

## TESI ED ELENCO DI PUBBLICAZIONI

### Tesi

P. Vidal García, *Generalized Study of the Complex Analysis of the Transmission Line Theory and its Application to Real Electromagnetic Systems*, Università di Oviedo (Spagna), 2019.

### Comunicazioni Scientifiche

- [J1] P. Vidal García, "A Logarithmic Complex Version of the Generalized Smith Chart", *Progress in Electromagnetic Research Letters (PIER-L)*, Vol. 68, pp. 53-58, 2017.  
doi: [10.2528/PIERL17022009](https://doi.org/10.2528/PIERL17022009)

### Comunicazioni ai Congressi Internazionali

- [I8] S. Atieh, L. Ferreira, L. Laín Amador, S. Leith, C. Pereira, G. Rosaz, K. Scibor, L. Vega Cid, W. Venturini Delsolaro, P. Vidal García, "Seamless 1.3 GHz Copper Cavities for Nb Coatings: Cold Test Results of Two Different Approaches", *2021 International Conference on RF Superconductivity (SRF'21)*, poster TUPTEV009 presentato online, 2021.
- [I7] P. Vidal García, E. Gago-Ribas, "The Logarithmic Generalized Smith Chart: Examples of Use", *International Conference on Electromagnetics in Advanced Applications (ICEAA'17) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale "Modern Problems of Mathematical and Computational Electromagnetics and their Advanced Applications", Verona (Italia), 2017.  
doi: [10.1109/ICEAA.2017.8065636](https://doi.org/10.1109/ICEAA.2017.8065636)
- [I6] P. Vidal García, E. Gago-Ribas, "The Logarithmic Generalized Smith Chart: Theoretical Analysis", *International Conference on Electromagnetics in Advanced Applications (ICEAA'17) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale "Modern Problems of Mathematical and Computational Electromagnetics and their Advanced Applications", Verona (Italia), 2017.  
doi: [10.1109/ICEAA.2017.8065636](https://doi.org/10.1109/ICEAA.2017.8065636)
- [I5] J. Heredia Juesas, E. Gago Ribas, P. Vidal García, "Application of the Rigged Hilbert Spaces into de Generalized Signals and Systems Theory: Practical Example", *Progress in Electromagnetic Research Symposium 2016 (PIERS 2016) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale "Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications", Shanghai (Cina), 2016.  
doi: [10.1109/PIERS.2016.7735737](https://doi.org/10.1109/PIERS.2016.7735737)
- [I4] J.L. Ganoza Quintana, E. Gago Ribas, P. Vidal García, "The Green's Functions Theory Based on a Generalized Signals & Systems Theory and Its Application to Electromagnetics", *Progress in Electromagnetic Research Symposium 2016 (PIERS 2016) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale "Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications", Shanghai (Cina), 2016.  
doi: [10.1109/PIERS.2016.7735283](https://doi.org/10.1109/PIERS.2016.7735283)
- [I3] P. Vidal García, E. Gago Ribas, "Complex Analysis of the Transmission Line Theory: Analytical Characterization and Examples of Use", *Progress in Electromagnetic Research Symposium 2016 (PIERS 2016) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale "Recent Advances in Challenging Problems of

Mathematical and Computational Electromagnetics and their Applications”, Shanghai (Cina), 2016.

doi: [10.1109/PIERS.2016.7735278](https://doi.org/10.1109/PIERS.2016.7735278)

- [I2] E. Gago Ribas, P. Vidal García, J. Heredia Juesas, “Complex Analysis and Parameterization of the Lossy Transmission Line Theory and its Application to Solve Related Physical Problems”, *International Conference on Electromagnetics in Advanced Applications (ICEAA’15) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione ordinaria “Electromagnetic Theory”, Torino (Italia), 2015.

doi: [10.1109/ICEAA.2015.7297091](https://doi.org/10.1109/ICEAA.2015.7297091)

- [I1] J. Heredia Juesas, E. Gago Ribas, P. Vidal García, “Application of the Rigged Hilbert Spaces into the Generalized Signals & Systems Theory”, *International Conference on Electromagnetics in Advanced Applications (ICEAA’15) Proceedings (IEEE Xplore Digital Library)*, presentato alla sessione speciale “Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications”, Torino (Italia), 2015.

doi: [10.1109/ICEAA.2015.7297341](https://doi.org/10.1109/ICEAA.2015.7297341)

#### **Comunicazioni ai Congressi Nazionali (Spagna)**

- [N1] P. Vidal García, E. Gago Ribas, “A Generalized Complex Transmission Line Theory: Characterization and some Examples”, *XXXI Symposium Nacional de la Unión Científica Internacional de Radio (URSI 2016)*, presentato alla sessione ordinaria “Teoría Electromagnética”, Madrid (Spagna), 2016.

