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CIC bioGUNE MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

UNIVERSITAT DE BARCELONA



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## **01 PRESENTATION:** INTRODUCTION

The Biomolecular NMR Laboratory Network, R-LRB, is part of the unique scientific-technical infrastructures of the Ministry of Science, Innovation, and Universities, focusing on Health Sciences. It comprises three nodes located at strategic points within the Iberian Peninsula in areas with a high concentration of industries and research centers dedicated to health sciences. These nodes, in Barcelona (LRB), Madrid (LRM), and Euskadi (LRE), house high-field Nuclear Magnetic Resonance spectrometers, including two 800 MHz and three 600 MHz spectrometers.

This network offers competitive access evaluated by external experts, enhancing national competitiveness in biomolecular NMR. In recent years, this technique has been very useful for both research (universities and technology centers) and the health industry.

Experts in the Biomolecular NMR Laboratory Network facilitate the use of the equipment for internal and external users from both public and private sectors, nationally and internationally.

During 2021-2022, the distributed ICTS of the Biomolecular NMR Laboratory Network, R-LRB, has provided access to its facilities to over 80 national and international users. New methods have been developed on demand, and services have been provided in various fields, such as protein dynamics, biomolecular interactions, structural studies of proteins, peptides, DNA, carbohydrates, metabolomics, food science, and intracellular NMR. Each ICTS node implements specific NMR methodologies according to the interests of its users.

In response to the COVID-19 pandemic, patient samples have been analyzed in collaboration with hospitals across Spain. Oscar Millet's group has focused on developing analytical tools for serological diagnosis and monitoring the virus's sequelae. Additionally, the LMR has participated in the International COVID19-NMR Consortium to find inhibitors of disordered proteins. At the LRB node, the structure of designed linear peptides has been studied, demonstrating their cooperative folding into stable alpha-helices and proposing design rules for applications in pharmacology, materials science, synthetic biology, and protein engineering.

Furthermore, the acquisition of a 1 GHz spectrometer at the University of Barcelona (LRB node) will strengthen NMR research, supported by the MCIN, improving precision medicine and drug design. Another 1 GHz spectrometer will



soon be added at the Euskadi node, establishing Spain as a reference in nuclear magnetic resonance.

The nodes currently composing this distributed network are:

LRB	LMR	LRE	
Laboratorio de RMN de la Universitat de Barcelona http://www.rmn.ub.es/lrb/	Laboratorio de RMN "Manuel Rico" https://lmr.csic.es/	Laboratorio de RMN de Euskadi https://www.cicbiogune.es/resea rch/platforms/nuclearMagneticR esonance	
UNIVERSITAT DE BARCELONA	CONSELO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS	CIC DIO GUNE MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE	
https://www.ub.edu	https://www.csic.es	https://www.cicbiogune.es/	



http://www.rmn.ub.edu/r-lrb/index.html



## **01 PRESENTATION: TIMELINE**



APR 2021 New Director CCiTUB (LRB Node)



OCT 2021 Installation of new BMPC2 for AV800MHz



NOV 2021 Grant @ LRB BRUKER 1 GHz

JUL 2022

Project

SEPT 2022 ICTS's Working Day (Sevilla)





Remote NMR European

(LRE & LRB Nodes)

OCT 2022 11<sup>th</sup> GERMN biennial NMR meeting (Almería) OCT-NOV 2022 Installation @ LRB

BRUKER 1 GHz





## **01 PRESENTATION: LOCATION**

The LRB NMR facility belongs to the University of Barcelona and is integrated into the Scientific and Technological Centers of the University of Barcelona (CCiTUB) that includes a wide range of complementary infrastructures; this generates a stimulating environment and synergies for the users. Industrial companies have an important share in the use of the NMR facility and, for some of them, NMR represents a strategic tool.

The "Manuel Rico" NMR spectroscopy Laboratory (LMR) is a scientific-technical service of the CSIC is located on the Central Campus of the CSIC in a historical and privileged location, just a stone's throw from the "Residencia de Estudiantes" and the Rockefeller building. The LMR is managed by the Rocasolano Institute of Physical Chemistry (IQFR-CSIC).

The LRE is located at the Centre for Cooperative Research in Biosciences (CIC bioGUNE) in the Technological Park of Bizkaia. CIC bioGUNE has modern scientific infrastructures, led by prestigious scientists, which allow it to compete with the main European research institutes.



