AARTOS™
AARONIA
DRONE DETECTION
GENERATION 6

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

- ✓ **Real-time decoding of many drone protocols** (DJI Ocusync, 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**

drone-detection-system.com

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Highlights
of the AARTOS™ Drone Detection System

GENERATION 6

- ☑ **Real-time decoding of many drone protocolls (DJI Ocusync, 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 8 THz/s sweep speed
- ☑ Tracks 3G, 4G and 5G drones
- ☑ Up to 50 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

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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.

AARTOS™ Antenna Trailer Mast

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.

Fully mobile AARTOS™ Shelter Command Center

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. 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 equipped AARTOS™ Sprinter

Aaronia AARTOS™ DDS

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

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 Aaronia 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 Aaronia AARTOS™ DDS is developed, designed, individually assembled, and calibrated in Germany. This guarantees the highest production and quality standards.
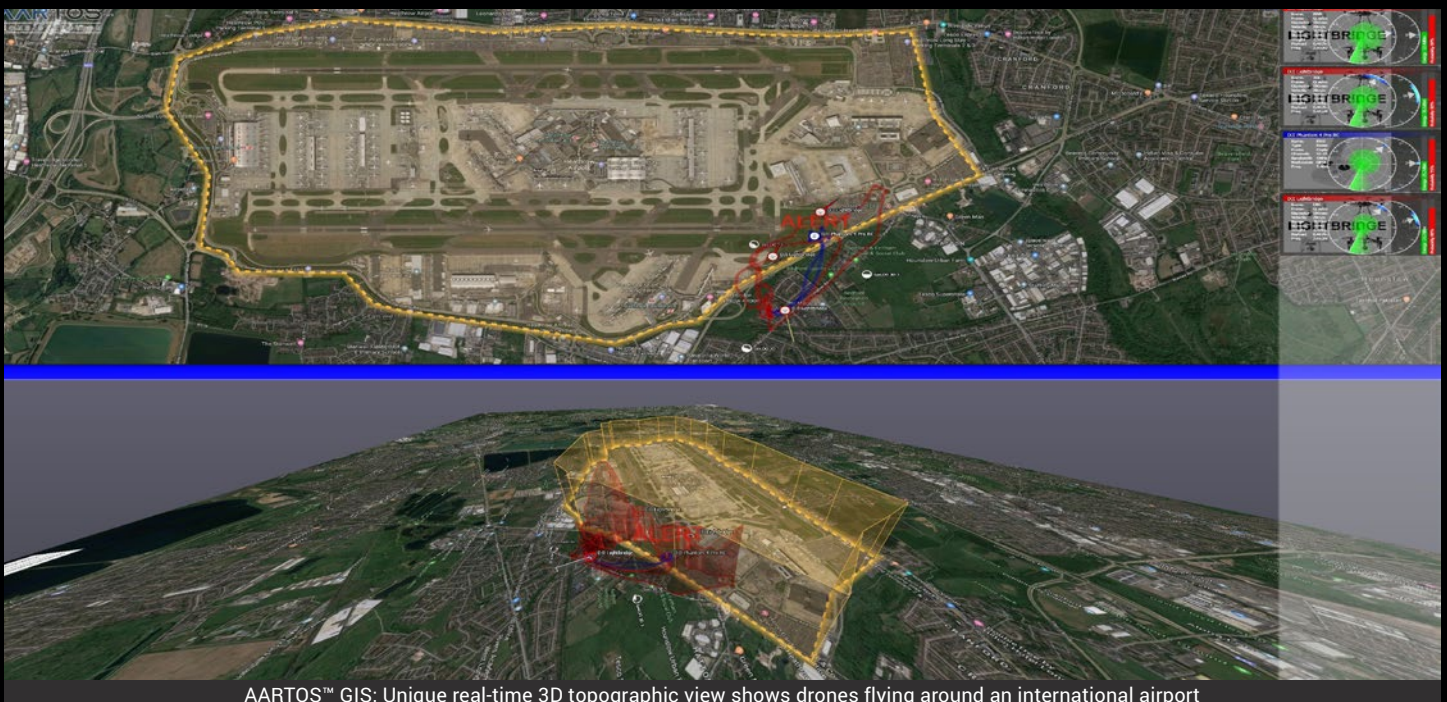
AARTOS™ GIS: Unique real-time 3D topographic view shows drones flying around an international airport

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.

