

# Mu2e CO2 leak test progress

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July 6<sup>th</sup> 2015

# Minnesota group introduction

- 5 people in Minnesota CO2 leak test group
  - Dan Conin-Hennessy (Associate Prof.)
  - Hajime Muramatsu (Post Doc)
  - Daniel Ambrose (Post Doc)
  - Andrew Vold (Grad Student)
  - Yan Ke (Undergrad Student)
- I've been working on the CO2 leak test since April 2015

# CO2 Leak rate test apparatus

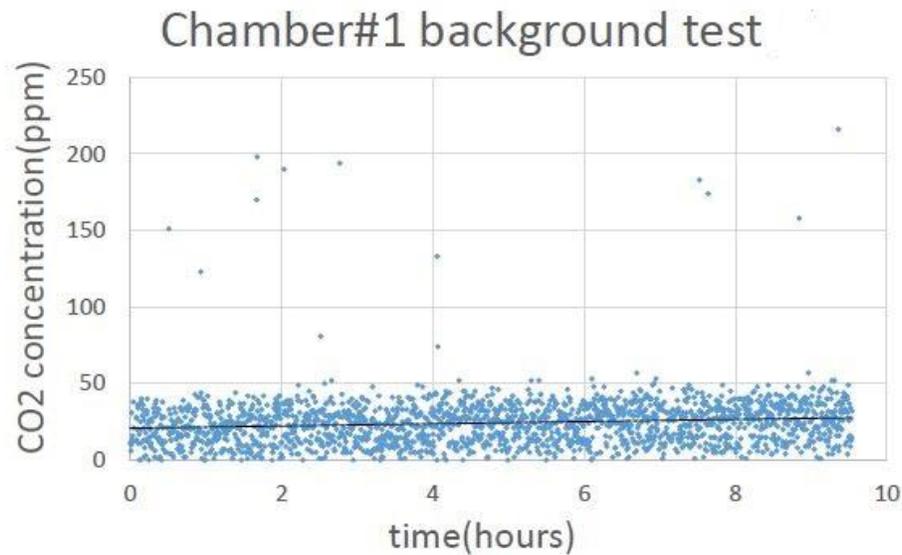


- There are 3 working chambers now
- Chamber leak rate  
(Background leak rate)

Each chamber has leak rate from CO2 outside to inside of less than  $7.3 \times 10^{-6} \text{ ccm/min}$ . The upper limit of the leak rate for each straw is  $3.3 \times 10^{-4} \text{ ccm/min}$

