Joint Transnational Call 2021

for transnational research projects in synergy with the

Graphene Flagship & Human Brain Project

Call pre-announcement

FLAG-ERA (the Flagship ERA-NET) will publish its fourth Joint Transnational Call (JTC) for collaborative research projects in synergy with the two FET Flagships by the end of 2020 at www.flagera.eu and other sources of information. The purpose of this pre-announcement is to enable interested parties to start building their consortia and preparing their proposals. It provides a tentative timeline, the foreseen list of participating funding organisations, contact points, main eligibility rules and call procedures, and descriptions of the call topics. Note that the present pre-announcement is for information purposes only: It does not create any obligation for the FLAG-ERA consortium nor for any of the participating funding organisations, and the official call announcement shall prevail.

FLAG-ERA gathers National and Regional Funding Organisations (NRFOs) in Europe and beyond with the goal of supporting, together with the European Commission, the FET Flagship initiatives, *i.e.*, the Graphene Flagship and the Human Brain Project (HBP) Flagship. One of its main aims is to allow researchers to complement the current Flagship projects and to collaborate towards the achievement of their vision using existing or dedicated transnational, national and regional calls. In particular, FLAG-ERA aims at launching dedicated JTCs allowing researchers from several countries to jointly contribute to the Flagship goals. Note that researchers interested to work in the framework of the Flagships can also do so using other sources of funding in combination with the Flagship association mechanisms[1].

Tentative Timeline

A one-step submission procedure will be used: Applicants are invited to submit full proposals. A tentative timeline is provided below.

End of November 2020	Call announcement publication
January 2021	Information webinar
April 2021	Proposal submission deadline
September 2021	Notification of accepted full proposals
Nov 2021 - March 2022	Project start

[1] http://graphene-flagship.eu/project/partnering/Pages/Partnering-Mechanisms-under-Horizon-2020.aspx, https://www.humanbrainproject.eu/partnering-projects.

Participating NRFOs and indicative budgets

The table below provides the list of NRFOs participating to the call. Note that the list of participating NRFOs depends on the Flagship and, for the Graphene Flagship, on the sub-call (basic research or applied research and innovation). Budgets figures are indicative.

Country		Funding agency	GRA-BR	GRA-ARI	HBP	Foreseen Budget
BE	Belgium	FNRS	Yes	No	Yes	400 k
BE	Belgium	FWO	Yes	Yes	Yes	700 k
BG	Bulgaria	BNSF	Yes	Yes	Yes	230 k
DE	Germany	DFG	Yes	No	No	tbc 2000 k
ES	Spain (Asturias)	IDEPA	Yes	Yes	No	tbp
ES	Spain	ISCIII	tbc	tbc	tbc	tbc
FR	France	ANR	Yes	Yes	Yes	2000 k
HU	Hungary	NKFIH	tbc	tbc	tbc	tbc
IL	Israël	Innovation Authority	tbc	tbc	tbc	tbc 300-500k
LT	Lithuania	LMT	Yes	Yes	Yes	300 k
LV	Latvia	VIAA	Yes	Yes	Yes	420 k
NL	Netherlands	ZonMW / NWO	No	No	Yes	250 k
RO	Romania	UEFISCDI	No	Yes	Yes	tbc 500k
SE	Sweden	VR	Yes	No	No	420 k
SI	Slovenia	MIZS	Yes	Yes	Yes	Gra 420 k / HBP 210 k
SK	Slovakia	SAS	Yes	Yes	Yes	240 k
TR	Turkey	TUBITAK	Yes	Yes	No	tbc 400k
UK	United Kingdom	UKRI	No	No	tbc	tbc

