ATDI

SPECTRUM MANAGEMENT & ELECTRONIC WARFARE

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Today's Agenda

1. Introducing ATDI
2. Automated Battlespace Spectrum Management Solution
3. HTZ Warfare - key capabilities and demo videos

A. Annex 1 – HTZ Warfare technical capabilities

A. Annex 2 – Key references

About Us

BATTLESPACE SPECTRUM MANAGEMENT AND ELECTRONIC WARFARE NETWORK PLANNING AND MODELLING SOFTWARE SOLUTIONS

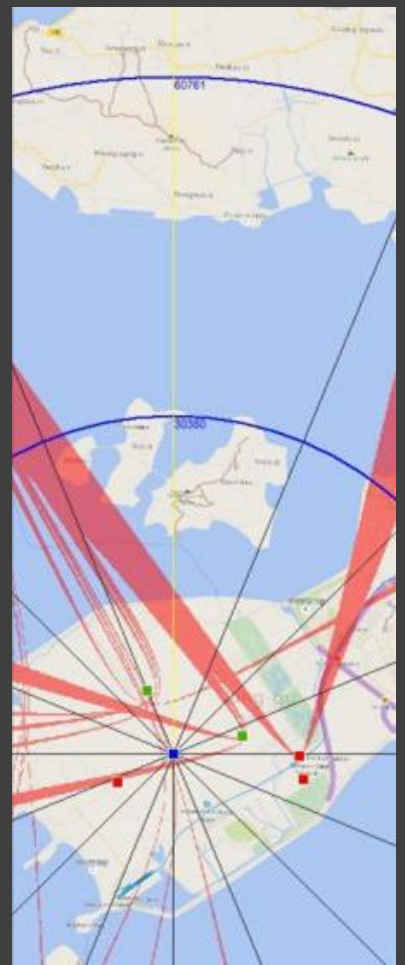
OUR FOCUS IS TO SUCCEED AT EVERY LEVEL OF COMMAND IN ELECTROMAGNETIC SPECTRUM OPERATIONS

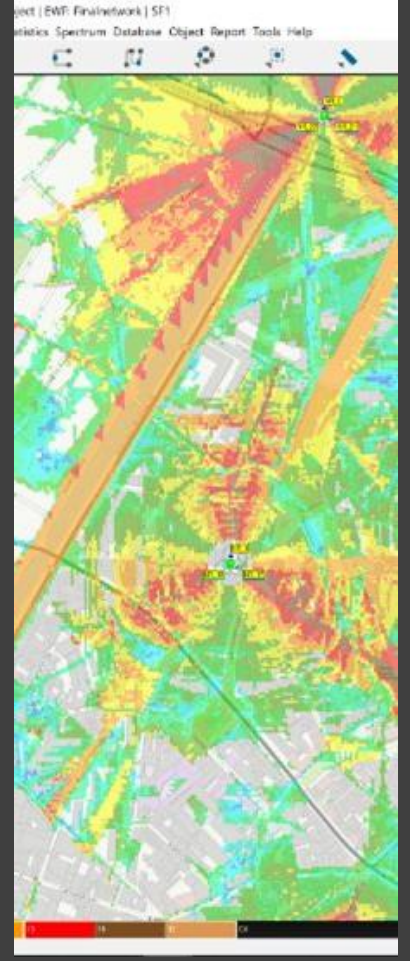
ATDI are global leaders in the development and implementation of automated spectrum management solutions.

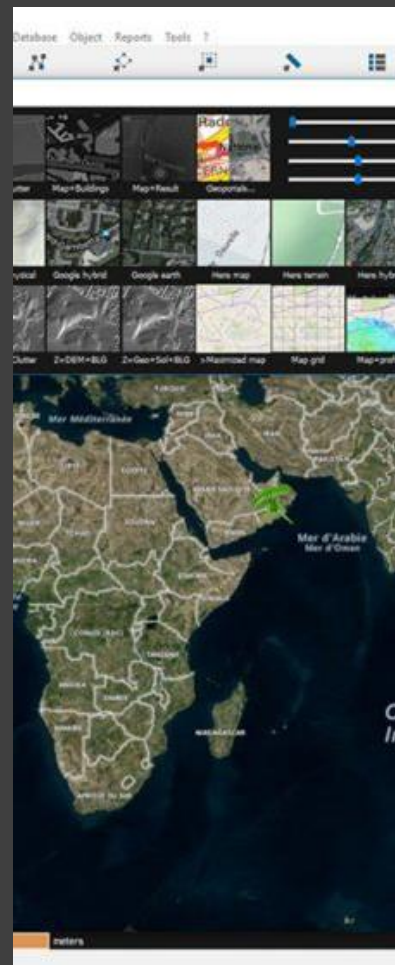
For over three decades, we have backed over 2,000 civil and defence spectrum agencies, operators and vendors. Our solutions continue to evolve to meet the growing needs of the defence industry.

We provide a unique and global solutions for:

- **Radio planning and optimisation:** activities for all communication and transmission systems used by the Ground/Air/Sea/Space forces;
- **Frequency management (FM)**
- **Spectrum management solution (SMS):** for planning, coordinating, and managing joint use of the EMS through operational, engineering and administrative procedures;
- **Electronic Warfare (EW)** management / interception and intelligence

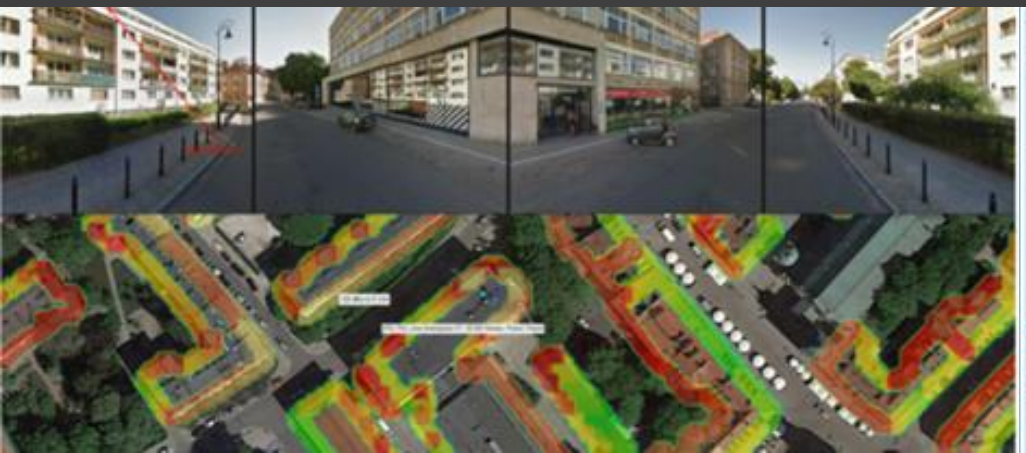


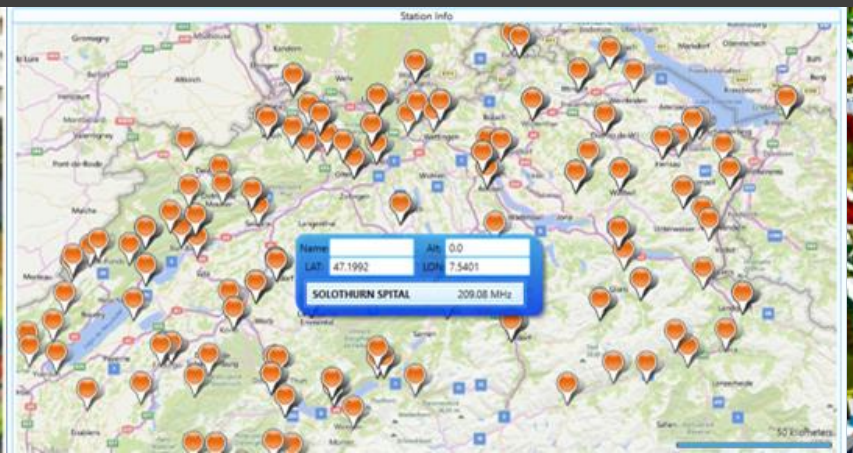


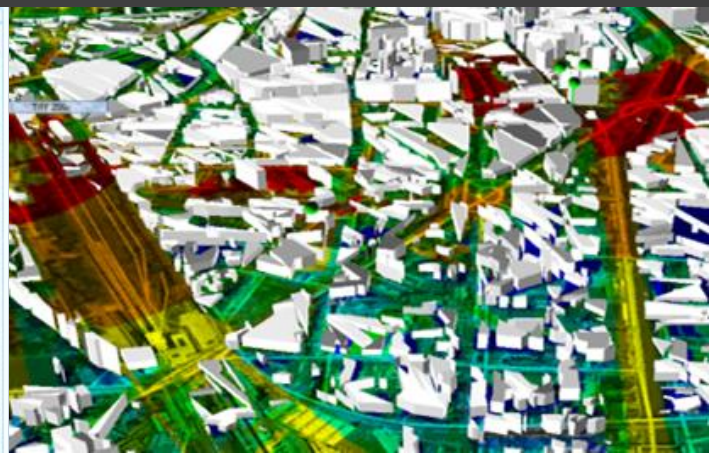


Our
Values & Contributions

- Dedicated R&D to ensure we stay ahead of the game
- Solutions compatible with ITU regulations. Contributions to industry organisations including ITU-R and ITU-D, NATO-STCCT, DCI and Old Crows.
- Our team has an excellent understanding of our customers needs – how – discussions/industry experience and a desire to find the best fit (solution) for the end user
- Our team – built from diverse backgrounds enables us to draw from a wealth of knowledge and understanding of the industry and its requirements
- Work in partnership with our end users to ensure both pre-production, throughout project rollout and beyond.







Our Offices
Global Footprint

- Allows us to leverage different time zones
- Provide support around the clock
- Fast response times

- Draw resources from across the group to support larger projects ensuring we offer the very best services to our end users

- Shared experiences – combining many man-years experience across the group. At every stage of the project (from project outset to going live) we aim to learn and improve our services. To do that we carry out regular internal project reviews and a group review at handover.

Automated Battlespace
Spectrum Management Solution

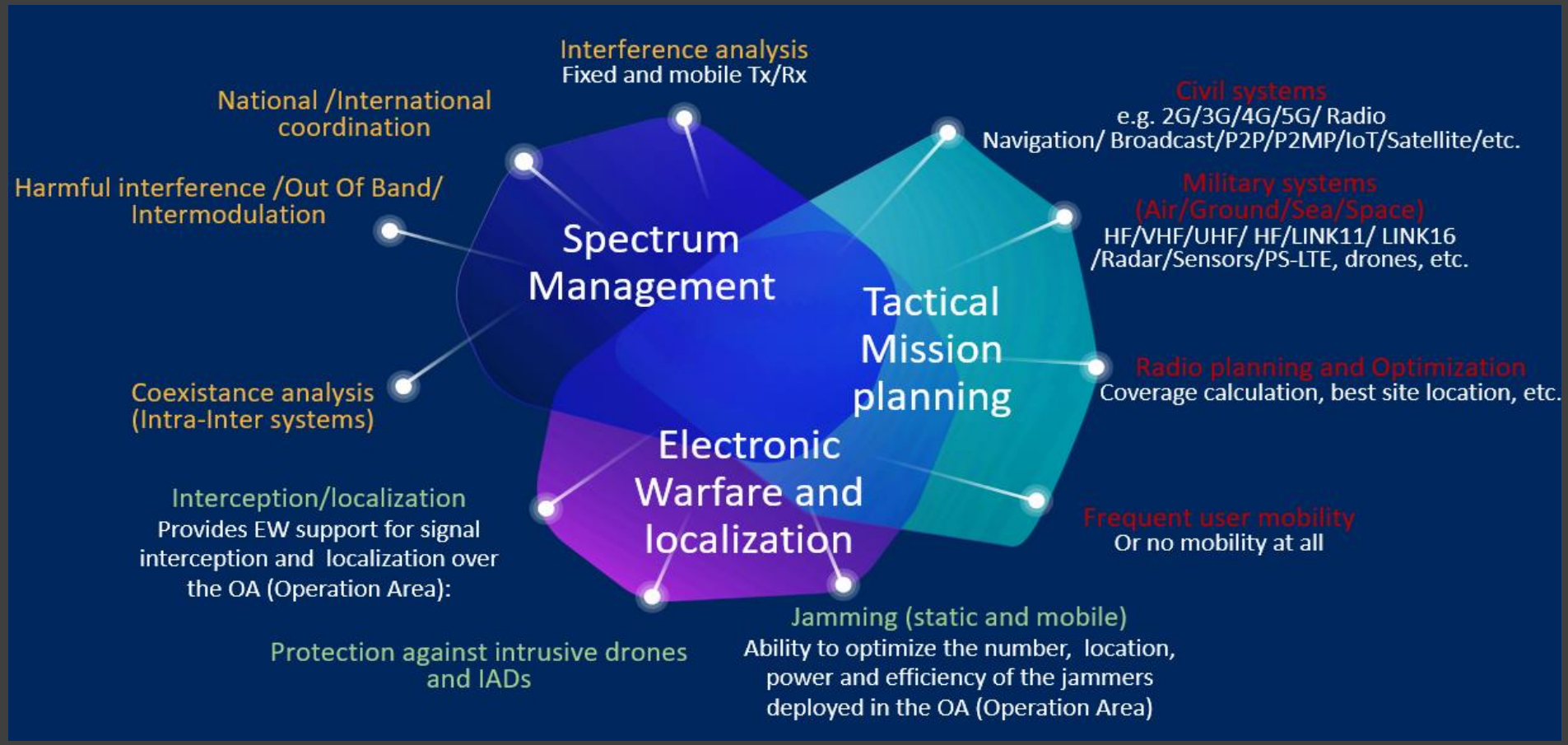
Electromagnetic Spectrum (EMS) is widely used for military operations. Competing demands for radio spectrum means it must be strictly coordinated and controlled. Battlespace spectrum management is the planning, coordination and management of EMS, to enable military systems to perform their functions without causing or suffering from harmful interference.

With over three decades of development, ATDI has developed a leading military network planning, EW modelling tool and frequency management solutions, HTZ Warfare and ICS manager.

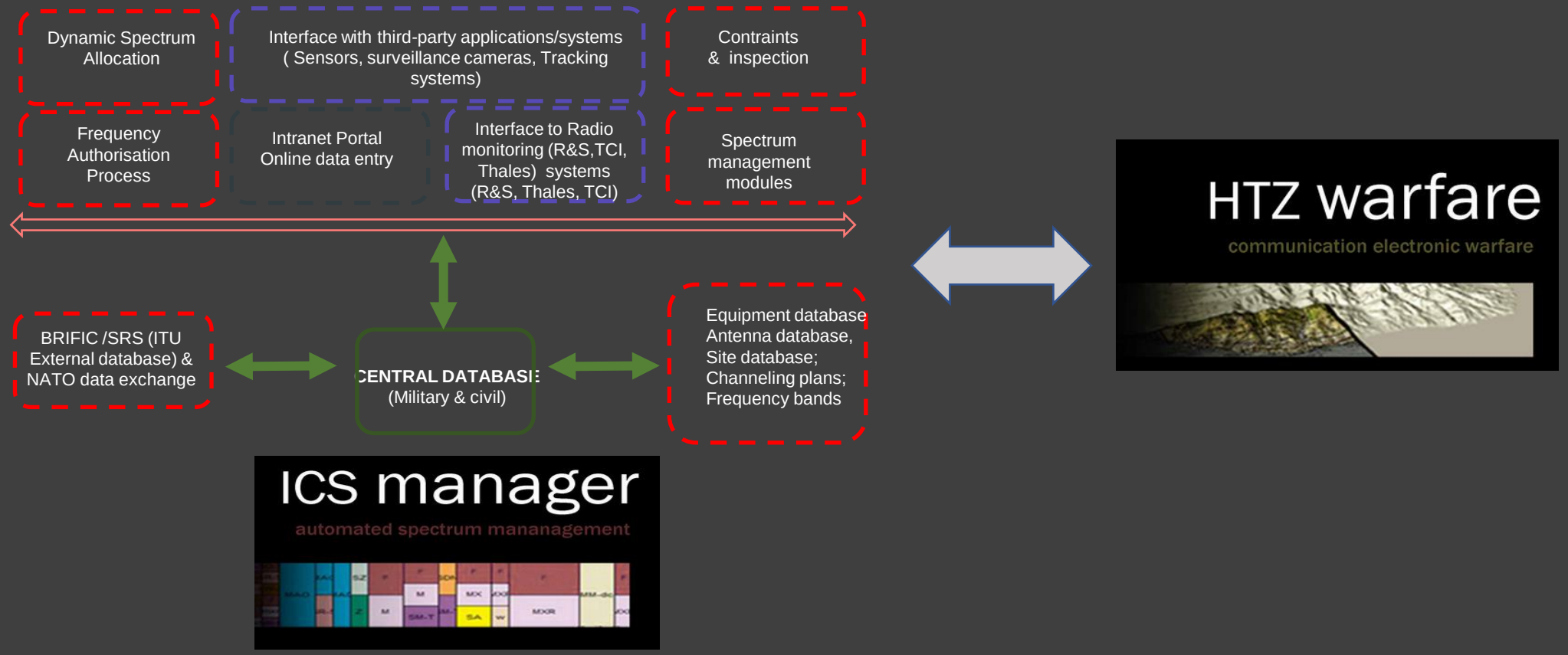
Our solutions allow defence spectrum managers to:

- **Control** the use of spectrum
- **Deconflict** electromagnetic spectrum interference
- **Joint Mission Operation** support standard mission planning data (SFAF, SMEDEF-XML, etc)
- **Tactical Mission Planning** rapid tactical mission network deployment and frequency assignment
- **Convert** private GIS dataset to secure confidential information
- **Automate** complex mission planning workflows to support field operations
- **Share and Control** database to support simultaneous data access

Automated Battlespace
Spectrum Management Solution



Automated Battlespace
Spectrum Management Solution



HTZ Warfare
All-in-One Multi Technology Capability

HTZ WARFARE SUPPORTS ALL TECHNOLOGIES & FUNCTIONS FOR THE DEFENCE AND SECURITY MARKETS:

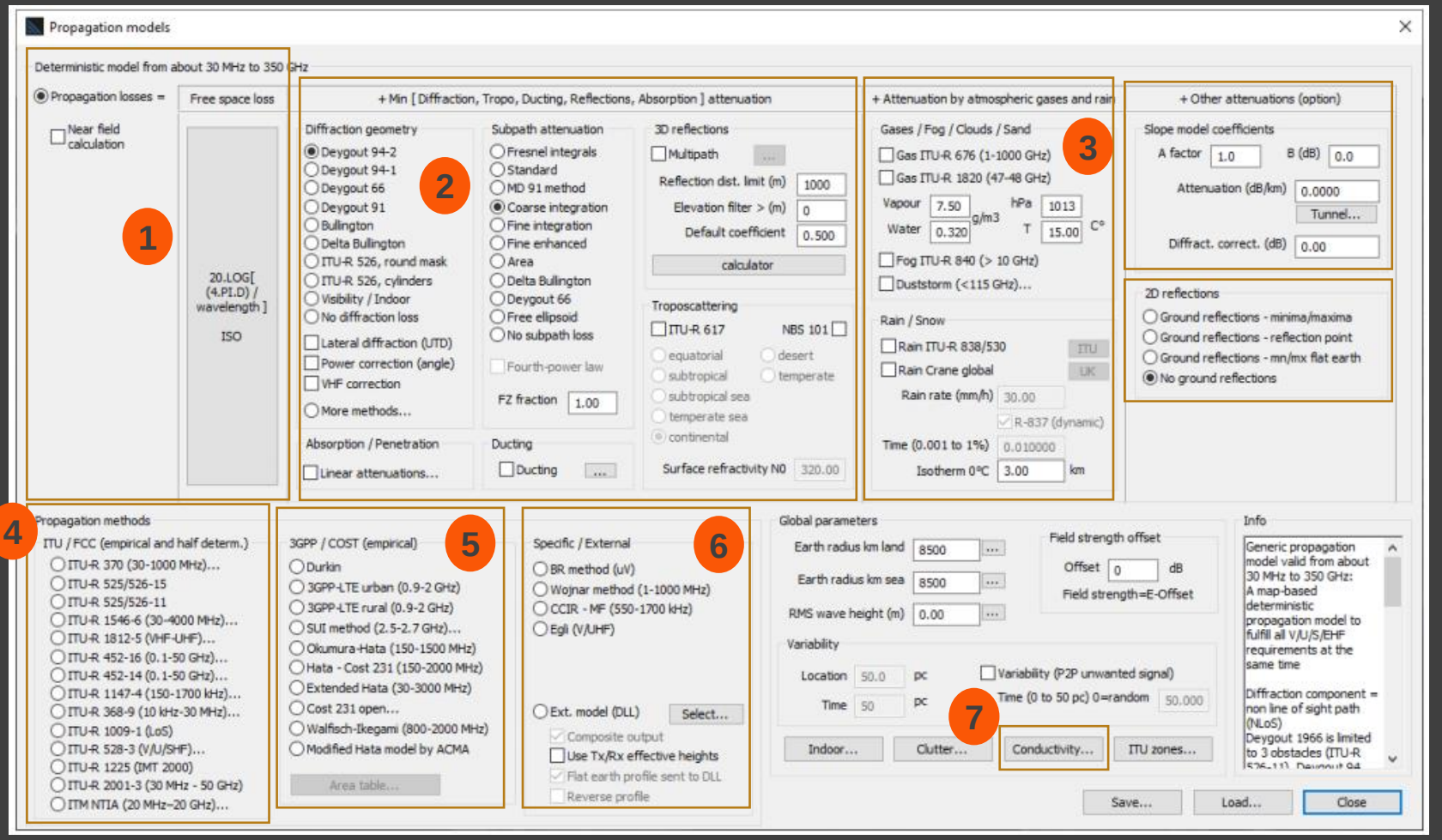
- Radio Critical Communication: VHF/UHF, HF, LINK11, LINK16, TETRA, PMR, TETRAPOL , P25, DMR, CDMA, CDMA 2000, TEDS, PR4G, PS-LTE (Public Safety) , paging…
- Satellite/Earth station
- Microwave-links & Point to Multi-Points
- Radio cellular technologies: GSM, GPRS, EDGE, EDGE Evolution PMR, Trunked Radio Systems (TETRA, TETRAPOL, APCO-25, MPT 1327), GSM-R, DCS, CDMA EVDO GPRS, Wi-Fi (802.11a/b/g/ac), WiMax (802.16 a/d/e), UMTS, R99, HSDPA, HSUPA, HSPA+, DB-HSDPA, DC-HSDPA, CDMA 2000 1x, CDMA 200 EV-DO, DCS, LTE Advanced (latest 3GPP release), MBSFN-LTE, NB-IoT (3GPP), IoT/LoRA/SigFox, WiFi, Ingenu, LoWPAN, RPMA, Zigbee, Enocean, ISA 100, LTE-M, LTE-R (TDD/FDD), ZWave, Mesh network, Smart Grid, CISCO smart grid technology, 5G-NR (FDD/TDD), SCADA,
- Aeronautical & UAVs : Communications (Ground To Ground/Ground To Air), Radio Navigation (GP, markers, Loc, MLAT, DME, TACAN, NDB, Markers, GBAS RX, MLS AZ, etc.) and Surveillance systems, drones
- Radio-localisation: (DF/Sensors/MLAT, Telemetry, TDOA, RSSI, etc.)
- Jammers (Fixed frequency mode, **wide band – diffusion** , **wide band – adaptive mode)**
- Broadcast : Radio analog and digital (FM, AM, LF/MF, TDAB, etc.), TV analog and digital (DVB, DVB-T2, ISDB-T, DMR, DVB-S, DVBS2, etc.)
- Subscribers and User Equipment

HTZ WARFARE SUPPORTS ALL TECHNOLOGIES & FUNCTIONS FOR THE DEFENCE AND SECURITY MARKETS, INCLUDING:

- TACTICAL COMMUNICATIONS (ELINT, COMINT)
- UAV/UAS MISSION PLANNING
- MARITIME COMMUNICATIONS
- LMR/PMR/P25/TETRA
- PUBLIC SAFETY NETWORK/PPDR
- HF COVERAGE ANALYSIS
- MICROWAVE LINKS
- SATELLITE & EARTH SEGMENT (GSO/NON-GSO) DESIGN
- RADAR, INTERCEPTION, JAMMING EFFICIENCY

HTZ Warfare
Propagation models

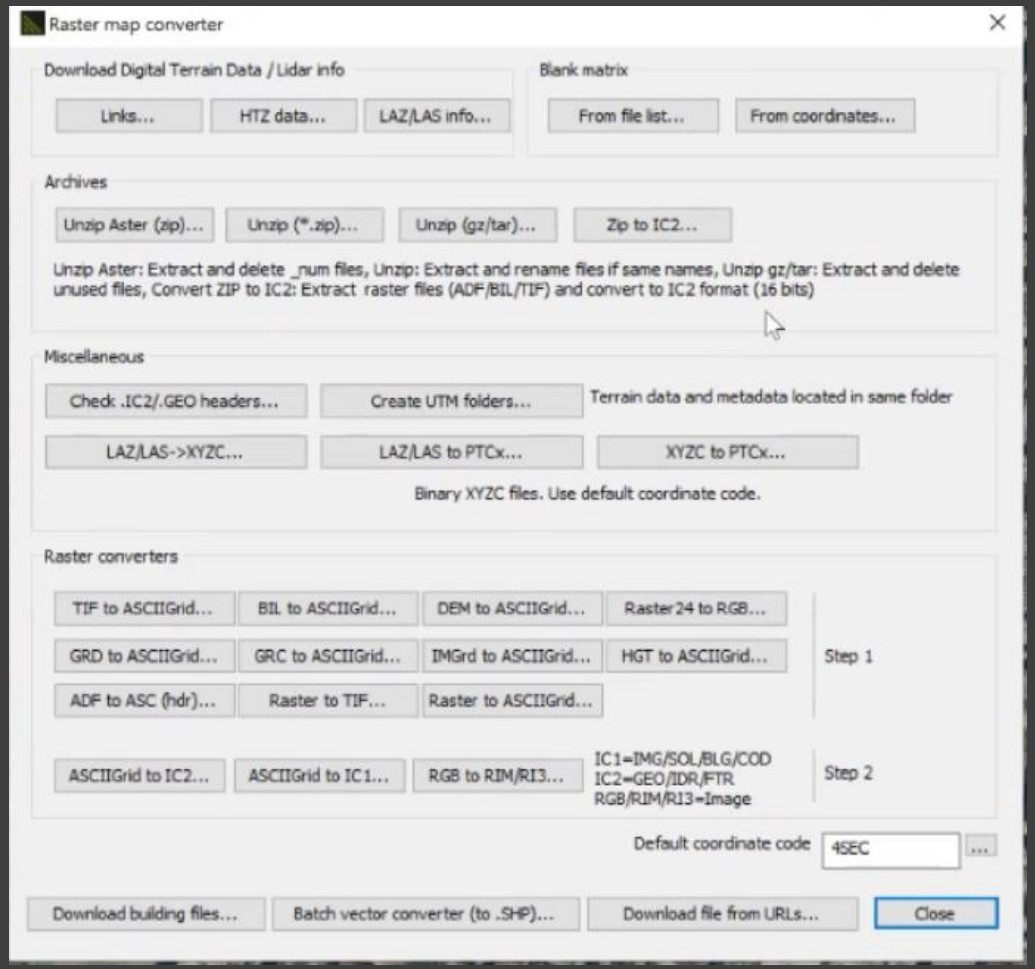
1. Free Space model
2. Diffraction models
3. Tropo-scattering models
4. Deterministic ITU Recommendations
5. Industry standard models including aeronautical models
6. Specific/external & custom-built models
7. HF conductivity model



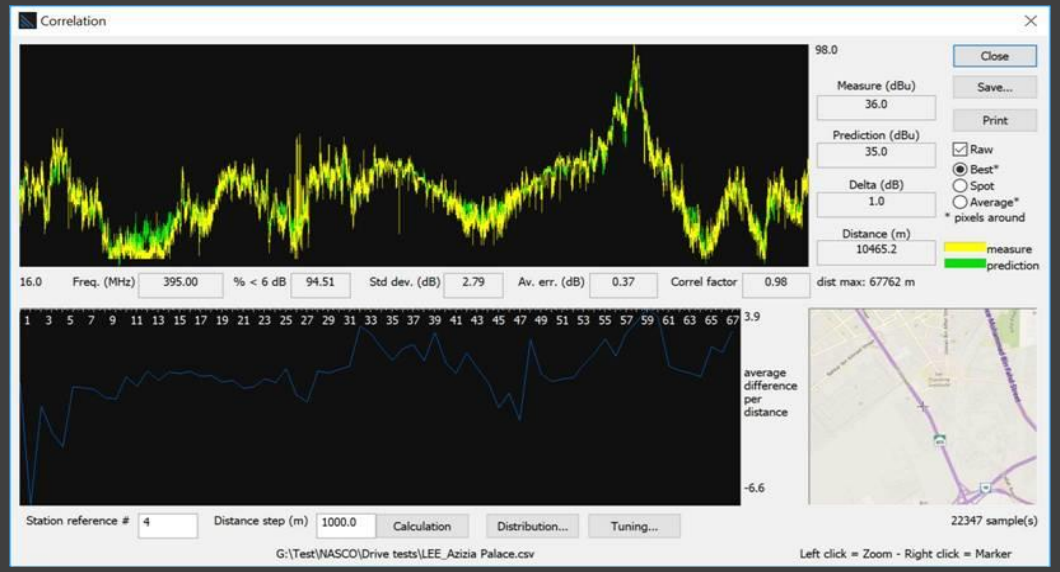
HTZ Warfare
Robust GIS Data Support

HTZ Warfare has various tools to acquire and manage digital maps including DTM, clutter, image and vector files

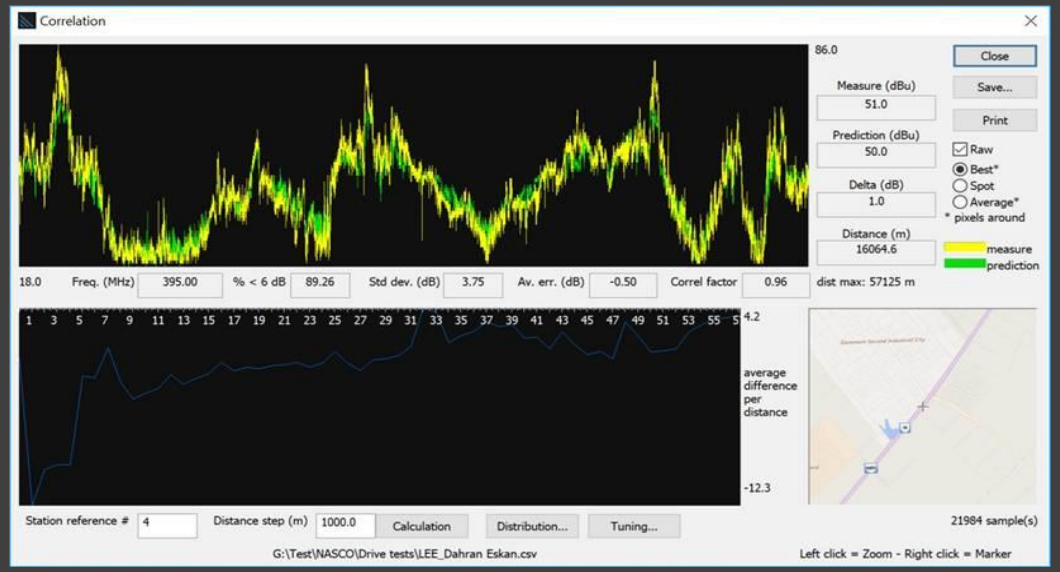
- In-built tool to access ATDI GIS database to download medium to high resolution DTM and clutter worldwide. High resolution 3D building layer is also available for some cities;
- 3rd party map image API connection like Google Maps, MS Bing Maps, Geospatial, Open Street Maps, etc.
- Private GIS data conversion using Raster Map Converter in HTZ Warfare. The tool supports generic formats to convert into HTZ formats.
- Data production and development services are also available for any specific project needs.



