DATA ACQUISITION FOR PRE-OPERATIONAL TESTING OF BNL-E951 15T PUSLED MAGNET

Chen-yu Gung

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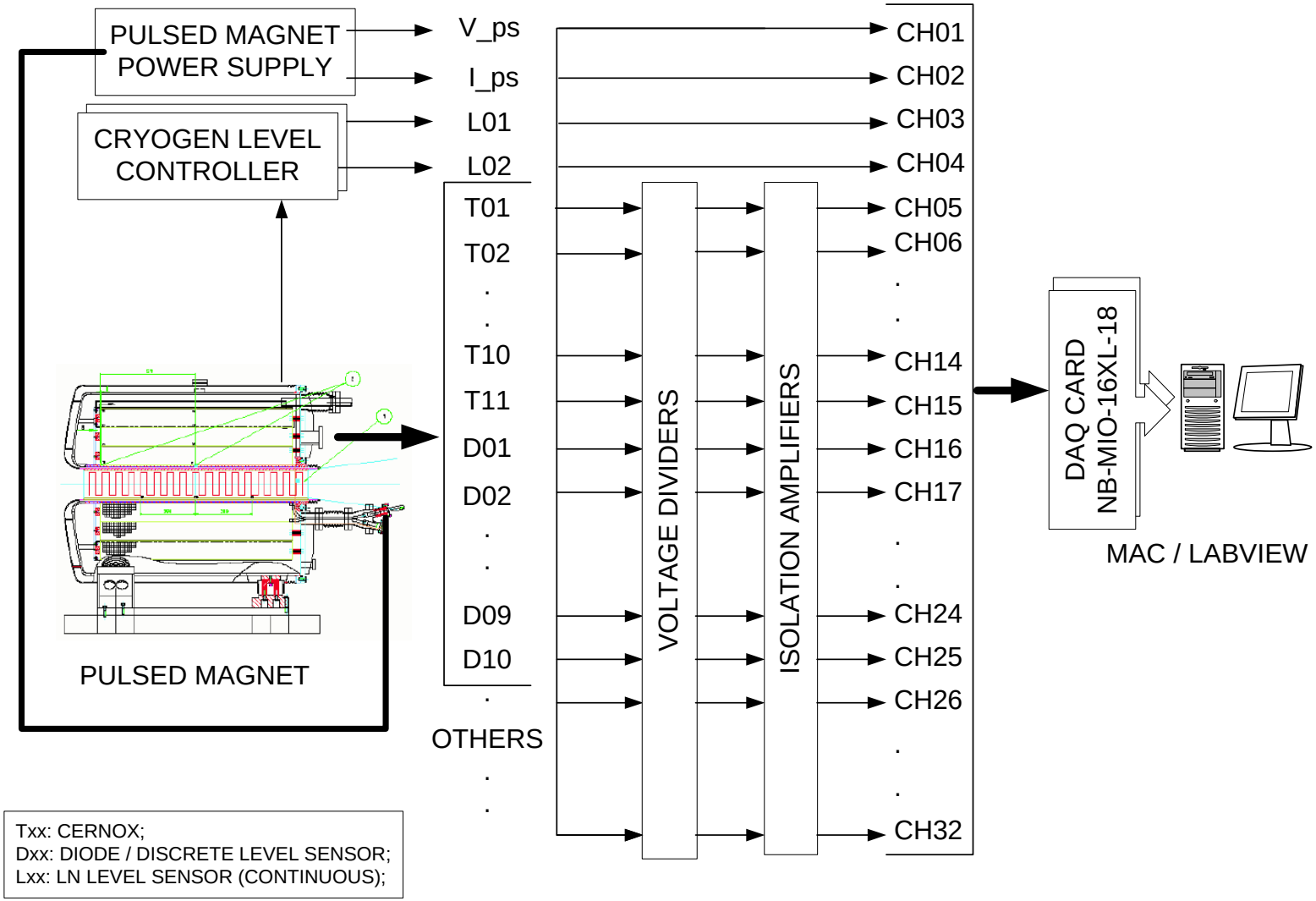
Instrumentation and Signal Level

