University *of* Massachusetts
Amherst
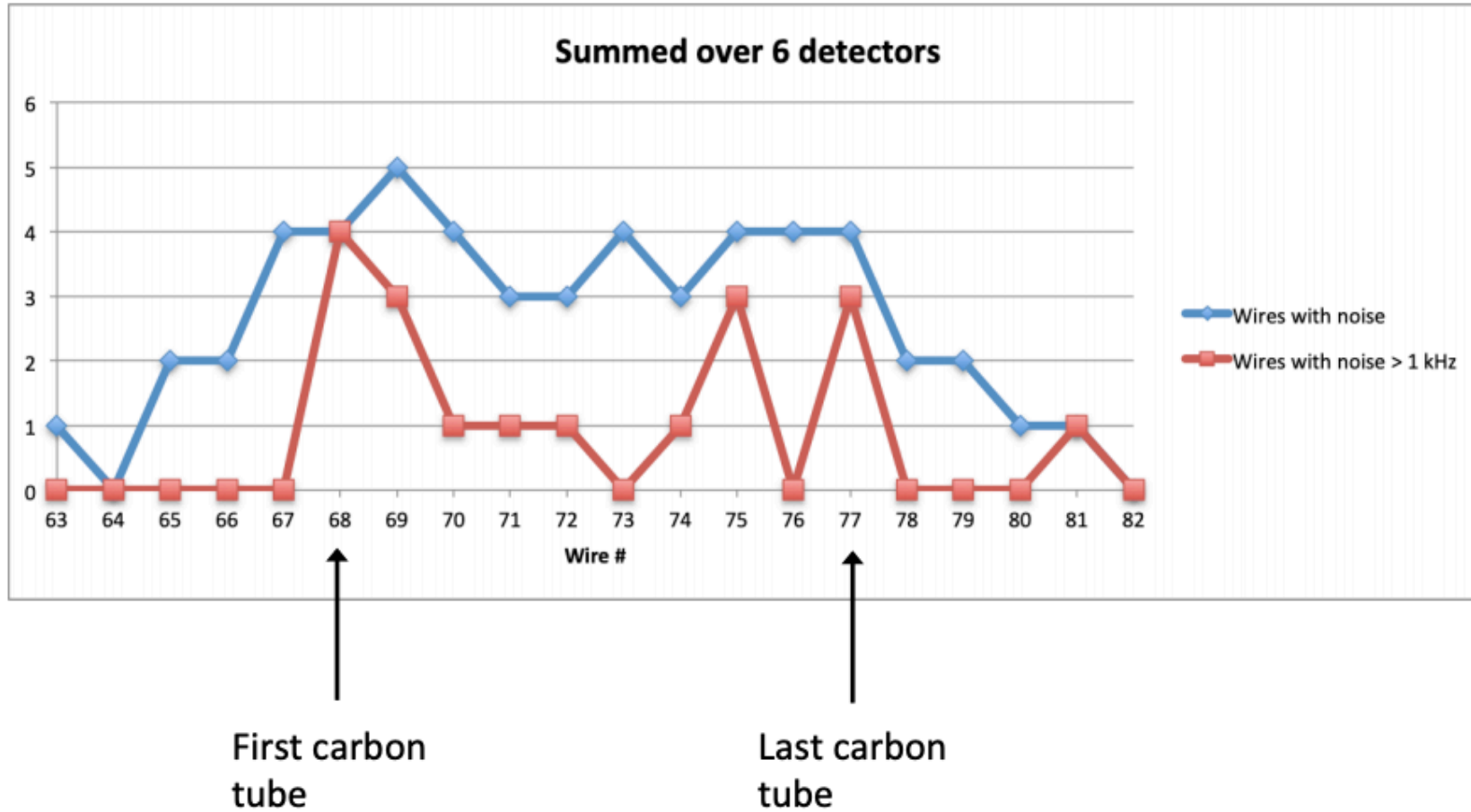
MENP

Wire Capacitance In Garfield++
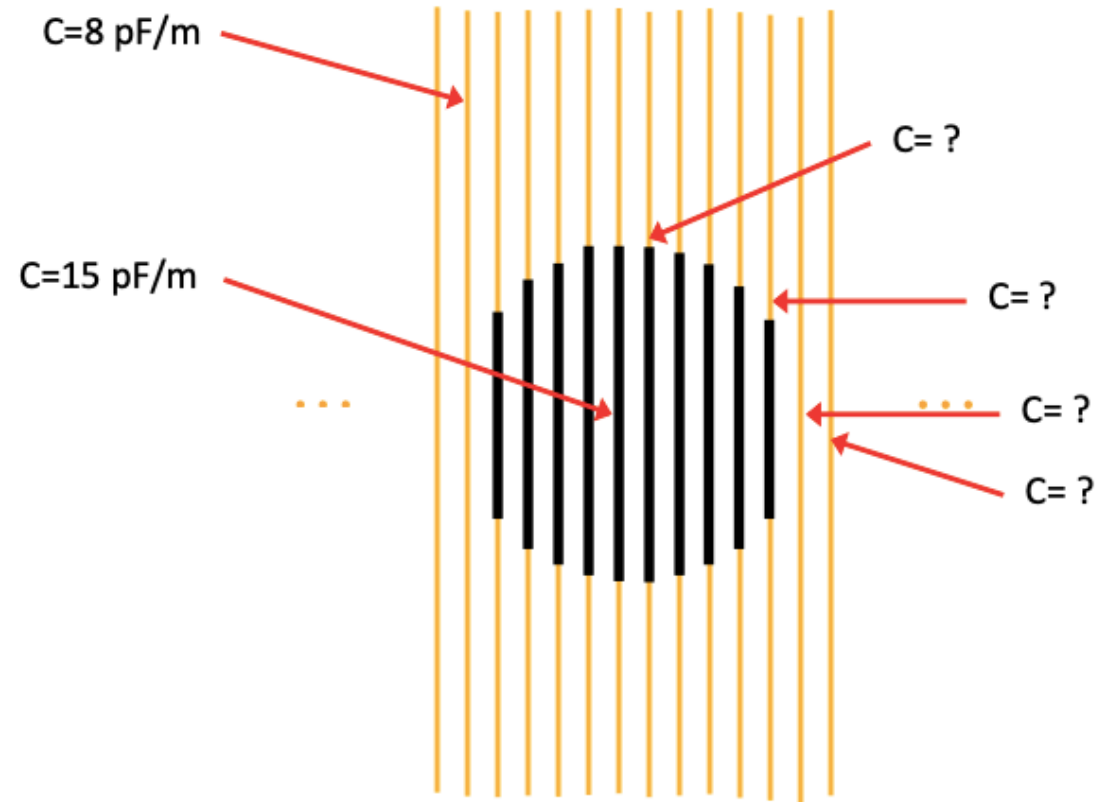
Andrew Schick

