# 1. Identificação do projeto

1. Project description –

## Domínio Científico

Scientific Domain

Ciências Exactas e da Engenharia

## Área científica principal

Main Area

Ciência e Engenharia de Materiais

## Área científica Secundária

Secondary area

Nanomateriais e Dispositivos

## Acrónimo

Acronym

Texto aqui

## Título do projeto (em português)

Project title (in portuguese)

Texto aqui

## Título do projeto (em inglês)

Project title (in english)

Texto aqui

## Financiamento solicitado

Requested funding

Texto aqui (só o valor total)

## Palavra-chave 1 Keyword 1

Texto aqui

## Palavra-chave 2 Keyword 2

Texto aqui

## Palavra-chave 3 Keyword 3

Texto aqui

## Palavra-chave 4 Keyword 4

Texto aqui

## Data de início do projeto

Starting date

10-10-2015

## Duração do projeto em meses

Duration in months

18

# 2. Instituições envolvidas

2. Institutions and their roles –

## Instituição Proponente

Principal Contractor

Instituto de Engenharia de Sistemas e Computadores – Microsistemas e Nanotecnologias (INESC MN)

## Descrição da Instituição

INESC Microsisteemas e Nanotecnologias (INESC MN) is a private, non-profit Research and Development institute created in January, 2002 from the former Solid State Technology group of INESC. INESC MN operates a Class 100/10 cleanroom with optical and e-beam lithography allowing nanoscale device fabrication.

INESC MN is dedicated to:

-leading edge research and development in strategic technological areas of micro- and nanotechnologies and the application of these technologies to electronic, biological and devices;

-advanced training of young and engineers at the university, post-graduate and post-doctoral levels in micro- and nanotechnologies;

-transfer of technology to both Portuguese and international industries through collaborative research, contract research, prototyping and consulting.

Research areas:

-Magnetics

-Thin Film MEMS

-Biosensor and Biomedical Applications

-Organic Electronics

-Simulation of Materials

## Instituição Participante

Participating Institution

There are no Participating Institutions

## Descrição da Instituição

Participating Institution Description

## Unidade de Investigação

Research Unit

Instituto de Engenharia de Sistemas e Computadores – Microsistemas e Nanotecnologias (INESC MN)

## Unidade de Investigação Adicional

Additional Research Unit

There are no additional research units

## Instituição de Acolhimento

Host Institution

Instituto de Engenharia de Sistemas e Computadores – Microsistemas e Nanotecnologias (INESC MN)

# 3. Componente Científica

3. Scientific Component –

## 3.1. Sumário (5000 caracteres) 3.1 Abstract

## 3.1.a Em português 3.1.a In Portuguese

Texto aqui

## 3.1.b Em ingles 3.1.b In English

Texto aqui

## 3.2. Descrição Técnica 3.2 Technical Description

### 3.2.1. Revisão da Literatura (6000 caracteres)

3.2.1. Literature Review

Texto aqui

## 3.2.2. Plano e Métodos (10000 caracteres) 3.2.2. Plan and Methods

As it was already mentioned before, the nowadays touch screens are made by using ITO (indium-tin oxide). However, it is predictable that this material will run out within 15 years, that will cause the rise of the price of the material and so we need to find an alternative. It was already proposed the usage of Silver nanowires (AgNWs) and it was proved that this could be a good alternative to ITO. However, there are some problems that appear when using AgNWs that are related to the electron transport between each one of the nanowires, so this means that an impedance greater than the one that is desired. This could be solved by using a greater density of AgNws, but then the solution wouldn’t become viable, economically speaking. The impedance can be minimized by combining the nanowires with other nanostructures.

What we propose is to combine the AgNWs with graphene, due to its mechanical and electrical properties. So, with this proposal we want to develop a sustainable alternative to ITO, improve the touch screen’s impedance and transmission, reduce the cost of fabrication of this type of screens and also enlarge the utilization spectra of the touch screen, since that the ITO is a brittle material so it is only used on flat surfaces. Given the properties of graphene we believe that will be possible to enlarge the utilization spectra of touch screens also to curve surfaces.

