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MultidisciplinarY training network for ATrial fibRillation monItoring, treAtment and progression

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Training Standards and Recruitment Plan

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Table of contents

1 Summary

This document defines the training standards for each Early Stage Research (ESR) who will be recruited within the project MYATRIA Marie Curie European Training Network. In addition, the document details the Recruitment plan implemented within MYATRIA.

2 Training Standards

Cardiovascular diseases are the leading cause of death accounting for 30% of deaths worldwide, according to the World Health Organization[1]. Among these diseases, the incidence and prevalence of pathologies related to atrial diseases, particularly atrial fibrillation (AF) and interatrial block (IAB), are today reaching pandemic proportions. The Global Burden of Disease Study estimated in 2010 a prevalence of AF of 373.1/100,000 for women and 596.2/100,000 for men. The costs associated with the care of patients with atrial disease are today reaching astronomical proportions: as an example, the total annual costs of AF care in the US are approximately $7 billion and roughly €13.5 billion in the European Union[2]. Nearly 75% of the costs of AF represent the direct and indirect costs associated with hospitalization. The societal costs of lost productivity should neither be overlooked. Thus, this is the time actions are needed to improve diagnosis and treatment of atrial disease.

MY-ATRIA brings together universities, companies and hospitals from 5 European countries (Italy, Spain, Sweden, Netherlands and Germany). The main scope of MY-ATRIA is to establish a multidisciplinary network able to develop research and training "without walls" among academic, industrial and clinical entities in the area of cardiac, atrial disease. The composite nature of the MY-ATRIA network will ensure a highly qualified training and research infrastructure, which meets the needs of academic research, industrial exploitation and clinical end-users.

In this scenario, MY-ATRIA *will address the challenging problems related to* detecting atrial arrhythmias with novel device technology as well as to understanding the influence of atrial geometries, anatomical substrates and remodelling processes in atrial disease development and response to treatment. This aim will be reached by training a new figure of modern professional researchers in AF field with multidisciplinary competencies, able to transfer advances in basic science to market and clinics. From a scientific point of view, several issues remain to be solved in three areas, which are the specific scientific objectives of MY-ATRIA:

[1] The Lancet, December 2014 (http://dx.doi.org/10.1016/ S0140-6736(14)61682-2)

[2] Coyne KS, et al. *Value Health*. 2006; 9: 348–356; Le Heuzey JY, et al.*Am Heart J*. 2004; 147: 121-6; www.ncbi.nlm.nih.gov/pubmed/16908781

i. *Understanding atrial arrhythmia mechanisms*: We aim at a better interpretation of atrial arrhythmias mechanisms by studying the electrocardiogram (ECG), and intra-cavity atrial electrogram (EGM) using a hybrid in-silico/in-vivo methodology. Abnormal interatrial connections, normal and dilated left atrium, electrical remodelling, coupling, and fibrosis will be the target of this research activity. These objectives will be reached by integrating signal processing and detailed 3-D models of both normal and dilated atrial morphologies including anatomical details such as: real atrial thickness, endocardial and epicardial direction of the fibres and fibrosis, and electrophysiological heterogeneities among others.

ii. *Monitoring, progression and risk stratification*: We aim at creating a set of new tools (new algorithms to be included in everyday sensor devices) to analyse and characterize the progression of paroxysmal AF suitable for implementation in wearable devices, to detect and monitor AF effectively in large populations for screening purposes. Moreover, multi-parametric AF detectors that include information from other available sensors (wristband, non-contact electrodes among others) will be developed.

iii. *Studying the effects of treatment*: As the efficacy of treatment (pharmacological cardioversion and ablation) varies among the patients, we aim at studying the effect of treatment developing computational models and linking them to ECG and EGM. Electrocardiographic markers of the AF process will be assessed and linked to the treatment outcome in different patient categories and subtypes of AF including new-onset AF, paroxysmal AF, and permanent AF in patients with and without structural heart disease.

Achievement of these objectives will be possible through a combined Research-Training coordinated program, providing training, by research, to twelve Early Stage Researchers (ESRs) through the individual research projects (IRP) conceived around the three main research areas previously described. In this regard, MY-ATRIA puts together a multi-sectoral consortium that will perform research in the multi-disciplinary area of atrial arrhythmias.

2.1 MY-ATRIA network-wide training program

MY-ATRIA is to implement a new, intersectoral, multi-disciplinary, multi-factorial paradigm of PhD training to shape a new figure of modern professional researchers in AF field. The current needs for the treatment of atrial pathologies ask for a new generation of researchers integrating ample knowledge of the pathology, the right skills for modelling, and a clear vison of the industrial needs, on top of a demonstrated fluency on the clinical language. The designed MY-ATRIA training program is very innovative. It integrates top level formation in three areas: academia, clinic and industry, overcoming the limit of sectorial AF training. This is

accomplished by pulling together EU leaders in the three areas, which will generate young researchers with the technological background well referenced to the clinical needs and to the industrial transference scenario. Success in this direction is the only alternative to obtain middle term success in technological development better fitted to the real needs, and so with a more efficient transition from idea to market. Thus, MY-ATRIA has designed a balanced Curriculum for each ESR, described in the following and summarised in the table below[3].

PhD Curriculum	Training Elements	Credits
Training through Research	Individual Project	80
	Secondments	55
Training through courses	Network-wide training on technical and complementary skills	15
	Local teaching training	10
	Local fellow-tailored training course	10
	Local complementary skills training	10
Total		**180**

Table 1. Training program of MY-ATRIA

Training through research corresponds to approximately 75% of the training effort, covering the individual project and secondments, guarantying sufficient exposition of each ESR to the different environments not directly related to his/her individual project. A minimum of three secondments are planned for each ESR. Two of the secondments will take place in another sector to guarantee the complementarity of the training.

Secondment training: All ESRs will spend at least six months in three sectors (academia, hospitals, and industry) during various phases of their training. In every secondment institution, there will be a mentor, supervising the ESR during the period, meeting with her/him every other week. Thanks to the mentor supervision, the ESR will learn how to relate to and understand the needs of people belonging to different sectors, speaking a unique language. The secondments will give the ESRs the opportunity to work directly with academia, hospitals and industries to become a complete researcher figure. In designing the secondment plan for each ESR attention is given to guarantee that at least two fellows are present at the

[3] Credits in Table 1 must be understood as indicative since PhD programs from different universities may have different requirements. For instance, Lund University requires at least 240 credits for the PhD program that the student may have to complement as local training activities. On the contrary, Universidad de Zaragoza only requires the PhD thesis.

host institution during the secondment stage. The objectives are twofold. First, to promote technical discussion among the fellows that, working in different problems may provide a fresh alternative toward the solution of the project. Secondly, the presence of another fellow provides support to the visiting fellow as well as speeds-up the insertion of the fellow to the new environment.

The ESR's Curriculum is reinforced with **training through courses**, i.e., **Network wide and local training** activities in both technical and complementary areas which are tailored to the individual needs of each ESR. Network wide activities include Summer Schools and special events (i.e. the Introductory and the Final event). Attendance to Network-wide activities is mandatory for all ESRs. Each ESR will count with an individualized local technical training programme consisting in individual technical university courses responding to the necessities of individual IRPs, and the potentiality of each ESR. Courses on scientific and technical skills (scientific technical and public communication, scientific writing, etc) will be included in the individual curricula as well as complementary training courses associated with project management, product development and language skills.

Each researcher will develop a **Personal Career Development Plan** together with his/her supervisor. This process will recognise existing skills and identify "skill deficiencies". These deficiencies will be address through a combination of **local training** and **network-wide training**, and **secondments** within the network. As the required skills training will depend on the background of the recruited researchers, this may imply a further refinement of the local and network-wide training activities described below. A template of the personal career development plan is provided in annex 1.

2.2 Local training activities

Each ESR will count with an individualized local technical training programme consisting in individual technical university courses responding to the necessities of individual IRPs, and the potentiality of each ESR. Courses on scientific and technical skills (scientific technical and public communication, scientific writing, among others) will be included in the individual curricula as well as complementary training courses associated with project management, product development and language skills.

