LEAP: The LENRIA Experiment and Analysis Program

Introduction and Progress Report

Steven B. Katinsky, David J. Nagel LENRIA Corporation

Melvin H. Miles, M. Ashraf Imam

12th International Workshop on Anomalies in Hydrogen Loaded Metals

5-9 June 2017

Hotel Langhe e Monferrato, Via Contessa di Castiglione, 14055 Costigliole d'Asti (AT), Italy

Strategy

Perform the same LENR experiment that has been qualified to produce excess heat, at multiple major laboratories.

Produce reports on the conduct and results of the experiments at each laboratory.

Coordinate simultaneous publication of the reports in a major scientific journal.

Goal is a change of perception of LENR by the scientific community, for 'very important people,' government agencies and the public.

History

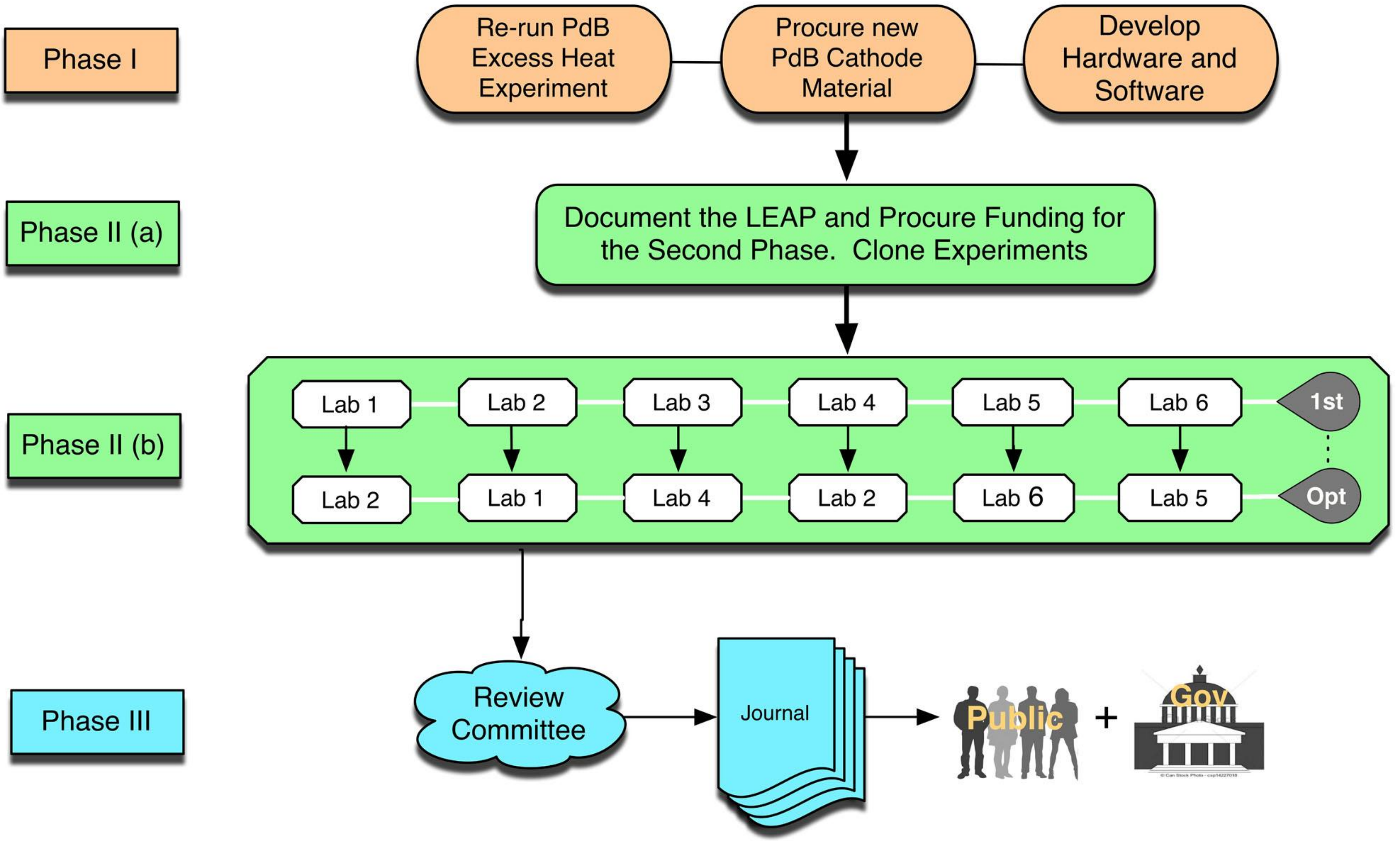
The multi-lab program, now called LEAP, was conceived in 2013.

Since then, we have examined experimental options for the program.

Last year, in 2016, we decided to base the program on the electrochemical loading of Pd-Boron alloys.

In recent months we have been acquiring and testing equipment to produce a modern, turn-key, automated system.

LEAP: The LENRIA Experiment and Analysis Program



LEAP: The LENRIA Experiment and Analysis Program

Consideration of experimental candidates for the LEAP Program

Rothwell, J., *Introduction to the Cold Fusion Experiments of Dr. Melvin Miles*. Infinite Energy, 1997. **3**(15/16): p. 27. Revised and updated, 2004.

Introduction to the Cold Fusion Experiments of Melvin Miles

Jed Rothwell

From 1989 until his funding was terminated in 1995, Melvin Miles performed some of the best cold fusion experiments on record, at the China Lake Naval Air Warfare Center. (He retired from China Lake in 2002.) His goal was to answer two critical questions: Does cold fusion produce helium along with excess heat, like a plasma fusion reaction? And if so, does it produce roughly as much helium per joule of energy as a plasma fusion reaction does? He answers both questions affirmatively. When a cold fusion palladium cathode becomes active, it releases helium into the electrolyte. The helium leaves the cell in the effluent deuterium and oxygen gas. Cathodes that produced more excess heat produced greater amounts of helium. The ratio of helium to energy is roughly comparable to that of hot fusion, within an order of magnitude. This is strong evidence that cold fusion really is some form of nuclear fusion, and not fission, zero point energy, or something else.

Another important lesson from this research is that cathode material is the key to success. This is no surprise to people familiar with the literature, but Miles makes the trend clear. He tested 94 cathodes from 12 different sources. Seventeen out of 28 experiments with Johnson-Matthey palladium produced excess heat. All four of the special Johnson-Matthey cathodes provided by Fleischmann worked. But with 19 cathodes from four other batches, not one worked.

Miles is a professional, and quite willing to share information, unlike some other researchers in the field. He has published fifteen papers in conference proceedings and peer reviewed journals and a 98-page report, which is abstracted in this issue. He has tried to publish more papers and letters, but most peer-reviewed mainstream journals turned him down. His lectures at the major cold fusion conferences have been models of clarity and rigor. He began research on helium detection 1990, in collaboration with B. F. Bush and J. J. Lagowski at the University of Texas. Bush is an expert in dealing with contamination from air, a critical factor in this experiment. Samples of the effluent gas from the experiment were analyzed at the University of Texas. After the experiment had been underway for some time, samples were sent to the U.S. Bureau of Mines, which specializes in gas detection, and to Rockwell International. Similar results were obtained from both laboratories.

Miles was the first to perform a systematic search for helium in the effluent gas. He also looked for helium in the cathode metal, where researchers expected to find it at first. He and others have found only negligible amounts of helium in the metal. This indicates that the reaction occurs near the metal surface rather than in the bulk. After Miles published his findings, other researchers in Italy and Japan also looked for helium in the gas. Results have been mixed, but in recent work using the best, most sensitive equipment yet, Cignini and Gozzi have confirmed Miles' findings. [1]

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Introduction to the Cold Fusion Experiments of Melvin Miles

Jed Rothwell

Dramatic Differences in Palladium from Different Sources

Miles found that palladium from different sources has dramatically different performance. Cathode material is the most important variable in these experiments. Here is a summary of Table 10 :

Source	Success Ratio (excess heat / total tests)
NRL Pd-B alloy	7/8
Johnson-Matthey (J-M) Pd	13/24
J-M from Fleischmann	4/4
NRL Pd (first batch)	1/2
Tanaka Pd (sheet)	1/3
NRL Pd (another batch)	0/4
NRL Pd-Ag	0/3
IMRA Japan Pd-Ag	0/2
WESTGO Pd	0/6
Pd/Cu	0/2
John Dash Pd (sheet)	0/2
Co-deposition (1992)	2/34
Total:	28/94

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Most of the samples produced 1 to 3 watts per cubic centimeter. One of the J-M samples produced 15 watts/cm^3, and in 1994 one of the J-M cathodes from Fleischmann produced 14 watts/cm^3. Contrary to the claims of Jones and other critics, Miles observed high levels of heat in the middle and latter stages of his research project, when he used improved, more sensitive calorimeters. Miles observed heat from Johnson-Matthey palladium wire. Samples of wire from the same spool were later tested in the improved China Lake calorimeter developed by Kendall Johnson, and other samples were tested by Wilfred Hansen at Utah State University. Excess heat was confirmed in these tests.

