



agency for science and higher education



Improvement of quality assurance
and enhancement systems in higher education

**Report
of the Expert Panel
on the Re-accreditation
of the University Postgraduate (Doctoral) Programme
in *Physics*
University of Rijeka, Department of Physics**

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INTRODUCTION

The Expert Panel appointed by the Agency for Science and Higher Education (ASHE) created this Report on the Re-accreditation of the University Postgraduate (Doctoral) Programme in *Physics* on the basis of the Self-Evaluation Report of the Programme, other documentation submitted and a visit to the University of Rijeka, Department of Physics.

The Agency for Science and Higher Education (ASHE), a public body listed in EQAR (European Quality Assurance Register for Higher Education) and a full member of ENQA (European Association for Quality Assurance in Higher Education), re-accredits higher education institutions (hereinafter: HEIs) and their study programmes in line with the Act on Quality Assurance in Science and Higher Education (Official Gazette 45/09) and the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10). In this procedure parts of activities of higher education institutions and university postgraduate study programmes are re-accredited.

Expert Panel is appointed by the Agency's Accreditation Council, an independent expert body, to carry out independent evaluation of post-graduate university study programmes.

The Report contains the following elements:

- Short description of the study programme,
- The recommendation of the Expert Panel to the Agency's Accreditation Council,
- Recommendations for institutional improvement and measures to be implemented in the following period (and checked within a follow-up procedure),
- A brief analysis of the institutional advantages and disadvantages,
- A list of good practices found at the institution,
- Conclusions on compliance with the prescribed conditions of delivery of a study programme,
- Conclusions on compliance with the criteria for quality assessment.

Members of the Expert Panel:

- Prof. Jordi Colomer Feliu, University of Girona, Italy
- Prof. John Doran, Technological University Dublin, Ireland
- Kateryna Lemishko, PhD Student, Autonomous University of Madrid, Spain
- Professor Frank Witlox, Ghent University, Belgium, Panel Chair
- Professor Thomas Nedomysl, Lund University, Sweden
- Doctoral student Rowan Jaines, University of Sheffield, United Kingdom.

The higher education institution was visited by the following Expert Panel members:

1. Prof. Jordi Colomer Feliu, University of Girona
2. Prof. John Doran, Technological University Dublin, moderator of the site visit
3. Kateryna Lemishko, PhD Student, Autonomous University of Madrid.

In the analysis of the documentation, site visit and writing of the report the Panel was supported by the following representatives of Agency for Science and Higher Education:

- Emita Blagdan, coordinator, ASHE
- Lida Lamza, interpreter at the site visit and Report translator, ASHE.

During the visit to the Institution the Expert Panel held meetings with the representatives of the following groups:

- Management,
- Study programme coordinators,
- Doctoral candidates,
- Teachers and supervisors.

The Expert Panel also had a tour of research laboratories.

SHORT DESCRIPTION OF THE STUDY PROGRAMME

Name of the study programme contained in the licence: Physics

Institution delivering the programme: University of Rijeka

Institution providing the programme: Department of Physics

Collaborating institutions: Institute of Physics (Zagreb), Clinical Hospital Centre Rijeka

Place of delivery: Rijeka

Scientific area and field: Natural sciences, Physics

Number of doctoral candidates (all): 10

Number of HEI funded doctoral candidates: 6 (assistants employed at that or another HEI or institute)

Number self-funded doctoral candidates and employer-funded doctoral candidates: 4

Number of inactive doctoral candidates: 0

Number of teachers: 20 total (the ones employed by the HEI as well as the external associates), 15 on active courses

Number of supervisors:

7 supervisors (10 doctoral candidates)

6 co-supervisors (7 doctoral candidates)

Number of doctoral candidates with officially appointed supervisors: 10

Learning outcomes of the programme:

LO 1: Knowledge: creating and evaluating new facts, terms, procedures, principles and theories in the field of physics on which the doctoral dissertation focuses, which leads to advancing knowledge in the chosen field.

LO 2: Cognitive skills: using advanced, complex, original, highly specialised knowledge, skills, activities and procedures necessary for the development of new knowledge and new methods in the field of physics, as well as for the integration of different areas of physics and their relations primarily within the STEM disciplines.

LO 3: Psychomotor and computing skills: creating, evaluating and conducting new specialised procedures and methods, instruments, tools and materials, when the doctorate involves the application of experimental methods in physics, software development and application of advanced computer languages and programs.

LO 4: Social skills: communicating with relevant researchers and institutions, via personal contacts, e-mail, social media; the popularisation of student's own findings and achievements through various media, with the aim of popularising STEM areas.

LO 5: Independence: expressing personal professional and ethical authority; managing scientific research activities; dedication to the development of new ideas a/or processes in the field of

physics that is the focus of the doctoral dissertation; expanding ideas/processes to new areas with the dissertation as the solid starting point.

LO 6: Responsibility: taking ethical and social responsibility for the successful conducting of research projects, for the social utility of findings and possible social consequences of the findings presented in the dissertation.

