Centre of Physics of the University of Minho

Activity Report 2019

February 2020

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1. Introduction

The year of 2019 has certainly been memorable for the Physics Centre of Minho University (CFUM). After several years of expecting and expectations, finally we were evaluated by the FCT Evaluation Panel. The global quality classification attributed to our joint centre, CF-UM-UP is VERY GOOD. The first reaction might be disappointment remembering that CFUM once was evaluated as Excellent, some 12 years ago. However, more recent history can make us thinking in the opposite way and, taking into account a considerable increase of the annual central funding authorized for the period of 2020-23, compared to the last 5 years, this result should be considered as a success.

The Evaluation Panel members wrote in their report:

"The scientific work of the reporting period is on a high level, in several cases also internationally... Based on the rather succesful work during the period 2013-2017, the plan for the future is mainly the continuation of the work along the [existing] research lines. The researchers – the young PhD students as well – are rather motivated albeit being well aware of financial constraints the Unit is envisaging. ...The presentation by Prof. M Vasilievskiy concluded with the statement:

» Strength: The strongest points of the Centre are related to its interdisciplinary character. There are several researchers working actively at frontiers between Physics and other disciplines, such as Optometry, Molecular and Cell Biology, Engineering of new sensors, functional (e.g. photo-catalytic) surfaces, and systems for energy applications.

» Weakness: Several research facilities are not up to date and possibilities of their upgrading are very limited. The last serious upgrade of the scientific park of the Centre took place in 2006 (part of the National Re-equipment Program 2004). Since then, only occasional acquisitions have been possible.

» Opportunities: Increasing number of candidates to the UM and UP courses in Physics (BSc and MSc in Physics and Master in Engineering Physics) in the last years.

» Threats: Funding and timings incompatible with the dynamics of internationally competitive scientific research. With the overwhelming priority to "earn money", the scientific research can be biased towards solely applied projects.

The Panel members do share this opinion.

The Unit has a substantially large number of projects/activities. It is highly recommended to reduce the topics to the most rewarding ones. The Unit is internationally highly regarded in some select areas, but not in others. Due to the limited money allocated in total by FCT, applying for external grants such as EU ERC is highly desirable."

As can be seen from this quotation, the Panel's opinion is quite objective. The increased funding (thanks to this evaluation!) and the number of young researchers that were hired with (reasonably) long-term contracts during the last year are two strong positive factors that can help increasing the level of research and related activities at CFUM in the near future.

I see the considerable increase of the number of effective members of the Centre (69 against 51 in 2018) as the most important change that took place in 2019. Even though most of these new CFUM effective members have limited-time contracts within particular research projects, some can be considered as CFUM full-time research staff (5 contracts within the so-called "Transitory Norm", 2 contracts of FCT Researchers from 2018 Call, and very recently 1 PREVPAP contract). Three new openings are expected within the Institution-Supported FCT Program. The new Strategic Projects brings a programmatic funding for contracting (for CF-UM-UP) two additional full-time researchers and a laboratory technician (as well as 8 PhD fellowships). These full-time researchers with long-term contracts, already at the CFUM or hired in the near future, will certainly bring a new blood to the Centre's body.

The number of funded projects at CFUM remained stable (around 50), while the budgetary execution rate increased considerably in 2019 compared to 2018 (and this is in spite of all difficulties with money handling at UM that we all are familiar with). In particular, for the FCT central funding ("PA 2019"), it achieved 98%. The Portuguese agencies, FCT and ANI, remain our principal sources of funding. Unfortunetely, European Commission funding decreased again in 2019.

We notice a slight increase in the number of published articles (171 in 2019 vs 155 in 2018 for ISI WoK papers) and the average impact factor has grown substantially (3.34 → 4.11). At the same time, the distribution of the scientific production among Centre's members remains quite uneven, with a significan percentage of effective members who publisted just one paper or none in 2019. The number of concluded PhD Theses also increased (10 in 2019 vs 7 in 2018) but still remains too low compared to the number of ongoing PhD projects with a link to CFUM (67 in 2019). As a good sign, there is a considerable number of awards received in 2019 by spin-off projects, in particular, in the area of Nanotechnology (medicine, cosmetics, environment).

The year ended with the general CF-UM-UP Workshop (Jornadas), which attracted a record number of attendees. The success was achieved, in a big part, thanks to the efforts and creativity of three young researchers, Ana Rita Rodrigues, Bruno Amorim and Joel Borges, who organized it. The Jornadas revealed the huge potential as well as shortcomings of our Centre. The very idea of creation of the CF-UM-UP was to explore the complementarity of the researchers with different profiles, both Physicists and scientists with background in adjacent areas, to achieve synergies in research across disciplines. Does it work? I think yes but it could work better. As told by all of our Steering Committees and Evaluation Panels including the last one, we need "to reduce the topics to the most rewarding ones". Also, even working on very applied research topics and technology development, it has to be supported by a robust backbone of fundamental Physics.

I hope that the successful development of the Physcs Centre in the framework of the new Strategic Project (2020-23) will be based on a good balance between applied and fundamental research, experiments and theory, Physics and other disciplines, and pushed by the dynamics and creativity of the younger generation of CFUM researchers.

Mikhail Vasilevskiy

2. Organisation

Members of the Centre

Effective Members with PhD	69
Post-Docs and Collaborators with PhD	26
PhD Students	67

Management Entities

Director:
Mikhail Igorevich Vasilevskiy

Deputy Director:
Luís Manuel Fernandes Rebouta

Executive Committee Members:

1. Paulo José Gomes Coutinho
2. José Manuel Gonzalez Meijome
3. Martin Andritschky

Members of the Scientific Council (effective CFUM members):

1 Ana Rita Oliveira Rodrigues – Researcher - PTDC/QUI-QFI/28020/2017
2 Anabela Gomes Rolo
3 António Baptista
4 António Macedo
5 António Queirós Pereira
6 Armando Ferreira –Junior Researcher
7 Bernardo Gonçalves Almeida
8 Bruno Amorim - Junior Researcher
9 Cacilda Moura
10 Carlos Tavares
11 Clarisse Ribeiro – Junior Researcher
12 Daniela Lopes Ferreira
13 Diego Martinez
14 Eduardo Pereira
15 Elisabete Maria dos Santos Castanheira Coutinho
16 Etelvina de Matos Gomes
17 Filipe Vaz
18 Francisco José Machado de Macedo
19 Gaspar Machado
20 Gueorgui Vitalievitch Smirnov
21 Irene esteves Caride - Researcher - Bosch

22 Isabel Sofia Pereira - Researcher - PTDC/BTM-MAT/28237/2017
23 João Manuel Maciel Linhares
24 João Pedro Santos Hall Agorreta Alpuim
25 Joaquim Carneiro
26 Joel Borges - Junior Researcher
27 Jorge Figueiredo
28 Jorge M. Martins Jorge
29 José Filipe Vilela Vaz
30 José M. González Méijome
31 José Pedro Basto da Silva - Junior Researcher
32 Juliana Dias - Researcher - PTDC/FIS-MAC/28157/2017
33 Lina Ballesteros - Researcher - NAN-MAT/30789/2017
34 Luca Legio -Researcher - PTDC/FIS-OTI/31486/2017
35 Luís Cunha
36 Luís Manuel Gomes Vieira
37 Luís Rebouta
38 Luís Silvino Alves Marques
39 Madalena Lira
40 Manuel Filipe Costa
41 Maria de Fátima Guimarães Cerqueira
42 Maria Elisabete da Cunha Dias Real Oliveira
43 Maria Jesus Gomes
44 Mariana Marques - Researcher - PTDC/CTM-REF/30708/2017
45 Mário Pereira
46 Mário Rui da Cunha Pereira
47 Marlene Lucio - Researcher - PTDC/NAN-MAT/32651/2017
48 Marta Maria Duarte Ramos
49 Martin Andritschky
50 Michael Scott Belsley
51 Mikhail Igorevich Vasilevskiy
52 Nuno Miguel Machado Reis Peres
53 Paulo Fernandes
54 Paulo José Gomes Coutinho
55 Peter Shellemberg - Researcher - PTDC/NAN-OPOT/29265/2017
56 Ricardo Pedro Lopes Martins de Mendes Ribeiro
57 Rosa Baptista - Junior Researcher
58 Rui Pereira
59 Sandra Carvalho
60 Sandra M. Braga Franco
61 Senentxu Mendez
62 Sergey Pyrlin – Researcher - PTDC/CTM-REF/28108/2017
63 Sérgio M. Cardoso Nascimento
64 Sofia Lopes

65 Sofia Peixoto
66 Stanislav Ferdov
67 Stephane Louis Clain
68 Tatiana Rappoport - Researcher - PTDC/FIS-MAC//28114/2017
69 Vasco Teixeira

1	Ana Rita Oliveira Rodrigues	Junior Researcher - Project
2	Anabela Gomes Rolo	UM teaching staff (Dep. Physics)
3	António Filipe Teixeira Macedo	UM teaching staff (Dep. Physics)
4	António Manuel Gonçalves Baptista	UM teaching staff (Dep. Physics)
5	António Manuel Marques Queirós Pereira	UM teaching staff (Dep. Physics)
6	Armando José Barros Ferreira	Junior Researcher - CFUM
7	Bernardo Gonçalves Almeida	UM teaching staff (Dep. Physics)
8	Bruno António Campos Amorim	Junior Researcher - CFUM
9	Cacilda Maria Lima de Moura	UM teaching staff (Dep. Physics)
10	Carlos José de Macedo Tavares	UM teaching staff (Dep. Physics)
11	Clarisse Marta Oliveira Ribeiro	Junior Researcher - CFUM
12	Daniela Patricia Lopes Ferreira	UM teaching staff (Dep. Physics)
13	Diego Martinez Martinez	Invited Researcher FCT (until junhe 30th)
14	Eduardo Jorge Nunes Pereira	UM teaching staff (Dep. Physics)
15	Elisabete Maria dos Santos Castanheira Coutinho	UM teaching staff (Dep. Physics)
16	Etelvina de Matos Gomes	UM teaching staff (Dep. Physics)
17	Francisco José Machado de Macedo	UM teaching staff (Dep. Physics)
18	Gaspar José Brandão Queirós Azevedo Machado	UM teaching staff (Dep. Mathematics)
19	Gueorgui Vitalievitch Smirnov	UM teaching staff (Dep. Mathematics)
20	Irene Estevez Caride	Assistant Researcher - Project
21	Isabel Sofia Melo Pereira	Junior Researcher - Project
22	João Manuel Maciel Linhares	UM teaching staff (Dep. Physics)
23	João Pedro Santos Hall Agorreta Alpuim	UM teaching staff (Dep. Physics)
24	Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro	UM teaching staff (Dep. Physics)
25	Joel Nuno Pinto Borges	Junior Researcher - Project
26	Jorge Manuel da Silva Figueiredo	UM teaching staff (Dep. Mathematics)
27	Jorge Manuel Martins Jorge	UM teaching staff (Dep. Physics)
28	José Filipe Vilela Vaz	UM teaching staff (Dep. Physics)
29	José Manuel González Méijome	UM teaching staff (Dep. Physics)
30	José Pedro Basto da Silva	Junior Researcher - CFUM
31	Juliana Cristina Rodrigues Dias	Junior Researcher - Project
32	Lina Fernanda Ballesteros Giraldo	Junior Researcher - Project
33	Luca Legio	Junior Researcher - Project
34	Luís António Carvalho Gachineiro da Cunha	UM teaching staff (Dep. Physics)
35	Luís Manuel Fernandes Rebouta	UM teaching staff (Dep. Physics)
36	Luís Manuel Gomes Vieira	UM teaching staff (Dep. Physics)
37	Luís Silvino Alves Marques	UM teaching staff (Dep. Physics)
38	Manuel Filipe Pereira da Cunha Martins Costa	UM teaching staff (Dep. Physics)
39	Maria de Fátima Guimarães Cerqueira	UM teaching staff (Dep. Physics)

40	Maria de Jesus Matos Gomes	UM teaching staff (Dep. Physics)
41	Maria Elisabete da Cunha Dias Real Oliveira	UM teaching staff (Dep. Physics)
42	Maria Madalena da Cunha Faria de Lira	UM teaching staff (Dep. Physics)
43	Mário António Caixeiro de Castro Pereira	UM teaching staff (Dep. Physics)
44	Mário Rui da Cunha Pereira	UM teaching staff (Dep. Physics)
45	Marlene Susana Dionísio Lúcio	Junior Researcher - Project
46	Marta Maria Duarte Ramos	UM teaching staff (Dep. Physics)
47	Martin Andritschky	UM teaching staff (Dep. Physics)
48	Michael Scott Belsley	UM teaching staff (Dep. Physics)
49	Mikhail Igorevich Vasilevskiy	UM teaching staff (Dep. Physics)
50	Nuno Miguel Machado Reis Peres	UM teaching staff (Dep. Physics)
51	Paulo José Gomes Coutinho	UM teaching staff (Dep. Physics)
52	Paulo Rodrigues Botelho Fernandes	UM teaching staff (Dep. Physics)
53	Pedro Libânio Abreu Martins	Assistant Researcher - CFUM
54	Pedro Manuel Abreu Martins	Junior Researcher - Project
55	Peter Michael Schellenberg	Junior Researcher - Project
56	Ricardo Pedro Lopes Martins de Mendes Ribeiro	UM teaching staff (Dep. Physics)
57	Rosa Maria Ferreira Batista	Junior Researcher - CFUM
58	Rui Miguel Soares Pereira	UM teaching staff (Dep. Mathematics)
59	Sandra Maria de Braga Franco	UM teaching staff (Dep. Physics)
60	Sandra Maria Fernandes Carvalho	UM teaching staff (Dep. Physics)
61	Sandra Mariana Silva Marques	Junior Researcher - Project
62	Senen Lanceros-Mendez	UM teaching staff (Dep. Physics)
63	Sérgio M. Cardoso Nascimento	UM teaching staff (Dep. Physics)
64	Serguey Pyrlin	Junior Researcher - Project
65	Sofia Oliveira Lopes	UM teaching staff (Dep. Mathematics)
66	Stanislav Lazarov Ferdov	Assistant Researcher - CFUM
67	Stephane Louis Clain	UM teaching staff (Dep. Mathematics)
68	Tatiana Gabriela Rappoport	Junior Researcher - Project
69	Vasco Manuel Pinto Teixeira	UM teaching staff (Dep. Physics)

Colaborators with PhD – staff members

1	Ana Maria Fernandes de Pinho Dias	UM (Dep. Physics)
2	António Mário Lourenço da Fonseca Almeida	UM (Dep. Physics)
3	Jorge António Silva Mendes	Instituto Politecnico Vila do Conde
4	José Alberto Díaz Rey	UM (Dep. Physics)
5	José Carlos Viana Gomes	Singapore National University (Dep. Physics)
6	José Luis Pires Ribeiro	UM (Dep. Physics)
7	Júlia Maria Simões Dias Barata de Tovar Ayres de Campos	UM (Dep. Physics)
8	Li-Jian Meng	ISEP (Dep. Physics)
9	Maria José Fontes Alexandre Forjaz de Sampaio	UM (Dep. Physics)
10	Maria Teresa Pitta de Lacerda-Arôso	UM (Dep. Physics)
11	Mário Jorge Dias Zamith Silva	UM (Dep. Physics)
12	Teresa Maria Santos Ribeiro Viseu	UM (Dep. Physics)

13	Vasco Miguel Nina de Almeida	UBI (Dep. Physics)
14	Vanessa Fernandes Cardoso	UM (Engineering School)
15	Vitor Manuel Gomes Correia	UM (Enginnering School)

Colaborators with PhD - Post-Docs

1	Augusto Cesar Lima Moreira	UMINHO/BPD/38/2019 (100%)
2	Carlos Miguel Silva Costa	SFRH/BPD/112547/2015 (100%)
3	Claudia Jesus Ribeiro Lopes	UMINHO/BPD/5/2019 (100%)
4	Filipe André Peixoto Oliveira	UMINHO/BI/474/2019 (100%)
5	Filipe Daniel Fernandes	SFRH/BPD/116334/2016 (100%)
6	Jaime Eduardo Vieira Silva Moutinho Santos	UMINHO/BI/407/2018 (100%)
7	Margarida Maria Macedo Francesko Fernandes -	SFRH/BPD/121464/2016 (70%)
8	Maria José Bastos Pires Lima	UMINHO/BI/355/2019 (since october) (100%)
9	Pedro Filipe Ribeiro Costa	SFRH/BPD/110914/2015 (50%)
10	Raquel Diana Carneiro Alves	UMINHO/BI/53/2019 (100%)
11	Yuliy Bludov	UMINHO/BPD/20/2016) (100%)

PhD Students

Name	PhD Program	Completed/ongoing
Tiago André Rodrigues Marinho	Materials Engineering doctoral program	Ongoing
Abbas M.k. AL-Rjoub	PhD in Physics (MAP-Fis), ECUM	Completed
Alshaarawi Salem	PhD in Optometry and Vision Sciences	Ongoing
Ana Catarina Lima	Materials Engineering doctoral program	Ongoing
Ana Isabel Carvalho Amorim de Sousa	PhD in Optometry and Vision Sciences	Ongoing
Andreia Marina de Sousa Almeida	PhD program in Biomedical Sciences, ICBAS, Univ. Porto	Ongoing
António Castro	Materials Engineering doctoral program	Ongoing
Balaji Sompalle	PhD in Physics (MAP-Fis), ECUM	Ongoing
Beatriz Dias Cardoso	Materials Engineering doctoral program	Ongoing
Bogdan Postolnyi	PhD AdvaMTech	Ongoing
Bruna Gonçalves	Materials Engineering doctoral program	Ongoing
Bruna Machado da Silva	PhD in Physics (MAP-Fis), ECUM	Ongoing
Catarina Filipa Matoso Abreu	PhD in Health and Medical Studies, Swansea University Medical School	Completed
Catarina Isabel da Silva Oliveira	Materials Engineering doctoral program	Ongoing
Celso Joel O. Ferreira	PhD in Physics (MAP-Fis), ECUM	Ongoing

César Rui Freitas Bernardo	PhD in Physics (MAP-Fis), ECUM	Ongoing
Clara Maria dos Santos Pereira.	PhD In Science (Biology)	Ongoing
Cláudia Vanessa Dias Reis	PhD in Science and Engineering of Polymers and Composites	Ongoing
Danilo Pedrelli	PhD in Physics (MAP-Fis), ECUM	Ongoing
Diogo Cavaleiro	Materials Engineering doctoral program	Ongoing
Diogo Costa	PhD in Physics (MAP-Fis), ECUM	Ongoing
Diogo Lopes	PhD in Science (Math)	Completed
Diogo Ramos	Materials Engineering doctoral program	Ongoing
Edgar Carneiro	Materials Engineering doctoral program	Ongoing
Eduarda Barbosa Fernandes	Materials Engineering doctoral program	Ongoing
Eduardo Ínsua Pereira	PhD in Optometry and Vision Sciences	Ongoing
Eduardo Teixeira	PhD in Biomedicine (UBI)	Ongoing
Estela Marisa oliveira Carvalho	Materials Engineering doctoral program	Ongoing
Filipe da Costa Correia	Materials Engineering doctoral program	Ongoing
Helena I. Ferreira Neves	PhD In Science (Physics)	Completed
Hugo Manuel Castro Gonçalves	PhD in Physics (MAP-Fis), ECUM	Completed
Hugo Salazar	Materials Engineering doctoral program	Ongoing
Ícaro Jael Mendonça Moura	PhD in Physics (MAP-Fis), ECUM	Ongoing
Iran Segundo	Materials Engineering doctoral program	Ongoing
Isabel Lopes	PhD AdvaMTech	Ongoing
Jessica Gomes	PhD in Optometry and Vision Sciences	Ongoing
Jivago Serrado Gomes Aguiar Nunes	Materials Engineering doctoral program	Ongoing
Joana Margarida Fernandes da Silva Ribeiro	Materials Engineering doctoral program	Ongoing
João Carlos Barbosa	Materials Engineering doctoral program	Ongoing
João Manuel Barros da Cruz Mota Faria	PhD AdvaMTech	Completed
João Miguel Peixoto Oliveira	PhD in Physics (MAP-Fis), ECUM	Ongoing
José David Castro	Materials Engineering doctoral program	Ongoing
Juliana Filipa Gouveia Marques	Materials Engineering doctoral program	Ongoing
Juliana Oliveira	Materials Engineering doctoral program	Completed
Luísa Fialho	Materials Engineering doctoral program	Ongoing
Liliana Fernandes	Materials Engineering doctoral program	Ongoing
Lina Rodríguez Cely	PhD in Optometry and Vision Sciences	Ongoing
Manuela Proença	PhD in Physics (MAP-Fis), ECUM	Ongoing
Marco S. Rodrigues	PhD in Physics (MAP-Fis), ECUM	Ongoing
Marta Adriana Félix Forte	PhD AdvaMTech	Ongoing
Nelson Miguel Macedo da Silva Pereira	PhD Engenharia Electrónica Industrial e Computadores	Ongoing
Patrícia Daniela Cabral da Silva	PhD in Physics (MAP-Fis), ECUM	Ongoing
Paulo André Gonçalves	Technical University of Denmark	Completed
Pedro Lima	PhD in Science (Math)	Ongoing
Rafaela Marques Meira	Materials Engineering doctoral program	Ongoing
Ricardo Daniel Pereira da Costa	PhD in Science and Engineering of Polymers and Composites	Ongoing
Ricardo Jorge Brito Gonçalves Pereira	Materials Engineering doctoral program	Ongoing
Rute J. Macedo-de-Araújo	PhD in Optometry and Vision Sciences	Completed
Salmon Landi	PhD in Science (Physics)	Ongoing
Sérgio Abílio Pereira Gonçalves	Material Engineering doctoral program	Ongoing
Sergio Rafael da Silva Veloso	PhD in Physics (MAP-Fis), ECUM	Ongoing
Simone Pereira Rodrigues	University of Coimbra	Completed
Sylvie de Oliveira Ribeiro	Material Engineering doctoral program	Ongoing