Other researchers who have tested palladium from different sources also report that the best samples come from Johnson-Matthey. Fleischmann says the best palladium is a special grade available from Johnson-Matthey in 2-kilogram lots for $20,000. Miles discusses some of the morphological and metallurgical differences between working and non-working palladium. Storms describes them in greater detail. [6]

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ANOMALOUS EFFECTS IN DEUTERATED SYSTEMS

Melvin H. Miles, Benjamin F. Bush, Kendall B. Johnson
Naval Air Warfare Center, China Lake 09/96

Source	d, cm	V, cm^3	Px/V, W/cm3	Success ratio	
NRL Pd-B (0.75%)	0.6	0.57	0.6	2/2	
NRL Pd-B (0.75%)	0.25	0.12	2.1	1/2*	(7/8)
NRL Pd-B (0.50%)	0.40	0.25	0.4	2/2	
NRL Pd-B (0.25%)	0.40	0.25	0.8	2/2	

TABLE 10. Summary of Palladium Materials Tested for Excess Power.

Source	d, cm	V, cm^3	Px/V, W/cm3	Success ratio	
NRL Pd-B (0.75%)	0.6	0.57	0.6	2/2	
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NRL Pd-B (0.50%)	0.40	0.25	0.4	2/2	
NRL Pd-B (0.25%)	0.40	0.25	0.8	2/2	
JM Pd	0.63	0.36	1.4	9/14	
JM Pd	0.63	0.67	0.3	1/1	
JM Pd JM	0.40	0.20	0	0/2	(17/28)
(F/P) Pd	0.20	0.038	3.1	1/1	
JM (F/P) Pd	0.10	0.012	14.0	1/4	
JM Pd	0.10	0.02	15.0	3/7	
JM Pd-Ce (F/P)	0.41	0.25	1.1	2/2	
NRL Pd	0.40	0.25	0.4	1/2	(2/5)
Tanaka Pd (Sheet)	…	0.05	1.2	1/3	
NRL Pd	0.40	0.25	0	0/4	
NRL Pd-Ag	0.42	0.21	0	0/3	
IMRA Pd-Ag	0.40	0.20	0	0/2	(0/19)
WESGO Pd (1989)	0.14	0.09	0	0/6	
Pd/Cu	(0.63)	0.02	0	0/2	
John Dash Pd (sheet)	…	0.04	0	0/2	
Co-deposition (1992)	(0.63)	0.002	75	2/34	

1/1 NHE Japan

1/1 NRL**

1/1 Miles Ridgecrest

10/11 Aggregate Pd-B

Solid experimental base behind the experiment we chose.

* Non-performing cathode was observed to have defect

** Excess heat measured before calorimeter failure

ANOMALOUS EFFECTS IN DEUTERATED SYSTEMS

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Naval Air Warfare Center, China Lake 09/96

TABLE 3. Helium Measurements Using Metal Flasks.
Experiments producing excess power.

Electrode	Flask/cell, date	$^4He^a$, ppb	Px,W	$^4He/s$ *W^b
Pd Sheet (1.0 mm × 3.2 cm × 1.6 cm)	3/A (5/21/93)	9.0 ±1.1	0.055	1.6×10^{11}
Pd Rod[c] (1 mm × 2.0 cm)	4/B (5/21/93)	9.7 ±1.1	0.040	2.5×10^{11}
Pd Rod[c] (1 mm × 1.5 cm)	1/C (5/30/93)	7.4 ±1.1	0.040	1.4×10^{11}
Pd Rod[c] (2 mm × 1 .2 cm)	2/D (5/30/93)	6.7 ±1.1	0.060	7.0×10^{10}
Pd Rod[d] (4 mm × 2.3 cm)	1/A (7/7/93)	5.4 ±1.5	0.030	7.5×10^{10}
Pd Rod[d] (6.35 mm × 2.1 cm)	2/A (9/13/94)	7.9 ±1.7	0.070	1.2×10^{11}
Pd-B Rod[d] (6 mm × 2.0 cm)	3/B (9/13/94)	9.4 ±1.8	0.120	1.0×10^{11}

[a] Helium analysis by U.S. Bureau of Mines, Amarillo, Texas.
[b] Corrected for background helium level of 5.1×10^{13} ^4He/500 mL.
[c] D_2O + LiOD (I = 400 mA).
[d] D_2O + LiOD (I = 500 mA).

The helium measurements presented in Table 3 are all taken from experiments that produced steady excess heat effects. For example, the 2/D (5/30/93) sample is from the experiments involving the 2-mm palladium rod obtained from Martin Fleischmann that is shown in Figure 17. Larger excess power effects were present later in this experiment, but no metal flasks were available due to the slow turnaround time for the shipment and analysis. The 1/C (5/30/93) sample involves the 1-mm palladium rod, while the 3/A (5/12/93) result was obtained with the

The largest excess power in Table 3 was obtained using a Pd-B cathode (0.75 weight %B) prepared by NRL.

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New Hydrogen Energy Laboratory (NHE)

Sponsored by New Energy Development Organization (NEDO)

- Dr. Melvin H. Miles visits Japan as a NEDO Guest Researcher
- Location: NHE Laboratory, Sapporo, Japan
- Dates:
  October 23, 1997 to March 31, 1998
- Included is a Pd-B Alloy Experiment

LEAP: The LENRIA Experiment and Analysis Program

NEDO FINAL REPORT

ELECTROCHEMICAL CALORIMETRIC STUDIES OF PALLADIUM AND PALLADIUM ALLOYS IN HEAVY WATER

Dr. Melvin H. Miles
NEDO Guest Researcher
NHE Laboratory
3-5 Techno-Park 2-Chome Shimonopporo
Atsubetsu-ku, Sapporo-004, Japan

DATES:
October 23, 1997 to March 31, 1998

PRESENT ADDRESS:

Dr. Melvin H. Miles
Department of Chemistry
University of La Verne
1950 3rd Street
La Verne, California 91750
909-593-3511 Ext. 4646
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LEAP: The LENRIA Experiment and Analysis Program

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NEDO Final Report, Electrochemical and Calorimetric Studies of Palladium and Palladium Alloys in Heavy Water. Dr. Melvin H. Miles. 1998.

LEAP: The LENRIA Experiment and Analysis Program

PALLADIUM ALLOY CATHODES IN FLEISCHMANN - PONS TYPE CELLS

A. INTRODUCTION / EXPERIMENTAL

The palladium cathodes selected for calorimetric studies were PdñCeñB, Pd-0.5B (0.5 weight % boron), and Pd-Ce. The first two samples were prepared at the Naval Research Laboratory in Washington, D.C. for cold fusion studies, and the third sample (Pd-Ce) was obtained from Martin Fleischmann. In order to test possible effects of the polishing procedures, the Pd-Ce-B sample was polished only by myself using silicon-carbide paper. The Pd-0.5B sample was polished solely by Mari Hosoda using normal NHE procedures involving diamond paste. The third sample, Pd-Ce, gave excess heat in a previous study at China Lake, but now contained a deep, long crack that was difficult to remove. This sample was also polished by Mari Hosoda to remove the crack while the final polish was done by myself using silicon-carbide paper. The final dimensions of these rods were 4.40 x 20.05 mm for the Pd-Ce-B sample (V=0.305 cm^3, A=2.92 cm^2), 4.71 x 20.1 mm for the Pd-0.5B (V=0.350 cm^3, A=3.15 cm^2), and 3.16 x 19.54 mm for the Pd-Ce cathode (V=0.153 cm^3, A=2.02 cm^2). These cathode rods were each spot welded to platinum lead wires that were sealed in thin glass rods. The spot weld areas for each cathode were covered with Epoxy for protection and strength. These electrodes along with the normal platinum anode cage structures were assembled in the Fleischmann ñ Pons cells. The platinum spiral anode is supported by a thin Kel-F disk containing glass rods at the base of the cell. The Pd-Ce-B was in Cell A-1, the Pd-0.5B was in Cell A-2, and the Pd-Ce was in Cell A-3. The cell tops were sealed with silicon rubber and 90 cc of 0.1 M LiOD was added to each cell. These cells were assembled in the water bath and connected to the Icarus 2.00 data acquisition system. This experiment was turned on at 10:00 a.m. on December 5, 1997.

