

VD-PD

SiPM-Hybrid connection

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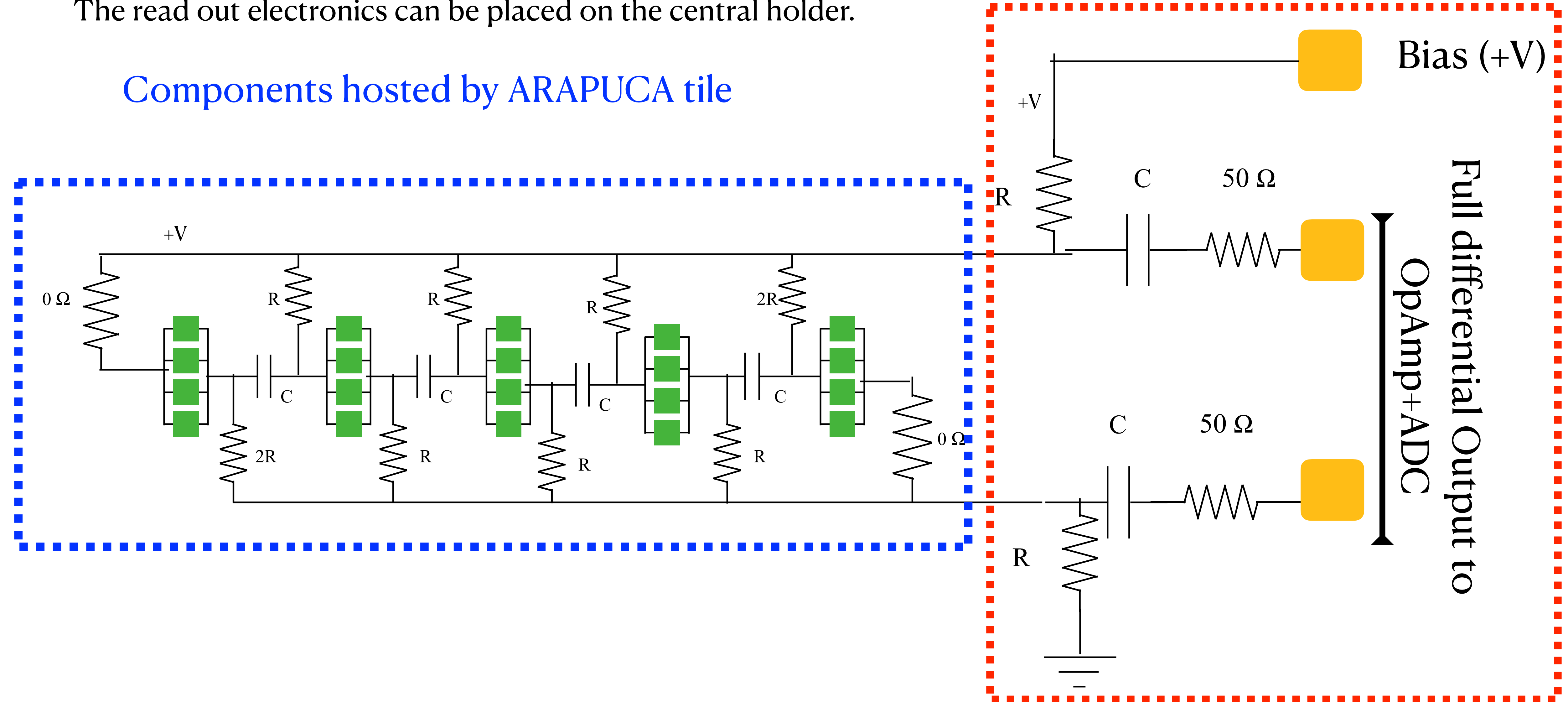
April 12, 2021

20 SiPM-Hybrid (passive) connection

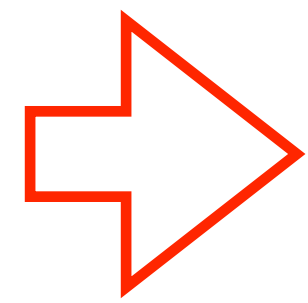
8 "BLUE" groups per each tile, each group need a twisted cable,
The read out electronics can be placed on the central holder.

