



**Active Optical Phase-Change Plasmonic Transdimensional Systems
Enabling Femtojoule and Femtosecond Extreme Broadband Adaptive
Reconfigurable Devices**

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**Project Communication Kit, Booth and
Leaflets**

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1. Executive Summary

One of the main goals of WP5 is to implement an efficient strategy to **disseminate the project results and communicate the project impacts and success stories** towards stakeholders, including scientific communities, the industry (in particular SMEs) and to EU citizens. To ensure effective communication, both external and internal, PHEMTRONICS has produced a number of promotional tools and materials as a part of the project branding.

This document provides a general overview of the communication kit of PHEMTRONICS at the first stage of the project, as well as their current and future implementation within the project communication strategy to be developed in the following stages to continue positioning and increase the visibility of the project.

The strategy for the external communication herewith presented includes the creation and distribution of project leaflets, stickers, poster and roll-up booth. Among other dissemination channels the leaflets should serve to support and enhance the key project objectives related to the effective dissemination of the results. The project leaflets and poster are online available at <http://www.phemtronics.eu/public-documents.html> and printed leaflets and miniposter will be distributed on direct contacts with representatives of the project target groups at conferences and events. Further assets, including gadgets and a short animated video, are planned to be produced in the next phase in order to support the project's outreach and impact.

2. Introduction

The dissemination and communication of the project results is an important objective to ensure that the innovations of the PHEMTRONICS project will be properly transferred, and their benefits exploited industrially and academically by partners upon the project completion, creating the critical mass of interest necessary for the exploitation or use of the results of the project. Therefore, the dissemination and communication activity has the following objectives:

- To share the technical results of the project with the scientific community interested to the topics addressed by PHEMTRONICS project, in order to promote the research and receive useful inputs from other scientists and International Communities.
- To improve the knowledge of PHEMTRONICS results in the industrial community as a basis to create new opportunities for building quality products and services.
- To attract potential customers and generate expectation towards the project results, in order to prepare its exploitation.
- To identify additional potential application fields, customers and business opportunities based on the reactions to the dissemination activity.

In order to achieve these goals, as a foundation of the future effective communication activities, a sound set of working dissemination and communication tools and materials is crucial to be established within the first months of the project. Accordingly, an external Communication Kit has been developed in the first 4 months to form the backbone of public visibility.

As dissemination and communication tools, the project booth, poster and leaflets have been designed to give an overall overview / basic information on the project to a broad interested group of people. The booth will be exhibited at major events, therefore, the leaflets will be distributed as a printed version at project related conferences, trade fairs and other events.

Moreover, an online version is available at <http://www.phemtronics.eu/public-documents.html> to anyone interested.

3. PHEMTRONICS Booth/Roll-up

The PHEMTRONICS ROLL-UP has been developed by the design team of PHEMTRONICS composed of young talented researchers from beneficiaries of CNR-NANOTEC and UC with the content input of the whole consortium. The roll-up will be exhibited during events to reinforce the presence and visibility of the project. It includes the project logo with its tagline, consortium composition, and a brief explanation of the project and its outcomes, using the icons also displayed on the website. Social media, website and email details are displayed, as shown in Fig. 1.

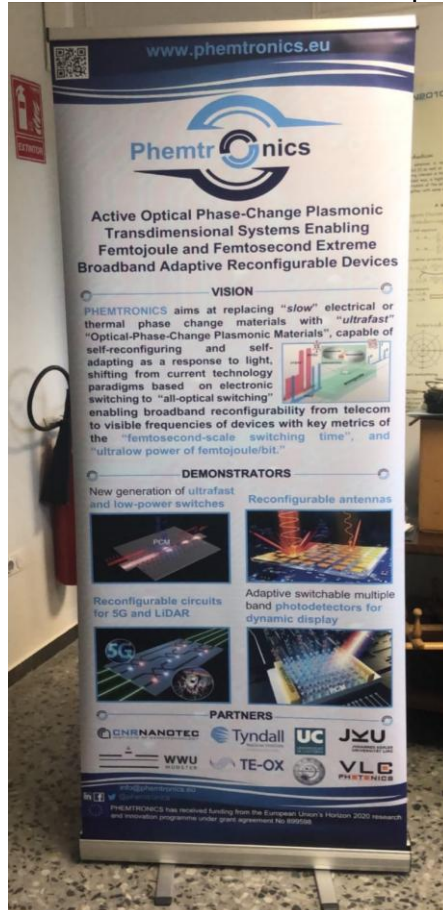


Figure 1: PHEMTRONICS ROLL-UP and picture of the group at the partner UC-University of Cantabria

