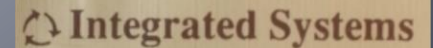# An Empirical Pursuit of Mach's Principle:
Experimental Results Indicating a "Machian" Inertial Reaction Force is Detectable and Electromagnetic

P.M. Jansson, PhD, PE
Associate Professor – Electrical Engineering – Bucknell University
President – INTEGRATED SYSTEMS
Senior Member *IEEE*

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INTEGRATED SYSTEMS

2nd Advanced Propulsion Workshop, El Segundo, CA, 1-3 No 2017

Aims of this talk

- Discuss empirical investigations into a demonstration of Mach's Principle, and the motivation for this novel research and sensor development
- Describe in detail our apparatus so others can work in this area and help replicate our findings
- Share our very preliminary findings of statistical "outliers" and data correlations which have encouraged us to publish what we have thus far observed
- Seek broader input from the APW Mach Effect community as to possible better methods to detect / observe this potentially "novel phenomenon"

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Motivating quotes…

- "Local physical laws are determined by the large-scale structure of the universe."[19] - Hawking & Ellis

- "I have remained to the present time ***the only one who insists*** upon referring the law of inertia to earth, and in the case of notions of great spatial and temporal extent, to the fixed stars"[20] - Ernst Mach

- "… the entire inertia of a point mass is the effect of the presence of all other masses, deriving ***from a kind of interaction*** with the latter."[3] - Albert Einstein

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Why look for a "Machian" reaction force?

- Resolution of previous anomalous data observations (Mill Lane Laboratory, Univ. of Cambridge 2000)
- Origin of inertia remains a contentious topic between engineers and physicists (Is it a real vs. pseudo force?)
- Increased interest in Mach's Principle by MET / physics community (Estes Park Advanced Propulsion Workshop, Sep 2016)
- Search for / discovery of new knowledge

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'Academic' Mach's Principle activity

- *Mach's Principle: From Newton's Bucket to Quantum Gravity* was held in Tübingen, Germany July 26-30, 1993
- *International Workshop on Mach's Principle and the Origin of Inertia* was held at the Indian Institute of Technology in Kharagpur, India on February 6-8, 2002.
- *Estes Park Advanced Propulsion Workshop* was held in Colorado, USA on September 19-22, 2016.

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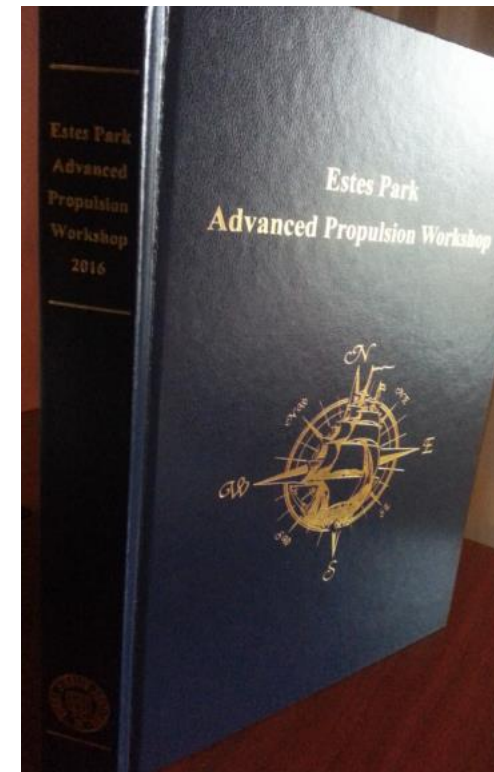
Why "search" for the Mach Effect?

- "If there is a moral in the early history of Mach's Principle… Its promise lies in the realm of empirical science, in the attempt to draw the doctrine of relativity and Mach's Principle into a physical theory that can be subject to experimental test, where one allows that experience may speak against it."[5]

- "Inertia is one of the main physical properties of all bodies. Its origin poses problems of a fundamental nature. Ernst Mach proposed that the inertia of any body is caused by its interaction with the rest of the Universe. The idea reflects a deep connection between the cosmos at large and its individual constituent bodies, thereby implying a holistic conception of nature. On the whole, Ernst Mach had a seminal influence on the evolution of Physics in the 20th Century, and will influence the future development of Physics in the 21st century." [2]

- ***Scientific approach:*** Popperian sophisticated methodological falsificationism (and ***discovery driven)***
- First functional model was created to better understand inertia and intriguing gyroscopic phenomena
- ***Experimental protocol:*** Externally power central inertia wheel until gyroscopic properties manifest, switch to battery power (DCGS - 8), then attempt to rotate (via bungee) and observe how the system behaves
- Serendipitous observations of transient mass fluctuations and instantaneous battery polarity reversal initiated fascination in Feb 2000

- ***Concept of Ni-Cad battery as potential "Mach effect sensor" emerged***
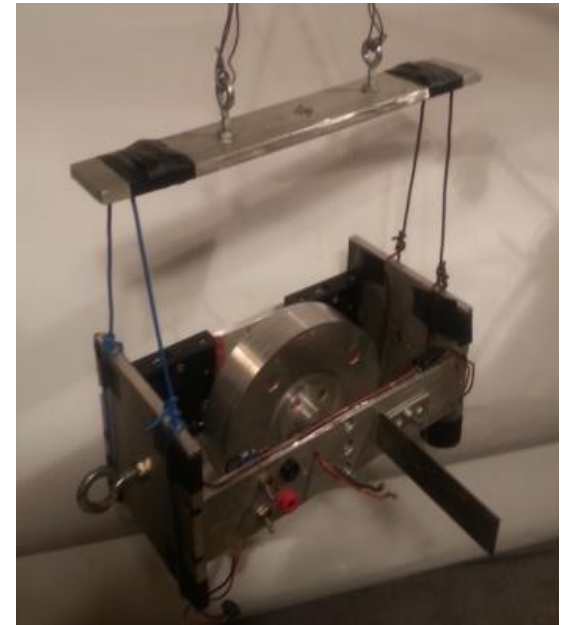
Why INTEGRATED SYSTEMS Lab vs. Bucknell?

- Cost

- Personnel

- Legal

- Resources

Recent Work

- ***Scientific device:*** Central 6"(15.24cm dia.) inertia wheel driven by two (2) 3-7.2V DC motors (MFA/Como drills part no. 457RE380) to achieve > 6000 rpm. Inertial wheel assembly is connected on top and bottom to spherical frame by two (2) DC pancake motors (model GPM9LR by Printed Motor Works). Spherical frame (35 cm dia.) is comprised of eight (8) arms which support the battery / voltage sensor arrays.

- ***Note: In current detector embodiment less than 10% of the surface area of the sphere is monitored by the sensor system, possibly making it more challenging to have regular replication of the phenomena***


RE - 380 (3 POLE)
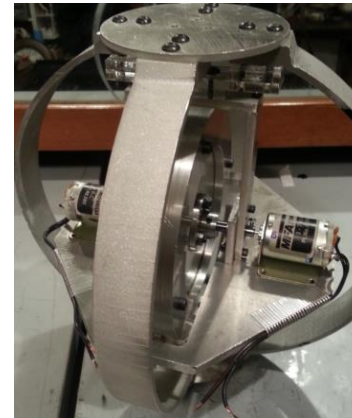
← *Inertia Wheel*

Sensor Arm →

Battery and Voltage Sensor Network

- **_Sensors embedded in device:_** Each of the eight (8) sensor arms (A-H) support a series string of six (6) 1.2V Nickel-Cadmium batteries. These strings are connected in parallel and provide primary motive power to the inertia wheel for the 4 minute period when the detector is disconnected from the start-up grid power. Voltage meters (DSN-DVM-368 v 3.01) are on each armature (A-H) six (6) battery positions filled with 1.2V, AA Ni-Cd 600 mAh rechargeable batteries (by Camelion®)

- **_Experimental protocol:_** Externally power central inertia wheel 4min – transition to battery array (DCGS - 48), when >6k rpm, apply torque from pancake motors and observe how DC voltage measurements change. Measure batteries' V with external DVM pre & post test.

Digital Voltage Sensor

DVM – In-Situ →

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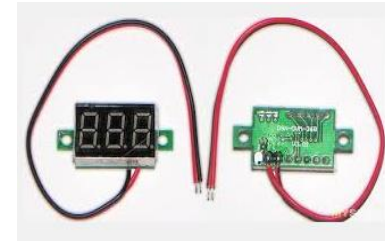
2016 Results submitted for peer review

- ***IEEE Sensors Application Symposium 2017***

- ***Presented "Battery as Sensor" model***

- ***Published in IEEExplore***

- ***available:***
- ***IEEE Xplore Digital Object Identifier:***
  10.1109/SAS.2017.7894107

2017 IEEE
SENSORS APPLICATIONS SYMPOSIUM
MARCH 13-15, 2017 | GLASSBORO, NEW JERSEY, USA

A Novel Sensor Network Capable of Observing the Hypothetical Mach Field

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[2]Integrated Systems, Lewisburg, PA, USA

Abstract—The Newton-Mach paradigm, held by a minority of physicists, suggests that the underlying cause of inertia in matter is based on an "action-at-a-distance" interaction between that local matter and the remaining matter of the universe. Research commenced nearly two decades ago, employing Popperian falsificationism, observed electromagnetic phenomena suggesting inertial reaction forces (originating externally to the high-inertia device under test) may actually be real and measurable via sensors. After years of developing a scientific device and test protocol to reliably detect this e-m reaction field (or force) these researches now present three (3) experimental results with greater than 8 sigma statistical significance for review by the broader scientific community. This paper focuses on the sensor network as it evolved over the development of this scientific device and provides sufficient detail and protocol so that the work can be replicated by others. Our early findings suggest a reaction Mach-field (or force), electromagnetic in nature, is detectable when a high-inertia, rotating wheel experiences torque. These e-m effects are not sensed during control runs in the presence of the same mass when it is rotating at high speeds (>6,000rpm) undisturbed. Rational, probable alternative explanators have not yet been identified by these researchers.

Keywords—*Mach's Principle; electromagnetic fields; sensor networks; high inertia wheel; methodological falsificationism; empirical research*

I. INTRODUCTION

Sensors, by their very design, are often created to measure known phenomena to aid us in better understanding our world or helping our high-tech society better control or optimize our environments. Most sensors are engineered to complete a specific measurement task with materials and circuitry devised