Telma Bezerra Soares	PhD in Molecular and Environmental Biology, ECUM	Ongoing
Teresa Isabel Marques de Almeida	Materials Engineering doctoral program	Ongoing
Veniero Lenzi	PhD Science (Physics)	Ongoing
Vitor Filipe Henriques da Silva	PhD in Biomedical Engineering, EEUM	Ongoing

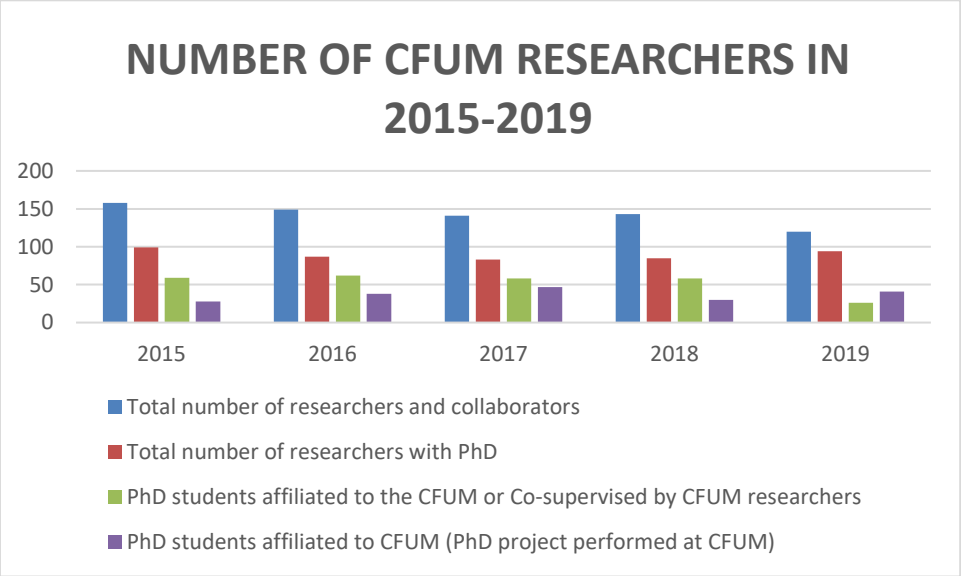
Advisory Board

- Prof. Sir Konstantin Novoselov, School of Physics & Astronomy, University of Manchester, Manchester, United Kingdom.

- Prof. Antti-Pekka Jauho, Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark.

- Prof. Emeritus Denis Weaire, School of Physics, Trinity College, Dublin.

- Prof. Norberto López-Gil, Department of Physics, University of Murcia, Spain.



Graph 1: Number of CFUM researchers and collaborators in the last five years

3. Strategic Research Lines

Strategic Research Lines	Coordinator
Assessment and enhancing visual performance	José Manuel Gonzalez Meijome
Physics of quantum materials and bionanostructures	Paulo José Gomes Coutinho
Functional and smart materials and surfaces for advanced applications	Martin Andritschky

4. Facilities and Infrastructure

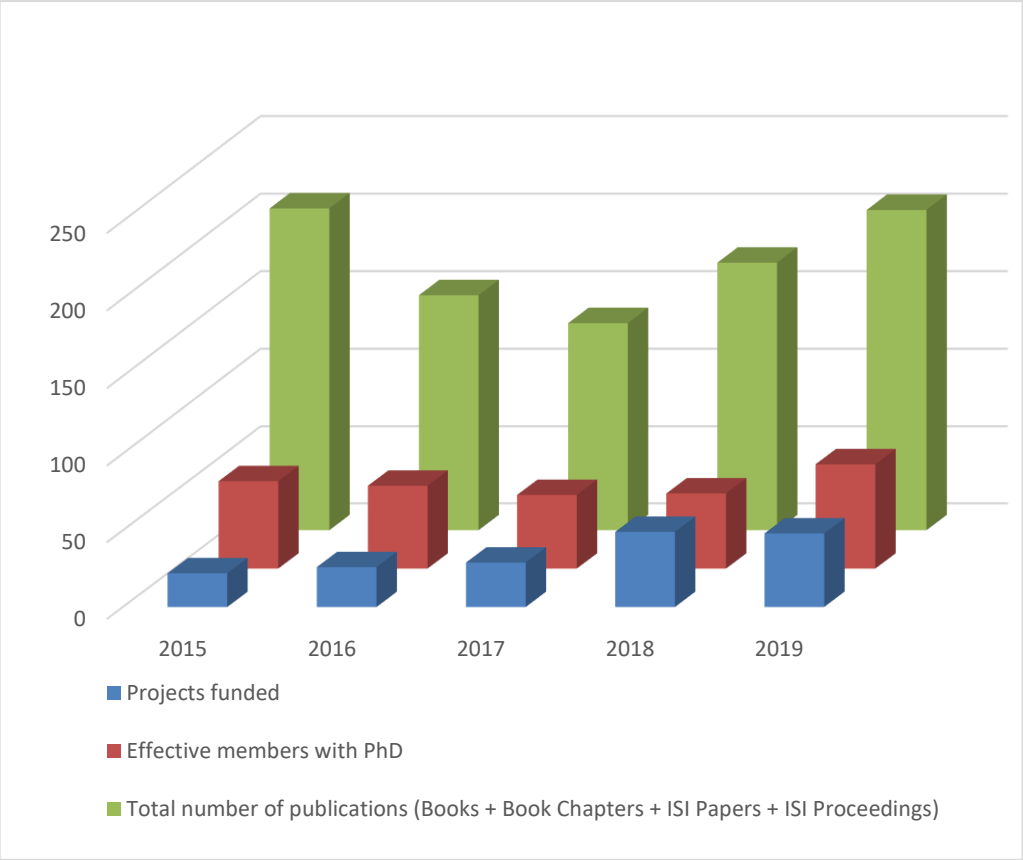
4.1 Research Laboratories

Laboratory – location	Research Line	Responsable
Biophysics – Gualtar	Line 2	Paulo José Gomes Coutinho
Ceramics Research – Azurém	Line 3	Mário António Caixeiro de Castro Pereira
Computational Physics – Gualtar	Line 3	Luís Silvino Alves Marques
Corrosion and electrochemical testings – Azurém	Line 3	Sandra Maria Fernandes Carvalho
Crystal Growth – Gualtar	Line 2	Etelvina de Matos Gomes
Doelectric Properties – Gualtar	Line 2	Bernardo Gonçalves Almeida
Electromechanical properties of materials – Azurém	Line 3	Senen Lanceros-Mendez
Femtosecond Laser Spectroscopy –Gualtar	Lina 2	Michael Scott Belsley
Functional Coatings I – Azurém	Line 3	Martin Andritschky
Functional Coatings II – Azurém	Line 3	Luís Manuel Fernandes Rebouta
Functional Coatings III – Azurém	Line 3	José Filipe Vilela Vaz
Infrared Spectroscopy – Gualtar	Line 2	Luís Manuel Gomes Vieira
Magnetic and Electromechanical Properties – Gualtar	Line 2	Bernardo Gonçalves Almeida
Materials Processing – Azurém	Line 3	Stanislav Lazarov Ferdov
Microtopography – Gualtar	Line 3	Manuel Filipe Pereira da Cunha Martins Costa
Visual Optics and Ophthalmic Instrumentation – Gualtar	Line 1	Sandra Maria Braga Franco
Optoelectronics – Azurem	Line 3	Carlos José de Macedo Tavares
Photoconductivity – Gualtar	Line 2	Maria de Fátima Guimarães Cerqueira
Photophysics I – Gualtar	Line 2	Elisabete Maria dos Santos Castanheira Coutinho
Photophysics II – Gualtar	Line 2	Elisabete Maria dos Santos Castanheira Coutinho
Preparation – Azurém	Line 3	Sandra Maria Fernandes Carvalho
Preparation I – Gualtar	Line 2	Elisabete Maria dos Santos Castanheira Coutinho
Preparation II – Gualtar	Line 3	Maria de Jesus Matos Gomes
Raman Spectroscopy and Photothermal Measurements – Gualtar	Line 3	Francisco José Machado de Macedo
Research in Clinical and Experimental Optometry – Gualtar	Line 1	Jorge Manuel Martins Jorge/ José Manuel González Meijome
Science of Vision and Colour – Gualtar	Line 1	João Manuel Maciel Linhares
Surface analysis – Azurem	Line 3	José Filipe Vilela Vaz
Thin Films I – Gualtar	Line 3	Maria Jesus Matos Gomes
Thin Films II – Gualtar	Line 3	Mário António Caixeiro de Castro Pereira
Visual Rehabilitation – Gualtar	Line 1	António Manuel Gonçalves Baptista
Electrofisiology	Line 1	José Manuel González Meijome / Paulo Rodrigues Botelho Fernandes
Applied Optics Laboratory	Line 2	Eduardo Nunes Pereira

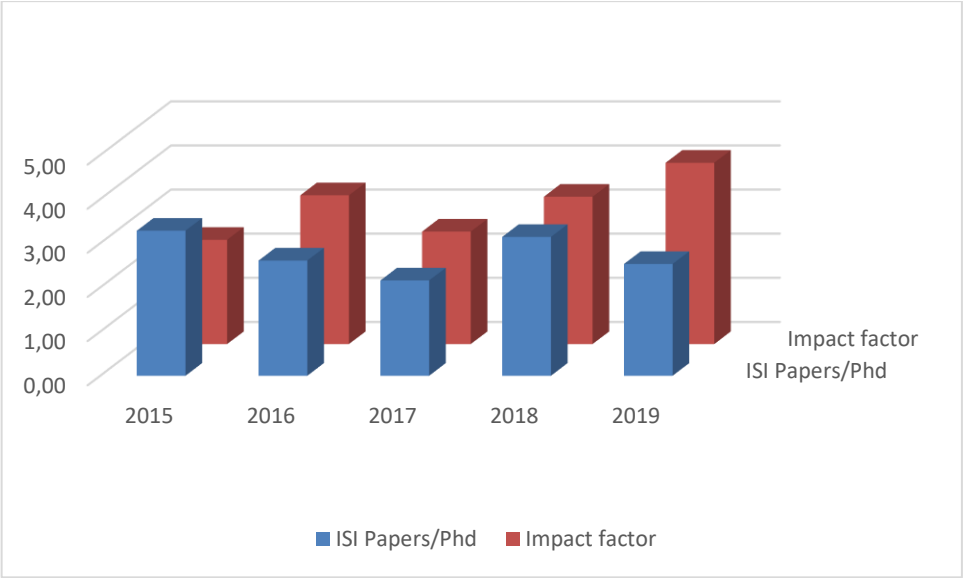
5. Indicators of the Centre Performance

5.1 Publications

Publications	Number
ISI papers (regular journal articles/ conference journal articles)	171/23
Books (edited)	2
Book chapters	11
Patents (national /international)	1 / 4
Oral Presentations in Internationa Conferences (total/by invitation)	104 / 77



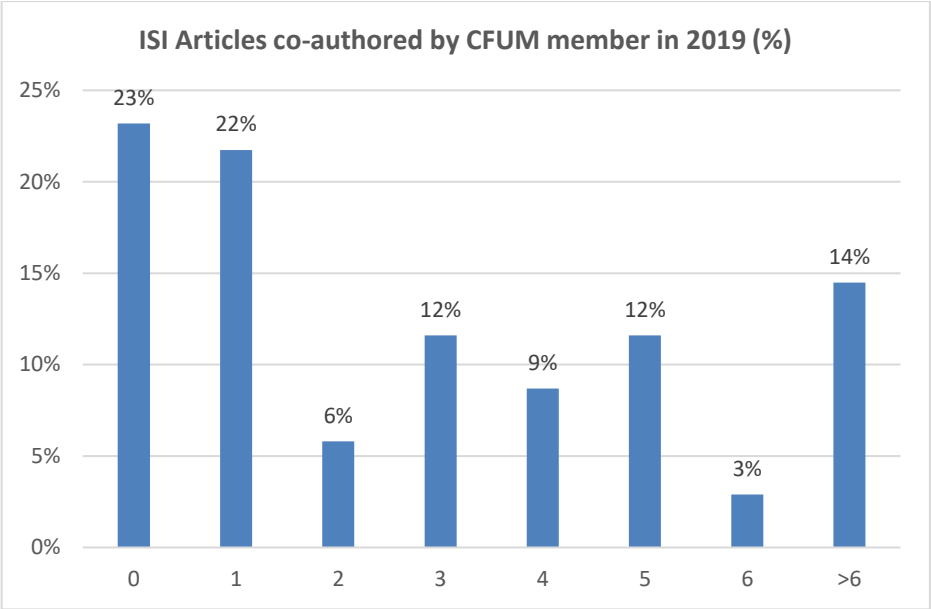
Graph 2: Scientific production, number of members, and number of funded projects



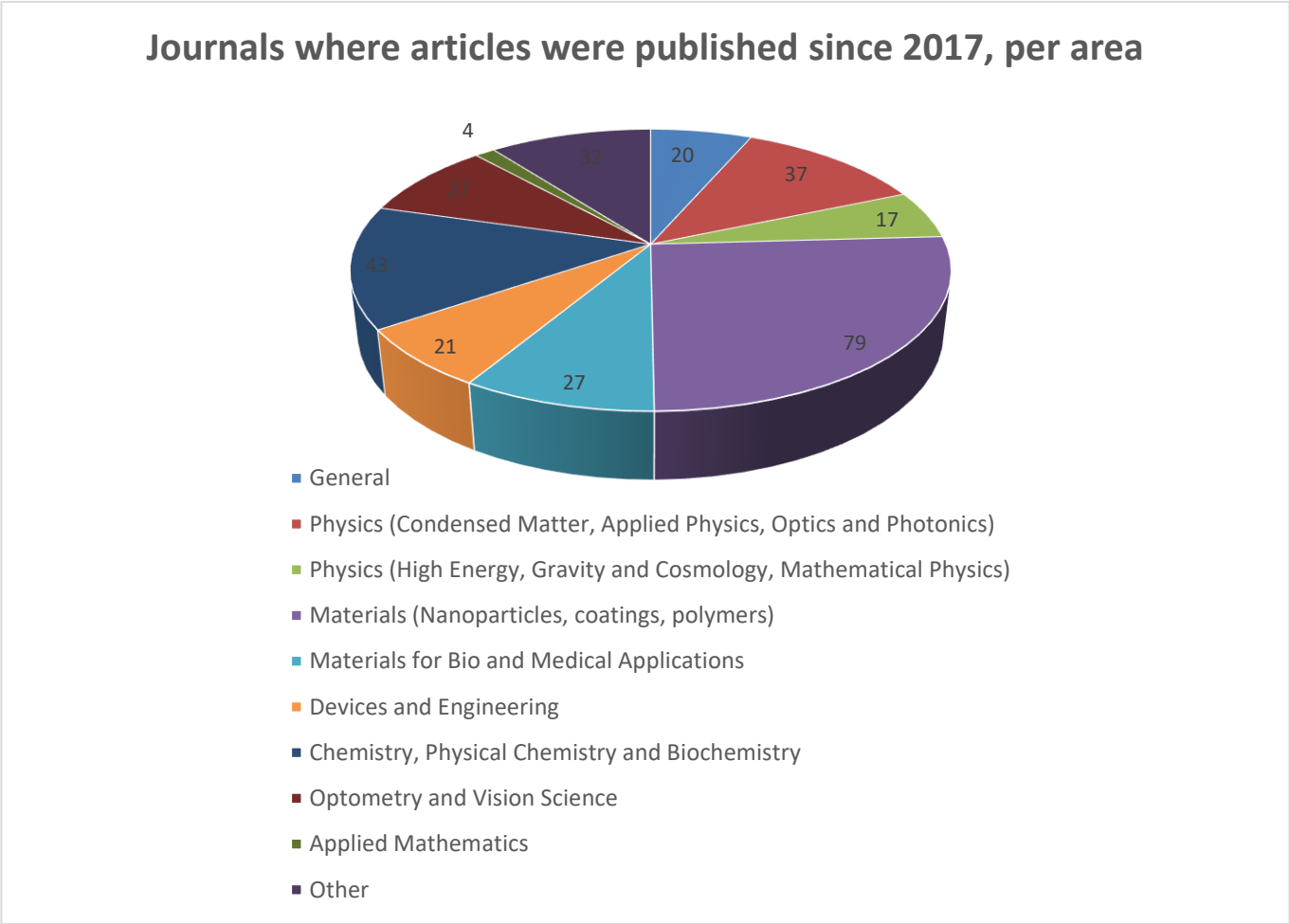
Graph 3: Number of journal articles published (per effective member with PhD) and average impact factor os journals where the articles were published

Box 1: Global data on Centre's publications and citations from ISI Web database

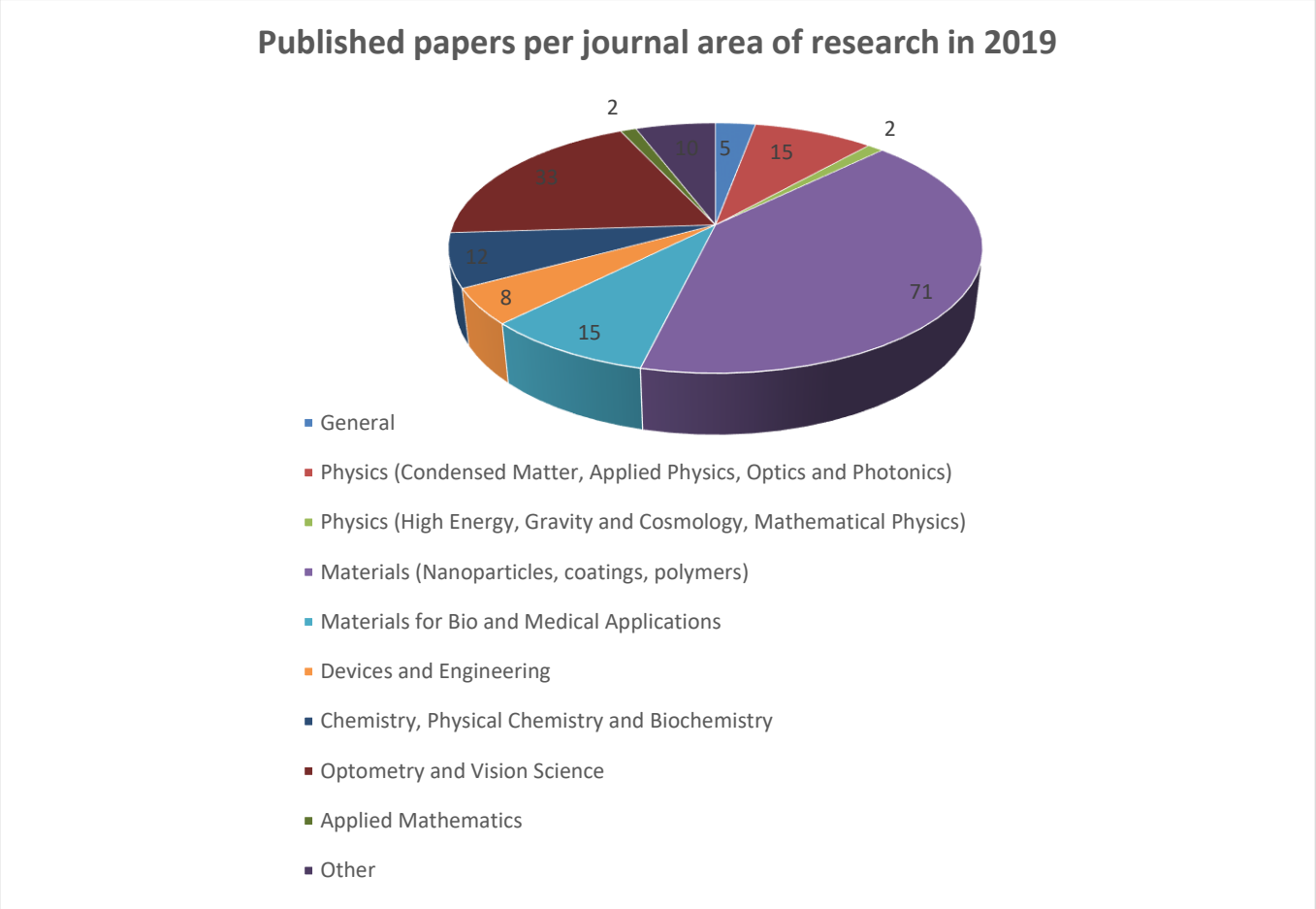
Sourse:
http://apps.webofknowledge.com/CitationReport.do?product=UA&search_mode=CitationReport&SID=C1Suvgc7DnzVISTRIjk&page=1&cr_pqid=3&viewType=summary



