

# CURRICULUM VITÆ

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## GUILLEM DOMÈNECH FUERTES

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**Inspire record:** <https://inspirehep.net/authors/1701362>

**EXECUTIVE SUMMARY:** I am leading an Emmy Noether Research Group at the Institute for Theoretical Physics at the Leibniz University Hannover. My research focuses on gravity and cosmology. I am currently one of the leading experts in the research on the interplay between secondary gravitational waves and primordial black holes. I have 36 published articles with more than 1200 citations in total, with an h-index of 19.

My research topics are:

*General Relativity; Early Universe Physics; Inflation; Modified Gravity; CMB Physics;  
Cosmological Perturbation Theory; Gravitational Waves; Euclidean Gravity; Dark Matter; Dark Energy.*

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### EDUCATION:

- 2014 - 2017 Doctor Course in Cosmology,**  
Yukawa Institute for Theoretical Physics, University of Kyoto, Japan  
Thesis: *Inflationary Cosmology in Scalar-Tensor Theories* [available online]  
Advisor: Prof. Misao Sasaki
  - 2013 - 2014 Research student in Cosmology,**  
Yukawa Institute for Theoretical Physics, University of Kyoto, Japan  
Advisor: Prof. Misao Sasaki
  - 2012 - 2013 Master of Physics in Astrophysics, Particle Physics and Cosmology,**  
University of Barcelona, Spain  
9.6/10 *First Class Honours* | Major: Cosmology and Particle Physics  
Thesis: *Canonical Halo Mass Definition and Universal Halo Mass Function*  
Advisor: Prof. Eduard Salvador-Solé
  - 2008 - 2012 Bachelor in Physics**  
University of Barcelona, Spain  
9.1/10 *First Class Honours* | Major: Particle Physics
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### ACADEMIC POSITIONS:

- 02/2023 - 02/2029 Emmy Noether group leader**  
Institute for Theoretical Physics, Leibniz Universität Hannover, Germany  
Host: Domenico Giulini
  - 10/2022 - 01/2023 Visitor: Secondment Fellini**  
Max Planck Institute for Astrophysics, Garching, Germany  
Host: Eiichiro Komatsu
  - 10/2020 - 01/2023 Marie-Curie Fellini Fellow**  
Istituto Nazionale di Fisica Nucleare, Padova University, Italy  
Host: Sabino Matarrese
  - 10/2017 - 09/2020 Research Associate**  
Institute for Theoretical Physics, Heidelberg University, Germany  
Host: Christof Wetterich
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## SUPERVISION OF GRADUATE STUDENTS:

04/2018 - 03/2019 Co-supervised master student (w/ Javier Rubio): Julius Wons.  
Institute for Theoretical Physics, Heidelberg University, Germany  
Thesis: *Interacting spectator fields in the Primordial Universe* (resulted in [P16]).

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## INSTITUTIONAL RESPONSIBILITIES:

2018 - 2020 Seminar organiser of the cosmology group (Prof: Luca Amendola)  
ITP, Heidelberg University

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## SCIENTIFIC EVALUATION:

2022 - Present Expert evaluator for Agencia Estatal de Investigación (AEI) RyC, Spain.  
2021 - Present Member of the Einstein Telescope Observational Science Board, fundamental physics and cosmology.  
2021 - Present Topic Editor at Universe, MDPI.  
2021 - 2022 Topic Editor at Frontiers in Astronomy and Space Sciences.  
2021 - 2022 Member of evaluation board for Paris Region Fellowship Programme, France.

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## FELLOWSHIPS AND AWARDS:

2022 Emmy Noether Fellowship from the German Research Foundation (DFG).  
2022 Ramon y Cajal Junior Fellowship from the Spanish Ministry of Sciences and Innovation. (Declined)  
2022 Junior Fellowship of Scientific Employment Stimulus  
from the Portuguese Foundation of Sciences and Technology (FCT). (Declined)  
2020 Marie-Curie Fellini Fellow (European Union's Horizon 2020 research and innovation programme  
No.754496) at Istituto Nazionale di Fisica Nucleare.  
2020 Japan Society for the Promotion of Science (JSPS) Postdoctoral Fellowship. (Declined)  
2020 Participant of InvisiblesPlus programme, European Union's Horizon 2020 under the Marie  
Skłodowska-Curie grant agreement No.690575 (one month visit to Berkeley University)  
2019 Balzan Center for Cosmological Studies Program (one month visit to Johns Hopkins University)  
2014 Japanese Government Scholarship (MEXT) for Graduate Students (Doctor course)  
2012 Faculty of Physics Masters Scholarship (Catalunya Caixa)  
2008 Undergraduate degree Scholarship (Caixa Manresa)

