MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

SELF-EVALUATION REPORT MODULE 3

EVALUATED UNIT: Institute of Experimental and Applied Physics, Czech Technical University

FORD: 1. Natural Sciences

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

MODUL 3 SOCIAL RELEVANCE

SOCIAL RELEVANCE / SOCIAL BENEFIT OF THE EVALUATED UNIT[1]

3.1 General self-assessment of the social benefit of R&D&I in the fields of research at the evaluated unit, and of the evaluated unit as a whole

The evaluated unit gives a concise, general but informative account of the benefit of R&D&I in the fields in the 2014–2018 reporting period.

Self-evaluation: IEAP CTU in Prague is a university research institute covering a broad range of fundamental and applied research (subatomic, particle and astrophysics; biology and medicine; materials research). Research activities support direct and intensive cooperation with industry (establishment of a successful spin-off company, common patents, licences, carrying out clients' orders – e.g. mutual cooperation with ATEKO company, which delivered facilities valued at more than EUR 3.2 mil.), reciprocal cooperation with international partners (ESA, NASA, CERN, JINR, underground laboratories, etc.), recruitment of accomplished researchers from abroad for R&D in the Czech Republic (at present, 24 foreign researchers out of a total of 84 employees), professional education of Czech and foreign students (master and PhD theses; cooperation with the Jablotron company in developing the MX-10 educational kit based on pixel detectors) and the organization of international summer schools (e.g. the Pontecorvo neutrino summer school) and international conferences (MEDEX'15, MEDEX'17).

HTML links to additional documentation:

1) Summer schools: http://theor.jinr.ru/~neutrino15, http://theor.jinr.ru/~neutrino17

2) Conferences: http://medex17.utef.cvut.cz/index.html

3) Web page of MX-10: http://www.particlecamera.com/index.php

4) Web page of spin-off company: https://advacam.com/company

APPLIED RESEARCH PROJECTS

3.2 Applied research projects [2]

[1] *In accordance with Section 22(1) of Act No 111/1998 on universities, amending certain acts (the Universities Act), as amended.*

[2] *Under Section 2(1)(b) of Act No 130/2002, applied research is theoretical and experimental work aimed at gaining new knowledge and skills for the developing of new or substantially improved products, processes or services; applied research includes industrial research or experimental development, or a combination of both. Under Article 2 of Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, industrial research means planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services, or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of component parts of complex systems, and may include the construction of prototypes in a laboratory environment or in an environment with simulated interfaces to existing systems as well as of pilot lines, when necessary for the industrial research and notably for generic technology validation; experimental development means acquiring, combining, shaping and using existing scientific, technological, business and other relevant knowledge and skills with the aim of developing new or improved products, processes or services. This may also include, for example, activities aiming at the conceptual definition, planning and documentation of new products, processes or services.*

The evaluated unit presents a maximum of the five most significant (from the perspective of evaluated unit) applied research projects in the 2014–2018 reporting period from the complete list in the appendix (tables 3.2.1 and 3.2.2), particularly with regard to the results achieved or a project's potential for application.

Self-evaluation:

Application-oriented research at IEAP CTU is very intensive (in total, 29 projects in the 2014–2018 period, 6 as the main applicant supported in the Czech Republic (CR), 15 as a co-applicant supported in the CR, 3 supported from abroad as the main applicant, and 5 supported from abroad as a co-applicant). The total financial support for these projects was in excess of CZK 186 mil. (approximately EUR 7.4 mil.). We have selected the 5 most important projects in terms of their potential for application:

1) LM2015072 – this project is in support of the research infrastructure provided by the Ministry of Education, Youth and Sports (MEYS) connected with activities in the deep underground laboratory in Modane (France). The project covers maintenance and construction of the infrastructure in the LSM. Czech technological companies (ATEKO, NUVIA etc.) are strongly involved in these activities. The project has provided orders for companies worth almost EUR 4 mil. (ATEKO – delivery of anti-radon facilities, NUVIA – common patents and orders worth EUR 0.44 mil., CRAC s.r.o. – delivery of clean rooms for EUR 0.2 mil.).

2) Norwegian funds – a project undertaken within the period of 2014–2017, in close cooperation between Czech institutions and Sintef company, focused on R&D on neutron detectors and gamma radiation detectors. The project made a significant contribution to the Czech Republic with its budget, and was evaluated as a project with excellent results.

3) CK RANUS (TE01020445) – an important long-term project based on cooperation among important research institutions in the CR (IEAP CTU, Charles University, University of Defence, National Radiation Protection Institute) and the most important detector production companies and operators of nuclear facilities (NUVIA, CRYTUR).

4) ESA project MIRAM – this project was a continuation of its successful predecessor, the Satram project (development and installation of a pixel detection unit on the Proba-V satellite in 2013). The aim of MIRAM was to develop a sophisticated new miniaturized radiation monitor using new-generation pixel detectors. This project with huge application potential has been working on R&D of advanced detection technology.

5) ARDENT – this project was based on close cooperation with the CERN to educate young experts in broad areas of the detection of various types of radiation with the use of sophisticated detectors. Training sessions with pixel detectors were organized regularly by IEAP CTU.

HTML links to additional documentation:

1) Web page of RI LSM: http://lsm.utef.cvut.cz

2) Web page of ARDENT: https://ardent.web.cern.ch/ardent.php

3) Web links to patents of IEAP CTU staff accepted in the period of 2014–2018:

a) 2016 – Plastic scintillator on base of polystyrene for detectors (CZ 305762),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-933&plang=EN

b) 2016 – Plastic scintillator on base of polystyrene for detectors (CZ 305761),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-934&plang=EN

c) 2016 – Detector of antineutrinos on base of plastic scintillator (CZ 306053),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2015-359&plang=EN

d) 2016 – Detector of antineutrinos on base of plastic scintillator (CZ 306054),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2015-360&plang=EN

e) 2014 – Detector of ionizing radiation allowing the creation of a continuous digital image (CZ 304899),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2013-669&plang=EN

f) 2015 – Arrangement of transmission display system for detection of radiation (CZ 305373),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-103&plang=EN

g) 2016 – Arrangement of portable display system for radiation detection (US 9,411,373),
https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20150820&DB=&locale=en_EP&CC=US&NR=2015234428A1&KC=A1&ND=4,
http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=9411373.PN.&OS=PN/9411373&RS=PN/9411373

h) 2016 – Setup of coincidence imaging by secondary electrons (CZ 306489),
https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-739&plang=EN

i) 2016 – Single layer 3D tracking semiconductor detector (US 9,297,912),
https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20141113&DB=&locale=en_EP&CC=US&NR=2014332691A1&KC=A1&ND=4,
http://patft.uspto.gov/netacgi/nph-Parser?Sect2=PTO1&Sect2=HITOFF&p=1&u=/netahtml/PTO/search-bool.html&r=1&f=G&l=50&d=PALL&RefSrch=yes&Query=PN/9297912

j) 2016 – A single layer 3D tracking semiconductor detector (JP 6040248),
https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20141218&DB=&locale=en_EP&CC=JP&NR=2014534414A&KC=A&ND=4,
https://www.j-platpat.inpit.go.jp/c1800/PU/JP-2014-534414/937AF7EAB85AF2D789CF3BB8F5B0DADDAABA46DD06BB2F603C9A8AEAB0230791/11/en

k) 2019 – Detector of ionizing radiation enabling a coherent digital image (US 10,168,437),
https://worldwide.espacenet.com/publicationDetails/biblio?II=6&ND=3&adjacent=true&locale=en_EP&FT=D&date=20160721&CC=US&NR=2016209521A1&KC=A1#,
http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=10168437.PN.&OS=PN/10168437&RS=PN/10168437

3.3 Contract research [3]

The evaluated unit briefly comments on revenues from contract research for the 2014–2018 reporting period from the complete list in the appendix (tables 3.3.1 and 3.3.2).

