

The MTA and Muons Inc Experiment

MuCool Test Area

Pierrick Hanlet
Muons, Inc

Muons, Inc

- Mohammad AlSharo' a
- Pierrick Hanlet
- Robert Hartline
- Rolland Johnson
- Kevin Paul
- Tom Roberts
- Katsuya Yonehara

Fermilab AD

- Al Moretti
- Milorad Popovic



Background

Motivation

- Different idea from ILC
- Neutrino Factory
- Muon Collider

Challenges

- Cool muons in 6-D
- Acceleration
- *This must be done QUICKLY*

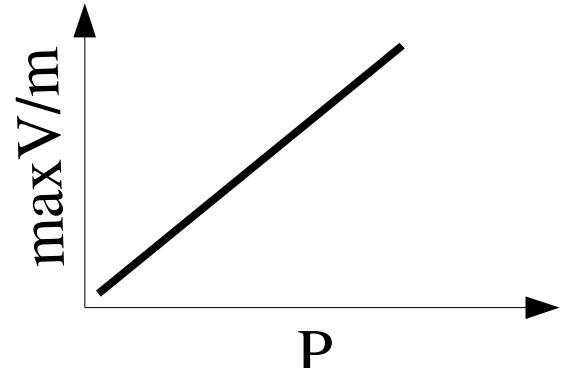
Muons Inc Approach

6-D Cooling

- Several techniques being simulated:
- Helical Cooling Channel
- Phase Ionization Cooling (parametric resonance)
- Reverse Emmitance Exchange

Muons Inc Approach

Acceleration



Pressurized RF cavities based on Paschen's Law

Benefits are 3 for 1 with high density H₂:

- beam cooling with $\frac{1}{2}$ _{LH2}
- breakdown suppression (higher gradients)
- built in cryogenics for cooling cavity

Muons Inc Previous Results at Lab G



Figure 3. Picture of the Test Cell Stainless Steel Disks and Cylinder before copper plating.

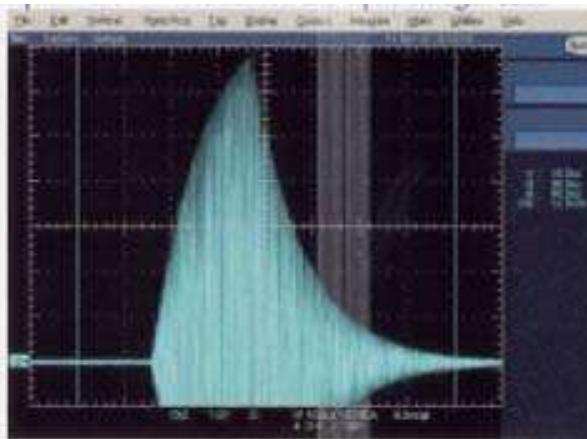


Figure 4. The probe signal taken during the last hours of operation at 250PSI and 77K. The pulse time of 20 μ s corresponds to the rising part of the 800MHz envelope.

