Start Counter

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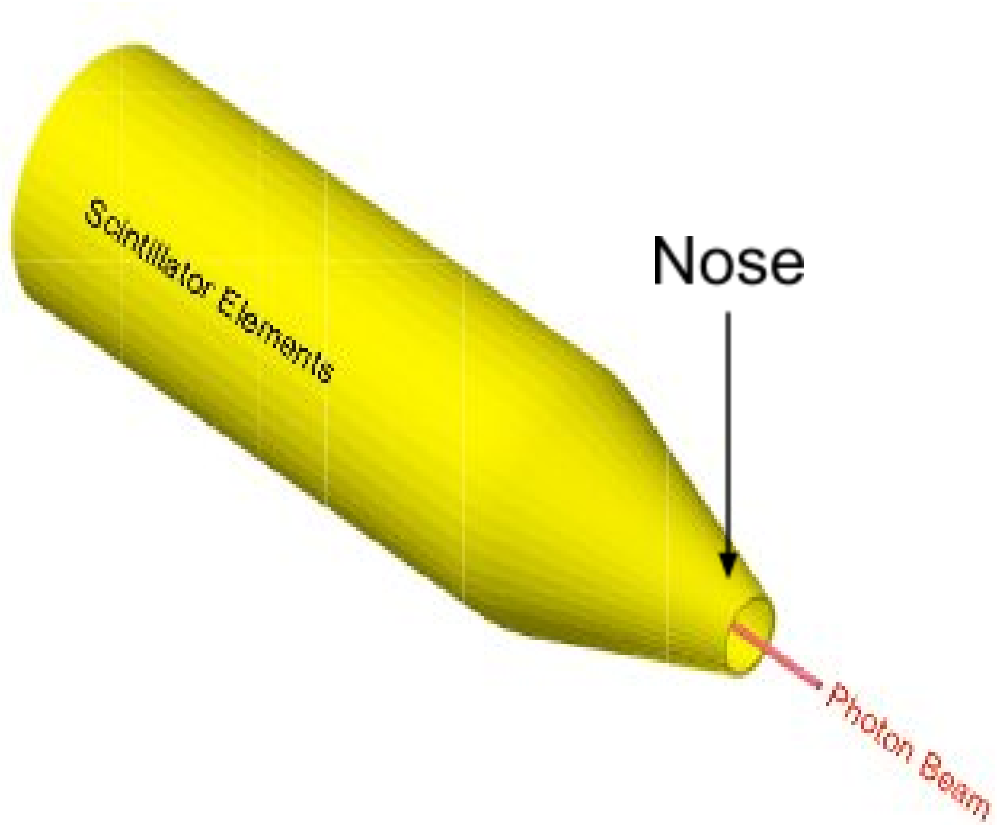
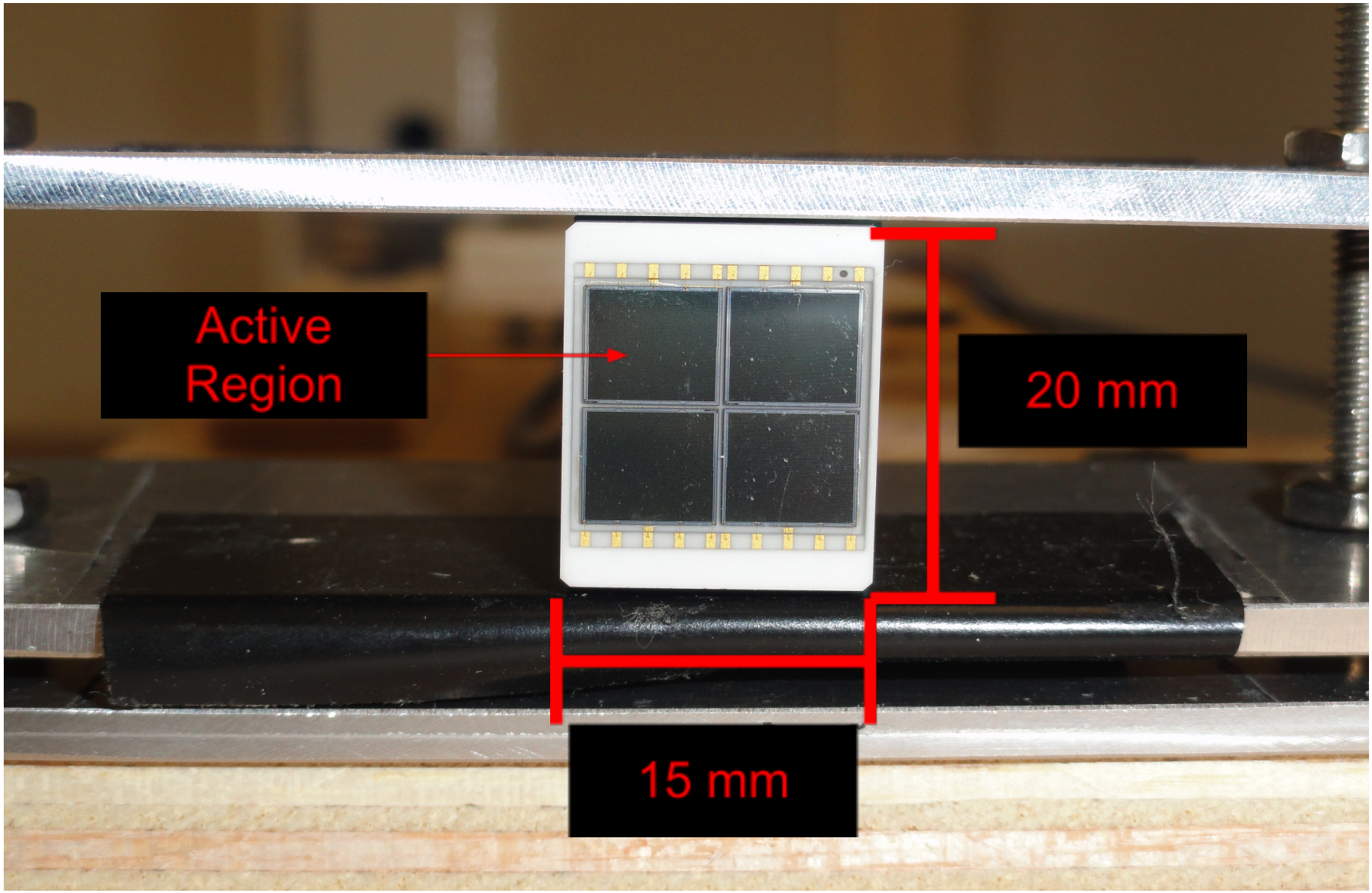
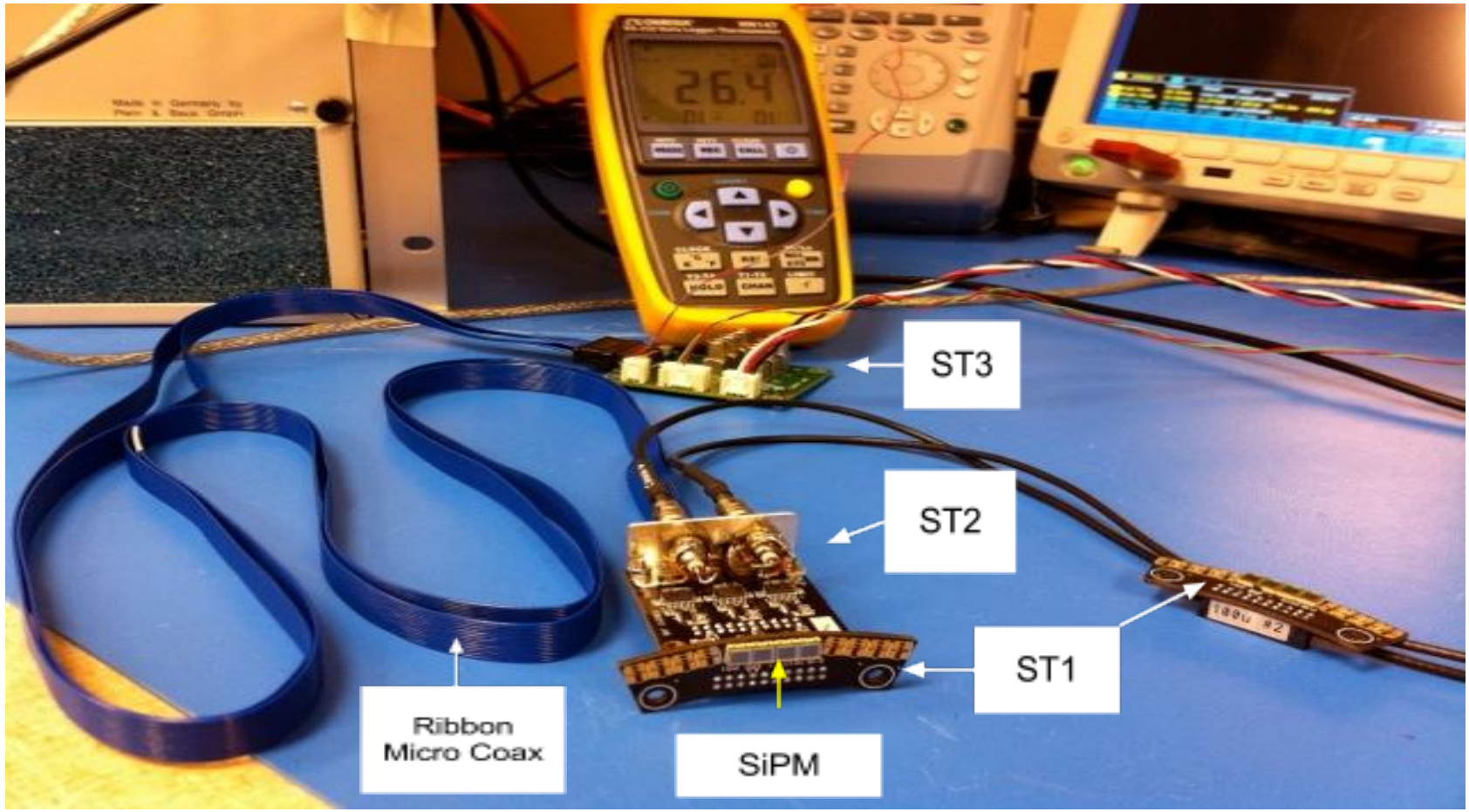
- Start Counter Read Out
- Experimental Setup
- Attenuation Lengths
- Time Resolution Studies
- Start Counter Construction
- Future Plans



"Old" SiPM (16, 3x3 mm array)



