Super-Kamiokande Plus [*SKPLUS*, SK✚]

a H2020 MSC RISE 2014 project by

UAM: University Autonoma Madrid **[Coordinator]**

NCBJ: Narodowe Centrum Badan Jadrowych, Poland

National Center for Nuclear Research

WUT: Politechnika Warszawa, Poland

Warsaw Polytechnic University

ICRR: Institute for Cosmic Ray Research, The University of Tokyo, Japan

[Third Country Partner, host of Secondments]

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Jornada informativa Acciones Marie Sklodowska-Curie en España

Convocatoria RISE 2015

Madrid, 27 de febrero 2015

Gran Agreement number: **641540**

Project duration: **December 1st, 2014 → November 30th, 2018**

Budget summary:

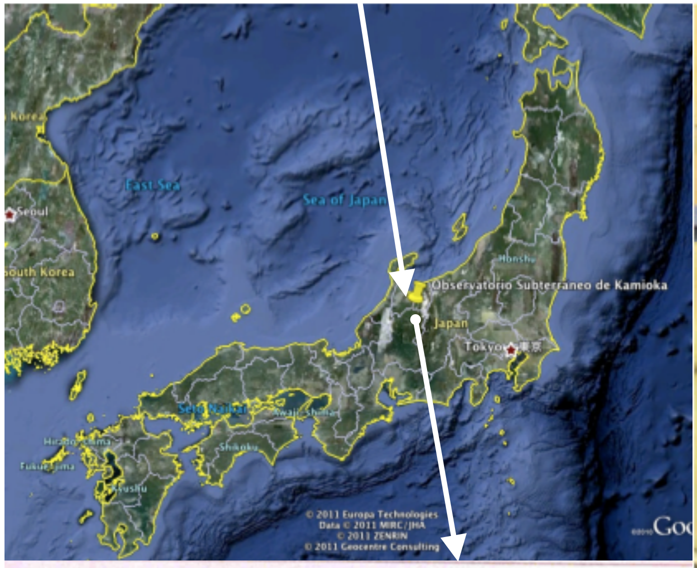
		Cost of seconded staff	Institutional costs		
			research training networking	management indirect	
	number of researchers / month	per unit: 2000	per unit: 1800	per unit: 700	total = total EU
UAM	43	86000	77400	30100	193500
NCBJ	13	26000	23400	9100	58500
WUT	13	26000	23400	9100	58500
ICRR					-
				Total	310500

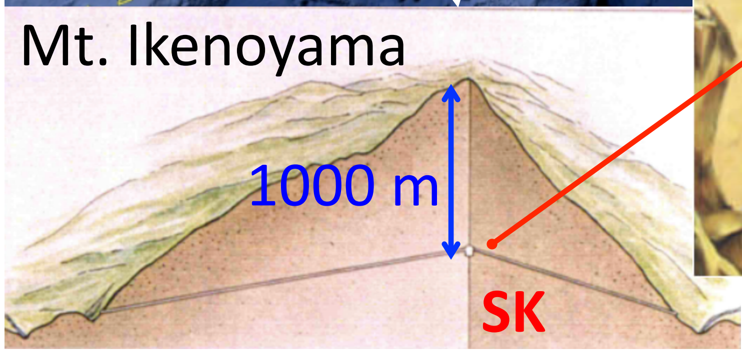
Not very much but extremely useful !

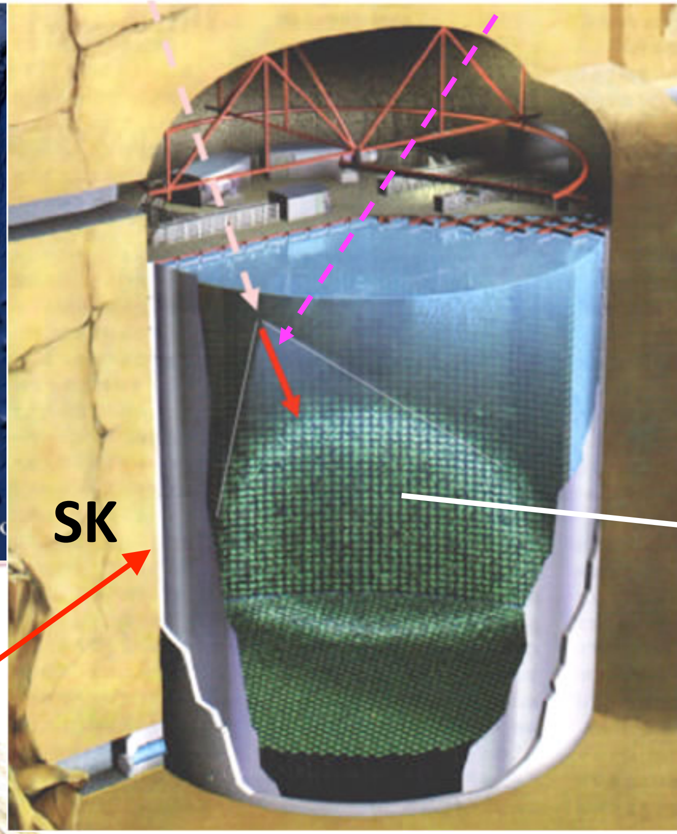
the core of the project is the
***Super-Kamiokande* experiment (SK) at Kamioka Observatory**
of *The Institute for Cosmic Ray Research, ICRR, U. Tokyo*
[ICRR: third Country Partner, host of Secondments]

