

c v n CURRÍCULUM VITAE NORMALIZADO



Generated from: Editor CVN de FECYT
Date of document: 27/10/2016
v 1.4.0
04e89ff42494d9191a2ec61edade7a60

This electronic file (PDF) has embedded CVN technology (CVN-XML). The CVN technology of this file allows you to export and import curricular data from and to any compatible data base. List of adapted databases available at: <http://cvn.fecyt.es/>

Summary of CV

This section describes briefly a summary of your career in science, academic and research; the main scientific and technological achievements and goals in your line of research in the medium -and long- term. It also includes other important aspects or peculiarities.

Let me introduce myself. I am a recent PhD in theoretical high energy physics (phenomenology) under the supervision of profs. A.Dobado and F.J. Llanes-Estrada (UCM). I am focused on the study of the phenomenology associated with a hypothetical electroweak symmetry breaking sector (EWSBS) with strong interactions. That is, a QCD-like theory (composite Higgs?) for the new physics that may describe the EWSBS at the TeV scale, which is being tested at the LHC.

What makes the difference is that I am not specifying a particular model, that is, a particular UV completion. Instead, non-linear effective field theories (EFTs) at the Next to Leading order (NLO), and dispersion relations (unitarization procedures) are used to parametrize the dynamics of the EWSBS constituents. This has several advantages. For instance, it only contains a few parameters. Seven in the case of scattering inside the EWSBS itself ($W_{L\pm}$, Z_L and h). A few more if couplings with $\gamma\gamma$ and $t\bar{t}$ states are also considered. And, even more, the masses and widths of the resonances emerge as a consequence of the low-energy behaviour of the theory: they are not free parameters of the model.

In fact, this approach is used by several groups, as a way to parametrize slight deviations from the SM in the 0.5TeV scale, most of them still assuming a weakly interacting regime. For instance, see the works from O.Catà, G.Buchalla, R. Alonso, M.B.Gavela, L.Merlo, R.Contino, C.Grojean, C.Krause,... You could also refer to the CERN's LHCHSWG - YELLOW REPORT 4 [<https://cds.cern.ch/record/2215893>], which summarizes the state-of-the-art of EFTs applied to the EWSBS, and points out the huge interest in this field due to its direct application to the LHC phenomenology.

My study extends the validity of the EFTs by using the analytical properties (dispersion relations) of the S-matrix, by means of the so-called unitarization procedures. This approach has been used successfully for the low-energy regime of QCD. See, for instance, [PRD56 (1997) 3057-3073].

As part of my research, I have implemented the EFTs in FeynRules-FeynArts-FormCalc, and used Mathematica (both with the mentioned packages and alone). For implementing the unitarization procedures, I have used both Mathematica and Fortran. And some Python modules (f2py, matplotlib, mayavi, scipy, multiprocessing,...) for drawing plots from the Fortran code. Indeed, I emphasize my experience with computing and super-computing (Mathematica, Fortran, C++, FeynRules-FeynArts-FormCalc, Python, MadGraph, Pythia,...). Some of my experience was acquired one year ago in the Max Planck Institute für Physik (Munich), under the supervision of prof. Thomas Hahn. It is also interesting the usage of the Cauchy's theorem



with numerical complex integration in order to look for poles of the scattering amplitude on the complex plane (“resonances”). The details of the implementation of this idea can be found on [PRD91 (2015) 075017].

A natural continuation of this work would be implementing the unitarized scattering matrices in Monte Carlo programs, for using them as an input for the experimentalists. In fact, we are now dealing with this in collaboration with the “Universidad Autónoma de Madrid” and the “Universitat de Barcelona”. I have some experience with Monte Carlo programs like MadGraph and Pythia, since I used them for a collaboration about the accelerators phenomenology of Kaluza-Klein (extra-dimensional).

**Current professional situation****Employing entity:** Universidad Complutense de Madrid**Department:** Departamento de Física Teórica I, Facultad de Ciencias Físicas**Professional category:** Contract under the FPI program / Contratado con cargo a Programa FPI**City employing entity:** Madrid, Community of Madrid, Spain**Phone:** (34) 91394 - 5016**Email:** rdelgadol@ucm.es**Start date:** 01/12/2014**Type of contract:** Temporary employment contract**Dedication regime:** Full time**Previous positions and activities**

	Employing entity	Professional category	Start date
1	Ministerio de Economía y Competitividad	FPI grant / becario FPI	01/12/2012
2	Consejo Superior de Investigaciones Científicas	Beca JAE-Intro de Introducción a la Investigación	27/06/2012

1 **Employing entity:** Ministerio de Economía y Competitividad **Type of entity:** MINECO**Department:** Departamento de Física Teórica I (UCM), Facultad de Ciencias Físicas**City employing entity:** Madrid, Community of Madrid, Spain**Professional category:** FPI grant / becario FPI**Phone:** (34) 91394 - 5016**Start-End date:** 01/12/2012 - 30/11/2014**Duration:** 2 years**Type of contract:** Grant-assisted student (pre or post-doctoral, others)**Dedication regime:** Full time**2** **Employing entity:** Consejo Superior de Investigaciones Científicas **Type of entity:** State agency**Department:** Instituto de Física Teórica**Professional category:** Beca JAE-Intro de Introducción a la Investigación**Start-End date:** 27/06/2012 - 30/09/2011**Duration:** 2 months**Type of contract:** Grant-assisted student (pre or post-doctoral, others)**Dedication regime:** Full time



