GEM Detector Hardware Meeting

Weekly update from INFN-LNF

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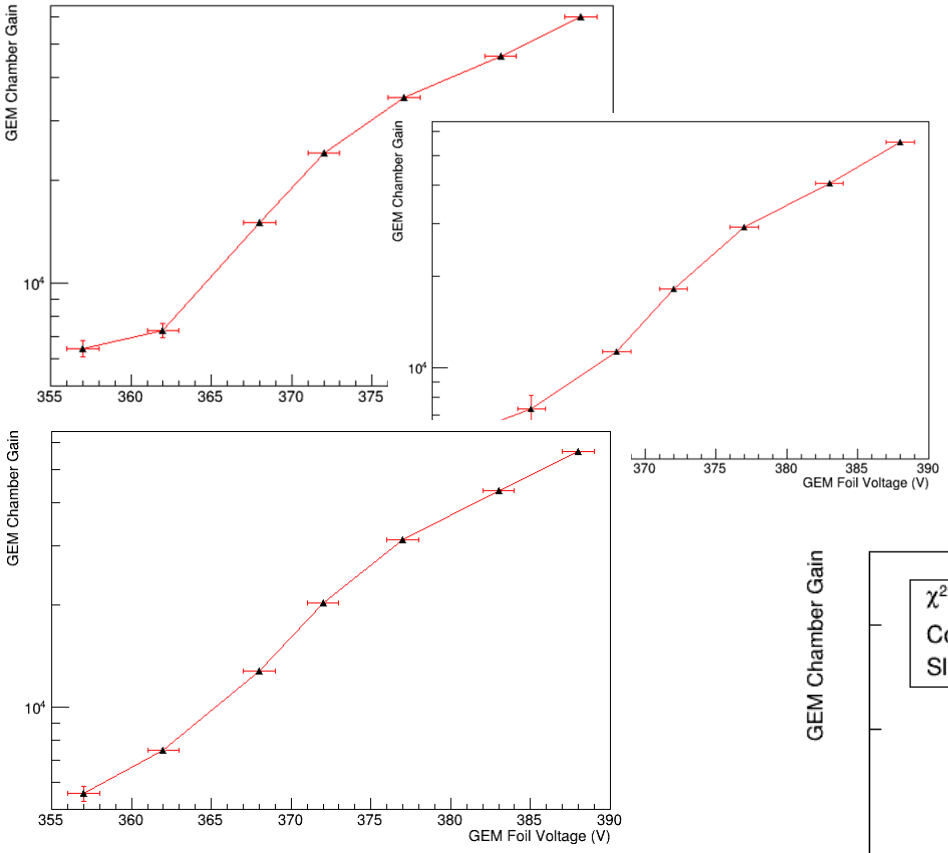
29th July, 2014

What We Did - Gain Curves

- From last presentation, we had several gain curves for 70% Ar, 30% CO_2 and one for 90% Ar, 10% CO_2.

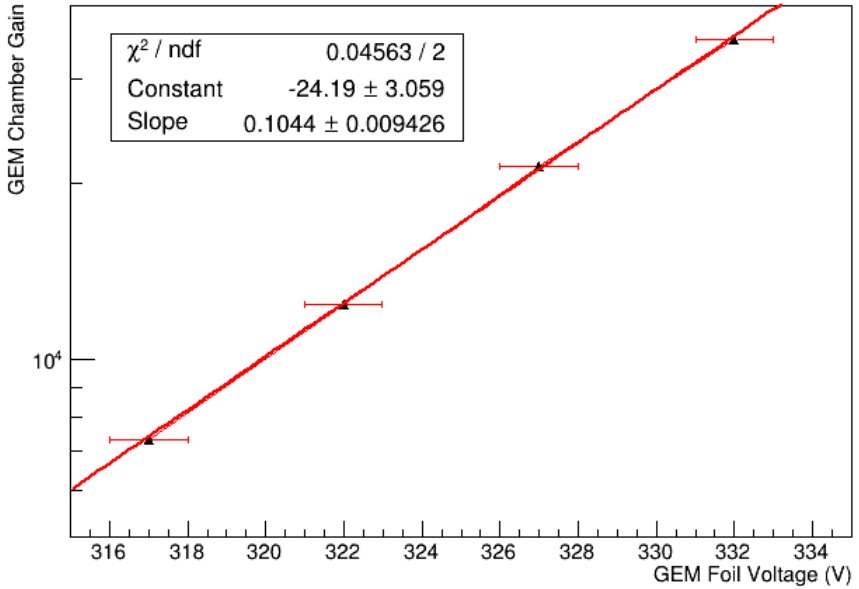
- Since then, we took two more measurements for 70% Ar, 30% CO_2 and two for 80% Ar, 20% CO_2. These measurements had interesting similarities…

Gain Curves - From Last Time…



70% Ar / 30% CO_2 (right)