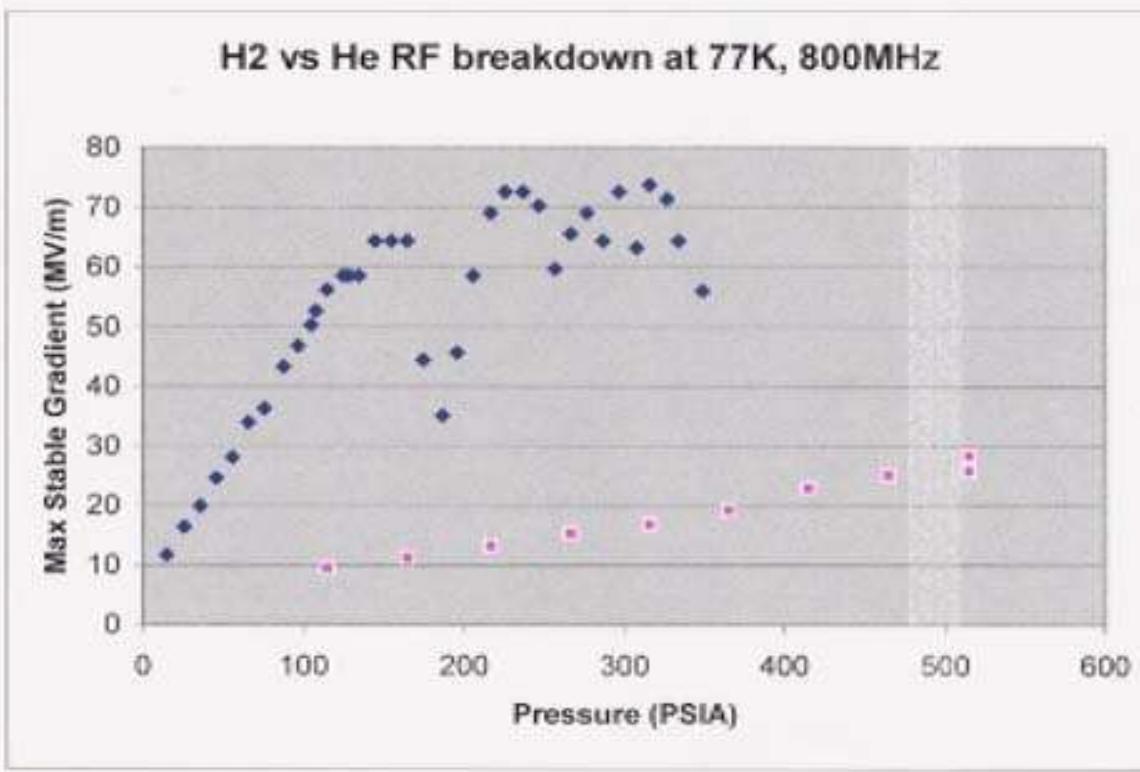


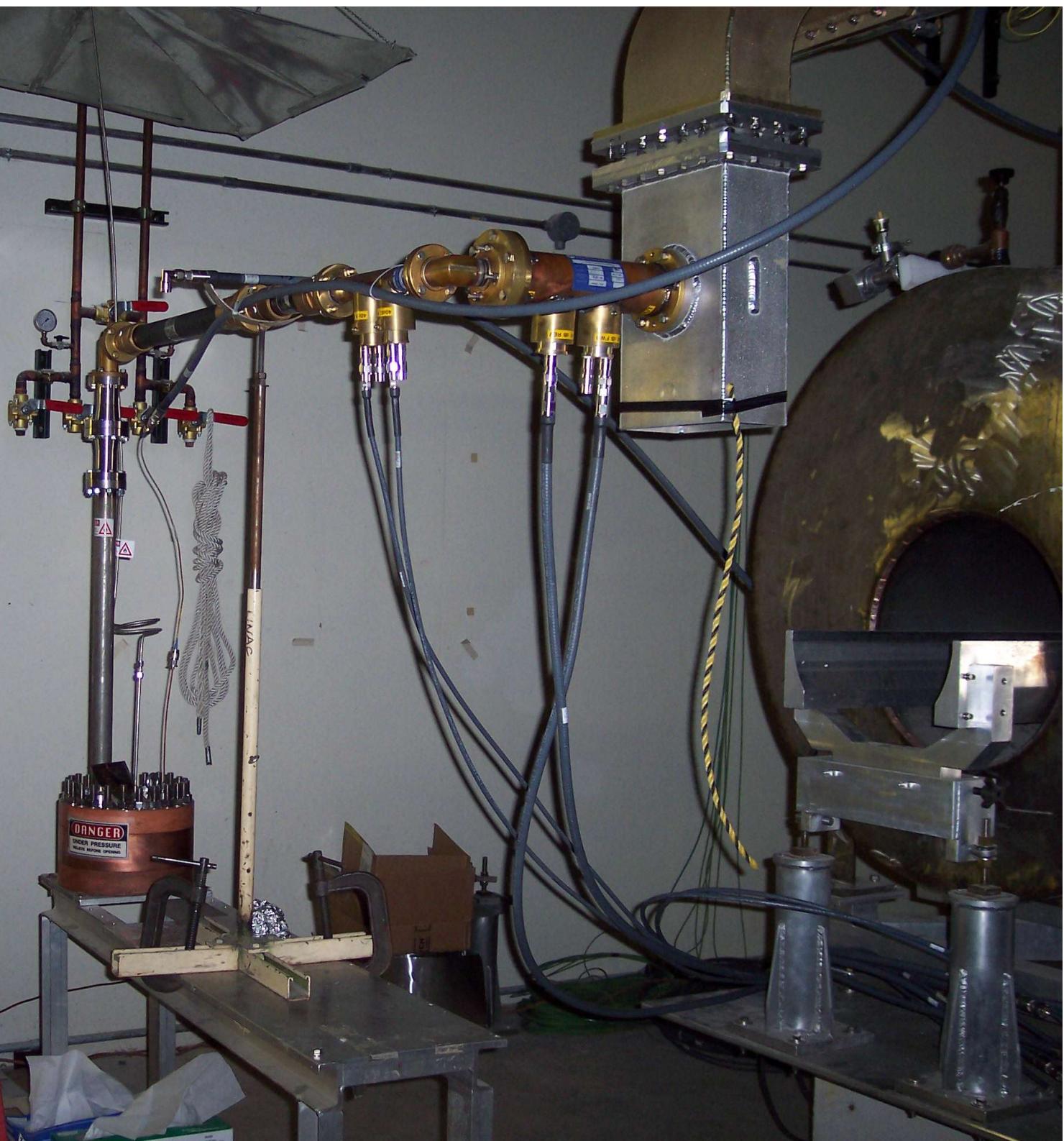
Figure 5. Paschen curve measurements for hydrogen (black diamonds) and helium (red squares) at liquid nitrogen temperature. Each datum was determined by first setting the klystron frequency at reduced voltage, raising the voltage until breakdown occurred regularly, then reducing the voltage until breakdown did not occur.