Academic beneficiaries: POLIMI, LU, UNIZAR, UPV have their own Master and Doctoral Biomedical Engineering course, KIT offers courses in Electrical Engineering and Information Technology and UMIL in Computer Science. All university tracks train students through an interdisciplinary education in engineering, mathematics, medical and biological knowledge to develop high level problem-solving abilities in life sciences. ESRs will attend at least three

courses. Each ESR will participate to different workshops and courses organized by the universities regarding proposal writing and communication skills, as well as project management courses offered by other departments to complement their formation apart from the purely scientific content. A selection of courses of interest for the ESRs has been made in all the universities of the consortium and a list is provided in Table 2.

Area	Course title (Institution)
Biomedical & Research topics	○ Electronic technologies in biomedical engineering (POLIMI) ○ Bioelectromagnetism (POLIMI) ○ Advanced processing of biomedical signals and data (POLIMI) ○ Numerical solution of non-linear reaction-diffusion equations. Application to the bioelectric modeling of the heart (POLIMI) ○ Computational biology of the heart (POLIMI) ○ Bioelectricity and electrophysiology (UNIZAR) ○ Biomechanic modelling of the cardiovascular system (UNIZAR) ○ Advanced biomedical signal processing (UNIZAR) ○ Pattern recognition techniques (UNIZAR) ○ Medical image analysis (LU) ○ Technology, risk and research ethics (LU) ○ Optimal and adaptive signal processing (LU) ○ Advances in biomedical signal processing (LU) ○ Modeling, analysis and optimization of networks (UMIL) ○ Advanced intelligent systems (UMIL) ○ Advanced topics in signal processing (UMIL) ○ Electromagnetics and numerical calculation of fields (KIT) ○ Radiation protection (KIT) ○ Modelling and simulation of bioelectric systems. Application to electrical activity of the heart (UPV)
Transferable Skills	○ Ethics in research (POLIMI) ○ Scientific communication in English (POLIMI) ○ Management of Research (POLIMI) ○ Informational abilities for PhD students (UNIZAR) ○ Ethical and regulatory aspects in the research with animals and humans (UNIZAR) ○ Academic English (UNIZAR) ○ Academic writing for publication in the engineering and science disciplines (LU) ○ Project management in R&D projects (LU) ○ Innovation and value creation in research (LU) ○ Intellectual Property Rights & Research exploitation (UMIL) ○ Copyright and open access (UMIL) ○ Fit for teaching – basics of teaching and learning at university level (KIT) ○ Learning and teaching in a multilingual and multicultural environment (KIT) ○ Applied research methodology (UPV)

Table 2. University courses available to the different ESR's within MY-ATRIA

2.3 Network-wide training activities

Network wide activities include three Summer Schools and two special events (i.e. the Introductory and the Final event). Attendance to Network-wide activities is mandatory for all ESRs.

Summer schools will be concentrated in the first two years of the PhD programmes. The first one will introduce the ESRs to the clinical world of atrial arrhythmias, the second one will focus on the methodologies for atrial modelling, monitoring and diagnosis, and the third one will deal with the technology transfer and impact (details below). All ESRs will attend all the summer schools. However, all summer schools will be opened to a more general public, as other university students, clinical doctors and professionals in the biomedical engineering business. This aspect provides a unique opportunity for each fellow to demonstrate his/her communication skills by presenting his/her research to a broader audience, prone to criticisms.

In connection with the summer school a fundamental event is the ***ESR's Day***, which will be devoted to ESRs' presentation of their research activities. A panel discussion will follow each group of talks, to offer suggestions and contributions to ESRs for ongoing and future research activities. Besides the academic program, social activities will be organized to permit ESRs to spend time together and further bond in a true international team. Moreover, the morning of the second day of all Summer Schools will focus on complementary skills (scientific writing, communication, grant writing).

<table>
<tr><th colspan="2">Introductory Event</th></tr>
<tr><td>This event will take place over two days in Milan at the end of the recruitment period to allow ESRs to gain an understanding of their IRP projects. The event will provide an opportunity for all ESRs to meet for the first time and will promote network cohesion and interactions between MY-ATRIA consortium members. Training activities will focus on complementary skills (communication and presentation skills), but also will provide training in issues associated with research ethics and management and reporting requirements of MY-ATRIA. It will also provide ESRs with information related to the main research topics related to MY-ATRIA, and entrepreneurship.</td><td>Day 1:
○ Network presentation (POLIMI)
○ IRPs presentation (POLIMI)
○ ESRs introduction (POLIMI)
○ Communication and presentation skills and research ethics and integrity (UMIL)
Day 2:
○ Introductory lectures on atrial dysfunction (UMIL)
○ Review on numerical simulation of atrial activity (UPV-KIT)
○ Review on atrial signals analysis (UNIZAR)
○ Initial presentation on "from idea to product" (EMP)</td></tr>
<tr><td colspan="2">Primary skills address:
○ Communication and presentation skills
○ Research ethics and integrity
○ Research and project management
○ Entrepreneurship</td></tr>
</table>

Summer school 1: Arrhythmic substrate in the human atria: histology, structure and function	
This event will take place over three days in Lund at LU main campus. Training will be delivered to address the issues associated with atrial structure and function and current clinical treatment of atrial disease. The event, lead by industrial and clinic partners of the consortium will offer an opportunity for interdisciplinary in-depth discussions on which are the corner stones of the scientific content of the network collaboration. The event will offer training in soft-skills associated with scientific writing in the engineering and clinical context, as well as training in ethical issues associated with experimentation and clinical trials.	**Day 1:** ○ ESRs day: Poster presentation and project pitching exercise. ○ Social event **Day 2:** ○ Scientific writing in medicine and engineering (LU/SKANE) ○ Workshop on manuscript and abstract writing (LU/SKANE) ○ Anatomy and electric function of the human atria (SKANE-Clinic) ○ Atrial arrhythmias: clinical impact and diagnostic challenges (SKANE-Clinic) **Day 3:** ○ Mechanisms of atrial arrhythmias (OMP-Clinic) ○ Techniques of AF screening (SKANE-Clinic) ○ AF screening in the clinical context (SKANE-clinic) ○ ECG-based assessment of drug effects (BRC-Industry) ○ AF Management and evidence-based recommendations (BRC-Industry) ○ Catheter ablation for AF (SKANE-Clinic) ○ Scientific experiments, clinical trial, and related ethical issues (BRC-Industry)
Primary skills address: ○ Complementary skills: Scientific writing, ethical issues related to experiments and clinical trials. ○ Science: Atrial functioning and structure, mechanisms of atrial fibrillation, AF screening modalities and signal analysis techniques ○ Clinic: AF Diagnosis and screening in the clinical context ○ Industry: AF screening and monitoring from the industrial viewpoint	

Summer school 2: Modelling and signal processing	
This event will take over three days in Zaragoza, Spain. The event will be held in the University residence in Jaca belonging to the university and including teaching facilities (http://www.unizar.es/resijaca/html/inicio.php). It will build on the experience of Summer School 1 to complement experimental and clinical approaches for AF diagnosis and monitoring. The training, led by academic partners, will focus on modelling and signal processing techniques and its application to AF management, emphasizing the future challenges in the development of tools for detection, diagnosis, therapy delivery and	**Day 1:** ○ ESRs day. Conference communication ○ Social event **Day 2:** ○ Uncovering atrial activity from surface ECG. Risk stratification (POLIMI, UMIL) ○ Atrial signal extraction and characterization (LU, UNIZAR) **Day 3:** ○ Characterization and quantification of intracardiac electrograms by signal processing. Application to ablation therapies (UNIZAR, BRC)

monitoring. Complementary skills of ESRs will also be developed indirectly, as ESRs will be required to present results of their research at first day of the summer school followed by a panel discussion chaired by industrial and clinical partners.	○ Detection and monitoring of AF (BRC,EMP,MIE,POLIMI) ○ Computational modelling of human atria (KIT,POLIMI,UPV) ○ Effect of neural-regulation and drug therapies on atrial cardiomyocytes (UNIZAR) ○ Clinical use of early AF detection. AF ablation management (SKANE, Invited Speaker from clinics) ○ From algorithm to commercial products (LU, GRAD)
Primary skills address: ○ Complementary skills: Oral (conference presentations) and writing communications (poster preparation). ○ Signal processing: Processing atrial signal from ECG and intracardiac electrograms ○ Modeling and simulation: Computational modeling of human atria. Patient specific modelling. Numerical techniques for computational electrophysiology of the atria	