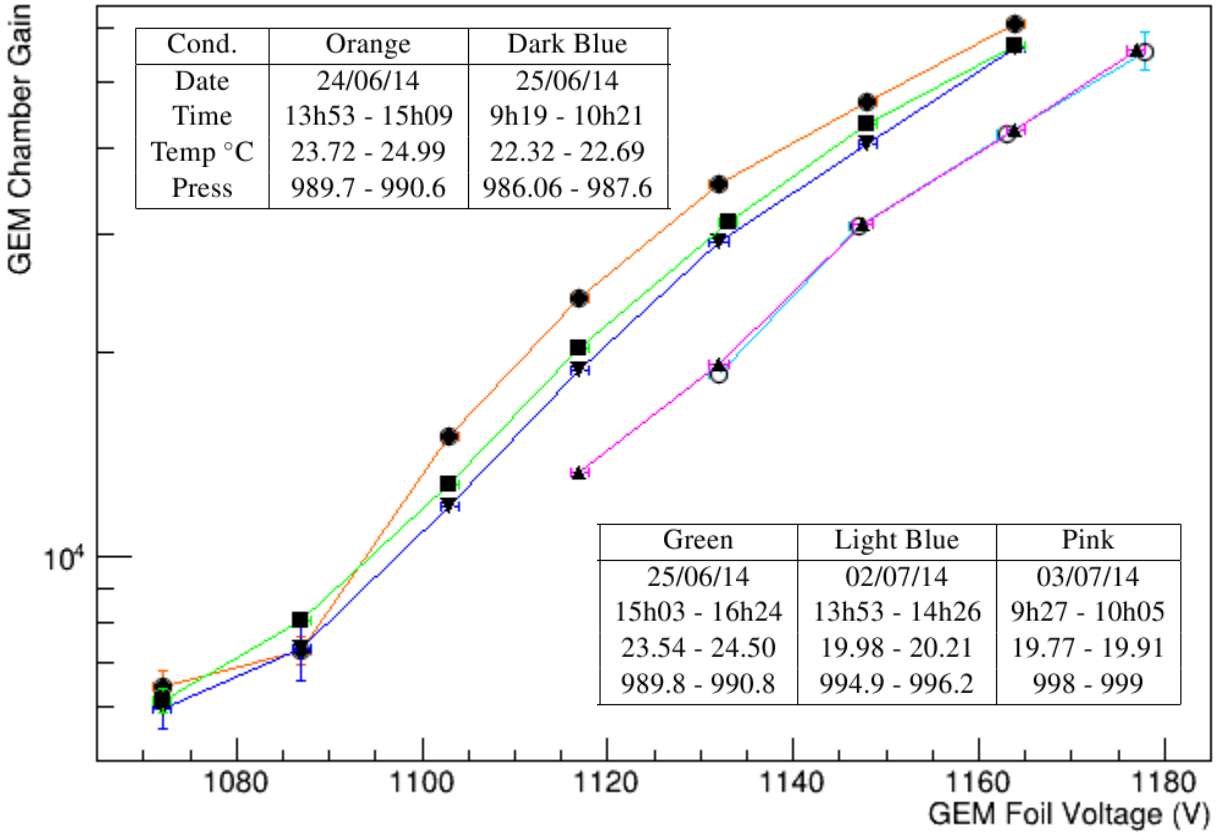
90% Ar / 10% CO_2 (below)



Gain Curves – Ar/CO_2 (70/30)

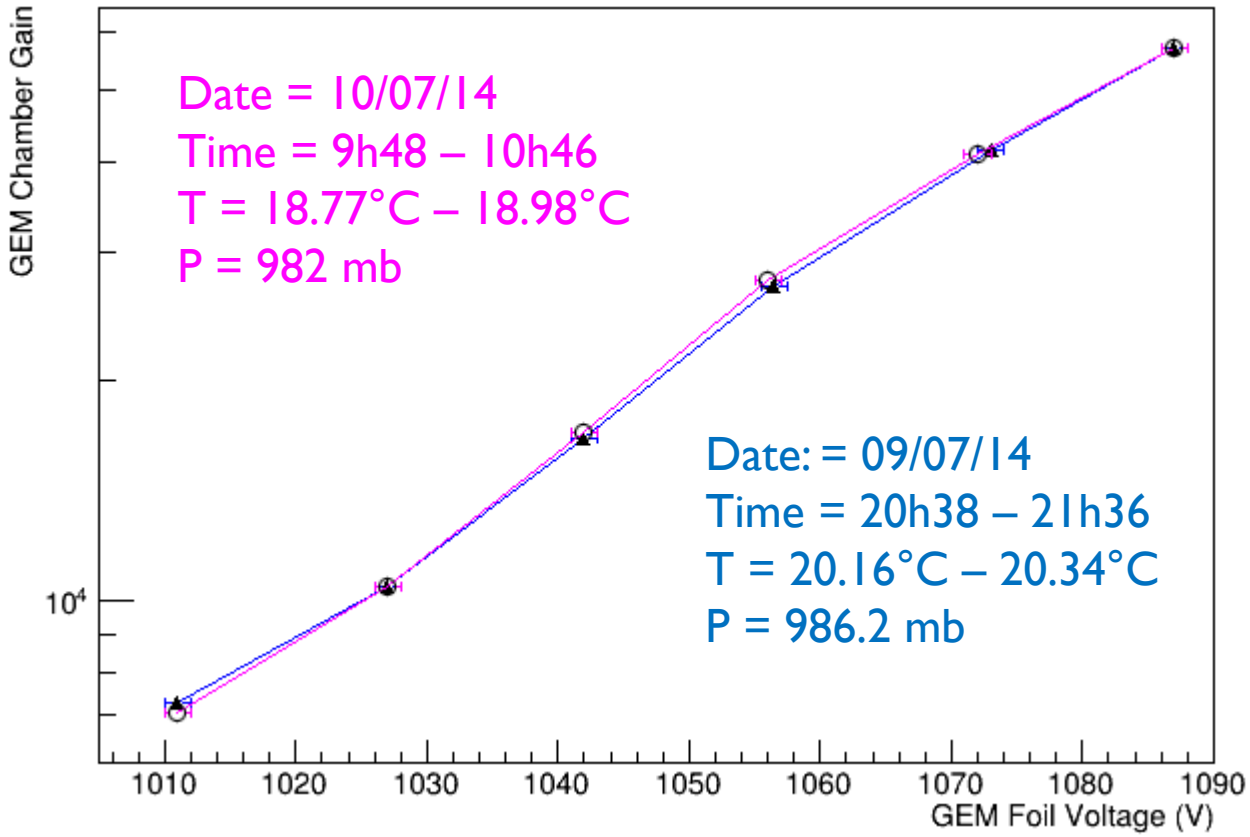
The blue and pink data points to the right were taken under similar conditions as the left curves but with a stricter trigger threshold (-3.75 mv rather than -2.75 mv)

Interestingly, these two curves show the same repeatable deviation from a linear curve on a log scale…may be the result of a non-linearity of the amplification system.

