MINISTERIO DE CIENCIA E INNOVACIÓN

Cofinanciado por la Unión Europea

AGENCIA ESTATAL DE INVESTIGACIÓN

CURRICULUM VITAE ABREVIADO (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

First name	RICARDO		
Family name	VERGAZ BENITO		
Gender (*)	Male	Birth date (dd/mm/yyyy)	[redacted]
Social Security, Passport, ID number	DNI [redacted]		
e-mail	rvergaz@ing.uc3m.es	URL Web -	
Open Research and Contributor ID (ORCID)(*)		0000-0002-2304-129X	

(*) Mandatory

A.1. Current position

Position	Ass. Professor (Profesor Titular de Universidad)		
Initial date	[redacted]		
Institution	Universidad Carlos III de Madrid		
Departament/Center	Departamento de Tecnología Electrónica. Escuela Politécnica Superior.		
Country	SPAIN	Teleph. number	916246017
Key words	Electrooptic characterization, photodetectors, solar cells, nanostructures, free-space optical communications, assistive technologies		

A.2. Previous positions (research activity interuptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
January – March 1998	Grant Artículo 11 - Grafos S.A, Spain.
March 1998 – March 2001	FPI Grant at Universidad de Valladolid
March – December 2001	Prof. Ayudante de Escuela Universitaria – Univ. Carlos III de Madrid
December 2001 – October 2003	Prof. Visitante – Univ. Carlos III de Madrid
October 2003 – September 2005	Prof. Ayudante Doctor – Univ. Carlos III de Madrid
September 2005 – December 2009	Prof. Titular Interino – Univ. Carlos III de Madrid

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Doctor (Physics)	Universidad de Valladolid / Spain	2001
Electronics Engineer (BSc)	Universidad de Valladolid / Spain	2000
Physics (BSc)	Universidad de Valladolid / Spain	1996

Part B. CV SUMMARY *(max. 5000 characters, including spaces)*

Ph.D. in Physics about solar radiation scattering to detect atmospheric aerosol properties. In 2001 moved to Universidad Carlos III de Madrid, where I teach electronics and photonics both in theoretical and practical (lab) lectures. Working in the GDAF-UC3M (Displays and Photonics Applications Group) of Electronics Technology Department. I began characterizing electrooptic devices, mainly new generation-liquid crystal displays. Due to my previous experience on scattering and characterization, my evolution was to open new research lines in the group.

Thus, I started a new line of electrochromic materials and devices characterization. In this line I have supervised two Ph.D. thesis, a competitive Project and several JCR publications. Moreover, this line has allowed the development of a technical aid for people with visual disabilities. Widening this point, I opened a research line of new technical aids based on augmented and virtual reality for people with

retinal diseases, projecting them to clinical trials. This is remarkably active line in the GDAF-UC3M and I have boosted it through collaborations with Hospital San Rafael de Madrid, new materials groups (IK4-CIDETEC at San Sebastián, Spain), Instituto de Oftalmobiología Aplicada (IOBA) and the Psychiatry department at Universidad Complutense de Madrid. Recently, a Project funded by Indra has been obtained in this line. On the other hand, I take part in the research lines of electrooptic devices characterization at GDAF-UC3M, being relevant my expertise in electrochemical impedance spectroscopy and the retrieval of manufacturing and performance parameters using equivalent circuits to fit that spectral behaviour. It has produced collaborations with other research groups and a great percentage of my papers. I also started a line based on the characterization of suspended particle devices (SPD) and electrophoretic ones, linking this work to the highest-level contacts (Amströng Laboratory at Uppsala University, Sweden), being part of one of the supervised Ph.D thesis and research leaves, as well as producing my most cited papers. I have leaded a research line about free-space optical communications, currently active in the group with VLC works. I signed four contracts with a Company and supervised another Thesis, whose author is currently one of the most renowned world experts in laser communications in space at NICT, Japan. I currently work in the line open by Prof. García-Cámara in GDAF-UC3M: designing new devices using both nanoparticle and nanostructures to shape metasurfaces, mainly dielectric ones, to improve solar cell efficiency or LEDs. It is achieved by light trapping or by producing wavelength or directional-selective plasmonic resonances. I lead an Explora Project, I was co-PI of a Plan Nacional's Project, I established contacts with groups abroad (Helhomtz Zentrum Berlin) or national ones (INAM at UJI), and supervised another Thesis. I am recently co-PI of one Transición Ecológica Project with UJI on perovskite solar cells applications, and a Prueba de Concepto about a Liquid Crystal varifocal Lens and its application. With regards to the divulgation topic, I am Subdirector for End of Degrees and Master Students in my Department, and I actively participate in a University Program for Institutos de Secundaria since 2009, currently visiting 5-10 per year and focusing on Photonics divulgation and promoting STEM for girls to break the gender gap in Engineering and Science.
A brief summary in numbers:

- [redacted]
- Supervisor of 5 Ph. D. Thesis in the last 10 years.
- Publications in JCR: 54.
- h-index: 24 (excluding self-citation according to Scopus at 16/02/2023, 20).
- Latest 5 years cites (Scopus, excluding self-citation of all authors, 16/02/2023): 1207.
- 1 patent (1 PCT), 1 reg. software, 1 mod. utilidad (licensed): SUNBOX.
- Acting as regular Reviewer for more than 10 JCR indexed journals in the fields of Photonics, Sensors and Solar cells.

Part C. RELEVANT MERITS *(sorted by typology)*

C.1. Publications *(see instructions)*

Paper: E. López-Fraguas, F. Binkowski, S. Burger, S. Hagedorn, B. García-Cámara, R. Vergaz, C. Becker, P. Manley. 2022. "Tripling the light extraction efficiency of a deep ultraviolet LED using a nanostructured p-contact". *Scientific Reports.* 11480, 12(1). doi: 10.1038/s41598-022-15499-7.

Paper: F.A. Chaudhry, L. Escandell, E. López-Fraguas, R. Vergaz, J.M. Sánchez-Pena, B. García-Cámara. 2022. "Light absorption enhancement in thin film GaAs solar cells using dielectric nanoparticles". *Scientific Reports.* 9240, 12(1). doi: 10.1038/s41598-022-13418-4..

Paper: D. C. Zografopoulos, J. F. Algorri, W. Fuscaldo, J. M. López-Higuera, R. Vergaz, J. M. Sánchez-Pena, I. A- Karolos, R. Beccherelli, V. E. Tsioukas, T. V. Yioultsis, E. E.. Kriezis, 2021. "All-Dielectric Toroidal Metasurfaces for Angular-Dependent Resonant Polarization Beam Splitting". *Adv. Optical Mater.* 2002143. doi: 10.1002/adom.202002143. IF: 9.926. 7/99 in Optics.

Paper: B. Arredondo, G. Del Pozo, E. Hernández-Balaguera, D. Martín Martín, M.C. López González, B. Romero, E. López-Fraguas, R. Vergaz, X. Quintana, J. Lamminaho, E. Destouesse, M. Ahmadpour, V. Turkovic, M. Madsen. 2020. "Identification of degradation mechanisms in slot-die coated non-fullerene ITO-free organic solar cells using different illumination spectra". *ACS Appl. Energy Mater.* doi: 10.1021/acsaem.0c00711. IF: 6.024. 34/114 in Energy & Fuels.

Paper: M. Elshorbagy, E. López-Fraguas, J. M. Sánchez-Pena, B. García-Cámara, R. Vergaz. 2020. "Boosting ultrathin aSi-H solar cells absorption through a nanoparticle cross-packed metasurface". *Solar Energy*, 202, 10-16. doi: 10.1016/j.solener.2020.03.075, 9 times cited. IF: 5,742. 38/114 in Energy and Fuels.

Paper: M. Elshorbagy, E. López-Fraguas, F. A. Chaudhry, J. M. Sánchez-Pena, R. Vergaz, B. García-Cámara. 2020. "A monolithic nanostructured-perovskite/silicon tandem solar cell: feasibility of light management through geometry and materials selection". *Scientific Reports*, 10, 2271. doi: 10.1038/s41598-020-58978-5. 5 times cited. IF: 4.380. 17/72 in Multidisciplinary Sciences.