tbc: to be confirmed; tbp: to be precised

FLAG-ERA

National Contact Points

Country		Funding agency	Name	e-mail	Phone
BE	Belgium	FNRS	Florence Quist Joël Groeneveld	florence.quist@frs-fnrs.be; joel.groeneveld@frs-fnrs.be	+32 2 504 93 51; +32 2 504 92 70
BE	Belgium	FWO	Toon Monbaliu	eranet@fwo.be	+32 2 550 15 70
BG	Bulgaria	BNSF	Milena Aleksandrova	aleksandrova@mon.bg	+359 884 171 363
DE	Germany	DFG	Michael Mößle Martin Winger	michael.moessle@dfg.de; martin.winger@dfg.de	+49 228 885 2351; +49 228 885 2039
ES	Spain Asturias	IDEPA	Ana E. Fernández Monzón	anae@idepa.es	+34 985 98 00 20
ES	Spain	ISCIII	Rafael De Andrés Medina	rdandres@isciii.es	+34 91 822 21 84
FR	France	ANR	Marie-Alexandra Neouze	marie-alexandra.neouze@anr.fr	+33 1 73 54 83 08
HU	Hungary	NKFIH	Edina Németh	edina.nemeth@ist.hu	+36 70 221 0387
IL	Israël	Innovation Authority	Danny Seker	dan@iserd.org.il	+972 3 5118121
LT	Lithuania	LMT	Saulius Marcinkonis	saulius.marcinkonis@lmt.lt	+370 676 17256
LV	Latvia	VIAA	Maija Bundule	maija.bundule@viaa.gov.lv	+371 67227790
NL	Netherlands	ZonMW / NWO	Marjolein Scholten	scholten@zonmw.nl	
RO	Romania	UEFISCDI	Cristina Cotet	cristina.cotet@uefiscdi.ro	+40 213023884
SE	Sweden	VR	Tomas Andersson	tomas.andersson@vr.se	+46 8 546 441 73
SI	Slovenia	MIZS	Andrej Ograjenšek	andrej.ograjensek@gov.si	+386 1 478 46 34
SK	Slovakia	SAS	Zuzana Panisova	panisova@up.upsav.sk	+421 2 57 51 02 45
TR	Turkey	TUBITAK	Serkan Ucer	serkan.ucer@tubitak.gov.tr; ncpfet@tubitak.gov.tr	+90 312 298 1787
UK	United Kingdom	UKRI	Maryam Crabbe-Mann	maryam.crabbe-mann@epsrc.ukri.org	

For further information, please visit us on the FLAG-ERA website: http://www.flag-era.eu.
For general questions about the JTC and national eligibility criteria, please contact your national or regional contact point (see above).
For technical questions regarding the JTC (electronic submission, etc.), please contact the Joint Call Secretariat: marie-alexandra.neouze@agencerecherche.fr.

Eligibility of Consortia

Consortia must be international. They must involve **at least**

- **3 partners requesting funding from 3 participating countries, or**
- **2 partners requesting funding from 2 participating countries and a partner from another country securing its own funding as a Flagship Core Project partner.**

In both cases, partners requesting funding may be Flagship Core Project members.

In any case, the consortium coordinator must be a partner requesting funding (and be eligible for funding) from an organisation participating in the call.

Consortium including a partner from a participating widening country will be highly appreciated and will be taken into account during funding discussion

Consortium with gender balance will be highly appreciated and will be taken into account during funding discussion

While applications will be submitted jointly by groups from several countries, each group will be funded by its respective national or regional funding organisation. The applications are therefore subject to **eligibility criteria of individual funding organisations**.

Duration

Projects may be funded for a period of **up to 3 years** and according to individual funding organisation regulations.

Procedure

A **One-step submission procedure** applies. A **joint transnational proposal** shall be prepared by the applicants, and must be submitted electronically by the coordinator. The proposal shall include a draft application to become a Flagship Partnering Project.

Widening Countries

In the Call 2021, the project consortia are **strongly encouraged to include partner(s) from the Widening Countries**[2] able to strengthen the quality and add value to the proposal. To enhance the participation of the researchers located in the Widening Countries, in case of ex-aequo projects, if not all can be selected due to lack of funding, the Call Steering Committee will prioritise projects including Widening Countries.

The participating Widening Countries to the FLAG-ERA Call 2021 are: Bulgaria, Hungary, Latvia, Lithuania, Romania, Slovenia, Slovakia and Turkey.