B. CALORIMETRIC EQUATIONS FOR FLEISCHMANN – PONS CELLS

The Dewar-type electrochemical cells are silvered in their top portions so that heat transfer is confined almost exclusively to radiation across the lower, un-silvered part. The calorimetric equations, therefore, are given by

$$P_{calor} = P_{EL} + P_x + P_H - P_{out} - P_{gas} \quad (18)$$

where

$$P_{EL} = [E(t) - \square E_H]\, I \quad (19)$$

$$P_{out} = K\,(T^4_{cell} ñ\ T^4_{bath}) \quad (20)$$

$$P_{gas} = (\square I/F)\{[0.5\, C_{P,D2} + O.25\, C_{p,\,O2} + 0.75\,(P/(P^*ñP))C_{p,D2O\,(v)}]\square T + 0.75\,(P/(P^*ñP))\,L\} \quad (21)$$

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4.71 x 20.1 mm for the Pd-0.5B

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cell. The Pd-Ce-B was in Cell A-1, the **Pd-0.5B was in Cell A-2**, and the Pd-Ce was in Cell A-3.

Pd-0.5B was in Cell A-2

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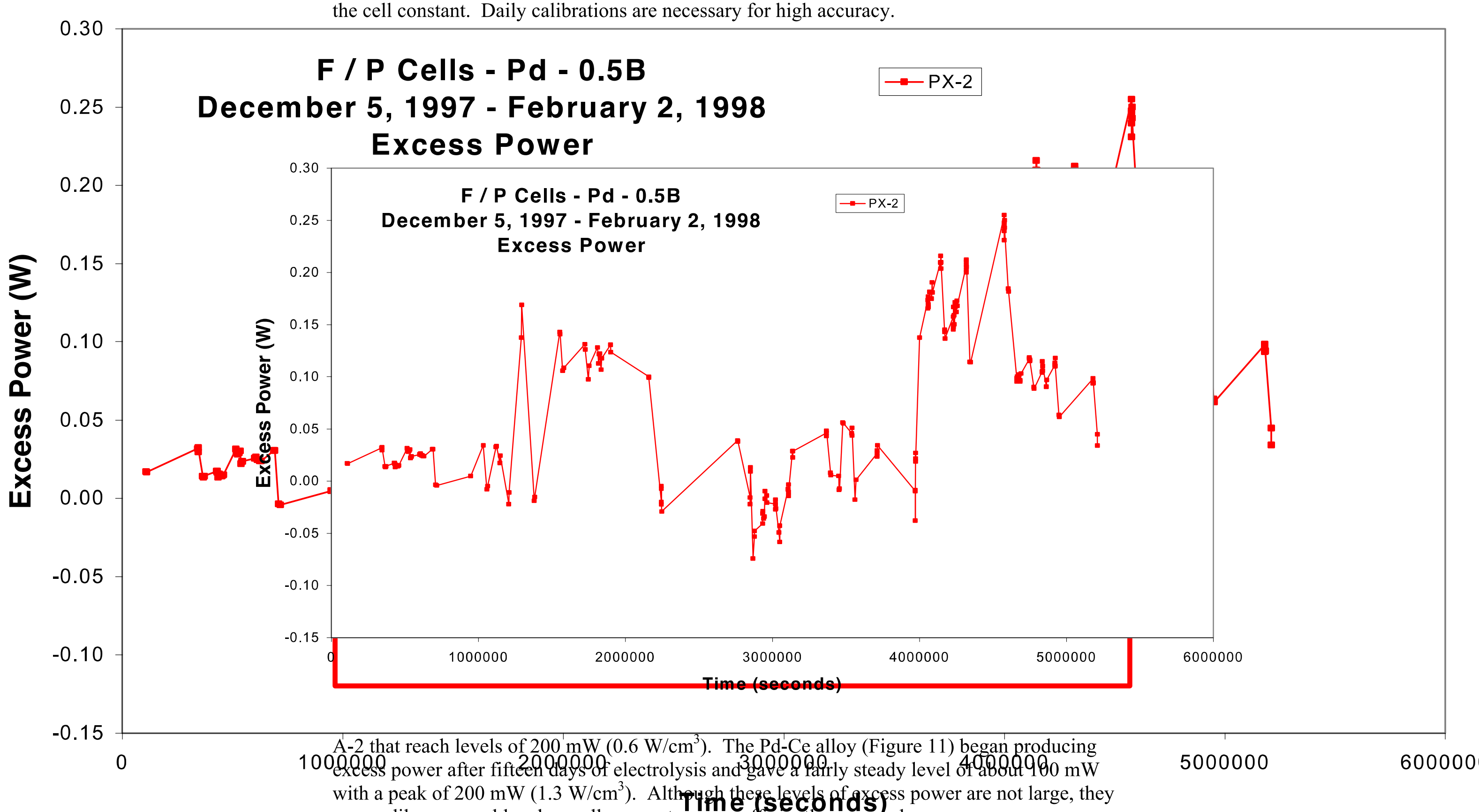
This cell was initially run for ten days at a current of 0.151 A. The cell constant varied apparently in a random manner from day to day during this time period. The large variations in the cell constant at this current illustrates the error in using a single heating pulse to determine the cell constant. Daily calibrations are necessary for high accuracy.



A-2 that reach levels of 200 mW (0.6 W/cm^3). The Pd-Ce alloy (Figure 11) began producing excess power after fifteen days of electrolysis and gave a fairly steady level of about 100 mW with a peak of 200 mW (1.3 W/cm^3). Although these levels of excess power are not large, they are readily measurable when cell parameters are sufficiently averaged.

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Off to See Mel

Assist Mel in looking for Pd-B A2 NHE Cathode

- Mel extended an Invitation to come visit him in Ridgecrest, CA
- About 2.5 hours and 154 miles north of Los Angeles.
- Home of China Lake Naval Air Weapons Station
- Mel worked as an electrochemist and researcher at the China Lake labs


