Recruitment of Doctoral Candidates official announcement

IN-NOVA

MSCA Doctoral Network

Active reduction of noise transmitted into and from enclosures through encapsulated structures

project no. 101073037

Leader: Silesian University of Technology, Gliwice, Poland

Coordinator: Marek Pawelczyk

HORIZON EUROPE

Starts on October 1st, 2022

#InNova_MSCA

Funded by the European Union

List of Participating Organisations

	Consortium Member	Legal Entity Short Name	Academic	Non-academic	Awards Doctoral Degrees	Country	Dept./ Division/ Laboratory	Scientist-in-Charge
Beneficiaries								
Silesian University of Technology	Politechnika Slaska	SUT	✓		✓	PL	Department of Measurements and Control Systems	Prof. Marek Pawelczyk Prof. Stanislaw Wrona
UNIVERSITAT POLITÈCNICA DE VALÈNCIA	Universitat Politècnica de València	UPV	✓		✓	ES	Institute of Telecommuni-cations and Multimedia Applications	Prof. Alberto Gonzalez Dr. Maria de Diego
POLITECNICO MILANO 1863	Politecnico di Milano	PDM	✓		✓	IT	Department of Mechanical Engineering	Prof. Hamid Reza Karimi Prof. Francesco Ripamonti
KU LEUVEN	Katholieke Universiteit Leuven	KUL	✓		✓	BE	Department of Mechanical Engineering, and Department of Physics and Astronomy	Dr. Bert Pluymers Prof. Nicolaas Bernardus Roozen
DLR	Deutsches Zentrum fur Luft - und Raumfahrt EV	DLR	✓			DE	Institute of Composite Structures and Adaptive Systems	Dr. Malte Misol Dr. Stephan Algermissen
SIEMENS	Siemens Industry Software NV	SISW		✓		BE	RTD Division	Prof. Herman van der Auweraer

	Consortium Member	Legal Entity Short Name	Academic	Non-academic	Awards Doctoral Degrees	Country	Dept./ Division/ Laboratory	Scientist-in-Charge
Associated Partners								
	University College London	UCL	✓		✓	GB	Bartlett School for Environment, Energy and Resources	Prof. Jian Kang Dr. Francesco Aletta
	University of Southampton	UOS	✓		✓	GB	Institute of Sound and Vibration Research	Prof. Stephen Elliott Prof. Jordan Cheer
	Otto-von-Guericke Universitaet Magdeburg	OVGU	✓		✓	DE	Institute of Mechanics	Prof. Hans Peter Monner
	Müller-BBM Active Sound Technology GmbH	MBBM		✓		DE	—	Dr. Rolf Schirmacher
	Airbus Operations GmbH	AB		✓		DE	—	Dr. Christian Thomas
	Analog Devices S.L.U.	AD		✓		ES	Parc Cientific Lab.	Dr. Javier Calpe-Maravilla

Supported by:




1 Introduction

Applications are invited for **13 Doctoral Candidates** (DCs), funded by the Marie Skłodowska-Curie Actions Doctoral Network IN-NOVA (Active reduction of noise transmitted into and from enclosures through encapsulated structures; project 101073037) within the Horizon Europe Programme. IN-NOVA is an international consortium of high-profile universities, research institutions and companies located in Poland, Spain, Italy, Belgium, Germany, and United Kingdom. We are looking for 13 outstanding Doctoral Candidates. The positions have a duration of 3 years.

1.1 Benefits

The Marie Skłodowska-Curie Actions (MSCA) programme offers a **highly competitive and attractive salary and working conditions**. The successful candidates will receive a gross salary in accordance with the MSCA regulations for doctoral candidates. Exact gross salary will be confirmed upon appointment (employer costs and other deductions depend on recruiting host): living allowance = €40.800/year (correction factor to be applied per country) + monthly mobility allowance = €600. An additional monthly allowance of €660 is applicable depending on family situation. In addition to their individual scientific projects, all fellows will benefit from further continuing education, which includes secondments (internships), a variety of training modules as well as transferable skills courses and active participation in workshops and conferences.

Within IN-NOVA each recruited researcher will spend three secondment periods at three of the other complementary Beneficiaries or Associated Partners for a duration of 2-3 months for each secondment. The DCs hosted by academic Beneficiaries will engage in an inter-sectoral secondment by working in industry to impart knowledge transfer and gain experience of the industrial research and implementation culture. Normal practice during secondments is for the researchers to keep their contract with the sending organisation, which also pays the travel and subsistence expenses (e.g. accommodation). During their secondment, researchers receive supervision and training at the premises of the receiving organisation. Secondments are mandatory. If you apply for one of the positions then you agree that you will be seconded to other organisations during your contract.

1.2 Eligibility Criteria

Doctoral Candidates must have not been awarded a doctoral degree. Conditions of international mobility requires that researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting host organisation for more than 12 months in the 3 years immediately before the recruitment date. Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status under the Geneva Convention are not taken into account.

2 Objective of the IN-NOVA

The main goal of the IN-NOVA project is to develop the noise-reducing methods by training 13 DCs (10 MSCA Fellows + 3 DCs funded by UK) through intersectoral, multidisciplinary and international joint research in engineering, acoustics and material science, in both academia (universities and research centres) and industry.