Summer school 3: Technology transfer	
This event will take over three days in "Palazzo Feltrinelli", in the Garda lake in Gargnano (BS, Italy) belonging to UMIL and equipped with teaching facilities (4 classrooms and an auditorium, for up to 120 students, and a library). The event will focus on the exploitation of research results and will be led by the industrial partners EMP, BRC, MIE and GRAD. Training will include aspects related to project management, Intellectual property protection, Commercialisation, Quality assurance and Entrepreneurship in life science, and the importance of networking and the challenges related to collaborative research. Complementary skills of ESRs will also be developed thorough the delivery of lectures on grant writing. Following the structure of the two previous summer schools ESRs will be required to present results of their research at first day of the summer school. POLIMI and UNIMI research and project management offices will provide a talk in grant writing and project management.	**Day 1:** ○ ESRs day ○ Social event **Day 2:** ○ Grant writing (UMIL) ○ Project management (POLIMI) ○ How to identify the potentials in your own research (BRC) **Day 3:** ○ How to assess the technological and commercial potential of your own research (BRC,MIE) ○ Intellectual Property protection (MIE, BRC). ○ Quality assurance (MIE) ○ Marketing and Entrepreneurship in Life Sciences (BRC) ○ How to make an efficient technology transfer to industry (GRAD)
Primary skills address: ○ Complementary skills: Successful grant writing. ○ Research and project management ○ Commercial exploitation of your results (IRPs), entrepreneurship, intellectual property protection. ○ Understanding market needs and requirements, quality assurance, and efficient technology transfer to industry	

Final Event	
This event will take place for two days and will be held in Milan at POLIMI main campus. During this event, all the recruited ESRs will give a talk on their projects, showing the results of their training path. A general management and scientific report by the network coordinator will precede the ESRs presentations where a general overview of the achievements of the network will be presented to the public.	**Day 1:** ○ General network management and scientific report (POLIMI + all) ○ ESR presentations (IRP1 to IRP6) ○ Open panel discussion (POLIMI) **Day 2:** ○ ESR presentations (IRP7 to IRP13) ○ Open panel discussion (UMIL) ○ Closing presentation by the network coordinator (POLIMI)
Primary skills address: ○ Communication and presentation skills ○ Research and project management	

3 Recruitment plan

3.1 Generalities

MY-ATRIA is an Innovative Training Network programme for highly motivated young scientists, where state-of-the-art research is combined with a comprehensive training programme.

Six university partners: Politecnico di Milano-Italy (POLIMI), Karlsruhe Institute of Technology-Germany (KIT), Lund University-Sweden (LU), Università degli Study di Milano-Italy (UMIL), Universidad Politécnica de Valencia-Spain (UPV), and Universidad de Zaragoza-Spain (UNIZAR); and industrial partners: Medtronic-Netherlands (BRC) and Mortara-Italy (MIE), will recruit highly motivated candidates for 12 PhD positions (ESR's). Project description, starting date, duration of the studies and other details of each fellowship are given in annex 4.

MY-ATRIA adopts a central recruitment process where all beneficiaries participate. The call for applications is open from 15 December 2017 until 28 February 2018.

3.2 Employment conditions

General employment conditions are as follow:

- The contract will last 36 months.
- The gross salary for all ESR (PhD) positions is around 38000 euros/year plus a mobility allowance of about 600 euros/month and a family allowance of 500 euros ca. per month, where applicable.
- The ESR will be employed full-time, unless the Research Executive Agency has approved a part-time employment for personal or family reasons.
- The ESR will be working exclusively for the action.
- Each ESR will have to complete at least three secondments (temporary transfer to another MY-ATRIAL academic, industrial or clinical partner) for a total period of minimum 6 months during the term of his/her employment.
- Each ESR must actively participate in the events organized by Universities and partners, such as training/network events as well as in regular yearly Outreach Activities targeting different audiences.
- Recruitment, selection and appointment of the ESR follow the European Charter & Code of Conduct. All MY-ATRIA partners commit themselves to provide equal opportunities for male, female and disabled ESR's.
- ESR's progress will be regularly monitored. Every year, the candidate and his/her work will be challenged and questioned. Failure in providing evidence of a regular and continuous commitment may result in his/her exclusion from the programme.

- Further conditions set by hosting countries and institutions may apply.

3.3 Requirements for eligible ESR

Eligible ESR candidates may be of any nationality and must comply with the following **Mobility Rule** imposed by the EU:

- At the time of recruitment, the researcher must not have resided or carried out his/her main activity (work, studies, etc.) in the country of their host organization for more than **12 months in the 3 years** immediately prior to his/her recruitment.
- Short stays, such as holidays, are not taken into account

In addition, ESR Candidates must be, at the time of recruitment by the host organization, in the first four years (full-time equivalent) of their research careers and have not yet been awarded a doctoral degree. This is measured from the date when they obtained the Master's degree that would formally entitle them to embark on a doctorate.

Specific requirements imposed by MY-ATRIA are: i) proficiency in the English language (including both written and oral fluency), ii) the Candidate must hold a M.Sc. Degree by the starting date of the fellowship, in one of the following areas: Engineering, Physics, Applied Mathematics or Computer Science. Further specific requirements and restrictions set by hosting countries and institutions are listed in each fellowship description (see Annex 4).

3.4 Application procedure

Candidates may apply for more than one fellowship (maximum 12), but only with a single application, in which the candidate has to provide the list of fellowships for which he/she is applying in order of preference.

List of Documents to be provided

a) Application Form (see Annex 2)
b) Letter of motivation (max. 1 page)
c) Copies of degree and academic transcripts (with grades and rankings)
d) Resumé of Master's thesis (max. 1 page)
e) Short CV including a publication list (if any)
f) Two reference letters from academics[4]. Candidates must indicate the academics detail in the Application Form when applying.
g) Proof of English language skills (if required by the host institution)

[4] The letters must be compiled using only the given template (annex 3). The Academics need to send the letters directly to the Coordination Office from their official e-mail address, no later than 28/2/2018. It is the Applicant's responsibility to contact the Academics and provide them with the Recommendation Template.

h) Passport copy

All the above-mentioned documents must be collected in a single pdf file (max 10Mb). The pdf file has to be sent to the MY-ATRIA Coordination Office at the following email address: myatria@polimi.it. This being a compulsory procedure, any other means/format for submitting the application will not be accepted.

Eligibility in terms of EU requirements will be verified by the Consortium and notified to each applicant by email.

3.5 Selection procedure

A common scoring system and recorded interviews will be used, respecting privacy and protection of the Applicant's data. Female candidates and candidates with disabilities are encouraged to apply.

The whole list of applicants will be managed by the Coordinator of the action (POLIMI) who will separate them in groups associated with each IRP according to his/her application. A commission formed by one member of each beneficiary (see Section 3.6 for details) will be in charge of evaluating each applicant.

The selection process is based on two steps:

1. Assessment of academic records, based on the documentation provided by the Applicant (50 points)
2. For shortlisted candidates, remote interviews will be organized via teleconference (50 points).

The candidate must reach a minimum of 75 points to be eligible.

The **assessment of academic records** will be performed according to the following scoring system:

1. Academic performance during bachelor and masters (0-20)
2. Closeness of Master Thesis to Project topic (0-10)
3. Relevant scientific publications in the project topic (0-10)
4. Motivation and reference letters (0-10)

At the end of the selection process the consortium will issue a ranked list with the selected candidates for each project. In case of resignation, the following candidate in the list will be called. Each ESR will received an electronic notification of the result of the selection process. In case of acceptance, the candidate will have fifteen days to accept the offer before the next candidate in the list is called.

3.6 Evaluation Commission

The members of the Commission in charge of evaluating the Applicants and ranking them were established during the Kick-off meeting. The appointed members are listed in the following table (Table 3). One member per Beneficiary was included.