Figure 1.3 Map of distributed ICTS Red de Laboratorios de RMN de Biomoléculas (R-LRB).



# **02 GOVERNING, EXECUTIVE AND SUPPORT BODIES**

The R-LRB was approved by the "Consejo de Política Científica y Tecnológica y de Innovación" the 6<sup>th</sup> of November 2018 and formally established by an agreement between the University of Barcelona, the Consejo Superior de Investigaciones Científicas" and CIC bioGUNE, published on 11<sup>th</sup> September 2020. The management is regulated by the bylaws approved by the Coordination Committee on 23<sup>rd</sup> September 2020.



Figure 2.1 Organization chart.

The legal representatives of the institutions owning the various nodes, or the people they designate, form the **Steering Committee**, which oversee the legal and economic aspects of the distributed ICTS.

The R-LRB is managed by the Coordination Committee, chaired by a coordinator, who acts as a representative of the R-LRB. The **Coordination Committee** is formed by the scientific directors and the technical facility managers of each node.

The **Scientific Advisory Board** is formed by six internationally recognized experts and its role is to provide advice to the coordination committee on strategic decisions. The **External Access Committee** is in charge of evaluating the suitably of competitive access request by users. The access protocol has been approved by the coordination committee and is common to the three nodes.



## **STEERING COMMITTEE**

UB	CSIC	CIC bioGUNE
Rector	Vice-President for institutional Affairs and Organization	General Director
Joan GUÀRDIA OLMOS	Carlos Juan CLOSA MONTERO	José M. MATO DE LA PAZ

## **EXECUTIVE COMMITTEE**

#### ICTS COORDINATOR

	Carlos GONZALEZ	
LRB	LMR	LRE
Scientific Director	Scientific Director	Scientific Director
Miquel PONS	Carlos GONZÁLEZ	Óscar MILLET
Facility Managers	Facility Manager	Project Manager
Margarida GAIRI	David PANTOJA-UCEDA	Beatriz G. VALLE
Mª Teresa GONZÁLEZ		

## **EXTERNAL ACCESS COMMITTEE**

Institut de Química Avançada de Catalunya,	Departamento de Química Orgánica,	
CSIC, Barcelona	Universidad de Sevilla	
Ignacio ALFONSO	Jesús ÁNGULO	
Instituto de Química Orgánica General,	Centro de Investigaciones Biológicas, CSIC,	
CSIC, Madrid	Madrid	
Juan Luis ASENSIO	Francisco BLANCO	
Juan Luis ASENSIO	Francisco BLANCO	
Centro Nacional de Investigaciones	Centro de Investigaciones Biológicas, CSIC,	
Oncológicas, Madrid	Madrid	



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Instituto de Investigaciones Químicas, cicCartuja, Sevilla	Facultad de Ciencias y Tecnologías Químicas, UCLM, Ciudad Real
Irene DÍAZ	Mª Victoria GÓMEZ
Instituto de Química Física Rocasolano, CSIC, Madrid	Instituto de Química Física Rocasolano, CSIC, Madrid
M <sup>a</sup> Ángeles JIMÉNEZ	Douglas V. LAURENTS
Structural Characterization of Macromolecular Assemblies, IRBB, Barcelona	Unidad RMN, RiAiDT, Universidad de Santiago de Compostela
María MACÍAS	Manuel MARTÍN-PASTOR
Instituto de Investigaciones Químicas, CSIC, Sevilla	Laboratory of Molecular Biophysics, IRBB, Barcelona
Pedro NIETO	Xavier SALVATELLA

# SCIENTIFIC ADVISORY BOARD

Magnetic Resonance Florence, Italy Isabella FELLI	Center, University of	Institute for Cancer and Genomic Sciences College of Medical and Dental Sciences University of Birmingham, UK Ulrich GÜNTHER
Max F Perutz Labora Vienna, Austria	tories, University of	Institute de Sciences Analytiques, University of Lyon, France
Robert KONRAT		Anne LESAGE
Slovenian NMR cente	er, Slovenia	Director of the Center for Biomolecular Magnetic Resonance, University of Frankfurt, Germany
Janez PLAVEC		Harald SCHWALBE



## **03 RESOURCES**

The distributed ICTS consists of a network of the highest field NMR instrumentation currently available in Spain – including two 800 MHz spectrometers– placed in different locations of Spain. Additionally, this ICTS offers access to three 600 MHz spectrometers.



