



Scientific-based **Exposure** and risk **Assessment** of radiofrequency and mm-**Wave** systems from children to elderly (5G and Beyond)

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PROJECTS & RESULTS

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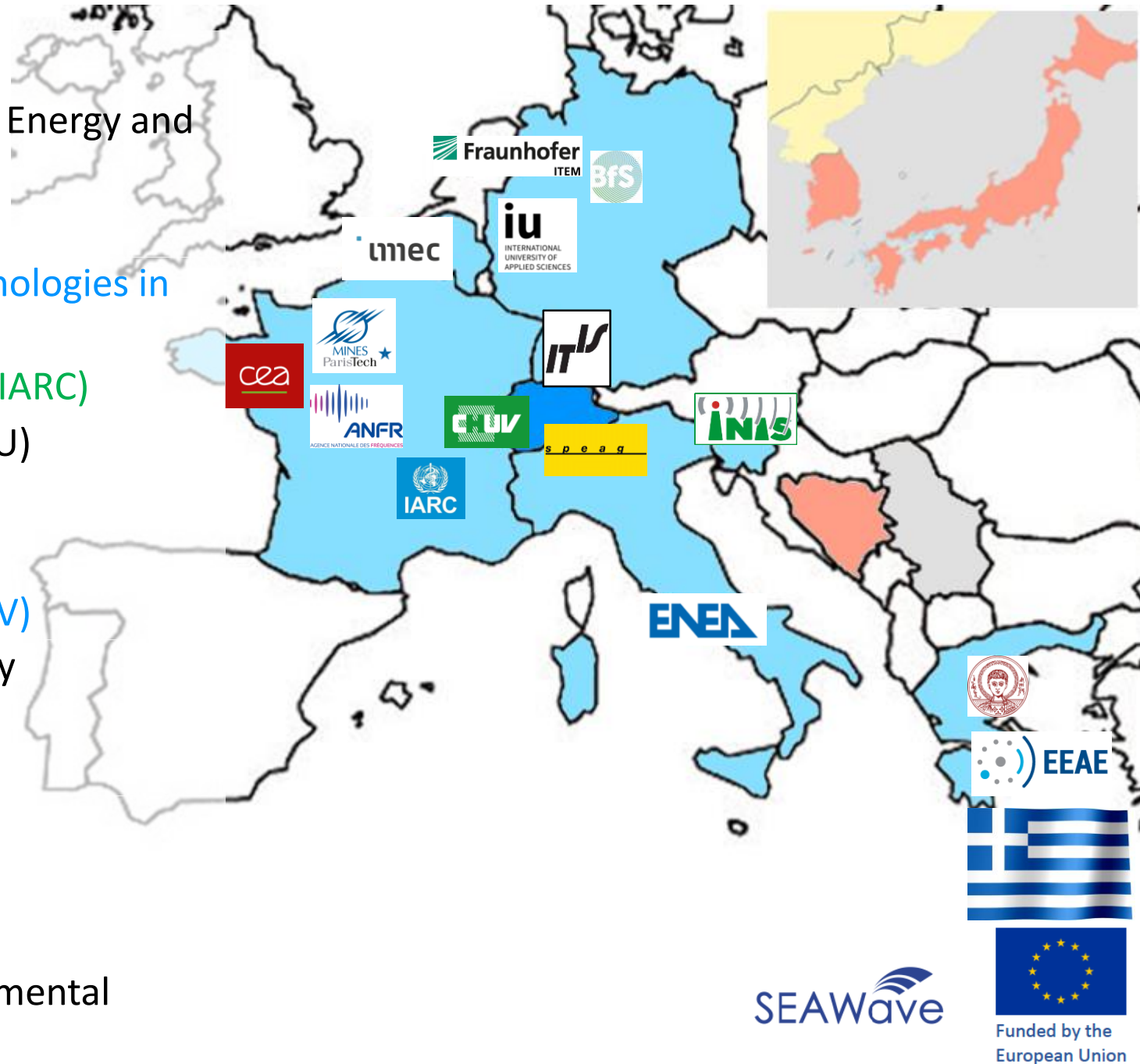
Exposure to electromagnetic fields (EMF) and health

