IC1301 -WiPE

Wireless Power Transmission for Sustainable Electronics

Joint MC/WG Meeting (MCM2)

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WIPE

COST IC1301

Agenda

- Objectives
- Organization
- Time-table
- Pending issues
- Summary / Technical discussion

Main Objective

» (…) address efficient **Wireless Power Transmission (WPT)** circuits, systems and strategies specially tailored for **battery-less** systems, battery-free sensors, passive RFID, Near Field Communications (NFC)

» (…) to develop and foster the **internet of things** (IoT) evolution

Establish Europe as a leading scientific and industrial community in the field of wireless power transmission

Key Action Points

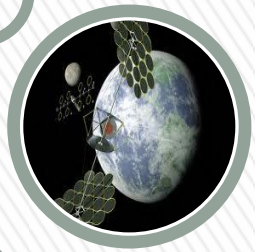
» Bring together RF circuit and system designers **both from academia and industry** and with **different backgrounds** to:

1) Provide enhanced circuit and subsystem solutions to increase the efficiency in WPT;
2) Investigate the use of novel materials and technologies that allow minimizing cost and maximizing integration of the electronics with the environment and with the targeted applications;
3) Contribute to standardization and regulation issues related to this research area.

Reasons for the Action

Battery-less Sensors for health applications

Car Energy Collector



High Efficient Energy Collection

RFID's

Domestic Appliances Wireless Energized

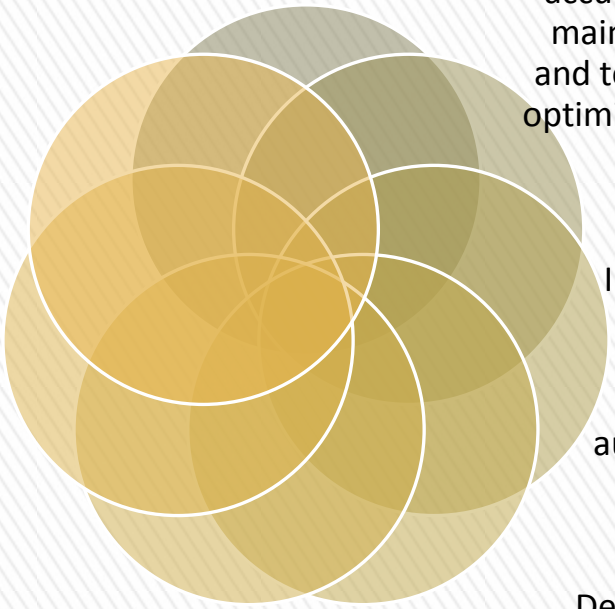
Agriculture passive sensors

Objectives

Provide WPT solutions that allow sensors and electronics to operate fully autonomous.

Increase collaboration between academic and industrial partners in the WPT domain;

Establish design rules and define accurate and efficient models of the main components of a WPT system and techniques to be adopted for the optimization of far-field and near-field systems.



WPT Technology transfer to the European industrial partners to increase their competitiveness in terms of energy efficient solutions;

Investigate the feasibility of low-cost materials such as paper, organic substrates, PET and fabrics, for realizing energy-autonomous eco-friendly devices.

Improve and strengthen worldwide the role of Europe in the field of WPT.

Development of highly qualified young researchers through scientific exchanges, and by creating multi-disciplinary Focus Area(s) led by young researchers.

Develop efficient integration technologies and strategies for highly efficient and low-cost wireless systems

Benefits

Technological benefits:

- Promoting research towards the design and improvement of wireless power transmission circuits and systems,
- Incorporate those results in commercial available solutions.
- The supporting of cutting edge research in the proposed fields through collaboration.
- Industry participation provides a more practical viewpoint to the research objectives of the various groups.

Societal benefit:

