ASTROFYZIKA A IT

APLIKÁCIA INFORMAČNÝCH TECHNOLÓGII V ASTROFYZIKÁLNOM VÝSKUME.

ASTROFYZIKA A IT

- rozvoj aktivít na KPI FEI TUKE zameraný na aplikáciu informačných technológii v astrofyzikálnom výskume
  - TUKE Space Forum
  - predmet Spracovanie dát z kozmického výskumu
  - Diplomové a PhD. práce na túto tému na KPI FEI TUKE
  - zapojeniu TUKE do JEM-EUSO experimentu

TUKE SPACE FORUM

POPULARIZAČNÝ PROJEKT O VESMÍRNOM VÝSKUME

TUKE SPACE FORUM

- TUKE Space Forum je projekt podporovaný Európskou vesmírnou agentúrou ESA pre zvýšenie povedomia o vesmírnom výskume a technológiách s ním spojených.
- Cieľom je priblížiť najzaujímavejšie projekty vesmírneho výskumu cez prezentácie zahraničných odborníkov, ktorí na týchto projektoch pracujú.

TUKE SPACE FORUM

- Web - spaceforum.sk
- Meetup - www.meetup.com/TUKE-Space-Forum

TUKE SPACE FORUM / 2021

- Aká téma vesmírneho výskumu vás zaujíma najviac?

2020

TUKE SPACE FORUM

- Prezentácie pripravené pre prvý plrok 2020 zahŕňajú najhorúcejšie témy súčasného výskumu vesmíru. Od výskumu gravitačných vĺn, čiernych dier, exoplanét, tmavej hmoty a energie cez ochranu planéty Zem pred nárazmi asteroidov a mapovanie hviezd, po výskum systému Slnko-Zem, cez prieskum magnetosféry Zeme a slnečného vetra.

Predbežný program diskusií

- 1. Michael Küppers (Hera Project Scientist), webinár o misii HERA, 26.2.2020
- 2. Timo Prusti (Gaia Project Scientist), webinár o misii Gaia, 11.3.2020
- 3. Matteo Guainazzi (Study Scientist for Athena), webinár o misii Athena, 25.3.2020
- 4. Graziella Branduardi Raymont, webinár o misii SMILE, 22.4.2020
- 5. Benjamin Joachimi (University College London), webinár o misii Euclid, 29.4.2020
- 6. Ana Heras (Mission Project Scientist), webinár o misii PLATO, 13.5.2020
- 7. Paul McNamara, (ESA Mission Project Scientist), webinár o misii LISA, 27.5.2020
- 8. Chris Finlay (DTU Space), webinár o misii SWARM, 10.6.2020

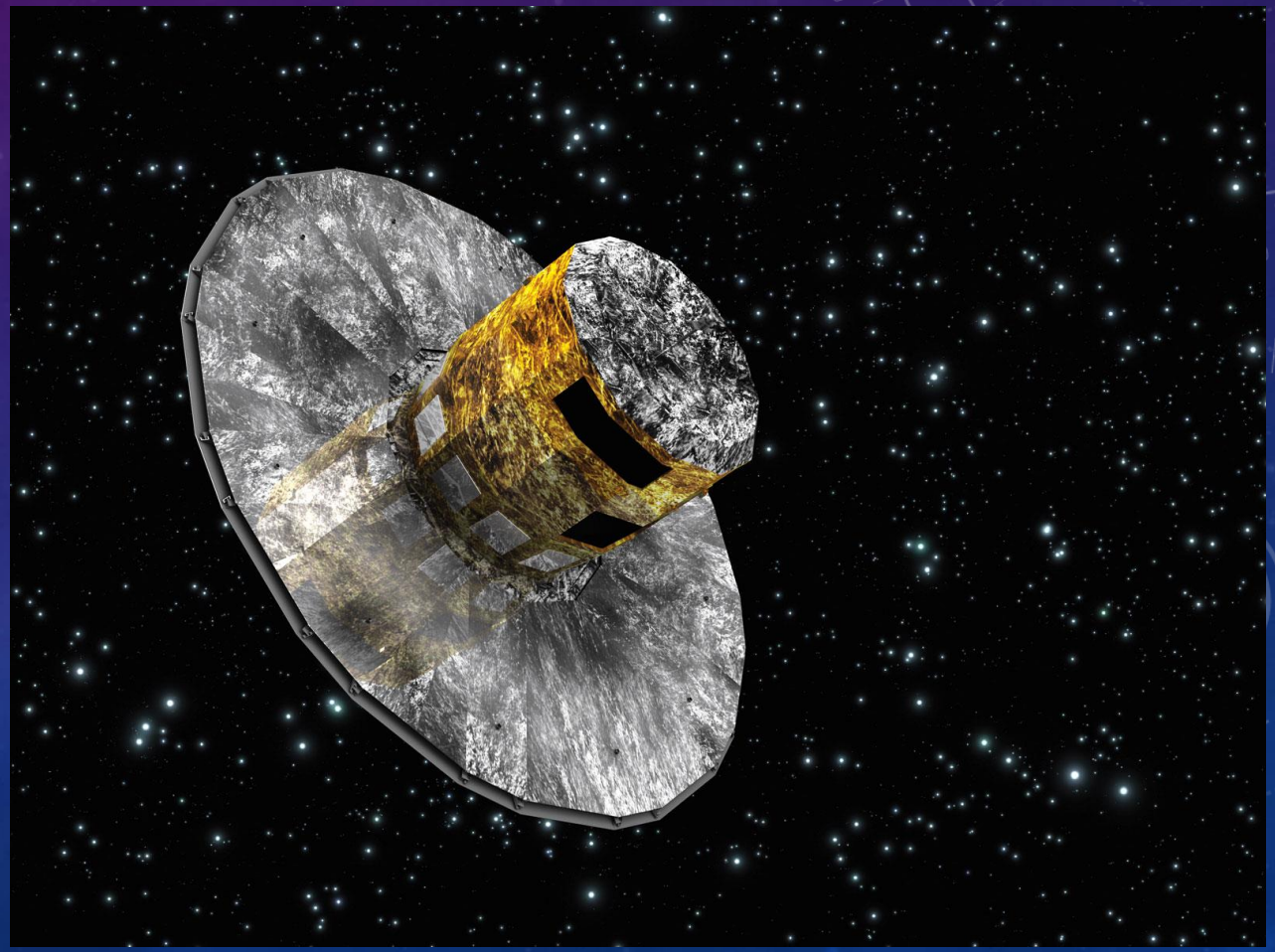
2020

TUKE SPACE FORUM
GAIA, NAJPRESNEJŠIE OKO NA POZOROVANIE HVIEZD

Gaia je misia Európskej vesmírnej agentúry ESA s cieľom vytvorenia najpresnejšieho 3D katalógu hviezd astronomických objektov doteraz. Gaia je navrhnutá na astrometrické pozorovania s ďaleko väčšou presnosťou ako doterajšie misie.

