

# **DEPARTAMENTO DE FISICA**

## **DEPARTAMENTO DE FISICA**

### **Actividades de investigación**

#### **Tesis Doctorales**

- A study of the physics of pellet injection in magnetically confined plasmas in stellarators.  
*Autor:* PANADERO, N.  
*Director/Codirectores:* MARTIN, J. R.; MCCARTHY, K.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID  
*Año:* 2018
- Caracterización térmica y de defectos en materiales compuestos mediante imagen infrarroja. Modelización física, sistema experimental y técnicas de reducción de datos  
*Autor:* JUSTO-MARÍA, C.  
*Director/Codirectores:* MELENDEZ, J.; LOPEZ, F.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID  
*Año:* 2018
- Estudios de reflectometría Doppler en el stellarator TJ-II: comparación entre simulaciones y resultados experimentales  
*Autor:* FERNANDEZ, F.  
*Director/Codirectores:* GARCIA, L.; ESTRADA, T.; BLANCO, E.J.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID  
*Año:* 2018
- Free-boundary extension of the SIESTA code and its application to the Wendelstein 7-X stellarator.  
*Autor:* PERAZA, H.A.  
*Director/Codirectores:* SANCHEZ, R.; REYNOLDS, J.M.; ERNSTGEIGER, J.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID  
*Año:* 2018
- Geolocalización posnewtoniana, mediante TDOA-FDOA, de radiotransmisores pasivos situados en el entorno de la tierra.  
*Autor:* CLARES, F. J.  
*Director/Codirectores:* GAMBI, J. M.; MING-SHA TUNG, M.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID  
*Año:* 2018
- Modelling and application of Doppler Reflectometry for advanced turbulence studies on the ASDEX Upgrade Tokamak and the TJ-II Stellarator  
*Autor:* PINZON, J.R.  
*Director/Codirectores:* MARTIN, J. R.; HAPPEL, T.; ESTRADA, T.  
*Universidad:* UNIVERSIDAD CARLOS III DE MADRID

Año: 2018

- The numerical study of filament dynamics in tokamak scrape-off layer plasmas  
Autor: GRACIAS, W.A.  
Director/Codirectores: GARCIA, L.; PITTS, R.; SERRE, E.  
Universidad: UNIVERSIDAD CARLOS III DE MADRID  
Año: 2018

## **Publicaciones y actividades de difusión de resultados**

### **Publicaciones en revistas científicas internacionales**

- ALAEE, R.; CHRISTENSEN, J.; KADIC, M.  
Optical pulling and pushing forces in bilayer PT-symmetric structures, *Physical review applied*, Vol. 9 (014007), 2018, pp. 1-8.
- ALAEE, R.; GURLEK, B.; CHRISTENSEN, J.; KADIC, M.  
Optical force rectifiers based on PT-symmetric metasurfaces, *PHYSICAL REVIEW B*, Vol. 97, Núm. 19 (195420), 2018, pp. 1-, ESTADOS UNIDOS DE AMERICA.
- ANSARI-RAD, M.; ATHANASOPOULOS, S.  
Theoretical study of equilibrium and nonequilibrium exciton dynamics in disordered semiconductors, *PHYSICAL REVIEW B*, Vol. 98, Núm. 8 (085204), 2018, pp. 1-11, ESTADOS UNIDOS DE AMERICA.
- BONCAGNI, L.; ESPOSITO, B.; GOSPODARCZYK, M.; GABRIELLI, A.; CARNEVALE, D.; FERRO, G.; SASSANO, M.; MARTINELL, F.; POPOVIC, Z.  
Control-oriented model of disruption generated RE beam at FTU, *FUSION ENGINEERING AND DESIGN*, Vol. 135, 2018, pp. 42-49, SUIZA.
- CARNEVALE, D.; ARIOLA, M.; ARTASERSE, G.; BAGNATO, F.; BIN, W.; BONCAGNI, L.; BOLZONELLA, T.; BOMBARDA, F.; BURATTI, P.; CALACCI, L.; CAUSA, F.; CODA, S.; CORDELLA, F.; DECKER, J.; DE TOMMASI, G.; DUVAL, B.; ESPOSITO, B.; FERRO, G.; FICKER, O.; GABELLIERI, L.; GABRIELLI, A.; GALEANI, S.; GALPERTI, C.; GARAVAGLIA, S.; HAVRANECK, A.; GOBBIN, M.; GOSPODRACZYK, M.; GRANUCCI, G.; JOFFRIN, E.; LENNHOLM, M.; LIER, A.; MACUSOVA, E.; MARTINELLI, F.; MARTIN, J. R.; MYNAR, J.; PANACCIONE, L.; PAPP, G.; PASSERI, M.; PAUTASSO, G.; POPOVIC, Z.; POSSIERI, C.; PUCELLA, G.; SHEIKH, U.A.; RAMOGIDA, G.; REUX, C.; RIMINI, F.; ROMANO, A.; SASSANO, M.; TILIA, B.; TUDISCO, O.; VALCAREL, D.  
Runaway electron beam control, *PLASMA PHYSICS AND CONTROLLED FUSION*, Vol. 61, Núm. 1, 2018, pp. 014036-, REINO UNIDO.
- CHINEDU, C.; TILE, N.; JOHANNES, R.; NAVARRO, A.; GALIANA, B.  
Long wavelength stacking induced shift of the near-infrared photoluminescence from unintentional MOVPE grown InGaSb/GaSb quantum wells, *AIP ADVANCES*, Vol. 8, 2018, ESTADOS UNIDOS DE AMERICA.
- CORDOBA, P.; SANTALLA, S. N.; CUERNO, R.; RODRIGUEZ, J.  
Kardar-Parisi-Zhang universality in first-passage percolation: the role of geodesic degeneracy, *JOURNAL OF STATISTICAL MECHANICS-THEORY AND EXPERIMENT*, Vol. 2018 (063212), 2018, pp. 1-25,