Structure of programme:

First year: The research programme commences in the first year. The students also complete most of the taught element of the programme in the first year. This taught component comprises a set of compulsory and optional modules, as decided by the Council of Doctoral Studies on a student-by-student basis depending on the student's research project and prior learning.

Second year: Predominantly research work. Remaining elements of the taught part of the programme are completed.

Third year: Research work.

Teaching/research ratio: The exact ratio varies somewhat from student to student as the ECTS for the taught component can vary from student to student as decided by the Council of Doctoral Studies. Overall the programme is dominated by research activity. The teaching/research ratio is approximately 10/90.

RECOMMENDATION BY THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL

Upon the completion of the re-accreditation procedure and the examination of the materials submitted (Self-Evaluation Report etc.), the visit to the higher education institution and interviews with HEI members in accordance with the visit protocol, the Expert Panel renders its opinion in which it recommends to the Accreditation Council of the Agency the following:

Issue a confirmation on compliance for performing parts of activities (renew the licence)

Note: As the programme is still at an early stage of operation, with a first enrolment of students in 2018, and therefore has not yet had PhD theses completed and defended, it is not possible yet to indicate that the programme is of high quality. Nevertheless, the Panel are of the view that the operation of the programme so far has been very good.

RECOMMENDATIONS FOR THE IMPROVEMENT OF THE STUDY PROGRAMME

1. The Department should consider the ensuring that all PhD candidates have the same procedures applied to them in relation to thesis evaluation and defence. For example, the Thesis Evaluation Committee has 'at least' three members and the Thesis Defence Committee 'possibly' includes experts from foreign institutions. The Panel recommends that the number of members on each of these committees is constant, and that the constitution of the committees is constant, always including one member external to the University in the case of the Thesis Defence Committee (not necessarily from a different country). It is also recommended that neither of these Committees would include the supervisor of the PhD student being examined.
2. The Department should consider the incorporation of transferable skills in the areas of technology transfer, entrepreneurship, and business skills, into the programme as a formal compulsory element rather than an optional element.
3. The Department should consider the incorporation of a formal element of training on research ethics. This need not be time-consuming. For example, it could involve a small number of seminars on the topic and the student being required to make a submission to the Department's Ethics Committee in relation to their research project.
4. Students indicated that some aspects of the annual evaluation documentation were confusing. The Department should clarify this.

ADVANTAGES OF THE STUDY PROGRAMME

1. The research output of the Department is of a high quality and includes some examples of research output that is excellent by international standards.
2. The programme is modern and well-structured and has a very strong orientation towards research, with the taught component being very clearly designed to support the research aspect.
3. Students on the programme are very satisfied with their experience to date and with the level of supervision and teaching that they have received.
4. Supervisors are very engaged and committed to the students.

5. Laboratory facilities available to the students are of a good quality.
6. The use of English as the language for teaching, reporting, and documentation within the programme will help with internationalisation activity.

DISADVANTAGES OF THE STUDY PROGRAMME

1. Some students on the programme are required to carry out significant teaching duties.

EXAMPLES OF GOOD PRACTICE

1. The very strong orientation towards research, with the taught component being very clearly designed to support the research aspect.
2. The use of English as the language for teaching, reporting, and documentation within the programme.

COMPLIANCE WITH THE PRESCRIBED CONDITIONS FOR THE DELIVERY OF A STUDY PROGRAMME

Minimal legal conditions:	YES/NO notes
1. Higher education institution (HEI) is listed in the Register of Scientific Organisations in the scientific area of the programme, and has a positive reaccreditation decision on performing higher education activities and scientific activity.	YES
2. HEI delivers programmes in the two cycles leading to the doctoral programme, i.e., first two cycles in the same area and field/fields (for interdisciplinary programmes), and employs a sufficient number of teachers as defined by Article 6 of the Ordinance on the Content of a Licence and Conditions for Issuing a Licence for Performing Higher Education Activity, Carrying out a Study Programme and Re-Accreditation of Higher Education Institutions (OG 24/10).	YES
3. HEI employs a sufficient number of researchers, as defined by Article 7 of the Ordinance on Conditions for Issuing Licence for Scientific Activity, Conditions for Re-Accreditation of Scientific Organisations and Content of Licence (OG 83/2010).	YES
4. At least 50 % of teaching as expressed in norm-hours is delivered by teachers employed at the HEI (full-time, elected into scientific-teaching titles).	YES
5. Student: teacher ratio at the HEI is below 30:1.	YES, University Library
6. HEI ensures that doctoral theses are public.	YES
7. HEI launches the procedure of revoking the academic title if it is determined that it has been attained contrary to the conditions stipulated for its attainment, by severe violation of the studying rules or based on a doctoral thesis (dissertation) that has proved to be a plagiarism or a forgery according to provisions of the statute or other enactments.	YES
Additional/ recommended conditions of the ASHE Accreditation Council for passing a positive opinion	YES/NO notes
1. HEI (or HEIs in joint programmes) has at least five teachers appointed to scientific-teaching titles in the field, or fields relevant for the programme involved in its delivery.	YES
2. In the most recent reaccreditation, HEI had the standard Scientific and Professional Activity marked as at least "partly implemented" (3).	YES
3. The doctoral programme is aligned with the HEI's research strategy.	YES
4. The candidate: supervisor ratio at the HEI is not above 3:1.	YES, 1.4:1
5. All supervisors meet the following conditions: a) PhD, elected into a scientific title, holds a scientific or a scientific-teaching position and/or has at least two years of postdoctoral research experience; b) active researcher in the scientific area of the programme, as evidenced by publications, participation in scientific conferences and/or projects in the past five years (table 2, Supervisors and candidates);	a) YES b) YES c) YES d) YES e) YES, some younger mentors were

