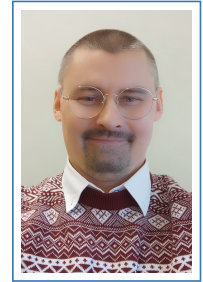


Dawid Kucharski

Curriculum vitae

Division of Metrology and Measurement Systems
Institute of Mechanical Technology
Poznan University of Technology
☎ +48 536 862 779
☎ +48 (61) 665 35 69
✉ dawid.kucharski@put.poznan.pl



Education

2015

PhD in Technical Science, Metrology, Machine Building, Poznan Univeristy of Technology, Poznan.

Also completed several random courses.

2008

MSc, Eng. in Technical Physics, Poznan University of Technology, Poznan.

Passed with distinction

PhD thesis

- title *Interferometric system for non-tactile shape deviation measurements*
- supervisors Dr Hab. Eng. Czesław Janusz Jermak
- description The thesis describes the design and construction of an interferometric system for non-contact shape deviation measurements. This is a new method applied to roundness measurement. An analysis of the state of knowledge of modern methods to measure shape deviations, construction of metrological equipment and development of technical metrology to increase the measurement resolution, was crucial when formulating the goal of this thesis in the following words: The development of an optical, interferometric system for shape deviation measurements with nanometric resolution and precision. After experimental verification of the design and the construction assumptions a system was built: to control a non-contact, non-destructive measurement method; to allow to achieve the shape deviation values (roundness) with much smaller measurement uncertainty compared to contact methods, i.e. with a maximum uncertainty not exceeding a few tenths of nanometers; to enable rapid measurement with a full rotation angle of the object (or with multiple angles of 2π) with a very large number of data points (e.g. 75 points per 1 degree of rotation); with optomechanical components in a modular system, whose configuration and individual components can be replaced, depending on the measurement requirements; using „ open source ” software to evaluate the measurement data. Comparative measurements were done, to determine the metrological parameters of the system constructed. The principles how to measure with this device were developed, as well as a method to process the data for technical metrological applications. A beta version of the software was written in the C, Octave and Python languages and form a base for further development. The possibility to adapt this device to measure other metrological quantities in an optical, non-contact way is also presented.

Master thesis

- title *Interactions of ions with electromagnetic field in the Paul trap with imperfect geometry*

supervisors Dr Gustaw Szawiola

description In thesis the physical effects concerning the change in the state of ions inside a Paul trap under the influence of an electric field disturbance of a specific shape are presented. The range of changes by disturbance parameters as the vibration amplitude for ions and their frequency was determined numerically. We assumed that these effects are experimentally measurable and the idea was proved that they may be the basis for a single ionic electric field sensor. Moreover, they may be the basis for a sensor of atomic force. The numerical results were experimentally verified on the macroscopic model. Especially the range of change of the vibration amplitude for ions under the influence of a grounded spherical object, was determined. The accuracy of the frequency measurements was verified by means of Fourier transforms without sound optimisation. Finally, a strategy for further experiments was developed and conditions for displaying the properties of a surface were determined.

Achievements

- Polish Physical Society prize for best Master's thesis in Physics (2008)

Languages

Polish	Native	<i>Mother Tongue</i>
English	Fluent	<i>Daily practice</i>
Russian	Fluent	

Interests

Activities	Hiking, Trekking, Bushcraft, Camping
Sport	Biking, Swimming
Music	Classic
Science	Non-destructive measurements, optical metrology, quantum optics, physics

Experience

Vocational

2011

Researcher, Assistant, *Department of Metrology and Measurement Systems, Poznan University of Technology, Poznan, Poland.*

- Research in optical metrology;
- Construction of new optical systems and interferometers for shape deviation measurements;
- New open-source computer algorithms for metrology data evaluation;
- Non-destructive testing with shearography and laser vibrometry;
- Lectures in metrology, optoelectronics and biomedical engineering.

2008
2012

Researcher, *National Laboratory of Atomic, Molecular and Optical Physics, Nicolaus Copernicus University, Torun, Poland.*

Ion trap group.

- Experimental investigation of small group of ions trapped in a Paul trap;
- Diode laser stabilization developments;
- CCD camera adjustments;
- Optical setup building;
- Vacuum technology improvements.

Training

2013

Apprentice, *Mechatronika Wyposażenie Dydaktyczne Sp. z o. o.*, Poznan, Poland.

Practice in the company.

- Practice and training in transfer and commercialization of knowledge and intellectual property protection.

Research stays

2010

Research stay, *Quantum Optics and Spectroscopy group, Innsbruck University*, Innsbruck, Austria.

Ion trap group.

- Experiments with cold Calcium ions in the Paul traps;
- Construction of four-channel vacuum cavity for *Pound-Drever-Hall* laser stabilization.

2010

Short visit, *Quantum Optics and Spectroscopy group, Innsbruck University*, Innsbruck, Austria.

