

L.6 : Development of photon counting version of Uranium analyser for trace measurement of uranium in potable water

Laser Instrumentation Laboratory, Laser Biomedical Application and Instrumentation Division had developed various version of Laser fluorimeter for uranium analysis. These instruments used a sealed nitrogen laser as the excitation source. These laser tubes have a life of about a year after which they need to be refilled. To address this issue, trails were done using high brightness pulsed UV LEDs as excitation the source for the fluorimeter. A prototype system was built using a 200 mW pulsed UV LED emitting at a centre wavelength of 385 nm. The system had a detection limit of 0.5 ppb, which was lower than what the instrument was capable of (0.05 ppb) using nitrogen laser as excitation source. To achieve the detection limit of 0.05 ppb the PMT based fluorescence detection sub-system was redesigned to operate in single photon counting mode. A prototype system was assembled using the pulsed UV LED as excitation and photon counting based fluorescence detection. A FPGA and microcontroller based embedded interface card (shown in fig. L.6.1) was also developed for the control and operation of the photon counting version of uranium analyser.

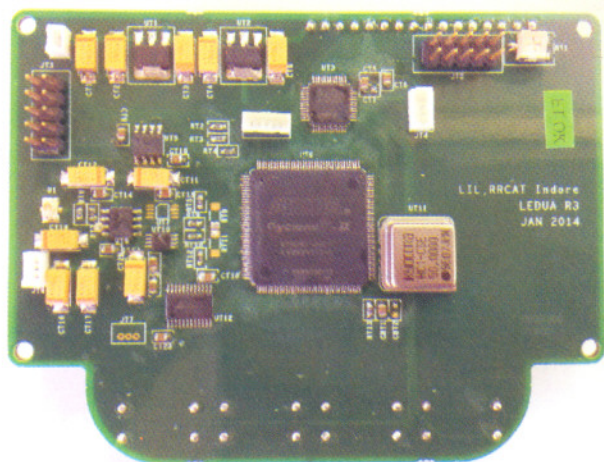


Fig.L.6.1 The FPGA and microcontroller based embedded interface card developed for the control and operation of the photon counting version of uranium analyser

This instrument achieved a detection limit of 0.02 ppb and was field-tested at Environment Assessment Division, BARC. A hand held version of this version of the instrument is being developed for rapid measurement of trace uranium in potable water to address the requirements of EAD.

ECIL, Hyderabad had also expressed its desire to take up production of this version of the instrument. A photon counting based Uranium Analyser has been developed with a detection limit of 0.02 ppb and a range of up to 100 ppb which is shown in the Fig. L.6.2. The technology for this instrument is being transferred to ECIL.



Fig.L.6.2 The Photon counting version of the uranium analyser, technology for which is being transferred to ECIL.

*Reported by :
Sendhil Raja S (sendhil@rrcat.gov.in)*