

# First results of continuous night sky brightness monitoring at Astronomical observatory at Kolonica Saddle

Đuriš, P. Ing.

Results of the first automated night sky brightness monitoring at **Poloniny Dark-Sky Park** are presented. The night sky brightness was measured and monitored using a light-sensing device called the Sky Quality Meter over an almost 12-month long period. Automated station was installed at the beginning of December 2010. A total of 168,384 individual measurements were taken at different zenithal distances measured on the local meridian. However, 36,087 measurements were taken during dark time (moonless astronomical night) only.

## Automated Sky Quality Meter

The SQM-LU measures the darkness of the night sky to provide readings of magnitudes per square arc second through a USB connection. A light sensor (TSL237) provides the microcontroller with a light level, and readings from the temperature sensor are used to compensate the light sensor readings for various operating temperatures. It is covered by a near infrared blocking Hoya CM-500 filter so that the combined filter-sensor system would have similar sensitivity to that of a human eye.

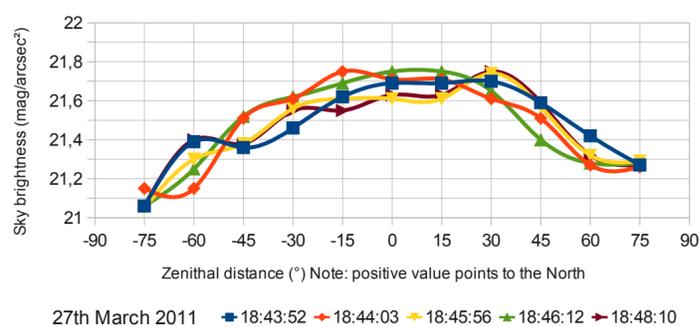
Each meter is factory-calibrated. The absolute precision of each meter is  $\pm 10\%$  ( $\pm 0.10$  mag/arcsec<sup>2</sup>). The difference in zeropoint between each calibrated SQM-L is typically  $\pm 10\%$  ( $\pm 0.10$  mag/arcsec<sup>2</sup>). The Half Width Half Maximum (HWHM) of the angular sensitivity is  $\sim 10^\circ$ . The sensitivity to a point source  $\sim 19^\circ$  off-axis is a factor of 10 lower than on-axis. A point source  $\sim 20^\circ$  and  $\sim 40^\circ$  off-axis would register 3.0 and 5.0 magnitudes fainter, respectively. SQM is driven with simple mount. It moves in elevation across local meridian.



## Theory of operation and data analysis

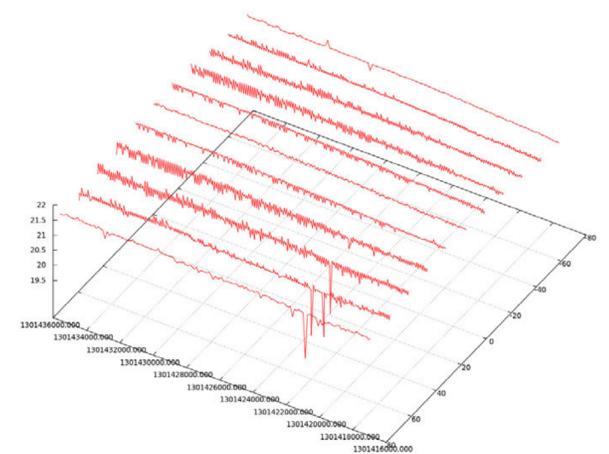
Each night the motorized SQM-LU moves in altitude through Zenith between North and South horizon across the local meridian. Data is collected constantly. One sweep across meridian lasts circa 5 minutes. Collected data are stored for later processing.