Education

University education

1st and 2nd cycle studies and pre-Bologna degrees

University degree: Higher degree

Name of qualification: Licenciado en Ciencias Físicas

Degree awarding entity: Universidad Complutense **Type of entity:** University de Madrid

Date of qualification: 30/06/2012

Average mark: Outstanding

Prize: Special award for degree

Doctorates

Doctorate programme: Programa Oficial de Doctorado en Física

Degree awarding entity: Universidad Complutense **Type of entity:** University de Madrid

City degree awarding entity: Madrid, Community of Madrid, Spain

Date of degree: 09/06/2016

European doctorate: Yes

Date of certificate: 09/06/2016

Thesis title: Study of the Electroweak Symmetry Breaking Sector // Estudio del Sector de Ruptura de Simetría Electro débil para el LHC

Thesis co-director: Antonio Dobado González; Felipe José Llanes Estrada

Obtained qualification: Sobresaliente "Cum Laude"

Recognition of quality: Yes

Other postgraduate university studies

Type of education: Masters

Postgraduate qualification: Máster en física fundamental

City degree awarding entity: Madrid, Community of Madrid, Spain

Degree awarding entity: Universidad Complutense **Type of entity:** University de Madrid

Faculty, institute or centre: Facultad de Ciencias Físicas

Date of qualification: 30/06/2013

Obtained qualification: 9.87



Specialised, lifelong, technical, professional and refresher training (other than formal academic and healthcare studies)

- 1** **Type of training:** Course
Training title: Tutorial on Monte Carlo Tools for Colliders
City awarding entity: Cantoblanco, Community of Madrid, Spain
Awarding entity: Instituto de Física Teórica **Type of entity:** State agency
End date: 10/09/2015 **Duration in hours:** 12 hours
- 2** **Type of training:** Course
Training title: 2015 International Summer Workshop on Reaction Theory
City awarding entity: Bloomington, IN, United States of America
Awarding entity: Indiana University **Type of entity:** University
End date: 19/06/2015 **Duration in hours:** 76 hours
- 3** **Type of training:** Course
Training title: Training program of the 2nd BSC International Doctoral Symposium
Awarding entity: Centro Nacional de Supercomputación **Type of entity:** R&D Centre
End date: 06/05/2015 **Duration in hours:** 8 hours
- 4** **Type of training:** Course
Training title: Terascale Monte Carlo School 2014
City awarding entity: Hamburgo, Hamburg, Germany
Awarding entity: DESY **Type of entity:** R&D Centre
End date: 14/03/2014 **Duration in hours:** 24 hours
- 5** **Type of training:** Workshop
Training title: XLII International Meeting on Fundamental Physics
City awarding entity: Benasque, Aragon, Spain
Awarding entity: FUNDACION CENTRO DE CIENCIAS DE BENASQUE
Aims of the entity: Conocimiento del "estado del arte" en el campo de Altas Energías
End date: 01/02/2014 **Duration in hours:** 30 hours
- 6** **Type of training:** Conferencia
Training title: CONFERENCIA: Avances en las Matemáticas Computacionales y su influencia en otras ciencias
City awarding entity: Madrid, Community of Madrid, Spain
Awarding entity: ADDLINK SOFTWARE CIENTIFICO, S.L.
Aims of the entity: Manejo del programa de cálculo simbólico y numérico Mathematica
End date: 11/11/2013 **Duration in hours:** 6 hours
- 7** **Type of training:** Workshop
Training title: II Postgraduate Meeting on Theoretical Physics
Awarding entity: Instituto de Física Teórica **Type of entity:** State agency
Aims of the entity: Formación orientada a Física de Altas Energías
End date: 11/10/2013 **Duration in hours:** 20 hours
- 8** **Type of training:** Course
Training title: TALLER DE ALTAS ENERGIAS 2013 (TAE 2013)
City awarding entity: Benasque, Aragon, Spain

**Awarding entity:** FUNDACION CENTRO DE CIENCIAS DE BENASQUE**End date:** 28/09/2013**Duration in hours:** 71 hours**9 Training title:** Simposio Internacional: "El legado de Alan Turing"**Awarding entity:** Fundación Ramón Areces**Type of entity:** Foundation**Aims of the entity:** Complemento de la asignatura "Información Cuántica y Computación Cuántica" del "Máster en Física Fundamental"**End date:** 24/11/2012**Duration in hours:** 12 hours**10 Type of training:** Course**Training title:** TALLER DE ALTAS ENERGIAS COMPLUTENSE 2012 (TAE 2012)**City awarding entity:** Madrid, Community of Madrid, Spain**Awarding entity:** Universidad Complutense de Madrid**Type of entity:** University**End date:** 27/07/2012**Duration in hours:** 70 hours**11 Type of training:** Course**Training title:** Desarrollos instrumentales en Radioastronomía**Awarding entity:** Universidad Nacional de Educación a Distancia**Type of entity:** University**End date:** 06/07/2012**Duration in hours:** 20 hours**12 Type of training:** Simposio**Training title:** Symposium Quantum and Optical Dynamics in Transport Phenomena**Awarding entity:** Centro de Física Miguel Antonio Catalán**Type of entity:** State agency**Aims of the entity:** Parte del progr. colab. con el prof. Fernando Sols (publicación en PRD y Trabajo Fin de Máster)**End date:** 29/06/2012**Duration in hours:** 6 hours**13 Type of training:** Course**Training title:** Astronomía popular y recreativa: taller manual, audiovisual, informático y radiofónico**Awarding entity:** Universidad de Alcalá**Type of entity:** University**Training manager:** Javier Bussons Gordo**End date:** 22/07/2011**Duration in hours:** 23 hours**14 Type of training:** Course**Training title:** Astropartículas: ¿de qué está hecho el universo?**Awarding entity:** Universidad de Alcalá**Type of entity:** University**Training manager:** Javier Bussons Gordo**End date:** 30/07/2010**Duration in hours:** 25 hours

