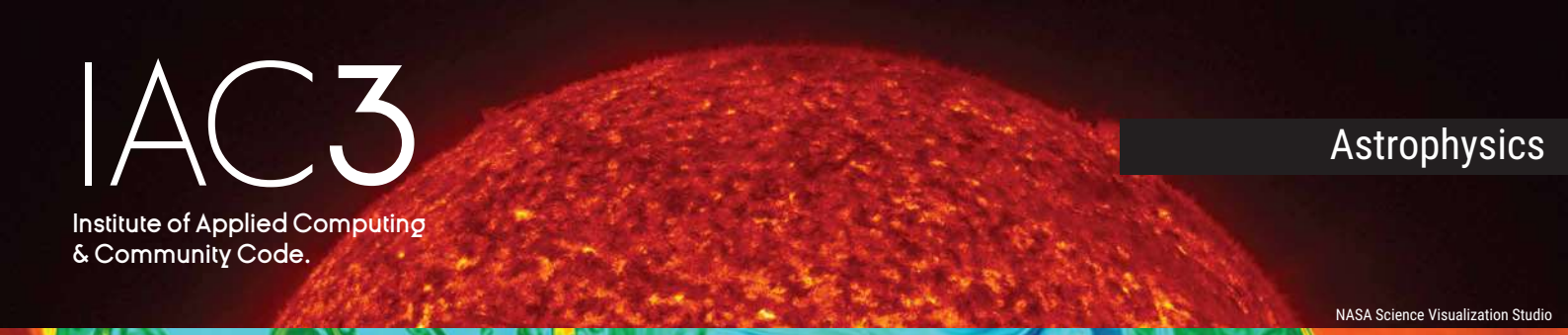
IAC3

Institute of Applied Computing & Community Code.



Astrophysics

NASA Science Visualization Studio

Computer Applications

Dynamical Systems

Image Processing

cnes

CENTRE NATIONAL D'ETUDES SPATIALES

Relativity

UIB

Universitat de les Illes Balears

IAC3 Institute of Applied Computing & Community Code.

2020 Annual Report

iac3.uib.es

Content

1 Director Letter

Despite the circumstances that occurred during the past year 2020, the IAC3 has continued to develop its research and dissemination activities although, of course, due to the pandemic, some activities such as participation in Meetings have been hampered. Through our research excellence, we try to better serve our society by educating and training new generations of scientists and, at the same time, we try to help spread the values of science in general.

On the other hand, I am pleased to welcome the new members who have joined the IAC3, as well as to wish to those who have obtained their Ph. D. thesis and have joined different Research Centers as Post-docs the best in their future professional lives as scientists. Furthermore, I would like to highlight here the application made to the María de Maeztu Program for units of excellence, this application was evaluated by an international panel and as a result of this evaluation we obtained three marks of Excellent, one of Outstanding and one of Good, which was not enough to obtain financial support. For us, the important result of this evaluation was to be able to know the external opinions about our weaknesses and where we should improve in the next future. Also, I would like to thank the Scientific Committee, led by Dra. Alicia Sintes, which prepared this application, for the excellent work done which will set the path for future applications.

I would not like to end this introduction to the IAC3 Report without mentioning once again the most pressing needs of the Institute, which are: Physical space to carry out its activities as well as an improvement in the budget allocated by the University and the Local Government to Research Institutes in general. For some time now, we have been awaiting the allocation of premises in the research complex built in Parc Bit, whose putting into operation, hopefully immediately, would provide us with facilities that would help our research tasks.

Finally, taking into account that my term as Director of the IAC3 is about to end and a new Director, Dr. Bartomeu Coll, has been elected, I would like to take advantage of this Introduction to say goodbye to the members of the IAC3 thanking all them and, in particular, to the members of the Steering Committee and the management team, for their collaboration throughout these years, and to wish the new Director every success in his tenure.

José Luis Ballester

Director IAC3

2 About the Institute of Applied Computing with Community Code

The Institute of Applied Computing with Community Code (IAC3, http://iac3.uib.es) was created by the University of the Balearic Islands (UIB) in July 2008 to foster synergies between different research groups driven by the quest for excellence and their common focus on computational modelling and a modern approach to code sharing and development. The creation of the IAC3 institute also recognizes the increasingly important role of computationally intensive modelling, high performance computing, and the processing of massive data sets in fundamental and applied science and in innovation. Initially composed of research groups in Astrophysics, Relativity, and Image Processing in 2008, IAC3 grew to five groups by 2015, and our staff is now composed of members of seven recognized research groups of UIB: The groups for Advanced Computational Physics, Non-Linear Waves, Solar Physics, Relativity and Gravitation, and Gravitational Physics: Theory and Observation are part of the Department of Physics, and the groups for Mathematical Analysis and Image Processing and for Dynamical Systems form part of the Department of Mathematics and Computer Science. Our work is currently structured along five overlapping lines of research: Astrophysics, Computational Applications, Dynamical Systems, Image Processing, Relativity and Gravitation. IAC3 provides a multidisciplinary, interactive and creative environment formed of researchers that cooperate to achieve common goals and profit from the shared knowledge between interdisciplinary fields.

The Institute's profile is characterized by a unique blend of fundamental research and knowledge transfer. For example, research on image processing has taken a very direct path from mathematical algorithms to industrial applications and satellite imaging. Knowledge transfer at IAC3 is demonstrated by the collaboration with Spanish (Atos, Deimos Space, Telefónica) and French (DxO, Thales) companies in a variety of research projects, or by the registration of several patents on methods of image processing. In contrast, research on gravitational physics and methods to investigate black hole spacetimes has started out purely curiosity driven, but has branched off into research on frameworks to solve general partial differential equations, multi-scale modelling in applied physics, and computational physiology. It has also led to our participation in the LIGO Scientific Collaboration and the LISA consortium (collaborations with more than 1000 researchers). Continuing the original line, relativity research has developed into an effort to model sources of multi-messenger astronomy and joint work in magnetohydrodynamics with the solar physicists and applied mathematicians at IAC3. Hence, synergies and cooperation between the groups are well established.

Members of IAC3 have made key contributions to develop source models used in gravitational wave (GW) data analysis which have been crucial to identify the source parameters of the first detection of a gravitational wave signal in 2015. The senior contributors to this achievement in relativity and gravitational physics are all pioneers in their fields, and Sintes and Husa are the two top-cited researchers in the Balearic Islands Community (https://www.webometrics.info/en/GoogleScholar/Spain). IAC3 has also been successful in attracting new talent: IAC3 currently hosts 5 Ramón y Cajal (RyC) researchers (2 of them already got permanent positions at UIB), and will grow further by incorporating another RyC plus a Beatriz Galindo researcher in 2020.

The Institute participates in the teaching of the Advanced Physics and Applied Mathematics Master Degree at UIB. 13 PhD students defended their thesis between 2015 and 2021, and there are 15 ongoing doctoral theses. During the period 2015-2019 the members of the IAC3 have published more than 230 papers in refereed journals, contributed to international conferences or schools with more than 150 oral contributions and 40 conference proceedings. In the same period they obtained 21 grants with financial support, 29 grants for computing allocations of more than 109 million hours, 8 grants for telescope time, 4 research contracts with companies and 6 patents. IAC3 members also hold relevant positions in international scientific organizations and are members of several editorial boards.

3 Personnel

3.1 IAC3 Management Board

Director: José Luis Ballester Mortes
Deputy Director: Bartomeu Coll Vicens
Secretary: Alicia Magdalena Sintes Olives

3.2 Research Staff

Name	Main research subject	Mail	Position
Álvarez Torres, María Jesús	Dynamical Systems	chus.alvarez(a)uib.es	Titular Universidad
Ballester Mortes, José Luis	Astrophysics	joseluis.ballester(a)uib.es	Catedrático Universidad
Bona Casas, Carles	Computer Applications	carles.bona(a)uib.es	Profesor Ayudante Doctor
Bona Garcia, Carles	Relativity Computer Applications	cbona(a)uib.es	Catedrático Universidad
Buades Capó, Antoni	Image Processing	toni.buades(a)uib.es	Titular Universidad
Carbonell Huguet, Marc	Astrophysics	marc.carbonell(a)uib.es	Titular Universidad
Carot Giner, Jaume	Relativity	jaume.carot(a)uib.cat	Catedrático Universidad
Cerdà Pino, Joan Josep	Computer Applications	jj.cerda(a)uib.es	Profesor Contratado Doctor
Cerrato Casado, Antonio	Computer Applications	antonio.cerrato(a)uib.cat	Profesor Ayudante Doctor
Coll Vicens, Bartomeu	Image Processing	tomeu.coll(a)uib.es	Catedrático Universidad
Duran Grimalt, Joan	Image Processing	joan.duran(a)uib.es	Profesor Ayudante Doctor
Husa, Sascha	Relativity	sascha.husa(a)uib.es	Profesor Contratado Doctor
Javaloyes, Julien Joseph Pierre	Computer Applications	julien.javaloyes(a)uib.es	Titular Universidad
Keitel, David Benjamin	Relativity	david.keitel(a)uib.es	Investigador Distinguido
Lisani Roca, José Luis	Image Processing	joseluis.lisani(a)uib.es	Titular Universidad
Luna Bennasar, Manuel	Astrophysics	manuel.luna(a)uib.es	Contratado Ramón y Cajal
Massó Bennàsar, Joan	Relativity Computer Applications	joan.masso(a)uib.es	Titular Universidad
Maucher, Fabian Marcus	Computer Applications	f.maucher(a)uib.es	Profesor Contractado Doctor Interino
Navarro Oliver, Julia	Image Processing	julia.navarro(a)uib.es	Profesora Ayudante
Oliver Herrero, Ramón	Astrophysics	ramon.oliver(a)uib.es	Catedrático Universidad
Palenzuela Luque, Carlos	Relativity	carlos.palenzuela(a)uib.es	Profesor Contratado Doctor
Petro Balaguer, Ana Belén	Image Processing	anabelen.petro(a)uib.es	Profesora Contratada Doctor

Prohens Sastre, Rafel	Dynamical Systems	rafel.prohens(a)uib.cat	Titular Universidad
Sbert Juan, Catalina	Image Processing	catalina.sbert(a)uib.es	Titular Universidad
Sintes Olives, Alicia M.	Relativity	alicia.sintes(a)uib.es	Titular Universidad
Soler Juan, Roberto	Astrophysics	roberto.soler(a)uib.es	Profesor Contratado Doctor
Terrades Calafell, Jaume	Astrophysics	jaume.terradas(a)uib.es	Profesor Contratado Doctor
Teruel Aguilar, Antonio Esteban	Dynamical Systems	antonioe.teruel(a)uib.es	Profesor Contratado Doctor
Vich Llompart, Catalina	Dynamical Systems	catalina.vich(a)uib.cat	Profesor Contratada Doctor

3.3 Scientific Collaborators

Name	Line of Research	Mail	Position
Arbona Nadal, Antoni	Computer Applications	antoni.arbona(a)uib.es	Técnico de proyectos
Ramos Buades, Antoni	Relativity	antoni.ramos(a)uib.es	Investigador colaborador UIB

3.4 Postdoctoral Researchers

Name	Main research subject	Mail	Comments
Cerrato, Antonio	Computer Applications	antonio.cerrato(a)uib.cat	Until 01/08/20
Colleoni, Marta	Relativity	marta.colleoni(a)uib.es	Investigador Marie Curie
García Quirós, Cecilio	Relativity	cecilio.garcia(a)uib.es	
Gurevich, Svetlana	Computer Applications	svetlana.gurevich(a)uib.cat	DAAD PRIME fellowship Germany
Ortega Piwonka, Ignacio	Computer Applications	ignacio.ortega(a)uib.es	
Piantschitsch, Isabell	Astrophysics	isabell.piantschitsch(a)uib.es	

3.5 PhD Students

Name	Main research subject	Mail	Coments
Adrover González, Andreu	Astrophysics	a.adrover(a)uib.es	FPI
Aguiar-Kriginsky Silva, Matheus	Astrophysics	matheus.akriginsky(a)uib.es	FPI-CAIB
Aguilera Miret, Ricard	Relativity	ricard.aguilera(a)uib.cat	FPI
Díaz Suárez, Sergio	Astrophysics	s.diaz(a)uib.es	FPI
Estellés Estrella, Héctor	Relativity	hector.estelles(a)uib.es	FPI
Hessel, Denis	Computer Applications	denis.hessel(a)uib.cat	Contrato predoctoral CIBER
Jaume Amengual, Rafel	Relativity	rafel.jaume(a)uib.es	FPI-CAIB

Martorell Nadal, Onofre	Image Processing	o.martorell(a)uib.cat	FPI-CAIB
Mateu Lucena, Maite	Relativity	mt.mateu(a)uib.es	FPI-CAIB
Modafferi, Luana	Relativity	luana.modafferi(a)ligo.org	
Penalva Vadell, Jordi	Dynamical Systems	jordi.penalva1(a)estudiant.uib.cat	FPI-CAIB
Schelte, Christian	Computer Applications	c.schelte(a)uib.cat	FPI
Tenorio Márquez, Rodrigo	Relativity	rodrigo.tenorio(a)uib.es	FPU

3.6 Collaborative Students

Name	**Group**
Calafell Campos, Sandra	Relativity
Martí Solana, Cristina	Relativity
Melis Sánchez, Llorenç	Astrophysics
Planas Llompart, Lluc	Relativity
Rosselló Sastre, Maria	Relativity

4 Highlights

"La física al descobert" in the Universitat Oberta de Majors

The Universitat Oberta a Majors (UOM) is an educational, cultural and social programme designed, developed and started up by two professors of the Science and Education departments in the UIB during the 1997-98 academic course. It is thought for people who are older than 50 years old or pre-retired people with primary studies who are interested in taking place in any of the programmes which are held in the University, in the University municipal centres and in other places which can be agreed.

Carles Bona, Josep Lluís Ballester , Alicia Sintes and Joan J. Cerdà have participated in these courses.

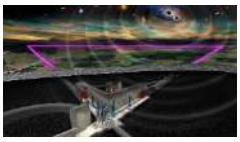
Estalmat

ESTALMAT is a programme from the la Real Academia de Ciencias Exactas, Físicas y Naturales. In the Balearic Islands it is organised together by the Universitat de les Illes Balears and the Societat de Matemàtiques SBM-XEIX.