Paper: M. Elshorbagy, A. Cuadrado, B. García-Cámara, R. Vergaz, J. A. Gómez-Pedrero, J. Alda. 2020. "Ultra-narrow spectral response of a hybrid plasmonic-grating sensor". *IEEE Sensors Journal*, 20(7), 3520-3528. doi: 10.1109/JSEN.2019.2960556. IF: 3.301. 96/273 in Engineering, Electrical and Electronic.

Paper: E. López-Fraguas, B. Arredondo, C. Vega-Colado, G. del Pozo, M. Najafi, D. Martín-Martín, Y. Galagan, J. M. Sánchez-Pena, R. Vergaz, B. Romero. 2019. "Visible Light Communication system using an organic emitter and a perovskite photodetector". *Organic Electronics*, 73, 292-298 10.1016/j.orgel.2019.06.028. 34 times cited. IF: 3.310. 41/154 in Applied Physics.

Paper: M. Elshorbagy, B. García-Cámara, E. López-Fraguas, R. Vergaz. 2019. "Efficient light management in a monolithic tandem perovskite /silicon solar cell by using a hybrid metasurface". *Nanomaterials*. 23(9), 5, 791. doi: 10.3390/nano9050791. IF: 4.324. 89/312 in Materials Science: Multidisciplinar.

Paper: E. López-Fraguas, J.M. Sánchez-Pena, R. Vergaz. 2019. "A low-cost LED-based solar simulator". *IEEE Transactions on Instrumentation & Measurement*. 68(12), 4913-4923 doi: 10.1109/TIM.2019.2899513. 13 times cited. IF: 3.658. 11/61 in Instruments and Instrumentation, 65/266 in Engineering, Electrical and Electronic.

Paper: J.F. Algorri, D. Zografopoulos, A. Ferraro, B. García-Cámara, R. Vergaz, R. Beccherelli, J. M. Sánchez-Pena. 2019. "Anapole modes in hollow nanocuboid dielectric metasurfaces for refractometric sensing". *Nanomaterials* 9(30). 10.3390/nano9010030. 19 times cited. IF: 4.324. 89/312 in Materials Science: Multidisciplinar.

Paper: C. Vega-Colado, B. Arredondo, J.C. Torres, E. Lopez-Fraguas, R. Vergaz, D. Martin-Martin, G. del Pozo, B. Romero, P. Apilo, X. Quintana, M. A.Geday, C. de Dios, J.M. Sanchez-Pena, 2018. "An all-organic flexible visible light communication system". *Sensors*, 18. Nºpaper: 3045. doi: 10.3390/s18093045. 14 times cited. IF: 3.031. 15/61 in Instruments and Instrumentation.

C.2. Congress, indicating the modality of their participation (invited conference, oral presentation, poster)

Authors: B. Garcia-Camara, E. Lopez-Fraguas, M. H. Elshorbagy, J. M. Sánchez_Pena, R. Vergaz. Title: Improving the optical response of solar cell using dielectric metastructures. Oral (B. García-Cámara). Congress: NanoPlasMeta 2021 – Photoptics -2021, 9th International Conference on Photonics, Optics and Laser Technology. 2021 (11 – 13th February), Online.

Authors: E. López-Fraguas, B. García-Cámara, R. Vergaz. Title: Total internal reflection using nano-gratings for enhancing the optical response of perovskite solar cells. Oral (E. López-Fraguas). Congress: META 2019. The 10th International Conference on Metamaterials, Photonic Crystals and Plasmonics. 2019 (23 – 26th July), Lisbon, Portugal.

Authors: R. Vergaz, J.F. Algorri, A. Cuadrado, J.M. Sánchez-Pena, B. García-Cámara. Title: Towards the Polarization Control of the Directional Scattering of Semiconductor Nanodisks. Poster. Congress: META'16: The 7th International Conference on Metamaterials, Photonic Crystals and Plasmonics, 2016 (25 – 28th July), Torremolinos, Spain.

C.3. Research projects, indicating your personal contribution. In the case of young researchers, indicate lines of research for which they have been responsible.