Fig. 3.1. Equipment of Distributed ICTS of R-LRB.



Fig. 3.2. Human Resources of Distributed ICTS of R-LRB (25 people between 3 nodes).



# **ESSENTIAL EQUIPMENT**

LRB	LMR	LRE
LRB-AV600 Magnet:14.1T Ultrashield Bruker Console: Avance III Probe: TCI cryoprobe	LMR-AV600 Magnet:14.1T Oxford Console: AVANCE NEO (since May 2020) Probe: TXI cryoprobe	LRE-AV600 Magnet: 14.1 T US Console: AVANCE III Probe: PA-TXI, TXI for high salt, QXI ( <sup>31</sup> P), QXI ( <sup>19</sup> F), SEF, TBI, BBO, TXI HR-MAS Extras: 6 Preamplifiers: <sup>1</sup> H, <sup>2</sup> H, <sup>15</sup> N, <sup>19</sup> F <sup>,</sup> X- BB (2x) HR-MAS unit (15.000 rpm)
		evicer 600 Utashield"
LRB-AV800 Magnet: 18.8 T Bruker Console: AVANCE NEO (since October 2018) Probe: TCI cryoprobe	LMR-AV800 Magnet:18.8 US2 Bruker Console: AVANCE NEO (since May 2021) Probe: TCI cryoprobe	



LRB-LAB	LMR-LAB	LRE-LAB
Production, Preparation NMR Samples	Production, Preparation NMR Samples	Production, Preparation NMR Samples

# HUMAN

LRB	LMR	LRE
Miquel Pons Scientific Director Research	Carlos González Scientific Director Research	Jesús Jiménez-Barbero Scientific Director Research
José Ramon Seoane CCiTUB Director Management (until March 2021) Juan Francisco Sangüesa CCiTUB Director Management (from April 2021)	M <sup>a</sup> Ángeles Jiménez Research Advisor Douglas V. Laurents Research Advisor José Manuel Pérez Research Advisor	Oscar Millet Adjunct Director Research
Margarida Gairí LRB Facility Manager NMR technician M. Teresa González LRB Facility Manager NMR technician M Antònia Molins NMR technician M Victoria Muñoz-Torrero NMR technician Albert Gallén Support NMR technician Agustí Martínez Support NMR technician	David Pantoja-Uceda Facility NMR Manager Technician Daniel Calvo Support NMR Technician Miguel Treviño Facility LAB protein Manager Technician Irene Gómez Pinto Facility LAB ADN Manager Technician	Tammo Diercks Facility NMR Manager Technician Ana Poveda NMR Specialist Research
Victor Meriel Lab Technician		
Oscar Nieto R-LRB web Manager Francisco Cárdenas NMR Facility Manager Management		Beatriz G. Valle Project Manager Management



## 04 CATALOGUE OF SERVICES AND ACCESS

The facility is strongly linked to internationally recognized NMR groups that ensure that the facility remains at the leading edge of the technique and is available to offer advice to non-expert users. The dedicated staff of the facility is a team of specialists who take care of the instruments and promoting education in the area of NMR. The facility personnel guide the users according to their need, ranging from experts wishing to implement new experiments to non-expert users requiring help in experimental design and interpretation to take full advantage of the NMR facilities. Typical users come from a wide diversity of areas, including among others:

- Protein 3D structure and dynamics
- Atomic characterization of IDPs and linear peptides
- Structure and dynamics of nucleic acids and their derivatives.
- Biomolecular recognition and interactions (including carbohydrates and lipids).
- Metabolic studies (metabolomics).
- Functional Biology.
- Drug discovery and drug design (ligand screening and optimization).
- Structural elucidation in Organic and Inorganic Chemistry.
- Biologics characterization
- Food Science and Technology.
- New methodologies: NMR applications development.

The R-LRB is open to research groups from public and private centers and offers access to the instrumentation and the know-how of scientific-technical staff responsible for NMR spectrometers. The competitive access corresponds to research projects in which an intensive use of the spectrometers is required. The access is regulated by an open competitive procedure, with an independent and transparent evaluation process. The call for competitive access is permanently open. The potential users must complete the online Access Application Form that will be evaluated by the External Access Committee (see below). A complete description of the access protocol can be found here (<u>http://www.rmn.ub.edu/r-lrb/pages/access.html</u>).

Data management protocols are being implemented to ensure open access and data traceability according to EU directives.



