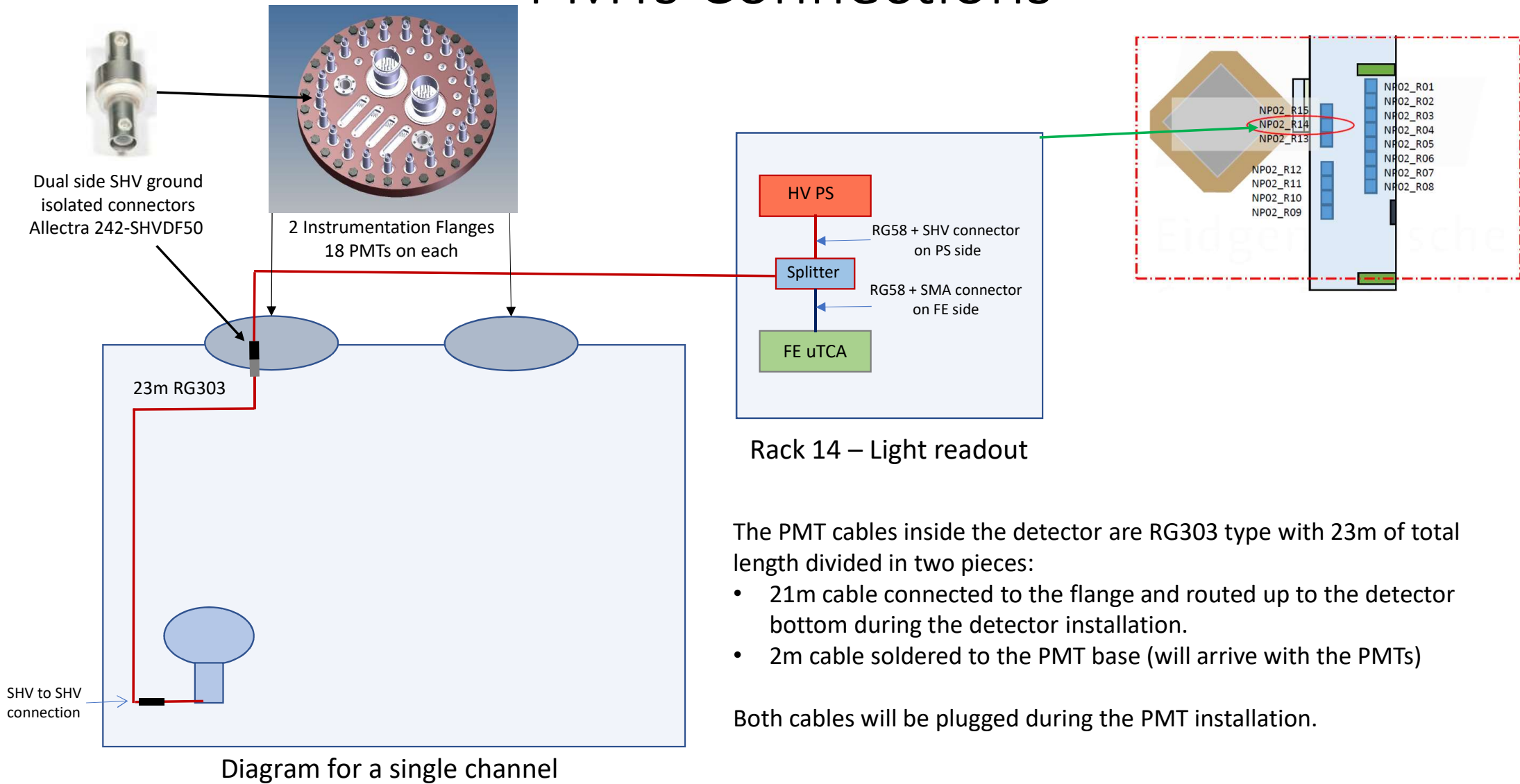
**WA105 collaboration meeting**

22-23 March 2017

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On behalf of CIEMAT

# PMTs Connections

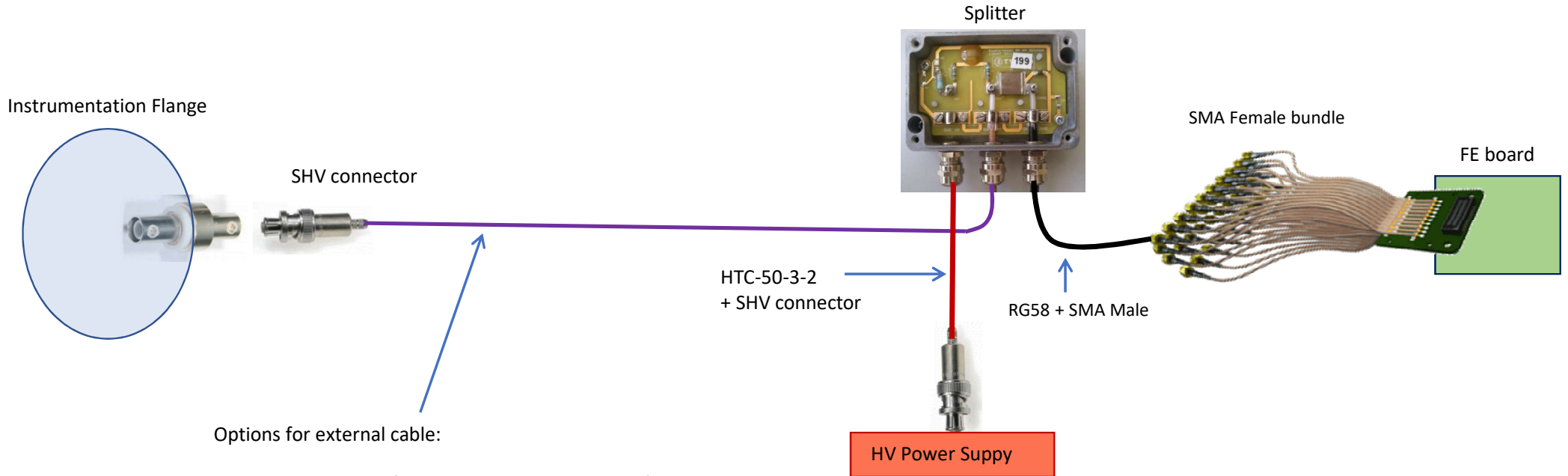


The PMT cables inside the detector are RG303 type with 23m of total length divided in two pieces:

- 21m cable connected to the flange and routed up to the detector bottom during the detector installation.
