Purposes: To build a cost-effective and versatile optically stimulated luminescence detector (OSLD) reader.

Methods: An instrument was built to perform three integrated tasks including light detection, stimulation and instrument control. A photomultiplier tube (PMT) is used to detect the OSLD's luminescence. Four high-powered green light emitting diodes (LEDs) are used as stimulation sources. The PMT and LEDs are controlled using a data acquisition board (DAQ). A custom-made light-tight chamber made of aluminum integrates these components. A 24 V DC power supply powers an LED driver, which supplies a constant current to the LEDs. The PMT is powered using the same power supply and a voltage regulator. The DAQ is controlled by a computer connected via a USB cable running a program written in LabVIEW, which allows continuous wave (CW) and pulsed OSL measurements.

Results: Preliminary results show that the standard deviation of the PMT counts is 1.2 times higher than that expected due to Poisson statistics. The initial intensity of the OSL signal from four Al2O3:C OSLDs exposed to 100 mGy were within 2%. A linear dose response curve was observed for Al2O3:C OSLDs exposed to doses between 100 mGy and 10 Gy.

Conclusions: The OSLD reader presented good stability with reproducible results of the initial intensity of the OSL signal. The device is portable, more cost-effective and yet more versatile than the currently available commercial OSLD readers. Our OSLD reader may be used to perform OSL research in clinical dosimetry. The detailed design of our OSLD reader including technical drawings, circuitry and software are available upon request.