<p>c) confirms feasibility of the draft research plan upon admission of the candidate (or submission of the proposal);</p> <p>d) ensures the conditions (and funding) necessary to implement the candidate's research (in line with the draft research plan) as a research project leader, co-leader, participant, collaborator or in other ways;</p> <p>e) trained for the role before assuming it (through workshops, co-supervisions etc.);</p> <p>f) received a positive opinion of the HEI on previous supervisory work.</p>	<p>not co-mentors in the past, but they were all successful mentors on graduate studies</p> <p>f) Not applicable, study program is in its 1st year</p>
<p>6. All teachers meet the following conditions:</p> <p>a) holds a scientific or a scientific-teaching position;</p> <p>b) active researcher, recognized in the field relevant for the course (table 1, Teachers).</p>	<p>a) YES</p> <p>b) YES</p>
<p>7. The supervisor normally does not participate in the assessment committees.</p>	<p>YES</p>
<p>8. The programme ensures that all candidates spend at least three years doing independent research (while studying, individually, within or outside courses), which includes writing the thesis, publishing, participating in international conferences, field work, attending courses relevant for research etc.</p>	<p>YES</p>
<p>9. For joint programmes and doctoral schools (at the university level): cooperation between HEIs is based on adequate contracts; joint programmes are delivered in cooperation with accredited HEIs; the HEI delivers the programme within a doctoral school in line with the regulations and ensures good coordination aimed at supporting the candidates; at least 80% of courses are delivered by teachers employed at HEIs within the consortium.</p>	<p>Not applicable.</p>

QUALITY ASSESSMENT

	Quality assessment (“high level of quality” or “improvements are necessary”) and the explanation of the Expert Panel
1. RESOURCES: TEACHERS, SUPERVISORS, RESEARCH CAPACITIES AND INFRASTRUCTURE	
<p>1.1. HEI is distinguished by its scientific/ artistic achievements in the discipline in which the doctoral study programme is delivered.</p>	<p>High level of quality The HEI provided sufficient evidence to show that the scientific achievements of the staff of the Department are appropriate for delivery of the programme. Details on publications in refereed papers over the past five years, number of citations, and h-indexes for staff are presented. Within the discipline, the research output is of high quality overall, and excellent in some cases, with sufficient papers in excellent journals, including Nature and Science, with more than 80% of papers published in Q1 journals. The number of national and international research collaborations for each supervisor is also presented. All supervisors have national research collaborations and most are involved in international research collaborations. Under this criterion, the Department achieves a high level of quality.</p>
<p>1.2. The number and workload of teachers involved in the study programme ensure quality doctoral education.</p>	<p>High level of quality The information provided by the HEI demonstrates that more than 75% of the programme is delivered by its own faculty, and more than 85% when staff of partner institutions are included. The teaching staff are experts in the areas in which they teach. The Panel noted the very committed practice of staff tailoring the content of modules to the particular students to whom the modules are being taught, depending on their particular research projects. This is possible because the number of students taking each module is small. The teaching of modules on the doctoral programme is not counted as part of the overall teaching load of the staff, which must be made up from undergraduate and graduate teaching. Staff report this as non-ideal.</p> <p>On the basis that more than 50% of the teaching is carried out by the HEI’s own faculty, under this criterion the programme is of high quality.</p>