Štart v roku 2013.

Gaia misii bude venovaná druhá prednáška z cyklu popularizačných prednášok “Diskusií s vedcami”. Svetom Gaia misie nás prevedie Timo Prusti pôsobiaci ako Gaia Project Scientist. Prednáška je plánovaná na 11. marca 2020.

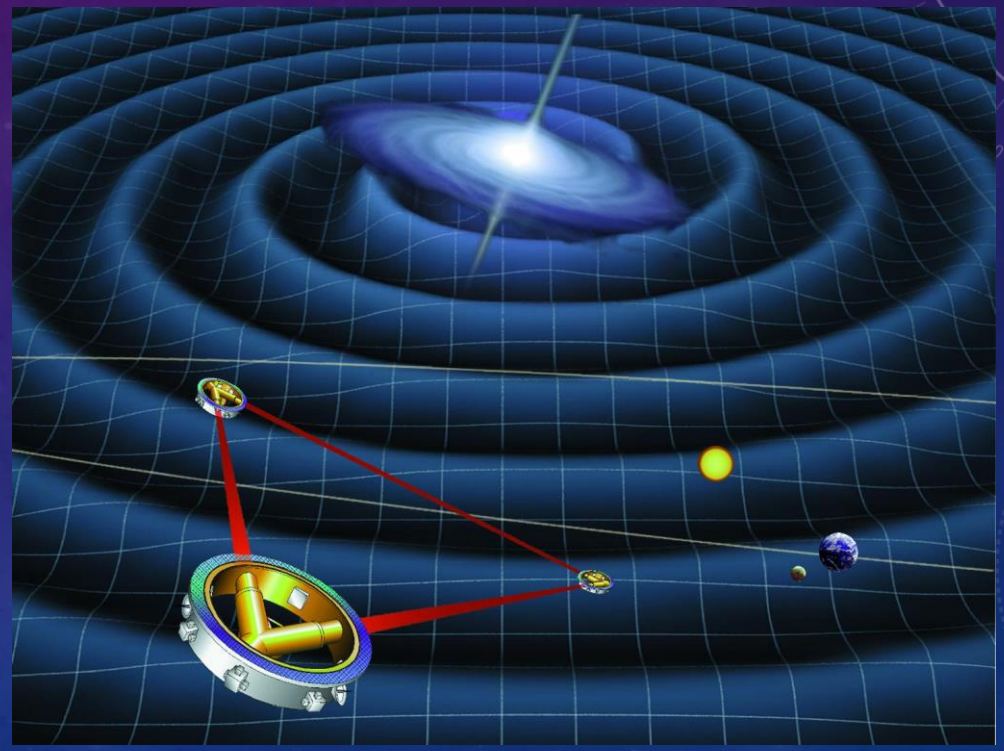


2020

TUKE SPACE FORUM
ATHENA & LISA

Matteo Guainazzi, Study Scientist for Athena webinár o misii Athena, 25.3.2020

Predpokladaný štart v roku 2031



Paul McNamara, ESA Mission Project Scientist webinár o misii LISA, 27.5.2020

Predpkladaný štart v roku 2034

2020

TUKE SPACE FORUM
ATHENA

Abstrakt

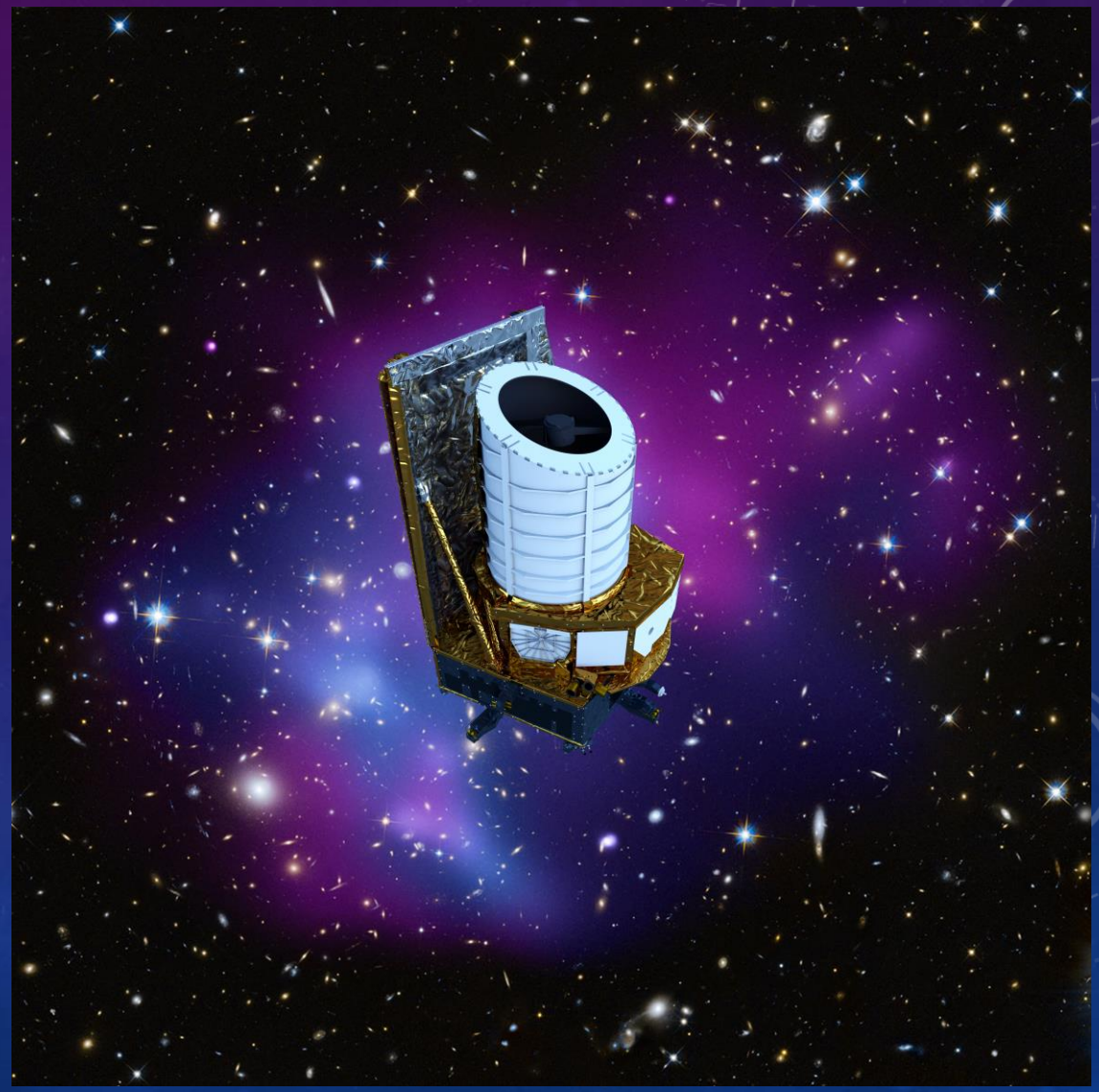
- Ako a prečo sa bežná hmota zhromažďuje do veľkých štruktúr?
- Ako sa baryóny zachytené v týchto štruktúrach vyvíjajú od epochy ich sformovania?
- Ako čierne diery rastú a pôsobia na ich okolie, ako ovplyvňujú kozmologickú evolúciu galaxii kde sa nachádzajú?

