Live Open Science

A Status Report: MFMP's Glowstick Project
August 2016

"Live Open Science" describes the work of the Martin Fleischmann Memorial Project, or MFMP. The group is a loose collaboration of labs and volunteers from around the world, working to demonstrate the validity of LENR through totally open replication efforts. This openness builds a reputation for high integrity.

Live open science is an experimental process the MFMP is pioneering. "Live" means publishing protocol, logbooks and data output from experiments being undertaken - live to the web. This prevents promoters of the experiment from "cherry picking" data and hiding problems.

Results are also preserved in a permanent open-access archive. These resources enable a wide number of people to see the data as it is generated, and to call up historical results for comparison with current data in post analysis.

Most of our work is documented in the MFMP web site at http://quantumheat.org. The site has grown too large for the current format, so patience and digging may be needed to find a specific section. A list of experiments with links to the work will be added here in a future revision.

History: Rossi and the Lugano test and report

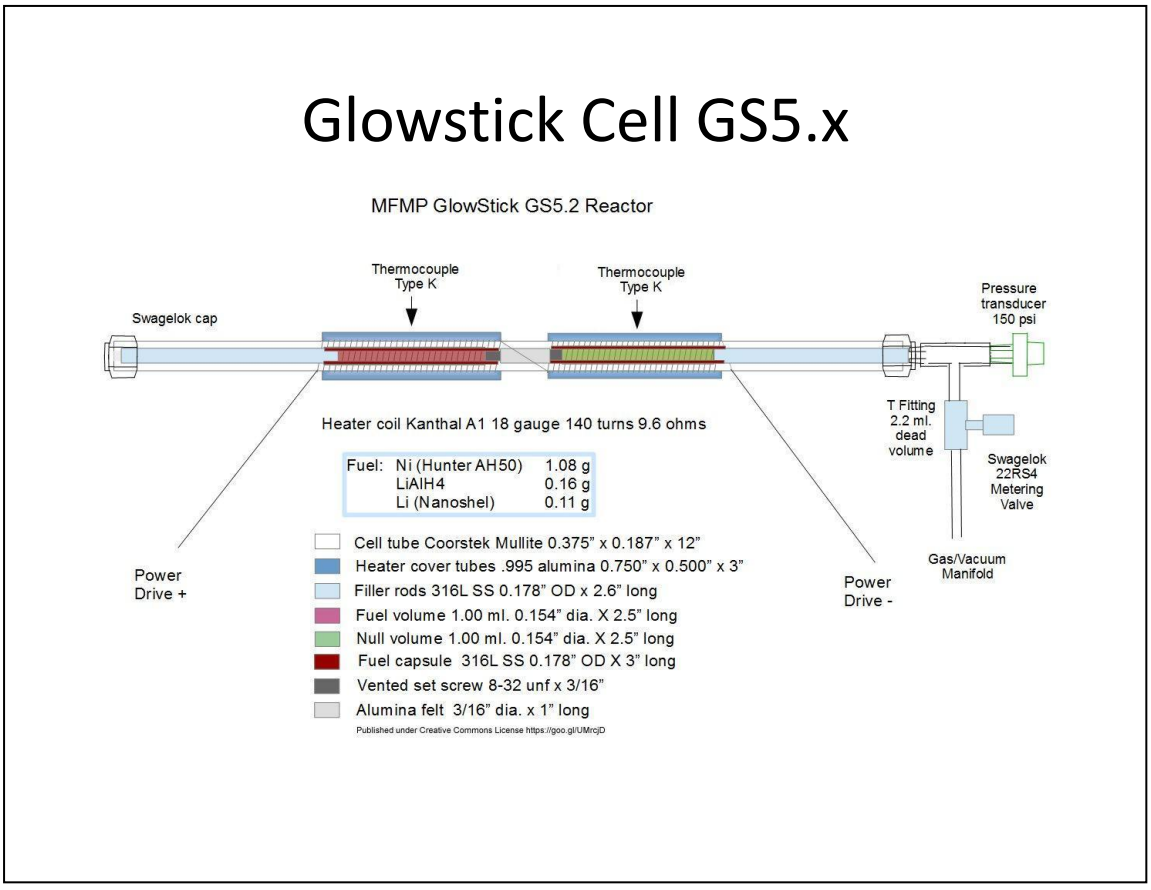
After the October 2014 release of the report for the extended test in Lugano of Rossi's Hot Cat, questions were raised about measuring heat output with a thermal camera.

Following discussion, MFMP conducted several experiments to test the accuracy of the reported Lugano results. We scheduled a workshop at the lab of Hunt Utilities Group, where three of us met to run a series of experiments.