Self-evaluation:
In the reporting period, IEAP CTU applied revenues from contract research in the amount of EUR 255 000. In the Czech Republic, we received EUR 26 760 (payments from ATEKO, NUVIA, NRPI, Institute of Nuclear Research, and Widepix company). A total amount of EUR 228 240 was obtained from abroad (payments from CERN, CEA Saclay, DESY, JINR, University of Erlangen and XIE, Germany). In most cases, we supplied readout systems for progressive detector technologies.

[3] *For a definition of contract research for the purposes of evaluation in the universities sector, see Article 2.2.1 of the Community framework for State aid for research and development and innovation (2014/C 198/01).*

HTML links to additional documentation:

3.4 Revenues from non-public sources (besides grants or contract research) from research work

The evaluated unit briefly comments on revenues for the 2014–2018 reporting period for R&D&I from non-public sources, besides grants or contract research (e.g. licences sold, spin-off revenues, gifts, etc.). It presents a complete list in the appendix (table 3.4.1).

Self-evaluation:
In 2011, the company ADVACAM (formerly Widepix) was founded by five IEAP CTU employees. Based on a licence agreement with IEAP CTU, this spin-off company produces and develops pixel detectors. According to this agreement, the company regularly pays licence fees for detectors that are sold (during the reporting period the licence fees amounted to EUR 120 040). Other licence fees were obtained from CERN, ATEKO, CRYTUR, JABLOTRON, NUVIA and also from the University of West Bohemia (RICE, Pilsen). In total, EUR 188 680 was obtained in this way.

HTML links to additional documentation:

APPLIED RESEARCH RESULTS

3.5 Applied research results with an existing or prospective economic impact on society

The evaluated unit briefly comments on a maximum of the five most significant (from the perspective of the evaluated unit) applied research results that have already been applied in practice, or that will realistically be applied, in the 2014–2018 reporting period from the overview in the appendix (table 3.5.1).

Self-evaluation:
IEAP CTU pays great attention to transferring the results from fundamental research into applications in industry. During the reporting period, IEAP CTU staff prepared as authors 10 patents (2x in USA, 1x in Japan, 7x in CR), 5 software packages, 3 prototypes, 2 industrial patterns and 2 utility patterns. The areas covered by these practical results are very broad, from detection of various types of radiation (including reactor antineutrinos), to defectoscopy and tests on materials towards biology or medicine. We have selected the following results as the most significant:

1) patent – Single layer 3D tracking semiconductor detector (US 9,297,912 B2),

2) patent – Arrangement of portable display system for radiation detection (US 9,411,373),

3) software – Pixelman for Neutron Radiography Detectors (Widepix 4x5 and Multipix system),

4) patent – Detector of ionizing radiation allowing the creation of a continuous digital image (CZ 304899),

5) patent – Plastic scintillator based on polystyrene for detectors (CZ 305761).

The first four of these results are closely connected with IEAP CTU's long-term activities in the R&D of pixel detectors, and have a direct industrial impact through the production performed by spin-off company ADVACAM.

The fifth selected result is a nice example of cooperation between IEAP CTU and NUVIA company. (This result was evaluated among the best results in Module 1 in Natural Sciences by the Research, Development and Innovation Council, which was established by the Government of the CR as a top advisory body. This patent allowed NUVIA company to obtain major contracts – EUR 485 000 for deliveries to CERN; EUR 440 000 for the delivery of scintillating detectors used in neutrino physics.)

HTML links to additional documentation:

1) Spin-off company ADVACAM – https://advacam.com

2) Company NUVIA – https://nuvia.cz/en

3) The web pages of all patents are given in item 3.2

3.6 Significant applied research results with an impact other than an economic one on society

The evaluated unit gives a concise account of a maximum of the five most significant (from the perspective of the evaluated unit) applied research results with an impact other than an economic one on society in the 2014–2018 reporting period (typically results from disciplines in the humanities and social sciences) from the overview in the appendix (table 3.6.1).

Self-evaluation:

IEAP CTU also supports applied research without a direct economic impact. For this section, we have selected the following results: i) a book (the author is young researcher A. Smetana), ii) a textbook with 50 progressive pixel detector tasks, in Czech and English versions, iii) a summer school for students from all over the world (one of the lecturers was Barry Barish, a Nobel Prize winner for the detection of gravitational waves), and iv) the organization of international conferences. The impact of these activities is educational (supporting the knowledge of students). They attract gifted students into research and development, provide new scientific knowledge, support the mobility of early-stage scientists, and advertise Czech research and educational institutions. Last but not least, these activities also have an impact on the promotion of the Czech Republic abroad.

Special attention is given to cooperation with secondary schools, which is a standard part of our activities. During the reporting period, three teachers from secondary schools were partly employed at our institute. Their responsibilities were in connection with two projects: i) introduction of pixel detectors into the teaching process and ii) the CZELTA project (detection of high energy secondary cosmic rays). Both projects were (and still are) successful. They support the interest of gifted secondary school students in science and research through a broad range of activities (physics, mathematics, software, electronics, etc.).

More recently, IEAP CTU obtained MEYS accreditation for teacher education in Progressive Detection Methods in Teaching Subatomic and Particle Physics in Secondary and Basic Schools. These educational courses are regularly organized at IEAP CTU twice per year, with the participation of 15–20 teachers.

HTML links to additional documentation:

1) Summer schools: http://theor.jinr.ru/~neutrino15, http://theor.jinr.ru/~neutrino17

2) Conferences: http://medex17.utef.cvut.cz/index.html

3) Web page of the MX-10 educational kit: http://www.particlecamera.com/index.php

4) Web page of the CZELTA project: http://czelta.utef.cvut.cz/publicweb/?language=en

5) Web page of the textbook written by V. Vícha:
https://eobchod.cvut.cz/e_publication_ctu/e_publication_ctu/experiments_using_pixel_detector_in_tea_ing_nuclear_and_particle_physics-150032066

6) Web page on the book written by A. Smetana:
https://www.springer.com/gp/book/9783319070728

COOPERATION WITH THE NON-ACADEMIC ENVIRONMENT AND TECHNOLOGY TRANSFER

3.7 The evaluated unit's most significant interactions with the non-academic application/corporate sphere

The evaluated unit gives a concise account of the most typical users of its outputs. It explains whether and how it identifies them and how it works with them. It provides examples of a maximum of ten of the most significant interactions with the non-academic environment in the 2014–2018 reporting period.