It intends to detect, orient and stimulate in a continuous way and through two courses, the exceptional mathematical talent of students who are between 12 and 13 years old. It takes place without taking them off their environment and through a weekly orientation session which lasts for three hours.

María Jesus Alvárez, Ana Belen Petro, Catalina Vich, Antonio Teruel, Tomeu Coll and Alicia Sintes have participated in these courses.

Einstein Telescope



The consortium of the Einstein Telescope, in which the IAC3 has participated since its foundation, has presented the proposal to include the project for a future gravitational wave observatory in the 2021 update of the route of the European Strategic Forum for Research Infrastructures (ESFRI), the program that describes the main future research infrastructures in Europe.

The Einstein Telescope (ET) is the most ambitious project for a future gravitational wave earth observatory. Its conceptual design has been supported by a grant from the European Commission. Now a consortium of European countries and research institutions and universities in Europe has officially presented the proposal to move this infrastructure forward with the political support of five European countries: Belgium, Poland, Spain, the Netherlands and Italy, who leads the projects.

LIGO and Virgo annouce new detections in update gravitational-wave

The Gravity group at UIB has contributed to the analysis of the 39 new signals detected between April 1 and October 1, 2019 by the LIGO and Virgo detectors
After a highly successful third observing run and several months of thorough analysis, the LIGO Scientific Collaboration and the Virgo Collaboration have released an updated catalog of gravitational wave detections. This new GWTC-2 catalog follows the previous one from the first two observing runs (GWTC-1, published in November 2018), and contains 39 new signals from black-hole or neutron-star collisions detected between April 1—Oct 1, 2019, which more than triples the number of confirmed detections. The new set includes some of the most interesting systems we have seen so far, and enables qualitatively new studies of astrophysical populations and fundamental physics.

XI Campus Cientificotècnic d'Estiu

The IAC3 has collaborate in XI Campus Cientificotècnic d'Estiu. The main objective is to encourage interest in science, technology and innovation among students in the 4th year of ESO and the 1st year of high school in the Balearic Islands.

Among the activities that will be carried out, the IAC3 participates in:
Gravitational Waves and Their Simulation. Want to know more about gravitational waves and black holes? Some young researchers will tell you everything. You will also have the opportunity to make your own gravitational wave detector using homemade material from your home.
Appointment with Scientist: Alicia Sintes. You will have the opportunity to meet and interact with a UIB researcher. We recommend that you prepare many questions, because after explaining your professional career, you will be able to ask them.

Students of IAC3 granted with FPI-CAIB

Students from the institute have received grants for their PhD studies related with the research lines of the institute. The students Maite Mateu Lucena, Matheus Aguiar-Kriginsky Silva and Jordi Penalva Vadell have received a FPI-CAIB grant. The FPI-CAIB grant is awarded by the Govern de les Illes Balears. These grants are aimed at training pre-doctoral researchers in centers and companies located in the Balearic Islands.

GOVERN ILLES BALEARS

5 Research Visits

Visitor	Visiting Institute	Arrival-Departure	Line of Research
Tenorio, Rodrigo	LIGO Hanford Observatory, USA	01/03/2020-04/06/2020	Relativity
Navarro, Julia	Interdigital, France	02/03/2020-31/12/2020	Image Processing

6 Visitors

Name	Home Institute	Arrival-Departure	Line of Research
Liakh, Valeriia	Instituto de Astrofísica de Canarias (IAC), Spain	29/10/2020-13/11/2020	Astrophysics
Pérez Cervera, Alberto	The Czech Academy of Sciences Institute of Computer Sciences	15/09/2020-15/12/2020	Dynamical Systems
Sopuerta, Carlos F.	Institute of Space Sciences (ICE, CSIC and IEEC)	22/07/2020-22/07/2020	Relativity
Haney, Maria	University of Zurich, Switzerland	20/07/2020-24/07/2020	Relativity
Viñas, Adolfo	NASA, Goddard Space Flight Center, USA	01/03/2020-10/06/2020	Astrophysics
Haney, Maria	University of Zurich, Switzerland	10/02/2020-18/02/2020	Relativity

7 Research Projects

7.1 Agencia Estatal de Investigación

Astrophysics

- *Dinámica de los plasmas de la atmosfera solar.*
  Ref: AYA2017-85465-P. Ministerio de Economía, Industria y Competitividad
  IPs: Ramón Oliver, Roberto Soler
  Amount: 132.000 €
  Date: 01/01/2018-30/09/2021

- *Elaboración de herramientas numéricas y de visualización para el estudio de la lluvia coronal*
  Ministerio de Economía, Industria y Competitividad
  Refs: PEJ2018-002989-A. Program: Ayuda para la promoción de empleo joven e implantación de la Garantía Juvenil en I+D+I.
  PI: Ramón Oliver
  Amount: 39.200 €
  Dates: 01/10/2019 - 30/09/2021

Computer Application

- *Estudio mediante simulaciones numéricas multiescala del comportamiento del glicocálix*
  Refs: DPI2017-86610-P. Ministerio de Economía y Competitividad
  PI: Joan Josep Cerdà, Carles Bona-Casas
  Amount:175.450 €
  Date: 01/01/2018-01/01/2020

- *Movelight*
  Ref: PGC2018-099637-B. Convocatoria 2018 de Proyectos I+D de Generación de Conocimiento.
  PI: J. Javaloyes.
  Amount: 18.150 €
  Dates: 01/01/2019- 31/12/2020

Dynamical Systems

- *Qualitative study of dynamic systems and their applications, with emphasis in neuroscience.*
  Refs: MTM2017-83568-P. Ministry of Economía, Industria y Competitividad.
  PI: Rafel J. Prohens
  Amount: 37.268,00€
  Date: 01/01/2018-31/12/2021

Relativity and Gravitation

- *Jets, kilonovas y ondas gravitacionales: astronomía de multi-mensajeros en colisiones de estrellas de neutrons.*
  Ministerio de Economía y Competitividad
  Refs: AYA2016-80289-P.
  PI: Carlos Palenzuela, Joan Massó
  Amount: 114.000 €
  Dates: 30/12/2016 - 31/12/2020

- *Jets, kilonovas y ondas gravitationales: conectando simulaciones numéricas de colisiones de estrellas de neutrones con observaciones de multimensajeros (JeKiL2)*
  MCIUN - Ministerio de Ciencia, Innovación y Universidades
  Refs: PID2019-110301GB-I00
  PI: Carlos Palenzuela Luque; Juan Massó Bennásar
  Amount: 96.800
  01/06/2020-31/05/2023

- *Red consolider CPAN.*
  Ministerio de Economía, Industria y Competitividad
  Refs: FPA2017-90687-REDC.
  Coordinator: Antonio Pich. PI: Carles Bona.
  Amount: 30.000 €
  Dates: 01/07/2018 - 31/12/2020

- *Gravitational waves: from first detections to full design sensitivity with Advanced LIGO. (IGraWaveEra)*
  Ministerio de Economía y Competitividad
  Refs: FPA2016-76821-P
  PI: Alicia M. Sintes, Sascha Husa
  Amount: 377.520 €
  Date: 30/12/2016 – 31/12/2020

- *RENATA: Red nacional telemática de astropartículas.*
  Ministerio de Economía y competividad.
  Refs: RED2018-102661-T
  PI: Carlos José Delgado Méndez, Alicia M. Sintes (UIB)
  Amount: 17.000 €
  Date: 01/01/2020-31/12/2021

- *Redes estratégicas. Participación Española en Estructuras Europeas de Investigación en Física de Partículas, Astropartículas y Nuclear.*
  Ministerio de Economía y competividad.
  Refs: RED2018-102573-E
  PI: Antonio Pich Zardoya, Jaume Carot (UIB)
  Amount: 60.000 €
  Date: 2019 – 2020

- *Red consolider multidark: Multimessenger Approach for Dark Matter Detection.*
  Ministerio de Economía y Competitividad.
  Refs: FPA2017-90566-REDC.
  Coordinator: Carlos Muñoz, PI: Alicia M. Sintes
  Amount: 30.000 €
  Date: 01/07/2018 – 31/12/2020

- *Explotación del potencial científico de los detectores de ondas gravitacionales avanzados en su sensibilidad de diseño*
  Ministerio de Ciencia e innovación
  Refs: PID2019-106416GB-I00 / AEI / 10.13039/501100011033
  PI: Alicia M. Sintes, Sascha Husa
  Amount: 180.000€
  Date: 01/06/2020 – 31/05/2023

Image Processing

- *Cadena completa de procesamiento multi-imagen y video.*
  TIN2017-85572-P, Ministerio de economía y competitividad.
  PI: Antoni Buades
  Amount: 55.176€
  Date: 2018-2020

7.2 International Sources

Astrophysics

- *The role of partial ionization in the formation, structure and dynamics of solar prominences.*
  International Space Science Institute
  Refs. Team 457
  PI: J. L. Ballester, M. Luna
  Amount: 50.000 €
  Dates: 06/2019-06/2021

Dynamical Systems

- *Investigación colaborativa: CRNS US-Spain propuesta de investigacion: mecanismos de toma de decisiones adaptativas a nivel de circuito*
  Refs: PCI2020-112026
  PI: Cati Vich
  Amount: 13.0450€
  Dates: 2020 - 2023

Computer Applications

- *ChipAI - Energy- efficient and high-bandwidth neuromorphic nanophotonic Chips for Artificial Intelligence systems.*
  Refs: EU 828841.
  PI: B. Romeira. UIB: J. Javaloyes
  Amount: 256.875 €
  Date: 01/03/2019- 28/02/2022

- *PRIME fellowship for Dra. Svetlana Gurevich.*
  Deutscher Akademischer Austauschdienst German Academic Exchange Service
  PI: J. Javaloyes and S. Gurevich.
  Dates: 01/08/2019 - 31/01/2021
  Amount: 149.508,00€

Relativity and Gravitation

- *Gravitational waves, black holes and fundamental physics.*
  Programme Horizon 2020.
  CA COST Action CA16104. EU Framework.
  Management Committee: Vitor Cardoso (chair), Alicia M. Sintes (UIB)
  Date: 07/04/2017 - 06/10/2021

- *The multi-messenger physics and astrophysics of neutron stars.*
  Programme Horizon 2020
  Refs:CA COST Action CA16214. EU Framework
  PI: Dr Nanda REA (chair), Alicia M. Sintes (UIB).
  Date: 22/11/2017-21/11/2021

- *Gravitational waves from extreme mass-ratio inspirals (GWsFromEMRIs)*
  Marie Skłodowska-Curie Individual Fellowships
  Refs: H2020-MSCA-IF-2016.
  Proposal number: 751492. Research Executive Agency (REA)
  PI: Marta Colleoni, Sascha Husa
  Date: 01/02/2018 - 01/02/2020
  Amount: 158.121,60 €

- *A network for Gravitational Waves, Geophysics and Machine Learning.*
  Refs: CA COST Action CA17137. EU Framework
  Programme Horizon 2020
  Management Committee: Dra. Elena Cuoco (chair), Alicia M. Sintes (UIB)
  Date: 13/04/2018-17/10/2022

- *Quantum gravity phenomenology in the multi-messenger approach.*
  Programme Horizon 2020
  Refs: CA18108 COST Action, EU Framework
  PI: Dr. Jose Manuel Carmona
  Date: 14/03/2019-13/03/2023

- *Tests of General Relativity with the Laser Interferometer Gravitational-Wave Observatory.*
  Swiss National Science Fundation.
  Refs: Early Postdoc Mobility Fellowship
  PI: Leïla Haegel, Sascha Husa
  Date: 01/01/2019 – 30/06/2020
  Amount: 54.500 €

Image Processing

- *Desing and implementation of a Video Denoising Method for Mobile RAW Data.*
  HUAWEI, China
  Ref: YBN2018115053
  IPs: Prof. Antoni Buades
  Amount: 90.000 €
  Date: 01/01/2019 - 31/12/2020

7.3 Regional Sources

Relativity and Gravitation

- *Conveni Ones Gravitacionals.*
  Govern de les Illes Balears. Vicepresidència i Conselleria d'Innovació, Recerca i Turisme per a la recerca en l'àmbit de la física d'ones gravitacionals.
  PI: Alicia M. Sintes
  Amount: 175.000€
  Dates: 2016-2020

- *Programa Prometeu per a grups d'investigació d'excel·lència – PROMETEU 2019*
  Conselleria d'Innovació, Universitats, Ciència i Societat Digital. Generalitat Valenciana
  Refs PROMETEU/2019/071
  PI: José Antonio Font Roda. Coinvestigator: Alicia M. Sintes and Sascha Husa (UIB)
  Amount: 72.4553 €
  Dates: 01/01/2019-31/12/2022

- *De LIGO a LISA: Hacia una nueva era en la astronomía de ondas gravitacionales*
  Comunitat Autonoma de les Illes Balears a través de la Direcció General de Política Universitaria i Recerca con fondos de la Ley de Impuestos de Estancias Turísticas
  Ref: PRD2018/24
  PI: Alicia M Sintes Olives
  Amount: 102.420€
  Date: 01/07/2020-01/07/2023

Image Processing

- *Cámaras submarinas como sensores biológicos: deep learning en ecología submarina*
  Govern de les Illes Balears
  Ref: PRD2018-26
  PI: I. Catala and J. L. Lisani
  Amount: 95.214 €
  Date: 2020-2023

7.4 Observational grants

Astrophysics

- *GREGOR Solar Telescope*
  Magnetic field inference in spicules and in the lower corona
  Comisión de asignación de tiempo solar en los observatorios de Canarias
  Ref: 46710

PI: Matheus Aguiar-Kriginsky Silva
Dates: 16/11/2020 - 17/11/2020

- *1-m Swedish Solar Telescope*
  Magnetic field, plasma structure and dynamics of spicules
  Comisión de asignación de tiempo solar en los observatorios de Canarias
  Ref: 46704
  PI: Ramón Oliver
  Dates: 01/07/2020 - 11/07/2020