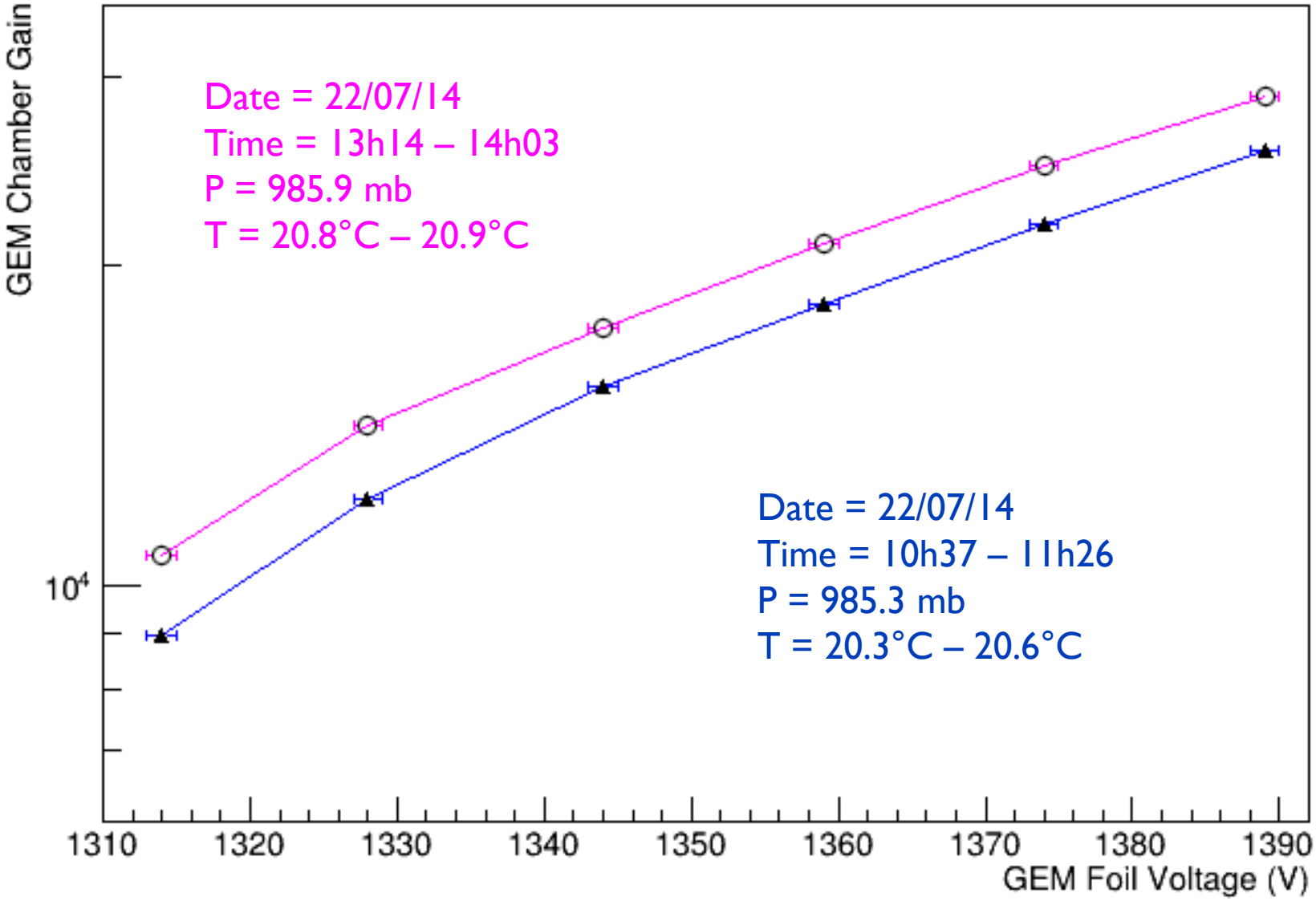


Gain Curves – Ar/CO_2 (80/20)

This same repeatable deviation is seen in the 80%/20% gas mixture, as seen below:



Gain Curve – $Ar/CO_2/CF_4$ (45/15/40)