[2] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/spreading-excellence-and-widening-participation#postcard

Gender balance

In the Call 2021, the project consortia are **strongly encouraged to ensure gender balance**. To enhance the participation of gender balanced consortia, in case of ex-aequo projects, if not all can be selected due to lack of funding, the Call Steering Committee will prioritise projects with balanced consortia.

Evaluation and Selection of Proposals

Proposals are assessed by an independent international Scientific Evaluation Panel with the help of external reviewers. They are evaluated and ranked according to the following criteria:

1. Excellence (Scientific and/or technological quality);
2. Implementation;
3. Impact.

On the basis of the ranking, of available funding and in the case of ex-aequo projects on the basis of the widening countries and gender balance aspects, the Call Steering Committee, composed of the NRFOs participating in the JTC, will prepare a list of projects recommended for funding.

Association to the Flagship

Projects recommended for funding will be invited to proceed with the formal association to the Flagship, using the Flagship standard association procedure. Any issue at this stage will be treated through classical project risk management.

Research areas

The FLAG-ERA JTC 2021 comprises two topics, one for each Flagship. Each topic covers a specific list of research areas listed below and described in the following pages. The Graphene sub-call is sub-divided into two parts, one for basic research and one for applied research and innovation. Relevant parts of the Flagship and contact points for each area are provided on the call web page.

Graphene Basic Research JTC areas
1. Layered Magnetic Materials and Heterostructures
2. Growth and device integration of two-dimensional amorphous materials
3. Scalable growth & device integration of UltraLow Power Spin-Orbit Memories based on GRMs
4. Bacterial degradation of GRMs
5. GRM based devices and circuits for neuromorphic computing
6. Infrared+THz emission and detection with twisted GRMs
7. Functionalized GRMs for advanced multivalent metal-ion batteries (MMIBs)
8. Chemical sensing with GRMs
9. MXene foams for capacitive deionization water desalination
10. Rheological models for GRM suspensions and multiphase flows
Graphene Applied Research and Innovation JTC areas
1. Antiviral protection with GRM-based foams and coatings
2. GRM-based Neural Interfaces for Bioelectronic Medicines
3. GRM-based spectrometer for visible and infrared
4. GRM-based, Ultra-Broadband THz-Transceiver technologies for 6G compliant wireless communication
5. Tuning the hot-carrier lifetime in layered materials heterostructures for photoresponsivity enhancement
6. GRMs for advanced metal-ion supercapacitors
7. GRM-based electrodes for redox flow batteries
8. GRM components for Self-charging and Self-powered Electronics

HBP Research and Innovation JTC areas
1. Studying genotype-phenotype relationships related to Brain Function **2.** Tackling Psychiatric Diseases **3.** Accelerating the diagnosis and the development of therapeutic approaches for rare diseases affecting the nervous system

Graphene – Basic research JTC areas

1. Layered Magnetic Materials and Heterostructures

Synthesis and characterization of Layered Magnetic Materials and their heterostructures to assess and exploit their potential for future technologies. All aspects will be addressed. Development of new layered magnetic materials; understanding the nature of magnetic interactions (exchange, anisotropy, Dzyaloshinskii-Moriya, etc.) and how they determine different magnetic states; control of magnetic interactions and state (by doping, optically, via non-equilibrium); spatially dependent magnetic structures (skyrmions, domain walls, etc.); new techniques to probe magnetism in layered materials, proof-of-principle opto-electronic devices to achieve new functionalities

Keywords: Magnetic materials, Layered materials heterostructures, magnetism, devices

2. Growth and device integration of two-dimensional amorphous materials

Synthesis, characterization and device integration of new forms of scalable amorphous two-dimensional materials. The objective is to achieve the growth of two dimensional amorphous carbon and/or amorphous Boron Nitride compounds on various types of substrates and evaluate their performances for device applications. The projects should target growth and integration, as well as specific applications, such as permeation and diffusion barriers, encapsulation, flexible electronics, photonics, or magnetic recording devices and spintronics. The consortium should be able to realize a device prototype, demonstrating integration of the amorphous materials with metals and dielectric (using Atomic Layer Deposition), showing strong reduction of hysteresis when integrated in capacitors , or usefulness of the material as efficient low-dielectric interface.

