

BeamMap2/BeamR2 Pulsed Laser Procedure

Introduction


This note outlines the steps of measuring low duty cycle pulsed laser beams with a BeamMap2 or a BeamR2. Be sure that your software is up to date before beginning. You can check for updates by visiting the [DataRay website](#) and checking the [Downloads](#) page.

The example used in this document is a 33 kHz PRR, with a 1 μ s pulsewidth and a 15 μ m waist. This is close to the limits at the 2 RPS rotation rate. Note that the minimum allowable frequency, f_{min} , for a beam diameter $2W_a$ (in μ m), is:

$$f_{min} = \frac{500}{2W_a} \text{ kHz} \quad (1)$$

First Time Setup

Use the following steps to set up a measurement for the first time:

1. Start the DataRay scanning slit software and press **Go** with the laser off.
2. Go to **Setup -> Device EEPROM programming** and set the **Nominal motor start speed** to **2 RPS**. Click **OK**.
3. Go to **Setup -> Enter wavelength** and enter the wavelength of your beam in nm. Click **Yes**.
4. After 40 seconds, with laser off, press the green padlock  in the toolbar to lock the baseline.
5. Click the **Filter** drop-down menu and select **No Filter**.
6. Turn on the laser. As soon as all profiles are visible, center the beam to within 100 μ m of the image coordinates (0, 0). See Fig. 1 for reference.

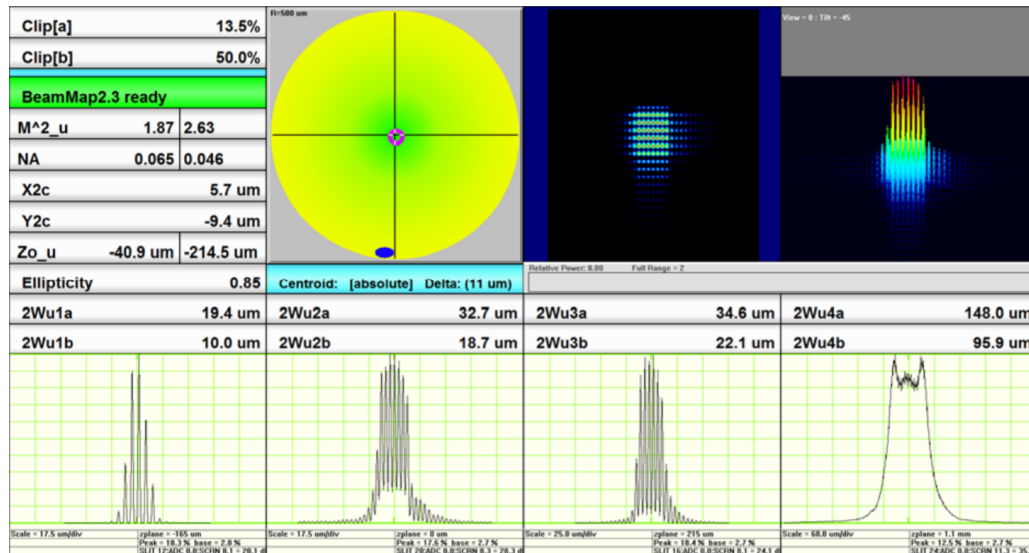


Figure 1: The software display after initial setup and centering of the beam

7. Right-click on one of the profiles and deselect **Auto Gain**.
8. Click **X** in the toolbar to show only the u profiles. Adjust all four individual profile gains to 8-12 dB lower than their current values, until the troughs of the profile data are no longer above zero (see Fig. 2).

