



This paper describes objective technical results and analysis. Any subjective views or opinions that might be expressed in the paper do not necessarily represent the views of the U.S. Department of Energy or the United States Government.

SAND2020-8199C

Annular Core Research Reactor

Cadmium Detector failure modes

Idaho Project Meeting Nov 6-8, 2018

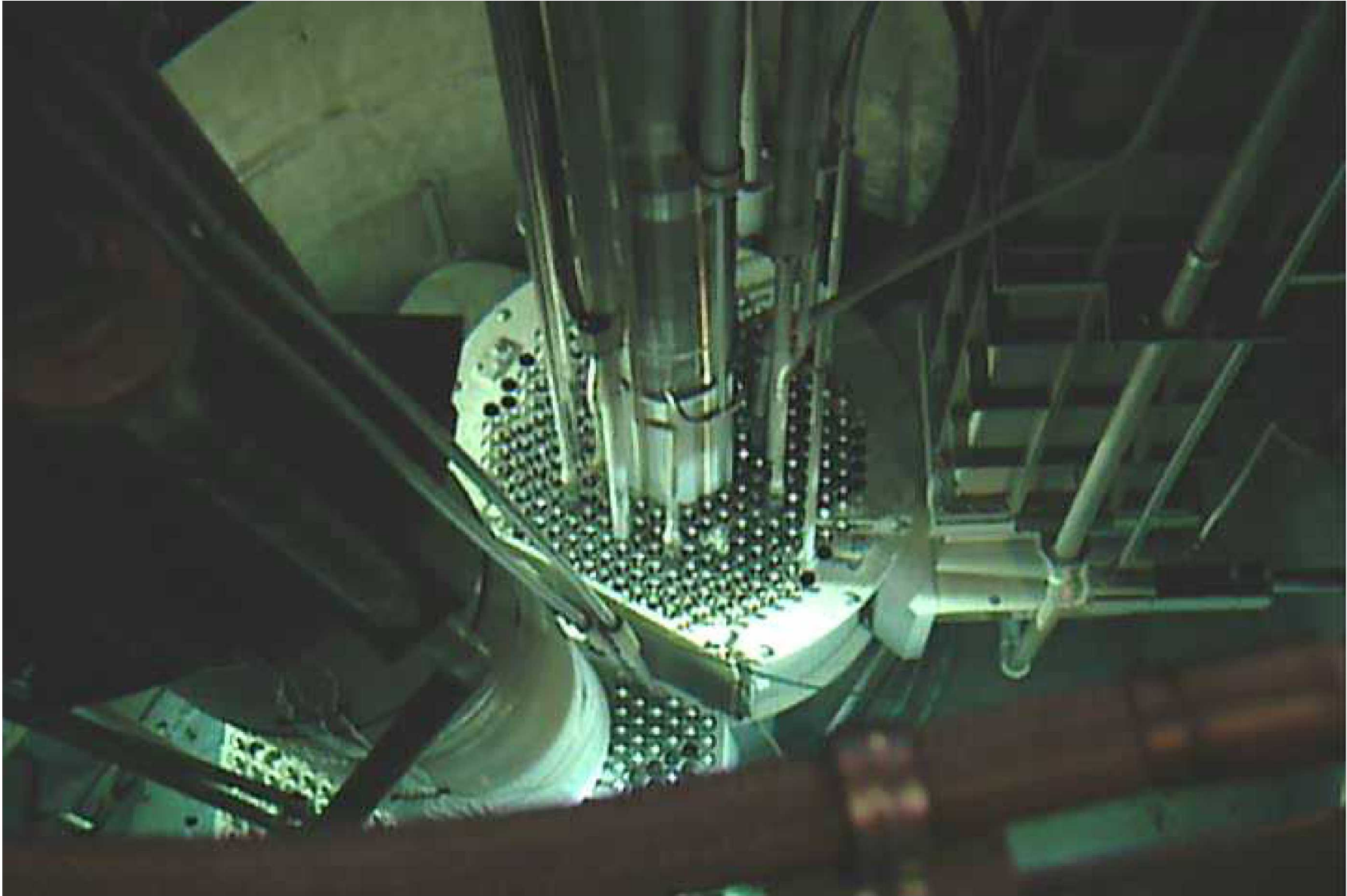
Ken Mulder Plant Protection Engineer



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.