Pd—


0. 5B


THE RIGHT CHEMICALS
THE RIGHT CHEMISTRY
Silver phosphate (ortho)
Palladium

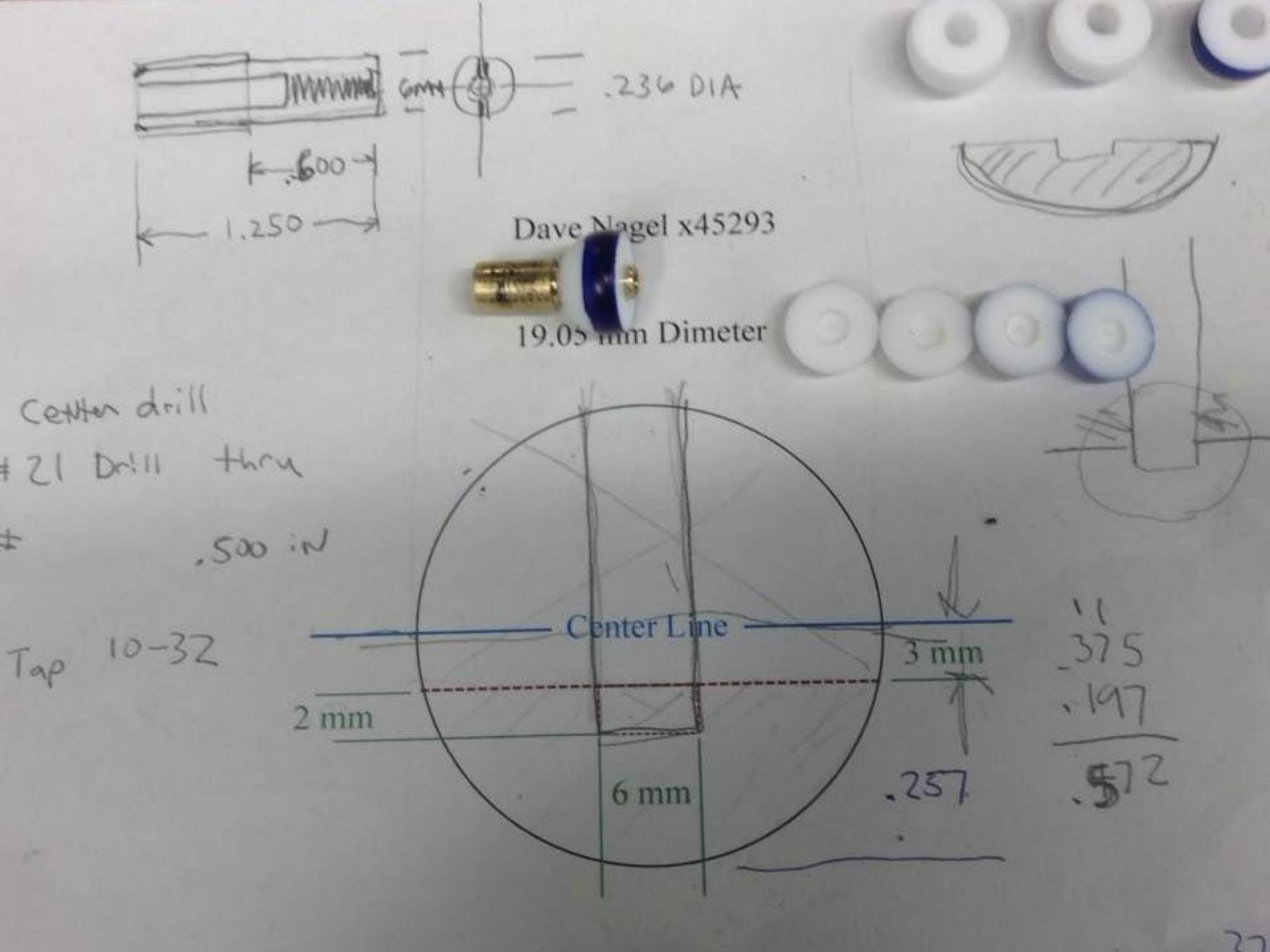

M.J. Miles
At work in the early 80's!


M.J. Miles
At work in the early 80's!


SELECTION
Fibre


02/10/2017 08:01


MIYACHI
DUAL PULSE



.600
1.250
6mm
.236 DIA
Dave Nagel x45293
19.05 mm Dimeter
Center drill
#21 Drill thru
#
.500 IN
Tap 10-32
Center Line
3 mm
2 mm
6 mm
.257
.375
.197
.572


PYREX
03/16/2017 07:57


03/16/2017 07:57


03/16/2017 07:58

Dr. Melvin Miles Ridgecrest Lab Bench

- Heater/circulator for water bath
  Techne, TE-10D Tempette, 1000 W, Model # FTE10DPC.
- Thermistor thermometer 5 channel
  Cole Parmer Model 8502 Series displays the temperatures to 0.01 C.
- Potentiostat/Galvanostat
  PAR (Princeton Applied Research) Model 362 Scanning Potentiostat.
- Digital Multimeter (DMM)
  GW Digital Multimeter, Model GDM-8145.
- Waterbath
  Aqua Culture 10 Gallon Glass Aquarium, Walmart #: 0008022662


Princeton Applied Research
Model 362
SCAN RATE
OVERLOAD
METER
INITIAL POTENTIAL
FINAL POTENTIAL
E INITIAL
RUN
REVERSE
HOLD
SINGLE
MULTIPLE
STOP AT E
LINEAR SCAN
CONSTANT I
(CONTROL I ONLY)
MODE
CONTROL E
CONTROL I
CELL
IR COMPENSATION
ON
OFF
EXT IN
CURRENT % OF FULL SCALE
POTENTIAL mV / SEC
1uA
10uA
100uA
1mA
100mA
1A
POTENTIAL MONITOR
CURRENT MONITOR
POWER
COAX CABLE ASSEM
PROBE SELECT
RESET
SCAN
ENTER
HOLD/RUN


M.H.Miles
THERMISTOR THERMOMETER
Cole Parmer
102.8 1C
AVG
MAX
DIFF
C/F
MIN
AVG
HOLD/RUN
PROBE SELECT
1
2
3
4
5
RESET
SCAN
ENTER
Mel Miles


GW
DIGITAL MULTIMETER
MODEL : GDM-8145
DC1200V
AC1000V
MAX
500V
MAX
20A
2A
MAX
20A
MAX
TRUE
RMS
AC
DC
V
mA
kΩ
200mV 2 20 200 1000VAC 1200VDC
200μA 2 20 200 2000 20A
200Ω 2 20 200 2000 20MΩ
PWR
Due Date
12/27/2016
FOR SENSO W/ PHONE PLUG
ts this purchase order subject to its terms and conditions which can be found at
agree to any additional or different terms imposed by individual customers, which
nt of this order. All quoted delivery dates are at time of quotation and are subject to
our sales department at time of order.
atient connected applications


TECHNE
43.3
TE-10D Tempunit
set

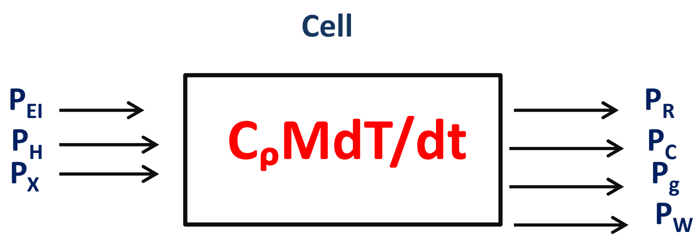

5653
1300
1000
-5.646
03/31/2017 12:24

The Fleischmann-Pons Calorimetric Methods And Equations

Melvin H. Miles SSICCF20 Xiamen, China

Mathematical Modeling and Calorimeter Equations

MODEL



$$C_{\rho}MdT/dt = P_{EI} + P_H + P_X + P_R + P_C + P_g + P_W$$

$$P_{EI} = (E - E_H)\, I$$

$$P_R = -k_R f(T) \text{ where } f(T) = T^4 - T_b^4$$

$$P_C = -k_C (T - T_b)$$

$$C'_P = C_{\rho}, (D_2O) + C_{\rho}, (\text{glass}) + C_P (\text{metals}) = C_{\rho}M \ (JK^{-1})$$