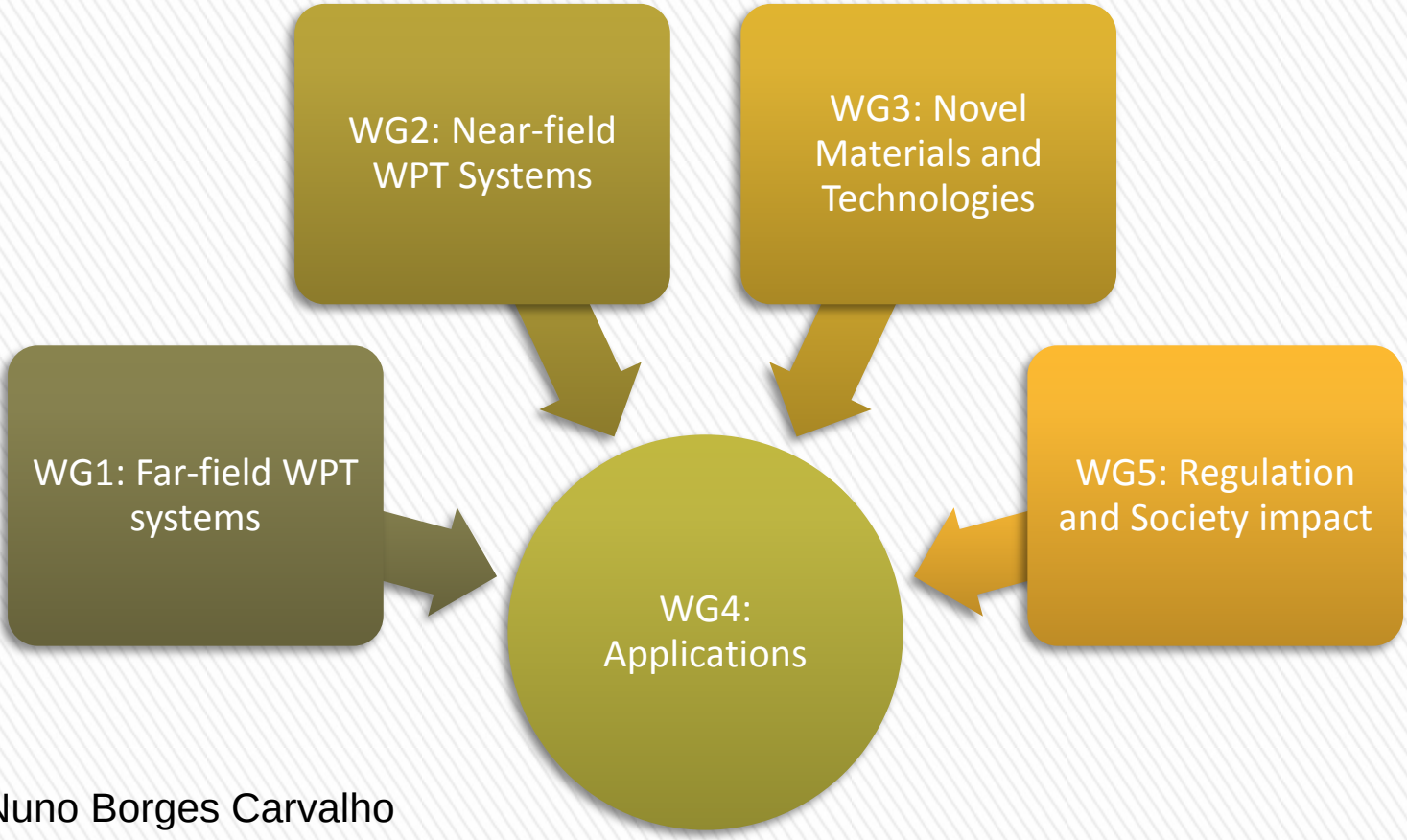
- Raising questions on how to regulate this technology, and its impact on society.
- From an environmental point of view the concept of electromagnetic energy harvesting will also complement the efforts made in the autonomous scenario.

Other benefits:

- Facilitate the dissemination and industrial exploitation of novel results.
- Development of a qualified generation of young researchers by undertaking an active role and responsibilities in the Action as well as through research exchanges.

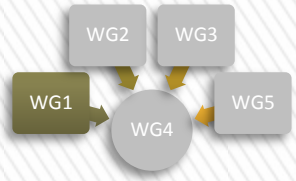
Working Groups : Multi-disciplinary Focus

Chair, Vice-chair, Secretary, Management Committee



Chair: Nuno Borges Carvalho
Vice-chair: Apostolos Georgiadis
Grant-holder Representative: Pedro Cruz

Working Groups Revisited: Multi-disciplinary Focus



WG1: Far-field WPT Systems

LEAD: Alessandra Constanzo CO-LEAD: Ana Collado

SUBTASKS

- Exploitation of nonlinear design tools to maximize the RF-to-DC conversion efficiency;
- Joint techniques for co-optimizing the WPT building blocks;
- Design of new architectures for rectenna elements that lead to improved performance;
- Explore new reduced-size antenna structures that allow integration of rectenna based WPT systems in small devices;
- Design of optimum RF signals to maximize efficiency;
- System design for intentional autonomous powering ;
- Architectures for highly efficient DC-DC converters;
- Development of optimum power and energy management strategies;
- High level power links;
- Novel design of switched-mode single-device high power rectifiers;
- Strategies to guarantee RF powering from a predicted source while preserving safety regulations,
- Design of special waveguides and coupling elements for powering spots.

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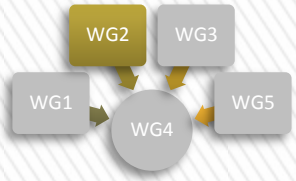
Working Groups Revisited: Multi-disciplinary Focus



WG2: Near-field WPT Systems

LEAD: Jan Kracek CO-LEAD: George Goussetis

SUBTASKS

- Development of nonlinear design tools for the broadband optimization of entire WPT link at all the possible link distances and loading conditions (charging level);
- Operating frequency optimization as a tradeoff between efficient power transfer and distance to be covered;
- New architectures for highly efficient DC-DC converters and power management strategies;
- Optimization of coupling elements towards better performance and compactness;
- Development of strategies for coverage of given space by an AC signal with respect to safety regulations.

