SenTech Srl

COMPANY ACTIVITIES AND COOPERATIONS

2024

Sentech Srl is an Italian company with 16 year of history in innovation in the embedded computing sector, in dedicated solutions for signal processing boards and special functions, in the design of complex components such as antennas and process/measurement controllers, in integration of complex systems and related sensors.

The Company is ISO 9001:2015 certified in SW and HW design and operates mainly in R&D and SW design and development for the Aerospace and Defense domain. It is specialized in the analysis and design of complex systems and related sensors using both high-level technical simulation SW (e.g. MATLAB/Simulink, CST, Solid Works, Ansys Fluent, Altium Designer) and programming language as C/C ++/C#, Python, LabVIEW, Java, Android and SQL.

Sentech is a member of AIAD (Federation of Italian Aerospace, Defense and Security Companies).

Company expertise covers the following activities:

1. Scenario Simulators for RF/Radar and Electro-Optical sensors for military scenarios;
2. Automatic Test Equipment design and implementation;
3. CV (Computer Vision) and AI (Artificial Intelligence) algorithms design and development (e.g. Automatic Target Recognition and Identification, Object detection and tracking, Change Detection;
4. RF algorithm design and implementation for Electronic Support Measures and Direction Finder Systems;
5. Embedded board RTOS/FPGA Algorithms design and programming and RTOS Control Systems,;
6. DO 178 SW development, test and Documentation.
7. Research & Development for national and EU projects in military / aerospace domains
8. eHealth (TELE-MED:integrated system for remote teleproctoring -telementoring in surgery and for the training of surgical specialist , Tele-Rihabitilation including Gamefication, Veterans Therapy and rehabilitation Integrated System)

Radar Target Generator (RTG) and **Electronic Warfare Simulation System (EWSS)** are essential tools for testing and training RADAR and EW systems in real environment.

The SenTech RTG receives the radar pulses and in real time is able to respond with echoes simulating multiple air targets and/or missiles with phase Coherence and Doppler Shift. RTG response can include Electronic Counter Measures. The motions of the targets are realistic and varied (multiple targets, planes launching missiles, variations of all parameters such as position, speed, acceleration).

Among the three possible approaches for radar testing (radar test range, simulation, and pulse replication) the last one is the best solution because:

- allows testing in a controlled environment;
- could include intentional (Electronic Counter Measures) and unintentional interferers;
- can create e realistic scenario and do not require knowledge of the radar system architecture;
- has the capability to record the detected reaction from the radar under test;
- It is easily deployable.

RTG Main Panel

Generation of **synthetic datasets** and **complex scenarios** in the various optical bands (IR and VIS) through the use of latest generation graphics engines for training neural networks on classes / targets with unavailable datasets

Sentech creates military simulated scenario useful for the following purposes:

- Neural Networks training and testing
- Computer vision algorithms testing
- Feasibility study on military systems

Main Pros of simulated scenarios are also:

- Supports keyframe animations and SQF scripts
- Thousands of vehicles, equipment and scenarios available;
- Realistic graphic;
- Realistic and scriptable effects (Daylight, fog, rain, dust, explosions, etc.);
- Realistic IR models;
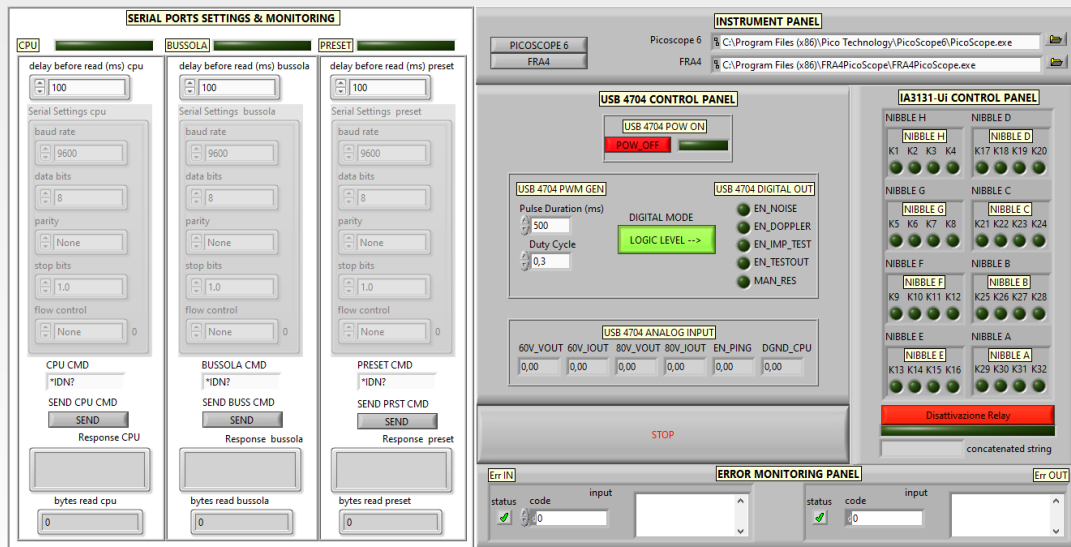- Simulated custom dataset generation.