## 04 CATALOGUE OF SERVICES AND ACCESS: ACCESSES

The Network of Laboratories for Nuclear Magnetic Resonance of Biomolecules, R-LRB, as a distributed Singular Scientific and Technical Infrastructure (ICTS, according to its initials in Spanish) of NMR, has granted during the period 2021-2022 a total of 86 Open Accesses to the scientific community for the use of its 5 NMR spectrometers.



Figure 4.1 Statistics of competitive access in 2021 and 2022.

Despite the slight reduction in the total number of days available (8.8% less in 2022) and the days used through competitive access in 2022 compared to 2021, the infrastructure has maintained a consistent level of service, with minimal difference between the two years. The percentages of competitive access usage over the total available days were



similar (35.7% in 2021 and 36.8% in 2022), indicating stability in the demand and utilization of the NMR facilities of the distributed ICTS of the Biomolecular NMR Laboratory Network. Of the Open Access time granted during the 2019-2020 period (a total of 1054 days, 25% of the total available time), 97% has been executed. The remaining 3% corresponds to ongoing projects, whose fulfillment is being carried out during the current year 2021.

	2021			
CIC bioGUNE	IRB - BARCELONA 8			UNIV. POMPEU FABRA 2
8	CIB-CSIC 1	ICP-CSIC 1	UNIV. AUTÓNOMA MADRID	UNIV. BARCELONA 1
	CBM-CSIC	IQOG-CSIC 1	UNIV. MIGUEL HERNÁNDEZ 1	UPV-EHU 1
IQFR-CSIC 8	ICGEB 1	UNIVERSIDA AUTÓNOMA DE BARCELONA	UNIZAR 1	UNIV. SEVILLA 1



Figure 4.2 Users by type of institute.



Figure 4.2 illustrates the diverse range of centers that have utilized the ICTS nodes' facilities through competitive access over the past two years. In 2021, 16 research centers and universities used the facilities, and this number increased to 24 in 2022. The efforts to promote the use of these facilities internationally have led to 9 new international centers requesting access in 2022, enhancing our international standing in the field of NMR.

The 86 Open Accesses have been used by a total of 60 different researchers. The number of new users who have made use of the ICTS equipment has been 63% each year. On the other hand, the loyalty of users has been maintained for whom the use of the ICTS NMR spectrometers is absolutely essential for their research projects. Without these instruments, they would have been forced to request these resources in other European facilities.



## **05 KNOWLEDGE TRANSFER**

The users of the R-LRB have published a total of 91 works, including articles and book chapters, during the 2021-2022 biennium, many of them in high-impact journals. Regarding conference presentations, the number has significantly decreased due to COVID-19, totaling 41 presentations. However, the return to normalcy is reflected in the increase in these publications during 2022. The conference presentations - both oral and written - and invited lectures in prestigious national and international Congress were given where the research resulting from the use of the R-LRB was presented.



Figure 5.1. Publications in journals and conference presentations resulting from the utilization of the espectrometers at the R-LRB Node.





Figure 5.2. Types of training by ICTS users.



Figure 5.3 Thesis defended in R-LRB.

During this period, five PhD students, who made extensive use of ICTS (Singular Scientific and Technical Infrastructures) resources, successfully defended their



doctoral theses. Their research likely involved substantial collaboration and interaction with advanced scientific infrastructures, contributing significantly to their academic achievements. The use of ICTS resources underscores the importance of cutting-edge facilities in fostering innovative research and supporting doctoral candidates in achieving their scholarly goals.

Furthermore, the R-LRB offers to the high-field NMR community both methodological development and application services. New methods are developed on demand. Application services are provided on the fields of IDPs, protein dynamics, biomolecular interactions, structural studies of proteins and peptides, structural studies of DNA, structural studies of carbohydrates, metabolomics, food science and in-cell NMR. In general, each node of the distributed ICTS implements and develops specific NMR methodology, according to their users main interests.