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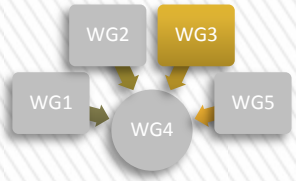
Working Groups Revisited: Multi-disciplinary Focus



WG3: Novel materials and technologies

LEAD: Hendrik Rogier

CO-LEAD: Maurizio Bozzi

SUBTASKS

- Study and analysis of new materials for WPT sub-systems implementations as:
  - Graphene and Carbon Nanotubes (CNTs) for new generations of electronic devices and interconnections,
  - organic semiconductors,
  - recyclable materials such as polyethylene terephthalate (PET),
  - bioplastics,
  - magneto-dielectric materials,
  - paper and fabrics.
- Use of substrate integrate waveguide (SIW) technology as a system-integration paradigm
- "System on Substrate" (SoS) concept evaluation and design
- Use of metamaterial technology for the reduction of the size of antennas and microwave devices
- Stimulate and harmonize researches among participants in order to foster and support the development of WPT technologies and techniques.

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Working Groups Revisited: Multi-disciplinary Focus

WG4: Applications to health, security, agriculture, …

LEAD: Pierre Nicole CO-LEAD: Luca Roselli

SUBTASKS

- **Healthcare:** developing autonomous low-power smart solutions for biomedical monitoring; and RFID for integrated biomedical solutions; organic substrates for in-body electronics;
- **Security:** develop trustworthy low-cost wireless subsystems for pervasive security monitoring;
- **Agriculture:** develop miniature, low-cost, high-performance and bio-degradable sensors for monitoring, to be used for optimization of agricultural production;
- **Vehicular** Industry: develop battery chargers embedded on roads, autonomous sensor networks for motor management and ESP, ABS;
- **Sports and Gaming**: autonomous sensor networks to monitor movements and life signs of athletes and gamers;
- **Aerospace** Industry: remotely powered sensors using EM waves and leaky and/or smart cables;
- **Flexible manufacturing industry**: fully flexible, programmable and wireless sensors.
- Energetically autonomous wireless sensors for structural health monitoring

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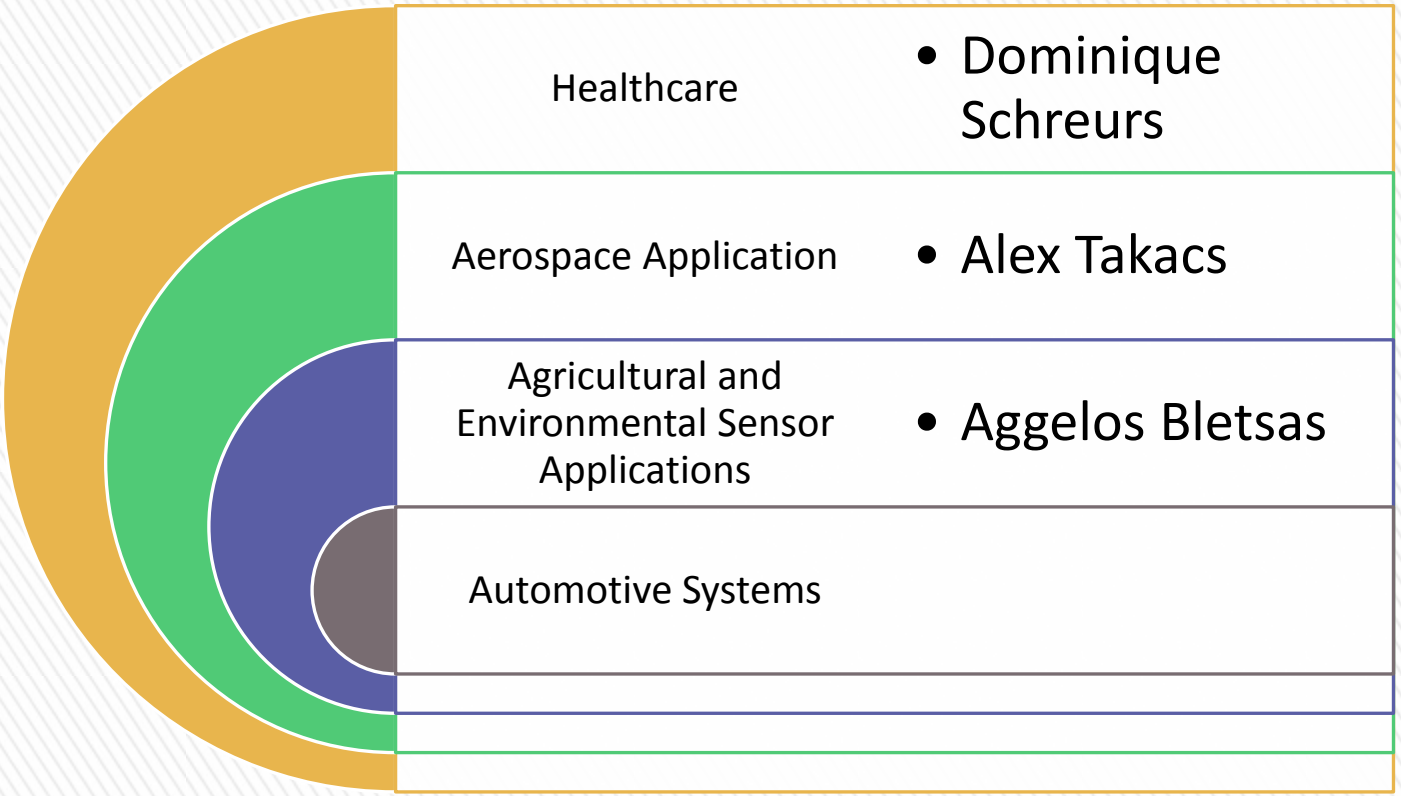
Working Groups Revisited: Multi-disciplinary Focus

