



MARTOS™

AARONIA

DRONE DETECTION

GENERATION 6

WORLD'S MOST SUCCESSFUL DRONE DEFENSE SYSTEM
WITH HUNDREDS OF INSTALLATIONS WORLDWIDE!

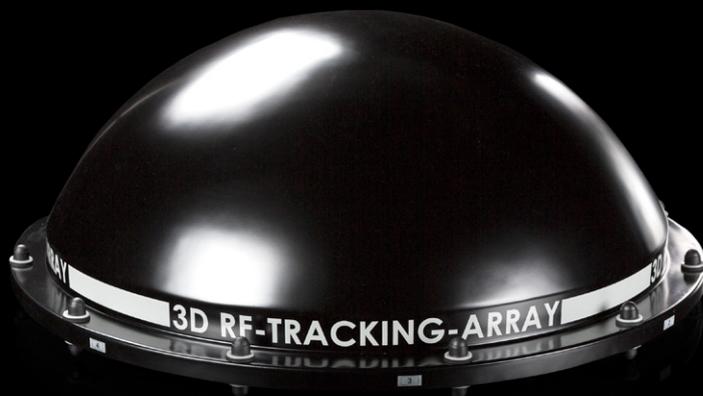


- ✓ **NEW** Real-time decoding of many drone protocols (DJI Ocusync, Lightbridge, DJI WiFi, Mavlink, Yuneec etc.)
- ✓ Real-time AI and 3D DF frequency monitoring, including height information
- ✓ Real-time frequency monitoring (NO bands)
- ✓ Extremely high detection range of up to 50 km
- ✓ 360° full dome coverage with high tracking accuracy
- ✓ Scalable for huge sites and borders
- ✓ Ultra-wide frequency range (20 MHz to 8 GHz)
- ✓ Can be switched to a fully remote mode (no operator required)
- ✓ Locates drone swarms and drone operators

Highlights

GENERATION 6

- ✓ **NEW** Real-time decoding of many drone protocols (DJI Ocusync, Lightbridge, DJI WiFi, Mavlink, Yuneec etc.)
- ✓ Unique technology: real-time frequency monitoring (NO bands)
- ✓ Real-time 3D DF frequency monitoring for all frequencies and directions
- ✓ Up to 16 THz/s sweep speed
- ✓ Tracks 3G, 4G and 5G drones
- ✓ Up to 14 km detection range
- ✓ Latest AI-based multi-target image and RF pattern recognition
- ✓ Ultra-wide frequency range (20 MHz to 8 GHz)
- ✓ Multi-frequency, multi-directional swarm attack detection
- ✓ Able to detect pre-programmed drones
- ✓ Can be switched to a fully automatic mode (no operator required)
- ✓ 360° azimuth and full 90° elevation gapless full dome coverage with high tracking accuracy
- ✓ Provides real-time measuring of the RF emissions from drones/UAVs, jammers, phones, etc.
- ✓ Tracks and locates the operator(s) controlling the drone(s)
- ✓ Identifies the drone manufacturer and model / protocol
- ✓ Enables 24/7 seamless recording (tracking and/or raw data) and monitoring
- ✓ 3D DF measurement accuracy up to ITU class A
- ✓ Scalable for huge sites (airports, cities, borders, even countrywide installations)
- ✓ Tested and running under most adverse weather conditions (night, fog, rain, etc.)
- ✓ Enhanced temperature range (desert installations)
- ✓ All-in-one solution (RF, radar, camera, jammer and software)
- ✓ Setup and ready to use within a minute (portable version)
- ✓ Powerful mobile app with automatic multi-level threat alerts and threat map display
- ✓ Hardware and software made in Germany



Gewerbegebiet Aaronia AG II, DE-54597 Strickscheid
Tel.: +49(0)6556-9019-355 Fax: +49(0)6556-93034
www.aaronia.com E-Mail: mail@aaronia.de



MADE IN GERMANY

Aaronia AARTOS DDS

The best Anti-UAV system to monitor, detect and defeat unwanted drones

After five years of development, Aaronia is introducing its latest drone detection system – the AARTOS DDS Generation 6. Designed to detect intruding drones, the system is based on real-time directional measurements of a drone’s electromagnetic emissions (including its remote control). AARTOS DDS users receive accurate warnings and alerts about incoming drones.

Drones – more than just a nuisance

Increasingly easy access to mini and micro UAVs makes them a growing potential threat to national and commercial security. Easy to produce, cheap to buy, simple to fly, and hard to detect, these drones are available commercially and non-commercially and are among the most quickly developing technological threats to military and civilian interests. In March 2015, a commercial drone reportedly alarmed the Secret Service when it got too close the President’s golf resort. This is just one of countless similar situations, where a state-of-the-art drone detection system like AARTOS would have been vital.

Detection range

Our system’s detection range far exceeds that of its targets. Under normal circumstances, the detection range is equal to (or longer than) the maximum distance between the operator and the drone, depending on the transmitter power of the drone and/or its operator. Taking into account factors such as drone type and topography, the range of the AARTOS DDS can reach 50 km or more.

Early detection

The AARTOS triggers an alarm as soon as an operator starts sending signals to a drone, even before it is actually airborne. Allowing countermeasures to be initiated before a potential threat even arises.

Ready for action when you need it

Aaronia’s drone detection system can be used virtually anywhere. The AARTOS has proven itself in protection of borders, sports events or concerts, residential areas, government facilities as well as commercial or industrial sites such as nuclear plants. Available as a single-site or multiple-site solution, the system can be adjusted to the characteristics of the respective terrain to be monitored.

