



Dipartimento  
di Fisica  
e Astronomia  
*"Ettore Majorana"*



UNIVERSITÀ  
degli STUDI  
di CATANIA



# SiPM@Catania

MEASUREMENTS AND MASS TEST

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JUNO-Ita meeting 06/05/2022

# Catania SiPMs test

- ▶ Preliminary measurements on SiPM
- ▶ Mass test
- ▶ Mass test station

# Preliminary measurement on SiPM

RECAP ON LAST 2 YEARS MEASUREMENTS AT CATANIA

# Catania and SiPMs

- ▶ Preliminary measurements on SiPM
- ▶ Procedure for mass testing
- ▶ Building of mass test system

# Catania and SiPMs

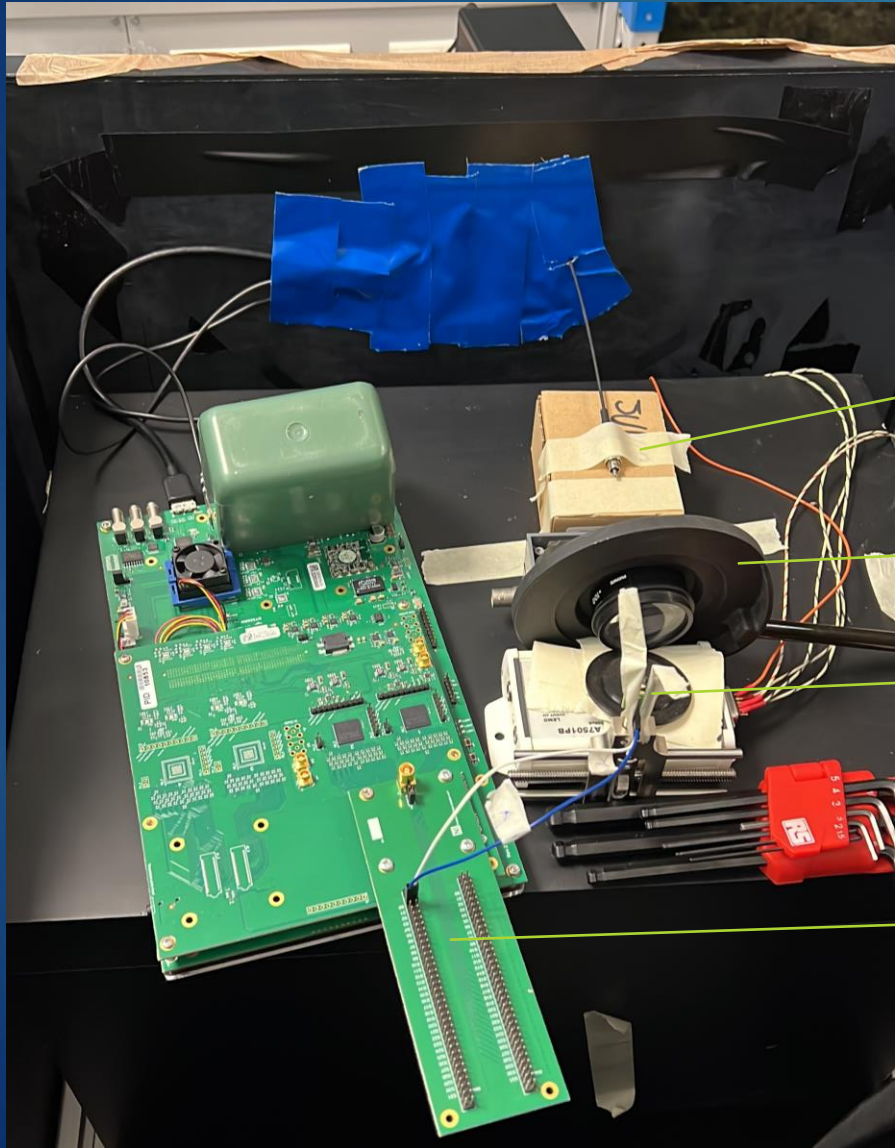
- ▶ Preliminary measurements on SiPM→2020-2022
- ▶ Procedure for mass testing→2021-2022 (FDR ny the end of May)
- ▶ Building of mass test system→2022-???

# Preliminary measurements on SiPM

- ▶ Measurements inside and outside climatic chamber
  - ▶ Staircase, Curve I-V, Dark count, charge spectrum
  - ▶ Different setup to test different conditions for final setup (measurements with and without lens, dark box, in air...)