Components hosted by ARAPUCA tile

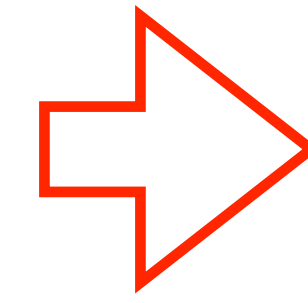
Components on the
central electronics board



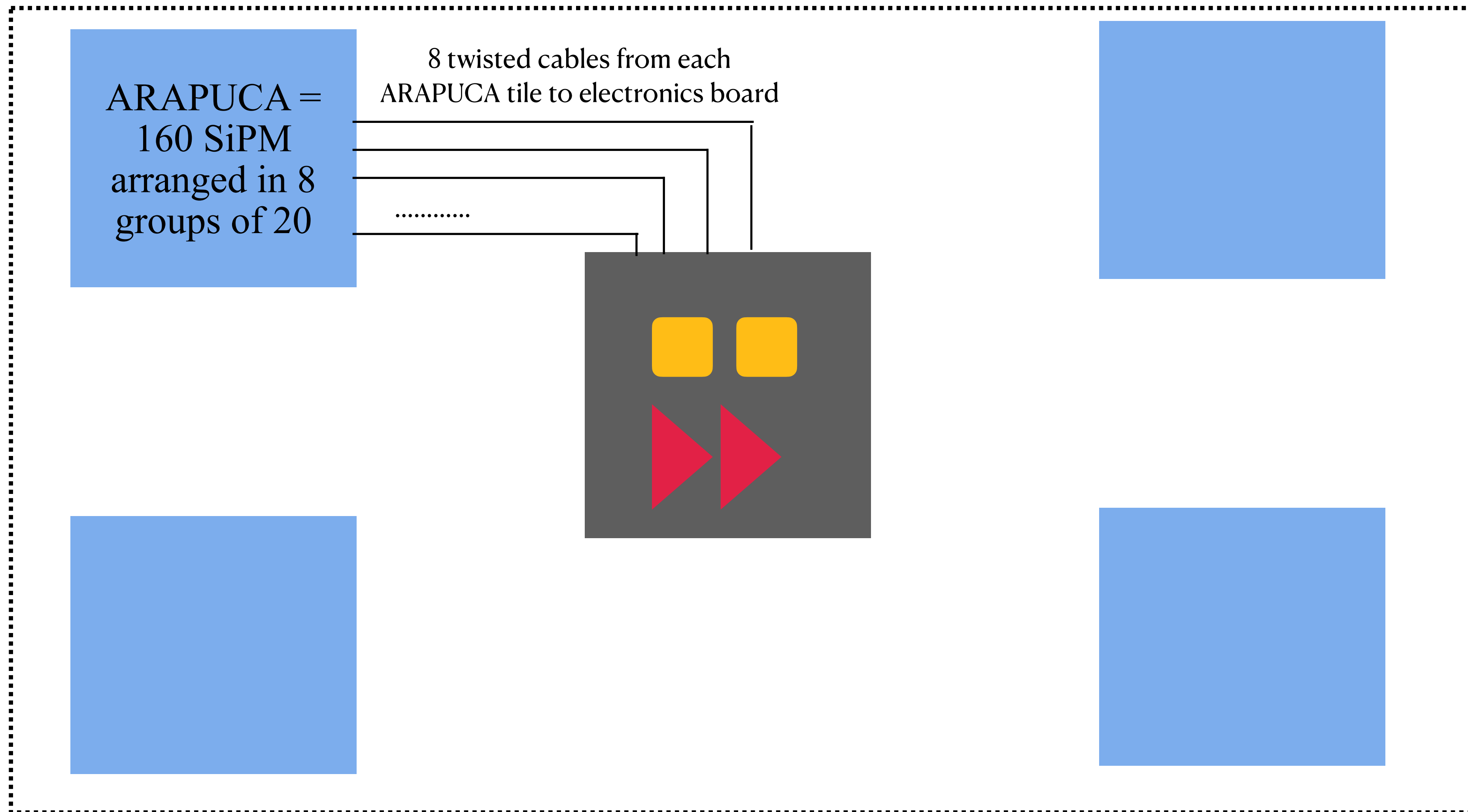
1 X-ARAPUCA = 160
SiPM = 8 groups of 20 in
Passive-Hybrid



