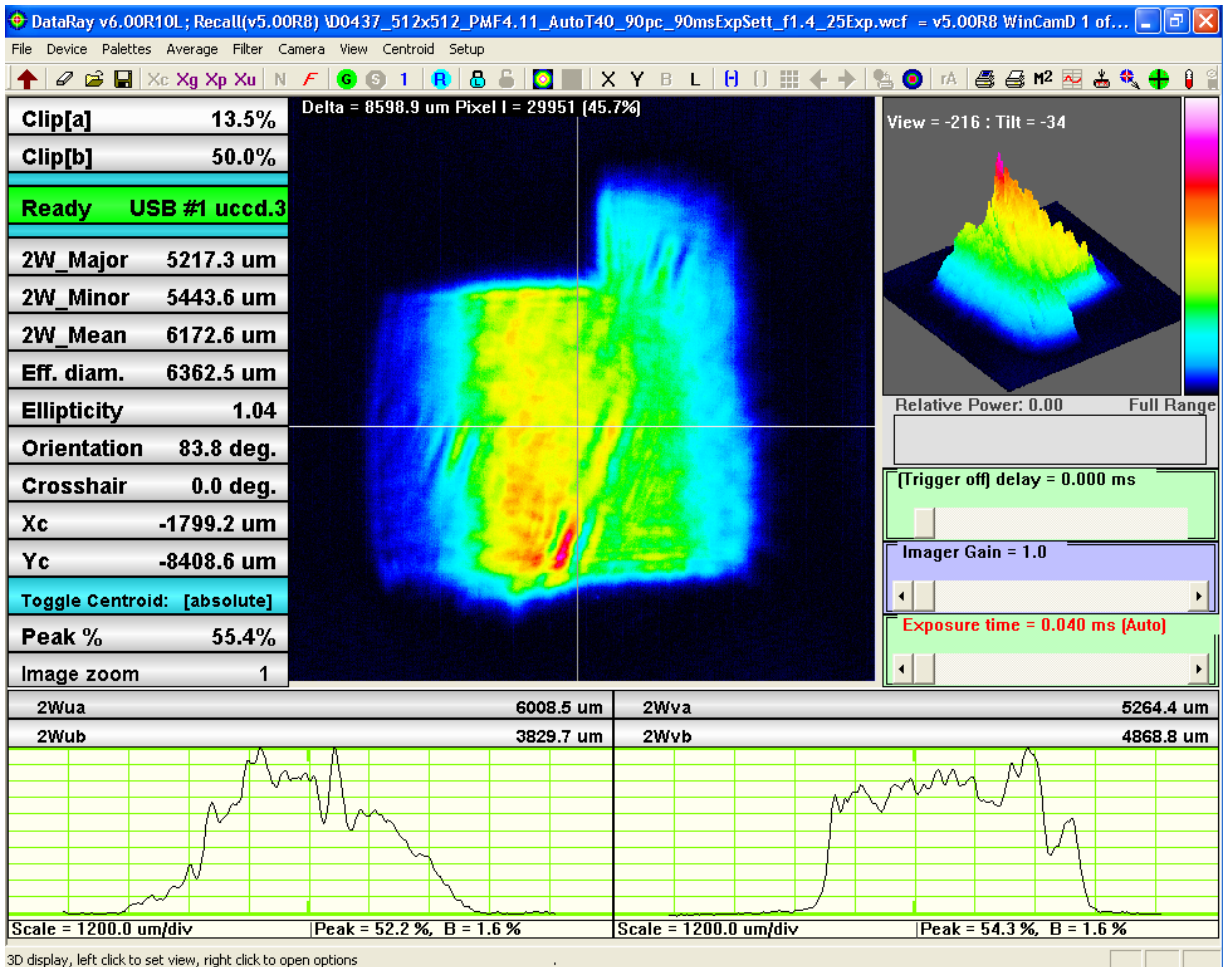


DataRay Inc. Application Note

WinCamD measurement of 337 nm Nitrogen lasers

Beam Profiling ... Engineered as a system
... Delivered as a Solution



337 nm Nitrogen laser with StarTech Converter and WinCamD

The Measurement Requirement

Nitrogen lasers at 337.1 nm have typical specs as follows:

- Pulse Rates of ~1 to 10's of Hz.
- Pulse power around 10's to few 100's of μJ per pulse.
- Pulse width < 5 ns.
- Beam sizes of few to < 10 mm.
- Beam shape, top hat 'rectangular'. E.g. 3 x 7 mm is a common specification.
- Beam divergence < 10 mrad.
- Significant pulse to pulse variation in intensity distribution and energy.