WG4: Applications to health, security, agriculture, …

LEAD: Pierre Nicole CO-LEAD: Luca Roselli



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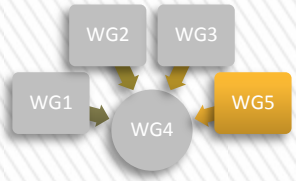
Working Groups Revisited: Multi-disciplinary Focus



WG5: Regulation and Society Impact for future WPT systems

LEAD: Winfried Bilgic CO-LEAD: Hubregt Visser

SUBTASKS

- New standards for WPT safety
- Study of the awareness of exposure limits for electromagnetic fields and for specific absorption rate in the human body,
- Follow the literature and new regulations relevant to the Action topics.
- Propose new standards for WPT products
- Discuss the society impact of the “wireless energy” future
- Setting a knowledge database on relations between EM signals and biological phenomena

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Society Impact

- Create awareness of this problem and discuss it among broad society partners
- Involve the social media in this discussion
- Invited experts in order to discuss the influence of WPT on health issues, by inviting experts from ongoing health related COST Actions or from the recently finished COST Action:

  COST Action BM0704 “Emerging EMF Technologies and Health Risk Management” (end: 2012)
- Discuss the influence of “antennas” on societal behavior (health and psychology), by joining social life actions and promote common discussi

Society Impact - Proposals

- Create a database of who is who in WPT around Europe
  - A request will be sent for a simple data fill out related to each company and academic institution represented within WiPE
- Request for Information that could be fed to the social network and web-page accounts
- Search for volunteer(s) for the production of a monthly newsletter related to WiPE, to be given to a list of interested subscribers
- Production of a slide-show/video presentation of the interest of WPT in nowadays society….

