SP203P – Phosphor-Coated CMOS Beam Profiler

SWIR Lasers Beam Profiling

Increasing usage of SWIR lasers in various devices and applications requires beam profiling as part of the laser operation diagnostics process.

SWIR, and especially 1550nm lasers, are eye-safe and provide the high contrast required for high resolution imaging, thus, those light sources are frequently used as LIDAR for remote sensing applications and face recognition. Due to high transmittance properties of optical fibers at those wavelengths, 1550 nm lasers are often employed in telecommunication devices. In addition, they are widely used in research, science, and industrial measurements.

All those applications frequently require characterization of the laser beam.

Beam profiling is often required as a diagnostics tool to track laser and other light source power distribution stability for 1550nm and other SWIR wavelengths in this region.

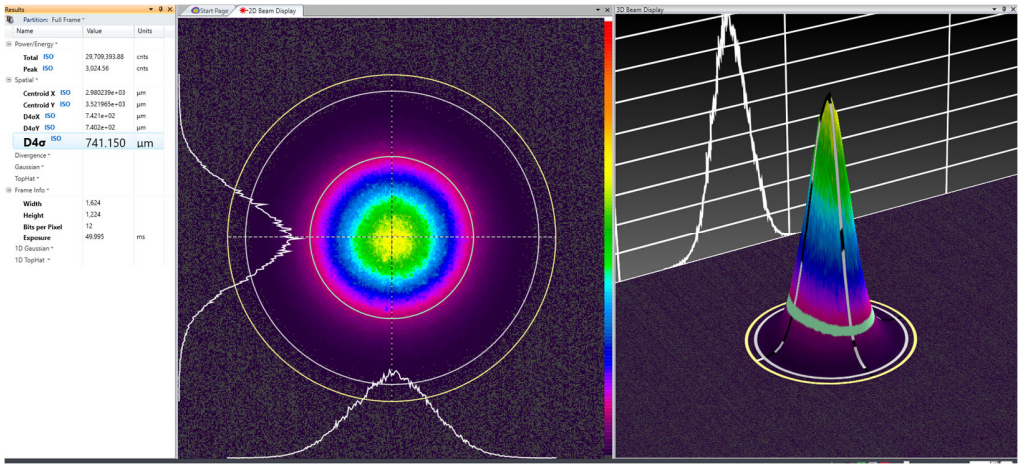

Figure1, BeamGage image of Beam Profile of 1550nm laser

SP203P – Phosphor-Coated CMOS camera

As the sensors of standard beam profilers are unable to detect wavelengths above 1100 nm, Ophir offers a line of cameras with phosphor coating on a standard silicone sensor. This coating is designed to absorb 1440-1605 nm incident photons and emit visible photons toward the sensor, enabling beam profiling for SWIR wavelengths.

MKS Ophir has recently introduced a new model of phosphor-coated CMOS Beam Profiler – the **SP203P** camera. This new CMOS sensor is more advanced than the previous CCD and provides higher frame rate and improved sensitivity,

Figure2, SP203P – SWIR Laser Beam Profiler

Higher frame rate is important, as often the devices operating in the SWIR region have a higher repetition rate. The SP203P camera is now capable of operating at 24Hz, which should be appropriate for most applications.

Some SWIR instruments operate at low intensity. The increased sensitivity of the new Phosphor coated sensor of just 3mW/cm2 at 1550nm, widens the range of devices it can measure.

Because of the phosphor layer coating the sensor, the actual sensor resolution is smeared due to photon leakage to neighboring pixels. Thus, in case ISO standard beam profiling is required, the beam size should be at least 1mm. Smaller beams are also measurable but with lower accuracy compared to MKS Ophir InGaAs sensor cameras or NanoScan (scanning slit) beam analyzers.

In case of smaller or focused beams, the SP203P can be used in combination with an X4 Beam Expander, thus reducing minimal size of analyzed beam to just 250µm.

Figure3, X4 Beam Expander for laser beam profilers provide ISO beam profiling and good resolution in case of narrow and focused laser beams.

In case better resolution and more accurate measurements are required, MKS Ophir offers InGaAs cameras. However, they are less affordable and, in some regions, restricted, by ITAR (International Treaty and Arms Regulations) due to military usage capability. Phosphor-coated cameras, being less accurate, are mostly used to track for laser stability and beam profile form.

A combination of compact design of SP203P and affordability enables it to be used in field service and even integrated inside systems equipped with a SWIR laser, VCSEL or light sources widely used in remote sensing applications.

The usage of the SP203P camera is like any other MKS Ophir camera, with the only difference being that gamma correction in BeamGage should be set to 1.95 in the "Source" Tab to correct for the non-linear response of the coating.

Sensitivity at Other Wavelengths

Although 1550 nm is the most popular wavelength in the SWIR region, wavelengths in the range1440-1600nm are also used for various applications due to their eye safety. While using phosphor-coated CMOS cameras it is important to understand the difference in spectral response for different wavelengths.

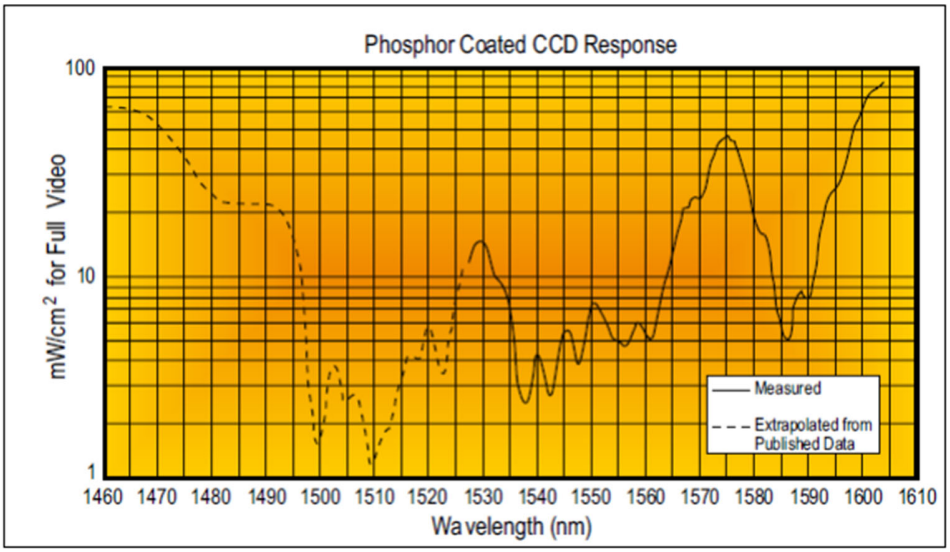

Figure 4, The absorption curve for the Phosphor coated cameras showing higher efficacy of phosphor coating converting 1550nm beam than 1400nm or 1600nm beam into visible light, detected by the sensor