Institut national de **physique nucléaire** et de **physique des particules**

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The strong interaction at the frontier of knowledge: fundamental research and applications (STRONG-2020)

Barbara Erazmus (F. Maas)

Annual meeting of the german committee Hadrons and Nuclei

Physikzentrum Bad Honnef, Germany, December 6/7 2018

Project STRONG-2020

- Steering Committee
  - Barbara Erazmus (Coordinator): IN2P3/SUBATECH (France)
  - **Nora Brambilla: TUM (Germany)**
  - David d'Enterria: CERN (Switzerland)
  - Carlo Guaraldo: INFN (Italy)
  - Boris Hippolyte: IN2P3 (France)
  - Tord Johansson: University of Uppsala (Sweden)
  - Chiara La Tessa: INFN-Tifpa (Italy)
  - **Frank Maas: HIM, GSI, JGU Mainz (Germany)**
  - Franck Sabatié: CEA (France)
  - Carlos Salgado López: Universidad de Santiago de Compostela (Spain)

  - Víctor de Benito Rubio (Project Manager) : CNRS/IN2P3 (France)

Horizon 2020

- Horizon 2020 or H2020 is the European programme for research and development during 2014-2020
- It has a budget of 79 billion euros
- Several calls
  - H2020-INFRAIA-01-2018-2019

Call	Budget (Million EUR)		Deadlines
	2018	2019	
Opening: 5 December 2017			
INFRAIA-01-2018-2019 (RIA)	101,5		22 March 2018
Opening: 14 November 2018			
INFRAIA-01-2019-2020 (RIA)		125	20 March 2019
Indicative total budget	136,5		

Call INFRAIA-01-2018-2019 Integrating Activities for Advanced Communities

- Work Programme 2018-2020
  - Several topics: biology, maths, physics...
    - Hadron physics

- Provide and facilitate access to key research infrastructures in Europe for the study of the properties of nuclear material in extreme conditions, transforming the advances of experimentation in hadron physics and new applications

It should provide a long-term, sustainable perspective on the integration of relevant facilities and related resources

Project STRONG-2020

- 32 Work Packages
  - Management and Coordination
  - Dissemination and Communication
  - 7 Transnational Infrastructures (COSY, MAMI, ELSA, GSI, LNF, CERN, ECT*)
  - 2 Virtual Infrastructures
  - Experimental / Theoretical / Instrumentation Activities
    - 7 Networking Activities (NA)
    - 14 Joint Research Activities (JRA)

- 44 participating institutions
  - 16 countries: Austria, Belgium, Switzerland, Germany, Spain, Finland, France, Croatia, Ireland, Italy, Montenegro, The Netherlands, Poland, Portugal, Sweden and United Kingdom

List of participants

Participant name	Short name
Centre National de la Recherche Scientifique	CNRS
Oesterreichische Akademie der Wissenschaften	OeAW
Universite Catholique de Louvain	UCL
European Organization for Nuclear Research	CERN
Deutsches Krebsforschungszentrum Heidelberg	DKFZ
Facility for Antiproton and Ion Research in Europe GmBH	FAIR
Forschungszentrum Juelich GmBH	FZJ
GSI Helmholtzzentrum fuer Schwerionenforschung GmBH	GSI
Johannes Gutenberg-Universitat Mainz	JGU MAINZ
Rheinische Friedrich-Wilhelms-Universitat Bonn	UBO
Ruhr-Universitaet Bochum	RUB
Ruprecht-Karls-Universitaet Heidelberg	UHEI
Technische Universitaet Muenchen	TUM
Universitaet Hamburg	UHAM
Universitaet Regensburg	UREG
Westfaelische Wilhelms-Universitaet Muenster	WWU
Universidad Autonoma de Madrid	UAM
Universidad Complutense de Madrid	UCM
Universidad de Salamanca	USAL
Universidade de Santiago de Compostela	USC
Universidad del Pais Vasco/Euskal Herriko Unibertsitatea	UPV/EHU
Universitat de Valencia	UVEG

List of participants

Participant name	Short name
Jyvaskylan Yliopisto	YJU
Commissariat a l'Energie Atomique et aux Energies Alternatives	CEA
Ruder Boskovic Institute	RBI
Sveuciliste u Zagrebu	UNIZG
The Trinity College of Dublin	TCD
Consiglio Nazionale delle Ricerche	CNR
Fondazione Bruno Kessler	FBK
Istituto Nazionale di Fisica Nucleare	INFN
Politecnico di Milano	POLIMI
Javna Ustanova Univerzitet Crne Gore Podgorica	UOM
Rijksuniversiteit Groningen	RUG
Stichting Nederlandse Wetenschappelijk Onderzoek Instituten	Nikhef
Narodowe Centrum Badan Jadrowych	NCBJ
Politechnika Warszawska	WUT
The Henryk Niewodniczanski Institute of Nuclear Physics	IFJ PAN
Uniwersytet Jagiellonski	UJ
Laboratorio de Instrumentacao e Fisica Experimental de Particulas	LIP
Universidade de Aveiro	UAVR
Uppsala Universitet	UU
The University of Birmingham	UOB
The University of Edinburgh	UEDIN
University of Glasgow	UGLASGOW