## I. Career

### Work Experience

Last position	
<b>CERN</b>	<i>Period: 01/03/2020 - 28/02/2022</i>
<b>Superconducting RadioFrequency section (SY-RF-SRF)</b>	
<i>CIEMAT Spanish Traineeship Program FTEC-2019 (Spanish Ministry of "Ciencia e Innovación")</i>	
<i>Position: Trainee</i>	
<i>Job title: Superconducting RF (SRF) cavity and sample testing at the cryolab</i>	
<i>Job details: <a href="#">See Appendix A</a></i>	
Past experience	
<b>University of Oviedo</b>	<i>Period: 17/11/2015 - 16/11/2019</i>
<b>Department of Electrical, Electronic, Computers and Systems Engineering (DIEECS)</b>	
<i>FPI-2015 predoctoral grants for researchers (Spanish Ministry of "Economía y Competitividad")</i>	
<i>Position: Researcher</i>	

### Education

Doctorate	
<b>PhD. in Telecommunication Engineering</b>	<i>Date: 15/11/2019</i>
<i>University of Oviedo</i>	
<i>Thesis title:</i>	<i>Generalized Study of the Complex Analysis of the Transmission Line Theory and its Application to Real Electromagnetic Systems</i>
<i>URI:</i>	<i><a href="http://hdl.handle.net/10651/54099">http://hdl.handle.net/10651/54099</a></i>
Graduate	
<b>MSc. in Telecommunication Engineering</b>	<i>Date: 11/09/2014</i>
<i>University of Oviedo</i>	
<b>BSc. in Telecommunication Engineering</b>	<i>Date: 11/09/2014</i>
<i>University of Oviedo</i>	
Undergraduate	
<b>BSc. in Mathematics</b>	<i>Period: 10/2021-ongoing</i>
<i>UNED</i>	
<b>BSc. in Physics and Mathematics</b>	<i>Period: 09/2016-05/2018</i>
<i>University of Oviedo</i>	

### Training

Courses	
<i>Title:</i>	<i>The Technology and Applications of Particle Accelerators (20h)</i>
<i>Organizer(s):</i>	<i>European Scientific Institute</i>
<i>Place:</i>	<i>Online</i>
	<i>Dates: 15/02/2021 - 18/03/2021</i>
<i>Title:</i>	<i>EASITrain School on Applied Superconductivity (2 ECTS)</i>
<i>Organizer(s):</i>	<i>EASITrain, CERN, University of Genoa</i>
<i>Place:</i>	<i>CNR SPIN, Genoa, Italy</i>
	<i>Dates: 28/09/2020 - 05/10/2020</i>

## II. Scientific Involvement

### Researcher information

Codes	
Open Researcher and Contributor ID (ORCID):	0000-0003-0820-3286
SCOPUS Author ID:	57076869300

Keywords	
<i>Electromagnetism:</i>	Guided waves in lossy media, Generalized Transmission Line Theory, wave scattering.
<i>Superconductivity:</i>	Fundamental theory, RF characterization/measurements.
<i>Math. methods:</i>	Complex Analysis, Functional Analysis and Operator Theory, Green's Functions Theory, and Asymptotic Analysis; applied to electromagnetic problems.

Scientific bio	
<p>Firstly, the scientific research was focused on those theoretical aspects of the EM wave propagation in lossy media, motivated by the precedent of study, design, and fabrication of substrate integrated waveguides presented in the MSc. thesis. Thus, starting from the rigorous analysis of losses in equivalent transmission line (TL) models, a <i>Generalized Study of the Transmission Line Theory (GTLT) and its Application to Real EM Systems</i> was proposed as main research during the doctorate. The analyses presented in the relative PhD. dissertation are based on those resources taken from the classical Complex Analysis (as for example the <i>complex mappings</i>) to be used to describe the behavior and characteristics of lossy TLs that represent those solutions (modes) in waveguides (for example, the usual complex planes seen as charts, e.g. the Smith Chart, but generalized, i.e. including the rigorous description of losses without approximations). As a result, those analyses turn out to be geometrical on complex planes, and many physical interpretations may be deduced from them.</p> <p>Secondly, as the developed methods may be understood in a wide or generalized sense, any problem that fits the underlying equations (<i>Telegrapher's equations</i> or those related PDEs that may be transformed into) may be studied through the GTLT as an example of application. In this sense, conductors and superconductors may be seen as the lossy media for the waves that slightly penetrate ("propagate") within, whose parameters completely characterize the conductor/superconductor RF response. In particular, just as an example, the usual treatment of superconductors in the <i>London limit</i> has straightforward link to the Lossy TLT. Keeping this in mind, a valuable experience on measuring conductors and superconductors was acquired at CERN (see <a href="#">Appendix A</a>). Future challenging measurements for material characterization may be addressed for the subsequent physical interpretations to be deduced.</p> <p>Altogether, the research carried out on a <i>Generalized Signals and Systems Theory</i> based on both the Functional Analysis and Operator Theory has been crucial to give the appropriate framework and description to all the mentioned studies. Thus, this is also a research line to be developed.</p>	

