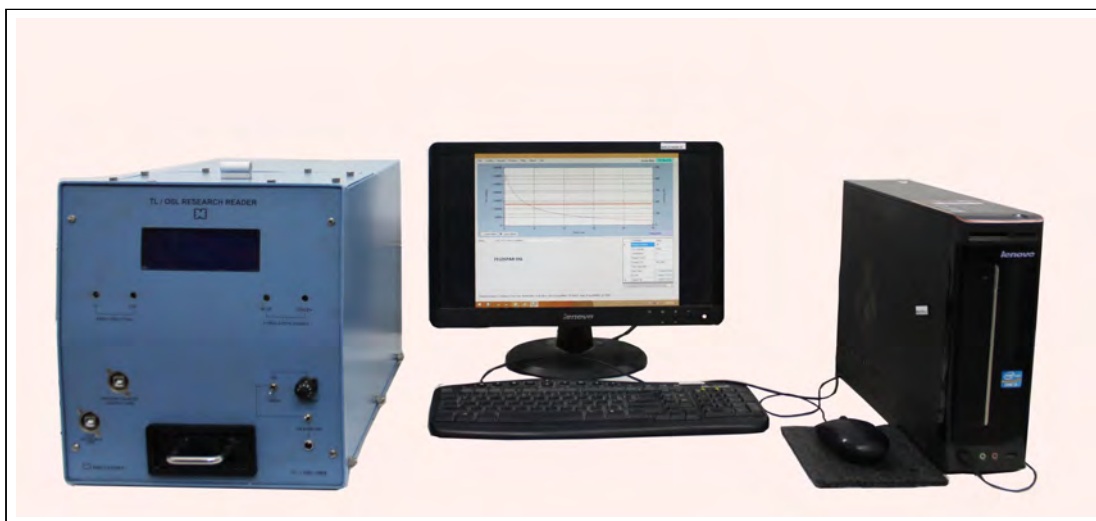


PC CONTROLLED TL / OSL READER

TL/OSL-1008

Technical Data



PC Controlled TL/OSL Reader TL/OSL 1008 manufactured by Nucleonix systems is a compact integral unit, designed primarily to meet the requirements of TL/OSL research community in R&D labs & universities who are engaged in luminescence studies of TL/OSL materials. The drawer & sample holder of this system facilitates, single sample TL/OSL acquisition & analysis, at a time.

System has precisely designed stimulation & detection opto- electronics & photon counting module with appropriate filters, focusing lenses & sample drawer assembly with heating arrangement all enclosed in a single mechanical chamber. System facilitates loading of the TL/OSL samples on to kanthal strip. For OSL samples separate cups/ planchets can be provided.

TL/OSL data acquisition & analysis is controlled by PC software. In case of OSL, optical stimulation by BLUE & GREEN LEDs provided is also controlled by PC software and electronic circuits & embedded code in the microcontroller. System can be operated in TL or OSL or TL-OSL modes as required by the user. Photon counting module acquires luminous intensity data -for both TL & OSL samples. Two modes of OSL stimulation have been provided in this system namely, CW - OSL (Continuous wave OSL) and LM - OSL (Linearly modulated OSL).

Specifications

I. TL / OSL Stimulation & Detection chamber

It is a light leakage free, precisely fabricated mechanical assembly, houses photon counting module with detection filter basket, LED stimulation assemblies (four) diagonally placed around photon counting module cylindrical enclosure. TL/OSL sample holders with Kanthal heater strip & drawer arrangement are also built-into this chamber.

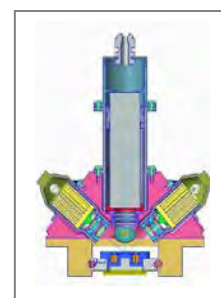
II. Optical Stimulation Assembly

Optical Stimulation System consists of BLUE & GREEN LED cluster(s) with, each LED of 3 watt power. Either BLUE or GREEN LED cluster(s) each cluster containing two LEDs can be stimulated. These LEDS are placed diagonally 180° opposite, with suitable lense arrangement, provides uniform luminous intensity onto the sample area.

