

CV date	05/07/2024
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Part A. PERSONAL INFORMATION

First name	Florencia		
Family name	Almonacid Cruz		
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Open Research and Contributor ID (ORCID)(*)	0000-0001-7352-2377		

A.1. Current position

Position	Full Professor		
Initial date	10/2022		
Institution	University of Jaén		
Department/Center	Department of Electronic and Automatic Engineering		
Country	Spain	Teleph. number	953212426
Keywords	Solar Energy, Photovoltaics, PV converters, Light sources,		

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

Period	Position/Institution/Country/Interruption cause
06/10/1999-31/03/2007	Profesor Asociado (University of Jaén , Spain)
01/04/2007-01/01/2010	Profesor Colaborador (University of Jaén, Spain)
02/01/2010-23/10/2019	Profesor Contratado Doctor (University of Jaén, Spain)
24/10/2019 -04/10/2022	Tenured Professor
05/10/2022-	Full Professor

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
PhD. in Electronic Engineering	University of Jaén	2009

Part B. CV SUMMARY

Currently, I am full professor in the Department of Electronic and Automatic Engineering of the University of Jaén (2022-). I have more than 20 years of experience in the field of the photovoltaic solar energy. My main research lines are related with the photovoltaic (PV), concentrator photovoltaic (CPV) and **currently** in emerging photovoltaic technologies with the development of novel concept to promote their efficiency and competitiveness. In particular, in this last one, **I am working the development of new generation of ultra-efficient optical photovoltaic converters (OPC)** suitable for transforming power in the order of kilowatts. This new and exciting research line is attracting the interest of the science community and **has received a great interest from relevant PV social media** (<https://www.pv-magazine.com/2023/12/28/optical-photovoltaic-converters-for-high-power-transmission-systems/>).

As a summary of my research career, **I have participated in more than 19 research projects** with funding exceeding 4M euros, including 4 international and 3 EU. I have been **Principal Investigator of 8 projects**, including 2 EU and 3 nationals, with total funding exceeding 700k euros. Most of these projects are **related** to a greater or lesser extent **with the project theme** (see section C3). I have also conducted research visits in prestigious research centres for a total period above 1 year. Due to this activity, **I have published +100 peer-review papers (+50 related with the theme of the project)**, see section C1 for the last ten) indexed in ISI JCR (+85% T1), ten book chapters and presented \approx 50 contributions in the



most relevant international conferences and workshops. **I am co-inventor of three patents**, one of them (PCT/US2019/026049) with the National Renewable Energy Laboratory of USA that is in an industrialization phase and has received funding of \$ 1.4 million from the Department of Energy (DOE) of USA". The last one (P202130520) has attracted the attention of an independent venture capital firm specialized in industrial high technology transfer and Seed and Early stages, BeAble Capital (<https://beablecapital.com/>) that has already invested in a first stage ~ 190 000€ for the creation of a technology-based company of which **I am a one of the founding members, SOLARCROP, S.L.**, and the development of a Proof of Concept of the patented technology.

I have co-supervised six doctoral theses, two of them Extraordinary Thesis Award, that have generated high-impact publications and results, Thus, I would like to mention that **the majority of the graduated PhDs are working in prestigious institutions related to the PV sector**: Dr. Álvaro Fernández is working as researcher at the German Aerospace Center (DLR) - Plataforma Solar de Almería (https://www.dlr.de/en/images/2011/3/research-platform-in-almeria-spain_2109). Dr. Mathew Muller work as PV expert in the National Renewable Energy Laboratory (NREL) of USA; Dr. Alberto Soria Moya works as PV expert at the Solar Energy Training Centre (CENSOLAR); Dr. Pedro M. Rodrigo is researcher/teacher at the Panamericana University (Mexico) since 2014, Secretary for Research at the Engineering Faculty since 2016 and member of the National System of Researchers of México. He obtained a Beatriz Galindo fellowship from the Spanish Government (BGP18/00034) and a Marie Curie action (MSCA-IF-2019 HybridCPV2000 (882504)). Currently, he is the vice-chancellor of Research at the Panamericana University

Due my research activities, **I keep strong international and national collaborations with researchers from different centres and institution**, i.e.: the Environment and Sustainability Institute of Exeter University (UK), the Thermoelectrics and Photovoltaics laboratory of Cardiff University (UK), the Universidad Panamericana- Campus Aguascalientes (México), the FOSS Research Centre for Sustainable Energy of the University of Cyprus (Cyprus), the Universidad de Santiago de Compostela (Spain), the Lleida University (Spain), the National Renewable Energy Laboratory (USA) and the Sandia National Laboratories (USA).

