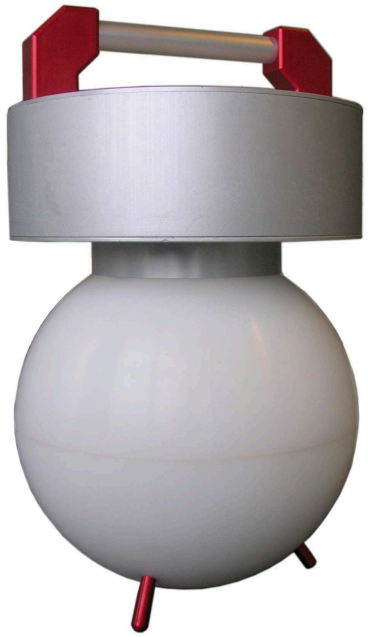
## NEUTRON REM COUNTER FOR PULSED FIELDS

# LUPIN 5401 Series

### MAIN FEATURES

- Proportional counter: $^3$He (spherical moderator) or $BF_3$ (cylindrical moderator)
- Energy range: from thermal up to 5 GeV
- Energy response closely resembles the ICRP74 conversion curve
- H*(10) rate: from 10 nSv/h to 100 mSv/h
- Unaffected by signal pile-up and so particularly suited for pulsed neutron field
- Maximum H*(10) per burst in pulsed fields: 200 nSv ($^3$He), 2 µSv ($BF_3$)
- Connectable to Saturn series rate-meters
- Available interfaces for communication with the Saturn series rate-meter: serial RS232 (default), RS485/422 for long distance (optional), Ethernet (optional), Wireless ZigBee up to 1 km (optional)
- Excellent gamma rejection (< 0.5 µSv/h at 50 mSv/h, 662 keV)



**LUPIN 5401 HE3-NP**

### DESCRIPTION

The environmental monitoring unit **LUPIN 5401** is a modular system for neutron H*(10) measurements, with excellent performance for detection in pulsed neutron fields.

The instrument is composed by the following parts:

- Neutron Proportional Counter: $^3$He (LUPIN 5401 HE3-NP) or $BF_3$ (LUPIN 5401 BF3-NP);
- Spherical or cylindrical moderating assembly
- Built-in Power Supply, Signal Acquisition and Processing, and Control Electronics.

The built-in electronics processes the signal coming from the detection unit, and elaborates the instantaneous H*(10) rate value every second.

The data are sent to the connected SATURN Series rate-meter, which locally displays the instantaneous H*(10) rate and the integrated values, and compares them to the pre-set alarm thresholds.

The SATURN rate-meter provides also the light indications and the acoustic signal to alert the operator when an Alarm or Pre-alarm status occurs.

The Alarm signal can be instantaneous or delayed by setting a delay time. The Good Functioning of the unit is always checked by the built-in CPU board.

The Alarm, the Pre-alarm thresholds and the operating parameters are stored on a non-volatile memory and they can be set by the operator on the keyboard or remotely via the remote management software (optional).

The connection to the Host PC can be made by using direct link or multi-drop depending on the communication type (RS232/Ethernet or RS485).


*Papers published in international scientific journals:*

- *M. Caresana, M. Ferrarini, G.P. Manessi, M. Silari and V. Varoli, LUPIN, a new instrument for pulsed neutron fields, Nuclear Instruments and Methods in Physics Research Section A 712 (2013) 15-26.*
- *M. Caresana, C. Cassell, M. Ferrarini, E. Hohmann, G.P. Manessi, S. Mayer, M. Silari and V. Varoli, A new version of the LUPIN detector: improvements and latest experimental verification, Review of Scientific Instruments 85 (2014) 065102.*

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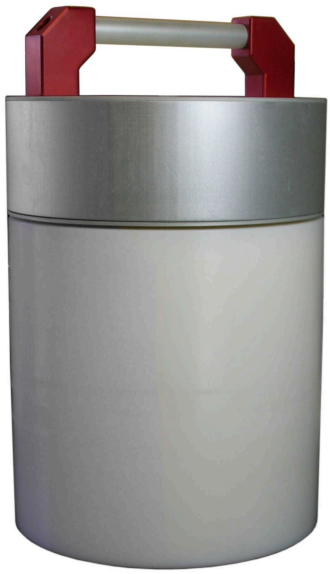
## TECHNICAL SPECIFICATIONS

### $^3$He Detector

- Model: Centronic SP9, 2 atm filling gas pressure
- Type: $^3$He Spherical Proportional Counter
- Energy range: from 0.025 eV to 5 GeV
- H*(10) rate range: from 10 nSv/h to 100 mSv/h
- Neutron sensitivity: 1 cps/µSv/h
- Gamma sensitivity: < 0.5 µSv/h at 50 mSv/h, 662 keV
- Angular dependence: < 5%
- Temperature Range: 0° ÷ 40 °C
- Total weight: 14 kg
- Max H*(10) per burst in pulsed fields with underestimation ≤ 10%: 200 nSv



**LUPIN 5401 BF3-NP**

### $BF_3$ Detector

- Model: Centronic BF3-15EB20/25-SHV
- Type: $BF_3$ Cylindrical Proportional Counter
- Energy Range: from 0.025 eV to 5 GeV
- H*(10) rate range: from 10 nSv/h to 100 mSv/h
- Neutron sensitivity: 0.6 cps/µSv/h
- Gamma sensitivity: < 0.5 µSv/h at 50 mSv/h, 662 keV
- Angular dependence: < 20%
- Temperature Range: 0° ÷ 40 °C
- Total weight: 18 kg
- Max H*(10) per burst in pulsed fields with underestimation ≤ 10%: 2 µSv

### Built-in Electronics

- Processing circuit: Current Amplifier
- Integrated HV module
- Analog to Digital Converter: 12 bits at 10 Msps
- Digital Pulse Processing: Cyclone III FPGA device
- Watchdog: Good Functioning circuit control
- Available Communications: serial RS232, serial for long distance RS485/422 half duplex/full duplex, Ethernet 10-100Mbit/s (optional), Wireless ZigBee up to 1 km (optional)
- Memory: not volatile for parameters storage
- Temperature Range: 0° ÷ 40 °C
- Optional hardware configuration: the Acquisition and control unit is detached from the Neutron probe and hosted in a separate housing (maximum distance 30 m)

### Electrical characteristics

- Power requirements: 24 VDC; 2.5 W (max consumption)

## OPTIONS

- Configurations: stand-alone portable monitor (with LCD display), wall mountable
- Communication: RS485, Ethernet or ZigBee
- Ultra-fast response (Alarm signal in 50 ms) for dual use as neutron rem counter – beam loss monitor

## ACCESSORIES AVAILABLE UPON REQUEST

1. Data concentrator PC with 5700 sMON software
2. Trolley kit: bare/unwired trolley for wheeled transport
3. Flight case
4. Warranty extension from 12 months to 24 months

*Different hardware and Software configurations are quoted on demand*



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