To make this objective possible we divided our work on three main tasks:

-Theoretical study and structure modulation (main task 1)

-Manufacture (main task 2)

-Characterization (main task 3)

In the first main task we seek to develop a theoretical model to describe our structure so that we can then compare the results that we will actually obtain, after the characterization, with our theoretical model. The task leader will be António Balula.

In the second main task we will proceed to the structure manufacture using spray coating to deposit the AgNWs (since this method allows the control of a variety of parameters such as pressure and temperature) and we will use the INESC-MN’s machine of graphene deposition to create the hybrid AgNWs/graphene. The task leader will be Luís Macedo.

Spray coating is a technique that uses an arc that is formed between two electrodes in a plasma forming gas. The plasma is heated by the arc and so it will expand and is accelerated through a nozzle.

In the third main task we will then characterize our structure in terms of electrical, optical and structural properties. Also we collect this data we will compare it to the theoretical model concerning main task 1. The task leader will be Pedro Ribeiro.

When we talk about characterization there are a lot of measurements that are needed. In this work we will measure the following quantities:

-Electrical quantities

-Impedance and reactance of the material

-Response in frequency

-Determination of the electrical limits for which the material has de wanted behavior

-Optical Quantities

-Transmission coefficient for visible light

-Study of the electrical response of the material varying the wavelength of incident light

-Structure of the material

-Measurement of the optical and electrical response by applying torsion on the structure

-Structural integrity of the material

-Data analysis

-Fit of the experimental results with the theoretical model

This project has an ambitious goal but our goal is also a need since it is predictable that we will run out of ITO within 15 years, so we are confident that our AgNWs/graphene hybrid will be a reliable option to this material. Also, if our expected results are confirmed it will have an impact not only scientifically but also economically, since the touch screens will be less expensive to produce.

The partner involved in this project is INESC-MN that has a strong background on deposition and characterization of structures so it is a very good partner to this project, not only because of the knowledge but also because of the infrastructures. The principal investigator of this project will be Susana Freitas witch has extended experience on the fabrication and optimization of structural devices.

## 3.2.3. Tarefas

## 3.2.3. Tasks

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ordem | Designação da tarefa | Data de início | Data de fim | Duração | Pessoas \* mês |
| Order | Task denomination | Start date | End date | Duration | Person \* months |
| 1 | Kick-off meeting | 10-10-2015 | 10-10-2015 | 0 | 0 |

## Descrição da tarefa e Resultados Esperados (4000 caracteres) Task description and Expected results

Official start of the project. This meeting will have an introductory character and will serve the purpose of discussing dates issues.

## Membros da equipa de investigação nesta tarefa Members of the research team in this task

Susana Isabel Pinheiro Cardoso de Freitas; Luís Filipe Guedelha Macedo; Pedro Manuel Quintela Ribeiro; António Samuel Ávila Balula; Isolinda Marta Fonseca Marques; Pancráceo José Adelino Silva; Fracesca Toblerone Malakova; Bolseiro de Investigação.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ordem | Designação da tarefa | Data de início | Data de fim | Duração | Pessoas \* mês |
| Order | Task denomination | Start date | End date | Duration | Person \* months |
| 2 | Simulation- Stage 1 | 18-10-2015 | 18-12-2015 | 3 | 7 |

## Descrição da tarefa e Resultados Esperados (4000 carcateres) Task description and Expected results

Texto aqui

## Membros da equipa de investigação nesta tarefa Members of the research team in this task

António Samuel Ávila Balula; Isolinda Marta Fonseca Marques; Pancráceo José Adelino Silva

….

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ordem | Designação da tarefa | Data de início | Data de fim | Duração | Pessoas \* mês |
| Order | Task denomination | Start date | End date | Duration | Person \* months |
| 3 | Manufacturing-Stage 1 | 1-01-2016 | 31-08-2016 | 8 | 12.5 |

## Descrição da tarefa e Resultados Esperados (4000 carcateres) Task description and Expected results

This task involves using spray coating to deposit the Silver nanowires on the substrate. After this deposition is complete we will proceed to the graphene deposition using the Langmuir-Schaefer method.