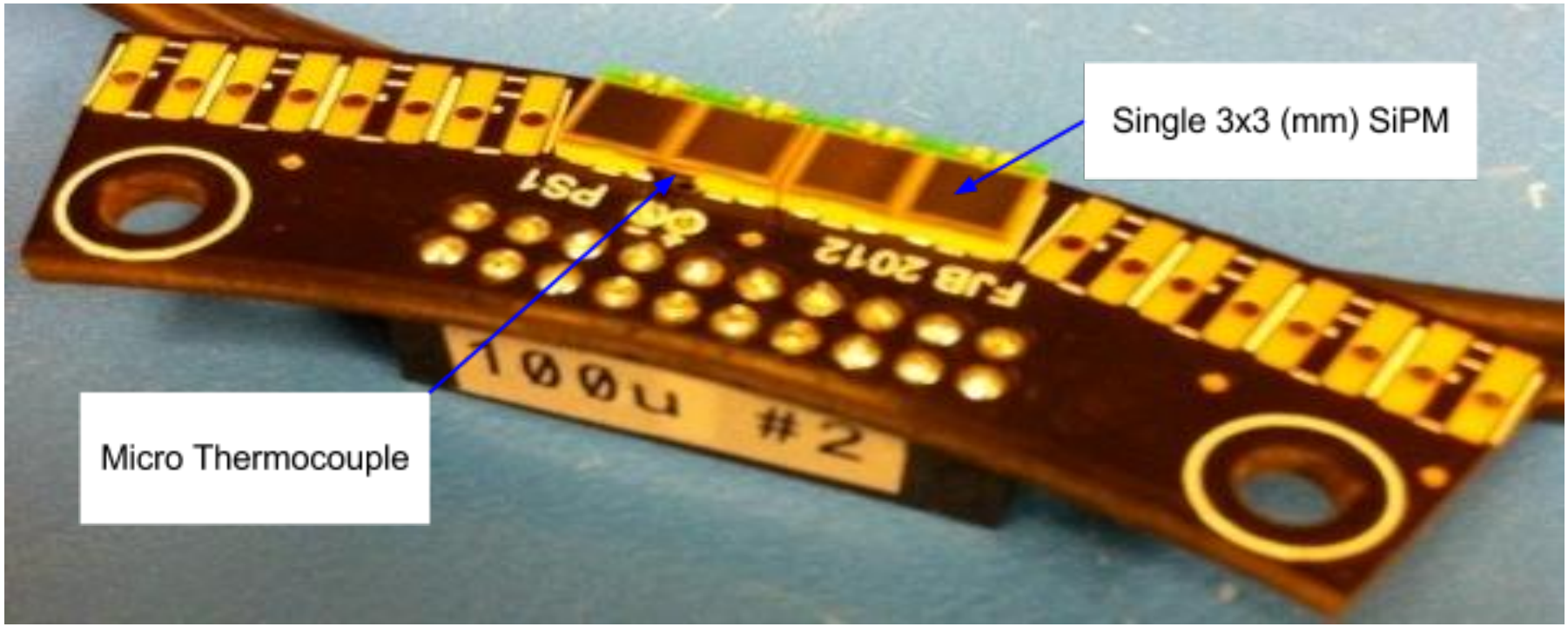
Prototype Start Counter Read Out



- ST2: Has 3 channels of preamplifiers, buffers (3 ADC outputs) and x5 amplifiers (3 TDC outputs); it has 3 bias distribution channels with individual temperature compensation via thermistors
- ST3: provides interface to the power and bias supplies, routes the 6 signal outputs and the TC output. The actual implementation will have this function installed in a chassis upstream of the ST and next to the beam pipe

Source: F. Barbosa

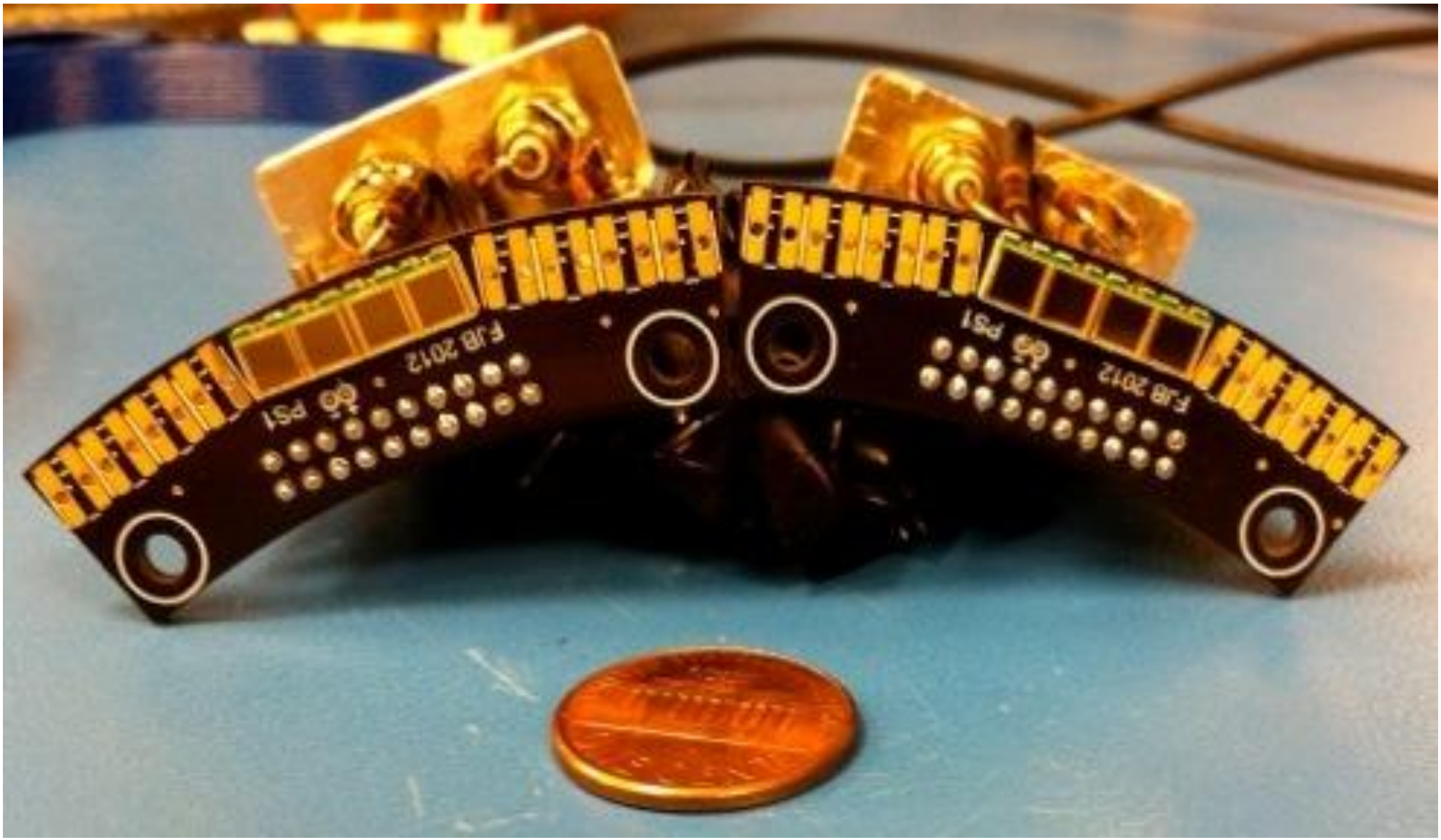
"New" SiPM (4, 3x3 mm array)



- ST1: Holds 12 SiPMs (3 x 3 mm) in alignment, implements current sum and bias distribution per group of four SiPMs and has a thermocouple (TC) for temperature monitoring
- The ST1 is aligned and rigidly attached to the detector; the ST2 is attached to the ST1 via a 90 degree hermaphroditic connector; a multi-conductor micro-coax cable assembly connects the ST2 to the ST1

Source: F. Barbosa

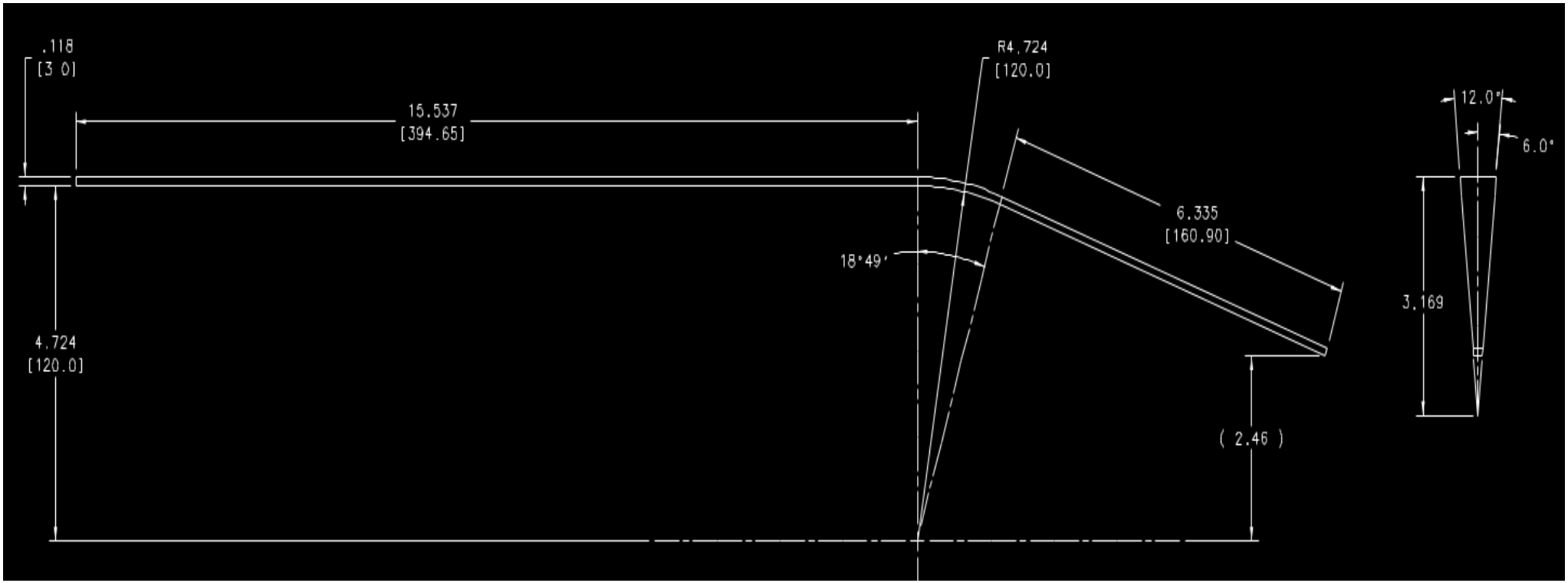
"New" SiPM (4, 3x3 mm array)