Relativity and Gravitation

- *Monitoring electromagnetic counterparts of gravitational wave events with NOEMA.*
  Institut de Radioastronomie Millimétrique.
  Refs: W19EL
  PI: I. Agudo. Coinvestigators: Alberto J. Castro-Tirado (ES), Melanie Krips (IRAMF), Cinthya Herrera Contreras (IRAMF), Carsten Kramer (IRAMF), Alicia Sintes (ES), Jose Antonio Font (ES)
  Date: 01/12/2019-31/05/2020

7.5 Computational grants

Relativity and Gravitation

- The end of an era - analysing the last gravitational wave detections before LIGO-Virgo design sensitivity.
  RES: -BSC Marenostrum + Picasso (UMA)
  REF: AECT-2020-3-0022.
  PI: Sascha Husa.
  Amount: 9000kh BSC Marenostrum + 880kh Picasso (UMA)
  Date: 1/11/2020 - 29/02/2021

- The end of an era - analysing the last gravitational wave detections before LIGO-Virgo design sensitivity.
  RES: BSC Marenostrum + Picasso (UMA)
  REF: AECT-2020-2-0015.
  PI: Sascha Husa.
  Amount: 9200kh BSC Marenostrum + 1000kh Picasso (UMA)
  Date: 01/07/2020 – 31/10/2020

- Testing models for gravitational waves from coalescing black holes with generic configurations.
  RES-BSC Marenostrum, Picasso – UMA
  REF: AECT-2020-1-0025
  PI: Sascha Husa.
  Amount: 7200 kh BSC Marenostrum, + 1000 kh.
  Picasso – UMA
  Date: 01/03/2020 - 30/06/2020

- Testing models for gravitational waves from coalescing black holes with generic configurations
  Ref: AECT-2019-3-0020
  RES: BSC Marenostrum – UMA Picasso
  PI: Sascha Husa
  Amount: 8.300 Kh.
  Date: 01/11/2019 - 29/02/2020

- All-sky searches of continuous gravitational-wave signals from spinning neutron stars in binary systems using Advanced LIGO O3 data
  Refs: AECT-2019-3-0011,
  RES-BSC P9
  PI: Pep Covas
  Amount: 114 Kh
  Fecha: 01/11/2019 - 29/02/2020

8 Academic Achievements

8.1 Doctoral Theses

Searching for continuous gravitational waves with Advanced LIGO

Student: Josep Blai Covas Vidal
Director: Dra. Alicia M. Sintes Olives
Date: 28 July 2020

Abstract:

The first direct detection of gravitational waves (GWs) on September 142015 marked the beginning of gravitational-wave astronomy. All of the GWs that havebeen detected until now came from compact binary coalescences, a type of signal thatis detectable during seconds or a few minutes. A completely different type of gravitational waves are continuous gravitational waves (CWs), which are long-lasting waves mainly produced by asymmetric rotating neutron stars, either isolated or inbinary systems. Although many searches for CWs have been done, none of them has reported a detection. Even though CWs can be tracked during much longer times than compact binary coalescences, the amplitude of these gravitational waves is expected to be many orders of magnitude smaller: the amplitude of the detected GWs is around 10-21, whereas CW searches are constraining this amplitude to be less than 10-26 for some pulsars, which clearly underlines the challenge of detecting CWs. CW searches can be divided between searches for GWs from known pulsars and searches for GWs from unknown neutron stars. Unlike searches for GWs from pulsars (whose locations, gravitational wave emission frequencies, and spin-down rates are well known), searches for electromagnetically quiet sources require algorithms that look at vastly larger parameter spaces, because the data has to be correlated with theoretical waveforms that depend on these unknown parameters, which have to be included to take into account the different modulations such as the Doppler modulation produced by Earth's rotation and orbit around the sun. Unfortunately, there is not enough computing power available to search such a large and nearly continuous parameter space in sky position, frequency, and spin-down rate. For this reason, developing non-optimal algorithms that can deal with this huge parameter space is an important task within the data analysis community. This thesis is separated in two different parts. The first part is made up of three chapters that give introductions to different topics that are needed to understand CW searches: how gravitational waves are generated and propagated, what neutron stars are and how they can generate gravitational waves, and what statistical methods have to be used in order to detect a CW signal and estimate its parameters. The second partis made up of four chapters that summarize original results that have been published in high-impact journals.

Waveform modelling of Binary Black Holes in the Advanced LIGO era

Student: Cecilio García Quirós
Directors: Dr. Sascha Husa & Dra. Alicia M. Sintes Olives
Date: 22 July 2020

Abstract:

The focus of this thesis is the development of accurate and computationally efficient waveform models for the description of the signal of non-precessing and precessing black-hole binary systems detected by the LIGO-Virgo detectors. Waveform models play a key role in the detection and parameter estimation of gravitational wave signals. The more accurate these models are, the more signals can be detected, but even more importantly, inaccuracies in the signal description will lead to systematic errors for the estimated parameters of the source. The models presented in this thesis include the description of several subdominant effects, which were not considered in the studies during the two first observation runs O1 and O2 of the LIGO-Virgo interferometers, but break degeneracies in the signal and generally improve the accuracy of parameter estimation. During the gap between the O2 and O3 runs several research groups have incorporated the most important subdominant harmonics into their models, however we find that the models presented in this thesis improve the accuracy of several of these models and outperform in computational efficiency to all of them. The non-precessing model follows the standard strategy of the phenomenological models of calibrating an analytical ansatz to numerical relativity simulations. I produced a number of these simulations specifically for the calibration of the model placing them strategically in regions of the parameter space poorly populated. I also produced a number of waveforms in the extreme mass ratio limit extending the calibration region of the model from mass ratio 1 to 1000.

On the other hand, the precessing model follows the standard technique of twisting-up a non-precessing model but extended in this case to a model with subdominant harmonics. The evaluation of the models is then accelerated by incorporating the interpolation technique of "multibanding", originally introduced by Vinciguerra et. al. I have extended this technique, adapted it to the two frequency domain models presented in this thesis, and formulated the technique in a way to make it applicable to any analytical frequency or time domain model.

Gravitational waves from generic binary black holes: From numerical simulations to observational results

Student: Antoni Ramos Buades
Director: Dr. Sascha Husa
Date: 21 July 2020

Abstract:

The focus of this thesis is the development of accurate and computationally efficient waveform models for the description of the signal of non-precessing and precessing black-hole binary systems detected by the LIGO-Virgo detectors. Waveform models play a key role in the detection and parameter estimation of gravitational wave signals. The more accurate these models are, the more signals can be detected, but even more importantly, inaccuracies in the signal description will lead to systematic errors for the estimated parameters of the source. The models presented in this thesis include the description of several subdominant effects, which were not considered in the studies during the two first observation runs O1 and O2 of the LIGO-Virgo interferometers, but break degeneracies in the signal and generally improve the accuracy of parameter estimation. During the gap between the O2 and O3 runs several research groups have incorporated the most important subdominant harmonics into their models, however we find that the models presented in this thesis improve the accuracy of several of these models and outperform in computational efficiency to all of them. The non-precessing model follows the standard strategy of the phenomenological models of calibrating an analytical ansatz to numerical relativity simulations. I produced a number of these simulations specifically for the calibration of the model placing them strategically in regions of the parameter space poorly populated. I also produced a number of waveforms in the extreme mass ratio limit extending the calibration region of the model from mass ratio 1 to 1000.

On the other hand, the precessing model follows the standard technique of twisting-up a non-precessing model but extended in this case to a model with subdominant harmonics. The evaluation of the models is then accelerated by incorporating the interpolation technique of "multibanding", originally introduced by Vinciguerra et. al. I have extended this technique, adapted it to the two frequency domain models presented in this thesis, and formulated the technique in a way to make it applicable to any analytical frequency or time domain model.

8.2 Ongoing Doctoral Theses

- Title *Non-linear evolution of MHD waves in solar atmospheric flux tubes.*
  Student: Sergio Díaz Suárez.
  Director: Roberto Soler

- Title: *Coronal rain as a plasma physics laboratory*
  Student: Matheus Aguiar-Kriginsky Silva
  Director: Ramón Oliver

- Title: *Large-Amplitude Oscillations in Erupting and Quiescent Solar Prominences*
  Student: Valeriia Liakh (Instituto de Astrofísica de Canarias (IAC))
  Director: Manuel Luna
  Co-Director: Elena Khomenko (Instituto de Astrofísica de Canarias (IAC))

- Title: *3D numerical simulations of oscillations in solar prominences and gravitational instability in threads.*
  Student: Andrés Adrover González
  Director: Dr. Jaume Terradas

- Title: *Jets, Kilonovas and Gravitational Waves: Multimessenger astronomy in mergers of binary neutron stars*
  Student: Ricard Aguilera-Miret
  Director: Carlos Palenzuela

- Title: *Accurate models of gravitational wave signals from precessing black holes*.
  Student: Héctor Estellés Estrella
  FPI BES-2017-082182 associated with the project FPA2016-76821-P
  Director: Dr. Sascha Husa.

- Title: *Decoding big data sets: strategies in parameter estimation for gravitational wave signals from LIGO sensitivity to future detectors*.
  Student: Maite Mateu Lucena.
  FPI-CAIB.
  Director: Dr. Sascha Husa.

- Title: *Novel Strategies for Continuous Gravitational Wave Searches in the Era of the Advanced Detectors*
  Student: Rodrigo Tenorio Márquez.
  Directora: Dra. Alicia M. Sintes Olives,
  FPU18/00694

- Title: *Searching for long-duration transient gravitational waves from spinning*
  neutron stars
  Student: Luana Michela Modafferi
  Directors: Dra. Alicia M. Sintes, Dr. David Keitel

- Title: *Acelerando la física de ondas gravitacionales con hardware de computación paralela masiva*
  Student: Rafel Jaume Amengual
  Directors: Dra. Alicia M. Sintes and Dr. Sascha Husa
  FPI-CAIB

- Title: *Neuronal piecewise reproducing bursting dynamics*
  Student: Jordi Penalva Vadell
  Director: Dr. Mathieu Desroches (Inria, Sophia-Antipolis - Méditerraneé Centre), Dr. Antonio E Teruel and Dra. Catalina Vich.
  FPI-CAIB

- Title: *Dynamics of Optical Localized Structures in Passively Mode-Locked Lasers.*
  Student: Christian Schelte
  Director: Dr. J. Javaloyes and Dra. Svetlana Gurevich
  Co direction UIB/WWU Munster, Germnay

- Title*: Dynamics and bifurcation analysis of localized structures in coupled optical micro-cavities*
  Student: Denis Hessel
  Director: Dr. Julien Javaloyes and Dra. Svetlana Gurevich
  Co direction UIB/WWU Munster, Germany

- Title: *Frequency combs and dynamics of nonlinear Gires-Tournois interferometers*
  Student: Thomas Seidel
  Directors: Dra. Svetlana Gurevich and Dr. Julien Javaloyes
  Co direction UIB/WWU Munster, Germany

- Title: Complete chain in multi-image and video processing
  Student: Onofre Martorell Nadal
  Director: Dr. Antoni Buades Capó
  FPI-CAIB

- Title: Multi-image processing by deep variational learning
  Student: Iván Pereira Sánchez
  Director: Dr. Joan Duran Grimalt

8.3 Master Theses

- Title: *Determinació de les característiques de modes normals a partir de simulacions numèriques mitjançant l'anàlisi CEOF: Absorció ressonant*
  Student: Biel Enric Castell Cladera
  Director: Ramon Oliver Herrero
  Defense: 18 December 2020

- Title: *Mejorando los resultados de la estimación de parámetros para los primeros tres períodos de observación de LIGO-Virgo mediante la adición de armónicos más altos*
  Student: Alicia Calafat Jaso
  Director: Sascha Husa
  Defense: 17 December 2020

- Title: *Recoil of Binary Black Hole systems and the multipolar structure of gravitational wave detectors*
  Student: Rafel Jaume Amengual
  Director: Sascha Husa
  Denfense: 17 December 2020

- Title: *Testing waveform models for the LISA and Einstein Telescope gravitational wave detectors*
  Student: Friso Snel
  Director: Sascha Husa
  Defense: 16 December 2020

- Title: Elaboració d'un mètode de classificació automàtica de peixos costaners mitjançant mètodes de intel·ligència artificial.
  Student: Toni Sabater Font
  Directors: Ignacio A. Catalán, Amaya Álvarez, José Luis Lisani
  Date: 10 December 2020

- Title: Alfvén wave heating in partially ionised thin threads of solar prominences
  Student: Llorenç Melis Sánchez
  Director: Roberto Soler
  Denfese; 28 October 2020

- Title: *Compleció de vídeo a partir de la distribució espaciotemporal de patches*
  Student: Iván Pereira Sánchez
  Directors: Tomeu Coll & Joan Duran
  Defense: 26 October 2020

- Title: *Influence of Time Delayed Feedback on the dynamics of Temporal Localized Structures*
  Student: Thomas Seidel
  Directors: J. Javaloyes and S. Gurevich
  Defense: 20 September 2020

- Title: *Topological Localized States in a Delayed Adler Equation*
  Student: Florian Eckel
  Directors: J. Javaloyes and S. Gurevich
  Defense 4 September 2020

- Title: *Topological Localized States in Excitable Delayed Systems*
  Student: Leon Munsberg
  Directors: J. Javaloyes and S. Gurevich
  Defense: 11 May 2020

- Title: *Bound States of Light Bullets in Semiconductor Laser Systems with Saturable Absorber*
  Student: Thomas Seidel
  Directors: J. Javaloyes and S. Gurevich
  Defense: 4 April 2020

8.4 Final Degree Theses

- Title: *Segmentación de fondos y objectos en vídeo utilizando movimiento entre imágenes*
  Student: Marco Sánchez Beeckman
  Directors: Tomeu Coll and Antoni Buades
  Defense: 14 October 2020

- Title: *Dynamics of Pulses in Passively Mode-locked Semiconductor Lasers*
  Student: Henrik Schiller
  Directors: J. Javaloyes and S. Gurevich
  Defense: 25 September 2020

- Title: *Una aplicació a la segmentació d'imatges mèdiques*
  Student: Xavier Gallego
  Director: Tomeu Coll and Antoni Buades
  Defense: 14 July 2020