REINO UNIDO.

- DOMINGUEZ, R.; REMENTERIA, R.; CAPDEVILA, C.; MATEO, C.; CABALLERO, F.G.; POPLAWSKY, J.D.; GUO, W.; URONES, E.  
Carbon Clustering in Low-Temperature Bainite, *METALLURGICAL AND MATERIALS TRANSACTIONS A-PHYSICAL METALLURGY AND MATERIALS SCIENCE (METALLURGICAL AND MATERIALS TRANSACTIONS A-PHYSICAL METALLURGY AND MATERIAL)*, Vol. 49, 2018, pp. 5277-5287, ESTADOS UNIDOS DE AMERICA.
- EGAÑA, A.M.D.; TARDIO, M. M.; MUÑOZ SANTIUSTE, J. E.; TORRE, C.; VAREZ, A.; CANTELAR, E.  
Spectroscopy and Judd-Ofelt analysis of Er<sup>3+</sup> ions in Li<sub>5</sub>La<sub>3</sub>Nb<sub>2</sub>O<sub>12</sub> garnet-type ceramic powder, *JOURNAL OF LUMINESCENCE*, Vol. 202, 2018, pp. 232-238, HOLANDA - PAISES BAJOS.
- EGAÑA, A.M.D.; TORRE, C.; TARDIO, M. M.; VAREZ, A.; MUÑOZ SANTIUSTE, J. E.  
Structural, morphology and luminescence study of Er<sup>3+</sup>-doped garnet-type Li<sub>5</sub>La<sub>3</sub>Nb<sub>2</sub>O<sub>12</sub> electrolytes as a potential new phosphor, *CERAMICS INTERNATIONAL*, 2018, pp. 18969-18977, REINO UNIDO.
- GOGOLEVA, A.; VELA, L.E.  
Towards a new image processing system at Wendelstein 7-X: From spatial calibration to characterization of thermal events, *REVIEW OF SCIENTIFIC INSTRUMENTS*, Vol. 89, Núm. 12, 2018, ESTADOS UNIDOS DE AMERICA.
- HERNANDEZ, J.; GARCIA, L.; CARRERAS, B.A.; VAN MILLIGEN, B.P.  
Applicability of transfer entropy for the calculation of effective diffusivity in heat transport, *PHYSICS OF PLASMAS*, Vol. 25, Núm. 10, 2018, ESTADOS UNIDOS DE AMERICA.
- HERNÁNDEZ, M.A.; MUÑOZ SANTIUSTE, J. E.; LAVIN, V.; LOZANO, A.D.; RODRÍGUEZ, P.; MUÑOZ, A.; VENKATRAMU, V.; MARTÍN, I.R.; RODRIGUEZ, U.R.  
High pressure luminescence of Nd<sup>3+</sup> in YAlO<sub>3</sub> perovskite nanocrystals: A crystal-field analysis, *JOURNAL OF CHEMICAL PHYSICS*, Vol. 148, Núm. 4, 2018, ESTADOS UNIDOS DE AMERICA.
- IÑARREA, J.  
Beating pattern in radiation-induced oscillatory magnetoresistance in 2DES: Coupling of plasmon-like and acoustic phonon modes, *APPLIED PHYSICS LETTERS*, Vol. 112, 2018, ESTADOS UNIDOS DE AMERICA.
- LI, B.; CHRISTENSEN, J.  
Heat conduction tuning by hyperbranched nanophononic metamaterials, *JOURNAL OF APPLIED PHYSICS*, Vol. 123, 2018, ESTADOS UNIDOS DE AMERICA.
- MACIAS, J.; LEGUEY, T.; DE CASTRO, V.  
Effect of hot cross rolling on the microstructure and mechanical properties of an Fe-14Cr ODS ferritic steel, *MATERIALS SCIENCE AND ENGINEERING A-STRUCTURAL MATERIALS PROPERTIES MICROSTRUCTURE AND PROCESSING (MATERIALS SCIENCE AND ENGINEERING A-STRUCTURAL MATERIALS PROPERTIES MICROST)*, Vol. 711, 2018, pp. 448-459, SUIZA.
- MARTIN, J. R.  
Neutron spectroscopy measurements of 14 MeV neutrons at unprecedented energy resolution and implications for deuterium-tritium fusion plasma diagnostics, *MEASUREMENT SCIENCE and*