4. PHEMTRONICS Posters

Two PHEMTRONICS A0 posters have been produced at the beginning of the project with eye-catching design to introduce the project at scientific conferences and meetings and at general public and stakeholders events. The posters reflect the main PHEMTRONICS design concept to keep the project branding consistent and to make the project easily recognizable (Fig.2). Both posters have been subject to online discussion with the consortium.

Active Optical Phase-Change Plasmonic Transdimensional Systems Enabling Femtojoule and Femtosecond Extreme Broadband Adaptive Reconfigurable Devices

www.phemtronics.eu

PHEMTRONICS Vision

PHEMTRONICS has the ambitious vision of creating a unique path for translating forefront knowledge in phase-transformation dynamics in *light controllable active matter with reconfigurable and interactively tunable dynamical properties* into extreme broadband reconfigurable and adaptive devices by developing a radically novel **transdimensional active matter platform** that is intrinsically itself phase change, low-loss plasmonic and electronically topological. The photon-electron-phonon coupling will enable a new technology paradigm of adaptive optical signal processing with ultrafast network reconfiguration with key metrics of the *femtosecond-scale switching time, ultralow power (femtojoule/bit) and broadband (microwave-to-optical frequencies) capability* required for reliable multibit operations.

Dimensionality

Free Carrier Density

Field Confinement

Trans-dimensional extreme light-matter interactions

Figure 1: The PHEMTRONICS radical new vision addressing two novel transdimensional phase changes regimes.

Phase-Change Smart Combinations

PHEMTRONICS technologies will be based on *smart combinations of phase-change materials (PCMs)*.

These materials are characterized by the possibility of tuning their optical and electrical properties through a phase-change triggered by an external stimuli, such as electrical or optical pulses, allowing the controlled manipulation of light and optical signal processing.

The proposed PCMs smart transdimensional system include combinations of:

- **Plasmonic PCM metal.** PHEMTRONICS will use Ga as a PCM plasmonic metal, for its chemical stability and polymorphism. Ga passes 7 phases depending on the dimensionality with markedly different optical properties ranging from those of a covalent solid to those of a highly metallic liquid.

- **Low-loss high refractive index PCM dielectrics.** With PHEMTRONICS we will surpass the current paradigm of PCMs (GST and VO₂) by developing extreme broadband transparent PCMs that combine broadband low loss (0.4 – 18.5 μm) and large optical contrast ($\Delta n \approx 2$) based on sulphides (GaS, Ga₂S₃, Sb₂S₃, GeS), which possess several phases, optical band gap, higher refractive indices and low phonon frequencies. These characteristics are attractive for applications that require high transmission from the visible to the mid-infrared.

Demonstrators

PHEMTRONICS exciting outcomes include demonstrators of:

- New generation of **ultrafast and low-power switches.**
- **Reconfigurable antennas.**
- **Reconfigurable circuits for 5G and LIDAR.**
- **Adaptive switching multiple band photodetectors for dynamic displays.**

Partners

Funding

PHEMTRONICS has received funding from the European Union's Horizon 2020 with GA No. 899598

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Active Optical Phase-Change Plasmonic Transdimensional Systems Enabling Femtojoule and Femtosecond Extreme Broadband Adaptive Reconfigurable Devices

www.phemtronics.eu
Phase-Change Materials for Reconfigurable Technologies
H2020 FETOPEN PROJECT

PHEMTRONICS aims at replacing “slow” electrical or thermal phase change materials with “ultrafast” *Optical-Phase-Change Plasmonic Materials*, capable of self-reconfiguring and self-adapting as a response to light, shifting from current technology paradigms based on electronic switching to “all-optical switching” enabling broadband reconfigurability from telecom to visible frequencies of devices with key metrics of the “femtosecond-scale switching time”, and “ultralow power of femtojoule/bit.”