Ion trap group.

- Experiments with cold Calcium ions in the Paul traps;
- Lasers adjustments, wavelength stabilization.

2011

Research stay, *Quantum Optics and Spectroscopy group, Innsbruck University*, Innsbruck, Austria.

Ion trap group.

- Experiments with cold Calcium ions in the Paul traps;
- New cavity testing.

Skills

Scientific

Experimental Laser optics, Optical instrument design, development and testing, Interferometers construction

Theoretical Optical modelling, both geometrical and physical, Classical and Quantum Optics

Development

Languages C#, Python, R, Octave, Bash

Programs Comsol Multiphysics, Comsol Script, CAD, Inventor

Books

2017

D., Kucharski, L. Marciniak-Podsadna, and E. Stachowska (2017). *A medical apparatus laboratory (orig. Laboratorium aparatury medycznej)*. Polish. Ed. by Paweł Ziętek. 1st ed. Vol. 1. Poznan: Poznan University of Technology.

Journal Publications

2021

D., Kucharski and Bartczak M. (2021). "Application of digital holographic microscopy to evaluate the dynamics of a single red blood cell influenced by low-power laser light". In: *Optics & Laser Technology* 142, p. 107262.

2020

Kucharski, D. and M. Musiałowski (2020). "On the laser Doppler velocimetry for surface rotation measurements". In: *Preprints* October, pp. 1–15.

- 2020 Kucharski, D and H Zdunek (2020). "A low-cost, simple optical setup for a fast scatterometry surface roughness measurements with nanometric precision". In: *Bull. Polish Acad. Sci. Tech. Sci.* 68.48, pp. 485–490. contr. (80%).
- 2018 D., Kucharski and Lemanik A. (Nov. 2018). "Calibration system for breath-alcohol analysers". English. In: *Journal of Physics: Conference Series* 1065.24, p. 242004. contr. (70%).
- 2018 F., Meijer, Kucharski D., and Stachowska E. (2018). "Determination of the phase in the center of a circular two-beam interference pattern to determine the displacement of a rough surface". In: *Optical Engineering* 57.10, p. 1. contr. (30%).
- 2013 Bula, K. and D. Kucharski (2013b). "Warpage of injection molded parts in case of asymmetrical mold temperature (orig. Analiza odkształceń wyprasek wtryskowych wytwarzanych w warunkach asymetrii temperatury formy)". In: *Przetwórstwo Tworzyw* 3, pp. 155–161. contr. (50%).
- 2013 Bula, K., D. Kucharski, L. Marciniak-Podsadna, and J. Stęśnik (2013). "Evaluation of the factors influencing the molded parts warpage (orig. Ocena czynników wpływających na deformację wyprasek)". In: *Tworzywa Sztuczne w Przemysle* 5, pp. 56–60. contr. (30%).
- 2012 Wieczorowski, M., S. Carras, D. Śmierzchalski, Th. Mathia, and D. Kucharski (2012). "A concept of multisensor solution in surface roughness measurements". In: *Zeszyty naukowe ATH w Bielsku-Białej*. contr. (10%).
- 2008 Szawioła, G., A. Buczek, W. Koczorowski, D. Kucharski, P. Mazarewicz, A. Walaszyk, and E. Stachowska (2008a). "Concept of an FM type single-atom electric field sensor (orig. Koncepcja jednoatomowego sensora pola elektrycznego typu FM)". In: *Elektronika* 6, pp. 149–151. contr. (20%).
- 2008 Szawioła, G., A. Buczek, W. Koczorowski, D. Kucharski, P. Mazarewicz, A. Walaszyk, and E. Stachowska (2008b). "Demonstration of the model of an AM single-atom electric field sensor (orig. Demonstracja modelu jednoatomowego sensora pola elektrycznego typu AM)". In: *Elektronika* 5, pp. 23–25. contr. (20%).

Conference Publications

- 2019 Gapiński, Bartosz, Michał Wieczorowski, Lidia Marciniak-Podsadna, Natalia Swojak, Michał Mendak, Dawid Kucharski, Maciej Szelewski, and Aleksandra Krawczyk (2019). "Use of White Light and Laser 3D Scanners for Measurement of Mesoscale Surface Asperities". In: *Lect. Notes Mech. Eng.* Pp. 239–256.
- 2019 Kucharski, Dawid and Marta Michalska (Aug. 2019). "Repeatability Investigations of a Handheld Electronic Spirometer". In: *Innovations in Biomedical Engineering*. Cham: Springer International Publishing, pp. 77–84. contr. (80%).