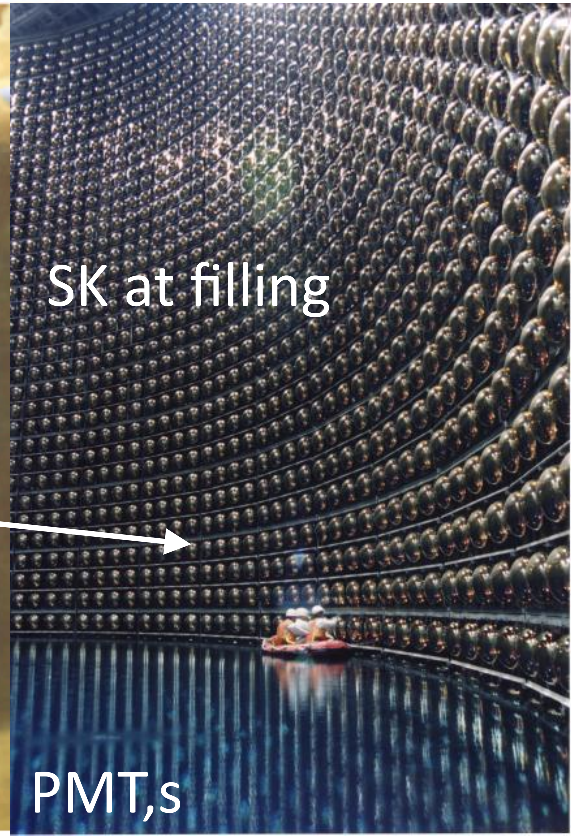
Kamioka Observatory

***SK* measures** *Cherenkov radiation*









2700 m.w.e. overburden

0.05 Mt water tank
40m ∅ x 40m H

ID: 11148, 50cm ∅
OD: 1885, 20cm ∅

1 Kamioka Observatory, ICRR, Univ. of Tokyo, Japan
2 RCCN, ICRResearch, Univ. of Tokyo, Japan
3 University Autonoma Madrid, Spain **UAM**
4 University of British Columbia, Canada
5 Boston University, USA
6 Brookhaven National Laboratory, USA
7 University of California, Irvine, USA
8 California State University, USA
9 Chonnam National University, Korea
10 Duke University, USA
11 Fukuoka Institute of Technology, Japan
12 Gifu University, Japan
13 GIST College, Korea
14 University of Hawaii, USA
15 KEK, Japan
16 Kobe University, Japan
17 Kyoto University, Japan
18 Miyagi University of Education, Japan
19 STE, Nagoya University, Japan
20 SUNY, Stony Brook, USA
21 Okayama University, Japan
22 Osaka University, Japan
23 University of Regina, Canada
24 Seoul National University, Korea
25 Shizuoka University of Welfare, Japan
26 Sungkyunkwan University, Korea
27 Tokai University, Japan
28 University of Tokyo, Japan
29 Kavli IPMU (WPI), University of Tokyo, Japan
30 Dep. of Phys., University of Toronto, Canada
31 TRIUMF, Canada
32 Tsinghua University, China
33 University of Washington, USA
34 National Centre For Nuclear Research, Poland **NCBJ**