<p>1.3. The teachers are highly qualified researchers who actively engage with the topics they teach, providing a quality doctoral programme.</p>	<p>High level of quality The staff teaching modules are well qualified to teach those modules. They have sufficient scientific publications in relevant fields of research to underpin the delivery. The meetings with the staff and students revealed that, due to small numbers of students in each module, the normal method of delivery for these modules is through discussion of advanced research topics in the area with the postgraduate students. Students were happy with the operation of these modules and with the different styles of delivery that they encountered.</p>
<p>1.4. The number of supervisors and their qualifications provide for quality in producing the doctoral thesis.</p>	<p>High level of quality The programme employs sufficient number of supervisors to ensure that the candidate: supervisor ratio is below the required 3:1, even when the maximum number of 30 students are enrolled - when the programme is fully operational. There is also further supervision capacity in partner institutions – the Institute of Physics (Zagreb), and the Clinical Hospital Centre (Rijeka). The Panel commends the practice of having a co-supervisor on the faculty of the University even for students who are supervised by a staff member within a partner institution. The supervisors are appropriately qualified, based on the research outputs as presented in the Self-evaluation Report, and based on the involvement of supervisors in national and international research collaborations.</p>
<p>1.5. The HEI has developed methods of assessing the qualifications and competencies of teachers and supervisors.</p>	<p>High level of quality The requirements for eligibility for doctoral supervision are clearly established, and the process for ensuring this is set out in the Self-evaluation Report. These requirements, based on scientific activity, are appropriate and ensure that doctoral students are supervised by active scientists with good records of research output and research practice.</p> <p>There are formal mechanisms in place for the evaluation of supervisors and teachers on an annual basis. Samples of such evaluation documents were seen by the Panel.</p> <p>Under this criterion the programme is of high quality.</p>
<p>1.6. The HEI has access to high-quality resources for research, as required by the programme discipline.</p>	<p>High level of quality The HEI has access to high-quality resources for research, both through its own laboratory facilities and through collaborations (e.g. CERN and observatory facilities at La</p>

	<p>Palma). The SER outlined the facilities available at the University and also provided a web link which outlines the various laboratories. The Panel visited a sample of research laboratories within the Department and observed the SEM and XPS facilities. These facilities were of a high quality, state-of-the-art, and were well maintained, indicating a high level of good practice. Some of the facilities were unique within Croatia.</p> <p>The students who were interviewed also spoke about the Centre for Advanced Computing and Modelling, which hosts the leading supercomputer within Croatia and to which they have access.</p> <p>Students reported that there can be some issues with access to scientific papers as the availability of e-journals is limited, but they did not report this as a major issue.</p>
<p>2. INTERNAL QUALITY ASSURANCE OF THE PROGRAMME</p>	
<p>2.1. The HEI has established and accepted effective procedures for proposing, approving and delivering doctoral education. The procedures include identification of scientific/ artistic, cultural, social and economic needs.</p>	<p>High level of quality Appropriate procedures are in place within the HEI for the introduction of new programmes. This programme was introduced in response to the recommendations of an Expert Panel that re-accredited the Department of Physics in 2015.</p> <p>The advantages and rationale for developing the programme are set out in section 1.2 of the <i>Description of Study Programme</i> document. The Panel believes that the development of the programme is valuable for the scientific and economic life of Croatia and the Rijeka region, and for the ongoing development of the Department of Physics and of the University of Rijeka.</p>
<p>2.2. The programme is aligned with the HEI research mission and vision, i.e. research strategy.</p>	<p>High level of quality The <i>University of Rijeka Strategy 2014-20</i> was provided (in English). The programme is aligned to and responsive to this strategy. The SER picks several objectives from the strategy which are directly relevant, including ‘to increase the number of PhD candidates....’, ‘to increase the number of students in STEM’, ‘to increase the number of postgraduate programmes conducted in the English language’.</p> <p>A document entitled Strategic Programme of Scientific</p>

	<p>Research (2018-2020) for the Department of Physics was also provided, of which Goal 2.3 is the establishment of a programme of doctoral studies in physics.</p> <p>Under this criterion, the programme is of high quality.</p>
<p>2.3. The HEI systematically monitors the success of the programmes through periodic reviews, and implements improvements.</p>	<p>Improvements are necessary</p> <p>The University has a system of Quality Assurance for study programmes. The Department of Physics has a Quality Assurance and Improvements Committee. An annual standardised report is submitted by the head of the doctoral study programme to the Council of Doctoral Study. That Council monitors the operation of the programme and propose improvements where necessary. Students and staff confirmed to the Panel that these processes operated during 2018/19, which was the first year of operation of the programme.</p> <p>Annual reports from PhD students and from their supervisors are mandatory, and evaluated by the Council of Doctoral Study. The Panel viewed samples of such annual reports from staff and students and believes that this process is of good quality.</p> <p>Students indicated that some aspects of the standardised report templates are confusing and could be improved.</p> <p>Overall, the Panel believes that there is a good level of monitoring within the programme. As the programme is new, there has not yet been an opportunity for the Department to obtain feedback from stakeholders such as employers.</p>
<p>2.4. HEI continuously monitors supervisors' performance and has mechanisms for evaluating supervisors, and, if necessary, changing them and mediating between the supervisors and the candidates.</p>	<p>High level of quality</p> <p>PhD students and their supervisors are required to submit annual reports, which are evaluated by the Council of Doctoral Studies. The Panel viewed samples of such reports. The programme has operated for only one year and so there were no examples yet of problems arising where it was necessary to change a supervisor. However, the process for doing this is outlined in the <i>Regulation on Doctoral Study</i>, which is an extensive and detailed document outlining all aspects of the doctoral programme.</p> <p>The Panel believes that the HEI has appropriate mechanisms in place for monitoring supervisors.</p>

