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| Thesis Title | Laser Diode Self-Mixing Technique for Optical Metrology Applications |
| Thesis Credits | 12 |
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Abstract

In this research work, an optical measurement known as Self-Mixing technique or External Optical Feedback has been studied and designed for displacement measurement, especially for the depth measurement of the small cylindrical hole. The principle of the system is that the light from laser diode is launched into a tested sample, then the reflected light is allowed to re-enter the laser cavity. It generates the variation of output power and laser oscillation conditions. The variation of output power can be detected by its own photodiode and then converted and amplified to an electric signal by electronic circuit. The small cylindrical holes were made of metal. They are stainless steel, brass and steel. The experimental results were analyzed by the mathematical relationship between the displacement and the feedback signal, which is calibration equation. This work was also applied for roughness testing of the metal surface. The parameters that effect to the measurement system are the distance between laser and the external reflector, the reflectance and properties of metal surface and the size of laser beam. The experimental results show that the depth in the range of 0 – 30 mm can be measured, and the roughness testing of metal surfaces was correspond with the values from the mechanical testing equipment, the Form Talysurf Series2 120 mm.