Non-Linear Amplification

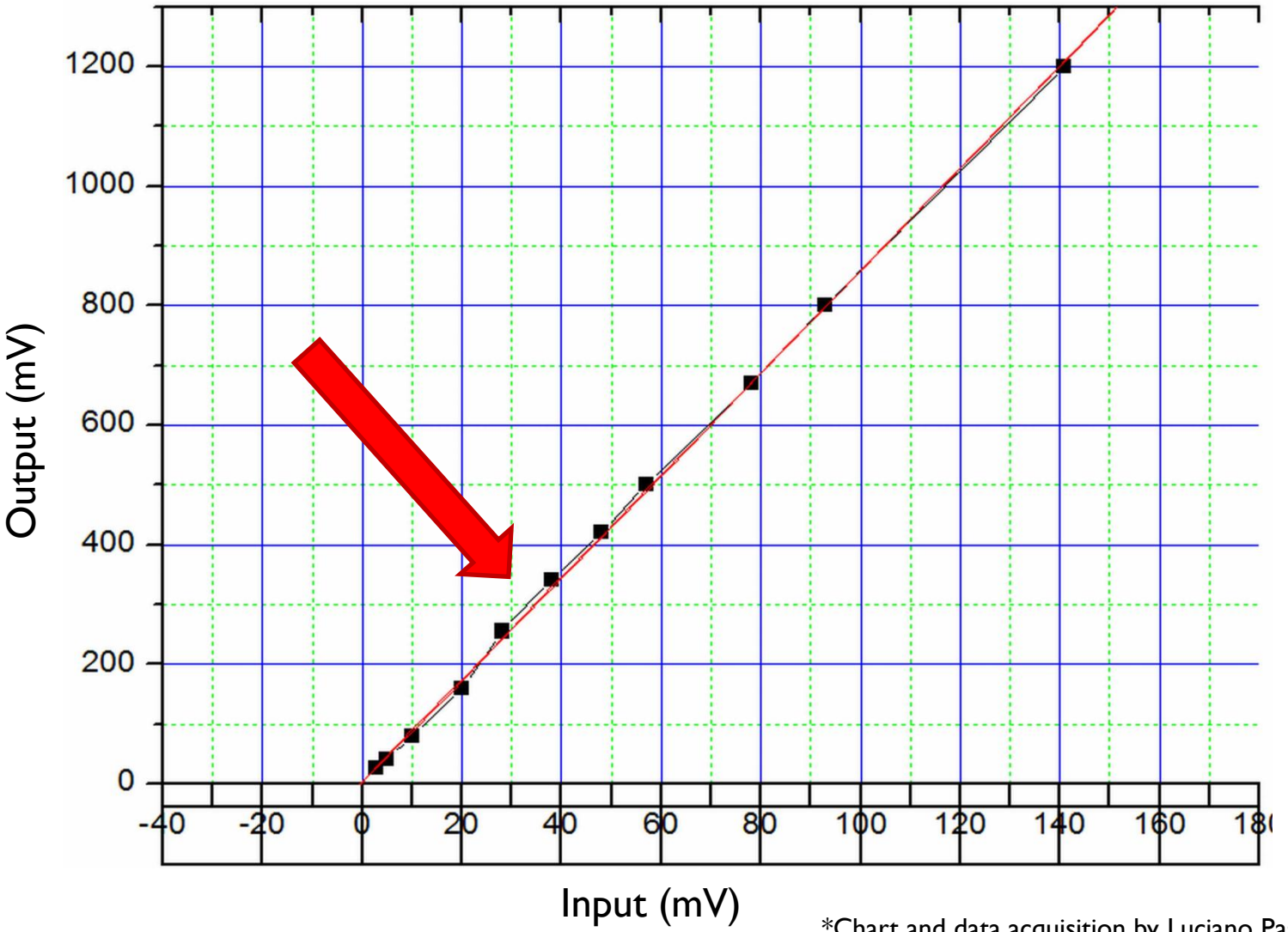
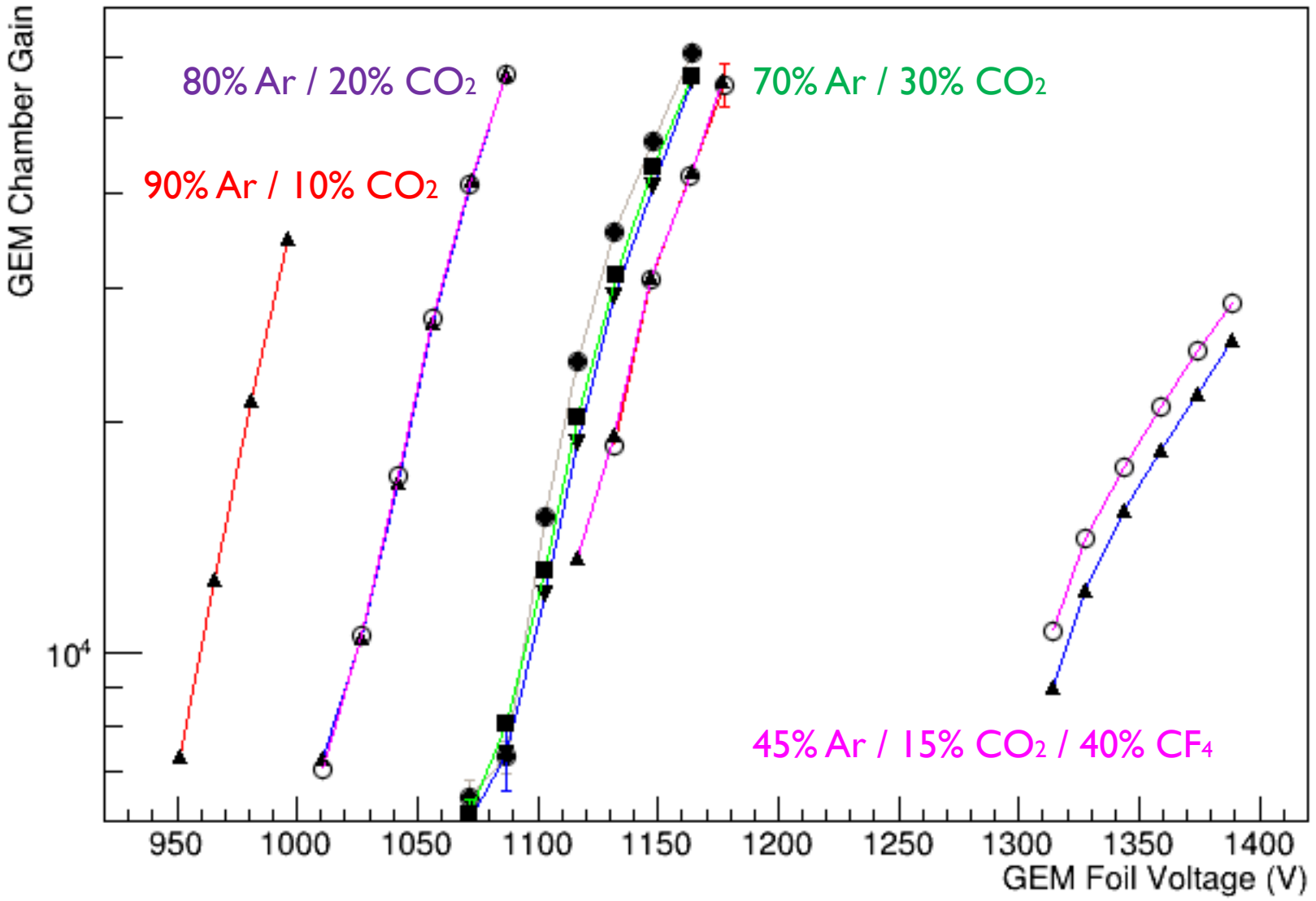