Muons Inc Present Effort

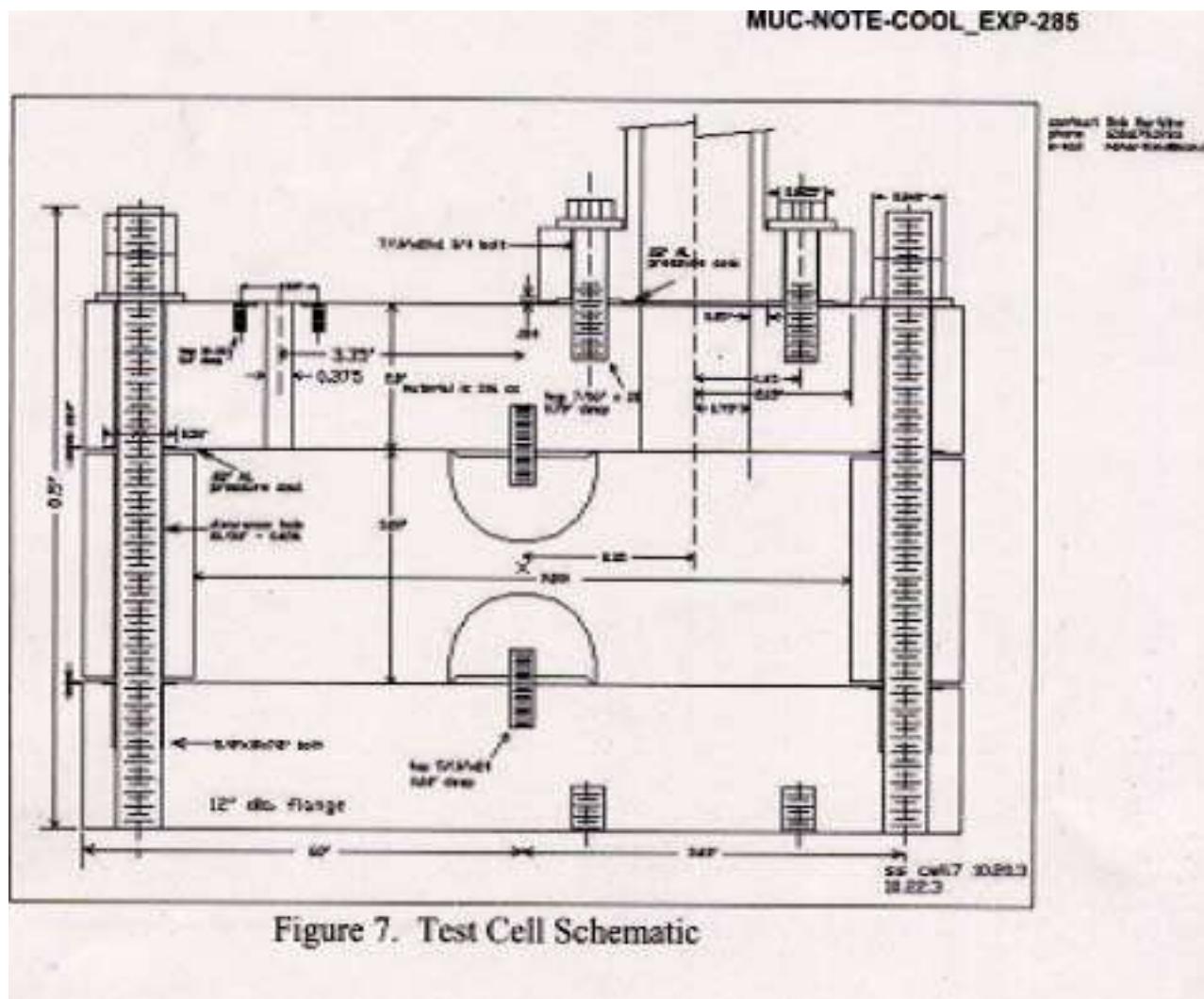
Material Testing for RF cavities

Paschen's Law predicts suppression of gas breakdown