Project STRONG-2020
List of Work Packages

Acronym	Title	Coordinator(s)
MAN	Project Management and Coordination	Barbara Erazmus (CNRS, Nantes)
DISCO	Dissemination & Communication	Catalina Curceanu (INFN, Frascati)
TA1-COSY	TA1: Transnational Access to COSY	Dieter Grzonka (FZJ, Jülich)
TA2-MAMI	TA2-Transnational Access to MAMI	Achim Denig (UMainz)
TA3-LNF	TA3-Transnational Access to LNF	Carlo Guaraldo, Catalina Curceanu (INFN, Frascati)
TA4-ELSA	TA4-Transnational Access to FTD/ELSA	Hartmut Schmieden (UBO, Bonn)
TA5-GSI-FAIR	TA5-Transnational Access to GSI /FAIR	Yvonne Leifels (GSI, Darmstadt)
TA6-ECT*	TA6-Transnational Access to ECT*	Jochen Wambach (FBK, Trento)
TA7-CERN	TA7-Transnational Access to CERN	David d'Enterria (CERN, Geneva)
VA1-NLOAccess	VA1-Automated perturbative NLO calculations for heavy ions and quarkonia	Jean-Philippe Lansberg (CNRS, Orsay)
VA2-3DPartons	VA2-Virtual Access to 3DPartons	Hervé Moutarde (CEA, Saclay)
NA1-FAIRnet	NA1-QCD physics at GSI/FAIR	Fritz-Herbert Heinsius (RUB, Bochum)
NA2-Small-x	NA2-Small-x Physics at the LHC and future DIS experiments	Néstor Armesto (USC, Santiago de Compostela) Tuomas Lappi (JYU, Jyväskylä)
NA3-Jet-QGP	NA3- Quark-Gluon-Plasma characterisation with jets	Guilherme Milano (LIP, Lisbon) Marco van Leeuwen (Nikhef, Amsterdam)
NA4-PREN	NA4- Proton Radius European Network	Dominique Marchand (CNRS, Orsay) Randolf Pohl (UMainz)
NA5-THEIA	NA5-Strange Hadrons and the Equation-of-State of Compact Stars	Josef Pochodzalla (UMainz)
NA6-LatticeHadrons	NA6-LatticeHadrons	Michael Peardon (TCD, Dublin)
NA7-Hf-QGP	NA7-Quark-Gluon Plasma characterisation with heavy flavour probes	Joerg Aichelin (CNRS, Nantes) Giuseppe Bruno (INFN, Bari)

Project STRONG-2020
List of Work Packages

Acronym	Title	Coordinator(s)
JRA1-LHC-Combine	JRA1-Inter-experiment combination of heavy-ion measurements at the LHC	Raphaël Granier de Cassagnac (CNRS, Palaiseau)
JRA2-FTE@LHC	JRA2- Fixed Target Experiments at the LHC	Cynthia Hadjidakis (CNRS, Orsay) Pasquale Di Nezza (INFN, Frascati)
JRA3-PrecisionSM	JRA3-Precision Tests of the Standard Model	Mikhail Gorshteyn (UMainz) Andrzej Kupsc (University of Uppsala)
JRA4-TMD-neXt	JRA4-3D structure of the nucleon in momentum space	Alessandro Bacchetta (INFN, Pavia)
JRA5-GPD-ACT	JRA5-Generalized Parton Distributions	Silvia Niccolai (CNRS, Orsay) Kresimir Kumericki (UNIZG, Zagreb)
JRA6-Next-DIS	JRA6-Challenges for next generation DIS facilities	Daria Sokhan (UGlasgow) Francesco Bossu (CEA, Orsay)
JRA7-HaSP	JRA7-Light-and heavy-quark hadron spectroscopy	Marco Battaglieri (INFN, Genova) Juan Nieves (UVEG, Valencia)
JRA8-ASTRA	JRA8-Advanced ultra-fast solid STate detectors for high precision RAdiation spectroscopy	Johann Zmeskal (OeAW, Vienna)
JRA9-TIIMM	JRA9-Tracking and Ions Identifications with Minimal Material budget	Eleuterio Spiriti (INFN, Frascati)
JRA10-CryPTA	JRA10-Cryogenic Polarized Target Applications	Hartmut Dutz (UBO, Bonn)
JRA11-CRYOJET	JRA11-Cryogenically cooled particle streams from nano- to micrometer- size for internal targets at accelerators	Alfons Khoukaz (WWU, Münster)
JRA12-SPINFORFAIR	JRA12-Spin for FAIR	Paolo Lenisa (INFN, Frascati)
JRA13-P3E	JRA13-Polarized Electrons, Positrons and Polarimetry	Eric Voutier (CNRS, Orsay)
JRA14-MPGD_HP	JRA14-Micropattern Gaseous Detectors for Hadron Physics	Bernhard Ketzer (UBO, Bonn) Fulvio Tessarotto (INFN, Frascati)


SWEDEN
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POLAND
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FRANCE
SWITZERLAND
AUSTRIA
CROATIA
SPAIN
PORTUGAL
ITALY
MONTENEGRO
Beneficiary

Project STRONG-2020

- Relations to other laboratories in the world:

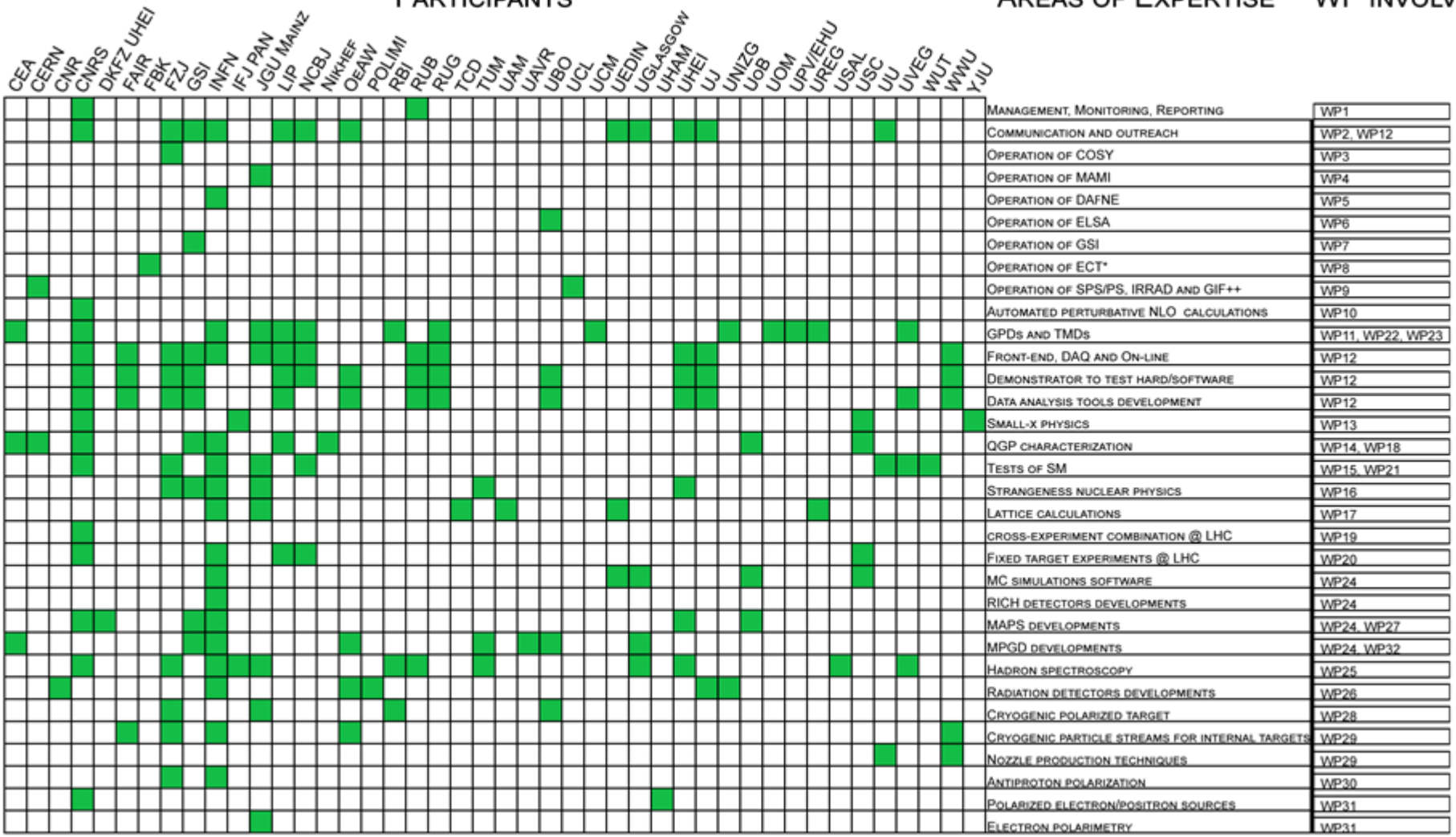
- JINR (DUBNA)
  - NA1-FAIRnet
  - NA4-PREN
  - NA5-THEIA (NICA)
  - JRA10-CryPTA

- TJNAF
  - NA4-PREN
  - NA5-THEIA
  - JRA3-PrecisionSM
  - JRA4-TMD-neXt
  - JRA5-GPD-ACT
  - JRA6-next-DIS
  - JRA7-HaSP
  - JRA10-CryPTA
  - JRA13-P3E
  - JRA14-MPGD_HP

- KEK (J-PARC)
  - NA5-THEIA
  - JRA3-PrecisionSM
  - JRA7-HaSP
  - JRA8-ASTRA

- EIC
  - VA2-3DPartons
  - NA2-Small-x
  - JRA4-TMD-neXT
  - JRA5-GPD-ACT
  - JRA6-next-DIS
  - JRA13-P3E
  - JRA14-MPGD_HP