HTZ Warfare
Unprecedented Modelling Accuracy

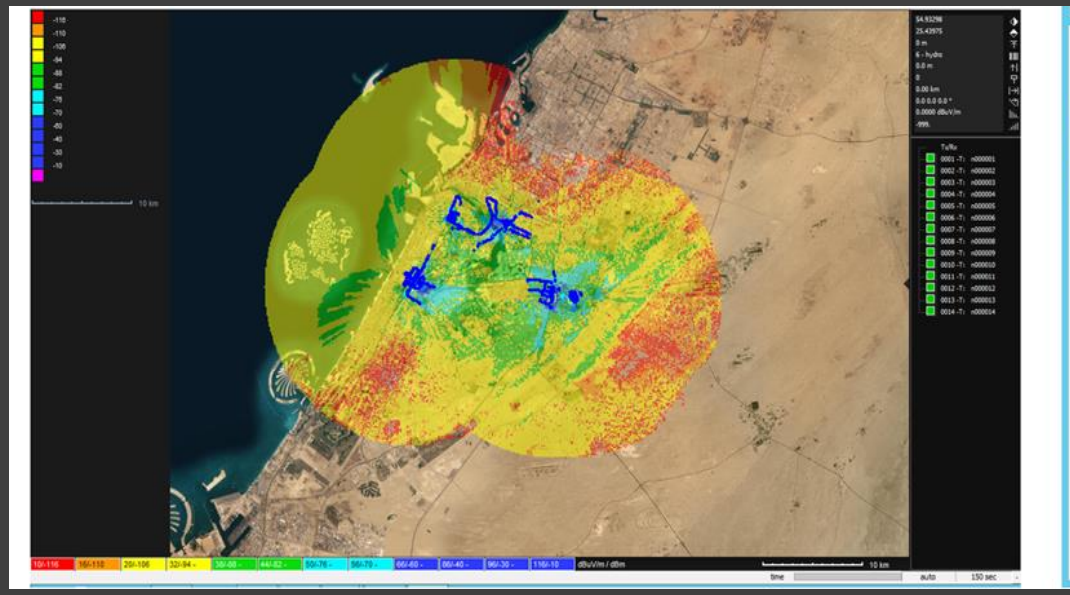


TETRA station located in Dammam KSA (Azizia Palace)
Standard Deviation Error (dB): 2.79
Correlation Factor: 0.98
Sample measurement: 22347

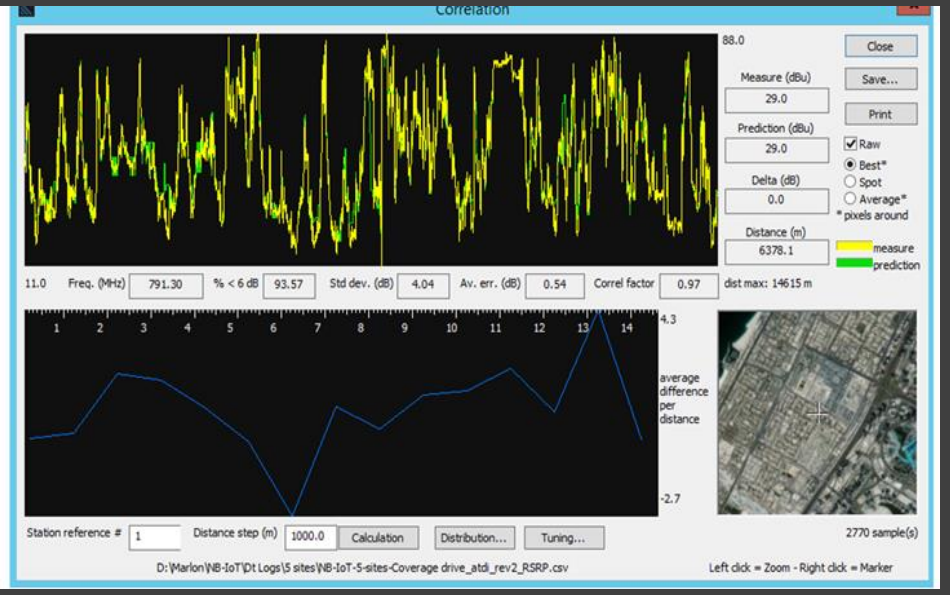


TETRA station located in Dahran Eskan (KSA)
Standard Deviation Error (dB): 3.75
Correlation Factor: 0.96
Sample measurement: 21984

HTZ Warfare
Unprecedented Modelling Accuracy



5G-NR coverage prediction (3.5GHz) Dubai city (UAE)



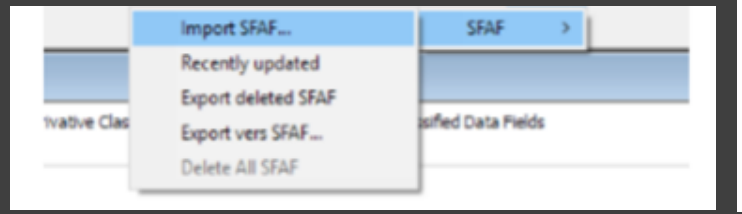
NE501 RSRP coverage prediction vs. Scanner (3.5GHz) Dubai city (UAE)
Standard Deviation Error (dB): 4.04
Correlation Factor: 0.97
Sample measurement: 2770

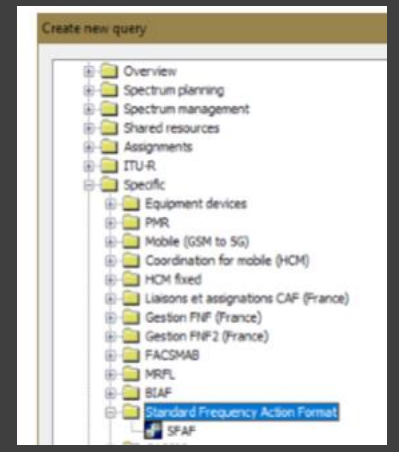
HTZ Warfare
Tactical Mission Planning

In the mission critical environment, access to online and offline operations for rapid network planning and frequency assignment is the key for the mission success. HTZ Warfare supports:

- Examines links between communication assets and assesses the performance of the link in detail. All simulations are based on proven, accurate simulation methods;
- Moves individual sites and analyses communication capabilities virtually instantly;
- Assesses the impact of communication site failures and their impact on the network, so that contingency plans can be included as part of the normal system design process;
- Identifies network capabilities for moving elements, such as convoys, through hostile territory. Suitable locations for talk-through sites can be easily identified;
- Supports the complete design of communication networks, including the ability to minimise interference, assign frequencies and generate alternative communication plans;
- Network changes to any part of a network can be analysed and viewed virtually instantaneously. This includes the ability to assess the effect of failure or enemy action on the network. This supports mitigation planning and reduces the likelihood of communication failures in the field;

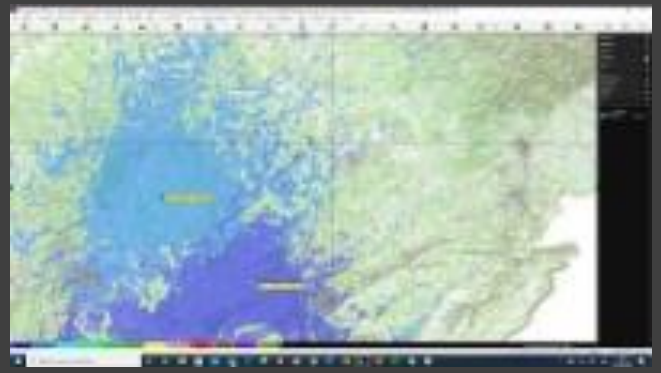
SFAF and SMADEF-XML formats are compatible





HTZ Warfare
Tactical Mission Planning demonstration

Part 1: Mission Scenario and Project Set up in HTZ Warfare
http://www.youtube.com/watch?v=mdKWJaw09GQ



Part 2_Mission Network Analysis and Frequency Assignment
http://www.youtube.com/watch?v=cHZIWm8ycSE

Part 3_HTZ Warfare mission planning process summary
http://www.youtube.com/watch?v=S7_2IAkoctM

HTZ Warfare
Electronic Warfare

Battlespace spectrum management is the planning, coordination and management of EMS, to enable military systems to perform their functions without causing or suffering from harmful interference.

Significant importance is placed on the performance of radio intercept receivers, direction finders and communications jamming equipment. Key features that determine the success of a mission is the ability to intercept or jam enemy communications. And similarly, to share information with the command structure without undue interference.

- Assess the risk of interception or jamming by known enemy electronic warfare assets;
- Electronic warfare for communications planning can be included by analysing intercept vulnerability, identifying the possible effects of enemy jamming and developing plans to overcome these factors;
- Plans for the deployment of intercept receivers, including intercept coverage assessment and gap identification, maximising the efficiency of deployed sensors or minimising the assets assigned to a given objective;
- Deploy direction finders with best site searching, DF baseline coverage assessment and communications planning between assets. The system can be integrated with DF systems, so that DF hits can be displayed directly on the planner's screen;
- Plan offensive communication jamming missions, including asset optimisation, communications planning and assessments of jamming effects on own communications systems;
- Determine the vulnerable points in known enemy communications systems and prioritise targets for attack.

HTZ Warfare
Electronic Warfare Use Case

UAV/UAS Counter-drone network analysis

Part 1: Mission Scenario and Project Set up in HTZ Warfare
https://www.youtube.com/watch?v=5EqnNwfG7xw&t=1s

Part 2 Counter-drone jamming effects analysis in HTZ Warfare
http://www.youtube.com/watch?v=M3fYDETfNv8

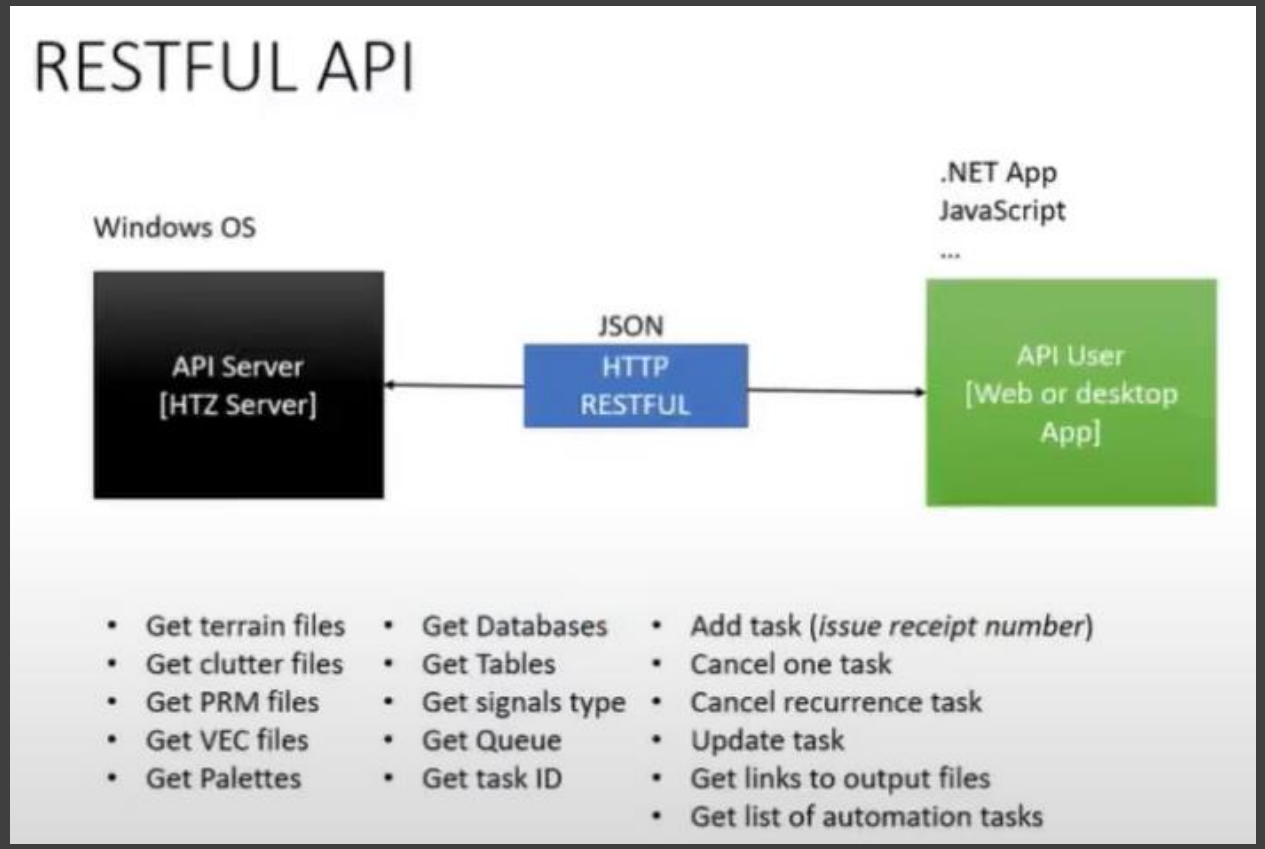
HTZ Warfare
Planning Automation

Staying connected to Headquarters while in enemy territory is an essential part of many military missions.

HTZ Warfare provides the ability to custom workflows to support different end-user requirements or system capabilities. This simplifies interfaces for software users who may not have a radio propagation background.

For instance, by identifying the areas with no possible communication with headquarters, routes can be chosen for ground vehicles, helicopters and planes moving at different speeds and using different types of equipment.

The entire planning and problem solving is managed in an automated fashion.



HTZ Warfare
Planning Automation use case (videos)

Part 1: MANET concept and introduction
http://www.youtube.com/watch?v=-NAFafSWWog

Part 2: Project set up and simulation analysis in HTZ Warfare
http://www.youtube.com/watch?v=UGrBOjz83CA

Part 3: Continue Part 2 and Automation in HTZ Warfare (**starts at 8:10)**
http://www.youtube.com/watch?v=7bg8HFhT4Sc

Our Services

Training

Customised training service online or onsite.

Support

24/7 global technical support via phone, email and web-conference

System Customisation

Business analysis, system design, architecture, customisation, integration, and configuration.

Spectrum consulting

Provide professional consulting services in spectrum engineering and management to solve any spectrum issues.

Cartographic data

Medium to High resolution DTM and Clutter library.
Cloud base digital map image streaming and cache support.

System Deployment & Maintenance

Support on Go-Live, Testing, and bug fixing.
On-going maintenance support with software updates.

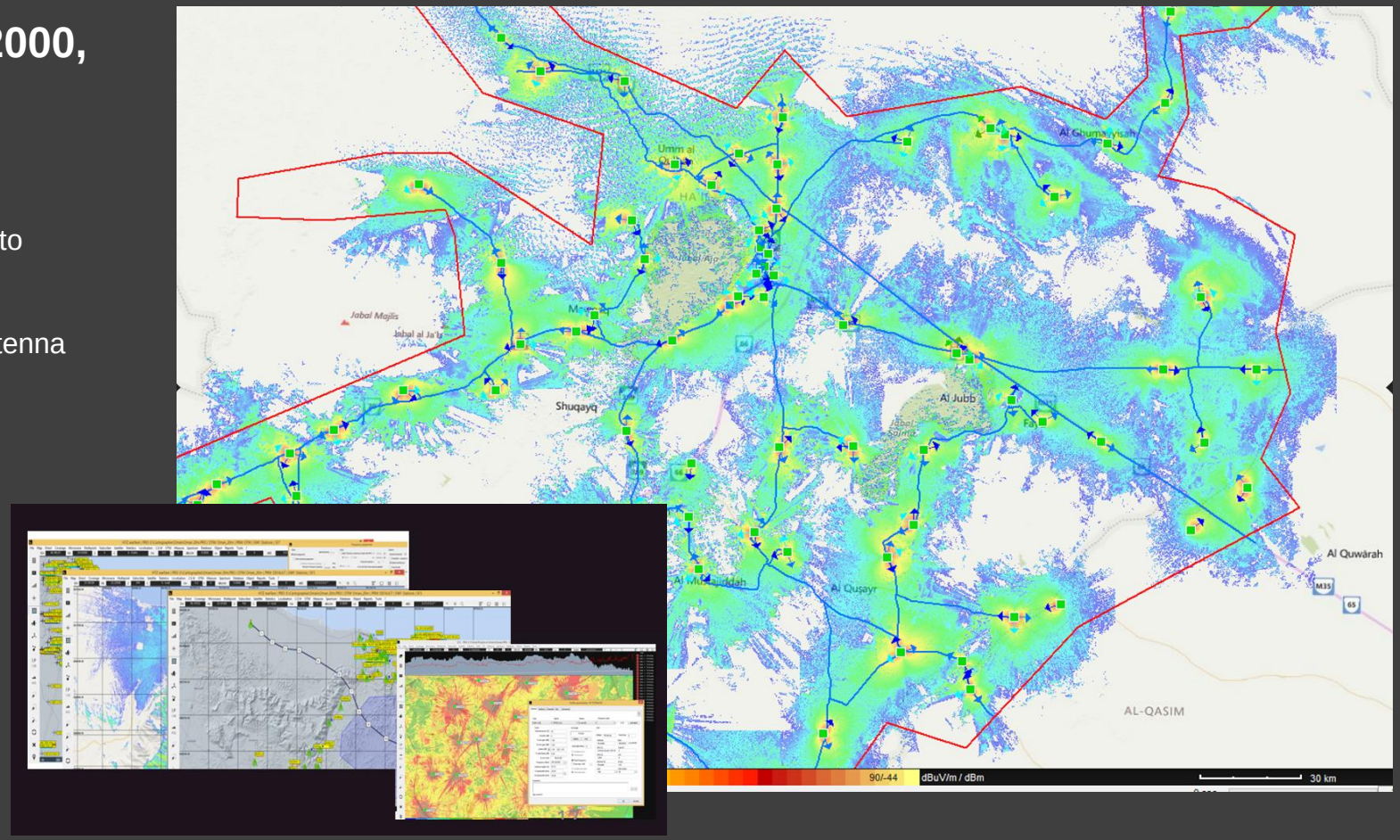
Annex

Technical Analysis Capabilities in HTZ Warfare

HTZ Warfare
Critical Comms Network Planning

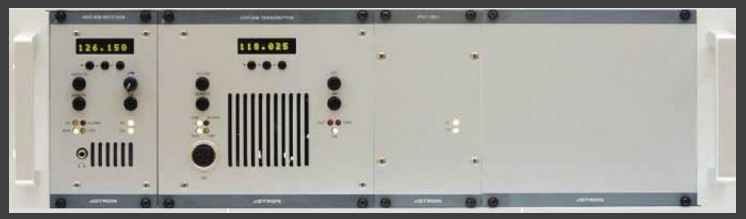
TETRA, P25, DMR, CDMA, CDMA 2000, TEDS,
TETRAPOL, PS-LTE, VHF/UHF…

- DL/UL Coverage planning (outdoor, indoor , in car)
- DL/UL link budget calculator
- Automatic best site selection candidates according to coverage objective
- Automatic site planning
- Automatic site optimization (azimuth, power, tilt, antenna model…)
- Interference calculations
- Automatic Frequency assignment
- Traffic & mobility profile editor (UE)
- Capacity planning (Erlang, data)
- Automated handover, neighbor list planning
- Monte Carlo simulations