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## TEACHING ACTIVITIES:

04/2019 - 07/2019 Tutoring for Advanced Quantum Field Theory (Prof: Christof Wetterich)  
ITP, Heidelberg University, Germany  
10/2018 - 03/2019 Co-coordinator of the Cosmology course (Prof: Luca Amendola)  
ITP, Heidelberg University, Germany  
04/2018 - 07/2018 Co-coordinator of the General Relativity course (Prof: Luca Amendola)  
ITP, Heidelberg University, Germany  
10/2017 - 03/2018 Tutoring for Theoretical Statistical Physics (Prof: Ulrich Schwarz)  
ITP, Heidelberg University, Germany

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## REFEREEING EXPERIENCE:

I have refereed several articles for various leading international journals. In particular, I have been a referee for:

- Journal of Cosmology and Astroparticle Physics
- Physical Reviews D
- Monthly Notices of the Royal Astronomical Society Letters
- European Physics Journal C

- Physics Letters B
- International Journal of Modern Physics D
- Physics of the Dark Universe
- iScience
- Public Library of Science ONE

#### WORKSHOP ORGANIZATION:

- Main organizer of the Fellini international workshop on "Messengers of the very early universe: gravitational waves and primordial black holes" on December 12-14th in Padova.

#### CHAIRING EXPERIENCE:

- Chaired several sessions in Fellini international workshop 2022, December, INFN Padova.
- Chaired inflation session in Gravity and Cosmology 2018, February, YITP, Kyoto University, Japan.

#### OUTREACH ACTIVITIES:

- 09/2021 Outreach talk to the European Researcher's Night, Padova, Italy. Video available at my webpage.
- 02/2020 Outreach talk to bachelor students at University of San Marcos, Lima, Peru.
- 12/2015 Outreach talk in Sunion high-school, Barcelona, Spain.
- 05/2013 Outreach talk in Sunion high-school, Barcelona, Spain.

#### COMPUTATIONAL TOOLS:

- Boltzmann codes: CLASS (basic)
- Monte Carlo codes: MontePython (basic)
- Computer Languages: Python (intermediate) & Fortran (intermediate)
- Scientific Software: Mathematica including xAct (tensor computation), L<sup>A</sup>T<sub>E</sub>X & R

#### LANGUAGES:

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| Spanish: Native | Japanese: Basic |
| Catalan: Native | Italian: Basic  |
| English: Fluent | German: Basic   |

## 10 SELECTED PUBLICATIONS

- [1] "*Conformal Frame Dependence of Inflation*"  
G. Domènech & M. Sasaki,  
arXiv:1501.07699, JCAP 04 (2015) 022.
- [2] "*Cosmological disformal invariance*"  
G. Domènech, A. Naruko & M. Sasaki,  
arXiv:1505.00174, JCAP 04 (2015) 022.
- [3] "*Derivative-dependent metric transformation and physical degrees of freedom*"  
G. Domènech, S. Mukohyama, R. Namba, A. Naruko, R. Saitou & Y. Watanabe,  
arXiv:1507.05390, Phys.Rev.D92 (2015) 8, 084027.

- [4] “*Hamiltonian approach to second order gauge invariant cosmological perturbations*”  
G. Domènech & M. Sasaki,  
arXiv:1709.09804, Phys.Rev.D 97 (2018) 2, 023521.
- [5] “*Vacuum birefringence and the Schwinger effect in (3+1) de Sitter*”  
M. Banyeres, G. Domènech & J. Garriga,  
arXiv:1809.08977, JCAP 10 (2018) 023
- [6] “*Induced gravitational waves in a general cosmological background*”  
G. Domènech,  
arXiv:1912.05583, IJMPD Vol. 29, No. 03, 2050028 (2020).
- [7] “*Induced gravitational waves as a probe of thermal history of the universe*”  
G. Domènech, S. Pi & M. Sasaki,  
arXiv:2005.12314, JCAP 08 (2020) 017.
- [8] “*Approximate gauge independence of the induced gravitational wave spectrum*”  
G. Domènech & M. Sasaki,  
arXiv:2012.14016, Phys.Rev.D 103 (2021) 6, 063531.
- [9] “*Cosmology of strongly interacting fermions in the early universe*”  
G. Domènech & M. Sasaki,  
arXiv:2104.05271, JCAP 06 (2021) 030.
- [10] “*Scalar Induced Gravitational Waves Review*”  
G. Domènech  
arXiv:2109.01398. Universe 7 (2021) 11, 398.