Scientific objectives of IN-NOVA project are based on a precisely targeted dual noise problem, related to the transmission of noise into and from enclosures through encapsulated structures that concern a vast majority of the population and this can be divided into the two key objectives:

1. Develop comprehensive noise-reducing casing solutions that globally control the excessive noise generated and radiated by industrial devices and household appliances, whilst consuming much less energy, sensors and actuators than classical ANC systems. This is referred to as the in-out problem.
2. Develop versatile active/passive control techniques for the reduction of noise transmission into enclosures, as represented by vehicle and aircraft cabins. This is referred to as the out-in problem.

A conceptual sketch of the technologies that will be developed within IN-NOVA is presented in Fig. 1.

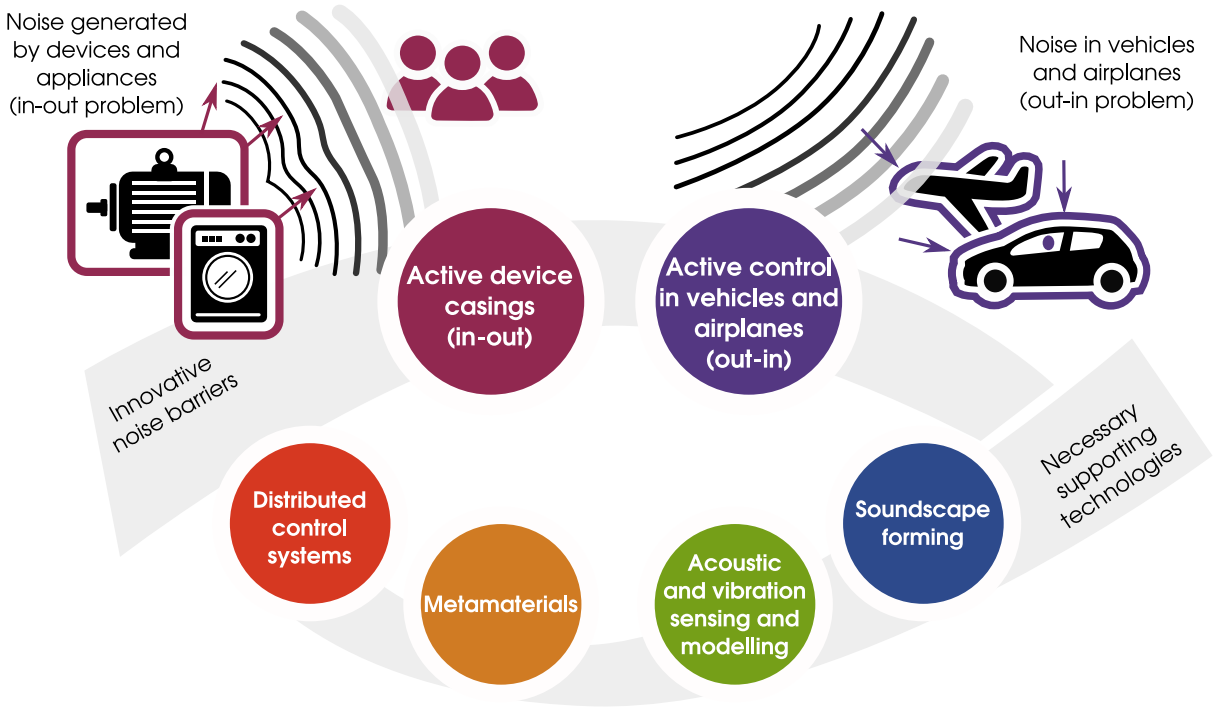

Figure 1: A conceptual sketch of technologies developed within IN-NOVA.

The IN-NOVA DN for the first time will investigate the reduction of noise passing through encapsulated structures in a complete manner, considering both in-out and out-in forms of this specific, but ubiquitous problem. It will be possible thanks to interdisciplinary and complementing composition of the Consortium, integrated into well-coordinated network. Exploration and integration of synergies between the hitherto disjointed noise control techniques will create new knowledge and enable development of two complete systems reducing noise (i) generated by devices and (ii) in cabins.

New models representing complete vehicle and aircraft cabin will be developed and validated, enabling both analysis of vibroacoustic systems behaviour, and design and validation of a variety of control solutions. The considered techniques includes, inter alia: advanced passive materials and metamaterials; active and semi-active control systems with robust distributed architecture; soundscape and psychoacoustic aspects; remote sensing and novel control algorithms.

Two comprehensive and feasible noise control solutions will developed during the project, dedicated to vehicle/aircraft cabins and device casings. Although related and synergetic in many aspect, they will be tailored specifically for the two targeted problems, going far beyond the current state of the art.

3 Overview of the doctoral training programme

The IN-NOVA project combines well-established structured PhD programmes into outstanding doctorates with ECTS award schemes in all Academic Beneficiaries with innovative training elements, including:

- **Experimental research** in some of Europe's leading and best-equipped laboratories for vibroacoustic research.
- **Industry-academia collaboration** through dedicated business-focussed events, inter-sectoral secondments as projects, and both academic and non-academic experts co-supervising DCs.
- **Transferable skills**, including complementary technical skills and generic skills, such as IP, communication skills, consulting methodologies, ethics principles, project management, business plan development, and spin-off establishment and running, that will be tailored to the specific needs of the researchers.
- **Network-wide events** with scientific and non-scientific training elements, with high attention to integration, especially the annual IN-NOVA Days and wide contacts with DCs from other ITNs/DNs.
- **International exposure at summer schools, conferences and trade shows** to enhance scientific and business networks beyond the IN-NOVA members, and help training presentation and promotion skills.