HTZ Warfare
Critical Comms Network Planning

Ground to Ground Communications

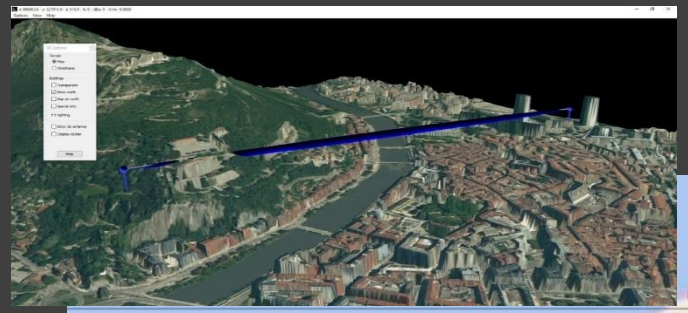


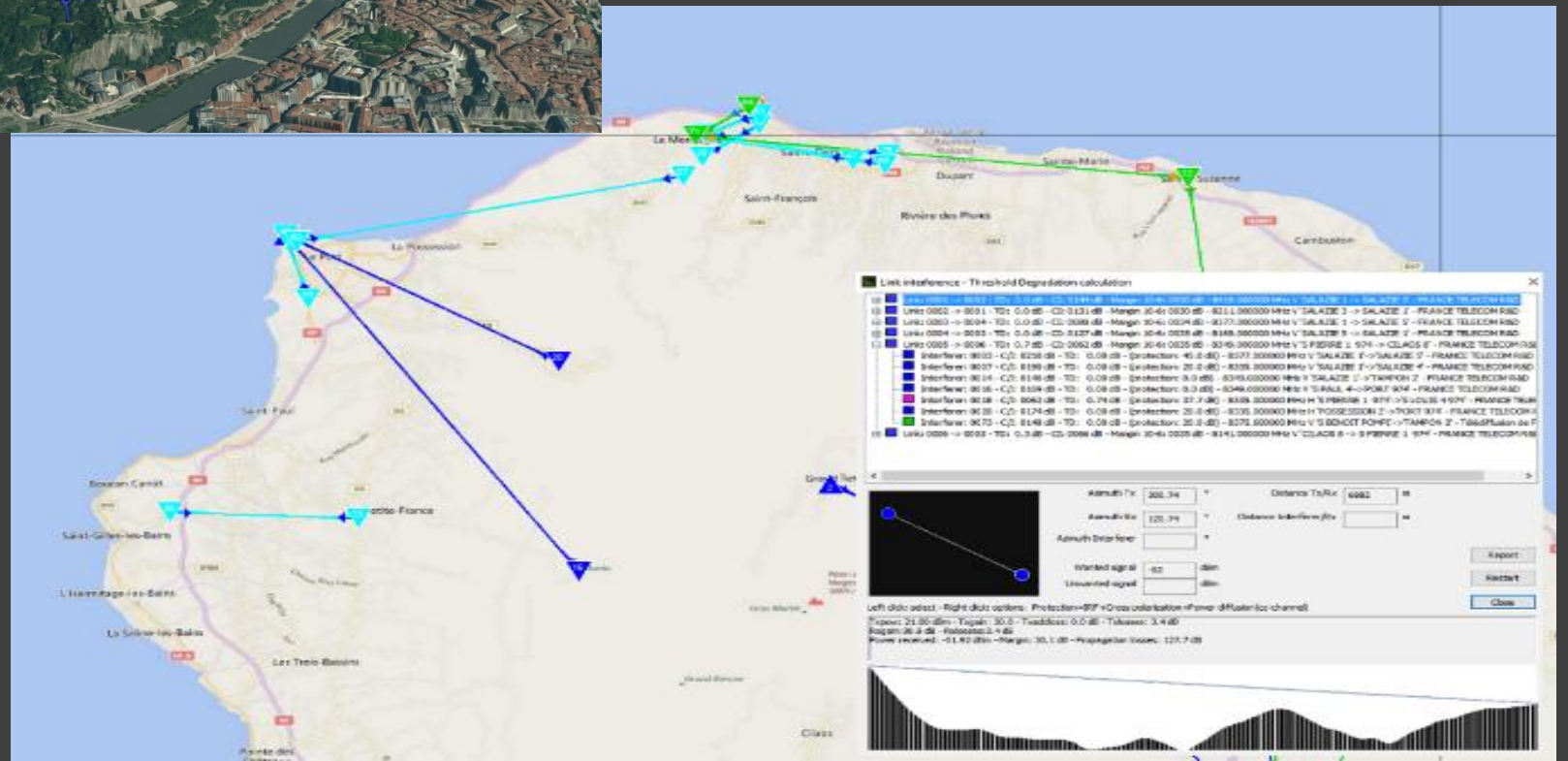
VHF AM radio base station JOTRON (TR-7550)
- Portable Radios (ICOM)
- Mobile Radios (ICOM)

ITEM	CH FREQ. (MHZ)	USE
1	CH 1: 133.500	Ground to Ground communication
2	CH 2: 121.700	Operation room to Tower communication
3	CH 3: 118.100	Monitor in operation room from Air to Ground communication

HTZ Warfare
Microwave, P2MP, Backhaul, mm Wave bands

- Profile budget calculations
- Frequency and space diversity
- Multi-K factor calculations
- Climate and rain parameters
- Reliability calculations
- Automatic antenna orientation
- Link optimization
- Automated frequency planning
- Interference calculations
- Quality objectives calculations (ITU-R F. 1703 and ITU-T G.827
- MIMO Antenna systems
- M2M, D2D, SCADA, CDMA 450, MMDS, WiMAX, LMDS, etc.

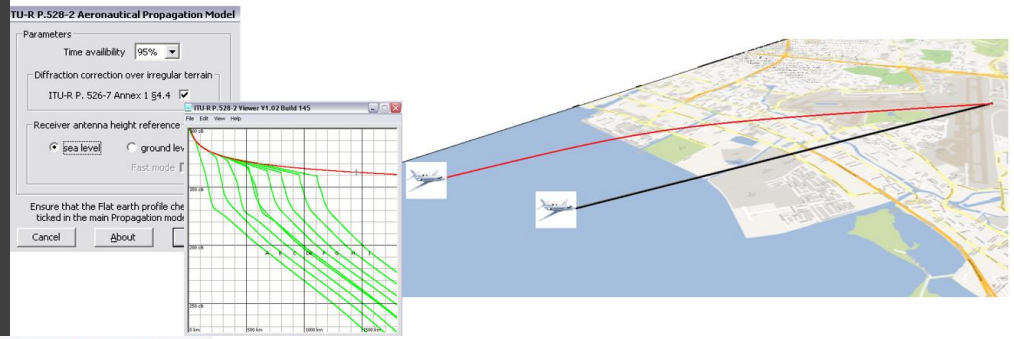


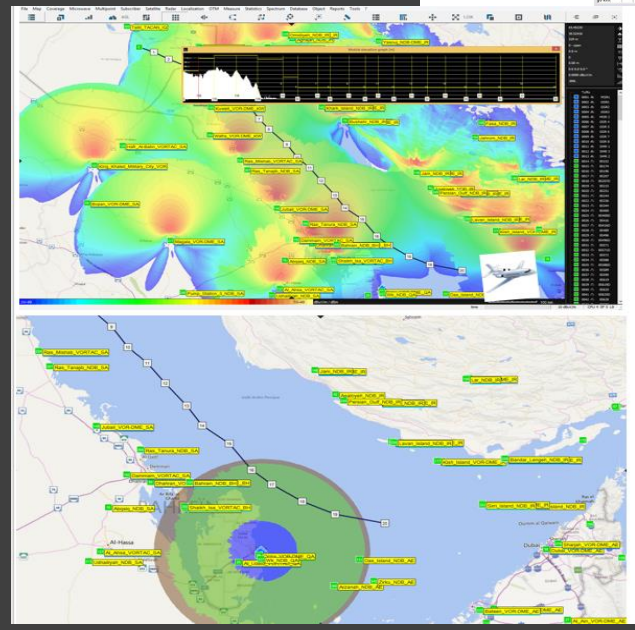


HTZ Warfare
Aeronautical Services

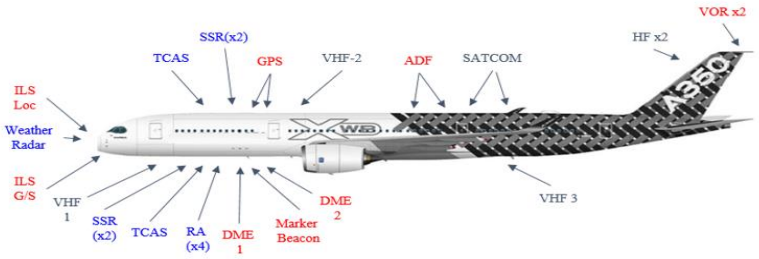
- Aeronautical Communication Systems (VHF/UHF Ground To Air, Air to Ground, Broadband LTE A2G (Air To Ground),
- Radio navigation systems: GP, markers, Loc, MLAT, DME, TACAN, NDB, Markers, GBAS RX, MLS AZ, etc.
- Surveillance system: Radar (PSR, SSR, etc.) including coverage, interference and coexistence analysis
- Multi-lateration (Time Sum of arrival – TSOA / Time Difference of arrival (TDOA)
- Building restricted area ICAO recommendations
- Coexistence between aeronautical services and FM network (ITU-R/ SM1009)
- Coexistence between radar and LTE network (from OFCOM recommendations)
- Traffic/Interference analysis and Automatic Frequency Assignment

ITU-R P. 528-2 + ITU-R P.526-7 (diffraction)



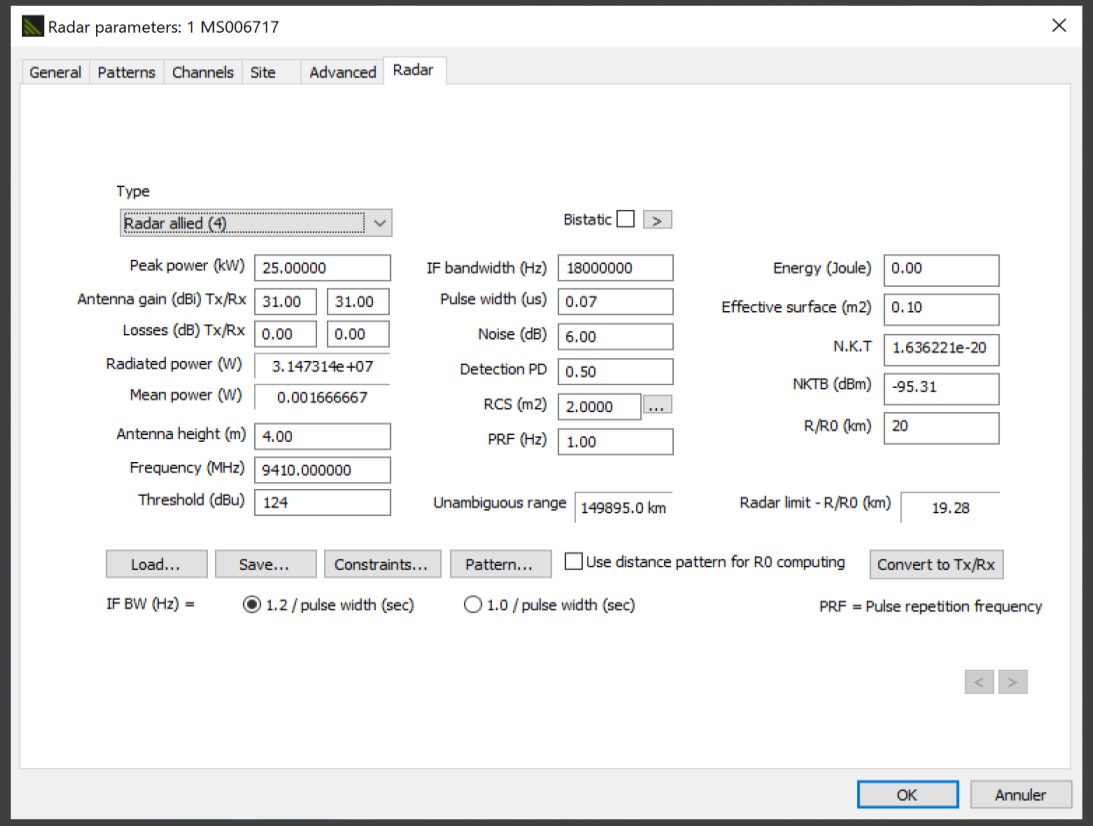


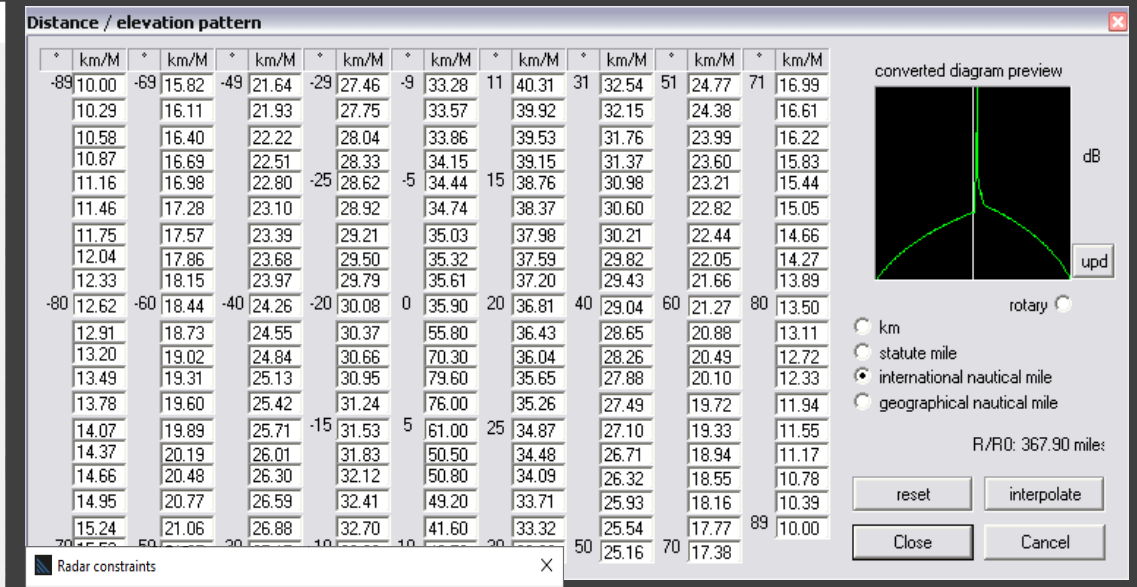
Modeling aircrafts with all radio navigation equipments with HTZ warfare