During these two years (2021-2022), collaborations have been maintained between the following entities and the different nodes of the distributed ICTS:

- The collaboration agreement between the University of Barcelona (UB) and the Barcelona Institute of Biomedical Research Foundation (IRBB) to strengthen scientific and technical collaboration between the UB NMR Unit and IRBB researchers, leveraging the available technological instrumentation.
- The collaboration with the European Economic Interest Group EuroBioNMR to create a pan-European structure to coordinate European investments in nuclear magnetic resonance.
- The collaboration agreement between Bruker and CIC bioGUNE for the validation of NMR software.
- The collaboration between CIC bioGUNE, CIC biomaGUNE, and Bruker through a Framework Agreement to develop new specific collaboration lines, research projects, and training.
- A Memorandum of Understanding between Bruker and CIC bioGUNE for development and research in various disciplines within the field of clinical metabolomics.
- A collaboration agreement between CIC bioGUNE and Bruker for mutual scientific-technical advice and collaboration in the joint organization of courses, conferences, etc., to promote the dissemination of NMR techniques.



# 05 KNOWLEDGE TRANSFER: SUCCESS CASES

• A glutamine-based single a-helix scaffold to target globular proteins Nature Communications 2022, 13, 7073 https://doi.org/10.1038/s41467-022-34793-6

Researchers at the Institute for Research in Biomedicine leaded by Prof. Xavier Salvatella used the NMR resources of the LRB Barcelona node to probe the structural properties of a series of designed linear peptides and confirmed their cooperative folding into single a-helices under physiological conditions. They explored the key rules governing helix stability and showed that by concatenating glutamine side chain to main chain hydrogen bonds, very stable a-helices could be formed. The amino acid sequences of the resulting peptides can be tailored to interact with specific globular proteins. The authors of this work propose simple peptide design rules to be used to engineer helical peptides, potential templates for a wide range of applications in pharmacology, material science, synthetic biology and protein engineering.



 A methionine chemical shift-based order parameter characterizing global protein dynamics

ChemBioChem 2021, 22, 1001-1004 https://doi.org/10.1002/cbic.202000701

NMR spectroscopy has been crucial for the research led by Prof. Miquel Pons from the University of Barcelona to describe a new type of order parameter, which is sensitive to dynamics on a time scale that modulates the averaging of the chemical shifts. Since the methyl groups of methionines are very sensitive to their environment and undergo fast dynamics, the comparison of experimental chemical shift values with those calculated from rigid models (X-ray structures) provides a measure of the local mobility. In this paper, the authors show that the flexibility experienced by distant residues of the same protein is correlated and the degree of averaging is a characteristic of the protein that can be quantified through a global parameter. This study has been used by other research groups to characterize the effect of drugs on the mobility of neurotensin receptor (Bumbak et al, Cell Reports 2023, 42, 112015; Bumbak et al, Nature Communications 2023, 14, 3328)





• Metabolic landscape of the mouse liver by quantitative 31P-NMR analysis of the phosphorome.

#### Hepatology https://doi.org/10.1002/hep.31676

31P-NMR provides an innovative and simple holistic view of the inherent complex metabolism in health, disease and as a response to treatment. In this context, phosphorylated metabolites occupy a prominent position in all anabolic and catabolic pathways. In Millet's laboratory, they have developed a 31P-NMR-based method to study the "phosphorome" in tissue samples through the simultaneous identification and quantification of multiple hydrophilic and hydrophobic phosphorylated metabolites. The methodology included the standardization and optimization of the protocol to yield a robust and quantitative measurement of the phosphorylated metabolism. They are now adapting this technique to define the metabolic landscape in several organs -including liver, brain, heart, and pancreas- of mouse models and of human tissue samples as well.





 The first DNA/ligand complex involving a G-quadruplex/duplex junction. Chemistry. A European Journal Cover: doi.org/10.1002/chem.202100456

Paper: doi.org/10.1002/chem.202100456

Researchers of two groups at CSIC used NMR to study a new designed pharmacophore based on cationic aromatic frameworks that selectively binds with high affinity to quadruplex–duplex junctions, while presenting a poorer affinity for G-quadruplex or duplex DNA alone. The structure of the complex be ween a quadruplex–duplex junction with a ligand of the HIV-1 LTR-III family has been determined. According to these data, the remarkable selectivity of this structural motif for quadruplex–duplex junctions is achieved through an unprecedented interaction mode so far unexploited in medicinal and biological chemistry: the insertion of a benzylic ammonium moiety into the centre of the partially exposed Gtetrad at the interface with the duplex.



 SARS-CoV-2 Disordered Protein Targeted for Inhibition. <u>https://covid19-nmr.de/</u>



The "Manuel Rico" NMR lab, LMR is characterizing SARS-CoV-2 disordered protein and collaborating as part of International Consortium COVID19-NMR in the search of inhibitors as drug leads.