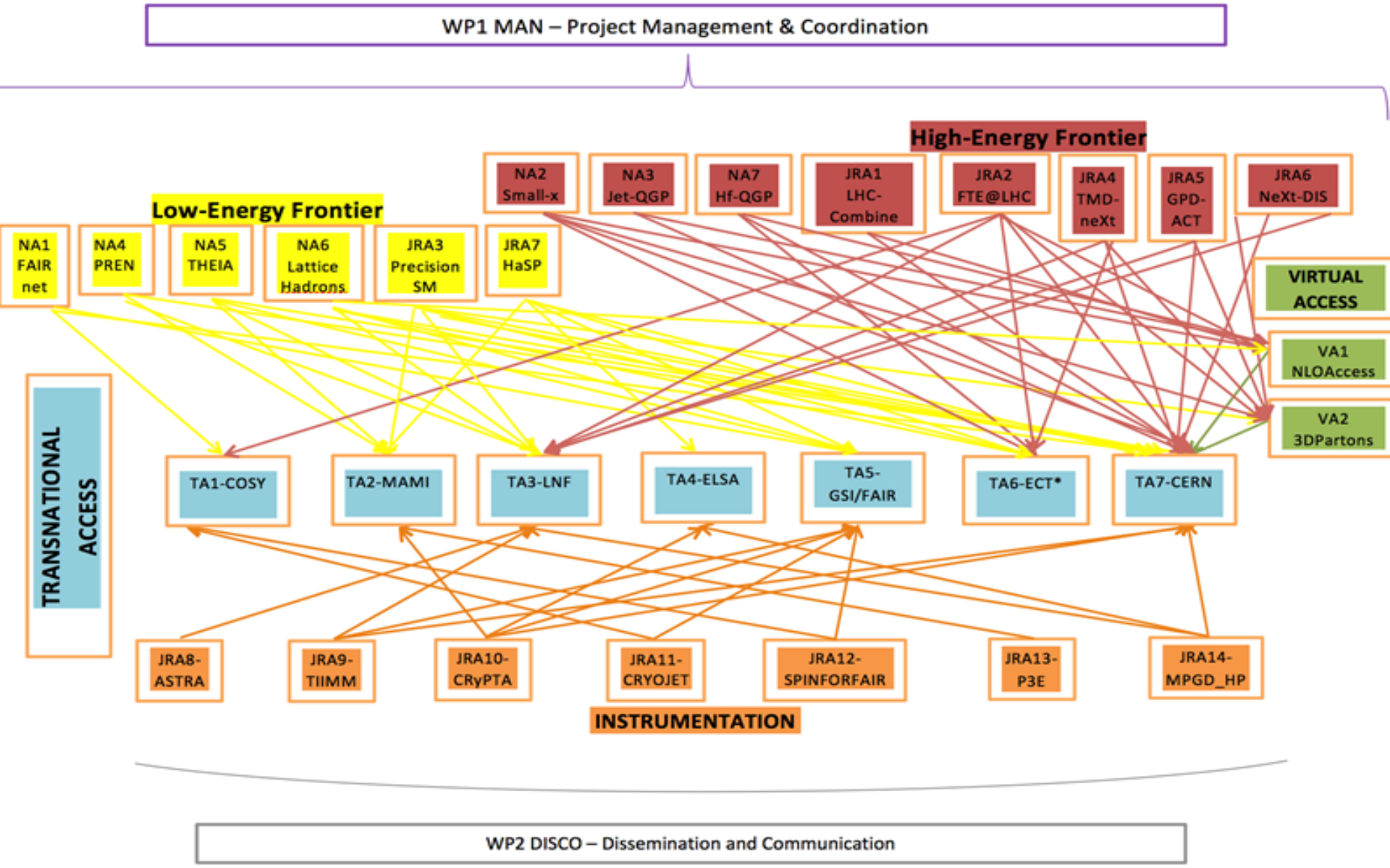
Key areas of expertise



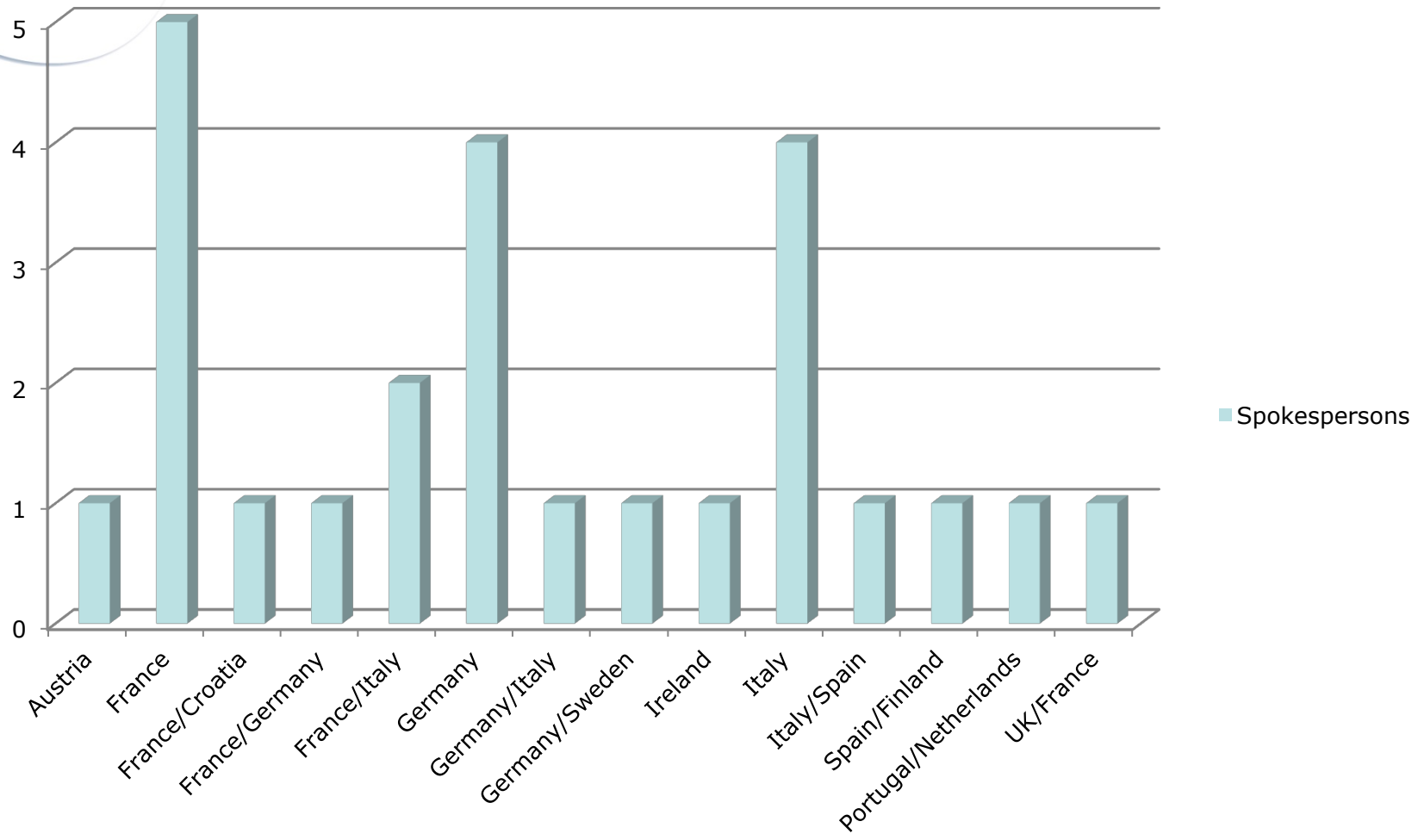
Project STRONG-2020

- Division of Work Packages:
  - MAN-Project Management and Coordination
  - DISCO-Dissemination and Communication
  - Facilities: 7 Transnational Access
  - 7 Low-Energy Frontier Activities
    (NA1, NA4, NA5, NA6, JRA3 and JRA7)
  - 10 High-Energy Frontier Activities
    (VA1, VA2, NA2, NA3, NA7, JRA1, JRA2, JRA4, JRA5 and JRA6)
  - 7 Instrumentation Activities
    (JRA8, JRA9, JRA10, JRA11, JRA12, JRA13 and JRA14)

Inter-relations between the Work Packages



Work Package Spokespersons



Description of Work Packages

- The Work Packages are organized around the following three pillars: (i) low- and (ii) high-energy frontier studies, and (iii) instrumentation:

Low-Energy Frontier

- **JRA-PrecisionSM**: Precise determination of the muon anomalous magnetic moment (g-2)μ; the CKM matrix element Vud from beta decay, and the weak mixing angle from parity-violating electron scattering.

- **NA-PREN**: Address the "proton-radius puzzle" via combined data-theory analyses of new results in atomic spectroscopy (laser spectroscopy of Hydrogen molecules and molecular ions, muonic atoms, He+ ions, positronium, and muonium) and very-low momentum transfer (Q2) lepton-proton elastic scattering at various energies.

- **NA-LatticeHadrons**: Development of combined software, data sharing, and methodologies in lattice QCD theory across Europe along 4 axes: (i) hadron spectroscopy and structure, (ii) hadrons under extreme conditions, (iii) hadrons in the SM and beyond, (iv) novel numerical algorithms and computing for lattice hadron physics.