## Membros da equipa de investigação nesta tarefa Members of the research team in this task

Luís Filipe Guedelha Macedo, Francesca Toblerone Malakova, Susana Isabel Pinheiro Cardoso de Freitas, Bolseiro de Iniciação Científica

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Ordem | Designação da tarefa | Data de início | Data de fim | Duração | Pessoas \* mês |
| Order | Task denomination | Start date | End date | Duration | Person \* months |
| 6 | Manufacturing- Stage 2 | 1-09-2016 | 31-01-2017 | 5 | 8.2 |

## Descrição da tarefa e Resultados Esperados (4000 carcateres) Task description and Expected results

This task will be very similar to task number 2, with the exception that the deposition parameters used will take into account the results of the first stage of characterization and simulation. The same techniques will be used but with different parameters.

## Membros da equipa de investigação nesta tarefa Members of the research team in this task

Luís Filipe Guedelha Macedo, Francesca Toblerone Malakova, Susana Isabel Pinheiro Cardoso de Freitas, Bolseiro de Inciciação Científica

(repetir tantas vezes quanto necessario

## 3.2.4. Calendarização e Gestão do Projeto 3.2.4. Project Timeline and Management

## 3.2.4.a Descrição da Estrutura de Gestão (3000 caracteres) 3.2.4.a Description of the Management Structure

Texto aqui

## 3.2.4.b Lista de Milestones 3.2.4.b Milestone List

|  |  |
| --- | --- |
| **Data** | **Designação da milestone** |
| **Date** | **Milestone denomination** |
| 31-03-2016 | Fabrication process optimized |

## Descrição Description

The research and optimization of the fabrication process is ready.

|  |  |
| --- | --- |
| **Data** | **Designação da milestone** |
| **Date** | **Milestone denomination** |
| 31-07-2016 | Structures ready for characterization |

## Descrição Description

The desired structures are manufactured and are ready for the characterization process.

|  |  |
| --- | --- |
| **Data** | **Designação da milestone** |
| **Date** | **Milestone denomination** |
| 1-09-2016 | Paper on manufacturing process |

## Descrição Description

One paper relative to the first stage of the manufacturing process is complete.

|  |  |
| --- | --- |
| **Data** | **Designação da milestone** |
| **Date** | **Milestone denomination** |
| 31-11-2016 | Second stage of manufactured structures ready for characterization |

## Descrição Description

The new manufactured structures, with different characteristics from the first ones, are ready for the characterization process.

|  |  |
| --- | --- |
| **Data** | **Designação da milestone** |
| **Date** | **Milestone denomination** |
| 31-01-2017 | Second stage of manufactured structures ready for characterization |

## Descrição Description

The paper relative to the second stage of manufacture is complete.

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(repetir tantas vezes quanto necessario

## 3.2.4.c Cronograma 3.2.4.c Timeline

Ficheiro com a designação "timeline.pdf", no 9. Ficheiros Anexos, desta Visão Global (caso exista).

File with the name "timeline.pdf" at 9. Attachments (if exists).

Para o trabalho é suficiente que adicionem o cronograma em anexo juntamente com todas as figuras que considerarem relevantes