only two from EU

~120 collaborators
34 institutions
7 countries

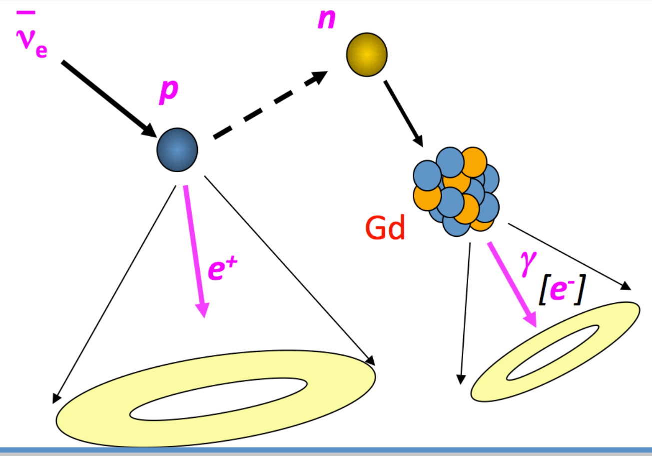
the project aims to help continuing and expanding our full involvement in an experimental program that is providing major scientific achievements to HEP since almost two decades, and it is currently tackling truly fundamental problems in Basic Science, remarkably:

- solar ν flux,
- matter effects in ν oscillations,
- precise measurement of leptonic mixing matrix elements

- Grand Unification Theories; search for Proton Decay

- nearby Galactic Supernova; neutrino physics at very high temperature and density

✚ the R&D program [*EGADS*] to provide SK and its Next Generation, Hyper-Kamiokande (HK), the ability to distinguish the character anti- / particle of the interacting ν



e^+ is detected

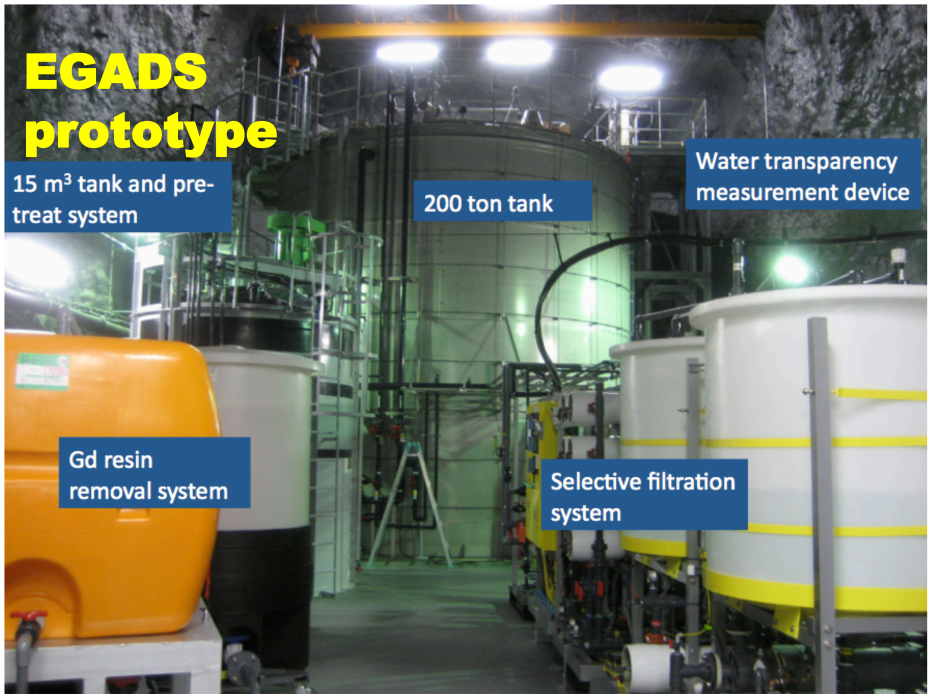
n wanders around for ~12μs until thermalises