International Workshop on Mach's Principle and the Origin of Inertia was held at the Indian Institute of Technology in Kharagpur, India on February 6-8, 2002. Each of these conferences included multiple papers where eminent scientists from across the globe discussed their perspectives on Mach's Principle. According to these scientists, the initial published reference to the principle was first articulated by Einstein [3] as opposed to Ernst Mach himself. He is credited with stating it simply as: "… the entire inertia of a point mass is the effect of the presence of all other masses, deriving from a kind of interaction with the latter." It is important to point out here that the veracity of this hypothesis or specifics of this interaction have not been formalized or accepted by the mainstream physics community. As Einstein articulates Mach's Principle he is careful to reference Mach's own writings [4] even directing his audience to a specific chapter where he says the principle is clearly stated, using words such as "This is exactly the point of view which E. Mach urged…" Other scientists have reviewed that chapter in Ref [4] subsequently and do not find as clear an articulation of the central theme as Einstein obviously gleaned from it.[5]
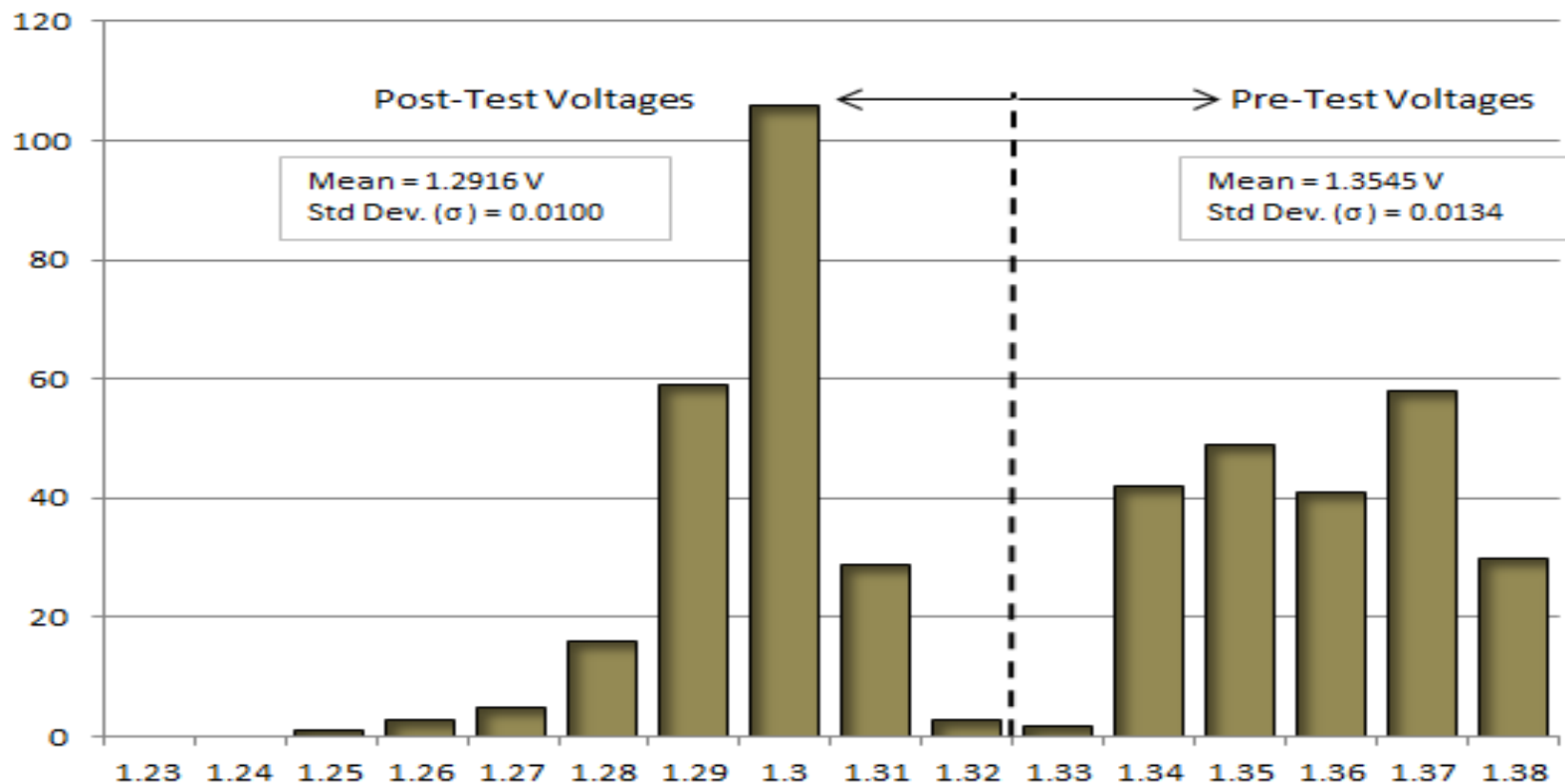
From these two seminal conferences there is clearly much to digest, but in the interest of introducing this paper we provide two brief quotations (one from each) for the reader's consideration. "If there is a moral in the early history of Mach's Principle… Its promise lies in the realm of empirical science, in the attempt to draw the doctrine of relativity and Mach's Principle into a physical theory that can be subject to experimental test, where one allows that experience may speak against it."[5] The empirical investigations we have conducted (and present below) actually provide such an experimental test.

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Battery Voltages – <u>Control</u> Runs (all data)

As expected $\rightarrow$ $V_{post} < V_{pre}$ $\Delta = 62.9mV$ *Standard Deviations within 25% (Post lower)*

Post-Test Voltages

Mean = 1.2916 V
Std Dev. (σ) = 0.0100

Pre-Test Voltages

Mean = 1.3545 V
Std Dev. (σ) = 0.0134

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Battery Voltages – <u>Experimental</u> Runs (removed OL)

As expected $\rightarrow$ *$V_{post} < V_{pre}$ $\Delta = 81.2mV$*   *Standard Deviations within 38% (Post higher)*
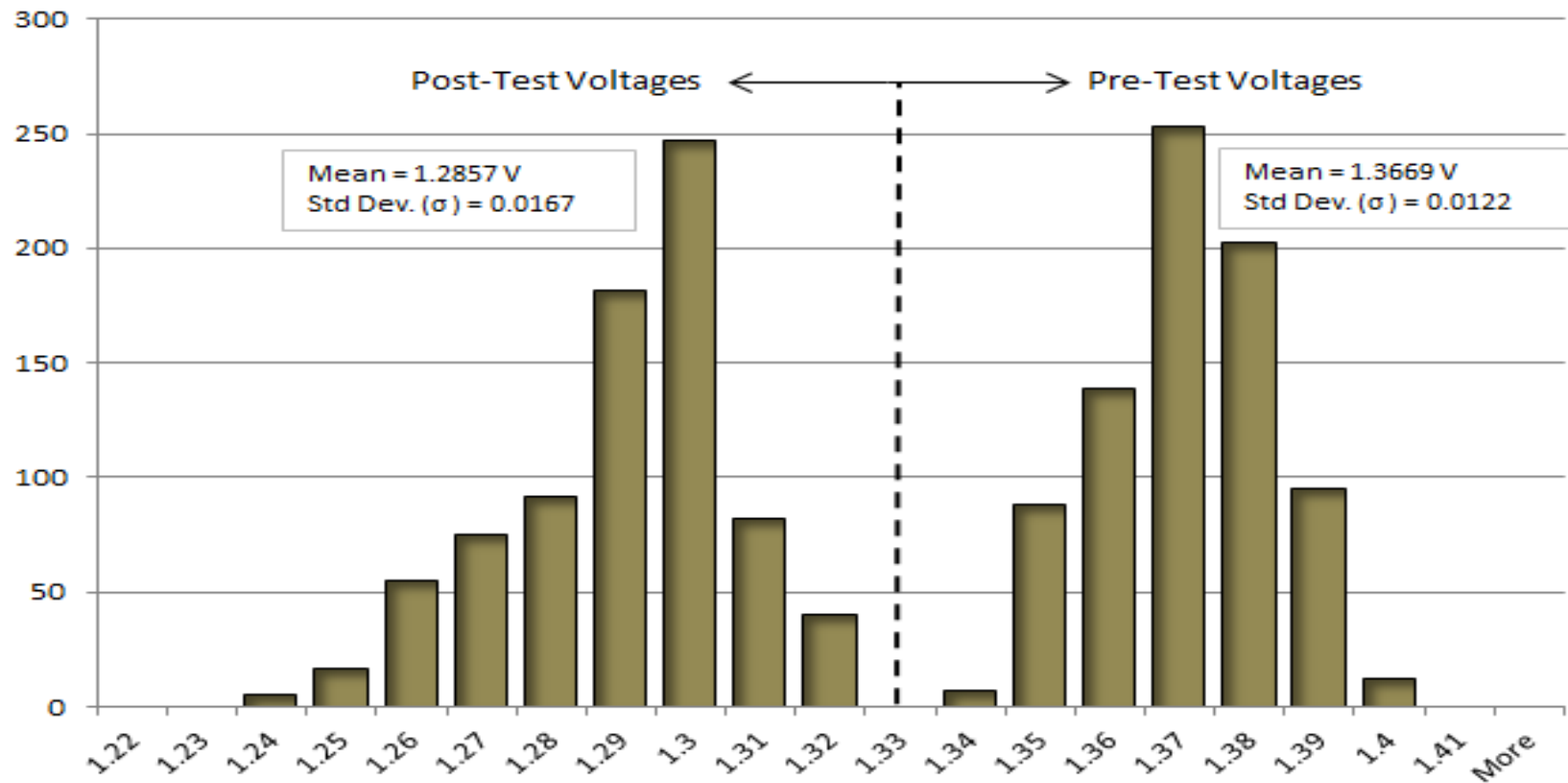
Post-Test Voltages $\longleftarrow$ $\cdots$ $\longrightarrow$ Pre-Test Voltages

Mean = 1.2857 V
Std Dev. (σ) = 0.0167

Mean = 1.3669 V
Std Dev. (σ) = 0.0122

How we "read" detector

Read V_{in} of all batteries
Read V_{out} of all batteries
Calculate Δ

A

B   H

C   G

D   F

E   W

E

C

↑

EARTH Arms

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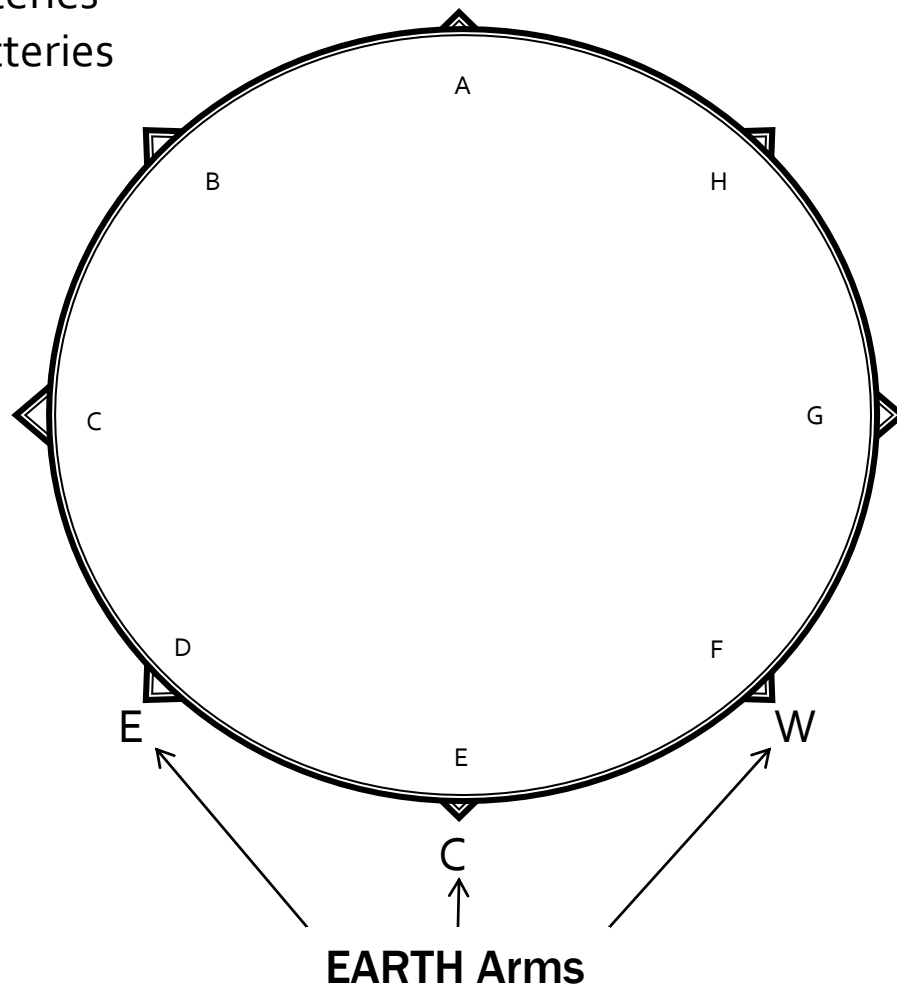
Battery Voltages – <u>Experimental</u> Runs (ALL post-run data)

Mean = 1.284 with, 1.2857 without
Std Dev. (σ) = 0.0345 w/ Outliers
Std Dev. (σ) = 0.0167 w/o Outliers