Institution	Member
POLIMI	Luca Mainardi
KIT	Olaf Doessel
LU	Leif Sörnmo
UMIL	Roberto Sassi
UPV	Javier Saiz
UNIZAR	Pablo Laguna
MEDTRONIC BRC	Mirko de Melis
MIE	Johan deBie

Table 3. Evaluation commission

3.7 Advertisement

The advertisement of the project will be performed through the website of the project and local and international networks summarized in the following list

- My-Atria website (www.myatria.polimi.it/recruitment)
- EURAXESS
- National networks:
  - Italian National Group of Bioengineering
  - Swedish Association of Biomedical Engineering and Physics
  - Spanish Society of Biomedical Engineering
  - CIBER-BBN (Spain)
- International networks:
  - European Society of Biomedical Engineering
  - International Society of Biomedical Engineering
- Academic positions

4 Annexes

Annex 1: Personal Career Development Plan template

Annex 2: Application form

Annex 3: Recommendation letter template

Annex 4: List of IRPs as announced in the recruitment process

Annex 1: Personal Career Development Plan template

Career Development Plan-Year 1
(Draft)

Name of fellow:

Department:

Name of Supervisor:

Date:

BRIEF OVERVIEW OF RESEARCH PROJECT AND MAJOR ACCOMPLISHMENTS EXPECTED (half page should be sufficient):

LONG-TERM CAREER OBJECTIVES (over 5 years):

1. Goals:

2. What further research activity or other training is needed to attain these goals?

SHORT-TERM OBJECTIVES (1-2 years):

1. Research results
    - Anticipated publications:

    - Anticipated conference, workshop attendance, courses, and /or seminar presentations:

2. Research Skills and techniques:
    - Training in specific new areas, or technical expertise etc:

3. Research management:
    - Fellowship or other funding applications planned (indicate name of award if known; include fellowships with entire funding periods, grants written/applied for/received, professional society presentation awards or travel awards, etc.)

4. Communication skills:

5. Other professional training (course work, teaching activity):

6. Anticipated networking opportunities

7. Other activities (community, etc) with professional relevance:

Date & Signature of fellow: Date & Signature of supervisor

Career Development Plan-Final year
(Draft)

BRIEF OVERVIEW OF PROGRESS, ACHIEVEMENT AND PERFORMANCE (half page should be sufficient):

LONG-TERM CAREER OBJECTIVES (over 5 years):
If relevant, mention any adjustments to your long-term career objectives as a result of the training received.

SHORT-TERM OBJECTIVES ACHIEVED DURING THE TRAINING PERIOD:

1. Research results
   - Publications (incl. in press):
   - Conference, workshop attendance, courses, and /or seminar presentations:
2. Research Skills and techniques acquired:
   - Training in specific new areas, or technical expertise etc:
3. Research management:
   - Fellowship or other funding applications achieved (indicate name of award if known; include fellowships with entire funding periods, grants written/applied for/received, professional society presentation awards or travel awards, etc.)
4. Communication skills:
5. Other professional training (course work, teaching activity):
6. Anticipated networking opportunities
7. Other activities (community, etc) with professional relevance:

Date & Signature of fellow: Date & Signature of supervisor

Career Development Plan
Guidance on some of the competencies expected

The following points are a non-exhaustive series of aspects that could be covered by the career development plan, and it is relevant to the short-term objectives that will be set by the researcher and the reviewer at the beginning of the fellowship period. The objectives should be set with respect to the skills and experience that each researcher should acquire at a given time of his/her career. A postgraduate researcher at PhD level will have very different needs compared to a post-doctoral researcher at an advanced stage of his/her professional development. These objectives should be revised at the end of the fellowship and should be used as a pro-active monitoring of progress in the researcher's career.

1. Research results.

These should give an overview of the main direct results obtained as a consequence of the research carried out during the training period. It may include publications, conference, workshop attendance, courses, and /or seminar presentations, patents etc. This will vary according to the area of research and the type of results most common to each field. The information at this level should be relatively general since the career development plan does not strictly constitute a report on the scientific results achieved.

2. Research Skills and techniques acquired.

Competence in experimental design, quantitative and qualitative methods, relevant research methodologies, data capture, statistics, analytical skills.
Original, independent and critical thinking.
Critical analysis and evaluation of one's findings and those of others
Acquisition of new expertise in areas and techniques related to the researcher's field and adequate understanding their appropriate application
Foresight and technology transfer, grasp of ethics and appreciation of IPPR.

3. Research management.

Ability to successfully identify and secure possible sources of funding for personal and team research as appropriate.

Project management skills relating to proposals and tenders work programming, supervision, deadlines and delivery, negotiation with funders, financial planning, and resource management.

Skills appropriate to working with others and in teams and in teambuilding.

4. Communication skills.

Personal presentation skills, poster presentations, skills in report writing and preparing academic papers and books.
To be able to defend research outcomes at seminars, conferences, etc.
Contribute to promote public understanding of one's own field

5. **Other professional training (course work, teaching activity):**

Involvement in teaching, supervision or mentoring

6. **Anticipated networking opportunities.**

Develop/maintain co-operative networks and working relationships as appropriate with supervisor/peers/colleagues within the institution and the wider research community

7. **Other activities (community, etc) with professional relevance.**

Issues related with career management, including transferable skills, management of own career progression, ways to develop employability, awareness of what potential employers are looking for when considering CV applications etc.

Annex 2: Application form

MY-ATRIA: Multidisciplinar**Y** training network for **AT**rial fib**R**illation monItoring, tre**A**tment and progression

Application form

Surname (family name):	**First name(s):**
Nationality: **Date of birth:** **Place of birth (country):** **Residency:** I declare that I have lived in the following countries for less than 12 months in the last three years, including the time left until my hypothetical enrolment in MY-ATRIA:	**Passport No:** **Date and place issued:** **Expiry date:**
Applicant's contact address: **Tel:** □ I would like to receive notification via text message **E-Mail:**	

List of attached documents (please check all items)	**List of fellowship(s) for which the Candidate is applying (in order of preference)[a]**
□ Copy of passport □ Letter of motivation (max 1 page) □ Copies of degree and academic transcripts (with grades and rankings) □ Resumé of Master's thesis (max 1 page) □ Short CV □ Proof of English language skills (required for ESR 1, ESR 5, ESR 9) □ Contact details of Academics for reference letters (Full name, address, and email)	1.- 2.- 3.- 4.- 5.- 6.- 7.- 8.- 9.- 10.- 11.- 12.-

[a] The fellowships have to be indicated with the acronyms: ESR1, ESR2, etc.

Signature

_____

Annex 3: Recommendation letter template

Recommendation Letter

THE APPLICANT

CANDIDATE FAMILY NAME _____ FIRST NAME _____
DATE OF BIRTH (D/M/Y) |_|_| |_|_| |_|_|

TO THE REFEREE

The MY-ATRIA partners wish to thank you for the time you are taking to write on behalf of this candidate who is applying to the PhD programme in the MY-ATRIA network. You can find a detailed description of the network on our website www.myatria.polimi.it . Your direct contact with the candidate allows you to provide a candid and informed opinion of his or her qualities and potential for doctoral studies and careers requiring strong research and analytical capabilities. Your assessment is invaluable in assisting us in selecting from a large body of qualified applicants those candidates who can best benefit from and contribute to our network. Your recommendation is for use only in the admission process and will be held in the strictest confidentiality. Please answer in English the questions listed on this form and send it directly by e-mail to myatria@polimi.it on or before February 28, 2018. Your prompt return of this form will be most appreciated, as the applicant cannot be considered without it.

FAMILY NAME FIRST NAME	
ORGANISATION:	
ADDRESS	
TELEPHONE:	E-MAIL:
RELATIONSHIP TO CANDIDATE: ❑ EDUCATIONAL	❑ PROFESSIONAL ❑ PERSONAL
How long have you known the candidate and in what context?	
SIGNATURE DATE	

1. How do you rate the candidate on the following qualities:

4.1.1.1.1.1.1.1	4.1.1.1.1.1.1.2 TOP 2 %	VERY GOOD TOP 10 %	GOOD TOP 25 %	AVERAGE TOP 50%	BELOW AVERAGE BOTTOM 50%	UNOBSERVED
Academic ability						
Competence in his/her field						
Professionalism						
Motivation/drive						
Intellectual curiosity						
Enterprising spirit/initiative						
Creativity and innovation						
Teamwork Ability						
Organisational Ability						
Oral communication						
Written communication						
Leadership						

2. How would you describe the candidate's potential for completing doctoral studies in bioengineering?

3. How would you describe the candidate's potential for a successful career in a foremost research institution?

4. How would you characterise the candidate's major strengths?

5. What do you consider his or her major weaknesses?

6. How would you evaluate the candidate's motivation, initiative, and drive?

7. Are there other issues you think the Admissions Committee should consider in assessing this candidate's suitability for the MY-ATRIA programme?