*Chart and data acquisition by Luciano Passamonti

Gain Curves – All in One



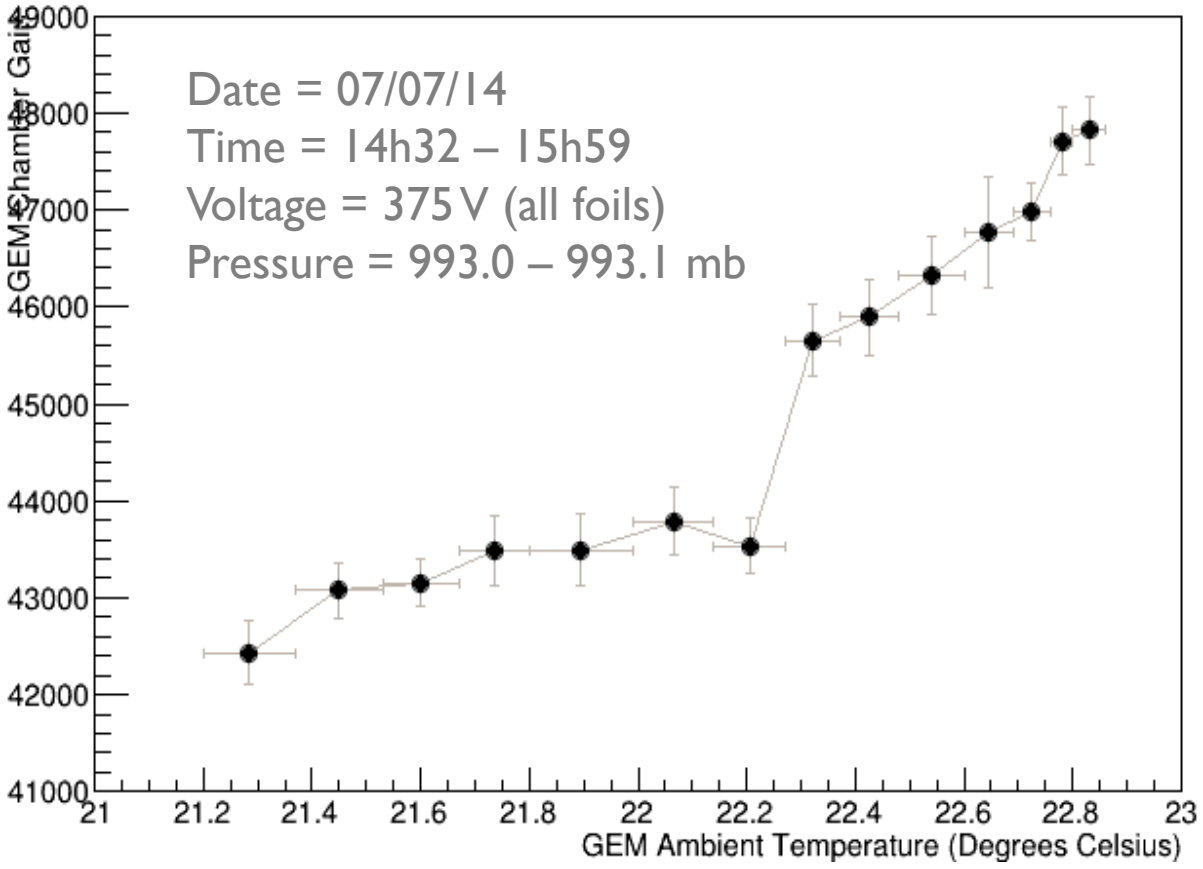
Gain vs. Temperature

- We attempted to perform a gain vs. temperature measurement, using the natural temperature increase caused by the sun shining through the windows into the GEM room.
- Measurements were taken in 5,000 event increments, with both the starting and ending temperatures noted.
- However, results were not as expected…

Gain vs. Temperature – Ar/CO_2 (70/30)

Our current idea is that a voltage fluctuation on one of the foils caused the large jump at ~22.2°C, but voltage was not monitored during the test (it was assumed to be at a stable1125V) so this cannot be confirmed without repeated testing.