Seeker view (up left) Military targets (up right) and scenario (down)
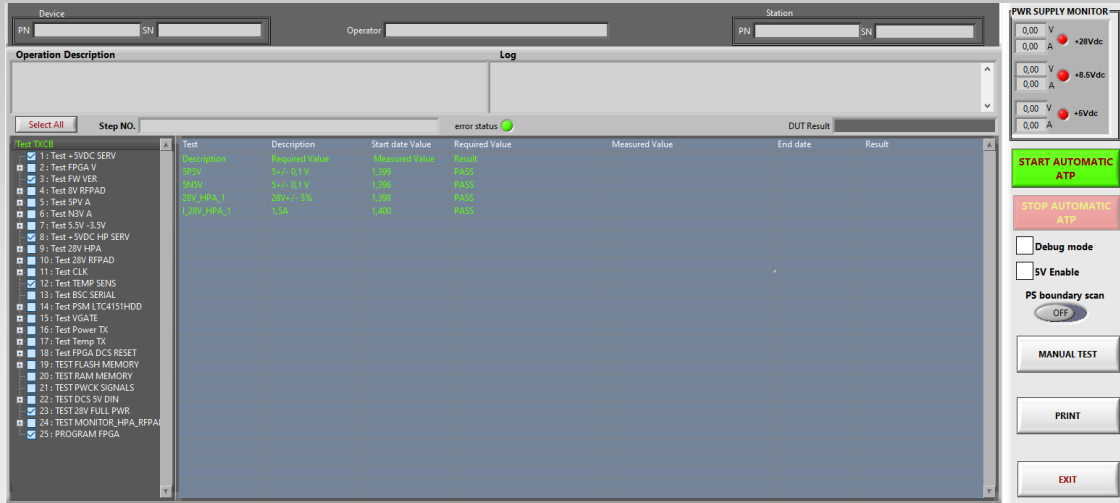
ATE Main Panel

ATE Manual Panel

Sentech design and develop **custom made ATE** with the following characteristics:

- Automatic execution of the entire test chain or test groups/single test selection;
- Automatic generation of Test Data Report on custom templates (Word, Excel, Xml, Others);
- Manual Panel;
- Debug Mode
- Instrument management (oscilloscopes, relay cards, COM boards, other peripherals/instruments);
- Error and error log management;
- Management of different communication protocols (Canbus, Canopen, EtherCat, others);
- Easy Installer with all needed library included;
- Auxiliary file management for automatic parameter settings, measurement offset;
- User Friendly interfaces.

SenTech
Systems and Energy Technologies

Design and implementation of complex multi-domain CV & AI systems for Terrestrial, UAV and aerospace platforms:

- Change Detection on Lidar Point Cloud and Electro-optical data;

- Object Detection on Lidar Point Cloud and Electro-optical data;

- Object Classifiers;

- Integration with ESRI GIS;

- Neural Networks Training and Testing on custom specs and dataset;

- Registration and Data Fusion Algorithms
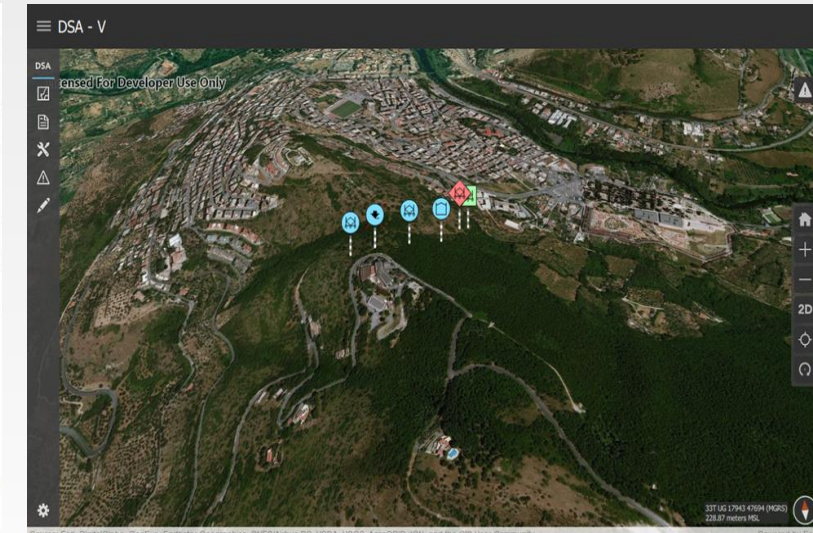
- Data Augmentation for training Datasets