Each Doctoral Candidate will have a Personal Career Development Plan and be guided by five experts - the main supervisor, three other experts from the consortium, including academia and industry, and one expert from a non-European university. Joint or double degree programmes can be arranged provided two organisations agree for that.

The DC from the academic sector will be seconded to a non-academic member at least once. Each DC from the non-academic sector will be seconded to an academic member at least twice to obtain research experience and network. All seconded DCs will have defined projects during their secondments, and the results will be reported to their ISCs. At the end, all DCs will have a first-hand experience of research in both sectors.

4 Overview of the host institutions

Silesian University of Technology (SUT)

The Silesian University of Technology (SUT), is the oldest technical university in the region and one of the most prestigious and highly ranked in Poland. It was established in 1945 as a scientific and educational facility for Upper Silesia, the most industrialized area in Poland, and one of the most industrialized in Europe. SUT has about 3200 employees including 1700 academic staff, 600 PhD candidates and over 20,000 students at bachelor and master levels of study. The Dept. of Measurements and Control Systems is internationally recognised research centre in the field of control engineering, metrology and digital signal processing, active noise and vibration control, leading multiple research projects. In 2019 Polish Ministry of Science has announced Research Excellence Initiative and SUT has been established one of 10 most promising universities in Poland. SUT is a member of Eureca-Pro European University alliance.

Prof. Marek Pawelczyk, Vice Rector for Science and Development of the SUT, Head of the Department of Measurements and Control Systems (about 30 staff members and PhD students), President of the International Institute of Acoustics and Vibration (IIAV), Managing Editor of International Journal of Acoustics and Vibration (JCR recognised), expert in adaptive control, active noise control, signal processing, author of 3 books on active noise control, over 230 journal and proceeding papers, co-author of three academic textbooks, co-author of 9 patent applications, supervisor of 8 PhDs. Coordinator of over 20 research projects sponsored by state institutions or industry, with many solutions commercially available. Coordinator of 3 EU-sponsored structural fund projects, and local coordinator of H2020 project. Chair or Co-chair of about 10 International Congresses on Sound and Vibration Congresses with participants from more than 50 countries.
• **Prof. Stanislaw Wrona**, lecturer, co-author of 45 scientific publications, expertise in active noise control and mathematical modelling of vibroacoustic systems.

Universitat Politècnica de València (UPV)

Universitat Politècnica de València (UPV) is one of the leading universities in Spain and is listed in all the world university rankings. It is one of the Spanish top five Universities with the highest revenue from both public research and knowledge transfer activities, and is a national leader in patent license income and start up creation. With an R&D activity of over 52 million euros, UPV already participates in 148 projects in H2020. Universitat Politècnica de València (UPV) Spain, will participate through its Research Division Audio and Communications Signal Processing Group (GTAC) of the Institute of Telecommunications and Multimedia Applications (iTEAM). The iTEAM is the first research institution in the field of Telecommunications of the Valencia region, including research groups on optics, satellite and mobile communications. GTAC focuses its research in signal processing algorithms used in sound and wireless communication applications.

Prof. Alberto Gonzalez, is the former dean of the Technical School of Telecommunciations Engineering at the UPV. Since 2010, he has published 44 articles in JCR journals and over 60 in conferences on signal processing for sound and communication signals. Dr. Gonzalez has led more than 20 research projects and participated in more than 30. • **Dr. Maria de Diego**, has been involved in over 25 research projects financed by public funds, and has led several of them. She is co-author of more than 20 journal papers listed in the Journal Citation, and around 50 conference papers. She is a Senior Member of the IEEE and a Member of the International Institute of Acoustics and Vibration (IIAV). • **Dr. Miguel Ferrer**, belongs to the GTAC group since 1999. During this period he has authored or co-authored over seventy papers related with signal processing in renowned journals and conferences.

Politecnico di Milano (PDM)

Politecnico di Milano (PDM) is the leading scientific-technological university in Italy, training Engineers, Architects and Industrial Designers. PDM has now several Campuses in North of Italy with about 1300 Professors, 1200 technical and administrative staff members, 1000 PhD students and 40000 students. Being involved in many EU and Italian funded programs PDM has always focused on the quality and innovation of its teaching and research, developing a fruitful relationship with the business and productive world by means of experimental research and technological transfer. Research has always been linked to teaching and it's a priority commitment that allowed PDM to achieve high quality results at an international level. The 2022 QS World University Rankings positioned PDM in the 13th world rank in the field of Mechanical, Aeronautical & Manufacturing Engineering.