Instrumentation Name	Number of Signals	Signal Level
Power Supply	2 (V_{magnet} & $V_{shunt\ resistor}$)	0 – 10 V
AMI LN level sensor	2	0 – 10 V
CERNOX	11	Varies with temperature
Discrete level sensor diode	10	Unknown
Others, such as TC's, Hall probe, etc.	TBD	TBD

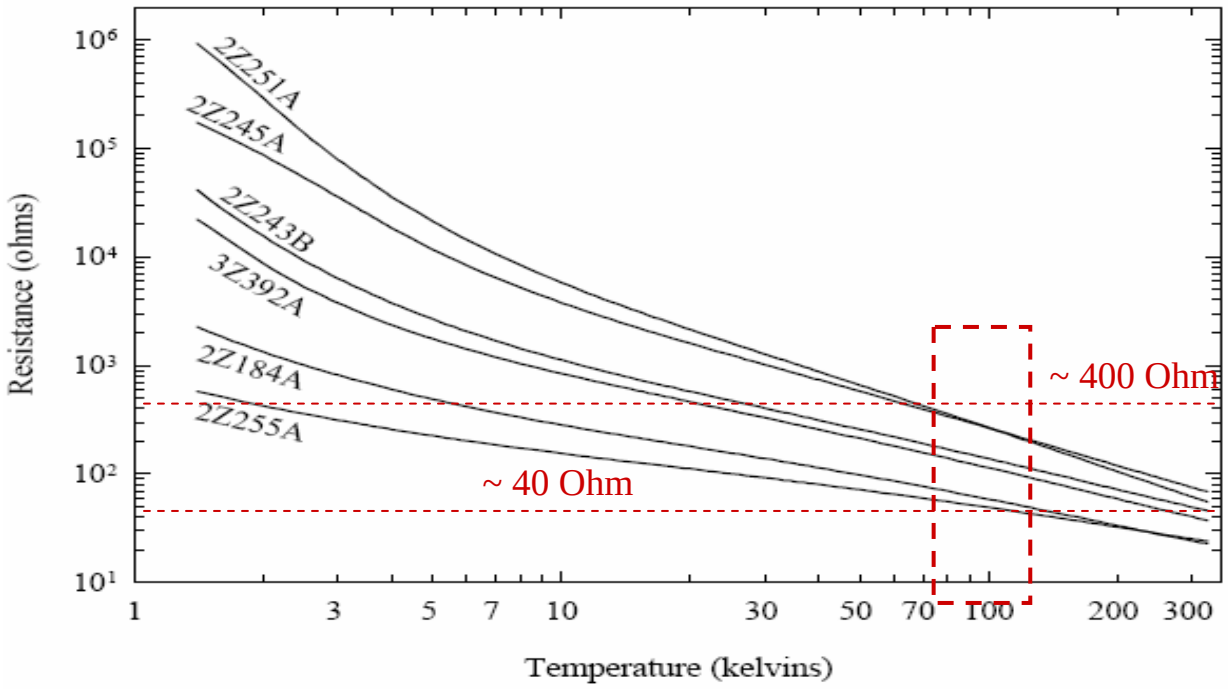
SIGNALS AND DATA ACQUISITION FOR PULSED MAGNET TEST



Data Acquisition System

- Use 2 National Instrument NB-MIO-16XL-18 in one Macintosh computer.
- DA is programmed in Labview.
  - Thing to do – modify existing program.
- Precision at 16 bit for bipolar DA between ± 10 V: ~ 0.3 mV.
- Maximum (damaging) input voltage: ± 35 V.
- Max. sampling rate for single channel DA: 55 Ksamples/sec.
- Max. sampling rate for multi-channel DA: 20 Ksamples/sec.

CERNOX Temperature Sensor



. Typical resistance versus temperature characteristic for each wafer tested for stability.

Ref: Courts, S.S and Swinehart, P.R., 'Stability of Cernox Resistance Temperature Sensors', Adv. in Cryogenic Eng., Vol. 45, 2000.