Light Source (s):

(i). Blue LEDS cluster, each of 3 watt output placed 180° degrees opposite gives stimulation output with peak wavelength emission of 465nm, having Luminous flux radiometric power of 30mW @ 700ma & emission wave length band is (460-470)nm.

(ii). Two Green LEDS cluster has peak wavelength emission of 525nm and gives 99mW radiometric power @ 700mA. Emission wavelength band is (520 -535) nm.



Constant Current Driver:

Electronic circuits built-in provide Constant current drive to each of the LED clusters with dimming control, to vary the luminous intensity.

Stimulation Filter:

Each of the LEDS assembly is provided with a long pass, stimulation filter of 420nm of 12.5mm dia. This prevents the scattering light below 420nm, entering the PMT directly.

Focusing Lense:

A suitable focusing Plano-concave lense is provided in front of the LEDS to focus the light on to the OSL samples placed in the planchet.

Heat Sink:

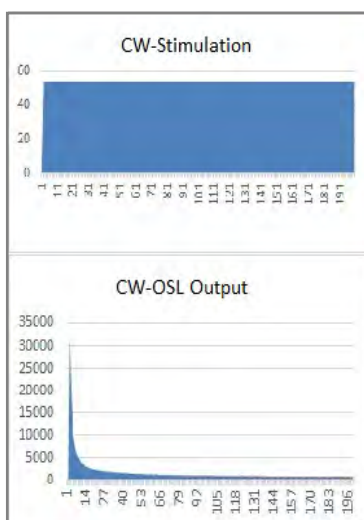
Each of the LED assembly has been provided with a specially designed Heat sink (cylindrical) to keep the LED at lower temperature to obtain uniform illumination, onto the sample holder.

Photo Diode / Photo sensor:

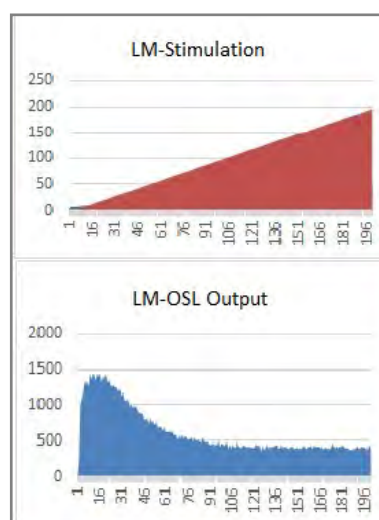
A suitable photo diode, with appropriate electronics reads stimulation intensity & proportionately plots on Y-axis in the software through ADC.

Stimulation modes provided:

(i) CW-OSL-continuous wave OSL



ii) LM-OSL Linearly modulated OSL



III. TL-OSL READER-Light Detection System/Photon Counting Module

Photon counting module, is an integral part of the TL-OSL Reader. Photon counts received from the luminescence emission from the TL / OSL materials are counted in this module & the data counts are transferred to PC, thru RS232/USB interface. This module essentially is plug-and play photo detector package, comprises of selected 25mm diameter end window PMT, a positive high voltage power supply, high speed amplifier- discriminator, counter & a microcontroller. All these are encapsulated with in a cylindrical mumetal case providing a high level of external magnetic shielding.

PMT: 25 mm PMT with ultra-low dark counts.

Count rate capacity: 100 MHz

High Voltage: Built –in & set to optimum value.

PC Interface: RS 232 / USB serial port.



IV. TL Heating System

Heating Element: (Heater Strip)

Kanthal strip (72% Fe, 23% Al and 2% Cr or Nichrome) is used as a heating element. Kanthal Strip has a circular depression of 14mm to hold discs and powder samples. Additionally flat heater strips also can be provided on request.

Sample Heating Process:

Sample heating can be done in two modes:

"PROG MODE" of Temp. control through personal computer program.

"ISO MODE" (Internal mode) of Temperature Control, by varying the ten turn dial.

Temperature range / Programmed plateau heating:

From room temperature up to 500°C linear & plateau heating (Single / Two / Three plateau heating are possible).

Heating Rates:

Heater strip can be programmed to heat the sample from 1° C/sec up to 40° C/sec and a max set temperature allowed is 500° C.