H6 Sensor Exp #1 - 1 Oct
0.69V = 17.2 σ - 35.6 σ

G6 Sensor Exp #2 - 1 Oct
0.75V = 15.4 σ - 31.9 σ

F6 Sensor Exp #3 - 1 Oct
0.98V = 8.8 σ - 18.3 σ

E4 Sensor Exp #8 - 29 Oct
1.244V = 1.2/2.5 σ - 4.7 σ

F2 Sensor Exp #7 - 29 Oct
1.236V = 1.4/3.0 σ - 2.8 σ

G2 Sensor Exp #4 - 29 Oct
1.223V = 1.8/3.8 σ - 5.9 σ
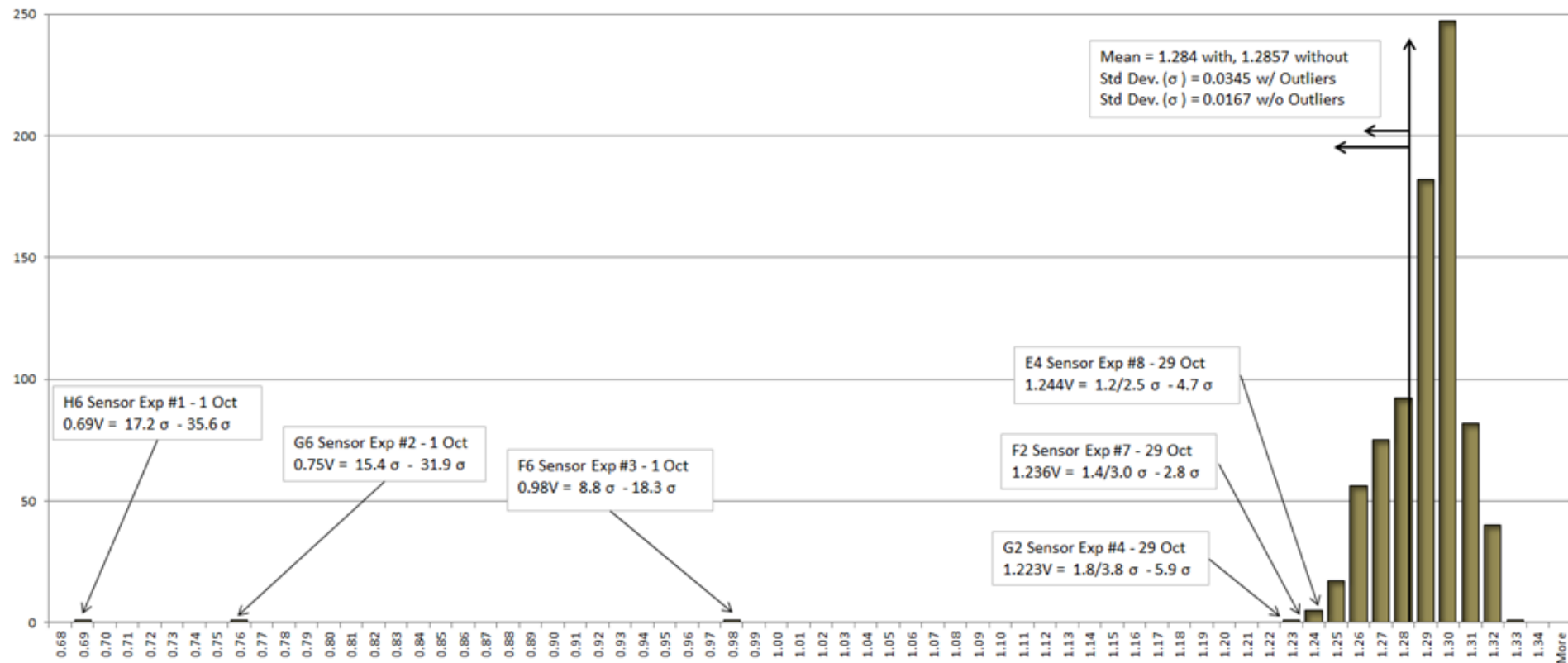
Statistical Significance / Analysis

Table 2 – Control & Experiment Sensor Statistics

	Mean (Voltage)	Std. Dev.(σ)
Controls		
Pre-Test	1.3545	0.0134
Post-Test	1.2916	0.0100
Experiments		
Pre-Test	1.3669	0.0122
Post-Test (w/o)	1.2857	0.0167
Post-Test (with)	1.2840	0.0345

Outliers		in Dist.	Not-in
Exp #1 – H6	0.69V	17.2σ	35.6σ
Exp #2 – G6	0.75V	15.4σ	31.9σ
Exp #3 – F6	0.98V	8.8σ	18.3σ

FOR COMPARISON: Two observations of gravitational waves from binary black hole mergers at LIGO (the Laser Interferometer Gravitational-Wave Observatory) have been made with a sigma (σ) of 5.1. The first observation [17] occurred in September of 2015 and was published in February of 2016.

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Alternative Explanators

- Battery failure
- Close-proximity electromagnetic or electrostatic interactions
- Potential back e.m.f. through the DC motors
- Mismatched battery impedance
- Human error
- Others?

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Why these Explanators were unconvincing

- <u>Battery failure</u> — observed phenomenon tracked astronomy
- <u>Close-proximity electromagnetic or electrostatic interactions</u>

  — no significantly elevated magnetometer levels measured near wheel at 7k rpm, no large sources of e-s phenomenon nearby – no grid connection during key portion of experiment
- <u>Potential back e.m.f. through the DC motors</u> — parallel strings of series batteries/sensors makes bias in reverse e.m.f. unlikely to be focused on only one portion of array
- <u>Mismatched Battery impedances</u> — could lead to vulnerability of sensors in unequal sharing of load, but would not explain directionality of observed results
- <u>Human error</u> — always a possibility, as with all empirical enterprise
- <u>Others?</u> — George – any ideas? (Please answer during Q&A)

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- Creation of the "Death Star" to test theory that effect interacts with materials vs. e-m field of power flow –
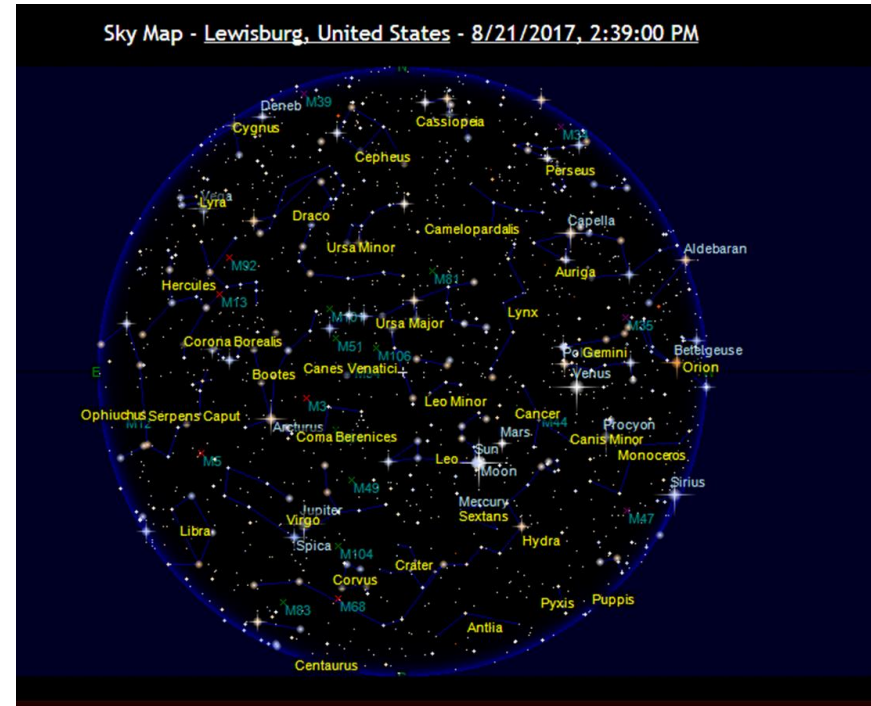
Long term underlying assumptions that may have held back our progress for 17 years…

- <u>Dramatic events</u> — observing amazing phenomena focused the searches in that direction and led us to "look" for only those "big" events

- <u>Interactions were all looked for in one direction</u> — since historic work identified battery polarity reversal and high impact (500-700 mV) reductions in battery voltage (large Deltas), only large reductions in V were regularly searched for

- <u>Any Mach effect impacts (if they were measurable) would directly affect the battery/sensor physically</u> — we were only thinking of large possible hits to battery chemistry or material itself not the potential for an e-m interaction with the field created by current flow in the battery

- <u>What was in the Sky was not important -</u>

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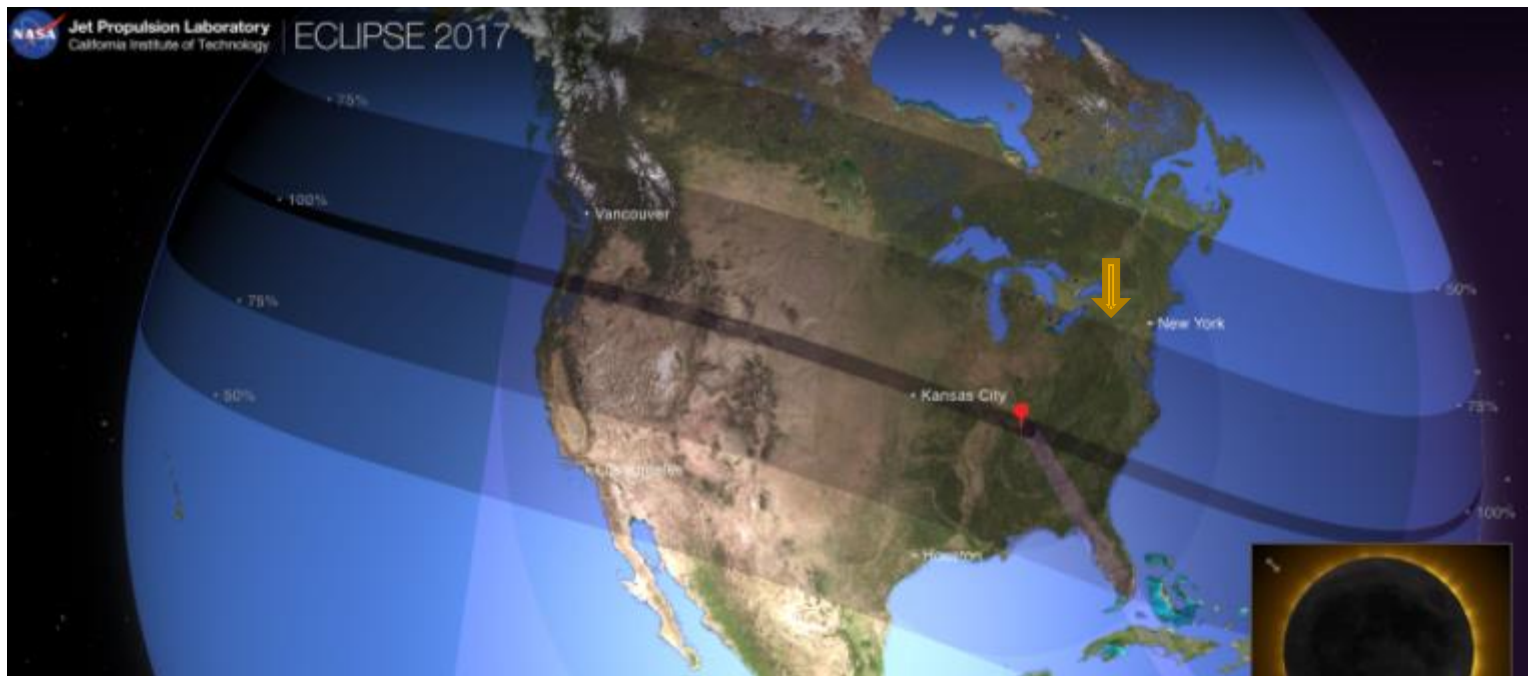# Most Recent Work (Integrated Systems Lab, 2017)

- **_Search moves to observing each battery voltage distribution in individual experiments:_**
- Carefully search Sky Maps for correlation of outliers with celestial alignments
- Attempts to reduce clutter created by many possible sources:
- Batteries charging over many different periods of time and grid voltages.
- Removal of sensor batteries that do not seem to hold charge well
- Account for 5-15mV of battery voltage rebound that occurs over the ~8 minute read post-voltage read period
- Attempt to run experiments during all predicted significant celestial alignments
    - Solar/Lunar Eclipse - Aug 21
    - Solar /Lunar/Virgo Supercluster alignment
    - Oct 1 2016 event repeated Oct 18/19 2017

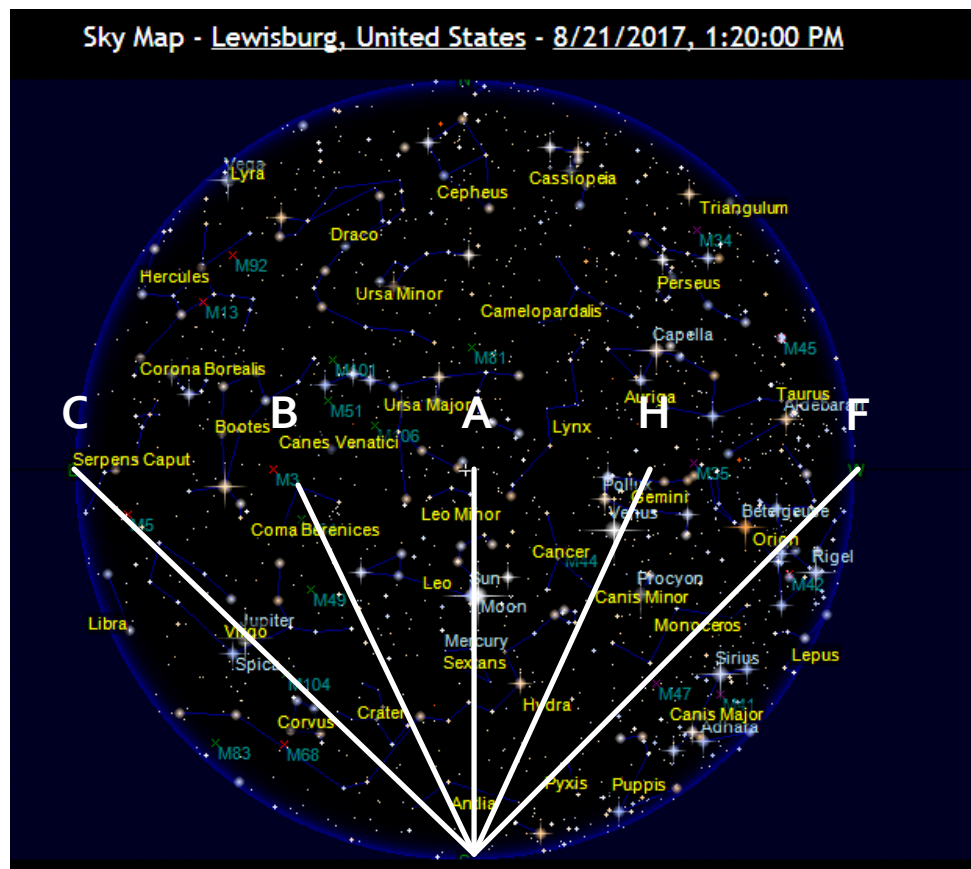Sky Map - Lewisburg, United States - 8/21/2017, 2:39:00 PM