- 2017
Kucharski, D. and J. Nowak (Jan. 2017). "A simple setup for repeatability analysis of a low-level laser therapy scanner". In: *Advances in Intelligent Systems and Computing*. Politechnika Poznanska, Poznan, Poland, pp. 97–105. contr. (70%).
- 2016
Kucharski, D., F. Meijer, and E. Stachowska (2016). "Image processing methods for interferometric shape deviation measurements with sub-micron resolution". In: *5th International Conference on Surface Metrology*. Poznań, Poland. contr. (30%).
- 2016
Meijer, F., K. Bula, D. Kucharski, and E. Stachowska (2016). "Non-destructive Deformation Measurements and Defect Testing of Polymer Structures". In: *The 24th Annual World Forum on Advanced Materials*. Poznań, Poland. contr. (20%).
- 2013
Bula, K. and D. Kucharski (2013a). "Warpage of injection molded parts in case of asymmetrical mold temperature (orig. Analiza odkształceń wyprasek wtryskowych wytwarzanych w warunkach asymetrii temperatury formy)". In: *XII Międzynarodowa Konferencja Naukowo-Techniczna, Kierunki Modyfikacji i Zastosowań Tworzyw Polimerowych*. Rydzyna, Poland. contr. (40%).
- 2013
Kucharski, D., F. Meijer, and E. Stachowska (2013). "A point probe for low level laser therapy". In: *IX Kongres Societas Humboldtiana Polonorum*. Poznań, Poland. contr. (40%).
- 2012
Kucharski, D., F. Meijer, Ł. Kłosowski, and E. Stachowska (2012). "Non-linear resonances and the formation of small ion crystals in a linear Paul trap". In: *VII Warsztaty Fizyki Atomowej i Molekularnej*. Jurata, Poland. contr. (30%).
- 2011
Kucharski, D., Ł. Kłosowski, M. Kumph, F. Meijer, and E. Stachowska (2011). "Optical Laser Stabilization System for Ion Trap Experiments". In: *Polska Konferencja Optyczna*. Międzyzdroje, Poland. contr. (25%).
- 2010
Kucharski, D., A. Walaszyk, Ł. Kłosowski, and E. Stachowska (2010). "Modeling of a linear Paul trap as a tool for nanotechnology". In: *Manufacturing*. Poznań, Poland. contr. (55%).
- 2010
Walaszyk, A., D. (50%) Kucharski, B. Pawałowski, and E. Stachowska (2010). "Construction and testing of Paul macro-trap". In: *Manufacturing*. Poznań, Poland. contr. (50%).
- 2009
Kucharski, D. and A. Walaszyk (2009). "Application of a Finite Elements Method to the Transport of Ions in a Linear Paul Trap". In: *II International Interdisciplinary Technical Conference of Young Scientists - InterTech*. Poznań, Poland. contr. (80%).
- 2008
Kucharski, D. and A. Walaszyk (2008). "Manipulation of individual ions in a Paul trap for quantum engineering applications". In: *Humboldt Kolleg - Sustainable Innovation Challenges, Issues and Solutions at the Interface of Medicine, Sciences and Technology*. Ślubice, Poland. contr. (80%).

2008

Szawioła, G., W. Buczek A. Koczorowski, D. Kucharski, P. Mazarewicz, A. Walaszyk, and E. Stachowska (2008a). "Concept of a single-ion atomic force sensor". In: *IX International Conference on Quantum Communication, Measurement and Computing*. Calgary, Canada. contr. (15%).

2008

Szawioła, G., W. Buczek A. Koczorowski, D. Kucharski, P. Mazarewicz, A. Walaszyk, and E. Stachowska (2008b). "Concept of an FM type single-atom electric field sensor (orig. Koncepcja jednoatomowego czujnika pola elektrycznego typu FM)". In: *X Konferencja Naukowa Czujniki Optoelektroniczne i Elektroniczne COE*. Poznań, Poland. contr. (15%).

Patents

2016

Kucharski, D., F. Meijer, E. Stachowska, and Cz.J. Jermak (2016). "An interferometric method for non-tactile shape deviation measurements (orig. Sposób bezstykowego pomiaru odchyłki kształtu metodą interferometryczną)". Pat. Pat/1667 P.405952 (P). contr. (25%).

2014

Kucharski, D., F. Meijer, E. Stachowska, and Cz.J. Jermak (2014). "Interferometric system for non-tactile shape deviation measurements (orig. Układ do interferometrycznego, bezstykowego pomiaru odchyłki kształtu)". Pat. Pat/1695 P.408075 (P). contr. (25%).

2013

Kucharski, D., F. Meijer, E. Stachowska, and Cz.J. Jermak (2013). "The method of measuring changes in surface roughness of construction components (orig. Sposób pomiaru zmian nierówności powierzchni elementów konstrukcyjnych)". Pat. Pat/1673 P.405953 (P). contr. (25%).

Thesis

2015

Kucharski, D. (2015). "Interferometric system for non-tactile shape deviation measurements". PhD. Poznań, Poland: Poznan University of Technology.

2008

Kucharski, D. (2008). "Interactions of ions with electromagnetic field in the Paul trap with imperfect geometry". MSc, Eng. Poznań, Poland: Poznan University of Technology.