Object Detection on Vis and IR Data
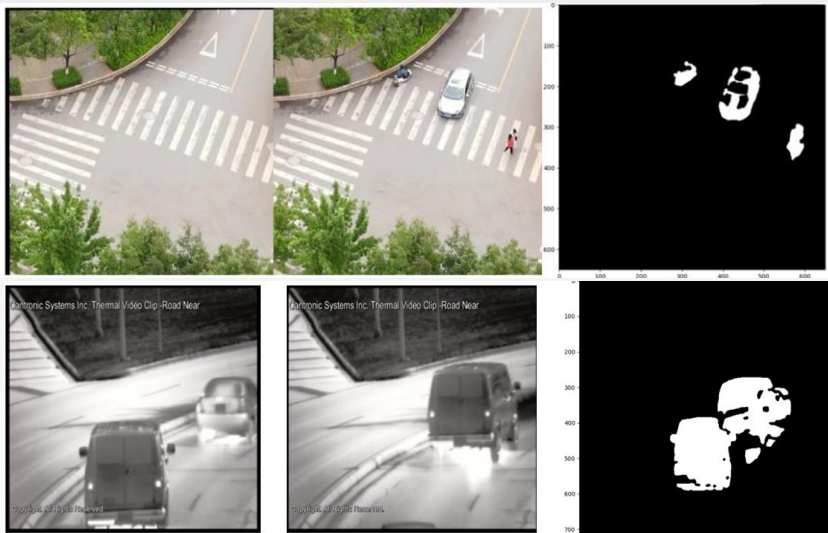
Change Detection on Vis and IR Data
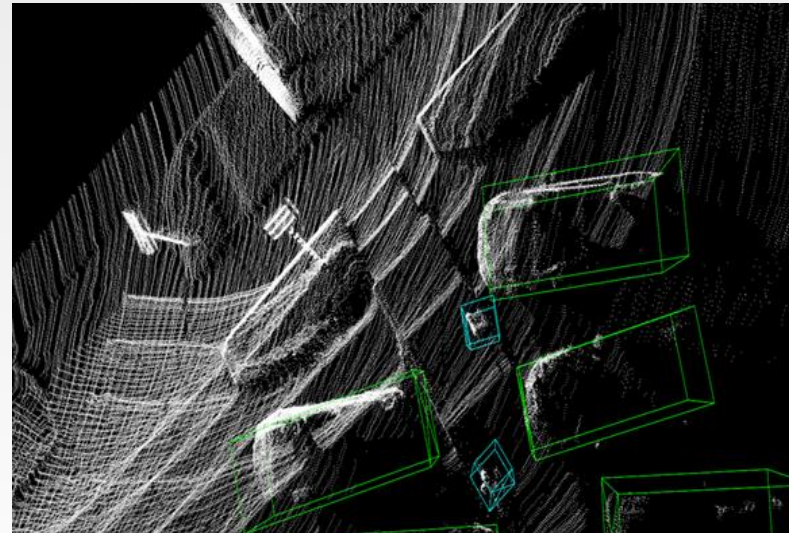
Object Detector on Lidar Data

Warning Generation on ESRI GIS

SenTech **CD & ATR** (Change Detection & Automatic Target Recognition) system in the SAR field includes the following Functions:

ATR Pipeline Functions

Pre-screening: Despeckling Filter and CFAR (Constant False Alarm Rate) Methods (in-house development of innovative methods e.g. Seg-CFAR, Seg-KDE)

LLC (Low Level Classifier): Elimination of Natural and Non Clutter residues + Chip candidate selection for the next stage

HLC (High Level Classifier):Target classification using AI techniques (Both Machine Learning (ML) and Deep Learning (DL))