<p>2.5. HEI assures academic integrity and freedom.</p>	<p>High level of quality</p> <p>The University's Statute and Code of Ethics ensures academic freedom and articulates the ethical standards to be maintained. The Physics Department has an Ethics Committee which is mandated, with the University's Ethics Committee, to enforce the Code of Ethics. The University of Rijeka has signed the <i>European Charter for Researchers</i> and the <i>Code of Conduct for the Recruitment of Researchers</i>. Learning outcomes 5 & 6 for the doctoral programme both involve ethics. Under this criterion, the programme is of high quality.</p> <p>Students were not clear on whether there is formal training on the topic of research ethics, but the Panel was under the impression that this is something that is picked up through practice, rather than formally dealt with. Some formal content on this topic is recommended.</p>
<p>2.6. The process of developing and defending the thesis proposal is transparent and objective, and includes a public presentation.</p>	<p>High level of quality</p> <p>The procedures around the entire process of thesis topic proposal are set out in some detail in Sections 22 and 23 of the <i>Regulation on Doctoral Study</i>. The process includes a public defence of the doctoral dissertation topic before a doctoral topic defence committee. This committee, which is appropriately formed and includes external experts, reports to the Council of Doctoral Study. Approval of the doctoral dissertation topic is a requirement for enrolment in Year 3 of the programme.</p> <p>As the programme is new, this aspect of the programme has not yet happened. Nevertheless, the procedures set out in the <i>Regulation on Doctoral Study</i> are good.</p>
<p>2.7. Thesis assessment results from a scientifically sound assessment of an independent committee.</p>	<p>Improvements are necessary</p> <p>As the programme is new, there has not yet been a dissertation produced, nor a dissertation defence. The procedures for developing and defending doctoral dissertations are set out in great detail in Sections 24-31 of the <i>Regulation on Doctoral Study</i>. These processes are robust. There is flexibility in the presentation of the thesis (either traditional monograph style, or based on published papers). A thesis evaluation committee is established by the Council on Doctoral Studies. This committee has at least three members, all of which must be suitably qualified. The Council on Doctoral Studies also establishes a thesis defence committee, which possibly includes experts from foreign institutions.</p>

	<p>The thesis defence is public, with the thesis being written in English and publicly available at least 15 days before the date of the defence.</p> <p>The procedures set out are satisfactory and in line with the practice within the University.</p> <p>The Panel would recommend that the Department consider ensuring that all PhD candidates have the same procedures applied to them. For example, the thesis evaluation committee has 'at least' three members and the thesis defence committee 'possibly' includes experts from foreign institutions. The Panel recommends that the number of members on each of these committees is constant, and that the constitution of the committees is constant, always including one member external to the University in the case of the thesis defence committee (not necessarily from a different country). It is also recommended that neither of these committees includes the supervisor of the PhD student being examined.</p>
<p>2.8. The HEI publishes all necessary information on the study programme, admissions, delivery and conditions for progression and completion, in accessible outlets and media.</p>	<p>High level of quality All of the relevant documentation is available through the webpage of the Department of Physics.</p>
<p>2.9. Funds collected for the needs of doctoral education are distributed transparently and in a way that ensures sustainability and further development of doctoral education (ensures that candidates' research is carried out and supported, so that doctoral education can be completed successfully).</p>	<p>High level of quality The SER states that the only source of funding for the programme are the tuition fees gathered from students. The income from these fees just support the programme. The costs associated with internationalisation and dissemination of research are additional costs that must be borne by the student or by the host institution of the candidate. Details of this how these additional costs are to be met is set out in the study plan for each student at the commencement of their studies.</p>
<p>2.10. Tuition fees are determined on the basis of transparent criteria (and real costs of studying).</p>	<p>High level of quality The SER indicates that the tuition fee was determined in order to cover expenses associated with operating the programme, including: general premises and consumables cost; magnetic cards; administrative cost; travel costs for non-local members of the Council of Doctoral Study; networking costs; teaching costs associated with delivery of the taught modules contained on the programme; costs of the PhD diploma.</p>