Hardware

AARTOS is based on our IsoLOG 3D DF antenna, real-time spectrum analyzers and a special software plug-in for the RTSA-Suite PRO software.



The AARTOS DDS Container: Stand-alone for up to 3 months

Combining all these elements allows for 24/7 monitoring, recording, and uninterrupted data streaming. The system is also both compact and flexible, allowing it to be set up in virtually any environment it is needed.



Fully mobile AARTOS Shelter Command Center



Fully equipped AARTOS Sprinter



AARTOS alerts include the brand and make of commercial drones

Countermeasures

The system can be extended to include an automated, fully integrated jammer, which effectively prevents any drone in the area from receiving RF signals, thus activating its fail-safe mode and forcing it to either hover and land or return to its point of origin.

Of course, the interference created is extremely selective in order to make sure other RF channels are not impaired. In addition, the jammer is directional, and will only jam signals in the direction of the incoming UAV.

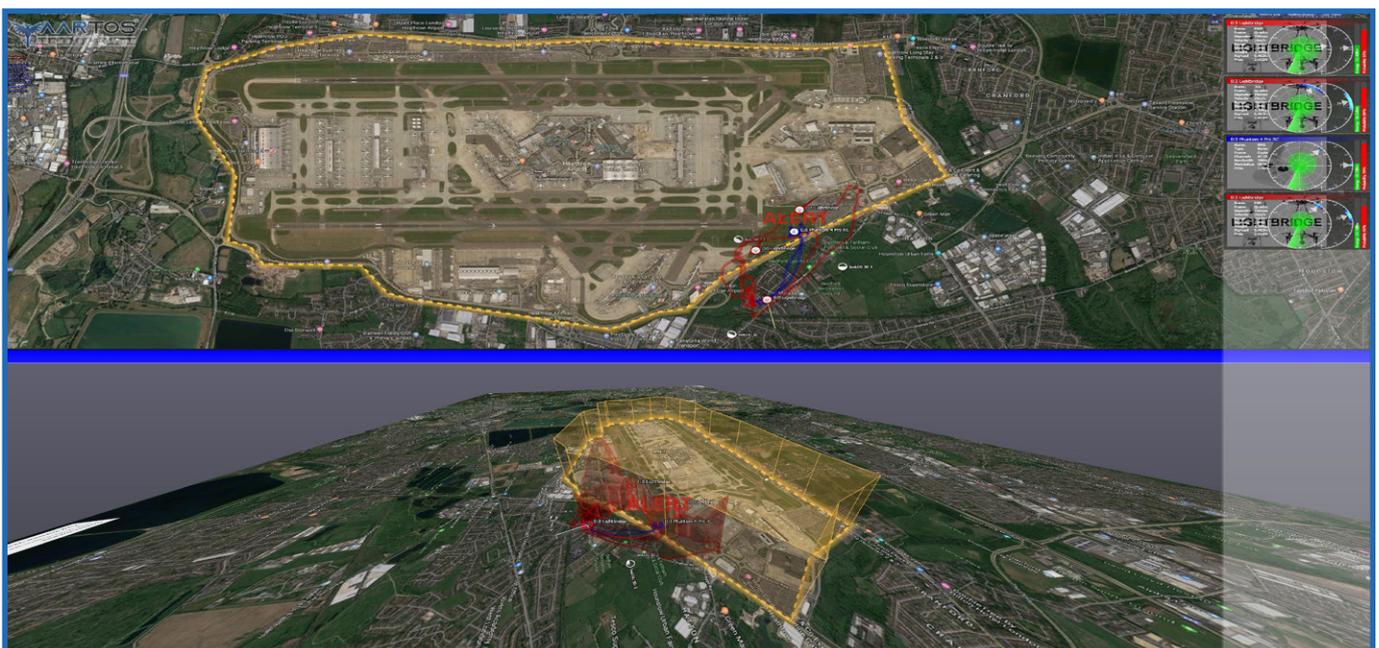
Advantages of a radio communication solution

RF detection of drone signals has significant advantages compared to other methods such as radar, optical and acoustic detection:

- **Safe detection – no false alarms**
Our system does not mistake UAVs for other flying objects such as birds, balloons or kites. Saving time and resources for real threats.
- **Early detection**
The AARTOS Drone Detector triggers an alarm as soon as a remote control sends its first signal, even before the actual drone is airborne. Allowing countermeasures to be launched at an early stage.
- **Tracking the drone operator**
Since the Aeronia AARTOS DDS detects both the drone (from downlink signals) and its corresponding remote control, the movement of both can be tracked in real-time. If two or more DDS systems are deployed, triangulation can then determine the exact position.

Made in Germany

The Aeronia AARTOS DDS is developed, designed, individually assembled, and calibrated in Germany. This guarantees the highest production and quality standards.