- Title: *Model FitzHugh-Nagumo: Relació entre canard maximal i llindar d'activació neuronal.*
  Student: Nofre Ruiz Salom
  Directors: Cati Vich and Antonio E. Teruel
  Defense: June 2020

- Title: *El desarrollo lógico matemático a través del juego. Junto a las tecnologías de la información y la comunicación*
  Student: Nadin Hofer Guzmán
  Director: Ana Belen Petro
  Defense: June 2020

- Title: *Proposta didàctica matemàtica per a infants d'educació infantil amb autisme o síndrome de Kanner*
  Student: Noelia Rubert Alfonso
  Director: Ana Belen Petro
  Defense: June 2020

- Title*: El pensament matemàtic en el primer cicle d'educació infantil*
  Student: Marina Vallespir Carbonell
  Director: Ana Belen Petro
  Defense: June 2020

- Title: *Las matemáticas en la etapa 0-3 existen. Rincón matemático en un aula de 2-3 años*
  Student: Aranzazu Blanch Pérez
  Director: Ana Belen Petro
  Defense: June 2020

- Title: *Recull de contes per treballar les matemàtiques*
  Student: M. Antònia Nadal Artigues
  Director: Ana Belen Petro
  Defense: June 2020

- Title: *Mejorar el ambiente de matemáticas de un centro de Educación Infantil*
  Student: M. Del Carmen Rubia Mezcua
  Director: Ana Belen Petro

- Title: *Ensenyança de la mesura utilitzant metodologia manipulativa*
  Student: Neus Villar Quintana
  Director: Ana Belen Petro

- Title*: Aprenem les matemàtiques al poble de Sóller i voltants*
  Student: Mireia Xumet
  Director: Ana Belen Petro

- Title: *Matemàtiques inclusives*
  Student: Daniell Ribas Llobera
  Director: Ana Belen Petro

- Title*: El pas del collaret de boles a la recta numèrica*
- Student: Marina Pascual Lorca
  Director: Ana Belen Petro

- Title: *Testing the use of quaternions in the description of the gravitational wave signal of precessing binary systems*
  Student: Maria de Lluc Planas Llompart
  Director: Sascha Husa
  Defense: June 2020

9 Memorandum of Understanding and Collaboration Agreements

- Academic, Scientific, and Cultural Collaboration Agreement between the Leibniz University of Hannover (Germany) and the University of the Balearic Islands (Spain). (Ref 3735) since 2019
- Agreement of double PhD and co-tutelle between WWU University of Münster and that of the University of Balearic Islands 2018
- Collaboration between the Astromallorca Association (ref. 3760) and the Balearic Islands University (2019).
- Memorandum of understanding for the national collaboration in Particle Physics, Astroparticles and Nuclear Physics fields between Spanish institutions dedicated to Science, Research and Technological Development. National Center for Particle, Astroparticle and Nuclear Physics (CPAN) (2016).
- Memorandum of Understanding with the Balearic Islands University and the Laser Interferometer Space Antenna (LISA).
- Memorandum of Understanding with the Balearic Islands University and VESF (The Virgo-EGO Scientific Forum).
- Memorandum of Understanding (LIGO-M020265-00) between the Balearic Islands University Relativity and Gravitation Group and the Laser Interferometer Gravitational Wave Observatory (LIGO) since 2002.
- Memorandum of Understanding (GE0-E2009-01) with the Balearic Islands University, Max Planck Institute for Gravitational Physics (Albert Einstein Institute), University of Glasgow, University of Hannover and Cardiff University (2009).
- In 2014, the IEEC (Institut d'Estudis Espacials de Catalunya) has signed a specific agreement for scientific collaboration between IEEC and UIB for "gravitational waves detection" (2014).
- Memorandum of Understanding with the Balearic Islands University and Long Island University (USA) (Dr. Steve Liebling). 1/09/2018-31/10/2020.
- Memorandum of Understanding with the Balearic Islands University and Hasselt University (Belgium) (Dr. Peter De Maesschalck). 1/09/2018-31/08/2020.
- Memorandum of Understanding between Institute d'Astrophysique Spatiale and IAC3
- Instrumental Agreement of grant with the Administration of the Balearic Islands and the Balearic Islands University for the research of gravitational waves. Govern de les Illes Balears.. (2016-2020)
- Memorandum of Understanding with the Balearic Islands University and Institut Mallorqui de Ciències de l'Espai (IMCE) (Ref.3559).

10 Societies and Collaborations Memberships

- American Physical Society, APS (Carles Bona Garcia, Carlos Palenzuela, Pep Covas).
- American Astronomical Society, AAS (Luna. M).
- American Geophysical Union, AGU (Luna. M).
- DANCE (Dinámica, atractores y no linealidad, caos y estabilidad). Group of Dynamical Systems and Image Processing.
- European Astronomical Society, EAS (José Luis Ballester, Sascha Husa, Ramón Oliver, Carlos Palenzuela, Alicia M. Sintes, Roberto Soler, Manuel Luna, Jaume Terradas and Daniele Viganò).
- International Society on General Relativity and Gravitation, ISGRG (Jaume Carot, Sascha Husa and Alicia M. Sintes).
- Institut Menorquí d'Estudis (Alicia M. Sintes).
- Institute of Physics (J. L. Ballester).
- International Astronomical Union (J. L. Ballester).
- LIGO Scientific Collaboration (Marina Adrover, Alicia Calafat, Marta Colleoni, Pep Covas, Héctor Estellés, Cecilio García, Leila Haegel, Sascha Husa, Rafel Jaume, Maite Mateu, Miquel Oliver, David Keitel, Geraint Pratten, Antoni Ramos, Alicia M. Sintes, Rodrigo Tenorio).
- LISA Consortium (Marina Adrover, Marta Colleoni, Pep Covas, Héctor Estellés, Cecilio García, Leila Haegel, Sascha Husa, Rafel Jaume, Miquel Oliver, Geraint Pratten, Antoni Ramos, Alicia M. Sintes, Rodrigo Tenorio).
- NASA Goddard Space Flight Center (Manuel Luna).
- New York Academy of Sciences (Carles Bona Garcia).
- Optical Society of America (Julien Javaloyes).
- Real Sociedad Española de Física, RSEF (José Luis Ballester, Carles Bona, Sascha Husa and Alicia M. Sintes).
- Societat Catalana de Física (Jaume Carot).

- Sociedad Española de Astronomía, SEA (José Luis Ballester, Sascha Husa, Ramón Oliver, Manuel Luna, Carlos Palenzuela, Alicia M. Sintes, Roberto Soler, Jaume Terradas and Daniele Viganò).
- Sociedad Española de Gravitación y Relatividad, SEGRE (Carles Bona, Jaume Carot, Sascha Husa and Alicia M. Sintes).
- Sociedad Española de Matemática Aplicada (Maria Jesus Álvarez, Bartomeu Coll).
- Societat Matemàtica de les Illes Balears (Maria Jesus Álvarez).
- Society for Industrial and Applied Mathematics (Bartomeu Coll, Onofre Martorell).

11 Patents

- L. Rudin, J. L. Lisani, P. Monasse, J. M. Morel. "Object recognition based on 2D images and 3D models", Núm. de Solicitud: 7587082 País de prioridad: Estados Unidos de América. Fecha de prioridad: 2009. En explotación por Cognitech.
- Buades, B. Coll, J.M Morel and B. Rougé, "Procedimiento de establecimiento de correspondencia entre una primera imagen digital y una segunda imagen digital de una misma escena para la obtención de disparidades", Spanish patent, Ref. P25155ES00, UIB, 2009. Extensión PCT conjunta UIB-CNES, solicitada también para EE.UU.
- F. Cao, F. Guichard, N. Azzabou, A. Buades, B. Coll, J.M. Morel, "Procedé de traitement d'objet numérique et systéme associé", French patent, Ref. PA080163EC, 2008. En explotación per DxO.
- Buades, B. Coll and J. M. Morel. "Image data process by image noise reduction and camera integrating the means for implementing this process". Patente europea UIB – CNRS – ENS Cachan, 2004. Extensión a EE. UU.: US 8,253,825 B2 (Aug. 28, 2012).
- L. Rudin, J.L. Lisani, J.M. Morel, P. Yu. "Video demultiplexing based on meaningful modes extraction", Núm. de Solicitud: 7328198. País de prioridad: Estados Unidos de América. Fecha de prioridad: 2008. En explotación por Cognitech.
- L. I. Rudin, J. L. Lisani, J. M. Morel." Registration and comparison of three dimensional objects in facial imaging", Núm de Registre: 8,605,989. Estats Units d'Amèrica (2013).

12 Publications

Astrophysics

- *Simultaneous longitudinal and transverse oscillations in filament threads after a failed eruption*
  Mazumder, Rakesh; Pant, Vaibhav; Luna, Manuel; Banerjee, Dipankar
  Astronomy and Astrophysics, 633, A12 (2020)
  https://doi.org/10.1051/0004-6361/201936453
  20 December 2019

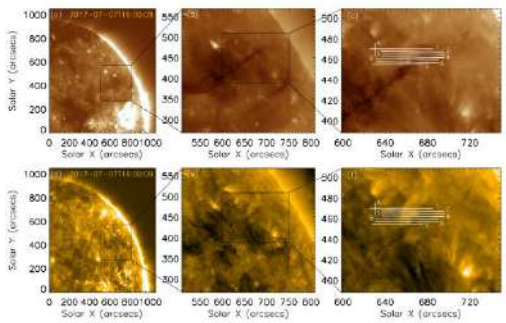


Figure 1: The upper row panels and lower row panels shows the filamentin SDO/AIA 193Å and 171Å respectively.

- *Ubiquitous hundred-Gauss magnetic fields in solar spicules*
  Kriginsky, M., Oliver, R., Freij, N., Kuridze, D., Asensio Ramos, A., Antolin, P.
  Astronomy & Astrophysics, 642, A61 (2020)
  https://doi.org/10.1051/0004-6361/202038546
  7 October 2020

- *Resonant absorption: Transformation of compressive motions into vortical motions*
  M. Goossens, I. Arregui, R. Soler, and T. Van Doorsselaere
  Astronomy & Astrophysics, 641, A106, (2020)
  https://doi.org/10.1051/0004-6361/202038394
  15 September 2020

- *Nonlinear coupling of alfvén and slow magnetoacoustic waves in partially ionized solar plasmas*
  J. L. Ballester, R. Soler, J. Terradas and M. Carbonell
  Astronoy and astrophysics, 641, A48 (2020)
  https://doi.org/10.1051/0004-6361/202038220
  8 September 2020

- *A new method for estimating global coronal wave properties based on their interaction with solar coronal holes*
  I. Piantschitsch, J. Terradas, and M. Temmer
  Astronomy and Astrophysics, 641, A21 (2020)
  https://doi.org/10.1051/0004-6361/202038182
  1 September 2020

- *Spectral characteristics and formation height of off-limb flare ribbons*
  Kuridze, D., Mathioudakis, M., Heinzel, P., Koza, J., Morgan, H., Oliver, R., Kowalski, A. F., Allred, J. C.
  The Astrophysical Journal, 896, 120 (2020)
  https://doi.org/10.3847/1538-4357/ab9603
  arXiv:2005.10924
  21 May 2020

- *Spectroscopic detection of coronal plasma flows in loops undergoing thermal non-equilibrium cycles*
  Gabriel Pelouze, Frédéric Auchère, Karine Bocchialini, Clara Froment, Susanna Parenti and Elie Soubrié
  Astronomy and Astrophysics, 634, A54 (2020)
  https://doi.org/10.1051/0004-6361/201935872
  12 May 2020

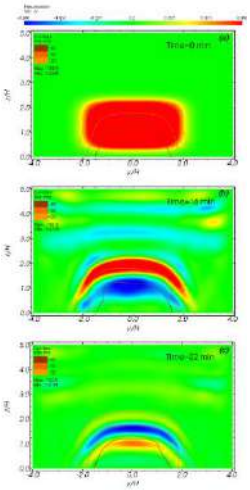


Figure 3: Evolution ofvyat they V_z-plane passing through x=0 for horizontal transverse oscillations with the prominence density(orange isocontours)

- *Numerical simulations of large-ampolitude oscillations in flux rope solar prominences*
  Liakh, V.; Luna, M.; Khomenko, E.
  Astronomy and Astrophysics, 637, A75 (2020)
  https://doi.org/10.1051/0004-6361/201937083
  19 May 2020

- *Phase Mixing of Kink MHD Waves in the Solar Corona: Viscous Dissipation and Heating*
  Zanyar Ebrahimi, Roberto Soler and Kayoomars Karami
  The Astrophysical Journal, 893, 157 (2020)
  https://doi.org/10.3847/1538-4357/ab80ca
  arXiv:2005.04389
  27 April 2020

- *Two-dimensional simulations of coronal rain dynamics. I. Model consisting of a vertical magnetic field and an unbounded atmosphere*
  Martínez-Gómez, D., Oliver, R., Collados, M., Khomenko, E.
  Astronomy & Astrophysics, 634, A36 (2020)
  https://doi.org/10.1051/0004-6361/201937078
  February 2020

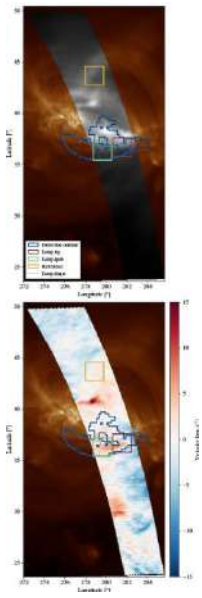


Figure 2: Both maps are overlaid on a AIA 193 Å map to help visualize the structure of the active region. Thetemporal evolution of AIA 193 Å can be seen in the online movie.