Prof. Hamid Reza Karimi, Scopus H-Index 87, is an academic staff and a professor of Applied Mechanics with the Dept. Mechanical Engineering, Politecnico di Milano, Milan, Italy. His current research interests include control systems and mechatronics with applications to vibration systems, vehicles, and wind turbines. Prof. Karimi is a Member of Academia Europa, Distinguished Fellow of the Int. Inst. of Acoustics and Vibration (IIAV), Fellow of The Int. Society for Condition Monitoring (ISCM), Member of Agder Academy of Science and Letters and also a member of the IFAC TC on Mechatronic Systems, the IFAC TC on Robust Control, and the IFAC TC on Automotive Control. He is serving as Chief Editor, Subject Editor, Technical Editor or Associate Editor for some int. journals and book series editor for Springer, CRC Press and Elsevier. He has been awarded as the 2016-2021 Web of Science Highly Cited Researcher in Engineering, the 2020 IEEE Trans. on Circuits and Systems Guillemin-Cauer Best Paper Award, August-Wilhelm-Scheer Visiting Professorship Award, JSPS Research Award, and Alexander-von-Humboldt-Stiftung research Award, for instance. • **Prof. Francesco Ripamonti** is an associate professor of Applied Mechanics with the Dept. Mechanical Engineering, Politecnico di Milano. His research activity is focused on vibroacoustics, dynamics and active control of smart structures, tire noise and cable dynamics. He is the coordinator of the Cable Dynamics laboratory and is involved in the reference interdepartmental research structure in the area of vibroacoustics, applied acoustics and sound processing - PSVL (Polimi Sound and Vibration Laboratory). He participated to several international projects. He is an author of over 100 publications and 11 patents.

Katholieke Universiteit Leuven (KUL)

The Katholieke Universiteit Leuven, founded in the year 1425, is one of the oldest universities in Europe and the largest one in Belgium. KU Leuven is a charter member of LERU and conducts fundamental and applied research in all academic disciplines with a clear international orientation. In the Reuters Top 100 of the World's most innovative institutions KU Leuven is listed as the 1st European university and in the Times Higher Education ranking KU Leuven is ranked as the 14th European university. KU Leuven participated in over 540 highly competitive European research projects (FP7, 2007-2013), ranking 6th in the league of HES institutions participating in FP7. In Horizon 2020, KU Leuven currently has been approved with 260 projects. KU Leuven takes up the 9th place of European institutions hosting ERC grants. KUL succeed in the FP7 and Horizon 2020 Marie Sklodowska Curie Actions with 229 Actions of which 111 are (I/E)TN.

Dr. B. Pluymers, Scientist-in-charge, supervisor of 7 defended PhD theses and coordinator of 8 FP7/H2020 MSCA ITN (https://www.kuleuven.be/wieiswie/en/person/00034704). • **Prof. N.B. Roozen**, guest professor at the Laboratory of Acoustics of the department of physics of KU Leuven. Physical-acoustics, sensor and actuator technologies, physcial modelling and experiment. Supervisor of > 20 MSc Students and co-supervisor of 5 PhD students (https://www.kuleuven.be/wieiswie/en/person/00083844). • **Dr. Elke Deckers**, acoustic modelling and testing, senior postdoctoral researcher, supervisor of 14 PhD students and >20 MSc students (https://www.kuleuven.be/wieiswie/nl/person/00059933).

Deutsches Zentrum fur Luft - und Raumfahrt EV (DLR)

The German Aerospace Center (DLR) is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport, digitalisation and security is integrated into national and international cooperative ventures. In addition to its own research, DLR is planning and implementing the German space programme. The DLR Institute of Composite Structures and Adaptive Systems is a leading facility in the field of lightweight structures research. The Institute's focus on adaptive systems enables the integration of additional capabilities into lightweight structures. Therefore, lightweight structures that use materials and technologies developed as adaptive systems are able to change their shape, actively reduce vibrations, or dampen noise emission and transmission or increase noise absorption of lightweight structures.

Dr. Malte Misol, lecturer, co-author of 76 scientific publications, expertise in active structural acoustic control and measurement and analysis of vibroacoustic systems. • **Dr. Stephan Algermissen**, lecturer, co-author of 94 scientific publications, expertise in active structural acoustic control, modelling and simulation of vibroacoustic systems.

Siemens Industry Software NV (SISW)

Siemens Industry Software NV (SISW) is a high technology industry active in test and mechatronic simulation in the automotive, aerospace and other mechanical industries. With a unique combination of mechatronic simulation software, testing systems and engineering services, the company tunes into mission-critical engineering attributes, ranging from structural dynamics, noise and vibrations and sound quality to durability, safety and power consumption. With multi-domain and mechatronic simulation solutions, SISW addresses complex engineering challenges associated with intelligent system design and model-based system engineering. The transportation industry is a major market for SISW, with an emphasis on the automotive and aerospace sector. SISW has an active research and development department in the domain of its products.

Prof. Herman van der Auweraer, PhD KU Leuven 1987, is Research Director at SISW and Guest Professor at KU Leuven. He has been (co-)advisor of multiple PhD with Flemish and international universities in the context of national, EU and bilateral PhD cooperation programs. He is member of the industrial advisory council at several universities and has been actively involved in establishing the Flemish industrial PhD Baekeland programme. • **Dr. Fabien Chauvicourt**, PhD KU Leuven and Université Libre de Bruxelles 2018 in vibro-acoustics of rotating electric machines, is Research Engineer at SISW. He has been fellow of the Marie Curie project ADEPT, hosted by SISW, and is now advisor of several Bachelors, Master and PhD students, including two PhDs from Marie Curie project INTERACT. His research interests mainly involve multi-level electrified vehicle simulation, noise and vibration in systems of mechatronic systems, artificial intelligence.

University College London (UCL)

UCL has a global reputation for excellence in research and is committed to delivering impact and innovations that enhance the lives of people in the UK, across Europe and around the world. UCL was identified by the UK Research Excellence Framework as the top university in the UK for research strength and UCL is consistently placed in the global top 10-20 across a wide range of university rankings (currently joint 7th in the QS World University Rankings). UCL's total competitively awarded research income annually stands at an impressive € 574 million, of which 11% is European funded research & innovation. UCL is one of the leading recipients of European Framework Programme grants, with over 400 Horizon 2020 projects and 700 projects funded during the Seventh Framework Programme (FP7). UCL has been involved in over 157 Marie Curie actions, Included 47 ITNs in H2020 and 27 in FP7.