SOURCE: http://www.skymaponline.net/

Day of the Eclipse

- Our laboratory was at edge of the 75% eclipse zone
- Exp #1 began at 1.20PM, Exp #2 began at 2.35PM

- Exp #1 began at 1.20PM, Sun/Moon overhead

Observed Delta in V is unexpected

- Experiment #1

Delta Voltage (V) - Eclipse - 21 Aug 2017

Exp #1 21 Aug 17
Echo Arm points
directly to Earth
Response

Echo Lowest Arm &
Echo Batteries (#1-4 & 6)
Echo Battery #2 (-141 mV)

Echo Highest Battery
Echo Battery #5 (149 mV)

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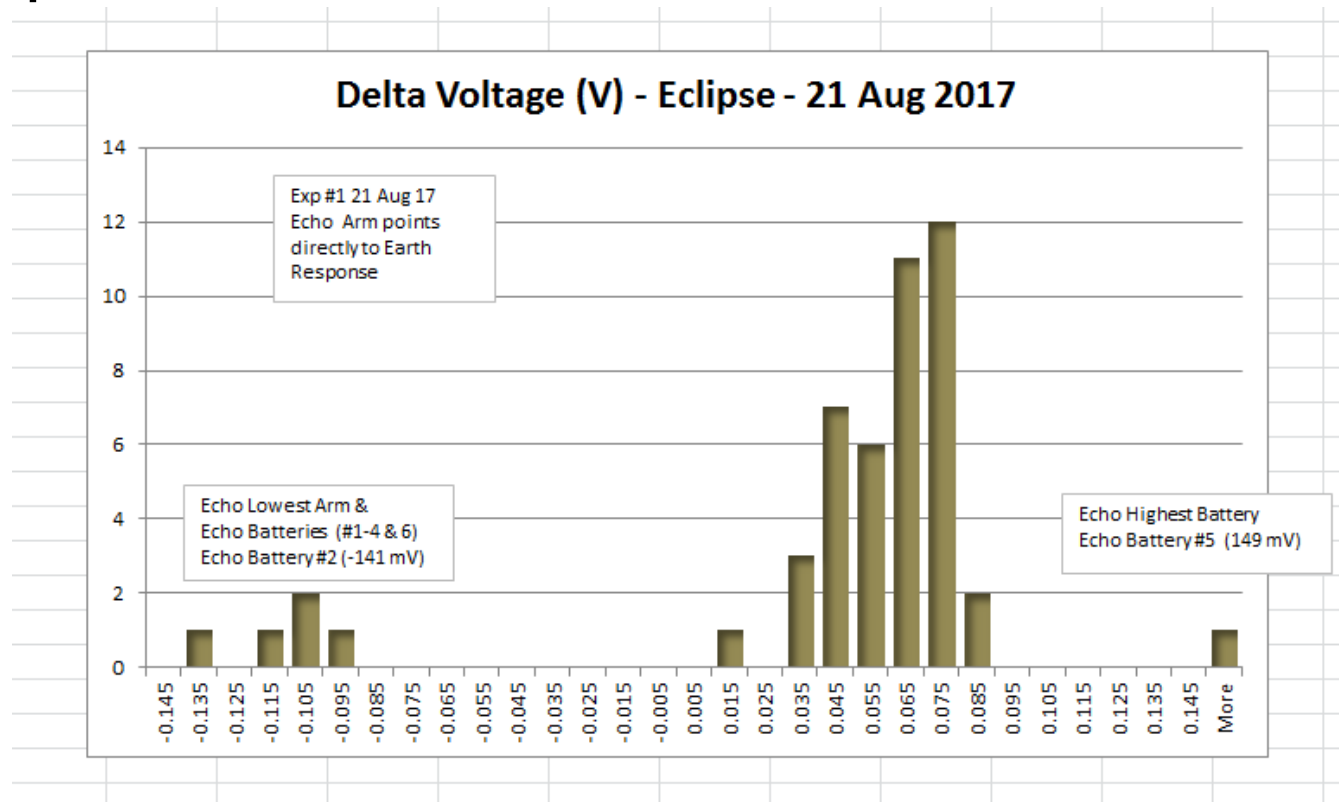
Day of the Eclipse – Exp #2 – Sky Map

- Exp #2 began at 2.39PM, Sun/Moon overhead at 1 o'clock
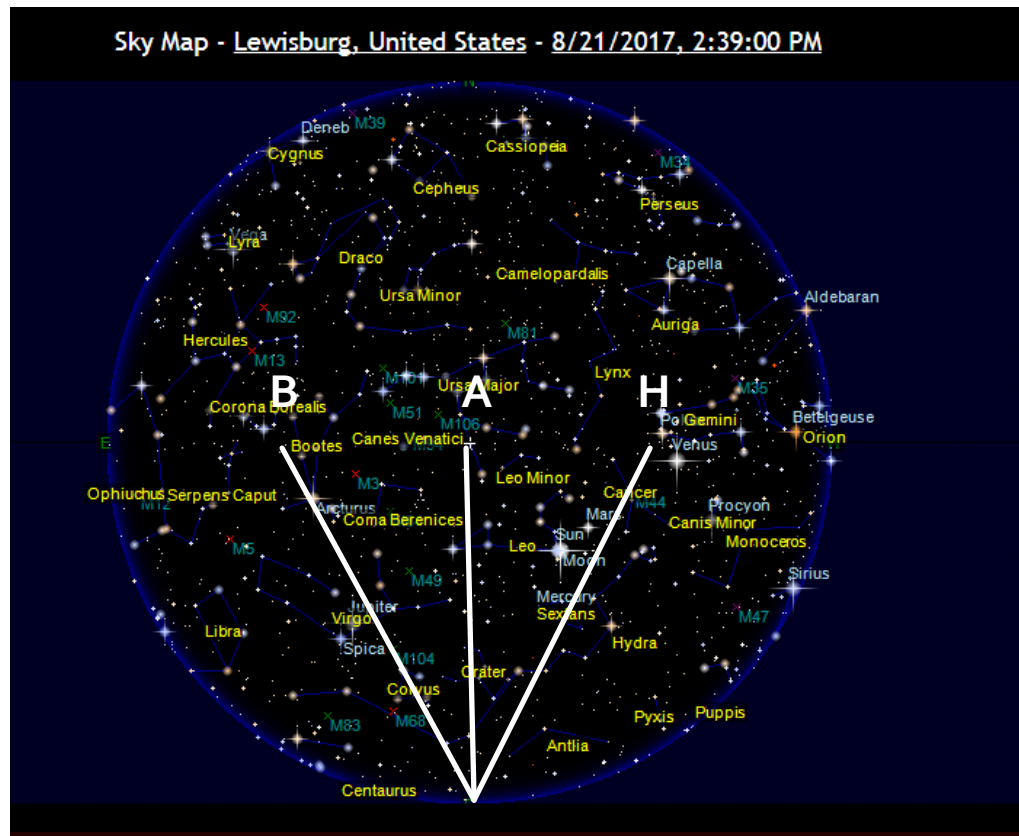
Observed Delta in V is more normal

- Experiment #2

Δ Voltage (V)

Exp #2 21 Aug 17
Hotel Arm points
directly to SM Eclipse
Bravo (Lowest Arm)
points to Virgo

Hotel Battery is Lowest
Battery #6 (15 mV)

Hotel Battery is Highest
Battery #5 (63 mV)
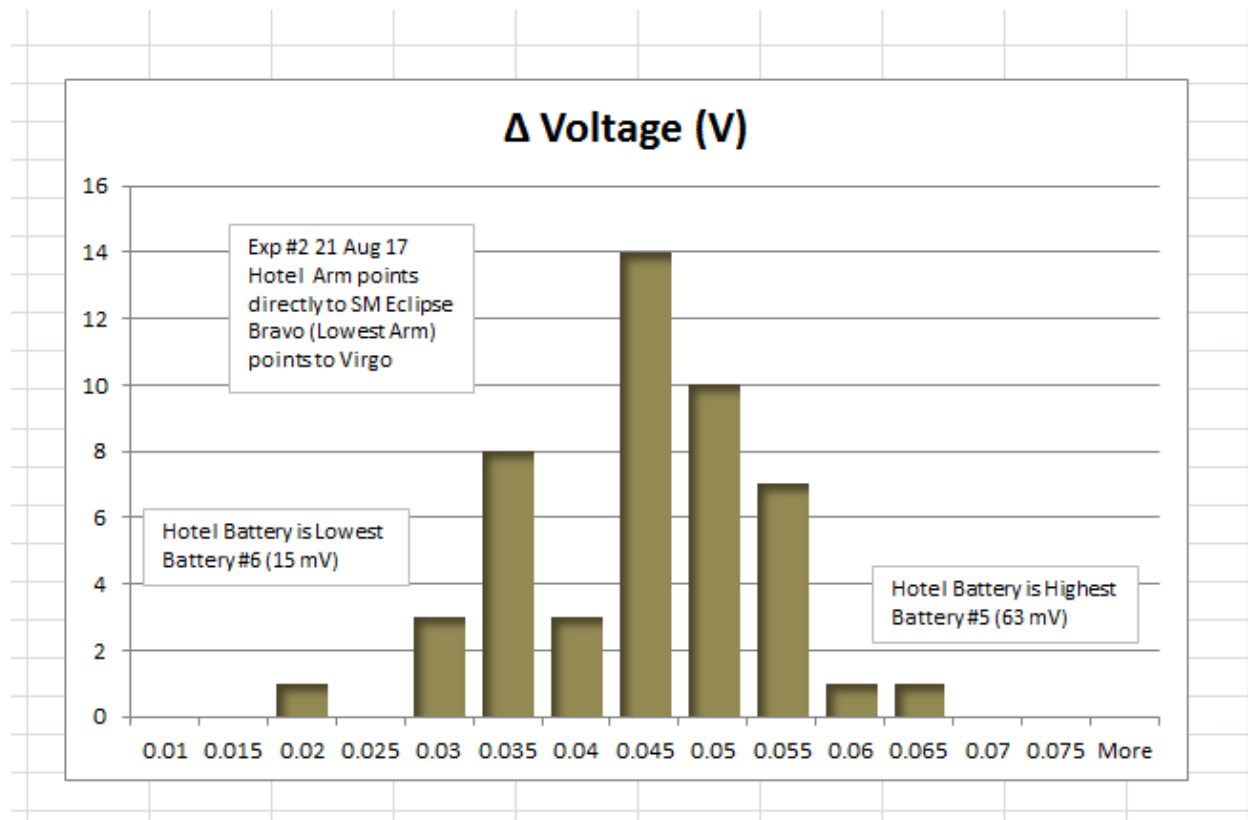
Search for Hi/Lo values as pointers

- Experiments #1 & #2 indicated hi/lo batteries and lowest arm as potential vectors / pointers
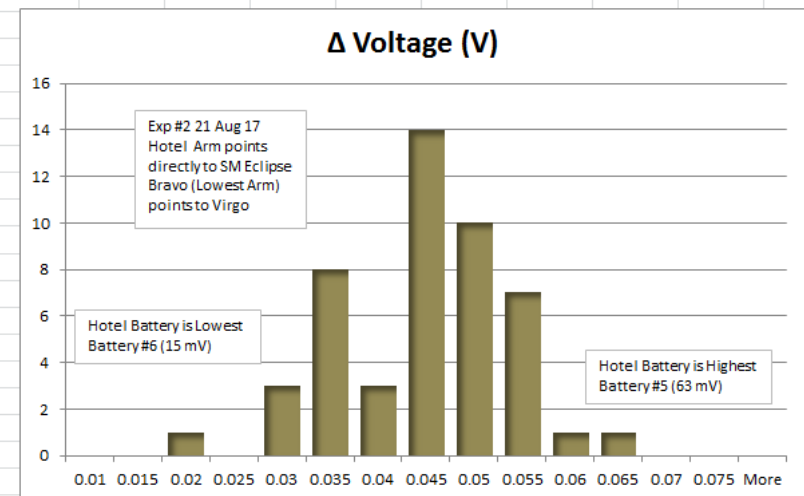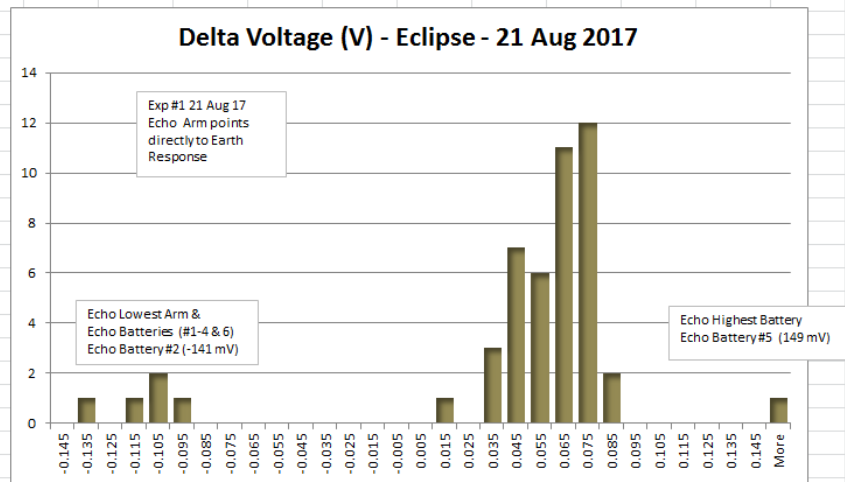
Recent October Sky Observations