Graph 4: Number of ISI articles co-authored by a PhD member in 2019; statistical frequencies



Graph 5: Journals where articles were published since 2017, per area



Graph 6: Published papers per journal area of research in 2019

5.2 Seminars, Colloquia, Workshops and Conferences organised by the Centre

Seminars

Electronic spectral properties of incommensurate van der Waals structures
Bruno Amorim, Centro de Física das Universidades do Minho e Porto
Friday, January 18th 2019 at 16h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Modelling of biological systems
João Carvalho, Universidade de Coimbra
Wednsday, February 20h 2019 at 15h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Group III–VI layered semiconductors and related structures
Liviu Leontie, Faculty of Physics and Integrated Center for Studies in Environmental Science for Northeast Region (CERNESIM), Alexandru Ioan Cuza University of Iasi
Tuesday, April 16th 2019 at 14:30h, Chemistry Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Getting colloidal nanomateriaqls to behave: challenges and applications
Aliaksandra Rakovich, Physics Department of King's College London

Wednesday, July 17th 2019 at 14:30h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Investigation of back metal contacts to transparent semiconductor oxides grown on glass by pulsed laser deposition
Ol'ga Sviridova, Physics Department, Technical University of Odessa, Ukraine
Tuesday, October 1st 2019, at 15h, School of Sciences – Building 2, room 0.37 - Campus Azurém

Simulation of solar cells based on artificial materials
Mohammed M. Shabat, Department of Physics, Islamic University of Gaza, Palestine, Institute of Energy Research and Physical Technologies, Clausthal University of Technology, Germany.
Wednesday, Novembre 27th 2019 at 15h, Chemistry Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Colloquia (organised in cooperation with LIP-Minho)

Fermiões de Dirac e de Majorana
Pedro Ferreira, Faculdade de Ciências da Universidade de Lisboa
Wednsday, April 3rd 2019 at 14:30h, Chemistry Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Stochastic spatial predator-prey models
Uwe Taeuber, Department of Physics, Virginia Tech University, USA
Wednsday, June 5th 2019 at 14:30h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

DUN: Probing the origin of matter with neutrino oscillations
José Maneira, LIP (Laboratório de Instrumentação e Física Experimental de Partículas), Lisboa
Thursday, July 4th 2019 at 15h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

The story of perovskites through ages and applications
Andrei Postnikov, LCPA2 MC,Université de Lorraine, Metz, France
Wednesday, October 9th 2019 at 14:30h, Physics Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Evolução do Universo e o Lugar da Terra no cosmos
Orfeu Bertolami, Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto
Friday, December 6th 2019 at 14h, School of Sciences Amphitheatre, School of Sciences - Building 06 - Campus Gualtar

Scientific Conferences organized by members of the Centre of Physics

- International

CIOCV -16th International Congress of Optometry and Vision Sciences. Universidade do Minho; Braga / Altice Forum Braga, May 4-5, 2019

CNM2019 - Congress on Numerical Methods in Engineering, 1-3 July 2019, Guimarães, Portugal.

IV International Conference on Applications of Optics and Photonics, 2019, Universidade de Lisboa, Lisboa (Portugal), May 31-June 4, 2019 (General Chair, Technical Chairs, Members of the Scientific Committee)

Shark FV 2019 Workshop - Sharing higher order advanced research know-how on Finite Volume", 20-24 May 2019, Póvoa de Varzim, Portugal, https://shark-fv.eu/ (Chairs, members of the organization and Scientific committees).

International Conference on Hands-on Science (16th), Innovative Education in Science and Technology, Kharkiv, Ukraine, September 2-6, 2019 (Chairs, members of the organization and Scientific committees).

IUVSTA School on Nano-Optics: From Principles to Basic Research and Applications (17th), February 18-22 2019, INL, Braga Portugal. Membership in the organizing committee. (http://nano-optics-school-2019.org/)

IBERTRIVA 2019 – XI Iberian Vacuum Conference - RIVA, June 26-28, Seville, Spain. Membership in the scientific committee. (http://aseva.es/conferences/ibertriva/)

IVC21 - 21st International Vacuum Congress, July 1-5 2019, Malmö, Sweden, Membership in the organizing committee. (https://mkon.nu/IVC21)

MATERIAIS 2019 – "Materials for a better life", 14th to 17th of April 2019, Lisbon, Portugal (Membership in the Scientific Committee)

RIVA, XI Iberian Vacuum Conference, June 26-28, Seville, Spain (Membership in the Scientific Committee)

EUROMAT 2019, European Congress and Exhibition on Advanced Materials and Processes, Symposium on Coatings and Surface Modification Technologies, 1-5 September, Stockholm, Sweden (Membership in the Scientific committee)

RICI8 - 8th Iberian Meeting on Colloids and Interfaces, 17-19 July 2019, Aveiro, Membership in the Scientific Committee Portugal.

- National

CMPNC2019 - 2-nd National Conference of Condensed Matter Physics, Porto, 8-10 May 2019.

Large Area 2D heterostructures for photodetectors, Seminar INL, Braga, 1 Feb. 2019.

DCE-19, Symposium in Engineering Physics, FEUP, Porto, 27-28 June 2019.

VÁCUO 2019, Universidade Nova de Lisboa, Caparica, Portugal, 26/02/2019. (https://www.soporvac.pt)

Jornadas do Centro de Física das Universidades do Minho e Porto, Universidade do Minho, Campus de Gualtar, December 13, 2019

5.3 Awards, prizes, membership in editorial boards of international journals and other forms of recognition by the community

2-nd Prize SpinUM 2019 – Spin-off project MAG2Clean: Magnetic Nanosystems for Environment; Team: Ricardo J. Fernandes, Carlos A. B. Magalhães and Paulo J. G. Coutinho; TECMinho, Guimarães, March 2019.

Winner of the Nourish Program 2019 (INL Spin-off Incubation Program) - Entrepreneurship project NBiON: Nanobiotechnology Solutions for cancer therapy; Team: Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira and Elisabete M. S. Castanheira Coutinho; INL, Braga, Jan.-Dec. 2019.

Winner of the i3S-Hovione Capital Innovation Prize – Entrepreneurship project NBiON: Nanobiotechnology solutions for cancer therapy; Team: Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira and Elisabete M. S. Castanheira Coutinho; Porto, Feb. 2019.

Finalist of the StartUp Braga Launch Program – Entrepreneurship project NBiON: Nanobiotechnology solutions for cancer therapy; Team: Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira and Elisabete M. S. Castanheira Coutinho; 2019.

Finalist of Everis Portuguese Awards – Entrepreneurship project MAG2Clean: Magnetic Nanosystems for Environment; Team: Ricardo J. Fernandes, Carlos A. B. Magalhães and Paulo J. G. Coutinho, Lisbon, July 2019.

2nd Prize in Scienpreneurs Contest – Entrepreneurship project MAG2Clean: Magnetic Nanosystems for Environment; Team: Ricardo J. Fernandes, Carlos A. B. Magalhães and Paulo J. G. Coutinho, INL, Braga, Sept. 2019.

Winner of the portuguese final of Biobased Innovation Student Competition (BISC) – Entrepreneurship project SciAlgae, Ecofriendly and Natural Cosmetics; Team: T. B. Soares, E. Fernandes, M. J. Faria, supervised by M. Lúcio, July 2019. Portuguese representant in BISC European finals in Berlin, Germany, October 2019.

Finalist in the Green Discoveries Acceleration Idea Program in Environmental Challenges Solutions – Spin-off "SPM Nanosolutions, Lda. - Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment", Base Militar de Alenquer, Nov. 2019.

Awards for the Best Oral and Poster Presentations at the Jornadas do Centro de Física das Universidades do Minho e Porto

Best Oral Presentation Award

Magneto-optical Kerr effect in spin split two-dimensional massive Dirac materials, G. Catarina, Jornadas CF-UM-UP 2019, December 13 2019, Braga, Portugal

Best Poster Presentation Award

Nano and micro materials for highly efficient arsenic removal from water, H. Salazar, P. M. Martins, K. P. Shejale, R. K. Sharma, R. Krishnapriya, S. Ferdov, M. Silva, G. Botelho, A. Fidalgo-Marijuan and S. Lanceros-Mendez, Jornadas CF-UM-UP 2019, December 13 2019, Braga, Portugal

Participation in Journal Editorial Boards

José Meijome

- Journal of Optometry - Editor-in-Chief
- Biomedical Research International - Editorial Board
- PlosONE - Academic Editor

Antonio Filipe Macedo

-Editor Scandinavian Journal of Optometry and Vision Sciences

Sérgio Nascimento

-Topical Editor Journal of the Optical Society of America A

António Queirós.

-Journal of Ophthalmology. Editorial Board

Nuno Peres

-EuroPhysics Letters, Co-Editor.

Michael Belsley

-Open Physics (de Gruyter), Editorial Board.

Mikhail Vasilevskiy

- Applied Sciences (MDPI), Guest Editor

Bernardo Almeida, Elisabete M. S. Castanheira Coutinho, Paulo J. G. Coutinho

-Co-editors of Materials (MDPI), Special Issue "Development of Magneto Nanoparticles for Biomedical and Environmental Applications".

Bernardo Almeida

-Editorial Director of "Gazeta de Física".

Joaquim Carneiro

- Coatings (ISSN: 2079-6412 – IF: 2.330) - Editorial Board
- International Journal of Photoenergy (ISSN: 1110-662X – IF: 2.026) – Academic Editor
- Current Smart Materials (ISSN: 2405-4658) - Editorial Board
- Academic Editor of Special Issue in Coatings: State of the Art on Coatings, Thin Films, Nano Materials and Structures: Production and Applications
- Academic Editor of Special Issue in Coatings: Optical Coatings and Coatings for Optics and Photonics—Selected Papers from the 4th International Conference on Applications of Optics and Photonics

Manuel Filipe M Costa:

-Óptica Pura y Aplicada, OPA - Editorial Board, International Advisor.

-Advances in Laser Optics and Photonics. - Editorial Board

-SAGE Open – Associate Editor

-Photonics – Guest Editor, Special Issue
-Coatings – Guest Editor, Special Issue

Carlos Tavares

- Catalysis Today, Special Issue - "Selected contributions from the 4th Photocatalytic and Superhydrophilic Surfaces Workshop", PSS2017 (https://doi.org/10.1016/j.cattod.2018.12.010)
- Coatings, Special Issue "Photocatalytic Thin Films", (ISSN 2079-6412), Guest Editor:. (https://www.mdpi.com/journal/coatings/special_issues/photocatal_thin_film)

Joel Borges

-Materials (ISSN 1996-1944), MDPI – Thin Films for Sensing Applications – Special Issue Editor

Senen Lanceros Mendez

-Editorial Board member: Frontiers in Bioengineering and Biotechnology
-Editorial Board member: Heliyon, Elsevier
-Editorial Board member: International Journal of Molecular Sciences MDPI
-Editorial Board member: Energies MDPI
-Editorial Board member: Materials MDPI
-Editorial Board member: Polymer Crystallization (Wiley)

Sandra Carvalho

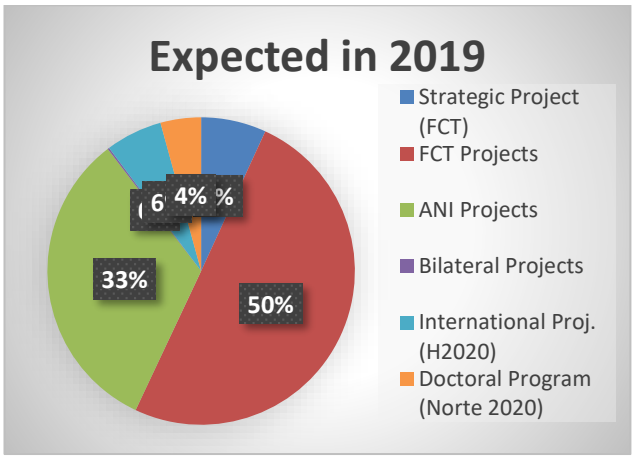
- Editorial Board member of Materials (MDPI)
- Editorial Board member of Dataset Papers in Materials Science
- Biological Physics section member of the Editorial Board of Dataset Papers in Physics
- Editorial Board member of ISRN Nanomaterials.
- Editorial Board member of Advances in Nanoscience and Nanotechnology

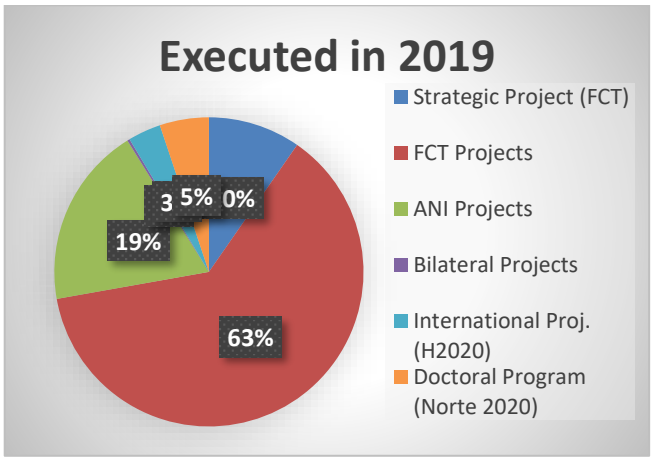
5.4 PhD and MSc degree leading projects at the Centre

MASTER THESES	COMPLETED	41	**total**
PH.D. THESES (PERFORMED AT CFUM / (CO-) SUPERVISED BY A CFUM MEMBER)	ONGOING	21/36	57
	COMPLETED	5/5	10

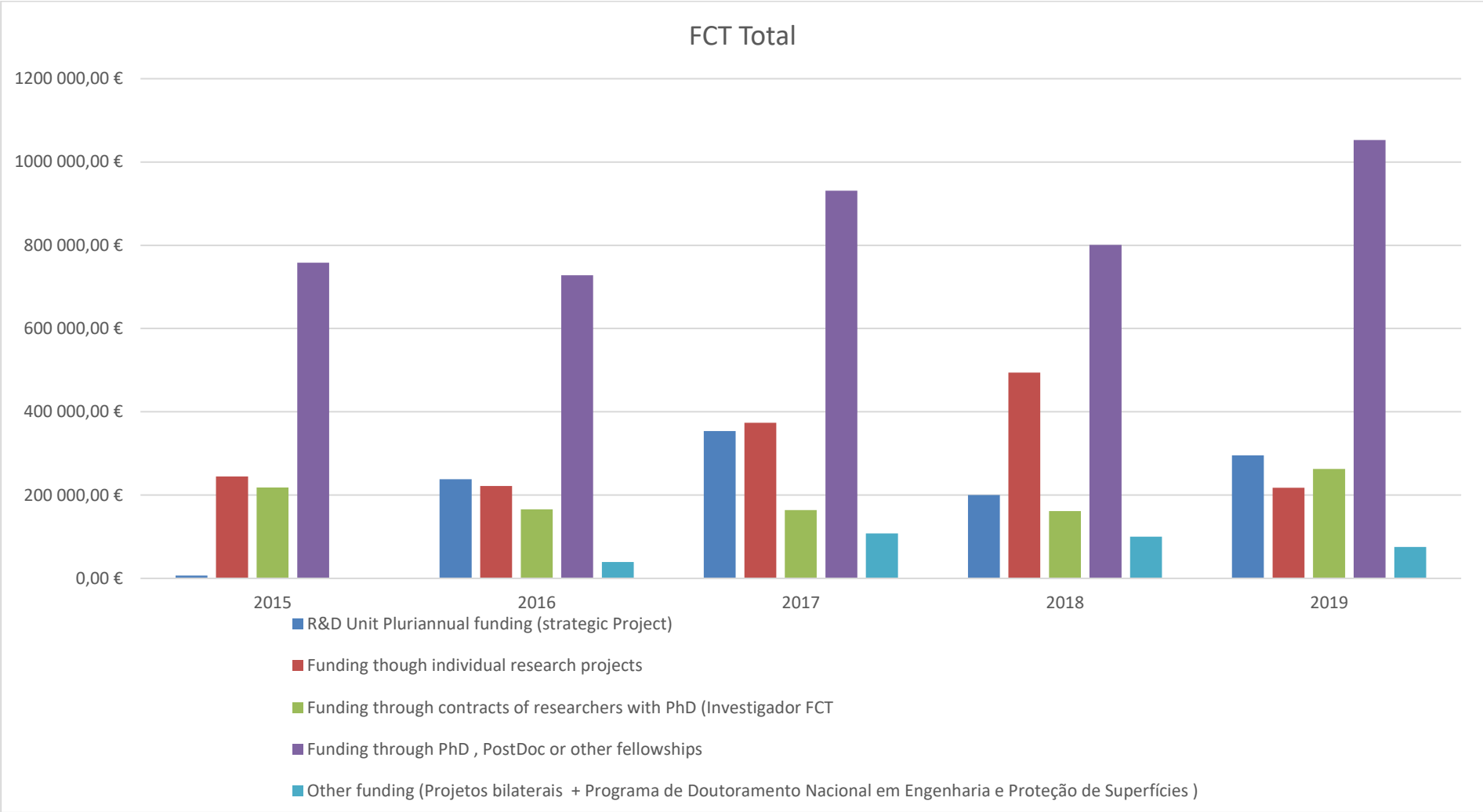
5.5 Funding Summary

	Expected in 2019	%	Received in 2019	%	Executed in 2019	Number of ongoing projects
Strategic Project (FCT)	170 000,00 €	6,86%	295 465,39 €	37,38%	133 993,00 €	1
FCT Projects	1 243 104,07 €	50,15%	217 851,56 €	27,56%	866 119,17 €	33
ANI Projects	807 870,46 €	32,59%	123 625,74 €	15,64%	262 655,02 €	10
Bilateral Projects	4 500,00 €	0,18%	3 000 €	0,38%	3 545,08 €	3
International Proj. (H2020)	147 618,26 €	5,96%	78 200,00 €	9,89%	47 729,94 €	3
Doctoral Program (Norte 2020)	105 750,00 €	4,27%	72 376 €	9,16%	71 184 €	1
Total	**2 478 842,79 €**	**100%**	**790 518,74 €**	**100%**	**1 385 226,65 €**	**51**