TOPIC ID: HORIZON-HLTH-2021-ENVHLTH-02-01

Grant

Consortium

- Aristotle University of Thessaloniki (AUTH)
- Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA)
- Schmid & Partner Engineering AG (SPEAG)
- Foundation for Research on Information Technologies in Society (IT'IS)
- International Agency for Research on Cancer (IARC)
- International University of Applied Sciences (IU)
- Institute of Non-Ionizing Radiation (INIS)
- Greek Atomic Energy Commission (EEAE)
- Centre Hospitalier Universitaire Vaudois (CHUV)
- French Alternative Energies and Atomic Energy Commission (CEA)
- Interuniversity Microelectronic Center (IMEC)
- Institute Mines-Telecom (TP-IPP)
- Federal Office for Radiation Protection (BfS)
- National Frequency Agency (ANFR)
- Fraunhofer Institute for Toxicology and Experimental Medicine (ITEM)



Collaborations

Programme	Funding	Partners
Research on possible health effects related to mobile telephones and base stations – in vitro, animal, human studies (PERFORM A, B, C)	EU FP5	P2, P4, P15
Risk Evaluation of Potential Environmental Hazards From Low-Energy EMF Exposure Using Sensitive In Vitro Methods (REFLEX)	EU FP5	P4, P15
Potential adverse effects of gsm cellular phones on hearing (GUARD)	EU FP5	P2, P4
Exposure at UMTS electromagnetic fields: study on potential adverse effects on hearing (EMF-Near)	EU SANCO	P2, P4
Effects of the Exposure to EMF (EMF-NET)	EU FP6	P1, P4, P5
MobiKids	EU FP7	P12
Generalised EMF Research Using Novel Methods (GERONIMO)	EU FP7	P4, P11, P10, P12
Sound Exposure Risk Assessment of Wireless Network Devices (SEAWIND)	EU FP7	P1, P4, P11, P3, P15
Advanced Research on Interaction Mechanisms of EM Exposures with Organisms for Risk Assessment (ARIMMORA)	EU FP7	P4, P3, P5, P15
Low EMF Exposure Future Networks (LEXNET)	EU FP7	P10, P12, P11,
SARSYS, SARSYS BWP, BASEXPO, WEMS	EU EUREKA	P1, P4, P11, P12
Le programme national de recherche Environnement-Santé-Travail (PNR EST)	ANSES (FR)	P12, P10, P5, P14

Knowledge Gaps

- Exposures from Cellular 5G vs. 2G–4G Networks
- Exposures from New 5G Local Networks in Workplaces
- Exposure Monitoring from 5G MaMIMO Base Stations
- Exposure Assessment of End User Devices
- Macro and Microdosimetry in the Human Skin
- FR2 Health Risk Studies – Skin Cancer & Other Skin Disease Modulation
- Citizens' Perceived Exposure

Gap #1: Exposures from Cellular 5G vs. 2G–4G Networks

- New applications enabled by 5G
(virtual reality, mobile big data, autonomous support, etc.)
- Increased number of mobile devices
- Change in the usage pattern of mobile devices
- Denser network of base transceiver stations (FR2)
- MaMIMO