Self-evaluation:
Users of IEAP results can be divided into several categories: i) our spin-off company ADVACAM; ii) Czech technology companies (ATEKO, NUVIA, CRYTUR, JABLOTRON); iii) foreign technology companies (IDEAS, Norway); iv) national organizations with national competence (National Radiation Protection Institute – NRPI); v) large foreign research infrastructures (e.g. LSM France, CERN); vi) space agencies (ESA, NASA, JAXA). In all cases, our cooperation with these entities has a long-term character. The search strategy is based on the following procedure: i) first contacts are made at conferences or are based on published results; ii) minor project collaboration supported from own financial sources, and later iii) preparation and implementation of a larger joint commercialization project. A special case is our cooperation with the company Jablotron, which is based on the development of the MX-10 educational tool (with a pixel detector), for which the IEAP CTU staff prepared a total of 50 measurement tasks (textbook in Czech and English language versions). The cooperation strategy is based on the division of tasks – IEAP has a major share in development and promotion of e.g. conferences, and is a partner in preparing a product for manufacturing, production and installation. Selected examples:

1) MX-10 – an educational kit based on a pixel detector manufactured by Jablotron,

2) ATEKO – a complex anti-radon facility (see link below),

3) SATRAM – a detector unit based on pixel detectors on the Proba-V satellite (see below),

4) RISESAT – a detector unit based on pixel detectors on the Japanese RISESAT satellite (see below),

5) XIE, CEA – cooperation in the development and production of Canpix and Nanopix cameras,

6) LITE – a detector for NASA on ISS, in cooperation with Univ. of Houston, USA.

HTML links to additional documentation:

1) Manufacturer's reference to the complex anti-radon device:
https://www.ateko.cz/radon-reduction-station-for-lngs-en

2) Links to an article about the SATRAM project:
https://www.czechspace.cz/en/satramtimepix-spacecraft-payload

3) References to an article about the RISESAT project:
https://directory.eoportal.org/web/eoportal/satellite-missions/r/risesat

4) Reference to an article about the detectors for the ISS:
http://www.nasa.gov/feature/nasa-cern-timepix-technology-advances-miniaturized-radiation-detection

3.8 System and support of technology transfer and intellectual property protection (can be extended to the whole university, emphasising the specific features of the evaluated unit)

The evaluated unit gives a concise account of its system of technology transfer. It conducts an evaluation of the quality of its applied research and the effectiveness of technology transfer using the data presented in the appendix (table 3.5.1). This commentary will highlight the number of filed and granted patents (Czech and international) and licences sold.

Self-evaluation:
IEAP CTU has clear and stable rules for technology transfer. The first rule is that we try to patent the results (we employ a patent specialist on a part-time basis). Priority in profiting from the results is given to potential future spin-off companies (without a proprietary relation to IEAP CTU). Practice has shown that most of the patents are produced in cooperation with already existing companies (patents with a clear purpose of use in industry before development work is undertaken). The list of patents contains 2 patents in the USA, 1 in Japan, and 7 in the Czech Republic. Of these, 2 from the USA, 1 from Japan and 3 from the Czech Republic were part of a licensing agreement with the spin-off company ADVACAM. Two other patents registered in the Czech Republic were produced in direct cooperation with the NUVIA company (improvement of the properties of the scintillation detector, the benefit for the company comes from 2 contracts – for EUR 440 000, and for EUR 485 000). The last two patents registered in the Czech Republic (reactor antineutrino detector) were produced in cooperation with NUVIA, but they do not yet have a specific use (their potential is great, as equipment based on this technology should have the ability to control illegal handling of fuel in nuclear reactors).

HTML links to additional documentation:

3.9 Strategy for setting up and support of spin-off firms or other forms of commercialization of R&D&I results (can be extended to the whole university, emphasising the specific features of the evaluated unit)

The evaluated unit gives a concise account of the practical use of its intellectual property in the form of setting up spin-off firms or other forms of commercialising R&D&I results (both with or without the participation of the university) established by the evaluated unit (university), another entity controlled by the evaluated unit (university), or an employee of the evaluated unit, presenting the model for their functioning and coordination, and control of intellectual property management of the evaluated unit (university).

Self-evaluation:
IEAP CTU's strategy is clearly defined. If IEAP's employees express interest in setting up a spin-off company, support is given. The principle is to conclude a license agreement (on what will be provided to the company from our know-how, and for what and how much the company will pay into the IEAP CTU budget, licence fees, and, in some cases, conditions for use of the equipment of the institute). The use of intellectual property by other companies is based on a concluded contract, in which the rules for the use of results are defined.

HTML links to additional documentation:

1) Company ADVACAM – https://advacam.com

RECOGNITION BY THE SCIENTIFIC COMMUNITY

3.10 The most significant individual awards for R&D&I

The evaluated unit presents a maximum of ten examples of the most significant R&D&I awards received (in the Czech Republic and in other countries) in the 2014–2018 reporting period.

Self-evaluation:

1) Erik H. M. Heijne (together with Prof. R. Klanner from the University of Hamburg and Dr. G. Lutz from the Max Planck Institute for Extraterrestrial Physics in Munich) received the European Physics Society (EPS) Award "High Energy and Particle Physics Prize" in 2017 for an outstanding contribution to the development of silicon strip detectors.

2) IEAP employee, Charles University MFA graduate Petr Mánek, was a three-time winner of the IT SPY competition (an elite academic competition which each year gives awards for the best master theses in the field of IT). In 2018, his thesis was chosen from the theses of 1607 graduates of 17 different faculties in Czechia and Slovakia. His thesis was on employing a pixel detector in a Compton camera. P. Mánek is continuing his PhD studies at UCL (London) and as an IEAP employee.

3) Jan Žemlička received the Best Poster Award at the IWORID conference in 2018 for his contribution under the title "Absorption grid based on CT X-ray phase contrast using a Timepix detector".

4) Vladimír Vícha (an employee of a secondary grammar school in Pardubice and of IEAP CTU) won the Prize for the Best Teacher in 2016. This prize is awarded by the Neuron Foundation and the Learned Society of the Czech Republic.

5) At the end of September 2015, the Rector of Comenius University in Bratislava awarded 19 Silver Medals to selected top scientific teams of the university. In the field of atomic, nuclear and elementary particle physics, only one team received an award, for Physics of Massive Neutrinos, Underground Laboratories, and Nuclear Structure. The team has been selected twice by the Slovak government as the top scientific team (in 2015 and 2017). Its head, prof. RNDr. Fedor Šimkovic, CSc., and members: Mgr. Rastislav Hodák, Ph.D., Mgr. Lukáš Fajt and Mgr. Miroslav Macko are also employees of IEAP CTU. An article about the scientific work of this top team at IEAP CTU was published in the Comenius University periodical "Our University".

6) Ing. Miloslav Vobecký, CSc. – received the Vladimír Majer Medal: This medal is awarded by a panel of Nuclear Chemistry experts from the Czech Chemical Society to persons who have contributed significantly to the development of nuclear chemistry or who have contributed decisively to the development of some areas of nuclear chemistry. Dr. Vobecký received the award

in 2015 for his scientific results in the field of instrumental analytical methods and for the development of this field in the Czech Republic and former Czechoslovakia.