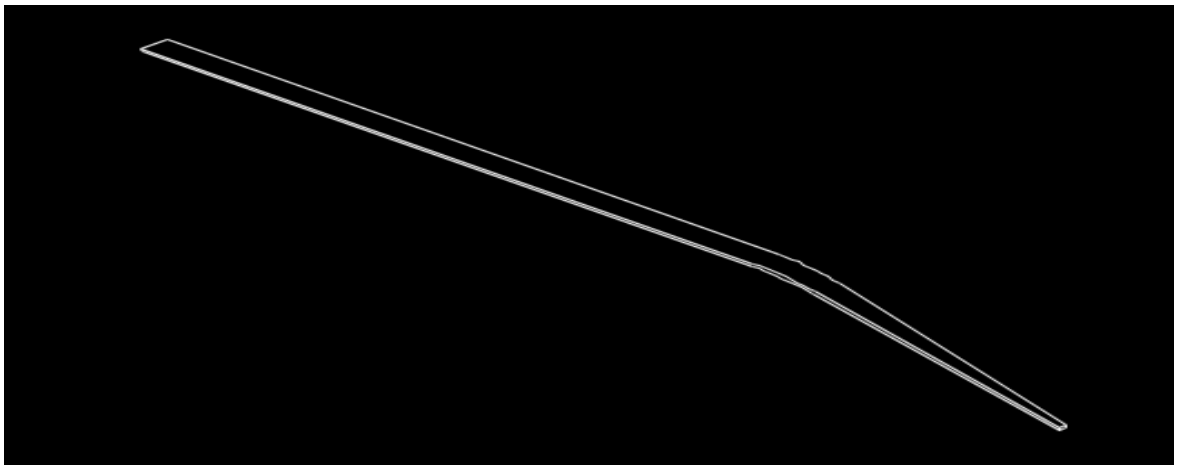


- The ST readout design has been tested and finalized

Source: F. Barbosa

Final Geometry Of Bent Scintillator

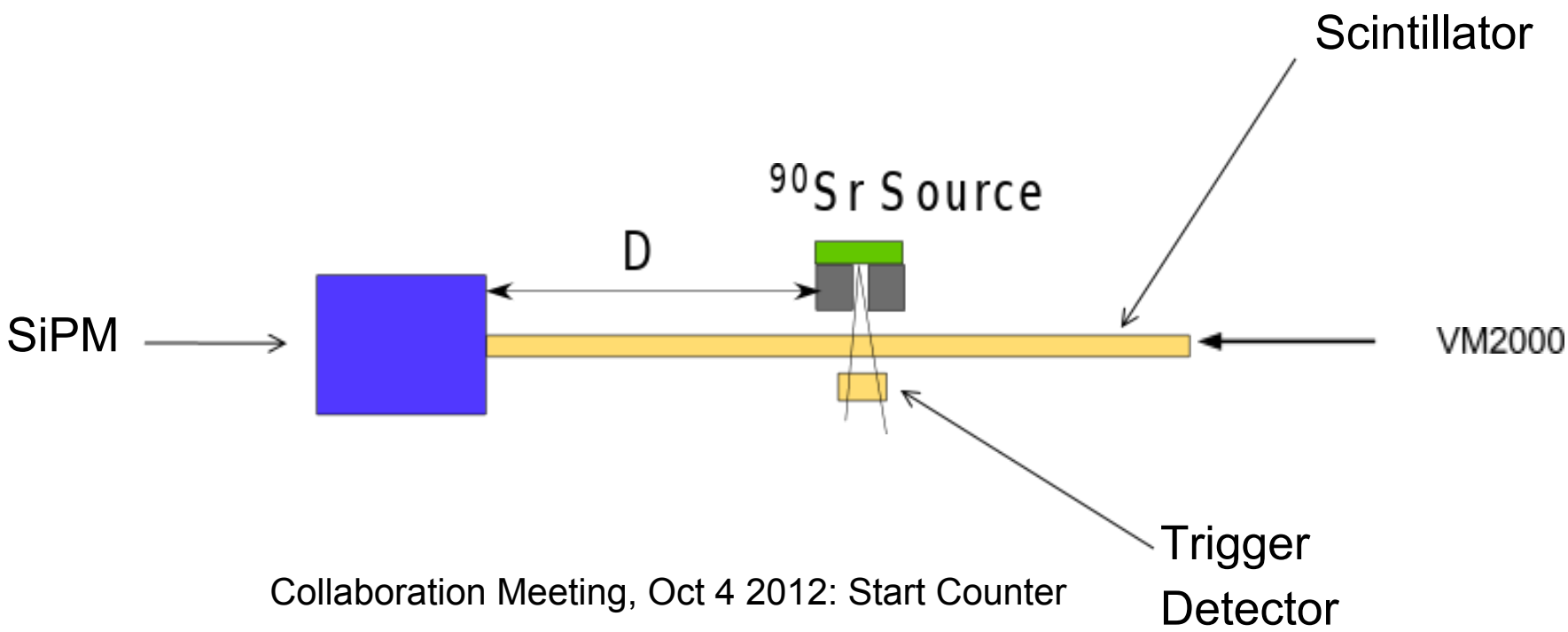




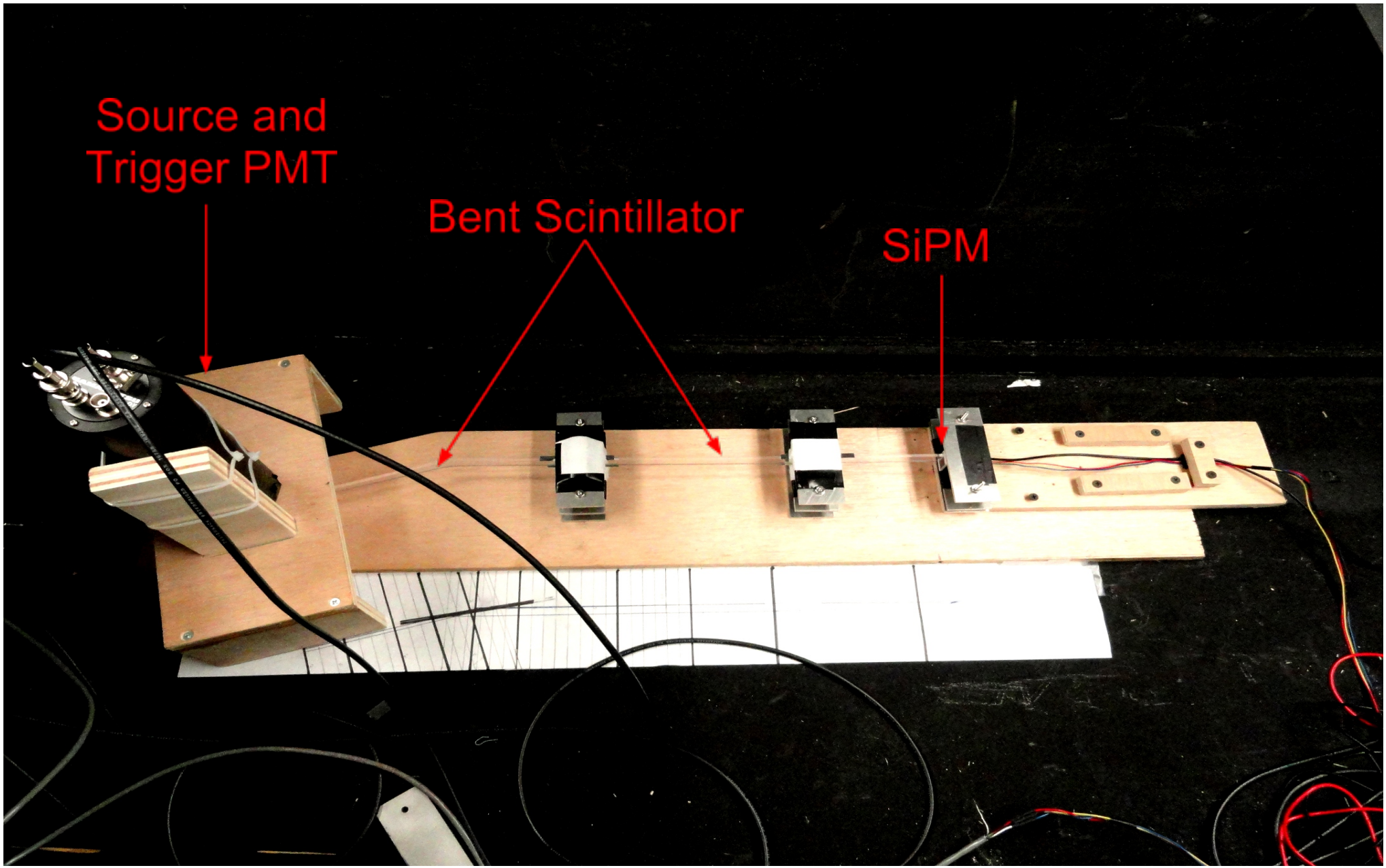
Measurements made at FIU

EJ-212 Scintillator Bar

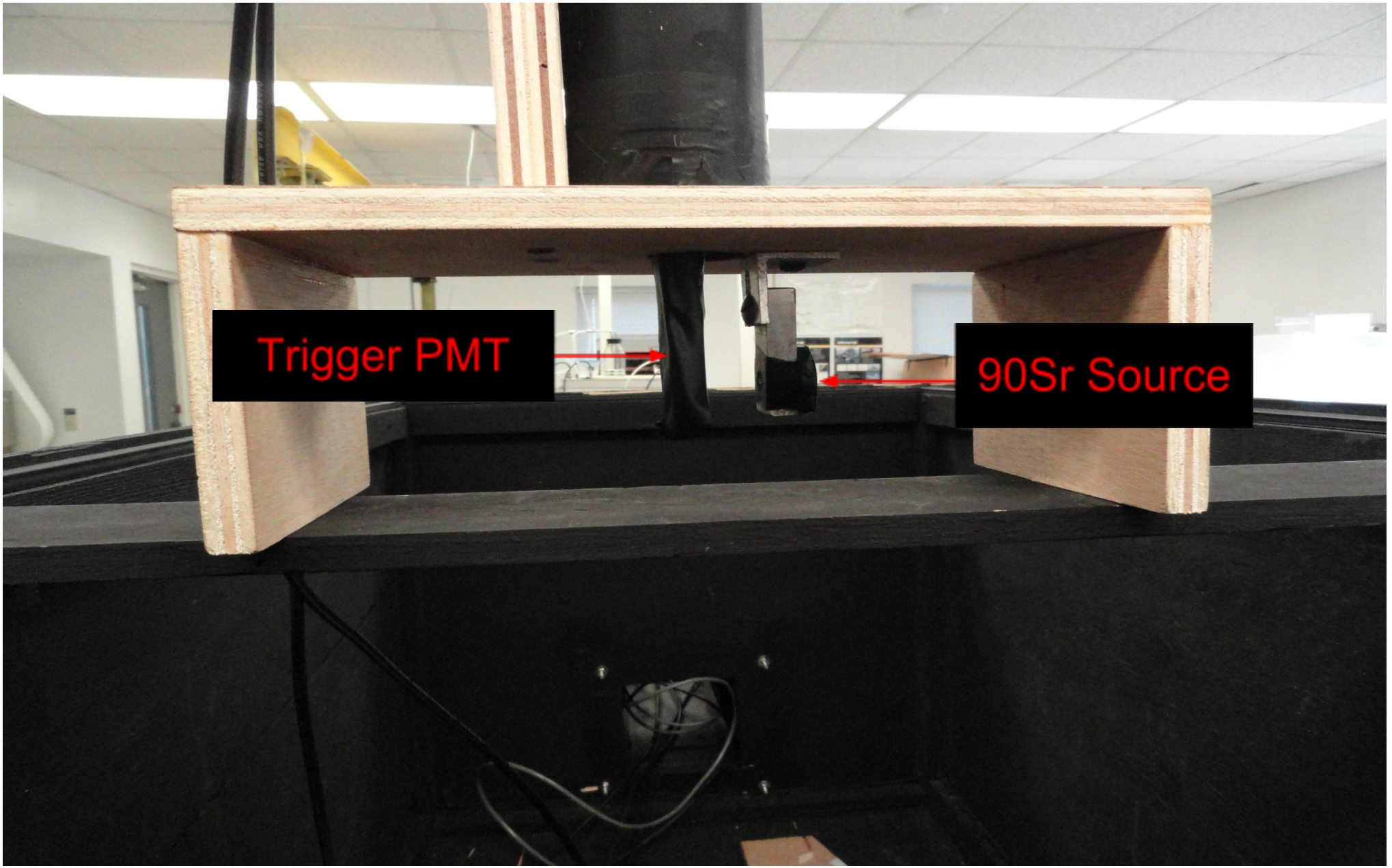
- Dimensions: 3 x 15 x 600 (mm)
  - Machined by McNeal to form 30 paddle design
- With and without a 2 micron mylar wrapped around the entire scintillator mounted in dark box