# Experimental Setup

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Optical Fiber

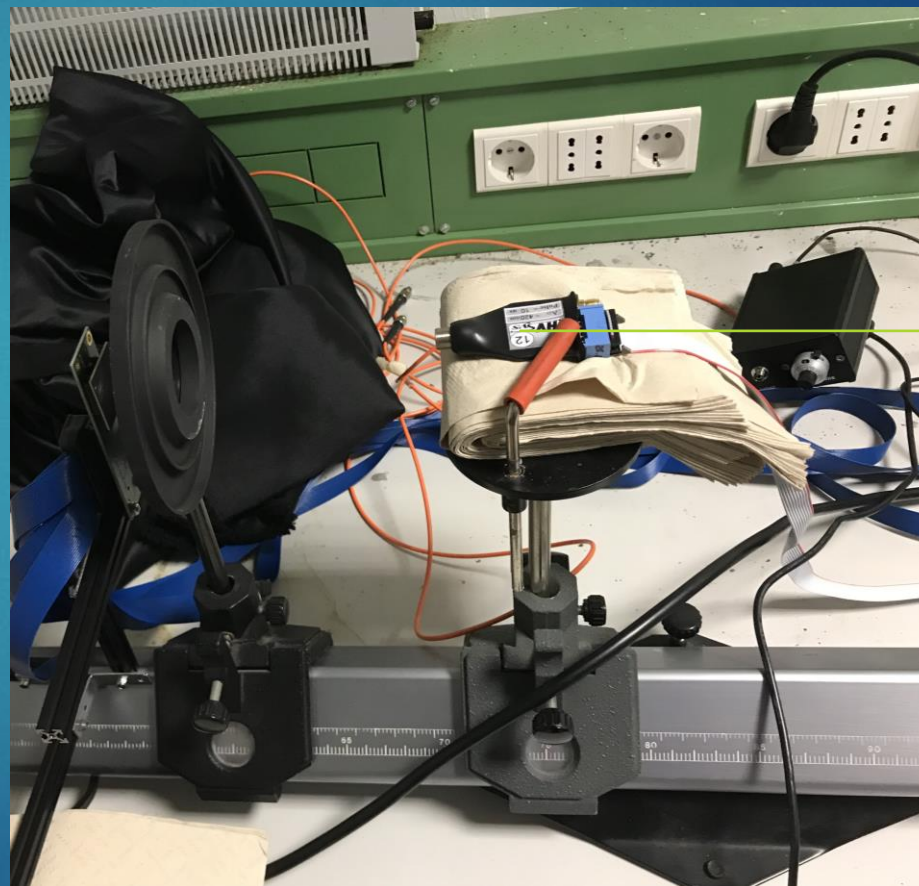
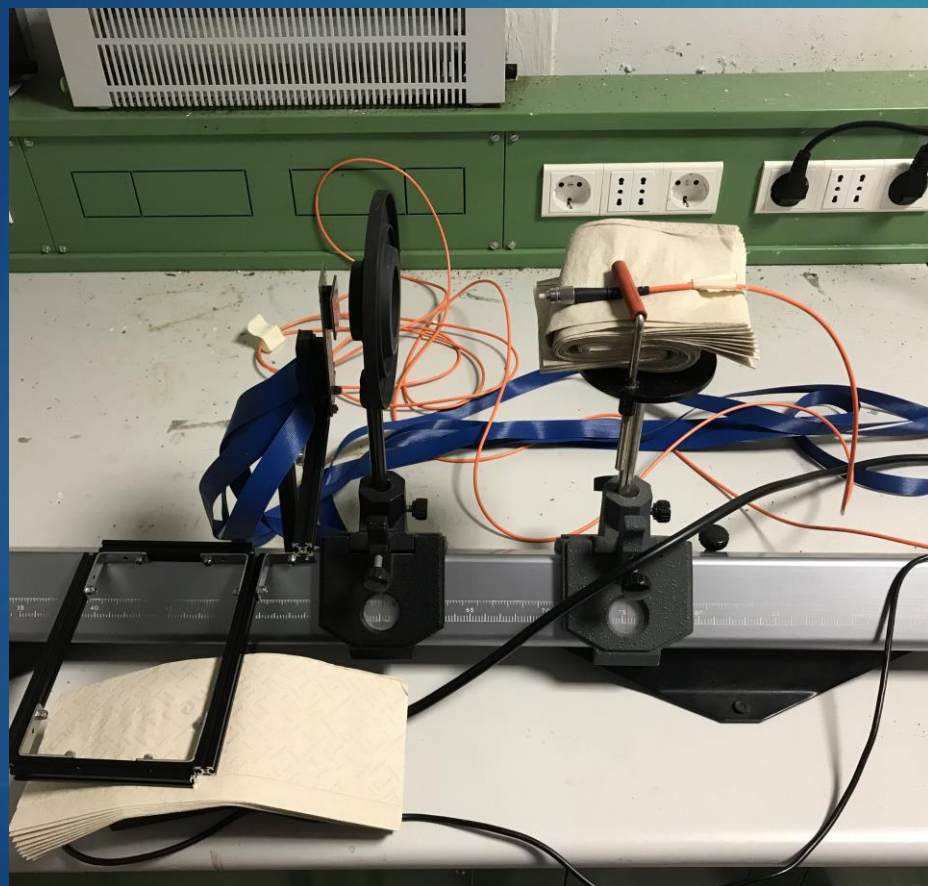
lens