- Alignment of Virgo, Sun and Moon (19 Oct 2017) similar to 1 Oct 2016

Sky Map - Lewisburg, United States - 10/19/2017, 12:40:00 PM

October Sky Experimental Setup

- Bringing to ground floor (18-21Oct 2017)

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October Sky Experimental Protocol

- **Inertia Wheel brought to acceleration using grid power**
  - Measure Battery Pre voltage (V_{in})
  - Load Device with screened batteries
  - 4 min protocol via grid to build system inertia
  - 4 min on batteries ONLY
  - Monitoring motor temp, rpm and DVMs
  - – See illustration →
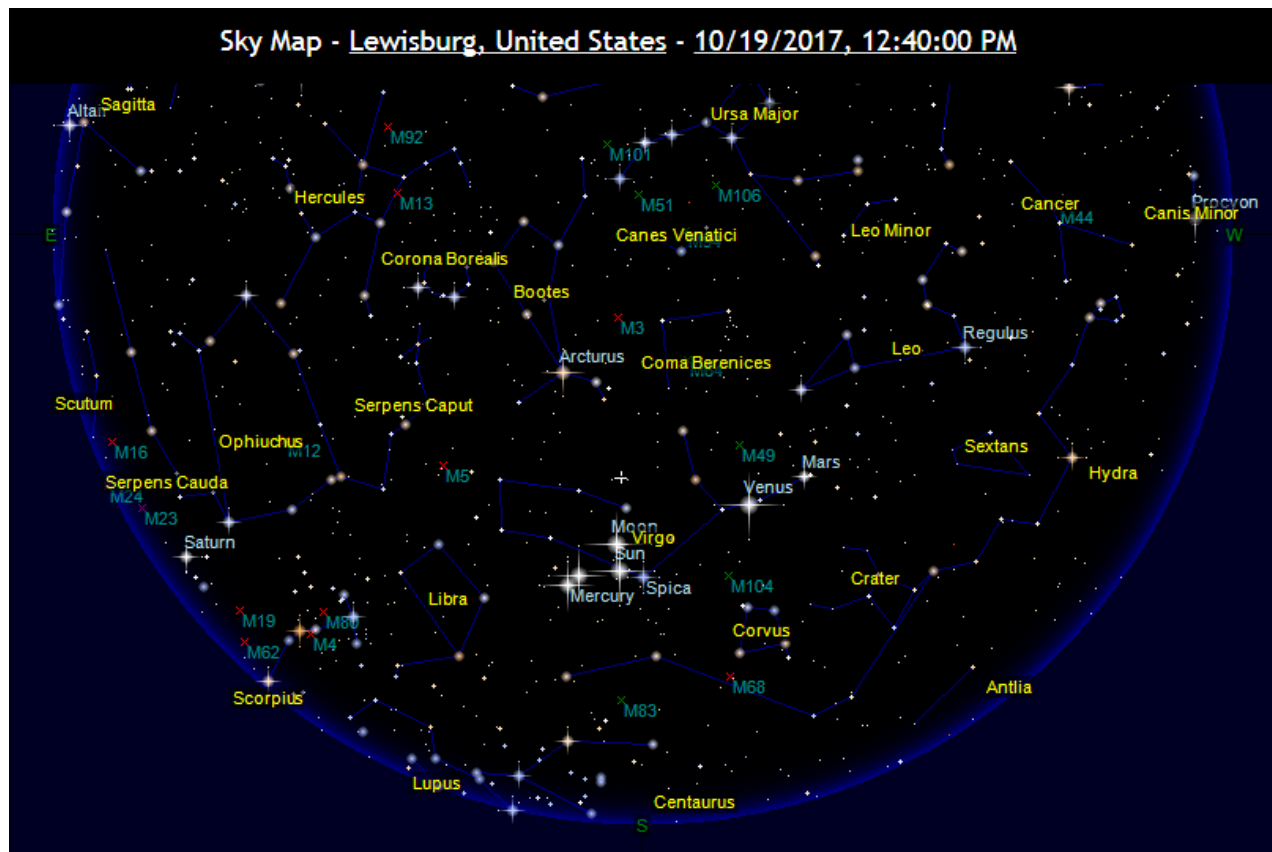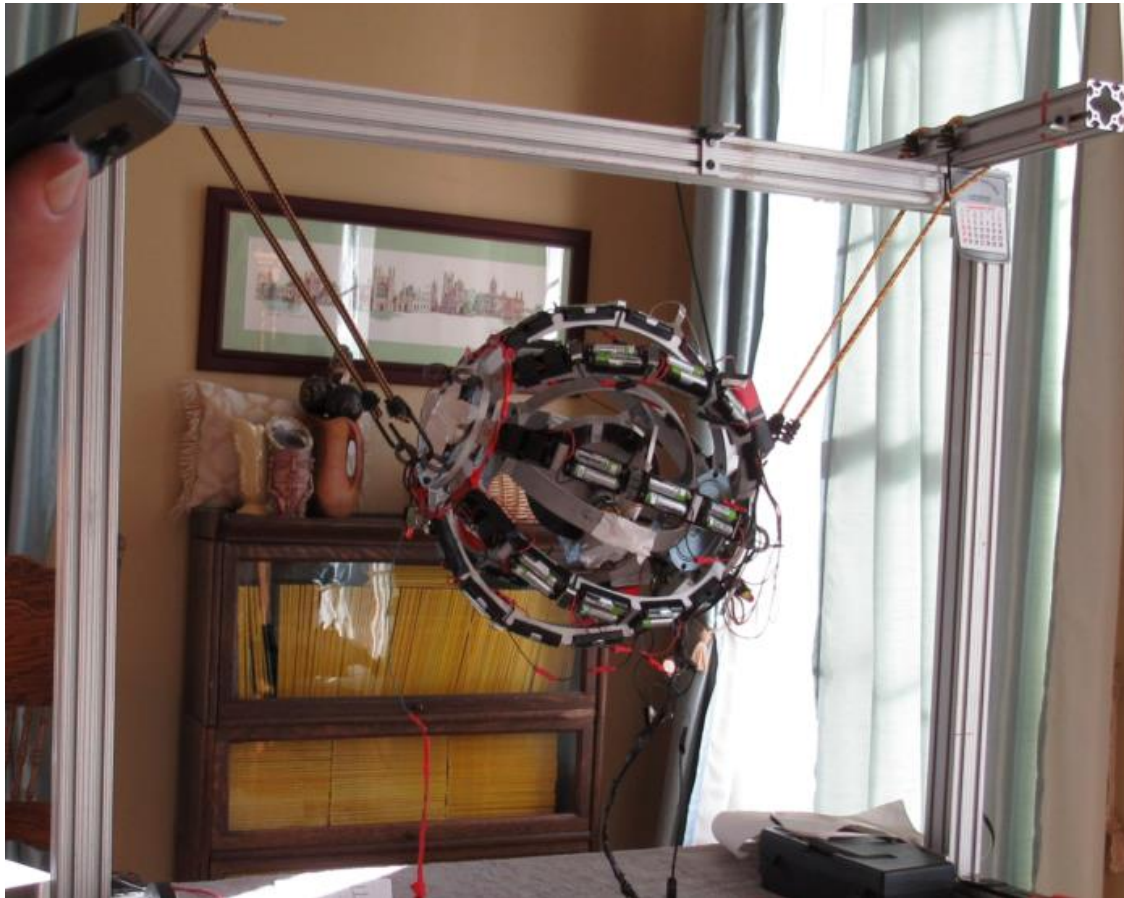 - (apply torque intermittently)
  - Terminate batteries at 8 minutes
  - After Last spin (~11-12m) turn off DVMs
  - Record Battery Post voltage (V_{out})
  - Adjust for Battery rebound (~5 – 12 mV) based on read time
- **POST PROCESSING**
  - Load data into Excel, record Hi/Lo Arms and Hi/Lo Batteries
  - Identify potential correlation with target "Machian" masses

Date: _____

Time: _____

TIME	Voltage	Current	Power
0	2		
30 sec	2		
1 min	3		
1m 30s	3		
2min	4		
2m 30s	4		
3min	5		
3m 30s	5		
4 min transition			
4m 30 s			
5 min			
5m 30s			
6min			
6m 30s			
7min			
7m 30s			
8min			
Terminate			

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October Sky Experimental Results

- Data being presented in the following slides have been double checked and all results are herein presented in summary form - we have not yet had sufficient time (since data capture ended on 21 Oct) to graphically depict all of our distributions in time for this conference
- Preliminary results are encouraging but we are just at the beginning of detailed analysis
- Statistical significance methodology is currently under development for the final method of analysis with the assistance of other experts

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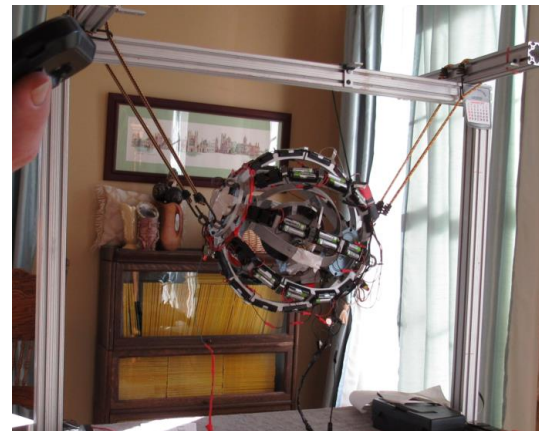
Summary of 23 Experiments
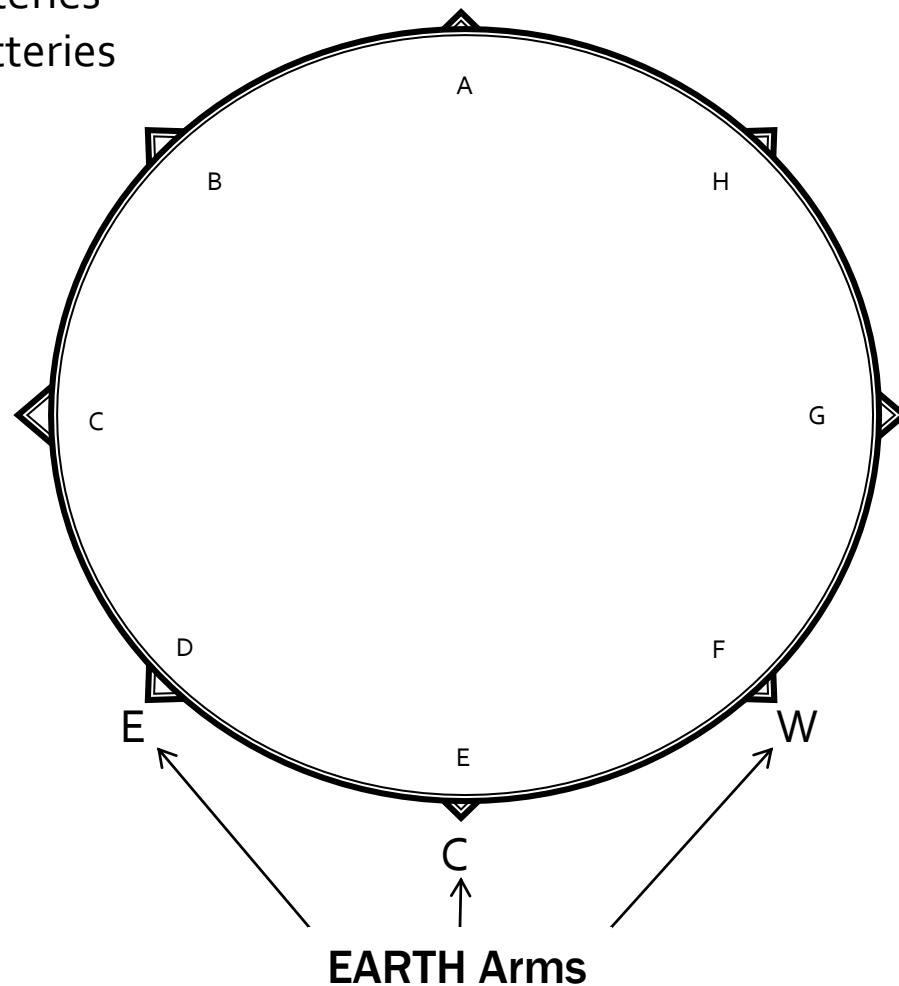
Exp.	Time	Exp	C/E	Sigma	Sigma	D
Date	EST	#		Low	High	
21-Oct	0938	1	E	-2.44	1.99	
20-Oct	0913	1	E	-1.83	2.39	
20-Oct	1026	2	E	-2.58	2.21	
20-Oct	1202	3	C	-2.09	1.68	
20-Oct	1345	4	E	-2.36	2.36	
20-Oct	1532	5	E	-2.57	3.90	
20-Oct	1731	6	E	-1.72	3.12	
20-Oct	1823	7	E	-2.24	2.34	
20-Oct	2052	8	E	-2.25	2.27	
19-Oct	0926	1	C	-2.61	3.24	
19-Oct	1020	2	C	-2.02	2.66	
19-Oct	1118	3	E	-2.51	3.98	
19-Oct	1225	4	E	-2.52	3.38	
19-Oct	1414	5	E	-1.59	2.54	
19-Oct	1511	6	E	-2.48	1.86	
19-Oct	1711	7	E	-2.80	2.21	
19-Oct	1818	8	E	-1.75	2.48	
18-Oct	0910	1	C	-2.15	1.75	
18-Oct	1000	2	E	-2.31	1.64	
18-Oct	1130	3	E	-2.42	1.66	
18-Oct	1421	4	E	-2.48	2.08	
18-Oct	1543	5	E	-1.71	2.08	
18-Oct	1730	6	E	-2.04	2.29	