- SiPM is coupled to the scintillator
- ^{90}Sr source



Experimental Set Up



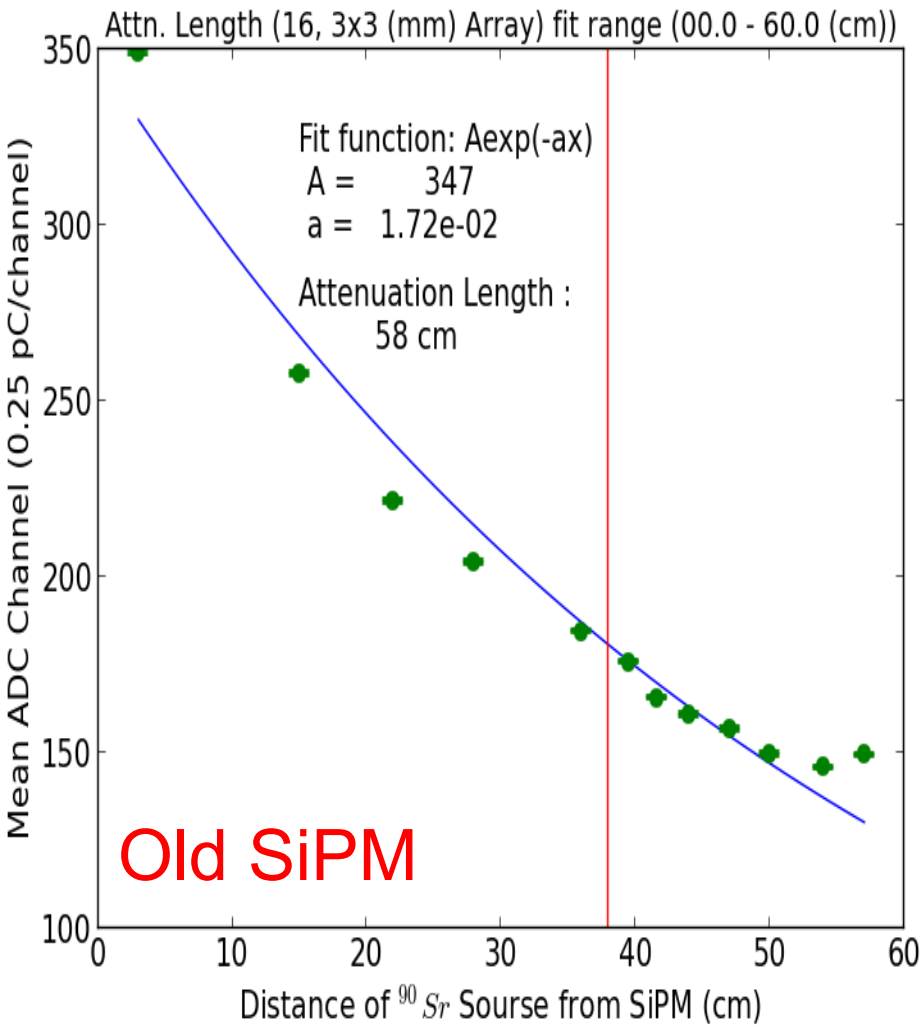
Trigger PMT and ^{90}Sr Source

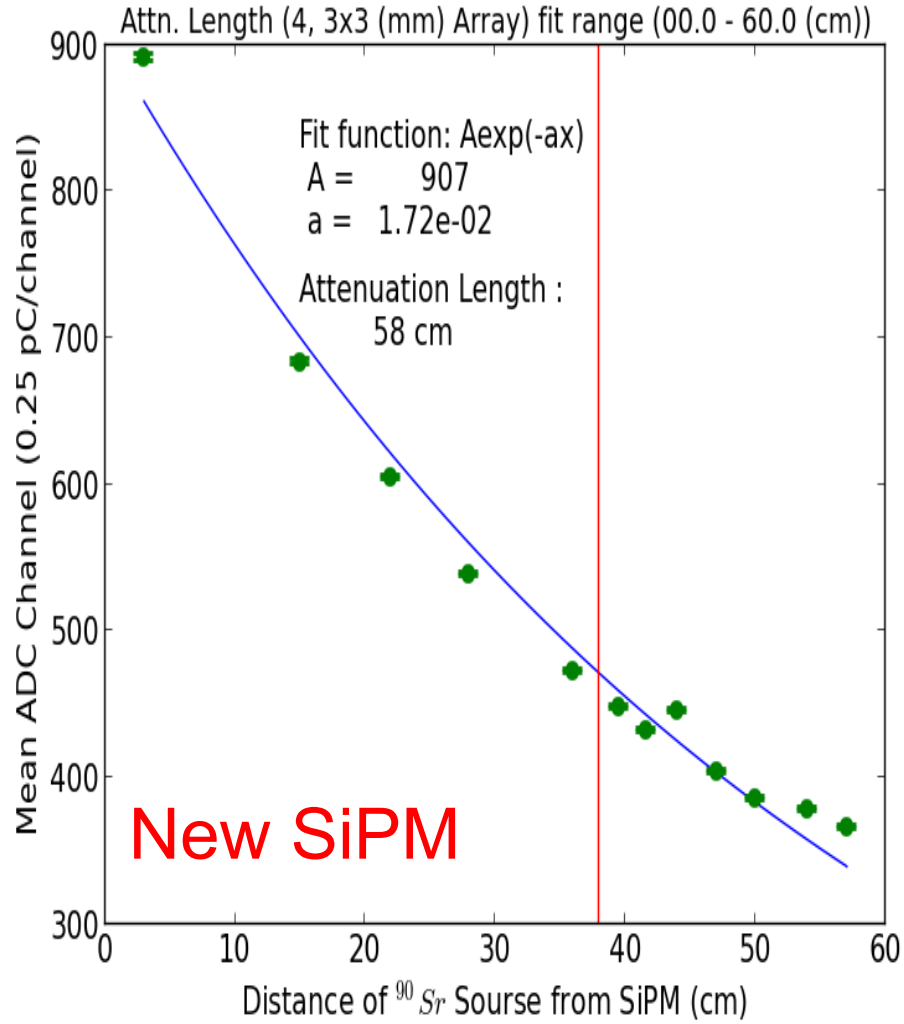


Attenuation Length Studies

- Measured the attenuation lengths
  - The EJ-212 straight bar (used as reference)
    - Comparison with the "old" and "new" SiPM's
      - "old": 16, 3x3 mm array
      - "new": 4, 3x3 mm array
  - Machined bar from McNeal
    - Wrapped and unwrapped in 2 micron aluminized Mylar