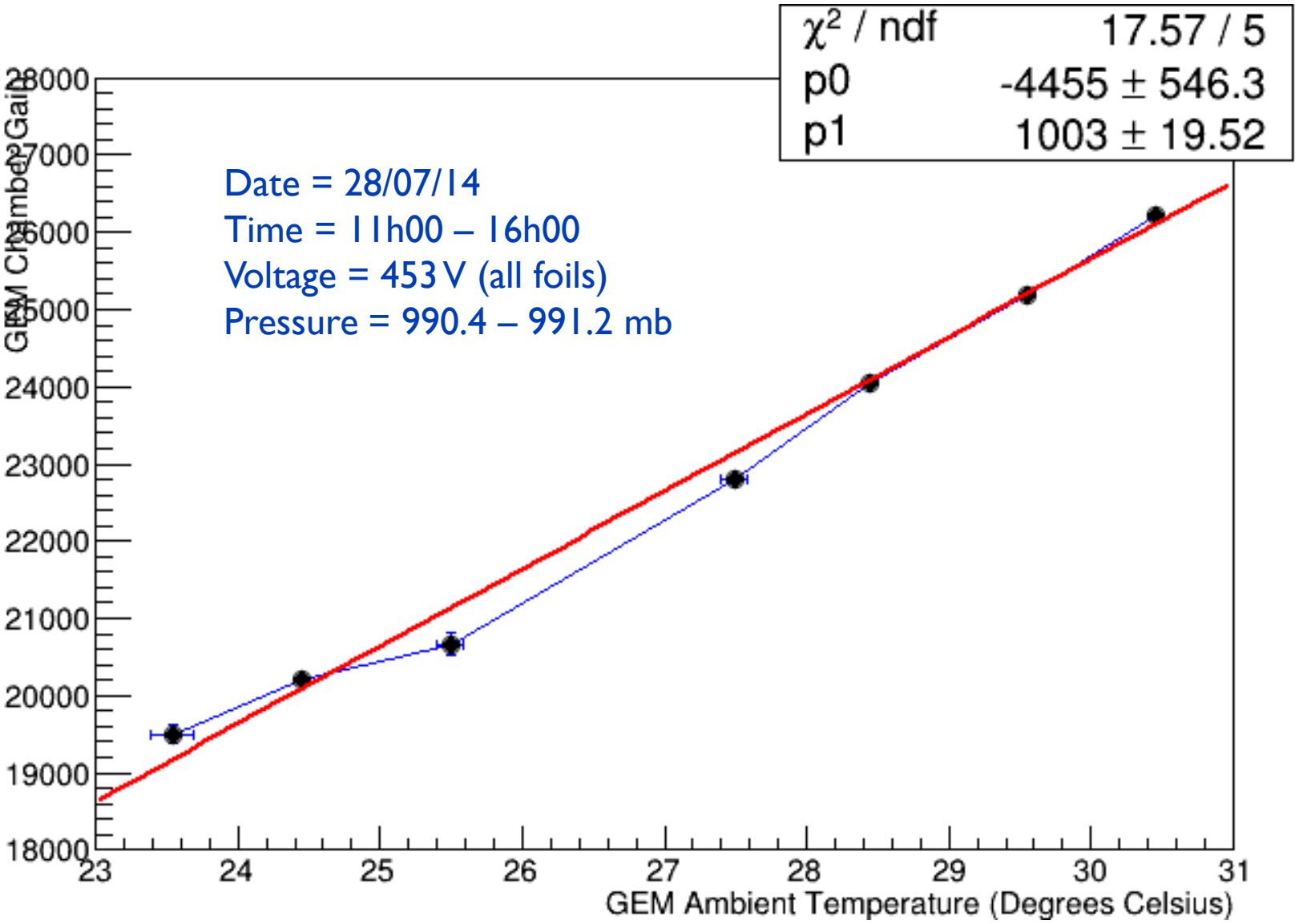
It doesn't help that the temp range is small.



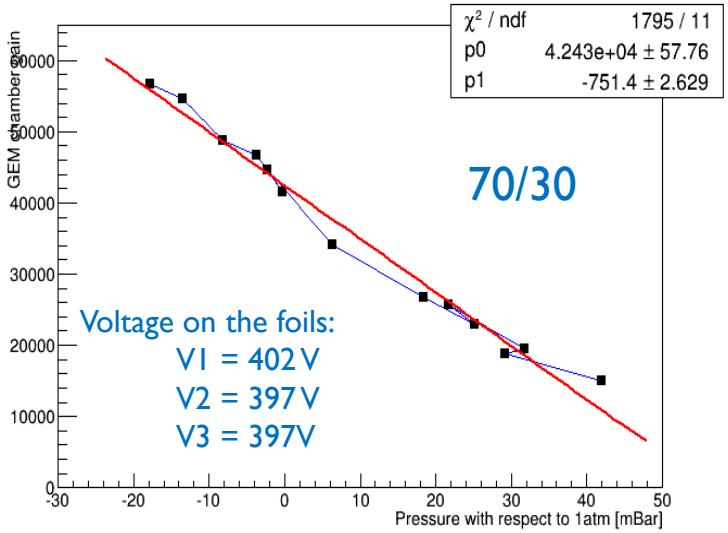
Gain vs. Temperature

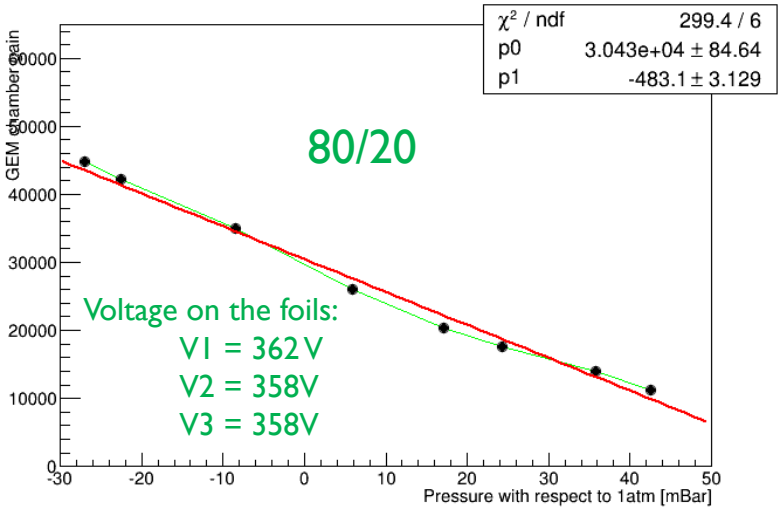
- We took a second temperature measurement, but did things a little differently…
- The GEM hut was cooled down to the lowest it could go, and the AC was turned off in the morning. A data point consisting of 5,000 events was taken at every degree (with one missing for lunch…) to see the "bigger picture".
- The voltage was monitored for any fluctuations (there were none) and the results are much nicer this time!

