Measurement of 2-Micrometers from 200-m Distance using Femtosecond Optical Comb

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Word-record resolution has been achieved in a distance measurement using a femtosecond laser. Number of precise frequency modes of a femtosecond laser (optical comb) gives a series of radio wave frequencies as a result of intermode beat. Distance information is obtained by the phase measurement of the radio wave. Because of the broadband frequency of the femtosecond laser, highly stable beats up to GHz to THz are generated. High frequency is essential for ultrahigh-resolution in distance measurement. By comparison between two-color measurements, automatic compensation of environmental fluctuation in distance measurements is realized. Simple setup is attractive for industrial applications as well as length standard.

Femtosecond-Comb Distance Meter in the optical testing tunnel at AIST. The arrow in the photograph indicates the laser beam.

Towards Commercialization of New Ultrasonic Urination Sensor
- Development of compact sensor based on expansion characteristics of bladder -

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A compact ultrasonic urination sensor has been developed that can measure the amount of urine in bladder with a good accuracy. The main purpose of this apparatus is to prevent urinary incontinence, to improve the quality of life in aged or spinal cord injured people. The principle is based on echoes of ultrasound to measure the volume of bladder and thus detect the amount of urine. Intensive clinical evaluations already demonstrated clearly the feasibility and viability of the urination sensor. Commercialization and extensions to deal with other urination dysfunction are now underway.

$$PD = \sum_{i=1}^{4} Pi \times Di$$
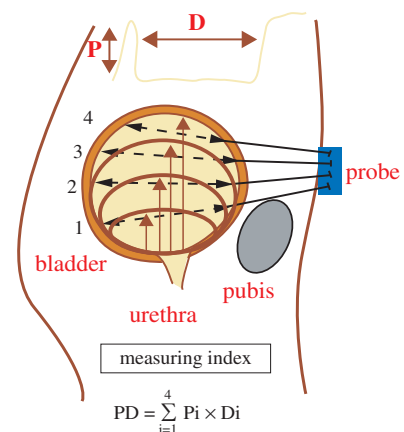
Principle of ultrasonic urination sensor and schematic illustration of expansion of bladder