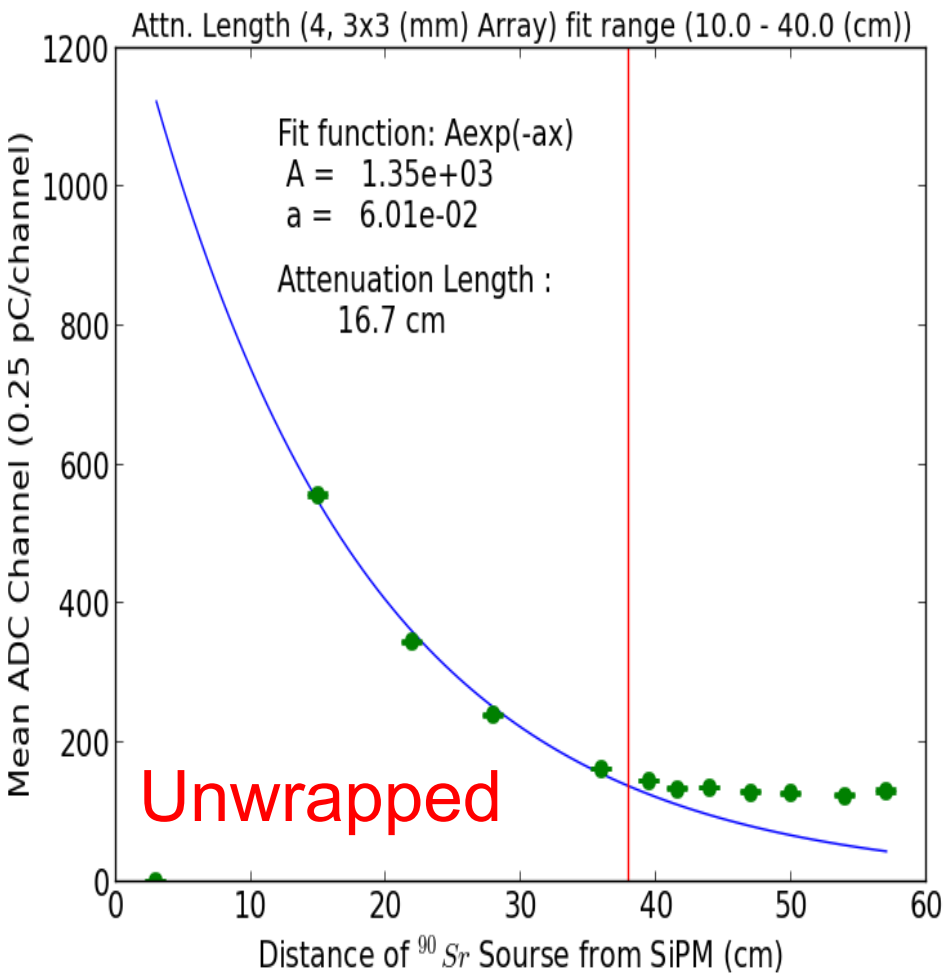
Attenuation Length (Straight Bar)

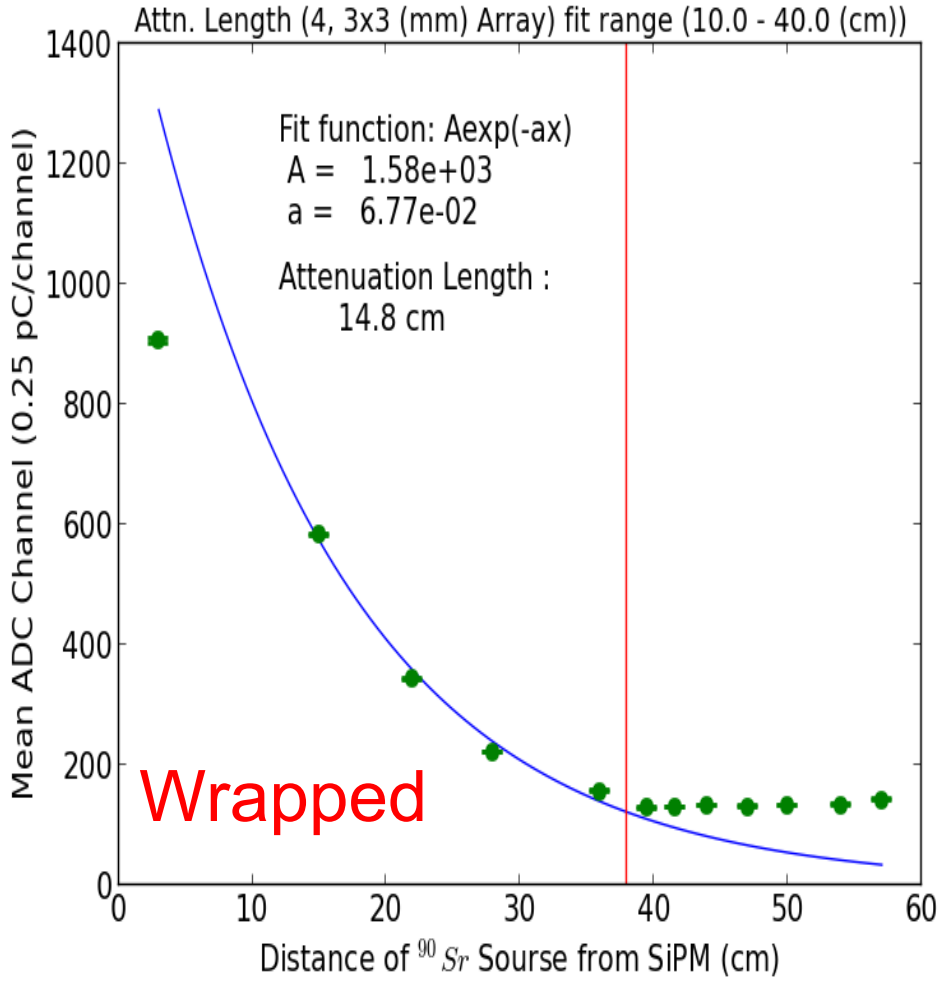




- Identical attenuation lengths measured with the "old" and "new" SiPM's

Attenuation Length (McNeal)





- Measured ~11% change in attenuation length
- We don't quite understand this effect

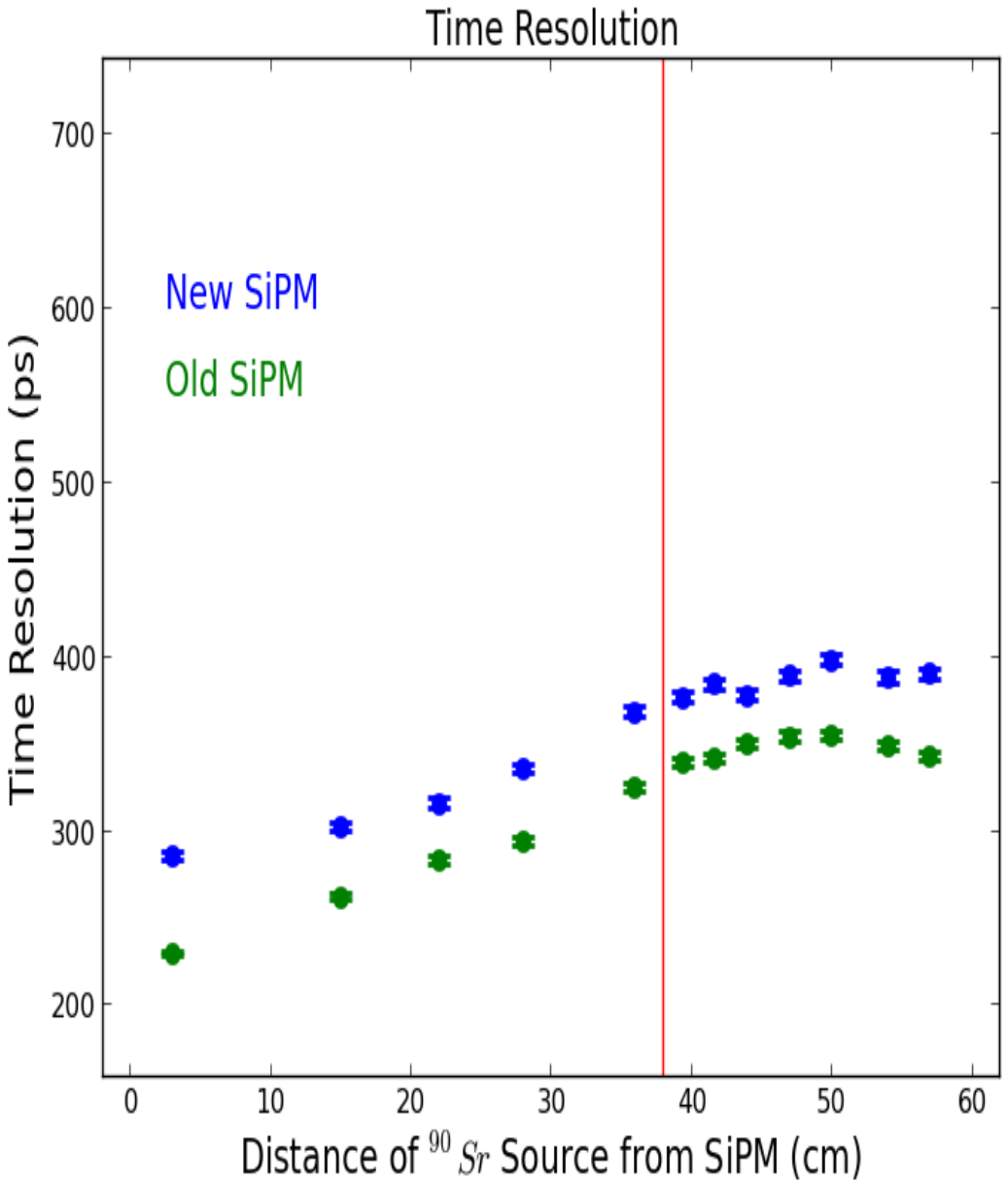
Attenuation Length Summary

- Straight bar:
  - "old" and "new" SiPM measurements are identical
- Machined (McNeal):
  - No substantial changes in measurement is observed between unwrapped and wrapped with Mylar