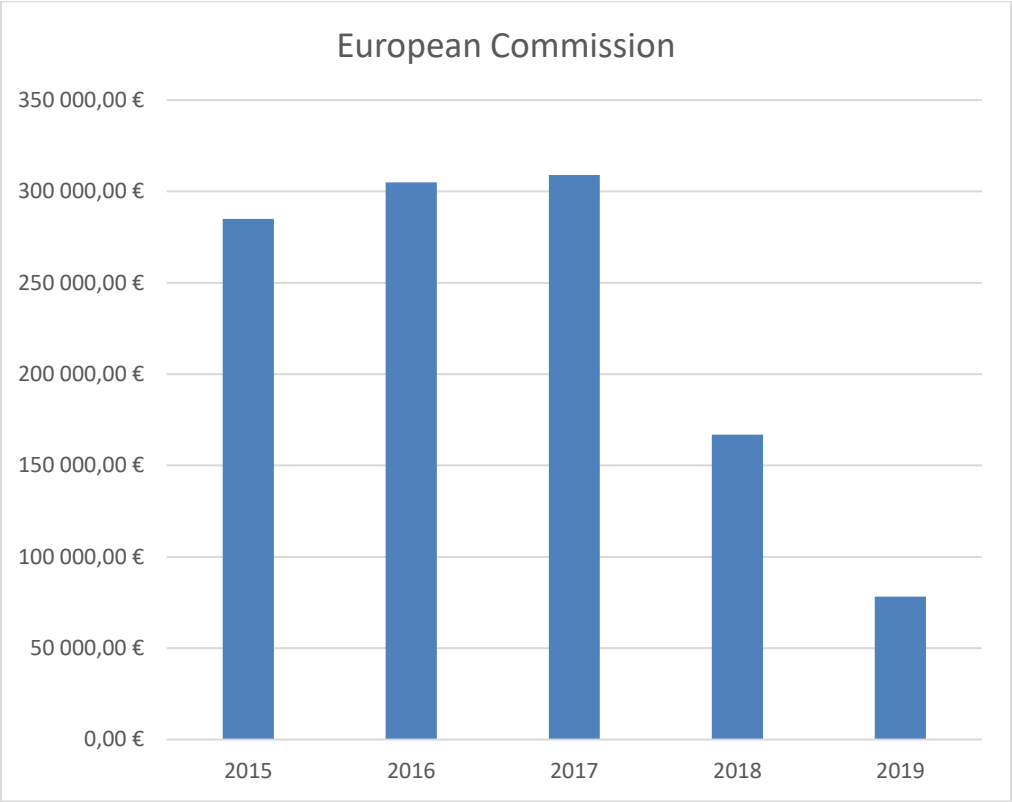




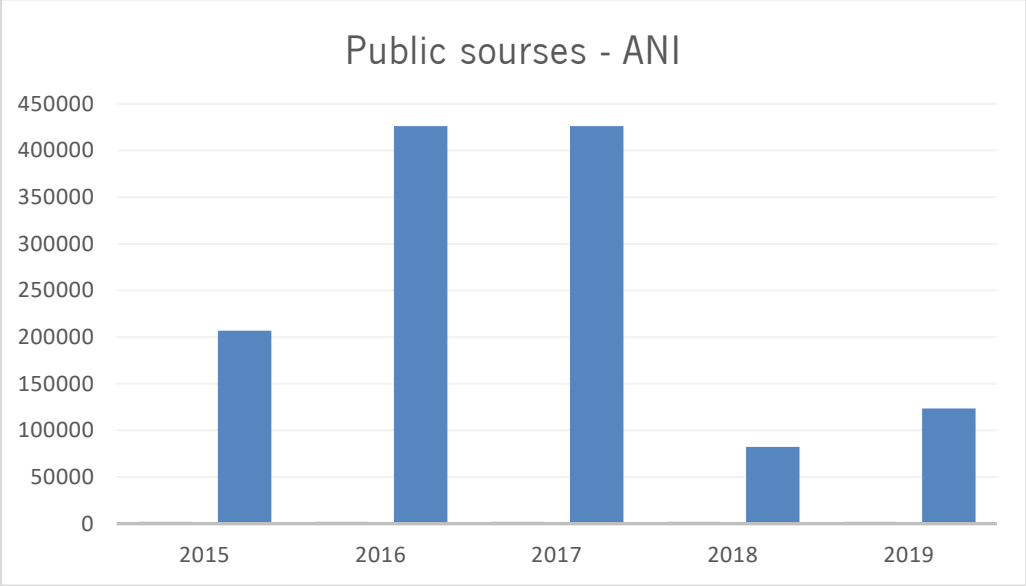
Graph 7: Funding expected in 2019 according to projects' contracts **Graph 8: Funding executed in 2019**



Graph 9: Funding history 2015-2019 (FCT)



Graph. 10: Funding history 2015-2019 (European Commission projects)



Graph. 11: Funding history 2015-2019 (ANI projects)

5.6 Scientific Production Indicators by Research Line

	Line 1	Line 2	Line 3	TOTAL
N° Effective Members with Ph.D.	12	29	28	69
Colaborators with PhD – staff members	3	6	6	15
Colaborators with PhD - Post-Docs (contracts in course at31/12/2016)	0	3	8	11
Books (Edited)	0	0	2	2
Book Chapters	1	1	8	11
Regular articles published in ISI Journals	27	50	94	171
Average Journal Impact factor	2.14	4.31	4.59	4.11
Conference Proceedings (ISI)	9	11	3	23
Invited Talks in Scientific Conferences (International/National)	23/1	13/12	5/23	41/36
PhD Theses concluded	2	5	3	10
PhD Theses in progress	8	16	33	57
Externally funded R&D projects (National sourses: FCT, ANI)*	2	18	24	44
Externally funded R&D projects (International sources: H2020)	0	1	2	3
Bilateral Cooperation Projects	0	0	3	3
Collaboration Projects with Industry	0	0	0	0
Patents and patent applications (National/Int)	0/0	1/3	0/1	1/4

*PE not included

6. Description of the Main Activities in 2019 by Research Line

6.1 Assessment and enhancing visual performance

6.1.1 Researchers

Principal investigator	José Meijome
Members	**Effective members of the Centre** António Filipe Teixeira Macedo António Manuel Gonçalves Baptista António Manuel Marques Queirós Pereira Daniela Patricia Lopes Ferreira João Manuel Maciel Linhares Jorge Manuel Martins Jorge José Manuel González Méijome Luca Legio Maria Madalena da Cunha Faria de Lira Paulo Rodrigues Botelho Fernandes Sandra Maria de Braga Franco Sérgio M. Cardoso Nascimento **Collaborators** Staff members with PhD Ana Maria Fernandes de Pinho Dias José Alberto Díaz Rey Vasco Miguel Nina de Almeida Sofia C. Peixoto de Matos **Integrated PhD students** PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students Alshaarawi Salem Ana Isabel Carvalho Amorim de Sousa Clara Maria dos Santos Pereira Eduardo Ínsua Pereira Eduardo Teixeira Helena I. Ferreira Neves Jessica Gomes Lina Rodríguez Cely Pedro Lima Rute J. Macedo-de-Araújo

6.1.2 Brief description of the scientific work carried out within the Research Line in 2019

The members of the Research Line in Assessment and Enhancement of Visual Performance developed work in the areas of clinical optometry, color vision, visual correction, visual rehabilitation and eye movements, visual electrophysiology. Research results in optometry field included the evaluation of differnet aspect of the ocular anatomy and function with particular emphasis on the applications in the context of optical and surgical visual correction and novel techniques to evaluate visual performance. Color vision research outcomes focused on the assessment of color vision testing strategies and human perception of natural scenes for normal and deficient chromatic observers. Visual correction strategies with special contact lenses have been extensivelly applied to conditions associated with corneal irregularities and signficant visual deficit demonstrating efficacy of such strategies on visual enhancement. Visual rehabilitation section investigated on the impact of visual impairment in productivity and other socioeconomic aspects of the visual deficiency. Additionally, relevant results have been produced in the area of reading assessment and other psychological aspects related with vision. Visual electrophysiology strategies were applied to different areas of visual correction and to the computational modelization of the retinal response to visual stimuli. The publication track record of the Research Line members achieved a significant output increase with over 30 papers published in ISI Web of Science journals. It is also remarkable that this mark has been achieved simultaneously with an increase in the average impact factor of the publications. Members have also been extensivelly requested as invited speakers at international conferences. There has also been an increas in the number of PhD Students pursuing a doctoral degree at the University of Minho and at other institutions under supervision of members of the research line in visual science of the Center of Physics. Following the trends of previous years, the number of Master Students supervised by staff members remains high as it is the number of students succesfully finishing their dissertatiosn. It is also to be highlighted the level of internationalization in the scientific cooperations, observable in the multinational authoriship of the research papers published, confereces attended as organizers or invited speakers. Altogether, the output of members of the Research Line in Assessment and Enhancement of Visual Performance demonstrated during 2019 a significant increase in the research output and also a significant intenational recognition.

6.1.3 Future research summary

The research efforts in the inmediate future in the context of the research line Assessment and Enhancement of Visual Performance will be focused on fundamental and applied aspects of visual evaluation, compensation, rehabilitation and enhancement of human visual capabilities. At present the group works at the frontier of several interdisciplinary areas involving optometry, optics, visual science, psychology, neuroscience and biology and it is expected that these interactions bring a more impactfull focus to the research conducted in this line. The recent evaluation of the Center of Physis has secured significant resources fort the next years what will allow to consolidate the activity conducted in the last years. Several line staff members participate actively in projects related with industry. This partially compensates the reduced ammount of projects secured in the last 3 calls of the Fundação para a Ciência e Tecnologia. However, considering the positive aspects mentioned in the previous section 6.1.1, it is expected that the members of the research line are able to secure more projects in the coming calls, starting in the first semester of 2020. Altogether it is expected that these funding schemes allow the group to strength the technical capabilities. The group should also keep in the positive aspects of the current publication track record, and continue raising the average impact factor of the journals where they publish as well as the number of citations received by other researchers. Members of the group have been active in pursuing funding opportunities in the European context including ITN, ERC and COST actions. Along with projects funded by other national entities this is fundamental to nurture the group with human resources 100% dedicated to research activities. This path should be reinforced in the future, if possible under guidance of the University Services or external advisors in order to increase the possibility of success of those competitive calls. The

research line should explore the bridges between the scientific and pedagogical areas, doing efforts to attract highly motivated MSc and PhD students.

6.1.4 Publications

6.1.4.1 Regular articles published in ISI/Scopus Journals

A 3-year Randomized Clinical Trial of MiSight Lenses for Myopia Control. Chamberlain P, Peixoto-de-Matos SC, Logan NS, Ngo C, Jones D, Young G. Optom Vis Sci. 2019;96(8):556-567. doi: 10.1097/OPX.0000000000001410.

A one-year prospective study on scleral lens wear success. Macedo-de-Araújo RJ, van der Worp E, González-Méijome JM. (2019) Cont Lens Anterior Eye.. pii: S1367-0484(19)30298-X. doi: 10.1016/j.clae.2019.10.140.

Age-Related Variations in Corneal Asphericity and Long-Term Changes. Amorim-de-Sousa A, Vieira AC, González-Méijome JM, Queirós A. Eye Contact Lens. (2019) .45(2):99-104. doi: 10.1097/ICL.0000000000000540.

Describing natural colors with Munsell and NCS color systems. Pastilha, Ruben C., Linhares, Joao M. M., Rodrigues, Ana I. C. Nascimento, S.M.C. (2019) Color Research and Application 44 , 3, 411-418.

Determination of central corneal clearance in scleral lenses with an optical biometer and agreement with subjective evaluation. Macedo-de-Araújo RJ, Amorim-de-Sousa A, Queirós A, van der Worp E, González-Méijome JM. Cont Lens Anterior Eye. (2019).;42(1):28-35. doi: 10.1016/j.clae.2018.11.013.

Hyperspectral environmental illumination maps: characterizing directional spectral variation in natural environments. Morimoto T, Kishigami S, Linhares JMM, Nascimento SMC, Smithson HE. (2019). Optics Express. doi: 10.1364/OE.27.032277.

IMI - Industry Guidelines and Ethical Considerations for Myopia Control Report. Jones L, Drobe B, González-Méijome JM, Gray L, Kratzer T, Newman S, Nichols JJ, Ohlendorf A, Ramdass S, Santodomingo-Rubido J, Schmid KL, Tan D, Tan KO, Vera-Diaz FA, Wong YL, Gifford KL, Resnikoff S. (2019) Invest Ophthalmol Vis Sci. 60(3):M161-M183. doi: 10.1167/iovs.18-25963.

Impact of contact lens materials on the mfERG response of the human retina. Amorim-de-Sousa A, Moreira L, Macedo-de-Araújo R, Amorim A, Jorge J, Fernandes PR, Queirós A, González-Méijome JM. Doc Ophthalmol. (2019). Oct 1. doi: 10.1007/s10633-019-09722-6.

Impact of Defocus and High-Order Aberrations on Light Disturbance Measurements. Amorim-de-Sousa A, Macedo-de-Araújo R, Fernandes P, Queirós A, González-Méijome JM. (2019) J Ophthalmol. 2019:2874036. DOI:10.1155/2019/2874036

In vivo assessment of the anterior scleral contour assisted by automatic profilometry and changes in conjunctival shape after miniscleral contact lens fitting.Macedo-de-Araújo RJ, van der Worp E, González-Méijome JM. (2019) J Optom.;12(2):131-140. doi: 10.1016/j.optom.2018.10.002.

Lexico-syntactic interactions during the processing of temporally ambiguous L2 relative clauses: An eye-tracking study with intermediate and advanced Portuguese-English bilinguals. Soares AP, Oliveira H, Ferreira M, Comesaña M, Macedo AF, Ferré P, Acuña-Fariña C, Hernández J, Fraga I. (2019) PlosOne;14(5):e0216779. doi: 10.1371/journal.pone.0216779.

Light distortion of soft multifocal contact lenses with different pupil size and shape. Monsálvez-Romín D, González-Méijome JM, Esteve-Taboada JJ, García-Lázaro S, Cerviño A. (2019) Cont Lens Anterior Eye.. pii: S1367-0484(19)30059-1. doi: 10.1016/j.clae.2019.11.014.

Light disturbance analysis in the controlled randomized clinical trial MiSight(®) Assessment Study Spain (MASS). Ruiz-Pomeda A, Fernandes P, Amorim-de-Sousa A, González-Méijome JM, Prieto-Garrido FL, Pérez-Sánchez B, Villa-Collar C. (2019) Cont Lens Anterior Eye.;42(2):200-205. doi: 10.1016/j.clae.2018.11.006.

Multifocal contact lenses: towards customisation? Faria-Ribeiro M, González-Méijome JM. (2019) Ophthalmic Physiol Opt.;39(1):37-45. doi: 10.1111/opo.12597.

Neighboring chromaticity influences how white a surface looks. Nascimento SMC, Pastilha RC, Brenner E. (2019). Vision Research, 165:31-35. doi: 0.1016/j.visres.2019.09.007.

Novel Method of Remotely Monitoring the Face-Device Distance and Face Illuminance Using Mobile Devices: A Pilot Study. Salmerón-Campillo RM, Jaskulski M, Lara-Cánovas S, González-Méijome JM, López-Gil N. (2019) J Ophthalmol. 2019:1946073. doi: 10.1155/2019/1946073.

Practitioner Learning Curve in Fitting Scleral Lenses in Irregular and Regular Corneas Using a Fitting Trial. Macedo-de-Araújo RJ, van der Worp E, González-Méijome JM. (2019) Biomed Res Int.;2019:5737124. doi: 10.1155/2019/5737124.

Productivity losses and their explanatory factors amongst people with impaired vision. Marques AP, Macedo AF, Hernandez-Moreno L, Ramos PL, Butt T, Rubin G, Santana R, and PORVIS-group (2019) Ophthalmic Epidemiology ;26(6):378-392. doi: 10.1080/09286586.2019.1632904.

Psychological and Psychosocial Interventions for Depression and Anxiety in Patients with Age-Related Macular Degeneration–A Systematic Review. Senra H, Macedo AF, Nunes N, Balaskas K, Aslam T, Costa E. (2019) The American Journal of Geriatric Psychiatry;27(8):755-773. doi: 10.1016/j.jagp.2019.03.001.

Pupil Function in Pseudophakia: Proximal Miosis Behavior and Optical Influence. Fonseca, E., Fiadeiro, P., Gomes, R., Sanchez-Trancon, A., Baptista, A., Serra, P. (2019). Photonics 6 (4), 114. http://dx.doi.org/10.3390/photonics6040114.

Refractive, biometric and corneal topographic parameter changes during 12 months of orthokeratology. Queirós A, Lopes-Ferreira D, Yeoh B, Issacs S, Amorim-De-Sousa A, Villa-Collar C, González-Méijome J. Clin Exp Optom. (2019). doi: 10.1111/cxo.12976.

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6.1.4.2 Books and book chapters

Chapters

Emotional, Sensory, and Social Dimensions of Consumer Buying Behavior. An Eye Tracking Study of the Effect of Sensory and Price In-Store Displays. (pp. 1-325). Rodrigues C, Brandão A, Macedo AF, Baskaran K. In book: Soares, A. M., & Elmashhara, M. G. (2020). Hershey, PA: IGI Global. doi:10.4018/978-1-7998-2220-2, ISBN13: 9781799822202, https://www.igi-global.com/book/emotional-sensory-social-dimensions-consumer/235713

6.1.4.3 Conference Proceedings with Pier Review appearing in the ISI Database

A Minimal-Model Approach to Analyze Neuronal Circuit Dynamics from multifocal ERG (mERG). Schröder P, Martínez-Cañada P, Amorim A, Fernandes P, Amorim-de-Sousa A, González-Méijome JM. (2019) 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Berlin, Germany, , pp. 2955-2958. DOI: 10.1109/EMBC.2019.8856840

Influence of pupil function in pseudophakia, Fonseca, E., Fiadeiro, P., Gomes, R., Sanchez-Trancon, A., Baptista, A., Serra, P, Proc. SPIE 11207 (2019), 112071N; https://doi.org/10.1117/12.2527412

Compensation effect between corneal and internal ocular aberrations during a computer task" Jessica Gomes, Andreia Gonçalves, and Sandra Franco, Proc. SPIE 11207 112071M (2019)

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Sandra Franco, Raquel Moreira, João Linhares, "The influence of coloured lighting on ocular amplitude of accommodation," Proc. SPIE 11207, Fourth International Conference on Applications of Optics and Photonics, 112071L (3 October 2019);https://doi.org/10.1117/12.2527402

A.F. Macedo. , Meeting ISPOR, Country: Denmark, November 2019, " ANTI-VEGF INTRAVITREAL INJECTIONS IN PORTUGAL: THE FIRST DECADE 2007-2017" Value in Health 22, S888-S889 DOI: https://doi.org/10.1016/j.jval.2019.09.2578

A.F. Macedo. , Meeting: ESLRR2019, Country: UK September 2019, 'Effect of a basic low vision rehabilitation intervention on patient reported measures'; Ophthalmic Physiol Opt. 2019 Nov;39(6):469-473. https://www.ncbi.nlm.nih.gov/pubmed/31696538

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6.1.5 Conference Presentations

6.1.5.1 Invited talks delivered at Conferences (International/National)

International

A visão como preditor do nível de desempenho de árbitros de futebol. XXII Congresso Internacional de Optometria e Contactologia UPOOP, 2019 (Lisboa, Portugal) António Baptista,

Aplication of ocular electrophysiology in the proffessional field of optometry. XV CAO´S – XV Conferências Abertas de optometria, APLO, 2-3 November 2019, Faro, Portugal.Paulo Fernandes.

Aspectos Actuales en Lentes de Contacto Multifocales. José M. González-Méijome. Jornadas de Contactologia. Universidad Politécnica de Cataluña, Terrasa. December 11th, 2019.

Colors in nature and art – what do we learn from spectral imaging data November 2019. S. M. C. Nascimento. University of Tucuman, Argentina.

Control de Miopía con Lentes Blandas. José M. González-Méijome.Contactologia, Evidencia, Eficacia y Evolución. Almeria, Spain. October 5-6, 2019.

Control de Miopía con Lentes de Contacto HIdrofílicas. José M. González-Méijome. Universidad del Mar- UNiversity of Murcia. Murcia, Spain. September 6-8, 2019.

Dry eye in Portugal. José Salgado-Borges, José M. González-Méijome. Tear Film and Ocular Surface Society (TFOS) Ambassadors Meeting. Rome. September 21-22, 2019.

Efficacia delle procedure utilizzate per il controllo della pro gressione miopica. José M. González-Méijome. Myopia Control Conference. Monopoli, Italy. October 13-14, 2019.

Ensayo Clínico Multicéntrico Control de Miopia con MiSight. Colegio Nacional de Opticos Optometristas de Cataluña. Barcelona, Spain. May 7, 2019.José M. González-Méijome.

Enseñanza e Investigación en Optometria y Ciencias de la Visión Basada en la Evidência. – Universidad de Santo Tomás de Aquino (USTA). Bucaramanga, Colombia. September 12-18, 2019.José M. González-Méijome.

Ensino e Investigação em Optometria e Ciências da Visão baseada na Evidência. José M. González-Méijome. Universidade do Contestado, Canoínhas, Brasil. May 26-28, 2019.

Epidemiología de la Miopía. José M. González-Méijome. Universidad del Mar- UNiversity of Murcia. Murcia, Spain. September 6-8, 2019.