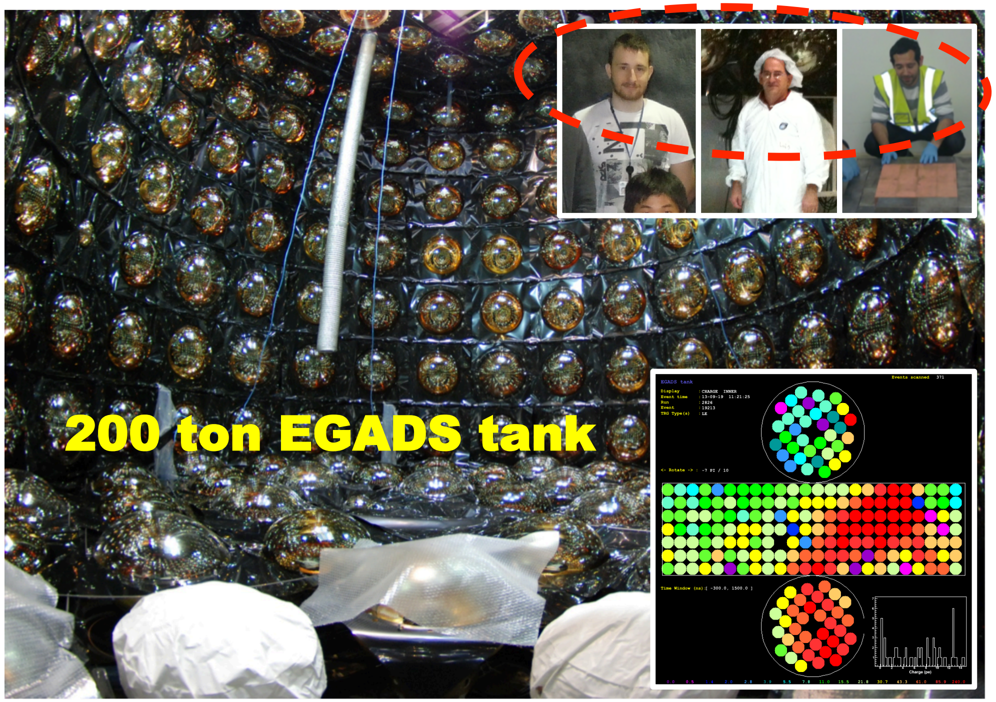
*~ 20μs [50cm] until **Gd**-capture*

8 MeV γ,s cascade

e^- are Compton-scat. off the γ and detected

$\bar{\nu}_e$ is identified from coincidence [e^+, delayed e^-]





✚ **The ability to distinguish the character anti- / particle of the interacting ν will open to SK , as SK-Gd, and its next generation HK, a whelm of top-interest processes**

- *leptonic mixing matrix*: precise measurement of the solar elements from nuclear reactor electron anti-ν

- ***Mass Hierarchy*** **: increase sensitivity from atmospheric ν and anti-ν traversing the earth before interacting in the detector. [Indication by SK-Gd, establishment by HK]**

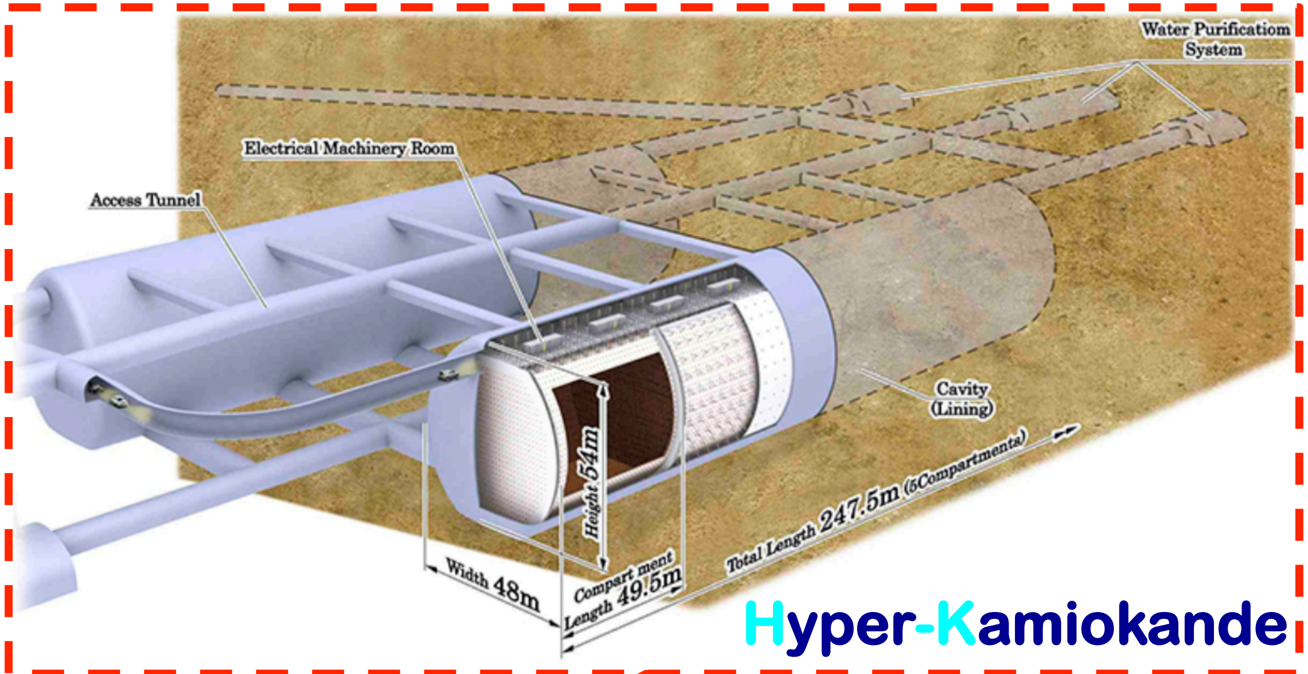
- ***Diffuse Supernova Neutrino Background*** **:**
  [discovery by SK-Gd, measurement of E spectrum by HK]
  evolution of the Universe, star formation, neutrino interactions