Time Resolution Studies

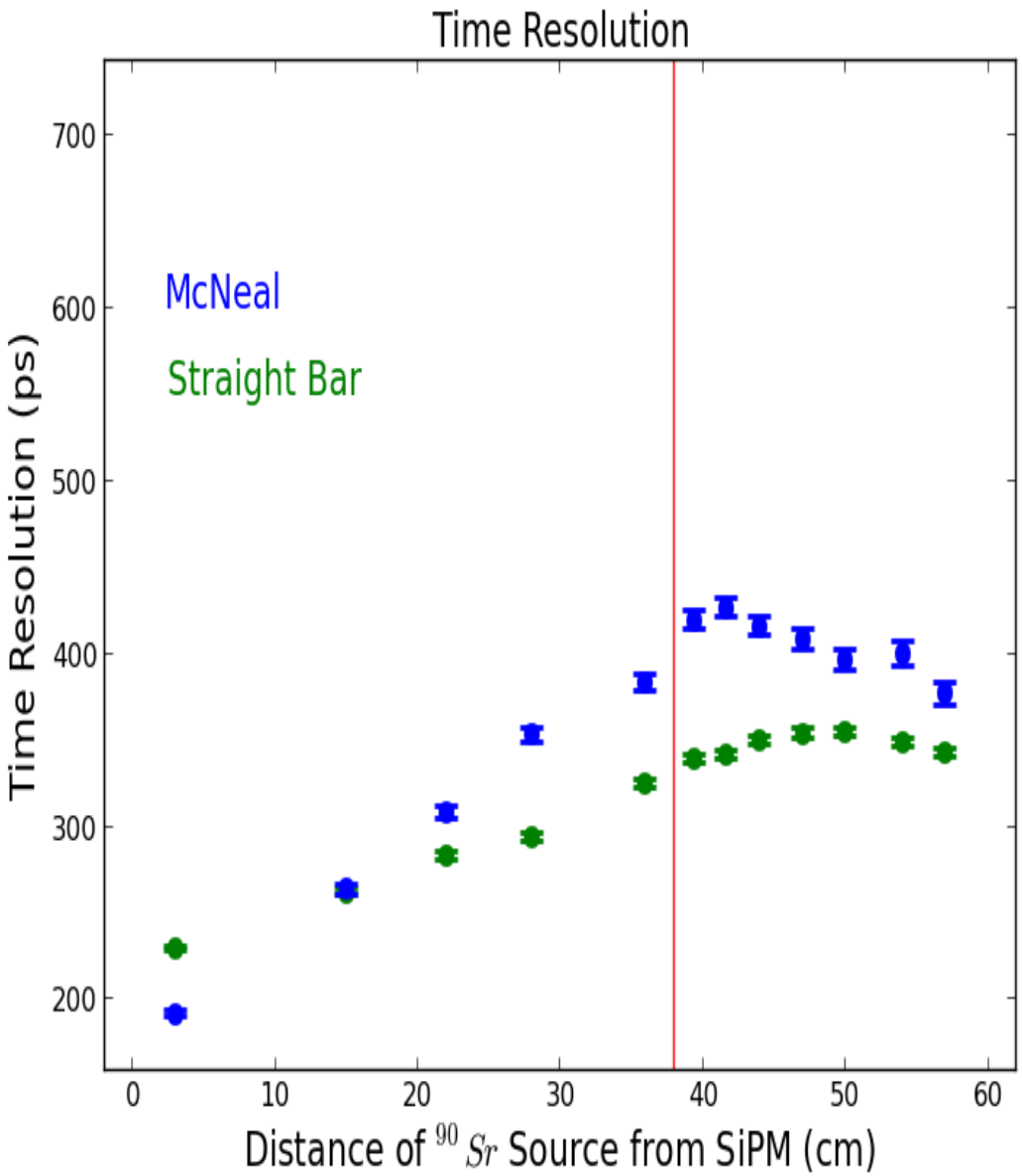
- Measured the time resolution as a function of distance of source from SiPM
- Comparative measurement with straight scintillator
  - "Old" and "New" SiPM
- Investigation of deterioration of McNeal machined bar
- Comparative measurement with and without 2 micron Mylar wrapping on machined scintillator

Time Resolution Measurements (Straight Bar)



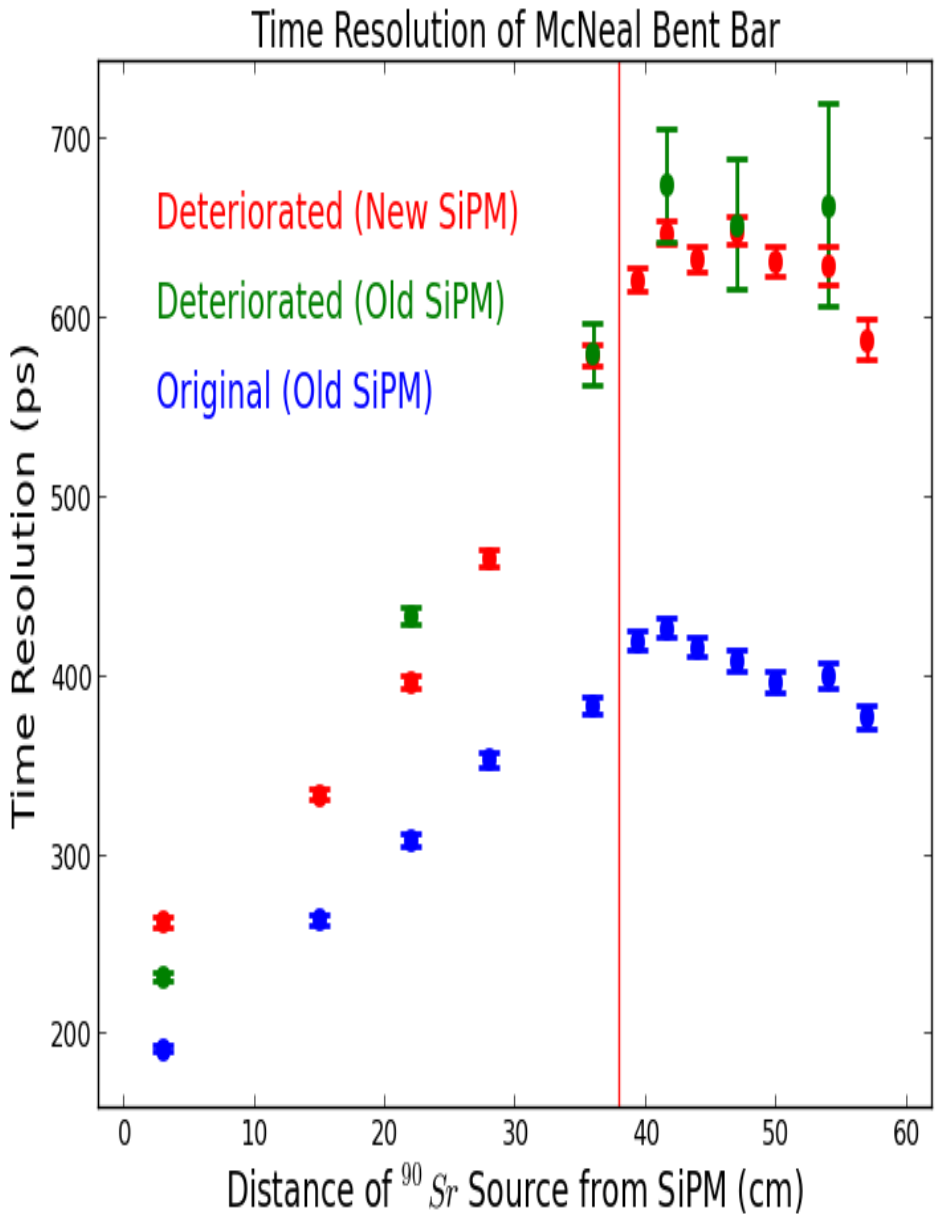
- No substantial difference between the "old" and "new" SiPM
- Average of ~80 ps difference between the "old" and "new" SiPM
- Possibly due to poor alignment of scintillator and SiPM

Time Resolution Measurements (Comparison)



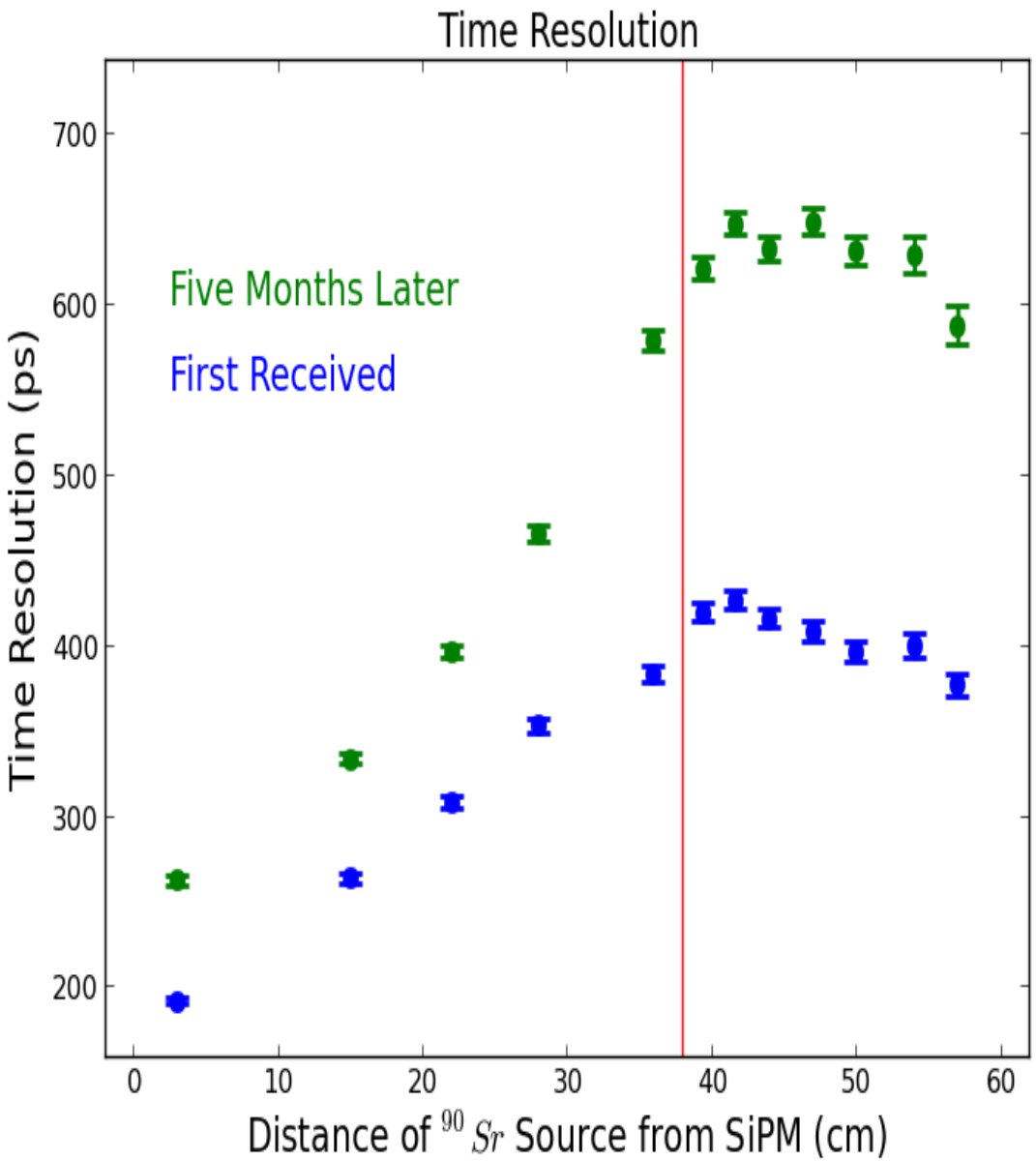
- Measurements made using the "old" SiPM
- McNeal bar measured as soon as it was received
- Best time resolution of machined paddles seen to date
- No substantial difference (~40 ps) between the McNeal bar and the straight bar
- McNeal bar is suitable for timing measurements
  - If the initial quality is maintained