*TECHNOLOGY (MEASUREMENT SCIENCE & TECHNOLOGY)*, Vol. 29, Núm. 4, 2018, REINO UNIDO.

- MARTÍNEZ, M.; ZURRO, B.; BACIERO, A.; JIMENEZ, D.; TRIBALDOS, V.  
Investigation of the role of electron cyclotron resonance heating and magnetic configuration on the suprathreshold ion population in the stellarator TJ-II using a luminescent probe, *PLASMA PHYSICS AND CONTROLLED FUSION*, Vol. 60, Núm. 2, 2018, REINO UNIDO.
- MERKEL, A.P.L.; ROMERO, V.; GROBY, J.P.; LI, J.; CHRISTENSEN, J.  
Unidirectional zero sonic reflection in passive PT-symmetric Willis media, *PHYSICAL REVIEW B*, Vol. 98, Núm. 20, 2018, ESTADOS UNIDOS DE AMERICA.
- MERKEL, A.P.L.; WILLATZEN, M.; CHRISTENSEN, J.  
Dynamic nonreciprocity in loss-compensated piezophononic media, *Physical Review Applied*, Vol. 9, Núm. 3 (034033), 2018, ESTADOS UNIDOS DE AMERICA.
- MIRONOVA, N.; SILDOS, I.; VASIL'CHENKO, E.; CHIKVAIDZE, G.; SKVORTSOVA, V.; KAREIVA, A.; MUÑOZ SANTIUSTE, J. E.; PAREJA, R.; ELSTS, E.; POPOV, A.I.  
Optical absorption and Raman studies of neutron-irradiated Gd<sub>3</sub>Ga<sub>5</sub>O<sub>12</sub> single crystals, *NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS (NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIO)*, Vol. 435, 2018, pp. 306-312, HOLANDA - PAISES BAJOS.
- MUÑOZ SANTIUSTE, J. E.; LAVIN, V.; RODRIGUEZ, U.R.; FERRER, C.; ERRANDONEA, D.; MARTINEZ, D.; RODRIGUEZ, P.; MUÑOZ, A.; BETTINELLI, M.  
Experimental and theoretical study on the optical properties of LaVO<sub>4</sub> crystals under pressure, *PHYSICAL CHEMISTRY CHEMICAL PHYSICS*, Vol. 20, Núm. 43, 2018, pp. 27314-27328, REINO UNIDO.
- NAVARRO, A.; GALIANA, B.; BALLESTEROS, C. I.; MARTINEZ, O.; JIMÉNEZ, J.; LOMBARDEO, I.; OCHOA, M.; GARCIA, I.; ALGORO, C.; GABAS, M.  
Cathodoluminescence Characterization of Dilute Nitride GaNSbAs Alloys, *JOURNAL OF ELECTRONIC MATERIALS*, Vol. 47, 2018, pp. 5061-5067, ESTADOS UNIDOS DE AMERICA.
- ORDAS, N.; GIL, E.; ITURRIZA, I.; CINTINS, A.; PURANS, J.; ANSPOKS, A.; KUZMIN, A.; DE CASTRO, V.; LEGUEY, T.  
The role of yttrium and titanium during the development of ODS ferritic steels obtained through the STARS route: TEM and XAS study, *JOURNAL OF NUCLEAR MATERIALS*, 2018, pp. 8-22, HOLANDA - PAISES BAJOS.
- PAZOS, D.; CINTIS, A.; DE CASTRO, V.; FERNÁNDEZ, P.; HOFFMANN, J.; GARCIA, W.; LEGUEY, T.; PURANS, J.; ANSPOKS, A.; KUZMIN, A.; ITURRIZA, I.; ORDAS, N.  
ODS ferritic steels obtained from gas atomized powders through the STARS processing route: reactive synthesis as an alternative to mechanical alloying, *Nuclear Materials and Energy*, Vol. 17, 2018, pp. 1-8.
- PERAZA, H.A.; REYNOLDS, J.M.; SANCHEZ, R.; TRIBALDOS, V.; GEIGER, J.  
Bootstrap current control studies in the Wendelstein 7-X stellarator using the free-plasma-boundary version of the SIESTA MHD equilibrium code, *PLASMA PHYSICS AND CONTROLLED FUSION*, Vol. 60, Núm. 2, 2018, REINO UNIDO.