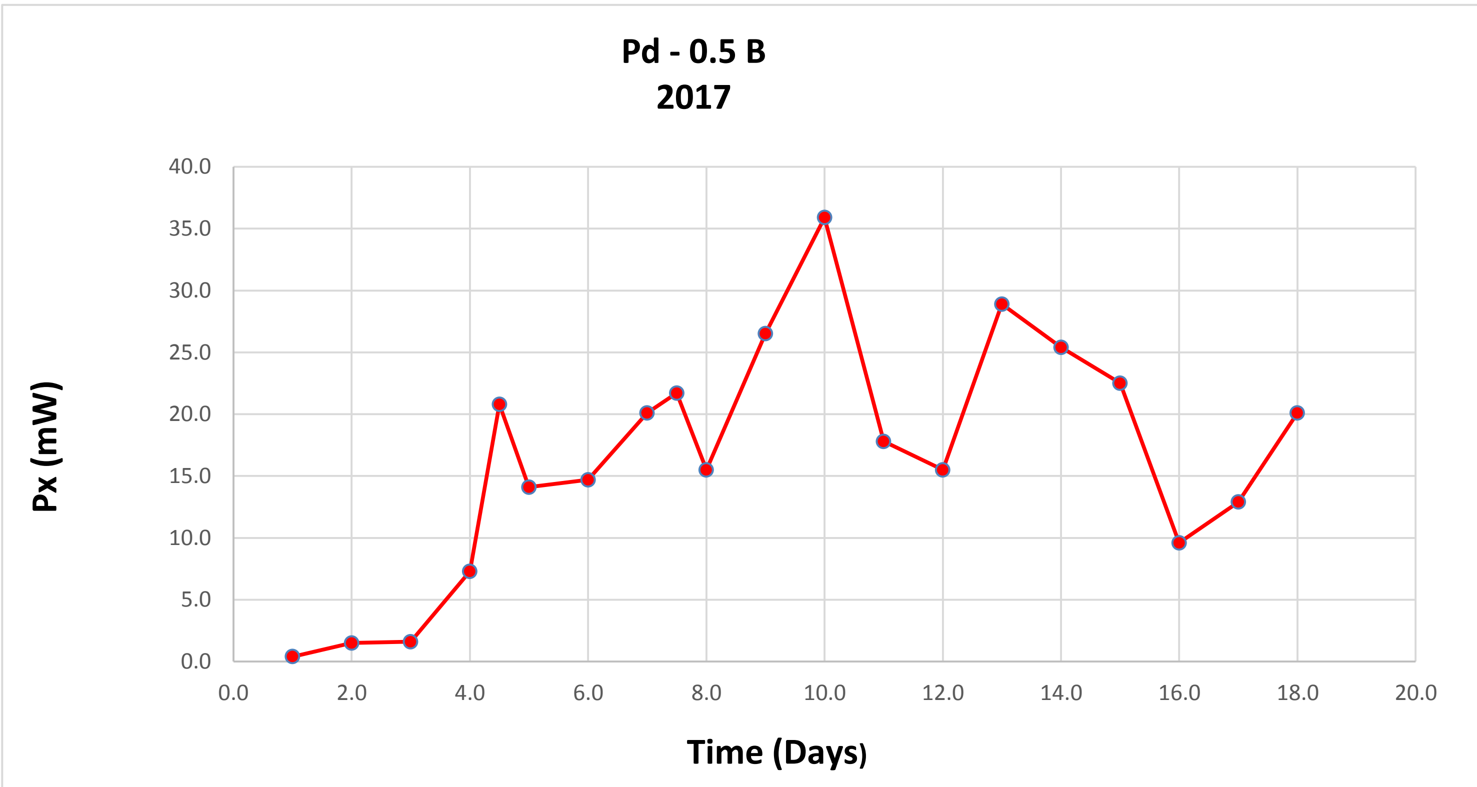
Cell Electrochemistry

$$D_2O_{(l)} \rightarrow D_{2(g)} + ½\, O_{2(g)}$$

$$C_{\rho}M = C_{\rho}M° (1 - \alpha t)$$

$$k_R = k°_R (1 - \beta t)$$

Preliminary Results LEAP PdB Qualification Experiment #1



Does not include power due to the gases exiting the cell. This is anticipated to add up to 20 mW excess power at the highest currents used. Currents used in increasing order: 0.150A, 0.300A, 0.500A.


DAWN
SIMPLY CLEAN
04/06/2017 09:11

“Dr. Imam's Pd-B cathodes have now shown excess heat using four different calorimeters”

• China Lake with insulation	±20 mW
• NRL Seebeck	±2 mW
• F-P Dewar at NHE	±0.1 mW
• Ridgecrest Copper Calorimeter	±3 mW

Mel Miles

Note: SRI International also measured a small excess heat with one of Dr. Imam’s Pd-B cathodes using their own Seebeck Calorimeter accurate to ±2-3 mW.

LENRIA (Los Angeles) Development Lab Bench

- Heater/Circulator for Water Bath
  Techne, TE-10D, 1000 W

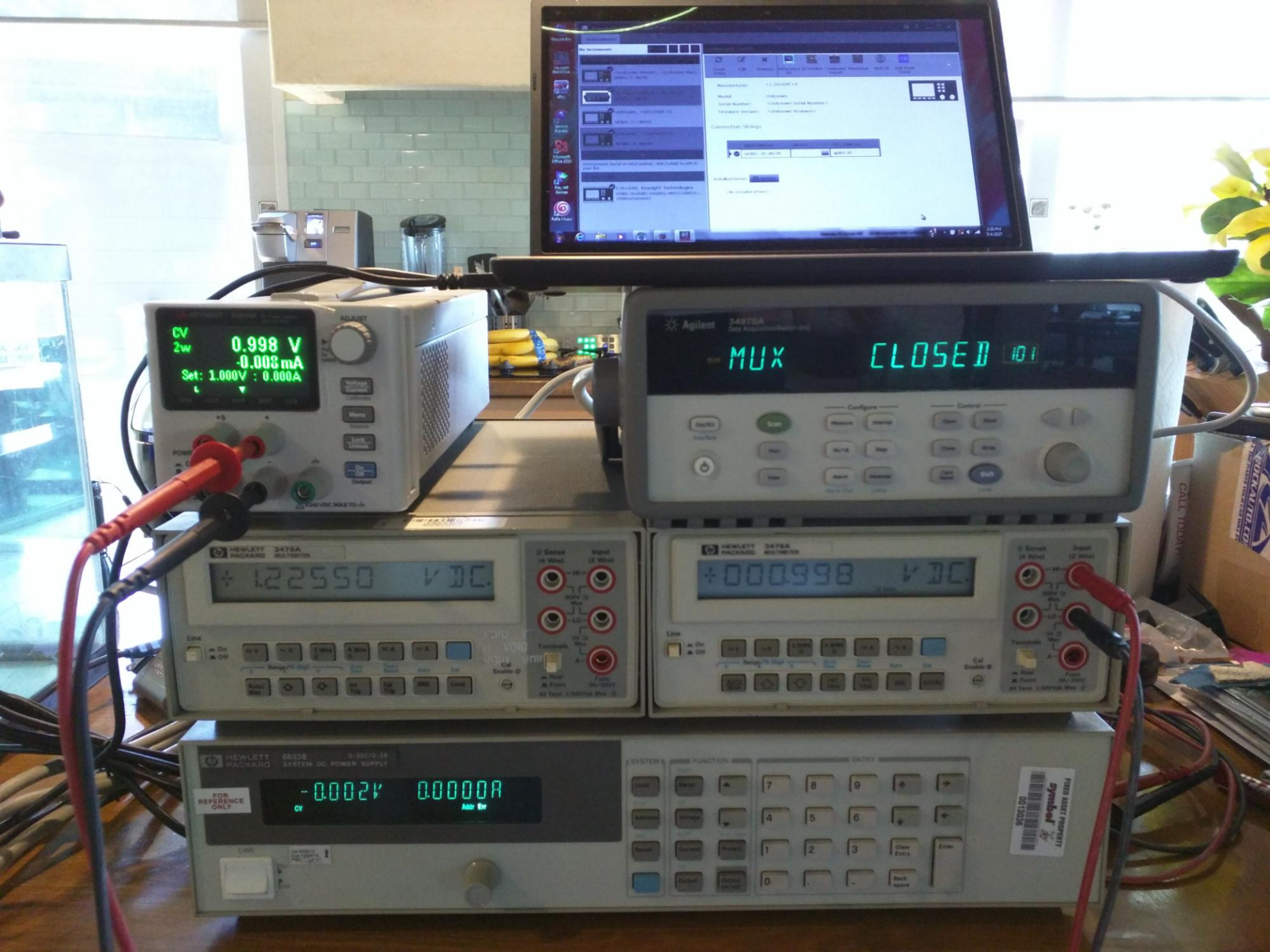
- HP/Agilent 34970A Data Acquisition and Data Logger Switch Unit
  HP/Agilent E34901A 20 Channel Multiplexer Module
  HP/Agilent E34901A Multifunction Module
  Built-in DMM Module

