

# Pervasive Ultra-wideband Low Spectral Energy Radio Systems Phase II

*The PULSERS (Pervasive Ultra-wideband Low Spectral Energy Radio Systems) project aims at exploration of the enormous potential of the innovative and disruptive radio technology embodied in Ultra-Wideband (UWB) and at enabling introduction of new services, applications and devices based on this technology.*

## At A Glance: PULSERS Phase II

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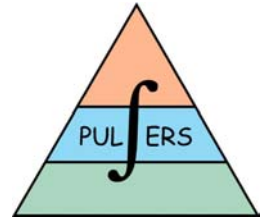
**Duration:** 01/2006 – 06/2008

**Total Cost:** €20,7m

**EC Contribution:** €12,4m

## PULSERS Main Objectives:

The Key objective of PULSERS is to provide significant contributions in the area of R&D related to UWB-Radio Technology (UWB-RT) with the ultimate goal of providing benefits to human, inter-machine and mixed communication needs. Bringing together experts on the topic from various European countries and cooperating with important UWB players from Asia, the PULSERS R&D organisations coming from key industrial and academic communities have the necessary critical mass to strongly advance the state-of-the-art and further the deployment of UWB-RT in Europe and world-wide.



PULSERS aims at realising the following major objectives:

- Materialise consolidated user application scenarios
- Provide UWB system solution verification platforms
- Perform interference and coexistence investigations
- Continue providing significant influence on regulation and standardisation on European and world wide level
- Further development and verification of key technologies
- Provide advanced technologies enabling large scale UWB exploitation

## Technical Approach

The R&D work is system and integration rather than basic technology research oriented. The approach taken in Phase II is to leverage and build upon the investigations performed in the previous phase (2004 – 2005), maturing and realising the UWB physical layer (PHY), media access control (MAC), and system concepts developed. The research activities are considered within a system context, inherently leading to the development of comprehensive UWB-RT system solutions that are able to peacefully coexist and interoperate.

The work on Low Data Rate Location tracking (LDR-LT) and Very High Data Rate (VHDR) PHY will be aimed at significantly more ambitious performance targets than the

current mainstream industrial developments. These goals can only be attained using a cross layer system view, and combining the benefits of innovative solutions on all layers. Specific investigations of the PHY for LDR-LT, and VHDR UWB-RT applications will be continued as well. PHY and MAC schemes will be investigated and implemented that go beyond the previous work within PULSERS and well beyond the work in major UWB standardisation efforts, as for example the IEEE working groups 802.15.3a and 802.15.4a. The project will take into account new regulatory constraints imposed by Europe's upcoming UWB deployment rules being different from FCC rules (influenced by previous PULSERS activities in this field).

R&D work on MAC and higher OSI layers for key UWB-RT applications scenarios is given a strong focus in Phase II. Work on these aspects across the layers will have a strong emphasis on system component integration, prototyping, and laboratory experimentation, on the basis of an industry driven commitment to complete system implementation and sophisticated system verification. The emphasis will be on system test beds that build on LDR-LT and VHDR base technologies.

At the end of PULSERS Phase II comprehensive system verification platforms will be integrated, covering all OSI layers. A selection of key application scenarios will be verified in realistic environments through these platforms. The PHY will be based on UWB technology, while the applications will support enhanced connectivity, convenience, and increased efficiency for the user. The system demonstrators will allow exploration of selected LDR-LT applications, as well as some aspects of VHDR providing wireless digital visual interface (DVI). Application areas of particular interest include sensor networks for industrial application, control, and building automation, localisation and tracking solutions, multimedia applications for body area networks, and private home applications such as fast download of multimedia content into fixed, portable and mobile appliances (VHDR data transfer).

In parallel to the main realisation tasks, PULSERS Phase II members continue to pursue advanced research topics in the area of distributed and co-located multiple antenna systems (MAS). Further a significant effort is still necessary to contribute in the crucially important activities on spectrum regulation and PHY/MAC standardisation, both at the European and world-wide level.

### Key Issues

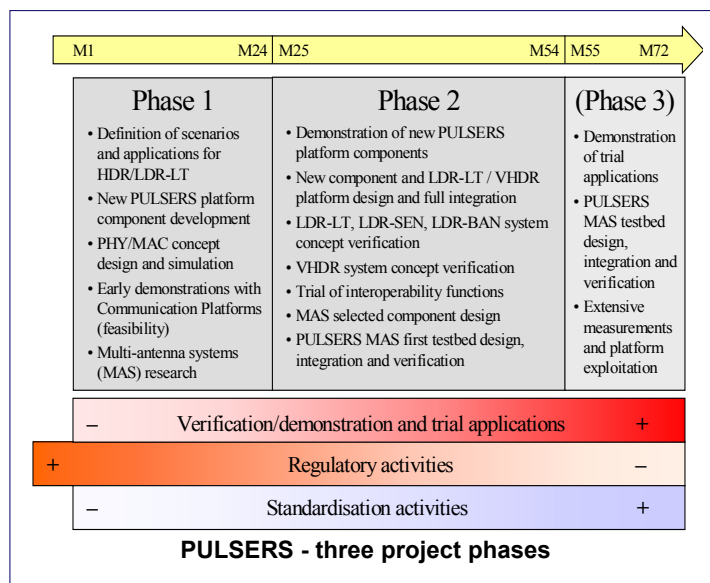
PULSERS ambitious targets may be summarized as i) R&D on UWB-RT technology, a challenging task in LDR-LT and VHDR, ii) use scenario and business case evaluation, system concept development and integrated system definition inclusive the verification platform implementation iii) contribution to regulation and standardisation

targeting to set pre-conditions for harmonised and viable (from technical and economical point of view) legal and technical framework enabling the use of UWB-RT and thus starting a new era of locally spatial efficient spectrum (re) use.

Selected high level project's systems and technology targets to be achieved are:

- Wireless networking, where application and network management are supported by precise and up-to-date location information;
- Satisfy increasing demand for short range very high data rate wireless data transmission for computer and consumer electronics industry applications
- Availability of truly low power and low cost UWB-RT, which offers inherently significant benefits compared to state-of-the-art short-range wireless technologies

- Wireless systems based on UWB-RT coexisting with existing wireless systems and services applying principle of under laying spectrum use.



### Expected Impact

The project members provide contributions to the Regulation and Standardisation as well as to the implementation of EC policies, especially concerning the

Directive 1999/5/EC (the R&TTE Directive).

PULSERS members are essential participants in the European regulation and standardisation process providing scientific excellence as well as significant practical support.

UWB technology in general applies a novel approach of spectrum use (under laying spectrum use as secondary radio service) enabling reuse of the radio spectrum locally, following the principles of peaceful coexistence with other existing legal radio systems and this way massively increasing the spatial capacity. The project members actively contribute towards "a consolidated European approach regarding the spectrum requirements (terrestrial and satellites) in the evolution beyond 3G and a clear European understanding of the novel ways of optimising spectrum usage when moving beyond 3G."