8. In the context of suitability for doctoral studies, what is your overall recommendation for this applicant?

4.1.1.1.1.1.1.3	❑ Recommend highly	❑ RECOMMEND	❑ RECOMMEND WITH RESERVATIONS	❑ DO NOT RECOMMEND	❑ STRONGLY ADVISE AGAINST

If you are involved in a doctoral programme as a faculty member, please answer the following question:

9. If this candidate applied to the doctoral programme in which you are involved, would you accept her/him?

Annex 4: List of IRPs as announced in the recruitment process

Fellow ESR1	**Host institution** Politecnico di Milano (ITALY)	**PhD enrolment** Yes	**Start date** May-Jul. 2018	**Duration** 36 months	**Gross Salary** ~47000€-50000€/year

Project Title and Work Package(s) to which it is related: Bottom-Up study on the implications of interatrial block in the mechanisms of atrial fibrillation (WP2 – T2.1)

Supervisor: Luca Mainardi (luca.mainardi@polimi.it**)**
Co-Supervisor: Jose Felix Rodriguez Matas (josefelix.rodriguezmatas@polimi.it**)**

Objectives:

- To study, in-silico, the influence that different interatrial conduction defects have on the morphology of the P-wave in patients with normal and dilated left atrium.
- To study the influence of anatomical variability of the interatrial connections on the interatrial conduction delay (IACD) associated with IAB on patients with normal and dilated left atrium.
- To study the effect of different atrial resynchronization pacing strategies on improving the IAB condition.

Expected Results:

- A comprehensive understanding of the mechanism related to IAB, helping to have both better diagnosis and better treatment of patients with AF
- A better interpretation of the ECG signal when different interatrial connections are abnormal, in the cases of normal and dilated left atrium
- A better understanding of the impact of anatomical variability on IAB and IACD helping to explain why some individuals develop interatrial conduction defects whereas others do not
- A reliable methodology for the selection of optimal pacing sites for resynchronization

Planned secondments:

- Universitat Politecnica de Valencia (M14) (3m): Experience of complementary numerical model
- Fondazione IRCCS Ca' Granda Ospedale Maggiore (M26) (1m): Experience on atrial resynchronization pacing therapies
- Medtronic BRC (M32) (2m): Feasibility on monitoring of IAB using subcutaneous implants supplied by BRC

Notes:

The candidates must comply with the Italian laws and Politecnico rules for signing the contract. In particular, they have to provide the original academic diploma or a true copy of the same made by an Italian authority.
Non-EU candidates must legally stay in Italy at the starting date of the activities. Please read carefully the file "Additional information of employment POLIMI" for further restrictions and information.
http://www.myatria.polimi.it

The hosting group: POLIMI is the largest Technical University in Italy and the Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB) and the Dipartimento di Chimica, Materiali ed Ingegneria Chimica Giulio Natta (DCMC) are the departments involved in MY-ATRIA. Within the DEIB, the Biosignals-Bioimaging-Bioinformatics (BBB) Group will participate to this network. The Group has long standing expertise in the processing of vital signals, feature extraction, system modelling as well as in the implementation of these methodologies in wearable or portable devices. Within DCMC, the Laboratory of Biological Structure Mechanics (LaBS) will participate to this network. The group aims at basic and applied research in the various fields of biomechanics, through the integration of mathematical modelling and experimental testing. The research at LaBS spans from orthopaedic and spinal devices to micro-fluidic chips for cell assays, from endovascular devices to micromechanics of materials and tissues, from blood pumps to regenerative medicine technologies, and electrophysiology applications.

Fellow	**Host institution**	**PhD enrolment**	**Start date**	**Duration**	
ESR2	Universitat Politecnica de Valencia (SPAIN)	Yes	May-Jul. 2018	36 months	**Gross Salary** ~43600€-46600€/year

Project Title and Work Package(s) to which it is related: Detailed 3-D computer models of human atria and torso for studying atrial fibrillation initiation and progression (WP2 – T2.2)

Supervisor: Javier Saiz (jsaiz@ci2b.upv.es**)**
Co-Supervisor: Lucia Romero (lromero@ci2b.upv.es**)**

Objectives:

- To develop detailed 3-D models of both normal and dilated atrial morphologies including anatomical details as well as electrophysiological heterogeneities.
- To develop electrophysiological models of the different AF types (paroxysmal, persistent, permanent), with different fibrosis degrees
- To develop models of ion channels mutations that can favour AF development and progression

Expected Results:

- Realistic computer models of atria with different anatomical, electrophysiological and structural characteristics.
- A relationship between the different AF types and biomarkers obtained from simulated surface bioelectrical signals
- Sensitivity analysis of different AF types and relation with ionic channel mutations.

Planned secondments:

- Politecnico di Milano (M14) (2m), Karlsruhe Institute of Technology (M27) (3m): To work on the numerical modelling and patient specific models of atria respectively
- Hospital Infanta Cristina, Badajoz (M20) (4m). To work on the anatomy and physiology of the atria (fibre orientation)
- Mortara Instrument Europe (M16) (1m). To work the analysis and data collection of signals of patients with different AF types for validation purpose.

Notes:
The candidates must comply with the Spanish laws and Universitat Politècnica de València rules for signing the contract. In particular, they have to provide the original academic diploma or a true copy of the same made by a Spanish authority.
Non-EU candidates must legally stay in Spain at the starting date of the activities.
For further information visit http://www.myatria.polimi.it

The hosting group: The Universitat Politècnica de València (UPV) is one of the four public universities in the Valencian Community (Spain). More than 4,000 teachers and researchers work in this university that has about 35,000 students. One of its main interests is research and UPV belongs to the top ten Spanish Universities with the highest degree of involvement in National and European projects. Further, the UPV is one of the top Spanish universities in the creation of spin-off companies. The UPV understands that spin-off companies are the most effective and complete mechanism for transferring innovative technology to society.
The Centre for Research and Innovation in Bioengineering (Ci2B) of the UPV and was founded 23 years ago. Ci2B has developed cardiac action potential models of different tissues (atrium, ventricles, Purkinje) and species (mainly rabbit, dog, guinea-pig and human), and has proposed the formulation of new ionic currents. The members of the Ci2B are familiar with a variety of tissue structures (unicellular, one-dimensional, bi-dimensional and more recently three-dimensional). The Ci2B has strong collaborations with national and international leading experimental research groups and with medical technology and pharmacological companies.

Fellow	**Host institution**	**PhD enrolment**	**Start date**	**Duration**	**Gross Salary**
ESR3	Karlsruhe Institute of Technology (GERMANY)	Yes	May-Jul. 2018	36 months	~44064€-47064€/year

Project Title and Work Package(s) to which it is related: Body Surface Potential Maps and ECG-signals of AF (WP2 – T2.3)

Supervisor: Olaf Doessel (olaf.doessel@kit.edu **)**
Co-Supervisor: Axel Loewe (axel.loewe@kit.edu)

Objectives:

- To understand the relationship between various patterns of depolarization in the atria during Sinus Rhythm, Atrial Flutter and Atrial Fibrillation and the corresponding 12-lead ECG and BSPM.
- To understand which of the atrial depolarization patterns can be detected, identified or localized reliably based on BSPMs and in a 12-lead-ECG.

Expected Results:

- Identification of depolarization patters on the atria that can be reconstructed by solving the inverse problem of ECG ("ECG-imaging").
- Sensitivity analysis to assess whether different patterns can be separated, showing up the unique features ("fingerprints") of specific patterns (like e.g. rotors)
- Identification (if possible) of ectopic centres (e.g. from the orifice of the pulmonary veins), of rotors (assessing their size and stability over time), of regions of slow conduction and of low-voltage areas from BSPM and 12-lead-ECG.

Planned secondments:

- Università degli Studi di Milano (M14) (2m), Universidad de Zaragoza (M20) (3m): To work on the advanced ECG signal analysis techniques
- Mortara Instrument Europe (M28) (2m). To work on ECG-imaging
- Karlsruhe Hospital (M17, M32) (1m+2m). To work on the acquisition of ECG and BSPM

Notes:
Candidates who do not hold a Master Degree in Electrical Engineering and Information Technology compatible to the Master degree at KIT must pass three lectures and exams in topics of Electrical Engineering and Information Technology during the first year in parallel to their doctoral research.
For further information visit http://www.myatria.polimi.it

The hosting group: KIT – Karlsruhe Institute of Technology (the former Universitaet Karlsruhe) is University of the State of Baden-Wuerttemberg and National Research Centre of the Helmholtz Association with 5600 scientists and 24.000 students (www.kit.edu). The Institute of Biomedical Engineering (IBT) is the leading laboratory in this field of competence at KIT joining forces with other laboratories active in this field e.g. in the Departments of Information Sciences, Mechanical Engineering and Biology. Research topics of IBT span from cardiac modelling and simulation, biosignal analysis of intracardiac electrograms and ECG and ECG-imaging (the inverse problem of ECG). IBT is among the top 5 laboratories in Germany in Biomedical Engineering. Currently, two Professors, one Associate Professor and 14 scientists are doing research at IBT. They are supported by a technical staff of five persons.