## 3.3. Referências Bibliográficas 3.3. Bibliographic References

|  |  |  |
| --- | --- | --- |
| **Referência** | **Ano** | **Publicação** |
| **Reference** | **Year** | **Publication** |
| R1 | 2002 | Granqvist,C.G.,Hultaker,A. “Transparent and conducting ITO films: new developments and applications.”, Thin Solid Films,2002,pp.411:1-5 |
| R2 | 2013 | Miller,M.S., et al. “Silver nanowire/optical adhesive coatings as transparent electrodes for flexible electronics.“ *ACS Appl. Mater. Interfaces.* 2013, pp. 5:10165-10172. |
| R3 | 2010 | Yugang,S. “Silver nanowires - unique templates for functional nanostructures.” *Nanoscale.* 2010, pp. 2:1626-1642. |
| R4 | 2012 | van de Goep, J. et al. “Transparent conducting silver nanowire networks.” 2012, pp. 12:3138-3144. |
| R5 | 2014 | Wolf, E.L., “*Applications of Graphene.”* s.l. : Springer, 2014. 978-3-319-03945-9 |
| R6 | 2008 | Xuan, W., Linjie, Z., Mullen, K., Transparent, conductive graphene electrodes for dye-sensitized solar cells.” *Nano Letters.* 2008, pp. 8:323-327. |
| R7 | 2008 | Bunch, J.,” *Mechanical and Electrical Properties of Graphene Sheets.”* s.l. : Cornell University, 2008. |
| R8 | 2014 | Jurewicz, Izabela, et al. "Insulator‐Conductor Type Transitions in Graphene‐Modified Silver Nanowire Networks: A Route to Inexpensive Transparent Conductors." *Advanced Functional Materials* 24.48 (2014): 7580-7587. |
| R9 | 2013 | Seo, Tae Hoon, et al. "Graphene-silver nanowire hybrid structure as a transparent and current spreading electrode in ultraviolet light emitting diodes."*Applied Physics Letters* 103.5 (2013): 051105. |
| 10 | 2012 | Bergin, Stephen M., et al. "The effect of nanowire length and diameter on the properties of transparent, conducting nanowire films." *Nanoscale* 4.6 (2012): 1996-2004. |
| 11 | 2012 | Shanmugharaj, A. M., and Sung Hun Ryu. "Excellent electrochemical performance of graphene-silver nanoparticle hybrids prepared using a microwave spark assistance process." *Electrochimica Acta* 74 (2012): 207-214. |
| 12 | 2013 | Liu, Bo-Tau, and Han-Lin Kuo. "Graphene/silver nanowire sandwich structures for transparent conductive films." *Carbon* 63 (2013): 390-396. |
| 13 | 2011 | Lee, Shie-Heng, et al. "Highly transparent and conductive thin films fabricated with nano-silver/double-walled carbon nanotube composites." *Journal of colloid and interface science* 364.1 (2011): 1-9. |

## 3.4. Publicações Anteriores 3.4. Past Publications

|  |  |  |
| --- | --- | --- |
| **Referência** | **Ano** | **Publicação** |
| **Reference** | **Year** | **Publication** |
| 1 | 2010 | “ATCA Advanced Control and Data acquisition systems for fusion experiments”, B. Gonçalves, J. Sousa, A. Batista, R. Pereira, M. Correia, A. Neto, B. Carvalho, H. Fernandes, C.A.F. Varandas, Transactions on Nuclear Science, Vol. 57, No. 4, (August 2010), pp2147- 2154 |
| Maximo 5 |  | Provavelement não se aplica aos vossos projectos a menos que tenham feito algum trabalho anterior |
|  |  |  |
|  |  |  |
|  |  |  |

## 3.5. Ressubmissão de projectos 3.5. Project Resubmission

## Ressubmissão? Resubmission?

NÃO (a menos que já tenham submetido um projecto à FCT)

## 4. Equipa de investigação 4. Research team –

## 4.1 Lista de membros 4.1. Members list

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Nome** | **Função** | **Grau** | **%** | **CV nuclear** | **CV** |
| **Name** | **Role** | **Degree** | **%** | **Core CV** | **CV** |
| Susana Isabel Pinheiro Cardoso de Freitas | Principal Investigator | Agregação | 40 | ✓ | FCTSIG/c |
| Luís Filipe Guedelha Macedo | Researcher | Phd | 35 | ✓ |  |
| Pedro Manuel Quintela Ribeiro | Researcher | Phd | 35 | ✓ |  |
| António Samuel Ávila Balula | Researcher | Phd | 35 | No |  |
| Francesca Toblerone Malakova | Phd Student | Master | 100 | No |  |
| Pancráceo José Adelino Silva | Phd Student | Master | 100 | No |  |
| Isolinda Marta Fonseca Marques | Mst student | Bachelor | 100 | No |  |

## 4.2. Lista de membros a contratar durante a execução do projeto 4.2. Members list to hire during project's execution

|  |  |  |  |
| --- | --- | --- | --- |
| **Membro da equipa** | **Função** | **Duração** | **%tempo** |
| **Team member** | **Role** | **Duration** | **%time** |
| Bolseiro de iniciação à investigação | Bolseiro | 18 | 25 |

