LMI TIPS: DETECTOR OVERLOAD December 1989

Many of us have experienced the problem with punctures or "bad" seals (commonly referred to as "light leaks") in the thin mylar face of an Alpha or Beta scintillator. The problem symptom occurs with a detector that has been functioning properly and then suddenly will not respond to normal background count or a check source. The counting instrument appears to have "died", so it usually becomes the first suspect because of no response on the meter except maybe in the BAT position.

Commonly it is "checked out" by substituting the questionable detector with a known "good" detector or by connecting a pulse generator and confirming count and HV operation. The detector has now been isolated as the problem and is closely inspected and found to have a small hole in the mylar face. Why doesn't the instrument respond to this light? After all, it is light that the photomultiplier (PMT) sees from the scintillation medium. The problem is the "light leak" which saturates the PMT. The overall gain of the PMT is decreased, thus reducing the incoming light pulses far below the threshold of the pulse counting instrument. This phenomenon will cause the instrument to appear "dead".

Another occurrence problem with scintillation and G-M detectors when the radioactive field intensity is increased until a decrease in count rate is observed. If field intensity is increased too much, once again no response or a "dead" instrument may be observed. The overall PMT gain has again decreased from both G-M and scintillation type detectors below the threshold of the pulse counting instrument due to count saturation.

The "dead" response of the counting instrument from the above phenomenons can be overcome by using another condition that occurs with the saturated detector. Even though the gain decreases from the detector, the Direct Current (DC) drain through the detector increases as it is saturated. The DC increase can be monitored within the instrument and used to activate a circuit to drive the analog meter to full end scale or illuminate an LED or etc. These circuits are referred as <u>detector overload</u>, saturation, detector paralysis or detector overrange with the former being the most commonly used terminology. This <u>detector overload circuit</u> (DOC) is usually provided with an adjustable control for activating the circuit at a finite point. Example: In the detector light leak condition, the DOC would be activated to drive the ratemeter to full end scale thus indicating the problem. The DOC activating point would be adjusted typically for 2.5 times full scale reading from the detector instead of at the "light leak" condition. This would insure that the meter would not decrease due to count saturation. It would also insure that even a very nonvisible light leak would not lower the meter reading.

For the G-M type detectors, the adjustment of the activating point should be made in between the full scale reading of the counting instrument and the point where the meter drive circuit no longer increases when the field intensity is increased. Care must be used in substituting different types of detectors with the same DOC. A scintillation detector is typically adjusted to trigger the DOC setting from .5 to 1 µA while a G-M pancake detector typically draws 2 - 3 µA at 10 mRad/hr to activate the overload circuit.

Caution must also be taken in the type of load connected to the instrument's overload circuitry. Example: the LMI 500 Pulser has a DC impedance of approximately 2 gigohms (2 X 10^9 ohms). If an DOC is set to activate at 0.5 microamps at 1000 volts, the pulser DC impedance would activate it's circuit (1000 divided by 2 X 10^9 = 0.5 µA). In this example, the circuit would be adjusted or disabled during calibration with the pulser then adjusted again with the detector.

If you have questions about these procedures, please give David Wyatt, our LMI Engineering Technician a call at 915/235-4866.

REPAIR DEPARTMENT NEWS

We are pleased to announce that we have made some necessary changes in the Repair Department to better serve instruments sent in for repair. Hopefully, these changes will be productive. This improved Repair Section offers repair and calibration of both Ludlum manufactured instruments and most other manufacturers related equipment.

Normal turn-around time for LMI equipment for repair is fifteen working days while LMI instrument calibration time requires five working days. Other manufacturers instruments may require a longer period due to parts and information availability.

Please give our Repair Department a call if they may be of assistance in regards to calibration or repair. A list of charges for services is listed below.

LMI CALIBRATION & REPAIR DEPARTMENTS: PRICES

Calibration:

GAMMA & PULSER

Standard calibration	$ 30.00 ea.
with extra detectors	$ 15.00 ea.
LMI Models:	
77-3	$ 50.00 ea.
261	$ 50.00 ea.
2200-16	$ 50.00 ea.
2600	$ 50.00 ea.

NEUTRON

Single detector units	$ 50.00 ea.
Dual detector units	$ 65.00 ea.

Repair:

LABOR

Technician	$ 35.00 hr.
Engineering Technician consulting via telephone	$ 50.00 hr.
Shop	$ 35.00 hr.
Technician Engineering	$ 50.00 hr.

Note: Prices quoted do not include sales tax or freight when applicable.

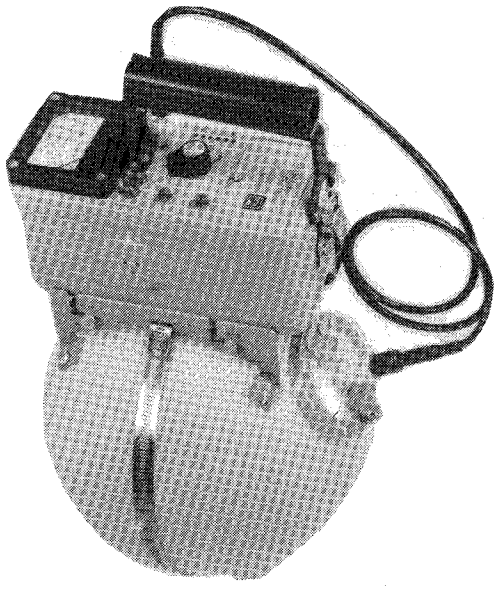
LMI MODEL 12-4 NEUTRON COUNTER December 1989

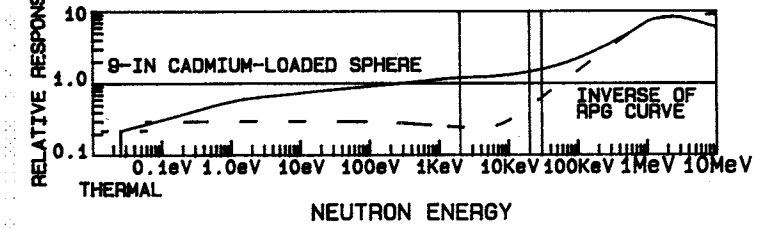
The Ludlum Model 12-4 Neutron Counter features a 16.6 cm by 2.5 cm BF_3 detector surrounded by a 3" diameter by .0015" thick CD shield which is encompassed by a 9" diameter moderator.

This instrument provides an approximate inverse RPG curve response for neutrons for an energy range of the thermal through 10 MeV. Efficiency for AmBe neutrons is approximately 30 cpm/mrem/hr while Gamma cut-off exceeds 10 R/hr.

Response times may be selected for either FAST (4 seconds) or SLOW (22 seconds) for 90 % of final reading.

It also features four counting ranges which include X1, X10, X100 and X1000 and a meter range from 0 - 10 mrem/hr. The sealed splash-proof instrument has a total weight of 21 pounds.





Calculated response of 9" sphere vs. energy
Reproduced from California University Los Alamos, NM
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