- **JRA-HaSP**: Development of a common data-theory analysis framework to determine exotic hadrons properties (new mesons and baryons, onia, dibaryon, multi-quark, glueballs, hybrids...) by fitting new experimental data (MAMI, TJNAF, BESIII, COMPASS, LHCb and ALICE at CERN) to lattice QCD and effective-field-theory predictions.

- **NA-FAIRnet**: Multi-prong improved data selection (trigger-detector-less data acquisition, deadtime-free front-end electronics, Field Programmable Array (FPGA) based online selection) plus distributed physics analysis (partial wave analysis of resonances, and multi-particle correlations) for rare signal events under high background conditions (multi-PByte/month) in anti-p-p, anti-p-A, and A-A collisions for the PANDA and CBM experiments at the future FAIR facility.

- **NA-THEIA**: Address the "neutron stars hyperon puzzle" (contradiction between the observation of 2-solar-masses neutron stars and microscopical predictions of a softening of the nuclear equation-of-state due to the presence of strange-quark hadrons) through combined theoretical and experimental studies of (anti)hypernuclei and bound strange-meson systems produced in hadronic collisions at various c.m. energies.

Description of Work Packages

High-Energy Frontier

- **VA-NLOAccess**: Extension of the well-known MadGraph automated on-line code for the novel computation of perturbative QCD cross sections in high-energy hadronic collisions (i) at next-to-leading- order (NLO) accuracy, (ii) using meson and heavy-ion beams, and (iii) for quarkonia final-states.

- **VA-3DPartons**: Development of a new combined framework to extract generalized (GPDs) and transverse momentum-dependent (TMDs) parton distributions, with higher-order fixed and twist corrections, from fits to experimental e-p and p-p data (handled in a Rivet-like format).

- **JRA-GPD-ACT**: Extraction of GPDs from new high-precision QCD analyses of novel high-statistics e-p and p-p measurements at fixed-target and collider energies.

- **JRA-TMD-neXt**: Extraction of unpolarized and polarized TMDs and parton fragmentation functions (FFs) from new high-precision QCD analyses of novel high-statistics measurements at e+e-, e-p and p-p at fixed-target and collider energies.

- **JRA-next-DIS**: Development of new Monte Carlo tools and studies of benchmark channels, for e-A collisions at future deep-inelastic experiments (Electron-Ion Collider, EIC). Optimisation of associated detector designs for high-resolution tracking, vertexing, photon, and PID.

- **NA-Small-x**: Extraction of high-precision nuclear parton distribution functions (nPDF) through global fits including the latest LHC p-A and A-A data. Extension of current gluon-saturation calculations (CGC, BFKL, TMD...) to NLO accuracy with resummation corrections, for observables with three jets and with heavy-quarks. Calculation of multi-particle correlations issuing from initial-state PDF effects to separate them from final-state hydrodynamic effects in small systems (p-p, p-A collisions).

Description of Work Packages

High-Energy Frontier

- **JRA-FTE@LHC**: Development of novel gas-target techniques to be able to carry out the most energetic fixed-target collisions ever performed in the lab, using the LHC beams at ALICE and LHCb. Evaluation of the novel expected constraints on PDFs at high-x in the proton and nucleus, parton spin dynamics, as well as QGP properties via unique quarkonia measurements.

- **NA-Jet-QGP**: Development of novel experimental and theoretical techniques for jet physics in A-A collisions, providing a reference implementation of jet interactions in a QGP via a full heavy-ion Monte Carlo (MC) event generator. Definition of new observables and development of new tools (based on quark/gluon jet substructure variables via machine-learning techniques) with increased sensitivity to the physical mechanisms involved in jet-QGP interactions.

- **NA-Hf-QGP**: Extraction of QGP transport coefficients from new high-precision theoretical calculations and experimental measurements of the production of open and closed heavy flavour (HF) quarks (charm and beauty) in A-A collisions at the LHC. Accurate measurements of total c-cbar, b-bbar cross sections in p-p, p-A and A-A collisions. Development of a new data-theory interface (with a Rivet-like standard format) to compare event-by-event experimental results to MC predictions.

- **JRA-LHC-Combine**: Combination of key LHC (ALICE, ATLAS, CMS, LHCb) measurements in p-p, p-A, and/or A-A collisions to achieve high-precision constraints on nuclear PDFs, QGP properties, SM parameters, and/or searches of physics beyond the SM. Examples include gauge bosons and jets differential cross sections to constrain nPDF, light-by-light scattering to constrain new physics (axion) searches, open charm or bottom hadron cross sections to determine QGP transport coefficients...