Toto sú fundamentálne astrofyzikálne otázky, na zodpovedanie ktorých je Athena, röntgenové observatórium nasledujúcej generácie Európskej Vesmírnej Agentúry, navrhnutá. No Athena bude mať, vďaka jej vedeckému výkonu prekračujúcemu o jeden rád akúkoľvek existujúcu röntgenovú misiu, vplyv na praktický každú oblasť astrofyziky.

Matteo Guainazzi, Study Scientist for Athena mission, webinár o misii Athena, 25.3.2020

2020

TUKE SPACE FORUM
EUCLID



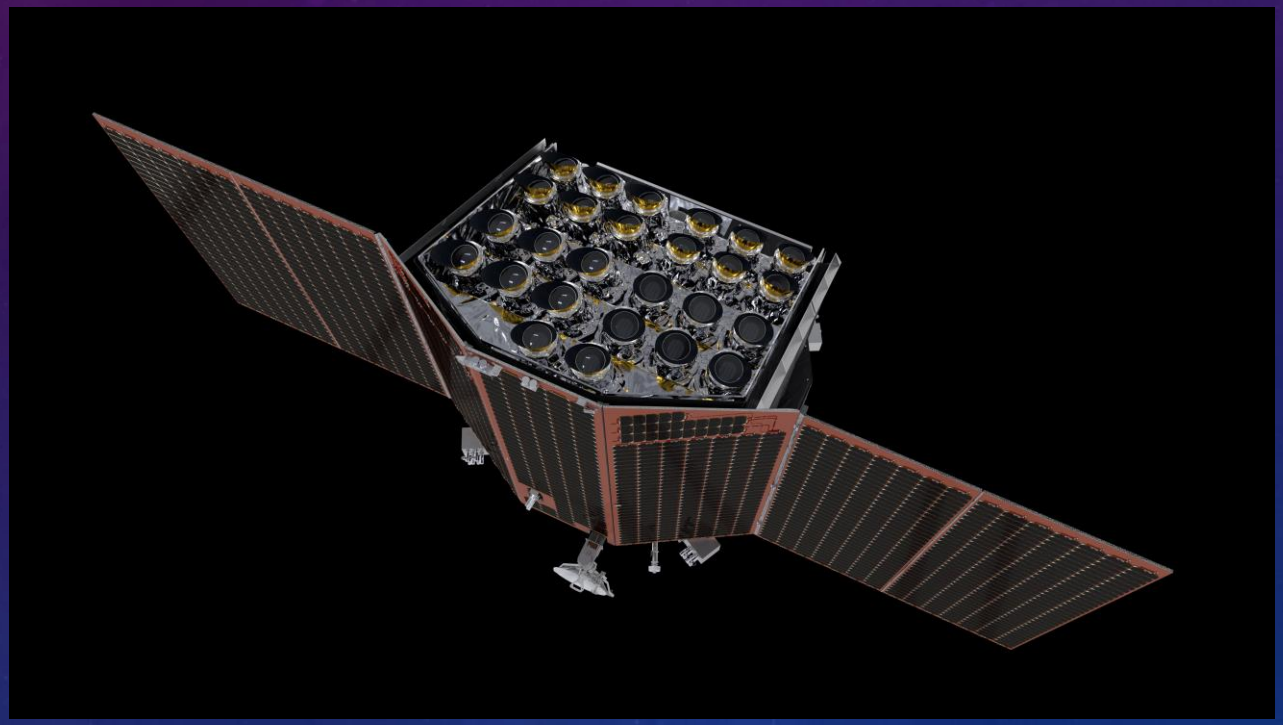
Euclid je vesmírny teleskop pracujúci v infračervenej a viditeľnej oblasti, ktorý v súčasnosti vyvíja Európska vesmírna agentúra ESA a konzorcium Euclid. Cieľom misie Euklid je lepšie porozumieť tmavej energii a tmavej hmote presným meraním zrýchlenia vesmíru.

Predpokladaný štart v roku 2022.

Benjamin Joachimi, University College London
webinár o misii Euclid, 29.4.2020

2020

TUKE SPACE FORUM
PLATO, LOVEC ZEMI PODOBNÝCH EXOPLANÉT



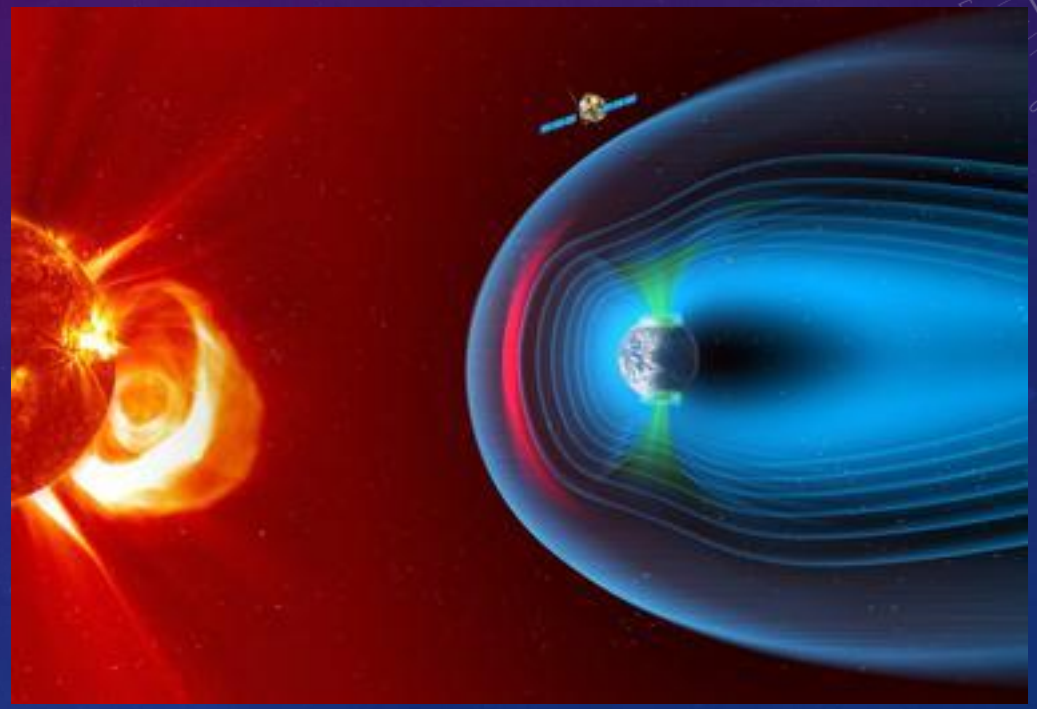
Ana Heras, Mission Project Scientist, webinár o misii PLATO, 13.5.2020