Fellow ESR4	**Host institution** Università degli Studi di Milano (ITALY)	**PhD enrolment** Yes	**Start date** May-Jul. 2018	**Duration** 36 months	**Gross Salary** ~47000€-50000€/year

Project Title and Work Package(s) to which it is related: Atrial complex networks in endocavitary recordings during AF (WP2 – T2.4)

Supervisor: Roberto Sassi (roberto.sassi@unimi.it**)**
Co-supervisor: Massimo Walter Rivolta (massimo.rivolta@unimi.it**)**

Objectives:

- To study concurrent EGMs collected in different positions within the atria in term of complex network measures
- To quantify local circuitry and their stability

Expected Results:

- A solid background in the theory of complex network and in the electrophysiological properties of the atria
- Testing and selection of relevant metrics, using computer simulation of the electrical activity of the atria
- A validation of the metrics with the design of proper experimental protocol to be conducted, after informed consent, during routine electrophysiological interventions

Planned secondments:

- Universitat Politecnica de Valencia (M14) (3m), Universidad de Zaragoza (M24) (2m): Complementary expertise in endocardial networks and endocardial EGM signal analysis, respectively
- Medtronic BRC (M20) (1m): Signal analysis and data collection of EGM signals from available clinical studies
- Fondazione IRCCS Ca' Granda Ospedale Maggiore (M30) (1m): Complementary expertise in clinical endocardial procedures

Notes:

The candidates must comply with the Italian laws and Università degli Studi di Milano rules for signing the contract. In particular, they have to provide the original academic diploma or a legalized copy of the same made by an Italian authority. Non-EU candidates must legally stay in Italy at the starting date of the activities. Additional requirements are listed in the file "Additional information of employment UMIL".
For further information visit http://www.myatria.polimi.it

The hosting group: Università degli Studi di Milano (UMIL), member of the League of European Research Universities (LERU), is a public teaching and research university, distinguished by its wide variety of disciplinary fields and the largest university in the region (65000 students and a teaching staff of about 2200 professors). The Department of Computer Science (DCS) is the unit directly involved in MY-ATRIA. Within the DCS, the BiSP (Biomedical image and Signal Processing) group will participate to the MY-ATRIA network. The BiSP group has a significant expertise in biomedical signal processing, computer simulations, information processing technology and systems, applied mathematics, and wearable technologies. The Department of Clinical Sciences and Health Community (DCSHC) will also be involved in the education of the Ph.D. student, with specific regard to the acquisition of medical signals and definition of the medical experimental protocols. DCSHC has a long-lasting experience in the autonomic regulation of cardiovascular system.

Fellow	**Host institution**	**PhD enrolment**	**Start date**	**Duration**	
ESR5	Mortara Instrument Europe (ITALY)	Yes	May-Jul. 2018	36 months	**Gross Salary** ~47000€-50000€/year

Project Title and Work Package(s) to which it is related: Paroxysmal atrial fibrillation: Continuous tracking of arrhythmia progression (WP3 – T3.1)

Supervisor: Johan De Bie, PhD (Johan.DeBie@mortara.com**)**
Co-Supervisor: Nicoletta Marzocchi, PhD (Nicoletta.Marzocchi@mortara.com)

Objectives:

- To develop noise-proof techniques that make it possible to continuously monitor and track the properties of paroxysmal atrial fibrillation (PAF) episodes, capable of detecting episodes as brief as 5s, where both intra- and interepisode information is taken into account.
- To study the correlation between brief PAF episodes and the risk for stroke.
- To evaluate the resulting algorithms under ambulatory circumstances to make sure that the performance remains reliable also in the presence of various types of disturbances.

Expected Results:

- Novel methodology for analysing and characterizing the progression of PAF.
- Feasibility analysis of the developed methodology for the purpose of predicting risk of ischemic stroke.

Planned secondments:

- Lund University (M10, M22, M34) (2m+2m+2m): To receive training on related subjects such as medical image analysis; risk and research ethics; biomedical, optimal, adaptive signal processing; academic writing; project management; innovation and value creation.
- Skåne University Hospital (M26) (1m): To develop means and methods for describing and visualizing the density of AF episodes.
- Fondazione IRCCS Ca' Granda Ospedale Maggiore (M17, M32) (1m+1m): Acquisition of clinical data and testing of algorithms under ambulatory conditions.

Notes:

Candidates must be willing to agree not to disclose any company confidential information learned in the course of the project
Non-EU candidates must legally stay in Italy at the starting date of the activities.
This ESR will pursue the PhD program at Lund University in Sweden and must comply with its rules for enrollment. See https://www.lth.se/english/education/phd-studies/ and https://www.lth.se/fileadmin/lth/lthhandboken/utbildningforskning/forskarutbildning/Biomedicinsk_teknik_2014-05-16_eng.pdf. The duration of the PhD program at Lund University is minimum four years.
For further information visit http://www.myatria.polimi.it

The hosting group: Mortara Instrument Europe s.r.l. is the Italian subsidiary of Mortara Instrument Inc., based in Milwaukee, USA (www.mortara.com). Mortara Instrument is a leading manufacturer of ECG-equipment, long term ambulatory monitoring equipment. The philosophy of Mortara is to continuously innovate, developing equipment and algorithms that are clinically useful and economically affordable. The company has developed a large number of innovative algorithms involving ECG processing analysis and interpretation, which are used in its products. The team in Italy consists of 11 qualified software engineers as well as the Chief Scientific Officer of the Mortara group, who is leading the algorithm development group physically located in Milwaukee. Participation in MY-ATRIA will allow us to experience new methods to measure the effectiveness of long term monitoring for atrial arrhythmias, in addition to the development of a multivariate database of long term continuous monitoring.

Fellow ESR6	**Host institution** Lund University (SWEDEN)	**PhD enrolment** Yes	**Start date** May-Jul. 2018	**Duration** 36 months	**Gross Salary** ~48876€-51876€/year

Project Title and Work Package(s) to which it is related: AF screening using everyday sensors and data fusion (WP3 – T3.2)

Supervisor: Leif Sornmo (leif.sornmo@bme.lth.se**)**
Co-Supervisor: Martin Stridh (martin.stridh@bme.lth.se**)**

Objectives:

- To develop robust techniques for detection of AF in cardiovascular signals obtained using everyday sensors (from optical sensors, e.g. mobile phone cameras, bioelectric signals, e.g. thumb ECG, mechanical measurements, e.g. ballistocardiogram and seismocardiogram).
- To study the interaction between the different signal modalities during AF.
- To study the feasibility of data fusion for improved detection of AF.
- To evaluate the resulting algorithms with respect to robustness to noise during ambulatory conditions.

Expected Results:

- Novel methodology for detecting AF, particularly well-suited for implementation in wearable devices where extremely low energy consumption is required for continuous detection during long time periods.
- Novel methodology for robust detection of AF using everyday sensors which can be used for AF screening in the general population.

Planned secondments:

- Universidad de Zaragoza (M14) (2m) and Politecnico di Milano (M20) (3m): To develop optimal fusion methods for signal information obtained using different types of everyday sensors.
- Empatica: (31) (1m): To test methods for AF detection in everyday sensors.
- Gradiant (M16) (1m): To develop noise-proof techniques for wearable devices.
- Skåne University Hospital (M19, M32) (1m+1m): Acquisition of clinical data.

Notes:

See https://www.lth.se/english/education/phd-studies/ and https://www.lth.se/fileadmin/lth/lthhandboken/utbildningforskning/forskarutbildning/Biomedicinsk_teknik_2014-05-16_eng.pdf. The duration of the PhD program at Lund University is minimum four years.
For further information visit http://www.myatria.polimi.it

The hosting group: Lund University (LU) is the largest in Scandinavia, and houses the two units participating in the current application: (1) the newly created Department of Biomedical Engineering (2014) and (2) Department of Cardiology, Clinical Sciences (Faculty of Medicine). The well-known research groups in biomedical signal processing and cardiac electrophysiology will participate in the proposed training network. A variety of research projects are currently pursued by the groups in biomedical applications, including issues in electrocardiology, dialysis, neuroengineering, and eye-tracking. Atrial fibrillation represents the main research focus, reflected by over 100 journal papers published during the last 10 years. The groups have long-standing collaboration with Swedish medical industry which to date has led to 10 patents.