Typical resistances of CERNOX are between 40 Ohm and 400 Ohm at respective temperatures of 120 K and 80K. The sensor voltage signals are between 0.4 V and 4 V if an excitation of 10 mA is used.

Excitation Source for CERNOX

Lake Shore Model 120CS Current Source

Output Current	1 μA to 100 mA
Accuracy	0.1% on fixed ranges
Stability	Better than ± 0.01%
Compliance Voltage	11 Volts up to 50 mA

- Each current source will be used to drive 4-5 CERNOX's connected in series with an excitation current set at 10 mA. Connections of the current leads will be made outside the magnet vessel.
- Four lead measurement will be used. The voltage leads will be tapped to the current leads outside the magnet vessel.
- The voltage drop along the lead wires needs be corrected.

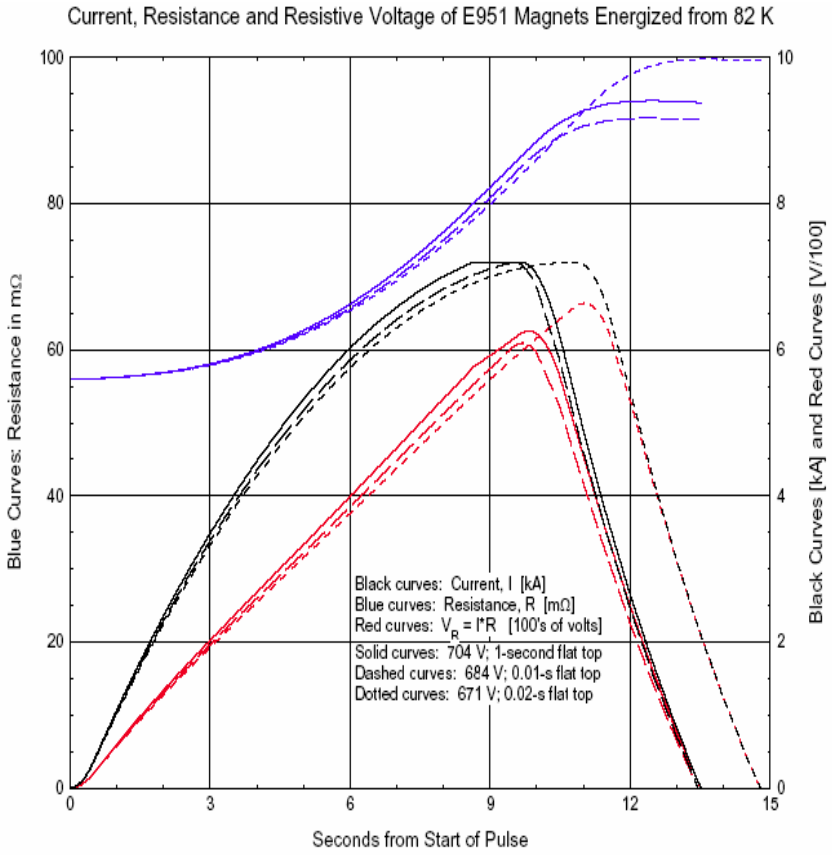
- The same type of current source will be used to drive the discrete LN level sensor diodes. Connection: TBD.

Data Acquisition
During Cool-down and After Pulsing

- During cool-down and before pulsing the magnet, including purging out LN, record
  - LN level
  - Temperature
  - DAQ sampling interval: 2 minutes (tentative)
- After pulsing the magnet, record
  - Temperature
  - DAQ sampling interval: 30 seconds (tentative)

Data Acquisition During a Pulse (Optional)

- Will attempt to record the power supply voltage and current, and the temperature variation during a pulse.
- But, it is dictated by the inductive voltage picked up by the DAQ system (noise and voltage limit).
- Need ~ 13 channels.; zero LN level signals will not be recorded.
- A typical pulse duration is ~ 15 seconds. The sampling interval can be set to 5 ms.



Summary

- Record temperature and LN level signals with existing equipment before and after pulsing the magnet is straightforward.
  - TBD: Excitation and signal level of discrete level sensor diode.
- Recording temperature signal during a pulse (optional) is dictated by the inductive voltages picked up by the DAQ.