As Principal Investigator:

PID2022-140090OB-C22. PLEDs - Caracterizacion y Desarrollo de Aplicaciones Tecnológicas para LEDs de Perovskita de Haluro. MCIN/Next Generation EU. Proyectos de Generación de Conocimiento 2022 Investigación Orientada Tipo Coordinado. 233.750 €. Co-IP

TED2021-131600B-C33. STEP-Forward - Caracterización y Aplicaciones Avanzadas para Células Solares de Perovskita. MCIN/Next Generation EU. Proyecto Transición ecológica y Digital. 01/12/2022- 30/11/2024. 184.000 €. Co-PI

PDC2021-121370-C22. LC-LENS Lentes Sintonizables de Cristal Líquido. MCIN/ AEI/10.13039/501100011033/. Proyecto Prueba de Concepto. 01/12/2021- 30/11/2023. 46.230 €. Co-PI

PEJ-2021-TL/TIC-22381, PEJ-2019-TL/TIC-13511, PEJ16/TIC/TL-1589, Ayudas para la realización de contratos para técnicos de laboratorio, Comunidad de Madrid, 01/11/2022- 11/12/2024 (the latest one), 38.000 € each. As PI.

TEC2016-77242-C3-1-R, Estructuras Sub-Longitud de Onda de Capa Delgada para Circuitos Fotónicos. Ministerio de Economía y Competitividad. AEI/FEDER, UE. 30/12/2016 - 29/12/2019. 213.000 €. Co-PI.

TEC2013-50138-EXP, Transistor Puramente Óptico Basado en Scattering por Nanopartículas Magnetodieléctricas, Ministerio de Economia y Competitividad, 01/09/2014- 28/02/2016, 54.450 €. As PI.

As Research Team Member

NAMEBOSH: Materiales Nanoensamblados para Sensado y Manipulación de Luz en Amplio Rango Espectral: Dispositivos de Fase Adaptativos y Metasuperfícies PID2019-109072RB-C31. Ministerio de Ciencia e Innovación. Proyectos de I+D+I - retos de la sociedad. 137.940 €. 01/06/2020 - 31/05/2023. Jose Manuel Sanchez-Pena & Braulio García-Cámara.

TEFLON-CM: Telealimentación Fotovoltaica por fibra Óptica para medida y control en entornos extremos. CAM-Consejeria Educación e Investigación, Proyecto Regional, Proyectos Sinérgicos. 824.593€. Carmen Vázquez. 01/01/2019 a 31/12/2020.

C.4. Contracts, technological or transfer merits, Include patents and other industrial or intellectual property activities (contracts, licenses, agreements, etc.) in which you have collaborated. Indicate: a) the order of signature of authors; b) reference; c) title; d) priority countries; e) date; f) Entity and companies that exploit the patent or similar information, if any

VISTACTO – Fundación Universia & Indra. 03/2021-03/2022. 24.000 €.

Construcción y suministro de 3 equipos SUNBOX, y su mantenimiento. La Tenda de Modesto S.L.U., 21/09/2020 – 20/01/2023. 19.350 €.

Estudio de utilización simple y en array de telescopios Cherenkov para Comunicaciones Ópticas, Ingenieria y Servicios Aeroespaciales, S.A, 01/04/2011- 31/12/2011, 25.000€.

Patents (all Title Entity: Universidad Carlos III de Madrid)

Dispositivo para Rehabilitación de Rodilla. Sergio Lomas Jiménez, Ricardo Vergaz Benito, David Rodríguez Sanz. Solicitud: P202030163. 26/02/2020. Publicación: ES2850357, 27/08/2021. Concesión: 12/04/2022. Extensión a PCT: WO/2009/150. 274. International Application No.: PCT/ES2009/070202.

Modelo de Utilidad. Simulador Solar para la Caracterización de Fotodetectores y Células Solares. Eduardo López Fraguas, José Manuel Sánchez Pena, Ricardo Vergaz Benito. Solicitud: U201931948. Reference: 5336b ES mu. 27/10/2019. Pub: ES1249534 20/07/2020. Conc.: 05/10/2020. Three ítems sold to Research Groups via a Spanish Company. Currently exploring licensing possibilities.

Registro Software: SUNBOX. Eduardo López Fraguas, José Manuel Sánchez Pena, Ricardo Vergaz Benito Solicitud: M-005247/2019. Registro Territorial de la Propiedad Intelectual de la Comunidad de Madrid (software). 21/02/2020.