Fellow ESR7	**Host institution** Lund University (SWEDEN)	**PhD enrolment** Yes	**Start date** May-Jul. 2018	**Duration** 36 months	**Gross Salary** ~48876€-51876€/year

Project Title and Work Package(s) to which it is related: Risk stratification and prediction of intervention outcome in AF using novel ECG-based markers of atrial remodelling (WP3 – T3.3)

Supervisor: Leif Sornmo (leif.sornmo@bme.lth.se**)**
Co-Supervisor: Pyotr Platanov (pyotr.platanov@med.lu.se**)**

Objectives:

- To study natural course and limits of applicability of novel atrial fibrillatory wave characteristics in patients with different types of AF
- To assess feasibility of non-invasive monitoring of effect of antiarrhythmic drugs during AF using real-time measurements of atrial fibrillatory rate
- To assess the implementation AFR in a single lead subcutaneous monitoring device and its clinical utility in prediction of the effects of a specific therapy and remote therapy management

Expected Results:

- Reference values for the key markers of atrial fibrillatory process detectable from surface ECG in different patient categories and subtypes of AF including patients with and without structural heart disease
- Assessment of the predictive value of atrial fibrillatory wave characteristics for prediction of the effect of interventions for AF such as administration of antiarrhythmic drugs, cardioversion or catheter ablation of AF
- Comprehensive understanding of the atrial fibrillatory rate implementation in a single lead monitoring device. A comprehensive algorithm will be created including the AF detection, atrial fibrillatory rate extraction and RR interval variability assessment.

Planned secondment(s):

- Skåne University Hospital (M13, M23, M31) (1m+1m+1m): Acquisition and treatment of clinical data
- Medtronic BRC (M15) (3m): To work on the assessment of atrial fibrillatory characteristics in long-term monitored with subcutaneous implants supplied by BRC.
- Università degli Studi di Milano (M26) (3m): To work on efficient algorithms for ECG-markers computations and risk stratification.

Notes:

See https://www.lth.se/english/education/phd-studies/ and https://www.lth.se/fileadmin/lth/lthhandboken/utbildningforskning/forskarutbildning/Biomedicinsk_teknik_2014-05-16_eng.pdf. The duration of the PhD program at Lund University is minimum four years.
For further information visit http://www.myatria.polimi.it

The hosting group: Lund University (LU) is the largest in Scandinavia, and houses the two units participating in the current application: (1) the newly created Department of Biomedical Engineering (2014) and (2) Department of Cardiology, Clinical Sciences (Faculty of Medicine). The well-known research groups in biomedical signal processing and cardiac electrophysiology will participate in the proposed training network. A variety of research projects are currently pursued by the groups in biomedical applications, including issues in electrocardiology, dialysis, neuroengineering, and eye-tracking. Atrial fibrillation represents the main research focus, reflected by over 100 journal papers published during the last 10 years. The groups have long-standing collaboration with Swedish medical industry which to date has led to 10 patents.

Fellow ESR8	**Host institution** Medtronic BRC (NETHERLAND)	**PhD enrolment** Yes	**Start date** May-Nov. 2018	**Duration** 36 months	**Gross Salary** ~46116€-49116€/year

Project Title and Work Package(s) to which it is related: Assessment of the AF triggers and their role in its progression (WP3 – T3.4)

Supervisor: Mirko De Melis (mirko.de.melis@medtronic.com **)**
Co-Supervisor: Lilian Kornet (lilian.kornet@medtronic.com**)**

Objectives:

- To characterize the role of premature atrial activity (PAC) in the onset of AF in combination with other ECG parameters, like atrial fibrillatory rate.
- To develop a PAC detector for a single lead continuous monitoring device, surface or subcutaneous.
- To assess in specific clinical applications, i.e. ablation, if this approach can predict AF progression

Expected Results:

- A comprehensive understanding of the PACs role as AF trigger and its combination with atrial fibrillatory rate to predict AF occurrence and to characterize its nature.
- A comprehensive algorithm suitable for implementation in a single subcutaneous or surface, monitoring device; testing and validation will be done using the datasets coming from BRC clinical studies.
- A clinical feasibility study, retrospective or prospective, where the patient status will be assessed using the aforementioned algorithm to predict AF progression.

Planned secondment(s):

- Lund University (M15) (2m), Politecnico di Milano (M20) (2m): To develop and improve atrial fibrillatory rate monitoring techniques.
- Skåne University Hospital (M27) (2m): Acquisition of clinical data of patients subjected to AF monitoring using implantable devices.

Notes:

This ESR will pursue the PhD program at Politecnico di Milano. Therefore, the candidates must comply with the Politecnico requirements for joining the PhD program. In particular, they have to provide the original academic diploma or a true copy of the same made by an Italian authority.
For further information visit http://www.myatria.polimi.it

The hosting group: Medtronic Bakken Research Center (BRC) was founded in Maastricht in 1987 as a research facility (350 employees). The BRC played a major role in the creation and realization of several world class therapies, like Deep Brain Stimulation and Cardiac Resynchronization Therapy and collaborated with Maastricht University Hospital in the definition of Atrial Fibrillation models. POLIMI is the largest Technical University in Italy and the Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB) is one of the departments involved in MY-ATRIA. Within the DEIB, the Biosignals-Bioimaging-Bioinformatics (BBB) Group will participate to this network. The Group has long standing expertise in the processing of vital signals, feature extraction, system modelling as well as in the implementation of these methodologies in wearable or portable devices.

Fellow ESR9	**Host institution** Politecnico di Milano (ITALY)	**PhD enrolment** Yes	**Start date** May-Nov. 2018	**Duration** 36 months	**Gross Salary** ~47000€-50000€/year

Project Title and Work Package(s) to which it is related: Evaluation of the interplay mechanism between AF and AT detected by a single lead ECG (WP3 – T3.5)

Supervisor: Luca Mainardi (luca.mainardi@polimi.it**)**
Co-Supervisor: Valentina Corino (valentina.corino@polimi.it**)**

Objectives:

- To characterize the role relationship between AT and AF.
- To develop an AT detector for a single lead continuous monitoring device, surface or subcutaneous.
- To assess in specific clinical applications, i.e. anti-arrhythmic drug regimen, if it is possible to discriminate the effect of the drugs in the AT/AF interplay.

Expected Results:

- Improved characterization of AT in combination with AF, for example as its trigger, and to capture the transition from AF to AT following a specific therapy
- An AT detector, for single lead surface or subcutaneous monitoring devices, with the intent of reaching high specificity, operating in parallel to current AF detection techniques; this combined algorithm is expected to keep high predictive value of the AF detection while having good specificity of AT detection
- A clinical feasibility study, retrospective or prospective, where the AT/AF relationship before and after drugs prescription would be assessed using the aforementioned algorithm

Planned secondments:

- Lund University (M15) (4m): Experience of complementary signal processing on AF detection
- Fondazione IRCCS Ca' Granda Ospedale Maggiore (M19) (1m): Exposure to clinical procedures
- Medtronic BRC (M23) (4m): engaged in clinical studies with single lead monitoring techniques (subcutaneous and surface)
- Empatica (M32) (1m): Experience on the design and development of single lead instruments

Notes:

The candidates must comply with the Italian laws and Politecnico rules for signing the contract.
In particular, they have to provide the original academic diploma or a true copy of the same made by an Italian authority.
Non-EU candidates must legally stay in Italy at the starting date of the activities.
Please read carefully the file "Additional information of employment POLIMI" for further restrictions and information http://www.myatria.polimi.it

The hosting group: POLIMI is the largest Technical University in Italy and the Dipartimento di Elettronica, Informazione e Bioingegneria (DEIB) is the largest Department of POLIMI with 250 faculties. Within the DEIB, the Biosignals-Bioimaging-Bioinformatics (BBB) Group will participate to this network. The Group has long standing expertise in the processing of vital signals (EEG, evoked potentials, ECG, arterial pressure, respiration, etc ...), feature extraction, system modelling as well as in the implementation of these methodologies in wearable or portable devices. It has been the pioneer in the application of the parametric spectral estimators to HRV analysis and it is a leading group in the development of time-frequency methods for biological signals characterization.