Nitrogen Flushing Nozzle:

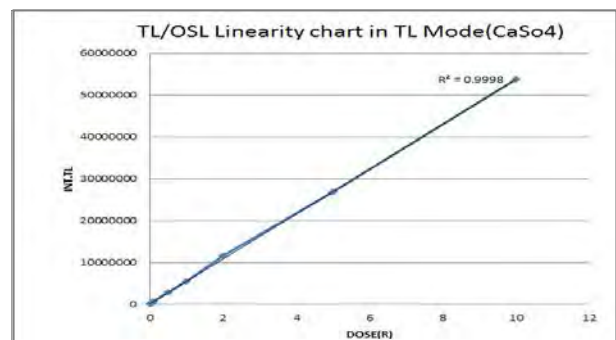
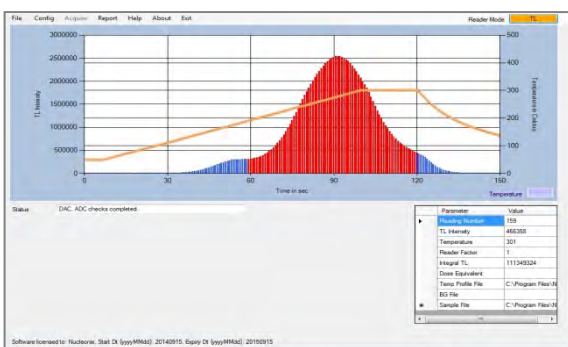
Nitrogen gas flushing nozzle, to suppress spurious luminescence from oxidation effects & also for cooling has been provided, on the rear panel.

V. PC Configuration

Branded computer system with Intel Core i3 @ 3.06Ghz, 2GB DDR2 RAM, 500GB SATA, DVD R/W, Keyboard and Internal ready Optical scroll, 19" TFT Monitor, Laser jet printer, Windows licensed OS-Windows 7.0.

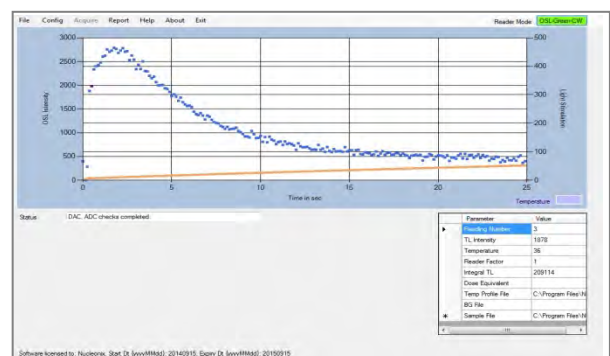
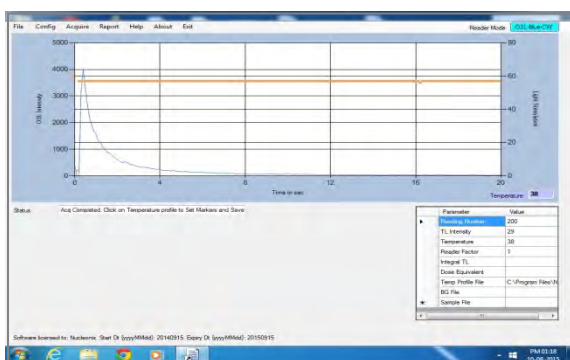
VI. Software features

TL / OSL reader system operates thru PC controlled user friendly software. Software performs Self diagnostics of the system & reports faults. Software facilitates one to choose TL or OSL mode for sample data acquisition, allows the user to configure for the required heating profile in TL mode & other parameters as required in OSL mode. Once data is acquired, acquired data can be saved or further processed depending upon the requirement.