AARTOS GIS: Unique real-time 3D topographic view shows drones flying around an international airport

Command and Control Software

Efficient drone detection requires intuitive display modes



Operators can zoom and move the map in real time

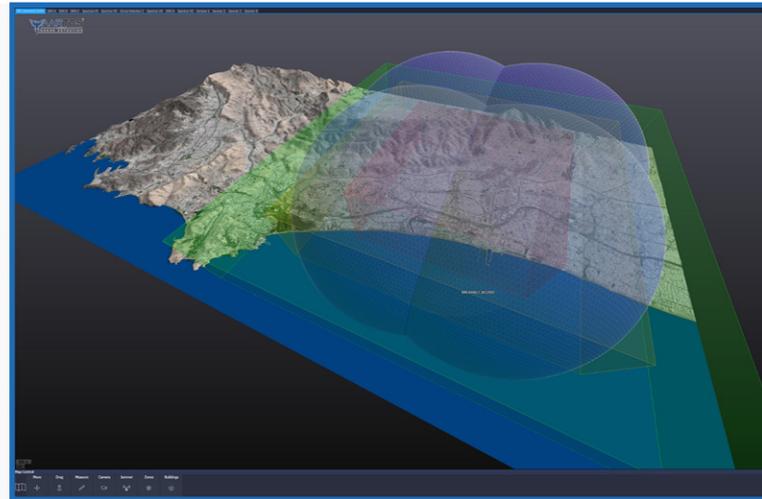
Simultaneous 2D Top-Down & 3D View

A top-down 2D perspective is the most commonly used visualization technique in drone detection. The program is easy to understand and navigate due to its similarity to common satellite-image-based map solutions.

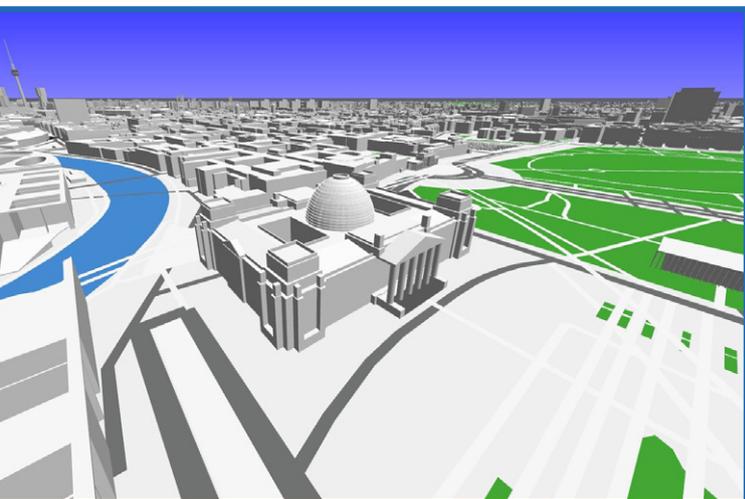
The 3D view expands our capabilities by adding the drone's altitude information (this requires multiple drone detection systems), and making it easier to evaluate distances between different objects on the map.

3D Topographic View

The topographic mode displays the surrounding terrain's surface, depicting hills, mountains, peaks and valleys. Combined with our 3D, man-made structures system building system, the topographic view creates the most accurate representation of the surrounding area.



Users can tilt, turn and zoom the GIS in real time



Realistic view of an airport using 3D models

Advanced 3D Model View

Aartos is also able to integrate 3D models of complex areas (e.g. cities, airports, etc.) into its 3D view, improving usability for end users.

Jammer Integration

Mobile Handheld Jammer



Directional antenna, covers a total of **4 bands**, **40 W** (up to 2 km range)

Fixed Bands Jammer (180°/360°)



2/4 sectors with 2/4 antennas, covers **up to 15 bands**, **180 W/360 W** (up to 3 km range) or **650 W/1300 W** (up to 8 km range)

Programmable Sector Jammer



8 sectors with 8 antennas, covers **all bands up to 6 GHz**, **240 W** (up to 4 km range) or **800 W** (up to 10 km range)

Jammer disclaimer

The AAROS CMS (Countermeasure Solutions) can only be sold to entities with proper government approval for the deployment of jammers. For more information, contact us at mail@aaronia.de.



Powerful jammer setup tool: Sectors, omni and even complex beam-forming shapes can be constructed or imported. This enables users to view the coverage of every jammer and frequency on the GIS display.

EO/IR Camera Integration

Additional protection through visual detection (optional)



Among the latest additions to the AARTOS DDS is the Visual Detection System, a fully integrated optical and thermal drone detection solution that is perfectly matched to the detection mechanisms of the AARTOS Drone Detection System.

This option enables the user to spot detected drones, even from afar, and identify potentially dangerous payloads attached to the drone, such as explosives.

Tracking will continue even if a drone enters autonomous flying mode while it is being tracked by the Visual Detection System.

General technical specifications

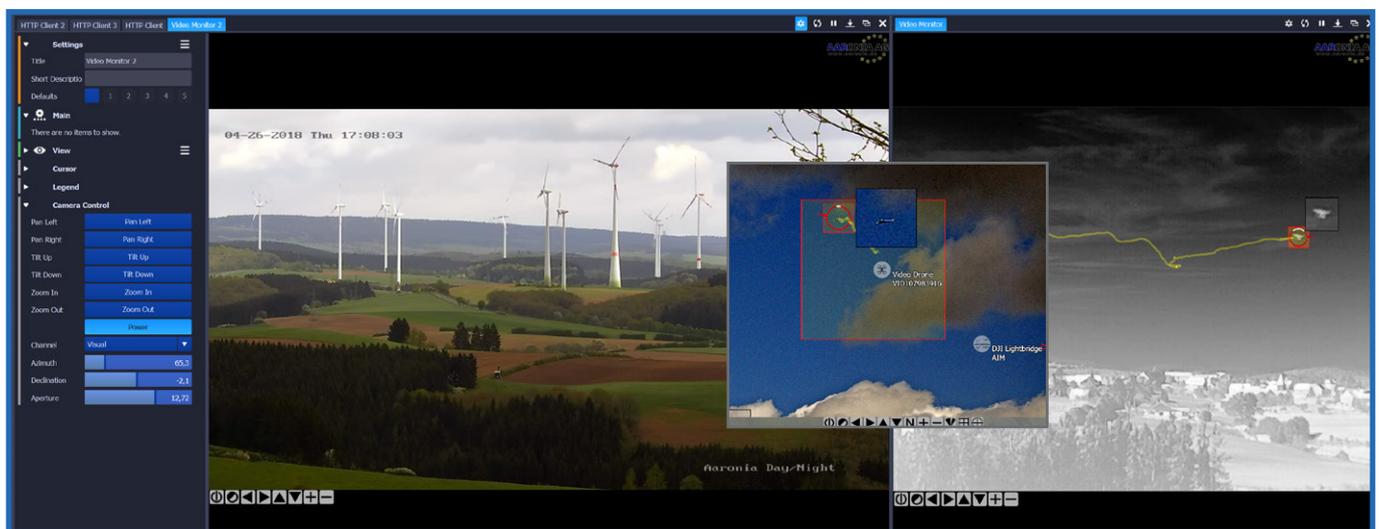
- Operating temperature: -40° C to 65° C
- Operating humidity: 10 - 100% RH
- Power: 24 V/AC, 120 W
- Lightning protection and more