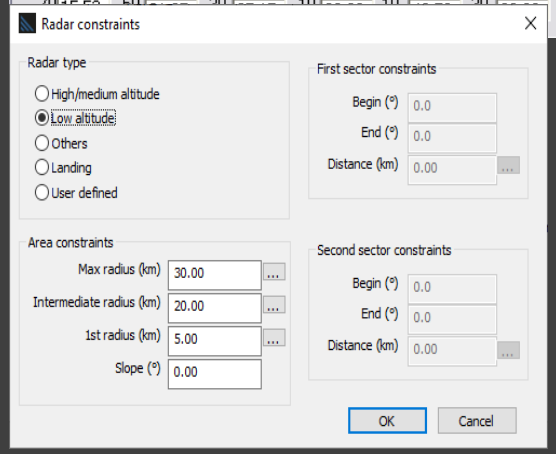


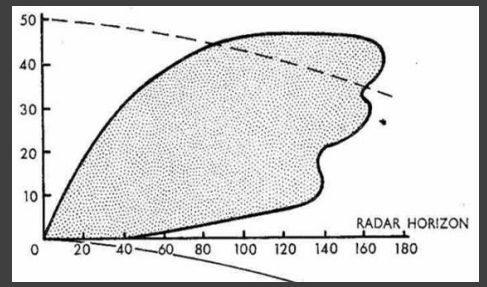
ADF :	Automatic Direction Finder	Loc	Localizer
DME:	Distance Measuring Equipment	RA:	Radio Altimeter
GPS:	Global Positioning System	SATCOM:	Satellite Communication
G/S:	Glide Slope	SSR:	Secondary Surveillance Radar
HF:	High Frequency	TCAS:	Traffic Collision Avoidance System
ILS:	Instrument Landing System	VOR:	VHF Omni ranging

HTZ Warfare
Radar - Parameters

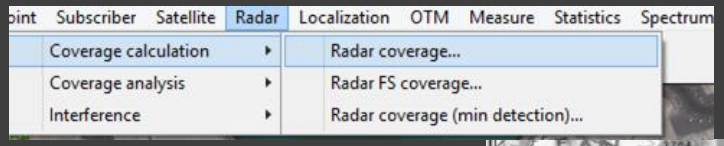


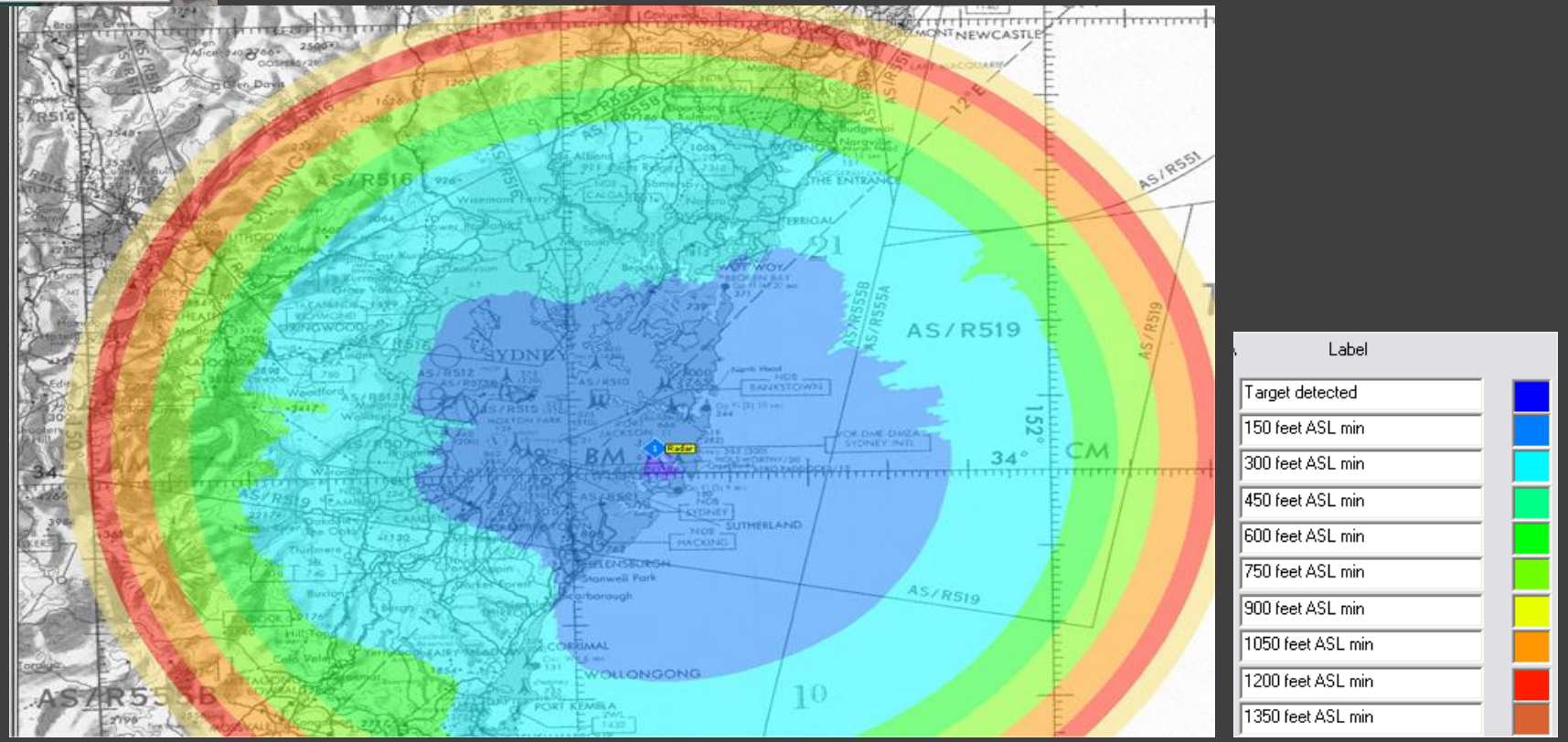




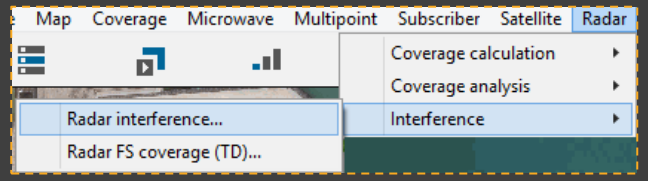


HTZ Warfare
Radar Minimum Detection Height

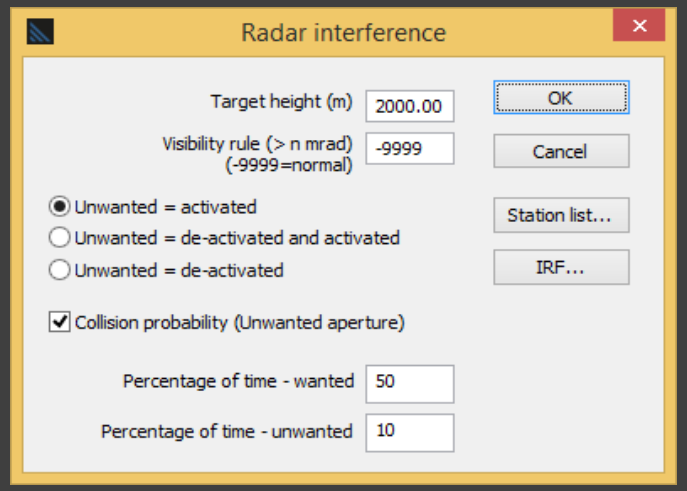


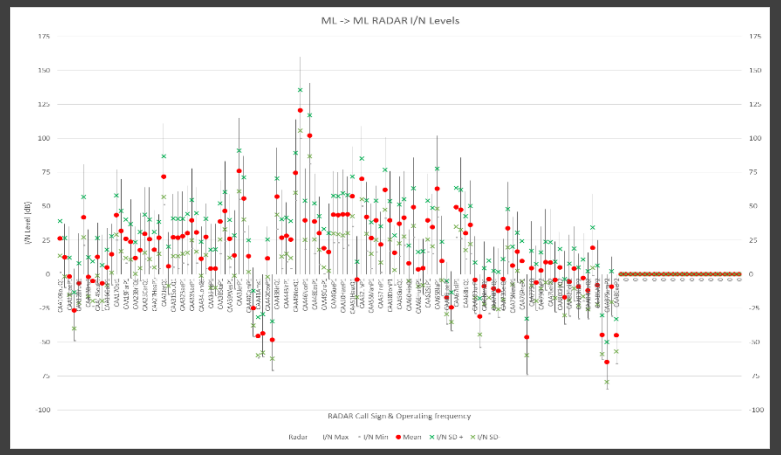


HTZ Warfare
Radar Interference Analysis

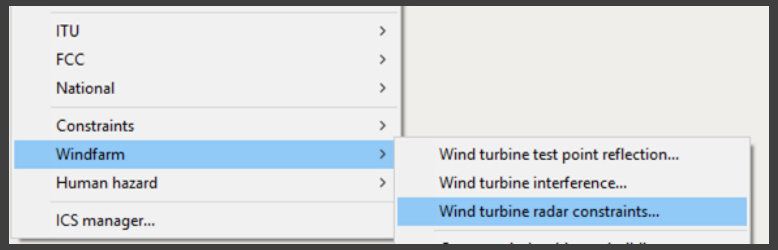


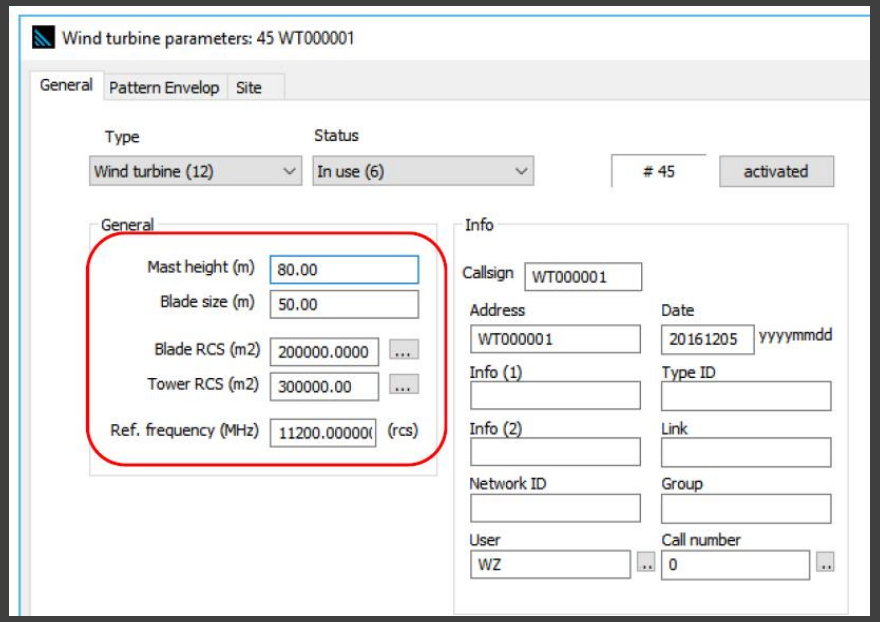
This functions rotates the radar horizontal antenna pattern in 1-degree intervals and calculates the I/N and Threshold degradation. The radar coverage is then calculated using the threshold degradation and then calculates the radar coverage for the given probability of detection and radar cross section.

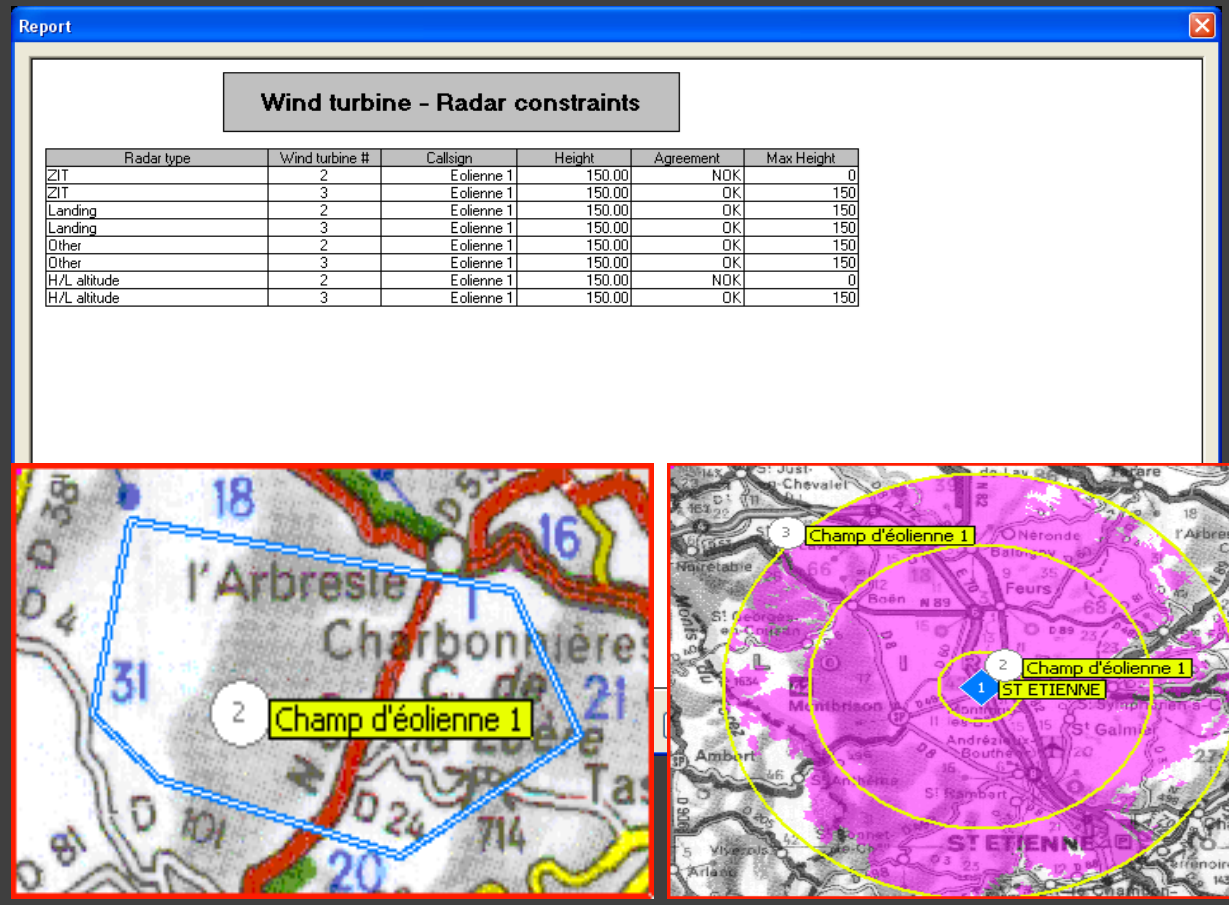




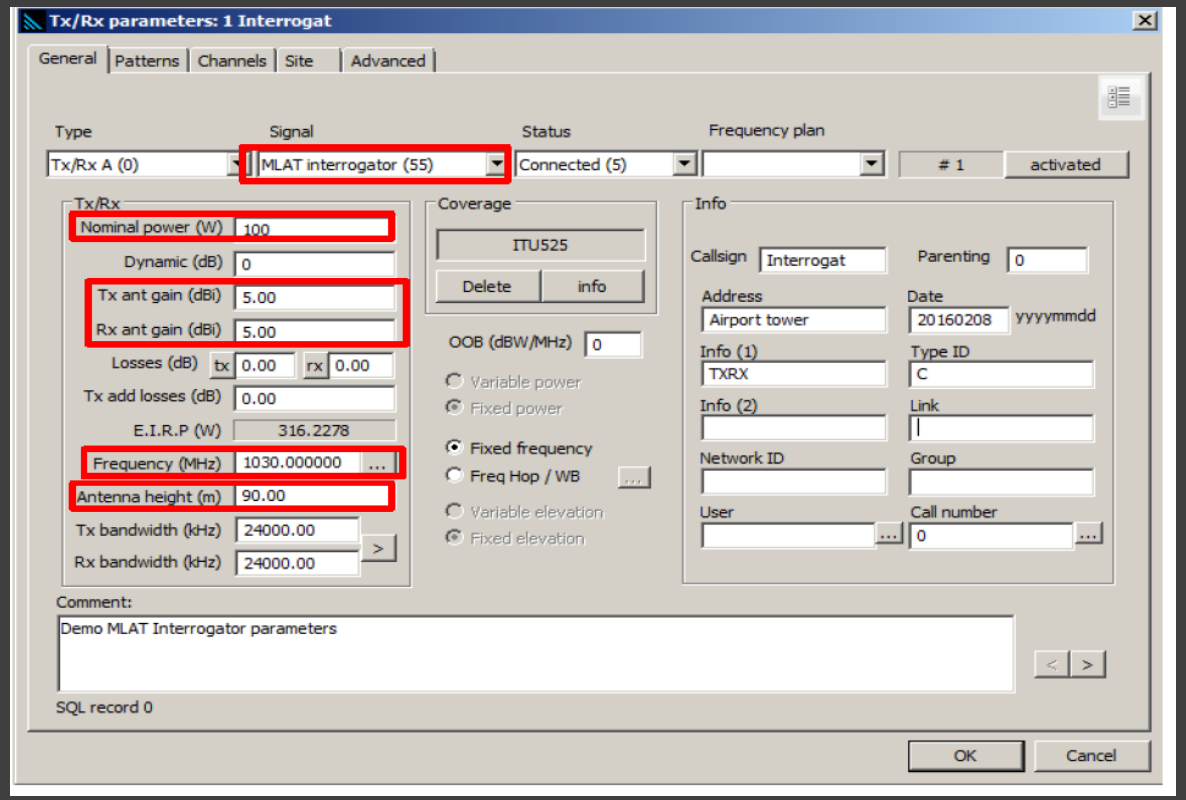
HTZ Warfare
Radar Coexistence; Radar Vs Windfarm