Time Resolution Measurements (McNeal)



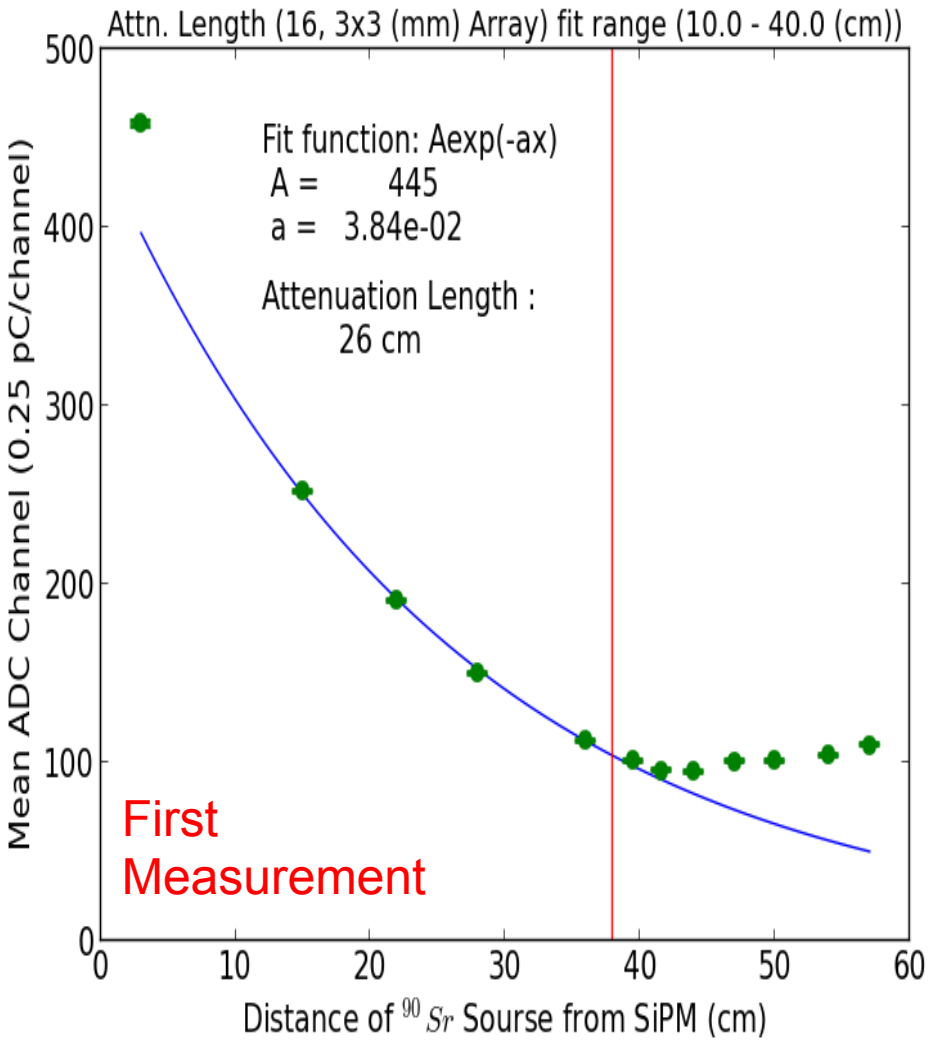
- Verified that time resolution is reproducible between the "old" and "new" SiPM
- Deterioration of McNeal paddle is evident

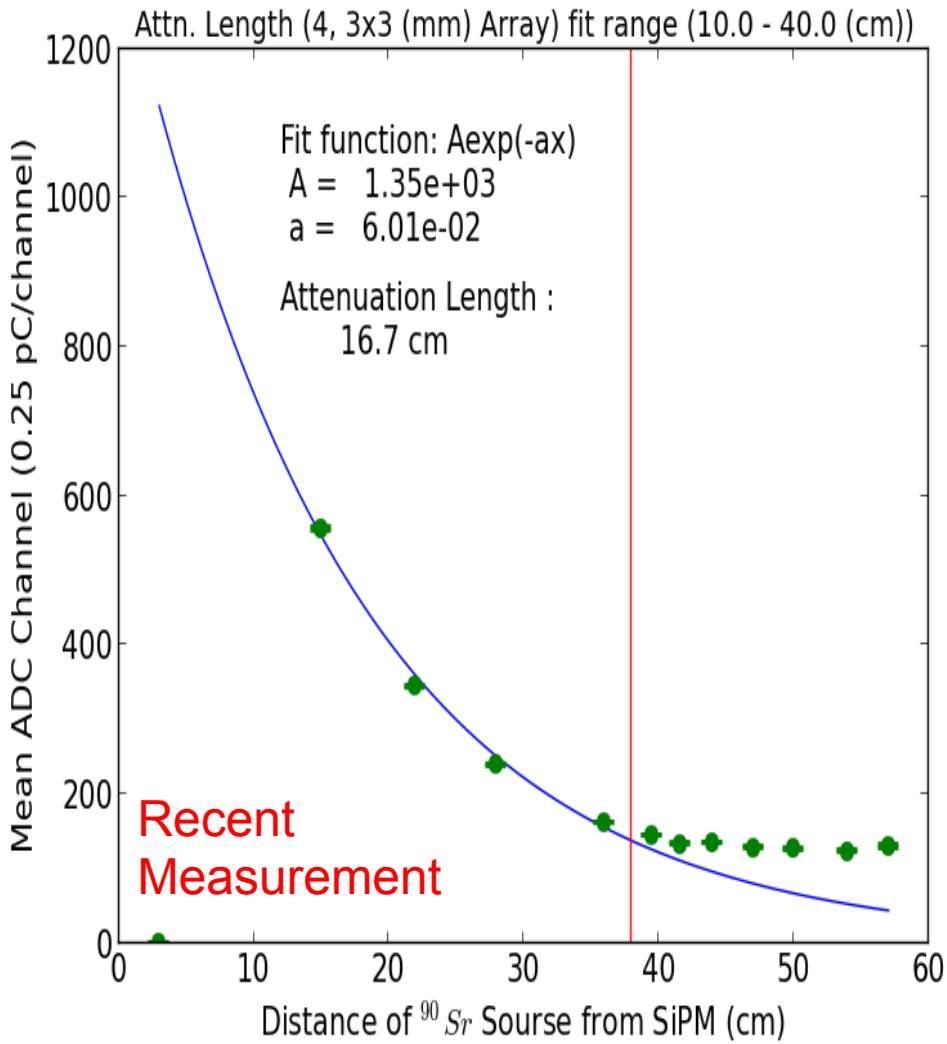
Time Resolution Measurements (McNeal)



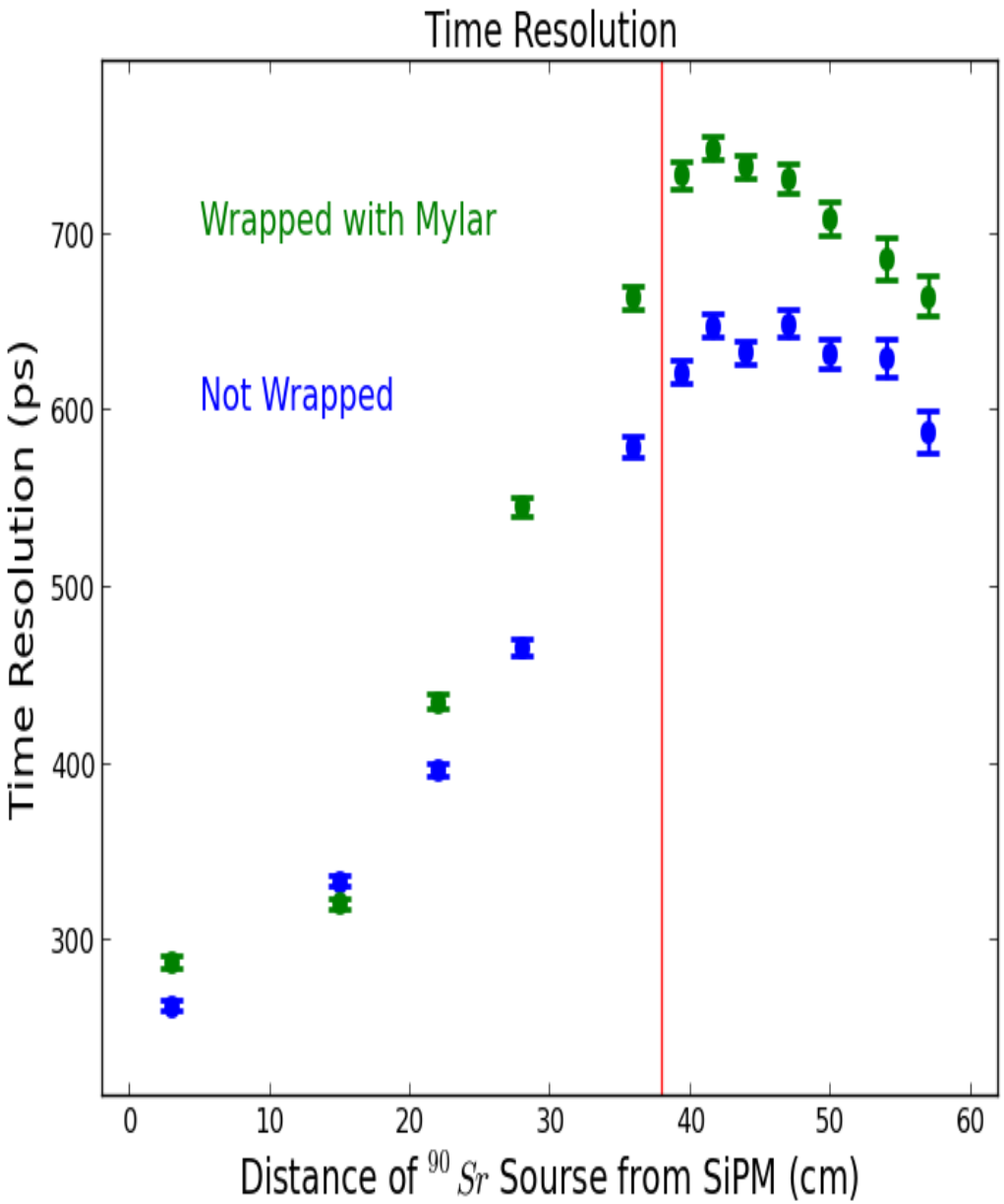
- There is visible deterioration in the McNeal bar
  - Surface crazing
  - Poor surface reflection
- Average time res. reduction of ~175 ps
- This is also seen in the attenuation length measurements