Sample data of night-sky brightness taken on the local meridian

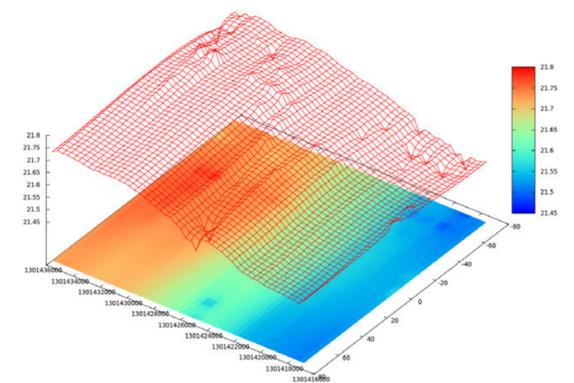


Exceptional night at Astronomical observatory at Kolonica Saddle. Zodiac light is clearly visible .

## Unprocessed measured single night data



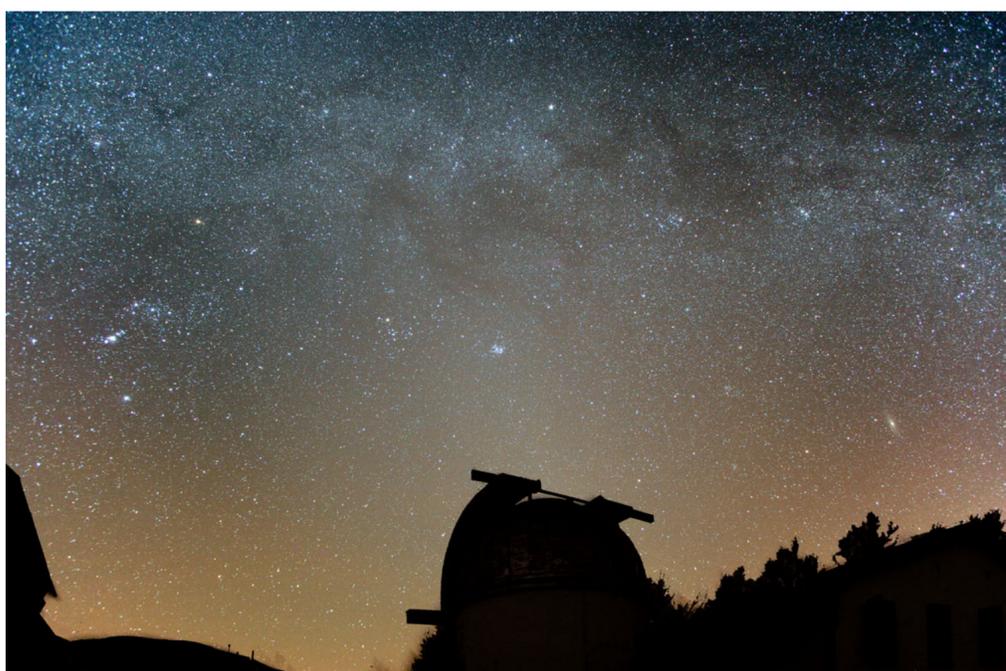
## 3D visualisation of single night measurement



## First results

The average sky brightness in the park is 21,56 mag arcsec<sup>-2</sup>. Depending on place and atmospheric conditions, it varies between 21.3 and 21.8 mag arcsec<sup>-2</sup>. Concerning the light pollution, the Poloniny Dark-Sky Park is the darkest area in Slovakia, where the night sky is preserved in its natural appearance. There are only a few such sites in the civilised world. The appearance of the sky corresponds to degree 2 or 3 on the Bortle Dark-Sky Scale. All the objects and phenomena typical for a natural sky are visible in good weather, such as zodiacal light, zodiacal band and counter glow. The naked-eye limiting magnitude is usually above 7 mag.

The First Survey	Min	Median	Average	Max
Sky Brightness in mag/arcsec <sup>2</sup> at zenith	21.32 ±0.10	21.61 ±0.10	21.56 ±0.10	21.88 ±0.10



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Astronomical observatory at the Kolonica saddle is situated on the territory of the Poloniny Dark-Sky Park between Kolonica and Ladomirov villages. It is a branch of the Vihorlat Observatory Humenné. The main instrument is VNT – the Vihorlat National Telescope with the primary mirror of 1 m in diameter. The quality of the night sky predestines this observatory for collecting of quality scientific data as well as for dissemination actions and the development of astro-tourism.

Day photos: Jan Kondziolka, Night photos: Pavol Ďuriš