- *Proton Decay searches*: increase the sensitivity for

✚ **Next Generation neutrino detector: Hyper-Kamiokande**

HK ≈ 25 x SK

Expected starts
- construction: 2018
- data taken: 2025



- **with Hyper-Kamiokande we want:**

  - **discover and measure neutrino CP Violation**
  - Dirac or *Majorana* nature of the neutrino,

    ➡ **the key for matter / anti-matter asymmetry**

  - **Grand Unification Theories; the ultimate (?) search for Proton Decay**

    ➡ **the key for a complete understanding of what fundamental interactions are**

  - **measurement of Energy spectrum of the Diffuse Supernova Neutrino Background**
  - nearby Galactic Supernova; neutrino physics at very high temperature and density

    ➡ **precious information on the evolution of the Universe, star formation & neutrino interactions**


ICRR, ...
5th Hyper-K Meeting
Canada
NCBJ, WUT
Physicists from 13 countries are
already contributing to Hyper-K
UAM

: SKPLUS team

The Institutes and the people

Beneficiary 1	*University Autonoma Madrid*
General Description	The University Autonoma Madrid is one of the most important Spanish universities in scientific research. Its Department of Theoretical Physics has among its members very relevant scientists in the field of Particle Physics in both, theory and experiment.
Role and Profile of key people	▪Prof. Luis Labarga, coordinator, researcher ▪Pablo Fernández Menéndez, PhD student, researcher ▪Javier Pérez Pérez, PhD student, researcher

most active people
in the project

foreseen: 1 new postdoc, 1 new PhD student

Beneficiary 2	*Narodowe Centrum Badan Jadrowych*
General Description	**National Centre for Nuclear Research(NCBJ**) came into existence on Sep/1st, 2011 in effect of merging the former Institute of Atomic Energy POLATOM with the former Andrzej Soltan Institute for Nuclear Studies. The **NCBJ** is the largest research Institute in Poland. It is also the only Polish research institution operating a nuclear reactor (the MARIA reactor). The Institute has branches in Warsaw (Department of High Energy Physics), Swierk, near Warsaw (Department of Accelerator Physics and Technology) and Lodz (Department of Cosmic Ray Physics). The **NCBJ** is involved in basic research in nuclear and particle physics, cosmic ray physics and plasma physics as well as in a development of new technologies in nuclear science and electronics. The Institute is engaged in education and is entitled to award the PhD and habilitation degrees. The strong group interested in neutrino physics is active in the Institute since 2000, consisting of 3 seniors, 5 Post-Docs, 2 PhD students (presently) and technical support in electronics and mechanics.
Role and Profile of key people **foreseen:** **1 new postdoc,** **2 new PhD students**	• Dr. Piotr Mijakowski, principal investigator of the project, experience in dark matter searches at direct and indirect experiments (Super-Kamiokande, ArDM) and in experimental neutrino physics (ICARUS, T2K) • Katarzyna Frankiewicz, PhD student, researcher • Prof. Dr. hab. Ewa Rondio, coordinator of the local neutrino group, scientific director of NCBJ, experience in neutrino physics (ICARUS, T2K), deep inelastic interactions (COMPASS)