Plánovaný štart v roku 2026

2020

TUKE SPACE FORUM
SWARM & SMILE

Chris Finlay, DTU Space,
webinár o misii SWARM, 10.6.2020
Štart 2013



Graziella Branduardi Raymont (SMILE European CO-PI)
webinár o misii SMILE, 22.4.2020

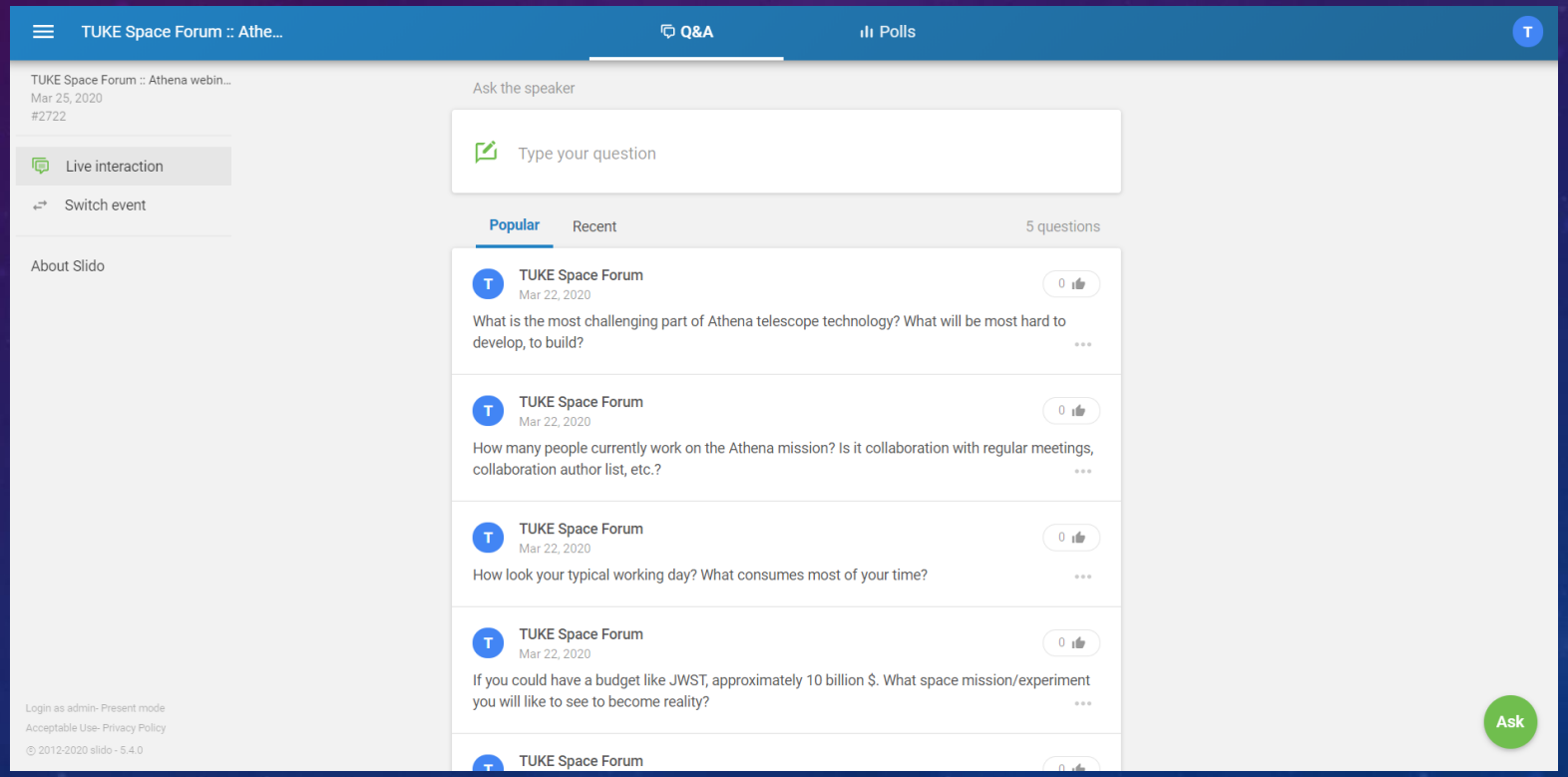
Štart plánovaný v roku 2023

TUKE SPACE FORUM
SOFIA

2020

TUKE SPACE FORUM

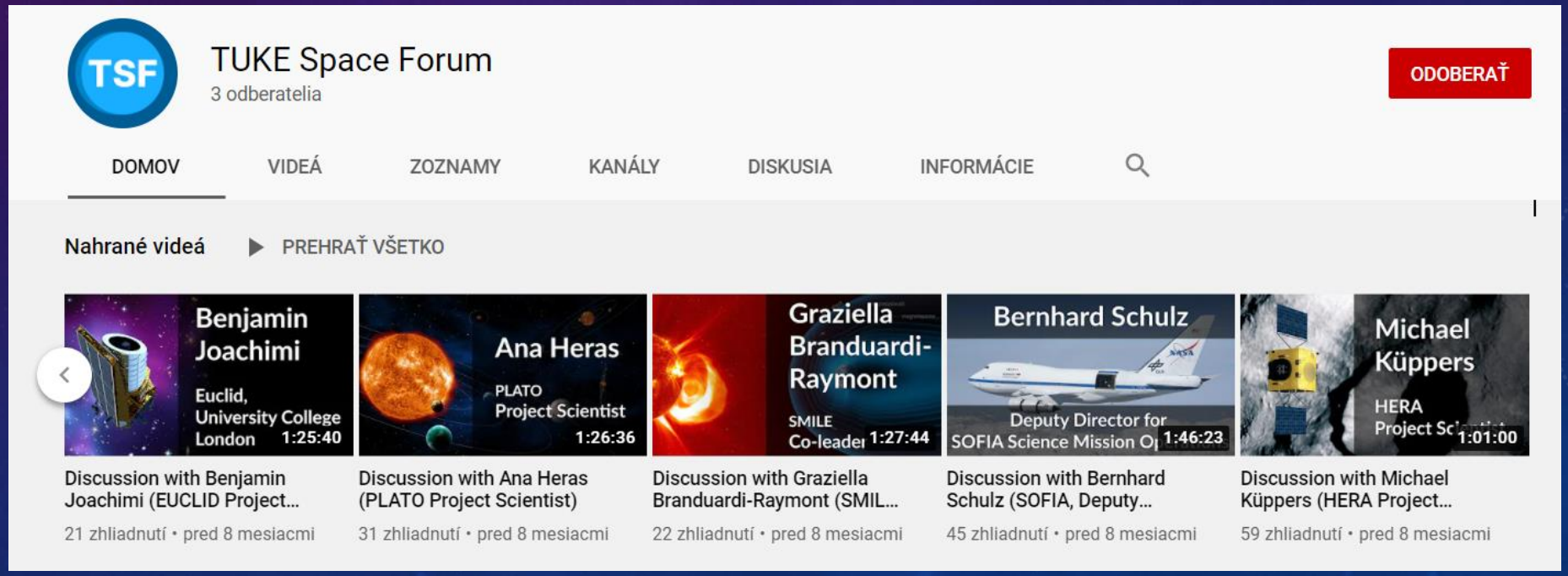
- Otázky cez: sli.do



TUKE SPACE FORUM

YouTube kanál TUKE Space Forum

- https://www.youtube.com/channel/UCjNXxp4f1I35jRIruxGdqaw



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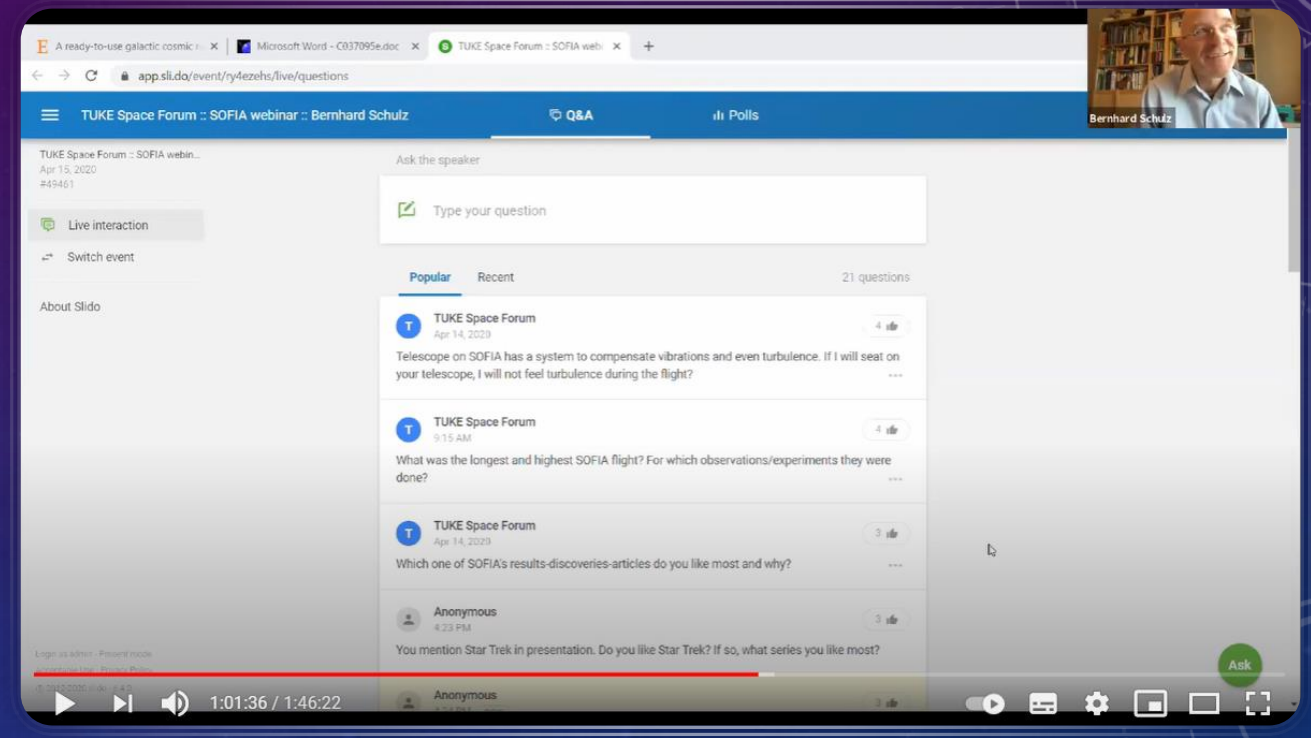
YouTube kanál TUKE Space Forum

- https://youtu.be/hxKTJODzm5E
- 1:01:30



2021

TUKE SPACE FORUM

- Sériu prednášok v roku 2021 začíname titulom

Projekt SpaceDrive - revolučný pohon pre medzihviezdne lety

21. apríl 2021 o 16:00

Meetup: https://www.meetup.com/TUKE-Space-Forum/events/277127694/

TUKE SPACE FORUM
PROJEKT SPACEDRIVE - REVOLUČNÝ POHON PRE MEDZIHVIEZDNE LETY

- Na Technickej Univerzite v Drážďanoch sú najlepší na svete testovaní medzihviezdných pohonov. Porozpráva nám o tom Prof. Martin Tajmar riaditeľ Aerospace engineering institute na TU v Drážďanoch.

- Slovami Martina Tajmara: Medzihviezdne lety v rozmedzí dĺžky ľudského života sú v súčasnosti mimo dosahu našich fyzikálnych a technických možností - alebo sú úplne nemožné. Napriek tomu - mnohé technológie, ktoré dnes používame, boli nie až tak dávno tiež nemožné. Takže, existujú na obzore nejaké technológie, ktoré môžu spôsobiť revolúciu v kozmickom cestovaní? Na TU Drážďany staviame najlepšie ťahové váhy na svete, aby sme dôveryhodne vyhodnotili tvrdenia z literatúry a testovali v režimoch, ktoré doposiaľ neboli dostupné. WARPový pohon, tu sme ...