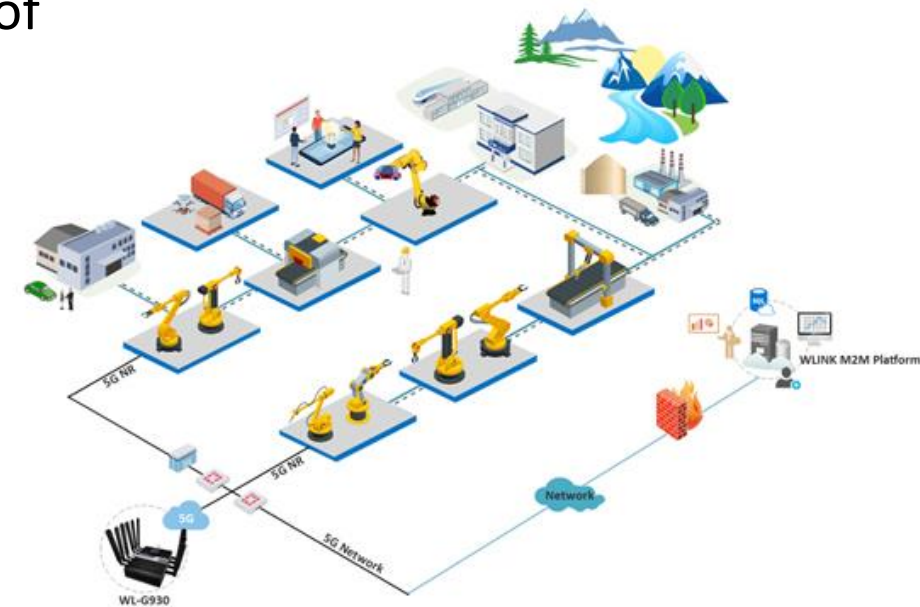


These patterns of usage must be quantified and forecasted for children, adolescents, adults, workers and elderly persons for each exposure scenario to enable appropriate risk assessment and communication.

Gap #2: Exposures from New 5G Local Networks in Workplaces

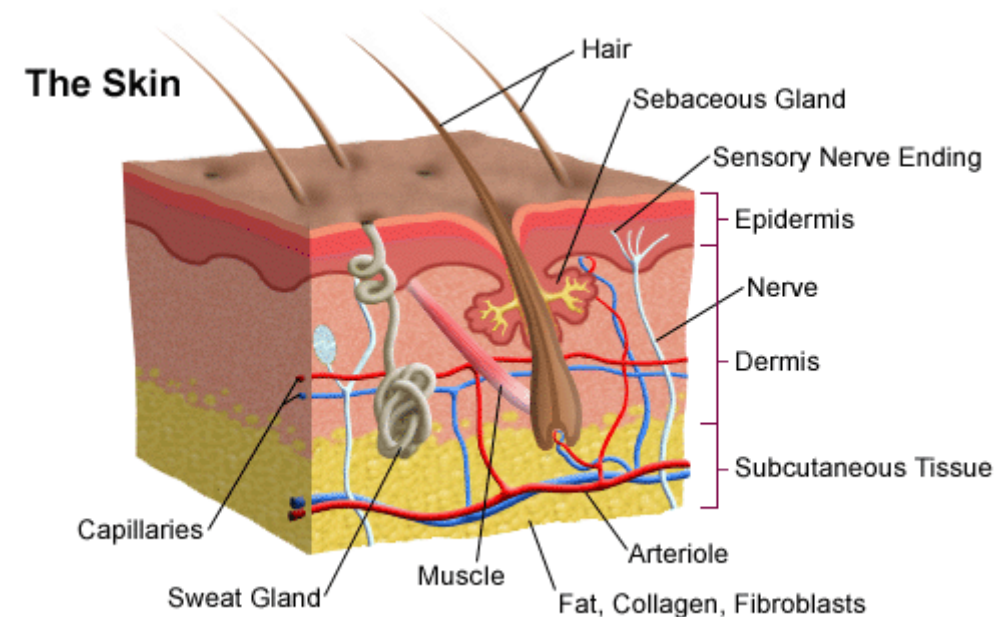
- Both FR1 and FR2 frequencies ranges within industrial environments
(Industrial IoT, IIoT, distributed actuator networks, 'Factory of the Future', Industry 4.0)
- Absence of a model for highly modular environments
- Other workplaces
(office workers, 'Smart Buildings')

It is necessary to describe the various wireless systems, especially in FR1, make measurements, create a parametric model for calculating EMF in the industrial environment, validate the model and extent it to FR2.