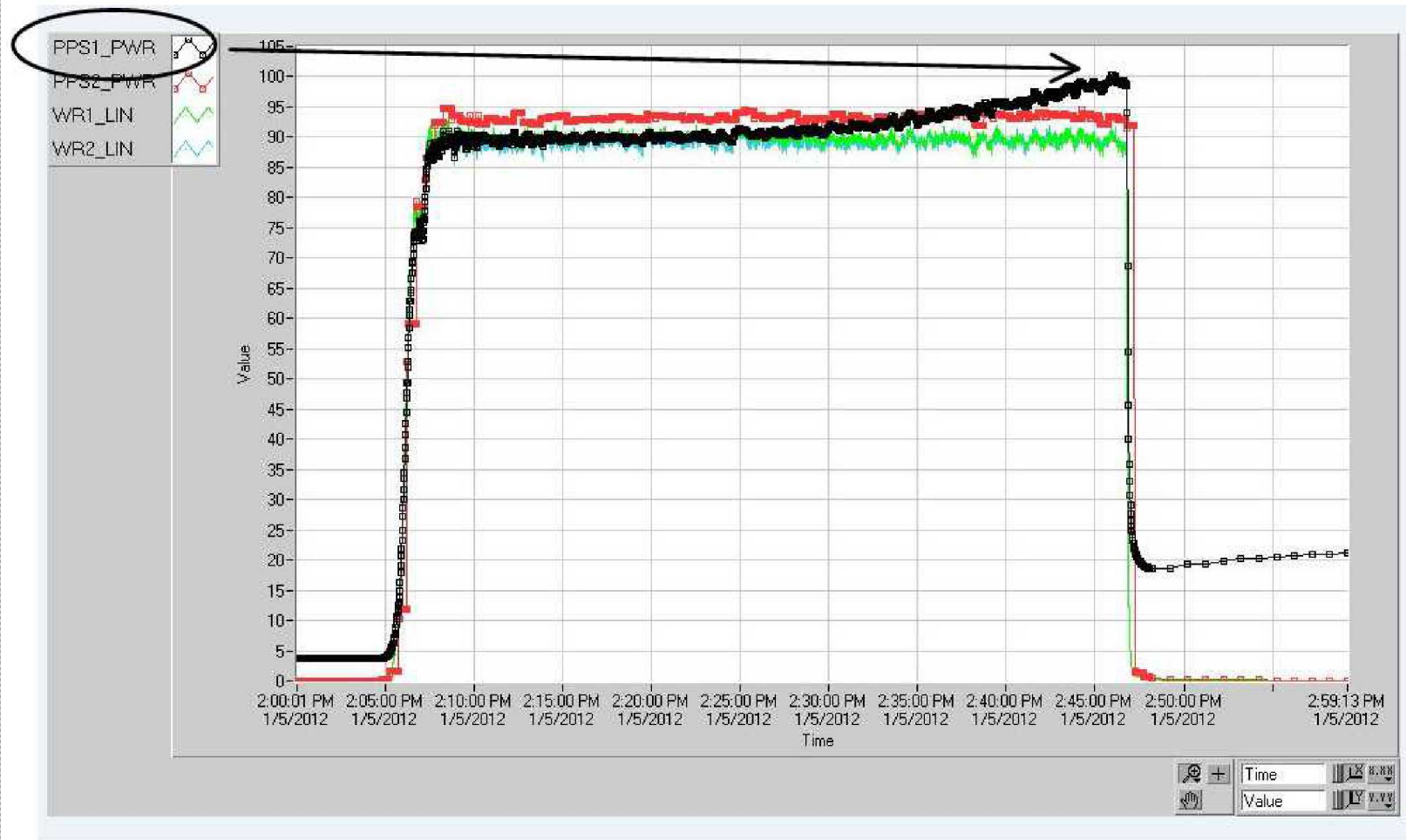




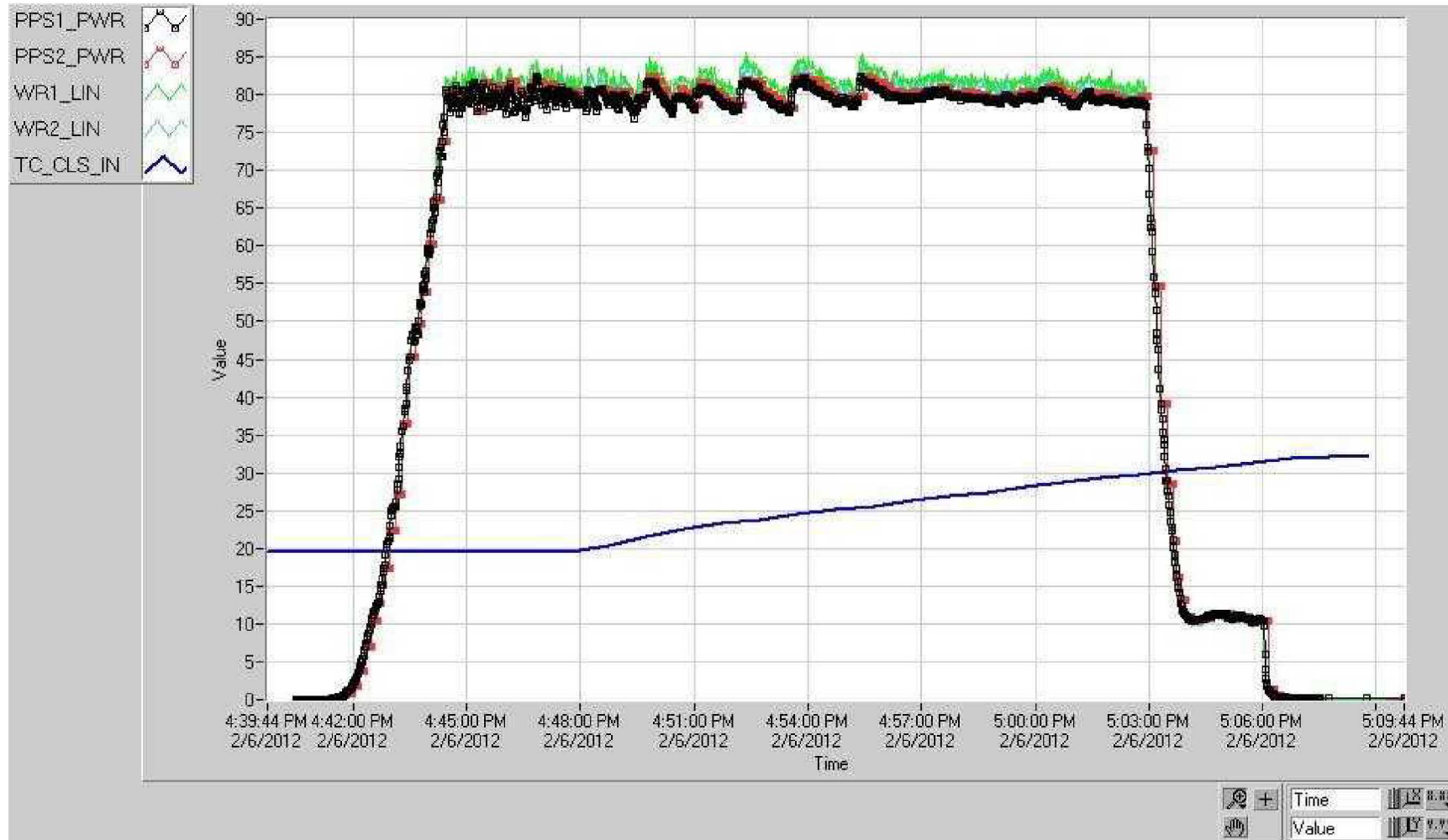
Replacement of a self-powered cadmium detector with a fission chamber

- **Jan 2012: Plant Protection Drawer #1 % Power channel signal degrades and is declared inoperable.**
- **No sound backup cadmium detectors available without impacting the experimenters.**
- **Had characterized a spare fission chamber in Oct 2011.**
- **Pulled spare fission chamber from pool to bend assembly for better fit.**
- **Re-installed spare fission chamber and calibrated channel. Operability of % Power channel restored.**