CD Methods

- Coherent Change Detection (CCD);
- Non - Coherent Change Detection (NCCD);
- Maximum Likelihood Estimate (MLE);
- Universal Image Quality Index (Q Index): Q1, Q2 and Q3;
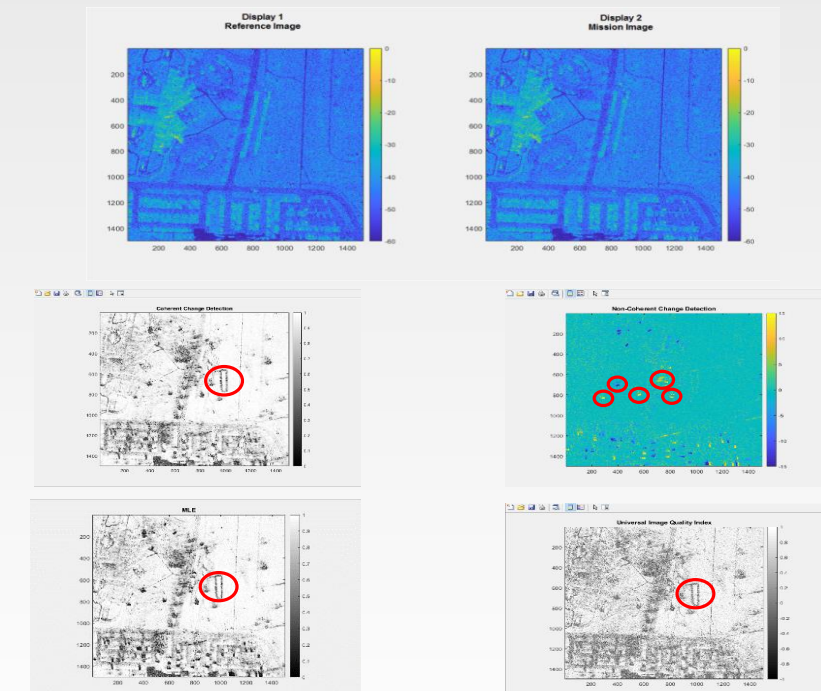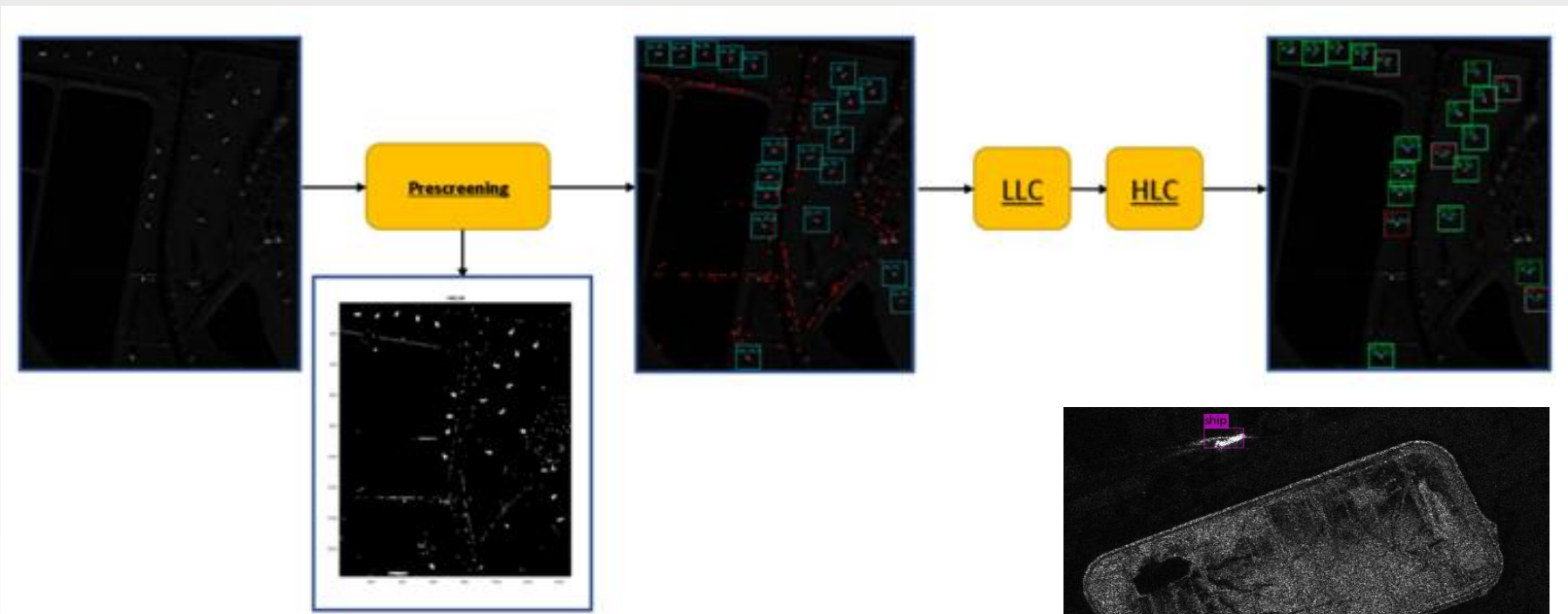
Sentech has the capabilities to

- Design and construction of **custom direction finding antennas** for special applications

- Study, design and implementation of **advanced Direction Finder algorithms** such as Super Resolution, Multipath Signals DOA, Low Signal Noise Ratio DOA;
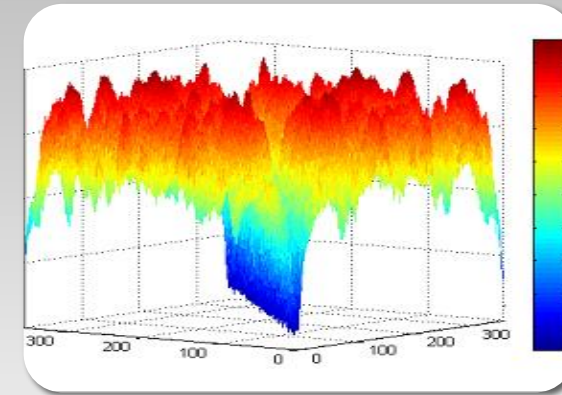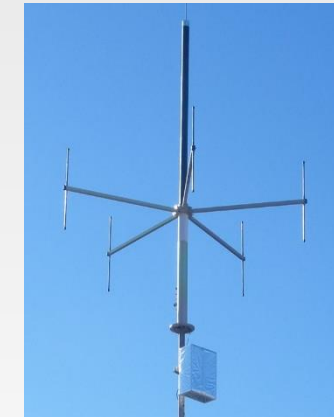