	<p>Fees for PhD education vary internationally, but the overall fee of €3,025 is not very high compared to many other countries and the outlined rationale for setting this fee are reasonable.</p>
<p>3. SUPPORT TO DOCTORAL CANDIDATES AND THEIR PROGRESSION</p>	
<p>3.1. The HEI establishes admission quotas with respect to its teaching and supervision capacities.</p>	<p>High level of quality The admission quota is set at 10 per year, which, assuming that the programme is fully filled, will give a candidate/supervisor ratio of 1.4:1. Entry to the programme is advertised publicly through the Department's website and applicants are interviewed. The intake of 10 students per year is an appropriate level for a new and developing programme of this type and is aligned with the recommendation of the previous international panel. Students are distributed among the supervisors so that no single supervisor has a disproportionately high number of students to supervise.</p> <p>The role of supervisors and co-supervisors, and of doctoral students, is set out in Articles 13-15 of the <i>Regulation on Doctoral Study</i>.</p>
<p>3.2. The HEI establishes admission quotas on the basis of scientific/ artistic, cultural, social, economic and other needs.</p>	<p>High level of quality The SER justifies the admission quotas on the basis of an original panel recommendation and on the basis of there being complete absorption of PhD graduates into the Croatian economy.</p> <p>The analysis of the societal/industrial need for PhD graduates is reasonable, although understandably quite broad, and it includes comment on the various sectors, for example industry and public sector. As the programme evolves and doctoral graduates emerge, it will be possible to do a more in-depth analysis.</p>
<p>3.3. The HEI establishes the admission quotas taking into account the funding available to the candidates, that is, on the basis of the absorption potentials of research projects or other sources of funding.</p>	<p>High level of quality Two-thirds of the candidates enrolled so far are fully financed, either by the University or research institutes in which they are employed. 30% of students are employed and have their tuition fees partly funded by their employer. Only one student is self-financed. The intake of 10 students/year is appropriately cautious in relation to ensuring that funding will be available for that number of students from the sources mentioned above.</p>

	<p>Partner institutions also have good scientific reputations and a track-record of obtaining funding for PhD students. On this basis, the Department expects that there will be the possibility for funding for this level of students into the future, and this is reasonable.</p> <p>With regard to this criterion, the programme is of high quality.</p>
<p>3.4. The HEI should pay attention to the number of candidates admitted as to provide each with an advisor (a potential supervisor). From the point of admission to the end of doctoral education, efforts are invested so that each candidate has a sustainable research plan and is able to complete doctoral research successfully.</p>	<p>High level of quality</p> <p>The potential supervisor is identified at the point of application to the programme, and the candidate must have the support of this supervisor. A study plan, approved by the supervisor, must be submitted before the student enrolls in the programme. This plan must be approved by the Council for Doctoral Study. These processes, along with the annual evaluation processes for students and supervisors, are appropriate for ensuring that students enrol into the programme with a high probability of completing a successful programme of research.</p>
<p>3.5. The HEI ensures that interested, talented and highly motivated candidates are recruited internationally.</p>	<p>High level of quality</p> <p>The programme is advertised on the Department's website, and the Euraxess Jobs web-portal. In the first year of operation, candidates were enrolled from five different institutions, which indicates that the advertising and awareness campaign within Croatia is effective. Delivering the programme in the English language, and having the annual evaluations and the thesis submitted in English will give the programme the best chance of recruiting good international students.</p>
<p>3.6. The selection process is public and based on choosing the best applicants.</p>	<p>Improvements are necessary</p> <p>The programme is advertised publicly for four months before the start of the academic year. The recommendation on admission to the programme is made by the Council on Doctoral Study based on the applications. The admission requirements and processes are clearly set in Articles 3 & 4 of the <i>Regulation on the Doctoral Study Programme</i>. Completion of a graduate study programme is a requirement. The Regulation further states that applicants may be called for an interview as part of the selection process. It is the understanding of the Panel that all applicants that have been enrolled to date have been interviewed.</p> <p>The criteria applied in selecting candidates for the</p>

	<p>programme are outlined in the SER and include: previous academic achievement; published papers, etc.; motivation as evaluated on the basis of the motivation letter and possible interview; written recommendations; quality of the proposed supervisor and the proposed research plan. These criteria are appropriate and comparable to criteria used internationally.</p> <p>It is recommended that it be clearly articulated in the public advertisement that all candidates will be interviewed prior to being admitted to the programme.</p>
<p>3.7. The HEI ensures that the selection procedure is transparent and in line with published criteria, and that there is a transparent complaints procedure.</p>	<p>High level of quality</p> <p>Articles 3-5 of the Regulation on Doctoral Study deal with all the aspects of the application and admission process. The SER indicates that the list of selected candidates is publicly announced on the Department's website, and that the right of an unsuccessful applicant to complain is guaranteed under state law. Candidates are informed of the time limit for complaints when they are informed of the success or otherwise of their application.</p> <p>These processes, as outlined above, seem to be fair and the outcomes transparent.</p>
<p>3.8. There is a possibility to recognize applicants' and candidates' prior learning.</p>	<p>High level of quality</p> <p>This is outlined in the <i>Regulation on Doctoral Study</i>. The Council of Doctoral Study reviews the applicant's prior education experience and on the basis of that as well as the proposed topic of research, determines the courses that must be taken by the student. Thereby, recognition of prior learning is built into the admission process.</p>
<p>3.9. Candidates' rights and obligations are defined in relevant HEI regulations and a contract on studying that provides for a high level of supervisory and institutional support to the candidates.</p>	<p>High level of quality</p> <p>The rights and obligations of PhD candidates are articulated in the <i>Regulation on Doctoral Study</i>. This document is detailed and of a very good quality. There is a Contract on Studying and Mentorship which is signed by the student upon the commencement of the programme.</p> <p>Under this criterion, the programme is of high quality.</p>
<p>3.10. There are institutional support mechanisms for candidates' successful progression.</p>	<p>High level of quality</p> <p>All of the University's offices and student services are available to the PhD candidates, including the Student Counselling Centre and Office for Careers.</p> <p>As the programme has only completed its first year of</p>