## **06 SCIENCE AND SOCIETY**

A total of 49 activities have been carried out to disseminate the capabilities of the R- LRB. These actions were oriented to promote cooperation with other institutions and to bring the ICTS closer to the general public. Activities included, interviews in TV programs, seminars, conferences, and Open Days among others, to foster the applications of NMR among researchers and/or industry stakeholders. Many activities were disseminated through media and digital tools. When possible, on-site visits to the R-LRB were scheduled in a regular basis from a wide range of visitors: elementary, high schools and vocational training students; high school teachers; science students and future researchers; university or other research institutions management staff; industry stakeholders and policy makers.





Broadcast of the Precision Medicine report at the LRE facilities on the program Teknopolis on Eitb1 and Eitb2. May 2021
https://www.eitb.tv/eu/bideoa/teknopolis-eu-2020-2021/7197/188152/osasun-pertsonalizaturantz/
https://www.eitb.tv/es/video/teknopolis-eu-2020-2021/7197/188152/hacia-la-salud-personalizada/





Press release on the Businesswire website (regarding the collaboration between ANPC and CIC bioGUNE on Long COVID research). May 2021

https://www.businesswire.com/news/home/20210520005741/en/



Interview with the adjunct director of the LRE Node about the use of NMR in the fight against COVID-19. June 2021



Video presentation of Dr. Borja Mateos, IRBB user of R-LRB Barcelona Node, for the Spanish Association Against Cancer. July 2021

#### BioTech

Un estudio metabolómico a gran escala permite diagnosticar el Síndrome Metabólico mediante la determinación de un conjunto de metabolitos en la orina

Inicio / Artículos / Cardiovascular y sistema circulatorio Urología , Servicios de investigación, Salud, Red de investigación, Instalaciones y servicios de salud, Infecciones, Centros de investigación, Cardiovascular y sistema circulatorio



El estudio llevado a cabo por investigadores de CIC bioGUNE, publicado en la revista Cardiovascular Diabetology, ha analizado el metaboloma de la orina de más de 11.000 individuos.

Investigadores del CIC bioGUNE -miembro del Basque Research & Technology Alliance, BRTA- han llevado a cabo un estudio metabolómico a gran escala que vincula el inicio y la progresión del Sindrome Metabólico a un pequeño grupo de metabolitos presentes en la orina.

simultáneamente y aumentan el riesgo de enfermedad cardiaca, accidentes cerebrovasculares y diabetes tipo 2. Estos trastornos incluyen obseidad, niveles elevados de glucosa en sangre, colesterol o triglicéridos, y aumento de la presión arterial. Tener uno solo de estos trastornos no implica tener Síndrome Metabólico, pero si significa tener un mayor riesgo de desarrollar la enfermedad.

Article on the use of NMR for the diagnosis of Metabolic Syndrome at the LRE node. September 2021





Installation of new BMPC2 for AV800MHz. October 2021



Workshop "Semana de la Ciencia". November 2021







Visit of the next generation of journalist: Students of Master COPE of journalism visited LMR lab. April 2022



La enfermedad silenciosa después УП

La pandemia de COVID-19 ha traído consecuencias inesperadas, entre ellas una nueva enfermedad denominada long COVID o COVID persistente. Afecta al diez por ciento de las personas que se han contagiado de COVID, tanto de manera asintomática como con afecciones. Los enfermos que la padecen sufren de una sintomatología diversa y muy variada, lo que dificulta su diagnostico y tratamiento. Teknopolis se acerca a la asociacion Long COVID Euskal Herria que lucha por dar visibilidad a esta enfermedad y conoce de primera mano la investigación que CIC Blogune,lleva a cabo para conocer cómo influye esta enfermedad aún desconocida en el

Interview with a user from the LRE node on the utilization of NMR for the study of biomarkers in individuals with Long COVID. May 2022





Video presentation of the NMR Facility for the "Semana de la Administración Abierta". June 2022



R-RLRB @ the XIV Manuel Rico School. June 2022



Workday of the ICTS at the University of Seville with the Minister of Science and Innovation. September 2022



Remote NMR (R-NMR) European project (LRE Bilbao & LRB Barcelona Nodes). July 2022





Visit of Professor Javier García-Martínez. IUPAC President. October 2022





R-RLRB @ 11th NMR GERMN Biennial NMR Meeting. October 2022