### Participation in Research Projects

International	
<i>Project title:</i> <b>Future Circular Collider Innovation Study (FCCIS)</b>	<i>Period:</i> 11/2020 - 10/2024
<i>Agreement no.</i> 951754 of European Union's H2020	
<i>Coordinator:</i> CERN	
<i>Project title:</i> <b>Multiple Information Resources to Improve Inverse EM techniques for reflectometry and imaging applications (MIRIEEM)</b>	<i>Period:</i> 11/2015 - 12/2017
<i>Ref.:</i> TEC-2014-54005P	
<i>Participants:</i> U. of Oviedo, Polytechnic U. of Catalunya, U. of Pisa, Lamar U.	

## National

Project title: **Tecnología de Onda Milimétrica basada en Grafeno (G-MILLITECH) (Graphene-based Microwave Technology)** Period: 11/2015 - 11/2019

Ref.: TEC-2016-80815P

Participants: University of Oviedo

Project title: **Generador de Señal de THz basado en Grafeno (TERAGRAPH) (Graphene-based THz Signal Generator)** Period: 05/2017 - 05/2019

Ref.: TEC2015-72110-EXP

Participants: University of Oviedo

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## Regional

Project title: **Grupo de Teoría de la Señal y Comunicaciones (TSC-UniOvi) (Signal Theory and Communications research group)** Period: 01/2015 - 12/2017

Ref.: FC-15-GRUPIN14-114

Participants: University of Oviedo

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## Internships

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### International

**Northeastern University College of Engineering** Period: 02/08/2018 - 07/09/2018  
**Multi-wave Sensing, Imaging, Control, and Actuation Laboratory (SICA-Lab)**

Activity: Measurements on wave scattering by dielectric objects in waveguides

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### National

**Polytechnic University of Valencia** Period: 12/03/2018 - 18/06/2018  
**Instituto de Telecomunicaciones y Aplicaciones Multimedia (iTEAM)**

Activity: Numerical methods for the analysis of wave scattering in waveguides

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## Publications

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### Journals (J)

(J1)

Authors: P. Vidal García, E. Gago Ribas

Title: *A Logarithmic Complex Version of the Generalized Smith Chart*

Journal: Progress In Electromagnetic Research Letters (PIER-L)

Vol.: 68

No.: -

pp.: 53-58

Date: 24/05/2017

DOI: 10.2528/PIERL17022009

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## Conferences

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### International (I)

(I8)

Authors: S. Atieh, L. Ferreira, L. Laín Amador, S. Leith, C. Pereira, G. Rosaz, K. Scibor, L. Vega Cid, W. Venturini Delsolaro, P. Vidal García

Title: *Seamless 1.3 GHz Copper Cavities for Nb Coatings: Cold Test Results of Two Different Approaches*

Type of participation: Poster in online session

Conference: 2021 International Conference on RF Superconductivity (SRF'21)