TECHNOLOGY DEMONSTRATORS

Three novel reconfigurable components are proposed with broadband tunability:

- Reconfigurable antenna:** reconfigurable broadband antenna array in the 1-30 GHz range with energy consumption per radiative element < 500 fJ.
- Adaptive Photodetector:** adaptive waveguide integrated switchable multidetector arrays in the 400 nm – 2000 nm
- Ultrafast Switches:** with fs time scale and < 500 fJ/pulse energy consumption.

Novel transdimensional photo-switchable phase-change sulphides materials platform.

It surpasses the current paradigm of PCM by developing extreme broadband transparent O-PCMs that combine broadband low loss (0.4 – 18.5 μm) and large optical contrast ($\Delta n \approx 2$) based on sulphides (GaS, Ga₂S₃, Sb₂S₃, GeS), which possess several phases, optical band gap, higher refractive indices and low phonon frequencies attractive for applications that require high transmission from the visible to the mid-infrared.

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Figure 2: PHEMTRONICS Scientific and General public posters

5. PHEMTRONICS Leaflets

The PHEMTRONICS leaflets have been designed in a way to capture the attention of the different target groups and increase awareness of the project. They have been designed by the young researchers involved in Phemtronics at CNR-NANOTEC, UC and TEOX partners. They explain the rationale behind the project - its objective, and main demonstrators planned. The leaflets have been created to reflect the conceptual design of the project logo and website and have been a subject to multiple online interactions and improvements with the project consortium. Two versions of the leaflet have been prepared one more direct for the industry and one more for general public. They are shown in Fig. 3

The leaflets serve for the dissemination and communication of general project information to interested parties, stakeholders, the wider academic and industrial communities and the general public at conferences, trade fairs, social science festivals, schools and other project related events.

The online version is available for download at <http://www.phemtronic.eu/>.



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ACTIVE OPTICAL PHASE-CHANGE PLASMONIC TRANSDIMENSIONAL SYSTEMS ENABLING FEMTOJoule AND FEMTOSECOND EXTREME BROADBAND ADAPTIVE RECONFIGURABLE DEVICES

H2020 FETOPEN PROJECT

RECONFIGURABILITY BY PLASMONIC-PHASE-CHANGE MATERIALS ESTABLISHES A NEW LINE OF ADAPTIVE BROADBAND TECHNOLOGY AT THE FEMTO- TIME AND ENERGY SCALES.

PHEMTRONICS RESEARCH FOCUS ON:

- NOVEL PHASE CHANGE MATERIAL (PCM)
- NOVEL ACTIVE PLASMONIC PLATFORM
- RECONFIGURABILITY AT DEVICE LEVEL

PHEMTRONICS TARGETS

- DEVELOPMENT OF BROADBAND TRANSPARENT 0-PCM
- DEVELOPMENT OF ACTIVE RECONFIGURABLE PLASMONICS
- IMPROVEMENT OF THE DEVICE SPEED AND ENERGY CONSUMPTION
- ENABLE BROADBAND RECONFIGURABLE TECHNOLOGY TOWARDS RF COMPATIBLE OPTICAL FREQUENCIES

TECHNOLOGY OBJECTIVES

- DEMONSTRATE ADAPTIVE WAVEGUIDE INTEGRATED SWITCHABLE MULTIDETECTOR ARRAYS
- DEMONSTRATE SELF-RECONFIGURABLE MICROWAVE ULTRAFAST LOW-POWER SWITCH
- TO ENABLE FREQUENCY&POLARISATION RECONFIGURABLE ANTENNA.

8 Partners
7 Countries

2 RTDs
3 Universities
3 SMEs

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Novel transdimensional photo-switchable phase-change materials

It surpasses the current paradigm of phase-change materials (PCM) by developing extreme broadband transparent O-PCMs that combine broadband low loss (0.4 – 18.5 μm) and large optical contrast ($\Delta n \sim 2$) based on sulphides (GaS, Ga₂S₃, Sb₂S₃, GeS), which possess several phases, optical band gap, high refractive indices and low phonon frequencies attractive for applications that require high transmission from the visible to the mid-infrared

Waveguide
Si₃N₄

Objective

PHEMTRONICS aims at replacing “slow” electrical or thermal phase change materials with “ultrafast” “Optical-Phase-Change Plasmonic Materials”, capable of self-reconfiguring and self-adapting as a response to light, shifting from current technology paradigms based on electronic switching to “all-optical switching”, enabling broadband reconfigurability from telecom to visible frequencies of devices with key metrics of the “femtosecond-scale switching time”, and “ultralow power of femtojoule/bit.”