Language skills

Language	Listening skills	Reading skills	Spoken interaction	Speaking skills	Writing skills
English	B2	C1	B2	B2	B2



Teaching experience

General teaching experience

- 1** **Type of teaching:** Official teaching
Name of the course: Cálculo
Type of teaching: Practical work (classroom-problems)
Type of subject: Obligatory
University degree: Grado en Física
Start date: 01/02/2016 **End date:** 01/06/2016
Type of hours/ ECTS credits: Hours
Hours/ECTS credits: 5
Entity: Universidad Complutense de Madrid **Type of entity:** University
Faculty, institute or centre: Facultad de Ciencias Físicas
Department: Física Teórica I
- 2** **Type of teaching:** Official teaching
Name of the course: Física de los Procesos Biológicos
Type of teaching: Practical work (classroom-problems)
Type of subject: Obligatory
University degree: Grado en Biología
Start date: 01/02/2016 **End date:** 01/06/2016
Type of hours/ ECTS credits: Hours
Hours/ECTS credits: 15
Entity: Universidad Complutense de Madrid **Type of entity:** University
Faculty, institute or centre: Facultad de Ciencias Biológicas
Department: Física Teórica I
- 3** **Type of teaching:** Official teaching
Name of the course: Física Cuántica I
Type of teaching: Practical work (classroom-problems)
Type of subject: Obligatory
University degree: Grado en Física
Start date: 01/02/2015 **End date:** 01/06/2015
Type of hours/ ECTS credits: Hours
Hours/ECTS credits: 10
Entity: Universidad Complutense de Madrid **Type of entity:** University
Faculty, institute or centre: Facultad de Ciencias Físicas
Department: Física Teórica I
- 4** **Type of teaching:** Official teaching
Name of the course: Cálculo
Type of teaching: Practical work (classroom-problems)
Type of subject: Obligatory
University degree: Grado en Física
Start date: 01/02/2014 **End date:** 01/06/2014
Type of hours/ ECTS credits: Hours



Hours/ECTS credits: 15

Entity: Universidad Complutense de Madrid

Type of entity: University

Faculty, institute or centre: Facultad de Ciencias Físicas

Department: Física Teórica I

5 Type of teaching: Official teaching

Name of the course: Física Cuántica I

Type of teaching: Practical work (classroom-problems)

Type of subject: Obligatory

University degree: Grado en Física

Start date: 01/02/2014

End date: 01/06/2014

Type of hours/ ECTS credits: Hours

Hours/ECTS credits: 10

Entity: Universidad Complutense de Madrid

Type of entity: University

Faculty, institute or centre: Facultad de Ciencias Físicas

Department: Física Teórica I

6 Type of teaching: Official teaching

Name of the course: Física de los Procesos Biológicos

Type of teaching: Practical work (classroom-problems)