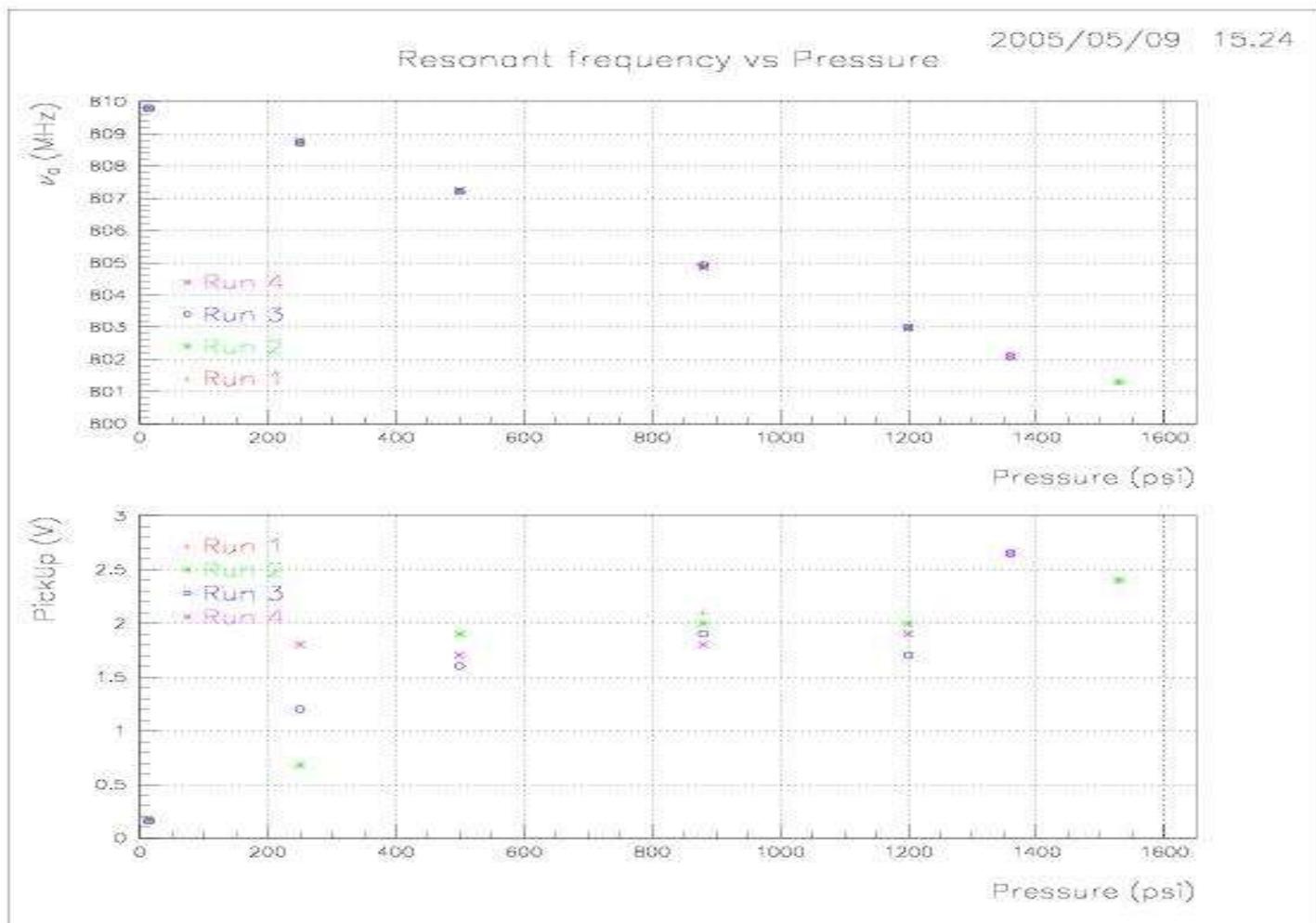
- Still want optimal material for cavity electrodes
- Use Paschen's curve to normalize data
- Materials to be Tested:
 - Cu
 - Mo
 - Be
 - Cr