PTZ (movement range and speed)

- Pan: 360° continuous rotation
- Tilt: From -90° to +45° (auto flip)
- Pan speed: Configurable, from 0.05°/s to 120°/s
- Tilt speed: Configurable, from 0.05°/s to 65°/s

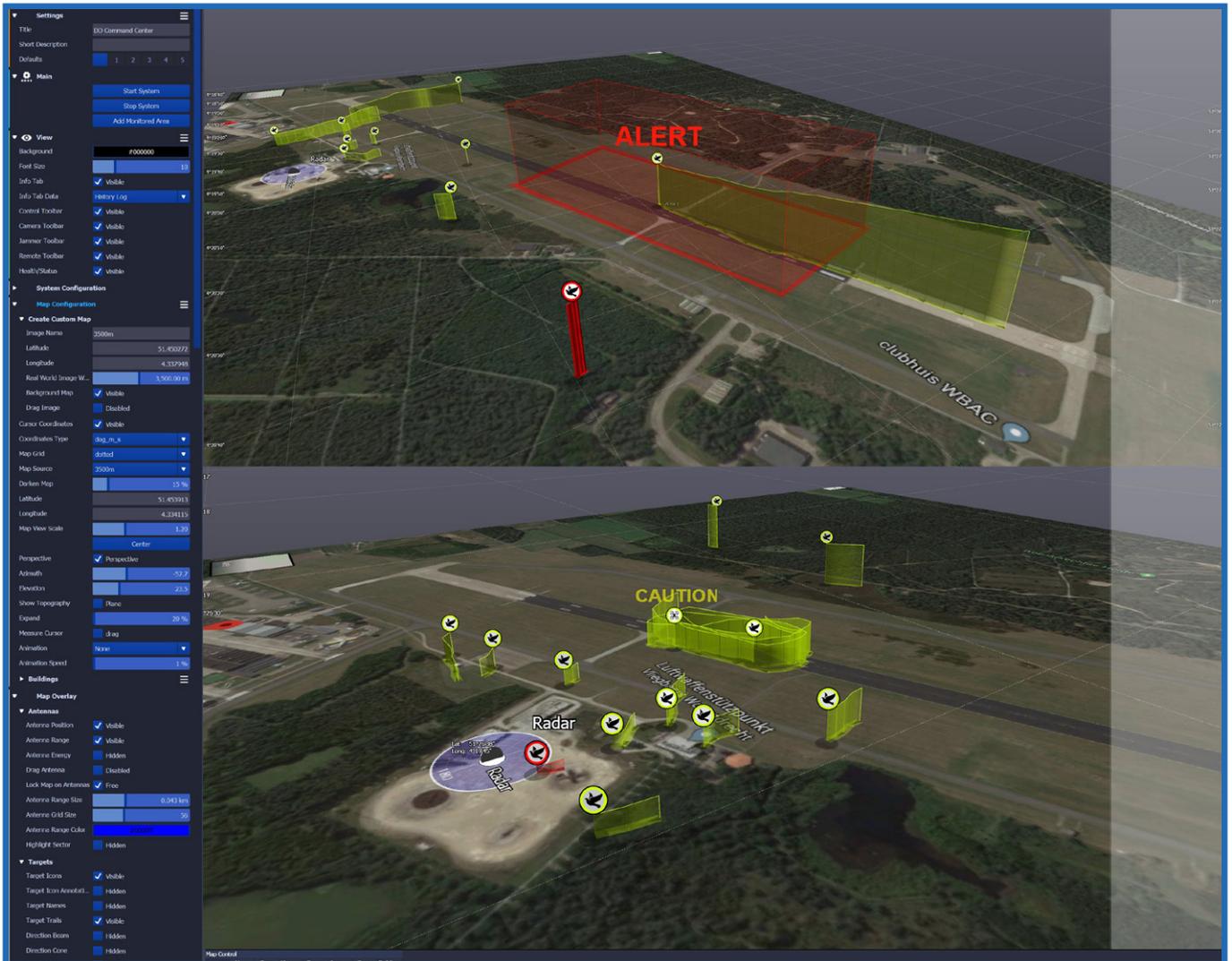
Features

- Thermal camera for 24/7 protection
- Sophisticated tracking and analysis algorithm
- Max. camera resolution of 1920 × 1080 px (full HD)
- Max. thermal module resolution of 640 × 480 px (scaled up to 800 × 600 px)
- 30x optical zoom
- 12x digital zoom
- IP66-certified protection