Publication: Poster TUPTEV009 at <https://indico.frib.msu.edu/event/38/>

Place: Online Dates: 28/06/2021-02/07/2021

- (17)
- Authors:** Pablo Vidal García, Emilio Gago Ribas
- Title:** *The Logarithmic Generalized Smith Chart: Examples of Use*
- Type of participation:** Invited talk in the special session “Modern Problems of Mathematical and Computational Electromagnetics and their Advanced Applications”
- Conference:** International Conference on Electromagnetics in Advanced Applications (ICEAA’17)
- Publication:** ICEAA’17 Proceedings (IEEE Xplore Digital Library)
- Place:** Verona, Italy **Dates:** 11-15/09/2017
- DOI:** 10.1109/ICEAA.2017.8065636
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- (16)
- Authors:** Pablo Vidal García, Emilio Gago Ribas
- Title:** *The Logarithmic Generalized Smith Chart: Theoretical Analysis*
- Type of participation:** Invited talk in the special session “Modern Problems of Mathematical and Computational Electromagnetics and their Advanced Applications”
- Conference:** International Conference on Electromagnetics in Advanced Applications (ICEAA’17)
- Publication:** ICEAA’17 Proceedings (IEEE Xplore Digital Library)
- Place:** Verona, Italy **Dates:** 11-15/09/2017
- DOI:** 10.1109/ICEAA.2017.8065638
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- (15)
- Authors:** Juan Heredia Juesas, Emilio Gago Ribas, Pablo Vidal García
- Title:** *Application of the Rigged Hilbert Spaces into de Generalized Signals and Systems Theory: Practical Example*
- Type of participation:** Invited talk in the special session “Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications”
- Conference:** Progress in Electromagnetic Research Symposium 2016 (PIERS 2016)
- Publication:** PIERS 2016 Proceedings (IEEE Xplore Digital Library)
- Place:** Shanghai, China **Dates:** 8-12/08/2016
- DOI:** 10.1109/PIERS.2016.7735737
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- (14)
- Authors:** José Luis Ganoza-Quintana, Emilio Gago-Ribas, Pablo Vidal-García
- Title:** *The Green's Functions Theory Based on a Generalized Signals & Systems Theory and Its Application to Electromagnetics*
- Type of participation:** Invited talk in the special session “Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications”
- Conference:** Progress in Electromagnetic Research Symposium 2016 (PIERS 2016)
- Publication:** PIERS 2016 Proceedings (IEEE Xplore Digital Library)
- Place:** Shanghai, China **Dates:** 8-12/08/2016
- DOI:** 10.1109/PIERS.2016.7735283
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- (13)
- Authors:** Pablo Vidal García, Emilio Gago Ribas
- Title:** *Complex Analysis of the Transmission Line Theory: Analytical Characterization and Examples of Use*
- Type of participation:** Invited talk in the special session “Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and their Applications”
- Conference:** Progress in Electromagnetic Research Symposium 2016 (PIERS 2016)
- Publication:** PIERS 2016 Proceedings (IEEE Xplore Digital Library)
- Place:** Shanghai, China **Dates:** 8-12/08/2016
- DOI:** 10.1109/PIERS.2016.7735278
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- (12)
- Authors:** Emilio Gago Ribas, Pablo Vidal García, Juan Heredia Juesas
- Title:** *Complex Analysis and Parameterization of the Lossy Transmission Line Theory and its Application to Solve Related Physical Problems*
- Type of participation:** Regular talk in the session “Electromagnetic Theory”
- Conference:** 2015 International Conference on Electromagnetics in Advanced Applications (ICEAA ‘15)
- Publication:** Proceedings of the ICEAA ‘15 (IEEE Xplore Digital Library)
- Place:** Turin, Italy **Dates:** 7-11/09/2015
- DOI:** 10.1109/ICEAA.2015.7297091
-

(I1)

*Authors:* Juan Heredia-Juesas, Emilio Gago Ribas, Pablo Vidal García,  
*Title:* *Application of the Rigged Hilbert Spaces into the Generalized Signals & Systems Theory*  
*Type of participation:* Invited talk in the special session "Recent Advances in Challenging Problems of Mathematical and Computational Electromagnetics and Their Applications"  
*Conference:* 2015 International Conference on Electromagnetics in Advanced Applications (ICEAA '15)  
*Publication:* Proceedings of the ICEAA '15 (IEEE Xplore Digital Library)  
*Place:* Turin, Italy *Dates:* 7-11/09/2015  
*DOI:* 10.1109/ICEAA.2015.7297341

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**National (N)**

(N1)

*Authors:* Pablo Vidal García, Emilio Gago Ribas  
*Title:* *A Generalized Complex Transmission Line Theory: Characterization and some Examples*  
*Type of participation:* Regular talk in the session "Teoría Electromagnética"  
*Conference:* XXXI Simposium Nacional de la Unión Científica Internacional de Radio (URSI 2016)  
*Place:* Madrid, Spain *Dates:* 5-7/09/2016