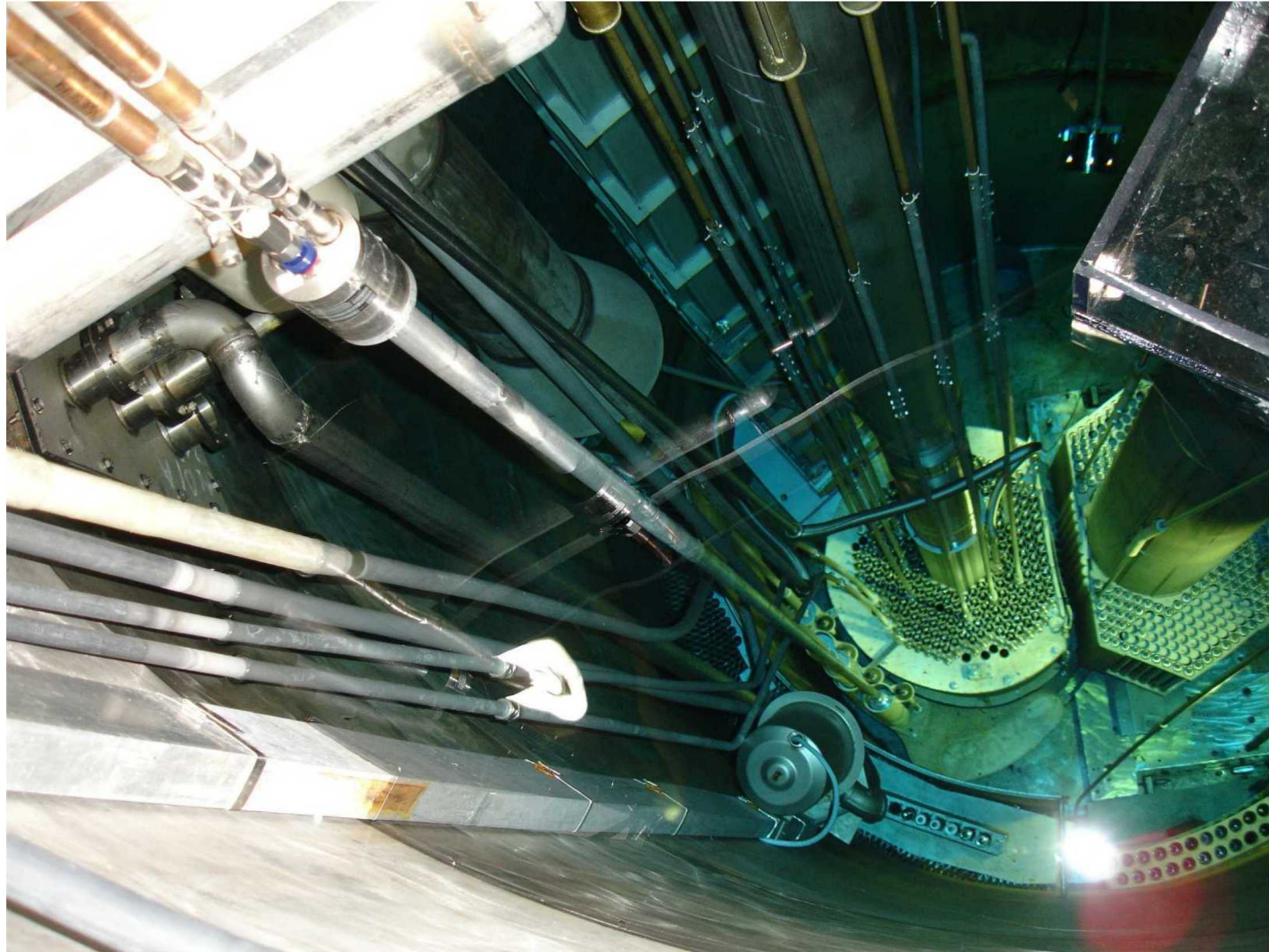
Replacement of a self-powered cadmium detector with a fission chamber