Type of subject: Obligatory

University degree: Grado en Biología

Start date: 01/02/2014

End date: 01/06/2014

Type of hours/ ECTS credits: Hours

Hours/ECTS credits: 9

Entity: Universidad Complutense de Madrid

Type of entity: University

Faculty, institute or centre: Facultad de Ciencias Biológicas

Department: Física Teórica I

7 Type of teaching: Official teaching

Name of the course: Laboratorio Computacional de Física Nuclear y de Partículas

Type of teaching: Laboratory work

Type of subject: Core

University degree: Licenciatura en Ciencias Físicas

Start date: 01/10/2013

End date: 01/02/2014

Type of hours/ ECTS credits: Hours

Hours/ECTS credits: 5

Entity: Universidad Complutense de Madrid

Type of entity: University

Faculty, institute or centre: Facultad de Ciencias Físicas

Department: Física Teórica I

Participation in innovative teaching projects

Project title: LHC@COMPLUTENSE

Type of participation: Team member

Name of the main researcher: Felipe José Llanes Estrada

Funding entity: Universidad Complutense de Madrid **Type of entity:** University

Start-End date: 01/09/2014 - 01/09/2016



Scientific and technological experience

Scientific or technological activities

R&D projects funded through competitive calls of public or private entities

- 1** **Name of the project:** Teorías Efectivas en Física de Partículas y Cosmología
Entity where project took place: Universidad Complutense de Madrid **Type of entity:** University
City of entity: Madrid, Community of Madrid, Spain
Name principal investigator (PI, Co-PI....): Antonio Dobado González; Felipe J. Llanes-Estrada
Funding entity or bodies: Ministerio de Economía y Competitividad **Type of entity:** MINECO
Name of the programme: Proyectos de I+D de Excelencia 2014
Code according to the funding entity: FPA2014-53375-C2-1-P
Start-End date: 01/01/2014 - 31/12/2016 **Duration:** 2 years
Total amount: 61.710 €
Dedication regime: Full time
- 2** **Name of the project:** Teorías Efectivas en Física Moderna
Entity where project took place: Universidad Complutense de Madrid **Type of entity:** University
City of entity: Madrid, Community of Madrid, Spain
Funding entity or bodies: Universidad Complutense de Madrid **Type of entity:** University
City funding entity: Madrid, Community of Madrid, Spain
Code according to the funding entity: UCM:910309
Start-End date: 01/12/2012 - 01/12/2016
- 3** **Name of the project:** Teorías Efectivas en Física de Partículas y Cosmología
Entity where project took place: Universidad Complutense de Madrid **Type of entity:** University
City of entity: Madrid, Community of Madrid, Spain
Name principal investigator (PI, Co-PI....): Antonio Dobado González
Funding entity or bodies: Ministerio de Economía y Competitividad **Type of entity:** MINECO
Name of the programme: Proyectos de Investigación Fundamental No Orientada
Code according to the funding entity: FPA2011-27853-C02-01
Start-End date: 01/12/2012 - 31/12/2014
Total amount: 60.000 €
Dedication regime: Full time



Scientific and technological activities

Scientific production

Publications, scientific and technical documents

- 1 Rafael L. Delgado; Antonio Dobado; Felipe J. Llanes-Estrada. Coupling WW, ZZ unitarized amplitudes to $\gamma\gamma$ in the TeV region. arXiv:1609.06206 [hep-ph]. [SENT TO JOURNAL], 2016. Available on-line at: <<http://arxiv.org/abs/arXiv:1609.06206>>.

Type of production: Scientific paper **Format:** Journal
- 2 Andrés Castillo; Rafael L. Delgado; Antonio Dobado; Felipe J. Llanes-Estrada. Top-antitop production from $W_L^+ W_L^-$ and $Z_L Z_L$ scattering under a strongly-interacting symmetry-breaking sector. arXiv:1607.01158 [hep-ph]. [SENT TO JOURNAL], 2016. Available on-line at: <<http://arxiv.org/abs/arXiv:1607.01158>>.

Type of production: Scientific paper **Format:** Journal
- 3 Delgado, Rafael L.; Dobado, Antonio; Llanes-Estrada, Felipe J. Possible New Resonance from WLWL-hh Interchannel Coupling. PHYSICAL REVIEW LETTERS. 114 - 22, AMER PHYSICAL SOC, 04/06/2015. ISSN 0031-9007, ISSN 1079-7114

Type of production: Scientific paper **Format:** Journal

Impact source: ISI **Category:** Science Edition - PHYSICS, MULTIDISCIPLINARY

Impact index in year of publication: 7.645 **Journal in the top 25%:** Yes

Position of publication: 6 **No. of journals in the cat.:** 79

Source of citations: WOS **Citations:** 4
- 4 Delgado, Rafael L.; Dobado, Antonio; Llanes-Estrada, Felipe J. Unitarity, analyticity, dispersion relations, and resonances in strongly interacting WLWL, Z(L)Z(L), and hh scattering. PHYSICAL REVIEW D. 91 - 7, AMER PHYSICAL SOC, 27/04/2015. ISSN 2470-0010, ISSN 2470-0029

Type of production: Scientific paper **Format:** Journal

Impact source: ISI **Category:** Science Edition - ASTRONOMY & ASTROPHYSICS

Impact index in year of publication: 4.506 **Journal in the top 25%:** No

Position of publication: 16 **No. of journals in the cat.:** 62

Impact source: ISI **Category:** Science Edition - PHYSICS, PARTICLES & FIELDS

Impact index in year of publication: 4.506 **Journal in the top 25%:** No

Position of publication: 8 **No. of journals in the cat.:** 28

Source of citations: WOS **Citations:** 6
- 5 Delgado, R. L.; Dobado, A.; Herrero, M. J.; Sanz-Cillero, J. J. One-loop $\gamma\gamma \rightarrow W-L(+) W-L(-)$ and $\gamma\gamma \rightarrow Z(L)Z(L)$ from the Electroweak Chiral Lagrangian with a light Higgs-like scalar. JOURNAL OF HIGH ENERGY PHYSICS. 7, SPRINGER, 29/07/2014. ISSN 1029-8479

Type of production: Scientific paper **Format:** Journal

Impact source: ISI

**Impact index in year of publication:** 6.111**Position of publication:** 3**Source of citations:** WOS**Category:** Science Edition - PHYSICS, PARTICLES & FIELDS**Journal in the top 25%:** Yes**No. of journals in the cat.:** 27**Citations:** 4

- 6** Delgado, Rafael L.; Dobado, Antonio; Llanes-Estrada, Felipe J. One-loop WLWL and Z(L)Z(L) scattering from the electroweak Chiral Lagrangian with a light Higgs-like scalar. JOURNAL OF HIGH ENERGY PHYSICS. 2, SPRINGER, 27/02/2014. ISSN 1029-8479

Type of production: Scientific paper**Impact source:** ISI**Impact index in year of publication:** 6.111**Position of publication:** 3**Source of citations:** WOS**Format:** Journal**Category:** Science Edition - PHYSICS, PARTICLES & FIELDS**Journal in the top 25%:** Yes**No. of journals in the cat.:** 27**Citations:** 11