Gap #5: Macro and Microdosimetry in the Human Skin

- Microstructures in the skin and their role in FR2
- Complicated structure of the skin and arrangement of the microstructures
- Problematic dielectric properties for various materials
- Absence of human models that reflect health condition and age
- Absence of murine skin models

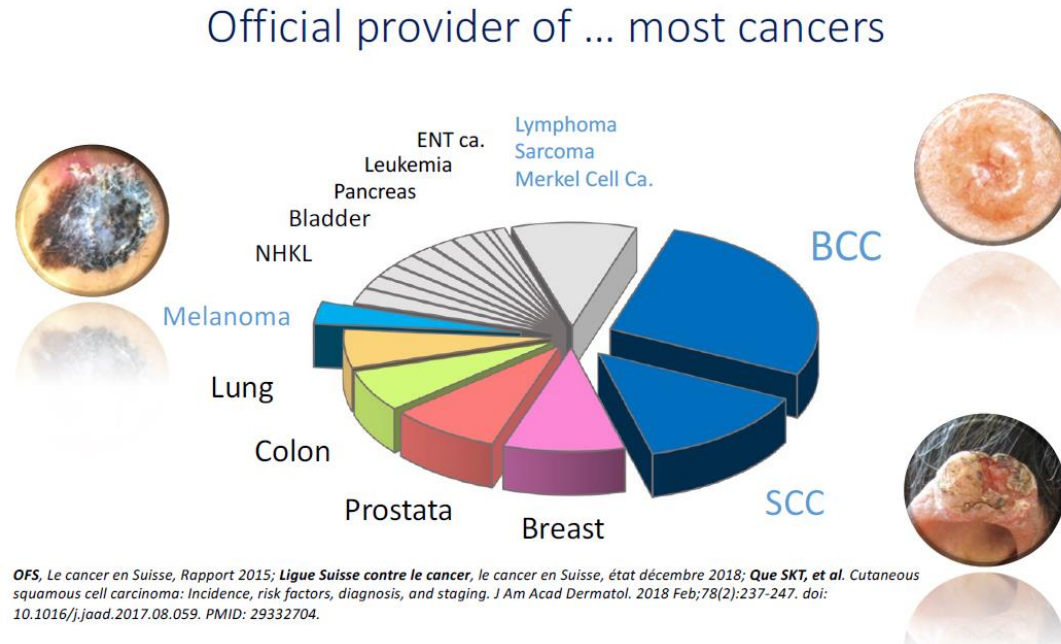


Create human models for statistical dosimetry and calculate its uncertainty through sensitivity analysis.