Keywords: Growth of amorphous two-dimensional materials, (opto)electronics, spintronics, device fabrication

3. Scalable growth & device integration of UltraLow Power Spin-Orbit Memories based on GRMs

The target is to design, model, synthesize, characterize and operate low-energy consumption spin-orbit torque (SOT) memories made out of novel layered ferromagnets and large spin-orbit materials. The growth and device integration of high-quality multilayer layered materials heterostructures should be achieved using state-of-the-art techniques, such as MBE, allowing for in-situ fabrication of fully integrated SOT devices. Experimental characterization of SOTs in the corresponding stacks should be included, in combination with DFT simulations with quantum calculation of spin torque efficiency in realistic models.

Keywords: MBE growth, spin-orbit torque, layered magnets, device fabrication, modelling

4. Bacterial degradation of GRMs

A fundamental aspect of GRM ecotoxicology concerns the assessment of possible ways for their degradation, when they are released into the aquatic environment or soil. Bacterial communities play a major role in the biogeochemical cycles of elements. Their metabolic versatility allows them to use organic materials dispersed in the environment as sources of reduced carbon, thanks to extracellular degradation processes. Furthermore, microbial communities are known to colonize contaminated sites and have the ability to metabolize recalcitrant xenobiotics. The huge diversity, versatility and plasticity of bacteria make them the best candidates among all living organisms to study the degradation of GRMs and their composites. The best candidates are the bacteria of graphite ore fields and/or with intense extracellular oxidative activities.

Keywords: Bacteria, GRMs, degradation, remediation

5. GRM based devices and circuits for neuromorphic computing

Neuromorphic computing is an emerging field with high potential for future ICT applications. This call will address the design and fabrication of devices and circuits based on GRMs for neuromorphic computing. This includes research on new devices for neuromorphic computing, such as like synaptic weights and integrated circuits for (analog) computing. The research activity should include theory and experiments.

Keywords: Neuromorphic computing, synaptic weights, integrated circuits.

6. Infrared+THz emission and detection with twisted GRMs

Twisted GRMs (TBG) comprise GRM layered stacked on top of each other, with a relative rotation of the crystal axes quantified by the twist angle θ. For twisted graphene of twist angles~1°, the system exhibits a pair of flat bands, and strong optical transitions emerge for the infrared and terahertz frequency range. This unique band structure, combined with bandgap and strong optical transitions, makes it highly promising for optical detection and emission. This calls aims to design and study infrared and terahertz devices based on GRMs, combinations of twisted multilayer GRM, or superlattices of GRMs. The projects should demonstrate devices with capabilities such as tuneable light emission, and enhanced photodetection, when compared to single layer GRMs.

Keywords: Twisted GRMs, Infrared, Terahertz, detection, emission

7. Functionalized GRMs for advanced multivalent metal-ion batteries (MMIBs)

Multivalent metal-ion (e.g., Zn^{2+}, Mg^{2+}, and Al^{3+}) chemistry offers pathways to develop next-generation energy storage technologies with higher energy density, better safety and lower cost, as the corresponding metals can be used as multielectron-redox anodes. To date, the main challenge faced by MMIBs is the limited availability of cathode materials. It is desirable to develop high-performance cathode materials for accommodating MMIs, to be coupled with multivalent metal anodes for upscalable energy storage devices. This call targets the development of advanced functionalized GRMs as high energy density cathodes to improve the current performance of MMIBs.

Keywords: GRMs; multivalent metal-ion batteries, high energy density, High power density; long cycle life

8. Chemical sensing with GRMs

GRMs are promising candidates for fabrication of sensors with high sensitivity to targeted chemical analytes present in a desired medium, by providing a measurable signal output across the whole range of relevant analyte concentrations. However, to achieve high selectivity, critical given the enormous number of known molecular substances, the GRM structure needs to be chemically tailored with highly selective (supra)molecular receptors of the chosen analyte. In order to achieve the integration of functionalized GRMs in commercial products, technologies allowing thin-films and coatings processing at temperatures <200°C are required, compatible with flexible polymeric substrates for portable devices, including Point-of-Care (POC).