Direction Finding Algorithm Study, Simulation and implementation
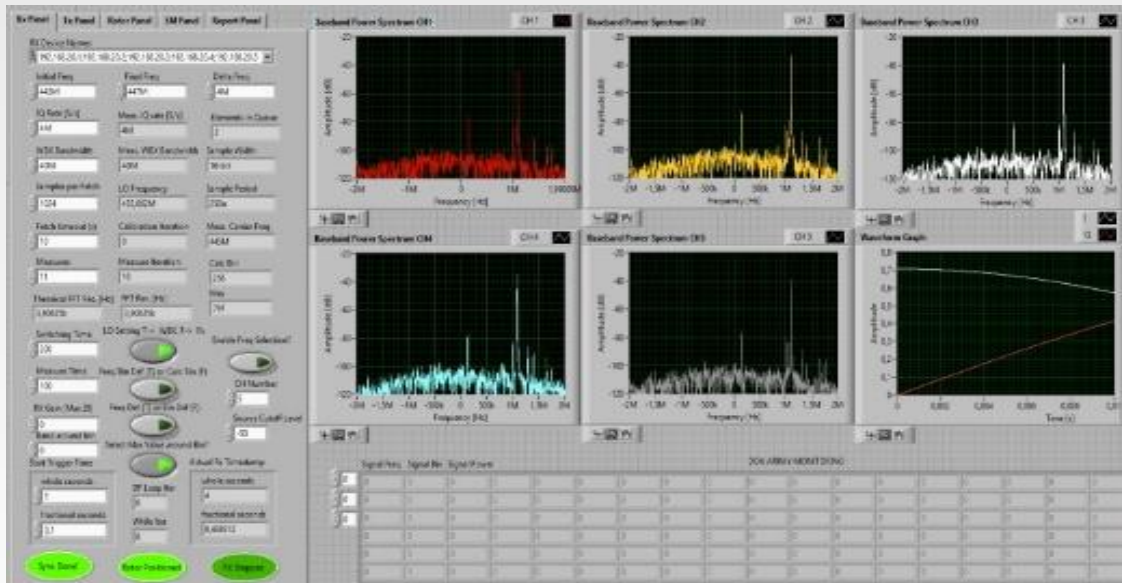
Direction Finding System HMI

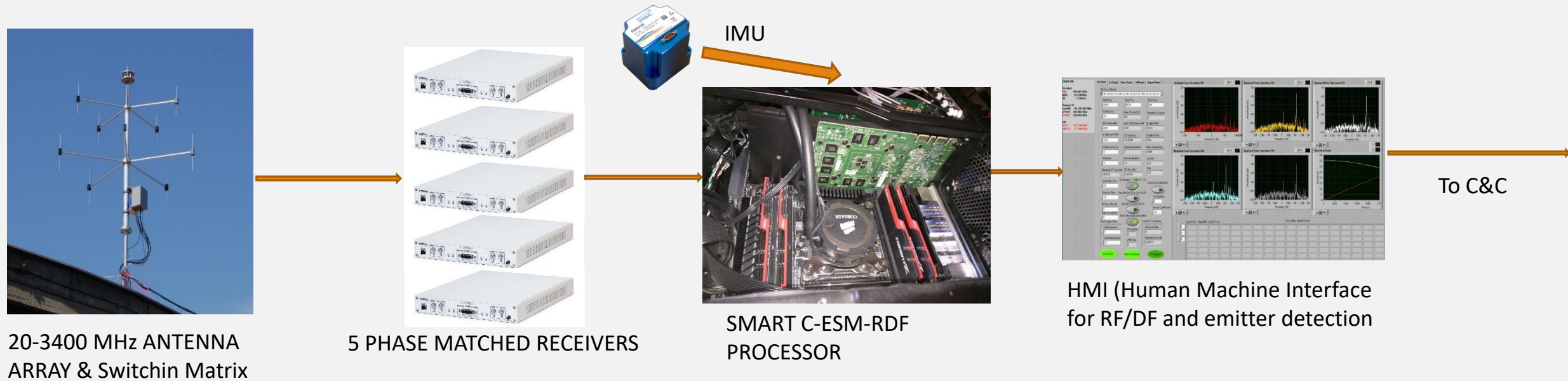*High accuracy Antenna 20-3400 MHz frequency range*

DF Antenna with lightening pole 100-400 MHz frequency range

DF Antenna 100-3400 MHz frequency range

4): DF (Direction Finder) System

IMU

20-3400 MHz ANTENNA ARRAY & Switchin Matrix

5 PHASE MATCHED RECEIVERS

SMART C-ESM-RDF PROCESSOR

HMI (Human Machine Interface for RF/DF and emitter detection

To C&C

- RF Band 30/3000 MHz - 20/6000 MHz
- Wide receiving frequency bandwidth, fast spectrum analysis and smart DOA (Direction Of Arrival) appraisal algorithms (such as vector correlative interferometry or super resolution) are the cornerstones of the C-ESM-RDF.
- Direction Of Arrival is assessed also against very short duration emissions as well as modern signals (such as TDMA, CDMA, OFDM, Frequency Hopping).
- Design, manufacturing and calibration of antenna system and main items is made all in house thus allowing the maximum flexibility and accuracy.