- *3D numerical simulations of oscillations in solar prominences*
  Adrover-González, Andrés; Terradas, Jaume
  Astronomy & Astrophysics 633, A113 (2020)
  https://doi.org/10.1051/0004-6361/201936841
  20 January 2020

Computer Applications

- *How carrier memory enters the Haus master equation of mode-locking*
  Jan Hausen and Kathy Lüdge and Svetlana V. Gurevich and Julien Javaloyes
  Optics Letters, 35, 6210-6213 (2020)
  https://doi.org/10.1364/OL.406136
  arXiv:2008.09058
  November 2020

- *Phase-Incoherent Photonic Molecules in V-Shaped Mode-Locked Vertical-External-Cavity Surface-Emitting Semiconductor Lasers*
  Hausen, Jan and Meinecke, Stefan and Javaloyes, Julien and Gurevich, Svetlana V. and Lüdge, Kathy
  Phys. Rev. Applied 14 044059 (2020)
  https://doi.org/10.1103/PhysRevApplied.14.044059
  arXiv:2005.12088

30 October 2020

- *Hopping and emergent dynamics of optical localized states in a trapping potential*
  Garbin, B. and Javaloyes, J. and Tissoni, G. and Barland,S.
  Chaos 30, 093126 (2020)
  arXiv:1710.01017
  https://doi.org/10.1063/5.0006130
  16 September 2020

- *Elastic thick shells in general relativity*
  Irene Brito, J. Carot, and E. G. L. R. Vaz
  Physical
  Phys. Rev. D 102, 024081 (2020)
  https://doi.org/10.1103/PhysRevD.102.024081
  arXiv:2005.03736
  15 July 2020

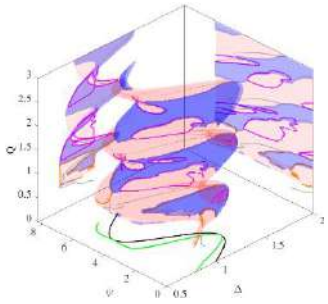


Figure 4: Three-dimensional representation of the bifurcation structure of periodic solutions. Blue and red surfaces representstable and unstable solutions. Grey, orange and magenta lines show borders of fold, period doubling and torus instabilities respectively.

- *NanoLEDs for energy-efficient and gigahertz-speed spike-based sub-λ neuromorphic nanophotonic computing*
  Bruno Romeira and José M. L. Figueiredo and Julien Javaloyes
  Nanophotonics, 20200177 (2020)
  https://doi.org/10.1515/nanoph-2020-0177
  June 2020

- *Topological localized states in the time delayed Adler model: Bifurcation analysis and interaction law.*
  L. Munsberg, J. Javaloyes, and S. V. Gurevich
  Chaos 30, 063137 (2020)
  https://doi.org/10.1063/5.0002015
  arXiv:2001.07556
  17 June 2020

- *Bound states of light bullets in passively mode-locked semiconductor lasers*
  Dohmen, Fabian and Javaloyes, Julien and Gurevich, Svetlana V.
  Chaos 30, 063120 (2020)
  https://doi.org/10.1063/5.0003227
  arXiv:2001.11728
  5 June 2020

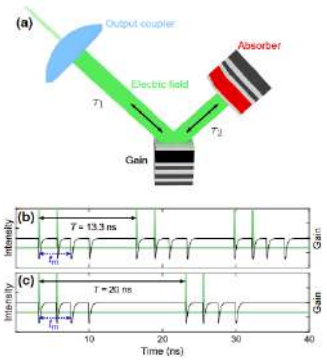


Figure 5: Setup of a passively mode-locked VECSEL withV-shaped cavity geometry. The main constituents are a semicon-ductor saturable absorber mirror, an out-coupling facet with highreflectivity (κ≈0.99), and a semiconductor gain chip that canbe optically or electrically pumped.

- *Discrete light bullets in passively mode-locked semiconductor lasers*
  Thomas G. Seidel, Auro M. Perego, Julien Javaloyes, and Svetlana V. Gurevich
  Chaos 30, 063102 (2020)
  https://doi.org/10.1063/5.0002989
  arXiv:2001.10963
  1 June 2020

- *Mesoscopic limit cycles in coupled nanolasers*
  Mathias Marconi, Fabrice Raineri, Ariel Levenson, Alejandro M. Yacomotti, Julien Javaloyes, Si H. Pan, Abdelkrim El Amili, and Yeshaiahu Fainman
  Phys. Rev. Lett. 124, 213602 (2020)
  https://doi.org/10.1103/PhysRevLett.124.213602
  arXiv:1911.10830
  27 May 2020

- *Dispersive Instabilities in Passively Mode-Locked Integrated External-Cavity Surface-Emitting Lasers*
  Christian Schelte, Denis Hessel, Julien Javaloyes, and Svetlana V. Gurevich
  Phys. Rev. Applied 13, 054050, (2020)
  https://doi.org/10.1103/PhysRevApplied.13.054050
  arXiv:2001.03446
  20 May 2020

Dynamical Systems

- *Estimation of Synaptic Activity during Neuronal Oscillations*
  C. Vich, R. Prohens, A. E. Teruel, A. Guillamon
  Neuronal Oscillations. Mathematics, 8, 2153 (2020)
  https://doi.org/10.3390/math8122153

21 November 2020

- *The credit assignment problem in cortico-basal ganglia-thalamic networks: a review, a problem, and a possible solution*
  Rubin, J. E., Vich, C., Clapp, M., Noneman, K., & Verstynen, T.
  European Journal of Neuroscience.
  https://doi.org/10.1111/ejn.14745
  17 April 2020

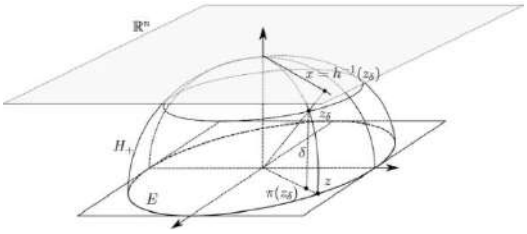


Figure 7: Poincaré compactification of a vector fieldf. The phase space R^{n} with the hyperplane of R^{n+1} tangent to the unit sphere S^n at the north pole e^{n+1}.

- *Asymptotic dynamics of a difference equation with a parabolic equilibrium*
  B. Coll; A. Gasull; R. Prohens
  Qualitative Theory of Dynamical Systems, Ms. No. QTDS-D-19-00241, 2020.
  https://doi.org/10.1016/j.jmaa.2019.123525
  1 June 2020

- *Asymptotic lower bounds on Hilbert numbers using canard cycles.*
  M.J. Álvarez, B. Coll, P. De Maesschalck, R. Prohens
  Journal of Differential Equations, 268 (7), 3370-3391 (2020)
  https://doi.org/10.1016/j.jde.2019.09.057
  15 March 2020

- *Corticostriatal synaptic weight evolution in a two-alternative forced choice task: a computational study*
  C. Vich, K. Dunovan, T. Verstynen, J. Rudin
  Communications in Nonlinear Science and Numerical Simulation, 82, 2020.
  https://doi.org/10.1016/j.cnsns.2019.105048
  March 2020

- *Poincaré Compactification for Non-polynomial Vector Fields*
  J. L Bravo, M. Fernández & A. Teruel
  Qualitative Theory of Dynamical Systems 19, 50 (2020)
  https://doi.org/10.1007/s12346-020-00386-1
  29 February 2020

- *Alien limit cycles in Abel equations*
  M. J. Álvarez; J. L. Bravo; M. Fernández; R. Prohens
  Journal of Mathematical Analysis and Applications, 482 (1) (2020)
  https://doi.org/10.1016/j.jmaa.2019.123525
  1 February 2020

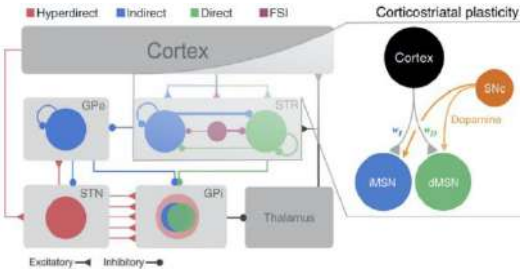


Figure 6: Circuit-level architecture of the cortico-basal ganglia-thalamic loop highlighting the major pathways within a single action channel.

Relativity and Gravitation

- *Accelerating the evaluation of inspiral-merger-ringdown waveforms with adapted grids*
  Cecilio García-Quirós, Sascha Husa, Maite Mateu-Lucena, Angela Borchers
  Classical and Quantum Gravity, 38(1):015006, 2020.
  https://doi.org/10.1088/1361-6382/abc36e
  arXiv:2001.10897
  27 November 2020

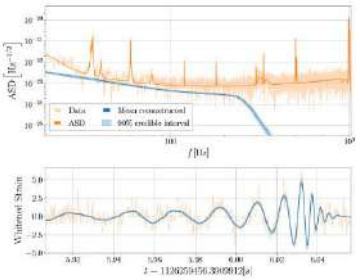


Figure 8: Reconstructed waveform for GW150914 for LIGOHanford. The top panel shows the amplitude spectral density ofthe signal (blue), data (light orange), and estimated noise ampli-tude spectral density (dark orange).

- *Effects of proper motion of neutron stars on continuous gravitational-wave searches*
  P. B. Covas
  Monthly Notices of the Royal Astronomical Society, 500, 5167–5176, 2021
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  arXiv:20008.00983
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- *Turbulent magnetic-field amplification in the first 10 milliseconds after a binary neutron star merger: Comparing high-resolution and large-eddy simulations*
  Ricard Aguilera-Miret, Daniele Viganò, Federico Carrasco, Borja Miñano, Carlos Palenzuela
  Physical Review D 102, 103006 (2020)
  DOI:10.1103/PhysRevD.102.103006
  arXiv:2009.06669

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- *Search for strongly lensed counterpart images of binary black hole mergers in the first two LIGO observing runs*
  Connor McIsaac, David Keitel, Thomas Collett, Ian Harry, Simone Mozzon, Oliver Edy, David Bacon
  Phys. Rev. D 102, 084031 (2020)
  https://doi.org/10.1103/PhysRevD.102.084031
  arXiv:1912.05389
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- *Gravitational-wave Constraints on the Equatorial Ellipticity of Millisecond Pulsars*
  R. Abbot et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  The Astrophysical Journal Letters, 902, 1
  https://doi.org/10.3847/2041-8213/abb655
  arXiv:2007.14251
  12 October 2020

- Simflowny3: An upgraded platform for scientifoc ,pdeñño mg and simulation
  C. Palenzuela, B. Miñano, A.Arbona, C. Bona-Casas, C.Bona, J.Massó
  Computer Physics Communications, 259 (2021)
  https://doi.org/10.1016/j.cpc.2020.107675
  Summited: 2 October 2020

- *Prospects for observing and localizing gravitational-wave transients with Advanced* LIGO, Advanced Virgo and KAGRA
  B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  Living Rev Relativ 23, 3 (2020)
  https/doi.org/10.1007/s41114-020-00026-9
  arXiv:abs/1304.0670
  28 September 2020

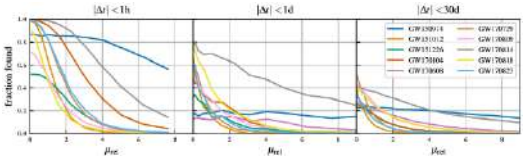

Figure 9: The probability of finding lensed images of the GWTC-1 events in each of the 10 corresponding searches as a functionof relative magnificationμrel=μ0/μinj, for several ranges of time delays Δt.

- *Bayesian inference for compact binary coalescences with BILBY: Validation and application to the first LIGO–Virgo gravitational-wave transient catalogue*
  I M Romero-Shaw, C Talbot, S Biscoveanu, V D'Emilio, G Ashton, C P L Berry, S Coughlin, S Galaudage, C Hoy, M Hübner, K S Phukon, M Pitkin, M Rizzo, N Sarin, R Smith, S Stevenson, A Vajpeyi, M Aréne, K Athar, S Banagiri, N Bose, M Carney, K Chatziioannou, J A Clark, M Colleoni, R Cotesta, B Edelman, H Estellés, C García-Quirós, Abhirup Ghosh, R Green, C-J Haster, S Husa, D Keitel, A X Kim, F Hernandez-Vivanco, I Magaña Hernandez, C Karathanasis, P D Lasky, N De Lillo, M E Lower, D Macleod, M Mateu-Lucena, A Miller, M Millhouse, S Morisaki, S H Oh, S Ossokine, E Payne, J Powell, G Pratten, M Pürrer, A Ramos-Buades, V Raymond, E Thrane, J Veitch, D Williams, M J Williams, L Xiao
  Monthly Notices of the Royal Astronomical Society, 499, 3295–3319, 2020
  https://doi.org/10.1093/mnras/staa2850
  arXiv:2006.00714
  21 september 2020

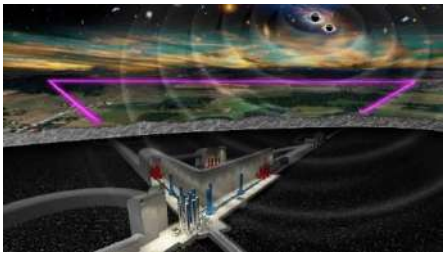

Figure 10: Einstein telescope (artistic representation)

- *Enhancing Gravitational-Wave Science with Machine Learning*
  Elena Cuoco, Jade Powell, Marco Cavaglià, Kendall Ackley, Michal Bejger, Chayan Chatterjee, Michael Coughlin, Scott Coughlin, Paul Easter, Reed Essick, Hunter Gabbard, Timothy Gebhard, Shaon Ghosh, Leila Haegel, Alberto Iess, David Keitel, Zsuzsa Marka, Szabolcs Marka, Filip Morawski, Tri Nguyen, Rich Ormiston, Michael Puerrer, Massimiliano Razzano, Kai Staats, Gabriele Vajente, Daniel Williams
  Machine Learning: Science and Technology, 2, 011002 (2020)
  https://doi.org/10.1088/2632-2153/abb93a
  arXiv:2005.03745
  16 September 2020

- *Introduction to Numerical Relativity*
  Carlos Palenzuela
  Frontiers in Astronomy and Space Sciences, 7 (2020)
  https://doi.org/10.3389/fspas.2020.00058
  10 September 2020

- *Site-selection criteria for the Einstein Telescope*
  Florian Amann, Fabio Bonsignorio, Tomasz Bulik, Henk Jan Bulten, Stefano Cuccuru, Alain Dassargues, Riccardo DeSalvo, Edit Fenyvesi, Francesco Fidecaro, Irene Fiori, Carlo Giunchi, Aniello Grado, Jan Harms, Soumen Koley, László Kovács, Giovanni Losurdo, Vuk Mandic, Patrick Meyers, Luca Naticchioni, Frédéric Nguyen, Giacomo Oggiano, Marco Olivieri, Federico Paoletti, Andrea Paoli, Wolfango Plastino, Massimiliano Razzano, Paolo Ruggi, Gilberto Saccorotti, Alicia M. Sintes, László Somlai, Peter Ván, and Matyas Vasúth
  Rev. Sci. Instrum. 91, 094504 (2020)
  https://doi.org/10.1063/5.0018414
  arXiv:2003.03434
  9 september 2020

- *Multimode frequency-domain model for the gravitational wave signal from nonprecessing black-hole binaries*
  Cecilio García-Quirós, Marta Colleoni, Sascha Husa, Héctor Estellés, Geraint Pratten, Antoni Ramos-Buades, Maite Mateu-Lucena, Rafel Jaume
  Physical Review D, 102, 064002 (2020)
  https://doi.org/10.1103/PhysRevD.102.064002
  arXiv:2001.10914
  2 september 2020

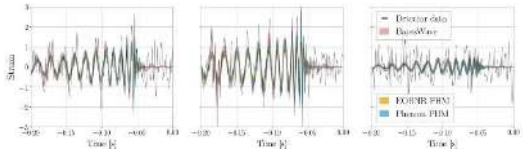

Figure 11: Reconstructions of the gravitational waveform of GW190412 in the LIGO Hanford, LIGO Livingston and Virgo detectors(from left to right).