Keywords: Sensors, functionalized GRMs, GRM hybrids

9. MXene foams for capacitive deionization water desalination

MXenes are emerging layered materials for different applications. MXene layers have high electrical conductivity, mechanical strength and volumetric capacitance in aqueous media. These properties make them ideal for capacitive deionization (CDI) electrodes for desalination. However, restacking of sheets can reduce the surface area and performance. Developing MXene foams could solve the restacking problem in CDI electrodes, thus providing new CDI electrodes with high efficiencies up to 80% salt removal.

Keywords: Water desalination, environmental application, MXene foams, capacitive deionization

10. Rheological models for GRM suspensions and multiphase flows

GRMs in liquid solutions play a key role in several fields, including large scale fabrication using liquid exfoliation, drop casting, ink-jet printing, etc. From an industrial point of view, models that can be included in engineering software for fluid dynamics simulations are necessary in order to design and improve fabrication, devices, composite materials etc. This call targets a joint theoretical and experimental development aiming at improving the knowledge of the rheology of GRM multiphase flows.

Keywords: GRM-multiphase flows, rheology, modelling and simulation

Graphene – Applied research and innovation JTC areas

1. Antiviral protection with GRM-based foams and coatings

The current pandemia caused by SARS-CoV-2 poses the urgent need to devise personal protective equipment (PPE) technologies capable of acting as highly efficient barrier between the external environment and the human body. New types of performant PPEs need to be developed to prevent infection, not only by Covid-19, but also by a broader spectrum of present and future viruses. GRMs are promising candidates for the fabrication of functional PPEs, including disposable or washable masks and aprons. To achieve high performance of PPEs against viruses, the GRMs structure should be chemically tailored to promote virus adhesion and destroy their biological activity once adsorbed. In order to integrate functionalized GRM in disposable or washable and re-usable commercial products, technologies allowing processing GRMs into foams and coatings at low cost should emerge.

Keywords: Personal protective equipment, functionalized GRMs, coatings

2. GRM-based Neural Interfaces for Bioelectronic Medicines

The rapid advances in neurotechnologies for the detection and modulation of electrical signalling patterns in the nervous system has triggered a new class of treatments known as Bioelectronic Medicines. The aim is to develop miniaturised implantable devices able to decipher and modulate neural signalling patterns, achieving therapeutic effects, selectively targeting particular functions of specific organs. For this vision to be realized, significant technology advances are needed in terms of fully implantable systems capable of chronically recording and stimulating the nervous system. GRMs have already shown great potential as building blocks of neural interfaces, not only for recording, but also stimulating neural circuits. In order to move forward the technology, GRM neural interfaces have to integrate additional building blocks, while demonstrating the long-term safety and chronic functionality in relevant preclinical models. These building blocks include data transmission and analysis systems, closed-loop operation, integration with commercial electronics, to name a few. This calls targets the developed of GRM-based technologies to treat chronic diseases, for neuromodulation, and rehabilitation. These have to be designed and evaluated together with clinical organizations and industrial partners, with a realistic path towards clinical applications.

Keywords: Bioelectronics medicines, GRMs, chronic implants, closed-loop, neural signal processing

3. GRM-based spectrometer for visible and infrared

Spectrometers that combine visible and infrared light can enable many applications, such as food inspection, recycling, water monitoring, etc. The growth of the current spectrometer market is limited by the functionality and availability of low-cost broadband detectors. Broader spectral operation range and miniaturization of a spectrometer would dramatically increase the size of this market, as the system could be deployed at consumer/retail sites. This goal in this call is to develop, test and evaluate a prototype broadband, compact and high resolution spectrometer (of ~2nm) covering simultaneously the visible and infrared ranges (at least 400-2000 nm) by employing GRM-based photodetectors. The technology should be validated by addressing at least one of the application areas and evaluate the

inspection capabilities with an end-user. The potential for near-future low-cost manufacturing is a key element and must be demonstrated as well benchmarking the technology.

