

WinCamD-LCM series SNR

The intrinsic **SNR (Signal to RMS Noise Ratio)** of **WinCamD-LCM** series cameras is **2500:1**. This value is derived as follows:

1. Select **File, Load defaults** to reset the camera defaults.
 2. With auto-exposure enabled, capture an image of a beam.
 - (a) The beam should have a diameter less than 1 mm and greater than 200 μm , so that there is a wide zero level.
 3. Right-click on the profiles. Select **Linear raw mode (ADC mode)**.
 4. Right-click on the profiles. Select **Enter Intensity Multiplier** and enter **20**.
 5. Right-click on the 2D area and select **Setup Software Aperture**; select **Turn off** and click **OK**.
 6. Click **Go**. Once the beam has stabilized, click **Stop**.
- The multiplied orange profile has a peak-to-peak noise of around 4% about a mean level around 50% (Fig. 1). Divided by the x20 Intensity Multiplier, the peak-to-peak noise is calculated at 0.2% of the signal ($\frac{4\%}{20}$). The offset level, around 2.5% of the ADC range ($\frac{50\%}{20}$), is deliberately set at this level in order to ensure that negative electrical noise is correctly sampled.
 - **SNR** conventionally refers to **Signal to RMS Noise Ratio**. Peak-to-peak Gaussian random noise is statistically 5 to 6 times the RMS noise, the RMS noise is therefore $\sim 0.04\%$ of the signal peak, a ratio of **2,500:1**.

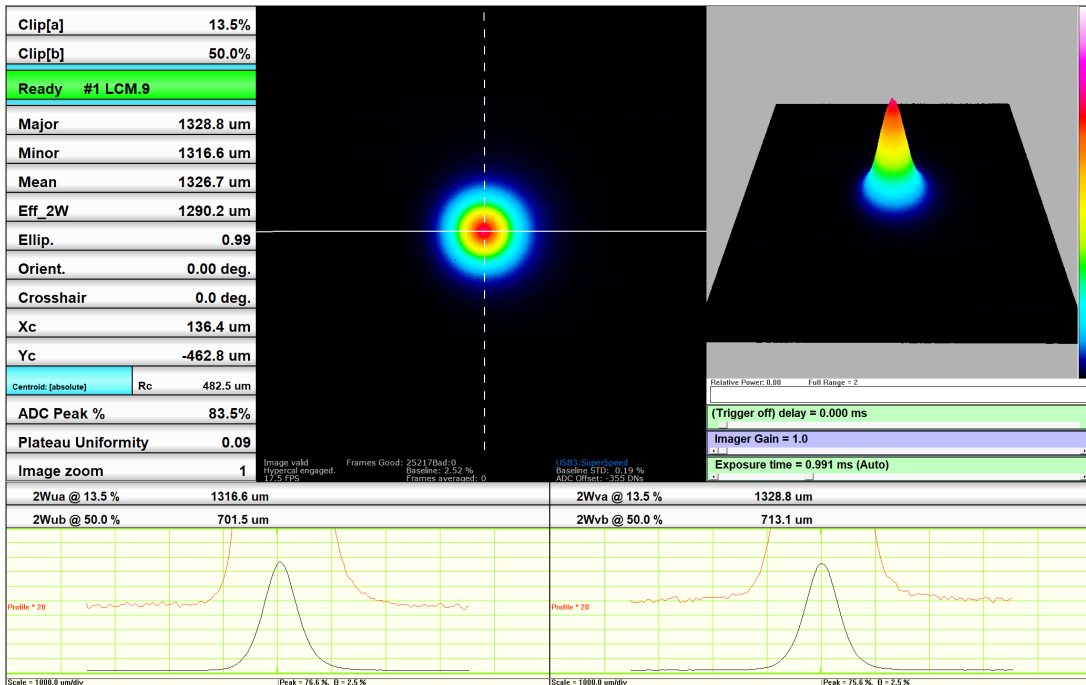


Figure 1: Above the zero level tails of the black profile curves, the orange lines represents the noise. **Linear raw mode (ADC mode)** is enabled. An **Intensity Multiplier** of 20 is enabled to make the noise on the plot more visible.

The profiles from Figure 1 use the default profile smoothing of 0.2% of full range - some level of smoothing is standard industry practice. With **no filter**, the noise is 2 to 3 times higher (Fig. 2).

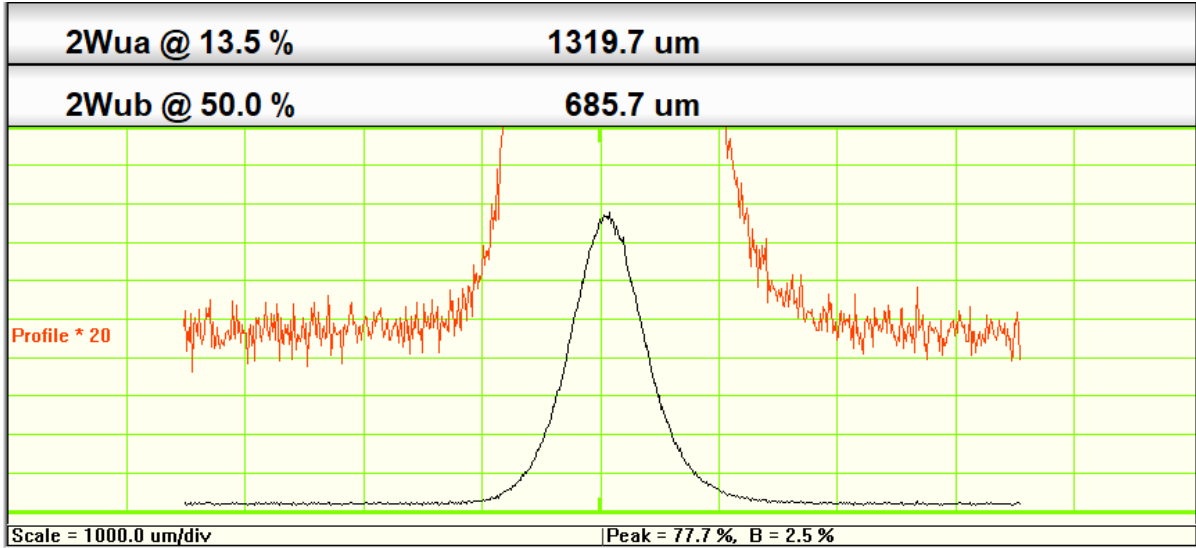


Figure 2: The profile without any smoothing. Note the absence of any 'structured' noise. Noise is very low and close to the sampling limits of the 4096 levels of the LCM's 12-bit ADC.