- 2m cable soldered to the PMT base (will arrive with the PMTs)

Both cables will be plugged during the PMT installation.

# PMTs Connections



Options for external cable:

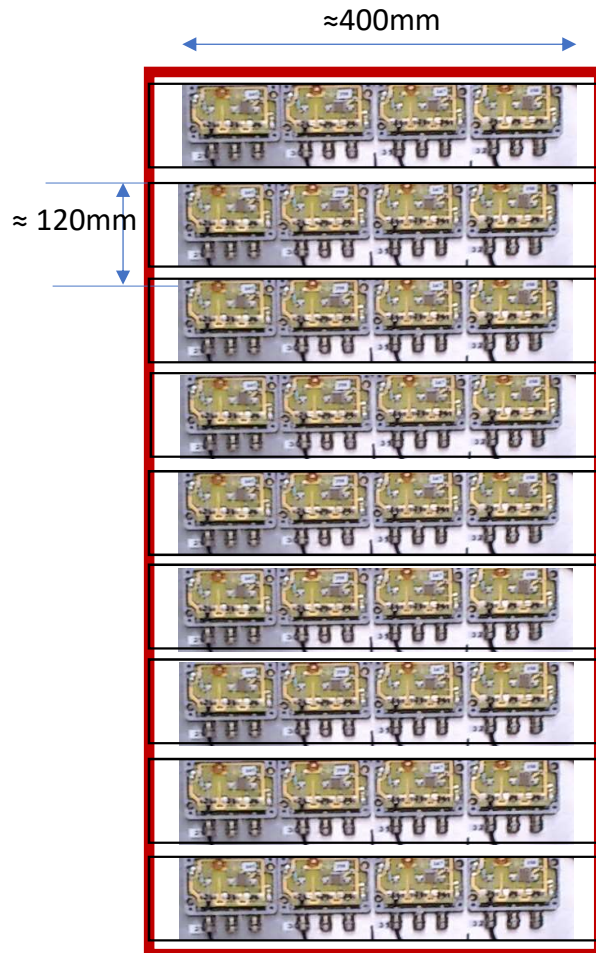
RG-303	3.7dB/20m @200MHz	2.6dB/20m @100MHz
RG-58	5.0dB/20m @200MHz	3.4dB/20m @100MHz
HTC-50-3-2 (SCEM 04.31.51.750.1) XL-PE (Cross-linked polyethylene)	4.1dB/20m @200MHz	2.9dB/20m @100MHz