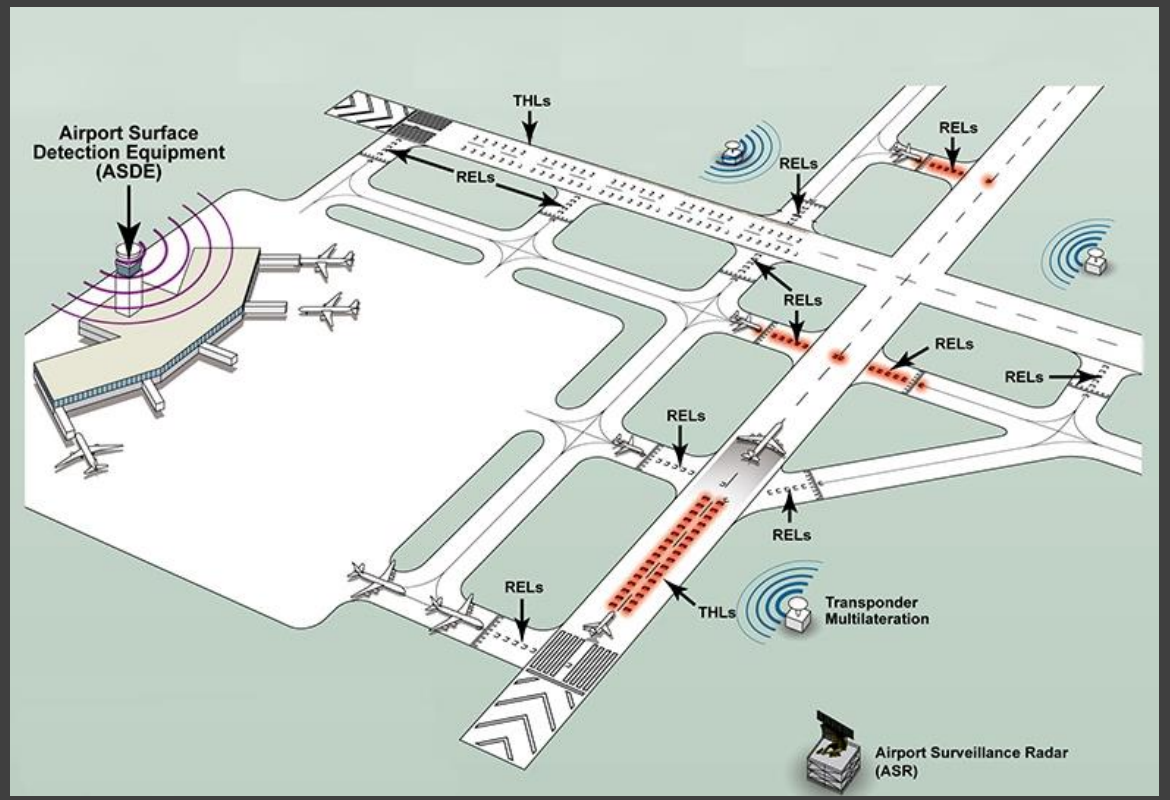






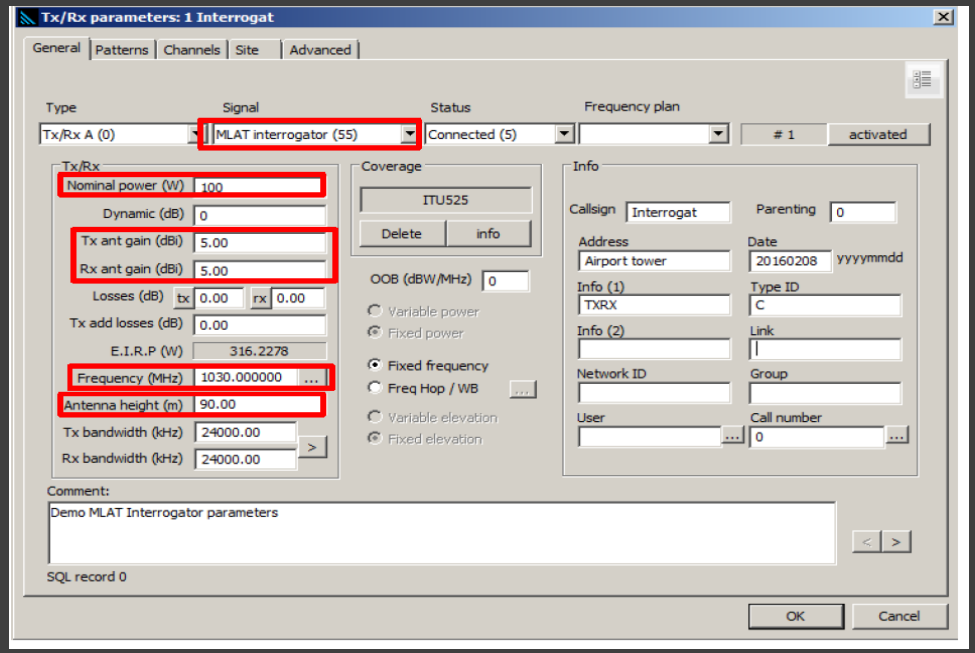
HTZ Warfare
Multi-lateration- Airport surface

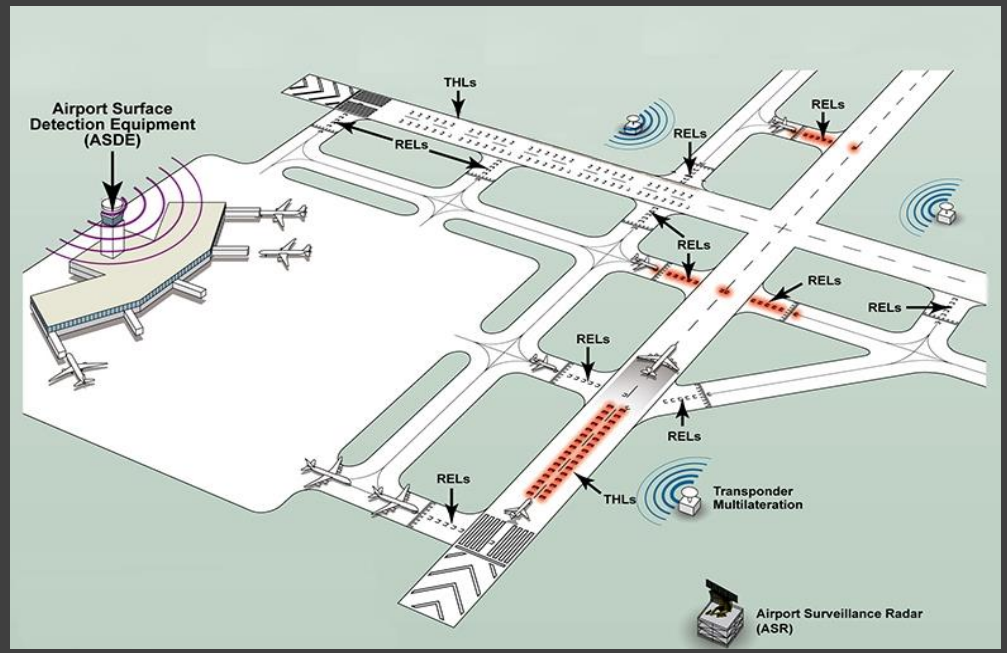




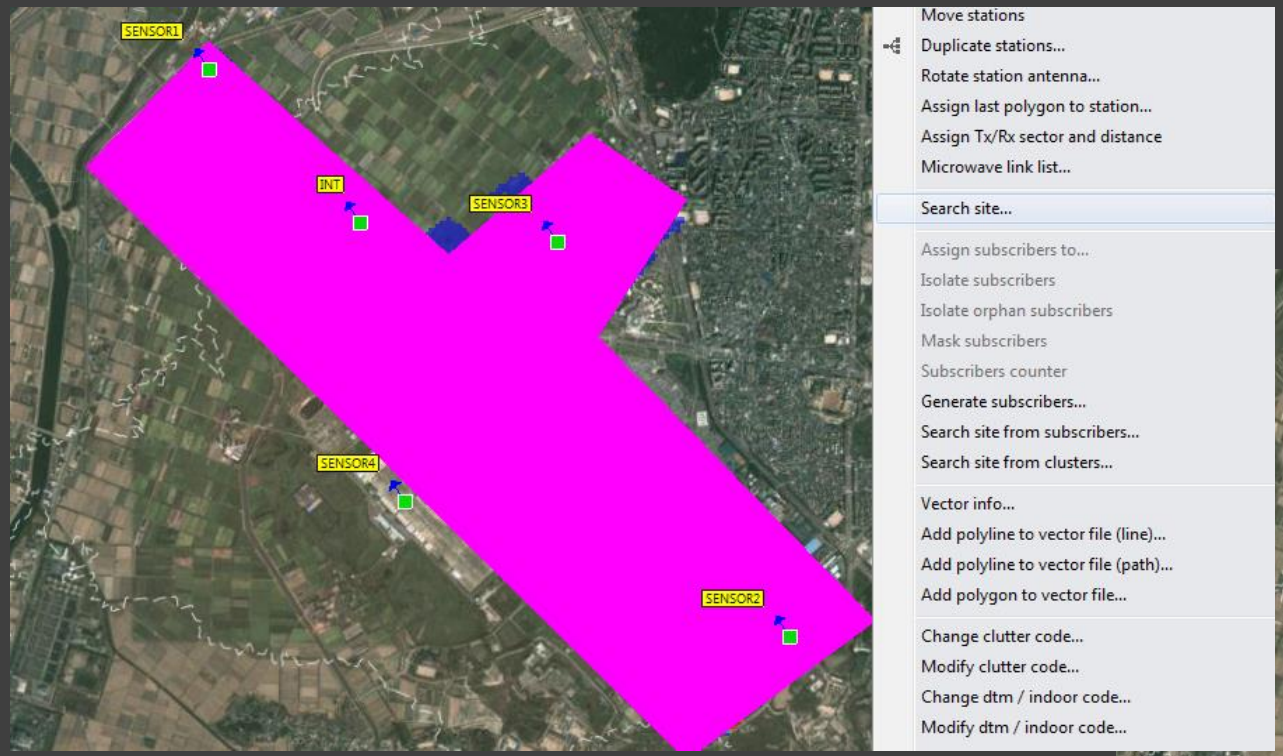
HTZ Warfare
Multi-lateration- Airport surface

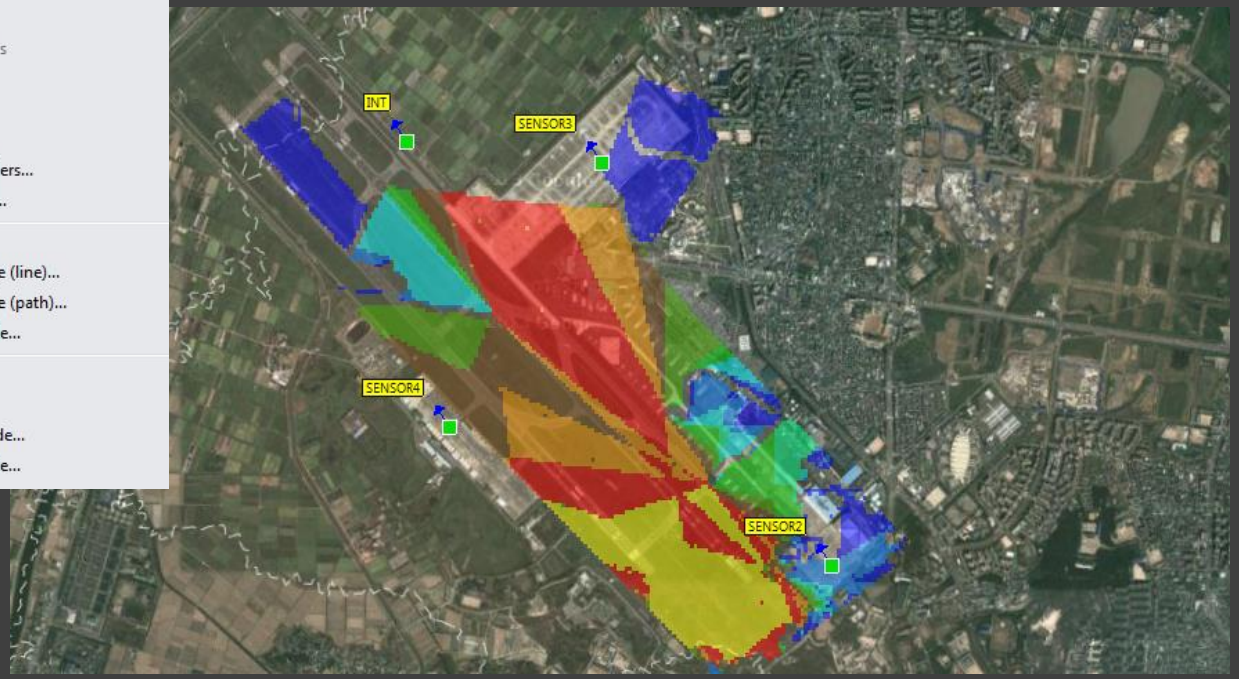
- Planning where to put the sensors
- Planning best spot to put the interrogator
- Evaluate the accuracy/range of the sensor network





HTZ Warfare
Multi-lateration- Airport surface





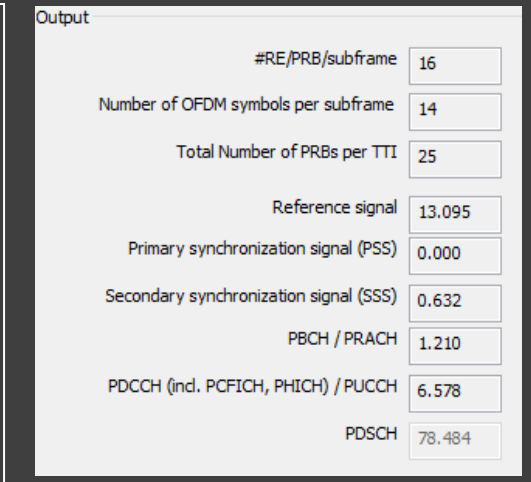
HTZ Warfare
Broadband LTE A2G

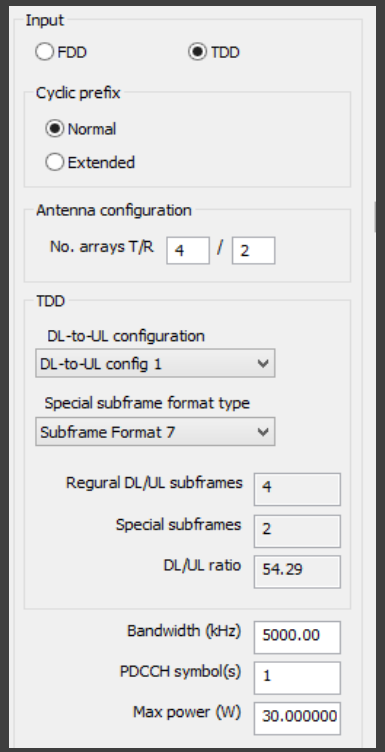
LTE configuration:

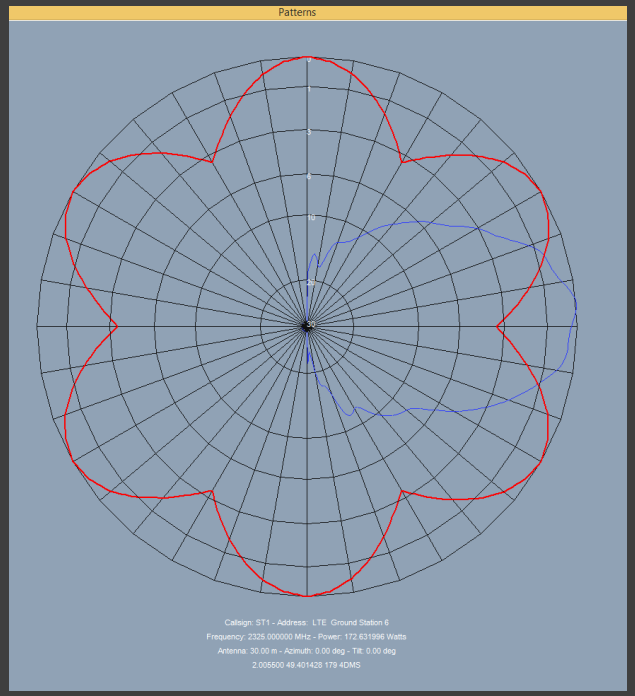
- Freq: 2325 MHz
- Bandwidth: 5MHz
- TDD mode (config 1/ Subframe format 7)
- MIMO 4x2 system

Throughput Target:

- DL/UL : 2Mbps
- Coverage probability: 87,5%
- Aircraft Altitude: 8000 ft.