SiPM

Pitch Adapter Board

# Experimental Setup

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LED  
Dubna

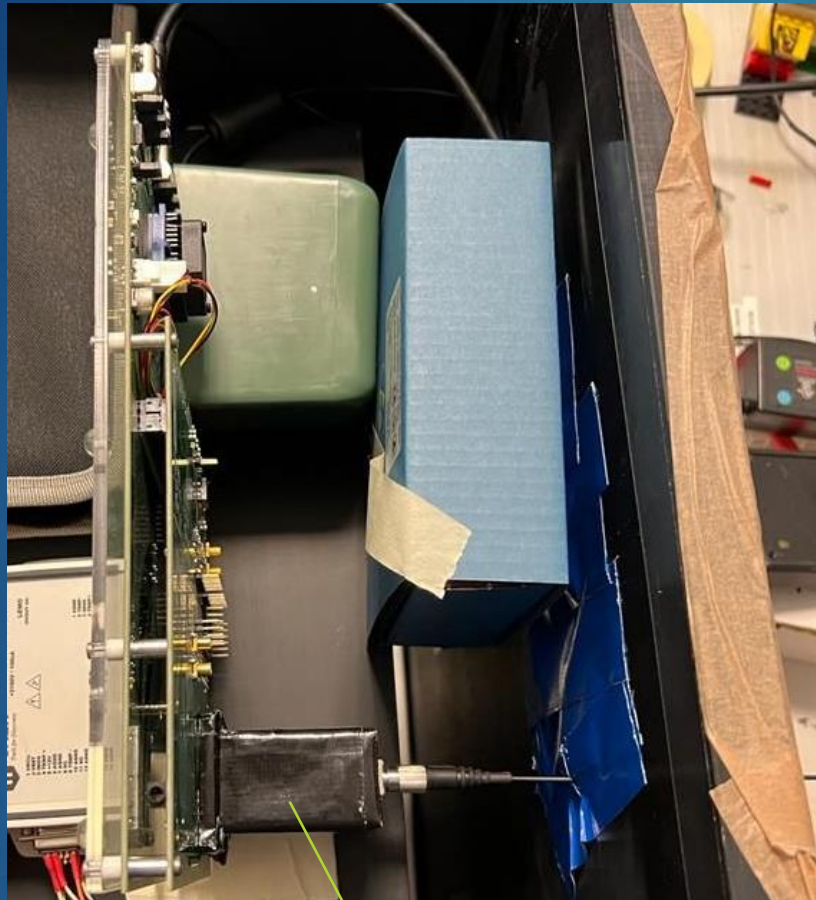


# Experimental Setup

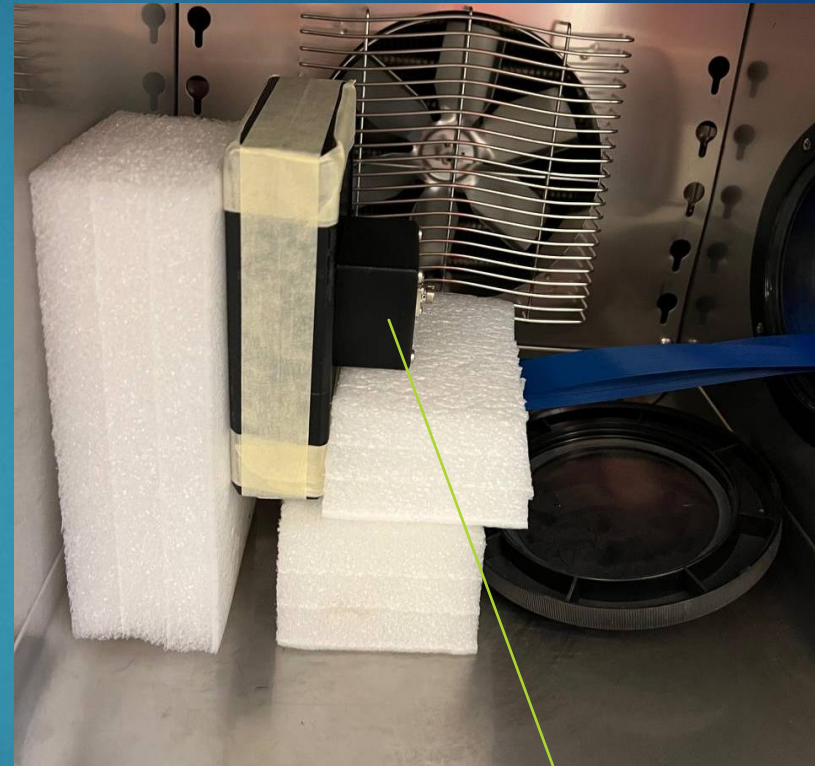
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# Experimental Setup



Dark Box "Custom 2"



Dark Box "Custom 1"

Mass test

# Mass test

- ▶ Over 4000 SiPMs will be tested:
  - ▶ Optical test
  - ▶ Burning test
  - ▶ Massive test

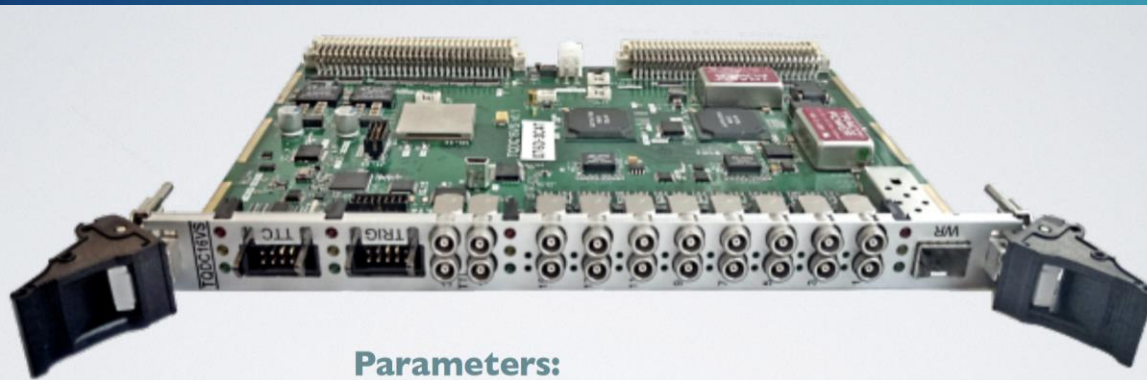
# Mass test

- ▶ Over 4000 SiPMs will be tested:
  - ▶ Optical test
  - ▶ Burning test
  - ▶ Massive test

# Mass test@Catania

- ▶ Writing the FDR before end of May
- ▶ We studied different hardware setups
- ▶ We studied the optical part of the mass station

- ▶ At the end we decided to use PS and Digit designed by Dubna and produced by Marathon in Russia



### Parameters:

- 16 channels VME board
- 125MHz,
- 14bit/2V
- 16us window
- 10GB optical link (~3kEvents/s)



### Power unit (128 channels)

- 4x DACs AD5535B
  - 32 channels
  - 0-200V range [adjustable by reference]
  - 550 uA/channel
  - 14 bits/selected voltage range
  - Temperature sensor
- 1x Microcontroller STM32F373 + additional multiplexers
  - 3 x24 bit ADC on chip
  - 7 channel multiplexers
  - 132 channels in total [128 voltage + 4 temperature]
- 4x integrated circuit (IC) of reference sources (selectable by jumper junction)
- current limiter IC
- 2x 68pin IDC connectors
- 1 HV connector for an external clean power supply
- VME 6U standard

Thanks to Arsenij

# Mass test@Catania

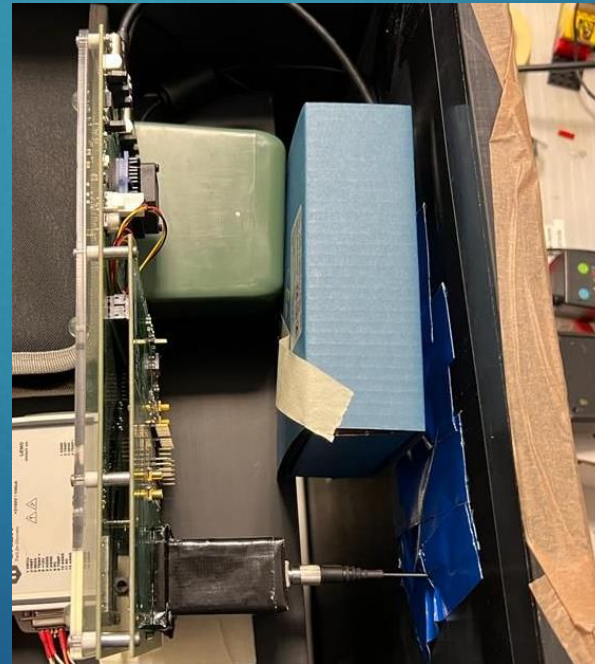
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- ▶ In the last 6 months we focused on a plan B for the hardware setup using two CAEN solutions

- ▶ CAEN DT5202



- ▶ CAEN DT5550W



Common:

- Citiroc1A;
- SiPM monocanale
- HPK S131361-3050-AE08;