Full HD camera view (left), AI visual pattern detection (center) and thermal camera view (right) in the RTSA Suite Pro software

Radar Integration



The AARTOS system supports powerful 3D radar integration



Typical radar for the AARTOS DDS

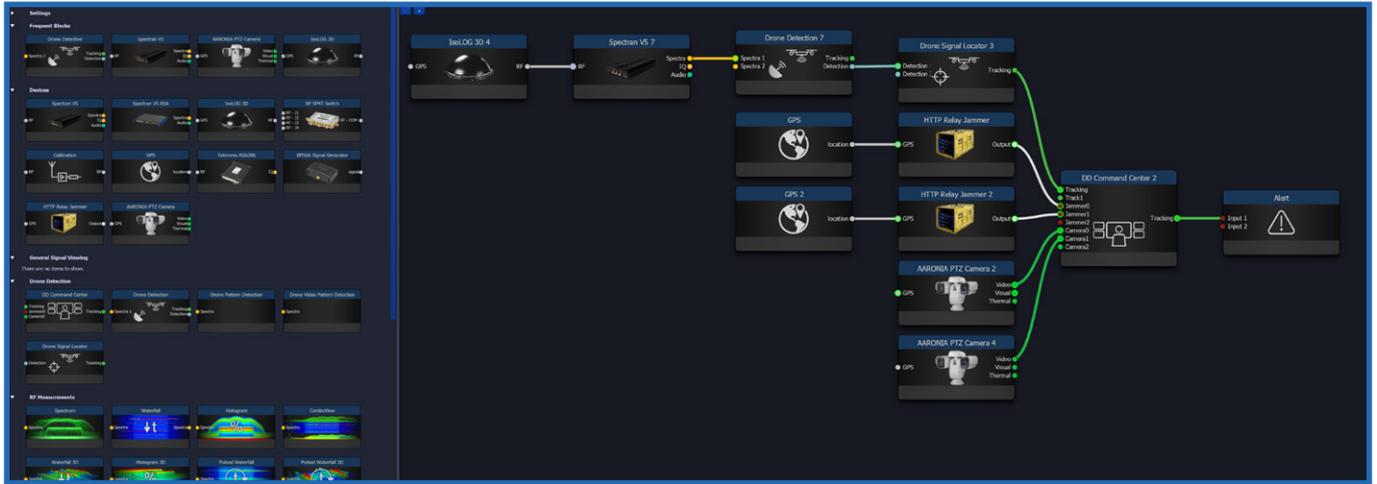
More than just drone detection

Using an (optional), sophisticated radar system, the AARTOS DDS can automatically determine and display the exact position, flight direction, altitude, speed and classification (i.e. make and model) of an inbound drone. The trajectory of the flight can also be tracked in real-time as a 3D model.

The system distinguishes between birds, fixed-wing drones and propeller drones. When a UAV enters the designated no-fly zone, a multi-alarm can be configured.

Customer Hardware Integration

Because software is key



The AARTOS drag and drop construction setup

Complete customization

The required equipment for AARTOS can be configured to match detailed customer requirements. End customers will receive hardware that is tailored to their specific needs, with all components chosen individually. This guarantees optimal drone detection performance in any given terrain or area.



A typical setup for drone detection

System Versions

AARTOS DDS X3 (Laptop)



Portable solution, omnidirectional, typ. range: 500 m - 2 km

Designed to be used as a concealed and portable drone and jammer detection device, the AARTOS X3 Laptop is lightweight and offers a battery life of 1.5 hours. On top of being easy to operate and carry, the system is ready to use within half a minute.

AARTOS DDS X7 (Advanced)



Typ. range: ~ 2 - 5 km

The highest-precision drone detection combined with an extremely large detection range. The AARTOS DDS X7 consists of a 16 sector IsoLOG 3D DF antenna array and a spectrum analyzer (V6 Command Center, V6 MIL or V6 Rugged Rack). Perfect for both single-system and multi-grid system setups.

AARTOS DDS X5 (Base)



Typ. range: ~ 1 - 2 km

The AARTOS DDS X5 base system consists of one analyzer (V6 MIL) and one IsoLOG 3D DF antenna array with 8 sectors. It is a highly cost-effective solution that can be used to cover to cover medium sized areas.

AARTOS DDS X9 (PRO)



Typ. range: ~ 5 - 14 km

The X9 combines highest precision and ultra-wide-band monitoring for instant, real-time detection over multiple bands. The system consists of an IsoLOG 3D DF antenna array with 16 sectors and the UWB unit, perfect for ultra-high-range drone detection grids.