8 twisted cables from
each ARAPUCA tile to
electronics board

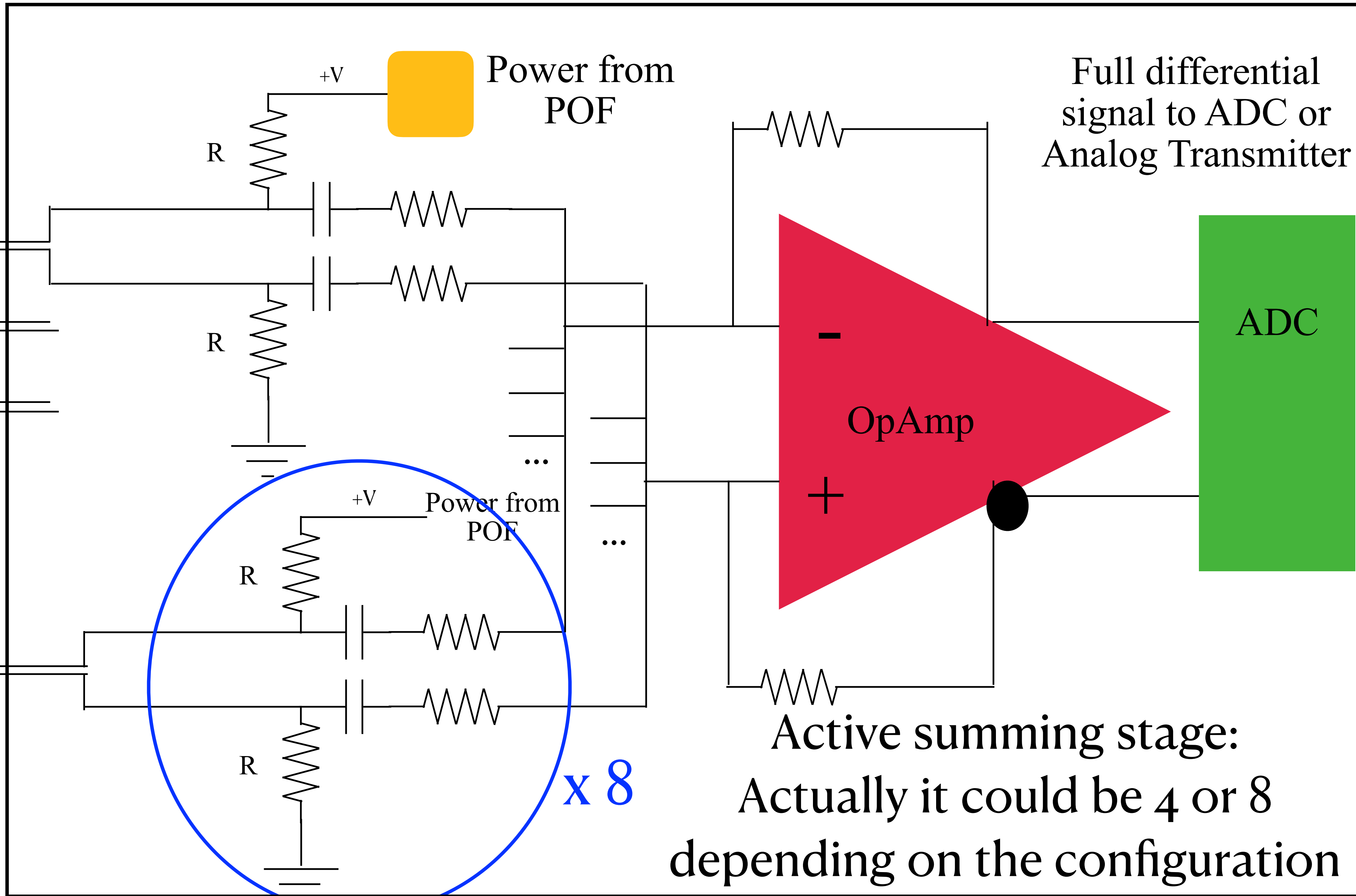


Similar cables to ones
used in protoDUNE



