PI name & contact details:	**Dr. Plamen Stamenov (Ussher Lecturer, Assistant Professor and Principal Investigator)**
School: ***Has project been agreed with head (or nominee) of proposed registration school?***	**School of Physics, Trinity College, Dublin 2, Ireland** ***Yes***
Research Centre / group affiliation:	**School of Physics and CRANN, Trinity College, Dublin 2, Ireland**
Research group / centre website:	**http://www.tcd.ie/Physics/Magnetism/** **http://www.crann.tcd.ie/**
PI website / link to CV:	**http://www.tcd.ie/Physics/people/Plamen.Stamenov/index.php** **http://www.crann.tcd.ie/Research/Investigators/School-of-Physics/Dr-Plamen-Stamenov.aspx**

Brief summary of PI research / research group / centre activity (2 or 3 lines max):

Dr. Stamenov's research is focused on the areas of magnetism, spin electronics and applied superconductivity. In particular, on topics such as magnetotransport, Andreev reflection spectroscopy, SQUID applications and magnetic sensors development.

Title & brief description of PhD project (suitable for publication on web):

Development of 2D and 3D Arrays of Magnetic Sensors based on Spin-Valves and Magnetic Tunnel Junctions

Spin-Valves (SVs) and Magnetic Tunnel Junctions (MTJs) are, in their simplest forms, sandwiches of two conducting and magnetic layers, separated by a nonmagnetic conductor or a nonmagnetic insulator, respectively. Their primary uses in spin electronics have been concentrated in the area of external magnetic field sensing. Another strand of spin electronics, however, relies on large arrays of SVs or MTJs, designed particularly to be insensitive towards the external magnetic field, as the storage elements in the so-called Magnetic Random Access Memory (MRAM). The two branches of the same field have, so far, had little interaction, but to the optimisation of the very SVs and MTJs used. The development of arrays of magnetic sensors should take the best of both worlds and provide useful measurement platforms for fields like magnetic bio-marking and imaging magnetometry.
The project will involve the analytical and numerical design, simulation, construction and characterisation of prototypes of 2D magnetic sensor arrays of relatively small sizes - 8 x 8, 16 x 16. Pending potential collaboration with an MRAM manufacturer, larger arrays and 3D arrays (die-stacked) may also be investigated. Applications in the reading of magnetic bar-codes and general micron- and sub-micron scale fringing field characterisation will be tested and evaluated. The project is best suited for a 4-year PhD programme.

Unique selling points of PhD project in TCD:
projects should offer something that's not available in Brazil – specific equipment, multi-disciplinarity, aspects of structured programme, links with industry, placements, links with other research groups etc.

The PhD student will be placed within a vibrant research group in the fields of magnetism and spin electronics, with numerous links and collaborations with other institutes in Europe, USA, China, India and Japan. Apart from all the conventional thin film deposition, structuring and characterisation equipment, necessary for the completion of the project, the student will have access to a world-class advanced microscopy suite and a number of purpose-build

magnetotransport and magnetometry systems. Preliminary links with an MRAM manufacturing company have been also established as a basis for this project.
The Trinity PhD is a structured PhD and students can access discipline-specific training, as well as generic and transferable skills. All PhD students are eligible to participate in the Innovation Academy, which offers a Postgraduate Certificate in Innovation and Entrepreneurship to assist PhD students identify and exploit the value within their research.

Name & contact details for project queries, if different from PI named above:

Please indicate the graduates of which disciplines that should apply:

Physics, Electronic Engineering

Ciência sem Fronteiras / Science Without Borders Priority Area:
Please indicate the specific programme priority area under which the proposed PhD project fits- choose only one (tick box):

Engineering and other technological areas	
Pure and Natural Sciences (e.g. mathematics, physics, chemistry)	
Health and Biomedical Sciences	
Information and Communication Technologies (ICTs)	
Aerospace	
Pharmaceuticals	
Oil, Gas and Coal	
Renewable Energy	
Minerals	
Biotechnology	
Nanotechnology and New Materials	X
Technology of prevention and remediation of natural disasters	
Biodiversity and Bioprospection	
Marine Sciences	
Creative Industry	
New technologies in constructive engineering	