System Versions



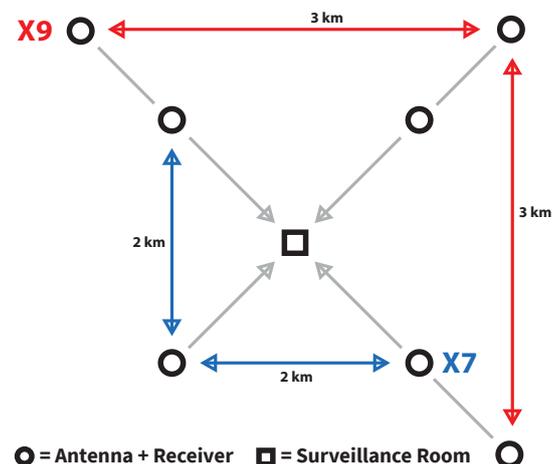
| Typ. Range | 500 m - 2 km | 1 km - 2 km | 2 km - 5 km | 5 km - 14 km |
|---|--------------------------|----------------------|--|--|
| Sectors | Omnidirectional | 8 | 16 | 16 |
| Typ. Tracking Accuracy (Line of Sight)* | Omnidirectional | 4° to 6° | 2° to 4° | 1° to 3° |
| Multi Frequency Swarm Attack | No | No | Limited | Yes |
| ITU Class for Tracking Accuracy | - | B | A | A |
| Amplifier Stages | 2 | 2 | 3 | 3 |
| Simultaneous Band Coverage | Hopping | Hopping | Hopping | Stitching/Hopping |
| Sweep/Scan Speed | 500 GHz/s | 1 THz/s | 2 THz/s – 4 THz/s | 8 THz/s – 48 THz/s |
| Real-Time 3D Triangulation (in preparation) | No | No | No | Yes |
| Receivers | 1 | 1 | 2 | 4 (up to 8 optionally) |
| Scalable | No | No | Yes | Yes |
| Max. Recommended Grid Distance | - | - | 2 km | 3 km |
| Equipment Included | V6 MIL, IsoLOG 3D Mobile | V6 MIL, IsoLOG 3D DF | Command Center / Remote Rack, IsoLOG 3D DF | Command Center / Remote Rack, IsoLOG 3D DF |
| Automatic Jamming Option | No | No | Yes | Yes |
| Radar Option | No | No | Yes | Yes |
| PTZ Support | No | No | Multi | Multi |

* Reference target at 2,4GHz (hovering drone), 1,5km distance (FCC)

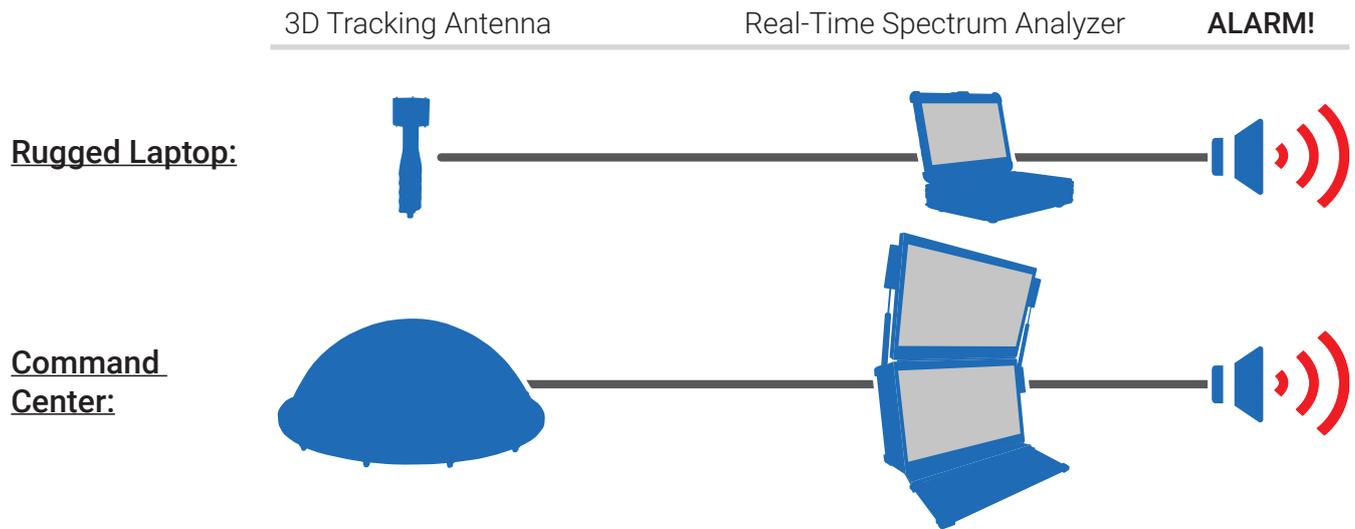
Scalable

When using the AARTOS DDS as a scalable grid solution for drone and RF detection, we recommend placing the antenna and receiver combos apart from each other at a reasonable distance, to ensure the best and most comprehensive coverage and detection. For the X7 a maximum distance of 2 km and for the X9 a maximum distance of 3 km.

The grid system can be conveniently remote-controlled from a central location.