HTML links to additional documentation:

1) Links to materials related to prof. Heijne's award:
http://www.utef.cvut.cz/recent-events/2017-05-29/erik-heijne-(ieap)-awarded-by-the-2017-high-energy-and-particle-physics-prize,
http://eps-hepp.web.cern.ch/eps-hepp/hepp-prize-awards.php,
https://eps-hepp.web.cern.ch/eps-hepp/PrizeAnnouncements/hep2017/LongCitation_EPSHEP_v170510-2.pdf

2) Links to the award for P. Mánek:
http://www.utef.cvut.cz/zpravy/2018-12-06/it-student-project-of-the-year,
https://www.itspy.cz/en/galerie-nejlepsich/projekty-2018

3) Link to the award for V. Vícha:
http://www.utef.cvut.cz/recent-events/2016-05-23/the-prize-for-educators-awarded-by-the-learned-society-of-the-czech-republic-and-by-the-science-supporting-endowment-fund-neuron

4) Links to the award for the team that worked on "Physics of massive neutrinos, underground laboratories and structure of nuclei":
http://www.utef.cvut.cz/in-media/2017-02-27/our-employees-are-members-of-an-excellent-team,
https://www.euraxess.sk/en/main/info/working/research-in-slovakia/excellent-research-teams

5) Link to the award for M. Vobecký:
http://csch.cz/en/about-society/awards/vladimir-majer-medal

3.11 Recognition by the international R&D&I community

The evaluated unit provides the following information / examples demonstrating recognition by the international scientific community in the 2014–2018 reporting period, with a commentary:
It presents a maximum of ten examples of its academic staff's participation on the editorial boards of international scientific journals (e.g. editor, member of the editorial board) in the appendix (table 3.11.1),
it presents a maximum of ten examples of the most significant invited lectures by the evaluated unit's academic staff abroad in the appendix (table 3.11.2),
it presents a maximum of ten examples of the most significant lectures by foreign scientists and other guests relevant to the R&D&I field in the appendix (table 3.11.3),
it presents a maximum of ten examples of the most significant elected memberships of professional societies (table 3.11.4).

Self-evaluation:
The most relevant entries from tables 3.11.1–4 are presented:

1) S. Pospíšil – outstanding professor at the University of Montreal (2009–2018)

2) F. Lehar, E. A. Strokovsky, C. Wilkin. "Experimental physics with polarized protons, neutrons and deuterons". Published in 2015 by the Czech Technical University in Prague, First edition, 220 pages, ISBN 978-80-01-05692-9

3) Presentation by B. Barish (CALTECH)

4) Presentation by P. Vogel (CALTECH)

5) Membership of I. Štekl in APPEC (representative of the Czech Republic)

6) Membership of S. Pospíšil in the Scientific board of JINR Dubna

7) Invited talk – S. Pospíšil, A look back on the development of Medipix/Timepix detectors for noiseless tracking of neutrons and charged particles, IWORID 2018, Sweden

8) Invited talk – E. Heijne, Past and future of semiconductor pixel detectors, IWORID 2018, Sweden

9) F. Šimkovic – membership in the editorial board of the magazine Atoms, Multidisciplinary Digital Publishing Institute (MDPI), Basel, Switzerland

10) Invited talk – S. Pospíšil, Application of semiconductor pixel detectors for high resolution X-ray and neutron imaging and for particle tracking, Summer School on Neutron Detectors and Related Applications NDRA, 2018, BKF, TIFPA, INFN, University of Trento, Trento, Italy.

HTML links to additional documentation:

1) Web page of the book written by F. Lehar, E. A. Strokovsky, and C. Wilkin:
https://eobchod.cvut.cz/ctu_specialized_literature/book/experimental_physics_with_polarized_protons_neutrons_and_deuterons-150029610

POPULARISATION OF R&D&I

3.12 The most significant activities in the popularisation of R&D&I and communication with the public

The evaluated unit gives a concise account of its main activities in the area of popularisation of R&D&I and communication with the public in the 2014–2018 reporting period, and presents a maximum of ten examples that it considers the most significant.

Self-evaluation:

1) On October 13, 2017, a seminar under the title "Silicon for Science" took place in the Balling's Hall of the National Library of Technology in Prague. Dr. Erik Heijne introduced the problem of using silicon in elementary particle physics. The lecture was attended by the professional community, students, and also by members of the general public interested in cutting-edge technology to push the boundaries of our knowledge of the world around us (Pražská technika 4/2017, pp. 8–9).

2) Guest of the Leonardo Studio: physics teacher and popularizer Vladimír Vícha (Gymnázium Pardubice, IEAP) (2014).

3) Guest of the Leonardo Studio: Karel Smolek spoke about the physics of elementary particles and astroparticle physics (2016).

4) Interview and video recording with V. Vícha on the occasion of receiving the Learned Society Award (the Czelta project – detection of cosmic rays at secondary schools – is also mentioned).

5) Stanislav Pospíšil spoke on Czech Radio Plus (CRO Plus) about space projects in which IEAP is involved (30.05.2018).

6) In August 2014, Czech Television recorded the first part of the Mystery Hunters cycle on science and technology. The cycle was designed for children from the higher classes of elementary schools and multi-year grammar schools, and was broadcast on channel CT:D. This episode was called Energy of Stone. It concerned radioactivity, and the filmmakers approached IEAP CTU because of their interest in the use of the MX-10 detector to visualize radioactivity. The recording was attended

by Vladimír Vícha, who prepared several experiments suitable for the age of the children watching the program.

7) Regular lecture cycles at the University of the Third Age (2 courses, participation of about 30–40 attenders).

8) Co-organization of the seminar on Czechoslovak nuclear and particle physics: between JINR and CERN, held on 23 October 2018 in the Presidium building of AS CR (Národní 3, Prague 1). The seminar was dedicated to the sixtieth anniversary of two international institutes, JINR (Joint Nuclear Research Institute in Dubna) and CERN (European Organization for Nuclear Research in Geneva). Z. Janout and I. Štekl presented a philatelic exhibition – exhibits on JINR and the microworld, world of smallest dimensions (postage stamps, commemorative postmarks, FDC, postcards, a collection of letter envelopes from prominent physicists including Nobel Prize laureates).

9) Organization of the issue of the postage stamp "60 years of JINR" (2016, I. Štekl, Z. Janout).