Antenna patterns (H/V)

HTZ Warfare
Broadband LTE A2G

E-Node B parameters:

Type	Signal
Tx/Rx A (0)	LTE TDD (57)

Tx/Rx

Nominal power (W)	30			
Dynamic (dB)	0			
Tx ant gain (dBi)	9.60			
Rx ant gain (dBi)	9.60			
Losses (dB)	tx 0.50	rx	0.50	
Tx add losses (dB)	1.50			
E.I.R.P (W)	172.632			
Frequency (MHz)	2325.000000	...		
Antenna height (m)	30.00			
Tx bandwidth (kHz)	5000.00			
Rx bandwidth (kHz)	5000.00	>		

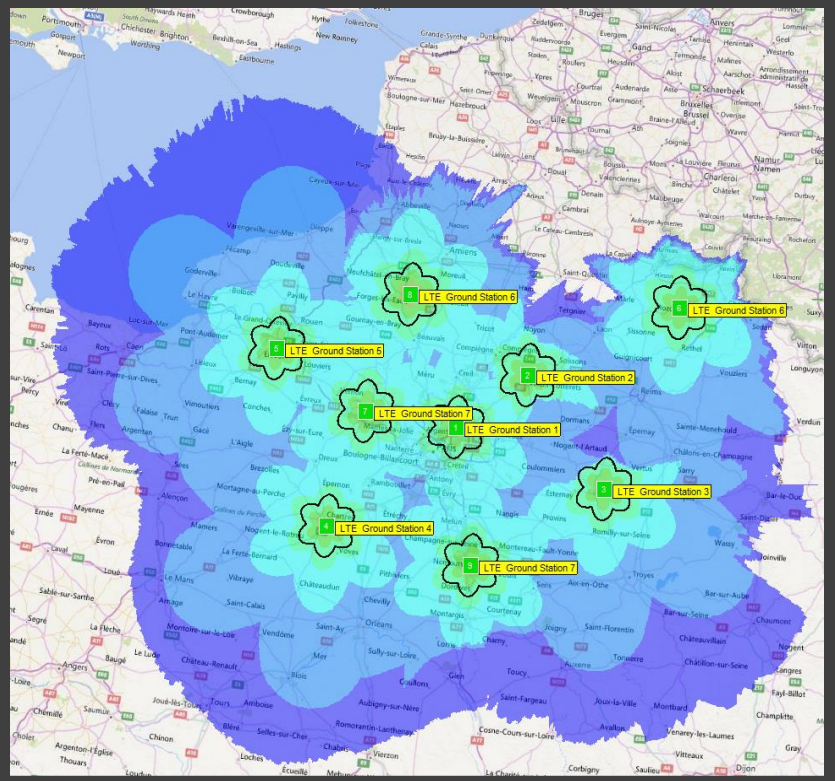


Fig 1: RSRP coverage (Aircraft altitude: 8000 ft)

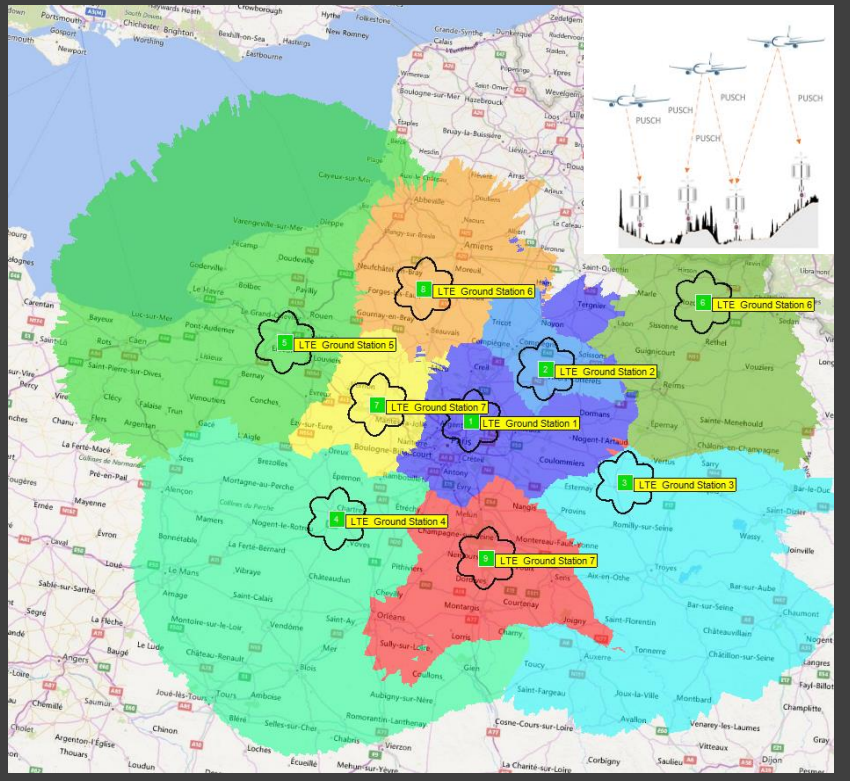
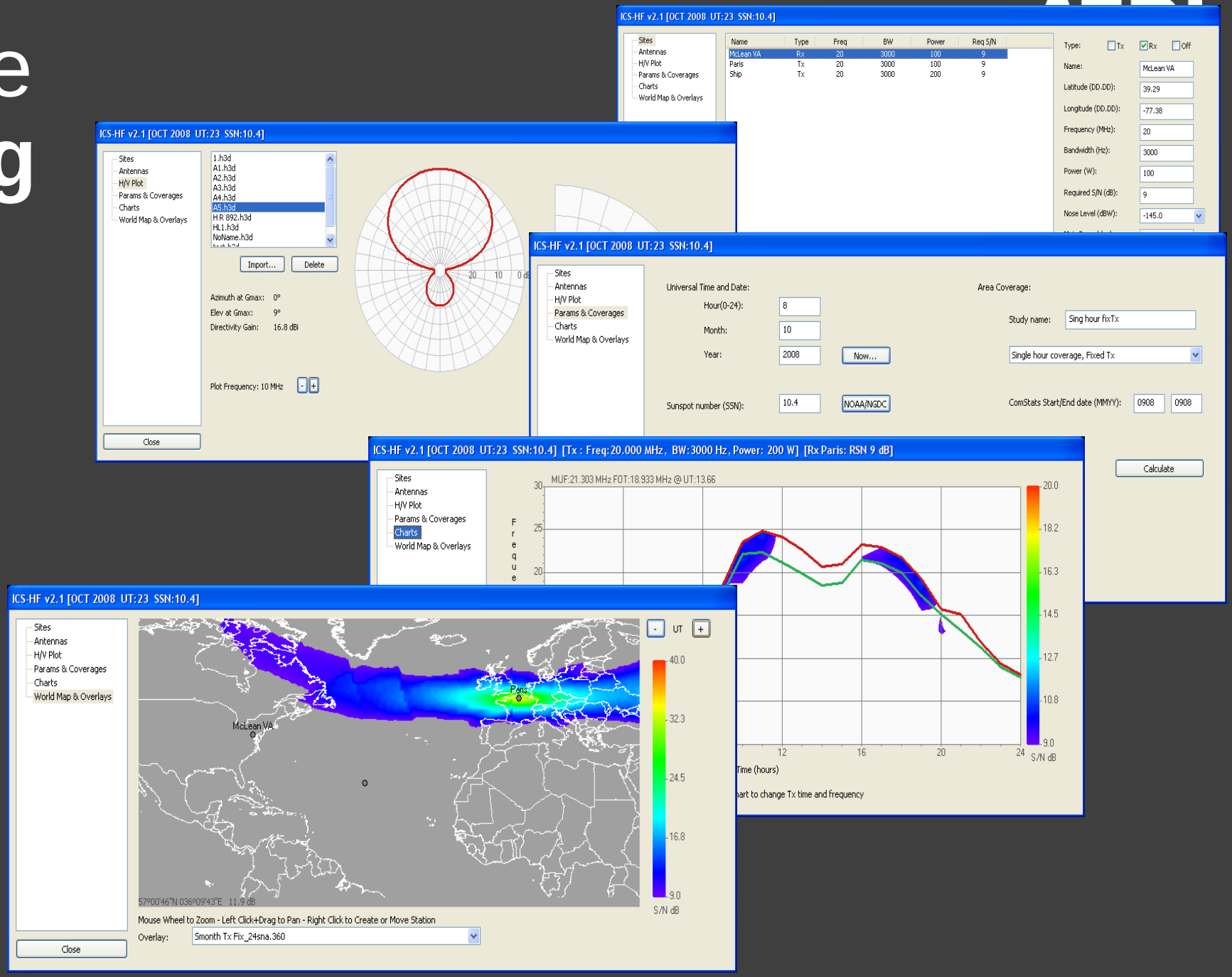


Fig 2: Best server RSRP map (Aircraft altitude: 8000 ft)

HTZ Warfare
HF Planning

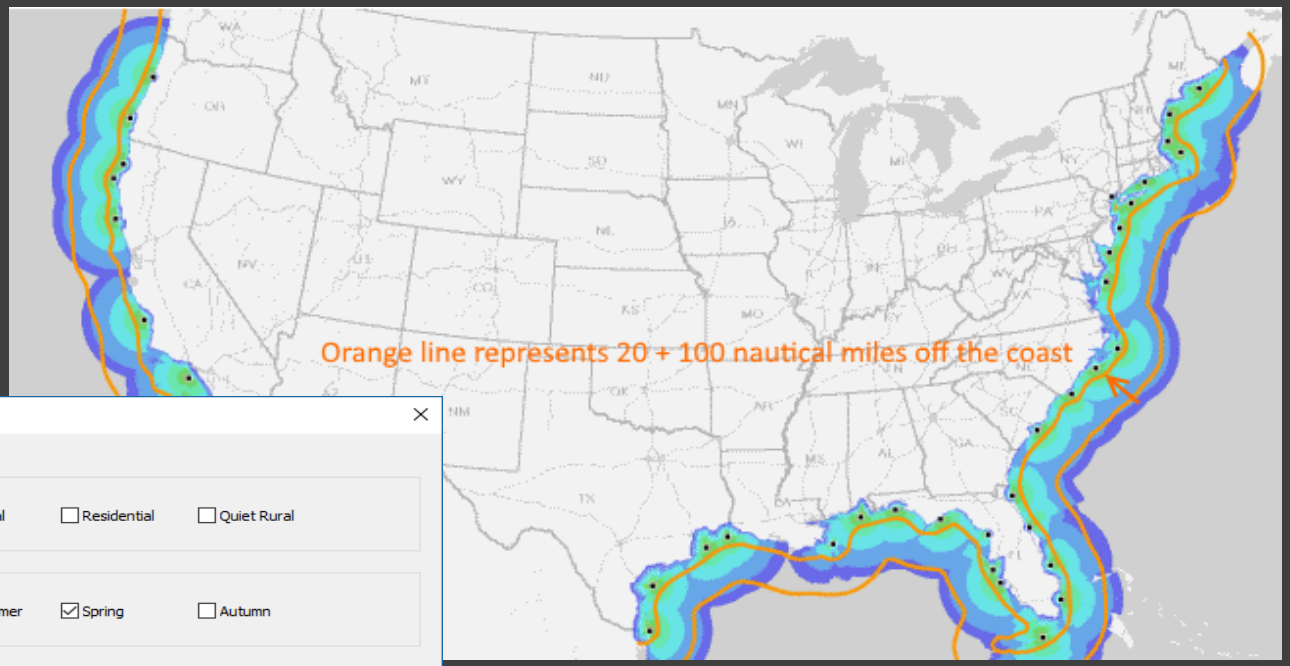
MODE	EQUIPMENT
SINGLE HOUR COVERAGE	FIXED TRANSMITTER
	MOBILE TRANSMITTER
SINGLE MONTH 24h COVERAGE	FIXED TRANSMITTER
	MOBILE TRANSMITTER

CHART ANALYSIS
MUF (Maximum Usable Frequency)
FOT (Frequency of Optimal Transmission)



HTZ Warfare
HF Planning – Maritime Groundwave

In order to properly model the radio wave propagation of MF signals, HTZ warfare integrates the latest ITU recommendations specific to MF Groundwave propagation: ITU-R P.368-9 and ITU-R M.1467-1.
Calculation feature used to generate the field strength received predictions for each pixel on the map is based on the integration of ITU-R P.368-9 into HTZ's propagation engine.



NOISEDAT Calculator

Freq (MHz):	0.518
Bandwidth (Hz):	500
S/N (dB):	8
Dt+(dB) (0->90% 3->95%):	0
Emrp (W):	1000
Latitude (dd.dddd):	45.700457
Longitude (dd.dddd):	2.191760

Rx Environment: ☐ Business ☑ Rural ☐ Residential ☐ Quiet Rural

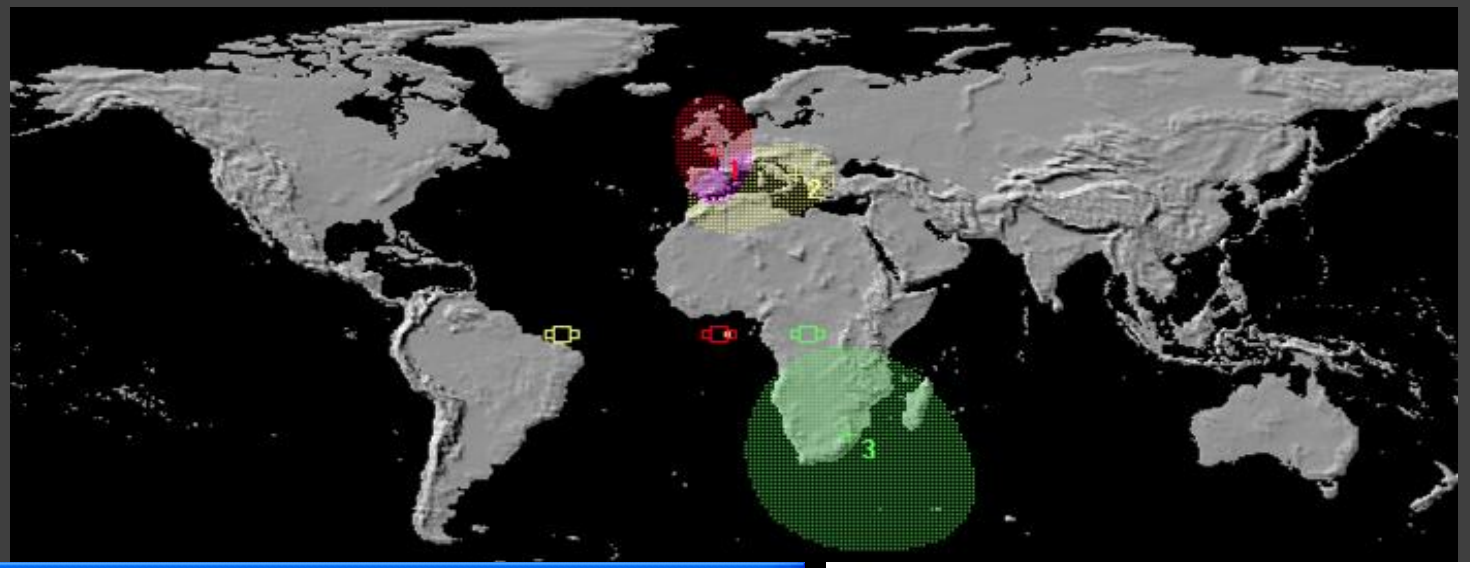
Season: ☐ Winter ☐ Summer ☑ Spring ☐ Autumn