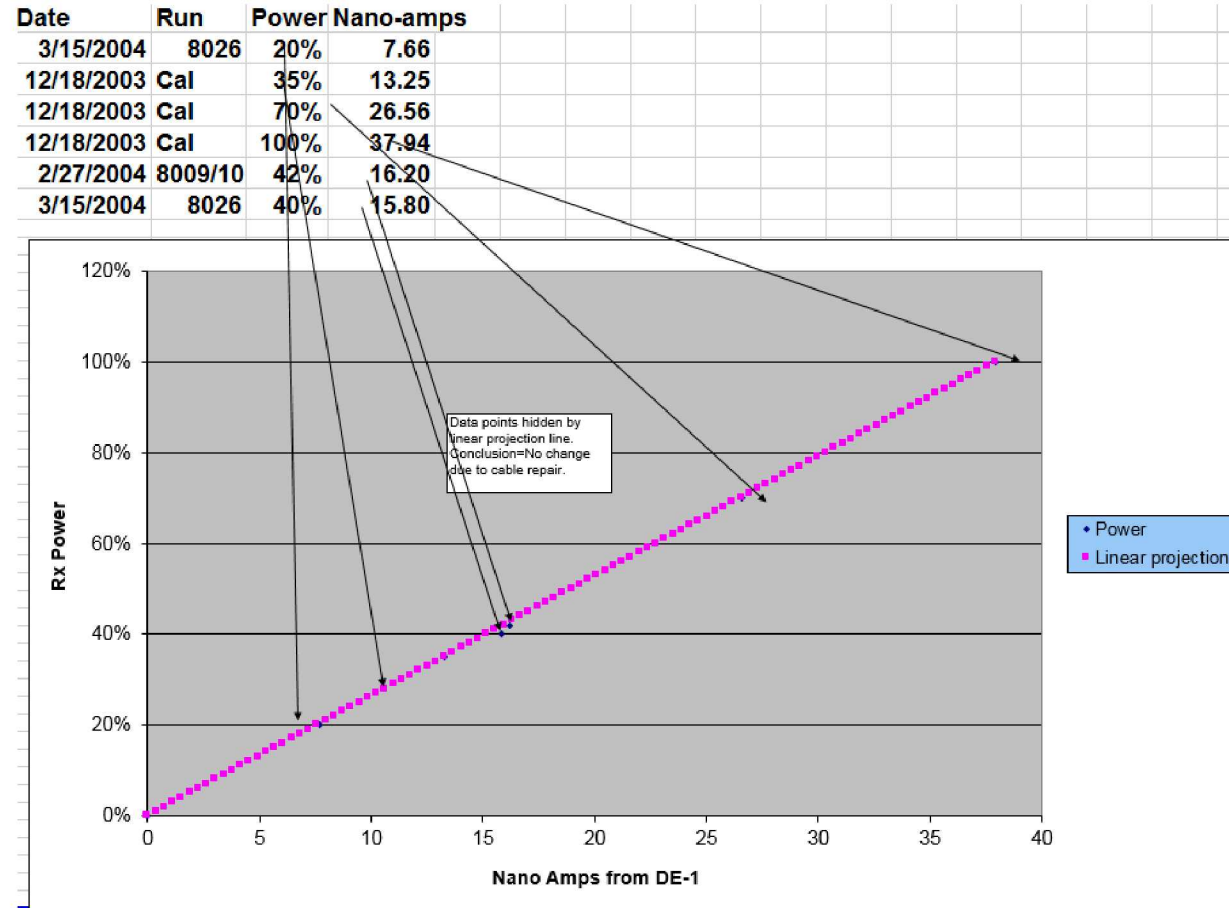
Replacement of a self-powered cadmium detector with a fission chamber