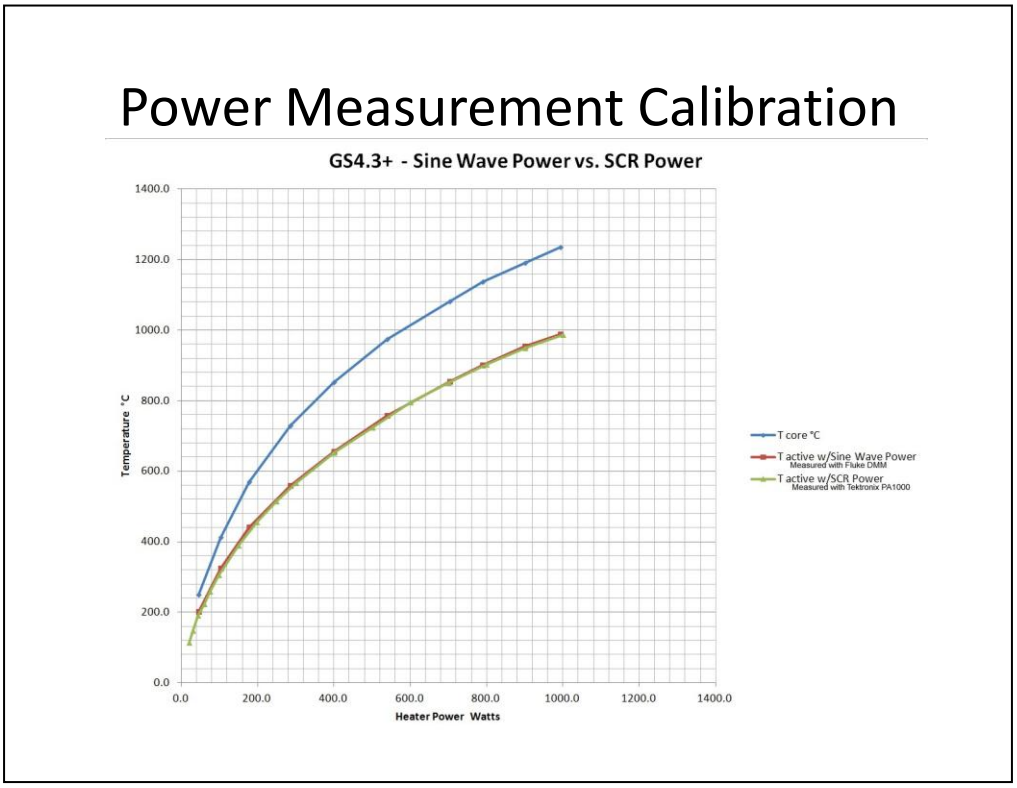
Subsequent analysis of the data revealed flaws in the Lugano test report, specifically that the Optris thermal camera needed an emissivity in the range of 0.95 to match temperatures seen by the thermocouples. Team member Bob Higgins followed up with an excellent white paper supporting our experiment results from 'first principles'.

MFMP Glowstick LENR Research Platform

The Glowstick design evolved through 5 versions and 10 experiments over about 18 months. The iterative process also resulted in better control and instrumentation, yielding stable operation and much useful data.

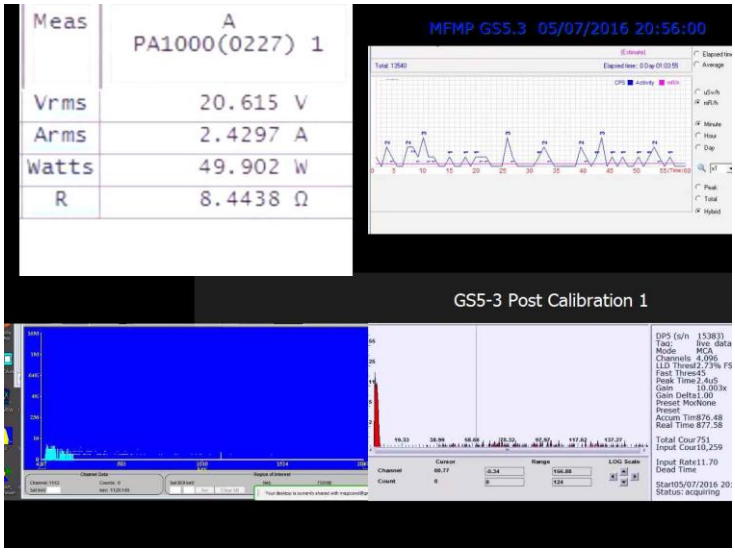


Good repeatability is a key requirement for scientific research, so that measurement artifacts and other possible sources of error can be reduced. The calibration curves from several runs with different instrumentation match within 1%, showing the stable and predictable thermal behavior of the system . Here the power was provided by Variac (sine wave, red trace) for the first run and by SCR control (chopped AC, green trace) for the second. Two different power measurement techniques were used, and the data still matched close enough that the calibration curves are identical.