Operators can zoom and move the map 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 / Fixed Band Jammer / Programmable Sector Jammer

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 AARTOS™ 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)

AARTOS™
Camera Examples

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.
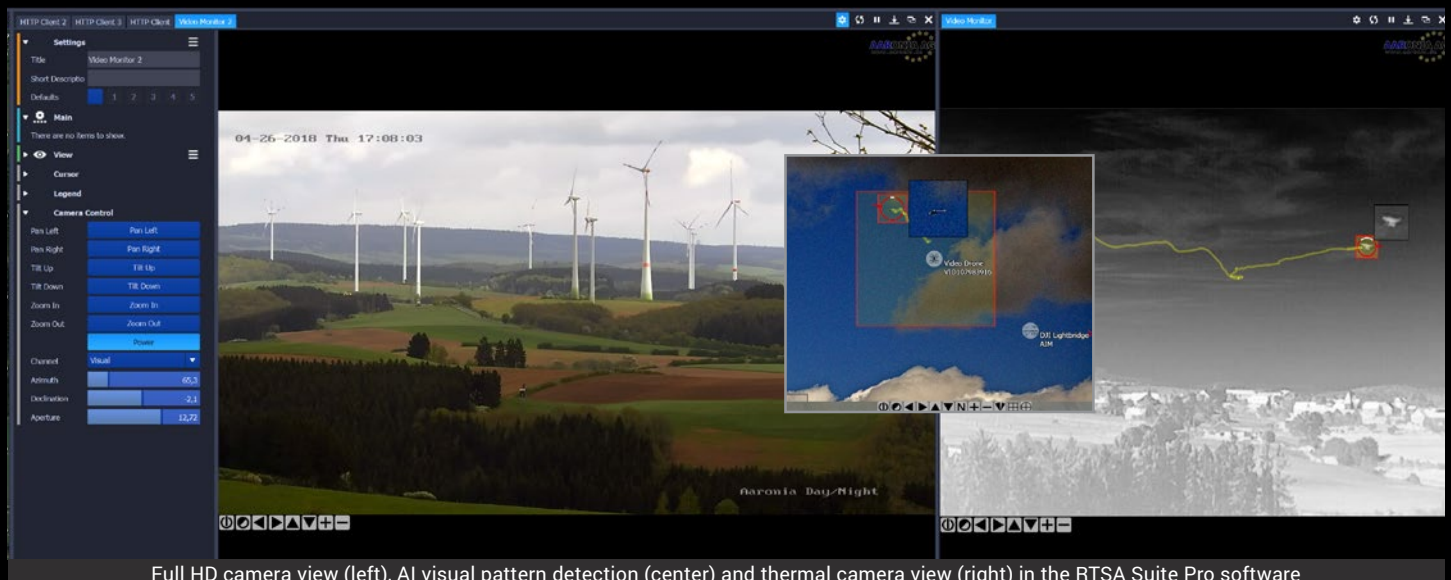
General technical specifications

- Operating temperature: -32° C to 55° C
- Operating humidity: 10 - 100% RH
- Power: 24 V/AC, 50 - 500 W
- Lightning protection and more

PTZ (movement range and speed)

- Pan: 360° continuous rotation
- Tilt: 90° BLDC
- Pan speed: 0.008 °/s to 120 °/s

Features

- Thermal and optical camera for 24/7 protection
- Sophisticated tracking and analysis AI
- Max. camera resolution of 1920 × 1080 px (full HD)
- Max. thermal module resolution of 1280 x 720 px
- Optical: 13 mm to 261.5 mm focal length
- Thermal: 72 mm to 900 mm focal length
- IP67-certified protection

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

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 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.

