

FEMTO TERABYTE

Spinoptical nanoantenna-assisted magnetic storage at few nanometers on femtosecond timescale

Funded from European Union's Horizon 2020 research and innovation program (under the call EC H2020-FETOPEN-1-2016-2017) under grant agreement no. 737093





Nan⊗sc



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The key ICT challenges: (i) to achieve the ability to store and process information at the highest possible rate with the lowest possible energy consumption and, (ii) to increase further data storage density beyond Moore's law

Our vision: A magnetic recording technology beyond the present industry roadmap in terms of speed (= all-optical) and density (= at the nanoscale).



spinoptical nanoantenna







Nan@sc



Radboud Universiteit







FEMTOTERABYTE partners:













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Context: Ultrasmall magnetic memory



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Currently developed technology: Heat-Assisted Magnetic Recording (HAMR)

Project aim: from terabit/inch² to terabytes/inch², 2×2 nm or

down to molecular magnets (sub-nm).



C. Vogler et al., Appl. Phys. Lett. 108, 102406 (2016)

















FEMTOTERABYTE: Publishing highlights



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FEMTOTERABYTE: Publishing highlights

32 publications in high-impact peer-reviewed journals

6 publications involve two or more Femtoterabyte partners



















FEMTOTERABYTE: Conferences, workshops, exchanges

Participation in more than 100 conferences & workshops

Dedicated symposia at JEMS 2019, META2019 and ECMM2019

(our mission: merging nano-optics and nanomagnetism)





FEMTOTERABYTE: Communication targeting industry

Participation in EFECS 2019 (November 2019, Helsinki, Finland)





Participation in the North German network for nanotechnology <u>https://www.nina-sh.de/?page_id=2560</u>





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NIVERSITA

FIRENZE

INTURESTTÀ DE PIS

THALES

FEMTOTERABYTE: Participation of early-career researchers in scientific conferences

5 conferences / 5 talks (S. Ruta); MRS - Boston 2019, poster (R. Rowan-Rpbinson); JEMS - Mainz 2019, poster (R. Rowan-Robinson); APS March Meeting 2018 (Los Angeles, USA, March 2018): 1 Poster and 1 Oral (M. Zapata); Nicolás Cabrera School (Madrid, 2018): assistant (M. Zapata); COST Action Magnetofon workshop , poster "GdFeCo nanoparticles for all-optical magnetization switching" (S. Parchenko); International School on plasmonics, Magnetoplasmonics and applications ISPMA-2019 (Bogotá-Colombia): co-organizer (M. Zapata); 9th International conference on Surface Plasmon Photonics (Copenhagen-2019): 2 posters (M. Zapata); 2019 ETSF Young Researchers Meeting (San Sebastián, Spain): Invited speaker (M. Zapata); META 2019, the 10th International Conference on Metamaterials, Photonic Crystals and Plasmonics: poster (M. Zapata); International School of Plasmonics and Nano-Optics, Cetraro (Cs), 15-18.06.2018, Pitch presentation ("Self-Assembly of Magnetic Nanoparticles

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Participation of early-career researchers of the project in more than 50 conferences & workshops

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Ultrafasc optical science of transcript 2016, Moscow, Russia, 01-05 october (2016), E. Smetanna, Magnetopiasmonics. magnetic cohtrol of light in the nanoscale landscapes", talk at "METANANO 2018" conference, Sochi, Russia, 17-21 September (2018), E. Smetanina; "Investigation of magnetization dynamics of Fe₂₀Pd₈₀ circular island arrays" May, 29th to 31st 2017, 11th Symposium on Hysteresis Modeling and Micromagnetics (HMM 2017), in Barcelona, Spain, Talk (A. Ciuciulkaite); "Au/TbxCo1-x layered pillars as tunable magneto-plasmonic resonators" July 10 to July 13, 2018, 16th International Nanotech Symposium & Nano-Convergence Exhibition (NANO KOREA 2018) in Ilsan, The Republic of Korea, Poster, (A. Ciuciulkaite); "Au/Tb_xCo_{1-x} layered pillars as tunable magneto-plasmonic resonators" 3rd to the 7th of September 2018 Joint European Magnetic Symposia (JEMS) in Mainz, Germany, Poster, (A. Ciuciulkaite); "Au/Tb_xCo_{1-x} layers for tunable magneto-plasmonic nano-resonators" 17-28 September 2018, European School on Magnetism 2018 in Krakow, Poland, Poster, (A. Ciuciulkaite); "Collective magnetization dynamics in nano-arrays of thin FePd discs", February 6th-8th 2019, Workshop on Frontiers in Artificial Spin Ice in Bad Zurzach, Switzerland, Poster, (A. Ciuciulkaite).

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FEMTOTERABYTE: Intellectual property protection

- Several patents for multiple applications being elaborated as a result of the project

- Proof-of-concept device for memory is created

 Demonstration of building blocks achieved: optical writing and electrical reading
Building blocks combined => ultra-fast, energy-efficient, scalable demonstrator

- Exploitation plans for memory and beyond with industrial partners





















FEMTOTERABYTE, SPINOPTICAL NANOANTENNA-ASSISTED MAGNETIC STORAGE AT FEW NANOMETERS ON FEMTOSECOND TIMESCALE

COORDINATOR: Göteborgs universitet

PARTNERS:

Uppsala universitet (SE) CIC NANOGUNE (ES) Università degli Studi di Firenze (IT) University of York (UK) Stichting Katholieke Universiteit (NE) Paul Scherrer Institut (CH) NanOsc (SE) Thales (FR) Università di Pisa (IT)



HORIZON 2020

European Commission

FUTURE AND EMERGING TECHNOLOGIES











The increasing need for more data storage is evident with the use of high bandwidth and in the widespread use of the mobile devices. We are set to directly impact the expanding worldwide market for nonvolatile ultra low energy memory.

CONTACT:

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More info:

https://www.gu.se/en/research/femtoterabyte

http://www.fetfx.eu/project/femtoterabyte/

https://cordis.europa.eu/project/id/737093

