- *Setting the cornerstone for a family of models for gravitational waves from compact binaries: The dominant harmonic for nonprecessing quasicircular black holes*
  Geraint Pratten, Sascha Husa, Cecilio Garcia-Quiros, Marta Colleoni, Antoni Ramos-Buades, Hector Estelles, Rafel Jaume
  Physical Review D, 102, 064001 (2020)
  https://doi.org/10.1103/PhysRevD.102.064001
  arXiv:2001.11412
  2 september 2020

- *Properties and Astrophysical Implications of the 150 M⊙ Binary Black Hole Merger GW190521*
  R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  The Astrophysical Journal Letters, 900, L13 (2020)
  https://doi.org/10.3847/2041-8213/aba493
  arXiv:2009.01190
  2 september 2020

- *GW190521: A Binary Black Hole Merger with a Total Mass of 150 M⊙*
  R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  Phys. Rev. Lett. 125, 101102 (2020
  DOI: https://doi.org/10.1103/PhysRevLett.125.101102
  arXiv:2009.01075
  2 september 2020

- *Erratum: "Searches for Gravitational Waves from Known Pulsars at Two Harmonics in 2015–2017 LIGO Data"*
  B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  Astrophys. J. 899, 2 (2020)
  DOI: https://doi.org/10.3847/1538-4357/abaabb
  arXiv:1902.08507
  26 August 2020

- *GW190412: Observation of a binary-black-hole coalescence with asymmetric masses*
  R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  Physical Review D, 102, 043015 (2020)
  https://doi.org/10.1103/PhysRevD.102.043015,
  arXiv:2004.08342
  24 August 2020

- *Impact of eccentricity on the gravitational wave searches for binary black holes: High mass case*
  A. Ramon, S. Tiwari, M. Haney, S. Husa
  Physical Review D, 102, 4, 043005(2020)
  arXiv:2005.14016
  https://doi.org/10.1103/PhysRevD.102.043005
  10 August 2020

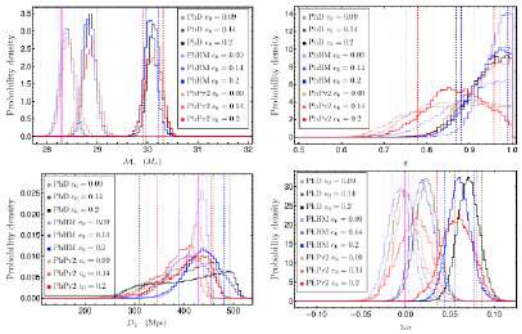

Figure 12: Posterior probability distributions for the eccentric injected NR simulations in TableI. The vertical dashed lines correspond to 90% credible regions. The magenta thick vertical line represents the injected value.

- *GW190814: Gravitational Waves from the Coalescence of a 23 Solar Mass Black Hole with a 2.6 Solar Mass Compact Object*
  R. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
  The Astrophysical Journal Letters, 896, L44 (2020)
  https://doi.org/10.3847/2041-8213/ab960f
  arXiv:2006.12611
  23 June 2020

- *General relativistic MHD large eddy simulations with gradient subgrid-scale model*
  Daniele Viganò, Ricard Aguilera-Miret, Federico Carrasco, Borja Miñano, Carlos Palenzuela
  Physical Review D, 101, 123019 (2020)
  https://doi.org/10.1103/PhysRevD.101.123019
  arXiv:2004.00870
  16 June 2020

- *Towards fidelity and scalability in non-vacuum mergers*
  S. L. Liebling, C. Palenzuela, L. Lehner
  Classical and Quantum Gravity, 37, 13 (2020)
  https://doi.org/ 10.1088/1361-6382/ab905c
  arXiv:1911.01496
  10 June 2020

- *Predicting the properties of black holes merger remnants with Deep Neural Networks*
  Leïla Haegel, Sascha Husa
  Classical and Quantum Gravity 37,135005 (2020)

https://doi.org/10.1088/1361-6382/ab905c,
arXiv:1911.01496
10 June 2020

- *First all-sky search for continuous gravitational-wave signals from unknown neutron stars in binary systems using Advanced LIGO data*
P. B. Covas, Alicia M. Sintes
Physical Review Letters, 124, 191102 (2020)
DOI: https://doi.org/10.1103/PhysRevLett.124.191102,
arXiv:2001.08411
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- *Validity of common modelling approximations for precessing binary black holes with higher-order modes*
Antoni Ramos-Buades, Patricia Schmidt, Geraint Pratten, Sascha Husa
Physical Review D, 101, 103014 (2020)
DOI: https://doi.org/10.1103/PhysRevD.101.103014
arXiv:2001.10936
11 May 2020

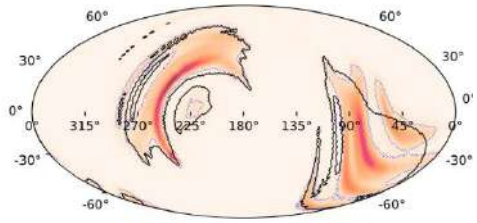

Figure 13: Sky map for GW190425. The shaded patch is the sky map obtainedfrom the Bayesian parameter estimation code LALINFERENCE(Veitch et al.2015)(see Section4)with the 90% confidence region bounded by the thin dottedcontour.

- *A Joint Fermi-GBM and LIGO/Virgo Analysis of Compact Binary Mergers From the First and Second Gravitational-wave Observing Runs*
B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Astrophys. J. 893, 100 (2020)
https://doi.org/10.3847/1538-4357/ab7d3e
arXiv:2001.00923
20 April 2020

- *A first survey of spinning eccentric black hole mergers: numerical relativity simulations, hybrid waveforms, and parameter estimation*
Antoni Ramos-Buades, Sascha Husa, Geraint Pratten, Héctor Estellés, Cecilio García-Quirós, Maite Mateu, Marta Colleoni, Rafel Jaume
Phys. Rev. D 101, 083015 (2020)
https://doi.org/10.1103/PhysRevD.101.083015
arXiv:1909.11011
10 April 2020

- *An Optically Targeted Search for Gravitational Waves emitted by Core-Collapse Supernovae during the First and Second Observing Runs of Advanced LIGO and Advanced Virgo*
B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration, ASAS-SN Collaboration, DLT40 Collaboration)
Physical Review D, 101, 084002 (2020)
Dhttps://doi.org/10.1103/PhysRevD.101.084002
arXiv:1908.03584
2 April 2020

- *GW190425: Observation of a Compact Binary Coalescence with Total Mass ~3.4 Msun*
B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
The Astrophysical Journal Letters, 892, L3 (2020)
https://doi.org/10.3847/2041-8213/ab75f5
arXiv:2001.01761
20 March 2020

- *Gradient subgrid-scale model for relativistic MHD large-eddy simulations*
Federico Carrasco, Daniele Viganò and Carlos Palenzuela
Physical Review D, 101, 063003 (2020)
https://doi.org/10.1103/PhysRevD.101.063003
arXiv:1908.01419
3 March 2020

- *A guide to LIGO-Virgo detector noise and extraction of transient gravitational-wave signals*
B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Class. Quantum Grav. 37 055002 (2020)
https://doi.org/10.1088/1361-6382/ab685e
arXiv:1908.11170
6 February 2020

- *A Multipolar Effective One Body Model for Non-Spinning Black Hole Binaries*
Alessandro Nagar, Geraint Pratten, Gunnar Riemenschneider, Rossella Gamba
Physical Review D, 101, 024041 (2020)
https://doi.org/10.1103/PhysRevD.101.024041
arXiv:1904.09550
22 January 2020

- *Model comparison from LIGO-Virgo data on GW170817's binary components and consequences for the merger remnant* B. P. Abbott et al. (LIGO Scientific Collaboration and Virgo Collaboration)
Class. Quantum Grav. 37 045006 (2020)
https://doi.org/10.1088/1361-6382/ab5f7c
arXiv:1908.01012
16 January 2020

Image Processing

- *CFA Video Denoising and Demosaicking Chain via Spatio-Temporal Patch-Based Filtering*
A. Buades, J. Duran
IEEE Transactions on Circuits and Systems for Video Technology, 30 (7), 4143-4157 (2020)
https://doi.org/10.1109/TCSVT.2019.2956691
November 2020

- *Enhancement of Noisy and Compressed Videos by Optical Flow and Non-Local Denoising*

A. Buades, J. L. Lisani
IEEE Transactions on Circuits and Systems for Video Technology, 30 (7), 1960-1974 (2020)
https://doi.org/10.1109/TCSVT.2019.2911877

Figure 14: Visual comparison with simulated noisy CFAs. From left to right: image by local demosaicking,image by temporal demosaicking plus VBM3D, proposed demosaicking, proposed CFA denoising plus localdemosaicking and complete chain.

- *Local Contrast Enhancement based on Adaptive Logarithmic Mappings*
  J. L. Lisani
  Image Processing On Line, 10, 43–61 (2020)
  https://doi.org/ipol.2020.300
  1 June 2020

- *Analyzing Center/Surround Retinex*
  J.L. Lisani, J.M. Morel, A.B. Petro, C. Sbert
  Information Sciences, 512, 741-759, (2020)
  https://doi.org/10.1016/j.ins.2019.10.009
  1 February 2020

- *Backlit Images Enhancement using Global Tone Mappings and Image Fusion*
  A. Buades, J.L. Lisani, A.B. Petro, C. Sbert
  IET Image Processing, 14(2), 211-219, (2020).
  https://doi.org/10.1049/iet-ipr.2019.0814
  30 January 2020

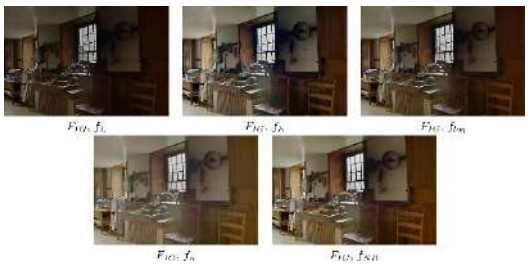

Figure 15: Comparison between the results obtained with different kernels and the fNR scale function.

13 Managament and participations in scientific committees

13.1 Organization of R&D activities

- Husa, S.
  Virtual Iberian Gravitational Wave Meeting
  Scientific Organizing Committee
  19-20 October 2020

- Javaloyes, J.
  European Semiconductor Laser Workshop
  Technical Committee
  Technical University of Eindhoven, Netherlands
  4-7 December 2020

- Javaloyes, J.
  20th International Conference on Numerical Simulation of Optoelectronic Devices
  Scientific Organizing Committee
  Turino, Italy
  14-25 September 2020

- Javaloyes, J.
  CLEO Europe CLEO/EQEC international conference
  Nonlinear Phenomena, Solitons and Self-organization
  Scientific Organizing Committee
  Munich Germany
  June 2020

- Sintes, A. M.
  Comitè organitzador.
  Topics in Astroparticle and Underground Physics (TAUP 2021)
  Valencia Conference Center, Spain
  Scientific Organizing Committee
  30 August - 3 September 2021

- Sintes, A. M.
  XIV.0 Reunión Científica (virtual) de la SEA
  Scientific Organizing Committee
  13-17 July 2020

- Sintes, A. M.
  Quantum Frontiers: General Assembly 2020
  Hannover – Online
  4-5 May 2020

- Sintes, A. M.
  Spanish Meeting on ET ESFRI proposal preparation
  Institut d'Estudis Espacials de Catalunya (IEEC) in Barcelona

3 February 2020

Member board
Trieste, Italy
13-16 January 2020

- Sintes, A. M.
  Gravitational Waves, Black Holes and Fundamental Physics

13.2 Scientific, technical and/or assessment committees

- Alvarez, M. J. member of Academic Committee of PhD in Information and Communications Technology.
- Ballester, J. L. referee for the Agencia Estatal de Investigación (AEI) of R&D projects.
- Buades A. member of the Editorial Board of Image Processing On Line (IPOL) journal.
- Carot J. member of the executive committee of the R + D + i sector commission of the CRUE.
- Carot J. member of the CRUE working group for the 'Iberian Agenda of Knowledge'.
- Carot J. member of the RIS3 Expert Group of the EUA.
- Carot J. member of the monitoring committee of the RIS3 strategy in the Balearic Islands.
- Carot J. member of the Science and Technology interdepartamental committee of the Balearic Islands Regional Government.
- Coll, B. member of the Editorial Board of Image Processing On Line (IPOL) journal.
- Coll, B. member of the Editorial SCM.
- Coll, B. member of the Math Accreditation Commission (ANECA)
- Coll, B. member of the Dissemination Committee of ICIAM 2019.
- Coll, B. Vice-President of the Red Española Matemàtica-Industria (Math-In) since June 2019.
- Husa S. member of the LIGO Scientific Collaboration Council
- Javaloyes, J. International Semiconductor Laser Conference (Advisory board)
- Keitel. D. coordinator and reviewer of the LIGO Scientific Collaboration science summaries.
- Luna, M. referee for Federal Research Policy Office of Belgium (BELSPO) in the FED-tWIN program.
- Lisani J. L. member of the Editorial Board of Image Processing Online (IPOL) journal.
- Sintes, A. M. QuantumFrontier General Assembly 2020 (Advisory board)
- Sintes, A. M. member of the LIGO Scientific Collaboration Council.
- Sintes, A. M. member of the Editorial Board of Astroparticle Physics.
- Sintes, A. M. member of the LIGO Scientific Collaboration Program Committee.
- Sintes A. M. panel member in the scientific evaluation of proposals submitted to the ERC Advanced Grant Call 2020 (PE9: "Universe Sciences ").
- Sintes, A. M. Review pannel member of “Universum 2020-2023, Erforschung von Universum und 27 Materie -ErUM“, German Ministry of Science and Education--Bundesministeriums für Bildung und Forschung (BMBF) in the area of astrophysics and astroparticle physics.