Prof. Jian Kang, FREng, MAE, FIIAV, FIOA, FASA, CEng, obtained his BEngArch and MSc from Tsinghua University and PhD from University of Cambridge. He joint UCL in 2018 as Professor of Acoustics, after worked as Professor of Acoustics at the University of Sheffield since 2003. Previously he also worked at the University of Cambridge and the Fraunhofer Institute of Building Physics in Germany. He has worked in environmental and architectural acoustics for 35+ years, with 60+ engineering/consultancy projects, 70+ research projects, and 800+ publications. His work on acoustic theories, design guidance and products has brought improvements to the noise control in underground stations/tunnels and soundscape design in urban areas. He was awarded IOA Tyndall Medal 2008, and Peter Lord Award 2014, and he is recipient of the prestigious Advanced ERC Grant on Urban Soundscapes. Prof. Kang is the President of the International Institute of Acoustics and Vibration (IIAV), and he also chairs the European Acoustics Association Technical Committee for Noise, and the EU COST Action on Soundscape of European Cities and Landscapes. • **Dr. Francesco Aletta**, Lecturer, Chartered Architect and Acoustician, trained as Urban Sound Planner within the EU-funded ITN "Sonorus". Author of 1 book, 30+ articles in peer-reviewed journals and 20+ conference papers. Editor of 5+ scientific international journals and reviewer of 200+ papers. International expert for the assessment of Italian scentific projects (Ministry of Research and Education). Full member of the Italian Acoustical Society.

University of Southampton (UOS)

The University of Southampton (UoS) is an excellent venue for conducting cutting-edge research and for providing high quality post-graduate education. It has over 7,500 postgraduates from more than 130 different countries. It is ranked in the top 100 universities worldwide (QS world university rankings 2020) and in the top 15 research led universities in the UK (REF 2014). UoS also has a strong record in European projects, and has signed 156 grants worth over €104m (as at July 2019). The University of Southampton is a founding member of the Worldwide Universities Network.

Prof. Stephen Elliott, Professor of Adaptive Systems in 1994 and served as Director of the ISVR from 2005 to 2010, publishing over 250 journal papers, 50 conference papers and three books in the area which cover acoustics, structural vibration and signal processing and control, authorship of the books “Active Control of Sound” with P.A. Nelson, “Active Control of Vibration” with C.R. Fuller and P.A. Nelson and, most recently, “Signal Processing for Active Control”. • **Prof. Jordan Cheer**, MSc (2009) and PhD (2012) in Sound and Vibration from the ISVR. Chartered Engineer and Fellow of the Higher Education Academy. Currently an Associate Professor at the University, Associate Editor for the Journal of the Acoustical Society of America and Subject Editor for the Journal of Sound and Vibration. Published more than 80 journal and conference papers in the areas of active noise and vibration control and directional sound reproduction. Supervised 1 PhD and 6 MSc students to completion, and currently supervising 10 PhD students.

5 Recruitment and selection process

We look for Doctoral Candidates (DCs) with a master degree (already awarded or to be awarded until the end of January 2023) in a relevant discipline (engineering/technical sciences) interested in combining academic and industrial research experience. The recruitment process is composed of following consecutive steps and time allowed for them:

1. (a) Filling an electronic questionnaire for the central IN-NOVA system: https://forms.office.com/r/nKubiURQZU
   (b) Submission of applications by the candidates directly to chosen host institutions. Compile your application in one pdf file, following the order: (i) maximum two-page motivation letter, (ii) CV, (iii) copies of transcripts of obtained degrees. The application must be written in English. Submit all the above documents via email as a single pdf file to chosen host institutions:
   - SUT – innova@polsl.pl
   - UPV – agonzal@dcom.upv.es or mdediego@dcom.upv.es
   - PDM – hamidreza.karimi@polimi.it or francesco.ripamonti@polimi.it
   - KUL – bert.pluymers@kuleuven.be or bert.roozen@kuleuven.be
   - DLR – malte.misol@dlr.de
   - SISW – fabien.chauvicourt@siemens.com

- UCL – j.kang@ucl.ac.uk
- UOS – j.cheer@soton.ac.uk

As the subject of your email, please use IN-NOVA application - your name. The candidate may apply to many DC subjects and different host institutions; the order of preference should be specified in the questionnaire mentioned in step 1(a) – 20 working days

2. Pre-selection of candidates by the main supervisors based on the CV and the motivation letter (creation of a long list for each subject) – 5 working days
3. Offering a research project to the long-listed candidates by the relevant ISC to verify competence of the candidates – 5 working days
4. Submission of research projects by the long-listed candidates – 10 working days
5. Review of the long list by the members of the relevant ISC based on the research project (creation of a short list) – 10 working days
6. Interview of short-listed candidates by the ISC via a web conference – 10 working days
7. Notification to successful candidates – 5 working days
8. Issuing work contract and declaring conformity of Doctoral Candidate by relevant HR departments – as soon as possible, based on each Party's internal processes.