HTML links to additional documentation:

1) Links to materials related to prof. Heijne's seminar:
http://www.utef.cvut.cz/recent-events/2017-10-13/lecture-of-dr-heijne-silicon-for-science

2) Link to the interview with V. Vícha:
http://www.utef.cvut.cz/recent-events/2016-05-23/the-prize-for-educators-awarded-by-the-learned-society-of-the-czech-republic-and-by-the-science-supporting-endowment-fund-neuron
(the interview is in Czech, abstract is in English)

3) Links to the seminar on "Czechoslovak Nuclear and Particle Physics: between JINR and CERN":
http://www.sujv.cz/en/index.php?Ns=406&id=1000092,
http://seminarcsjf.usd.cas.cz/?page_id=134 (English abstracts of seminar contributions)

4) Reference to the issue of the postage stamp marking the 60th anniversary of JINR :
http://www.collectorzpedia.com/2016/03/czech-republic-post-stamp-2016-60-years-of-joint-institute-for-nuclear-research-in-dubna-COLLECTORZPEDIA.html

APPENDICES (TABLES)

3.2 Applied research projects

3.2.1 Projects supported by a provider from the Czech Republic

As the beneficiary						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
TACR	**A device for achieving extremely low radon concentration**	**90.5**	**93.8**			
TACR	**Technologies for obtaining clean aboveground spaces with minimal radon activity and underground spaces with suppression of all types of ionizing radiation**	**41.3**	**108.1**	**108.0**	**109.0**	

MEYS	**Project LSM/ULISSE – contribution to the expansion of large research infrastructure of European importance (underground laboratory and construction of the SuperNEMO detector, continuation of the Czech participation)**	**307.7**	**307.7**			
MEYS Norwegian funds	**Advanced Detectors for Better Awareness of Neutrons and Gamma rays in Environment**	**178.2**	**346.8**	**319.3**	**125.0**	
MEYS	**LSM Underground Laboratory – participation of the Czech Republic**			**307.7**	**227.1**	**256.9**
MEYS	**Van de Graaff Accelerator – Tunable source of monoenergetic neutrons and light ions**			**162.6**	**135.2**	**140.6**
Total		**617.7**	**856.4**	**897.6**	**596.3**	**397.5**

As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
Ministry of Culture	**New mobile devices, laboratory and methodology for non-destructive material analysis of visual arts in the context of cultural heritage protection**	**97.7**	**101.0**			
Ministry of Culture	**Mobile X-ray device for displaying layered painting and polychromy of old art works and advanced tomographic analysis of polychromatic sculptures**					**99.0**
TACR	**Advanced techniques of ionizing radiation detection**	**48.7**				
TACR	**Workplace for non-destructive testing, diagnostics and 3D imaging using neutron radiography and tomography**	**33.5**	**33.5**			
TACR	**Development of new scintillation detectors and advanced testing technology**	**66.9**				
TACR	**Widescreen X-ray imaging system with Timepix detector**	**15.6**	**19.0**	**19.0**	**19.0**	
TACR	**Advanced X-ray radiography techniques for natural sciences and industry**	**34.6**	**80.8**	**80.8**	**80.8**	
TACR	**Center for the Development of Technologies for Nuclear and Radiation Safety: RANUS – TD**	**148.9**	**148.9**	**148.9**	**141.8**	**148.9**
TACR	**Center for Advanced Nuclear Technologies (CANUT)**	**21.0**	**21.2**	**22.6**	**15.6**	**10.8**

MEYS	**Quantitative inspection of complex composite aeronautical parts using advanced X-ray techniques**	**41.0**	**34.7**			
MEYS	**InovaNET – T. Slavíček**	**85.7**				
MEYS	**InovaNET – Tailor**	**103.4**				
Ministry of Interior	**Radiation measurement network for institutions and schools to ensure prompt information and increase the safety of citizens of towns and villages (RAMESIS)**		**12.7**	**64.4**	**54.2**	**45.7**
MEYS	**Research infrastructure for experiments at CERN**			**117.2**	**100.7**	**101.2**
TACR	**Material and technological research of scintillation detectors**					**41.5**
MEYS	**OP3V – HRAWARD**					**1.9**
Total		**697.0**	**451.8**	**452.9**	**412.1**	**350.0**

3.2.2 Projects supported by a provider from another country

As the beneficiary						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
ESA	**SATRAM**	**143**	**62**			
ESA	**Earth application of the Timepix space radiation monitor in a centralized network**			**56**	**24**	
ESA	**MIRAM – Miniaturised Radiation Monitor**					**120**
Total		**143**	**62**	**56**	**24**	**120**
As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018

EU – 7. RP	**QUICOM Quantitative inspection of complex composite aeronautic parts using advanced X-ray techniques**	**84**	**86**			
Marie Curie ITN project (CERN)	**ARDENT**	**174**	**259**			
H2020	**BrightnESS**		**15**	**63**	**64**	**32**
	NGS Duo				**93**	**74**
	Print3D Contact				**50**	**13**
Total		**258**	**360**	**63**	**207**	**119**

3.3 Contract research

3.3.1 Research work contracted by a client from the Czech Republic

Client	Research title	Revenues (EUR thousand)				
		2014	2015	2016	2017	2018
ATEKO	**sensitive Rn detection**		**1.6**	**2.6**		**0.3**
IEEE (CR)	**seminars**				**0.6**	
Physical Institute, AS CR	**delivery of readouts**	**1.8**				
NRPI	**Expert opinions/reports, measurements**	**9.5**	**9.5**			
Institute of Nuclear Physics	**calculation of Rn filtration**		**1.6**			
Widepix, s.r.o.	**calibration of TPX detectors**	**1.3**				
Total		**12.6**	**12.7**	**2.6**	**0.6**	**0.3**

Note: List and describe contract research work with the revenue for the calendar year in question.

3.3.2 Research work contracted by a foreign client

Client	Research title	Revenues (EUR thousand)				
		2014	2015	2016	2017	2018
CERN	**delivery of detection system**	**7.3**	**1.8**			

Saclay	**delivery of readouts**	**3.7**		**1.9**		
DESY	**delivery of readouts**	**2.1**				**3.4**
Italy	**delivery of readouts**		**1.9**			
JINR	**Summer school**				**29.9**	**10**
JINR	**delivery of TPX detectors**					
Italy	**delivery of readouts**	**1.9**	**3.7**			
Erlangen	**delivery of readouts**	**3.6**				
XIE	**delivery of USB readout**	**63.5**	**27.1**	**58.0**		
Total		**82.1**	**34.6**	**59.9**	**29.9**	**13.4**

Note: List and describe contract research work with the revenue for the calendar year in question.

3.4 Revenues from non-public sources (besides grants or contract research)

3.4.1 Overview of revenues from non-public sources raised for the 2014–2018 reporting period

Revenue type	Revenues (EUR thousand)				
	2014	2015	2016	2017	2018
licence fee CERN	**1.3**		**4.5**		**5.6**
licence fee ADVACAM	**28.3**	**10.3**	**36.1**	**21.6**	**19.1**
licence fee ATEKO			**4.1**		**3.4**
licence fee Crytur		**1.0**			
licence fee Jablotron	**19.0**	**8.2**	**5.2**	**5.3**	**4.2**
licence fee NUVIA			**0.5**	**0.4**	
licence fee RICE (UWB, Pilsen)		**1.7**		**1.8**	
Total	**48.6**	**21.2**	**50.4**	**29.1**	**32.3**

Note: List funds for R&D&I from non-public sources, besides grants or contract research (e.g. licences sold, spin-off revenues, gifts, etc.) in each calendar year.

3.5 Applied research results with an economic impact on society

3.5.1 Overview of applied research results in the 2014–2018 reporting period

List and describe the results that have already been applied in practice, or that will realistically be applied, with an existing or prospective economic impact on society. Under "patents" and "licences sold", list all the results; under other results list a *maximum* of five items. Unless otherwise specified below, the definition of a result must correspond to the definitions under the Methodology for Evaluating Research Organisations and Research, Development and Innovation Purpose-Tied Aid Programmes, Appendix No 4: Definitions of Types of Results.