	<p>operation, there is limited ability to give many examples of institutional support in areas such as travel to conferences, etc. However, 30% of students have full financial support from the Department of Physics. The current students reported to the Panel that they were satisfied with the level of support from the Department and from their supervisors, including support for travelling to other locations for conducting experimental work.</p> <p>The Panel believe that there is a good level of support for students to complete their studies.</p>
<p>4. PROGRAMME AND OUTCOMES</p>	
<p>4.1. The content and quality of the doctoral programme are aligned with internationally recognized standards.</p>	<p>High level of quality</p> <p>The HEI presented a clear document on the structure of the programme of study and the process of progression through the programme. The modules provided are at an appropriate level, and are well-produced and clear. The programme is very strongly research-oriented. The research work of a student starts from the point of admission and continues for at least three full years. The taught aspect of the programme is oriented directly towards the research projects of the students, as determined by the Council of Doctoral Study.</p> <p>There is an internationalisation component to the project within which the students can acquire ECTS credits for internationalisation activity, which can include visits to international laboratories, presentation at international conferences, and participation in international workshops and collaborations.</p> <p>The programme was designed in line with studies of high quality and successful doctoral programmes in other countries like the UK, Germany, and Belgium. The programme compares well to similar programmes internationally in terms of the programme structure and content, the quality of research opportunities for students, the taught component, and the general procedures for admission and progression through the programme. Supervisory procedures are good. There are opportunities for interdisciplinary science within the programme – in the areas of environmental physics and medical physics.</p> <p>Under this criterion, the programme is of high quality.</p>

<p>4.2. Programme learning outcomes, as well as the learning outcomes of modules and subject units, are aligned with the level 8.2 of the CroQF. They clearly describe the competencies the candidates will develop during the doctoral programme, including the ethical requirements of doing research.</p>	<p>Improvements are necessary</p> <p>The programme level learning outcomes are appropriate for a programme of this type, and are clearly set out in the SER, along with a table that shows where the students get opportunities for undertaking learning related to each of these high-level learning outcomes. The learning outcomes of individual modules are appropriate for the level of the programme. These learning outcomes are aligned with the CroQF level 8.2. Research competencies are met through the research element of the programme. As the programme is new, it is not yet possible to see the fulfilment of these learning outcomes as manifested in successfully defended and published theses.</p> <p>Research ethics is included in two of the programme learning outcomes, and students learn about this through the practice of research under the supervision of an ethical supervisor. A formal opportunity for developing knowledge on research ethics would be a welcome addition to the programme.</p>
<p>4.3. Programme learning outcomes are logically and clearly connected with teaching contents, as well as the contents included in supervision and research.</p>	<p>High level of quality</p> <p>The learning outcomes are clearly articulated in the Description of the Study Programme. The learning outcomes are appropriate for the level of study. Based on the interviews with the students and with the supervisors/teaching staff, the Panel is satisfied that there is a good alignment between the programme learning outcomes and the teaching and research activities undertaken by the students.</p>
<p>4.4. The doctoral programme ensures the achievement of learning outcomes and competencies aligned with the level 8.2 of the CroQF.</p>	<p>High level of quality</p> <p>The Description of the Study Programme document outlines the methods used in each course to assess each of the modules. These methods are appropriate and thorough. As the programme is new, it is not yet possible to see the evidence for the full range of learning outcomes for the programme, especially as related to the research component. Nevertheless, the evidence seen by the Panel in interviews with students and staff is very positive. Some students, although still at the early stages of research, are preparing research publications.</p>
<p>4.5. Teaching methods (and ECTS, if applicable) are appropriate for level 8.2 of the CroQF and assure achievement of clearly defined learning outcomes.</p>	<p>High level of quality</p> <p>The teaching methods and the allocation of ECTS are appropriate for level 8.2 of the CroQF. There are a variety of teaching methods employed in the taught courses. The</p>