Factores de riesgo para el desarrollo de la miopía. ¿Se puede prevenir?. José M. González-Méijome. OPTOM Meeting. Valladolid, Spain. June 15-16, 2019.

Intrumentazione per el controlo miópic a lenti a contati. José M. González-Méijome. Myopia Control Conference. Monopoli, Italy. October 13-14, 2019.

Manejo Integral de la Miopía Basado en Evidencia Científica. José M. González-Méijome. Asociación Latinoamericana de Ortoqueratologia y Control de Miopia, Iguazú, Brasil. March 27 to April 1, 2019.

Myopia Control with Optical Devices. José M. González-Méijome. Deutche Oftalmologue (DOG). Berlin, Germany. September 26-27, 2019.

MYOPIA, Public Health Issue. José M. González-Méijome. EurOk Conference. Transylvania, Romenia. November 15-17, 2019.

Ocular optical quality dynamics during accommodation in subjects with accommodative dysfunctions. Sandra Franco., Fourth International Conference on Applications of Optics and Photonics, June 2nd, 2019. (Lisboa, Portugal).

Orthokeratology and Myopia Control (convidado). TRANSILVANIA - 5th EUROK Internacional Meeting. EurOK - European Academy of Orthokeratology and Myopia Control. Cluj-Napoca - Romania. 15-17 November 2019, 2019.Queirós, António.

Principi di funcionamento delle lenti a contati (ortocheratologia & LC morbide) sul controllo della progressione miopica. José M. González-Méijome. Myopia Control Conference. Monopoli, Italy. October 13-14, 2019.

Superfície Ocular Pediátrica y Lentes de Contacto. José M. González-Méijome. Asociación Latinoamericana de Ortoqueratologia y Control de Miopia, Iguazú, Brasil. March 27 to April 1, 2019.

The role of surface properties in contact lenses III Jornadas de Optometria. Madalena Lira. Colégio de Ópticos-Optometristas de Galicia. 19_20 Outubro de 2019. Santiago de Compostela

Vision as a predictor of expertise in high demanding visual tasks. António Baptista, AOP2019, 31 May-4 June, 2019 (Lisbon)

National

Visão das cores: Alteração e deteção, Alcon Experience João M.M. Linhares. Academy, Março 2019, Lisboa, Portugal.

6.1.5.2 Contributed talks delivered at Conferences (International/National)

International

Breaking illuminant metamerism using directional spectral variation in natural environments: dichromats might benefit more than trichromats, Takuma Morimoto; João M.M. Linhares; Sérgio M.C. Nascimento; Hannah E. Smithson, Journal of Vision. 2019; 19(15):9. doi: https://doi.org/10.1167/19.15.9

Changes in Ocular Accommodation and Astigmatism During Near Vision with Prototypes of Contact Lenses for Myopia Progression Control.Pereira-da-Mota AF, Amorim-de-Sousa A, Pauné J, Queirós A, González-Méijome JM. European Academy of Optometry and Optics (EAOO) annual conference 2019. Roma, Itália. 19-05-2019.

Changes to grating orientation and spatial frequency in two different tests to assess the electrophysiological response of the retina. Amorim-de-Sousa A, Macedo-de-Araújo RJ, Filipa Mota A, Amorim A, Fernandes P, Queirós A, González-Méijome JM. XVI Congresso Internacional de Optometria, CIOCV 2019,Braga, 4-6 de maio,2019

Chromatic properties of Japanese paintings are similar to that of European paintings Sho Kishigami, Takuma Morimoto, João MM Linhares, Tetsuto Minami, Shigeki Nakauchi and Sérgio MC Nascimento. 25th Symposium of the International Colour Vision Society. 2019, Riga.

Determining vault size in implantable collamer lenses: preoperative anatomy and lens parameters, Pedro Serra, A. Sánchez-Trancón, S. Cerpa-Manito, O. Torrado, António Baptista, 37th Congress of the ESCR, Paris, 2019

Developing a test for measuring red-green residual activity based on confusion lines, Julio Lillo, Humberto Moreira, Leticia Álvaro, João M.M. Linhares & Sérgio M.C. Nascimento, 8th Iberian Conference on Perception June, 2019, San Lorenzo de El Escorial, Spain.

Effect of changes in grating direction and spatial frequency as a measure of the sensitivity of macular function – a pilot study. Amorim-de-Sousa A, Macedo-de-Araújo RJ, Pereira-da-Mota AF, Amorim A, Queirós A, Fernandes PRB, González-Méijome JM. European Academy of Optometry and Optics (EAOO) annual conference 2019. Roma, Itália. 18-05-2019.

Epidemiology of vision problems in Europe: a Portuguese perspective, Eduardo Teixeira, Francisco Brardo, António Baptista, AOP2019, Lisboa, 2019

Hyperspectral environmental illumination: directional spectral variation and a revisit of metamerism in the real world, Takuma Morimoto, Sho Kishigami, João MM Linhares, Sérgio MC Nascimento and Hannah E Smithson, 25th Symposium of the International Colour Vision Society. 2019, Riga.

Influence of pupil function in pseudophakia, Elsa Fonseca, Paulo Fiadeiro, Renato Gomes, Sanchez-Trancon, António Baptista, Pedro Serra, AOP2019, Lisboa, 2019

Local retinal sensitivity to different grating direction measured with mfERG. Amorim-de-Sousa A, Macedo de Araújo RJ, Pereira-da-Mota AF, Amorim A, Queirós A, Fernandes PRB, González-Méijome JM. European Academy of Optometry and Optics (EAOO) annual conference 2019. Roma, Itália. 18-05-2019.

Modelling effect of time on visual acuity for vanishing and conventional optotypes, Paulo Fiadeiro, Elsa Fonseca, António Baptista, Pedro Serra, AOP2019, Lisboa, 2019

Moreno, L; Macedo, AF, Meeting: CIOCV2019, Country: Portugal, April 2019, Title: 'Improving reading with vision rehabilitation';

Myopic trend in refractive error and biometric parameters in a population of young adults entering university in Portugal between 2016 and 2018. Lopes-Ferreira D, Macedo-de-Araújo RJ, Amorim-de-Sousa A, Fernandes PRB, Pereira-da-Mota AF, Amorim A, Faria-Ribeiro M, Peixoto-de-Matos S, Vaz AR, Miranda A, Jorge J, Queirós A, González-Méijome JM. European Academy of Optometry and Optics (EAOO) annual conference 2019. Roma, Itália. 19-05-2019.

Retinal Activity Changes with 3 Prototype Contact Lenses for Myopia Control.Ana Filipa Pereira-da-Mota, Amorim-de-Sousa A, Fernandes PRB, Amorim A, Pauné J, Queirós A, González-Méijome JM. European Academy of Optometry and Optics (EAOO) annual conference 2019. Roma, Itália. 19-05-2019.

Robust colour constancy in red-green dichromacy, Leticia Álvaro, Julio Lillo, Humberto Moreira, João M.M. Linhares & Sérgio M.C. Nascimento, 8th Iberian Conference on Perception June, 2019, San Lorenzo de El Escorial, Spain.

The colours of paintings from pre-primary children, Sérgio M.C. Nascimento, Catarina F. M. Herdeiro & João M.M. Linhares, 8th Iberian Conference on Perception June, 2019, San Lorenzo de El Escorial, Spain.

The Influence of the Illumination Intensity on Ocular Accommodation, Raquel Moreira, J Linhares, Sandra Franco, CIOCV 2019, Braga, 2019

National

Eletrofisiologia na ortoqueratologia. Costa J, Queirós A, Gonzalez-Meijome JM. Optomevista 2019, NEOUM - Nucleo de Estudantes de Optometria e Ciências da Visão, Braga, 13 de abril,2019

Refractive, Biometric and Corneal Topographic Parameters along 12 months of Orthokeratology.
(Authors: Daniela Lopes-Ferreira, António Queirós, Yeoh B, Issacs S, Amorim-de-Sousa A, César Villa-Collar, José M. González-Méijome), Optomevista 2019. Organized by Studens of Optometry Universidade do Minho (NEOUM), Braga, Portugal. April 13th, 2019.

The Influence of the illumination intensity on ocular accommodation, Raquel Moreira, João Linhares, Sandra Franco, 16th International Congress of Optometry and Vision Sciences. Universidade do Minho; Braga, May, 2019

6.1.6 National/International Patents

6.1.7 SPIN-OFFS, START-UPS

6.1.8 Supervision of Research Students

6.1.8.1 PhD projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Helena I. Ferreira Neves	José M. González Méijome, António Queirós	Analysis of Light Visual Distortion and Quality of Vision with Different Multifocal Lens Designs for the Compensation of Presbyopia	PhD In Sciences (Physics)
Rute J. Macedo-de-Araújo	José M. González Méijome	Clinical performance and biological interactions in scleral contact lens wear	PhD in Optometry and Vision Sciences

6.1.8.2 PhD projects in progress in 2019

Author	Supervisor	Title	Host institution/Program
Eduardo Teixeira	Francisco Ferreira (UBI), António Baptista	Os principais problemas de visão na Europa: a perspetiva Portuguesa	PhD Biomedicine (UBI)
Clara Maria dos Santos Pereira.	Madalena Lira e Paula Sampaio	Uma nova visão para as lentes de contacto.	PhD In Sciences (Biology)
Eduardo Ínsua Pereira	Madalena Lira e Paula Sampaio	Evaluation of cytotoxic potential and inflammatory response induced by contact lenses	PhD in Optometry and Vision Sciences
Jessica Gomes	Sandra Franco	Estudo das propriedades óticas e biométricas do cristalino de forma estática e dinâmica	PhD in Optometry and Vision Sciences
Alshaarawi Salem	Sandra Franco; António Baptista	Near vision stress among university students.	PhD in Optometry and Vision Sciences
Lina Rodríguez Cely	José Manuel González-Méijome	Impact of ocular parameters in contact lens fitting: european vs latinamerica population	PhD in Optometry and Vision Sciences
Ana Isabel Carvalho Amorim de Sousa	José M González-Méijome António Queirós Pereira	Selective optoelectrophysiological stimulation of the human retina with a novel microstimulation paradigm	PhD in Optometry and Vision Sciences
Pedro Lima	Filipe Macedo	To define	PhD in Science (Math)

6.1.8.3 MSc projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Micael Moreira Alves.	Madalena Lira e Elisabete Coutinho	Influência das soluções de manutenção na transmitância e refletância de lentes de contacto.	ECUM
Rita Maria Martins Alves.	Paula Sampaio e Madalena Lira	A new vision for Contact Lenses.	ECUM
Ana Teresa Gomes de Lacerda.	Madalena Lira	Acanthamoeba e Lentes de Contacto	ECUM
Ana Raquel de Pinho Moreira (MOA	Sandra Franco, João Linhares	Influência de Iluminação Colorida nos Parâmetros Acomodativos Oculares	ECUM
Vânia Valéria Pereira Fernandes (MOA)	Sandra Franco	Flexibilidade acomodativa: valores normais e influência do erro refrativo	ECUM
Ana Raquel de Pinho Moreira	Sandra Maria Braga Franco, João Manuel Maciel Linhares	A Influência de Iluminação Colorida nos Parâmetros Acomodativos Oculares	ECUM
João Pedro Teixeira da Cunha	João Manuel Maciel Linhares, Sérgio Miguel Cardoso Nascimento	Influência dos Meios Oculares na Perceção do Teste de Visão das Cores de Ishihara	ECUM
Ana Filipa Mota	José Manuel González-Méijome António Queirós	Performance Visual, Resposta Acomodativa e Análise Eletrofisiológica da Retina com Protótipos de Lentes de Contacto para o Controlo da Progressão da Miopia	ECUM
Jessica Costa	António Queirós José Manuel González-Méijome	Alterações na Resposta Retiniana Durante o Tratamento Ortoqueratológico	ECUM
Lília Marques	José Manuel González-Méijome	Resposta acomdoativa com lentes de contacto bifocais	ECUM
Ana Luísa Marques	José Manuel González-Méijome Rute J. Macedo-de-Araújo	Optical and Visual Quality of Two Scleral Lenses	ECUM
Micael Moreira Alves.	Madalena Lira e Elisabete Coutinho	Influência das soluções de manutenção na transmitância e refletância de lentes de contacto.	ECUM
Rita Maria Martins Alves.	Paula Sampaio e Madalena Lira	A new vision for Contact Lenses.	ECUM
Ana Teresa Gomes de Lacerda.	Madalena Lira	Acanthamoeba e Lentes de Contacto	ECUM
Ana Raquel de Pinho Moreira (MOA	Sandra Franco, João Linhares	Influência de Iluminação Colorida nos Parâmetros Acomodativos Oculares	ECUM
Vânia Valéria Pereira Fernandes (MOA)	Sandra Franco	Flexibilidade acomodativa: valores normais e influência do erro refrativo	ECUM

6.2. Physics of quantum materials and bionanostructures

6.2.1. Researchers

Principal investigator	Paulo José Gomes Coutinho
Members	**Effective members of the Centre** Ana Rita Oliveira Rodrigues Anabela Gomes Rolo Bernardo Gonçalves Almeida Bruno António Campos Amorim Eduardo Jorge Nunes Pereira Elisabete Maria dos Santos Castanheira Coutinho Etelvina de Matos Gomes Gaspar José Brandão Queirós Azevedo Machado Gueorgui Vitalievitch Smirnov Irene Estevez Caride Pedro Santos Hall Agorreta Alpuim Joel Nuno Pinto Borges Jorge Manuel da Silva Figueiredo Luís Manuel Gomes Vieira Maria de Fátima Guimarães Cerqueira Maria Elisabete da Cunha Dias Real Oliveira Mário Rui da Cunha Pereira Marlene Susana Dionísio Lúcio Michael Scott Belsley Mikhail Igorevich Vasilevskiy Nuno Miguel Machado Reis Peres Paulo José Gomes Coutinho Peter Michael Schellenberg Ricardo Pedro Lopes Martins de Mendes Ribeiro Rosa Maria Ferreira Batista Rui Miguel Soares Pereira Sofia Oliveira Lopes Stephane Louis Clain Tatiana Gabriela Rappoport **Collaborators** Staff members with PhD Jorge António Silva Mendes José Carlos Viana Gomes José Luis Pires Ribeiro Júlia Maria Simões Dias Barata de Tovar Ayres de Campos Maria José Fontes Alexandre Forjaz de Sampaio

	Teresa Maria Santos Ribeiro Viseu **-Post-Doctorate Researchers** Filipe André Peixoto Oliveira Jaime Eduardo Vieira Silva Moutinho Santos Yuliy Bludov **Integrated PhD students** PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students - Andreia Marina de Sousa Almeida - Balaji Sompalle - Beatriz Dias Cardoso - Bruna Machado da Silva - Catarina Filipa Matoso Abreu - Celso Joel O. Ferreira - César Rui Freitas Bernardo - Cláudia Vanessa Dias Reis - Danilo Pedrelli - Diogo Lopes - Eduarda Barbosa Fernandes - Hugo Manuel Castro Gonçalves - Ícaro Jael Mendonça Moura - João Miguel Peixoto Oliveira - Patrícia Daniela Cabral da Silva - Paulo André Gonçalves - Ricardo Daniel Pereira da Costa - Telma Bezerra Soares - Vitor Filipe Henriques da Silva

6.2.1. Brief description of the scientific work carried out within the Research Line in 2019

Previous scientific work developed in this Research Line was continued. Considering 2D materials, the 2019 activities were based on describing polaritonics in 2D materials. The studies were focused in two systems: graphene and transition metal dichalcogenides. The electro-optic properties of carbon fibres and graphene integrated in polymeric structures, including multi-layered systems, were simulated.
The electromagnetic response of 2D materials embedded in dielectric systems, including retardation effects, was investigated, as well as the absorption and dissipation due to the passage of fast charged particles. Transport properties of Weyl metals (including dissipation of heat) and electrostatic properties of graphene devices were also studied. Properties of non-reciprocal media showing magnetic optical activity were investigated. Theory and numerical modelling of surface plasmon-polaritons in graphene-based nanostructures incorporating other materials, such as nanoparticles or a 2D anti-ferromagnetic layer, for new device applications (e.g. sensing or enhanced absorption) were developed.

The modelling of the optical response of a system of interacting plasmonic particles embedded in a matrix or deposited on top of a substrate, polarised by external electromagnetic field, including the effects of losses in the matrix/substrate owing to interband or excitonic transitions in the latter was carried out. Modelling of the scattering of TEM electrons by a potential calculated using density functional theory of realistic materials (with INL Atomic Structure-Composition of Materials group) was also performed.
The synthesis and investigation of self-assembled dipeptide diphenylalanine derivatives was started. These systems were embedded into polymer nanofibers, with the fabrication of macroscopic two dimensional arrays with strong piezoelectric responses. Their linear optical absorption and photoluminescence was also addressed.
We have continued to experimentally explore the ultrafast nonlinear optical response of confined systems focusing on both organic molecules embedded in electro-spun fibers (e.g. nitroaniline derivatives) and optical second harmonic generation of individual nanofibers was studied, as well as second and third-order nonlinear responses of 2D materials. Defect centers in 2D h-BN layers showing single photon emission were investigated (collaboration with INL). To this end, 'blinking' and fluorescence decay kinetics were analyzed by FLIM.
New nanostructured materials were synthesized, consisting of multiferroic thin films and nanocomposite bilayers (Bi2ZnTiO6, CoFe2O4\LiNbO3), as well as piezoletric nanofibers with dipeptide nanotubes. Their dielectric, piezoelectric, ferroelectric and nonlinear optical properties were studied. The dielectric properties of metal-semiconductor-metal junctions, with different semiconductor concentrations, were investigated.
Magnetoliposomes based on fully-biocompatible magnetic nanoparticles (calcium ferrites and mixed calcium/magnesium ferrites) and magnetic/plasmonic multifunctional nanoparticles were developed. Novel magnetogels containing manganese ferrite and manganese ferrite/gold nanoparticles were developed and optimized for multimodal cancer therapy. Magnetic nanosystems for environmental applications were also obtained and successfully tested in effluent photoremediation. Boosting innovation in magnetic (bio)nanosystems for Health and Environment, a national patent was submitted and a new UMinho spin-off company, SPM Nanosolutions, Lda.: Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment, was created that won the 2019 INL Nourish spin-off incubation program.
Optimized lipid-based nanosystems and chitosan nanocapsules were prepared as nanocarriers for plant extracts focusing applications as biopesticides. Fluorescence of teeth and dental prosthesis material was studied (with State Univ. São Paulo, Brazil).
Multifunctional nanosystems carrying multiple strategies (hybrid composition, pH triggering and hyphenated drug/gene therapy) for improved therapeutic performance were developed. Microfluidics-based techniques for controlling the self-assembly of lipid nanosystems were explored. High-throughput screening methods and mimetic models of biointerfaces were developed for biophysical profiling of newly synthesized drugs, bioactives and nanotherapeutics.
Photovoltaic Grätzel cells sensitized by quantum dots (PbS, CdSxSe1-x) in mesostructured TiO2 films were developed and the use of inorganic solid state electrolytes, such as CuSCN hole conductor, was started.
We also focused on the development of tractable models of angular-dependent light scattering by rough surfaces with application to object detection (in the framework of UM-Bosch project SENSIBLE CAR).
The computational physics team was dedicated to the development of new numerical tools with a special focus on very high order finite volume method, aiming at predicting and simulating physics problems based on partial differential equations with complex boundaries. This methodology was applied in a large spectrum of problems (linear elliptic, parabolic equation), Euler system, Shallow water problem. The team was also dedicated to modeling, applying and developing optimal control tools for the irrigation planning problem, aiming to minimize the water used in irrigation systems using differential equations and control.