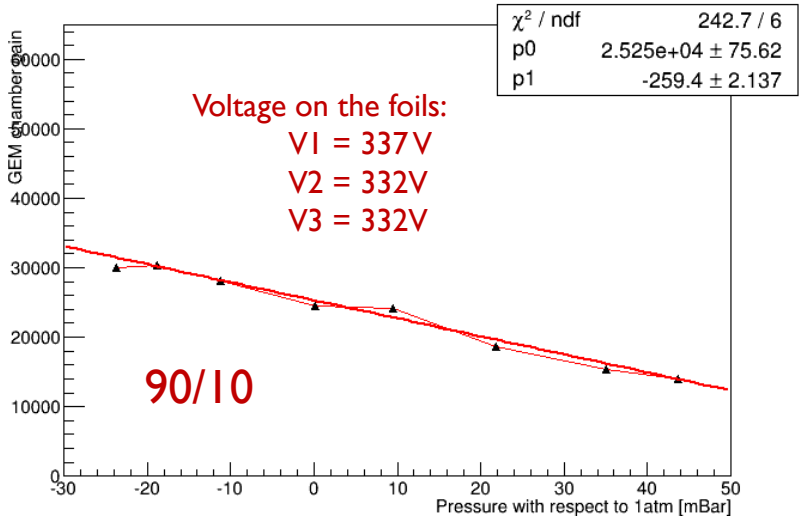
Gain vs. Temperature – Ar/CO2/CF4 (45/15/40)