Description of Work Packages

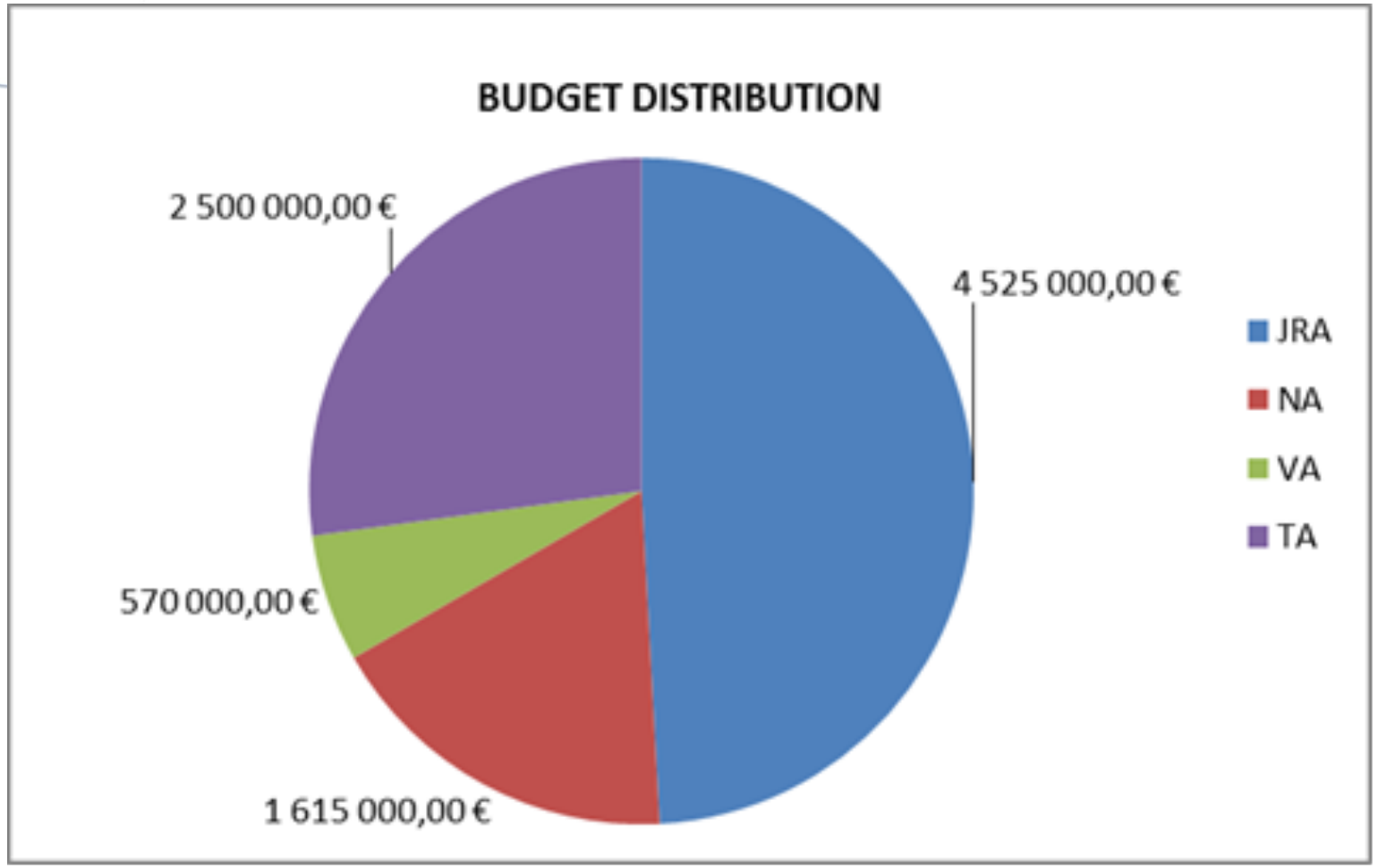
Instrumentation

- **JRA-MPGD_HP**: Development (up to the prototype stage) of new gas detectors with improved capabilities in tracking, charged particle identification, photon detection, and timing in the picosecond region, capable of operating under very high beam intensity conditions.
- **JRA-TIIMM**: Development of new silicon detectors based on Monolithic Active Pixel Sensors (MAPS) for high-precision tracking, and energy loss measurement for advanced particle identification.
- **JRA-ASTRA**: Development of beyond state-of-art radiation detectors based on semiconductors (Cadmium Telluride, Cadmium Zinc Telluride) able to perform high-precision measurements of X-ray and gamma-ray photons in different environments/conditions.
- **JRA-CryPTA**: Production of polarized nucleon targets (at the prototype level) using solid state materials combined with superconducting high-field magnets and the Dynamic Nuclear Polarization method.
- **JRA-CRYOJET**: Development of cryogenically-cooled cluster/pellet/microjet sources to be used as targets in a variety of collision setups (storage ring experiments, electron accelerators, or laser-driven hadron accelerators).
- **JRA-SpinForFAIR**: Optimization of the polarization of protons and antiprotons beams and targets for the GSI/FAIR storage ring.
- **JRA-P3E**: Optimization of high-intensity polarized electron and positron beam sources, and full design of the Hydro-Møller polarimeter detector using high-voltage monolithic active pixel sensors (HV-MAPS).

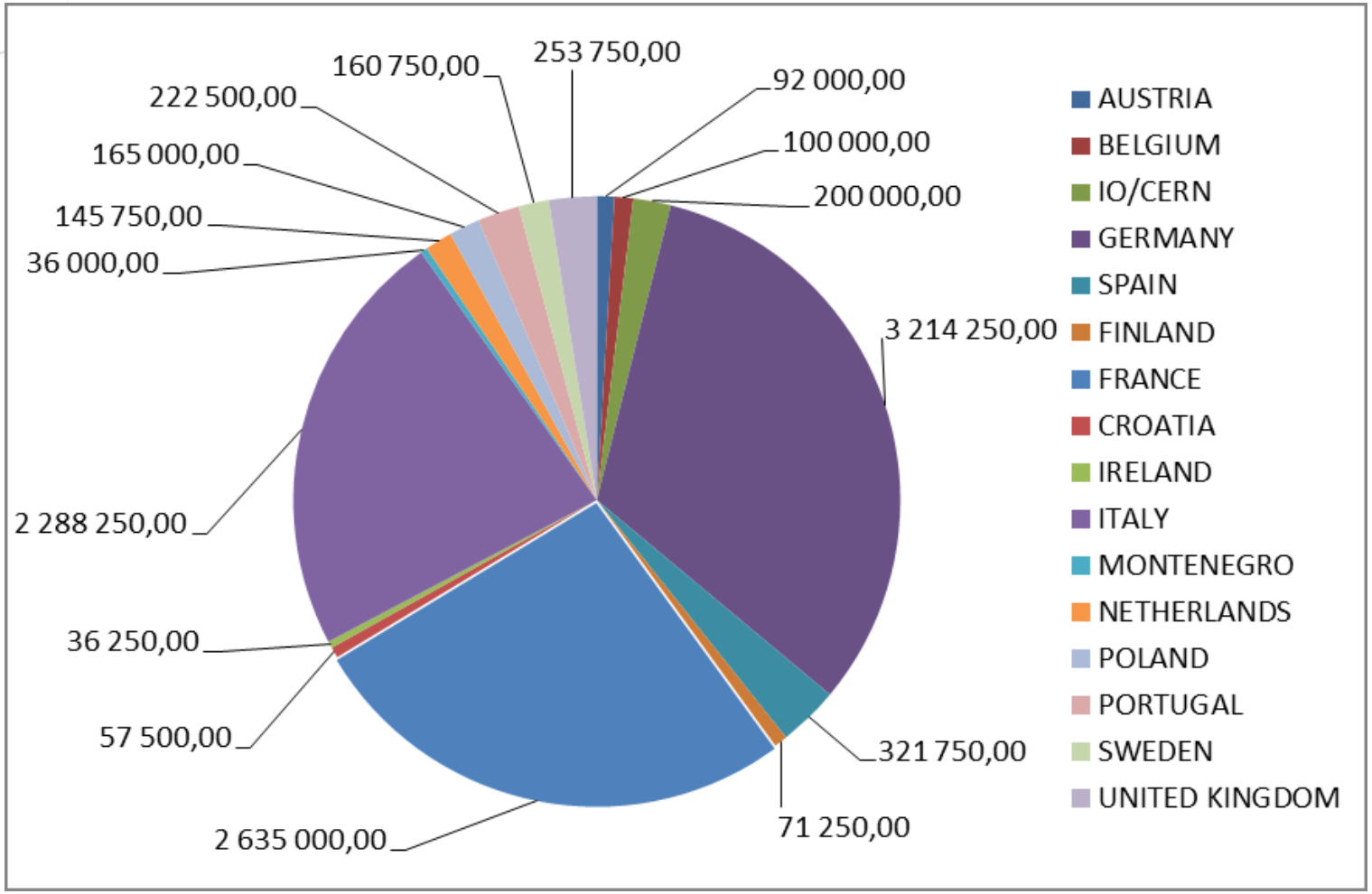
WP-MAN: It will take in charge the effective management, the steering of the whole project and the monitoring of the progress of all Work Packages including the planned scientific activities, industrial developments and applications as well as society issues. The management team will ensure the contractual and administrative implementation. It will oversee the use of resources and prepare Periodic and Final Reports.