6.2.2. Future research summary

In 2020, the characterisation of the optical properties of 2D materials will be continued, mainly focused on transition metal dichalcogenides. An efficient method to address this problem will be developed. We will start developing a new research topic, that of topological photonics. The studies focusing on the electromagnetic and optical properties of graphene and other 2D materials and their devices will be concluded. The non-equilibrium dynamics of electric double layers in graphene devices will be addressed. We will also focus on the theory and modelling of collective polariton modes in cavity-type structures incorporating 2D materials (graphene or TMD semiconductors) and quantum emitters. A method for the calculation of Berry connections starting from density functional theory calculations to obtain nonlinear optical properties of materials will de developed. The modelling of the optical response of a system of interacting plasmonic particles placed at an interface between two dielectrics (so that each of them behaves as a Janus particle) will be performed; we are going to explore their collective spectral response with the aim of designing new composite plasmonic materials for sensing applications without performing costly experiments.
We plan to focus on developing a pump-probe cross-phase modulation technique to characterize the dispersion of the nonlinear Kerr effect in graphene and other two-dimensional materials using a chirped white continuum. Different methods of annealing will be employed to clean the h-BN layer. We will set-up a Hanbury-Brown-Twiss type photon correlator to unambiguously identify single photon emitters. We will also produce 2D heterostructures to investigate influences of such systems on single photon emission.
The synthesis of several dipeptides and study of their linear and nonlinear optical properties (in crystalline state and solution) will be continued, with production of nanofiber arrays and evaluation of piezoelectric and nonlinear optical properties. Crystalline salts of selected dipeptides and organic acids will be synthesized and their structural, dielectric and nonlinear optical properties will be investigated, aiming at finding new materials with outstanding ferroelectricity and second harmonic generation properties.
Novel micro- and nanostructured materials (films, nanofibers, nanoparticles), with magnetic, ferroelectric and multiferroic properties, for biological, sensing and spintronic applications, will be developed and characterized on their structural, magnetic, optical and dielectric properties.
The development of stimuli-responsive magnetoliposomes entrapping antitumor drugs will be continued, for improved synergistic cancer therapy (hyperthermia/chemotherapy). The heat generation capability will be assessed and the most promising systems will be studied using suitable cell lines. New magnetogels and magnetolipogels for advanced therapeutic applications will be developed. The development of optimized nanoformulations containing plant extracts for biopesticides will be continued.
The development and optimization of quantum dot sensitized photovoltaic Grätzel cells will be continued. The photoconversion of water in hydrogen using pollutants as sacrificial donors will be attained, using either g-C3N4 coupled with ferrites or TiO2 decorated with silver. These systems will also be used in photoremediation applications.
Multifunctional nanosystems with hybrid composition (containing lipids, polymers and graphene oxide nanosheets) for hyphenated therapies (drug/gene therapies) and theranostic purposes will be further developed. The development of a microfluidic-based platform for controlling the fabrication process of lipid-DNA complexes with tuneable sizes and composition will be continued. A microfluidic based skin-biomimicry platform to screen compounds for topical cutaneous application will also be developed.
Fluorescence of teeth and dental prosthesis materials (with Dep. Biomatériaux Dentaires, Fac. d'Odontologie de Lorraine) will be investigated, as well as new fluorescence probes for biological systems.
Modelling of polarisation-sensitive light scattering by rough surfaces with application to materials/surfaces determination by means of Mueller polarimetry will be performed (in the framework of UM-Bosch project SENSIBLE CAR), as well as quantum simulations of the electronic structure of small molecules and resonant energy transfer processes using IBM-Q (QuantaLab collaboration).
We intend to apply the very high order technology to the linear Schrödinger equation involving complex configuration of material and geometries. The capacity to deal with a vast set of numerical methods enables to design efficient schemes, both in term of accuracy and computational resources. We also intend to develop the model of irrigation systems with partial differential equation and compare the numerical results with the real case.

6.2.3. Publications

6.2.3.1. Regular articles published in ISI/Scopus Journals

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6.2.3.2. Books and book chapters

Chapters

Twisted bilayer graphene: Low-energy physics, electronic and optical properties Gonçalo Catarina, Bruno Amorim, Eduardo V. Castro, João M. V. P. Lopes, Nuno Peres In Edited by Mei Zhang, Handbook of Graphene: Volume 3, Chap. 6, pp 117-230, John Wiley & Sons, New Jersey (2019)

6.2.3.3. Conference Proceedings with Pier Review appearing in the ISI Database

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6.2.4. Conference Presentations

6.2.4.1. Invited talks delivered at Conferences (International/National)

International

2D Materials for Polaritonics, Nuno Peres, V International Conference on Applications in Optics and Photonics (AOP 2019), 31 May-4 June, 2019, Lisbon, Portugal.

2D Materials for Polaritonics, Nuno Peres, Short-Course in the Conference 2D Materials: From Fundamentals to Spintronics, 16 Sept.-4 Oct. 2019, Natal (Brazil).

Biosensing with graphene electronic devices (keynote), Pedro Alpuim. European Graphene Forum 2019, 23-25 October 2019, Lisbon, Portugal

Colloids and interfaces studies as an approach to disease, M. Lúcio. 8th Iberian Meeting on Colloids and Interfaces (RICI8), 17-19 July 2019, Aveiro, Portugal.

Drug (Re)design guided by biophysical characterization of interactions with biomimetic membranes (keynote), E. Fernandes, S. Benfeito, M.E.C.D. Real Oliveira, F. Borges, M. Lúcio. 5th International Electronic Conference on Medicinal Chemistry (ECMC-5), 1-30 Nov. 2019, Online Conference.

Entrepreneurship project "EyeOnDrug - Nanotechnologic solutions for drug screening and formulations development", T. B. Soares, E. Fernandes, R. Machado and M. Lúcio; pitch at the Intellectual Property Booster Bioinvest'19 (organized by Cluster Transfronteirizo Biotecnológico CTBIO), Dec. 2019.

Exciton-polaritons in a cylindrical microcavity with an embedded 2D semiconductor layer, M. Vasilevskiy. 21st International Conference on Transparent Optical Networks (ICTON 2019), 9-13 July 2019, Angers, France,

Masterclass on Quantum computing: Principles, algorithms and applications, M. Vasilevskiy. 2019 Annual Conference of UT Austin – Portugal Cooperation Program, 20 Sept. 2019, Braga, Portugal.

Modeling of graphene-based plasmonic structures for applications in THz spectral range, M. Vasilevskiy, 1-st International Conference on Mathematical Modeling in Materials Science of Electronic Components, Moscow, Russia, October 21-23, 2019

Pharmaceutical Applications of Graphene-based Nanomaterials in Cancer Theranostics (keynote), M. Lúcio. 3rd Edition of Global Conference on Pharmaceutics and Drug Delivery Systems (PDDS 2019), 24-26 June 2019 Paris, France.

Spin-off Company "SPM Nanosolutions, Lda. - Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment", Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira, Ricardo J. C. Fernandes, Carlos A. B. Magalhães, supervised by Paulo J. G. Coutinho and Elisabete M. S. Castanheira Coutinho; talk at the Intellectual Property Booster Bioinvest'19 (organized by Cluster Transfronteirizo Biotecnológico CTBIO), Dec. 2019.

Towards a biosensing platform based on graphene field-effect transistors, P. Alpuim, T. Domingues, J. Rafaela Guerreiro, E. Fernandes, P. Cabral, A. Ipatov, D. Y. Petrovykh, J. Borme. NanoSpain 2019, May 28-31, 2019, Barcelona, Spain.

Very high-order finite volume method on curved boundary domains, Stéphane Clain, NumHyp19, Málaga, 17-21 June 2019.

National

Beyond a Carrier: Monoolein core-filled liposomes as a multifunctional tool for drug/gene delivery and image guided therapy, M. Elisabete C. D. Real Oliveira, Nanotechnology for Therapy and Diagnostics - Nanogateway Winter School, 16-18 January 2019, INL, Braga, Portugal.

Characterization of lipid-based nanotherapeutics as part of Safe-by-Design, M. Lúcio, Workshop "Nanotechnology and Brain Drug Delivery", Faculdade de Farmácia, Universidade de Coimbra, 19 June 2019, Coimbra, Portugal.

Graphene-based nanotheranostic strategies for cancer treatment: promises; facts and challenges, M. Lúcio, Nanotechnology for Therapy and Diagnostics - Nanogateway Winter School, 16-18 January 2019, INL, Braga, Portugal.

HSA-drug binding in preformulation studies: Improving drug biodistribution, E. Fernandes, Workshop "Nanotechnology and Brain Drug Delivery", Faculdade de Farmácia, Universidade de Coimbra, 19 June 2019, Coimbra, Portugal.

Nonlinear Optics as a probe of Condensed Matter systems, Michael Belsley, "Condensed Matter Physics National Conference", Porto, 8-10 May 2019.

Quantum Paradigm, Ricardo Mendes Ribeiro, Workshop "Quantum Days", 11-12 April 2019, Braga, Portugal.

Spin-off Company "SPM Nanosolutions, Lda. - Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment", Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira, Ricardo J. C. Fernandes, Carlos A. B. Magalhães, supervised by Paulo J. G. Coutinho and Elisabete M. S. Castanheira Coutinho; talk at Boosting Innovation Seminar, Biblioteca Almeida Garrett, Porto, Nov. 2019.

Spin-off Company "SPM Nanosolutions, Lda. - Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment", Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira, Ricardo J. C. Fernandes, Carlos A. B. Magalhães, supervised by Paulo J. G. Coutinho and Elisabete M. S. Castanheira Coutinho; talk at Electric Festival, Pasteleira Park, Porto, July 2019.

Talkabout: Graphene and 2D Materials for Next-Generation Devices. Pedro Alpuim, Chun-Da Liao, Patrícia D. Cabral, Jérôme Borme, IEEE UMinho Student Branch, Campus de Gualtar, Braga, Portugal. April 10, 2019.

Tecnologias Quânticas", Ricardo Mendes Ribeiro, Workshop "Tecnologias e Profissões do Futuro", 15 May 2019, Coimbra, Portugal.

The LiDAR hop-on-hop-off route: visiting the LiDARs past, present, and future landscapes, Eduardo J. Nunes-Pereira, AOP 2019 - IV International Conference on Applications of Optics and Photonics, 31 May-4 June 2019, Lisbon, Portugal.

Electronic properties of incommensuate van der Waals structures Condensed Matter Physics National Conference 2019 May 2019, Porto, Portugal

6.2.4.2. Contributed talks delivered at Conferences (International/National)

International

Photodetectors based on 2D materials in a van der Waals heterostructure", Pedro Alpuim, B. Sompalle, J. Rodrigues, J. Santos, B. Baumgartner, C.D. Liao, J. Borme, A. Capasso, S. Sadewasser. ICANS 28, 4-9 August 2019, Ecole Polytechnique, Palaiseau, France.

3-Nitroaniline crystals embedded in electrospun nanofibers as strong piezoelectric and nanoemitters of second harmonic light", Rosa Baptista, C. Bernardo, Etelvina de Matos Gomes, Paulo Lopes, Michael S. Belsley, 5th Smart Materials and Surfaces Conference (SMS 2019), 23-25 Oct. 2019, Lisbon, Portugal.

Beyond a Carrier: Monoolein core-filled liposomes as a multifunctional tool for cancer theranostics", M. E. C. D. Real Oliveira, O. F. Silvestre, J. B. Nieder, M. Lúcio, 33rd Conference of the European Colloid and Interface Society (ECIS2019), 8-13 Sept. 2019, Leuven, Belgium.

Core-shell magnetic-plasmonic nanoparticles enclosed in biocompatible hydrogels for multimodal cancer therapy", Sérgio R. S. Veloso, Paula M. T. Ferreira, J. A. Martins, Paulo J. G. Coutinho, Elisabete M. S. Castanheira, AOP2019 - IV International Conference on Applications of Optics and Photonics, 31 May-4 June 2019, Lisbon, Portugal; http://hdl.handle.net/1822/60719

Crystallographic and magnetic behavior of Gd5(Si,Ge)4 nanoparticles produced by a ns PLD", V.M. Andrade, N.R. Checca, J.H. Belo, A.L. Rossi, F. Garcia, B.G. Almeida, J.C.G. Tedesco, A. Poulain, M.S. Reis, A.M. Pereira, J.P. Araújo, K.R. Pirota, 1st International Sirius Workshop on X-Ray Nanospectroscopy, Nanodiffraction and Nanoimaging, 8-9 Oct. 2019, Campinas, Brazil.

Development of drug-loaded magneto-sensitive liposomes investigated by fluorescence techniques", Beatriz D. Cardoso, Daniela S. M. Pereira, A. Rita O. Rodrigues, Paulo J. G. Coutinho and Elisabete M. S. Castanheira, AOP2019 - IV International Conference on Applications of Optics and Photonics, 31 May-4 June 2019, Lisbon, Portugal; http://hdl.handle.net/1822/60729

Development of magnetic/plasmonic nickel ferrite/gold nanoparticles covered with lipid bilayers for applications in combined cancer therapy", Ana Rita O. Rodrigues, Irina S. R. Rio, Elisabete M. S. Castanheira and Paulo J. G. Coutinho, AOP2019 - IV International Conference on Applications of Optics and Photonics, 31 May-4 June 2019, Lisbon, Portugal; http://hdl.handle.net/1822/60730

Forecasting Temperature Time Series for Irrigation Planning Problems", C. Costa, A. M. Gonçalves, M. Costa, S.O. Lopes, International Workshop on Statistical Modelling 2019, Portugal, 2019.

Hands on Experiments About Water Needs in Agriculture and Their Mathematical Modelling Under Climate Change", M. T. Malheiro, R. M. S. Pereira, A. M. Gonçalves, P. Pereira, A. Caldeira, S. O. Lopes, Proceedings of the 2019 3rd International Conference on e-Society, e-Education and e-Technology, Spain, 2019.

High performance computation with ADI on Cartesian grid to solve the steady state 2D Convection-diffusion equation", D. Lopes, R. M. S. Pereira, S. Clain, SYMCOMP 2019 - ECCOMAS Thematic Conference, Porto, 2019.

Innovative numerical methods to improve the performance of computational rheology simulations in polymer processing applications", R. Costa, J.M. Nóbrega, S. Clain, G. J. Machado, 35th International Conference of the Polymer Processing Society - PPS 35, 26-30 May 2019, Izmir, Turkey.

Irrigation planning with fine meshes", S.O. Lopes, F. Costa, R. Pereira, M. T. Malheiro, F. Fontes, Eurogen 2019, Azurém, Guimarães, 2019.

Lipid-based nanocarriers as an innovative strategy for cancer treatment", T. B. Soares, A. Dias, H. Santos, B. Sarmento, M.E.C.D. Real-Oliveira, M. Lúcio, 17th European Student Colloid Conference (ESC 2019), 18-22 June 2019, Varna, Bulgaria.

Liposomal hydrogels as vaginal microbicides for HIV prophylaxis", M.J. Faria, T. Viseu, M.E.C.D. Real Oliveira, B. Sarmento, J. das Neves, M. Lúcio, 8th Iberian Meeting on Colloids and Interfaces (RICI 8), 17-19 July 2019, Aveiro, Portugal.

Microfluidics for controlled self-assembly of cubosome nanoparticles of tuneable size", C.J.O. Ferreira, V. Nasirimarekani, C. Botelho, M. E. C. D. Real Oliveira, B. F. B. Silva, 8th Iberian Meeting on Colloids and Interfaces (RICI 8), 17-19 July 2019, Aveiro, Portugal.

Mucoadhesive liposomal gel formulations as a novel vaginal delivery system to prevent HIV transmission", M. J. Faria, T. Viseu, B. Sarmento, M. Lúcio, J. das Neves, 17th European Student Colloid Conference (ESC 2019), 18-22 June 2019, Varna, Bulgaria.

Photodetectors based on CVD-grown 2D materials in a van der Waals heterostructure", P. Alpuim, B. Sompalle, C.D. Liao, J. Borme, M. F. Cerqueira, A. Capasso, Graphene for US, February 14-15, 2019, New York, USA.

Replanning the irrigation systems", S. O. Lopes, M. F. P. Costa, Rui M. S. Pereira, F.A.C.C. Fontes, SYMCOMP 2019 - ECCOMAS Thematic Conference, Porto, 2019.

Size-controlled Formation of Cubosome Nanoparticles Using Microfluidics", C. J. O. Ferreira, C. M. Botelho, M.E.C.D. Real Oliveira, B.F.B. Silva, CRS Society Annual Meeting, 21-24 July 2019, Valencia, Spain.

Strong piezoelectric response from electrospun fibers of hybrid polymer embedded dipeptide boc-diphenylalanine nanotubes", Rosa Baptista, Etelvina de Matos Gomes, M. Manuela M. Raposo, Susana P. G. Costa, Paulo Lopes, Bernardo Almeida, Michael S. Belsley, 5th Smart Materials and Surfaces Conference (SMS 2019), 23-25 Oct. 2019, Lisbon, Portugal.

Structural and Dielectric Properties of CoFe2O4\LiNbO3 Multiferroic Bilayers", B. Silva, D. Silva, J. A. Mendes, B. G. Almeida, IWAMO 2019 - International Workshop on Advanced Magnetic Oxides, 15-17 April 2019, Aveiro, Portugal.

Sustainable Irrigation System", A. Caldeira, P. A. Pereira, M. T. Malheiro, N. Haie, R. Pereira, S.O. Lopes, F.A.C.C. Fontes, 1st IFAC Workshop on Control Methods for Water Resource Systems (CMWRS2019), Netherlands, 2019.

Tamm polaritons in a J-Aggregates/PVA-DBR structure: potential for environmental sensing", Jorge Silva, Mikhail Vasilevskiy, 4th International Conference on Applications in Optics and Photonics (AOP2019), 31 May-4 June 2019, Lisbon, Portugal.

Temperature Time Series Forecasting in The Optimal Challenges in Irrigation (TO CHAIR)", A. M. Gonçalves, C. Costa, M. Costa, S. O. Lopes, R. Pereira, Eurogen 2019, Azurém, Guimarães, 2019.

Traceable and pH sensitive graphene-based hybrid nanosystems of cancer theranostic, T.B. Soares, R. Mendes, M.E.C.D Real Oliveira, A.C.P Dias, M. Lúcio, Suprabiomolecular Systems International Symposium (SupraBio 2019), May 2019, Barcelona, Spain.

Wavepacket diffraction on a metal film with a single slit covered by graphene, Y.V. Bludov, N.M.R. Peres, M.I. Vasilevskiy, AOP2019 - IV International Conference on Applications in Optics and Photonics, 31 May-4 June 2019, Lisbon, Portugal.

Hybrid plasmon-magnon polariton modes in graphene-antiferromagnet heterostructures, Y. V. Bludov, J. Gomes, G. Farias, J. Fernandez-Rossier, M.I. Vasilevskiy, N.M.R. Peres, 10th International Conference on Metamaterials, Photonic Crystals and Plasmonics, 23-26 July 2019, Lisbon, Portugal

Cobalt modified titanate nanotubular materials: how metal incorporation influences the semiconductor properties", B. Barrocas, M.S. Sharath Kumar, F.L. Deepak, A.G. Rolo, M.C. Oliveira, O.C. Monteiro, 6th Nano Today Conference, 16-29 june 2019, Lisbon, Portugal

National

Biophysical Characterization of drug-biomembrane model interactions: Redefining the drug screening process", E. Fernandes, T. B. Soares, S. Benfeito, F. Cagide, M. Elisabete C. D. Real Oliveira, F. Borges and M. Lúcio, NOVABIOPHYSICA, 4-6 Sept.2019, Lisbon, Portugal.

Diclofenac's toxicity revisited with biomimetic models and biophysical studies", M. Lúcio, C. M. Lopes, E. Fernandes, T.B. Soares, M.E.C.D. Real Oliveira, NOVABIOPHYSICA, 4-6 Sept.2019, Lisbon, Portugal.

Multiferroic CoFe2O4\LiNbO3 Bilayers", B.M. Silva, J. Oliveira, J. A. Mendes, B.G. Almeida, CMPNC19 - 2nd Portuguese Condensed Matter Physics Meeting, 8-10 May 2019, Porto, Portugal.

Simulation of the temperature profile of BaCaZrTiO3 thin films during laser annealing", T. Rebelo, B. G. Almeida, CMPNC19 - 2nd Portuguese Condensed Matter Physics Meeting, 8-10 May 2019, Porto, Portugal.

Supramolecular magnetogels as nanocarriers for multimodal cancer therapy", Sérgio R. S. Veloso, A. R. O. Rodrigues, Paula M. T. Ferreira, J. A. Martins, Paulo J. G. Coutinho, Elisabete M. S. Castanheira, 4th Symposium on Medicinal Chemistry, 24 May 2019, Braga (Portugal).

Very high order finite volume scheme for one-dimensional steady-state hyperbolic equations", G. J. Machado, S. Clain, R. Loubère, Congresso de Métodos Numéricos - CMN 2019, 1-3 July 2019, Guimarães, Portugal.

Very high-order accurate finite volume scheme on polygonal meshes for general boundary conditions on curved boundaries", R. Costa, J. M. Nóbrega, S. Clain, G. J. Machado, Congresso de Métodos Numéricos - CMN 2019, 1-3 July 2019, Guimarães, Portugal.