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

C.1. Publications (selection of the last ten related with the theme of the project)

1. Sanmartín, P., Almonacid, F., Ceballos, M.A., García-Loureiro, A., Fernández, E.F. Wide-bandgap III-V materials for high efficiency air and underwater optical photovoltaic power transmission (2024) Solar Energy Materials and Solar Cells, 266, art. no. 112662, DOI: 10.1016/j.solmat.2023.112662
2. Lozano, J.F., Seoane, N., Comesana, E., Almonacid, F.M., Fernandez, E.F., Garcia-Loureiro, A. Photogeneration and Performance Optimization (PhPO): A New Algorithm to Improve the Performance of Vertical Epitaxial Hetero-Structure Architecture Laser Power Converters (2023) IEEE Access, 11, pp. 84371-84378. DOI: 10.1109/ACCESS.2023.3302523
3. Valera, Á., Rodrigo, P.M., Ceballos, M.A., Almonacid, F., Fernández, E.F. Design, manufacturing and indoor/outdoor testing of a hybrid thermoelectric-concentrator photovoltaic mono-module at unprecedented ultra-high concentration levels (2023) Solar Energy Materials and Solar Cells, 254, art. no. 112269, DOI: 10.1016/j.solmat.2023.112269
4. Valera-Albacete, A., Almonacid, F., Rodrigo, P.M., Fernandez, E.F. The potential of a hybrid optical photovoltaic converter-thermoelectric receiver to enhance conversion efficiency (2023) IEEE Electron Device Letters, pp. 1-1. DOI: 10.1109/LED.2023.3288173
5. Lozano, J.F., Seoane, N., Comesaña, E., Almonacid, F., Fernández, E.F., García-Loureiro, A. Laser Power Converter Architectures Based on 3C-SiC with Efficiencies >80% (2022) Solar RRL, 6 (8), art. no. 2101077, DOI: 10.1002/solr.202101077

6. Outes, C., Fernández, E.F., Seoane, N., Almonacid, F., García-Loureiro, A.J. Dependence of the vertical-tunnel-junction GaAs solar cell on concentration and temperature (2022) *IET Renewable Power Generation*, 16 (8), pp. 1577-1588. DOI: 10.1049/rpg2.12456
7. Fernández, E.F., García-Loureiro, A., Seoane, N., Almonacid, F. Band-gap material selection for remote high-power laser transmission (2022) *Solar Energy Materials and Solar Cells*, 235, art. no. 111483, DOI: 10.1016/j.solmat.2021.111483
8. Outes, C., Fernandez, E.F., Seoane, N., Almonacid, F., Garcia-Loureiro, A.J. GaAs Vertical-Tunnel-Junction Converter for Ultra-High Laser Power Transfer (2021) *IEEE Electron Device Letters*, 42 (12), pp. 1882-1885. DOI: 10.1109/LED.2021.3121501
9. Ceballos, M.A., Fernandez, E.F., Rodrigo, P.M., Valera, Á., Perez-Higueras, P.J., Almonacid, F. High-performance 4096x ultra-high CPV module based on multiple concentrator units and optical guides (2021) *Optics Letters*, 46 (17), pp. 4188-4191. DOI: 10.1364/OL.432453
10. Seoane, N., Fernández, E.F., Almonacid, F., García-Loureiro, A. Ultra-efficient intrinsic-vertical-tunnel-junction structures for next-generation concentrator solar cells (2021) *Progress in Photovoltaics: Research and Applications*, 29 (2), pp. 231-237, DOI: 10.1002/ppp.3369

C.2. Books/ Book chapters

1. E. F. Fernández, F. Almonacid, P. M. Rodrigo, P. Pérez-Higueras, "Chapter II-4-A: CPV Systems", *McEvoy's Handbook of Photovoltaics* (third edition), Elsevier (2017), pp. 931-985.
2. M. Martínez, D. Sánchez, F. Rubio, E. F. Fernández, F. Almonacid, N. Abela, T. Zech, Gerstmaier, T., "Chapter 8: CPV Power Plants", *Handbook on Concentrator Photovoltaic Technology*, Wiley (2016), pp. 433-490.
3. Rodrigo, P., Micheli, L., Almonacid, F. The high-concentrator photovoltaic module (2015) *Green Energy and Technology*, 190, pp. 115-151. DOI: 10.1007/978-3-319-15039-0_5
4. F. J. Muñoz-Rodríguez, E. Muñoz-Cerón, F. Almonacid, E. F. Fernández, "Chapter 8: Efficiencies and energy balance in high-concentrator photovoltaic devices", *Green Energy and Technology* (2015), 190, pp. 239-260.
5. Hontoria, L., Aguilera, J., Almonacid, F., Nofuentes, G., Zufiria, P. Artificial neural networks applied in PV systems and solar radiation. (2006) *Artificial Intelligence in Energy and Renewable Energy Systems*, pp. 163-200.

