

DOI: [https://doi.org/10.15407/ techned2017.04.072](https://doi.org/10.15407/techned2017.04.072)

SPECTRAL METHOD TO EVALUATE THE UNCERTAINTY OF DYNAMIC MEASUREMENTS

Journal	Tekhnichna elektrodynamika
Publisher	Institute of Electrodynamics National Academy of Sciences of Ukraine
ISSN	1607-7970 (print), 2218-1903 (online)
Issue	No 4, 2017 (July/August)
Pages	72 – 78

Authors

O.M. Vasilevskyi¹, M.Yu. Yakovlev², P.I. Kulakov^{1*}

¹ – Vinnytsia National Technical University,
95, Khmelnytske Shose, Vinnytsia, 21021, Ukraine

² –Hetman Petro Sahaidachny National Army Academy,
32, Heroes of Maidan street, Lviv, 79012, Ukraine,
e-mail: o.vasilevskyi@gmail.com

*ORCID ID : <http://orcid.org/0000-0002-0167-2218>

Abstract

Article suggested spectral method of assessing the measurement devices dynamic uncertainty that allows to investigate measurement accuracy in dynamic operating conditions in frequency domain and to estimate amplitude values of dynamic uncertainty based on input signal frequency characteristic and spectral function. The results were approbated when evaluating the engines vibration acceleration dynamic measurements uncertainty. It was established that maximum value of vibration acceleration dynamic measurement uncertainty amounts to 0.137 m/s² for observation time of 600 sec and vibration acceleration signal nominal value of 0.35 m/s

2

at a frequency of 6 kHz.

References 10, figures 2, table 1.

Key words: dynamic uncertainty of measurement devices, quality assurance of dynamic measurements, spectral function, frequency characteristic, vibration acceleration.

Received: 13.05.2016

Accepted: 03.05.2017

Published: 15.06.2017

References

1. Vasilevskyi O. M. Methods of determining the recalibration interval measurement tools based on the concept of uncertainty. *Tekhnichna Elektrodynamika*. 2014 . No 6. Pp. 81 – 88. (Ukr.).
2. Gyzhko Yu., Myslovych M. Elements of the theory and practical application of systems for vibrodiagnostics of electrical machines moving parts. *Tekhnichna Elektrodynamika*. 2015. No 2. Pp. 45–56. (Ukr.).
3. Podzharenko V. O., Vasilevskyi O. M., Sevastyanov V. M. Evaluation of static metrological characteristics of measuring vibration channel. *Ukrainskyi metrolohhichnyi zhurnal*. 2005. No 2. Pp. 60–65. (Ukr.).
4. Eichstadt S. Analysis of Dynamic Measurements. Evaluation of dynamic measurement uncertainty. Berlin: Frankenberg, 2012. – 87 p.
5. Eichstädt S., Elster C., Smith Ian M., Eward Trevor J. Evaluation of dynamic measurement uncertainty – an open-source software package to bridge theory and practice. *Journal of Sensors and Sensor System* . 2017. No 6. Pp. 97–105.
6. Elster C., Eichstädt S., Link A. Uncertainty evaluation of dynamic measurements in line with

- GUM. XIX IMEKO World Congress on *Fundamental and Applied Metrology*. 2009. Pp. 2311 – 2314.
7. Eward T. J., Elster C., Hessling J. P. Analysis of dynamic measurements: new challenges require new solutions. XIX IMEKO World Congress on. *Fundamental and Applied Metrology*. 2009. Pp. 2307 – 2310.
8. Vasilevskyi O. M. A frequency method for dynamic uncertainty evaluation of measurement during modes of dynamic operation. *International Journal of Metrology and Quality Engineering*. 2015. Vol. 6. No 2. 202 p. DOI: <http://doi.org/10.1051/ijmqe/2015008>
9. ISO/IEC Guide 98-1:2009 Uncertainty of measurement – Part 1: Introduction to the expression of uncertainty in measurement. Geneva (Switzerland): ISO. 2009. 32 p.
10. Official company website Maple – Software developer Maple 9. Available at: <http://www.maplesoft.com>
(Serial Number IS: 917995808) (accessed 05.04.2016)

[PDF](#)