Fellow	**Host institution**	**PhD enrolment**	**Start date**	**Duration**	
ESR10	Karlsruhe Institute of Technology (GERMANY)	Yes	May-Nov. 2018	36 months	**Gross Salary** ~44064€-47064€/year

Project Title and Work Package(s) to which it is related: Integrated and personalized computational model of atria with AF for an efficient ablation therapy (WP4 – T4.1)

Supervisor: Olaf Doessel (olaf.doessel@kit.edu**)**
Co-Supervisor: Axel Loewe (axel.loewe@kit.edu)

Objectives:

- To develop computational models of the atria (with substrate modifications like fibrosis, slow conduction, lines of block) of patients suffering from AF including lines of ablation from a first (unsuccessful) ablation procedure.
- To compare in-silico arrhythmic depolarization patterns with the patterns observed in electrophysiological investigations during ablation procedures (EP-lab) on the patients using multi-electrode catheters and to develop an FEM forward calculation framework to adapt the model of the atria iteratively to fit to the measured signals.
- To compare various methods to determine AF vulnerability of atrial computer models (e.g. induce AF with a rapid pacing protocol or with a large number of S1-S2 stimuli) and to find the most robust and reliable.
- To implement a tool that enables the cardiologist to create ablation points and lines in the personalized atrial model and test AF vulnerability afterwards. The ablation pattern that is able to prevent the onset and continuation of AF will be determined.

Expected Results:

- A method for personalization of the atrial model, by iterative comparison the patterns of depolarization of a specific patient (measured in the EP-lab) with the patterns of the computational model.
- A method to test AF vulnerability of an atrial model.
- A first estimate of the inter-individual variability of patients related to the ablation outcome.
- A tool helping the cardiologist to predict the ablation outcome.

Planned secondment(s):

- Universitat Politecnica de Valencia (M15) (3m): To work on patient specific models of atria
- Medtronic BRC (M32) (2m). To work on AF-monitoring
- Karlsruhe Hospital (M25) (3m). To work on the acquisition of clinical data.

Notes:

Candidates who do not hold a Master Degree in Electrical Engineering and Information Technology compatible to the Master degree at KIT must pass three lectures and exams in topics of Electrical Engineering and Information Technology during the first year in parallel to their doctoral research.
For further information visit http://www.myatria.polimi.it

The hosting group: KIT – Karlsruhe Institute of Technology (the former Universitaet Karlsruhe) is University of the State of Baden-Wuerttemberg and National Research Centre of the Helmholtz Association with 5600 scientists and 24.000 students (www.kit.edu). The Institute of Biomedical Engineering (IBT) is the leading laboratory in this field of competence at KIT joining forces with other laboratories active in this field e.g. in the Departments of Information Sciences, Mechanical Engineering and Biology. Research topics of IBT span from cardiac modelling and simulation, biosignal analysis of intracardiac electrograms and ECG and ECG-imaging (the inverse problem of ECG). IBT is among the top 5 laboratories in Germany in Biomedical Engineering. Currently, two Professors, one Associate Professor and 14 scientists are doing research at IBT. They are supported by a technical staff of five persons.

Fellow	**Host institution**	**PhD enrolment**	**Start date**	**Duration**	
ESR11	Universidad de Zaragoza (SPAIN)	Yes	May-Nov. 2018	36 months	**Gross Salary** ~43600€-46600€/year

Project Title and Work Package(s) to which it is related: Assessment of AF therapies targeting ion channels and neural components (WP4 – T4.2)

Supervisor: Pablo Laguna (laguna@unizar.es**)**
Co-Supervisor: Esther Pueyo (epueyo@uniza.es**)**

Objectives:

- To assess the effect of anti-AF drugs modulating conductance and kinetics of the main ionic currents on personalized atrial models.
- To identify autonomic interventions that, on its own or in combination with anti-arrhythmic drugs, have the capacity to stop AF.

Expected Results:

- Realistic computer models of human atria with description of sympathetic and parasympathetic modulation of atrial electrical activity
- Determination of how sympathetic and parasympathetic stimuli act to modulate initiation and maintenance of AF.
- Description of anti-arrhythmic drug effects on personalized human atrial models.
- Characterization of the effects of autonomic interventions on stopping AF, both on its own and combined with modelled anti-arrhythmic drugs.

Planned secondments:

- Politecnico di Milano (M14) (2m), Karlsruhe Institute of Technology (M25) (3m): To work on the numerical modelling and patient specific models of atria, respectively, with incorporation of autonomic modulation of atrial activity.
- Karlsruhe Hospital (M24) (1m). To acquire clinical data relevant to drug therapy for treatment of AT and AF.
- Mortara Instrument Europe (M16) (1m). To work on the analysis and data collection of signals of patients with AF under drug therapy.

Notes:

The candidates must have a university degree in engineering, mathematics or physics plus master of science degree in related disciplines. Experience in signal processing, statistical data analysis and numerical simulations is advantageous. The candidates must comply with the Spanish laws and Zaragoza university rules for signing the contract. In particular, they have to provide the original academic diploma or a legalized copy of the same made by a Spanish authority.
For further information visit http://www.myatria.polimi.it

The hosting group: The Aragon Institute of Engineering Research (I3A), within the University of Zaragoza, comprises more than 500 researchers and a vibrant environment for multidisciplinary research. I3A has gained notable national and international recognition. Every year I3A participates in more than 300 research projects funded with over 10 M€ and more than 200 contracts with industry with 5 M€ turnover. Around 50 PhD theses supervised by I3A members are defended and nearly 300 papers are published in JCR journals every year. The Biomedical Signal Interpretation and Computational Simulation group at I3A, University of Zaragoza is a leading expert in the development of signal processing tools to aid in the diagnosis, prognosis and treatment of cardiovascular diseases and conditions. The expertise in processing of invasive and non-invasive signals is combined with modeling and simulation of cardiac electrophysiology to provide insight into the mechanisms underlying phenomena observed from the processed signals.

Fellow ESR12	**Host institution** Universidad de Zaragoza (SPAIN)	**PhD enrolment** Yes	**Start date** May-Nov. 2018	**Duration** 36 months	**Gross Salary** ~43600€-46600€/year

Project Title and Work Package(s) to which it is related: Effect of atrial fibrillation dynamics on the efficacy of ablation therapies (WP4 – T4.3)

Supervisor: Pablo Laguna (laguna@unizar.es**)**
Co-Supervisor: Juan Pablo Martínez (jpmart@unizar.es**)**

Objectives:

- To identify features from single-site EGM and simultaneous multisite EGM, whose mapping can be used to guide the ablation in the Electrophysiological Lab and to predict its efficacy.
- To simulate different AF rhythms to study the effect of different EGM-based ablation strategies, using computer models with different pathological and anatomical conditions.
- To characterize spatially sampled intra-atrial signal patterns (acquired either sequentially or simultaneously) and establish their relationship to the entire atrial activation pattern.

Expected Results:

- A tool to study the relationship between AF rhythms, EGM signals and the efficacy of ablation strategies.
- EGM signatures for different types of atrial activity (characterized by its different propensity to recur after different ablation strategies).
- Assessment of the ability of different features mapped from sequentially or simultaneously acquired intracardiac EGM to identify atrial activity type and the ablation sites that would most likely terminate AF.
- Determination of the requirement for spatially sampled intra-atrial analysis in terms of density of sites and type of acquisition required (is it possible to get similar information just from sequentially acquired sites?).
- Characterization of the activation patterns observed after the application of ablation and their correlation with the efficacy of ablation strategies.

Planned secondments:

- Universitat Politecnica de Valencia (M14) (2m) and Karlsruhe Institute of Technology (M25) (2m): To work with signals from patient-specific atrial models and modelling of ablation therapies treatment.
- Hospital Infanta Cristina, Badajoz (M12) (1m) and Karlsruhe Hospital (M24) (1m): To work in the database acquisition of surgical interventions.
- Gradiant (M16) (1m): To develop noise-proof techniques for monopolar signals.

Notes:

The candidates must have a university degree in engineering, mathematics or physics plus master of science degree in related disciplines. Experience in signal processing, statistical data analysis and numerical simulations is advantageous. The candidates must comply with the Spanish laws and Zaragoza university rules for signing the contract. In particular, they have to provide the original academic diploma or a legalized copy of the same made by a Spanish authority.
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