ABSTRACT

This paper describes a new type of correlation spectrometer, dubbed an "active spectrometer." It utilizes an oscillating mirror in a 1/4-m Rowland circle spectrometer configuration to displace the spectrum periodically in the dispersion direction relative to fixed exit slits. The wavelength of the light passing through each slit is modulated sinusoidally at the mechanical oscillation frequency and its intensity is measured with a spot detector such as a photomultiplier or photodiode. With a PC-based control/data acquisition system, the signal from each detector is sampled digitally at a frequency constrained to be an integral multiple of the mirror drive frequency. From the resultant phase locking between the signal sampling and the mirror oscillation, it follows that the correlation function between signal and mirror phase angle is obtained simply by averaging the data from successive mirror scans. Such a scan-averaged spectrum with low noise may then be compared with digitally stored reference spectra obtained through the same instrument. AC coupling of detector and amplifier results in rejection of continuum light and, when photodiodes are used as detectors, the maximization of preamplifier gain.