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How we "read" detector

Read V_{in} of all batteries
Read V_{out} of all batteries
Calculate Δ

A

B   H

C   G

D   F

E   W

E

C

↑

EARTH Arms

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"Possible" Hits in 23 Experiments

Detector Hi/Lo Arms and Hi/Lo Batteries > 2 sigma			
Hi Arm #1	**Lo Arm #1**	**Hi Batt #1**	**Lo Batt #1**
D	A	D*	F
B	F	E	F*
B	C	E	C
B	D	E*	F
B	F	A	A
A	G	E	C
D	F	C	D*
E	A	E	A
D	F	D	F
D	B	B	B
A	D	A	D
B	F	E	E
E	F	F	F
B	F	D	F*
E	F	H*	F
E	F	E	B
H	F	H	B*
C	F	B*	B
C	A	C*	F
B	A	D*	A
B	G	G	D
D	A	C	E*
D	A	D	F

This draft "possible" interaction matrix is a result of Solar/Lunar eclipse observations where these indicators emerged as likely suspects

* - values are max or min in the 48 battery test group, but < 2 sigma

In these 23 Experiments we observed

- **100%** of runs pointed to Earth as target mass
- **73%** of runs pointed to Virgo, Sun and/or Moon as targets

- **91.3%** had <u>Low Arm</u> pointing to a target mass
- **82.6%** had <u>High Battery</u> pointing to a target
- **73.9%** had <u>High Arm</u> pointing to a target
- **65.2%** had <u>Low Battery</u> pointing to a target

- Overall, Visible target masses correlate with Hi/Lo Batteries & Hi/Lo Arms for **78%** of all 96 possibilities
- What do these results mean? Just coincidence?
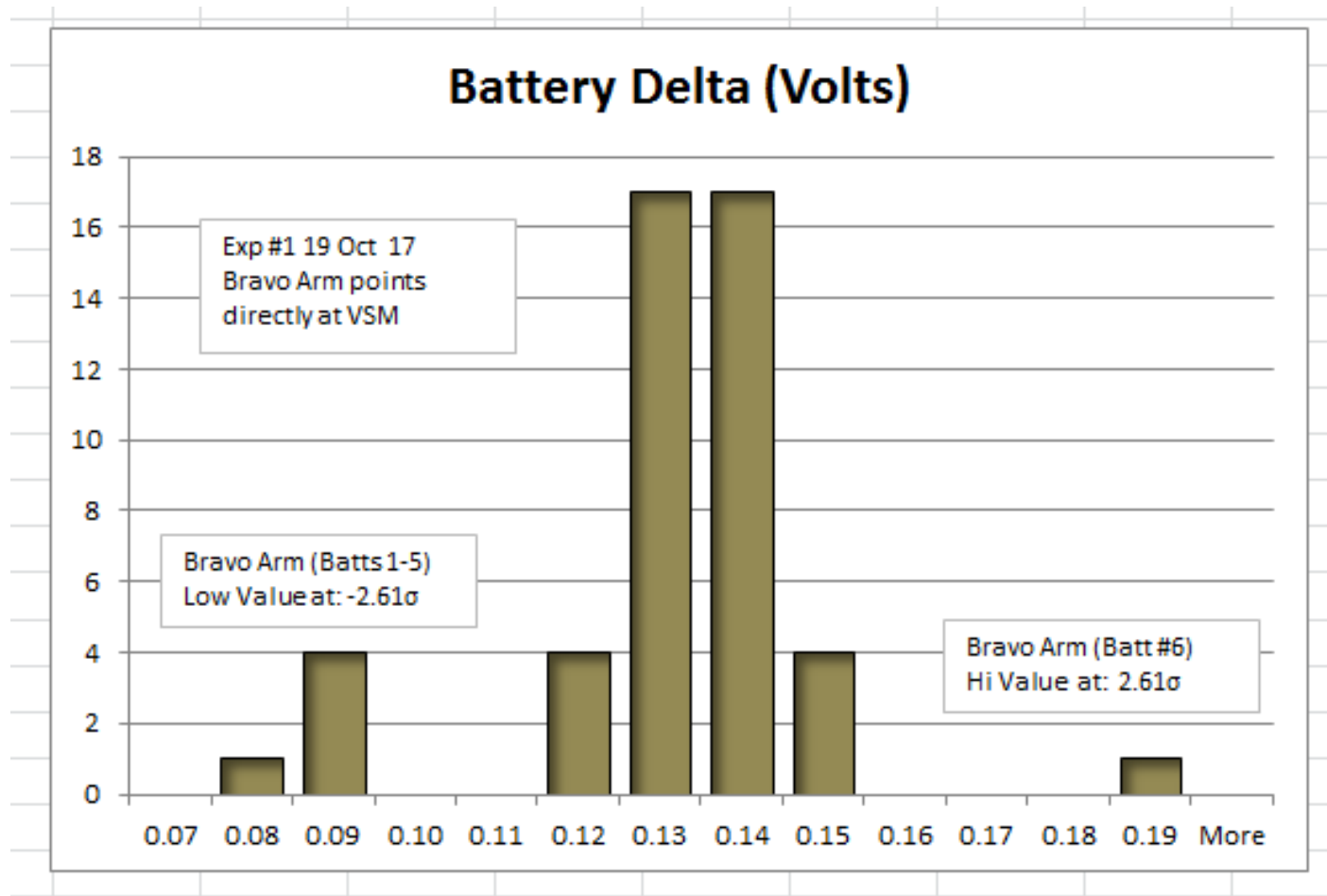- Or is there a possible underlying cause and effect?

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Earth Reaction Possible Detection

RED Letter indicates Detector positive

Large Inertial Masses and Orientation to Detector Arms					
Earth E	Earth C	Earth W	#	Possible Earth Reaction Force Hits?	
C	D	E	2	D - Hi Arm #1, Hi Batt #1 (Sigma=1.91)	
D	E	F	3	E - Hi Batt #1, F - Lo Arm #1, Lo Batt #1 (sigma=-1.83)	
D	E	F	1	E - Hi Batt #1	
D	E	F	3	D - Lo Arm #1, Lo Batt #1, E = Hi Batt#1 (sigma 1.68)	
D	E	F	1	F - Lo Arm #1	
E	F	G	2	E - Hi Batt #1, G - Lo Arm #1	
E	F	G	1	F -Lo Arm #1	
E	F	G	2	E - Hi Arm #1, Hi Batt #1	
E	F	G	2	F - Lo Arm #1, Lo Batt #1	
C	D	E	1	D - Hi Arm #1	
C	D	E	2	D - Lo Arm #1, Lo Batt #1	
D	E	F	3	F - Lo Arm #1, E - Hi Batt #1, Lo Batt #1	
D	E	F	4	E - Hi Arm #1, F - Lo Arm #1, Hi Batt #1, Lo Batt #1	
D	E	F	3	D - Hi Batt #1, F - Lo Arm #1, Lo Batt#1 (sigma=-1.59)	
D	E	F	3	E - Hi Arm #1, F - Lo Arm #1, Lo Batt #1	
E	F	G	3	E - Hi Arm #1, Hi Batt #1, F - Lo Arm #1	
E	F	G	1	F - Lo Arm #1	
C	D	E	1	C - Hi Arm #1	
C	D	E	2	C - Hi Arm #1, Hi Batt #1 (sigma=1.64)	
C	D	E	1	D - Hi Batt #1 (sigma=1.66)	
E	F	G	2	G - Hi Batt #1, Lo Arm #1	
E	F	G	1	E - Lo Batt #1 (sigma=-1.71)	
F	G	H	1	F - Lo Batt #1	
9	14	8	45	Total Possible Interactions (Earth)	
			1.96	Interactions per Experiment	
			49%	% of ALL interactions Possibly Implicating Earth	

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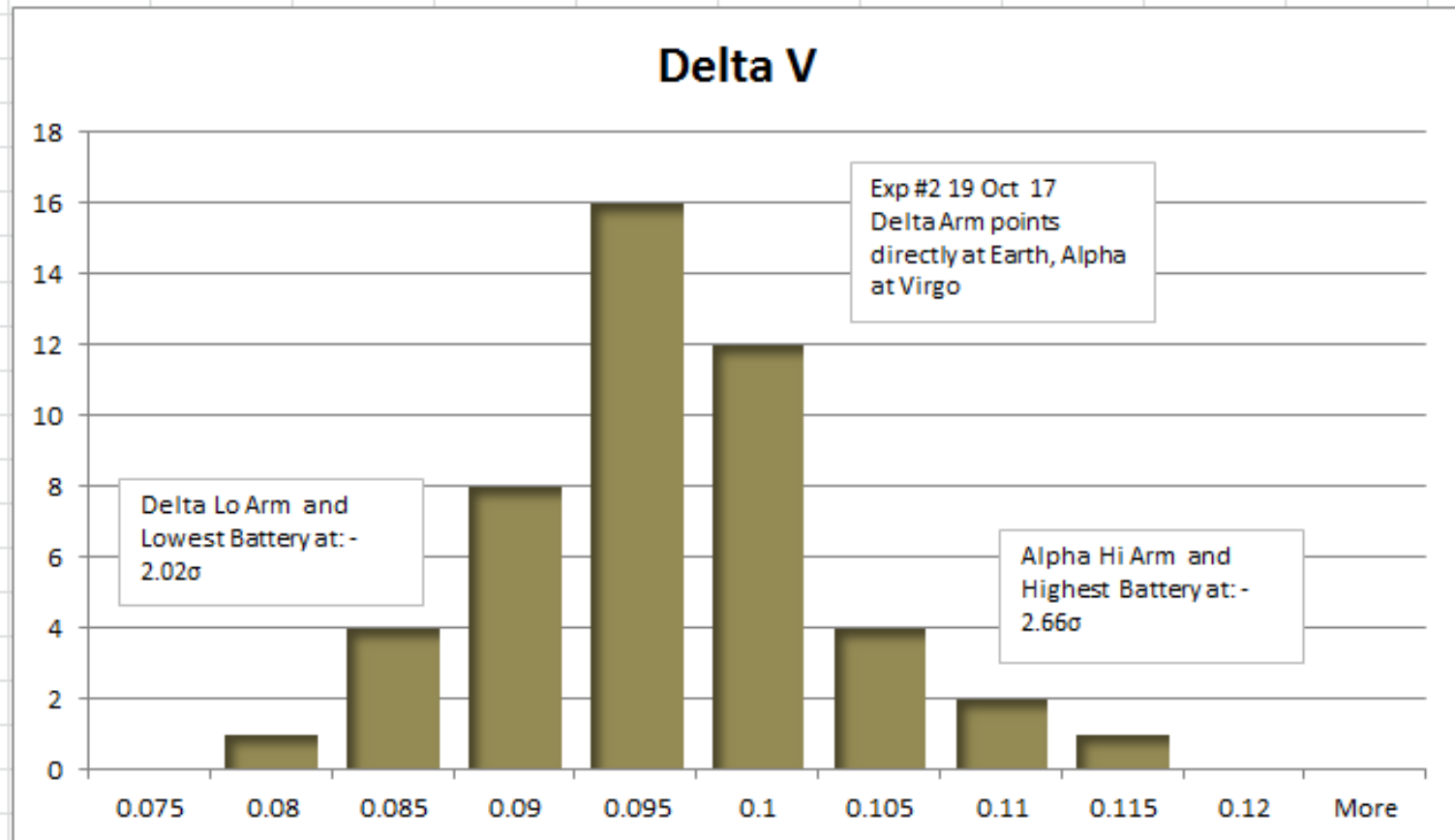# Virgo, Sun, Moon Possible Detection