Keywords: GRM-based Spectrometer, Photodetectors, Inspection

4. GRM-based, Ultra-Broadband THz-Transceiver technologies for 6G compliant wireless communication

Future 6G wireless networks will handle bit rates up to several 100Gbit/s operating at carrier frequencies≥1THz. Such networks will consist of small cells with limited coverage, coupled to a broad band optical backhauling link by e.g. seamless connection to an optical fibre infrastructure. Low costs, energy efficient operation, small form factor, and direct conversion from wireless THz- to optical-layer are key performance features of such transceivers. This call targets the realisation of GRM-based transceivers to enable seamless efficient conversion from THz to optical signals, as well as ultra-fast detection mechanisms to convert optical signals to THz.

Keywords: THz, 6G, GRMs

5. Tuning the hot-carrier lifetime in layered materials heterostructures for photoresponsivity enhancement

GRM-based photodetectors have potential in terms of high-bandwidth and low-cost production. Their responsivity is proportional to the carrier lifetime. The calls targets the tuning of the carrier lifetime in layered material-based heterostructures to maximize their photoresponsivity.

Keywords: Layered materials heterostructures, hot-carrier injection, hot-carrier lifetime, GRM based-photodetectors responsivity

6. GRMs for advanced metal-ion supercapacitors

Metal-ion capacitors (MICs) are energy storage devices that cover the gap between supercapacitors and batteries. MICs have higher energy density than supercapacitors, with high power and longer term cyclability. However, their energy density is still lower than lithium ion batteries. Thus, new strategies should be developed to increase the energy density. This call targets the development of GRMs as high energy density negative electrodes to improve the current performance of MICs.

Keywords: GRMs; High power; long cycling; electrochemical hybrid capacitors.

7. GRM-based electrodes for redox flow batteries

The fabrication of reliable and cost-effective electrodes with high catalytic activity towards vanadium redox reactions is crucial for the widespread dissemination of vanadium redox flow batteries (VRFBs). This call targets the development of hierarchical carbonaceous VRFB electrodes based on GRMs through solution deposition techniques combined with rapid (minute-timescale) physical gas plasma treatments. The GRM properties (including high conductivity, high surface with abundant catalytic sites, tuneable porosity and hydrophilicity), together with the use of scalable production and processing, should enable large-area (≥ 25 cm^2) GRM-based electrodes for VRFBs, targeting efficiency and rate capability superior to the state of the art, non-GRM based, technologies.

Keywords: Energy storage systems, vanadium redox flow batteries, GRMs, gas plasma treatments, solution deposition techniques

8. GRM components for Self-charging and Self-powered Electronics

A low-emission solution to power the increasing number of devices required for Big Data analysis is to make them sustainably self-powered and self-charging, through the development of efficient energy harvesters. A novel concept enabling high power conversion efficiency of mechanical energy exploits triboelectric nanogenerators (TENGs). GRMs have tuneable chemical and electronic properties, making them ideal candidates to enhance the triboelectrification charge density of insulating materials. This calls targets the combination of GRMs with solution processable TENGs fabrication, to prepare low cost, sustainable solutions for powering future electronics.

Keywords: Self-powered Electronics, Energy harvesters, GRMs, Triboelectric nanogenerators, Mechanical energy

HBP Research and Innovation JTC areas

The projects should propose holistic approaches combining computer sciences and neurosciences to address at least one of the following aims:

1. Studying genotype-phenotype relationships related to Brain Function

Research projects aiming to establish the relationship between genetics and phenotype are essential to understand the causality relationship between identified mutations and brain dysfunction or functional compensation leading to resilience.

Research projects dealing with anatomical (micro, meso, macroscales, molecular and cellular type maps) as well as functional phenotypes (behavior, functional connectome, etc) in animal models as well as in large human cohorts are eligible. The projects are encouraged to address non-genetic determinants of variability among individuals.