13.3 R&D managament

- Carles Bona Garcia Director Physics Department, Universitat de les Illes Balears.
- Carlos Palenzuela member of Academic Commission of PhD in Physics, Universitat de les Illes Balears)
- María Jesús Alvarez Secretary of the Centre for Postgraduate, Universitat de les Illes Balears

14 Organitzation to I+D+I Activities

14.1 IAC3 Meetings/Conferences

- *II Jornadas sobre sistemas dinámicos y sus aplicaciones*
  Online Workshop
  22-24/07/2020

14.2 IAC3 seminars

- 18 December 2020: Luana Modafferi.
  Markian 421: the X-ray temporal and spectral analysis of and incredibly variable blazar
- 17 December 2020: Alicia Calafat
  Mejorando los resultados de la estimación de parámetros para los primeros tres periodos de observación de LIGO-Virgo mediante la adición de armónicos más altos
- 17 December 2020: Rafel Jaume
  Recoil of Binary Black Hole systems and the multipolar structure of gravitational wave signals
- 16 December 2020: Alberto Pérez-Cervera.
  Phase Amplitude reduction of Oscillatory dynamics
- 16 December 2020: Friso Snel
  Testing waveform models for the LISA and Einstein Telescope gravitational wave detectors
- 18 November 2020: Ricard Aguilera Miret
  Turbulent Dynamo in binary neutron star mergers
- 18 September 2020: Sergio Díaz Suárez and Roberto Soler
  3D numerical simulations of torsional Alfvén waves in solar flux tubes.
- 4 November 2020: Sascha Husa
  Phenomenological Waveform Modelling at UIB
- 10 Setembre 2020: Rodrigo Tenorio Marquez
  Continuous Gravitational Waves: All-sky searches using the Hough transform algorithm
- 10 September 2020: Olena Podladchikova (Royal Observatory of Belgium)
  Stereoscopic Measurements of Coronal Doppler Velocities with Solar Orbiter
- 31 July 2020: Fabian Maucher
  Two Examples of Pattern-formation
- 8 March 2020: Azaymi Litzi Siu Tapi (Max Planck Institute for Solar System Research, Instituto de Astrofísica de Andalucía)
  Magnetic properties of short-lived penumbral microjets
- 8 Enero 2020: Miquel and Isabel Anaí Echeverría Oviedo (OIST, Japan)
  Opportunities for collaboration, Research Internships and PhD programs at the Okinawa Institute of Science and Technology Graduate University (OIST) in Japan

15 Contribution to conferences and workshops

15.1 Invited Talks

Astrophysics

- Matheus Aguiar-Kriginsky Silva
  Ubiquituous hundred-Gauss magnetic fields in solar spicules
  Astrophysics (Solar Physics) group seminar, Northumbria University, UK
  23 September 2020
- Matheus Aguiar-Kriginsky Silva
  Ubiquituous hundred-Gauss magnetic fields in solar spicules
  Plasma Dynamics Group seminar, University of Sheffield, UK
  18 June 2020

Relativity and Gravitation

- Marta Colleoni
  Towards the routine use of PhenomX waveform models
  UCD Applied and Computational Mathematics online seminar series
  University College Dublin, Ireland
  14 November 2020
- Alicia Sintes
  Descubrimiento de las ondas gravitacionales: enseñanzas para los profesionales de la salud
  XLVI Congreso Nacional Sociedad Española De Reumatología (online)
  https://www.ser.es/evento/congreso-nacional/#1480578913254-fcb6ce4e-207c
  20-24 October 2020
- David Keitel
  Gravitational Waves from Binary Black Hole Mergers - Insights from a Rapidly Growing Observational Field

David Keitel for the LIGO Scientific Collaboration and Virgo Collaboration
XII Jornadas CPAN
https://indico.ific.uv.es/event/4262/
22 October 2020

- David Keitel
  Recent LIGO-Virgo searches for gravitational waves from neutron stars
  David Keitel for the LIGO Scientific Collaboration and Virgo Collaboration
  XIV.0 Reunión Científica Virtual de la Sociedad Española de Astronomía
  Invited contribution (sesión Galaxias y Cosmología)
  https://www.sea-astronomia.es/reunion-cientifica-2020
  13-15 July 2020

15.2 Contributed Talks

Astrophysics

- Manuel Luna
  Confined jets in a filament-channel and its iteractions with a prominence: large-amplitude oscillations.
  MHD Coronal Seismology 2020: Twenty Years of Probing the Sun's Corona with MHD Waves (Online)
  University of Warwick
  8-11 December 2020

- Sergio Díaz Suárez y Roberto Soler.
  3D numerical simulations of torsional Alfvén waves in solar flux tubes.
  XIV.0 Reunión Científica (virtual) de la SEA
  14 July 2020

- *Matheus Kriginsky, Ramón Oliver, Nabil Freij, David Kuridze, Andrés Asensio Ramos, Patrick Antolin*
  Magnetic field inference in the chromosphere and lower corona
  XIV.0 Reunión Científica (virtual) de la SEA (Online)
  14 July 2020

- Andrés Adrover González, Jaume Terradas
  Three-dimensional simulations of oscillations in solar prominences
  European Solar Physics Seminars (ESPOS)
  6 February 2020

Dynamical Systems

- Antonio E. Teruel
  Slow-passage through bifurcation
  II Jornadas sobre sistemas dinámicos y sus aplicaciones
  Workshop Online
  23 July 2020

- Jordi Penalva
  PWL version of the Morris-Lecar system
  II Jornadas sobre sistemas dinámicos y sus aplicaciones
  Workshop Online
  23 July 2020

Image Processing

- Antoni Buades
  Fusion, registration and noise removal for images with different exposure
  Huawei Workshop in futur technologies for ISP, (Online)
  14 July 2020

- Cati Vich
  Bursting oscillations in the PWL version of the Morris-Lecar system
  II Jornadas sobre sistemas dinámicos y sus aplicaciones
  Workshop Online
  23 July 2020

- Cati Vich
  Neural Networks: a work on plasticity
  II Jornadas sobre sistemas dinámicos y sus aplicaciones
  Workshop Online
  23 July 2020

- Rafel Prohens
  EDOs en el plano. Número de ciclos límite en ecuaciones diferenciales
  II Jornadas sobre sistemas dinámicos y sus aplicaciones
  Workshop Online
  24 July 2020

Computer Applications

- J. Hausen S. Gurevich, K. Lüedge, J. Javaloyes
  Incoherent Photonic molecules in V-shaped passively mode-locked lasers
  European Semiconductor Laser Workshop Technical Committee
  Technical University of Eindhoven, Eindhoven, Netherlands
  4-7 December 2020

- S. Gurevich, C. Schelte, J. Javaloyes
  Third Order Dispersion in Optical Time DelayedSystems: The case of Mode-Locked VerticalExternal-Cavity Surface-Emitting Lasers
  European Semiconductor Laser Workshop Technical Committee
  Technical University of Eindhoven, Eindhoven, Netherlands
  4-7 December 2020

- S. Gurevich, C. Schelte, J. Javaloyes
  A Functional Mapping for Passively Mode-Locked Semiconductor Lasers

20th International Conference on Numerical Simulation of Optoelectronic Devices
Turino, Italy
14-25 September 2020

Relativity and Gravitation

- David Keitel, Joan Moragues
  O3 post-glitch long-transient search, LIGO Document G2001776
  LIGO-Virgo Continuous Waves group telecon talk
  14 October 2020

- Alicia M. Sintes, Rodrigo Tenorio, Pep B. Covas
  Early O3 all-sky binary CW: Second DAC Update, LIGO Document G2001754
  Presentation at the LIGO-Virgo DAC telecon
  2 October 2020

- Marta Colleoni, Maite Mateu-Lucena, Antoni Ramos-Buades, Geraint Pratten, Cecilio Garcia-Quiros, Hector Estelles, Rafel Jaume, David Keitel, Sascha Husa
  Toward the routine use of higher modes: re-analysis of GW190412 with the IMRPhenomX family, LIGO Document G2001752
  LIGO-Virgo Waveform Group call
  1 October 2020

- Marta Colleoni, Maite Mateu-Lucena, Sascha Husa, David Keitel, Geraint Pratten, Cecilio Garcia-Quiros, Hector Estelles, Antoni Ramos-Buades, Rafel Jaume
  Toward the routine use of higher modes: re-analysis of GW190412 with the IMRPhenomX family, LIGO-G2001741
  Presentation at the LIGO-Virgo parameter estimation call
  28 September 2020

- David Keitel
  Searching for Continuous and Long-Duration Gravitational Waves from Neutron Stars
  LIGO Document G2001288
  Annual Meeting of the Astronomische Gesellschaft 2020, (virtual)
  German Astronomical Society (splinter session on relativistic astrophysics)
  25 September 2020

- Otto Akseli Hannuksela, Collaborators: P. Ajith, T. Broadhurst, J.M. Diego, K. Haris, D. Keitel, K. Kim,S. Kumar, K.H. Lai, T.G.F. Li, P.L. Kelly A.K. Mehta, G. Pagano, G.F. Smoot III,I. Wong, Peter T. H. Pang, Tim Dietrich, Ian Harry, T. Collett, M. Çalışkan
  Gravitational-wave lensing with ground-based gravitational-wave detectors, LIGO Document G2001565
  Virtual Seminar: Space Science @ Drop Tower Seminar
  15 September 2020

- Rodrigo Tenorio, Pep Covas, David Keitel, Alicia M. Sintes
  O3a BinarySkyHough Search Update: Sensitivity Estimation and First Follow Up Stage, LIGO Document G2001561
  LVK September 2020 held from 14 Sep 2020 to 18 Sep 2020 in Virtual
  CW F2F session on
  14 September 2020

- Antoni Ramos-Buades, Maria Haney, Sascha Husa
  IMRPhenomXE: adding eccentricity to the IMRPhenomX waveform models
  LIGO Document G2001589
  LVK September 2020 held from 14 Sep 2020 to 18 Sep 2020 in Virtual
  Presentation for Waveforms F2F,
  14 September 2020

- Héctor Estellés, Sascha Husa, Marta Colleoni, Maite Mateu, David Keitel, Cecilio G. Quirós, Lluc Planas
  IMRPhenomTPHM roadmap, LIGO Document G2001577
  LVK September Meeting 2020, WF F2F
  14 September 2020

- Sascha Husa
  UIB MOU presentation 2020/21 for the waveforms group. LIGO Document: G2001401.
  Sascha Husa, David Keitel, Marta Colleoni, Cecilio Garcia-Quiros, Héctor Estellés, Maite Mateu-Lucena, Alicia Calafat, Rafel Jaume, Lluc Planas, Friso Snel, Miquel Duran and Angela Borchers.
  31 August 2020

- Sascha Husa, David Keitel, Marta Colleoni, Cecilio Garcia-Quirós, Héctor Estellés, Maite Mateu-Lucena and Alicia Calafat.
  UIB 2020/21 MOU presentation for the CBC PE group.
  LIGO Document: G2001404.
  31 August 2020

- Alicia M. Sintes, Rodrigo Tenorio, Pep B. Covas,
  Early O3 all-sky binary CW: First DAC Update, LIGO Document G2001258
  Presentation at the LIGO-Virgo DAC telecon
  07 August 2020

- Maite Mateu-Lucena, Marta Colleoni, Antoni Ramos-Buades, Cecilio García-Quirós,David Keitel, Geraint Pratten, Héctor Estellés, Sascha Husa.
  Using convergence tests to understand the performance of a parallel parameter estimation sampler for gravitational wave applications. LIGO Document G2001055
  XIV.0 Reunión Científica de la SEA, 13-15 julio 2020
  13 July 2020

- Héctor Estellés, Sascha Husa
  IMRPhenomTHM: review kick-off call.
  LIGO Document G2001083
  Presentación a review team de la Colaboración LIGO
  13 July 2020

- Otto Hannuksela, David Keitel, Riccardo Buscicchio, Peter Pang, K. Haris, Rico Lo, Xiaoshu Liu, Alvin Li, Connor McIsaac, Isaac Wong, Eungwang Seo
  O3 lensing analysis, LIGO Document G2001078
  LIGO-Virgo virtual plenary talk:
  09 July 2020

- Héctor Estellés
  IMRPhenomTHM: review readiness. LIGO Document G2000982
  Héctor Estellés, Sascha Husa, Marta Colleoni, David Keitel, Maite Mateu-Lucena
  Presentación a grupo de trabajo de la Colaboración LIGO, Waveform Group.
  25 June 2020

- Rodrigo Tenorio, Pep B. Covas, Alicia M. Sintes
  O3a BinarySkyHough Search Update: Post processing, LIGO Document G2000969
  Presentation at the LIGO-Virgo CW telecon
  24 June 2020

- Antoni Ramos-Buades, Shubhanshu Tiwari, Maria Haney, Sascha Husa
  Impact of eccentricity on the gravitational wave searches for binary black holes, LIGO Document G2000793
  Presentation for the PyCBC call on
  22 May 2020

