Investigation of interference filter in optical design of laser location station

Tistechko M., Martyniul-Lotochkyi K.P., Apunevych S.V.

Faculty of Physics, Faculty of Physics, Ivan Franko National University of Lviv, 8 Kyrylo and Mefodiy St., Lviv, 79005, Ukraine, sofiya.apunevych@gmail.com

Досліджено температурну залежність інтерференційного фільтру в діапазоні від 18 до 45 градусів Цельсія. Інтерференційний фільтр становить елемент оптичної схеми експериментального комплексу для здійснення лазерної локації штучних супутників Землі. Для первинної обробки даних був використаний функції із середовища статистичного програмування R, пакет "stats".

Scientific research involves different activities, e.g. theoretical research, planing of the experiment, conducting experiments and drawing conclusions. Various utilities can help in making conclusions, data pre-processing and visualization. However, the open-source packages seem to be the most attractive due the availability, flexibility and functionality richness. So, we decided to use R.

Satellite laser ranging is powerful experimental method for determination of satellite orbits, i.e. exact positions of an orbiting satellite at the fixed moments of time. Optical design of the experiment is quite complicated, and contains a lot of diferent elements, and needs to have regular maintaining and recalibration. Main parts of optical scheme is:

1. Telescope
2. Laser System
3. Receiver System
4. Time and Frequency Standards
5. Meteorological Instrumentation

This research facility is registered as National Property of Ukraine named "The Scientific and Research Complex of Facilities for the Exploration of Artificial Celestial Bodies of Near Space at Astronomical Observatory of Ivan Franko National University of L'viv", and it has been state of art since 2009.

This satellite laser-ranging station (SLR), code "Lvil-1831", laser-ranging station is situated in astronomical dome on the sites of suburban station of Astronomical Observatory of L'viv University, in Bryuhovychi village.

The SLR station incorporates the one of the largest telescopes in Ukraine, the TPL-1M, with 1000 mm diameter of main mirror, the laser-pulse transmitter SL-212 with output power of 1TW, and receiving/detection system, the unique development of Latvian Institute of Electronics, providing the precision of picoseconds. The station corresponds to the third generation of SLR according to the international classification. In 2002, the SLR station had been included into the International Laser-ranging service (ILRS) network, with acronym LVIL, the international code of system is 1831 and 12368S001 for the dome, as well as into

national network of Ukrainian centre of determination of Earth Orientation Parameters at Main Astronomical Observatory of National Academy of Sciences of Ukraine. The SLR station fulfills the measurements of ranges to the special-purpose satellites in orbits varying from 800 km to the 25000 km in heights. By the SLR observations the coordinates of Lviv-1831 station have been determined to be 49º 55' 3.36" N, 23º 57' 25.92" E, and elevation 359.368 m, or X = 3760674.975 m, Y = 1670776.340 m, Z = 4857165.479 m.

Continuous maintaining of this system includes, for example, an examination of interference filter or dichroic filter. This filter reflects one or more spectral bands or lines and transmits others, while maintaining a nearly zero coefficient of absorption for all wavelengths of interest. Field of interest of our system is wave 532nm which is second generation mode of our laser system. We try to investigate temperature dependence of transmited spectral band.

We have carried out spectroscopic examination of filter, and rough estimation of temperature dependence.

The results of measurement were processed using R. This includes the visualization, linear fitting for calibration and temperature dependence, also for interpolating values of dependences. Standard packages like "stats" and basic plotting system provide all necessary functionality.

Sources:

1.The R Stats Package. Available from:
https://www.rdocumentation.org/packages/stats/versions/3.3.3
2. LLS Lvil-1831. Available from:
https://ilrs.cddis.eosdis.nasa.gov/network/stations/active/LVIL_sitelog.html

Застосування вільного програмного комплексу freecad для підготовки технічних спеціалістів на морському транспорті та в містобудуванні

Шапо В.Ф., Шевченко Т.І.

Національний університет "Одеська морська академія", Одеська державна академія будівництва та архітектури,
stani@te.net.ua, shevtat11@gmail.com

Necessity of CAD software application for specialists preparing in maritime and city planning, designing and building branches is shown. Possibilities and positive sides of FreeCAD software are described.

Відомо, що залишилися позаду ті часи, коли студенти технічних спеціальностей мали готувати будь-які креслення та схеми за допомогою лише олівця та паперу. На додаток та зміну їм прийшли комп'ютери та численні програмні засоби побудови креслень та схем, які також мають назву систем автоматизованого проектування (САПР або CAD, Computer Aided Design). Зрозуміло, що підготовка кадрів для промисловості повинна базуватися саме