Full documentation through Open Science also enables outside replicators to confirm our findings and perform their own experiments with confidence. Experiment data and video are broadcast live in real time to MFMP team members and others, and all data is posted to a public archive during and following each experiment.

Snapshot of Live Data Web Page

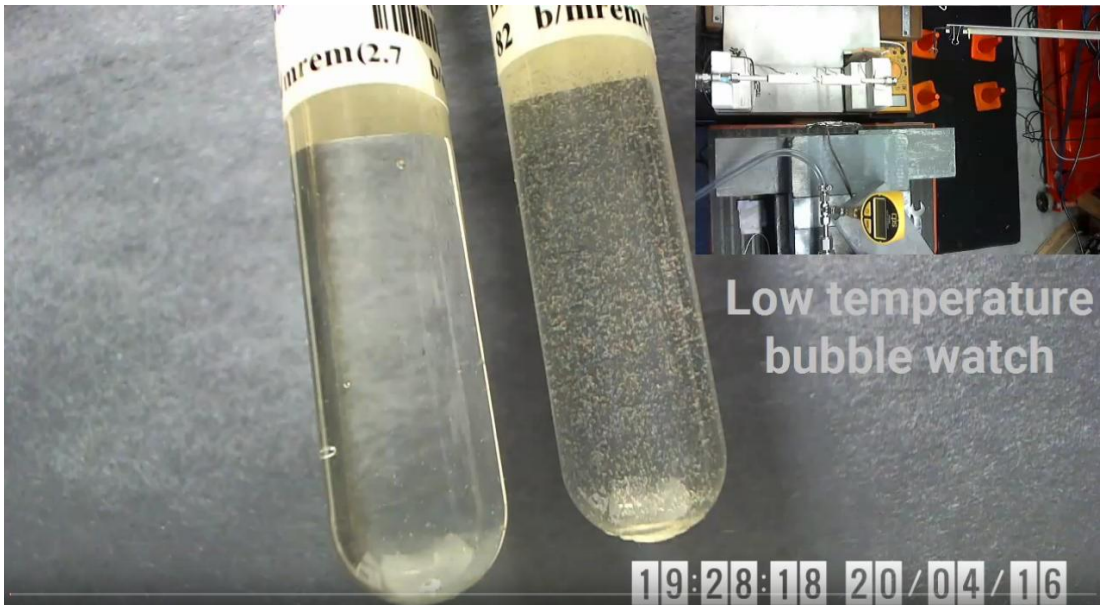


Thanks to recent donations and new team members, we have added more instrumentation for temperature measurement (Optris) and radiation (SpecTech UCS30 and Tracor TN7200). This yields enough data to require two separate live video streams. Screen snapshots recorded every 10 seconds or so also give a permanent record of the data, for quick reference and to back up the primary computer files.

Neutron Detection

In our latest experiment we also added basic detection of both fast and slow neutrons using “bubble detector” dosimeters. Neutrons are both hard to shield and potentially hazardous in quantity. We detected several emissions of thermal (slow) neutrons, not enough to be hazardous but indicative of nuclear activity in the experiment.

Live Video Broadcast
Showing Neutron Bubble Detectors



MFMP member Bob Higgins has designed an open-source, low-cost electronic neutron detection system. We’ll be using it in future experiments, and will encourage our collaborators to use neutron detection as an essential safety measure in their work.