- 7** Delgado, Rafael L.; Dobado, Antonio; Llanes-Estrada, Felipe J. Light 'Higgs', yet strong interactions. JOURNAL OF PHYSICS G-NUCLEAR AND PARTICLE PHYSICS. 41 - 2, IOP PUBLISHING LTD, 01/02/2014. ISSN 0954-3899

Type of production: Scientific paper**Impact source:** ISI**Impact index in year of publication:** 2.777**Position of publication:** 11**Impact source:** ISI**Impact index in year of publication:** 2.777**Position of publication:** 7**Source of citations:** WOS**Format:** Journal**Category:** Science Edition - PHYSICS, PARTICLES & FIELDS**Journal in the top 25%:** No**No. of journals in the cat.:** 27**Category:** Science Edition - PHYSICS, NUCLEAR**Journal in the top 25%:** No**No. of journals in the cat.:** 21**Citations:** 13**Relevant results:** Seleccionado en los 'Highlights of 2014' de la revista, y gráfica de portada.

- 8** Delgado, R. L.; Hidalgo-Duque, Carlos; Llanes-Estrada, Felipe J. To What Extent is Gluon Confinement an Empirical Fact?. FEW-BODY SYSTEMS. 54 - 11, pp. 1705 - 1717. SPRINGER WIEN, 01/11/2013. ISSN 0177-7963

Type of production: Scientific paper**Impact source:** ISI**Impact index in year of publication:** 1.508**Position of publication:** 30**Source of citations:** WOS**Format:** Journal**Category:** Science Edition - PHYSICS, MULTIDISCIPLINARY**Journal in the top 25%:** No**No. of journals in the cat.:** 78**Citations:** 1

- 9** Cembranos, Jose A. R.; Delgado, Rafael L.; Dobado, Antonio. Brane worlds at the LHC: Branons and KK gravitons. PHYSICAL REVIEW D. 88 - 7, AMER PHYSICAL SOC, 29/10/2013. ISSN 1550-2368, ISSN 1550-7998

Type of production: Scientific paper**Impact source:** ISI**Impact index in year of publication:** 4.864**Position of publication:** 12**Format:** Journal**Category:** Science Edition - ASTRONOMY & ASTROPHYSICS**Journal in the top 25%:** Yes**No. of journals in the cat.:** 59

Impact source: ISI**Impact index in year of publication:** 4.864**Position of publication:** 6**Source of citations:** WOS**Category:** Science Edition - PHYSICS, PARTICLES & FIELDS**Journal in the top 25%:** Yes**No. of journals in the cat.:** 27**Citations:** 15

- 10** Delgado, R. L.; Bargueno, P.; Sols, F. Two-step condensation of the charged Bose gas. PHYSICAL REVIEW E. 86 - 3, AMER PHYSICAL SOC, 04/09/2012. ISSN 1539-3755

Type of production: Scientific paper**Impact source:** ISI**Impact index in year of publication:** 2.313**Position of publication:** 10**Impact source:** ISI**Impact index in year of publication:** 2.313**Position of publication:** 6**Source of citations:** WOS**Format:** Journal**Category:** Science Edition - PHYSICS, FLUIDS & PLASMAS**Journal in the top 25%:** No**No. of journals in the cat.:** 31**Category:** Science Edition - PHYSICS, MATHEMATICAL**Journal in the top 25%:** Yes**No. of journals in the cat.:** 55**Citations:** 0

- 11** Handbook of LHC Higgs cross sections: 4. Deciphering the nature of the Higgs sector. Working Group 2 Nonlinear EFT. Geneva(Switzerland): CERN, 10/2016. Available on-line at: <<https://cds.cern.ch/record/2215893>>.

Type of production: Book chapter**Corresponding author:** No**Format:** Book

- 12** Rafael L. Delgado; Antonio Dobado; Felipe J. Llanes-Estrada. A Strongly Interacting Electroweak Symmetry Breaking Sector with a Higgs-like light scalar. AIP Conf. Proc.1701, pp. 090003 - 090003. 2016.

Type of production: Proceedings**Format:** Journal

- 13** R. L. Delgado; A. Dobado; M. J. Herrero; J. J. Sanz-Cillero. Electroweak chiral Lagrangian with a light Higgs and $\gamma\gamma \rightarrow Z_L Z_L, W_L W_L + W_L W_L - \gamma$ scattering at one loop. Nucl. Part. Phys. Proc.273-275, pp. 703 - 709. 2016.

Type of production: Proceedings**Format:** Journal

- 14** Rafael L. Delgado; Antonio Dobado; Felipe J. Llanes-Estrada. Strongly interacting $W_L W_L, Z_L Z_L$ and hh from unitarized one-loop computations. Nucl. Part. Phys. Proc.273-275, pp. 2436 - 2438. 2016.

Type of production: Proceedings**Format:** Journal

- 15** Antonio Dobado González; Rafael Delgado López; Felipe José Llanes Estrada; Domenec Espriu. Comparing mesons and WLWL TeV-resonances. arXiv:1510.03761. 14/10/2015.

Type of production: Proceedings**Corresponding author:** No

- 16** Antonio Dobado González; Rafael Delgado López; Felipe José Llanes Estrada. Resonances in WLWL, ZLZL and hh scattering from dispersive analysis of the non-linear Electroweak+Higgs Effective Theory. arXiv:1509.04725 [hep-ph]. 15/09/2015.

