<u>**SUMMARY OF THE FINDINGS (IN 500 WORDS)**</u>

NAME AND ADDRESS OF THE PRINCIPAL INVESTIGATOR: Dr Dann V J, Assistant Professor, Dept of Physics, Maharaja's College, Ernakulam

We have developed a 6 channel multispectral imaging system and the image captured at different bands are used to demonstrate the fact that combining the information present in the spectral bands residing in and outside the visible domain can lead to a richer analysis of paintings. The 2/3" NIR monochrome CMOS imaging device is equipped with six different band pass filters. Each filters are characterized by CWL and FWHM. The filters (bands numbered from 1-6) with CWL 450nm, 550nm, 650nm, and 700nm have 80nm FWHM. Filters with CWL 785nm and 880nm have FWHM 62nm and 50nm respectively.

The bands residing in the visible domain (450 nm – 700nm) provide an accurate measurement of the color information which can be used for analysis but also for conservational and archival purposes. The bands (5 and 6) near infrared give us a great deal of information about vague under drawings possible. These bands allow us to investigate different depths in the painting and uncover "hidden" features. The band-1 near the UV allows for the study of the superficial layer of the painting. It not only gives us a better view on the brushstrokes but also shows defects such as air bubbles, which are not so discernible in the other bands.

We have successfully reconstructed the reflectance spectra of different pigments used in paintings and the conclusions are verified by comparing with the spectral response of bulk samples.

Further, in the art conservation field, the effort to conduct sensible accelerated ageing tests can be seen as an attempt in forecasting the effects of certain conservation and restoration treatments. Long term UV exposure is the most important stress factor that could induce rapid and significant degradation and aesthetic modifications to the artifact. Traditionally, UV accelerated ageing mechanisms on a painting are studied by FTIR-ATR analyses, chemical analyses like pyrolysis–gas chromatography–mass spectrometry and colorimetric analyses. All these require sample from the art work and are invasive methods. Study by spectral imaging is non-invasive and can be made digitally.

We have studied the the light fastness properties of different commercial acrylic paints using the stimulated UV-ageing imposed on a painting containing three commercial acrylic colours. We observe that red color is stable against UV ageing. A stratigraphical study (differentiating between the individual paint layers) on classified regions in the painting has also been made. Band - 1 shows minimum variation in reflectivity of red color which means that superficial layers are also not much affected by the UV irradiation on this color. Maximum color degradation is suffered in the green area. We also observe that the continuous UV irradiation for two months produced major changes in the reflectance spectra of blue color. Our observations are in close agreement with the results obtained by Valentina Pintus et al through their studies on light fastness properties of acrylics using FTIR-ATR analyses (Anal Bioanal Chem (2012) 402:1567–1584).

We have noted specific differences in UV sensitivity and stability in the multispectral analyses. Red color require longer UV irradiation time to achieve deterioration. UV resistance of the blue acrylic paint is lower than that of the green and red colours, as blue changed most after UV ageing.