- Webinár sa uskutoční v Stredu, 21. apríl 2021 o 16:00

https://www.meetup.com/TUKE-Space-Forum/events/277127694/

TUKE SPACE FORUM

PROJEKT SPACEDRIVE - REVOLUČNÝ POHON PRE MEDZIHVIEZDNE LETY

O prednášajúcom:

- Prof. Martin Tajmar získal titul B.Sc., M.Sc. z fyziky a doktorát z elektrotechniky na Viedenskej technickej univerzite v Rakúsku, ako aj magisterský titul v kozmických štúdiách na International Space University vo francúzskom Štrasburgu. V roku 1999 nastúpil do Európskej vesmírnej agentúry ESA na pozícii Young-Graduate-Trainee v sekcii elektrických pohonov. V roku 2000 prešiel na Austrian Institute of Technology, kde bol v roku 2005 vymenovaný za vedúceho oddelenia vesmírneho pohonu a pokročilých konceptov. V rokoch 2010 - 2012 bol docentom pre letecké inžinierstvo na KAIST v Kórei a v roku 2012 bol vymenovaný za riadneho profesora a vedúceho katedry kozmických systémov na Drážďanskej Technickej Univerzite (TU Dresden) v Nemecku vyvíjajúcej elektrický / pokročilý pohon, inovatívne energetické a mikrosatelitné riešenia. Od roku 2014 je riaditeľom ústavu leteckého inžinierstva na TU v Drážďanoch.

- Webinár sa uskutoční v Stredu, 21. apríl 2021 o 16:00

https://www.meetup.com/TUKE-Space-Forum/events/277127694/

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In other projects

EmDrive

From Wikipedia, the free encyclopedia

For thrusters that use electrical power to change the velocity of spacecraft, see Electrically-powered spacecraft propulsion. For rocket that uses thrust from the momentum of emitted photons, see Photon rocket.

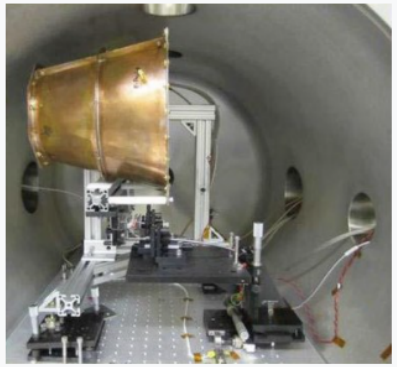
A **radio frequency** (**RF**) **resonant cavity thruster** is a device concept that is claimed to be a spacecraft thruster.[1][2] It is purported to generate thrust by reflecting microwaves internally in the device, in violation of the law of conservation of momentum and other laws of physics.[3][4][5][6][7][8][9][10] The device is also known as an **EmDrive** and has been often referred to by the media as the **Impossible Drive**.[11][12][13][7] It was introduced in 2001 by Roger Shawyer.[14][15]

There exists no official design for this device, and neither of the people who claim to have invented it have committed to an explanation for how it could operate as a thruster or what elements define it, making it difficult to tell whether a given object is an example of such a device. However, several prototypes based on its public descriptions have been constructed and tested. In 2016, the Advanced Propulsion Physics Laboratory at NASA reported observing a small apparent thrust from one such test,[16] a result not since replicated. No other published experiment has measured apparent thrust greater than the experiment's margin of error.[17]

Contents [hide]

1 History and debunking
2 Designs and prototypes
  2.1 EmDrive
  2.2 Cannae and other drives
3 Theoretical inconsistencies
4 Tests and experiments
  4.1 Tests by inventors
  4.2 Northwestern Polytechnical University
  4.3 NASA Eagleworks
  4.4 Dresden University of Technology
  4.5 Tests in space
5 Experimental errors
  5.1 Measurement errors
  5.2 Shift in center of gravity due to thermal effects

EmDrive



EmDrive built by NASA Eagleworks laboratory during their 2013–2014 experiments

Country of origin	United States
Date	2001
Application	Spacecraft thruster
Status	Device concept
Performance	
Thrust (SL)	0.02 N (0.072 ozf) (disputed)

TUKE SPACE FORUM

Dragonfly: A Rotorcraft Lander for Saturn's Moon Titan

O prednáške

- Dragonfly is NASA's most recently selected "New Frontiers" planetary science mission, that will exploit Titan's low gravity and dense atmosphere to fly to many different sites on Titan using eight rotors. It will explore Titan's diverse surface composition, and perform geomorphological, Meteorological and geophysical studies.

- 12. máj 2021 o 16:00

DRAGONFLY: A ROTORCRAFT LANDER FOR SATURN'S MOON TITAN

Štart v roku 2027, trvanie misie ~12 rokov

DRAGONFLY: A ROTORCRAFT LANDER FOR SATURN'S MOON TITAN

O prednášajúcom

- Ralph Lorenz worked as an engineer for the European Space Agency on the design of the Huygens probe to Saturn's moon Titan, and as a planetary scientist at the University of Arizona, and since 2006, at the JHU Applied Physics Lab. His activities have centered on Titan, Cassini-Huygens and future missions there, but his interests include Mars, Venus, dust devils, sand dunes, and aerospace systems. He is associated with NASA's InSight and Pereverance missions at Mars and the Japanese Venus orbiter Akatsuki, and is the Mission Architect for Dragonfly. He is author or co-author of nine books including 'Lifting Titan's Veil','Spinning Flight', 'Exploring Planetary Climate' and 'Space Systems Failures', as well as over 300 journal publications.

https://www.amazon.com/s?i=stripbooks&rh=p_27%3ARalph+Lorenz&s=relevancerank&text=Ralph+Lorenz&ref=dp_byline_sr_book_1

TUKE SPACE FORUM

Interstellar travel in the real world / André Füzfa / 19. máj 2021

O prednáške:

- There is but one truly serious physical problem and that is interstellar travel. Although not theoretically impossible, it has ever been largely considered unfeasible, leaving this important topic abandoned, controversial and left in despair to speculative physics. In this talk, I will give a constructive yet critical overview of the main ideas that have been proposed to reach the stars: relativistic reaction propulsion, generation ships, spacetime distortions and faster-than-light travels. We will then focus on what is likely the most plausible options: directed energy propulsion and interstellar (Bussard) ramjets. Detailed numerical examples of interstellar exploration with nanoprobes (Starshot project) and manned spaceships will be given, based on recent modeling within relativity that have revived the topic. The goal of the talk is to show at which conditions interstellar travel might become possible in the real world, without relying on speculative physics, and what are some key research issues that should be investigated nowadays to reach the stars in the future.

TUKE SPACE FORUM

Interstellar travel in the real world

O prednášajúcom

- Pr. André Füzfa is a theoretical astrophysicist based at the Institute for Complex Systems at the University of Namur (Belgium). He has a wide research background in cosmology (dark energy and large-scale formation), modified gravity and tests of general relativity, primordial black holes formation and detection, as well as sci-fi inspired topics like gravitational field generators and interstellar travel. He has also patented two devices of electromagnetic generators and detectors of gravitational waves.