- C-ESM-RDF is the technological solution for direction finding and geolocalization of targets through detection and processing of their broadcast RF signals. Wide receiving frequency bandwidth, fast spectrum analysis and smart DOA (Direction Of Arrival) appraisal algorithms (such as vector correlative interferometry or super resolution) are the cornerstones of the C-ESM-RDF.
- Direction Of Arrival is assessed also against very short duration emissions as well as modern signals (such as TDMA, CDMA, OFDM, Frequency Hopping).
- Design, manufacturing and calibration of antenna system and main items is made all in house thus allowing the maximum flexibility and accuracy.
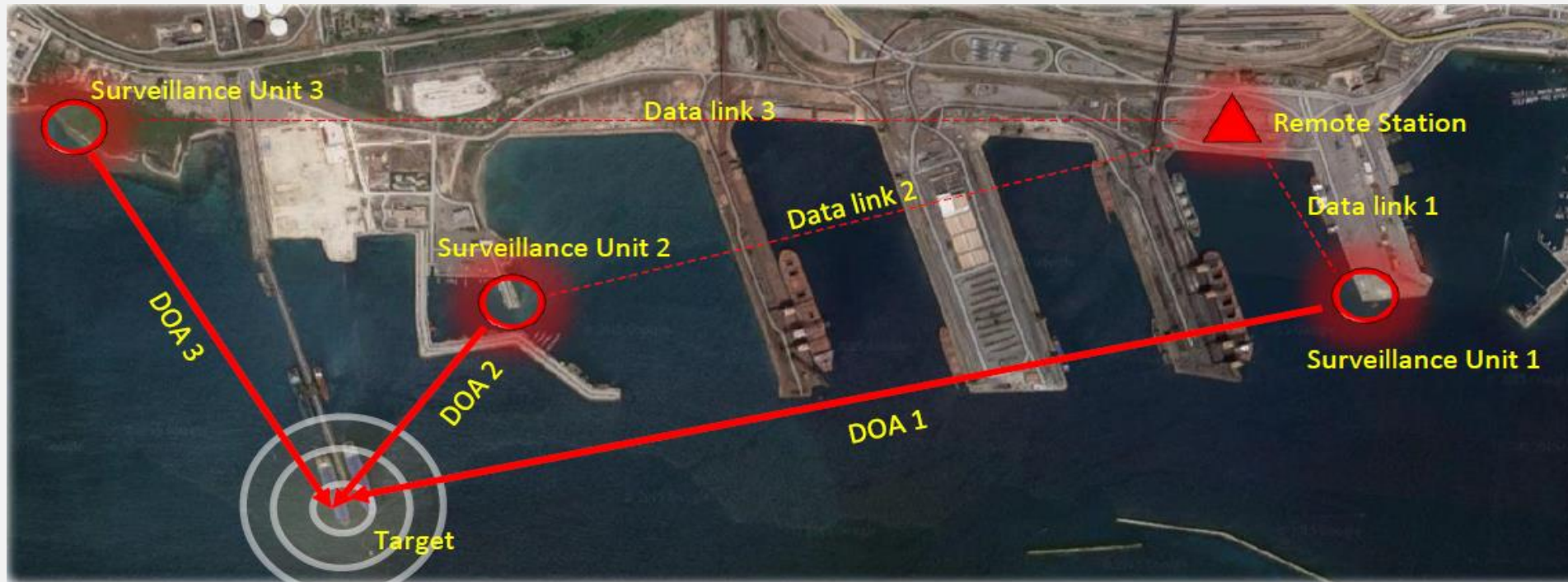
Using several systems located in different positions or a mobile station, it is possible to geolocate the broadcasters.

We design and develop **Control Boards for complex systems**. Here an example of a microturbine generator where we worked on the complete simulator of the control system and power converter (model of the microturbine implemented with the University of Florence). Implementation of the Control and Shut Down System including starting drive and booster converter.