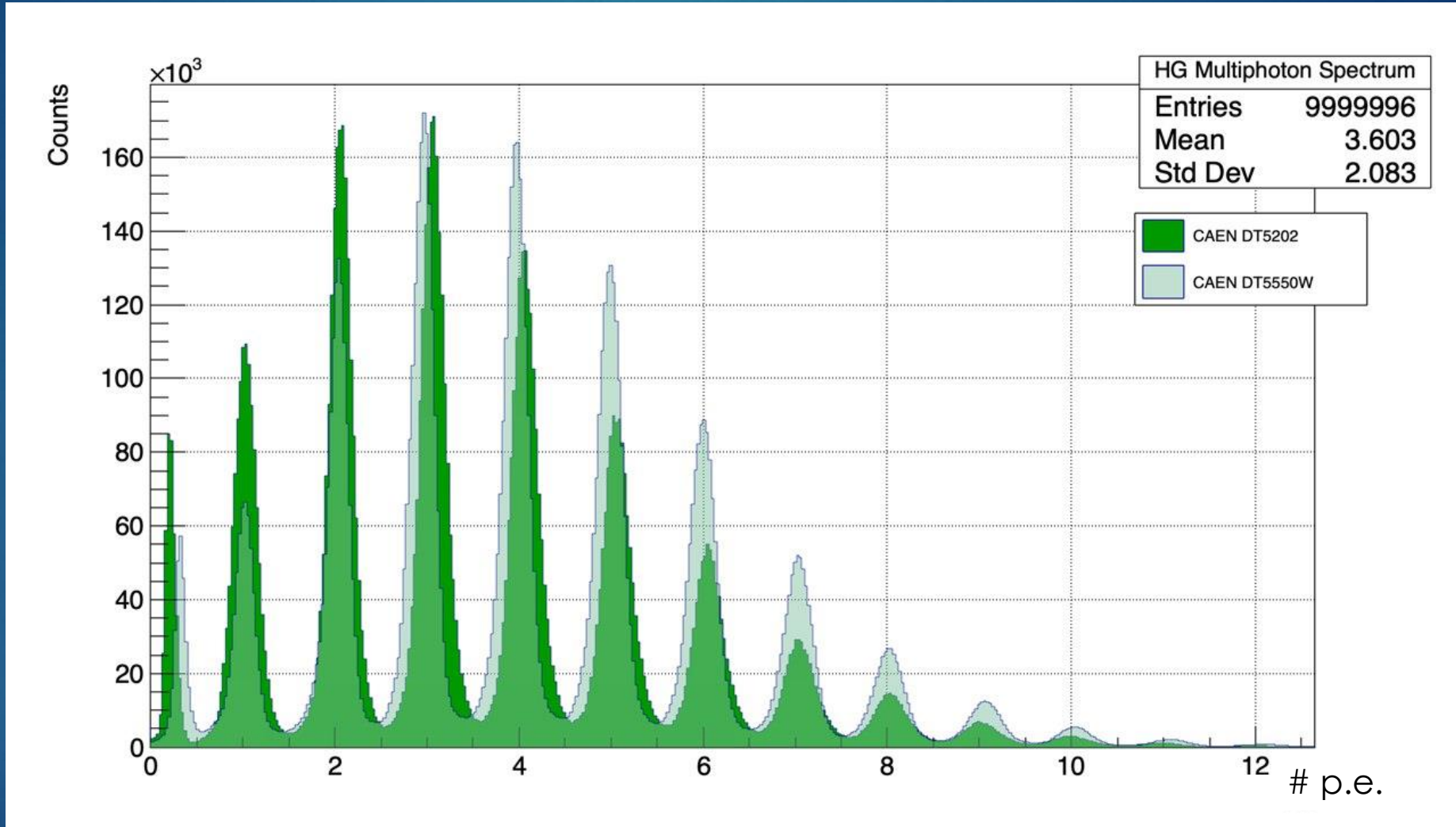
Measurements:

- at 20 °C and -20 °C
- Different optical setups



# HPK S13 8x8

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# Mass test@Catania

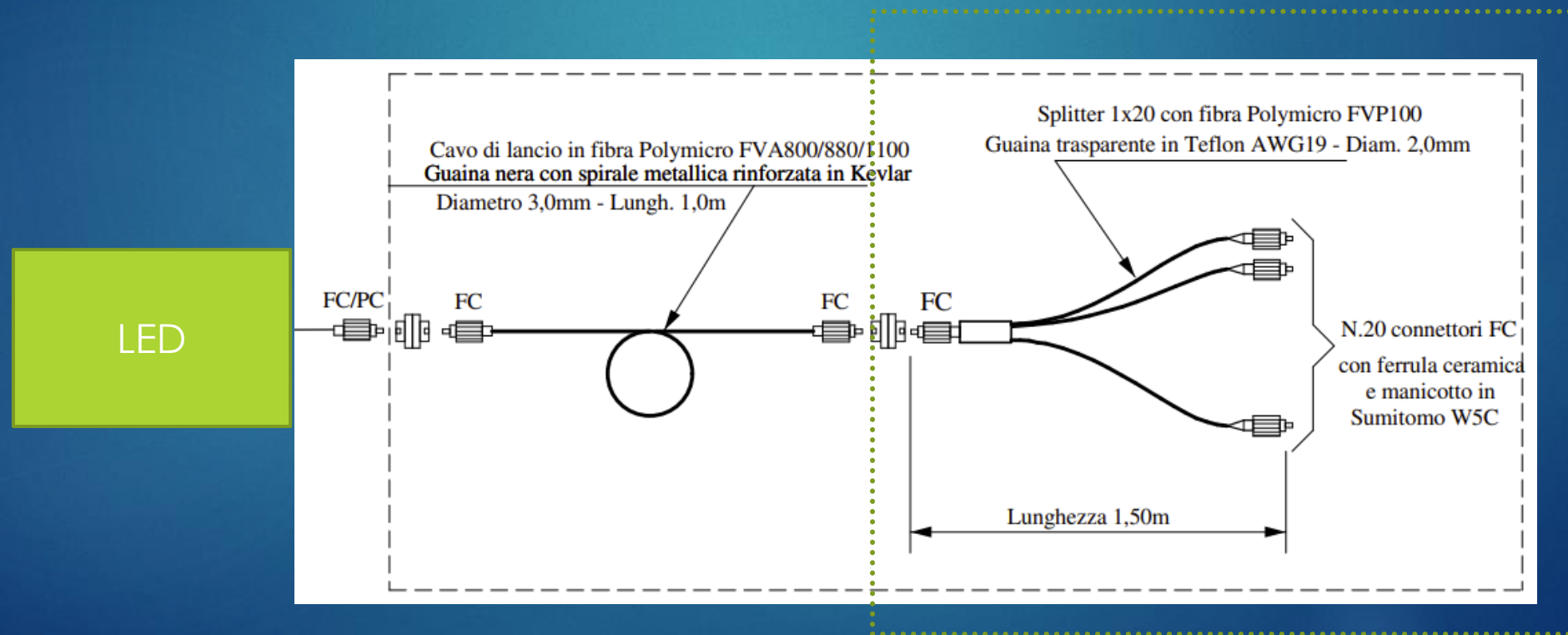
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- ▶ DT5202 better than DT5550W however PS + digit option is the best solution (acquiring the waveform for further studies, offline integration?)
- ▶ How can we get the supplies from Russia? (Hard problem for Chinese colleagues)

# Mass test@Catania

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- ▶ Similar but different from the Russian proposal