TUKE SPACE FORUM

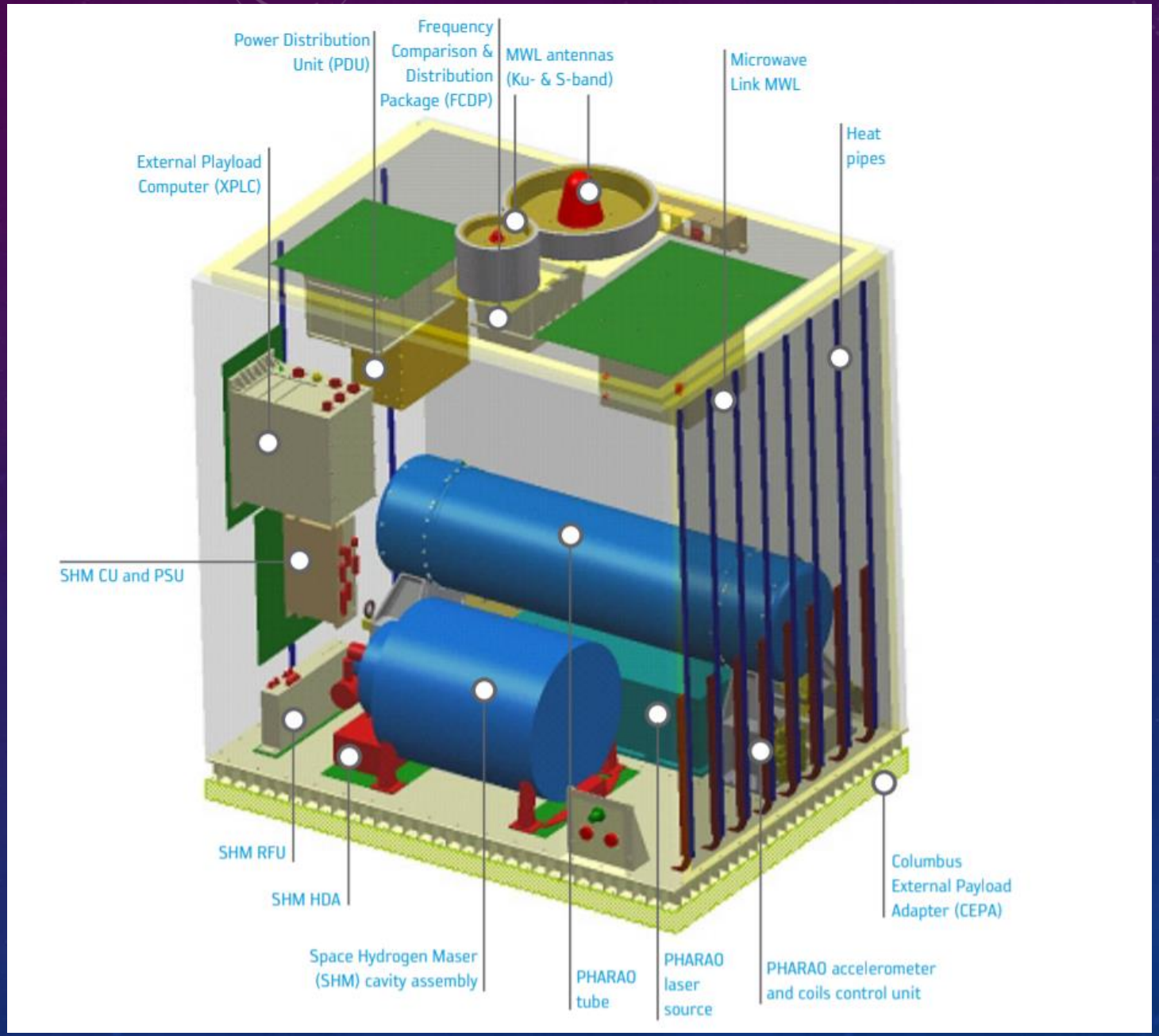
- Luigi Cacciapuoti

  - project scientist pre ACES

- ESA misia ACES: Atomic Clock Ensemble in Space

ACES is developing high stability and accuracy clocks that will be deployed on-board the International Space Station. From there, the ACES clock signal will be compared to the best clocks on the ground to perform a precision measurement of the Einstein's gravitational time dilation and for Standard Model Extension tests.

- 16. jún 2021, 15:00


Power Distribution Unit (PDU)
Frequency Comparison & Distribution Package (FCDP)
MWL antennas (Ku- & S-band)
Microwave Link MWL
Heat pipes
External Playload Computer (XPLC)
SHM CU and PSU
SHM RFU
SHM HDA
Space Hydrogen Maser (SHM) cavity assembly
PHARAO tube
PHARAO laser source
PHARAO accelerometer and coils control unit
Columbus External Payload Adapter (CEPA)

MISSION OBJECTIVES ACES PERFORMANCE	
Test of a new generation of space clocks	
Cold atoms in a micro-gravity environment	Study of cold atom physics in microgravity.
Test of the space cold	PHARAO performances: frequency stability better than 3 x 10-16 clock PHARAO at one day and accuracy at the 10-16 atom level. The short-term frequency stability will be evaluated by direct comparison to SHM. The long term stability and the systematic frequency shifts will be measured by comparison to ultra-stable ground clocks.
Test of the Space Hydrogen Maser SHM	SHM performances: frequency stability better than 2.1 x 10-15 at 1,000 s and 1.5 x 10-15 at 10,000 s. The medium term frequency instability will be evaluated by direct comparison to ultra-stable ground clocks. The long-term stability will be determined by the on-board comparison to PHARAO.
Precise frequency transfer	
Test of the MWL performance	Time transfer stability will be better than 0.3 ps over one ISS pass, 6 ps over 1 day, and 23 ps over 10 days.
Time and frequency comparisons between ground clocks	Common view comparisons will reach an uncertainty level below 1 ps per ISS pass. Non common view comparison will be possible at an uncertainty level of: 2 ps for τ = 1,000 s 5 ps for τ = 10,000 s 20 ps for τ = 1 day
Absolute synchronisation of ground clocks	Absolute synchronisation of ground clock time scales with an uncertainty of 100 ps.
Contribution to atomic time scales	Comparison of primary frequency standards with accuracy at the 10-16 level.
Fundamental physics tests	
Measurement of the gravitational red shift level	The uncertainty on the gravitational red-shift measurement will be below 50 x 10-6 for an integration time corresponding to one ISS pass (~ 300 s). With PHARAO full accuracy, uncertainty will reach the 2x 10-6.
Search for a drift of the fine structure constant with different atoms	Time variations of the fine structure constant α can be measured at the level of precision α-1 x dα / dt < 1 x 10-16 year-1. The measurement requires comparisons of ground clocks operating.
Search for Lorentz transformation ground of SME	Measurements can reach a precision level of $\delta c / c \approx 10\text{-}10$ in the search for anisotropies of the speed of light. These measurements rely on the time stability of SHM, PHARAO, MWL, and clocks over one ISS pass.