Gain vs. Pressure - From Last Time

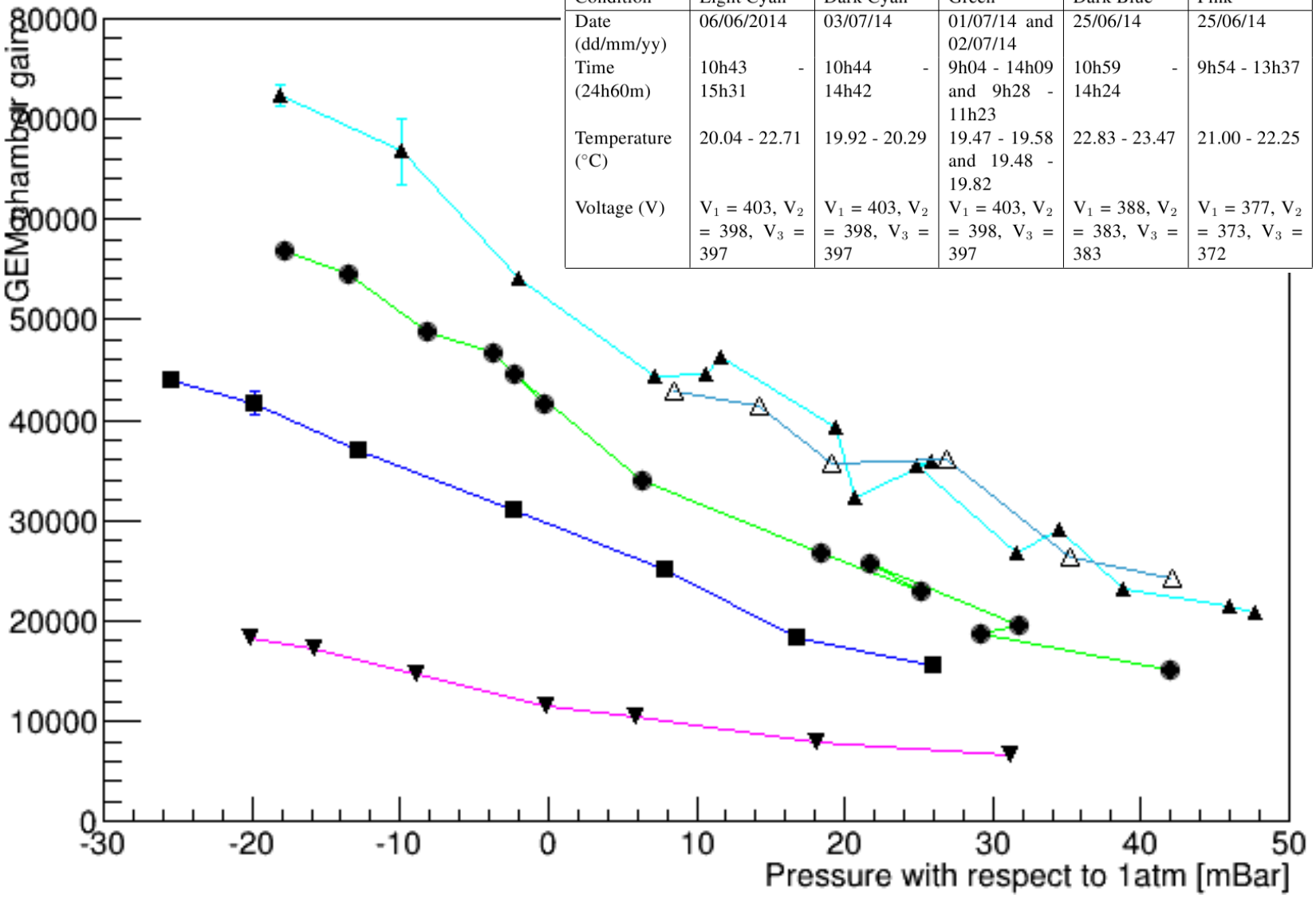




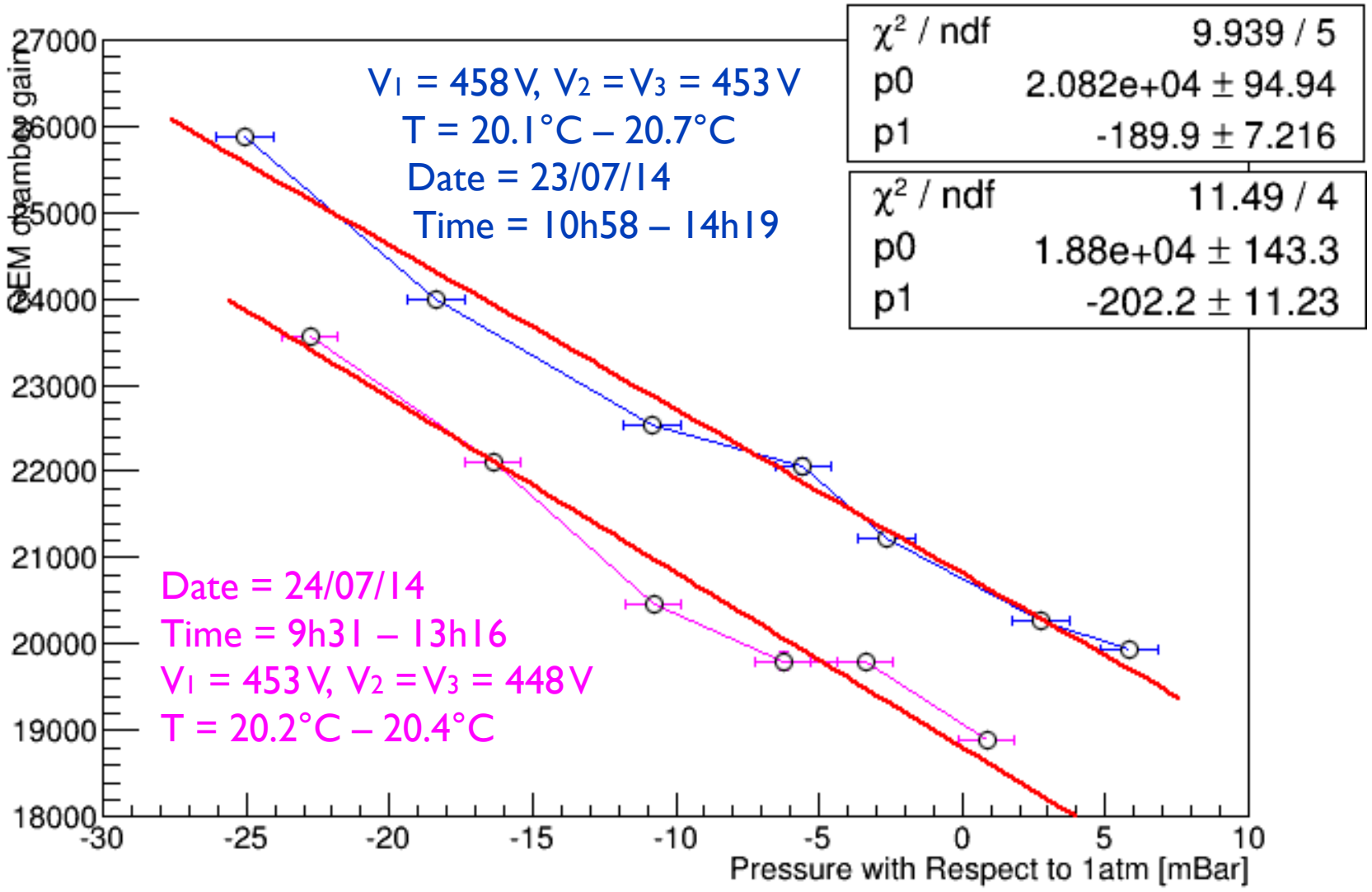


Gain vs. Pressure – Ar/CO_2 (70/30)

Condition	Light Cyan	Dark Cyan	Green	Dark Blue	Pink
Date (dd/mm/yy)	06/06/2014	03/07/14	01/07/14 and 02/07/14	25/06/14	25/06/14
Time (24h60m)	10h43 - 15h31	10h44 - 14h42	9h04 - 14h09 and 9h28 - 11h23	10h59 - 14h24	9h54 - 13h37
Temperature (°C)	20.04 - 22.71	19.92 - 20.29	19.47 - 19.58 and 19.48 - 19.82	22.83 - 23.47	21.00 - 22.25
Voltage (V)	V_1 = 403, V_2 = 398, V_3 = 397	V_1 = 403, V_2 = 398, V_3 = 397	V_1 = 403, V_2 = 398, V_3 = 397	V_1 = 388, V_2 = 383, V_3 = 383	V_1 = 377, V_2 = 373, V_3 = 372



Gain vs. Pressure – Ar/CO2/CF4 (45/15/40)



What's Next

- Do timing studies with cosmics for the 40% Ar, 15% CO_2, 45% CF_4 mixture.
- Go home to Florida!
- Many thanks to everyone at INFN-LNF!!!!!!!