## 5. Outros projetos 5. Other projects –

## 5.1. Projetos financiados 5.1. Funded projects

|  |  |  |
| --- | --- | --- |
| **Referência** | **Título** | **Estado** |
| **Reference** | **Title** | **Status** |
|  |  |  |
|  |  |  |

Não têm de preencher (a menos que tenham feito projectos anteriores)

## 5.2. Candidaturas similares 5.2. Similar applications

NÃO (a menos que realmente sejam participantes em propostas similares submetidos à FCT)

## 6. Indicadores previstos 6. Expected indicators –

## Indicadores de realização previstos para o projeto Expected output indicators

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Descrição**  **Description** | **2012** | **2013** | **2014** | **2015** | **2016** | **Total** |
| **Descrição**  **A – Publicações**  **Publications** | | | | | | |
| **Livros**  **Books** |  |  |  |  |  |  |
| **Artigos em revistas internacionais**  **Papers in international journals** |  |  |  |  |  |  |
| **Artigos em revistas nacionais**  **Papers in national journals** |  |  |  |  |  |  |
| **B - Comunicações**  **Communications** | | | | | | |
| **Comunicações em encontros científicos internacionais**  **Communications in international meetings** |  |  |  |  |  |  |
| **Comunicações em encontros científicos nacionais**  **Communications in national meetings** |  |  |  |  |  |  |
| **C - Relatórios**  **Reports** |  |  |  |  |  |  |
| **D - Organização de seminários e conferências**  **Organization of seminars and conferences** |  |  |  |  |  |  |
| **E - Formação avançada**  **Advanced training** | | | | | | |
| **Teses de Doutoramento**  **PhD theses** |  |  |  |  |  |  |
| **Teses de Mestrado**  **Master theses** |  |  |  |  |  |  |
| **Outras**  **Others** |  |  |  |  |  |  |
| **F - Modelos**  **Models** |  |  |  |  |  |  |
| **G - Aplicações computacionais**  **Software** |  |  |  |  |  |  |
| **H - Instalações piloto**  **Pilot plants** |  |  |  |  |  |  |
| **I - Protótipos laboratoriais**  **Prototypes** |  |  |  |  |  |  |
| **J - Patentes**  **Patents** |  |  |  |  |  |  |
| **L - Outros**  **Other** | | | | | | |
| ADCIONAR SE ADEQUADO |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

Os indicadores apenas são validos nos anos de execução do projecto

## Acções de divulgação da actividade científica Scientific activity spreading actions

The project results will be presented to the scientific community through papers in international and national journals, as well as communications in international and national meetings. The thesis from the BI students will also serve as a way to diffuse our results to the scientific community.

INESC-MN is also widely-known by very articles published in important international and national journals. Also, INESC-MN provides summer internships that will help to diffuse the results of this work.

INESC-MN is also involved in many European projects, and so it is a way to get our results and papers to reach the groups which are also involved on those projects.

We will also have a patent on the end of our work, and so we will also have that way to spread our results.

## 7. Orçamento 7. Budget

## Instituição Proponente Principal Contractor

Instituto de Engenharia de Sistemas e Computadores- Microsistemas e Nanotecnologias

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Descrição**  **Description** | **2015** | **2016** | **2017** | **Total** |
| Recursos Humanos  Human resources | 2.896,56 | 26.263,44 | 3.395,52 | 32.555,52 |
| Missões  Missions | 0 | 6.000,00 | 12.300,00 | 18.300,00 |
| Consultores  Consultants |  |  |  |  |
| Aquisição de bens e serviços  Service procurement and acquisitions | 0 | 16.100,00 | 2.400,00 | 18.500,00 |
| Registo de patentes  Patent registration |  |  |  |  |
| Adaptação de edifícios e instalações  Adaptation of buildings and facilities | 0 | 0 | 0 | 0 |
| Gastos gerais  Overheads | 0 | 0 | 0 | 0 |
| **TOTAL DESPESAS CORRENTES**  **TOTAL CURRENT EXPENSES** |  |  |  |  |
| Equipamento  Equipment |  |  |  |  |
| **Total** |  |  |  |  |