WP-DISCO: The main aim of the DISCO WP is to promote and realize efficient and targeted dissemination, exploitation of results and communication activities resulting from the research and transnational activities performed within the project, in order to raise the awareness, to promptly inform the various communities on the obtained results and to enhance the future financing opportunities targeting the self-sustainability of the community

Overall Budget Distribution (€)



Budget allocation by country (€)
Total 10 M €



Evaluation Summary Report

	scores (0-5)
– **Excellence**	4.00
– **Impact**	5.00
– **Quality and efficiency of implementation**	3.50

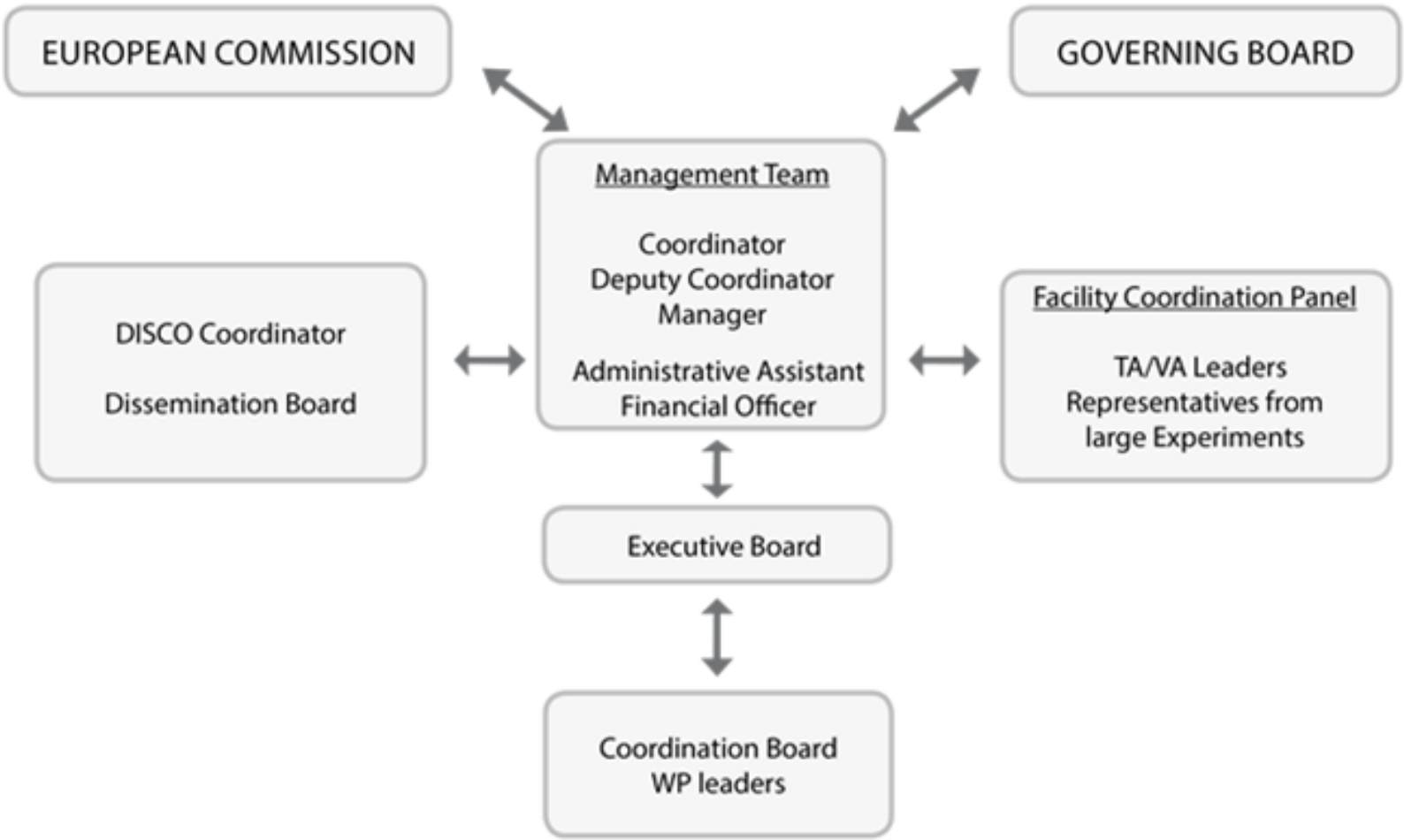
– Total 12.50 (Threshold 10)

