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on the
air

AULOS
PASSIVE COVERT LOCATION RADAR

Predictable results
for unpredictable threats



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AULOS

In the civil-paramilitary environment there is a need for an increased surveillance capability and covertness versus “traditional” active surveillance, because of the general public concern with regards to interference and health issues, and to allow surveillance against terrorists in areas where conventional radars could not be deployed.



SELEX Sistemi Integrati Passive Covert Location (PCL) Radar provides a flexible approach to surveillance with strong potential in the urban environment. The PCL makes use of free electromagnetic emission in the Frequency Modulation (FM) band with remarkable advantages such as:

- Exploit complement “traditional” surveillance, especially against low-flying or stealth targets
- Remain covert, i.e. avoid revealing the existence of surveillance
- Avoid anti-radiation missiles that can reduce the efficacy of defensive military Radio Frequency (RF) transmitting systems

OVERVIEW

The innovative PCL exploiting non co-operative FM radio transmitter has been designed, developed and tested. The environment where the radar is required the realization of brand new antennas and receivers, in order to reject the intense co-channel interference and permit revealing low flying and low Radar Cross Section (RCS) targets. The signal and data processing algorithms have all been designed and developed according to radar coverage and real time requirements.

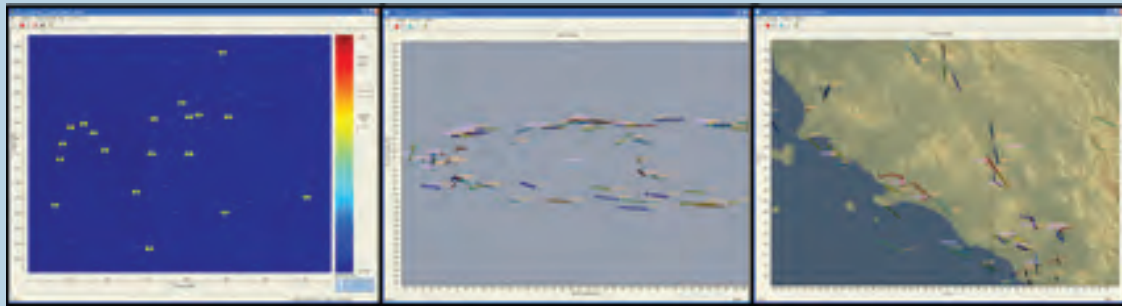
This FM-band passive covert radar observes aircraft at 360° azimuth sector and refreshes target tracks in less than 3 seconds. The tracking algorithm, which includes the application of particle filtering to confirmed bistatic tracks, is a noticeable step forward in the development of passive covert radars. Moreover, the comparison with Air Traffic Control (ATC) tracks as opportunity targets has proved an outstanding tracking accuracy in the bistatic domain. Strengths of the develops PCL are:

- Low-cost (purchase and Operation & Maintenance)
- Reliable (no moving parts or transmitter)
- Physically small (sitting easy)
- Accurate (Doppler frequency & range)
- Military advantages (covert, low-frequency)

R&D INNOVATIONS

Adaptive algorithms such as spatial nulling, STAP (Space Time Adaptive Processing) and ADBF (Adaptive Digital Beam Forming) are applied to further remove co-channel interference and to reject multi-path. Techniques have been considered to cope with the multipath effect on the reference signal exploited by a PCL. The CMA (Constant Modulus Algorithm) can be exploited to obtain a blind adaptive equalization of the reference signal.





PERFORMANCE

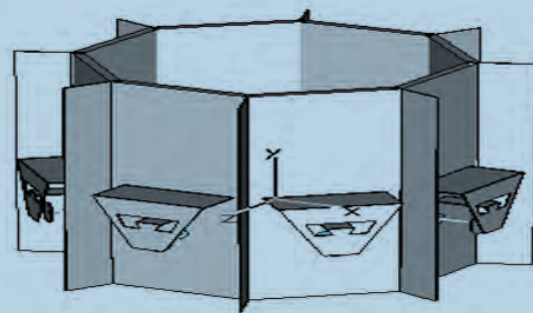
Volumetric coverage:

- 300° azimuth coverage
- 60° elevation coverage
- Bistatic range: according to the antenna configuration

Adaptive thresholding to automatically detect targets on range-Doppler maps maintaining a constant false alarm probability via a custom bi-dimensional Cell-Average CFAR (Constant False Alarm Rate).

Accurate targets range, velocity, azimuth and elevation estimations via application of particle filtering to transform target bi-static range, Doppler and bearing into Cartesian position and velocity.

- Effective operation in presence of strong multipath
- Adequate computing power (i.e.: parallel processing)
- Dedicated PCR Human Machine Interface



MAIN TECHNOLOGICAL FEATURES

- Wide band LPDA antennas for surveillance and reference
- IF Sampling
- Very high dynamic range receivers
- Fast, high dynamic range A/D converter
- Very high speed real time signal and data processing algorithms
- Effective mitigation of co-channel interference
- Adaptive suppression of intentional interference

INDUSTRIAL PRODUCT

A PCL system can be installed along countries' borders to provide a complementary low and medium altitude air surveillance capability.

PCL can additionally exploit other types of available opportunity signals, including: (i) OIRT (Organisation International de Radio et Télévision) FM signals, (ii) DAB (Digital Audio Broadcast) signals, (iii) DVB-T (Digital Video Broadcast - Terrestrial) signals. Tracker can also: (i) aggregate individual reports from the PCL Video & Plot Extractor into primary tracks, (ii) aggregate Automatic Dependent Surveillance - Broadcast (ADS-B) Reports into secondary tracks, (iii) aggregate PCL reports and ADS-B reports into combined tracks.