C.3. Research projects related with the theme of the project

1. Rear concentrator photovoltaic bifacial module for agrivoltaics. RearCPVbif (Cód.: TED2021-130463B-I00). Funded by the AEI. Proyectos transición ecológica y digital 2021 (2023-2025), Principal Investigators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo. (12/2022- 11/2024). 143.750€€.
2. Ultra-efficient Micro-scale new generation hybrid Concentrator PhotoVoltaic systems: ULTRAMicroCPV (Cód.: PID2019-106497RBI00). Funded by Ministerio de Ciencia, Innovación y Universidades. Proyectos de I+D+i 2019. Principal Investigators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo. (01/06/2020- 31/05/2023). 272.250€.
3. Nuevas Arquitecturas de Células de Concentración Fotovoltaica y TErmoeléctricos para el desarrollo de módulos híbridos de nueva generación: NACe-CPV/TE (Cód.: P18-RT-1595). Funded by Plan Andaluz de Investigación (2020-2023). Principal Investigators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo. (01/01/2020-31/12/202) 122.968 €.
4. Efficient lightweight hybrid thermoelectric generator-concentrator photovoltaic module at 2000x light concentration factor. HybridCPV2000 (882504). Funded by UE. H2020-MSCA-IF-2019. Coordinators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo (2020). €172,932.48.



5. Novel Soiling Identification Logics for Photovoltaics. NoSoilPV (793120). Funded by UE. H2020-MSCA-IF-2017. Coordinators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo (2018-2020). €158,121.60
6. Nuevas Arquitecturas para el Desarrollo de Sistemas a Ultra-Alta Concentración Fotovoltaica (ENE2016-78251-R). Funded by Ministerio de Economía y Competitividad. Programa estatal de investigación. Principal Investigators: Almonacid Cruz, Florencia; Fernández Fernández, Eduardo (2016-2019). 113.740€
7. Nuevos conceptos basados en tecnología de concentración fotovoltaica: Desarrollo de sistemas de muy alta concentración (ENE2013-45442-R). Funded by Ministerio de Economía y Competitividad. Principal Investigator: Perez-Higueras, Pedro Jesus. (2014-2016). 115580 EUR.
8. Desarrollo de un módulo fotovoltaico basado en nuevos conceptos ópticos operando a ultra alta concentración (UHCPV) (Ref: UJAEN2015/07/01). Funded by Universidad de Jaén. Principal Investigator: Florencia Almonacid Cruz (01/01/2016-31/12/2017). 30000€
9. Scalable solar thermoelectrics and photovoltaics (SUNTRAP) (Reef: EPSRC (EP/K022156/1). Funded by Engineering and Physical Sciences Research Council. Program "SUPERGEN". Principal Investigator: Knox A., Mallick TK., et al (2013-2017). £2.5m
10. Development and Integration of Biomass and Concentrating Photovoltaic System for Rural and Urban Energy Bridge: BioCPV (Ref: EPSRC (EP/J000345/1). Funded by Engineering and Physical Sciences Research Council. Program "BURD". Principal Investigator: Mallick TK et al. (2011-2016). £2.9m

C.4. Contracts, technological or transfer merits

- **Patent.** E. F. Fernández, F. Almonacid, P. Rodrigo, P. Pérez-Higueras, "Bifacial semi-transparent photovoltaic module with back irradiance concentrators", University of Jaén (Spain), 2021, P202130520, 2021
- **Patent.** E. F. Fernández, M. Muller, L. Micheli, F. Almonacid, "Methods and systems for determining soiling on photovoltaic devices", National Renewable Energy Laboratory (USA) and University of Jaén, US Patent 16/376,547 (US 2019/0312548 A1) and international PCT Patent PCT/US2019/026049 (WO 2019/195718), 2019. This patent has received funds >1 million euros from the Department of Energy (DOE) of USA (<https://www.sbir.gov/node/1541715> - Phase I ref. 245689, Phase II ref 0000254206).
- **Patent.** P. Perez-Higueras, E. F. Fernández, F. Almonacid, J. I. Fernández-carrasco, "Sistema de concentración de haces de rayos de luz (Concentration system of beams of sunlight), University of Jaén (Spain), P201430087 (Publication no. ES2493740A1, 2015).
- **Technology-based company.** Founding member of the UJA Spin-Off, SOLARCROP, S.L, which has received fund (~190.000€) from BeAble Capital (<https://beablecapital.com/>), company specialized in industrial high technology transfer and Seed and Early stages