6.2.5. National/International Patents

"Magnetic nanosystem and method to produce the nanosystem", Beatriz D. Cardoso, Daniela S. M. Pereira, A. Rita O. Rodrigues, Paulo J. G. Coutinho, Elisabete M. S. Castanheira, Pedido Provisório de Patente Nacional PPP61328, Portugal, 26 April 2019.

Adaptive Filtering Module", Annemarie Ingrid Holleczek, André Antunes de Carvalho Albuquerque, Alexandre Manuel Ribeiro Correia, Pedro Manuel de Lima Gomes Caldelas, Timo Knecht, Nico Heussner, Eduardo Jorge Nunes-Pereira. Pub. No.: WO/2020/002975; International Application No.: PCT/IB2018/054943; Publication Date: 02.01.2020; International Filing Date: 04.07.2018

Artificial Eye for Calibration of an Eye-Tracker, Eye Tracking Calibration System and Method Thereof", Flávio Pedro Gonçalves Fernandes Ferreira, António Filipe Teixeira Macedo, Isabel Maria Ferreira Marques, Marco António Neves

Sousa, Helder Tiago Correia, Eduardo Jorge Nunes-Pereira, Boris Paul Jean Bret. International Application Number: PCT/IB2018/055345; International Filing Date: 18.07.2018; International Publication Date: 23.01.2020

Terrestrial vehicle range finder device and operation method thereof", Annemarie Holleczek, André Antunes de Carvalho Albuquerque, Eduardo Jorge Nunes-Pereira, Alexandre Correia, Pedro Caldelas, Ângela Rodrigues, Hélder Xavier Pereira Peixoto. International Application Number: PCT/IB2018/055588; International Filing Date: 26.07.2018; International Publication Date: 30.01.2020

6.2.6. Spin Off

SPM Nanosolutions, Lda. - Superparamagnetic Nanotechnological Solutions for Advanced Therapies and Environment – Spin-off Company joining Mag2Clean and NBiON entrepreneurship projects, created in 2019. Team: Ana Rita O. Rodrigues, Beatriz D. Cardoso, Daniela S. M. Pereira, Ricardo J. C. Fernandes, Carlos A. B. Magalhães, supervised by Paulo J. G. Coutinho and Elisabete M. S. Castanheira Coutinho.

6.2.7. Supervision of Research Students

6.2.7.1. PhD projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Catarina Filipa Matoso Abreu	Pedro Alpuim	Biosensors for enhanced in vitro fertilization outcomes	PhD in Health and Medical Studies, Swansea University Medical School
Diogo Lopes	Stéphane Clain, António Ramires (C. Algoritmi)	Cirurgia Numérica: Modelação, Simulação e Visualização em tempo real	PhD in Science (Math)
Hugo Manuel Castro Gonçalves	M. Belsley	Unusual photonic properties of doped nano-structured polymeric fibers	PhD in Physics (MAP-Fis), ECUM
Paulo André Gonçalves	Asger Mortensen; Nuno Peres	Plasmonics and Light-Matter Interactions in Two-dimensional Materials and in Metal Nanostructures	Technical University of Denmark
João Manuel Barros da Cruz Mota Faria	José Luís C. M. Alves (DEM, EEUM), Eduardo J. Nunes Pereira	High Accuracy Positioning of LIDAR Optical System with the Request to Ensure System's Accuracy over Lifetime	PhD AdvaMTech

6.2.7.2. PhD projects in progress in 2019

Author	Supervisor	Title	Host institution/Program
Andreia Marina de Sousa Almeida	Bruno Sarmento (i3S), Marlene Lúcio,S. Schwartz (CIBBIM, Barcelona)	Mucoadhesive camptothecin polymeric micelles as nanodelivery systems for oral chemotherapy to treat colorectal cancer	PhD program in Biomedical Sciences, ICBAS, Univ. Porto
Balaji Sompalle	Pedro Alpuim	Fabrication of a photodetector based on 2D vertical Van der Waals heterostructures	PhD in Physics (MAP-Fis), ECUM
Beatriz Dias Cardoso	Elisabete M. S. Castanheira Coutinho, Vanessa Cardoso, S. Lanceros-Méndez	Microfluidic evaluation of drug-loaded magnetoliposomes as multifunctional platforms for advanced cell therapies	Materials Engineering doctoral program
Bruna Machado da Silva	Bernardo Almeida, João Pedro Araújo (FCUP), Armandina Lopes (IFIMUP)	Naturally Layered Perovskyte Heterostructures	PhD in Physics (MAP-Fis), ECUM
Celso Joel O. Ferreira	Bruno Silva (INL),M. Elisabete C.D. Real Oliveira	Microfluidics for size-controlled cationic liposome-DNA complexes: going beyond the universal transfection curve	PhD in Physics (MAP-Fis), ECUM
César Rui Freitas Bernardo	Michael Belsley, Mikhail Vasilevskiy	Energy transfer dynamics and light-harvesting in Quantum Dots structures	PhD in Physics (MAP-Fis), ECUM
Cláudia Vanessa Dias Reis	Stéphane Clain, Mário Lopes (CERIS-IST), Maria Ana Baptista (ISEL)	Structural Behavior due to Successive Earthquake and Tsunami Actions	PhD in Science and Engineering of Polymers and Composites
Eduarda Barbosa Fernandes	Marlene Lúcio, Vanessa Cardoso and S. Lanceros-Méndez	BIOMYSKIN – Biomimicry profiling supporting drug discovery for topical applications	Materials Engineering doctoral program
Ícaro Jael Mendonça Moura	Ricardo Mendes Ribeiro	Estudo de heteroestruturas de materiais bidimensionais	PhD in Physics (MAP-Fis), ECUM
João Miguel Peixoto Oliveira	Bernardo Almeida, Leonard Francis (INL)	Multiferroic bilayer composites for coupled magnetic-electric-optical functionalization	PhD in Physics (MAP-Fis), ECUM
Patrícia Daniela Cabral da Silva	Pedro Alpuim	Immuno-field-effect transistor platforms based on 2D materials for early detection of biomarkers of ischemic stroke	PhD in Physics (MAP-Fis), ECUM
Ricardo Daniel Pereira da Costa	Stéphane Clain, João Miguel Nóbrega (IPC/i3N)	Innovative Computational Rheology Methods for Advanced Polymer Processing Applications	PhD in Science and Engineering of Polymers and Composites
Sérgio Rafael da Silva Veloso	Elisabete M. S. Castanheira Coutinho, P. M. T. Ferreira, Miguel Correa Duarte (U. Vigo)	Development of multifunctional supramolecular magnetogels for multimodal cancer therapy	PhD in Physics (MAP-Fis), ECUM

Telma Bezerra Soares	Marlene Lúcio,Bruno Sarmento (i3S), Hélder A. Santos (U. Helsinki, Finland)	GraphLightCancer – Graphene Quantum Dots for cancer theranostic	PhD in Molecular and Environmental Biology, ECUM
Vitor Filipe Henriques da Silva	Pedro Alpuim	Radio-frequency graphene technology oscillators for biomedical devices	PhD in Biomedical Engineering, EEUM
Danilo Pedrelli	Danilo Alves (University of Pará, Brazil); Nuno M. R. Peres (CFUM)	Propriedade óticas do grafeno na proximidade de folhas metálicas	PhD in Physics (MAP-Fis), ECUM

6.2.7.3. MSc projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Ana Cláudia da Silva Lopes	Elisabete M. S. Castanheira Coutinho; Lorena Diéguez (INL)	Validation of a microfluidic device for the isolation and enumeration of circulating tumor cells and cancer progression monitoring in metastatic breast cancer	MSc. in Biophysics and Bionanosystems, ECUM
Ana Rita Caldas	Marlene Lúcio; Carla M. Lopes (Univ. Fernando Pessoa)	Desenvolvimento e otimização de uma formulação tópica contendo ómega 3 encapsulado em dispersões coloidais lipídicas	MSc. in Biophysics and Bionanosystems, ECUM
Bruna Machado da Silva	Bernardo Almeida	Nanoestruturas compósitas magnéticas por ablação laser	MSc. in Physics, ECUM
Bruno Silva Correia Alexandre	Nuno Peres	Difração de luz em aberturas metálicas cobertas com materiais 2D	MSc. in Physics, ECUM
Cátia Andreia Vieira Rocha	Paulo J. G. Coutinho; Juan Gallo (INL)	(Para)Magnetic Solid Lipid Nanoparticles for the early detection and treatment of solid tumours	MSc. in Biophysics and Bionanosystems, ECUM
Daniel Portela de Brito	Sascha Sadewasser; Pedro Alpuim	Growth and characterization of Cu(In,Ga)Se2 thin films for solar cells by pulsed hybrid reactive magnetron sputtering	MSc. in Engineering Physics, EEUM/ECUM
Irina Soraia Rainho Rio	Elisabete M. S. Castanheira Coutinho; Paulo J. G. Coutinho	Multifunctional magnetoliposomes containing magnetic/plasmonic nanoparticles for application in dual therapy (photothermal/ chemotherapy)	MSc. in Biophysics and Bionanosystems, ECUM
João Marco Carneiro Ferreira	Paulo J. G. Coutinho; Elisabete M. S. Castanheira Coutinho	Otimização de magnetolipossomas sólidos multifuncionais para aplicação em terapia combinada de hipertermia e quimioterapia	MSc. in Biophysics and Bionanosystems, ECUM
João Tiago Costa Silva	Ricardo Mendes Ribeiro; Nuno Peres	Propriedades eletrónicas e óticas de dicalcogenetos de metais de transição	MSc. in Physics, ECUM
Lucas Morais Baptista	Sascha Sadewasser; Pedro Alpuim	Growth and characterization of Cu(In,Ga)Se2 thin films for solar cells by pulsed hybrid reactive magnetron sputtering	MSc in Engineering Physics, EEUM/ECUM
Luísa Lopes Caldas	Stéphane Clain, Luís Pinto (CMAT)	Deteção de fraudes em telecomunicações através de machine learning	Hired in the society WeDo
Maria João Fernandes Faria	Marlene Lúcio; José das Neves (i3S)	Desenvolvimento e otimização de nanoformulações lipídicas com ação microbicida anti-VIH	MSc. in Biophysics and Bionanosystems, ECUM
Micael Moreira Alves	Elisabete M. S. Castanheira Coutinho;Madalena Lira	Influence of lens care solutions on transmittance and reflectance of contact lenses	MSc. in Advanced Optometry, ECUM

Paulina Suquina	Stéphane Clain	Estudo e construção de árvores de decisão: aplicação ao ensino	MSc. Mathematics and Computation, ECUM
Ricardo Barbosa	Nuno Peres	Propriedades eletromagnéticas de nanoestruturas à base de grafeno	EEUM
Sarah Brito Bogas	Teresa Viseu; José das Neves (i3S)	Desenvolvimento de nanofibras poliméricas microbicidas anti-VIH pela técnica de electrospinning	MSc. in Biophysics and Bionanosystems, ECUM
Sérgio Manuel Rodrigues Caldas	Ricardo Mendes Ribeiro; Alberto Proença (DI/EEUM)	Performance tuning to determine electronic and optical properties of materials	MIEI, EEUM
Sérgio Rafael da Silva Veloso	Elisabete M. S. Castanheira Coutinho; P. M. T. Ferreira (CQUM)	Multifunctional nanogels containing magnetic/plasmonic nanoparticles for therapeutic applications	MSc. in Biophysics and Bionanosystems, ECUM
Telma Campos Domingues	Pedro Alpuim; Paulo Mendes	Understanding DNA-DNA interactions using graphene transistors	MSc in Micro/ Nanotechnologies, EEUM
Tiago Alves Queirós	Mikhail Vasilevskiy; Pedro Alpuim	Optical properties of a Composite Layer of Graphene and Plasmonic particles	MSc in Engineering Physics, EEUM/ECUM

6.3 Functional and smart materials and surfaces for advanced applications

6.3.1 Researchers

Principal investigator	Martin Andritschky
Members	**Effective members of the Centre** Armando José Barros Ferreira Cacilda Maria Lima de Moura Carlos José de Macedo Tavares Clarisse Marta Oliveira Ribeiro Diego Martinez Martinez Francisco José Machado de Macedo Isabel Sofia Melo Pereira Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro José Filipe Vilela Vaz José Pedro Basto da Silva Juliana Cristina Rodrigues Dias Lina Fernanda Ballesteros Giraldo Luís António Carvalho Gachineiro da Cunha Luís Silvino Alves Marques Luís Manuel Fernandes Rebouta Manuel Filipe Pereira da Cunha Martins Costa Maria de Jesus Matos Gomes Mário António Caixeiro de Castro Pereira Marta Maria Duarte Ramos Martin Andritschky Pedro Libânio Abreu Martins Pedro Manuel Abreu Martins Sandra Maria Fernandes Carvalho Sandra Mariana Silva Marques Senen Lanceros-Mendez Serguey Pyrlin Stanislav Lazarov Ferdov Vasco Manuel Pinto Teixeira **Collaborators** Staff members with PhD António Mário Lourenço da Fonseca Almeida Li-Jian Meng Maria Teresa Pitta de Lacerda-Arôso Mário Jorge Dias Zamith Silva Vanessa Fernandes Cardoso Vitor Manuel Gomes Correia

Post-Doctorate Researchers

Augusto Cesar Lima Moreira
Carlos Miguel Silva Costa
Claudia Jesus Ribeiro Lopes
Filipe Daniel Fernandes
Margarida Maria Macedo Francesko Fernandes
Maria José Bastos Pires Lima
Pedro Filipe Ribeiro Costa
Raquel Diana Carneiro Alves

Integrated PhD students

PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students

Tiago André Rodrigues Marinho
Abbas M.k. AL-Rjoub
Ana Catarina Lima
António Castro
Bogdan Postolnyi
Bruna Gonçalves
Catarina Isabel da Silva Oliveira
Diogo Cavaleiro
Diogo Costa
Diogo Ramos
Edgar Carneiro
Estela Marisa oliveira Carvalho
Filipe da Costa Correia
Hugo Salazar
Iran Segundo
Isabel Lopes
Jivago Serrado Gomes Aguiar Nunes
Joana Margarida Fernandes da Silva Ribeiro
João Carlos Barbosa
João Manuel Barros da Cruz Mota Faria
José David Castro
Juliana Filipa Gouveia Marques
Juliana Oliveira
Luísa Fialho
Liliana Fernandes
Manuela Proença
Marco S. Rodrigues
Marta Adriana Félix Forte
Nelson Miguel Macedo da Silva Pereira
Rafaela Marques Meira
Ricardo Jorge Brito Gonçalves Pereira
Salmon Landi
Sérgio Abílio Pereira Gonçalves
Sérgio Rafael da Silva Veloso
Simone Pereira Rodrigues
Sylvie de Oliveira Ribeiro
Teresa Isabel Marques de Almeida

6.3.2 Brief description of the scientific work carried out within the Research Line in 2019

In 2019 the focus of the work was directed to the development of materials, mainly multiple alloy oxides and nitrides and the study of the electrical, magnetic optical and other physical properties of those materials having in mind applications like sensors, actuators, battery elements and other kind of functionalization. One major technique for the material development was thin film deposition by magnetron sputtering and laser ablation. A second, low cost, technique applied was direct inkjet printing. Other techniques mainly tried to functionalize the materials also by nano and micro structuring. Examples of the material development are and their applications are:1. Photocatalytic performance of modified Titania. 2. Au-thin, nanostructured films for plasmonic sensing,3. 0.98[0.6Ba(Zr0.2Ti30.8)O3-0.4(Ba0.7Ca0.3)TiO3]-0.02BiZn1/2Ti1/2O3 ceramic capacitors 4. Transparent Magnetoelectric Materials for Advanced Invisible Electronic Applications 5. Enhanced performance of fluorinated separator membranes for lithium ion batteries through surface micropatterning 5. Surface engineering of nanostructured Ta surface with incorporation of osteoconductive elements by anodization.7.selective absorption of solar radiation for high temperature applications with structures based on nitride/oxynitride or ceramic/metal composites.8.Study and production of functionalized textiles substrates to promote de-pollution of conventional industrial effluents, general liquid media and also soils contaminated with petroleum derivatives.

6.3.3 Future research summary

The future research continues most of the present activities within running projects. Additionally:1.Development of multi –functional materials for sensors and actuators , energy and biomedical applications with focus on piezoelectric and -resistiv, magnetoeletric materials deposited by printing technologies. 2. For sensors and actuators and battery components,3.Plasmonic nanoparticles for bio-detection: Continuation of the growth and study of novel plasmonic structures with applications in biological and medical science 4.The On-Surf project was approved, as well as the socalled GREENCOAT project both in the framework of mobilisation projects involving national companies from different sectors and entities from the SI&I system, comprising a broad consortium around a priority axis of its Internationalization and Innovation agenda -Surface Engineering (SE). It is a cross-cut programme because it seeks to develop and apply surface modification processes that can promote advanced and innovative solutions:(i) in different sectors such as Automotive, Aeronautics, Molds&Tools, Health and Electronics; (ii) that can be aligned with the strategic objectives of the National Clusters: Health Cluster Portugal, ENERGYIN, Engineering &Tooling, Mobinov, Produtech, Tice;(iii) while involving companies positioned throughout the whole value chain, including the surface modifiers, the final solution appliers/end-users.

6.3.4 Publications

6.3.4.1 Regular articles published in ISI/Scopus Journals

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6.3.4.2 Books and book chapters

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6.3.5 Conference Presentations

6.3.5.1 Invited talks delivered at Conferences (International/National)

International

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A Holografia na Optometria e Ciências da Visão, Manuel F. M. Costa, XXII Congresso Internacional de Optometria e Contactologia, Academia das Ciências de Lisboa, 5 e 6 de Abril, 2019

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Electroactive Microenvironments and Advanced Manufacturing for Tissue Engineering" S. Lanceros-Menedz et al, talk at the "Red TerCel 2019 -Cellular Therapy Network meeting on "Tissue Engineering and Additive Manufacturing" at the Instituto de Salud Carlos III, Madrid, Spain. January 2019

Ferroelectric-dielectric structures for energy storage capacitors, J. P. B. Silva, J. M. B. Silva, M. J. S. Oliveira, T. Weingärtner, K. C. Sekhar, M. Pereira, M. J. M. Gomes, Workshop Vácuo 2019, Universidade Nova de Lisboa, 26 February 2019.

Fluoropolymer based smart and multifunctional materials and applications" S. Lanceros.Mendez et al, plenary talk at the "Fluoropolymers: research, production problems, new applications" meeting October 14-17, 2019, Kirov, Russia.

Hybrid multifunctional nanocomposite membranes for environmental remediation. Pedro Martins, S. lanceros-Mendez, "New Materials for Better Life workshop 2019", Bilbao, Spain, november 27, 2019.

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Printeed batteries: state of the aart and futire challenges", S. Lanceros-Mendez et al, the International Conference Mission 10000: Batteries, 10-11/10/2019 at the International Nanotechnology Laboratory, Braga, Portugal.

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Tuning active and multifunctional materials response and integration for advanced applications S. Lanceros-Mendez et al, Seminar at the Boston Precission Diagnostic Center, Univetsity of Boston (Catherine Klapperich), December 2019

Tuning structure and active response in polymer-based magnetoelectric materials S. Lanceros-Mendez, seminar (Prof. Andrey Shukurov) at the Charles University, Faculty of Mathematics and Physics, Prague. Czech Republic. November 2019

6.3.5.2 Contributed talks delivered at Conferences (International/National)

International

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Ag behaviour of thermoplastic polyurethane coated with Ag and Ag-Au clusters incorporated in a:C matrixMATERIAIS 2019 - XIX Congresso da Sociedade Portuguesa de Materiais and X International Symposium on Materials, Lisbon, Portugal, 14 – 17 April 2019. "", I. Carvalho, M. Henriques, S. Calderon A. Cavaleiro, S. Carvalho.