Attenuation Length (McNeal)





- Five months have elapsed between these two data sets
- ~35% change in attenuation length measurements



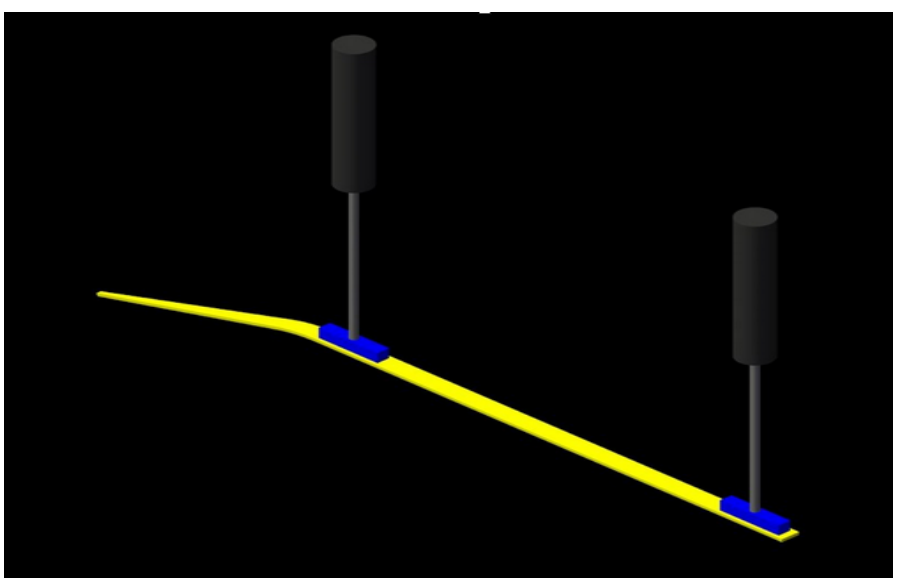
- Time resolution is reduced with Mylar wrapping
  - Attenuation length as well
- This effect is not clear

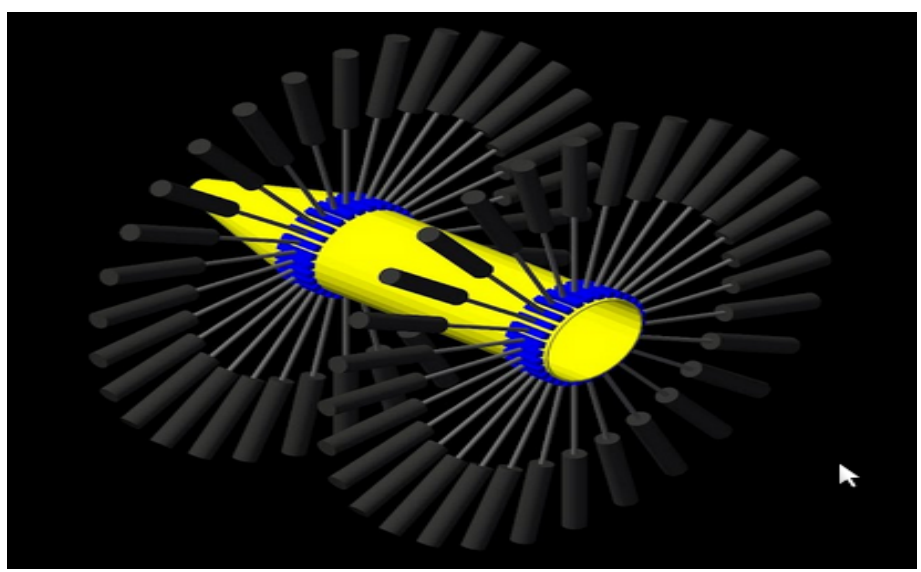
Time Resolution Summary

- Time resolution of straight bar was reproducible with "old" SiPM
  - Ensures that it had not undergone any deterioration despite being in the dark box for extended period of time
- Deterioration of bent bar possibly due to chemical reaction
  - Chemical used my McNeal in the manufacturing process

Future Plans

- 3 Newly machined scinitillators should be arriving from McNeal by the end of the week
  - Testing and quality control measures will be taken
- Designs regarding construction of start counter
- Cross talk tests with aluminized Mylar utilizing complete ST1, 2, 3 readouts
- Preperation for fabrication





Thank you for your time!

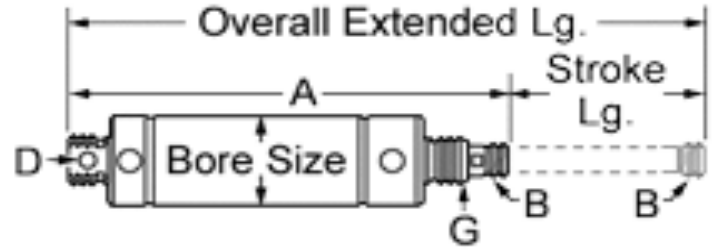
Questions?

McMaster-Carr Products

94 Products

Switch-Ready Stainless Steel Air Cylinders

Shown with Switch
(Sold Separately)



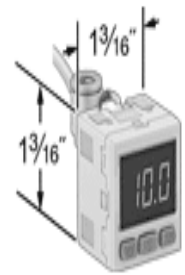
Digital Pressure Switches

- Use with air, water, and hydraulic oil
- Pipe Connection: Type 316 Stainless Steel NPT Male
- Amp Rating: 10 amps @ 250 volts AC

Install a switch that provides pressure readings at the source of your application. Set the LED to show your pressure, actuation point, or deactuation point. Digit height is 1/2". Accuracy is ±0.5%. Switches are single pole, double throw (SPDT)—they switch one circuit.

Housing is epoxy-coated aluminum and seal is Type 17-4 PH stainless steel. Temperature range is -20° to 180° F. Enclosure is NEMA 4X (washdown/corrosion resistant). Switches have screw terminals and a 3/4 NPT female conduit port.

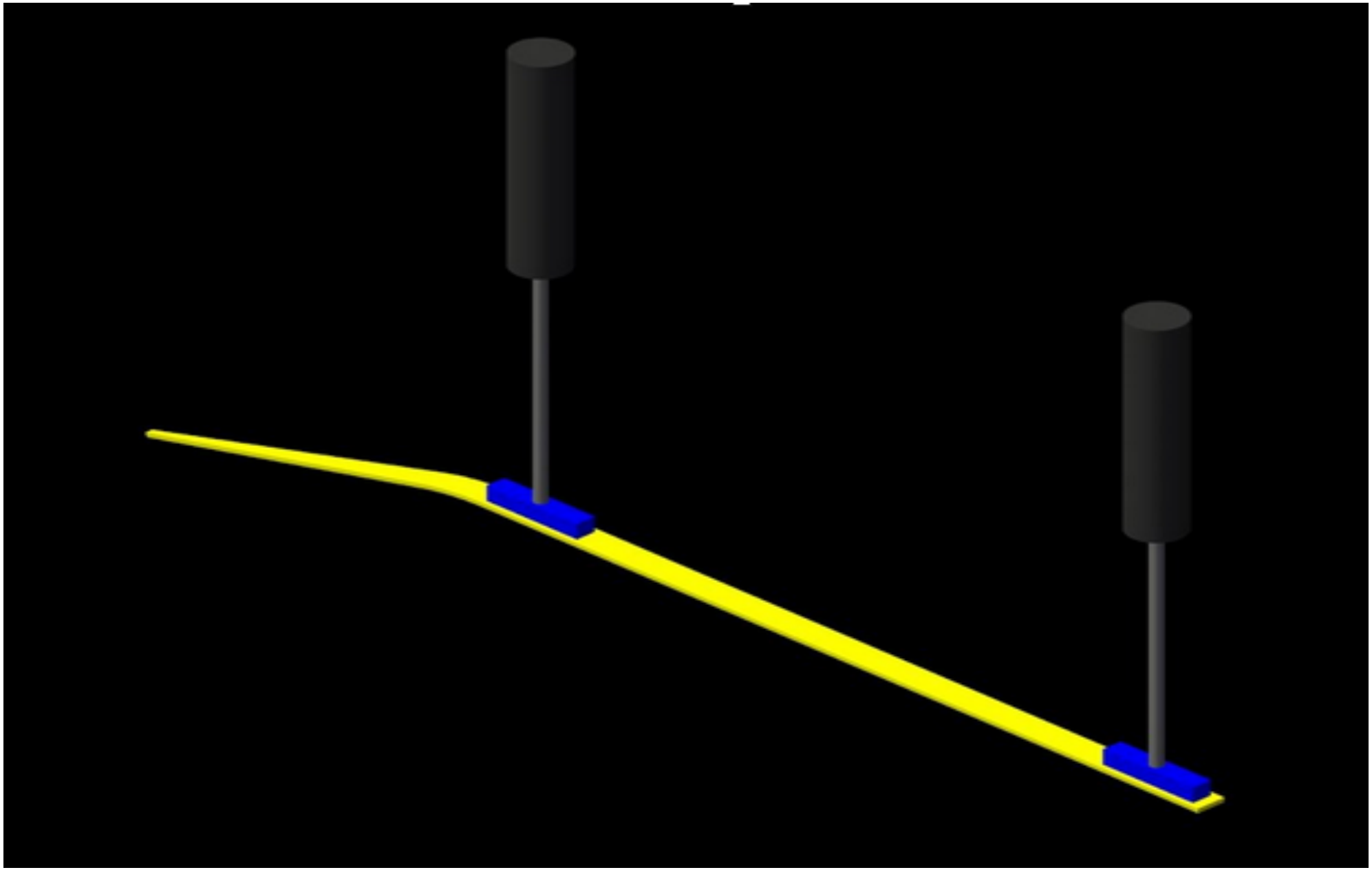
Miniature Digital Pressure Switches



- Use with air, argon, and nitrogen
- Connection: Nickel-plated brass
- Amp Rating: 80 mA @ 28 volts DC

Small enough to fit in tight spaces, use these switches with your programmable logic controller (PLC) for process automation. Set the LCD to show your pressure, actuation point, or deactuation point. Digit height is 3/8". Accuracy is ±0.2%. Housing is PBT plastic (polybutylene terephthalate) and seal is nitrile. Temperature range is 32° to 122° F. Switches have wire leads. View information about NPN and PNP switches.

Single Paddle with Pneumatic Cylinder



30 Paddles