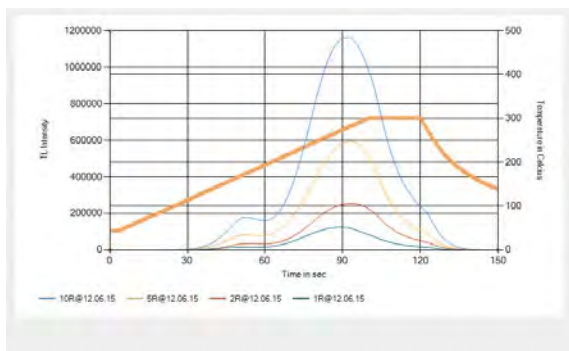
TL Glow curve of CaSO₄ using photon counting module

TL-OSL Linearity chart in TL Mode

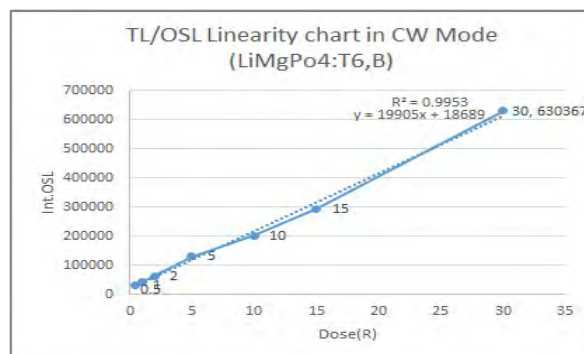


LiMgPo₄:Tb, B Glow curve acquisition CW-OSL Mode

LiMgPo₄:Tb, B Glow curve acquisition LM-OSL Mode



TL Glow Curves in Overlap Mode with Same Heating Profile



CW-OSL Performance study

Software Key features:

- **Mode Selection:** TL / OSL Green / OSL Blue. In OSL, Continuous Wave (CW) & Linear Modulated (LM) modes are available.
- **Heating profiles in TL mode:** Various Heating profiles can be configured – Linear, Single & Multi-plateau.
- **Temperature Calibration:** The software provides an easy & user friendly method for Temperature calibration.
- **Light Stimulation Profile:** Light stimulation profile can be configured for CW or LM modes.
- **Acquisition:** Data is acquired based on the selected Mode & Profile. Background spectrum / Sample data can be acquired.
- **Background Subtraction:** There is a provision to do background subtraction automatically during acquisition.
- **Export Spectrum data to Excel:** Software allows the spectrum data to be exported to Excel, which gives the convenience to the user for further processing.
- **Spectrum overlap:** Multiple spectra can be overlapped (up to 10) for comparative studies.
- **Spectrum subtraction:** 2 spectra can be mutually subtracted & resulting spectrum can be saved.
- **Help:** Software manual is provided which gives installation & usage instructions clearly.

Applications:

TL Phosphor Characterization, Medical Dosimetry, Personal Monitoring Research, Archeology dating, Environmental Radiation Monitoring, Medicine, Biology, Neutron Dosimetry, Reactor Engineering, High Level Photon Dosimetry with TL materials, standardization and inter comparison of TL dosimeters used in personnel monitoring etc.

Applications in radiation oncology: Therapy machine calibration checks & inter-comparison studies with other centers, treatment planning accuracy verification using phantoms, patient specific dosimetry, studies in Brach therapy physics, in X-ray diagnostics to determine absorbed doses to patients & in research etc.

Optional accessories :

A.TL Materials & Phosphors`

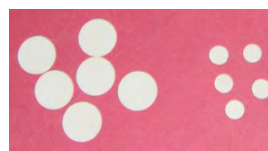
- (i) TL Phosphor CaSO_4 : Dy Powder
- (ii) TL Discs CaSO_4 : Dy discs with Teflon base
13.5mm dia X 0.8mm thick.
- (iii) LiF; Mg, Ti square chips
(3.2mm x 3.2mm x 0.9mm)
- (iv) Vacuum Tweezers
- (v) Neutral density filters.



(i)



(ii) & (iii)



(iii)



(iv)



(v)

B. Annealing Oven

Internal Dimensions 14 X 14 X 14 (inches).

Temp Range : up to 400°C.

Temp Indication: Digital.