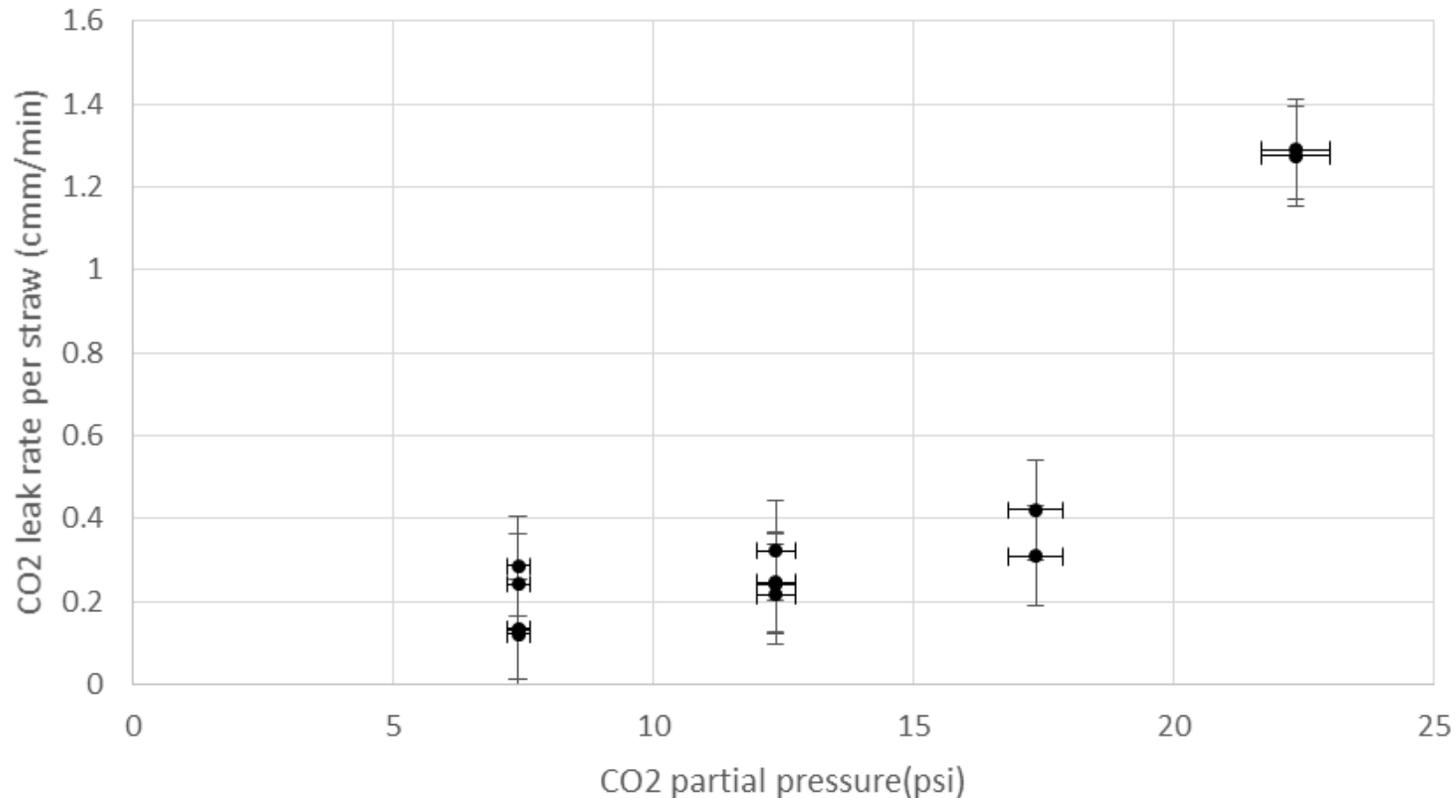
- Chamber volume:
  - The geometry estimate for chamber #1 is:
- For each straw measurement, we flushed the chamber with Nitrogen for around 2 mins
- 50% 50% Argon CO2 mixture used for pressurizing the straw.

Change chambers picture, flush rate unit?.