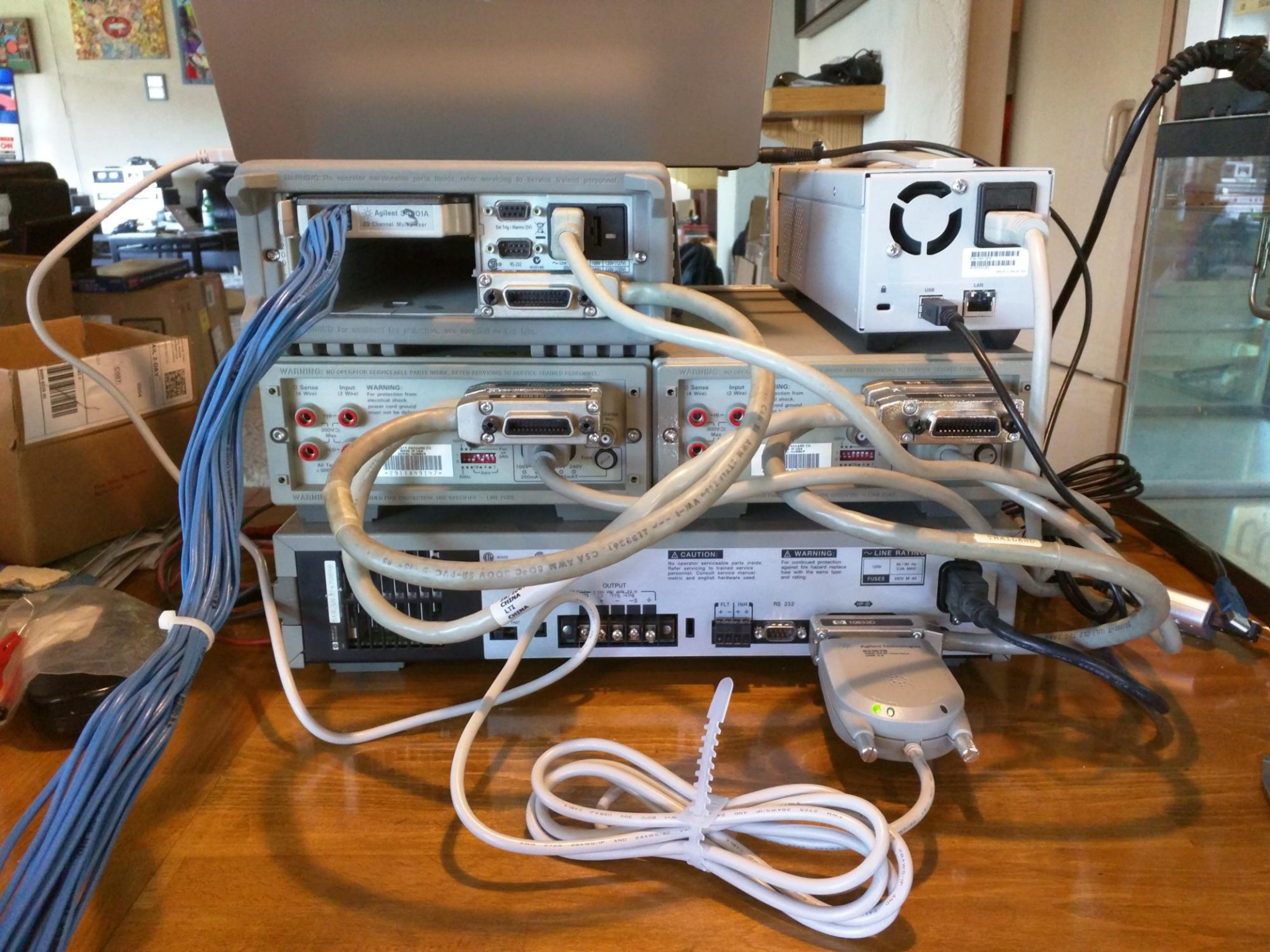
- Keysight E36104A DC Power Supply
  Accurate 35V, 1A, 35W DC power supply

- Hewlett Packard All-in-One PC
  23" Display LED Core i3 4170T 3.2GHz 4GB RAM - 23-q116

- Waterbath
  15 Gallon Glass Aquarium

(Washington, D.C. development work is going on in David Nagel's GWU LENR Lab)


CV
2w
0.998 V
-0.008 mA
Set: 1.000V : 0.000A
ADJUST
Agilent
34970A
MUX
CLOSED
101
HEWLETT PACKARD
3478A
+1.22550 VDC
HEWLETT PACKARD
3478A
+000.998 VDC
HEWLETT PACKARD
SYSTEM DC POWER SUPPLY
-0.002V
0.0000A
FOR REFERENCE ONLY
symbol


Agilent
20 Channel Multiplexer
RS-232
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MUX
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Keysight BenchVue
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Apps
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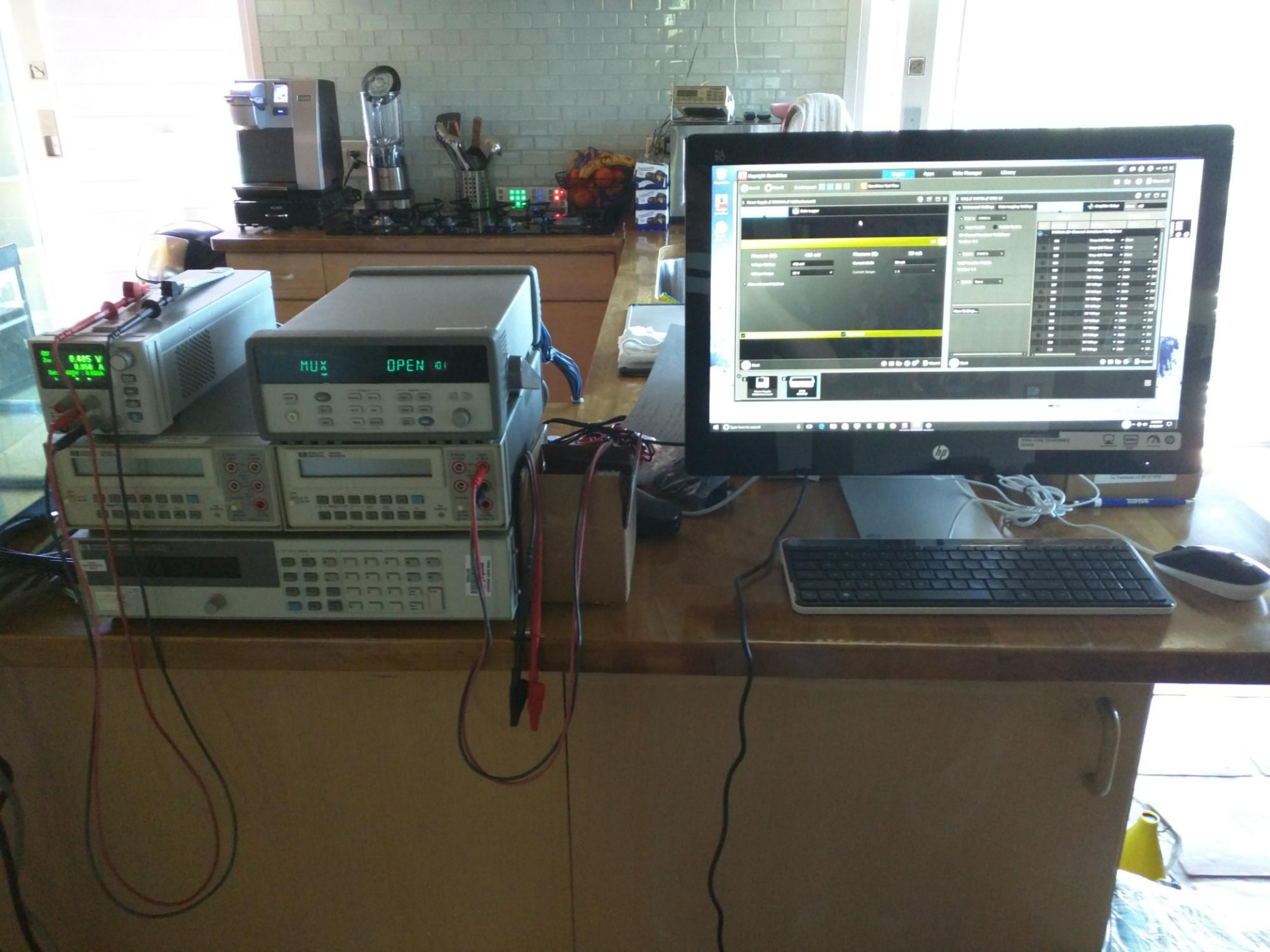
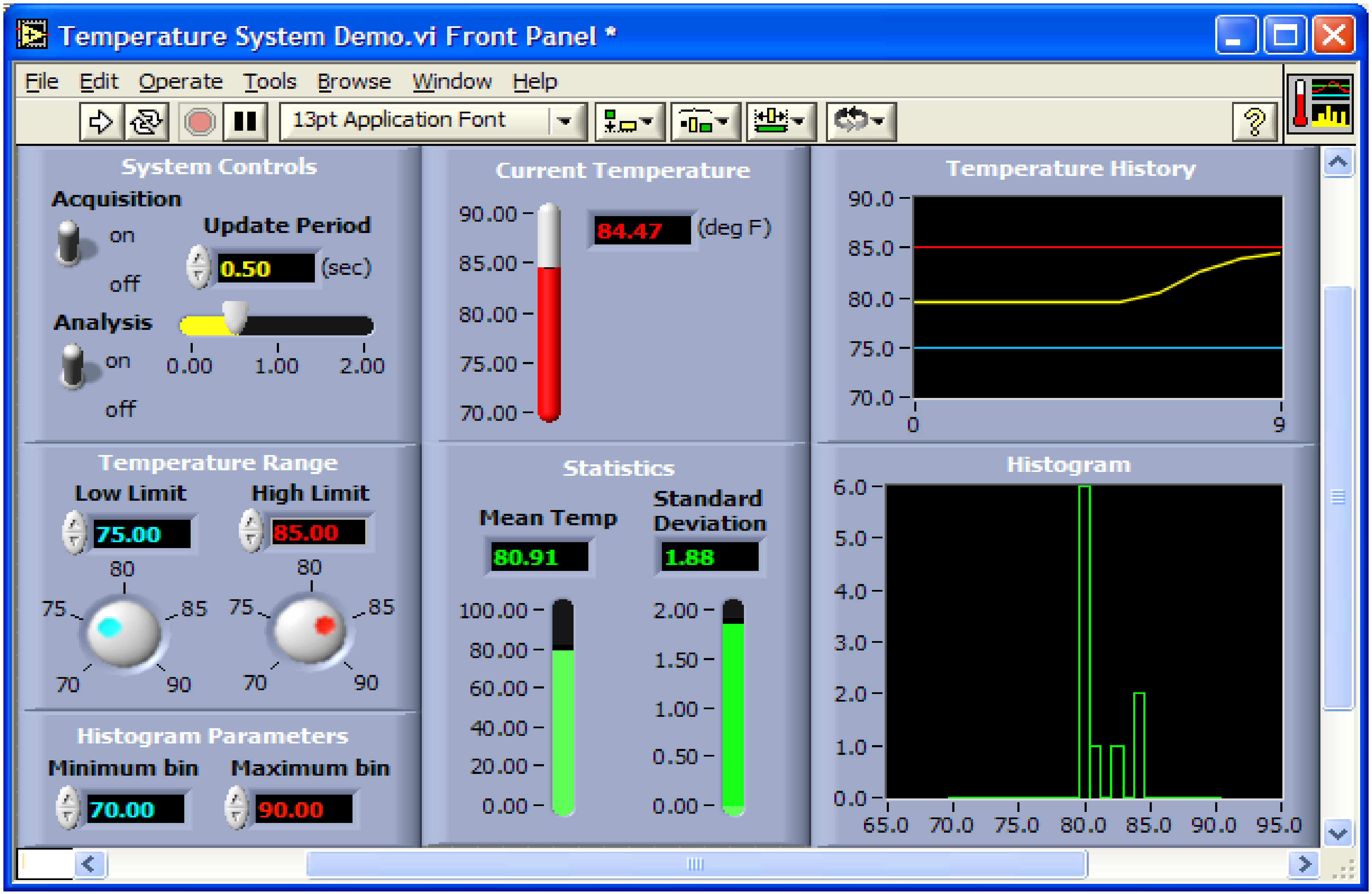
Library