Milestones

Geo-referenced database with EM power available for harvesting

Set-up collaborations for joint WPT prototypes

Joint publications training

Joint measurement standards

Publication for the general public on WPT

M12

M24

M36

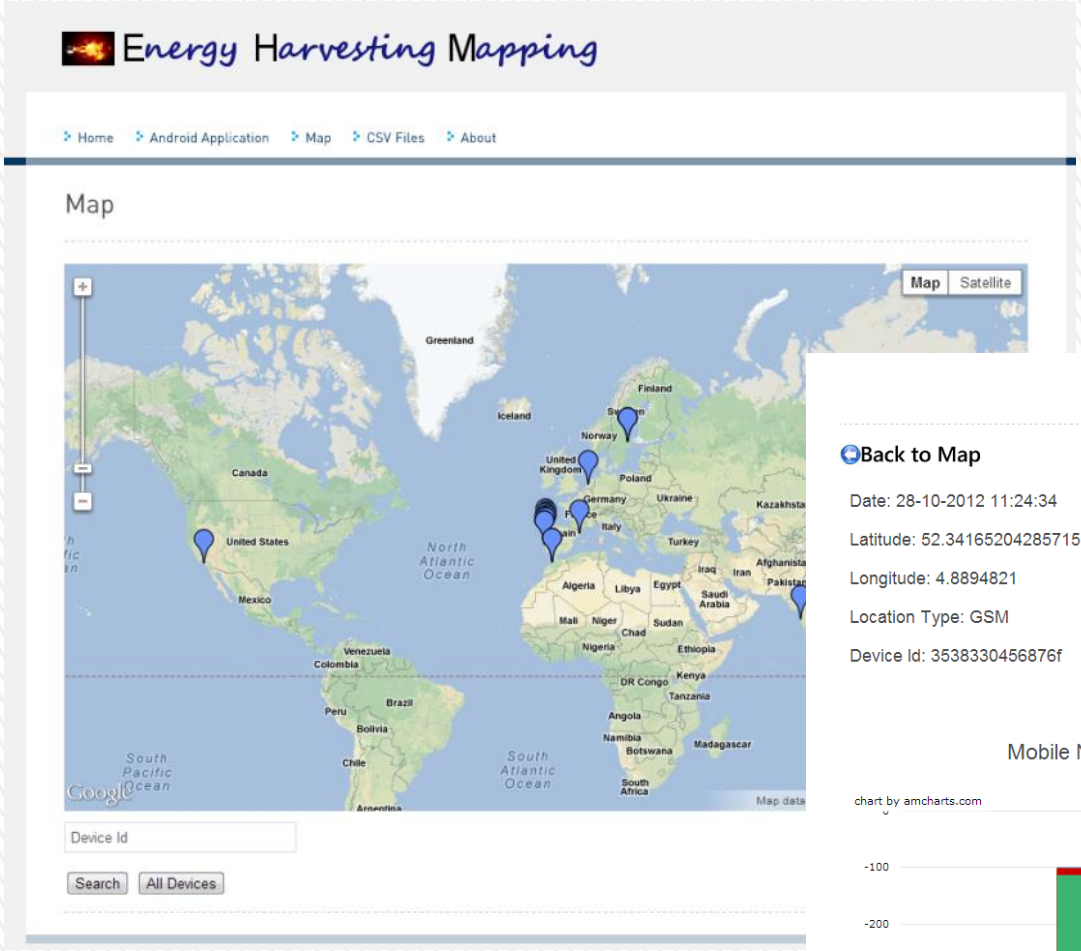
M48

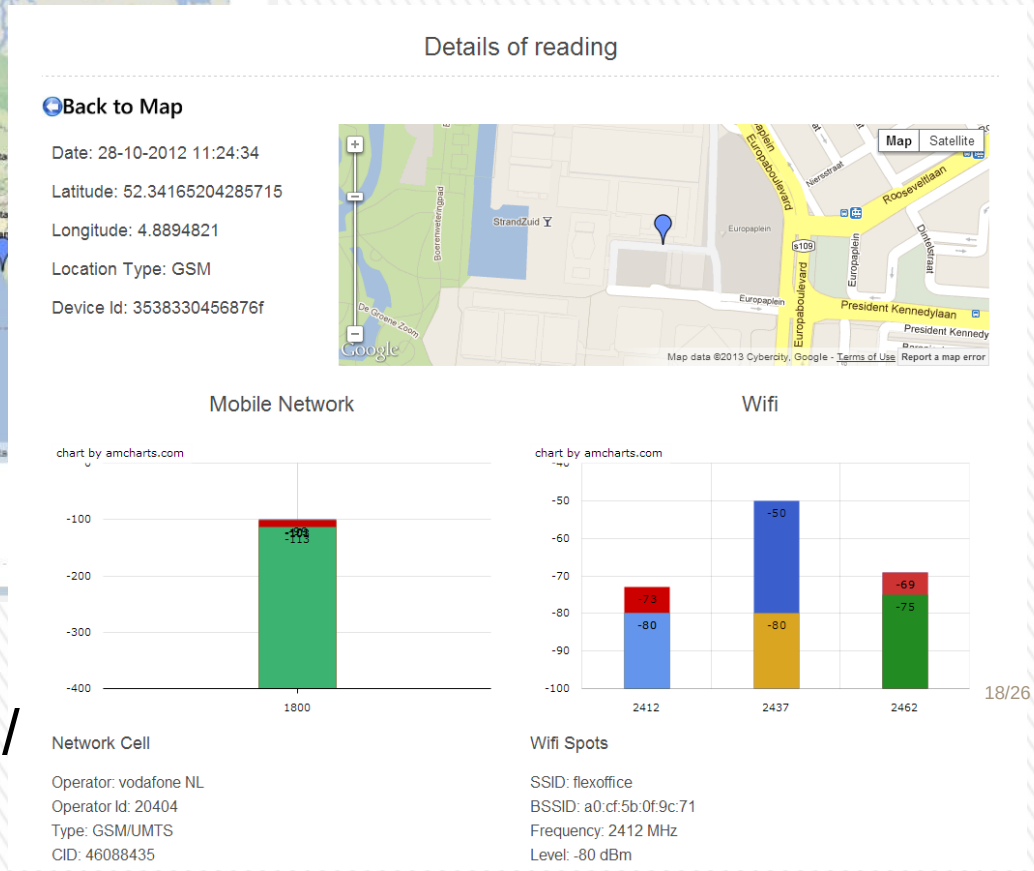
Joint preliminary prototypes of WPT modules

Book on WPT

Comparison between available WPT prototypes (report)