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Customer Hardware Integration

Because software is key

The AARTOS™ drag and drop construction setup
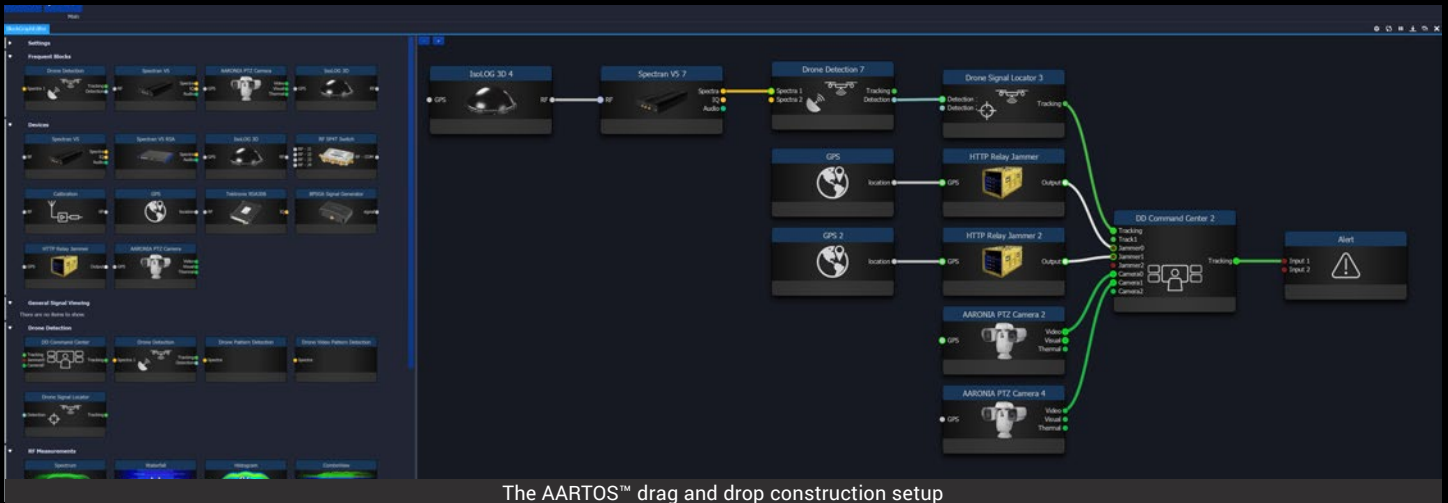
Complete customization

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.

System Versions

AARTOS™ X2   Portable solution, omnidirectional, typical range: ~ 1 - 5 km

The portable and quick-to-use AARTOS™ X2 is a decoding system that exactly shows the position of DJI drones and drone pilots and even their home position. Alternatively, it is also available as a purely stationary system with a range of up to 30km.

AARTOS™ X5   Portable solution, typical 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 medium sized areas.

AARTOS™ X7   Portable and stationary solution, scalable, typical 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 or 19" rack). Perfect for both single-system and multi-grid system setups.

AARTOS™ X9   Portable and stationary solution, scalable, typical range: ~ 5 - 14 km

The X9 combines highest precision and ultra-wideband monitoring for instant, real-time detection over multiple bands. The system consists of an IsoLOG® 3D DF antenna array with 16 sectors and the Command Center or 19" rack, perfect for ultra-high-range drone detection grids.

	X2	X5	X1	X9
RF tracking range	-	1 km - 2 km	2 km - 5 km	5 km - 14 km
Decoding range	Standard: max. 5 km Long range: max. 40 km	1 km - 2 km	2 km - 5 km	Standard: 5 km - 14 km Long range: max. 40 km
Usage	Mobile & stationary	Mobile	Stationary	Stationary
Frequency coverage	2.4 GHz + 5.8 GHz	10 MHz to 6 GHz		
Detection type	Drone protocol decoding	Drone protocol decoding & RF signal detection		
Sectors	Omnidirectional	8	16	16
Typ. tracking accuracy (line of sight)*	GPS accuracy	4° to 6°	2° to 4°	1° to 3°
Multi frequency swarm attack	No	No	Limited	Yes
Scalable	No (Yes with stationary versions)	No	Yes	Yes
Max. recommended grid distance	-	-	2 km	3 km
Radar and PTZ Camera	No (Yes with stationary versions)	No	Yes	Yes
Automatic jamming option	No	No	Yes	Yes

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

X2 X5 Single-Site Portable Examples

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.

Antenna(s) ⋯⋯⋯⋯ Real-time spectrum analyzer ⋯⋯⋯⋯ **ALARM!**

X2
Rugged Laptop:
(omnidirectional)

X5
Rugged Laptop:
(8 sectors)

Scalability
High accuracy for very large areas

X7 X9 Multi-Site Solution Example

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. Additionally, the X9 solution can also be upgraded with 2.4GHz/5.8GHz long range antennas with a detection range of up to 40 km.


