

Independent remote system to monitor ozone layer state and measure active biological erythema dose of ultraviolet radiation



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## **1. INTRODUCTION**

A double channel photometer for measuring the dose of active biological ultraviolet radiation and total ozone column has been originated at the National Ozone Monitoring Research & Education Center (NOMREC).

The system is fully independent and does not



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	PION-F photometer	
the line of the second second second	Device type:	Double channel UV photometer
	Detector:	Hamamatsu UV phototube
	Working temperature:	-30+40 °C
	Aperture:	180°
	Capacity of built-in battery:	6800 mAh
	Power consumption:	220 mW in measuring mode
		13 mW in sleep mode
	Measuring interval:	min 10 sec.

require an external power supply and a communication computer for control and data processing.

## **2. PURPOSE**

- 1. Creating a simple reliable and inexpensive device for automated remote monitoring of total ozone and biologically active UV radiation (UV dose).
- Conducting field tests of the instrument during the seasonal Belarusian Antarctic Expedition (BAE) of 2015-2016 at the Gora Vechernyaya Station and the Novolazarevskaya Station.



Spectral range

(at  $\lambda$ =441 nm)

Aperture: 180°

Scan time < 5 min

Spectral resolution



A PION-F photometer was calibrated against a UV spectroradiometer in 2015.

**UV-spectroradiometer** 

Detection threshold < 1 • 10<sup>-5</sup> W m<sup>-2</sup>nm<sup>-1</sup>

Calibration accuracy below 300 nm < 10%

Saturation threshold > 3 Wm<sup>-2</sup>nm<sup>-1</sup>

Stray light reduction degree < 1 • 10<sup>6</sup>

Wavelength precision 0.01 nm

Wavelength accuracy 0.1 nm

0.8 nm;

285-450 nm;

Internal data storage: 2 MByte Data transfer: GSM network or wireless COM COM port at 1km distance Protection: IP67



**Fig. 1. Spectral response of measurement channels.** A short-channel signal may be used after calibration as a value of the CIE biological effect.

**4. RESULTS** 

300 -

PION-F photometer signal ratio
Signal ratio with constant ozone value from Stamnes table





Fig.3. Total-column ozone calculated using PION-F photometer and Aura OMI data. Station of Gora Vechernyaya (Enderby Land, Antarctica)

Calculated ozone data from PION-F photometer
Aura OMI Total Ozone Data



Fig.2. Signal ratio with constant ozone value from Stamnes table via PION-F photometer signal ratio

SUMMARY

1. Based on the analysis of data collected during the Belarusian Antarctic expedition of 2015-2016, one may positively state that the instrument has been successfully tested in real conditions. Good results for total ozone measurements are obtained even at high zenith angles.





2. Several of these devices will enable to create an effective independent network for observations of total ozone and UV index with results available in the on-line mode.

Fig.4. Total-column ozone calculated from PION-F photometer and Aura OMI data. Novolazarevskaya Station. CONTACT E-mail: victordm@tut.by