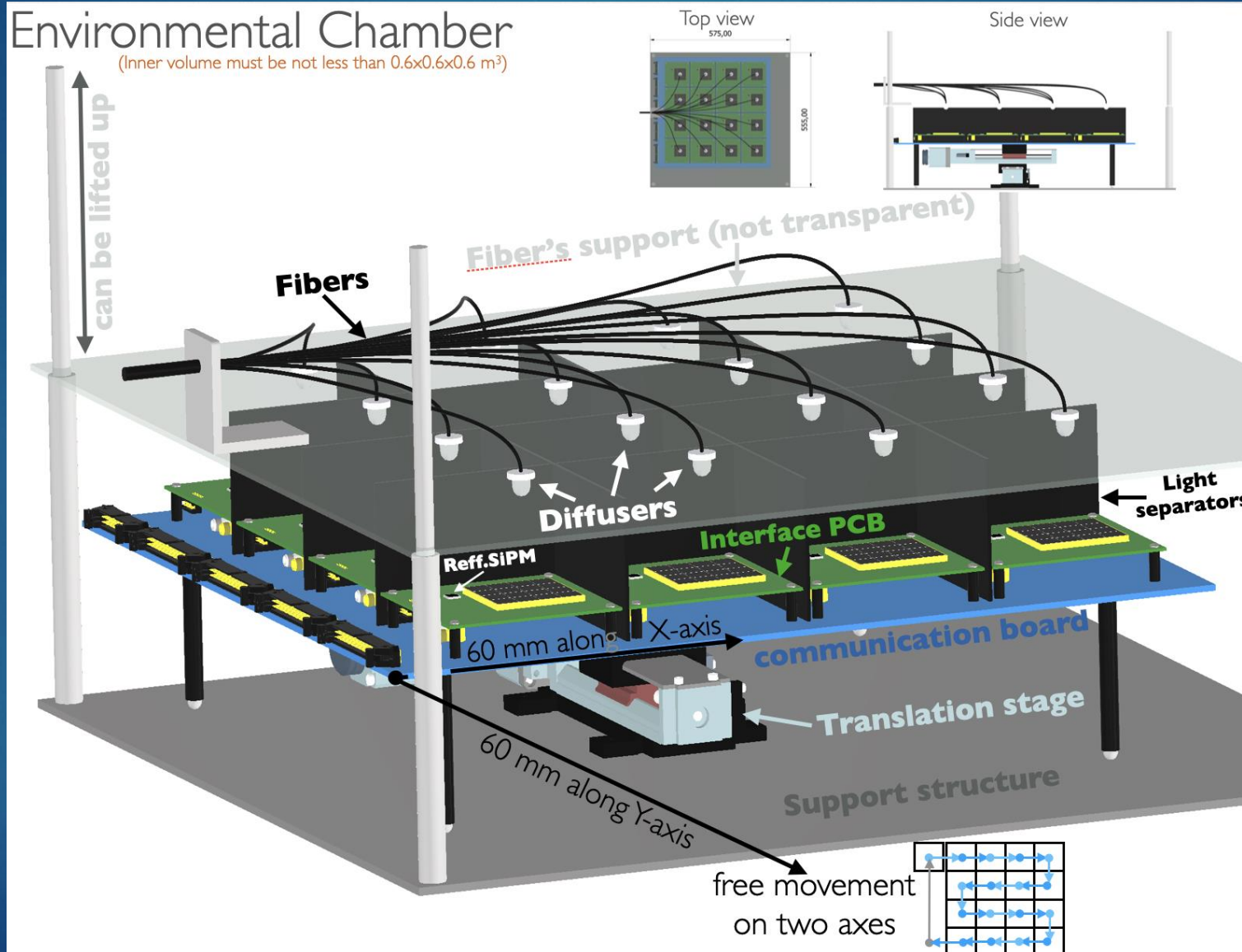
Environmental Chamber

# Mass test@Catania

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- ▶ Similar but different from the Russian proposal
- ▶ To be tested at -50 °C
- ▶ Diffusers at the end?

# Mass test@Catania



Mass station

# Mass station

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New lab @ Dipartimento di Fisica e Astronomia "E.Majorana" in Catania



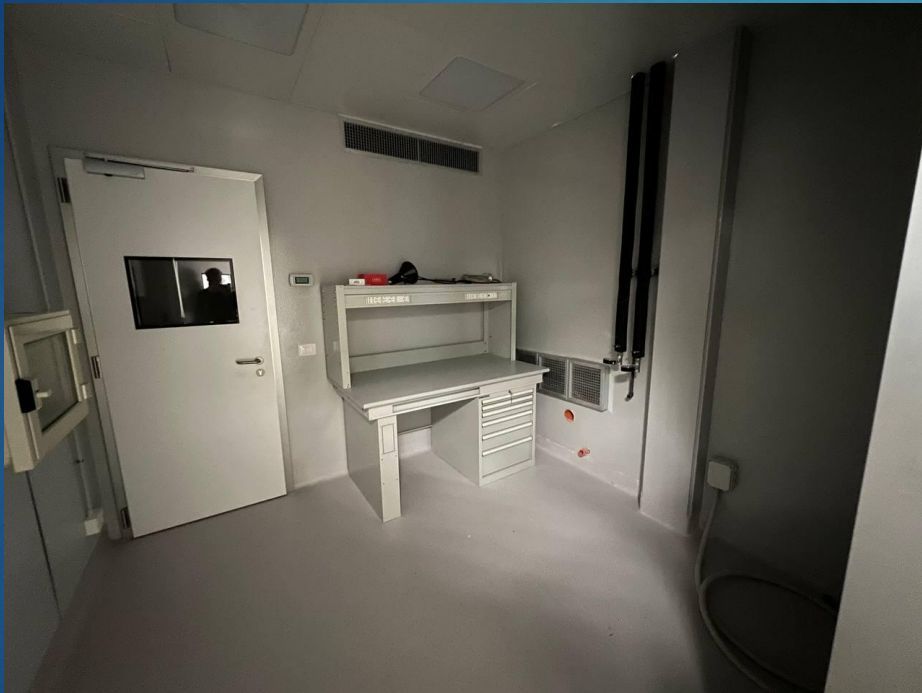
Environmental chamber room



Lab JUNO

# Mass station

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Environmental  
Chamber Room