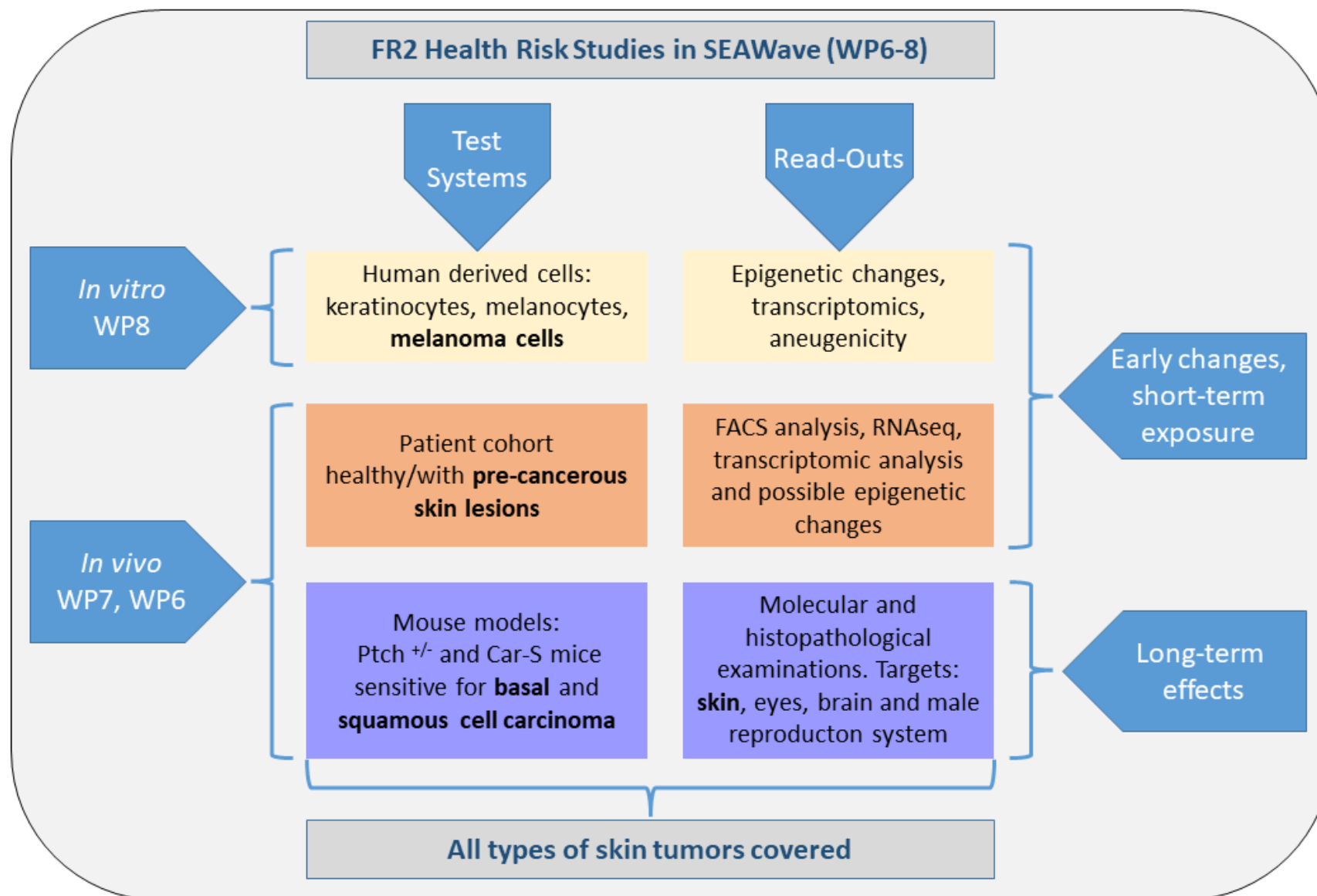
Gap #6: FR2 Health Risk Studies – Skin Cancer & Other Skin Disease Modulation

- Skin is the main target of 5G FR2.
- Scarce information about skin cancer/skin diseases from millimetre waves radiation