List of successful projects

- Main List
  - Synthesys Plus (UK) *Synthesis of systematic ressources*
  - EuroFleets Plus (IE) *New operational steps towards an alliance of European research fleets*
  - SFERA III (ES) *Solar Facilities for the European Research Area*
  - EASI Genomics (ES) *Employment and Social Innovation*
  - SOLARNET (DE) *High-Resolution Solar Physics Network*
  - EMP (DE) *Energy Modelling Platform for Europe*
  - IS-ENES-3 (FR, CNRS) *InfraStructure for the European Network for Earth System Modelling*
  - EPIC- XLS (NL) *Enabling Practical Wireless Tb/s Communications with Next Generation Channel Coding*
  - ARIADNEplus (IT) *ARgon ImAging DetectioN chambEr*
  - ESTEEM3 (DE) *Enabling Science and Technology through European Electron Microscopy*
  - RISIS 2 (FR, Uni. Marne La Vallée) *Research Infrastructure for Science and Innovation Studies*
  - RADIATE (DE) *Radiation Innovations for Therapy and Education*
  - STRONG 2020 (FR, CNRS) *The Strong Interaction at the Frontier of Knowledge*

- Reserve list :
  - TREEFORCE (FR, INRA) *Forestry and Environmental Challenges*
  - Micro4Life (FR, Institut Pasteur) *Microbial Bioindustry*

Organisational Structure



Link with the Work Programme

- STRONG-2020 offers open access to six world-class experimental facilities (COSY, MAMI, LNF, ELSA, GSI/FAIR and CERN). ECT* will play a crucial role in fostering innovative theoretical developments in hadron physics in close synergy with experimentalists. FAIR and LHC-HL are included in the ESFRI roadmap list. GSI/FAIR, ALICE at LHC and ECT* are recommended in the NuPECC Long Range Plan. Two complementary Virtual infrastructures (VA) will provide access to automated tools generating open-source scientific codes.

- Innovative technical developments will be performed in collaboration with Joint Institute for Nuclear Research in Dubna. In the frame of the future NICA project strong synergies exist with FAIR and are strongly supported by NuPECC.

- Joint theoretical and technical programmes will be performed with high-level Institutes outside Europe: JLAB, RHIC, Fermilab and future EIC in United-States, JPARC and BELLE in Japan, BESIII in China.

Link with the Work Programme

- The role of 14 JRAs will be to enhance the access to the infrastructures through challenging theoretical, experimental and high-level technology developments leading to strong advance in hadron physics and new industrial applications. 7 Networking Activities will initiate and foster new collaboration actions within TAs, VAs and JRAs.

- STRONG-2020 is complementary to ENSAR2 integrating activity. Two infrastructures (GSI/FAIR and ECT*) will offer access to both, hadron and nuclear physics communities, based on different, even though related, scientific objectives.

Thank you for your collaboration and support

Industrial partners

- 1.The Work Package FAIRnet explicitly states a cooperation of FZJ (partner) with companies like NVIDIA and Intel
- 2.Concerning the Work Package CryPTA, the relevant target group of Bonn University has a collaborative research project with CryoVac GmbH & Co KG, Troisdorf, a leading German manufacturer of cryogenic equipment and custom cryostats for low temperature STM-systems. The project is founded by the German Federal Ministry for Economic Affairs and Energy (BMWI) as a so called “ZIM-Project” (Central Innovation Program to foster market-driven technology-based R&D work within German SMEs) (for more information https://www.bmwi.de/Redaktion/EN/Artikel/SME-Sector/technology-neutral-project-support-01.htm)
- 3.There are two industrial companies involved in the Work Package TIIMM:

  - Tower Jazz (www.towerjazz.com), a global silicon foundry specialized in manufacturing analog integrated circuits. They will have the main role of producing the sensors prototypes implemented in the project

  - G&A Engineering (www.gaengineering.com), an enterprise which operates in the military and professional electronics that is also structured as a Research Center qualified by the Italian ministry of University and research. Their main role will be the assembly of the different prototypes which will be built thanks to their long standing expertise in silicon sensors, as evidenced in their overall assembly of the silicon tracker used in the AMS (Alpha Magnetic Spectrometer) experiment on the ISS (International Space Station).

Industrial partners

- 4. The Work Package SPINFORFAIR concerns a measurement in the field of hadron physics. In the preparation of the experimental test, industry has been involved as partner in the production of dedicated equipment:
  - superconducting solenoid (so called “siberian snake”) from a dedicated development by "Cryogenic Ltd" (UK) (http://www.cryogenic.co.uk)
  - semiconductor sensors from a dedicated development by "Micron Semiconductor Ltd" (UK) (http://www.micronsemiconductor.co.uk)
  - readout chips from a dedicated development of “Integrated Detector Electronics AS” (N). (http://ideas.no)
- 5. While the Work Package P3E doesn’t have industrial partners at this stage, the development concerning HV-MAPS and Polarized Positrons have a true potential of applications once successfully achieved
- 6. Regarding the Work Package CRYOJET, there are two companies involved:
  - The German company "Micreon GmbH" in Hannover will perform the last step in the cluster nozzle production line by laser drilling. This laser drilling for micrometer nozzles is a new topic for this company, so any experience gained here will be of high interest for further similar industrial products, i.e. injector nozzles for various fields.
  - The German company PROTIQ GmbH in Blomberg will produce in close cooperation with the JRA complex cryo-cooling devices using 3d-printing with, e.g., copper or stainless steel. The results performed for the planned state-of-the-art cryogenic targets are expected to open new fields for complex cryogenic cooler in many fields of technology.

Industrial partners

- 7. Three high-technology industrial partners will be involved in the project MPGD_HP:
  - ELTOS S.p.a., Arezzo, Italy
  - ELVIA PCB, Coutances, France
  - Technology Transfer Agency Techtra Sp. z o.o. TECHTRA, Wroclaw, Poland

They will provide standard as well as special custom-designed components for the detector prototypes, work in close collaboration with our Institutes to adapt the innovative elements developed in the framework of this JRA to an industrial environment, define and optimize together with us new quality assessment methods and protocols for the innovative MPGD components and participate in the technology transfer of novel ideas, procedures and applications emerging from the proposed JRA, in view of a potential increase of their competitiveness in the international market.