Type of production: Proceedings**Corresponding author:** No



- 17** Felipe José Llanes Estrada; Antonio Dobado González; Rafael Delgado López. Describing 2-TeV scale WLWL resonances with Unitarized Effective Theory. arXiv:1509.00441 [hep-ph]. 01/09/2015.
Type of production: Proceedings **Format:** Journal
Corresponding author: No
- 18** Antonio Dobado; Rafael L. Delgado; Felipe J. Llanes-Estrada. Resonances in W_{LW_L}, Z_{LZ_L} and hh scattering from dispersive analysis of the non-linear Electroweak+Higgs Effective Theory. PoS. EPS-HEP2015, pp. 173 - 173. 2015.
Type of production: Proceedings **Format:** Journal
- 19** Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Juan José Sanz Cillero. Electroweak chiral Lagrangians and $\gamma\gamma \rightarrow Z_L Z_L, W_L^+ W_L^-$ at One Loop. arXiv:1409.3983 [hep-ph]. 13/09/2014. Available on-line at: <<https://arxiv.org/abs/1409.3983>>.
Type of production: Proceedings
- 20** Antonio Dobado; Rafael L. Delgado; Felipe J. Llanes-Estrada. Strongly Interacting Electroweak Symmetry Breaking Sector with a Higgs-like light scalar. AIP Conf. Proc.1606, pp. 151 - 158. 2014.
Type of production: Proceedings **Format:** Journal

Works submitted to national or international conferences

- 1** **Title of the work:** Coupling of tt with a strongly interacting EWSBS
Name of the conference: XII Quark Confinement and the Hadron Spectrum
Type of event: Conference
Type of participation: Participatory - poster
Corresponding author: Yes
City of event: Thessaloniki, Kentriki Makedonia, Greece
Date of event: 28/08/2016
End date: 05/09/2016
 Rafael Delgado López; Andrés Fernando Castillo Ramírez; Antonio Dobado González; Felipe José Llanes Estrada.
- 2** **Title of the work:** Strongly Interacting EWSBS resonances in the diphoton channel
Name of the conference: XII Quark Confinement and the Hadron Spectrum
Type of event: Conference
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Thessaloniki, Kentriki Makedonia, Greece
Date of event: 28/08/2016
End date: 05/09/2016
 Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.
- 3** **Title of the work:** Effective Field Theories for studying a strongly interacting EWSBS at the TeV scale
Name of the conference: Seminar at the MPI
Type of event: Seminar
Corresponding author: Yes
City of event: Munich, Oberbayern, Germany
Date of event: 11/12/2015
Organising entity: Max-Planck-Institut für Physik **Type of entity:** R&D Centre
City organizing entity: Munich, Oberbayern, Germany
 Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.

- 4** **Title of the work:** Resonances at the TeV: Higgs-like boson, but a strongly interacting EWSBS
Name of the conference: VII CPAN Days
Type of event: Workshop
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Segovia, Castile and León, Spain
Date of event: 01/12/2015
End date: 03/12/2015
Organising entity: Centro Nacional de Física de Partículas, Astropartículas y Nuclear
Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.
- 5** **Title of the work:** Non-linear Electroweak Chiral Lagrangians at the TeV scale
Name of the conference: Seminar at the LMU
Type of event: Seminar
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Munich, Oberbayern, Germany
Date of event: 21/10/2015
Organising entity: Ludwig-Maximilians-Universität **Type of entity:** University
City organizing entity: Munich, Oberbayern, Germany
Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.
- 6** **Title of the work:** Unitarization and parameter space of the One-loop WLWL and ZLZL scattering from the Electroweak Chiral Lagrangian
Name of the conference: XXXV Reunión Bienal de la Real Sociedad Española de Física
Type of event: Conference
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Gijón, Principality of Asturias, Spain
Date of event: 13/07/2015
End date: 17/07/2015
Organising entity: REAL SOCIEDAD ESPAÑOLA DE FISICA
Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.
- 7** **Title of the work:** Unitarization Procedures applied to a Strongly Interacting EWSBS
Name of the conference: 2015 International Summer Workshop on Reaction Theory
Type of event: Summer Workshop **Geographical area:** Non EU International
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Bloomington, IN, United States of America
Date of event: 08/06/2015
End date: 19/06/2015
Organising entity: Indiana University **Type of entity:** University
City organizing entity: Bloomington, IN, United States of America
Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Felipe José Llanes Estrada;
Juan José Sanz Cillero.
- 8** **Title of the work:** How internet runs, a network of networks
Name of the conference: Seminarios "Transversal Seminars"
Type of event: Seminar



Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Madrid, Community of Madrid, Spain

Date of event: 24/05/2015

Organising entity: Universidad Complutense de Madrid

Type of entity: University

Rafael Delgado López.

9 Title of the work: Supercomputing simulations for Beyond Standard Model theories at the TeV scale: non-standard gravity and electroweak interactions

Name of the conference: 2nd BSC International Doctoral Symposium

Type of event: Workshop

Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Barcelona, Catalonia, Spain

Date of event: 05/05/2015

End date: 07/05/2015

Organising entity: Centro Nacional de Supercomputación

Type of entity: R&D Centre

Rafael Delgado López; José Alberto Ruiz Cembranos; Antonio Dobado González; Felipe José Llanes Estrada.