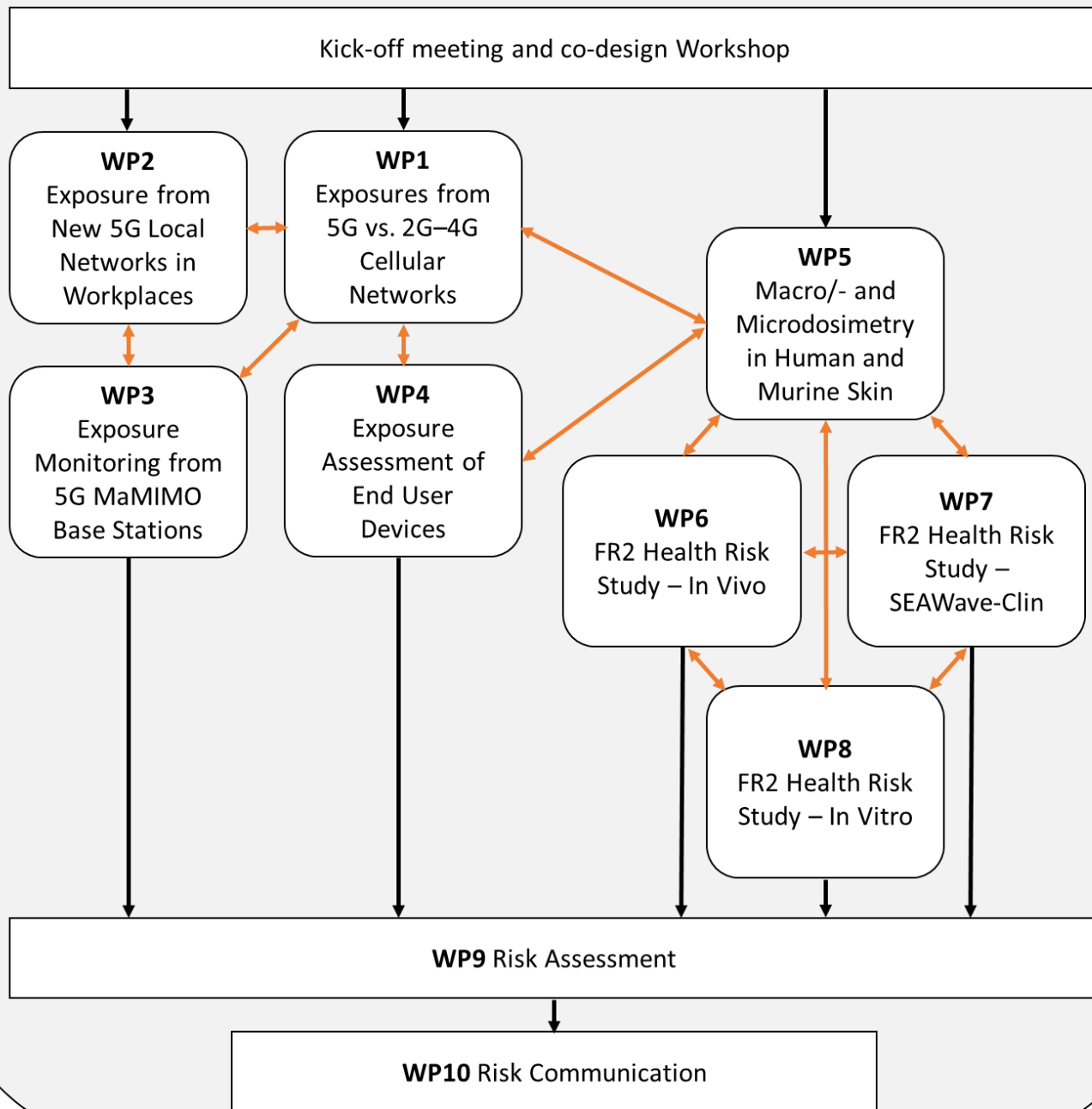
Study evidence for all lines of evidence (in vitro, animals, humans).



Gap #6: FR2 Health Risk Studies – Skin Cancer & Other Skin Disease Modulation



WP11 Project and Consortium Management



Profile

- Duration: 36 months
- Budget: 9'842'331 €
- Amount requested: 7'317'777 €
- Work effort: 851.5 PM
- External Advisory Board:
 - Clemens Dasenbrock (DE)
 - Ron Melnick (US)
 - Marvin Ziskin† (US)

TARGET GROUPS

- **Citizens:** Users of mobile devices and the whole population (EMF is ubiquitous)
- **European Commission services:** DG CNECT, DG EMPL, DG SANTE
- **Public authorities worldwide** (Health/ Environmental/Radiation Protection Agencies, etc.)
- **Manufacturing industry:** 'Smart Factories' (Industry 4.0)
- **Telecommunications industry:** Manufacturers of mobile equipment, network operators
- **Standardization organizations:** CEN, IEC, IEEE

EXPECTED RESULTS

- **New measurement standards** for compliance assessment of base stations (environmental EMF) and user devices (personal exposure).
- **IARC-like evaluation on carcinogenicity** of 5G (FR1 and FR2).
- **Novel communication tools**, based on gamification, for public authorities to communicate EMF exposure and health risks to the citizens.

IMPACTS

- **Market Authorization:** Scientifically sound method for equipment authorisation provides certainty for manufacturers and consumers.
- **Economic:** Accelerated launch of FR2 if the results demonstrate no potential risk posed by 5G; this will positively impact all sectors of the European economy and ensures its competitiveness, the value of which may exceed trillions of Euros.
- **Societal:** Important input for science-based communication, increased trust in science-based policy decisions; paradigm of new tools for public authorities to communicate research results on controversial environmental issues (like EMF).

SEAWavers at work! Zurich, 30 January 2023

