Measurement of the optical properties in the visible range by using a broad band optical frequency comb

Yohei Kayukawa [C, S]
AIST, National Metrology Institute of Japan, Tsukuba, Japan
kayukawa-y@aist.go.jp

We present a precise refractive-index measurement method for a broad range of wavelengths, using a Fabry-Perot interferometer and femto-second optical comb. The broad-band optical comb, which is a set of a large number of longitudal modes of continuous light with uniform frequency spacing, has recently become available by using an ultra-short pulsed mode locked laser and a nonlinear optical crystal. The output light spectrum of a Fabry-Perot interferometer using this optical comb as a light source has a number of peaks in the visible range. The FSR (free spectral range) of the peaks is directly proportional to the refractive index and the etalon gap. The gap can be obtained from measurement under vacuum (n = 1). Although FSR measurement resolution is not sufficiently fine for each peak, measurement uncertainty of the refractive index curve in the entire measurement range of visible light can be reduced by a statistical approach. The present preliminary result has shown that this measurement technique realizes a measurement uncertainty of a few parts of 10^{-5}.