As despesas só são válidas nos anos de execução do projecto

## Instituições Participantes Participating Institutions

Nome da Instituição

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Descrição**  **Description** | **2012** | **2013** | **2014** | **2015** | **2016** | **Total** |
| Recursos Humanos  Human resources |  |  |  |  |  |  |
| Missões  Missions |  |  |  |  |  |  |
| Consultores  Consultants |  |  |  |  |  |  |
| Aquisição de bens e serviços  Service procurement and acquisitions |  |  |  |  |  |  |
| Registo de patentes  Patent registration |  |  |  |  |  |  |
| Adaptação de edifícios e instalações  Adaptation of buildings and facilities |  |  |  |  |  |  |
| Gastos gerais  Overheads |  |  |  |  |  |  |
| **TOTAL DESPESAS CORRENTES**  **TOTAL CURRENT EXPENSES** |  |  |  |  |  |  |
| Equipamento  Equipment |  |  |  |  |  |  |
| **Total** |  |  |  |  |  |  |

As despesas só são válidas nos anos de execução do projecto

Repetir para as várias instituições participantes

## Orçamento Global

Global budget

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Descrição**  **Description** | **2015** | **2016** | **2017** | **Total** |
| Recursos Humanos  Human resources | 2.896,56 | 26.263,44 | 3.395,52 | 32.555,52 |
| Missões  Missions | 0 | 6.000,00 | 12.300,00 | 18.300,00 |
| Consultores  Consultants |  |  |  |  |
| Aquisição de bens e serviços  Service procurement and acquisitions | 0 | 16.100,00 | 2.400,00 | 18.500,00 |
| Registo de patentes  Patent registration |  |  |  |  |
| Adaptação de edifícios e instalações  Adaptation of buildings and facilities | 0 | 0 | 0 | 0 |
| Gastos gerais  Overheads | 0 | 0 | 0 | 0 |
| **TOTAL DESPESAS CORRENTES**  **TOTAL CURRENT EXPENSES** |  |  |  |  |
| Equipamento  Equipment |  |  |  |  |
| **Total** |  |  |  |  |

As despesas só são válidas nos anos de execução do projecto

## Plano de financiamento

Finance plan

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Descrição  Description | **2012** | **2013** | **2014** | **2015** | **2016** | **Total** |
| Financiamento solicitado à FCT  Requested funding |  |  |  |  |  |  |
| Financiamento próprio  Own funding |  |  |  |  |  |  |
| Outro financiamento público  Other public-sector funding |  |  |  |  |  |  |
| Outro financiamento privado  Other private funding |  |  |  |  |  |  |
| Total do Projecto  Total of the project |  |  |  |  |  |  |

## 8. Justificação do orçamento 8. Budget rationale –

## 8.1. Justificação dos recursos humanos 8.1. Human resources rationale

|  |  |  |
| --- | --- | --- |
| **Tipo**  **Type** |  | **Nº de pessoas**  **No. of persons** |
| (BIC) Bolsa de investigação científica |  | 1 |
| **Duração (em meses)**  **Duration (in months)** | **Custo envolvido (€) (calculado)**  **Total cost (€) (estimated)** | **Outros custos (€)**  **Other costs (€)** |
| 13 | 5.005,00 | 14.81,48 |
| **Justificação do financiamento solicitado**  **Rationale for requested funding** | | |
| A young researcher with knowledge in fabrication of structures and some experience in working in the cleanroom. The student will work on the task of manufacture. The BI will cover salary and social insurance expenses on a tax of 29.6%. | | |

|  |  |  |
| --- | --- | --- |
| **Tipo**  **Type** |  | **Nº de pessoas**  **No. of persons** |
| (BI) Bolsa de Investigação (Licenciado) |  | 1 |
| **Duração (em meses)**  **Duration (in months)** | **Custo envolvido (€) (calculado)**  **Total cost (€) (estimated)** | **Outros custos (€)**  **Other costs (€)** |
| 15 | 11.175,00 | 3.307,80 |
| **Justificação do financiamento solicitado**  **Rationale for requested funding** | | |
| A young researcher with knowledge on nanostructures modulation and experience in programming. The student will work on the task of programming and modulation. The BI will cover salary and social insurance expenses on a tax of 29.6%. | | |

|  |  |  |
| --- | --- | --- |
| **Tipo**  **Type** |  | **Nº de pessoas**  **No. of persons** |
| (BI) Bolsa de Investigação (Licenciado) |  | 1 |
| **Duração (em meses)**  **Duration (in months)** | **Custo envolvido (€) (calculado)**  **Total cost (€) (estimated)** | **Outros custos (€)**  **Other costs (€)** |
| 12 | 8.940,00 | 2.636,24 |
| **Justificação do financiamento solicitado**  **Rationale for requested funding** | | |
| A young researcher with knowledge in characterization techniques. The student will work on the task of characterization. The BI will cover salary and social insurance expenses on a tax of 29.6%. | | |