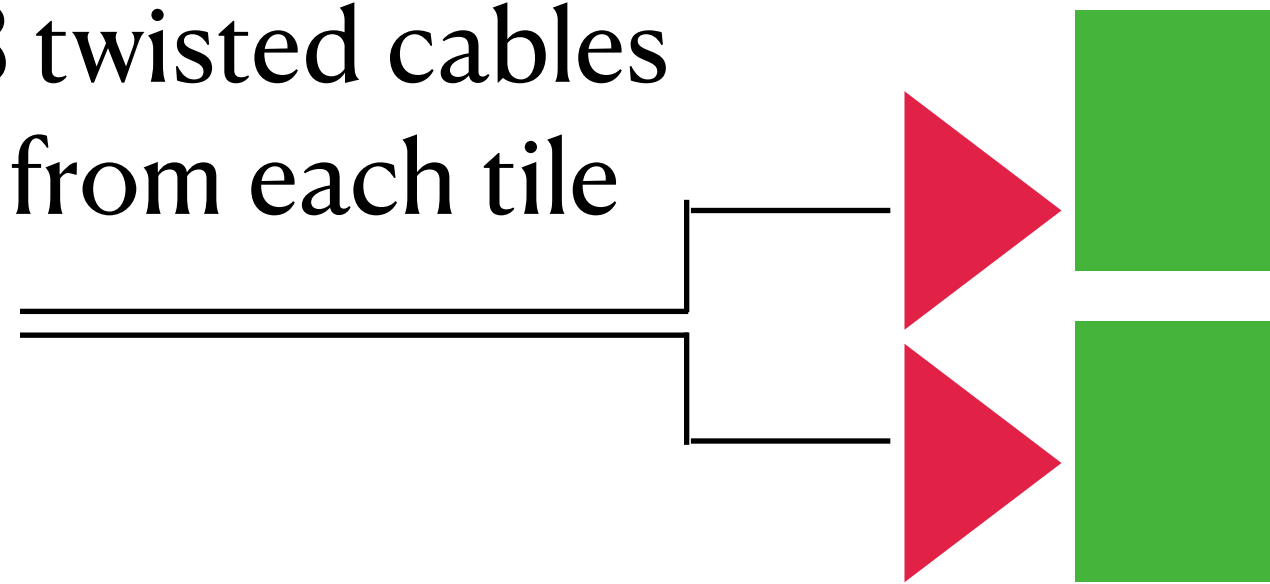
Read out electronics:

8 twisted cables from each tile



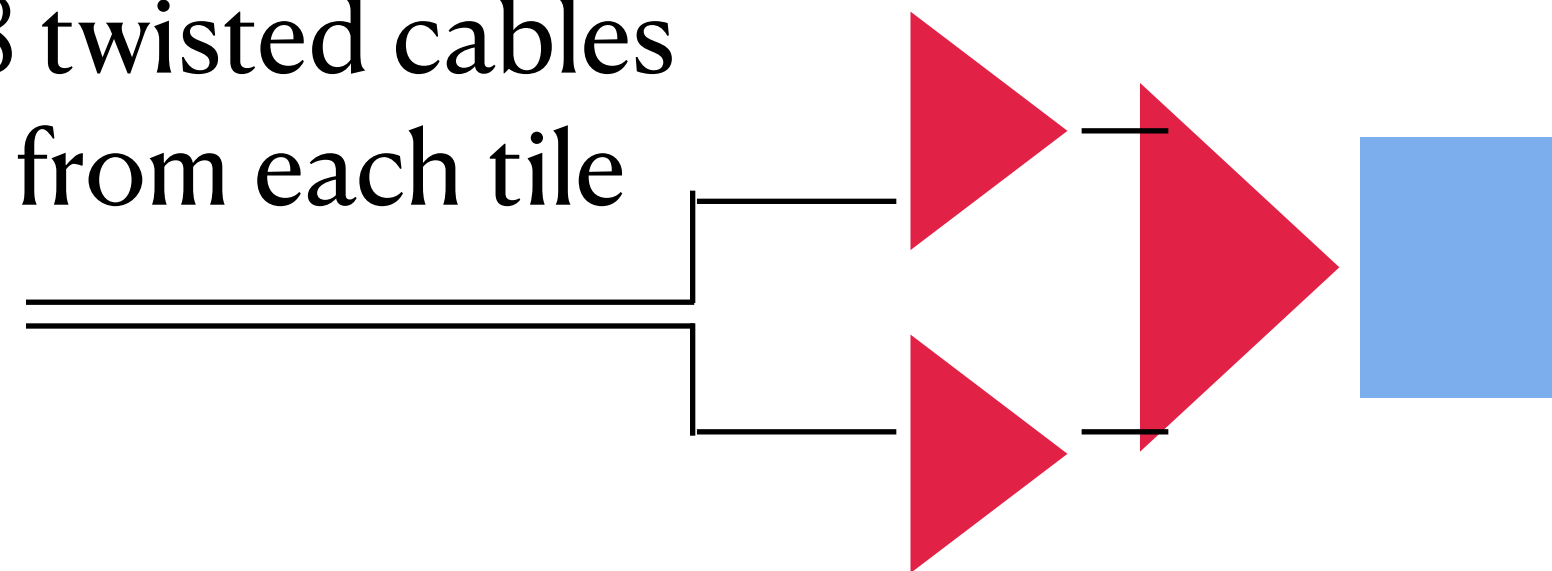
Possible configurations:

8 twisted cables
from each tile



Digital + 2 ADC per tile -> 4 twisted
cables per OpAmp per ADC

8 twisted cables
from each tile



Analog Double + double summing stage ->
4 twisted cables per OpAmp + Second
OpAmp to summing 4+4 -> Analog output

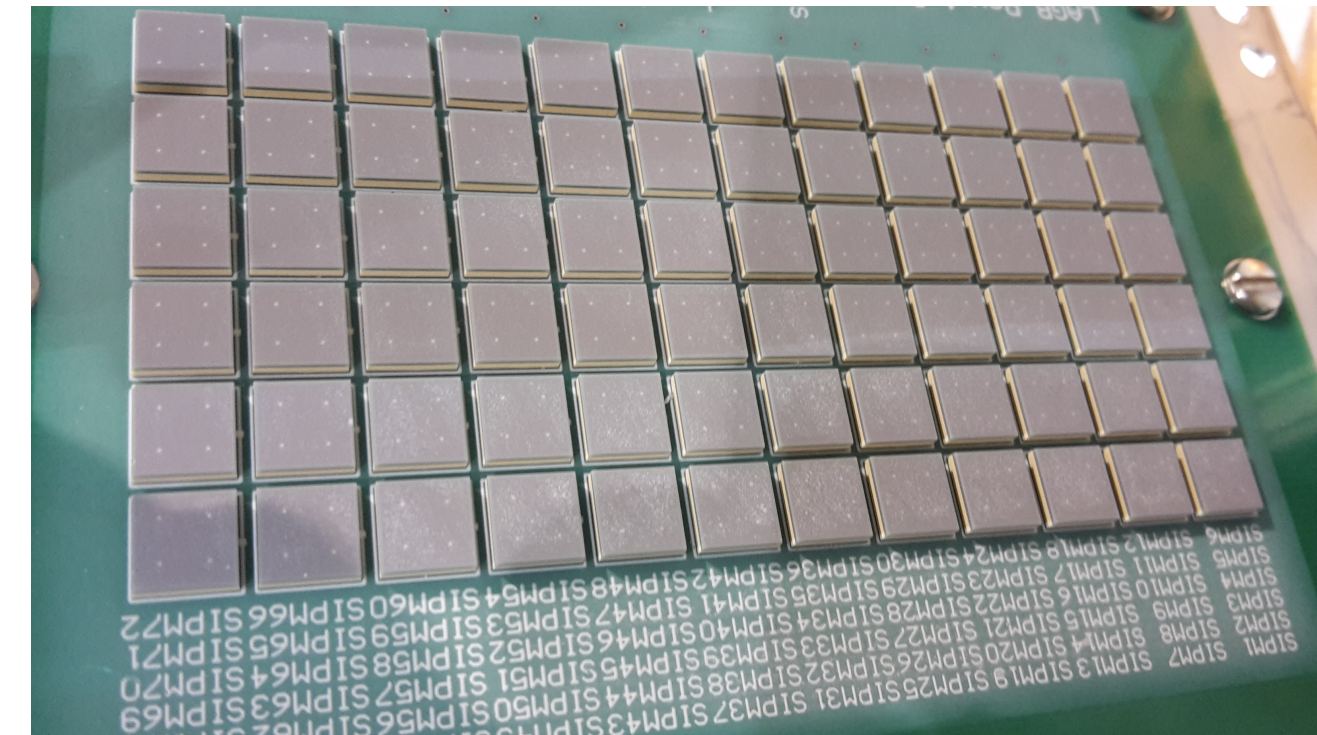
8 twisted cables
from each tile



Analog Double + summing stage -> 8 twisted
cables in a single OpAmp-> Analog output

What we know and what has to be tested

Summing 8 channels in a single OpAmp is already been tested (we summed successfully 12 groups of 6 SiPM in parallel each one).



12 groups of 6 SiPM Hamamtsu $6 \times 6 \text{ mm}^2$

A single Hybrid circuit of 20 SiPM need a stand alone test.

Final configuration: 8 groups of 20 SiPM in a single channel node.

Considerations on front-end electronics on the central board:

Pro:

- ARAPUCA tile design is not affected by the choice of the readout electronics
- OpAmp summing stage is the same needed for the ADC stage
- OpAmp stage near PoF and ADC or Analog transmitter (usually this is a recommendation for the OpAmp ADC interface)
- Avoid an OpAmp stage on the tile reduce spread of power distribution

Contra:

- 8 twisted cables from each tile