Real-time Instrumentation and Digital Processing for LENR Characterization

Frank E. Gordon [1]
Harper J. Whitehouse [2]
[1, 2] INOVL, Inc. USA
Email: Dr.Frank.Gordon@gmail.com

Optical Infrared (IR) measurements of 'active' Pd/D cathodes in real time, at the Navy's SPAWAR Laboratory and UCSD in San Diego, showed that LENR phenomenon take place on time-scales short relative to the response time of most calorimeters. SPAWAR further substantiated these results when Pd/D cathodes were directly codeposited on the surface of poled PZT ceramic transducers. A review of the electrical properties of these transducers showed that they belong to the class of ferroelectric materials which are simultaneously both pyroelectric and piezoelectric but on widely different time scales.

Motivated by these results and the belief that it's hard to optimize something that you can't measure, we have developed a number of real-time measurement techniques that simultaneously gather and processes multi-channel data on a 24/7 bases. The instrumentation system is based on a 14-channel USB LabJack™ 14-bit DAQ system typically operating at about 500 samples/second and includes real-time computer display and Excel processing of the recorded data on the same computer with only a two-minute latency. Both raw data and processed results are archived. The following sensors have been employed and will be described along with their advantages, limitations, and implementations including a summary of our findings:

Temperature: Thermocouples, RTDs and pyroelectric sensors for temperature change;
Magnetic field: Hall effect sensors;
Gamma rays: Digital Geiger-Müller and NaI scintillation energy-spectrum detectors;
Neutrons: PRESCILA fast neutron detector and He3 thermal neutron detector;
RF radiation: USB RF spectrum analyzer;
Acoustic radiation: Piezoelectric sensor and audio spectrum analysis;
Cell operating characteristics: Electrochemical immittance and transfer-function spectroscopy.