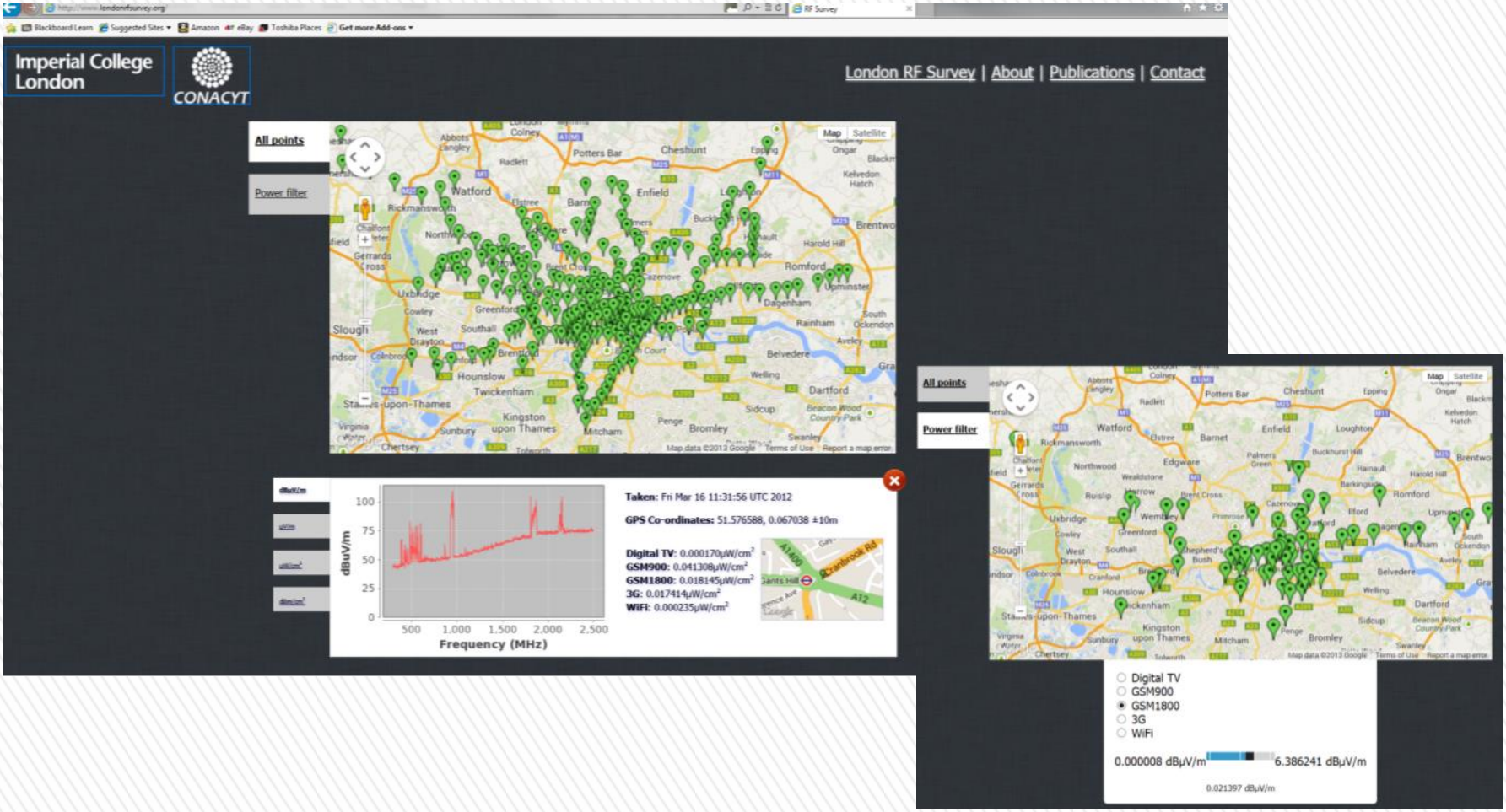
Energy Harvesting Map





http://ipis.av.it.pt/ehmapping/

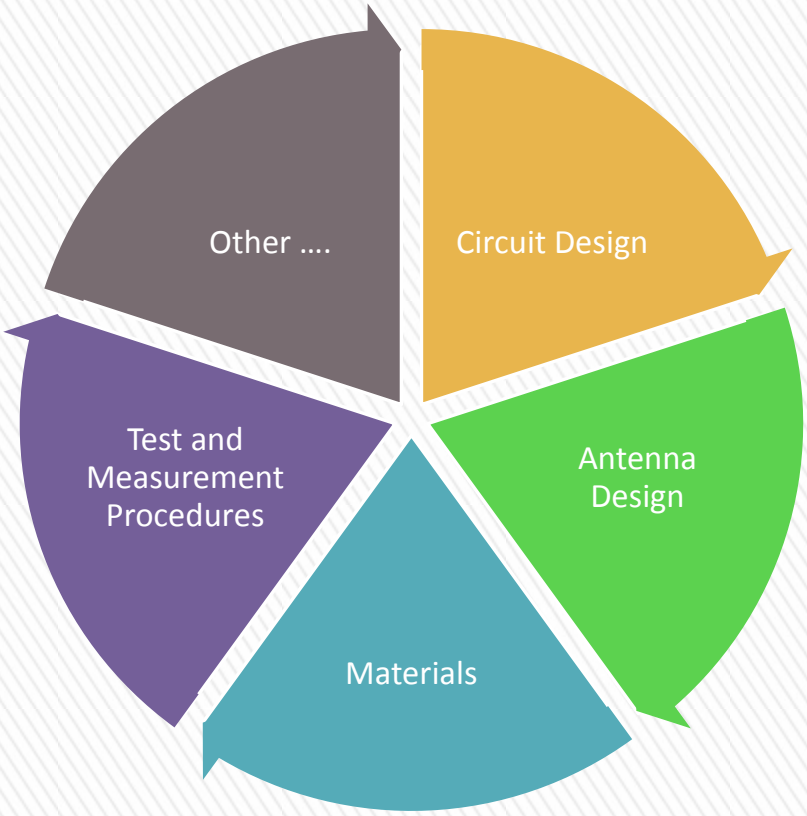
Dedicated Interactive EM Map of London



WWW.LondonRFSurvey.org

WPT prototype design - Proposals

Creation of a database, protected by password with a group of prototypes for benchmarking tests, covering:



Dissemination

Within the Action:

- Availability of research results to all participating researchers through the use of a website based database.
- Researcher scientific exchanges
- Industry – University collaboration by allowing the Industry Members to take on a consulting role especially towards young researchers and shape the research efforts.
- Include the Social Media and raise awareness of this technology among the society.
- New international journal on WPT research field

External to the Action:

- Action website-database.
- Organize workshops (WS), with published proceedings.
- Organize Schools (S), that will bring together academia and Industry.
- Technical reports and articles in peer-reviewed journals and conferences.
- Annual Reports from the Action.