September 18, 2019

Wires with avalanche discharge
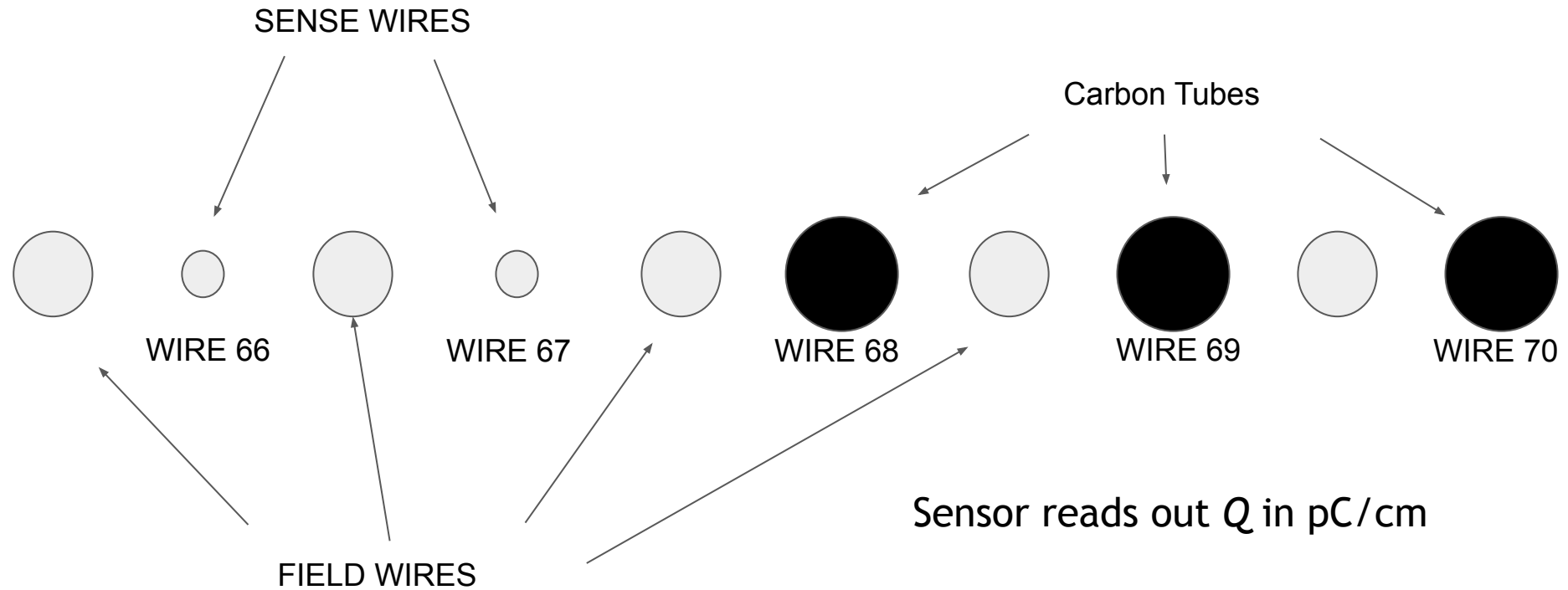

First carbon
tube

Last carbon
tube

Carbon tube layout in detectors 1 to 6 (field wires not shown)

C=8 pF/m

C=15 pF/m

C= ?

C= ?

C= ?

C= ?

Garfield++

- Garfield++ is an electric field solver
- Has analytic field solutions implemented for simple geometries (e.g. two planes with wires in between.)
- Has non-analytic methods implemented as well
- 2D and 3D cases simple to solve using analytic method—but there is no simple way to change a wire thickness midway through the wire. —> *Make the MWPC in Geant4 and import*
- Place wires in a box filled with gas. Each wire has a "sensor" that reads out the charge, *Q,* on them.

2D Case
Enlarged View Near Central Region

SENSE WIRES

Carbon Tubes

WIRE 66   WIRE 67   WIRE 68   WIRE 69   WIRE 70

FIELD WIRES

Sensor reads out Q in pC/cm

$$C = (100 \text{cm/m}) \cdot \frac{Q}{1800\text{V}}$$

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Capacitance vs. Wire Number