MUX
OPEN

NATIONAL INSTRUMENTS

LabVIEW™



KEYSIGHT TECHNOLOGIES

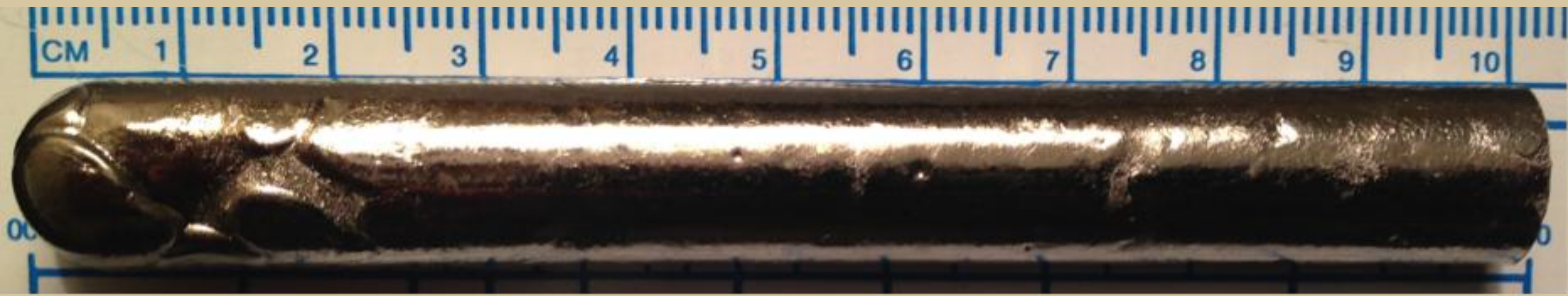
BenchVue

Virtual Instrument Interface

Test Flow

Automation Sequences

PdB 0.75% Ingot



Created by Dr. Ashraf Imam
Circa ~1993 - 1995

84.6 grams Elliptical Shape

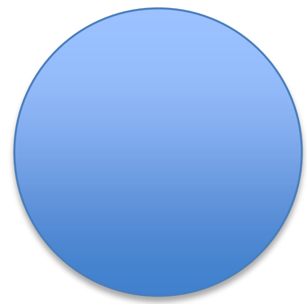
To be swaged and annealed into 4.7mm and/or 3mm rod

