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**FRAUNHOFER INSTITUTE FOR
HIGH FREQUENCY PHYSICS
AND RADAR TECHNIQUES**



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**FRAUNHOFER INSTITUTE FOR
APPLIED SOLID STATE PHYSICS**



 **propatria electronics**
THE THOUGHT BEHIND INTELLIGENCE

PRO PARTIA ELECTRONICS LTD.



SLOT CONSULTING LTD.



**UNIVERSITY OF CYPRUS,
DEPARTMENT OF ELECTRICAL AND
COMPUTER ENGINEERING**



**WARSAW UNIVERSITY OF
TECHNOLOGY, INSTITUTE OF
ELECTRONIC SYSTEMS**



SPOT SAR IMAGE FROM MUNICH TECHNICAL UNIVERSITY



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PROJECT INTRODUCTION



**SYNTHETIC
APERTURE RADAR
FOR ALL WEATHER
PENETRATING UAV
APPLICATION**

SYNTHETIC APERTURE RADAR FOR ALL WEATHER PENETRATING

Project description

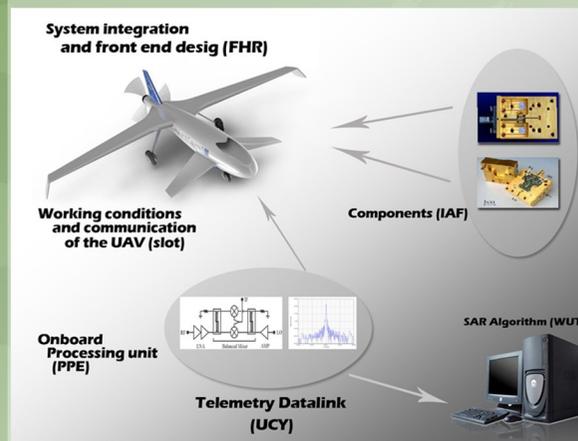
The capability to image scenes from unmanned aerial vehicles (UAVs) even through bad weather conditions or dust clouds is an important requirement for state-of-the-art synthetic aperture radar (SAR). Therefore, systems have to be of small size and low weight to fit in small aircrafts. High spatial resolution and online SAR-processing are also indispensable for the operational radar. These needs make great demands on hardware and signal processing. Especially, the fast preprocessing and data link to the ground, as well as the real-time SAR-processing algorithms are challenging tasks. The latter have to cope with the unstable flight conditions of small UAVs. The SARape-project (Synthetic Aperture Radar for all weather penetrating UAV application) aims to develop a sophisticated SAR-system fulfilling the high requirements of modern military and civilian applications. In this paper we present the new 94 GHz system developed in a cooperation of five consortium partners from four European countries.



Overview

The SARape project is formed to build up expertise in SAR measurements from UAVs as well as to develop a demonstrator that shows the prospects of the system. Each partner of the consortium brings in his key skill. On the other hand, all components and software inserted into the completed system depend on each other, so a near cooperation is intended to successfully handle the project and to build up a base for further cooperation.

The scheme in the figure above shows how the parts of the SARape system are divided between the project partners. The tasks were merged into 8 work packages, which are detailed in the table below.



WP Number	Title	Leader
WP 1.	Management Activities	Fraunhofer-FHR
WP 2.	Components	Fraunhofer-IAF
WP 3.	System integration	Fraunhofer-FHR
WP 4.	On Board Pre-processor Unit	Pro Patria Electronics
WP 5.	Telemetry Data Link	University of Cyprus
WP 6.	Signal processing simulations and algorithms development	Warsaw Technical University
WP 7.	Working conditions and communication of the UAV	Slot Consulting Ltd.
WP 8.	Dissemination and Exploitation	Slot Consulting Ltd.

System

The SARape system consists of the following key components:

- ⇒ Radar Front-End
- ⇒ Digital Down Converter (DDC) Unit
- ⇒ Inertial Measurement Unit (IMU)
- ⇒ Transmission and Receive Unit
- ⇒ Synthetic Aperture Radar (SAR) Processor

Ground Control Station

The SARape system will be designed to be compatible with a standard ground control station. The ground station should accommodate the hardware and software tools necessary to control the radar and record and display the downloaded SAR imagery and targets for increased situational awareness and mission management.