## INTERNATIONAL TALKS

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### Conferences:

- 12/2022 Messengers of the very early universe: GWs and PBHs. INFN Padova, Italy.
- 07/2022 Non-linear aspects of cosmological gravitational waves (hybrid). IPMU, Tokyo Univ., Japan.
- 02/2022 Dawn of Gravitational-wave Cosmology and Theory of Gravity (hybrid). Tohoku Univ., Japan.
- 02/2022 Second Chennai Symposium on Gravitation and Cosmology, February 2-5, 2022, Chennai, India.
- 06/2021 Primordial Black Holes and Gravitational Waves (online). YITP, Kyoto, Japan.
- 05/2021 Gravitational-Wave Primordial Cosmology (online). IAP, Paris.
- 05/2020 Spring workshop in Gravity and Cosmology. Jagiellonian University, Poland.
- 05/2019 Spring workshop in Gravity and Cosmology. University of Warsaw, Poland.
- 07/2018 String Pheno 18. University of Warsaw, Poland.
- 02/2018 Gravity and Cosmology 2018. YITP, Japan.
- 08/2017 COSMO-17. APC, University Paris Diderot.
- 01/2017 Testing Gravity 2017. SFU, Canada.
- 10/2016 Gravitation and the Universe (HGU 2016). VAST, Vietnam.  
Workshop on General Relativity and Gravitation JGRG26, Osaka, Japan.
- 01/2016 Mini-Workshop on Cosmology. APCTP, Korea.
- 12/2015 2nd LeCosPA International Symposium: Everything about Gravity. LeCosPa, Taiwan.  
Workshop on General Relativity and Gravitation (JGRG25). YITP, Japan.
- 11/2015 2nd Mini-Workshop on Gravity and Cosmology. IAP, France.
- 12/2014 Workshop on General Relativity and Gravitation (JGRG24). IMPU, Japan.
- 10/2013 IX International Workshop, The Dark Side of the Universe. SISSA, Italy.

**Invited seminars:**

12/2022	University of Barcelona, Spain.	11/2020	Copernicus webinar series.
11/2022	IPhT Saclay, Paris, France.	07/2020	Padova university (webinar), Italy.
10/2022	MPA Garching, Munich, Germany.	06/2020	McGill university (webinar), Canada.
10/2022	LMU, Munich, Germany.	01/2019	Johns Hopkins University, USA.
07/2022	Models of Gravity Colloquium, Germany.	11/2018	ITP, Heidelberg, Germany.
07/2022	Jagiellonian University, Poland.	10/2018	Warsaw University, Warsaw, Poland.
05/2022	LMU, Munich, Germany.	11/2017	ITP, Heidelberg, Germany.
03/2022	CENTRA, Lisbon, Portugal. [Youtube link]	09/2016	UPV-EHU, Bilbao, Spain.
05/2021	University of Bremen(webinar), Germany.		University of Barcelona, Spain.
03/2021	NTU Athens (webinar), Greece.	05/2016	NCTS, Hsinchu, Taiwan.
02/2021	Bielefeld university (webinar), Germany.	04/2016	LeCosPa, Taipei, Taiwan.
01/2021	ITP-CAS Beijing (webinar), China.	12/2015	University of Barcelona, Spain.
01/2021	LMU (webinar), Munich, Germany.	11/2015	IAP, Paris, France.
12/2020	LPTHE (webinar), Paris, France.	03/2015	APTCP, Pohang, Korea.

**Poster presentations:**

01/2017	Testing Gravity 2017. SFU, Vancouver, Canada.
06/2015	New Ideas Meet New Experimental Data. String Theory & Cosmology. Hong Kong

**Schools and workshops:**

02/2016	School on Strings and Fields, Yukawa Institute for Theoretical Physics, Kyoto University, Japan
08/2015	Summer School on Cosmology and Particle Astrophysics, RESCEU APCosPA, Japan
05/2015	Molecular type Workshop: Black hole information loss paradox, Yukawa Institute for Theoretical Physics, Kyoto University, Japan

# TOTAL LIST OF PUBLICATIONS

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## Peer Reviewed Publications