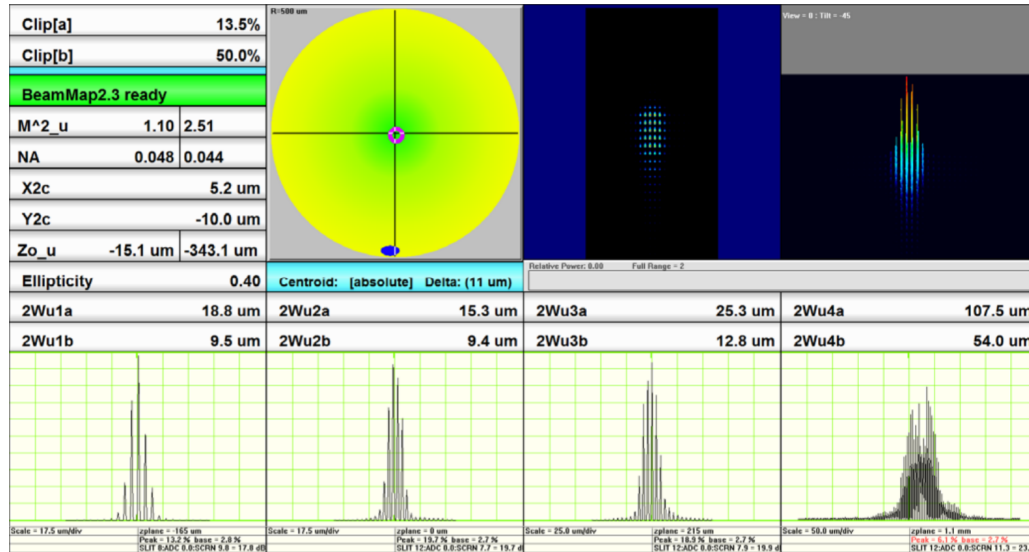


Figure 2: The profile gains should be lowered so that the troughs of the profile data all touch zero

9. Click **Y** in the toolbar to show only the v profiles. Adjust v profile set to the same gain values. Click **X** in the toolbar once more.
10. Take note of the laser and attenuator settings so that you can achieve the same power later to be sure that future setup is identical next time.
11. Click the **Filter** drop-down menu and select **Filter = 1.0% Full Scale**.
12. Click the **Average** drop-down menu and select **Average 5**. The result should look something like Fig. 3.

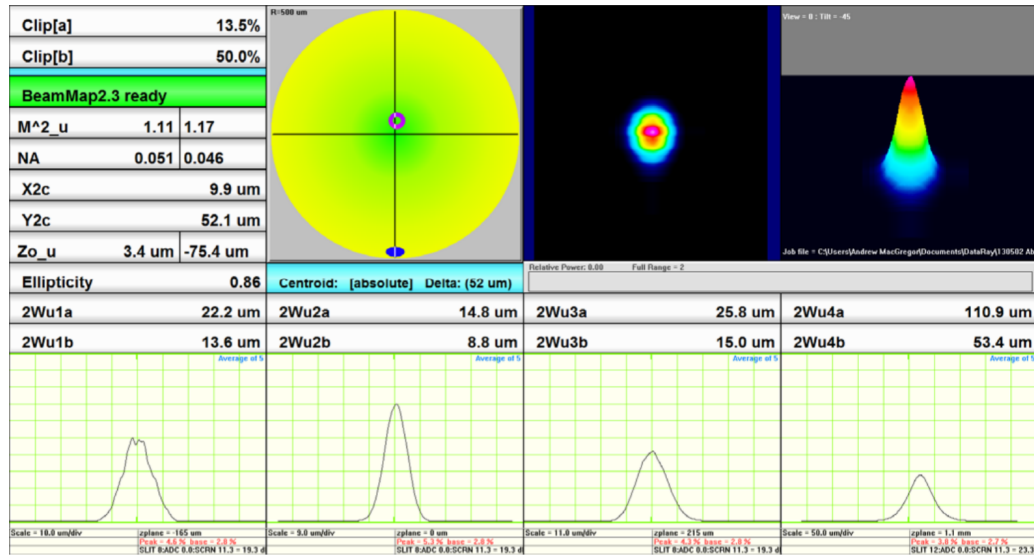
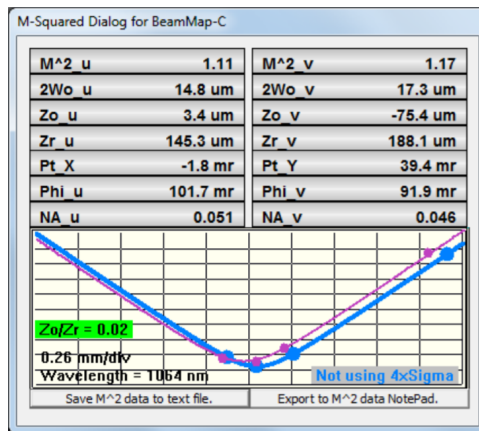
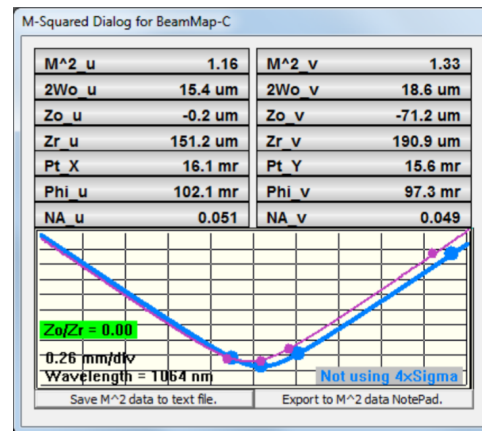