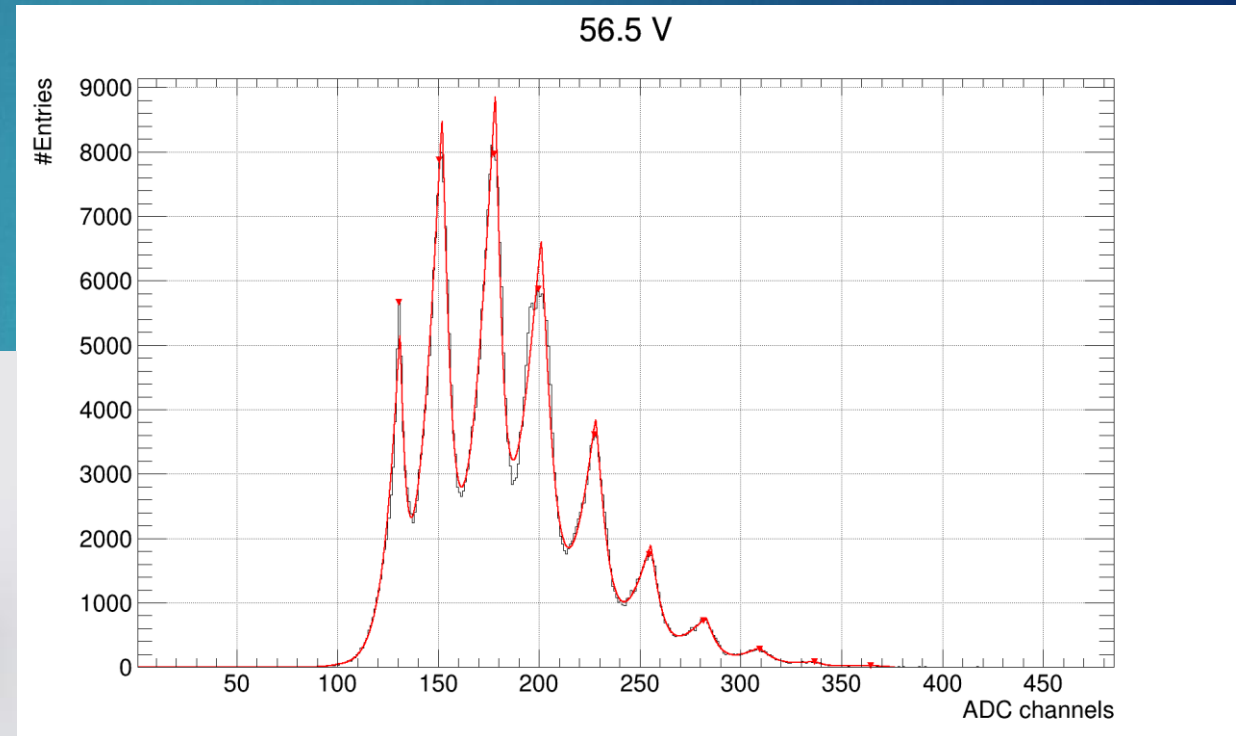
Environmental  
Chamber



# Mass station

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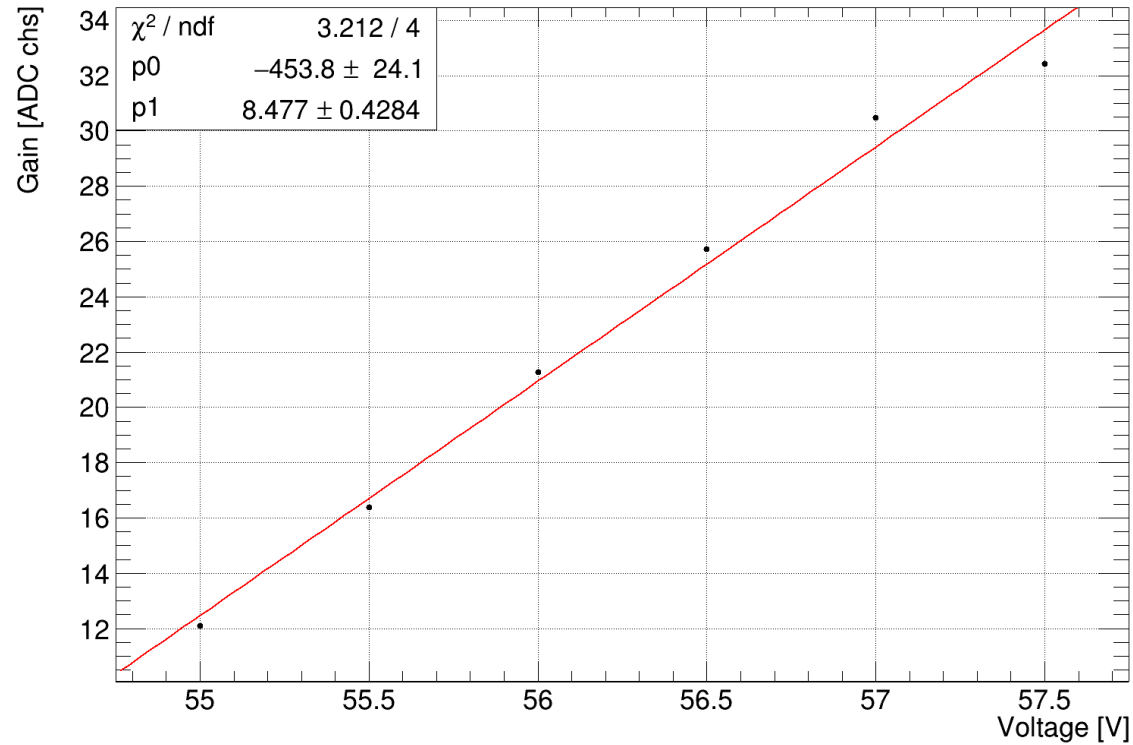
- ▶ 16 matrices to test + 16 ref SiPMs:
  - ▶ Single channel
  - ▶ HPK S13360-6050CS



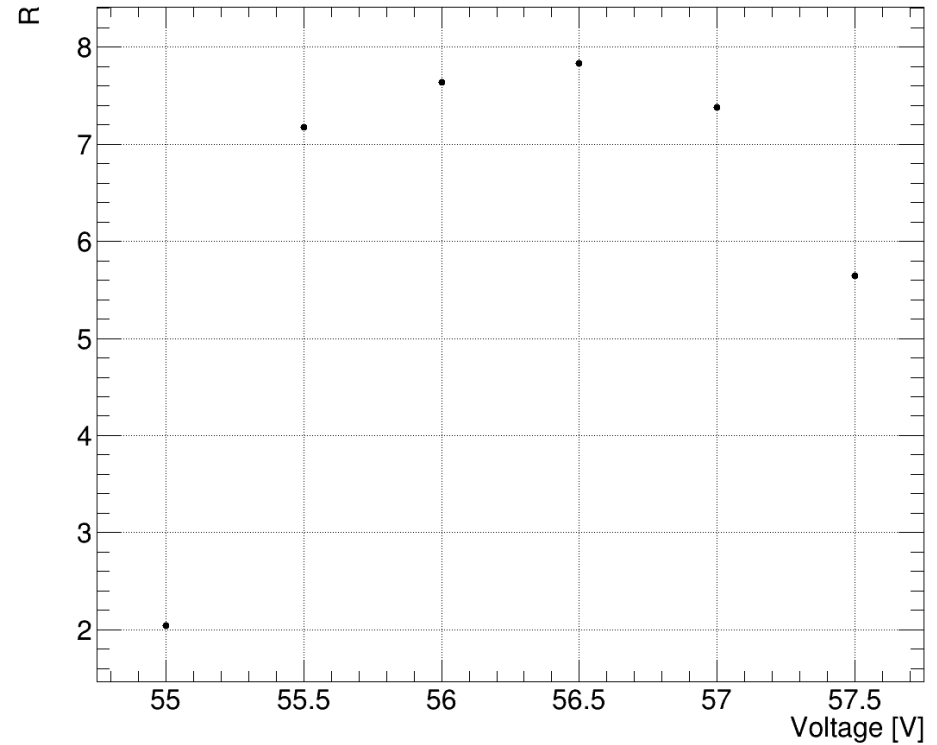
# Mass Station

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Gain vs Voltage



Scan of Resolution



# Conclusions

# Conclusions

## Done:

- ▶ Different plan B have been studied
- ▶ Draft of FDR
- ▶ First characterization of ref. SiPM