- Marta Colleoni, Maite Mateu-Lucena, Antoni Ramos-Buades, Geraint Pratten, Cecilio García-Quirós, Héctor Estellés, Rafel Jaume, David Keitel, Sascha Husa
  GW190412 PE convergence discussion: notes from IMRPhenomX re-analysis
  LIGO Document G2000778
  LIGO-Virgo PE convergence zoom call
  20 May 2020

- Antoni Ramos-Buades, Shubhanshu Tiwari, Maria Haney, Sascha Husa
  Impact of eccentricity on the gravitational wave searches for binary black holes, LIGO Document G2000755
  Presentation in the LIGO-Virgo IMBH call
  14 May 2020

- Marta Colleoni, Maite Mateu-Lucena, Antoni Ramos-Buades, Geraint Pratten, Cecilio García-Quirós, Héctor Estellés, Rafel Jaume, David Keitel, Sascha Husa
  Toward rapid, robust and reliable parameter estimation for CBC: re-analysis of GW190412 with the IMRPhenomX family, LIGO Document G2000681
  LIGO-Virgo parameter estimation call
  11 May 2020

- Maite Mateu-Lucena, Marta Colleoni, Antoni Ramos-Buades, Geraint Pratten, Cecilio García-Quirós, Héctor Estellés, Rafel Jaume, David Keitel, Sascha Husa
  Toward rapid, robust and reliable parameter estimation for CBC: re-analysis of GW190412 with the IMRPhenomX family, LIGO Document G2000680
  Presentation at the LIGO-Virgo Bilby development call
  04 May 2020

- Otto Akseli HannukselaP. Ajith, T. Broadhurst, J.M. Diego, K. Haris, D. Keitel, K. Kim,S. Kumar, K.H. Lai, T.G.F. Li, K.K.Y Ng,P.L. Kelly A.K. Mehta, G. Pagano, G.F. Smoot III,I. Wong, Peter T. H. Pang, Tim Dietrich, Ian Harry
  Gravitational-wave lensing within ground-based gravitational-wave detectors,
  LIGO Document G2000645
  Institut d'astrophysique de Paris, Talk
  25 April 2020

- Héctor Estellés, Antoni Ramos-Buades, Sascha Husa, Cecilio García-Quirós, Marta Colleoni, Leïla Haegel, Rafel Jaume
  IMRPhenomTP: A phenomenological time domain model for dominant quadrupole gravitational wave signal of coalescing binary black holes, LIGO Document
  LIGO Document G2000559
  Presentation at the LIGO-Virgo WF Call
  09 April 2020

- Antoni Ramos-Buades, Maite Mateu-Lucena, Geraint Pratten, Cecilio García-Quirós, Marta Colleoni, Héctor Estellés, Rafel Jaume, Maria Haney, David Keitel, Jonathan Thompson, Sascha Husa
  Parameter estimation with IMRPhenomXPHM models: Computationally efficient models for the dominant and sub-dominant harmonic modes of precessing binary black holes LIGO Document G2000519
  Presentation at the LIGO-Virgo PE call of
  30 March 2020

- Maite Mateu-Lucena, Antoni Ramos-Buades
  IMRPhenomXPHM runs using Parallel Bilby, LIGO Document G2000520
  Presentation at the IMRPhenomXPHM review call
  20 March 2020

- Geraint Pratten, Cecilio García-Quirós, Marta Colleoni, Antoni Ramos-Buades, Héctor Estellés, Maite Mateu-Lucena, Rafel Jaume, Maria Haney, David Keitel, Jonathan E. Thompson, Sascha Husa
  Let's twist again: Computationally efficient models for the dominant and sub-dominant harmonic modes of precessing binary black holes, LIGO Document G2000511
  Presentation for LIGO-Virgo Waveform Call
  26 March 2020

- Rodrigo Tenorio, Pep Covas, Alicia Sintes
  Update on the BinarySkyHough O3a search from Unknown Neutron Stars in Binary Systems:
  LIGO Document G2000221
  Congres: LIGO-Virgo-KAGRA online Collaboration Meeting.
  16-19 March 2020

- David Keitel, Gregory Ashton, Pep Covas
  Status of PyFstat as a general purpose follow-up tool. (LIGO Document: G2000381)

Congres: LIGO-Virgo-KAGRA online Collaboration Meeting.
16-19 March 2020

- Maite Mateu-Lucena, Antoni Ramos-Buades
  O3a PE without phase-marginalisation using Bilby, LIGO Document G2000236
  17 February 2020

- Antoni Ramos-Buades, Maite Mateu-Lucena,
  Parameter estimation on GW190412 with IMRPhenomXHM, LIGO Document G2000181
  04 February 2020

- Antoni Ramos Buades, Maite Mateu, Sascha Husa, Héctor Estellés, Cecilio García Quirós, Marta Colleoni, Geraint Pratten, Rafel Jaume
  Parameter estimation with the IMRPhenomX waveform family, LIGO Document G2000128
  Presentation for the CBC parameter estimation call on 27 January 2020

15.3 Posters

Computer Applications

- J. Hausen, S. Gurevich, K. Lüedge, J. Javaloyes
  How carrier memory enters the Haus master equation of mode-locking
  European Semiconductor Laser Workshop Technical Committee
  Technical University of Eindhoven, Netherlands
  4-7 December 2020

- T. Seidel, S. Gurevich, J. Javaloyes
  Influence of Time Delayed Feedback on the Dynamics of Temporal Localized Structures
  European Semiconductor Laser Workshop Technical Committee
  Technical University of Eindhoven, Netherlands
  4-7 December 2020

- D. Hessel, C. Schelte S. Gurevich, J. Javaloyes
  Dispersive instabilities in MIXSELs
  European Semiconductor Laser Workshop Technical Committee
  Technical University of Eindhoven, Netherlands
  4-7 December 2020

Relativity and Gravitation

- Héctor Estellés, Antoni Ramos, Sascha Husa, MartaColleoni, Cecilio García Quirós, Maite Mateu, Lluc Planas, David Keite, Leïla Haegel, Rafel Jaume
  *IMRPhenomT * family: phenomenological waveform modelling in the time domain,* LIGO Document G2001517
  LVK September Meeting 2020, Online
  14-18 September 2020

- Maite Mateu-Lucena, Marta Colleoni, David Keitel, Sascha Husa, Antoni Ramos-Buades, Héctor Estellés, Cecilio García-Quirós
  Addressing nested sampling implementation errors with nestcheck" LIGO Document G2001607
  LVK September Meeting 2020, Online
  14-18 September 2020

- Maite Mateu-Lucena, Marta Colleoni, Antoni Ramos-Buades, Cecilio García-Quirós, David Keitel, Geraint Pratten, Héctor Estellés, Sascha Husa.
  Using convergence tests to understand the performance of a parallel parameter estimation sampler for gravitational waves
  XIV Reunión Científica de la SEA
  13-17 July 2020

15.4 Lectures

- Ana Belen Petro
  Matemàtiques de l'Educació Primària
  Curs d'Expert Universitari
  Course 2019-2020

- Maria Jesús Álvarez, Tomeu Coll
  Poden infinits nombres sumar 1?
  Estalmat
  8 Febrer 2020

- Cristina Olivares, Ana Belén Petro
  Anem a comprar
  Estalmat
  8 Febrer 2020

- Alicia M. Sintes
  Gravitational Waves
  31st Chris Engelbrecht Summer School
  University of Cape Town, South Africa
  http://www.chrisengelbrecht2020.com/
  20-29 January 2020

15.5 Attendance

Astrophysics

- M. Aguiar-Kriginsky Silva
  2nd NCSP DKIST Data-Training Workshop Preparing for DKIST: Image Processing and Time Series
  California State University Northridge. USA
  13-15 January 2020

Relativity and Gravitation

- 13th International LISA Symposium,
  https://lisasymposium13.lisamission.org/
  Organized by the Gravitational Wave International Committee,
  associated with the official LISA Consortium.
  1-3 September 2020

- Sascha Husa, Alicia Sintes
  Round Table: *ET planning and ET Working Groups*
  Einstein Telescope Science- Online
  5 June 2020

16 Outreach

Radio Programs

- 4 September 2020: Entrevista a Alicia M. Sintes
  A hombros de gigantes
  RNE, Radio 1, Radio 5

Public Talks

- 22 December 2020: *Ondas Gravitacionales*
  Rafel Jaume
  Talk to highschool students
  Demolab 9:00h, 11:00h, IES Lluis Arxiduc, Campus UIB

- 3 December 2020: Alicia Sintes
  V Jornades jo també puc fer-ho
  Universitat de les Illes Balears

- 21 November 2020: *Nombres, nombres, nombres*
  Marc Carbonell, Cristina Olivares
  Estalmat

- 25 de September 2020: *Ones Gravitacionlas: Les noves missatgeres de l'Univers*
  Alicia M Sintes
  Jornada inaugural del Grau de Física a la UIB, curs 2020-21
  Aula 11, Edifici Mateu Orfila

- 17 de September 2020: *LIGO-Virgo virtual collaboration meeting*
  Education and Public Outreach / LSC Academic Advisory Committee tutorial session
  presenters/organisers: Joey Key, David Keitel, Peter Murray, Chris North

- 29 June 2020: *Ones Gravitacionals i la Seva Simulació*
  Antoni Ramos and Rafel Jaume
  XI Campus Cientificotècnic d'Estiu, UIB
  https://seras.uib.cat/campus_cientific/

- 29 June 2020: *Cita amb Científica: Alicia Sintes.*
  Alicia Sintes
  XI Campus Cientificotècnic d'Estiu, UIB

- 22 June 2020: *Ones Gravitacionals i la Seva Simulació*
  Antoni Ramos and Rafel Jaume
  XI Campus Cientificotècnic d'Estiu, UIB
  https://seras.uib.cat/campus_cientific/

- 22 June 2020: *Cita amb Científica: Alicia Sintes.*
  Alicia Sintes
  XI Campus Cientificotècnic d'Estiu, UIB

- 15 June 2020, LIGO Education & Public Outreach group telecon
  David Keitel
  Science Summaries focus session

- 22 February 2020: *Ondas Gravitacionales*
  Rafel Jaume
  Talk to highschool students
  Demolab 9:00h, 11:00h, IES Madre Alberta, Campus UIB

- 8 Febrer 2020: Conferència Pública
  Descubriendo los enigmas del Universo: las ondas gravitacionales
  Alicia M. Sintes
  Auditori d'Alcúdia, 18:30

- 22 February 2020: *Ondas Gravitacionales*
  Rafel Jaume
  Talk to highschool students
  Demolab 9:00h, 11:00h, IES Madre Alberta, Campus UIB

Round Tables

- 3 December 2020: Alicia Sintes
  V Jornades jo també puc fer-ho
  Universitat de les Illes Balears

Articles and Translations

- 2 September 2020: David Keitel
  GW190521: The Most Massive Black Hole Collision Observed To Date

- 29 July 2020: David Keitel
  No mountains yet on millisecond pulsars

- 23 June 2020: David Keitel
  The Curious Case of GW190814: The Coalescence of a Stellar-Mass Black Hole and a Mystery Compact Object

- 27 May 2020: David Keitel
  Improving gravitational wave searches for a wandering continuous wave signal from Scorpius X-1

- 20 April 2020: David Keitel
  The First Observation of an Unequal-Mass Black Hole Merger

- 4 March 2020: David Keitel
  How Gravitational-Wave Alerts during the second Advanced LIGO and Virgo observing run enabled the multi-messenger discovery of GW170817

- 2 March 2020: David Keitel
  Searching for weak gamma-ray bursts paired with gravitational-wave events

- 8 January 2020: David Keitel
  Open data from the first and second observing runs of Advanced LIGO and Advanced Virgo

- 6 January 2020: David Keitel
  GW190425: The heaviest binary neutron star system ever seen

In the Media

24/12/2020 – El Cultural: “Las vacunas exprés, el mayor hito científico de 2020”
17/12/2020 – Menorca: “Nuevo calendario institucional 2021 del Consell Insular”
15/12/2020 – La Vanguardia: “Nace ‘Ciencia con Alma’, podcast científico en español en la capital europea”
11/12/2020 – Levante: “Agujeros Negros”
07/12/2020 – El día: “Agujeros Negros”
03/12/2020 – Diario de Mallorca: “Agujeros negros”
25/11/2020 – La Sexta: “Nuevo catálogo con decenas de nuevas ondas gravitacionales captadas por Virgo i LIGO”
21/11/2020 – DIario de Mallorca: “Renovación del Consejo de la Infancia”
20/11/2020 – Ultiama Hora: “El Consejo de la Infancia de Palma se reactiva tras el estado de alarma e incorpora 14 nuevos miembros”
20/11/2020 – Europa Press: “El Consejo de la Infancia de Palma se reactiva tras el estado de alarma e incorpora 14 nuevos miembros”
20/11/2020 – 20 Minutos: “El Consejo de la Infancia de Palma se reactiva tras el estado de alarma e incorpora 14 nuevos miembros”
20/11/2020 – Estiamam Palma: “El Consell Municipal de la Infància incorpora 14 nous consellers i conselleres provinents de 4 centres educatius i 3 entitats”
17/11/2020 – Greenvasion: “Cómo identificar especies de peces con los ordenadores?

16/11/2020 – ForeinfAffairs: “Así enseñamos a los ordenadores a identificar especies de peces”
15/11/2020 – The Conversation: “Así enseñamos a los ordenadores a identificar peces”
30/10/2020 – Diario de Mallorca: “Investigadores de la UIB analizan 39 señales de ondas gravitacionales”
29/10/2020 – Noticias de la Ciencia: “LIGO y Virgo anuncian nuevas detecciones en un catálogo de ondas gravitacionales actualizado”
29/10/2020 – Yahoo, Deportes: “Investigadores de la UIB analizan 39 nuevas señales de ondas gravitacionales”
29/10/2020 – Yahoo, Vida y Estilo: “Investigadores de la UIB analizan 39 nuevas señales de ondas gravitacionales”
29/10/2020 – 20 Minutos: “LIGO y Virgo anuncian nuevas detecciones de ondas gravitacionales, en un trabajo con contribución de la UIB”
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