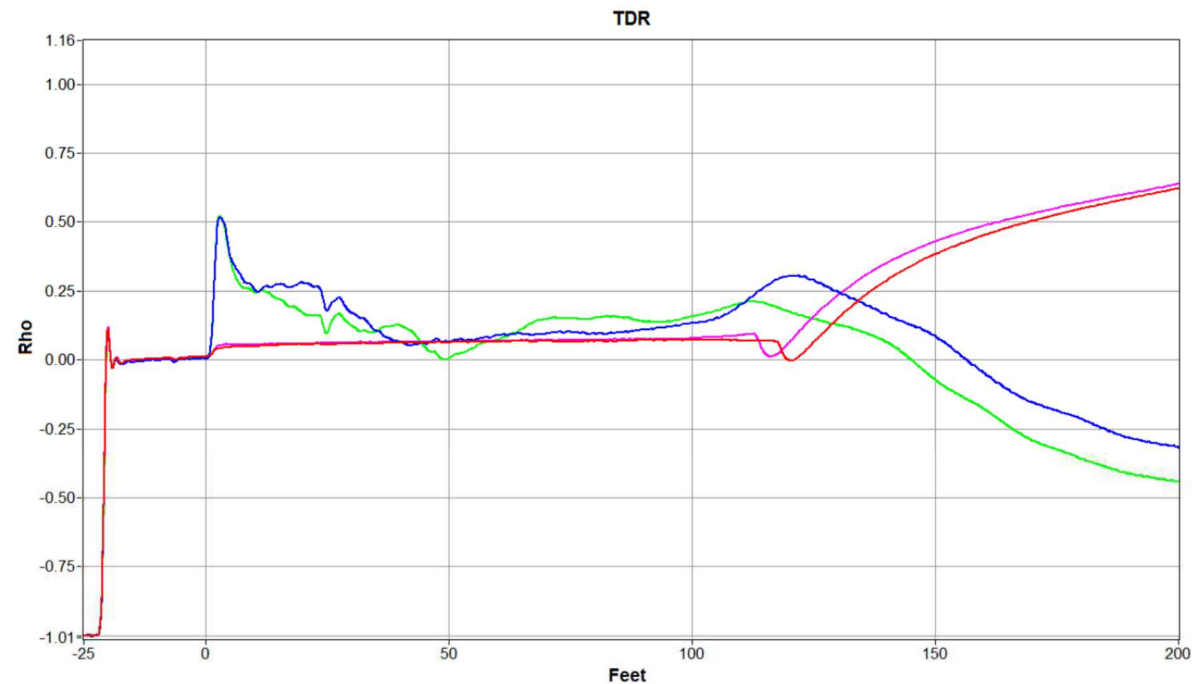
Replacement of a self-powered cadmium detector with a fission chamber



Amplifier absolved



TDR Baseline



	Equipment ID	Atc	Test Date	Test Time	Pts	T/Div	Positive Lead	Negative Lead	Comments
	ACRR PPS1 J5 DET SIG	1	21-May-2015	13:06:00	60000	62.5ns	Detector Cable Center Condu	Detector Cable Shield	Reactor Shutdown
	ACRR PPS1 J5 DET SIG	2	21-May-2015	13:07:19	60000	62.5ns	Detector Cable Shield	Ground	Reactor Shutdown
	ACRR PPS2 J5 DET SIG	1	21-May-2015	13:39:35	60000	62.5ns	Detector Cable Center Condu	Detector Cable Shield	Reactor Shutdown J5
	ACRR PPS2 J5 DET SIG	2	21-May-2015	13:40:38	60000	62.5ns	Detector Cable Shield	Ground	Reactor Shutdown J5

Capacitance Baseline

Test	Connection	Capacitance Inductance at 1kHz	Insulation Resistance
1	Detector Center Conductor to Shield	6.28 nF	*4.37 MΩ
2	Detector Shield to Ground	6.74 uF	*522.68 Ω

*This is a DC resistance measurement

Table 6.4. Impedance and Resistance Values for PPS 2 SPND (J5)

Test	Connection	Capacitance Inductance at 1kHz	Insulation Resistance
1	Detector Center Conductor to Shield	6.10 nF	*3.21 MΩ
2	Detector Shield to Ground	53.62 uH	*2.01 Ω

	Farads		Status
DE1 RS	19.3 to 17.3E-9		Good for Operations
DE1 IL3	68.9E-6		Good for experiments
DE2 RS	12.6E-6 Moves slowly up		Suspect
DE4 IL8	70.2E-6		Unknown
DE5 IL8	70-72E-6 Jumps around		Suspect