Beneficiary 3	*Politechnika Warszawa*
General Description	**Warsaw University of Technology** is one of the leading technical universities in Poland, and one of the largest in Central Europe. It has 20 faculties, covering almost all fields of science and technology. Currently, various groups from the University are involved in particle physics and nuclear research, both in terms of theory and development of scientific apparatus, including accelerators and detector systems. The **Institute of Radioelectronics** has a long term experience in development and construction of radiation detectors, dosimetry, nuclear electronics and the use of computer aided design (CAD) systems. The Institute is engaged in education and is entitled to award the PhD and habilitation degrees.
Role and Profile of key people foreseen: 2 new PhD students	• Dr. Michal Dziewiecki, principal investigator of the project, experience in detector design, nuclear electronics, photosensors (COMPASS, T2K experiments) • Marcin Ziembicki, M. Sc., principal investigator of the project, experience in detector design, nuclear electronics, photosensors (COMPASS, T2K experiments) • Prof. Dr. hab. Krzysztof Zaremba, dean of the Faculty of Electronics and Information Technology, supervisor of the radiation detectors and nuclear electronics group, experience: NMC, SMC, COMPASS, ICARUS, T2K • Prof. Dr. hab. Janusz Marzec, coordinator of the radiation detectors and nuclear electronics group, experience: COMPASS, T2K

Partner 1	*Institute for Cosmic Ray Research, The University of Tokyo*
General Description	**Institute for Cosmic Ray Research (ICRR), University of Tokyo**, is a host of **Kamioka Observatory**, a world frontier underground laboratory for particle physics responsible for discovery of neutrino oscillations in 1998 and a Nobel Prize granted in 2002 to M. Koshiba for detection of cosmic neutrinos with the Kamiokande detector.
Role and Profile of key people	• Prof. Takaaki Kajita, a director of ICRR, Univ. of Tokyo, • Prof. Yoichiro Suzuki, a director of Kamioka Observatory, ICRR, Univ. of Tokyo • Prof. Masayuki Nakahata, a coordinator of analysis group at the Super-Kamiokande related to study of solar, supernova and low energy neutrino interactions • Prof. Masato Shiozawa, a coordinator of analysis group at the Super-Kamiokande related to study of atmospheric neutrinos and search for proton decay