3 novel reconfigurable devices are proposed with broadband tunability

Ultrafast Switches:
PHEMTRONICS will enable a plasmonic actuated phase change microwave switch with the femtosecond time scale and with very low energy consumption < 500 fJ/pulse

Reconfigurable Antennas:
PHEMTRONICS proposes reconfigurable broadband antenna arrays in the 1-30 GHz range with energy consumption per radiative element < 500 fJ

Adaptive Photodetector:
adaptive waveguide integrated switchable multidetector arrays in the 400nm-2000nm

TECHNOLOGY DEMONSTRATORS

Figure 3: Leaflets of PHEMTRONICS

6. PHEMTRONICS Stickers and Tagline

Tagline: With a clarifying function, the tagline, also known as the slogan, is the phrase that accompanies the logo, when needed, in the dissemination materials, such as in the handout, and which gives extra information about the main purpose of the project. In the PHEMTRONICS case, the tagline is:

“Phase-Change Materials 4 Reconfigurable Technologies”

The PHEMTRONICS logo and tagline have been used to create promotional stickers that will be distributed outside the project partners at meetings, schools, social events in order to increase visibility of the project and to promote it in the community (Fig. 4). The stickers will also be used to create additional branding promotional gadgets.



Figure 4: PHEMTRONICS stickers

7. PHEMTRONICS Corporate Identity Templates

PHEMTRONICS corporate identity templates have been designed in the very beginning of the project implementation. These include:

- Milestone reports
- Deliverable reports
- Policy and technical briefs
- Power point presentation
- Meeting agenda and minutes
- Newsletter
- Letterhead template for official project letters

Each template is specifically tailored to the information the document is required to contain. The templates incorporate several important elements in common:

- Phemtronics project logo
- Suggests the information necessary to be included in the specific document

All templates are available through the Internal Online Document web site and easy to access and use for all partners.

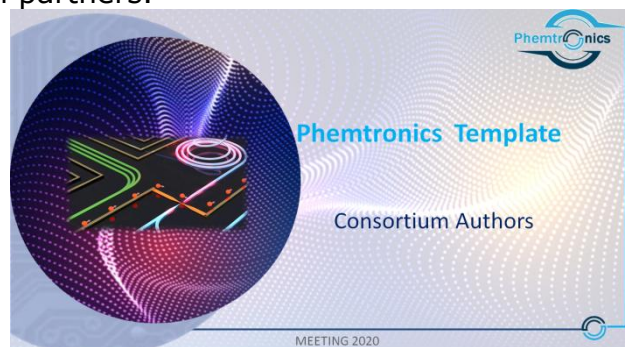


Figure 5: Iperlinks to www.phemtronics.eu via the partners' official websites

8. Summary and Outlook

The present deliverable described the work carried out within WP1 and WP5 for the set up of the Communication Kit. The deliverable includes the following activities:

- Development of project booth and poster.
- Development of the project leaflets.
- Development of the project stickers.

The printed project leaflets will be distributed by all partners at conferences and events.

As the project progresses and publishable results are available, the leaflet may be updated after discussion with the whole consortium.

For the second stage of PHEMTRONICS, the consortium is planning the development of additional dissemination materials that can contribute to PHEMTRONICS positioning and generate more awareness about the project's objectives and results. These materials are:

- PHEMTRONICS Videos: An animated short video (3 min max) will be delivered for the second stage of the project. The storyline will be provided by the technical teams working in WP2, 3, 4.
- In addition, the consortium has thought to provide some gadgets to have more brand impact at events where the project will be participating after the COVI19 emergency. A proposal has been shared among the consortium partners with an online survey to determine which options are better, considering the budget for this kind of material. Some of the options under consideration are:
 - PHEMTRONICS T-Shirts and bags: To be used by consortium partners at events booths, presentations, demos, etc., and by the attendants to PHEMTRONICS SCHOOLS AND WORKSHOPS.
 - PHEMTRONICS Pen drives: Novel and innovative designs of pen drives with the logo of the project to give to event's attendees and strategic partners of the project.
 - PHEMTRONICS Thermal Bottle: Branded with the project's logo for consortium partners and key strategic stakeholders.

The material developed will be included in further progress reports.