Key Glowstick Findings

- Deep loading of Hydrogen in pre-treated Ni, consistent with Piantelli and Parkhomov
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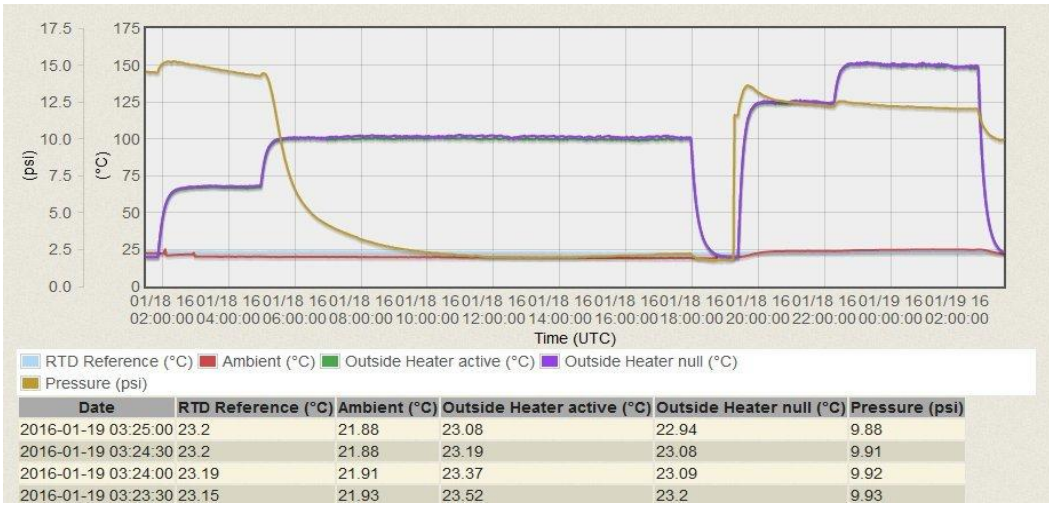
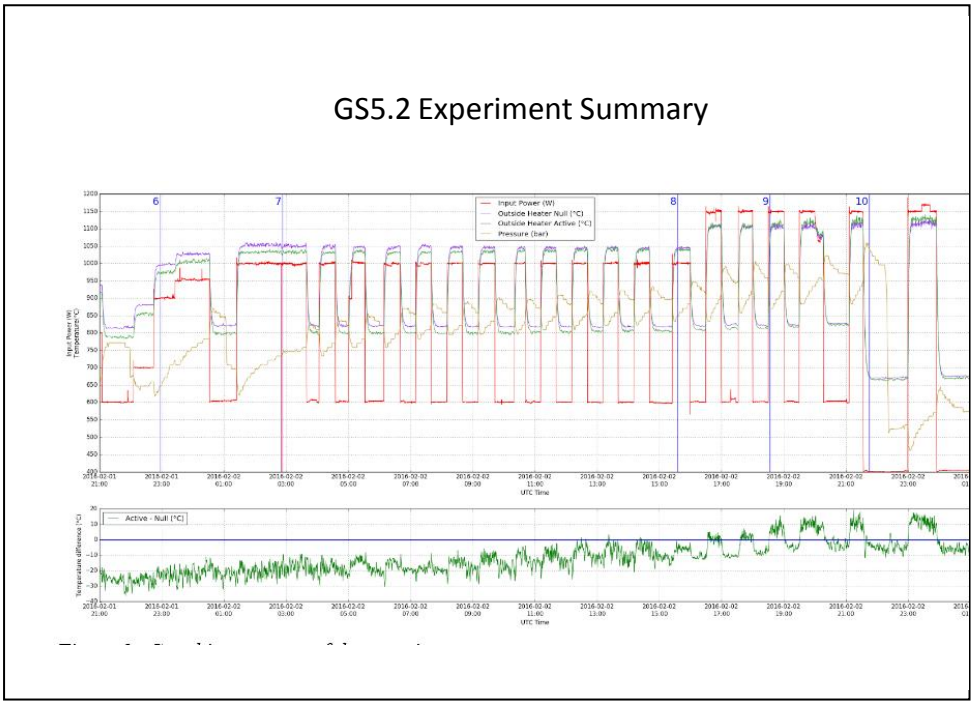