- Contributions to standardization bodies including European but also IEEE.
- Efforts to enlarge the Action size by attracting and including all the important European research community in the field of communication subsystems, as well as smaller groups and upcoming young researchers.
- WIPE will also include important colleagues in the area from USA and JAPAN as external consultants.
- Create common workshops with other COST actions.

Industrial Exploitation - Request for Volunteers

External industrial experts will be invited to evaluate the progress and help identify innovative research efforts and applications within the EU and in other parts of the world.

Setup a framework to settle Intellectual property rights.

Industrial Members actively involved in WG leading functions, advising on research directions, improving collaboration between Academia – Industry.

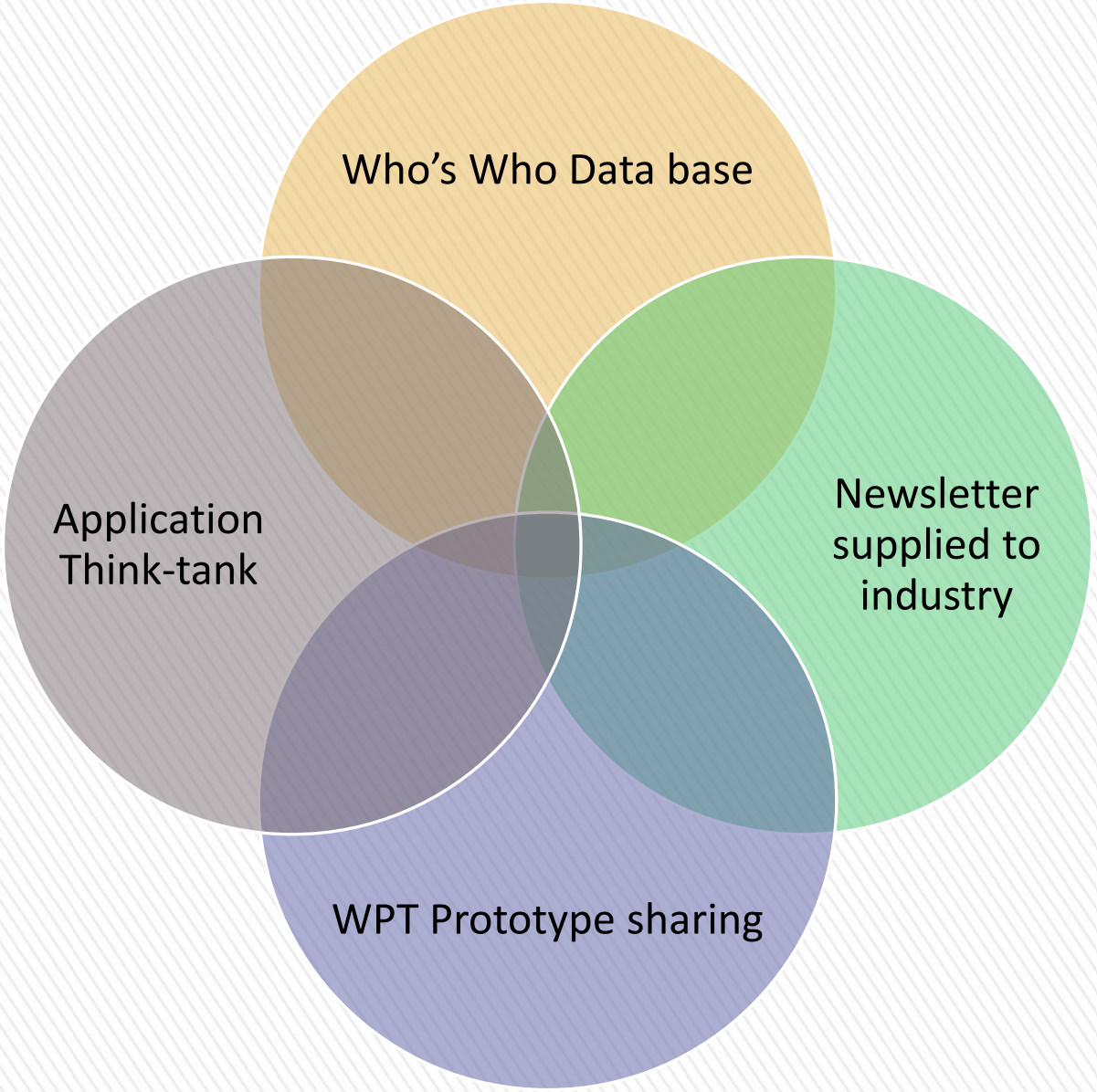
Working Groups target specific problems that represent real-world applications and therefore both research outcomes and trained researchers can be directly absorbed in the Industry.