#		Does Moon, Sun or Virgo interact with remaining Hi/Lo Arms / Hi/Lo Batteries?	
1	A or F	YES, A is Possible Hit by Virgo	No Visible object for Hit on F
1	B	YES, B is Possible Hit by Virgo	
3	B or C	YES, C is Possible Hit by Moon, Sun & Virgo, Virgo Possibly Hits B as well	
1	B	YES, B is Possible Hit by Moon, Sun & Virgo	
2	AA or B	YES, A is Possible Hit by Moon, Sun & Virgo	No Visible object for Hit on B
1	A or C	YES, A is Possible Hit by Moon & Virgo	No Visible object for Hit on C
0	C or DD		No Visible object for Hit on C or DD
0	AA		No Visible object for Hit on AA
0	DD		No Visible object for Hit on DD
3	BBB	YES, B is Possible Hit by Moon, Sun & Virgo	
2	AA	YES, A is Possible Hit by Virgo	
1	B	YES, B is Possible Hit by Moon, Sun & Virgo	
0			
0	B		No Visible object for Hit on B
1	H	YES, H is Possible Hit by Moon, Sun & Virgo	
0	B		No Visible object for Hit on B
2	B or HH	YES, H is Possible Hit by Moon, Sun & Virgo	No Visible object for Hit on B
2	BB or F	YES, B is Possible Hit by Moon, Sun & Virgo	No Visible object for Hit on F
1	A or F	YES, A is Possible Hit by Moon & Virgo	No Visible object for Hit on F
3	AA or B	YES, A is Possible Hit by Sun & Virgo, Virgo Possibly Hits B as well	
1	B or D	YES, B is Possible Hit by Virgo	No Visible object for Hit on D
1	A, C or D	YES, A is Possible Hit by Virgo	No Visible object for Hit on C or D
1	A or DD	YES, A is Possible Hit by Moon, Sun & Virgo	No Visible object for Hit on DD

27	Possible Additional Interactions (Moon, Sun, Virgo)	20	Un-Correlated Possible Hits
1.17	Interactions per Experiment	20	
29%	% of ALL interactions MSV	22%	% of ALL Interactions Uncorrelated
26	Possibly Implicating Virgo Supercluster direction		
18	Possibly Implicating Sun		
17	Possibly Implicating Moon		

Similar results – 19 Oct – Exp #1

Battery Delta (Volts)

Exp #1 19 Oct 17
Bravo Arm points
directly at VSM

Bravo Arm (Batts 1-5)
Low Value at: -2.61σ

Bravo Arm (Batt #6)
Hi Value at: 2.61σ

Similar results – 19 Oct – Exp #2

Delta V

Exp #2 19 Oct 17 Delta Arm points directly at Earth, Alpha at Virgo

Delta Lo Arm and Lowest Battery at: -2.02σ

Alpha Hi Arm and Highest Battery at: -2.66σ
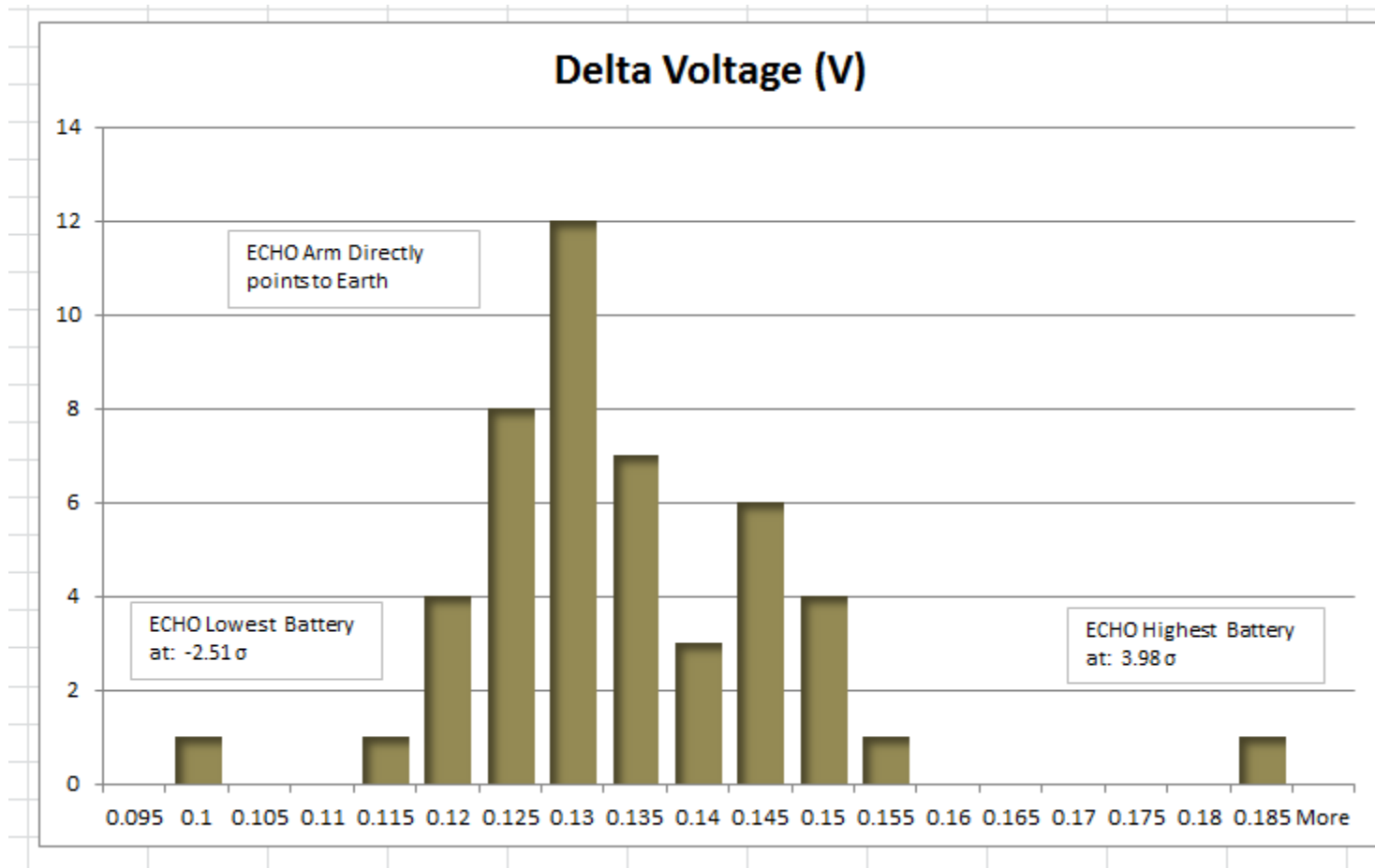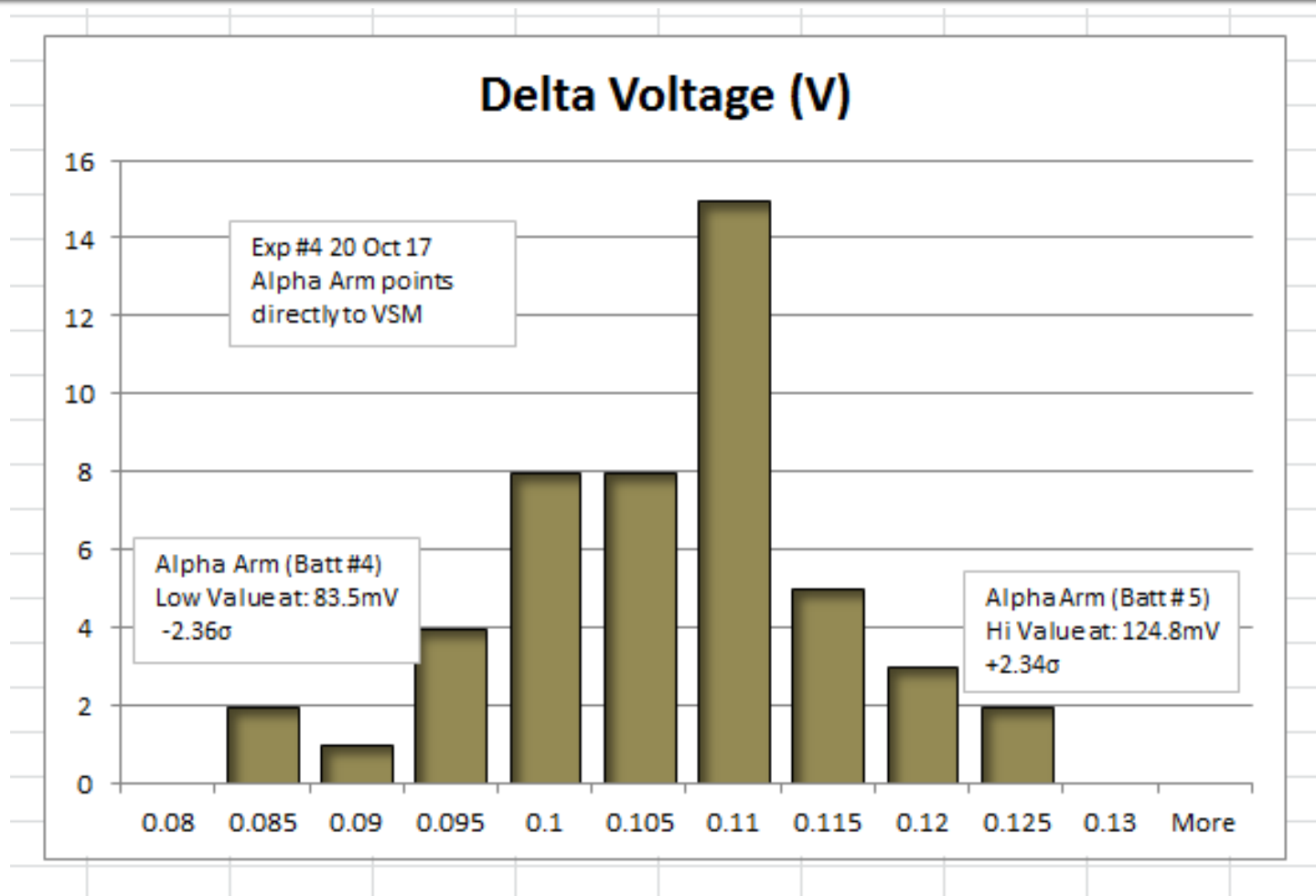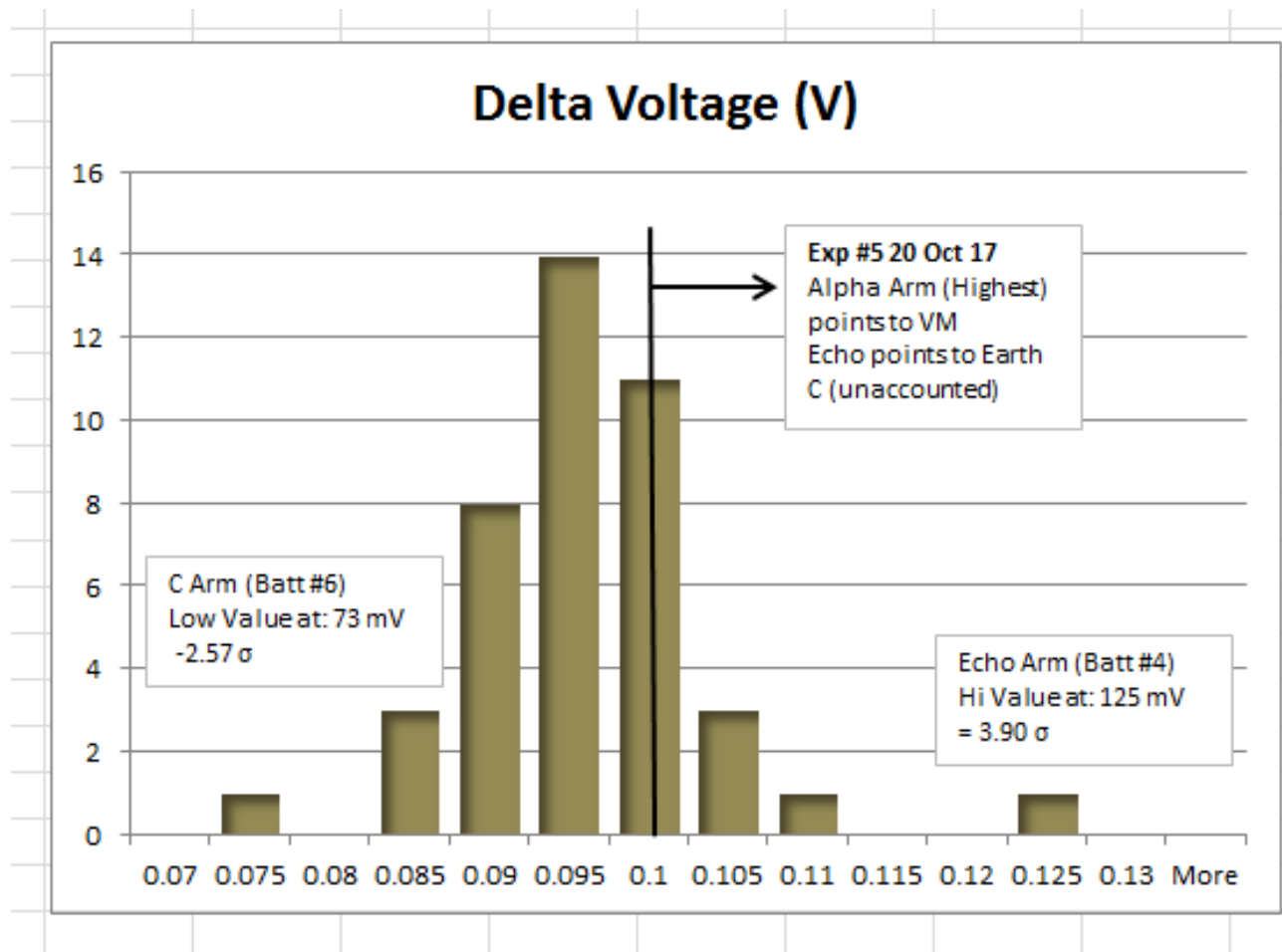
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Similar results – 19 Oct – Exp #3

