



RICANA (Radar Imaging, Challenges And New Approaches)



RICANA ("Radar Imaging: Challenges And New Approaches") is a recently launched European Project funded through the FP7-PEOPLE_IOF Programme. The RICANA project is concerned with the improvement of Radar Imaging technology and its application to Ground Penetrating Radar (GPR), or Through Wall Radar (TWR) systems. The general milestone of the RICANA project is to achieve novel advances in the Radar Imaging field so that a disruptive technology can emerge.

Objectives

The desired progress cannot be undertaken without solving previously known technological challenges.

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The participants are the Radio Systems Research Group of the University of Vigo (Vigo, SPAIN) (UVIGO

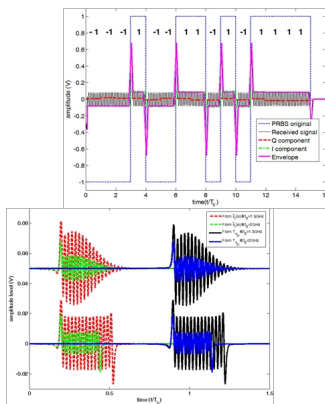
Outcomes

Up to present, the outcomes surpassed the initial objectives and the more noticeable result has been the achievement of the experimental demonstration of an electromagnetic phenomenon related to the dispersive nature of media such as soil, water, vegetation, tissues, metal and so on.

The dispersive propagation occurring in these media produces the arise out of a waveform known as Brillouin precursor which has slept down on scientific textbooks since its theoretical prediction in 1914 due to the mathematical and computational difficulties to board the study as well as the technical challenge to demonstrate their practical existence.

Theoretically, the Brillouin precursor can provide larger penetration depths into a dispersive medium compared to that achieved by the conventional single frequency or narrow-band signals, thereby providing: (i) enhanced signal-to-noise ratio (SNR) and thus better imaging through hard-to-image dispersive media; and/or (ii) larger propagation distance for the same transmitted power, or conversely less transmitted power to achieve the same distance for a given receiver sensitivity, hence contributing to “green technologies.

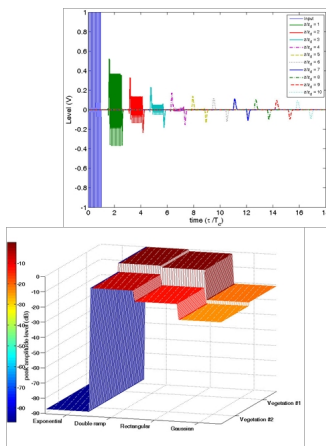
Brillouin precursors carry a significant portion of the energy of the propagating ultrawideband pulse in any dispersive attenuative media, thereby delivering either more power at the same distance, or larger distance, and/or both.



Neglecting these field means to eliminate an important and significant part of the received signal energy. It is therefore reasonable to conclude that Brillouin precursors have a large potential to impact positively the ground penetrating radar, through-the-wall imaging, imaging through seawater and leafy foliage, communication through foliage and seawater, non-destructive testing, material characterization, etc. So, alongside the remaining WPs of the RICANA project we have considered the dispersive propagation phenomenon in order to achieve an optimal system design and signal data processing.

The correct design of the radiating elements and also the suitable transmitted signal become key elements which must be analyzed under the light of the Brillouin precursor formation. These outcomes have reached a large impact on the international scientific community and it has been rewarded through the rapid publication of journal papers. Different conference papers have been also accepted and presented, and many other publications are under review process and elaboration. We can mention among other outcomes, a pending patent presented to protect the intellectual property on the measurement technique developed to detect and characterize the dispersive phenomenon of the Brillouin precursor waveforms.

The research team considers that with the work performed around the Brillouin precursor phenomenon, this break-up technology is stated to be practically possible and especially, the analysis performed can help to introduce important improvements in the imaging techniques under use at present.



Journal papers

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Ana Vázquez Alejos, Muhammad Dawood, Luis Medina, "Experimental dynamical evolution of the Brillouin precursor for broadband wireless communication through vegetation", Progress In Electromagnetics Research vol. 111, pp. 291-309, 2011.

Ana Vázquez Alejos, Muhammad Dawood, Habeeb U.R. Mohammed, "Analysis of Brillouin precursor propagation through foliage for digital sequences of pulses", IEEE Geoscience and Remote Sensing Letters, vol. 8, issue 1, pp. 59-63, January 2011.

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Conference papers

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Jose Carlos Garcia Valladares, Ana Vazquez Alejos, Ana Varela Cotelo, Manuel Garcia Sanchez, "Implementation of a FPGA-based system for Human Presence Detection by Using micro-Doppler radar at 24GHz", White Sands Chapter of International Test and Evaluation Association Live-Virtual-Constructive Conference, El Paso (NM, USA), January 2010.

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non-ideal receiving conditions", 2010 IEEE International Symposium on Antennas and Propagation – URSI Radio Science Meeting, Toronto (Canada), 2010.

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Jianxiong Sun, Ana Vazquez Alejos, Muhammad Dawood, "Under-Sea Remote Sensing Using Brillouin Precursors", 7th IEEE International Workshop on Antenna Technology, Hong Kong, April 5th – 7th, 2011.

Ana Vazquez Alejos, Muhammad Dawood, Jianxiong Sun, "Dynamical evolution of Brillouin precursors in multilayered sea water-based media", 2011 European Conference on Antennas and Propagation, Rome (Italy), April 11th-15th, 2011.

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Project RICANA

Written by Administrator

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