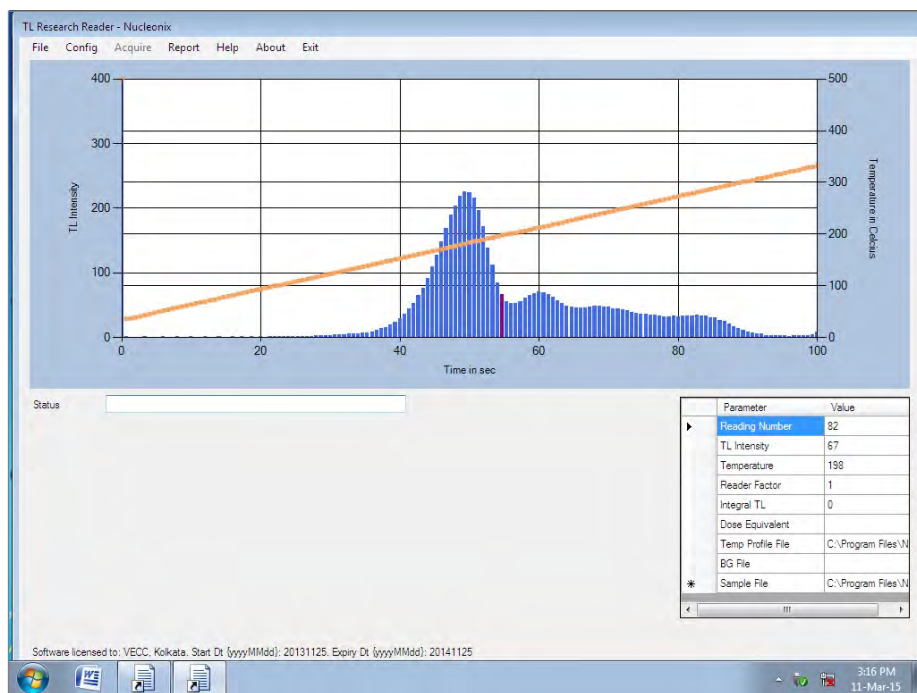
No. of trays: 2 nos.

Heating: High grade Nichrome wire placed in the ribs of sides and bottom for uniformity.

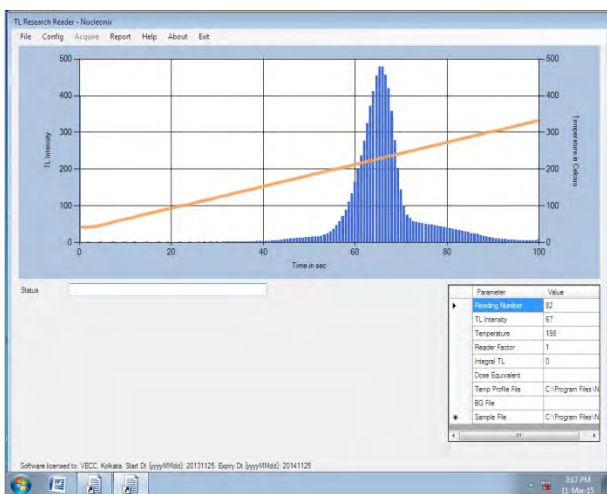
Power requirement: Single phase 220/230VAC supply.

Accuracy : +/-1° or better .

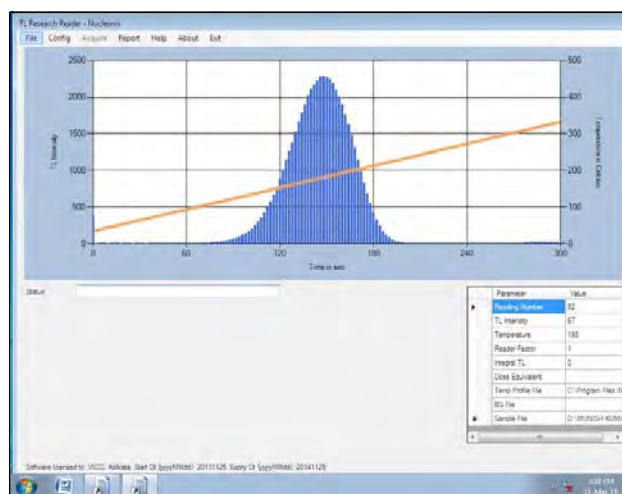




II. LiF- Glow Curve [LiF-N (Mg,Ti)]



III. a) Glow Curve of LiF – Mg copper



b) Glow Curve of Al₂O₃ (ALUMINA)