

Faraday dispersive filter: optimum transmission profile for a sodium lidar temperature and wind observation

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Temperature and wind observations by a sodium lidar at EISCAT radar observation site in Tromsø (69.6N, 19.2E), Norway, have been conducted to study the mesosphere and lower thermosphere (MLT) region between 80 and 115 km. The highly stable laser system is first of its kind to operate virtually maintenance-free during the observation season (from late September to March) since 2010. Now we plan to make all season observation with a ultra-narrow bandpass filter like a Faraday anomalous dispersion optical filter which can be by far better than any commercial filter in terms of bandwidth, transition edge and peak transmission. We demonstrated several transmission calculations to find optimal transmission. Under the condition of 1 cm cell length, the peak transmission around 90 % is found at 0 GHz frequency offset, at the cell temperature of ~190 degree C, and at the magnetic field of between 1950 and 2500 Gauss. In this condition, we discuss the Na lidar “three-frequency method” to measure temperature and wind velocity.

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