

## LDDM Technology vs. Michelson Interferometer Technology

	<b>LDDM technology</b>	<b>Michelson interferometer (Single frequency)</b>	<b>LDDM Advantage</b>
1.	Latest Electro Optics & Radio Frequency technology with many patents	Interferometer technology	<ul style="list-style-type: none"> <li>• Higher performance,</li> <li>• Lower cost</li> </ul>
2.	2-frequency, FM & heterodyne	Single-frequency, AM & homodyne	<ul style="list-style-type: none"> <li>• Higher Signal to Noise Ratio (consider FM Radio versus AM Radio)</li> <li>• Higher signal quality</li> <li>• Less interference</li> </ul>
3.	Frequency locked	Frequency locked	<ul style="list-style-type: none"> <li>• Frequency stable</li> </ul>
4.	Single aperture	Dual-aperture	<ul style="list-style-type: none"> <li>• Smaller retroreflector capability</li> <li>• Flat-mirror target capability</li> <li>• Larger beam diameter possible</li> <li>• Fewer Optical Components</li> </ul>
4a.	Small laser head	Large laser head	<ul style="list-style-type: none"> <li>• Compact</li> <li>• Easily mount on machine</li> <li>• No need for a tripod</li> <li>• Smaller carrying case</li> </ul>
4b.	Small retroreflector	Large retroreflector	<ul style="list-style-type: none"> <li>• Reduces the size of all optical components</li> <li>• More compact</li> </ul>
5.	2 elements to align	3 elements to align	<ul style="list-style-type: none"> <li>• Easy Faster setup and alignment</li> <li>• Fewer Separate Optical Components</li> <li>• More efficiency</li> <li>• Less training</li> </ul>
6.	Low laser output power	High laser output power	<ul style="list-style-type: none"> <li>• Eye Safe</li> </ul>
7.	Long range, up to 100 m	Short range	<ul style="list-style-type: none"> <li>• Long range without increasing laser power</li> </ul>
8.	Fast, 5 m/sec	Slow, 1 m/sec	<ul style="list-style-type: none"> <li>• Good for high speed linear motor machine</li> </ul>
9.	Digital electronics	?	<ul style="list-style-type: none"> <li>• Large Dynamic Range</li> </ul>

## Major Features and Comparison

### 1. Why LDDM is better?

The performance is higher and more flexible. The system is more efficient and accurate, easier to setup and operation, more compact and lower cost.

#### **What are the benefits?**

Higher performance with lower cost. Very good return on investment (ROI).

### 2. Why LDDM is more compact?

The laser head is single aperture and a small retroreflector is used as target. Hence all of the optical components are smaller. The laser head can be mounted directly on the machine and there is no need for a heavy tripod.

#### **What are the benefits?**

The laser head can be mounted directly on the machine for easy and fast setup and alignment. Movement of the machine on its leveling pads or isolation foundation does not influence the measurements. The complete system can be fitted into a single small carrying case for easy transportation and storage.

### 3. Why LDDM is more efficient?

For MCV-2002, there are two laser interferometers in one head. Hence the displacement error and the angular error can be measured simultaneously. For MCV-500 or MCV-5000, the patented vector method can measure all the positioning errors, including 3 displacement errors, 6 straightness errors and 3 squareness errors, in a few hours instead of a few days.

#### **What are the benefits?**

It automatically collects more data in a short time. Hence it reduces expensive machine downtime.

### 4. Why LDDM is easier to setup and align?

The laser head is very small. With a magnetic holder, it can easily be mounted directly on the machine. There are only 2 elements to be aligned instead of 3 elements. Hence the alignment is easier.

#### **What are the benefits?**

It reduces the expensive machine downtime and less training for the operator.

### 5. Why LDDM is flexible?

The laser system can use either a small retroreflector or a flat-mirror as target. Hence it is more flexible.

#### **What are the benefits?**

It can measure the static volumetric positioning accuracy, the dynamic contouring accuracy and the spindle error motion. It can perform both calibrating and compensating the static positioning errors, and monitoring and optimizing the dynamic servo parameters.

### 6. Why LDDM is versatile?

With add-on's, it can perform different tasks on different machines.

**What are the benefits?**

One LDDM for all the machines, save on capital expenses.

**7. Why LDDM is more accurate?**

The laser frequency is frequency locked and the laser accuracy is traceable to NIST. Because of the 2-frequency, FM, single-aperture and large beam diameter, it is less sensitive to environment interference. Hence it is more accurate in the shop environment.

**What are the benefits?**

Meet the ASME B5.54 and ISO 230 standards, and traceable to NIST.

**8. Why LDDM is Affordable?**

It uses the latest technology such as Electro-Optic, Radio Frequency and digital electronics and with many patents. The performance to price ratio is very high. Hence it is affordable.

**What are the benefits?**

Higher performance with lower cost.

**9. Why LDDM is faster?**

The FM carrier frequency is very high. Hence the signal frequency is very high. It can reach a maximum velocity of 5 m/sec or 300,000 mm/min.

**What are the benefits?**

It can be used for high speed linear motor machine and machines with high resonance frequency.

**10. Why LDDM has greater resolution?**

For a AM system, two detectors are needed to determine the direction of the displacement, while for a FM system only one detector is needed. Hence the LDDM is more sensitive.

**What are the benefits?**

The Signal to Noise ratio is large. Hence the misalignment tolerance is large. It is easy to setup and align. Machine evaluation requires less the machine downtime.

**11. Why LDDM is safer to the eye?**

The maximum laser output power is less than 0.5 mw. It is safer for the eye, when accidentally exposed to the laser beam.

**What are the benefits?**

No worries about personnel being affected by stray laser beams. Easily meets the laser safety requirement.

**12. Why LDDM is longer range?**

Since the laser head is single aperture, the laser beam diameter can be expanded to very large diameter, such as more than 25 mm diameter. Also, the detector is more sensitive and FM scheme is more immune to noise. All these factors make the LDDM longer range in a shop environment.

**What are the benefits?**

Can be used to calibrate very large machines.

### **13. Why LDDM has more capabilities?**

Since the laser head is single aperture, either a small retroreflector, a flat-mirror, or any specula reflecting surface can be used as target. Hence it has more capabilities.

#### **What are the benefits?**

It can measure the static volumetric positioning errors, dynamic contouring errors, and spindle error motion. One instrument for all the measurement, saves on capital expenses.

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