10 Title of the work: Light Higgs-like scalar, but strong interactions. It is possible?

Name of the conference: Jornadas de Doctorandos 2015

Type of event: Workshop

Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Madrid, Community of Madrid, Spain

Date of event: 23/04/2015

End date: 25/04/2015

Organising entity: Universidad Complutense de Madrid

Type of entity: University

Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Juan José Sanz Cillero.

11 Title of the work: A light Higgs in a Strongly Interacting Electroweak Symmetry Breaking Sector

Name of the conference: Seminarios "Transversal Seminars"

Type of event: Seminar

Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Madrid, Community of Madrid, Spain

Date of event: 16/01/2015

Organising entity: Universidad Complutense de Madrid

Type of entity: University

Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Juan José Sanz Cillero.

12 Title of the work: A light Higgs in a strongly interacting electroweak symmetry breaking sector

Name of the conference: NExT Meeting at Sussex

Type of event: Workshop

Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Sussex, Surrey, East and West Sussex, United Kingdom



Date of event: 19/11/2014

Organising entity: University of Sussex

Type of entity: University

City organizing entity: Falmer, Surrey, East and West Sussex, United Kingdom

Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Felipe José Llanes Estrada; Juan José Sanz Cillero.

13 Title of the work: BSM, the case of a Strongly Interacting Electroweak Symmetry Breaking Sector

Name of the conference: VI CPAN Days

Type of event: Workshop

Type of participation: Participatory - oral communication

City of event: Sevilla, Andalusia, Spain

Date of event: 20/10/2014

End date: 22/10/2014

Organising entity: EWSBS Centro Nacional de Física de Partículas, Astropartículas y Nuclear

Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.

14 Title of the work: A light Higgs in a strongly interacting electroweak symmetry breaking sector

Name of the conference: Seminar at the SHEP group

Type of event: Seminar

Type of participation: Participatory - oral communication

Corresponding author: Yes

City of event: Southampton, Hampshire and Isle of Wight, United Kingdom

Date of event: 16/10/2014

End date: 16/10/2014

Organising entity: University of Southampton

Type of entity: University

City organizing entity: Southampton, Hampshire and Isle of Wight, United Kingdom

Rafael Delgado López; Antonio Dobado González; María Jesús Herrero Solans; Felipe José Llanes Estrada; Juan José Sanz Cillero.

15 Title of the work: BSM through a strongly interacting Electroweak Symmetry Breaking Sector

Name of the conference: UK HEP Forum 2014 ("Future Colliders")

Type of event: Conference

Type of participation: Participatory - poster

Corresponding author: Yes

City of event: Abingdon, Oxford, Berkshire, Buckinghamshire and Oxfordshire, United Kingdom

Date of event: 13/10/2014

End date: 14/10/2014

Organising entity: Science and Technology
Facilities Council

Type of entity: State agency

City organizing entity: United Kingdom

Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Felipe José Llanes Estrada; Juan José Sanz Cillero.

16 Title of the work: One-loop computations from the Electroweak Chiral Lagrangian with a light Higgs

Name of the conference: XIth Quark Confinement and the Hadron Spectrum

Type of event: Conference

Type of participation: Participatory - poster

Corresponding author: Yes

City of event: Saint-Petersburg, Russia

Date of event: 08/09/2014

End date: 12/09/2014



Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.

- 17 Title of the work:** Strongly Interacting Electroweak Symmetry Breaking Sector with a Higgs-like light scalar
Name of the conference: XIth Quark Confinement and the Hadron Spectrum
Type of event: Conference
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Saint-Petersburg, Russia
Date of event: 08/09/2014
End date: 12/09/2014
Rafael Delgado López; Antonio Dobado González; María José Herrero Solans; Felipe José Llanes Estrada; Juan José Sanz Cillero.

- 18 Title of the work:** One-loop computations from the Electroweak Chiral Lagrangian with a light Higgs
Name of the conference: 37th International Conference in High Energy Physics
Type of event: Conference **Geographical area:** Non EU International
Type of participation: Participatory - poster
Corresponding author: Yes
City of event: Valencia, Valencian Community, Spain
Date of event: 02/07/2014
End date: 09/07/2014
Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.

- 19 Title of the work:** Graviton and Branon search at the LHC
Name of the conference: V CPAN Days
Type of event: Workshop
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Santiago de Compostela, Galicia, Spain
Date of event: 25/11/2013
End date: 27/11/2013
Organising entity: Centro Nacional de Física de Partículas, Astropartículas y Nuclear
Rafael Delgado López; José Alberto Ruiz Cembranos; Antonio Dobado González.

- 20 Title of the work:** Light Higgs, still strong interactions
Name of the conference: V CPAN Days
Type of event: Workshop
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Santiago de Compostela, Galicia, Spain
Date of event: 25/11/2013
End date: 27/11/2013
Organising entity: Centro Nacional de Física de Partículas, Astropartículas y Nuclear
Rafael Delgado López; Antonio Dobado González; Felipe José Llanes Estrada.

- 21 Title of the work:** Monte Carlo simulations for extra dimensional models at the LHC
Name of the conference: Taller de Altas Energías 2013
City of event: Benasque, Aragon, Spain
Date of event: 15/09/2013
End date: 28/09/2013
Rafael Delgado López; José Alberto Ruiz Cembranos; Antonio Dobado González.