- REDONDO-CUBERO, A.; LORENZ, K.; PALOMARES, F.J.; MUÑOZ, A.; CASTRO, M.; MUÑOZ, J.M.; CUERNO, R.; VAZQUEZ BURGOS, L.  
Concurrent segregation and erosion effects in medium-energy iron beam patterning of silicon surfaces, *JOURNAL OF PHYSICS-CONDENSED MATTER*, Vol. 30, Núm. 27 (274001), 2018, pp. 1-14, REINO UNIDO.
- RODRIGUEZ, J.; SANTALLA, S. N.  
Building an adiabatic quantum computer simulation in the classroom, *AMERICAN JOURNAL OF PHYSICS*, Vol. 86, 2018, pp. 360-367, ESTADOS UNIDOS DE AMERICA.
- ROSENDO, M.; MERKEL, A.P.L.; CHRISTENSEN, J.  
PT symmetric sonic crystals: From asymmetric echoes to supersonic speeds, *EPL*, Vol. 124, Núm. 3, 2018, FRANCIA.
- SANCHEZ, S.; JUSTO-MARÍA, C.; MELENDEZ, J.; LOPEZ, F.  
Measurement of the thermal parameters of composite materials during fire tests with quantitative infrared imaging, *FIRE TECHNOLOGY*, Vol. 54, Núm. 1, 2018, pp. 313-333, ESTADOS UNIDOS DE AMERICA.
- SANTALLA, S. N.; FERREIRA, S.C.  
Eden model with nonlocal growth rules and kinetic roughening in biological systems, *PHYSICAL REVIEW E*, Vol. 98, Núm. 2, 2018, ESTADOS UNIDOS DE AMERICA.
- SANTALLA, S. N.; RODRIGUEZ, J.; ABAD, J.P.; MARIN, I.; ESPINOSA, M.D.M.; MUÑOZ, J.M.; VAZQUEZ BURGOS, L.; CUERNO, R.  
Nonuniversality of front fluctuations for compact colonies of nonmotile bacteria, *PHYSICAL REVIEW E*, Vol. 98 (064027), Núm. 1, 2018, ESTADOS UNIDOS DE AMERICA.
- SCEPANOVIC, M.; LEGUEY, T.; AUGERB, M.A.; LOZANO, S.; ARMSTRONG, D.E.J.; GARCÍA, I.; DE CASTRO, V.  
Characterisation of ODS Fe-14Cr-2W-0.3Ti before and after high temperature triple and low temperature single ion irradiations, *MATERIALS CHARACTERIZATION*, Vol. 136, 2018, pp. 318-330, ESTADOS UNIDOS DE AMERICA.
- SHARMA, A.; ATHANASOPOULOS, S.; TAPPING, P.C.; SABATINI, R.P.; MCRAE, O.F.; MULLNER, M.; KEE, T.W.; LAKHWANI, G.  
Emission Decay Pathways Sensitive to Circular Polarization of Excitation, *Journal of Physical Chemistry C*, Vol. 122, Núm. 42, 2018, pp. 23910-23916, ESTADOS UNIDOS DE AMERICA.
- TRIBALDOS, V.; MARTÍNEZ, M.; MUÑOZ, D.  
Discrete fast-ion detection with energy discrimination in plasmas having edge-localized mode-like instabilities in the stellarator TJ-II, *CONTRIBUTIONS TO PLASMA PHYSICS*, Vol. 58, 2018, pp. 861-869, ALEMANIA.
- VAN MILLIGEN, B.; HOFEL, U.; NICOLAU, J.H.; HERNANDEZ, J.; GARCIA, L.; CARRERAS, B.A.  
Study of radial heat transport in W7-X using the transfer entropy, *NUCLEAR FUSION*, Vol. 58, Núm. 7, 2018, pp. 076002-076015, AUSTRIA.
- VAN MILLIGEN, B.P.; HERNANDEZ, J.; LIU, B.; GRENFELL, G.; LOSADA, U.; CARRERAS, B.A.;