The candidates applying to the given university should meet all criteria for PhD candidates defined by that university and may be subject to additional steps of the recruitment process including evaluation by a body established by that university. The candidates are allowed to contact directly the supervisors from that university or use the IN-NOVA email address (innova@polsl.pl) to ask questions about the PhD subjects and the recruitment process.

A DC will be enrolled to a structured PhD programme or programmes if the two Parties (being universities where two supervisors are affiliated to) agree and sign an agreement for a double/joint doctorate. All DCs will be covered under the social security scheme.

IN-NOVA organisations act in line with the principles of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers.

6 Doctoral Students' individual projects

Individual projects allow the DCs to gain experience working with all stages of the noise solution development from analysis and design to application and industrial evaluation, in tandem with their academic studies. Their training will be undertaken in some of the world's key laboratories for sound and vibration research and in Europe's leading companies of global reach.

The table below presents planned for IN-NOVA: the titles of PhD projects, the experts guiding the Doctoral Candidate, the host institution and the institution offering a PhD programme for that candidate. The consortium reserves the right to justified changes under specific circumstances.

Table 6.1: Individual Research Projects.

Fellow:	**Host institution:**	**Enrolment in Doctoral degree:**
DC1	SUT	SUT
International Supervisory Council (ISC): Prof. M. Pawelczyk (SUT), Dr. S. Wrona (SUT), Dr. M. de Diego (UPV), Prof. L. Cheng (SAB), Dr. C. Thomas (AB)		
Project Title: Distributed control algorithms for active device casings		
Objectives: The active casing wall panels' vibrations can be controlled to reduce the device noise emission. Such concept has been originally proposed and its efficiency has been preliminarily confirmed by the researchers of SUT. Developed prototypes are based on high-end laboratory grade controller with mostly centralized control architecture. However, further research is required to advance this solution for real applications. In particular, the DC will design a new control system architecture in order to improve system feasibility and scalability. The DC will develop a real-time implementation of distributed control algorithms on a dedicated modular hardware. The DC will address a design of distributed controller, necessary data exchange between control nodes, reduction of computational complexity and control performance experimental evaluation. The main goal is to provide global noise reduction in the entire enclosure, with reduced energy consumption and system complexity.		
Expected results: The project is expected to deliver a novel distributed adaptive control algorithm tailored for the active casing. Another result is a new prototype of distributed controller that will push the investigated method beyond the current state-of-the-art.		

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC2	SUT	SUT

ISC: Prof. M. Pawelczyk (SUT), Dr. S. Wrona (SUT), Prof. H. Karimi (PDM), Prof. W.S. Gan (SAB), Dr. R. Schirmacher (MBBM)

Project Title: Active device casings with an open part or made from a different material

Objectives: The idea of the active casing originally proposed at SUT is to control vibration of device walls in order to reduce noise emission globally to the entire room or area, where the devices are located. However, there are many practical situations, where the devices are not fully enclosed e.g., to be reached by an operator. Then, the problems go to another level. Controlling vibration of the remaining walls should be performed in a very specific way not only to reduce the noise just transmitted through the respective walls, but also contribute to controlling the noise going out through the opening. Additional sound sources are needed to support the vibrating walls in order to reduce the noise globally in the room.

Expected results: This DC's project is expected to originally analyse the problem of active casings with an opening, develop and experimentally verify control systems and algorithms to make them practically applicable.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC3	PDM	PDM

ISC: Prof. H. Karimi (PDM), Prof. F. Ripamonti (PDM), Prof. M. Pawelczyk (SUT), Prof. Y. Kajikawa (SAB), Dr. R. Schirmacher (MBBM)

Project Title: Deep learning-based active control of noise transmission through encapsulated structures

Objectives: In active noise control, especially dedicated for problems considered in IN-NOVA, in most cases deterministic components are mixed with a broadband part. Considering the difficulty to measure the acoustic pressure in advance to apply classical active noise control methods, artificial intelligence tools such as deep learning algorithms can be an effective data-driven approach. They can be applied to compute/predict the acoustic pressure due to their ability to capture spatial coherent patterns in the radiated acoustic pressure fields. In addition, deep learning-based ANC design can potentially play an important role in dealing with nonlinearities unavoidable in electro-acoustic system as well as broadband noise removal. Deep learning algorithms will also allow for including holistic aspects in the design. Knowledge about physical behavior of the plant will be incorporated to enhance performance.

Expected results: The DC will develop: a) deep-learning algorithms for calculating time-propagation of acoustic waves; (b) time-domain methods for deep learning-based ANC; (c) a simulation environment for deep learning algorithms applied to calculations of propagation of acoustic waves with acceptable accuracy levels and made available to other researchers in the project and beyond.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC4	PDM	PDM

ISC: Prof. H. Karimi (PDM), Prof. F. Ripamonti (PDM), Prof. S. Wrona (SUT), Prof. R. Paurobally (SAB), Dr. J. Calpe-Maravilla (AD)

Project Title: Direct data-driven active noise cancelation design based on near-field acoustic holography

Objectives: Traditional control design methods mainly follow the two steps: model parameters identification; model-based control design. However, direct data-driven control algorithms are introduced in time domain to merge the two steps by directly using input-output data for controller design purposes and making the system less dependent on a pre-identified model. Performance of noise control systems strongly depends on the primary path (noise propagation) and secondary path (compensation) models' quality used for designing the feedback control law. Considering that it is hard to find the correct model for control design, the direct data-driven approaches can be used to compute controllers that are suitable for ANC using only near-field acoustic holography by arranging microphones on the appliance fuselage, ex. study of the acoustic emission of a noisy device, and sound field produced by loudspeaker array, without any detailed knowledge of the system model. In this configuration, the near-field acoustic holography predicts the global sound field through near-field noise. Then, the direct data-driven method is applied to develop tractable algorithms for a novel noise canceller design.

