

Modernization of an analog laser energy meter into a digital one

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The article experimentally shows the possibility of upgrading analog devices using Arduino Uno controller. ILD-2M energy meter after modernization was tested in an installation for measuring the dependence of reflection coefficient of various materials by the energy density of pulsed laser radiation ($\lambda = 355$ nm). Laser energy meter NOVA II was used for calibration. The coefficient of correspondence between the energy measured by NOVA II and ILD-2M output voltage was found. The main problems that influenced the need to improve analog equipment are outlined. Modernization made it possible to process the results of the experiment using modern computer technologies.

Keywords: energy meter, laser, analog-to-digital converter, controller, Arduino.

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REFERENCES

1. Rakhmanov B. N. and Kibovsky V. T., Security in the technosphere **2** (6), 3–13 (2013) [in Russian].
2. Kazakov M. Yu., Muravyov S. V. and Sustov L. V., Electromagnetic Radiation Pulse Energy Meter. Patent for invention 2031378 (RF). 1995.
3. Zhukauskas A. and Latinis V., Solid State Physics **31** (10), 21–24 (1989) [in Russian].
4. Bogdankevich O. V., Dryagin S. V., Konovalov A. D., Meerovich G. A., Selivanov Yu. G., Stepushkin V. A., Ulasyuk V. N., Chebotarev M. P. and Shotov A. P., Soviet Journal of Quantum Electronics **19** (10), 1300–1301 (1989).
5. Zhevrlakov A. P., Isakov V. K. and Leshchenko D. O., Soviet Journal of Quantum Electronics **20** (8), 944–945 (1990).
6. Aleksandrovskii A. L., Naumova I. I., Tarasenko V. V., Kholodnykh A. I. and Yakovleva G. I., Soviet Journal of Quantum Electronics **19** (10), 1343–1345 (1989).
7. Goryunov F. G., Nagorny D. Yu. and Tarasenko V. F., Soviet Journal of Quantum Electronics **16** (7), 875–875 (1989).
8. Belyaev V. S., Vinogradov V. I., Matafonov A. P., Krainov V. P., Lisitsa V. S., Andrianov V. P. and Ignat'ev G. N., Journal of Experimental and Theoretical Physics Letters **81** (12), 616–620 (2005).
9. Karavansky V. A. and Krasovsky V. I., Proceedings of SPIE **6344**, 63442 (2006).
10. Stukhlyak P. D., Mytnik M. M. and Mikitishin A. Kh., Materials Science **36** (3), 412 (2000).
11. Khalturinsky N. A., Tserikidze O. N., Semenov D. V. and Malinovsky G. Ya., High Molecular Compounds **36** (9) 1468–1472 (1994).
12. Kulish N. R., Lisitsa M. P., Malysh N. I. and Romanenko P. F., Soviet Journal of Quantum Electronics **19** (10), 1384–1386 (1989).
13. Kamushkin A. G., Klinkov V. K., Korobkin V. V. and Shchebnev E. P., Soviet Journal of Quantum Electronics **19** (10), 1301–1302 (1989).

14. Ionusauskas G., Piskarskas A., Sirutkaitis V. and Juozapavichyus A., *Soviet Journal of Quantum Electronics* **17** (10), 1303–1304 (1987).
15. Khalimov Yu. Sh., Vlasenko A. N., Tsepkova G. A. and Sosyukin A. E., *Bulletin of the Russian Military Medical Academy* **21** (2), 209–214 (2019).
16. <https://arduino.ru/Hardware/ArduinoBoardUno>.
17. Malinskiy T. V., Zheleznov V. Yu., Rogalin V. E. and Kaplunov I. A., *Journal of Physics: Conference Series* **2103** (1), 012154 (2021).
18. Zheleznov V. Yu., Malinsky T. V., Mikolutsky S. I., Rogalin V. E., Filin S. A., Khomich Yu. V., Yamschikov V. A., Kaplunov I. A. and Ivanova A. I., *Technical Physics Letters* **47** (10), 734–736 (2021).
19. Zheleznov V. Yu., Malinsky T. V., Mikolutsky S. I., Rogalin V. E., Filin S. A., Khomich Yu. V., Yamschikov V. A., Kaplunov I. A. and Ivanova A. I., *News of higher educational institutions. Materials of electronic engineering* **23** (3), 203–212 (2021) [in Russian].