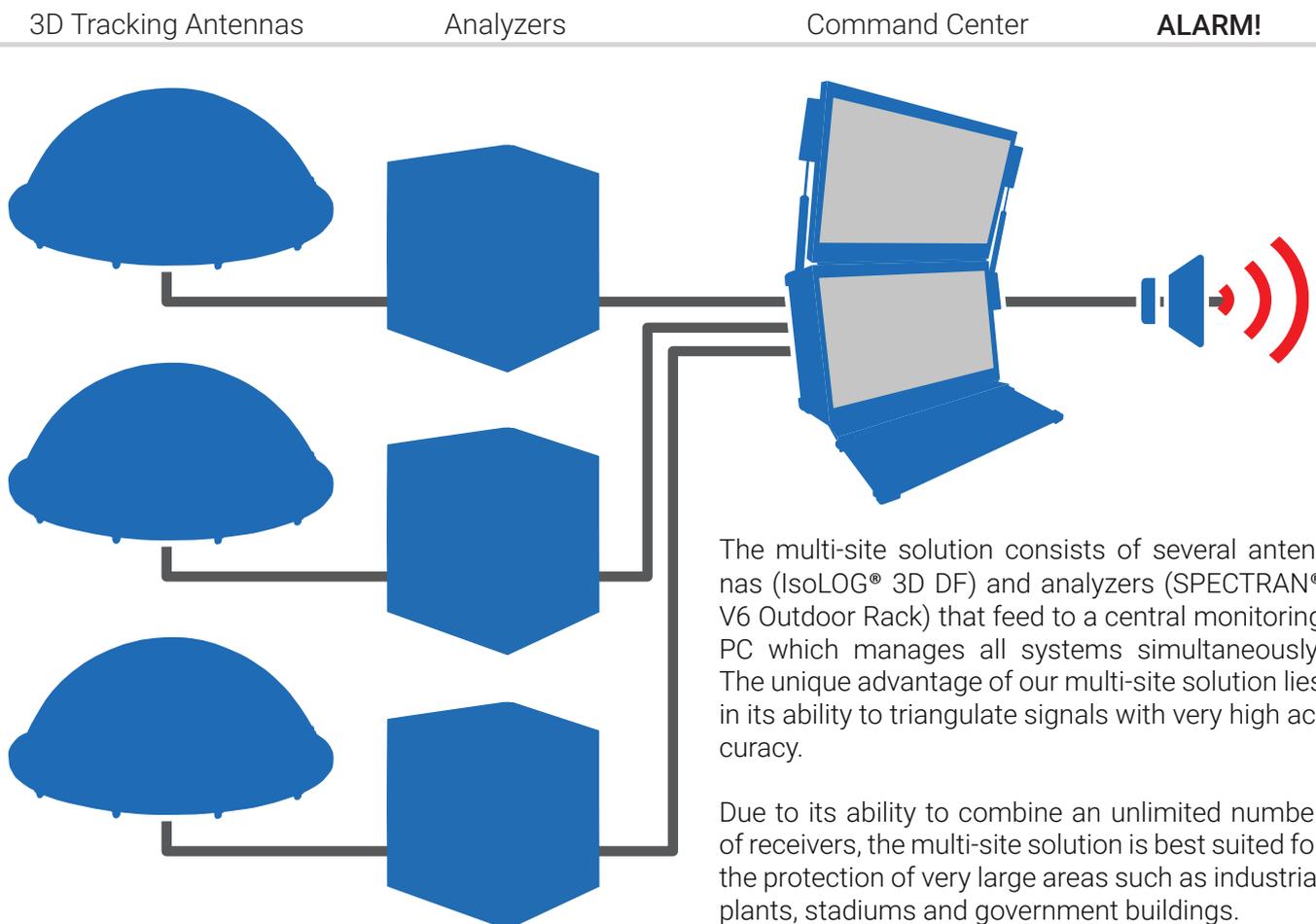


Single-Site Solution (Portable)



The Single-Site Portable solution contains a stationary or mobile spectrum analyzer (e.g. the RF Command Center or the V6 MIL) as well as the 3D directional-tracking antenna IsoLOG® 3D DF. Taking only a few minutes to set up and deploy, this system is perfectly suited for the surveillance of smaller areas, e.g. a house or a correctional facility.

Multi-Site Solution



The multi-site solution consists of several antennas (IsoLOG® 3D DF) and analyzers (SPECTRAN® V6 Outdoor Rack) that feed to a central monitoring PC which manages all systems simultaneously. The unique advantage of our multi-site solution lies in its ability to triangulate signals with very high accuracy.

Due to its ability to combine an unlimited number of receivers, the multi-site solution is best suited for the protection of very large areas such as industrial plants, stadiums and government buildings.

Design & Casing Options



Portable Rugged Laptop Analyzer

For portable solutions, the SPECTRAN® V6 MIL ENTERPRISE is the system of choice. This rugged, military-grade laptop features a powerful Intel® Xeon® E-2176M processor as well as an integrated spectrum analyzer.

This model is perfect for rapid deployment in the field - all it takes to detect drones is to set up the IsoLOG 3D DF antenna and connect it to the laptop.

Portable Command Center Analyzer

The SPECTRAN® V6 Command Center was designed with the latest and most powerful hardware and can be configured to your personal requirements. Its two 4K depict all the information processed by the RTSA Suite Pro software. Both its hardware and twin 24" sunlight-readable displays make the Command Center the perfect stationary system.



Portable Rugged 19" Rack

The SPECTRAN® V6 Rugged Rack is highly versatile and can be used as an indoor or outdoor analyzer, with multiple configurations for remote detection. Or, as part of an antenna-analyzer grid, allowing for coverage of large areas as well as the triangulation of drones and their operators. The rack is waterproof, dustproof, remotely controllable and requires almost no maintenance.

Stationary Cooled Outdoor 19" Rack

This IP65 Outdoor Rack is equipped with a double insulated housing plus efficient cooling modules to handle a temperature range from -30° to 60° Celsius. A high-end sand filter enables it to withstand sand storms. The Outdoor Rack resists all environmental conditions and is the best choice for permanent outdoor installations of the AARTOS system.