Schools will have a strong impact in the relation between Academia and Industry in this field.

Target short term missions of ESR's to Industrial partners.

Organize brainstorming sessions between Academia and industry partners

Industrial Exploitation - Proposals



Organization / Time table

- Kick-off meeting: define WG leaders.
- 8 Management Committee (MC) meetings at different Member States to improve collaboration / distribute responsibilities.
- During each MC meeting a technical (WG) meeting will also take place
- 4 Workshops (WS)
- 4 Schools (S)
- 4 Annual reports

Request: Volunteers for next meetings
To be discussed in the MC meeting tomorrow

Meeting	MCM2	School	MCM3
Month	5	9	12
Workshop	WG/WC		WS1
Schools		S1	
Report	Acta		1stAN

Deliverables

- Action website setup immediately after the kick-off meeting, including
  - information of the Action organization (MC members, WG, SIG,...)
  - participating members database with contact information and interest
  - Action outcomes (joint publications, joint projects, ...)
  - upcoming meetings, workshops, training schools,...
  - STSM application information
  - ...
- Initial report at the end of the first year
  - extensive survey on the state-of the art.
- Yearly progress reports that will evaluate the outcomes and progress of the Action and will contain future plans
- Workshop proceedings. Four workshops will be organized as part of the action.
- Training School material available to COST Members

Early Stage Researchers (ESR)

Volunteers for Newsletter and social networking info feeding

- Involvement of ESRs in coordination activities
- Invitation to participate in MC meetings
- Creation of Special Interest Groups led by ESRs
- STSM will target ESRs
- Student Paper Competition organized in the Action workshops
- Organization of Training Schools to form ESRs in the topics of the Action
- Foster networking between ESRs and senior partners from Industry and Academia
- Provide ESRs with opportunities to create a network of contacts
- Publication of open positions or grants from the Institutions participating in the Action targeting providing post-doctoral grants or jobs to ESRs or students that finish their PhD
- Linkedin group will be used to encourage discussion among ESRs regarding technical topics and experiences.
- Social networks used for brain-storming of research ideas.

Request: Volunteers for STSM Committee
To be discussed in the MC meeting tomorrow

Gender Balance

Women in Science Award – need for volunteers and prize support

- Target gender balance in MC members and WG leaders
- Promote the gender equality 50% female / 50% male in STSM Assessment Panel, Student Contest Evaluation Committee, External invited speakers
- Synergies with COST Action TA1201 “gender STE- Gender, Science, Technology and Environment”.
  - Invite experts from TA1201 to present in one of the workshops.
  - Explore the possibility of a joint workshop.
- The Action website will publish useful information, the published information will include existing grants aimed at women.
- When considering the criteria for ESR (<PhD+8 years) maternity leaves will be discounted.
- Lectures on leadership and management skills in the Training Schools towards the objective “women in decision making and leadership positions”.
- Yearly “Women in Science Award” that recognize the scientific excellence of a women participating in the Action.
- Yearly grants for ESR women participating in the Action that wants to pursue a course on management or leadership. [SUBJECT TO APPROVAL BY THE COST OFFICE]
- Collaboration with IEEE Women in Engineering

Economic dimension

» 27 Countries currently participate in the proposal:
Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Macedonia, Malta, Netherlands, Norway, Poland, Portugal, Serbia, Slovakia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

» 37 Academic Institutions, and 7 Industrial participants.

- Action website: www.cost-ic1301.org
- Mailing list: cost.wipe@av.it.pt