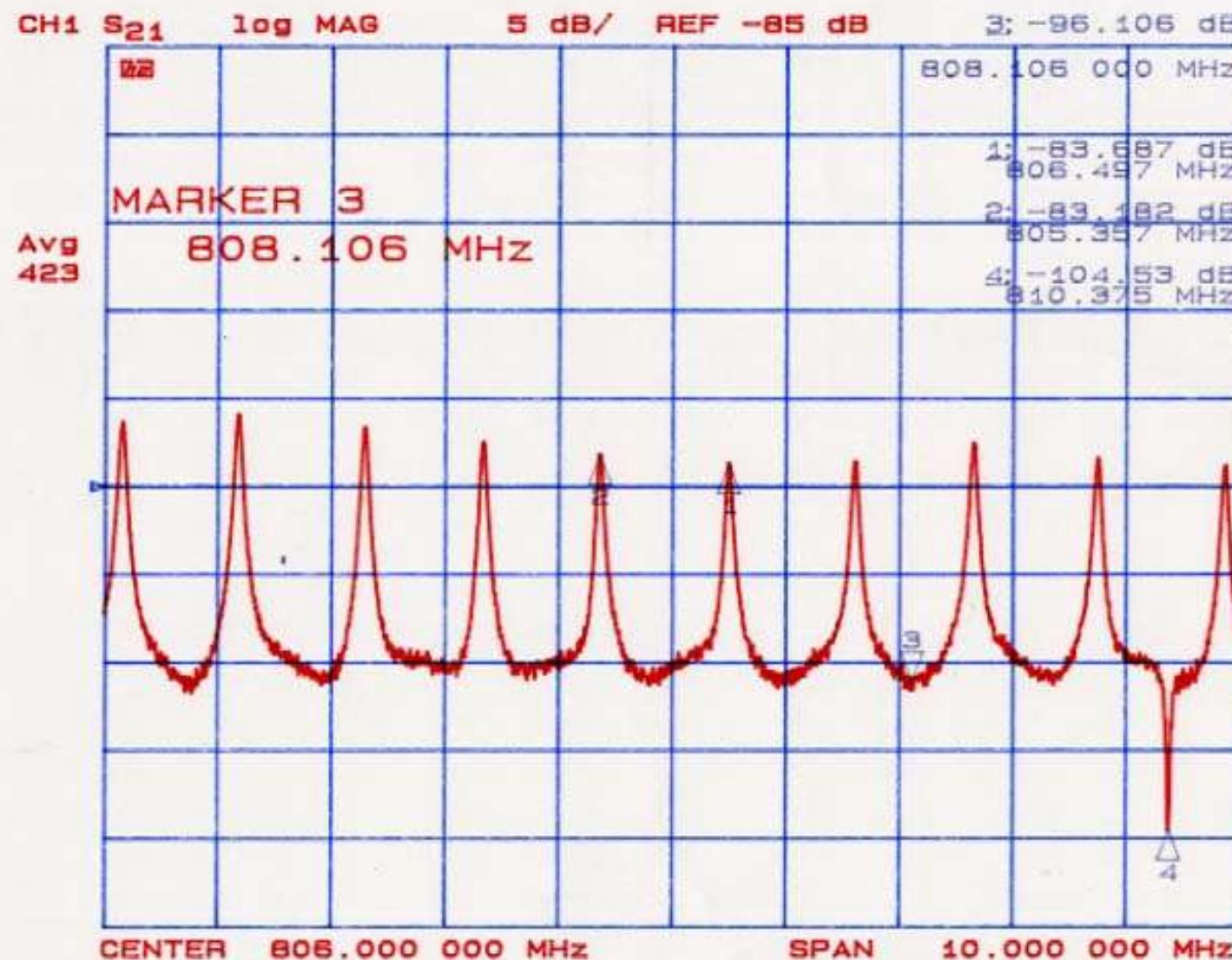
Muons Inc Present Effort



Muons Inc Present Effort

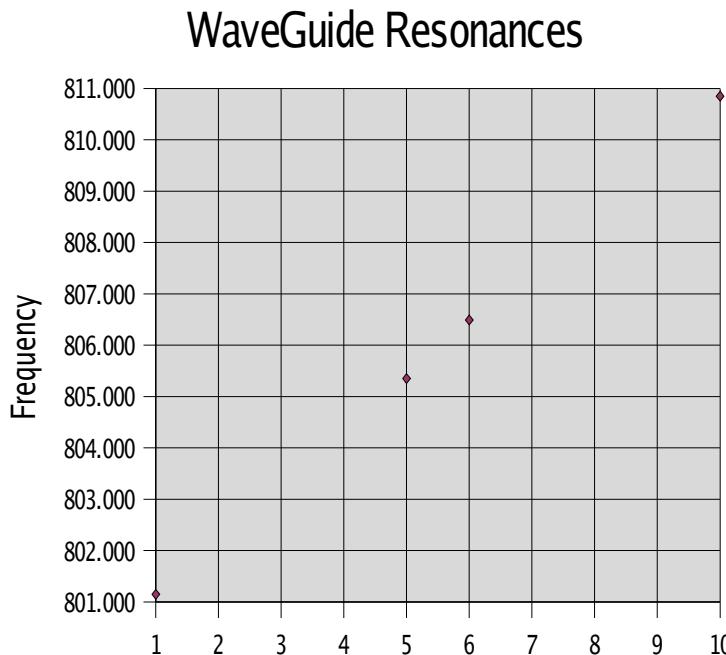


Muons Inc Present Effort



Muons Inc Present Effort

1	801.149
5	805.351
6	806.492
10	810.849



Step	rSlope	rlIntercept	Frequencies	pSlope	plIntercept	Pressure	Prun
0.5	1.078	800.071	800.610	-0.006	810.204	1590.96	1590
1.5	1.078	800.071	801.688	-0.006	810.204	1412.22	1410
2.5	1.078	800.071	802.766	-0.006	810.204	1233.48	1230
3.5	1.078	800.071	803.843	-0.006	810.204	1054.75	1050
4.5	1.078	800.071	804.921	-0.006	810.204	876.01	870
5.5	1.078	800.071	805.999	-0.006	810.204	697.28	690
6.5	1.078	800.071	807.077	-0.006	810.204	518.54	510
7.5	1.078	800.071	808.155	-0.006	810.204	339.81	330
8.5	1.078	800.071	809.232	-0.006	810.204	161.07	160
9.5	1.078	• 800.071	810.310	-0.006	810.204	-17.67	-20

Summary

- Ongoing efforts to make use of the MTA
- Beginning to take data for Muons Inc