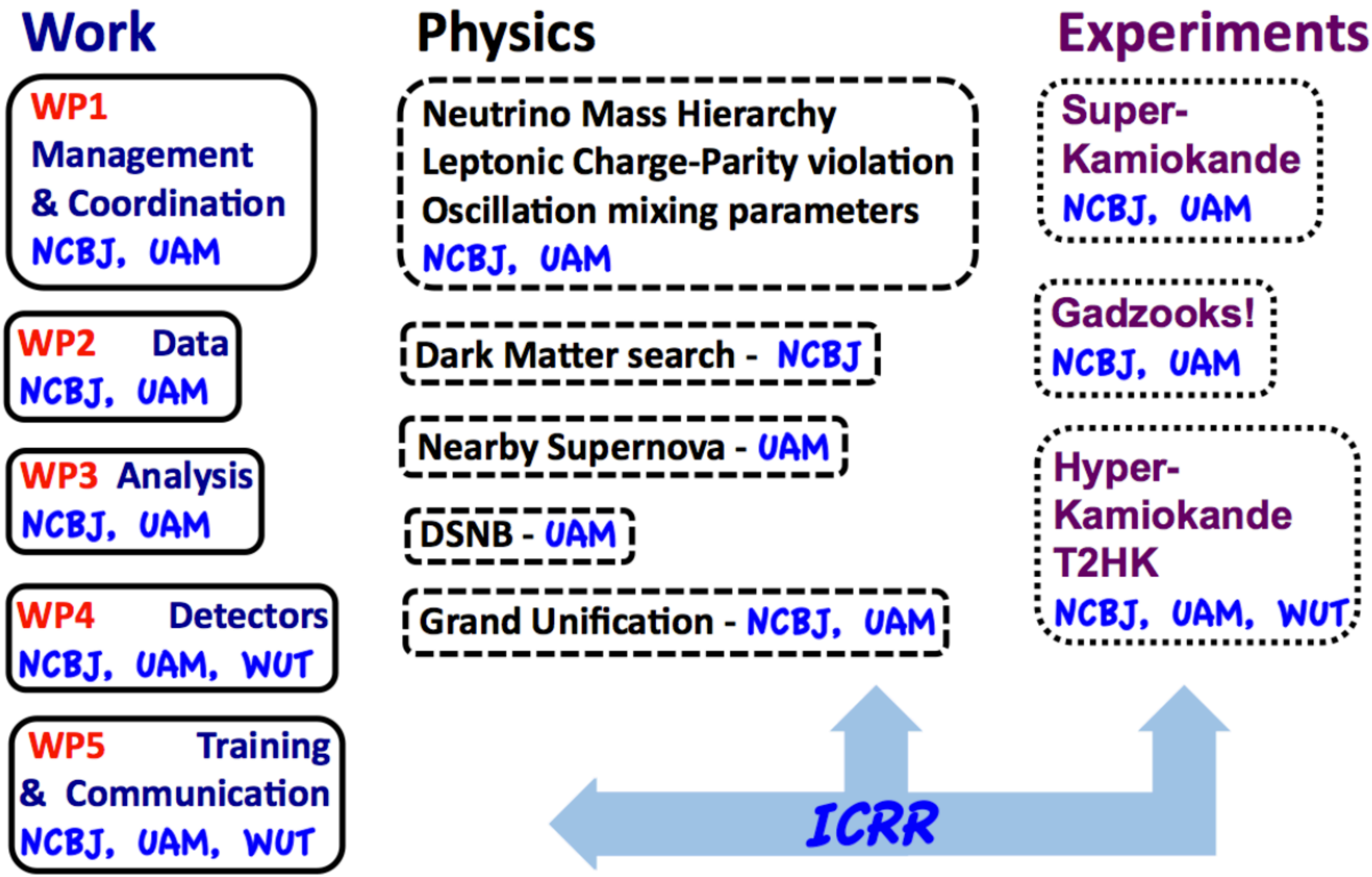


Figure 3: Participants' contributions to the Project.

Deliverables: try to match as much as possible with the "deliverables" of your regular scientific works

Deliverables **WP1: Management and Coordination**

- D1.1 *Summary and Excerpts of Meeting #2*. Expected month of delivery: 14
- D1.2 *Mid-term report*: Report of first two years activities; summary of the work done byWPs. Expected month of delivery: 26. Dissemination level: **CO**nfidential
- D1.3 *Summary and Excerpts of Meeting #4*. Expected month of delivery: 38
- D1.4 *Final report*: Summary of the work done by all the WPs; it will include a thorough review of the highlights of all the deliverables. Month of delivery: 48. Dissemination level: **CO**nfidential

Deliverables **WP2: Data**

- D2.1 *Intermediate Report on* Data *activities; It includes copies of the related material presented at SK Collaboration Meetings, technical notes etc.*. Month of delivery: 26. Dissemination level: **CO**nfidential
- D2.2 *Final Report on* Data *activities; It includes copies of the related material presented at SK Collaboration Meetings, technical notes etc.* Delivery Month: 48. Dissemination level: **Co**nfidential

Deliverables **WP3: Analysis**

Summary Reports:

- D3.1 *Report on AtmPd ANALYSIS activities. It includes copies of Technical Notes produced, related material presented at Collaboration Meetings, at international Workshops and at Major Conferences etc.* Estimated Month of delivery: 36. Dissemination level: **CO**nfidential
- D3.2 *Report on LowE ANALYSIS activities. CM Technical Notes. It includes copies of Technical Notes produced, related material presented at Collaboration Meetings, at international Workshops and at Major Conferences etc.* Estimated Month of delivery: 48. Dissemination level: **CO**nfidential

Deliverables (**WP4: Detectors**

- D4.1 *Intermediate Report on DETECTOR activities. It includes copies of the related material presented at Collaboration Meetings, International Workshops and Conferences etc.* Month of delivery: 32. Dissemination level: **CO**nfidential
- D4.2 *Final Report on DETECTOR activities. It includes copies of the related material presented at Collaboration Meetings, International Workshops and Conferences etc.* Month of delivery: 48. Dissemination level: **CO**nfidential

Deliverables

WP5: training and communication

- D5.1 *Ph.D. Thesis Manuscript, ESR1-UAM.* Expected month of delivery: 30. Dissemination level: **PU**blic
- D5.2 *Ph.D. Thesis Manuscript, ESR1-NCBJ.* Expected month of delivery: 40. Dissemination level: **PU**blic
- D5.3 *Summary and Excerpts of the "European Workshop on Water Cherenkov Precision Detectors for Neutrino and Nucleon Decay Physics"*. Expected month of delivery: 30. Dissemination level: **PU**blic

In addition, the following document would be an important milestone for us:

M5.1 *Summary and Excerpts of the "Hyper-Kamiokande Collaboration Meeting in Europe"*. Expected month of achievement: 48.

Proceso de solicitud de la Acción

¿Cómo se realiza la búsqueda de socios? ¿Cómo se crea el consorcio?
¿Cómo se ha planteado la dimensión intersectorial / internacional ?
¿Ha sido complicada la búsqueda de participantes en Terceros Países?