- [P34] “*Galaxy number-count dipole and superhorizon fluctuations*”  
Guillem Domènech, Roya Mohayaee, Subodh P. Patil & Subir Sarkar.  
arXiv:2207.01569. **JCAP 10 (2022) 019**
- [P33] “*Induced gravitational waves from slow-roll inflation after an enhancing phase*”  
Shyam Balaji, Guillem Domènech & Joseph Silk.  
arXiv:2205.01696. **JCAP 09 (2022) 016**
- [P32] “*Gravitational waves from dark matter isocurvature*”  
Guillem Domènech, Samuel Passaglia & Sébastien Renaux-Petel.  
arXiv:2112.10163. **JCAP 03 (2022) 03, 023**
- [P31] “*Expansion history-dependent oscillations in the scalar-induced gravitational wave background*”  
Lukas T. Witkowski, Guillem Domènech, Jacopo Fumagalli & Sébastien Renaux-Petel.  
arXiv:2110.09480. **JCAP 05 (2022) 05, 028**
- [P30] “*Were recently reported MHz events planet mass primordial black hole mergers?*”  
Guillem Domènech.  
arXiv:2110.00550. **Eur. Phys. J. C 81, 1042 (2021).**
- [P29] “*Scalar Induced Gravitational Waves Review*”  
Guillem Domènech.  
arXiv:2109.01398. **Universe 7 (2021) 11, 398**
- [P28] “*Exploring Evaporating Primordial Black Holes with Gravitational Waves*”  
Guillem Domènech, Volodymyr Takhistov & Misao Sasaki.  
arXiv:2105.06816. **Phys.Lett.B 823 (2021) 136722**
- [P27] “*Cosmology of strongly interacting fermions in the early universe*”  
Guillem Domènech & Misao Sasaki.  
arXiv:2104.05271. **JCAP 06 (2021) 030**
- [P26] “*Probing non-Gaussianities with the high frequency tail of induced gravitational waves*”  
Vicente Atal & Guillem Domènech.  
arXiv:2103.01056. **JCAP 06 (2021) 001**
- [P25] “*Approximate gauge independence of the induced gravitational wave spectrum*”  
Guillem Domènech & Misao Sasaki.  
arXiv:2012.14016. **Phys.Rev.D 103 (2021) 6, 063531**
- [P24] “*Gravitational wave constraints on the primordial black hole dominated early universe*”  
Guillem Domènech, Chunshan Lin & Misao Sasaki.  
arXiv:2012.08151. **JCAP 04 (2021) 062. JCAP 11 (2021) E01**
- [P23] “*NANOGrav Hints on Planet-Mass Primordial Black Holes*”  
Guillem Domènech & Shi Pi.  
arXiv:2010.03976. **Sci.China Phys.Mech.Astron. 65 (2022) 3, 230411.**
- [P22] “*Neutrino masses, vacuum stability and quantum gravity prediction for the mass of the top quark*”  
Guillem Domènech, Mark Goodsell & Christof Wetterich.  
arXiv:2008.04310. **JHEP01(2021)180**

- [P21] “*Induced gravitational waves as a probe of thermal history of the universe*”  
Guillem Domènech, Shi Pi & Misao Sasaki.  
arXiv:2005.12314. **JCAP 08 (2020) 017**
- [P20] “*Planck residuals anomaly as a fingerprint of alternative scenarios to inflation*”  
Guillem Domènech, Xingang Chen, Abraham Loeb & Marc Kamionkowski.  
arXiv:2005.08998. **JCAP10(2020)005**
- [P19] “*Induced gravitational waves in a general cosmological background*”  
Guillem Domènech.  
arXiv:1912.05583. **IJMPD Vol. 29, No. 03, 2050028 (2020)**
- [P18] “*Could the black hole singularity be a field singularity?*”  
Guillem Domènech, Atsushi Naruko, Misao Sasaki & Christof Wetterich.  
arXiv:1912.02845. **IJMPD Vol. 29, No. 03, 2050026 (2020)**
- [P17] “*Lensing anomaly and oscillations in the primordial power spectrum*”  
Guillem Domènech & Marc Kamionkowski  
arXiv:1905.04323. **JCAP11 (2019) 040**
- [P16] “*Mimicking features in alternatives to inflation with interacting spectator fields*”  
Guillem Domènech, Javier Rubio & Julius Wons,  
arXiv:1905.04323, **Phys.Lett. B790 (2019) 263-269,**
- [P15] “*Gravitational waves from global cosmic strings in quintessential inflation*”  
Dario Bettoni, Guillem Domènech & Javier Rubio,  
arXiv:1810.11117, **JCAP 1902 (2019) 034,**
- [P14] “*Vacuum birefringence and the Schwinger effect in (3+1) de Sitter*”  
Mariona Banyeres, Guillem Domènech & Jaume Garriga,  
arXiv:1809.08977, **Phys.Lett. B790 (2019) 263-269,**
- [P13] “*Vector disformal transformation of generalized Proca theory*”  
Guillem Domènech, Shinji Mukohyama, Ryo Namba & Vassilis Papadopoulos,  
arXiv:1807.06048, **Phys.Rev. D98 (2018) no.6, 064037,**
- [P12] “*Doppelgänger dark energy: modified gravity with non-universal couplings after GW170817*”  
Luca Amendola, Dario Bettoni, Guillem Domènech & Adalto R. Gomes,  
arXiv:1803.06368, **JCAP 1806 (2018) no.06, 029 ,**
- [P11] “*Hamiltonian approach to second order gauge invariant cosmological perturbations*”  
Guillem Domènech & Misao Sasaki,  
arXiv:1709.09804, **Phys.Rev. D97 (2018) no.2, 023521,**
- [P10] “*Thermal activation of thin-shells in anti-de Sitter black hole spacetime*”  
Pisin Chen, Guillem Domènech, Misao Sasaki & Dong-han Yeom,  
arXiv:1704.04020, **JHEP 1707 (2017) 134,**
- [P9] “*CMB Scale Dependent Non-Gaussianity from Massive Gravity during Inflation*”  
Guillem Domènech, Takashi Hiramatsu, Chunshan Lin, Misao Sasaki, Maresuke Shiraishi & Yi Wang,  
arXiv:1701.05554, **JCAP 1705 (2017) no.05, 034,**
- [P8] “*Strongly scale-dependent CMB dipolar asymmetry from super-curvature fluctuations*”  
Christian Byrnes, Guillem Domènech, Misao Sasaki & Tomo Takahashi,  
arXiv:1610.02650, **JCAP 1612 (2016) no.12, 020,**

