

## Laser Beam Intensity

The question often arises concerning laser beam intensity and more specifically, the issue on a dual sided tester about the difference between the two beams.

First, intensity or brightness is important. However, the tool is a frequency based device, not an amplitude based device. This means that the tool actually measures the frequency shift in the HeNe laser light, 632.8nm wavelength, reflected from the surface of the measurement piece.

Intensity is important only to insure that there is sufficient signal to make the measurement.

Since the tool uses Doppler techniques to make the actual measurement, the system is really looking at the frequency shift of the reflected laser beam. As the surface approaches the laser source, it compresses the 632.8nm wavelength and as it moves away from the beam, it stretches the wavelength.

This is analogous to listening to a train travel past you. As the train is approaching there is a higher frequency sound due to the compression of the sound wave (frequency + speed of approach) and as it departs, there is a lower frequency sound due to the stretching of the sound wave (frequency – speed of departure).

The sound can be loud, analogous to a high intensity or bright light, or it can be soft, analogous to a low intensity or dim light. Intensity does not change the frequency shift. If the sound gets so soft that we can no longer hear it, then there is a problem.

The tool has a built in monitor to check the laser intensity. This is done in two ways. First, this is checked when the laser is focused. In the dialog box used to focus the laser, the user is asked if the disk is glass or metal surface. Glass will have a lower reflection characteristic. The user focuses the laser and can then save the reflection value.

This value is saved to a file named “Summary\_LaserFocus.txt”. If the value is below a factory predetermined warning value for the material, glass or metal, an error message is displayed that states: “Laser output low but within usable limits. Please check the laser focus. If output continues to decrease, contact service personnel.”

If the output is below the factory set minimum value for safe operation an error message is displayed that states: “Laser output low, service required. Please check the laser focus. If output remains low, contact service personnel.”

The second method of checking the laser intensity is that a reading is taken at the beginning of each test. The reading is tested against the warning value and the minimum value for safe operation and messages displayed if necessary. The value is also saved in a file named “Summary\_LaserPower.txt”.

Both the Laser Focus and Laser Power files can easily be loaded into a spread sheet format and the laser intensity tracked by service personnel.

As long as the reflected energy level is above the minimum value for safe operation, the measurements will be accurate.

Internally the laser beam is split into two paths, the reference beam and the measurement beam. The reference beam is always 638.2nm in wavelength. The measurement beam gets modulated by the surface shape variations, morphology and defects, as the test sample is passed under the beam. This creates the Doppler shift that is measured by the system.

Intensity is not a concern, frequency shift of the HeNe light is measured.