Results	Year	Title
European patent		
American patent	**2016**	**Single layer 3D tracking semiconductor detector (US 9,297,912 B2)**
American patent	**2016**	**Arrangement of portable display system for radiation detection (US 9,411,373)**
Czech licenced patent	**2016**	**Method of coincidence imaging using secondary electrons and a device for executing this method (CZ 306489)**
Czech licenced patent	**2016**	**Arrangement of portable display system for radiation detection (CZ 305373)**
Czech licenced patent	**2014**	**Ionizing radiation detector enabling creation of continuous digital image (CZ 304899)**
Czech licenced patent	**2016**	**Plastic scintillator-based antineutrino detector (CZ 306053)**
Czech licenced patent	**2016**	**Plastic scintillator-based antineutrino detector (CZ 306054)**
Czech licenced patent	**2016**	**Plastic scintillator on the basis of polystyrene used as detectors (CZ 305761)**
Czech licenced patent	**2016**	**Polystyrene plastic scintillator used as detectors (CZ 305762)**
Other foreign patents	**2016**	**Single layer 3D tracking semiconductor detector (JP6040248, Japan)**
Licences sold		**in total 7, see table 3.4.1.**
Significant analyses / surveys / studies		**not relevant**

Spin-off with a stake held by the evaluated unit		**not relevant**
Spin-off with no stake held by the evaluated unit		**company ADVACAM, s.r.o**
Prototypes		
	2014	**Unique high volume scintillating detector**
	2016	**Detector of multi-component radiation field**
Varieties and breeds		**not relevant**
Other		
Utility model	**2018**	**Experimental system for phase-sensitive radiography (CZ 31511)**
Industrial Design	**2016**	**Detector for multi-component radiation field (Industrial Design CZ 36858)**
Industrial Design	**2017**	**Spectrometric imaging unit (Industrial Design CZ 36946)**
Software	**2015**	**Pixelman for Neutron Radiography Detectors (Widepix 4x5 and Multipix system)**
Software	**2015**	**Software for reconstruction of radiographic and tomographic measurements**

Note: “Licence” refers to a licence for a result of R&D&I in the broadest sense of the word (licences for patents, utility models, industrial designs; copyright licences for software and other works, and any other licences).

For the purposes of this methodology, a “spin-off” is a juridical person established to commercialise knowledge, usually with the inclusion/transfer of the rights to this knowledge to such juridical person. List all instances of legal persons.

3.6 Significant applied research results with an impact other than an economic one on society

3.6.1 Overview of applied research results for the 2014–2018 reporting period with an impact other than an economic one on society

Result type	Name	Anticipated impact
Book (2014)	**Adam Smetana: Electroweak Symmetry Breaking: By Dynamically Generated Masses of Quarks and Leptons**	**The book has also been published in electronic form with the following information: ISBN (e-book): 978-3-319-07073-5, ISSN (e-book): 2190-5061. Publisher Springer. The book presents new scientific knowledge.**
University textbook (EN, 2017)	**Vladimír Vícha: Experiments Using a Pixel Detector in Teaching Nuclear and Particle Physics**	**Publisher: Česká technika – nakladatelství ČVUT, ČVUT v Praze, ISBN 978-80-01-06108-4. The scripts extend the area of pixel detector users to students not only from universities but also from the ranks of high school students and teachers.**
Summer school (2017)	**The VII International Pontecorvo Neutrino Physics School**	**The regular summer school was held in 2017 at IEAP CTU (co-organizers MFF UK, Comenius University, Bratislava, and JINR Dubna). The event was attended by 22 lecturers and 65 students from all over the world. The impact of the event is educational in an important area of science – neutrinos, dark matter, astrophysics. It includes support for mobility. Student contributions were published as an anthology.**
Organization of a conference (2017)	**Workshop on Calculation of Double-Beta-Decay Matrix Elements (MEDEX'17)**	**An international conference regularly held (every two years, since 1997) at the Czech Technical University in the field of theory and experiments of neutrino physics and astrophysics, with the participation of 50–60 participants from all over the world. The impact is scientific and supports mobility.**
Book (2015)	**František Lehar, Eugene A. Strokovsky, Colin Wilkin: Experimental physics with polarized protons, neutrons and deuterons**	**Published in 2015 by the Czech Technical University in Prague, 220 pages, ISBN 978-80-01-05692-9. The book presents new scientific knowledge.**

Note: List and describe a maximum of five results (in line with the Definitions of Types of Results) that have already been applied in practice, or that will realistically be applied. These are typically results from disciplines in the humanities and social sciences, for which you should briefly describe their anticipated impact.

3.11 Recognition in the international R&D&I community

3.11.1 Participation of the evaluated unit's academic staff on the editorial boards of international scientific journals in the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Title, publisher, city(-ies) and country(-ies) of origin of the scientific journal

Fedor Šimkovic, prof. Mgr. CSc.	**journal "Atoms", Multidisciplinary Digital Publishing Institute (MDPI), Basel, Switzerland**
Fedor Šimkovic, prof. Mgr. CSc.	**Československý časopis pro fyziku, AV ČR, Praha, Czech Republic**

Note: List a maximum of ten examples of academic staff's participation on the editorial boards of international scientific journals (e.g. editor, member of the editorial board, etc.).

3.11.2 The most significant invited lectures by the evaluated unit's academic staff at institutions in other countries during the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Invited lecture title	Name of the host institution, conference or other event
Jan Žemlička, Ing. Ph.D.	**X-Ray µCT imaging with the Widepix photon counting detector**	**microCT Workshop, 22.11.2017, Jena**
Jan Dudák, Ing.	**Sub-micron resolution X-ray imaging using the Timepix large-area photon counting detector**	**ETCMOS 2018: Emerging Technologies in Communications, Microsystems, Optoelectronics and Sensors, 09.–11.05.2018**
Miroslav Macko, Mgr. PhD.	**Search for Neutrino-less Double Beta Decay with the SuperNEMO Experiment**	**Karlsruhe Institute of Technology, Hermann-von-Helmholtz-Platz 1. 2018-06-12**
Erik Heijne, Dr.	**Past and future of semiconductor pixel detectors**	**Conference IWORID 2018**
Stanislav Pospíšil, Ing. DrSc.	**A look back on the development of Medipix/Timepix detectors for noiseless tracking of neutrons and charged particles**	**Conference IWORID 2018**
Jun Terasaki, PhD.	**Neutrinoless double-beta decay matrix elements with the QRPA method**	**Institute for Nuclear Theory, June 13 – July 14, 2017, Seattle, US**
Fedor Šimkovic, prof. RNDr. CSc.	**Massive Neutrinos in Nuclear Processes (1 hour lecture); Double beta decay nuclear matrix elements (1 hour lecture); Quasiparticle Random Phase Approximation: Formalism (1 hour lecture)**	**Laboratori Nazionali del Gran Sasso, June 25–26, 2015**
Jun Terasaki, PhD.	**An examination of the consistency of the QRPA approach to double-beta decay**	**Conference "Nuclear Theory in the Supercomputing Era – 2018", October 29 – November 2, 2018, Daejeon, Republic of Korea**

Stanislav Pospíšil, Ing. DrSc.	**Neutrons: production, detection and application**	**Summer School on Neutron Detectors and Related Applications NDRA, 2014, University of Trento, Italy**
Stanislav Pospíšil, Ing. DrSc.	**Application of semiconductor pixel detectors for high resolution X-ray and neutron imaging and for particle tracking**	**Summer School on Neutron Detectors and Related Applications NDRA, 2018, BKF, TIFPA, INFN, University of Trento, Trento, Italy**

Note: List a maximum of ten examples.