Expected results: The DC will develop: a) input-output data acquisition under an experimental protocol; b) acoustic modal analysis of the device noise; c) optimization algorithms to compute structure controllers that are suitable for noise reduction.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC5	UPV	UPV

ISC: Prof. A. Gonzalez (UPV), Dr. M. de Diego (UPV), Dr. S. Wrona (SUT), Prof. R. Paurobally (SAB), Dr. J. Calpe-Maravilla (AD)

Project Title: Development of fast and distributed signal processing algorithms for active noise control

Objectives: The objective of this project is to develop and investigate distributed ANC systems in static and dynamic environments using acoustic nodes. The DC will search for algorithm solutions that could be used for network self-adapting of nodes placements or clustering objectives when we consider movement of listeners or transducers. He/she will develop and implement fast and distributed algorithms based on fast least squares. Moreover, the DC will implement and test novel sound field control strategies adapted to the environments where control points may vary with time. The base of the study will be both the remote microphone technique and the moving virtual sensing method.

Expected results: The DC will develop (a) distributed multichannel algorithms based on fast least squares and (b) algorithms that dynamically adapt the network topology. The project will also produce scientific results to improve signal processing tools. The prototypes and applications are expected to evolve into marketable products.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC6	KUL	KUL

ISC: Dr. B. Pluymers (KUL), Prof. N.B. Roozen (KUL), Prof. M. Pawelczyk (SUT), Prof. L. Cheng (SAB), Dr. S. Tong (SISW)

Project Title: Passive and active approaches in automotive applications

Objectives: Hybrid-electric vehicles (HEVs) and battery-electric vehicles (BEVs) are cleaner and produce less exterior noise than cars with internal combustion engines. However, the interior noise is characterized by high-frequency noise components which can be subjectively perceived as annoying and unpleasant. The challenge is to reduce the interior noise levels in (H/B)EV, without adding too much weight to the car. The objective of this DC is to develop a passive/active approach to reduce the annoyance of acoustic sound field in a car. The DC will focus on the vibro-acoustic modelling of structural vibrations and acoustic radiation of typical automotive structural parts (e.g., body panels), actively controlled by means of electromechanical actuators. The active control approach will be complemented with passive reduction approaches, e.g. exploiting metamaterials.

Expected results: Develop a trade-off between active control and passive control of typical automotive structural parts such as a firewall in terms of vibro-acoustic radiation. The main deliverable will be a laboratory test rig comprising of these parts, which is excited (through an electrodynamic shaker) by realistic vibro-acoustic forces occurring in an (H/B)EV.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC7	SISW	KUL

ISC: Dr. F. Chauvicourt (SISW), Prof. N.B. Roozen (KUL), Dr. M. de Diego (UPV), Dr. B. Pluymers (KUL), Prof. Y. Kajikawa (SAB)

Project Title: Vibro-acoustic design feature extraction using Artificial Intelligence

Objectives: Noise in the interior of an automotive cabin depends on many design factors of the cars, thus making it difficult for Original Equipment Manufacturers to optimize and/or define targets for new innovative designs. Overall system-level modelling strategies are required and must incorporate component behavior details; while making sure not to reinvent the wheel. To this end, the objectives of the DC will be to develop a holistic modelling framework that combines knowledge-based and data-based simulators to generate feature of unknown designs (interior cabin noise focus). Artificial intelligence will support the classification of a priori known data, and the prediction of new design features.

Expected results: This DC project is expected to define a set of design features for reducing interior cabin noise from knowledge-based and data-based engineering, which will be of high practical importance.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC8	UPV	UPV

ISC: Prof. A. Gonzalez (UPV), Dr. M. de Diego (UPV), Prof. J. Kang (UCL), Prof. W.S. Gan (SAB), J. Kirchhof (MBBM)

Project Title: Perceptual broadband ANC equalizer with spatially distributed user-selected profiles

Objectives: Active noise equalization algorithms have been proposed to deal with multi-frequency noise generated by mechanical systems such as the car engines to improve passenger comfort. These algorithms keep a desired residue of the noise by assigning simultaneously different equalization gains to each frequency and thus achieving pleasant sound spaces. However, broadband noises such as the road noise should be also considered in those complex scenarios, where warning sounds and communication between passengers are also present. In this regard, and addressing the need of a personalized active equalization of broadband noise, the DC will develop broadband active noise equalization algorithms and schemes. A practical road active noise equalization system that could provide different noise profiles at a set of spatially confined regions around the head of different passengers will be developed. When music is played in the vehicle cabin, the algorithm could also benefit from the masking effect of the music, leading to a perceptual broadband active noise equalizer. Remote microphone techniques will assist to address the personalized equalization challenges.

