untreated coatings in Fig.L.9.1. The change in reflectivity of the oil vapour exposed and unexposed HMDS treated coatings is small (~0.01). It was also observed that the ammonia and HMDS treated coatings have a higher LIDT at the lasing wavelength in comparison to untreated coatings after exposure to the oil vapour. This finding agree well with the measurements of imaginary part of refractive index at 1054 nm.

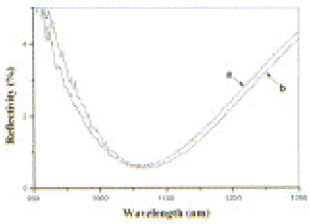

Fig.L.9.2: Reflection spectra of a) porous silica coating treated with ammonia and HMDS and b) the same coating after exposure to oil vapour.

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L.10 High voltage programmable ramp generator for high speed streak camera

Streak camera is a high speed recording instrument, used as a diagnostic tool for studying very fast events, especially in the field of intense laser-matter interaction. Streak camera consists of a streak tube which has a photocathode, deflecting plates and a phosphor screen. When the light from the event is incident on photocathode, it generates photoelectrons, which are deflected by deflecting plates and an image is generated on the screen. For this reason, streak camera requires a high voltage and fast ramp generator of amplitude of +/- 500 V and rise time of 1 ns. However, it is also necessary to vary the slope of this ramp so that the event can be analyzed properly. In this article, we have presented a high voltage ramp generator with programmable slope and microprocessor based control, developed for this purpose. The ramp generator consists of a high voltage step generator, followed by an integrator. The components of the integrator are designed such that they can be varied by a microcontroller. The unit generates two bipolar ramp voltages with fastest speed of < 1ns and provides continuous slope variation from 6 ns to 30 ns for a ramp voltage of 500 V. This is developed by Laser Electronics Support Section, RRCAT as a part of automation of streak camera.

The step voltage is generated by two stacks of avalanche transistors connected in series to minimize the jitter. The stacks are biased by applying positive ramp bias at one end of the first stack and negative ramp bias at the other end of the second stack. Both the stacks are triggered through a pulse transformer having one primary and two secondary windings (1:1:1). The outputs thus generated are connected to two integrator units through two high voltage dc relays. By activating these relays, the step voltages can be connected to the integrator units, thus getting slower slope of ramp voltages decided by the value of R, L, and C.

Variable and high voltage capacitor and inductor required for this unit and which can be controlled by microprocessor were developed in-house. For variable C, a gang capacitor with two identical capacitors variable from 47 pF to 253 pF was used. The shaft of the same is rotated by a stepper motor. For variable L, two solenoid coils are used and the inductances are varied by moving the ferrite cores by another stepper motor. The inductances vary between 3 μH to 15 μH. A resistor of 110 Ω is used for all the values of L and C as it provides overall satisfactory performance. A photograph of the variable slope ramp generator module showing its constructional features is shown in Fig.L.10.1. Fig.L.10.2 shows the ramp output waveforms with variable L and C.

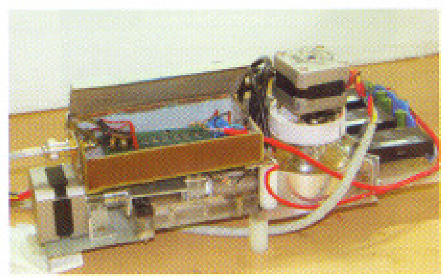

Fig.L.10.1: Programmable high speed ramp generator module.

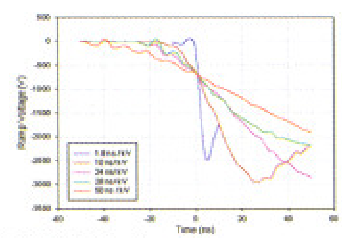

Fig.L.10.2: Variable slope ramp output wave forms.

For controlling various operations of the ramp generator, a micro controller ADμC831 (Analog Devices) is used. This microcontroller is programmed to drive both stepper motors described above and is interfaced to the PC using RS232 link. A LABVIEW based graphical user interface (GUI) is developed in personal computer for operation of the instrument.

In fastest mode, two step voltages with < 1ns rise time are generated. The rise time is calculated for a variation of 500 V in linear part of the ramp. The ramp speed can be adjusted to any desired value within the range 6 ns to 30 ns by changing L and C, with the help of stepper motors.

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