3D tracking antennas ·············· analyzers ···················· command center ··············· ALARM!

SCALABLE RECEIVERS

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 fro m 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.

X9   3 km   3 km

2 km

2 km

X7

○ = Antenna + Receiver   □ = Surveillance Room
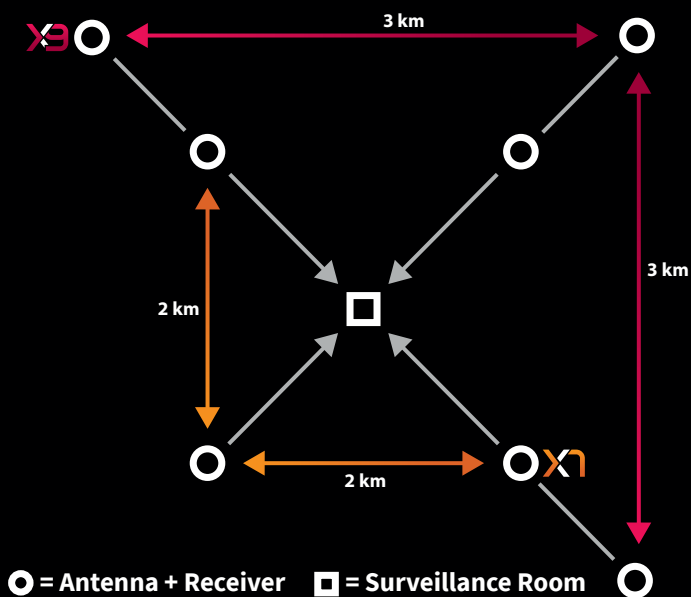
Design & Casing Options
of the AARTOS™ Drone Detection System

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.
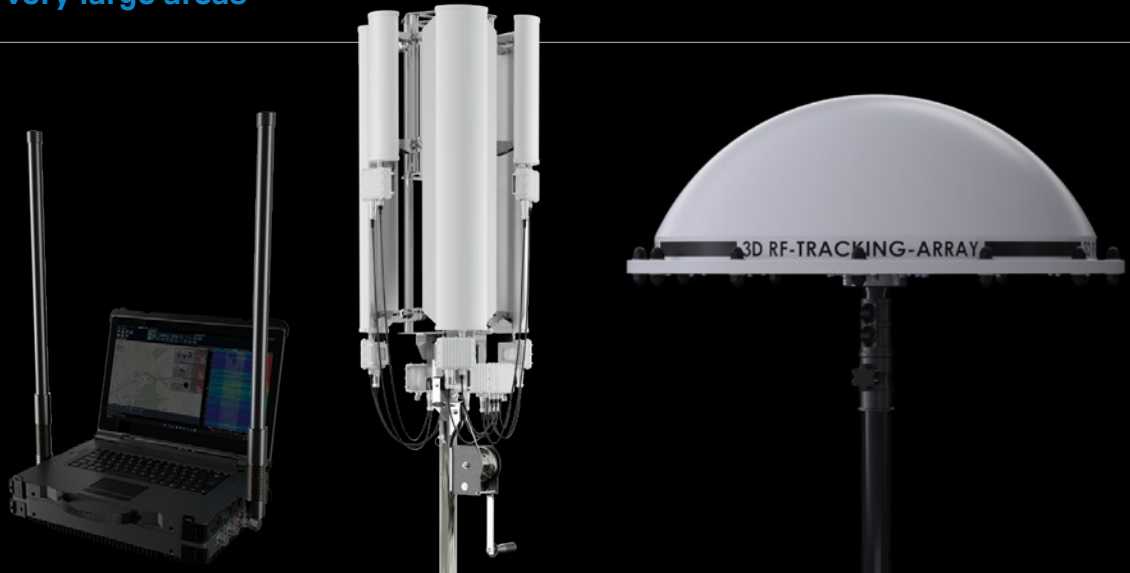
Stationary Cooled Outdoor 19" Rack

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.