Expected results: The DC will develop: a) broadband multichannel active noise equalization algorithms and (b) perceptual broadband multichannel strategies. The prototypes will gain interest as marketable offer.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC9	DLR	OVGU

ISC: Prof. H.P. Monner (OVGU), Dr. S. Algermissen (DLR), Dr. S. Wrona (SUT), Prof. J. Arenas (SAB), Dr. F. Chauvicourt (SISW)

Project Title: Contribution analysis of vibrating aircraft interior parts to overall cabin noise

Objectives: The objective is to develop an acoustic cabin simulator that allows the identification of cabin noise sources with simulation. The aircraft cabin is surrounded by various vibrating structures (ceiling and sidewall panel, hatrack, floor) which act as noise sources and contribute differently to the cabin noise depending of the load case. By identifying the most important noise sources for different load cases, effective treatments can be investigated and evaluated in the numerical framework on cabin level. Relevant load cases will be obtained from measurement data of full-scale aircraft on ground or in-flight operation.

Expected results: The key interior components which contribute to the cabin noise will be identified. Therefore, noise maps of the cabin with vibrating surroundings will be calculated in order to understand sound pressure distributions caused by different parts. A numerical framework will be available to evaluate the efficiency of individual cabin treatments.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC10	DLR	OVGU

ISC: Prof. H.P. Monner (OVGU), Dr. M. Misol (DLR), Prof. N.B. Roozen (KUL), Prof. Y. Kajikawa (SAB), J. Kirchhof (MBBM)

Project Title: Active aircraft interior parts with structurally integrated sensors for cabin noise reduction

Objectives: The vibration excitation of aircraft interior structural parts through external noise sources plays a major role for cabin noise. It is assumed that this transmission path is inherent to all aircraft and that it is not possible to completely eliminate this transmission path. Therefore, the main objective of this project is the development of active noise control for aircraft interior parts to counteract noise close to the passengers. Key features of such an active component are the structure-based sensing scheme and the modularity. The structure-based modular concept avoids the distribution of microphones in the cabin and permits each active interior part to act independently and decentralized. The active component is also able to emit useful sound (e.g. passenger announcement) or improve sound quality through noise masking or psychoacoustic features.

Expected results: A modular and robust aircraft interior part with active noise reduction capability will be available at the end of the project. Major intermediate results for the development of such a part are the selection of a suitable structure-based sensing scheme, the optimization of actuators and sensors, the design and implementation of a controller and the structural integration of the active components. Each active part will contribute to the reduction of noise in a neighbouring region of the cabin and their assembly will facilitate a global reduction in a dedicated section of the aircraft or even in the whole cabin.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC11	UOS	UOS

ISC: Dr. J. Cheer (UOS), Prof. S. Elliott (UOS), Prof. A. Gonzalez (UPV), Prof. R. Paurobally (SAB), Dr. C. Thomas (AB)

Project Title: Head tracking for local active sound control

Objectives: Initial experiments on the use of head tracking to improve the performance of local active control at a listener's ear have demonstrated its potential, but further research is required in a number of areas before this technique is practical. In particular, this PhD will address the tracking of head rotation as well as head translation, the speed at which the tracking needs to be implemented for seamless operation, and the trade-off between using large lookup tables of responses for different head positions and the use of interpolation between a smaller set of responses.

Expected results: The project is expected to evaluate head tracking for local active sound control in detail beyond the current state-of-the-art. It is expected that the project will develop advanced control strategies that effectively integrate head tracking information into novel active control algorithms and a real-time technology demonstrator will be implemented and tested.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC12	UOS	UOS

ISC: Prof. S. Elliott (UOS), Dr. J. Cheer (UOS), Prof. M. Pawelczyk (SUT), Prof. W.S. Gan (SAB), Dr. S. Tong (SISW)

Project Title: Directional microphone arrays for remote microphone virtual sensing

Objectives: The remote microphone technique is used to estimate the acoustic signal at a virtual sensor location using the outputs from a remote array of monitoring sensors, and is used in the implementation of active sound systems for both local control and for noise barriers. Current arrangements use pressure microphones as the monitoring sensors, but it is known that complimentary information about the sound field is available from pressure gradient microphones. Directional microphones, such as cardioids, are also available that combine elements of pressure and pressure gradient response. This PhD would investigate the optimum directivity and geometry of the microphones in a monitoring array for a local active control problem.

Expected results: The project is expected to evaluate the performance of different microphone directivities in the context of local active sound control. As a result of this insight, it is then expected that the project will develop optimised strategies for the definition of microphone directivity in remote sensing strategies and validate these strategies experimentally.

Fellow:	Host institution:	Enrolment in Doctoral degree:
DC13	UCL	UCL

ISC: Prof. J. Kang (UCL), Dr. F. Aletta (UCL), Prof. A. Gonzalez (UPV), Prof. J. Arenas (SAB), Dr. F. Chauvicourt (SISW)

Project Title: Noise barriers with a soundscape approach

Objectives: The general aim of this DC's research project will be investigating how to extend the scope of conventional noise barriers using the soundscape holistic approach. In the context of this research, noise barriers will not necessarily be considered as "physical infrastructures" that impede sound propagation, but rather as a set of technological solutions and/or implementation of psychoacoustics that can create quiet areas indoor or in car/aircraft cabins, offering opportunities for recovery and restoration from noise pollution. The DC will explore a number of alternative strategies: (1) energetic and attentional masking; (2) exploitation of benefits provided by non-acoustic (e.g., vision, smell) factors; (3) smart noise control engineering.

Expected results: Return research outcomes and recommendations to be used at small- and building scale by architects and interior designers to deliver indoor spaces and cabins with high acoustic comfort. The project deliverables will also lay the ground to develop further learning materials/syllabi or teaching programmes to be integrated into academic courses.