	<p>teaching methods used are appropriate for a strongly research-oriented programme. The employment of consultative one-to-one work is excellent.</p>
<p>4.6. The programme enables acquisition of general (transferable) skills.</p>	<p>Improvements are necessary</p> <p>The acquisition of a wide range of general skills is built into the programme, including analysis, writing, problem solving, computational skills, data analytics, dissemination, teamwork, and experimental skills.</p> <p>Candidates have the opportunity to attain a level VIII education qualification.</p> <p>Opportunities for the development of other generic (transferable) skills are provided through the University, e.g., technology transfer, intellectual property, business and managerial skills. Opportunities for participation in such activities are made known to all of the students of the doctoral programme.</p> <p>For the future, the Department could consider the incorporation of some important transferable skills, especially in the areas of technology transfer, entrepreneurship, and business skill, into the programme as a formal compulsory element rather than an optional element.</p>
<p>4.7. Teaching content is adapted to the needs of current and future research and candidates' training (individual course plans, generic skills etc.).</p>	<p>High level of quality</p> <p>The teaching content to be undertaken by the students is individually planned to be appropriate for the candidate's particular research project. A good range of courses are available that are appropriate for the research areas within the school. The teaching staff informed the Panel that the content of the individual courses is adapted to be of most value to the students, and this is extremely good practice, which was confirmed by the students. The small number of students taking most of the courses makes it possible to constantly adapt courses in this way, and it also demonstrates a strong degree of commitment from the teaching staff.</p>
<p>4.8. The programme ensures quality through international connections and teacher and candidate mobility.</p>	<p>High level of quality</p> <p>The involvement of all supervisors in international research collaborations is presented in the SER. More than 20 such international collaborations are indicated, which is a good level and ensures that the research conducted at the Department is at a very good level.</p>

	<p>The inclusion of a requirement for candidates to acquire at least 20 ECTS through mobility is a very good aspect of the programme, with a sufficient degree of flexibility in the interpretation of 'internationalisation' to make it realistic.</p> <p>Other commendable aspects are the membership in the IDPASC network, participation in the Erasmus Programme, the use of English as the language of teaching, reporting, and documentation for the programme, and the active involvement of staff in overseas institutions, as well as in the teaching and supervision aspect of the programme.</p> <p>Under this criterion, the programme is of high quality.</p>
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*** NOTE: RECOMMENDATIONS OF THE EXPERT PANEL TO THE ASHE'S ACCREDITATION COUNCIL AND QUALITY LABEL**

The role of the Expert Panel in the re-accreditation of doctoral study programmes is manifold. The Expert Panel or part of the Expert Panel visiting a higher education institution drafts a report on the basis of a self-evaluation report, the accompanying relevant documentation, and a site visit to HEI. The draft report is adopted by all members of the Cluster Expert Panel, while the president of the Cluster Expert Panel is responsible for coordinating the assessment levels.

The report contains an assessment on whether a doctoral study programme delivered at a higher education institution complies with the prescribed laws and by-laws, as well as any additional/recommended requirements defined by the Agency's Accreditation Council, and whether a higher education institution can obtain a positive, i.e. satisfactory quality assessment according to the criteria set out in this document. Moreover, the Expert Panel must make recommendations for quality improvement.

Based on the assessment of all these elements, the Expert Panel may propose to the Accreditation Council of the Agency to issue either a confirmation on compliance, a letter of expectation for the period up to three (3) years in which period the higher education institution should eliminate the identified deficiencies, or to deny the license.

If the Expert Panel has assessed that a doctoral study programme delivered by a higher education institution does not meet legal and other requirements or that the quality of a study programme is not ensured (i.e. that HEI does not meet additional requirements or recommendations made by the Accreditation Council, or has a very poor quality assessment), they should propose to the Accreditation Council to deny the license.

If the Expert Panel considers that the relevant laws and bylaws have been met by a higher education institution, but that certain elements mentioned above do not meet the quality requirements, while they consider that the identified shortcomings can be corrected within a time frame of three years, they should issue a letter of expectation.

If the Expert Panel considers that all legal and additional/recommended requirements have been met and the quality assessment is satisfactory, i.e. that a study programme fulfils the learning outcomes appropriately defined for that level and scientific area, they may propose the issuance of a certificate and have a HEI commit to quality improvement and reporting to the Agency during the follow-up period.

Finally, if the Expert Panel has, in accordance with the criteria mentioned above, proposed issuing the certificate of compliance and assessed that, in addition to meeting the minimum quality requirements – i.e. the qualification framework level - for a study programme, the programme should be identified as a doctoral programme of a 'high level of quality', the Expert Panel may propose to the Agency's Accreditation Council that such a doctoral study programme be awarded the 'high quality label'. Thus the Agency, with the consent of the Accreditation Council, grants a higher education institution the right to use the label for their academic and promotional purposes.

The 'high quality label' cannot be proposed or awarded to a programme or a higher education institution that does not comply with the requirements laid down by the laws and bylaws mentioned in this document, and any additional requirements recommended by the Accreditation Council. Moreover, the quality assessment awarded to a study programme should reflect a high level of quality inasmuch that at least half of the sub-criteria in each of the quality assessment criteria are assessed as

being of high quality. The Accreditation Council of the Agency issues a final opinion on the label awarded. The content and form of the quality labels shall be prescribed by the Agency in a relevant general act.

The Accreditation Council of the Agency discusses the final report with all recommendations and suggestions, and issues their opinion on the report. Based on a prior opinion of the Accreditation Council, the Agency issues an Accreditation Recommendation to the minister responsible for science and higher education, and upon receipt of the minister's final decision on the outcome of the procedure, awards the 'high quality label' to a higher education institution.