GARCIA, L.; HIDALGO, C.

Filaments in the edge confinement region of TJ-II, *NUCLEAR FUSION*, Vol. 58, Núm. 2, 2018, pp. 026030-026041, AUSTRIA.

- VELA, L.E.; SANCHEZ, R.; GEIGER, J.  
ALARIC: An algorithm for constructing arbitrarily complex initial density distributions with low particle noise for SPH/SPMHD applications, *COMPUTER PHYSICS COMMUNICATIONS*, Vol. 224, 2018, pp. 186-197, HOLANDA - PAISES BAJOS.
- WANG, M.; YE, L.; CHRISTENSEN, J.; LIU, Z.  
Valley physics in non-Hermitian artificial acoustic boron nitride, *PHYSICAL REVIEW LETTERS*, Vol. 120, Núm. 24 (246601), 2018, pp. 1-6, ESTADOS UNIDOS DE AMERICA.
- ZHANG, X.; XIAO, M.; CHENG, Y.; LU, M.H.; CHRISTENSEN, J.  
Topological sound, *Communications Physics*, Núm. 1, 2018.
- ZHANG, Z.; TIAN, Y.; CHENG, Y.; WEI, Q.; LIU, X.; CHRISTENSEN, J.  
Topological acoustic delay line, *Physical Review Applied*, Vol. 9, Núm. 3 (034032), 2018, pp. 1-11, ESTADOS UNIDOS DE AMERICA.
- ZHANG, Z.; TIAN, Y.; WANG, Y.; GAO, S.; CHENG, Y.; LIU, X.; CHRISTENSEN, J.  
Directional acoustic antennas based on Valley-Hall topological insulators, *ADVANCED MATERIALS*, Vol. 30, Núm. 36 (1803229), 2018, pp. 1-7, ALEMANIA.