Proceso totalmente natural, basado en una relación científica ya establecida

¿Cuáles son las tareas del coordinador en la fase de propuesta?

Básicamente:

- **“coordinar” la redacción de la propuesta**
- **asegurar una finalización a tiempo con calidad suficiente**
- **manejo ejecutivo de la aplicación web para la solicitud**

+ típicas intervenciones de “bombero”

Proceso de solicitud de la Acción

¿Cómo se plantea el acuerdo entre socios?

- **Cada grupo: planteamiento realista de las actividades previstas & búsqueda del óptimo aprovechamiento de RISE-H2020 para ellas → propuesta de "secondments" por cada instituto;**
- **Básicamente hubo acuerdo desde el primer momento**

¿Cómo se realiza la distribución interna de los fondos entre socios?

Los "secondments" determinan exactamente la financiación de cada beneficiario → la distribución de fondos se reduce a una regla de tres + transferencia bancaria [ya lo hemos hecho para la mitad del presupuesto]

Problemas con distribución de fondos, temas de Propiedad Intelectual, explotación de resultados etc.:

- **distribución de fondos perfectamente regulada en la convocatoria → ningún problema resaltable**
- **experimentación en física de altas energías tiene larga tradición internacional → bien establecidos los asuntos de PI, explotación etc. → ningún problema**

Proceso de solicitud de la Acción

¿Qué problemas existen a la hora de solicitar la acción?:

Problemas burocráticos: **No, los institutos involucrados tienen una administración suficientemente "engrasada" en el manejo de Proyectos Europeos**

Aplicación informática nueva: **razonablemente estable. Dejó en blanco entradas clave en la tabla de resumen económico en la generación de la solicitud final (OK en las previas) y sólo darnos cuenta ya cerrado el plazo para modificaciones → *susto + sofoco mayúsculos*. El problema fue resuelto, al cabo de meses, por técnicos informáticos de la UE**

Falta de apoyo (o no) de la institución para llevar adelante el proyecto, etc.: **procedimiento de solicitud razonablemente sencillo; con un conocimiento básico del funcionamiento H2020 se puede hacer bien**

Además, en mi Dpto. (UAM), dos excelentes admin. de alto nivel [de FP7-PEOPLE-ITN-invisibles]

Gestión diaria y seguimiento del proyecto

(en el caso de proyectos RISE de la convocatoria 2014 H2020, basta con explicar cómo se ha previsto hacerlo o como están siendo los inicios)

Gestión de los socios y / o del proyecto a nivel de dirección y a nivel técnico (reuniones necesarias, tipo de seguimiento establecido...)

El Proyecto RISE se basa en el día a día del trabajo científico y por ello esperamos que su gestión sea, en lo relevante, una parte de éste (así hemos planteado el proyecto)

Gestión administrativo- financiera del proyecto (trámites administrativos para la movilidad del personal, gestión de los fondos recibidos...)

No del todo claro. Nuestra aproximación actual es:

- **Cantidad disponible determinada por número de "secondments" realizados a acreditar eventualmente con documentos de viaje**
- **Tramitación de los gastos de acuerdo a los procedimientos generales de la Admin. del Estado y las particulares de la UAM**

Relación con Bruselas (reuniones de seguimiento, justificación ...)

Sin experiencia al respecto; dada la claridad de la convocatoria no esperamos dificultades

Aspectos positivos y negativos de nuestra participación (ser breve)

Aspectos económicos: cobertura de 100% de costes...

Aunque en nuestro caso no financia totalmente el proyecto científico, sí es una muy positiva ayuda económica y un excelente apoyo institucional

Aspectos estratégicos: fortalecimiento del conocimiento de la plantilla de I+D+I, transferencia de tecnología, visibilidad a nivel internacional...

- **muy positiva la transferencia Japón ←→ E.U.**
- **también gran potencial en la interacción Polonia ←→ España (aunque esta sea principalmente en Japón)**

Cuestiones asociadas a la movilidad: posibles problemas de integración cultural, trámites administrativos...

No veo ningún problema o dificultad al respecto en nuestro caso

Para finalizar:

1. tenéis un proyecto científico / técnico que consideráis bueno
2. y la convocatoria RISE-2020 se ajusta razonablemente a él

[en ese orden]

➡ **No lo dudéis y solicitadlo**
- es razonablemente sencillo hacerlo
- lo peor que puede pasar es que no os lo den (i.e. nada)