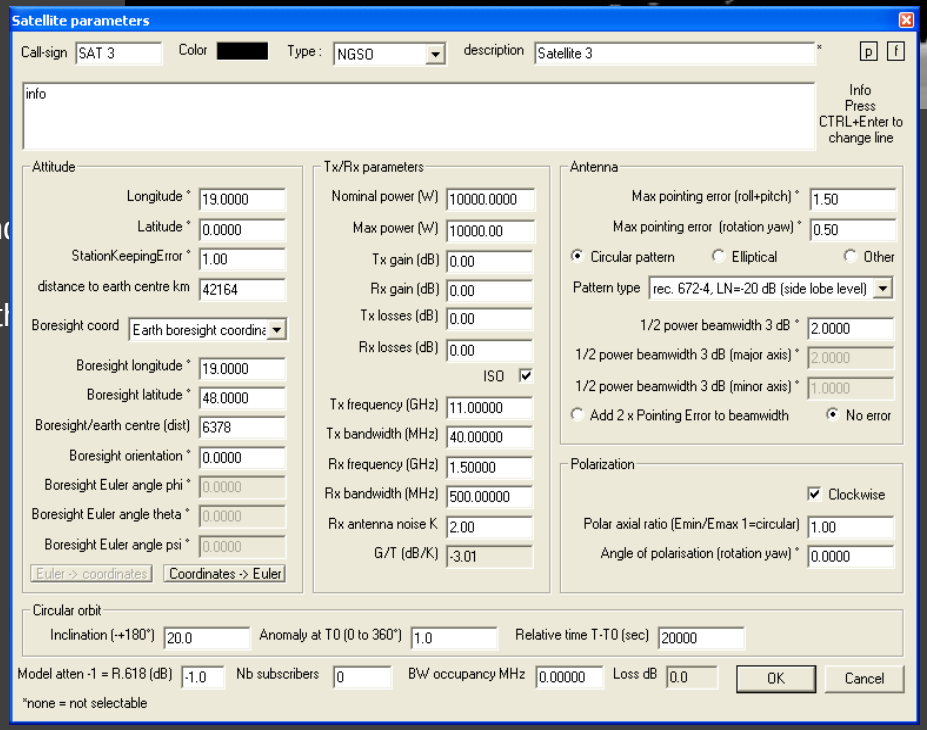
TIME	FA	THRESH	ATMO	GAL	MANMADE	OVERALL	DL	DU	SL
0000-0400	92.6	-46.4	80.4	58.6	75.1	82.0	9.5	10.1	2.2
0400-0800	84.3	-54.7	60.9	58.6	75.1	70.2	10.6	13.8	11.1
0800-1200	85.4	-53.6	47.4	58.6	75.1	75.2	5.9	9.7	1.5
1200-1600	81.7	-57.3	55.8	58.6	75.1	65.4	8.3	16.1	22.9
1600-2000	88.5	-50.5	69.0	58.6	75.1	69.5	15.4	18.7	18.0
2000-2400	92.2	-46.8	80.2	58.6	75.1	82.1	8.8	9.7	2.4

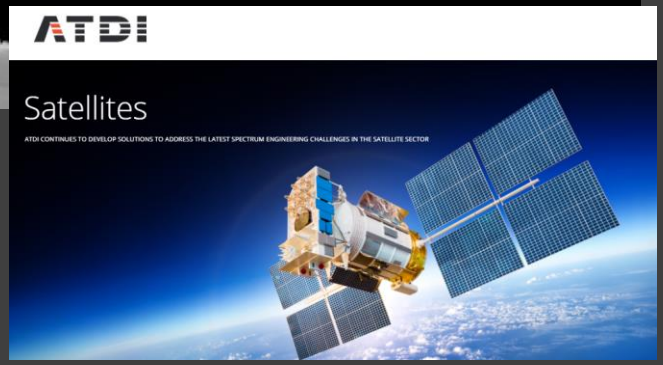
A2 | Calculate | Close

HTZ Warfare **Satellites**

- GSO/non-GSO satellite coverage planning and link budget (EIRP, G/T, C/N)
- Wide-beam and HTS beam planning across all satellite frequency bands
- Automated frequency planning
- GSO vs GSO and GSO vs non-GSO interference analysis (ΔT/T, C/I, PFD and EPFD masks)
- Satellite vs terrestrial co-existence analysis /Earth station coordination (ITU APP 7)
- DTH network planning /VSAT network planning and optimization
- Covers all satellite services: FSS, BSS, MSS, Earth exploration, meteorological and more

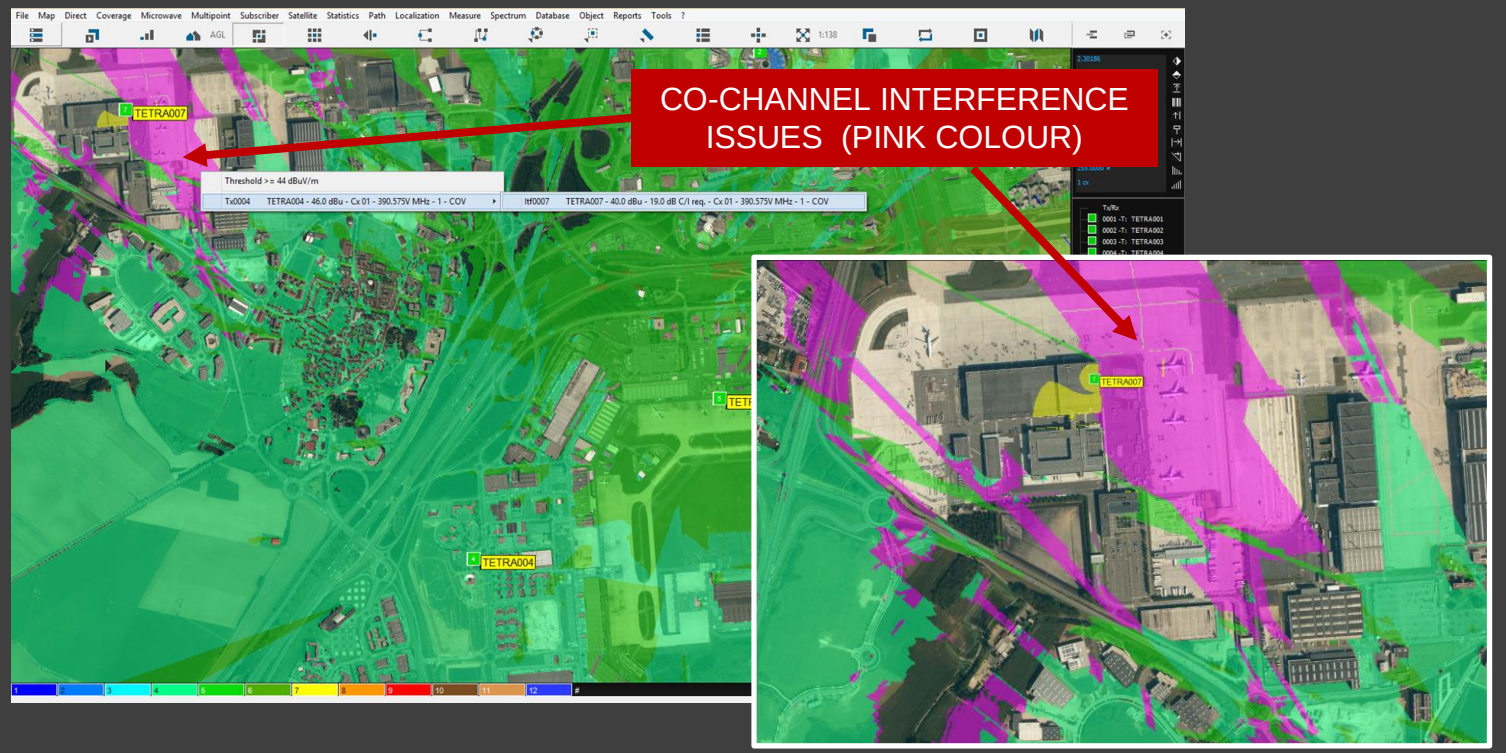






HTZ Warfare
Interference Analysis

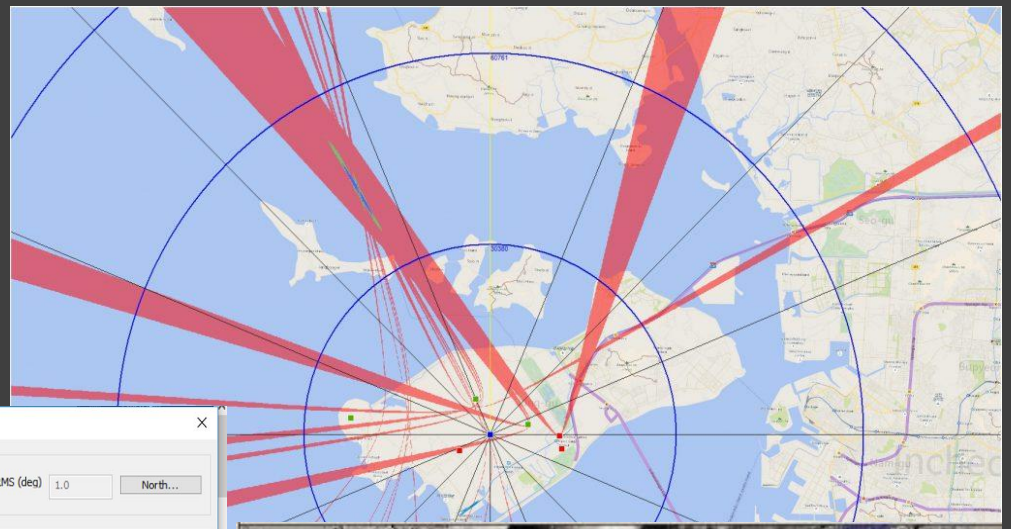
- Provides all capacities for frequency interference analyses (co-, interstitial and adjacent channel interference) based on propagation conditions and the scenario of existing stations.
- Procedures are implemented for all services and consider the special behavior of different service types with regards to bandwidth, spectral distribution or filter curve of the receiver. Interference analysis can be performed using a general analysis function delivering a fast result.
- Comprehensive report that summarizes all technical and operational details of the performed interference analysis can be generated . This includes for example the operational characteristics of the transmitters/receivers, their locations, the utilized propagation model, etc. All identified interference cases are presented on the produced interference reports. In addition, all interference cases may also be visualized graphically on the GIS.

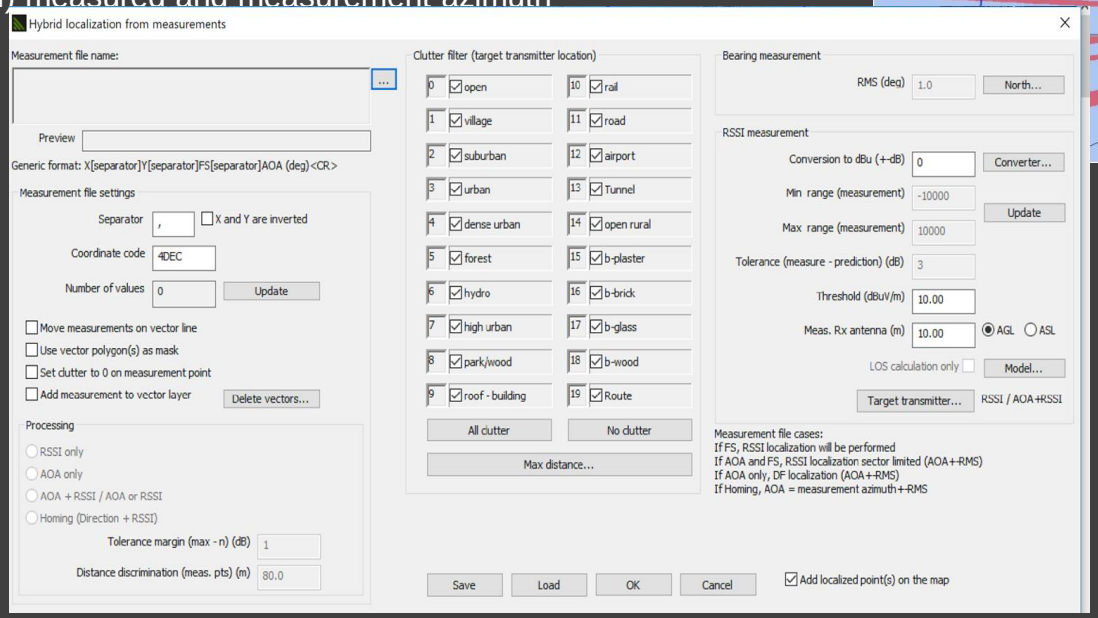


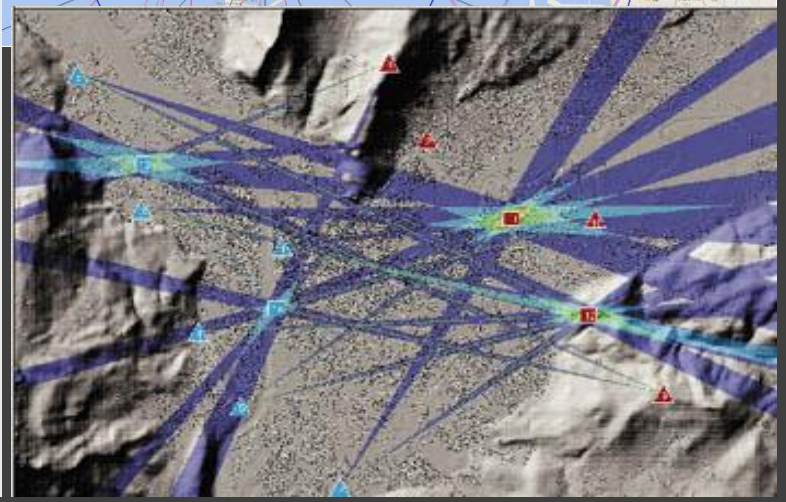
HTZ Warfare
Hybrid Localisation from Measurement

This function is drawing a map of the possible locations of the reference station that has been measured (Target transmitter). It will localize the “target transmitter”, based on the measurement file imported,
containing for each coordinate point, either:

- Field strength received (RSSI) measured, or
- Angle of arrival (AOA) of the signal received, or
- Angle of arrival (AOA) of the signal received and Field strength received (RSSI) measured,
- Field strength received (RSSI) measured and measurement azimuth







Annex

References

References
Military, Defence administrations

APCO AFC

US Army Spectrum Management Office

JSC, Joint Spectrum Center

FAA, Federal Aviation Administration

DOE, Dept. of Energy HQ Spectrum Management Office

Bonneville Power Authority

Western Area Power Authority

National Nuclear Security Administration

DOI, Dept. of Interior Wireless Management Office

FCC, Federal Communications Commission

USAF, United States Air Force

NASA, National Aeronautical Space Administration

National Security Agency

DHS, Dept. of Homeland Security Wireless Management

US Coast Guard HQ/LANT/PAC

US Customs and Border Patrol

Immigration and Customs Enforcement

DOJ, Dept. of Justice Wireless Management Office

FBI, DEA

INEL, Idaho National Engineering Laboratory

SPAWAR, Space and Naval Warfare Systems Command

NTIA, National Telecommunications Information Administration

References
Military, Defence administrations

France:
- French National Air Operation center / CNOA (centre national des opérations aériennes française)
- Signal Corps / CNGF (Centre nationale des Gestions des Fréquences)
- DGA MI (Direction Générale de l'armement)
- STAT (Section Technique de l'Armée de Terre)
- DCI (Défense Conseil International)

Europe:
- NARFA (National Allied Radio Frequency Agency) – Norway
- DSTL - Defense Science and Technology Laboratory (UK)
- Royal Air Force Henlow (UK)
- HMGCC – Her Majesty's Government Communications Centre (UK)
- Ministry of Defense (Belarus, Kazakhstan, Serbia, Poland, Romania, etc)
- RUAG Electronics (Switzerland)
- Armasuisse (Switzerland);
- FUB (frequency management department/Frequenzmanagement, Switzerland)
- Finnish Army;
- British Army;
- Portuguese Air Force;
- Norwegian Navy;
- Forsvarets forskningsinstitutt (FFI);

MENA:
- UAE Air Force (Abu Dhabi)
- UAE Electronic warfare (Abu Dhabi)
- Border Guards of KSA
- Direction Centrale des Transmissions et de Guerre Electronique (Algéria)
- QESC (Qatari Electronic Signal Corps)
- Minister of Defense (Bahrein) - BHQ (Bahrein Headquarter)
- Minister of defense of Morocco (Royal Marine)
- Ministry of Defense (Oman, Egypt);
- Egyptian Air Force (EAF)
- PSDARC (KSA)

Asia Pacific:
- Minister of defense of Bangladesh
- Minister of defense of China
- Korean Army Signal School (South Korea)
- Agency of Defence Development (South Korea)
- Joint Chiefs of Staff (South Korea)
- DSO & DSTG (Australia)
- DSTA (Singapore)
- PLPE (Malaysia)
- Land Engineering Agency, ADF (Australia)
- Indian Air force Army;
- DLRL (India);
- Taiwanese Army, Thai Army;…

References
Vendors

NOKIA Portugal

Motorola solution (UK, Poland, Norway, Oman, Duba, Pakistan,…)

Thales

Airbus (Germany, Romania, France, Qatar…)

Teltronic (Spain)

Ericsson (France)

KAPSCH (France, Austria, Bulgaria)

Marconi (UK)

Philips (Netherlands)

Raytheon (US)

Sepura (Malaysia)

SELEX (Finmeccanica, Italy)

Boeing (USA)

Rhode and Schwartz (Germany)

Lockheed Martin (USA, UK)

Hytera (Austria, Germany)

Etc...

Thank you!

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