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6.3.6 National/international Patents

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6.3.7 SPIN-OFFS, START-UPS

6.3.8 Supervision of Research Students

6.3.8.1 PhD projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Juliana Oliveira	Senentxu Lanceros-Mendez and José Gerardo da Rocha	Radiation detectors based on printing technologies	Materials Engineering doctoral program
Simone Pereira Rodrigues	A. Cavaleiro (University of Coimbra/CEMMPRE) and S. Carvalho (University of Minho/CF-UM-UP)	Development of hybrid surface treatments for controlling wettability and improving tribological performance	University of Coimbra (Portugal)
Abbas M.k. AL-Rjoub	Luis Rebouta	fabrication, characterization and aging studies of selective solar selective absorber surfaces	PhD in Physics (MAP-Fis), ECUM

6.3.8.2 PhD projects in progresso in 2019

Author	Supervisor	Title	Host institution/Program
Hugo Salazar	S.Ferdov, S. Lanceros Mendez	New generation of polymer composite membranes for water purification	Materials Engineering doctoral program
Salmon Landi	Joaquim Carneiro, Pier Parpot	Tratamento de efluentes industriais através de processos fotocatalíticos com dióxido de titânio	PhD in Science (Physics)
Iran Segundo	Elisabete Freitas, Joaquim Carneiro	Superfícies de pavimentos rodiviários ecológicas, fotocatalíticas, hidrofóbicas e autolimpantes	Materials Engineering doctoral program
Filipe da Costa Correia (Programa Doutoral de Engª de Materiais - UMinho)	Carlos Tavares (UMinho) e Adélio Mendes (UPorto)	Desenvolvimento de filmes finos heteroestruturados de ZnO com propriedades termoelétricas, para aplicação em células solares	Materials Engineering doctoral program
Juliana Filipa Gouveia Marques (Programa Doutoral	Carlos Tavares	Difusão controlada de compostos ativos do interior de microcápsulas mediada por ativação solar	Materials Engineering doctoral program

de Engª de Materiais - UMinho)			
Marta Adriana Félix Forte	Carlos Tavares (UMinho) e Rui Silva (UAveiro)	Encapsulation of phytonutrients in polymeric microcapsules coated with photocatalytic nano materials	PhD AdvaMTech
Catarina Isabel da Silva Oliveira	Luís Cunha, Diego Martinez-Martinez e Jeff de Hosson	Deposition and characterization of sputtered Zr-O-N based films for fine tuning of their physical properties	Mate Materials Engineering doctoral program rials Engineering doctoral program
Marco S. Rodrigues	Filipe Vaz Joel Borges	Nano-designed LSPR thin films using GLAD in reactive magnetron sputtering for optical sensing.	PhD in Physics (MAP-Fis), ECUM
Diogo Costa	Filipe Vaz Paula Sampaio (CBMA)Graça Minas (DEI)	Development of optical (T-LSPR) biosensors, based in nanoplasmonic thin films, for fast Legionella pneumophila detection in patients or environmental samples	PhD in Physics (MAP-Fis), ECUM
Manuela Proença	Filipe Vaz Joel Borges	Nanoplasmonic thin films of (Au-Ag/MOx) functionalized with molecular recognition elements to enhance sensitivity and selectivity of LSPR gas sensors.	PhD in Physics (MAP-Fis), ECUM
Liliana Fernandes	P. Martins S. Lanceros-Méndez D.M. Correia	Magnetic ionic liquid/polymer composites for printable sensors and actuators	Materials Engineering doctoral program
Rafaela Marques Meira	C. Ribeiro S. Lanceros-Méndez D.M. Correia	Electroactive polymer materials based heart-on-a-chip as a novel approach for cardiac tissue engineering	Materials Engineering doctoral program
Tiago André Rodrigues Marinho	Senentxu Lanceros-Mendez Pedro Costa Vitor Correia	Printable energy harvester systems for wearable sensors devices	Materials Engineering doctoral program
Sérgio Abílio Pereira Gonçalves	Pedro Sérgio Oliveira Branco, Senentxu Lanceros-Méndez, José Gerardo Vieira Rocha	New generation of interactive platforms based on novel printed smart materials	Materials Engineering doctoral program
Teresa Isabel Marques de Almeida	Clarisse Ribeiro, Senentxu Lanceros-Mendez, Hugo Fernandes	Biodegradable electroactive polymer materials as a novel approach for neural tissue engineering applications	Materials Engineering doctoral program
Estela Marisa oliveira Carvalho	Margarida Fernandes, Clarisse Ribeiro, Senentxu Lanceros-Mendez	Improving Titanium-Bone interfaces with electroactive and antimicrobial materials for effective orthopedic implants	Materials Engineering doctoral program
Ana Catarina Lima	Pedro Martins, Senen L. Méndez	"New inks for printed electronic components and sensing devices: integration into a fully printed magnetic sensor"	Materials Engineering doctoral program
Ricardo Jorge Brito Gonçalves Pereira	V. F. Cardoso, S. Lanceros-Mendez	A new generation of microfluidic platforms based on smart and multifunctional materials	Materials Engineering doctoral program
João Carlos Barbosa	Senen L. Méndez, Carlos M. Costa, Veronica Bermudez	Development of three component solid-polymer electrolytes for energy storage applications	Materials Engineering doctoral program

Edgar Carneiro	S. Carvalho	REACH Regulation: Alternative coatings to hexavalent chromium	Materials Engineering doctoral program
Luísa Fialho	S. Carvalho	Design of new biocompatible osseointegrated and antimicrobial dental implant	Materials Engineering doctoral program
Diogo Cavaleiro	S. Carvalho	The importance of Ag content for optimizing the machining performance of Ti-Si-(Ag)-N coatings	Materials Engineering doctoral program
Diogo Ramos	S. Carvalho	Development of new coatings for dental implants	Materials Engineering doctoral program
José David Castro	S. Carvalho	Development of new coatings with antifouling properties	Materials Engineering doctoral program
Veniero Lenzi	Luís Marques	Simulation of rheological and adhesive properties of isocyanate-based polymeric materials.	PhD in Sciences (Physics)
António Castro	Luís Marques UM), Sebastian Velasco (INL)	Study of the oxidation mechanisms of bimetallic Nanoparticles.	Materials Engineering doctoral program
Isabel Lopes	Co - Luís Manuel Fernandes Rebouta	Optical and tribological properties of femtosecond laser nanotextured surfaces	PhD AdvaMTech
Jivago Serrado Gomes Aguiar Nunes; Engenharia de Materiais	S. LancerosMendez	Polymer based sensors fabricated by printing technologies	Materials Engineering doctoral program
Nelson Miguel Macedo da Silva Pereira	José Rocha, Laneros Mendez (UM)	Development of a Magnetic Levitation System and Control, Applied to Sliding Windows	Materials Engineering doctoral program
Bogdan Postolnyi	Co - Luís Manuel Fernandes Rebouta	Multilayer CrN/MoN Protective Coatings with Enhanced Hardness and Toughness	Materials Engineering doctoral program
Bruna Gonçalves Programa Doutoral em Engenharia de Materiais	Senentxu LancerosMéndez (UM); Yury Kolen'ko (INL) e Gabriela Botelho (UM)	Printable photovoltaic systems based on Cu(In,Ga)Se2 chalcopyrite	Materials Engineering doctoral program
Sylvie de Oliveira Ribeiro Programa doutoral em engenharia de materiais	Senentxu L. Mendez (UM), Andreia Gomes (UM), Carlos Baleizão (Instituto Superior Técnico)	Tailoring electroactive polymer nanocomposites for novel muscle tissue engineering applications	Materials Engineering doctoral program
Joana Margarida Fernandes da Silva Ribeiro	Carlos Tavares (UMinho) e Torben Boll (Karlsruhe Institute of technology, Alemanha)	Transparent thermoelectric titanium dioxide-based thin films for thermal energy harvesting	Materials Engineering doctoral program

6.3.8.3 MSc projects completed in 2019

Author	Supervisor	Title	Host institution/Program
Jaffer Bressan Borinelli	Elisabete Freitas, Joaquim Carneiro	Desenvolvimento de revestimento antigelo, fotocatalítico e autolimpante para pavimentos flexíveis com o uso de nano e micromateriais	EEUM
Jaffer Bressan Borinelli	Elisabete Freitas, Joaquim Carneiro	Desenvolvimento de revestimento antigelo, fotocatalítico e autolimpante para pavimentos flexíveis com o uso de nano e micromateriais	EEUM
Luís Brioso Dias	Carlos Tavares	Estudo de filmes de Bi2O3 para aplicações fotocatalíticas	Mestrado em Engenharia de Materiais
Ana Isabel Oliveira	Carlos Tavares (UMinho) e Nuno Filipe Sá Dantas Meireles Barros (Leica)	Desenvolvimento e definição da metodologia de aferição dos equipamentos opto-mecânicos do telémetro M	Mestrado em Engenharia de Materiais
André Gustavo Silva de Macedo	Maria Gabriela Botelho, Vanessa Fernandes Cardoso	Desenvolvimento de esferas submicrométricas de base polimérica para aplicações biomédicas	ECUM
João Serra	Maria Manuela Silva (CQUM) and Daniela Correia (CFUM)	Avaliação de polímeros fluorinados para o desenvolvimento de separadores de baterias de ião-lítio	ECUM
Rita Magalhães Policia	Pedro Libânio Martins, Pedro Costa	Desenvolvimento de materiais magneto-eletroativos de base polimérica para aplicações avançadas	EEUM
Bruno Alexandre Alves Santos	Pedro Manuel Abreu Martins	Materiais Energeticamente Eficientes para Aplicação em Sistemas de Fotocatálise para Remoção de Poluentes	Completed
Rafael Pinto	Carlos Costa, Manuela Silva	Development of Printed Batterues	Completed
Nuno Elmano Lima	Luís Marques	Comparação de métodos computacionais para estimar a energia livre de Gibbs em reacções bioquímicas	Master in Biophysics BioNanoSystems

7 Appendices

7.1 Externally funded projects at CFUM ("*Projetos Individuais*"), ongoing in 2019

Title	Researcher	Funding entity	Start date	End date	Global Budget - UM
SAM - Otimização do desempenho térmico da moldação por injeção	Filipe Vaz	ANI	01-10-2016	31-12-2019	157 062,56 €
WinPSC - Novos avanços tecnológicos para a terceira geração de células solares sensibilizadas com perovskita	Carlos Tavares	ANI	01-01-2017	30-06-2020	193 150,03 €
ReleaseME - Micro ou nanocápsulas com propriedades fotocatalíticas para libertação controlada de agentes difusores e respetivo método de obtenção	Carlos Tavares	ANI	01-10-2016	30-09-2019	55 859,37 €
DermoID - Interhiegine	Carlos Tavares	ANI	01-12-2016	30-11-2019	61 163,77 €
GNESIS - Graphenest's New Engineered System and its Implementation Solutions	Nuno Peres	ANI	01/08/2018	27/07/2020	413 325,89 €
On-Surf .: Mobilizar competências tecnológicas em Engenharia de Superfcies	Sandra Carvalho/Filipe Vaz	ANI	01-10-2018	30-09-2021	478 235,35 €
TEXSTRA - TEXTILE STRATEGY FOR INNOVATIVE HIGHER EDUCATION	Sandra Carvalho	CE	01-09-2017	29-02-2020	26 225,00 €
	Nuno Peres	CE	01/04/2018	31/03/2020	250 129,78 €

SUPROCOAT - Super Protective Coatings (SUPROCOAT): MAX/Lubricant nanocomposite coatings deposited at low temperature by magnetron sputtering	Diego Martinez	FCT	01-01-2015	30-06-2019	50 000,00 €
"EyElectro - OPTICAL CUSTOMIZATION OF ELECTRIPHYSIOLOGICAL RETINAL ACTIVITY IN HUMANS	José Manuel Meijome	FCT	01-06-2016	30-11-2019	185 546,00 €
LA2D - Large area two dimensional heterostructures for photodetectors	Ricardo Ribeiro	FCT	01-07-2016	31-12-2019	58 380,00 €
ABSOLAR - Solar selective absorber for high temperature applications	Luís Rebouta	FCT	01-07-2016	31-12-2019	83 748,00 €
ClusterStent - Bimetallic clusters for controlled antimicrobial activity on stents	Sandra Carvalho	FCT	01-07-2016	31-01-2020	100 895,00 €
"NANOSENSING -Semiconductor nanocomposite thin films composed of noble metal nanoparticles dispersed in reactive metal-oxide matrixes for LSPR gas sensing applications"	Filipe Vaz	FCT	01-07-2016	31-12-2019	85 584,00 €
NANOCONCOR - New nanocontainers with extended functionality based on layered double hydroxides for application in corrosion protection	Luís Vieira	FCT	01-05-2016	31-07-2019	20 400,00 €

PrintPV - Large-scale printing of novel photovoltaics based on Cu (In, Ga) Se2 chalcoprite	Senen Lanceros Mendez	FCT	01-06-2016	31-12-2019	78 528,00 €
ALD4MAX - Atomic Layer Deposition For tailored bottom-top growth of MAX and MXene films	Diego Martinez	FCT	01-09-2017	31-08-2020	105 000,00 €
ATRITO-0: A sinergia entre texturização e revestimentos auto-lubrificantes para contactos mecânicos energeticamente mais eficientes e mais amigos do ambiente	Sandra Carvalho	FCT	01/06/2018	31/05/2021	75 206,25 €
DEMON - Defect Engineering in rare-earth nickelate thin films towards active magnetic and optical metamaterials	Bernardo Almeida	FCT	01/07/2018	30/06/2021	46 012,50 €
TO CHAIR: The Optimal Challenges in Irrigation	Sofia Lopes	FCT	01/06/2018	31/05/2021	168 785,31 €
GRAPHSENS .:Mid- and far-infrared plasmonic biosensing with graphene	Nuno Peres	FCT	01/07/2018	30/06/2021	78 211,01 €
NLINOP2DMAT: Non Linear Optical Properties of Layered Materials	Nuno Peres	FCT	15/07/2018	14/07/2021	27 000,62 €
MAGLIDUO - MAGnetoLIposomes for DUal cancer therapy	Paulo Coutinho	FCT	01/07/2018	30/06/2021	158 483,17 €

HEALTHYDENT - Design of new antimicrobial osseointegrated dental implants	Sandra Carvalho	FCT	26/07/2018	25/07/2021	193 420,63 €
NANOXYPACK - Nano-sized oxygen scavenger for new active food packaging	Sebastian Calderon	FCT	01/07/2018	30/06/2021	195 008,16 €
"LensUM - In vivo biometric and optical changes of the crystalline lens with accommodation and its impact in subjective retina image quality"	Sandra Franco	FCT	01/07/2018	30/06/2021	184 658,12 €
MusclEng: Development of advanced strategies and solutions for muscle tissue engineering based on electromechanical microenvironments	Clarisse Ribeiro	FCT	01/07/2018	30/06/2021	220 458,12 €
CONCERT –Silk-coated honeycomb nanocarriers for cancer therapy	Marlene Lúcio	FCT	01/07/2018	30/06/2021	238 120,65 €
ODe2D - Towards high speed optical devices by exploiting the unique electronic properties of engineered 2D materials	Michael Scott Belsley	FCT	01/07/2018	30/06/2021	234 301,87 €
PORTGRAPHE: Control of Port and Douro Wines authenticity using graphene DNA sensors	Bernardo Almeida	FCT	10/08/2018	09/08/2021	55 543,45 €
DNANO4BIO - Development of a nanoplasmonic sensing system for detection of mycotoxins in wine	Filipe Vaz	FCT	01/07/2018	30/06/2021	117 558,20 €
PORTGRAPHE: Control of Port and Douro Wines authenticity using graphene DNA sensors	João Pedro Alpuim	FCT	15/06/2018	14/06/2021	43 712,50 €

ON4SupremeSens: Optical Nanorulers for Super Resolution Microscopy & Sensing	João Pedro Alpuim	FCT	01/06/2018	31/05/2021	31 737,50 €
MicroTreat - Biomimetic microenvironment for the study and development of targeted therapies in hematological malignancies	Vanessa Cardoso	FCT	01/07/2018	30/06/2021	218 603,00 €
E-print .: Advanced Green Printed Batteries for Portable Devices	Carlos Costa	FCT	01/10/2017	30/09/2021	210 158,12 €
Controllub - Self-lubricant coatings for high temperature application with controlled release of the lubricious agent.	Luís Silvino	FCT	01/11/2018	30/06/2020	35 000,00 €
SATRAP .: Rational design of Self-Assembling networks for TRansparent electrode Applications	Marta Ramos/Luis Silvino	FCT	01/10/2017	30/09/2021	164 707,40 €
2DMS - Two dimensional magnetic semiconductors	Bernardo Almeida	FCT	01/09/2018	30/04/2020	24 076,00 €
BORN - Unconventional Thermoelectrics Based on Self-Organized Binary Nanocrystal Superlatices	Marta Ramos/Luis Silvino	FCT	01/11/2018	30/04/2020	48 923,00 €
SURFPROTEC - Programa de Doutoramento Nacional em Engenharia e Proteção de Superfícies	Sandra Carvalho	Norte 2020	01-09-2015	31-08-2019	317 250,00 €
GREENCoat - Green Vacuum Coatings – Metalização Ecológica de Plásticos	Sandra Carvalho	ANI	01-09-2019	31-08-2022	319 819,46 €
Science DiabetICC Footwear - Desenvolvimento de calçado terapêutico inovador para pé diabético	Sandra Carvalho	ANI	20/08/2019	30/09/2021	430 948,51

7.2 CFUM Research Fellows in 2019

Name	Tipe	Beginning	End
Andrey Postnikov	Invited Researcher	14/07/2019	14/08/2019

Name	Tipe	Supervisor	Beginning	End
Vítor Alexandre Abreu Pacheco	BGCT	Mikhail Vasilevskiy	01-01-2019	31-12-2019
César Rui Freitas Bernardo	BI	Michael Scott Belsley	01-10-2019	31-12-2019
Rute Juliana Ferreira Macedo Araújo	BI	José Manuel González Meijome	01-10-2019	31-12-2019
Diana Isabela Faria Meira	BI	José Filipe Vilela Vaz	22-07-2019	31-12-2019
Irina Soraia Rainho Rio	BI	Paulo José Gomes Coutinho	10-07-2019	31-12-2019
Dora Nazaré Marques	BI	João Manuel Maciel Linhares	15-07-2019	31-12-2019
Ana Filipa Antunes Lage	BI	Luís Manuel Fernandes Rebouta	01-10-2019	31-12-2019

7.3 Key Words by Research Line

7.3.1 Assessment and enhancing visual performance

Binocular vision	Color science	Ocular accommodation
Color science	Computational models	Ocular disease
Epidemiology	Contact lenses	Ocular surface
Visual assessement	Dry eye	Ophthalmic instrumentation
Ocular accommodation	Electrophysiology	Optical modelization
Ocular growth	Epidemiology	Optics
Ocular surface	Glare	Perception
Optics	Hyperspectral imaging	Presbyopia
Perception	Image quality metrics	Refractive surgery
Visual electrophysiology Visual enhancement	Intraocular lenses	Rehabilitation
Visual optics	Irregular cornea	Retina
Visual rehabilitation	Keratoconus	Stereoscopic vision
Aberrometry	Low vision	Tear film
Accommodative disorders	Microbial contamination	Vision performance
Adaptive optics	Myopia	Visual ergonomics
Augmented reality	Myopia control	Visual optics
Binocular vision	Myopia progression	Visual optimization
		Visual therapy

7.3.2 Physics of quantum materials and bionanostructures

Electronic structure,	FRET (Forster Resonance Energy Transfer)	Photocatalysis
(Bio)Sensors	Graphene	Plasmonic nanostructures
2D materials	Lipid (bi)layer	Quantum dot
Anti-tumour drugs	Luminescence	Quantum materials
Biomolecules	Magnetic nanoparticles	Quantum nanostructures
Bionanoconjugates	Mathematical Physics	Raman and Infrared Spectroscopy
charge carrier dynamics,	Nanocarriers	Solar Cells
Density Functional Theory (DFT)	Nanomedicine	Sol-gel
Drug delivery	Nonlinear optical materials	Surface Enhanced Raman Spectroscopy
Energy transfer / FRET	Optimal Control Theory	Surface plasmon resonance
Exciton	Partial differential equations	Thin films
Finite elements	Phase transitions	Transport properties,
Fluorescent probes	Phonon	Ultrafast Spectroscopy
Piezoelectric	pyroelectric properties	

7.3.3 Functional and smart materials and surfaces for advanced applications

Actuator	HWCVD - Hot wire chemical vapour deposition	Photoluminescense, fluorescence
Biomaterials	Hybrid material	Piezoelectric
Biosensor	Laser ablation	PLD - Pulsed laser deposition
Coating	Magnetoelectrics and magnetic properties	Printed, printing
Coating - antibacterial	Membrane	PVD - physical vapour deposition
Coating - medical device	Microporous	Sensor
Crystal growth	Modelling, materials modelling	Smart material
Crystallography	Nanomaterial, nanocluster, nanoparticle	Smart polymer
Decorative coating	Nanoporous	Solar cell
Density functional theory	Nitride	Sputtering
Detector	Non-linear optics	Surface topography, tribolofy, wettability
Electrical, thermal, mechanical properties	Optical properties	Synthesis
Energy harvesting	Oxide	Thin film, thin layer
Ferroelectric	Photocatalysis, catalysis	