As the ADC runs at 65/160 MHz the antialiasing filter should be ~80MHz

➤ We should consider a lower attenuation for the cables



# Splitters placement in the LRO rack



One option: all the 36 Splitters on 9 plates  
All on the same side of the rack

Space required: 485(rack width) x 1080mm (red rectangle)

Each single splitter box is 98mm x 64mm x 26mm.

We can mount the splitters on aluminum plates by rows (4 splitters by row) to maximize the flexibility on the allocation inside the rack . Or we can mount them on larger plates.

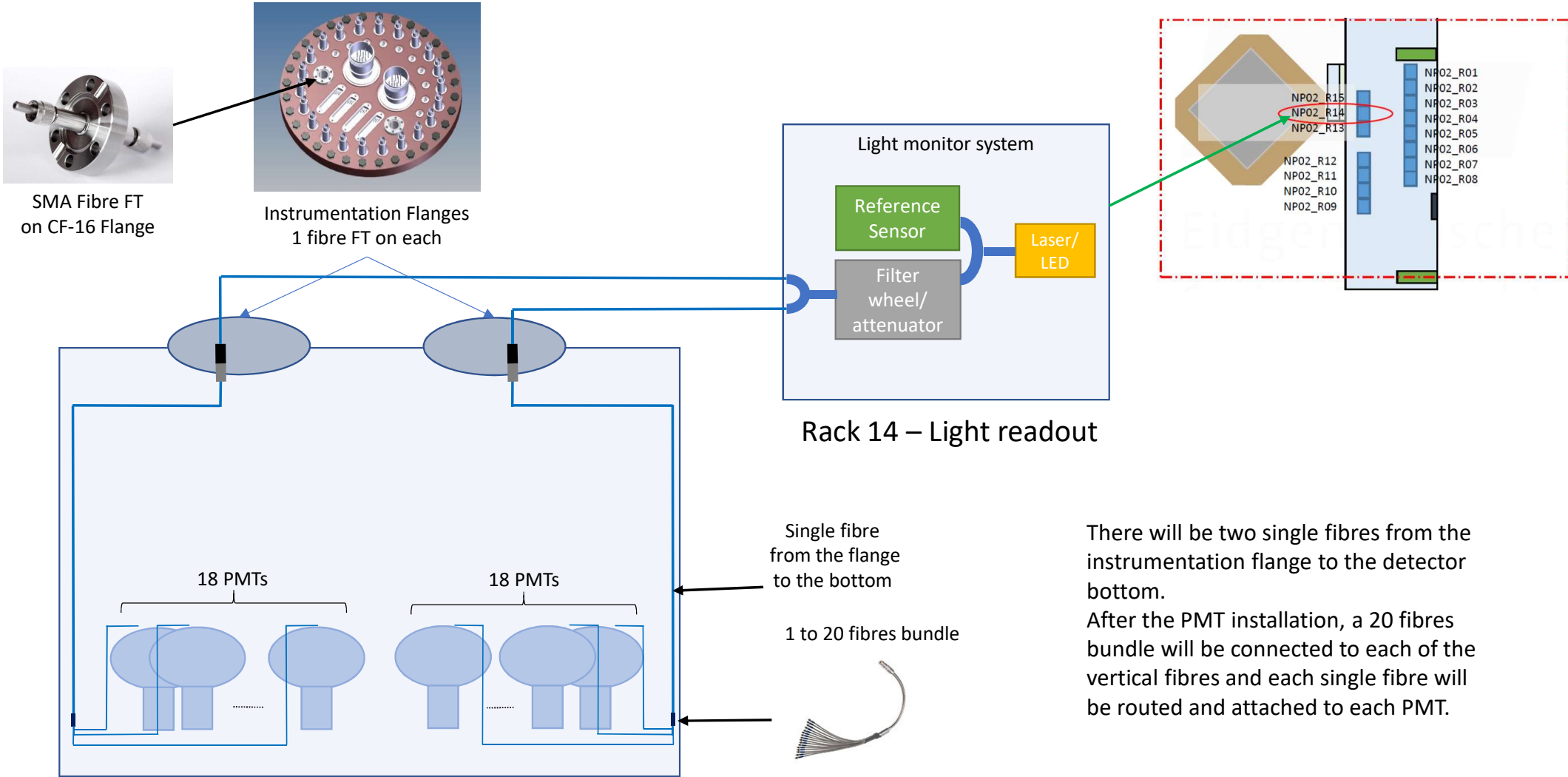
Some options:

All the splitters (36) on one side of the rack distributed in 9 plates will require about  $9 \times 12\text{cm} = 108\text{cm}$  (vertically)

Other option is to put 20 splitters on the rack front and 16 splitters on rear requiring about 55cm on each side.

And the third option is to mount the splitters on two trays (about 40cm x 60cm) and insert them in horizontally into the rack.

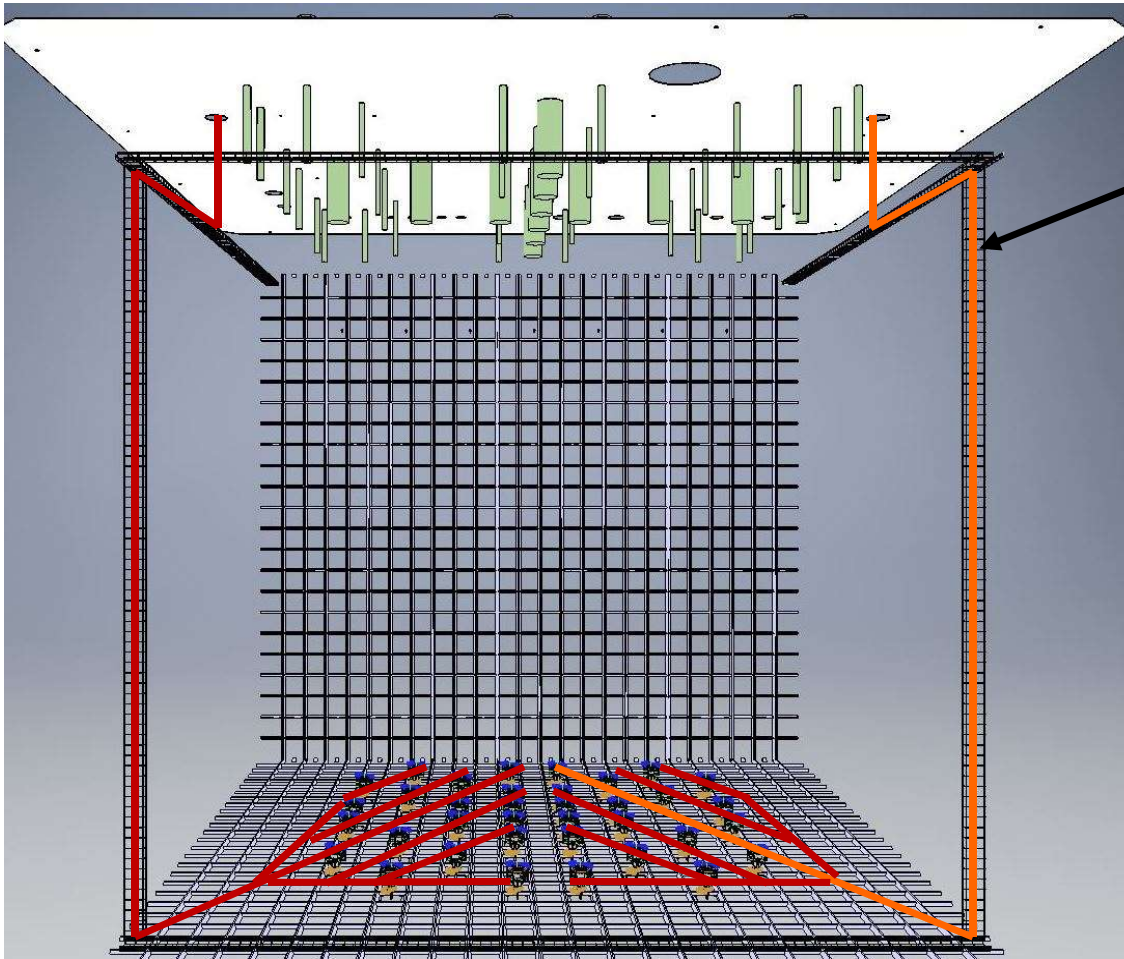
# Fibers Connections



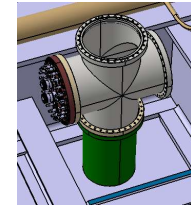
There will be two single fibres from the instrumentation flange to the detector bottom.  
 After the PMT installation, a 20 fibres bundle will be connected to each of the vertical fibres and each single fibre will be routed and attached to each PMT.

# PMT cables and fibers routing inside the detector

Fibers will follow the same routing scheme than the PMT cables



Longest distance from flange to PMT: 20.5m  
Including the T at the instrumentation flange exit



We have already ordered the PMT cables of 23m total length in two pieces 2m for the PMT base and 21m to be connected to the flange during the detector installation

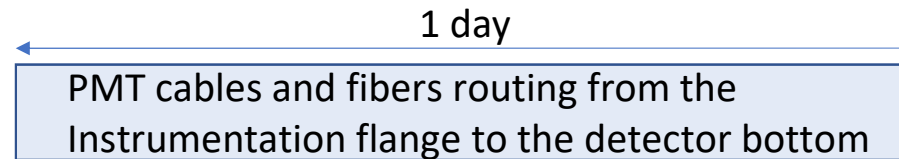