## Ponencias y Comunicaciones a congresos

- CRUZ, R. M. D. L.; KANYINDA-MALU, C.; MUÑOZ SANTIUSTE, J. E.  
*Dielectric response in an ordered rectangular array of Ag nanoparticles on LiNbO<sub>3</sub>*; en: NANOCON 2017: 9th International Conference on Nanomaterials: Research & Applications: Conference Proceedings: October 28th - 20th 2017, Brno, Czech Republic, EU, TANGER, LTD, REPUBLICA CHECA, 2018.
- DOBSON, I.; CARRINGTON, N.L.K.; CARRERAS, B.A.; REYNOLDS, J.M.  
*Exploring cascading outages and weather via processing historic data*; en: Proceedings of the 51st Hawaii International Conference on System Sciences, 2018.
- EGAÑA, A.M.D.; TORMO-MARQUEZ, V.; TORRENTE, E. A.; MUÑOZ SANTIUSTE, J. E.; OLIVARES, J.; TARDIO, M. M.  
*Swift heavy ion irradiation induces enhancement in electrical conductivity of LiTaO<sub>3</sub> and LiNbO<sub>3</sub> crystals*; en: Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms (International Conference on Radiation Effects in Insulators (REI-17), July 2-7, 2017 in Versailles, France), ELSEVIER, B.V, HOLANDA - PAISES BAJOS, 2018.
- GARCIA, L.; VARELA, J.; SPONG, D.A.; TODO, Y.  
*Alfvén eigenmode driven by alpha particles and NBI energetic particles*, 45th EPS Conference on Plasma Physics (EPS 2018), Praga, REPUBLICA CHECA, 2018.
- HERNANDEZ, J.; GARCIA, L.; CARRERAS, B.A.; VAN MILLINGEN, B.; LUI, B.; GRENFELL, G.; LOSADA, U.; HIDALGO, C.  
*Detection of filamentary structures using transfer entropy in TJ-II and W7-X*; en: 45th EPS Conference

on Plasma Physics: July 2 -6 2018, Prague, Czech Republic: [proceedings], 2018.

- LOARTE, A.; POLEVOI, A.R.; WEYENS, T.; LIU, Y.; LI, L.; HUIJSMANS, G.; ARTOLA, J.; VAN VUGT, D.; LIU, F.; REYNOLDS, J.M.; TRIBALDOS, V.; MEDVEDEV, S.Y.; FUTATANI, S.  
*Advances in modelling of plasma pedestal behaviour and ELM control in ITER reference plasma scenarios*; en: 27th IAEA Fusion Energy Conference: 22-27 October, 2018, Ahmedabad, India: programme and abstracts, 2018.
- MONTAÑES, F.; GARCIA, L.; BERENGUER, G.; MUÑOZ SANTIUSTE, J. E.  
*Sistemas inerciales absolutos y relativos de bajo coste en simuladores de lanza-misiles*; en: V Congreso Nacional de i+d en Defensa y Seguridad: Actas: Toledo, 22, 23 y 24 de noviembre de 2017, Ministerio de Defensa. Secretaría General Técnica., 2018.
- MUÑOZ, A.; EDDAHBI, M.O.; SAVOINI, B.; MONGE, M. A.  
*Mechanical properties and microstructure of W/CuY and W/CuCrZr composites produced by hot isostatic pressing*; en: 30th edition of the Symposium on Fusion Technology: 16th to 21st September, 2018, Giardini Naxos (Messina), Sicily, Italy: book of abstracts, 2018.
- NAVARRO, A.  
*Advanced characterization of inverted metamorphic solar cells, SALAMANCA, ESPAÑA, 2018.*
- RODRIGUEZ, U.R.; LAVIN, V.; HERNÁNDEZ, M.A.; MUÑOZ SANTIUSTE, J. E.; MARTÍN, I.R.  
*Nd<sup>3+</sup>-YAP nanocrystals: a high pressure luminescence study*; en: ICSTAR 2018: International Conference on Science, Technology and Applications of Rare Earths: September 23-25, 2018, Tirupati, Andhra Pradesh, India: [abstracts], 2018.
- SANCHEZ, R.; PERAZA, H.A.; REYNOLDS, J.M.; TRIBALDOS, V.; GEIGER, J.  
*Application of the free-boundary SIESTA MHD equilibrium code to bootstrap control scenarios in the W7-X stellarator*; en: 45th EPS Conference on Plasma Physics: July 2 -6 2018, Prague, Czech Republic: [proceedings], 2018.

## Propiedad Industrial/intelectual

- *Inventores*: DOMINGUEZ, R.; MUÑOZ, A.; SAVOINI, B.; RUIZ, M.B.  
Sistema modular de representación de topologías de red para invidentes  
*Tipo*: PATENTE  
*Titular*: UNIVERSIDAD CARLOS III DE MADRID  
*Número Solicitud*: **P201830545**  
*Fecha Solicitud*: 05/06/2018  
*Países*: ESPAÑA