3.11.3 The most significant lectures by foreign scientists and other guests relevant to the R&D&I field at the evaluated unit during the 2014–2018 reporting period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title
Barry Barish, prof.	**California Institute of Technology (CALTECH)**	**Observation of gravitational waves**
Petr Vogel, Ph.D.	**California Institute of Technology (CALTECH)**	**Reactor Spectra and Anomaly**
Jochen Greiner, PD Dr. rer. nat. habil.	**Max-Planck-Institut für extraterrestrische Physik, München, Germany**	**New Twists in Our Understanding of Gamma-Ray Bursts**
Alan Litke, prof.	**University of California, Santa Cruz**	**What Does the Eye Tell the Brain?**
Jakob Salfeld-Nebgen, Ph.D.	**Massachusetts Institute of Technology (USA)**	**Precision measurements at the LHC: Luminosity and W/Z cross section measurements with the CMS Experiment**
Thomas Brunner, prof.	**McGill University (Canada)**	**nEXO – Searching for Neutrinoless Double-Beta Decay in 136Xe**
Pier Giorgio Rancoita, prof.	**Istituto Nazionale di Fisica Nucleare (INFN) sez. Milano-Bicocca**	**Screened Relativistic Treatment of Displacement Damage and Space Radiation Environment**
Hendrik van Eerten, Dr.	**Max-Planck-Institut für extraterrestrische Physik, Garching**	**Gamma-ray burst afterglows**

Note: Relevant solely for the R&D&I field. List a maximum of ten examples.

3.11.4 The most significant elected membership in foreign of professional societies relevant to the R&D&I field at the evaluated unit during the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Name of professional society	Type of membership
Stanislav Pospíšil, Ing. DrSc.	**Scientific Board JINR**	**Elected position, international organization**
Ivan Štekl, doc. Ing. CSc.	**ESFRI SWG Energy**	**CR representative**
Ivan Štekl, doc. Ing. CSc.	**APPEC**	**CR representative**
Yuta Orikasa, Ph.D.	**The Physical Society of Japan (https://www.jps.or.jp/english/about-jps/about-jps.html)**	**Society member**
Ivan Štekl, doc. Ing., CSc.	**Program Advisory Committee for Nuclear Physics, JINR**	**CR representative**
Peter Rubovič, RNDr. Ph.D.	**Czech Society of Protection against Radiation**	**Regular member**
Stanislav Pospíšil, Ing. DrSc.	**Program Advisory Committee, ISINN (Interaction of Neutron with Nuclei, JINR Dubna)**	**Member in years 2014–2019**
Stanislav Pospíšil, Ing. DrSc.	**Scientific Board WBU Pilsen**	**Regular member since 2006**
Stanislav Pospíšil, Ing. DrSc.	**Committee for CERN**	**Member since 1998**
Stanislav Pospíšil, Ing. DrSc., Ivan Štekl, doc. Ing. CSc.	**Committee for Scientific Activities, Ministry of Transportation, CR**	**Members**

Note: List a maximum of ten examples.

SUMMARY LIST OF ADDITIONAL DOCUMENTATION IN MODULE M3

Document Title	Criterion	Location (HTML link)
VI International Pontecorvo Neutrino Physics School (*summer school's webpage*)	3.1	http://theor.jinr.ru/~neutrino15
VII International Pontecorvo Neutrino Physics School (*summer school's webpage*)	3.1	http://theor.jinr.ru/~neutrino17
MEDEX'17 meeting (*conference webpage*)	3.1	http://medex17.utef.cvut.cz/index.html

MX-10. Digital particle kamera (*product's webpage*)	3.1	http://www.particlecamera.com/index.php
Advacam, s.r.o., (*company's webpage*)	3.1	https://advacam.com/company
Underground Laboratory LSM. Participation of the Czech Republic (*Large Research Infrastructure's webpage*)	3.2	http://lsm.utef.cvut.cz
ARDENT. Advanced Radiation Dosimetry European Network Training (*project's webpage*)	3.2	https://ardent.web.cern.ch/ardent.php
PV2014-933 (Polystyrene plastic scintillator for detectors) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-933&plang=EN
PV2014-934 (Polystyrene-based plastic scintillator for detectors) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-934&plang=EN
PV2015-359 (Plastic scintillator-based antineutrino detector) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2015-359&plang=EN
PV2015-360 (Plastic scintillator-based antineutrino detector) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2015-360&plang=EN
PV2013-669 (Ionizing radiation detector enabling creation of continuous digital image) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2013-669&plang=EN
PV2014-103 (Arrangement of portable video system for detection of radiation) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-103&plang=EN
US2015234428 (A1) — 2015-08-20 (Arrangement of portable display system for radiation detection) (*database webpage with complete information about a patent*)	3.2	https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20150820&DB=&locale=en_EP&CC=US&NR=2015234428A1&KC=A1&ND=4
United States Patent 9,411,373 – August 9, 2016 (Arrangement of portable display system for radiation detection) (*database webpage with complete documentation of a patent*)	3.2	http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=9411373.PN.&OS=PN/9411373&RS=PN/9411373
PV2014-739 (A device for coincidence secondary electron imaging) (*database webpage with complete information about a patent*)	3.2	https://isdv.upv.cz/webapp/resdb.print_detail.det?pspis=PT/2014-739&plang=EN