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### III. Academia

#### Teaching

Courses		
<b>Teoría de la Comunicación (Communication Theory)</b>	<i>Time: 28h</i>	
<i>BSc. in Telecommunication Technologies and Services Engineering</i>	<i>Period: 01-05/2018</i>	
<i>Place: Polytechnic School of Engineering, University of Oviedo (Spain)</i>		
<b>Señales y Sistemas (Signals and Systems)</b>	<i>Time: 32h</i>	
<i>BSc. in Telecommunication Technologies and Services Engineering</i>	<i>Period: 09/2017 - 01/2018</i>	
<i>Place: Polytechnic School of Engineering, University of Oviedo (Spain)</i>		
<b>Procesado de Señal (Signals Processing)</b>	<i>Time: 20h</i>	
<i>BSc. in Telecommunication Technologies and Services Engineering</i>	<i>Period: 01-05/2017</i>	
<i>Place: Polytechnic School of Engineering, University of Oviedo (Spain)</i>		
<b>Radiación y Propagación (Radiation and Propagation)</b>	<i>Time: 40h</i>	
<i>BSc. in Telecommunication Technologies and Services Engineering</i>	<i>Period: 01-05/2017</i>	
<i>Place: Polytechnic School of Engineering, University of Oviedo (Spain)</i>		
Tutoring		
<i>Title:</i>	<i>Análisis complejo de la propagación de modos TEM en líneas de transmisión con modelos de pérdidas dependientes de la frecuencia (Complex analysis of TEM mode propagation on frequency-dependent lossy transmission lines)</i>	
<i>Type of participation:</i>	Co-tutoring in degree final project	
<i>Place:</i>	Faculty of Physics, University of Oviedo	<i>Course: 2017/2018</i>
<i>Title:</i>	<i>Análisis, diseño y desarrollo de una aplicación web con un sistema propio de gestión de estudios científicos (Analysis, design and implementation of a web application for the management of research documents)</i>	
<i>Type of participation:</i>	Co-tutoring in degree final project	
<i>Place:</i>	School of Engineering, University of León	<i>Course: 2017/2018</i>

#### Workshops

National		
<b>IX Jornadas de Innovación Docente (IX Meeting for the Teaching Innovation)</b>		
<i>University of Oviedo</i>		<i>Dates: 12/01/2017</i>
<b>XI Jornadas de Innovación Docente (XI Meeting for the Teaching Innovation)</b>		
<i>University of Oviedo</i>		<i>Dates: 16/01/2019</i>



## IV. Skills

Languages	
<b>Spanish</b> <i>Native</i>	
<b>English</b> <i>Advanced (CEFR B2 certificate)</i>	
<b>French</b> <i>Basic</i>	
<b>Italian</b> <i>Basic</i>	
Others	
<b>Driving license</b> <i>Class B</i>	

## Appendix A

### CERN-CIEMAT FTEC Spanish Traineeship Programme

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#### Background

The CIEMAT (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas; *Research Center of Energy, Environment and Technology*) is a Spanish public institution attached to the Spanish Ministry of Science and Innovation that is in charge of the technological R&D for the research on Nuclear and Atomic Physics, among others. The center collaborates actively with CERN -among others- and here one of the motivations is in the training of engineers and scientists on the technologies used on site. Thus, the CIEMAT offers several annual projects under public competitive concourse.

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#### FTEC2019-12

The project that was granted to me (ref. FTEC2019-12) was dedicated to the superconducting RF (SRF) cavity and sample testing at the CERN Cryolab. Also, the corresponding activities were carried out in the context of the FCC Innovation Study project. These tasks comprise the validation of superconducting coatings deposited on flat samples and 1.3 GHz elliptical mono-cells made of copper. In particular, special emphasis was given to improve the superconducting thin film adhesion on the mentioned supports.

My commitment was to: (i) carry out the RF tests of both flat samples in the *quadropole resonator* (QPR) as well as coated cavities. This task comprises the validation of testing setups, the improvement of the measuring techniques, and the evaluation of errors in the measurements; (ii) study the results and give them the appropriate physical interpretations; and (iii) communicate the results to the SRF section via internal reports, seminars<sup>1</sup> and workshops<sup>2</sup>, the SRF community worldwide via meetings<sup>3</sup> and conferences, [\[18\]](#), and the CIEMAT as periodic reports and workshops on those activities and the possible impact on R&D and industries.

As relevant outcomes, we got significant achievements by experimental results: in the QPR, normal conducting losses were proved to bias the calorimetric compensation; and no special field limits were found in Nb/Cu cavities, but the substrate treatment plays a fundamental role in the cavity performance.

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<sup>1</sup> (For example) "SRF Seminar: New and interesting CryoLab results from RF measurements in Niobium-on-Copper", in SRF Seminars, <https://indico.cern.ch/event/1083255/>.

<sup>2</sup> (For example) "Status and Expectations of QPR program", in V CERN SRF Workshop, <https://indico.cern.ch/event/1103356/>.

<sup>3</sup> (For example) "RF Characterization Techniques of 1.3 GHz cavities", in 2021 FCC Week, <https://indico.cern.ch/event/995850/>.