- 22** **Title of the work:** Monte Carlo simulations for extra dimensional models at the LHC
Name of the conference: XXXIV Reunión Biental de la Real Sociedad Española de Física
Type of event: Conference
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Valencia, Valencian Community, Spain
Date of event: 15/07/2013
End date: 19/07/2013
Organising entity: REAL SOCIEDAD ESPAÑOLA DE FISICA
 Rafael Delgado López; José Alberto Ruiz Cembranos; Antonio Dobado González.
- 23** **Title of the work:** Multistep condensation
Name of the conference: V Encuentro Gases cuánticos en Madrid
Type of event: Conference
Type of participation: Participatory - oral communication
Corresponding author: Yes
City of event: Madrid, Community of Madrid, Spain
Date of event: 14/01/2013
Organising entity: Centro de Física Miguel Antonio **Type of entity:** State agency
 Catalán
 Rafael Delgado López; Pedro Bargeño de Retes; Fernando Sols Lucia.
- 24** **Title of the work:** Multistep condensation
Name of the conference: V Jornadas de Jóvenes Investigadores en Física Atómica y Molecular
Type of event: Workshop
Type of participation: Participatory - oral communication
Corresponding author: Yes
Date of event: 14/01/2013
Organising entity: Universidad Complutense de Madrid **Type of entity:** University
 Rafael Delgado López; Pedro Bargeño de Retes; Fernando Sols Lucia.

Other achievements

Stays in public or private R&D centres

- 1** **Entity:** SLAC-National Accelerator Laboratory **Type of entity:** R&D Centre
City of entity: Merlo Park, California, United States of America
Start-End date: 01/11/2016 - 01/11/2016 **Duration:** 1 month
Goals of the stay: Guest
Provable tasks: Colaboración prof. S.Brodsky
- 2** **Entity:** Max Planck Society **Type of entity:** State agency
Faculty, institute or centre: Max Planck Institut für Physik in München
City of entity: Munich, Oberbayern, Germany
Start-End date: 15/09/2015 - 15/12/2015 **Duration:** 3 months
Goals of the stay: Guest
Provable tasks: Colaboración prof. Thomas Hahn



- 3** **Entity:** University of Southampton **Type of entity:** University
Faculty, institute or centre: Schools of Physics and Astronomy
City of entity: Southampton, Hampshire and Isle of Wight, United Kingdom
Start-End date: 26/06/2015 - 02/07/2015 **Duration:** 8 days
Goals of the stay: Guest
Provable tasks: Colaboración prof. Stefano Moretti
- 4** **Entity:** University of Southampton **Type of entity:** University
Faculty, institute or centre: School of Physics and Astronomy
City of entity: Southampton, Hampshire and Isle of Wight, United Kingdom
Start-End date: 15/09/2014 - 15/12/2014 **Duration:** 3 months
Goals of the stay: Guest
Provable tasks: Colaboración prof. Stefano Moretti

Obtained grants and scholarships

- 1** **Name of the grant:** Beca FPI de Formación de Personal Investigador
Aims: Pre-doctoral
Awarding entity: Ministerio de Economía y Competitividad **Type of entity:** MINECO
Conferral date: 28/11/2012 **Duration:** 4 years
End date: 01/12/2016
Entity where activity was carried out: Universidad Complutense de Madrid
Faculty, institute or centre: Facultad de Ciencias Físicas
- 2** **Name of the grant:** Beca de Excelencia de la CAM: obtenida los 5 años de Licenciatura
City awarding entity: Madrid, Community of Madrid, Spain
Aims: Pre-doctoral
Awarding entity: Comunidad de Madrid **Type of entity:** Consejería de Educación
Amount of the grant: 22.500 €
Conferral date: 01/06/2007 **Duration:** 5 years
End date: 01/06/2012
Entity where activity was carried out: Universidad Complutense de Madrid
Faculty, institute or centre: Facultad de Ciencias Físicas
- 3** **Name of the grant:** Beca JAE-Intro de Introducción a la Investigación
Aims: Pre-doctoral
Awarding entity: Consejo Superior de Investigaciones Científicas **Type of entity:** State agency
Conferral date: 22/03/2011 **Duration:** 2 months
End date: 30/09/2011
Entity where activity was carried out: Consejo Superior de Investigaciones Científicas
Faculty, institute or centre: Instituto de Física Teórica
- 4** **Name of the grant:** [RESIGNED, INCOMPATIBILITY / RENUNCIADA, INCOMPATIBILIDAD] IAC Summer Research Grants 2011
Aims: Pre-doctoral
Awarding entity: Instituto de Astrofísica de Canarias **Type of entity:** Public Research Body
Conferral date: 01/03/2011 **Duration:** 2 months



Entity where activity was carried out: Instituto de Astrofísica de Canarias

Scientific societies and professional associations

Name of the society: Real Sociedad Española de Física. Convenio con la APS y la EPS.

City: Spain

Start date: 28/10/2011

Prizes, mentions and distinctions

- 1** **Description:** "2014 Highlights" and journal cover
Awarding entity: Journal of Physics G: Nuclear and Particle Physics
Type of entity: Scientific journal
Conferral date: 04/03/2015
- 2** **Description:** Premio Extraordinario de Licenciatura
Awarding entity: Universidad Complutense de Madrid
Type of entity: University
City awarding entity: Madrid, Community of Madrid, Spain
Conferral date: 06/06/2013
- 3** **Description:** Premio Extraordinario de Bachillerato
Awarding entity: Junta de Comunidades de Castilla - La Mancha
Type of entity: Consejería de Educación y Ciencia
Conferral date: 25/01/2008