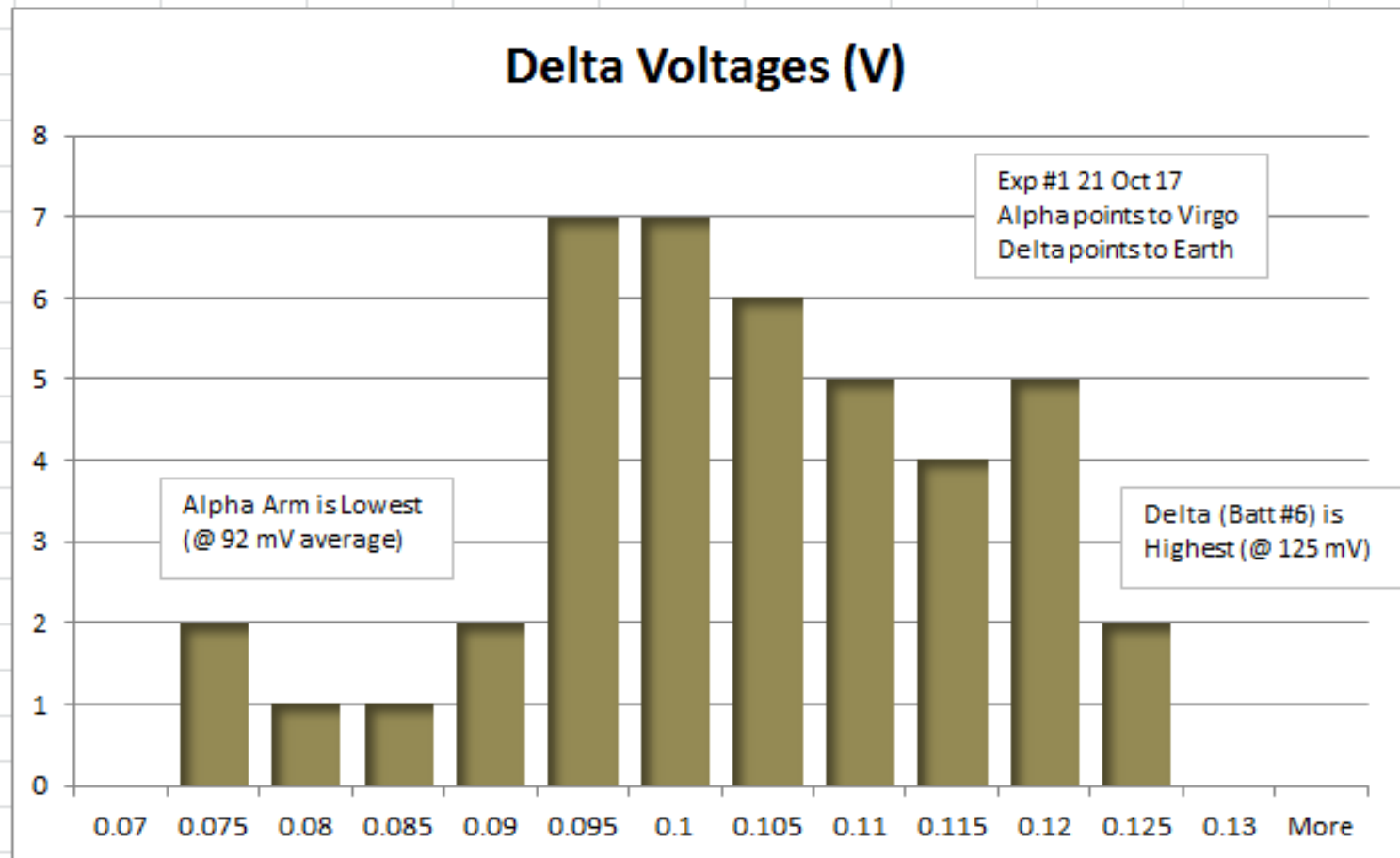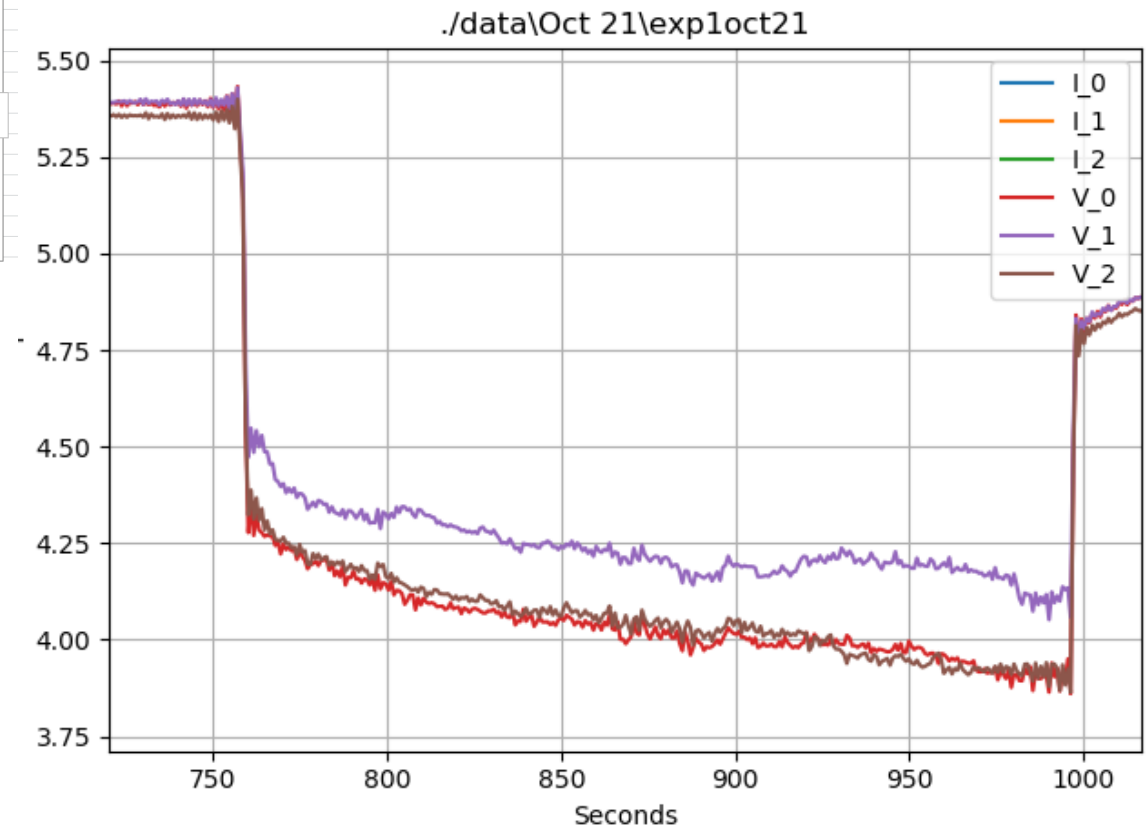# Similar results – 20 Oct – Exp #4
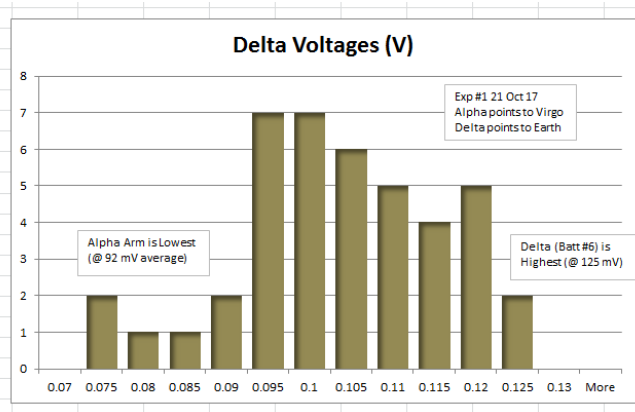
Similar results – 20 Oct – Exp #5

Delta Voltage (V)

Exp #5 20 Oct 17
Alpha Arm (Highest)
points to VM
Echo points to Earth
C (unaccounted)

C Arm (Batt #6)
Low Value at: 73 mV
-2.57 σ

Echo Arm (Batt #4)
Hi Value at: 125 mV
= 3.90 σ

Similar results – 21 Oct – Exp #1

Delta Voltages (V)

Exp #1 21 Oct 17
Alpha points to Virgo
Delta points to Earth

Alpha Arm is Lowest
(@ 92 mV average)

Delta (Batt #6) is
Highest (@ 125 mV)

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Similar results – 21 Oct – Exp #1

Delta Voltages (V)

Exp #1 21 Oct 17
Alpha points to Virgo
Delta points to Earth

Alpha Arm is Lowest
(@ 92 mV average)

Delta (Batt #6) is
Highest (@ 125 mV)

./data\Oct 21\exp1oct21

Quotable Quotes

- "To continue the progress of science, we have to again confront deep questions about space and time, quantum theory, and cosmology... the directions in which progress is being made – are taking theory back into contact with experiment." [6]

- "Gradually a solid Machian law of inertia is emerging. While not yet recognized by the physics community at large, its universal stature is sure to win through in the twenty-first century....The force of inertia is a signpost to new knowledge that underlies the laws of nature. It demonstrates the holistic aspect of the universe which is due to instantaneous action at a distance forces." [12]

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Synchronicity

I am open
to the guidance of
synchronicity,
and I do not let
expectations
hinder my path.

- Dalaï Lama -

Coincidence

Next steps....

- Review all previous experimental data with revised analysis method and reference to Sky Maps
- Building new, real-time wireless sensor array communication and data processing to accelerate data collection and allow immediate analysis /documentation of individual sensor interactions
- Complete submission of full patent (preliminary patent was filed in late Nov 2016)
- Build collaborations with other institutions/partners
- Submit latest results to peer reviewed journals

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- *Craftsmanship of:*
  - Charles Crouchman (formerly of the University of Cambridge – Department of Engineering - Institute for Manufacturing),
  - Charles Linderman (Rowan University – College of Engineering)
  - Tim Baker (Bucknell University – College of Engineering)
- *Support of:*
  - Dr. Chris Hope and Dr. Elizabeth Garnsey (University of Cambridge)
  - Dr. John L. Schmalzel, PE (Founding ECE Chair, Rowan University)
- *Inspiration of:*
  - Prof. James Woodward, Prof Heidi Fearn, and the participants of the 1st Advanced Propulsion Workshop (Sep 2016), Estes Park, Colorado

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Questions?

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