

## EC SYDDARTA PROJECT “SYSTEM FOR DIGITIZATION AND DIAGNOSIS IN ART APPLICATIONS” - SINGLE POINT SPECTROSCOPY

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The aim of the EC SYDDARTA Project “SYstem for Digitization and Diagnosis in ART Applications” is to set up a pre-industrial prototype for diagnosing the deterioration on movable assets by the acquisition of three dimensional hyperspectral imaging through scanning by means of non-invasive techniques. In order to meet the main objective, at first step it was necessary to know and reproduce the processes by which environmental agents affect the artwork by chemical and physical point of view. For this reason, the materials corresponding to the Baroque period (bases, pigments, binders and varnishes) were selected and used to produce model samples to mimic the structure of movable cultural heritage objects from the selected cultural period (historic models). The prepared models were subsequently exposed to the effects of climate parameters variations (temperature, relative humidity, UV-VIS radiation) under controlled conditions in specially designed chambers as well as to outdoors highly polluted environment.

The second step was the characterisation of degradation processes on the exposed model samples by several different spectroscopy methods, in order to test and calibrate the prototype. Among them, single point spectroscopy, with enhanced spectral and spatial resolution, represents an innovative approach for the evaluation of paintings degradation as well as pigments and binders identification.

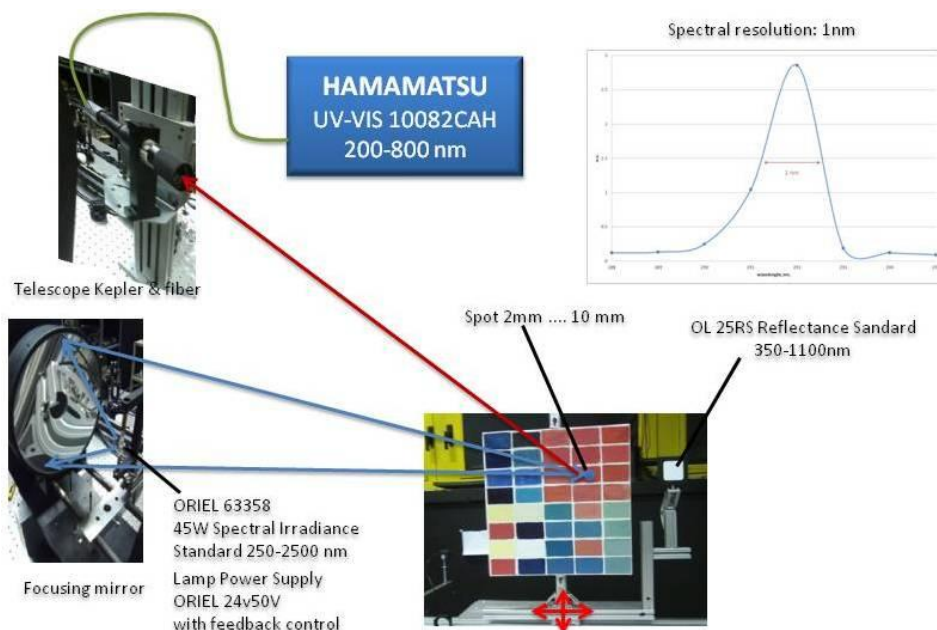


Fig. 1. The schema of the single point spectroscopy set for the analysis of canvas models within the SYDDARTA project

The instrumentation set for single point spectroscopy measurement for the characterization of materials and their degradation consist of (Figure 1):

- ORIEL 63358 45W Spectral Irradiance Standard 250-2500 nm
- Lamp power supply ORIEL 24V50V with feedback control
- Focusing mirror
- system with telecentric optical system installed on precision mechanical support with XYZ movements
- HAMAMATSU spectrometer UV-VIS 10082CAH 200-800nm
- OL 25 RS Reflectance Standard 350-1100 nm.

The output beam emitted from the source, is reflected from a spherical mirror and then focuses on the sample. The reflected beam from the sample, being probed, is collected by the optical system connected to Hamamatsu spectrometer through an optical fiber (Figure 1). The dimension of the light spot on the samples, from which a backward diffuse scattering is collected, can be set from 2 mm to 10 mm.

The single point analyses performed on the canvas models prepared within the SYDDARTA project, allowed to create a spectral database of pure pigments, pigments and their mixture in different binders and varnishes. The results achieved indicate that this method is an useful tool for pigments identification, in a fast and user-friendly way. The important issue within the project was to study degradation of pigments due to the climate parameters and air pollutants impact. For this aim, the single point analysis was also performed on the deteriorated models (UV-Vis chamber, relative humidity and temperature cycles chamber, exposition to air pollutants) and database with the spectra of deteriorated pigments and pigments mixture was provided indicating that that UV-Vis light and air pollution deposition are the most dangerous environmental parameters, leading to changes of reflectance.