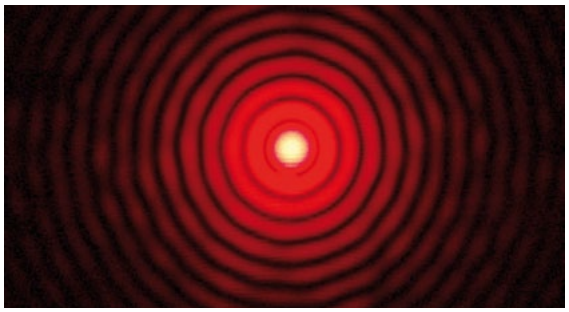
Group of Tomáš Tyc

Division of Theoretical Physics / Institute of Theoretical Physics and Astrophysics
Faculty of Science / Masaryk University

RESEARCH GROUP CONTACT

Kotlářská 2, 611 37 Brno
http://theor.physics.muni.cz

HEAD Prof. Tomáš Tyc
PHONE +420 549 497 789
E-MAIL tomtyc@physics.muni.cz



THEMATIC RESEARCH FOCUS

RESEARCH AREA

Theoretical physics, mainly optics – theory of invisibility and perfect imaging, wave propagation in optical devices, applications of geometry in optics

EXCELLENCE

Top in Central Europe

MISSION

We want to make a major contribution to the understanding of perfect imaging and propagation of waves in perfect lenses. To achieve this, we plan to extend the research team.

DEVELOPED TECHNOLOGIES

CONTENT OF RESEARCH

- Theory of invisibility
- Theory of perfect imaging
- Wave propagation in optical devices
- Applications of geometry in optics
- Problems in quantum theory and quantum information with continuous variables

MAIN CAPABILITIES

Basic research

- Transformation optics (article in Nature Materials)
- The draft of new type of invisible cloak (article in Science)

Application research + protection forms

- „Perfect lens" - an international patent with colleagues of the University in St. Andrews and Cornell University

FIELDS OF RESEARCH RESULTS APPLICATION

- Optics and nano-optics
- Geometry and optics
- Electronic industry

ALUMNI PROFILE

Graduates have a solid foundation in quantum mechanics, quantum optics, optics of charged particles and modern quantum theory (the string-inspired theory, quantum theory of gravitation), on which they successfully build their future work. Graduates are adequately prepared for individual scientific research in Czech or foreign institutions.

NUMBER OF RESEARCH POSITIONS ↘

SENIOR RESEARCH STAFF

1

JUNIOR RESEARCH POSITIONS (INCL. PH.D. STUDENTS)

3

BUDGET ↘

TOTAL (MIL. CZK/ MIL. EUR)

1.5 / 0.06

PART OF THE TOTAL BUDGET FROM PRIVATE RESOURCES (%)

0

PART OF THE TOTAL BUDGET FROM FOREIGN RESOURCES (%)

5

MAIN PROJECTS ↘

2005–2011: Mathematical structures and their physical applications (Institutional research plan MSM0021622409 financed by the Ministry of Education, Youth and Sports)

2000– : Interesting physics experiments with the electromagnetic field (financed by University Development Fund); for photography of interesting physics phenomena see http://zajfyz.physics.muni.cz/en

ACHIEVEMENTS ↘

» Proposal of a new type of invisibility cloak - paper published in Science - U. Leonhardt, T. Tyc, Broadband Invisibility by Non-Euclidean Cloaking, Science 323, 110 (2009)

» Invention of a method for eliminating material singularities in certain devices. This enabled the construction of an Eaton lens, which previously was just a purely theoretical proposal - T. Tyc, U. Leonhardt, Transmutation of singularities in optical instruments, New Journal of Physics 10, 115038 (2008)

» The first proposal ever of a magnifying perfect lens for imaging regions of 3D space - T. Tyc, M. Šarbort, Magnifying perfect lens with positive refraction, arxiv:1010.3178

MAIN COLLABORATING PARTNERS ↘

COLLABORATION WITH ACADEMIC PARTNERS

» University of St. Andrews (UK)

» Cornell University (US)

» Universities in Singapore and Hong Kong

04 / 2011