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PRELIMINARY SPECIFICATION

MODEL 2200SLE SCANNED LASER OSL EXCITER

- Temperature stable 10 mW diode pumped solidstate green laser (532nm), 0-100 per cent modulation
- Precise, low-drift postioning of laser beam by fast galvanometers
- 13 mm square field of scan
- 12-bit X, Y, and intensity control
- Optional defocusing lenses for variation of beam diameter under computer control
- Optional neutral density filter wheel for additional control of laser power (ND=0.0, 0.5, 1.0, 1.6)
- High efficiency light collection optics
- Flexible and versatile single grain and multiple grain aliquot configuration
- Very compact
- Easy set up; fast interchange with other accessories without time consuming alignment
- Compatible with both 2200 and 1100-series instruments (and Risø instruments with optional flange)
- Powerful microcontroller for easy interface to host computer
- Platform independent
- Fast serial communications channel, RS-232 or USB

Among the many problems faced in dosimetry of natural mineral materials is the often large grain-to-grain variation of TL/OSL properties, including the presence of poorly-bleached grains all of which affects dosimetry when an assemblage of grains is measured together (see for example, Roberts, et al., 1999) . Duller, et al. (1998) have described a laser scanning OSL detector system for the Risø reader that permits irradiation and heating of many grains at once, and individual readout for characterization of grains and dosimetry. We have developed a simple scanner of this sort for our model 2200 OSL reader system, using new subminiature galvanometer servos from Cambridge Technology (Cambridge MA) in an x-y scanner mount. The field of scan is 13 mm square. The beam from a 10 mW green diode pumped solidstate laser with optics to focus it down to a 10-250 micron diameter spot (galilean 3X beam expander plus appropriate biconvex focusing lens), power-, and temperature stabilization is directed into the galvo scanner, then reflected down onto the sample disk by a 8 mm by 12 mm turning mirror at 45 degrees. A segmented octagonal cone reflector, made of thin glass sheet with magnesium fluoride protected aluminum coating, collects light from the sample and efficiently couples it to the PMT. The 10 mm sample disk contains an array of 52 0.3 mm diameter sample wells on 1 mm centers to contain the grains, together with orientation holes. (This arrangement is provisional, and a larger number of wells may be provided as standard.) The sample array disks are photofabricated of stainless steel. Other sample arrays can easily be accommodated; in fact, we plan to make available disks with a smaller number of 1 mm diameter wells to hold multiple grain aliquots when they are desired. An optional mechanism holding two different concave lenses for altering the focus plus an aperture for the finely focused beam allows use of three different beam diameters for various purposes. This focusing arrangement is under software control. A series of radial scans is made from outside the disk inward till the edge is detected, in order to establish the center position and scale of the sample disk (without exposing the samples to the laser). The reflection off the disk is detected by a silicon photodiode. Once that is determined, the beam is scanned in a circle to find the postion of the orientation holes near the edge. With this information the positions of individual grains may be calculated. Since these galvanometers require no holding current, and the position-finding scans are fairly slow (compared to the 500 Hz raster scans possible with these devices), there is very little temperature rise to cause drift of the built-in position sensors (less than 0.05%of scan/C total zero and full scale drift). 12-bit x-y position information is applied to the servo controllers for a 3 micron position resolution. We expect the total thermal drift over the course of measurements of grains on a sample disk to be well under 20 microns. The galvanometer mount is equipped with a temperature sensor with digitized output so that the orientation scan can be repeated as needed if the temperature should rise more than a set maximum. This device is designed to be compatible with the 1100-series readers as well.

For flexibility, the laser scanner is packaged in two units. The optical head contained the laser, galvanometers, focus changer, and light collection optics. This mounts on the 2200 cover (or 1100 lid), and the PMT housing mounts on it in turn. The size is 125 x 200 x 50 mm. The second unit contains the control electronics and power supply, in a package 150 x 200 x 80 mm. Communication with the host computer is by a high speed serial channel (up to 57,600 baud). The controller is semiautonomous, with part of the control function done by the host computer (a callable subroutine or DLL for use by the OSL data taking software). Eventually, the entire control function will be contained in the microcontroller, without need of the host computer, to make the instrument entirely platform-independent. There is sufficient firmware memory (up to 512K bytes) to accommodate an extremely sophisticated control program, and the program can be upgraded in the field.