2. Accelerating the diagnosis and the development of therapeutic approaches for rare diseases affecting the nervous system

Research projects using holistic approaches and computational tools to develop, accelerate or improve diagnostic and therapeutic approaches for rare diseases[3] affecting the nervous system.

Clinical and preclinical proposals making use of available medical or preclinical datasets for analysis, modelling or simulation studies are eligible.

3. Tackling Psychiatric Diseases

Research projects developing diagnostic, patients stratification or treatment strategies for Psychiatric Diseases by combining diverse types of clinical data i.e. neuroimaging, molecular data, clinical records and/or questionnaires as well as data covering social aspects of these diseases including subjective well-being are eligible.

[3] According to EU a disease affecting 1 in 2000 people.

While preparing the proposals, consortia are encouraged to contact EBRAINS High-Level Support Team (HLST) (flag-era2021@ebrains.eu) if it is of their interest to explore whether the services developed by EBRAINS (https://ebrains.eu/) offer potentially valuable solutions to fulfil their aim. For relevant EBRAINS services related to this call for proposals please refer to section II.

Relevant EBRAINS services in the context of JTC 2021 FLAG-ERA

The projects falling within the scientific scope of this call for proposals are invited to consider using the following EBRAINS resources (https://ebrains.eu):

The Data and Knowledge services for finding and publishing FAIR data
The Data and Knowledge services (https://ebrains.eu/services/data-knowledge) provide services for sharing and publishing of research data from human and rodent brains, and facilitate research, e.g., on case-control studies, cohort studies, as well as on models of disease mechanisms. Storage and computing resources are available through the FENIX high performance computing infrastructure. For all projects in the present call, EBRAINS offers to publish FAIR data through the EBRAINS Knowledge Graph https://kg.ebrains.eu/search), and to couple FAIR data with journal publications (https://ebrains.eu/services/data-knowledge/share-data), with FENIX high performance computing infrastructure (https://fenix-ri.eu/about-fenix), and the other EBRAINS services, (e.g., in the area of brain simulation, neuromorphic computing, and neuro-robotics, https://ebrains.eu).

The Brain Atlas services for integrating and combining data in atlases
The Brain Atlas services (https://ebrains.eu/services/atlases/) offers tools and resources for integrating multiple reference spaces and maps of the human, rodent and mouse brain into a common framework, and for exploring and analyzing data in the atlases. For all projects in the present call, tools are available for registration of new data to the atlases, and for exploring and analyzing data through the interactive Atlas Viewer and a range of analytical tools.

The Medical Informatics Platform (MIP)
The Medical Informatics Platform, MIP (https://mip.ebrains.eu/) is currently installed in 30 centers, including 28 hospitals, with 8 more hospitals having signed an installation agreement. Use-cases have been implemented in the field of dementia, traumatic brain injury, mental health and epilepsy. More than 20.000 patients' datasets have been processed in the MIPs, including more than 10.000 in the MIP Federation. Importantly, a significant number of MIP equipped hospitals are part of the European Reference Network (ERN) EpiCare, with which HBP has signed an official partnership. Discussions are ongoing regarding a similar partnership with ERN RND for rare neurological diseases. EpiCare and ERN-RND are the two brain diseases oriented ERNs.

Costs for using EBRAINS services.
The use of EBRAINS services will be free for the FLAG-ERA projects (with a few exceptions, see below). In particular, the Data and Knowledge service will give priority to requests for data curation at no cost from FLAG-ERA projects. Projects are encouraged 1) to follow one of the paths for combined journal publication and publication of data on EBRAINS (https://ebrains.eu/services/data-knowledge/share-data) and to describe in their proposal which path they are planning to follow, and 2) to use the "Curation request form" on EBRAINS Share Data to deliver information concerning the curation need.

For projects that will require development of significant new functionalities that go beyond present planning of EBRAINS services, applicants are advised to describe their needs and request information through the service email for the FLAG-ERA call: flag-era2021@ebrains.eu .
For projects with high demands for high-performance computing or large data storage, conditions for access can be found at https://fenix-ri.eu/access. More information can be requested through the service email for the FLAG-ERA call: flag-era2021@ebrains.eu