the plasma chamber at a distance of about 50 cm from the plasma chamber centre at all glass windows.

The measured angular dose rate distribution showed anisotropy with a peak in the direction of the target normal with a dose of 40μSv/h as shown in Fig.L.17.2. The peak value is more than 200 times the background radiation dose rate ~ 0.2 μSv/h. To find the sources causing the anisotropy, the dependence of the x-ray dose rate as a function of distance along target normal direction ($\theta=0^0$) was measured. The inverse square distance dependence of the dose revealed that there exists a second source of hard x-rays at the glass window along the target normal direction. This further indicates that a significant number of fast electrons are produced along the target normal direction and they get slowed down / stopped in the glass window to produce another source of hard x-rays. The angular distribution of the hard x-rays from individual sources should be somewhat isotropic. However, the combination of two sources gives rise to the experimentally observed anisotropy due to the different detector-second source distance for various angular positions of the detector.

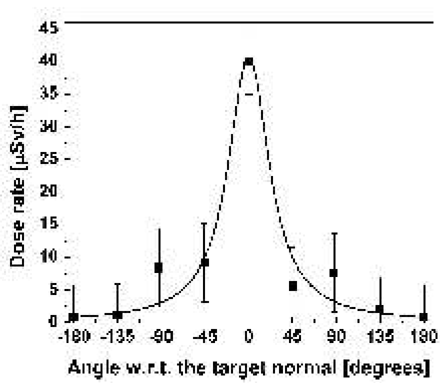

Fig.L.17.2 : Angular distribution of the hard x-ray dose rate outside the interaction chamber.

The present study [B. S. Rao, V. Arora, P. A. Naik, R. A. Khan, and P. D. Gupta, *J. Appl. Phys. 102, 063307(2007)*] reveals that the laser-solid interaction at intensities ~10^{18} W/cm^2 produces significant radiation not only from the interaction region but also from the surrounding materials as well. This radiation provides opportunity to tailor the geometry of the experiment so that the secondary sources may be put to useful radiological applications with more convenience. Considering the significant radiation levels observed in the present experiment, one should take appropriate steps to protect experimentalists from possible radiation hazards.

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L.18 : DSP based motion control system with fully digital PWM AC servo motor drive

An AC servo motor is highly efficient, has fast dynamic response, low maintenance and therefore most suitable for computer numerical control systems (CNC's), motion controllers and robots. The control system and drive developed at the Industrial CO_2 Laser Section of RRCAT, provides position, speed, direction and acceleration control of motor with trapezoidal motion profile. Such type of motion is required during laser material processing experiments.

The motor drive is controlled digitally by using digital signal processor (DSP) to provide electronic commutation. The algorithm is implemented for pulse width modulation (PWM) control of the motor for closed loop position control with inner speed control loop. A PC based user interface is developed using Visual Basic language. In order to use this system as an embedded system, a multi-line liquid crystal display (LCD) and a PC keyboard have also been used. The commands are sent to the system through keyboard using a very simple language. Actual speed and actual position can be read during run time. All PI parameters can be changed for smooth response according to application requirement. Fig.L.18.1 shows response of the system to a step command.

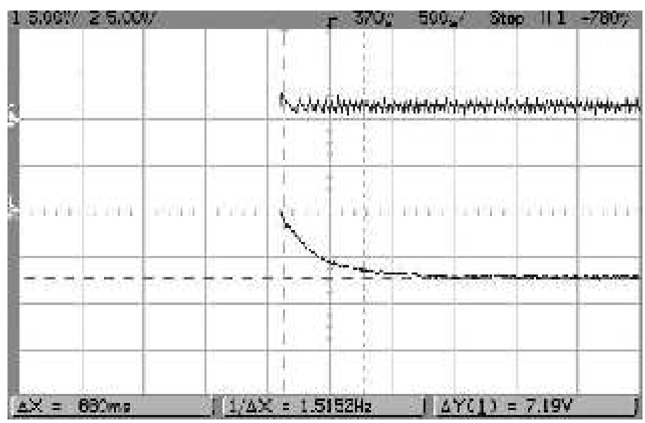

Fig.L.18.1 : Channel 1: 500 rpm/div, Step response of the drive for commanded speed 720 rpm ; Channel 2: 16.67 amp/div, Current in phase a of the motor.

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