3D DF Antenna Versions

IsoLOG 3D DF-80



8 sectors with 16 antennas
 Frequency range: 400 MHz to **8 GHz**
 Typ. tracking accuracy: **up to 4°**

IsoLOG 3D DF-160



16 sectors with 32 antennas
 Frequency range: 400 MHz to **8 GHz**
 Typ. tracking accuracy: **up to 1°**

Frequency Range

| | |
|------------------------|------------------|
| Standard | 400 MHz to 8 GHz |
| VLF Extender to 20 MHz | optional |

Additional Options

| | |
|-----------------------------------|------------------------|
| Internal GPS Receiver | Yes |
| Internal Low-Noise Pre-Amplifiers | Yes (included) |
| Customized Color (RAL Table) | Yes (standard - white) |

Measurements & Operating Specifications

| | |
|-----------------------|------------------------------------|
| Operating Temperature | -30° to +60° C (-22° to 140° F) |
| Storage Temperature | -40° to 70° C (-40° to 158° F) |
| Dimensions | 960 × 960 × 380 mm |
| Weight | approx. 22 kg |
| RF Output | N (50 Ohm) |

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Latest References

Examples of AARTOS use and deployment



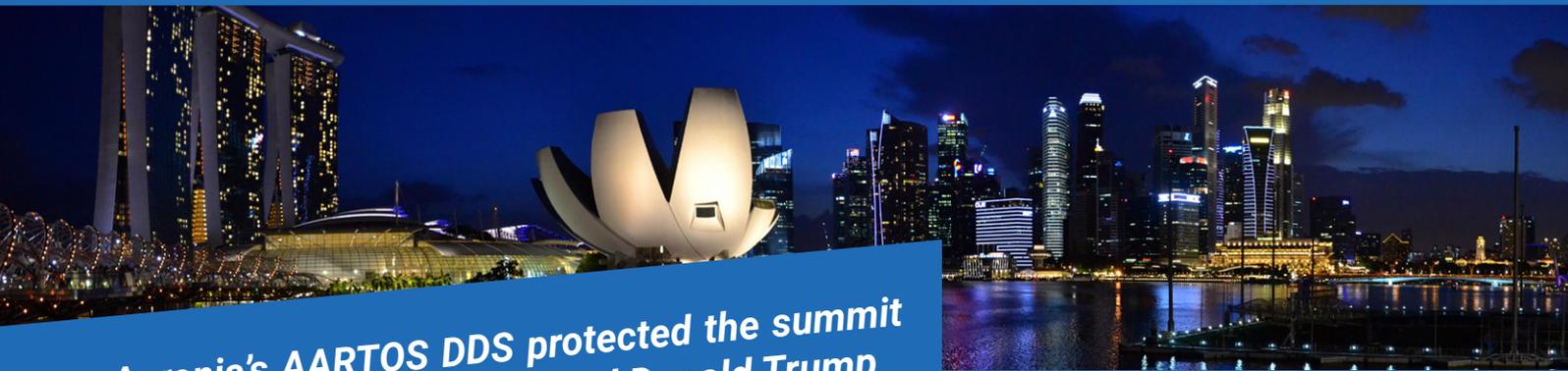
NATO summit protected from drones by Aaronia's AARTOS system



Aaronia's AARTOS drone detection system was the sole RF-based counter-UAV solution protecting the NATO Summit in Brussels.

Multiple systems were placed on top of NATO headquarters as well as the Triumphal Arch at the Cinquantenaire (Jubelpark), the location of the delegation dinner. In response to the growing threat posed by unmanned aircraft systems, the Belgian

Police handpicked AARTOS. This may not be surprising as it is the only RF-based detection system to meet all police requirements, with a special focus on multi-target, high-range detection in urban environments.



Aaronia's AARTOS DDS protected the summit meeting of Kim Jong Un and Donald Trump

We are proud to have provided our AI-based drone detection system AARTOS for the protection of the North Korea–United States summit held in Singapore.

Aaronia CEO Thorsten Chmielus: "We are delighted to have been a part of this historical and unique event, protecting the summit against drones. This is a great testimony to the unrivaled capabilities of our AARTOS system and its increasing international significance." Since drone technology is becoming more readily accessible, the use of micro or mini UAVs is starting to pose a potential threat to national and commercial security. The fully automated AARTOS Drone Detection System detects emissions from any RF signal and is able to analyze them in great detail and with high precision. Such signals may stem from "hopping patterns"

sent by drones and their remote controls, but also from other sources such as cell phones. AARTOS is capable of detecting even the most cutting-edge 4G-based drone systems.

The AARTOS system offers a unique ultra-high range (up to 50 km for a DJI P4 FCC) 360° dome coverage. Its detection technology is based on the patented Aaronia IsoLOG 3D DF Tracking Array Antenna, the UWB real-time RF receiver SPECTRAN V6 as well as a complex AI-based tracking system. Additionally the system incorporates a real-time situation awareness display which depicts highly detailed 3D flight trajectories.

International Airport Installations

AARTOS rollout for international airports around the globe



Muscat International Airport

Oman Airports has approved Aaronia's AARTOS DDS in cooperation with R & N Khimji LLC as the appropriate solution for drone detection at Muscat International Airport.



Heathrow International Airport

Heathrow International Airport in the UK also uses the AARTOS DDS, including our latest 3D model feature to monitor the entire airport area (including buildings, bridges, towers, etc.).



ASEAN International Airports

Our latest installations: ASEAN international airports use the AARTOS Drone Detection System.

- HUNDREDS OF INSTALLATIONS WORLDWIDE -

CUSTOMER GROUPS

- Military & police forces (ground & air)
- Convoys
- Airports
- Power plants
- VIP security services
- Border patrols
- Government buildings
(e.g. embassies, correctional facilities)
- Events
(concerts, political events, sports etc.)
- Seaports / marinas
- Private properties

AARTOS DDS REFERENCES