US2014332691 (A1) — 2014-11-13 (Single layer 3D tracking semiconductor detector) (*database webpage with complete information about a patent*)	3.2	https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20141113&DB=&locale=en_EP&CC=US&NR=2014332691A1&KC=A1&ND=4
United States Patent 9,297,912 – March 29, 2016 (Single layer 3D tracking semiconductor detector) (*database webpage with complete documentation of a patent*)	3.2	http://patft.uspto.gov/netacgi/nph-Parser?Sect2=PTO1&Sect2=HITOFF&p=1&u=/netahtml/PTO/search-bool.html&r=1&f=G&l=50&d=PALL&RefSrch=yes&Query=PN/9297912
JP2014534414 (A) — 2014-12-18 (A single layer 3D tracking semiconductor detector) (*database webpage with complete information about a patent*)	3.2	https://worldwide.espacenet.com/publicationDetails/biblio?FT=D&date=20141218&DB=&locale=en_EP&CC=JP&NR=2014534414A&KC=A&ND=4
Japan Platform for Patent Information – JP,2014-531107 (*The single layer 3D tracking semiconductor detector*) (*database webpage with complete documentation of a patent, including its English translation*)	3.2	https://www.j-platpat.inpit.go.jp/c1800/PU/JP-2014-534414/937AF7EAB85AF2D789CF3BB8F5B0DADDAABA46DD06BB2F603C9A8AEAB0230791/11/en
US2016209521 (A1) — 2016-07-21 (Detector of ionizing radiation enabling a coherent digital image) (*database webpage with complete information about a patent*)	3.2	https://worldwide.espacenet.com/publicationDetails/biblio?II=6&ND=3&adjacent=true&locale=en_EP&FT=D&date=20160721&CC=US&NR=2016209521A1&KC=A1#
United States Patent 10,168,437 – January 1, 2019 (Detector of ionizing radiation enabling a coherent digital image) (*database webpage with complete documentation of a patent*)	3.2	http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO1&Sect2=HITOFF&d=PALL&p=1&u=%2Fnetahtml%2FPTO%2Fsrchnum.htm&r=1&f=G&l=50&s1=10168437.PN.&OS=PN/10168437&RS=PN/10168437
Advacam, s.r.o., (*company's webpage*)	3.5	https://advacam.com
Nuvia, a.s., (*company's webpage*)	3.5	https://nuvia.cz/en
VI International Pontecorvo Neutrino Physics School (*summer school's webpage*)	3.6	http://theor.jinr.ru/~neutrino15
VII International Pontecorvo Neutrino Physics School (*summer school's webpage*)	3.6	http://theor.jinr.ru/~neutrino17
MEDEX'17 meeting (*conference webpage*)	3.6	http://medex17.utef.cvut.cz/index.html
MX-10. Digital particle kamera (*product's webpage*)	3.6	http://www.particlecamera.com/index.php
CZELTA. CZEch Large-area Time coincidence array (*project's webpage*)	3.6	http://czelta.utef.cvut.cz/publicweb/?language=en

Vícha, Vladimír: Experiments Using Pixel Detector in Teaching Nuclear and Particle Physics (*e-shop's webpage with complete information about a book*)	3.6	https://eobchod.cvut.cz/e_publication_ctu/e_publication_ctu/experiments_using_pixel_detector_in_tea_ing_nuclear_and_particle_physics-150032066
Electroweak Symmetry Breaking By Dynamically Generated Masses of Quarks and Leptons (Adam Smetana) (*publisher's webpage with complete information about a book*)	3.6	https://www.springer.com/gp/book/9783319070728
Linka zachycování radonu Modane, F (*Line for radon capture in Modane, France*) (*product's webpage; partly in English*)	3.7	https://www.ateko.cz/linka-zachycovani-radonu-modane-f
Radon Reduction Station for LNGS) (*product's webpage*)	3.7	https://www.ateko.cz/radon-reduction-station-for-lngs-en
Space Application of Timepix Radiation Monitor – SATRAM/Timepix (*project's webpage at the website of partner company*)	3.7	https://www.czechspace.cz/en/satramtimepix-spacecraft-payload
RISESat (Rapid International Scientific Experiment Satellite) / Hodoyoshi 2 (*project's webpage at the EOPortal website*)	3.7	https://directory.eoportal.org/web/eoportal/satellite-missions/r/risesat
NASA, CERN Timepix Technology Advances Miniaturized Radiation Detection (*information at the website of partner agency*)	3.7	https://www.nasa.gov/feature/nasa-cern-timepix-technology-advances-miniaturized-radiation-detection
Advacam, s.r.o., (*company's webpage*)	3.9	https://advacam.com
Erik Heijne (IEAP) awarded by the 2017 High Energy and Particle Physics Prize (*information at the website of our institute*)	3.10	http://www.utef.cvut.cz/recent-events/2017-05-29/erik-heijne-(ieap)-awarded-by-the-2017-high-energy-and-particle-physics-prize
The High Energy and Particle Physics Prizes (*list of the prize's recipients at the website of EPS*)	3.10	http://eps-hepp.web.cern.ch/eps-hepp/hepp-prize-awards.php
LongCitation_EPSHEP_v170510-2.pdf (*official prize announcement for the year 2017 at the website of EPS*)	3.10	https://eps-hepp.web.cern.ch/eps-hepp/PrizeAnnouncements/hep2017/LongCitation_EPSHEP_v170510-2.pdf
IT Student Project of the Year (*information at the website of our institute*)	3.10	http://www.utef.cvut.cz/zpravy/2018-12-06/it-student-project-of-the-year
Year 2018 (Gallery of the best participants) (*list of participants and winners of the competition at its website*)	3.10	https://www.itspy.cz/en/galerie-nejlepsich/projekty-2018
The prize for educators awarded by The Learned Society of the Czech Republic and by the science supporting endowment fund Neuron	3.10	http://www.utef.cvut.cz/recent-events/2016-05-23/the-prize-for-educators-awarded-by-the-learned-society-of-the-czech-republic-and-by-

(*information at the website of our institute*)		the-science-supporting-endowment-fund-neuron
Our employees are members of an excellent team (*information at the website of our institute*)	3.10	http://www.utef.cvut.cz/in-media/2017-02-27/our-employees-are-members-of-an-excellent-team
Excellent research teams at universities in Slovakia (*list of excellent teams at the website of the Euraxess portal*)	3.10	https://www.euraxess.sk/en/main/info/working/research-in-slovakia/excellent-research-teams
Vladimír Majer Medal (*list of the medal holders at the website of the Czech Chemical Society*)	3.10	http://csch.cz/en/about-society/awards/vladimir-majer-medal
Lehar, František: Experimental physics with polarized protons, neutrons and deuterons (Other authors: Strokovsky, Eugene A.; Wilkin, Colin) (*e-shop's webpage with complete information about a book*)	3.11	https://eobchod.cvut.cz/ctu_specialized_literature/book/experimental_physics_with_polarized_protons_neutrons_and_deuterons-150029610
Lecture of Dr Heijne Silicon for Science (*information at the website of our institute*)	3.12	http://www.utef.cvut.cz/recent-events/2017-10-13/lecture-of-dr-heijne-silicon-for-science
The prize for educators awarded by The Learned Society of the Czech Republic and by the science supporting endowment fund Neuron (*information at the website of our institute*)	3.12	http://www.utef.cvut.cz/recent-events/2016-05-23/the-prize-for-educators-awarded-by-the-learned-society-of-the-czech-republic-and-by-the-science-supporting-endowment-fund-neuron
Seminar meeting: Czechoslovak nuclear and particle physics: between JINR and CERN (*information about the seminar at the website of the Committee for cooperation of the Czech Republic with Joint Institute for Nuclear Research*)	3.12	http://www.sujv.cz/en/index.php?Ns=406&id=1000092
Československá jaderná a částicová fyzika: mezi SÚJV a CERN (Czechoslovak nuclear and particle physics: between JINR and CERN) – program semináře (*the seminar's time schedule at the website of co-organizing institution, including English abstracts of the contributions*)	3.12	http://seminarcsjf.usd.cas.cz/?page_id=134
Czech Republic 2016: 60 Years of the Joint Institute for Nuclear Research in Dubna (*post stamp's webpage at the Collectorzpedia website*)	3.12	http://www.collectorzpedia.com/2016/03/czech-republic-post-stamp-2016-60-years-of-joint-institute-for-nuclear-research-in-dubna-COLLECTORZPEDIA.html

Note: Only materials in English are included.