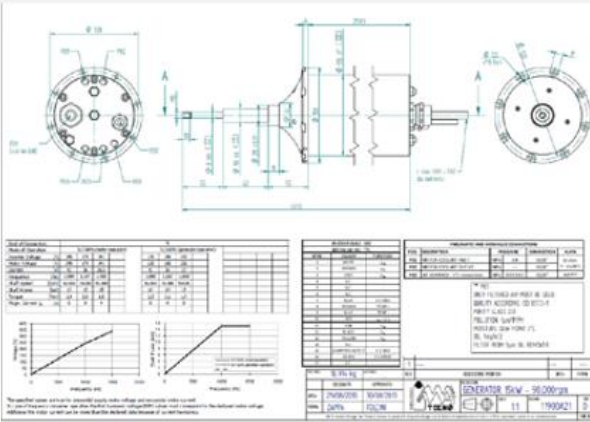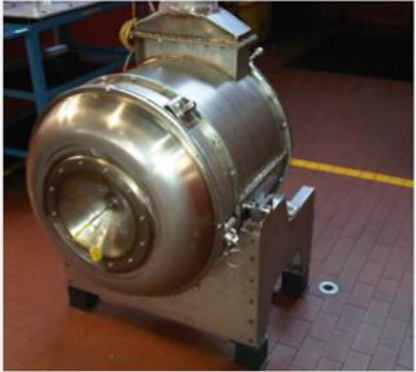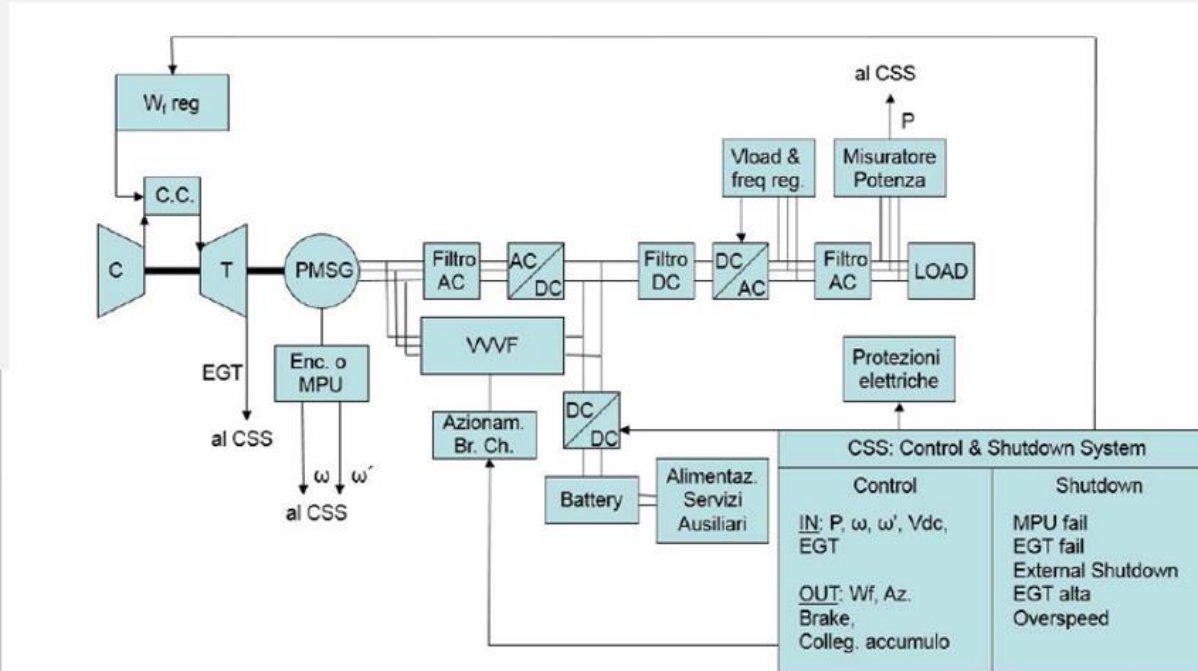Figura 45: Schema generale della macchina termica

Figura 47: Schema generale componenti sistema di controllo ed elettronica di potenza

Drive for PMSG (Permanent Magnet Synchronous Generator) with both Starter and Generator Functions

Battery booster converter with 12 kw 540/280 high frequency three-phase autotransformer with feedback card and six-phase bridge.

Microturbine control logic and actuation

SenTech develops **avionic software** as per the **DO178C standard**:

- DAL-A for one of the major Italian Defence company;
- DAL-C for a foreign Defence company.

DO178 SenTech Activities

- Equipment specification analysis.
- High level software requirements redaction.
- Low level software requirements redaction.
- Software interface requirement.
- Coding (C language MISRA).
- Software verification and testing.
- Code coverage.
- Software release.

- DO178C DAL (Design Assurance Level)
  - DAL-A: Software failure determines catastrophic failure condition for the system
    - ✓ Statement Coverage
    - ✓ Decision Coverage
    - ✓ MC/DC Coverage
  - DAL-C: Software failure determines major failure condition for the system
    - ✓ Statement Coverage
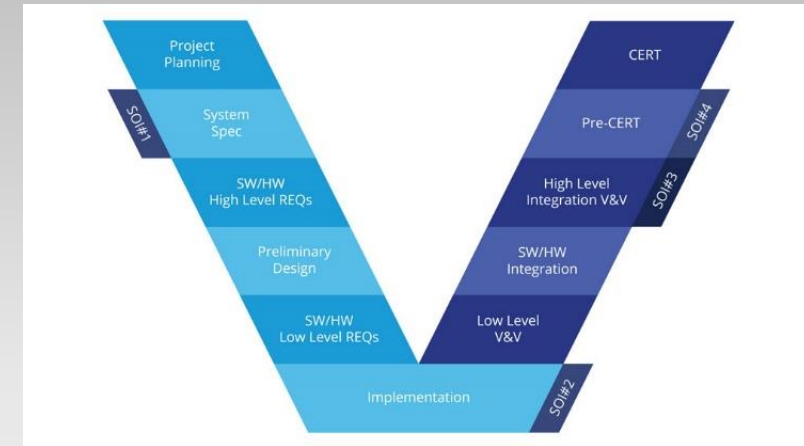
7) SENTECH RUNNING FINANCED **EDF** PROJECTS:

EDF 21 -SHOLFEA-SHoulderLaunched Family for European Armies

TOTAL COST: 2,5 M
Coordinator: GAHN
Sentech Activities: EO/IR Missile Seeker SW and FW
Others Main Partners: INSTALAZA, GELCO, STARTIUN, Others

EDF 21 -ARTURO-Advanced Radar Technology in eUROpe

TOTAL COST: 20 M
Coordinator: LEONARDO
Sentech Activities: Responsive complex Radar Target Generator and Electronic Warfare Countermeasure
Others Main Partners: AIRBUS DEFENCE AND SPACE, HENSOLDT SENSORS, INDRA SISTEMAS, THALES FRANCE, Others

EDF 22 -REACTII-Responsive Electronic Attack for Cooperation Tasks II

TOTAL COST: 69,7 M
Coordinator: INDRA SISTEMAS
Sentech Activities: Complex DES (Digital Environment Simulator) made up by Radar Emulator and a Scenario Generator capable of generating interfering signals (Comm, Radar).
Others Main Partners: ELETTRONICA, HENSOLDT SENSORS, THALES FRANCE, UNIVERSIDAD POLITECNICA DE MADRID, Others

EDF 22 -TIRESYAS-Technology Innovation for Radar European System ApplicationS

TOTAL COST: 15 M
Coordinator: LEONARDO
Sentech Activities: Generating the inputs (e.g. signals and disturbances received from both the radar and the EW apparatus) for the Radar Digital Twin implemented by Leonardo
Others Main Partners: AIRBUS DEFENCE AND SPACE, ELETTRONICA, HENSOLDT SENSORS, INDRA SISTEMAS, MBDA, Others

SenTech
Systems and Energy Technologies

7) SENTECH RUNNING FINANCED **EDF** PROJECTS:

EDF 23 -MARTE Main ARmoured Tank of Europe
TOTAL COST: 20,225 M
Coordinator: MARTE ARGE GbR
Sentech Activities: EO/IR/LPC AI SW for ATR/Change Detection
Others Main Partners: LEONARDO, Rheinmetall Landsysteme GmbH, INDRA, OTHERS

EDF 23 -SDAM4PRD SATELLITE DETECTION, ANALYSIS AND MEASUREMENTS SYSTEM FOR PROACTIVE AND REACTIVE DEFENCE
TOTAL COST: 7.377 M
Coordinator: INTEGRASYS SA
Sentech Activities: Sat Interference/jamming simulation and localization
Others Main Partners: AICOX SOLUCIONES SA, ECLIPTIC DEFENCE AND SPACE LTD, EXUS SOFTWARE

SenTech
Systems and Energy Technologies

7) eHealth

1-Sentech has development TELE-MED an integrated system for telemedicine , which can provide assistance to healthcare professionals in the following procedures: Cooperative surgery; Telementoring in surgery ; Remote consultation between specialists and health professionals

2- Veterans therapy and rehabilitation integrated system (intracranial neuronavigation system to be used during the TMS therapy phase, thus improving the precision of clinical practice; EEG recording and analysis system that can identify, using biomarkers defined through experimental measures and data present in the literature, the presence of PTSD; EEG evaluation of the areas actually stimulated by TMS)

3-Postural and EMG remote monitoring system

4-Re-Hab: System for the home-care service for the management of patients undergoing rehabilitation at the patient's home, and for the remote monitoring of related therapies;

SenTech
Systems and Energy Technologies

Customers	Industrial Cooperations
Ministero della Difesa - TERRARM	Elettronica S.p.A.
Ministero della Difesa - TELEDIFE	Leonardo S.p.A.
Ministero della Difesa - NAVARM	ESRI Italia S.p.A.
Ministero della Difesa - ARMAEREO	Expert System S.p.A.
Ministero della Difesa - COMMISERVIZI	MetaSensing S.r.l.
Elettronica S.p.A.	Dune S.r.l.
GELCO S.p.A.	Sigma Consulting S.r.l.
LEAT S.p.A.	Azienda Ospedaliera San Camillo Forlanini
Oral Engineering S.r.l.	Università La Sapienza
CELDES S.r.l.	Università Tor Vergata
Inalca S.p.A.	Campus biomedico

Giacomo Maria Russo
CEO

gmrusso@sentech.it
+39 0633610644
+39 3245646663

www.sentech.it
PEC: Sentech@pec.it

SenTech
Systems and Energy Technologies