Cathode Yield

Pd-B 0.75% Ingot 84.6 grams

Diameter 4.7mm

X 20mm



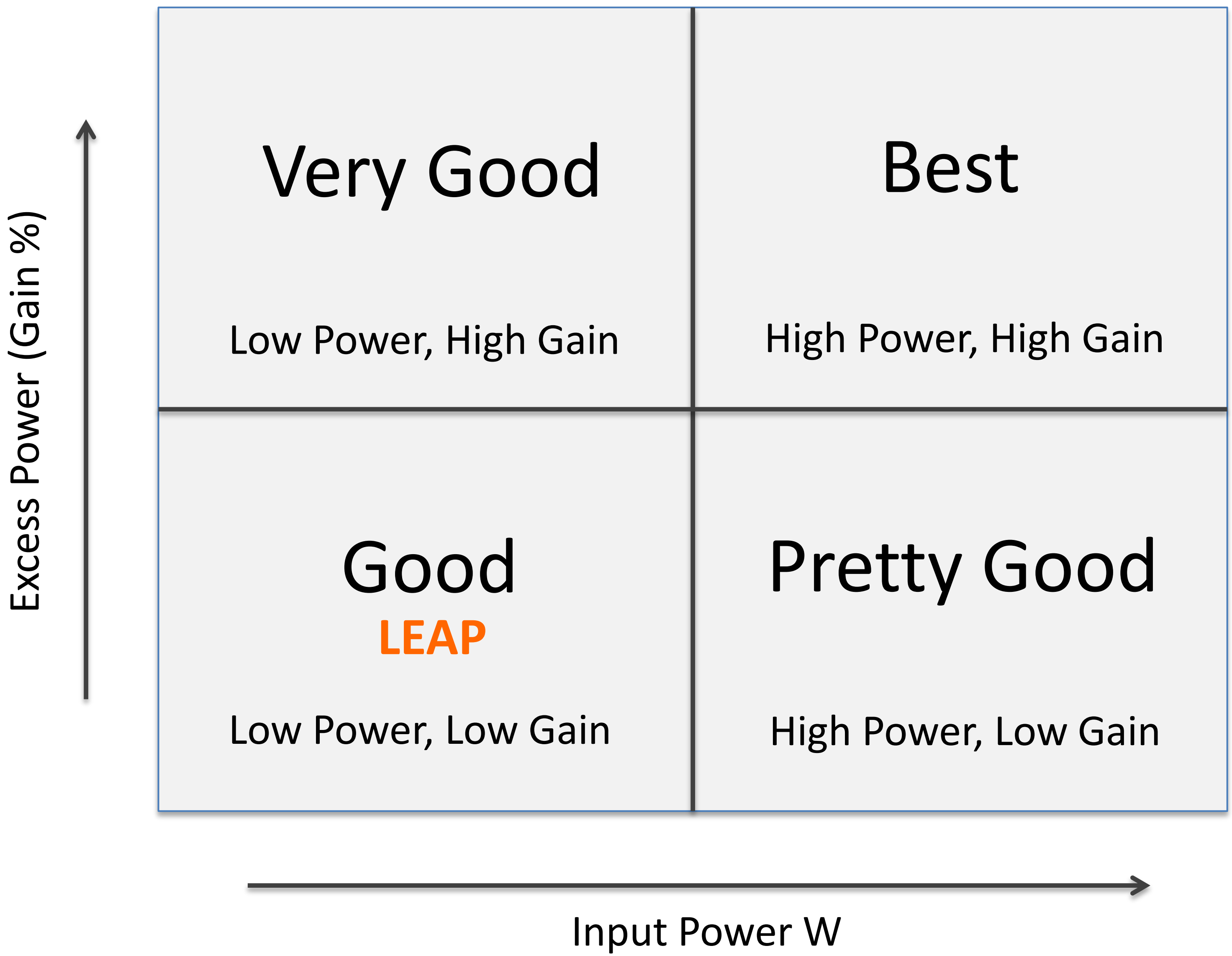
= ~20 units

Diameter 3.0 mm

X 20mm

= ~49 units

Four Quadrants of Performance



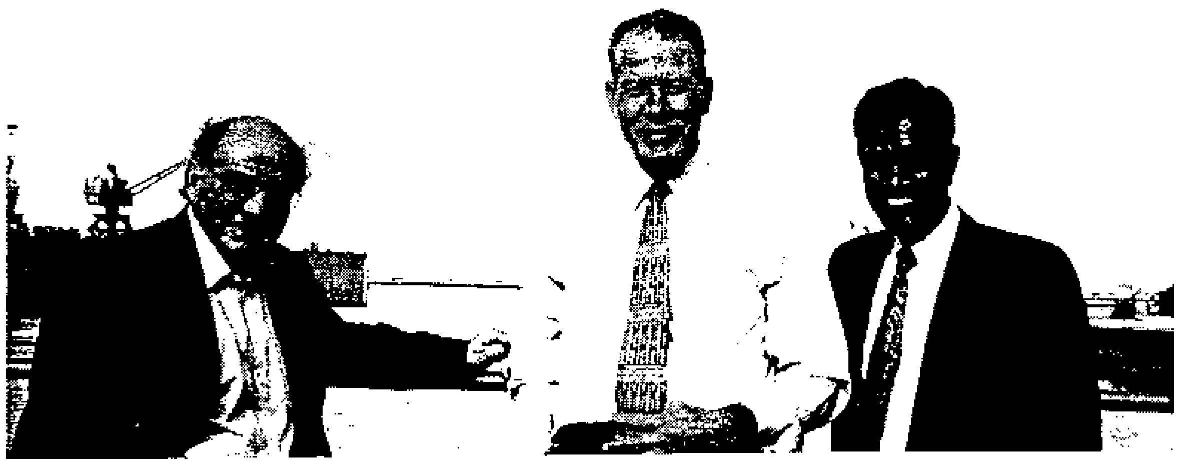
Calorimetric Analysis of a Heavy Water Electrolysis Experiment Using a Pd-B Alloy Cathode

M.H. MILES, M. FLEISCHMANN, M.A. IMAM

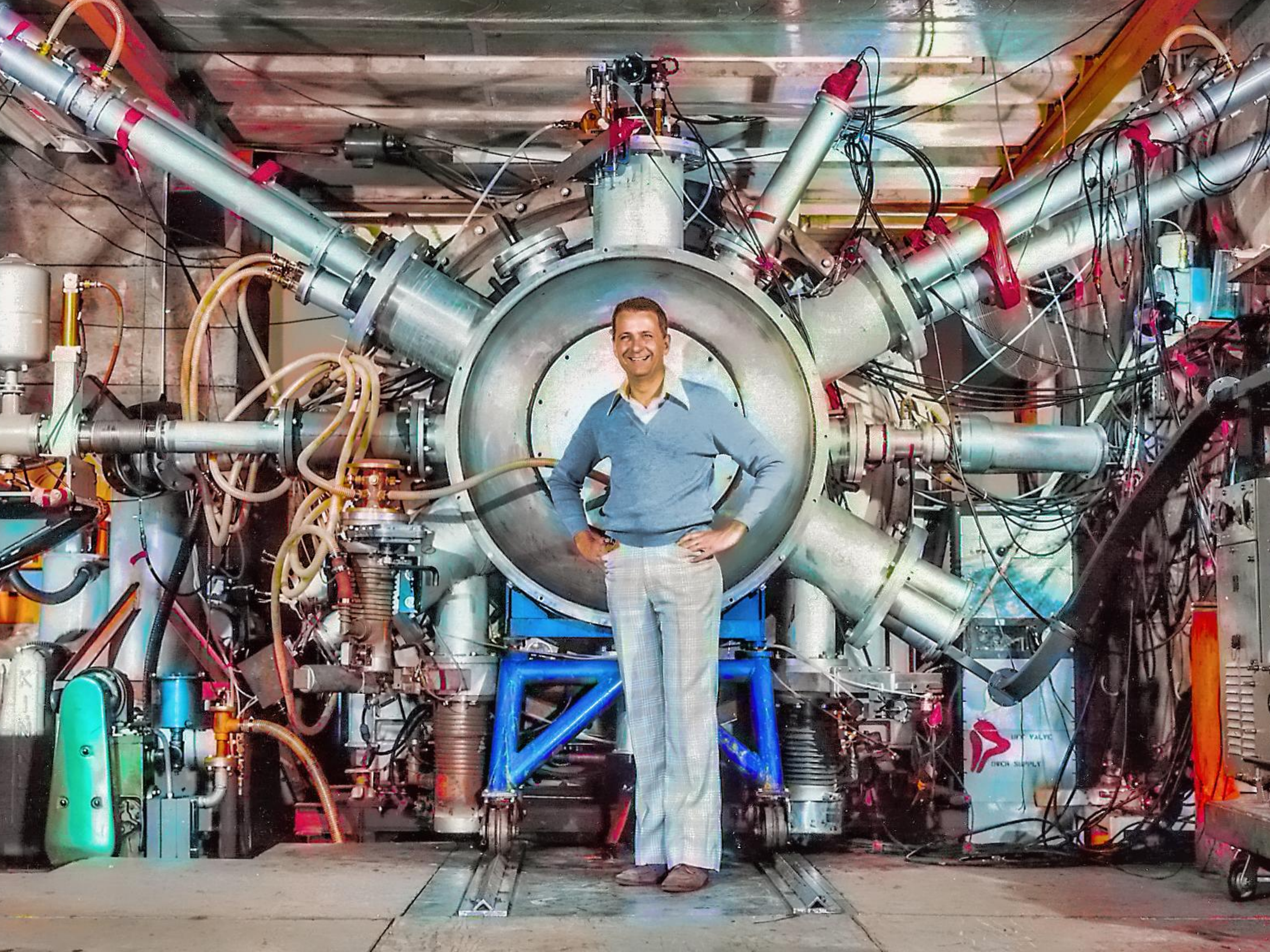
Dr. Martin Fleischmann

Dr. Melvin H. Miles

Dr. Ashraf Imam



DRS. FLEISCHMANN, MILES AND IMAM


VALVE
SUPPLY

Progress

Conceived of the program.

Identified the experiment on which to base the program.

Completed the first qualification experiment.

Began the process of equipment modernization.

LEAP: The LENRIA Experiment and Analysis Program

Plans

Complete all aspects of the system: Hardware, Software, Materials and Protocol.

Once we have everything in hand, we shall seek funding to clone the system.

In parallel we shall seek agreements with major laboratories to perform and document the experiment on a specified time scale.

LEAP: The LENRIA Experiment and Analysis Program

Steven B. Katinsky, David J. Nagel LENRIA Corporation
Melvin H. Miles, M. Ashraf Imam

12th International Workshop on Anomalies in Hydrogen Loaded Metals
5-9 June 2017
Hotel Langhe e Monferrato, Via Contessa di Castiglione, 14055 Costigliole d'Asti (AT), Italy