# Installation procedure

- **Before the installation all the PMTs will be tested one by one on their transport box.** The PMTs will be stored with a black bag covering them inside the transport box with the PMT cable outside the bag to allow the PMT testing without exposing them to light before the test.
- During the detector installation all the **36 RG-303 cables and the fibers for light calibration will be connected to the instrumentation flange** on one side and routed by the vertical cable trays down to the detector bottom.
- For the PMT installation we need **the ground grid to be raised** as much as possible to be able to access and install the PMTs below it.
- Before the PMT installation, **the cables and fibers will be routed** up to the corresponding PMT position at the detector bottom.
- The installation will **start at the opposite side of the detector entrance** ending at the detector entrance.
- **PMTs mechanical fixation and connection.** Each PMT will be connected to the corresponding cable going to the feedthrough. It's an SHV male-female connection, so, no soldering is needed. Also light calibration fibers will be attached to each PMT at the same time to avoid passing later between the installed PMTs.

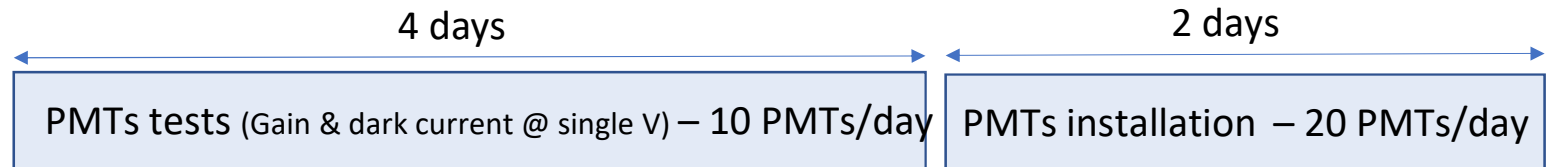
# Installation timing

## Inside Detector

At some time during the detector installation



At the end the detector installation



## Outside Detector

At the end the detector installation