- [P7] “*Consistency relation and inflaton field redefinition in the delta N formalism*”  
 Guillem Domenech, Jinn-Ouk Gong & Misao Sasaki,  
 arXiv:1606.03343, **Phys.Lett. B769 (2017) 413-417**,
- [P6] “*Inflationary Magnetogenesis with Broken Local U(1) Symmetry*”  
 Guillem Domènech, Chunshan Lin & Misao Sasaki,  
 arXiv:1512.01108 , **EPL 115 (2016) no.1, 19001**,
- [P5] “*Stationary bubbles and their tunneling channels toward trivial geometry* ”  
 Pisin Chen, Guillem Domènech, Misao Sasaki & Dong-han Yeom,  
 arXiv:1512.00565, **JCAP 1604 (2016) no.04, 013**,
- [P4] “*Derivative-dependent metric transformation and physical degrees of freedom*”  
 Guillem Domènech, Shinji Mukohyama, Ryo Namba, Atsushi Naruko, Rio Saitou & Yota Watanabe,  
 arXiv:1507.05390 , **Phys.Rev. D92 (2015) no.8, 084027**,
- [P3] “*Cosmological disformal invariance*”  
 Guillem Domènech, Atsushi Naruko & Misao Sasaki,  
 arXiv:1505.00174 , **JCAP 1510 (2015) no.10, 067**,
- [P2] “*Conformal Frame Dependence of Inflation*”  
 Guillem Domènech & Misao Sasaki,  
 arXiv:1501.07699 , **JCAP 1504 (2015) no.04, 022) 134** ,
- [P1] “*Fixing a Rigorous Formalism for the Accurate Analytic Derivation of Halo Properties*”  
 Enric Juan, Eduard Salvador-Solé, Guillem Domènech & Alberto Manrique,  
 arXiv: 1401.7335 **Mon.Not.Roy.Astron.Soc. 439 (2014) no.1, 719-724**,
- [P0] “*Halo Mass Definition and Multiplicity Function*”  
 Enric Juan, Eduard Salvador-Solé, Guillem Domènech & Alberto Manrique,  
 arXiv: 1401.7334 **Mon.Not.Roy.Astron.Soc. 439 (2014) no.3, 3156-3167**,

## Submitted

- [P34] “*A new universal property of cosmological gravitational wave anisotropies*”  
 Ameet Malhotra, Ema Dimastrogiovanni, Guillem Domènech, Matteo Fasiello & Gianmassimo Tasinato.  
 arXiv: 2212.10316.

## Proceedings

- [C3] “*Inflationary Magnetogenesis with On-shell Local U(1) Symmetry*”  
 Guillem Domènech, Chunshan Lin & Misao Sasaki,  
**J.Phys.Conf.Ser. 883 (2017) no.1, 012013**
- [C2] “*Conformal frames in cosmology* ”  
 Guillem Domènech & Misao Sasaki,  
 arXiv:1602.06332, **Int.J.Mod.Phys. D25 (2016) no.13, 1645006**,
- [C1] “*Stationary bubbles: information loss paradox?*”  
 Guillem Domènech & Misao Sasaki,  
 arXiv:1602.04969, **Everything about Gravity, pp. 572-577 (2017)**.