## To Do:

- ▶ Dark box and mechanical structure
- ▶ Light field with our splitter
- ▶ FDR
- ▶ Characterization of all the ref. SiPM

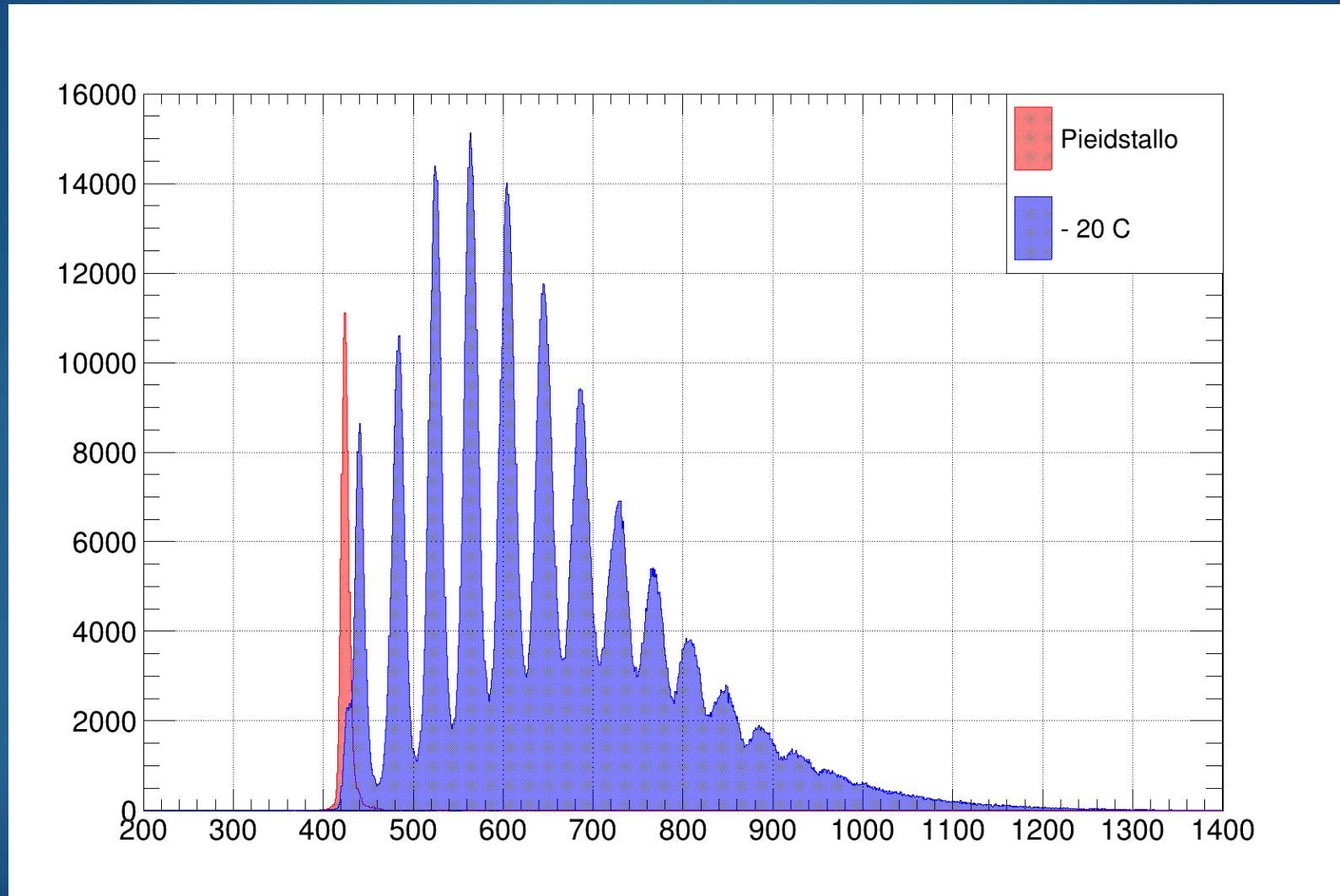
Thank You!