Antenna Versions

## high accuracy for very large areas

Compatible with	X2	X2 X3	X5	X7 X3
Antenna Type	Omnidirectional	Directional long range (4 sectors)	3D direction finding (8 sectors)	3D direction finding (16 sectors)
Frequency Range	2.4 - 2.5 GHz 5.1 - 5.9 GHz		400 MHz to 8 GHz (optionally to 20 MHz)	
Typ. Tracking accuracy	GPS		2° - 4°	1° - 3°
Connection	N (f), 50 Ohm		N (f), 50 Ohm	
Operating Temprature	-40 to +80° C	-20°C - +60°C	-30° to +60° C	
IP Rating	IP65		IP65	
Dimensions	2.4 GHz: Ø 25x400 mm 5.8 GHz: Ø 25x600 mm	2.4 GHz: 990x230x65 mm 5.8 GHz: 455x115x60 mm	960×960×380 mm	
Weight	0.5 kg	30 kg (6 Antennas with amps & tripod mount)	Approx. 22 kg	

The AARTOS™ X2 system with the long range antenna upgrade is able to detect drones within a 40 km radius.

Latest References

Examples of AARTOS™ use and deployment
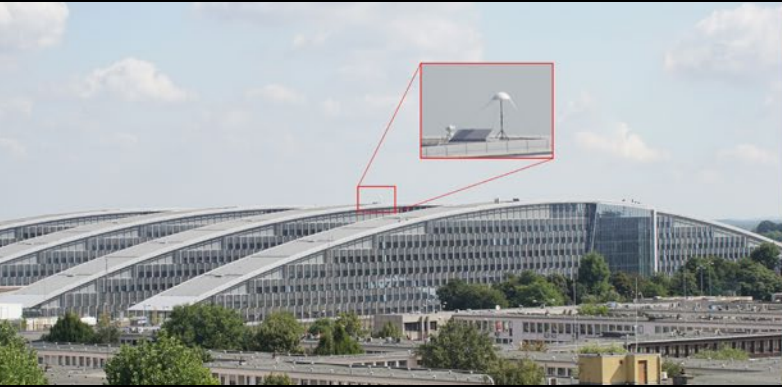
AARTOS™ protects Nato Summit

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

AARTOS™ protects 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.

AARTOS™ protects G20 Summit

AARONIA successfully protected the famed conference from illegal and unwanted drones with the AARTOS™ drone detection system.
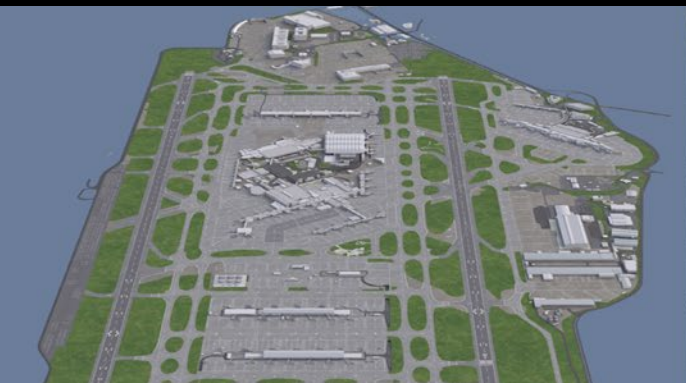
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Latest References
Examples of AARTOS™ use and deployment

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

AARTOS™ X9 installed: ASEAN international airports use the AARTOS™ Drone Detection System.

HUNDREDS OF INSTALLATIONS **WORLDWIDE**

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AARTOS™ DDS
REFERENCES

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

Map markers:
MEXICO, USA, CANADA, ECUADOR, TRINIDAD & TOBAGO, ICELAND, UK, SPAIN, FRANCE, GERMANY, MOROCCO, ALGERIA, NIGERIA, EQUATORIAL GUINEA, MALTA, CROATIA, AUSTRIA, CZECHIA, GREECE, SERBIA, POLAND, LATVIA, LITHUANIA, ESTONIA, UKRAINE, GEORGIA, TURKMENISTAN, RWANDA, KENYA, LEBANON, JORDAN, SAUDI ARABIA, QATAR, OMAN, UNITED ARAB EMIRATES, INDIA, CHINA, THAILAND, MALAYSIA, SINGAPORE, INDONESIA, AUSTRALIA, TAIWAN, SOUTH KOREA, JAPAN