Identified suppliers are: Newport (Spectra Physics Div.), SRS and PTI.

Nitrogen lasers are frequently used as pump sources for continuously tunable dye lasers.

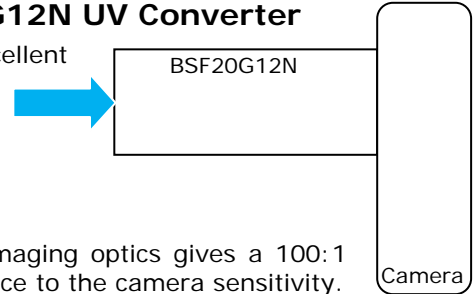
The Issues

- **Pulse-to-pulse Variation.** Frequently the interest is in looking at pulse to pulse variation in pulse shape, intensity distribution and centroid position. This means that the beam must be sampled/attenuated in order to ensure the correct irradiance on the sensor. Setting exposure times greater than twice the inverse of the repetition rate (e.g. > 200 ms for a 10 Hz laser) allow a wider range of irradiance at the expense of pulse averaging.

- **Attenuators.** Standard absorbing glass ND filters are highly absorbing at 337 nm, and are essentially useless for such UV applications. Stepped metallic film attenuators on silica substrates are the viable alternative.
- **Samplers.** A suitable ~3% sampler is an uncoated silica wedge such as the DataRay **CUB-UV**. Since wedges have multiple output beams, a spacer tube is used to separate the orders.

Option 1. WinCamD-UCD12 plus StarTech BSF20G12N UV Converter

The Startech **BSF** UV converter uses a fluorescent plate with excellent linearity and saturation characteristics. UV impinging on the plate converts to visible light and is reimaged at high resolution on to the detector.



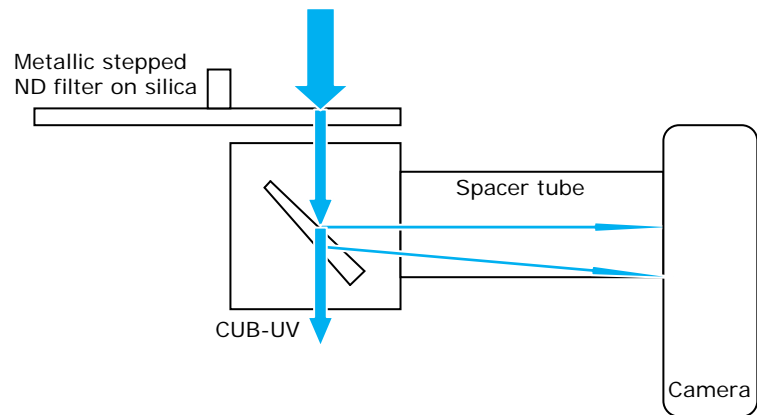
The advantages of this configuration are:

- It is a compact configuration
- With pulsed lasers, the f/1.6 to f/16 iris in the **BSF** reimaging optics gives a 100:1 intensity ratio which simplifies matching the beam irradiance to the camera sensitivity.
- The **BSF20G12N** input aperture is 16 x 11 mm.
For small beams use the **BSF10G12N**, 6.3 x 4.8 mm.
- The price is no greater than Option 2 below.

Option 2. WinCamD-UCD23-UV or WinCamD-UCD12-UV

An historic problem with UV exposure of CCD's has been 'browning' of the polymer 'lenslet' arrays (one lenslet per pixel) used to increase sensitivity on the best CCD's.

DataRay removes this lenslet array from **WinCamD-UCDXX-UV** sensors using a proprietary process, making them suitable for many applications down to 266 nm. [In the deep UV below 266 nm, some CCD array deterioration may still occur over time, and it is up to the user to monitor this.] The standard ND4 filter is provided, but a 3 mm thick UG11 filter is also provided. (Response shown below.)



This makes possible the configuration shown right:

- A **CUB-UV** sends a 3% sample to the camera
- A Metallic stepped ND filter wheel (3rd party) provides additional variable attenuation
- With the **WinCamD-UCD23-UV** the active area is 8.8 x 6.6 mm
- With the **WinCamD-UCD12-UV** the active area is 6.3 x 4.8 mm