TUKE SPACE FORUM

- Mark Hofstadter
  - Planetary Scientist working at NASA's Jet Propulsion Laboratory
  - Rosetta MIRO Principal Investigator

- Missions to the giant planets
  - najmä o misiách k Uránu a Neptúnu

- 30. jún 2021, 16:00

jpl.nasa.gov/missions/microwave-instrument-for-the-rosetta-orbiter-miro

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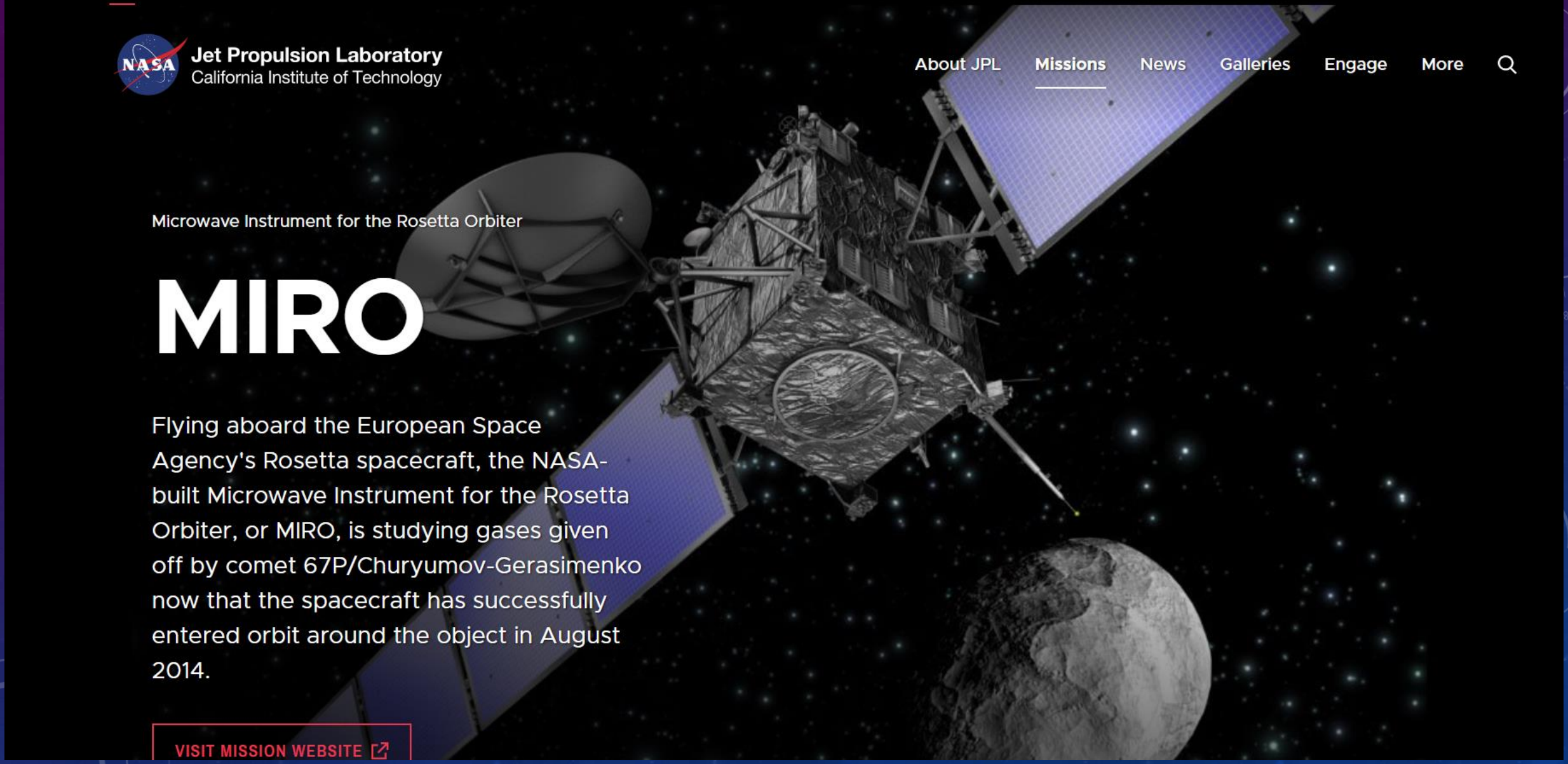

Microwave Instrument for the Rosetta Orbiter

MIRO

Flying aboard the European Space Agency's Rosetta spacecraft, the NASA-built Microwave Instrument for the Rosetta Orbiter, or MIRO, is studying gases given off by comet 67P/Churyumov-Gerasimenko now that the spacecraft has successfully entered orbit around the object in August 2014.

VISIT MISSION WEBSITE

TUKE SPACE FORUM

Open Access Article

The "Emerging" Reality from "Hidden" Spaces

by **Richard Pincak** [1,*], **Alexander Pigazzini** [2,3], **Saeid Jafari** [4] and **Cenap Ozel** [5]

[1] Institute of Experimental Physics, Slovak Academy of Sciences, 043 53 Kosice, Slovakia
[2] IT-Impresa srl, 20900 Monza, Italy
[3] Mathematical and Physical Science Foundation, 4200 Slagelse, Denmark
[4] College of Vestsjaelland South, Herrestraede 11, and Mathematical and Physical Science Foundation, 4200 Slagelse, Denmark
[5] Department of Mathematics, King Abdulaziz University, Jeddah 21589, Saudi Arabia
* Author to whom correspondence should be addressed.

Academic Editor: Antonino Del Popolo

Universe **2021**, *7*(3), 75; **https://doi.org/10.3390/universe7030075**

Received: 21 February 2021 / Revised: 16 March 2021 / Accepted: 16 March 2021 / Published: 23 March 2021

(This article belongs to the Section **Cosmology**)

SPRACOVANIE DÁT Z KOZMICKÉHO VÝSKUMU

DIPLOMOVÉ A PHD. PRÁCE SPOJENÉ S ASTROFYZIKÁLNYM VÝSKUMOM NA KPI FEI TUKE

- Aktuálne 2 bežiace PhD. práce, plus jedna relatívne nedávno ukončená
- Desiatky úspešne ukončených dipolomových prác od roku 2012
  - najviac prác zameraných na JEM-EUSO experiment

JEM-EUSO EXPERIMENT