backup

# Spettro a -20 °C HPK S12 8x8

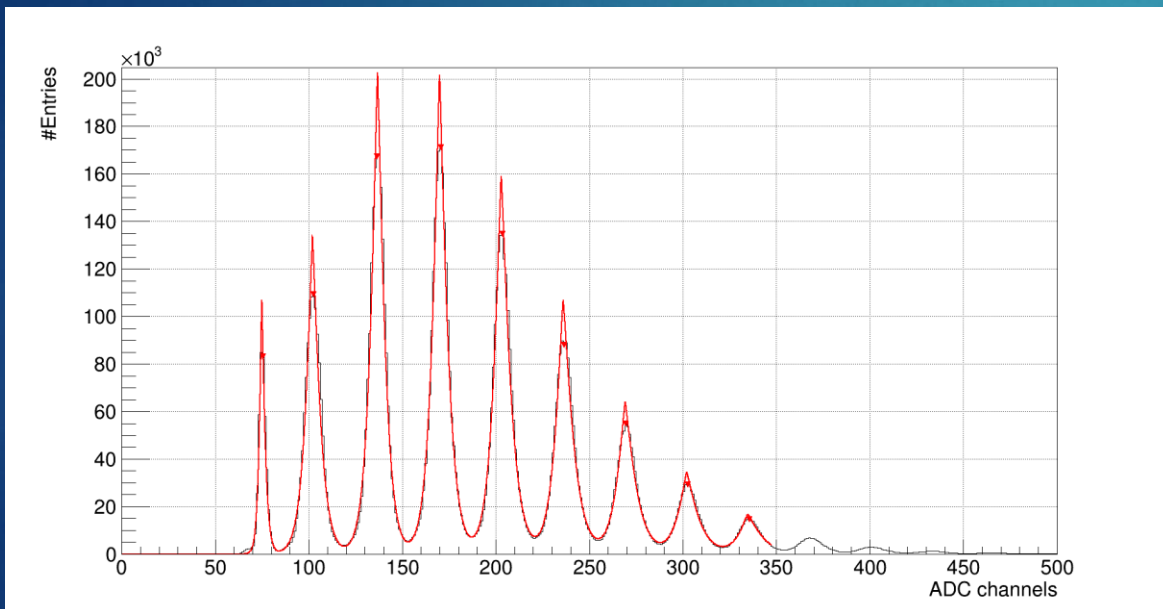
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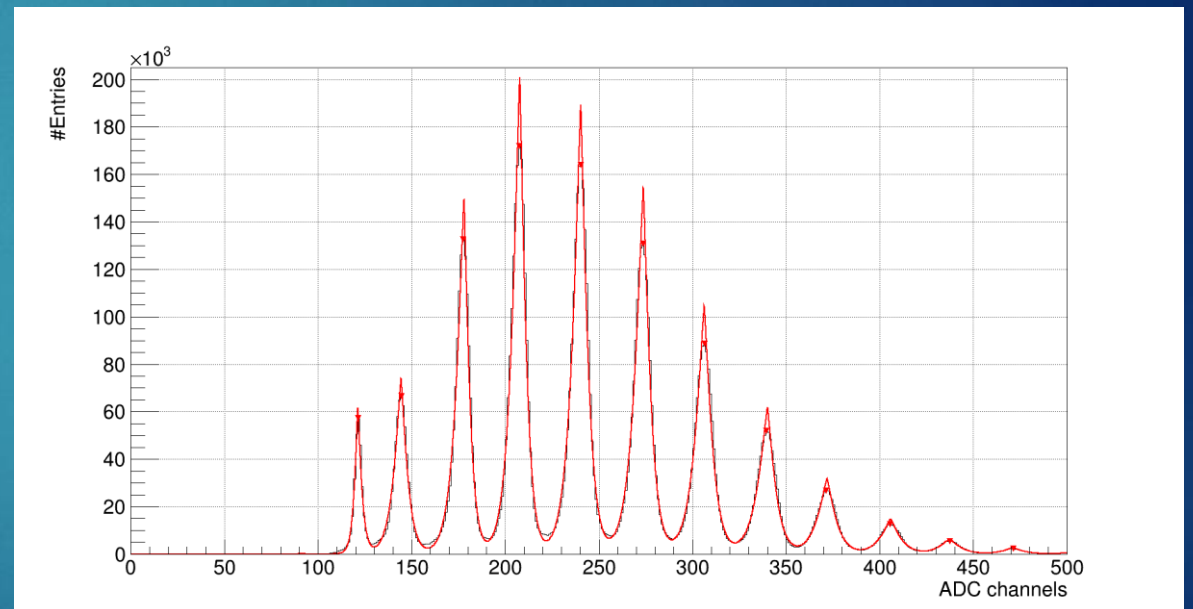
# Prima caratterizzazione HPK S13

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CAEN DT5202



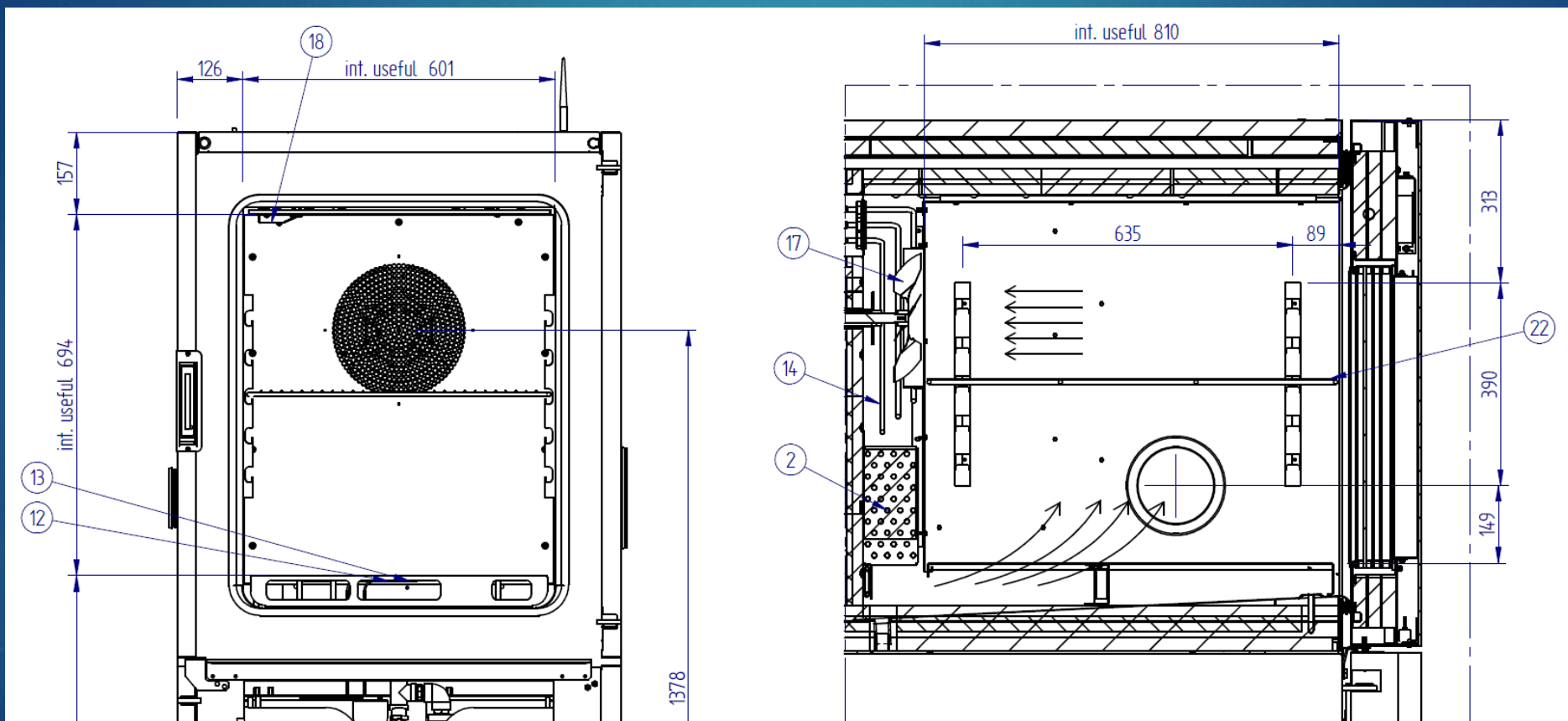
CAEN DT5550W





# Cella climatica

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# Cella climatica

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