## 8.2. Justificação de missões 8.2. Missions rationale

|  |  |
| --- | --- |
| Tipo  Type | Nº de deslocações  No. of participations |
| International | 4 |
| Local  Venue | Custo envolvido (**€**)  Cost (**€**) |
| Barcelona, Spain | 6.000,00 |
| Justificação do financiamento solicitado  Rationale for requested funding | |
| Presentation of the simulation results. | |

|  |  |
| --- | --- |
| Tipo  Type | Nº de deslocações  No. of participations |
| National | 3 |
| Local  Venue | Custo envolvido (**€**)  Cost (**€**) |
| Braga,Portugal | 1.800,00 |
| Justificação do financiamento solicitado  Rationale for requested funding | |
| Presentation of the manufacture results. | |

|  |  |
| --- | --- |
| Tipo  Type | Nº de deslocações  No. of participations |
| International | 3 |
| Local  Venue | Custo envolvido (**€**)  Cost (**€**) |
| Istambul, Turkey | 4.500,00 |
| Justificação do financiamento solicitado  Rationale for requested funding | |
| Presentation of the manufacture results. | |

|  |  |
| --- | --- |
| Tipo  Type | Nº de deslocações  No. of participations |
| International | 4 |
| Local  Venue | Custo envolvido (**€**)  Cost (**€**) |
| Munich, Germany | 6.000,00 |
| Justificação do financiamento solicitado  Rationale for requested funding | |
| Presentation of the results to the scientific community. | |

8.3. Justificação de consultores  
8.3. Consultants rationale

## Nome complete Full name

## Instituição nstitution

## Fase do projecto Project phase

## Custo (€) Cost (€)

Custo

## Justificação do financiamento solicitado Rationale for requested funding

Justificação

## Página na Internet onde pode ser consultado o CV do consultor Web page where the consultant’s CV can be accessed

Deve ser repetido para cada consultor

## 8.4. Justificação de aquisição de bens e serviços 8.4. Service procurement and acquisitions

## Tipo Type

Consumables for the diverse applications needed for this project

## Custo (€) Cost (€) 18.500,00€

## Justificação do financiamento solicitado Rationale for requested funding

Our process will have a lot of nanotechnological processes in the fabrication tasks. Wafers and materials to deposit to proceed to the structures fabrication will be needed. It is also considered machines maintenance as well as clean room maintenance.

Repetido para cada bem e serviço previsto

## 8.6. Justificação do Equipamento 8.6. Equipment rationale

## 8.6.1. Equipamento já disponível para a execução do projecto 8.6.1 Available equipment

**Não tenho exemplo mas se quiserem indicar basta uma descrição**

## 8.6.2. Discriminação do equipamento a adquirir 8.6.2. New equipment requested

## Tipo de equipamento Equipment type

Descrição curta

## Fabricante Manufacturer

Fabricante

## Modelo Model

Referencia do equipamento ou modelo

## Custo (€) Cost (€)

Custo

Repetir para cada equipamento a adquirir no projecto

## 8.7. Justificação de registo de patentes 8.7. Patent registration

Não tenho um exemplo mas introduzam uma descrição por cada patente prevista

## 8.8. Justificação de adaptação de edifícios e instalações 8.8. Adaptation of buildings and facilities

Não tenho um exemplo mas caso aplicável incluam uma descrição

# 9. Ficheiros Anexos 9. Attachments

Lista dos ficheiros anexados (No vosso caso listem os anexos)

# 10. Possíveis conflitos de interesse 10. Possible Conflicts of Interest

Descrição caso aplicável