Figure 3: The software after changing the filtering and averaging settings for the pulsed beam

- If any of the profiles are touching the top of their range, reduce the gain a further 4 dB.
- Press **Stop**, then **File** → **Save job file** and save these settings.
- Click on **M2** in the toolbar to show the screen in Fig. 4a. A CW laser dialog (Fig. 4b) is also given for comparison. For an example of the final result of proper first setup, see Fig. 5.



(a) M2 measurement of the pulsed laser after setup



(b) M2 measurement of a CW laser for comparison

Figure 4: M2 measurements of the final pulsed laser setup and a CW laser for comparison

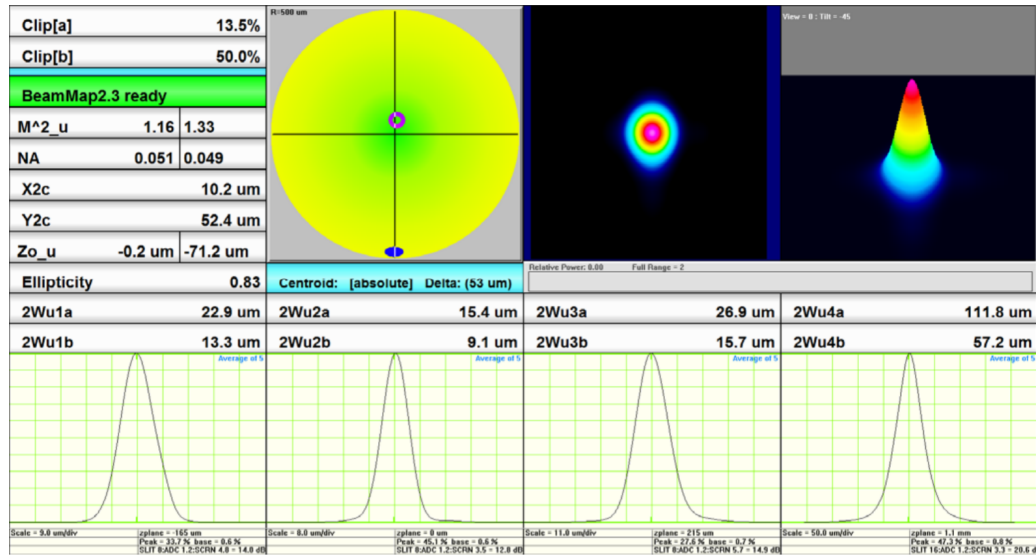



Figure 5: The final result of the pulsed laser setup in the DataRay software

Procedure

Use the following steps to run measurements after having completed **First Time Setup** instructions at least once:

1. Open the DataRay scanning slit software. Go to **File** → **Load defaults**.
2. With the laser off, press **Go**.
3. After 40 seconds, lock the baseline by pressing the green padlock  in the toolbar.
4. Press **Stop**, then **File** → **Load job file**, and load your settings (saved on first run, see **First Time Setup**).
5. Note that the laser and attenuator settings must give the same power onto the BeamMap as you used during **First Time Setup**. If not, repeat the instructions in the **First Time Setup** section of this document.
6. Press **Go** and turn on the laser to begin measurement.