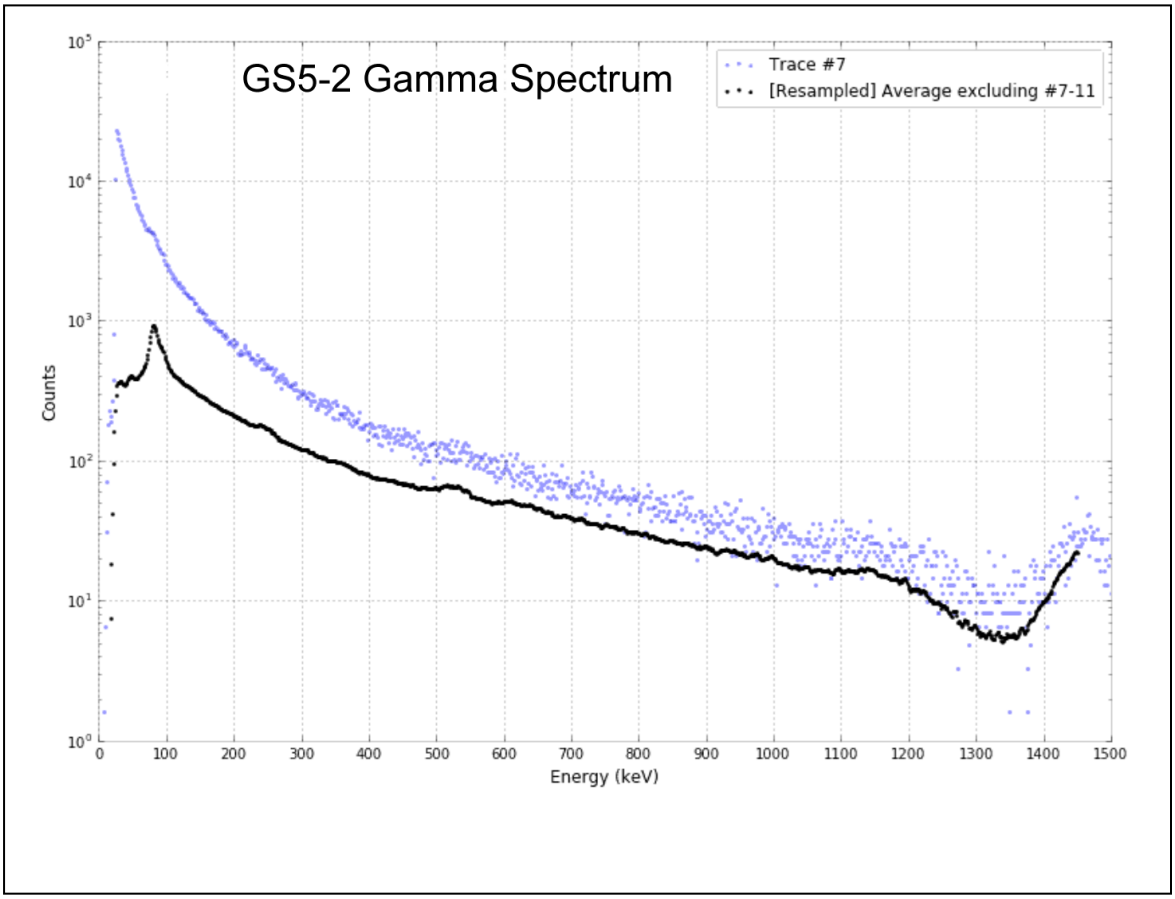
Date	RTD Reference (°C)	Ambient (°C)	Outside Heater active (°C)	Outside Heater null (°C)	Pressure (psi)
2016-01-19 03:25:00	23.2	21.88	23.08	22.94	9.88
2016-01-19 03:24:30	23.2	21.88	23.19	23.08	9.91
2016-01-19 03:24:00	23.19	21.91	23.37	23.09	9.92
2016-01-19 03:23:30	23.15	21.93	23.52	23.2	9.93

- Differential heat output of 12-15%. Data from thermocouples was confirmed by optical pyrometry in GS5.3



Key Findings (ctd)

- Broad-band X-ray/Gamma emission 10-400 keV seen in GS5.2, consistent with Bremsstrahlung radiation (purple trace).



This data was intensely analyzed by the crowd, to see if it could be an artifact of measurement error or contamination. Possibilities including a cosmic ray burst, Radon concentration and RF interference were proposed, tested and disproved. We now think that this signal was generated by nuclear (LENR) activity in the Glowstick cell.

Future Experiments and Goals

Our research goals are both incremental and diverse. We need to improve both the COP (excess heat) and the measurement accuracy (calorimetry) of our system.

- GS6 - detail improvements and added electric stimulus
- Use of isotopic tracers for testing divergent theories
- Fuel morphology and pre-treatment study at nano scale
- Improved process automation for multi-cell experiments

Equipment and Facilities Needed (US)

- A proper lab space is essential for expanding our team and scope
  - *1200-2500 sq. ft @$16-24 -> $20k - $60k /yr.*
- SEM for materials study and process analysis
  - $50-80k
- Glove box, fume hood and gas handling for safety and efficiency
  - $10k
- Improved vacuum systems and plumbing
  - $5k
- Materials , supplies and fabrication
  - $20k for 5 experiments
- Analytic services (ICP-MS, TOF-SIMS)
  - $10k for 5 experiments
- Furnishings, utilities, insurance, etc.
  - $15-20k
- Proposed budget for one year $130k – 205k exclusive of personal expenses.

Collaboration Opportunity (Europe)

Bob Greenyer has received an offer of lab space, analysis service and grad student support at Aarhus University in Denmark. The program will support a series of experiments performed as Live Open Science. We're very excited about this opportunity and welcome support and participation from those interested in MFMP's work.