# Straw leak rate in different pressure

Leak rate of st00135 vs. CO2 partial pressure

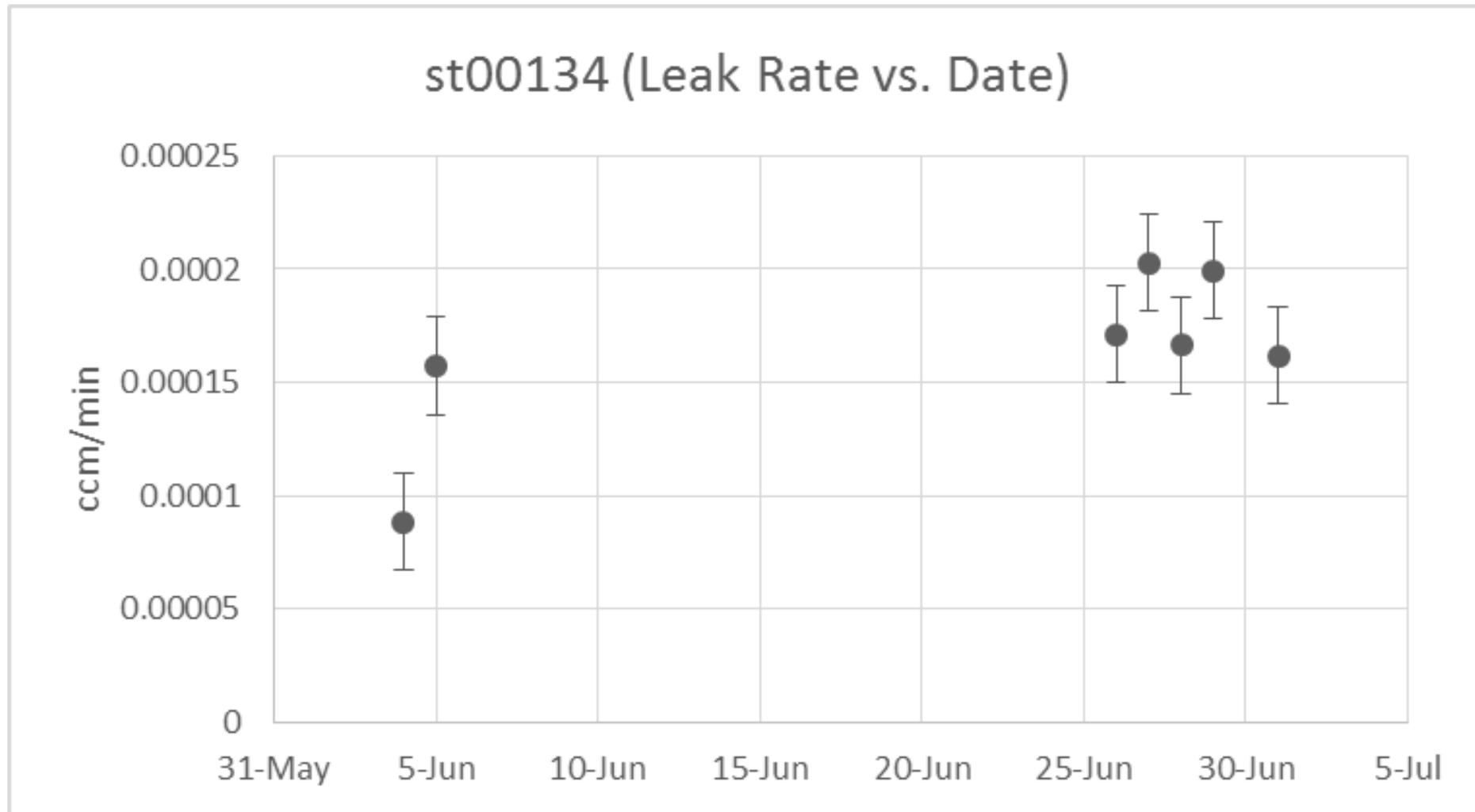


Explanations for this plot:

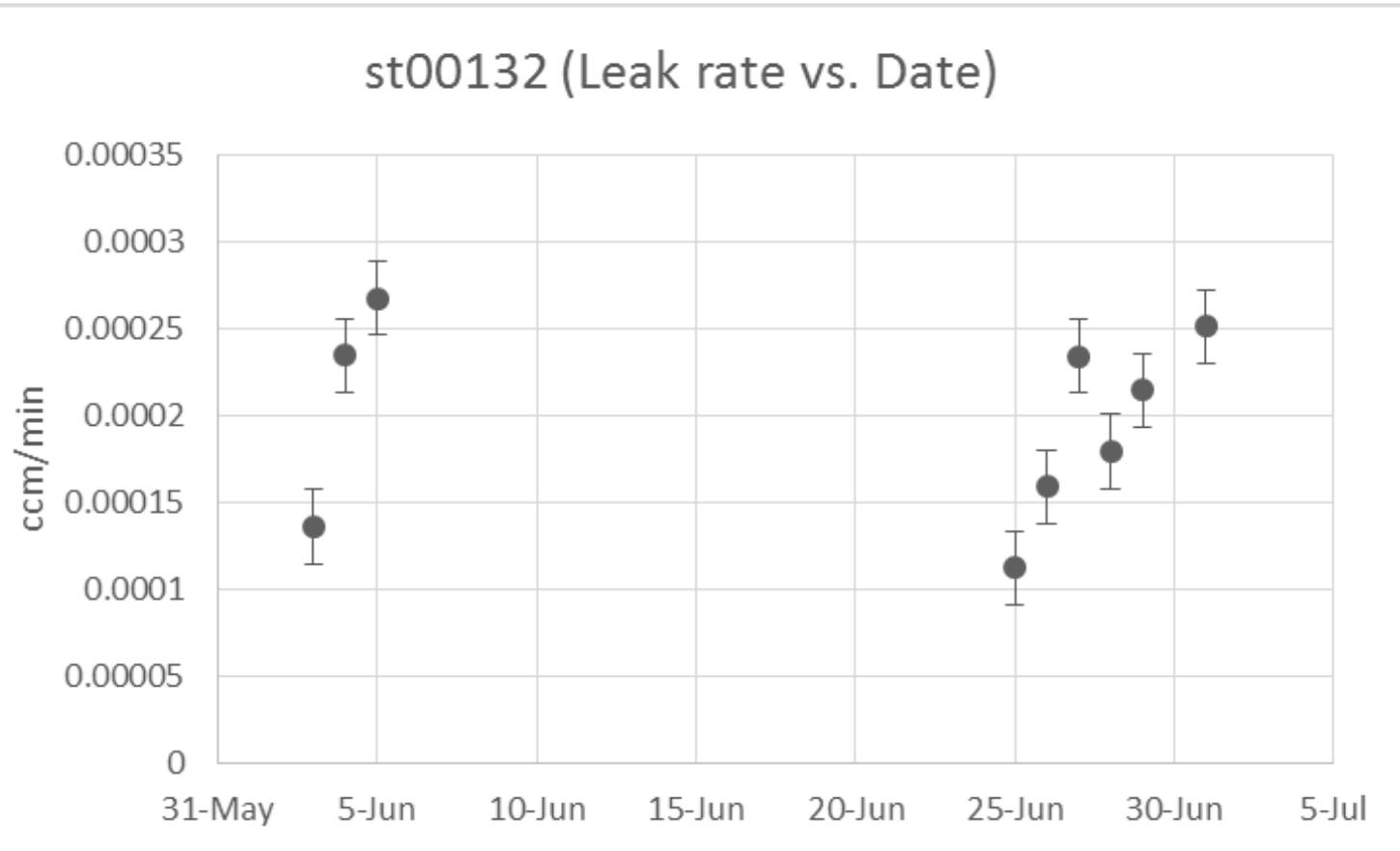
- For each data in the plot, it takes 1.5 hour of measurement.
- The error bar is based on 50 rounds of air back ground test
- All the test is been done by the same chamber and detector
- The leak rate increasing rate becomes much higher when co2 partial pressure goes to 22.35
- 15psi CO2 partial pressure in the plot represents 1 atm difference between inside the straw and outside. This is what will be using in Mu2e experiment.
- The upper limit of the leak rate for each straw is  $3.3 \times 10^{-4} \text{ ccm/min}$
- **Reminder: Error bar and unit need to be changed**

# Leak rate consistency test (straw 00134)

Straw 00134 seems consistent with itself



# Leak rate consistency test (straw 00132)



- It seems the leak rate is not consistent with it self.
- More consistency test on this straw need to be done because the increase of the leak rate might be a small probability event or indicate the straw have some kind of “memory” or other reasons we don’t know.
- This slide might need to be deleted

# Plans for coming weeks

- Will build a few more chambers .
- Will perform multiple measurement simultaneously.
- Do more consistency tests, including pressure dependency
- Do more background test.
- 10 new straws, calibration syringes and needles just arrived from Fermilab!
  - We have 2 kinds of viton here, one is hard one, the other one is soft. Soft viton start to have CO<sub>2</sub> leak after been pressurized for 2 hours, the hard viton can hold CO<sub>2</sub> for 5 hours without leak. Our straws is glued with soft ones. We are going to glue hard viton on the new straws to minimize the statistical error or do 1.5 hour measurement on each straw several times a day.
  - Do calibration tests on each chambers.