

Real-Time RF Drone and Radar Detection System

# Aaronia Drone Detector

Captures any kind of UAV / Real-time remote controllable / All-in-one solution



Extremely high coverage of several km

Locates the drone and the drone operator

360° coverage with high tracking accuracy

# Highlights

- ✓ Real-time measurement of the RF emissions from drones / UAVs, radar etc.
- ✓ Captures any kind of drone
- ✓ Tracks the operator who controls the drone too
- ✓ Extremely high coverage, several kilometers depending on the drone type
- ✓ Works with unlimited number of drones at the same time
- ✓ Identification of the drone type (e.g. DJI Phantom 4)
- ✓ Works at night, fog and bad weather
- ✓ Also works against drones „disguised“ between buildings, plants, trees..
- ✓ Allows a 24/7 monitoring and recording without any gaps
- ✓ High tracking accuracy of up to 2°
- ✓ Ready for use within a minute (portable version)
- ✓ 360° coverage
- ✓ Covers a frequency range from 20MHz to 6GHz
- ✓ Unlimited in size & numbers of receivers, arbitrary scalable and expandable
- ✓ High sensitivity even in urban environment, due to switchable sector-amps
- ✓ Made in Germany





# Aaronia Drone Detector

## Protect your privacy and make sure of your physical security

After 4 years of development, Aaronia introduces its new Drone Detection System. The Aaronia Drone Detector is used to detect the incursion of unwanted drones, based on the directional real-time measurement of the electromagnetic emissions of the drone and its remote control. It warns the operator when drones are in the area and send alerts.

### Drones can be more than just an annoyance

The rapid proliferation of micro/mini UAVs is a growing potential threat to national and commercial security.

Easy to make, cheap to buy, simple to fly, and hard to detect, commercial and non-commercial available drones are one of the most quickly evolving technological threats to military and civilian interests.

A commercial drone reportedly alarmed the Secret Service in March 2015 when the aircraft flew too close to President Barack Obama during a round of golf in Florida.

### Detection Range

The system has no limitation in detection range, usually the detection range is the same as the usable distance from the operator to the drone (or better), so it always depends on the transmitter power of the drone/operator. Depending on the drone type, it could be several km / miles without problems.

### Early detection

The Aaronia Drone Detector already gives an alarm as soon as a remote control is on air, so even before the drone is in the air. Countermeasures can therefore be initiated at an early stage.

### Aaronia Drone Detector can be used anywhere

The drone detection system can be used virtually anywhere. Typical use scenarios are the protection of residential areas, governmental buildings and commercial / industrial areas like nuclear plants.

Available as single-side or multiple-side solution, the system is adjustable to the characteristics of the terrain to be monitored.

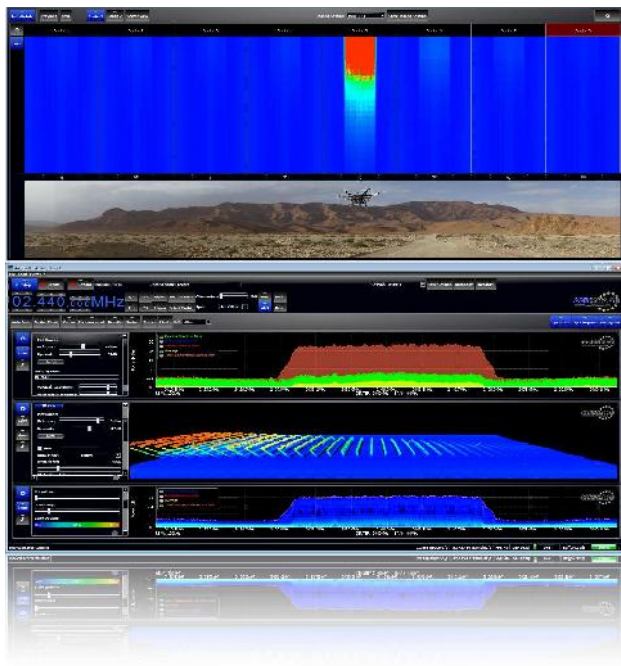
### Hardware

The drone detector is based on the Aaronia IsoLOG 3D antenna, a real-time Spectrum Analyzer (XFR V5 PRO or RF Command Center) and a special software plugin for the RTSA Suite software. All parts combined allow a 24/7 monitoring and recording with a gapless data-streaming. The

system saves considerable measurement time and is compact and flexible. It can be set up at any place you need to control.



Typical Detection Range of the Aaronia DDS



### Counter-Measures

The system can be extended by a jammer that can effectively prevent rf contact to a drone to force it into the fail-safe mode, e.g. to land or to hover. The interference is extremely selective, that other rf channels are not impaired.

Besides the selectivity the jammer is highly directional and only jams in the direction of the incoming UAV.

### Advantages of a radio communication solution

The rf detection of the drone signals has minor advantages compared to other methods such as radar, optical and acoustic detection:

- ◆ **Safe detection without false alarms**

The system can not be irritated by other flying objects such as birds, balloons or dragons.

- ◆ **Early detection**

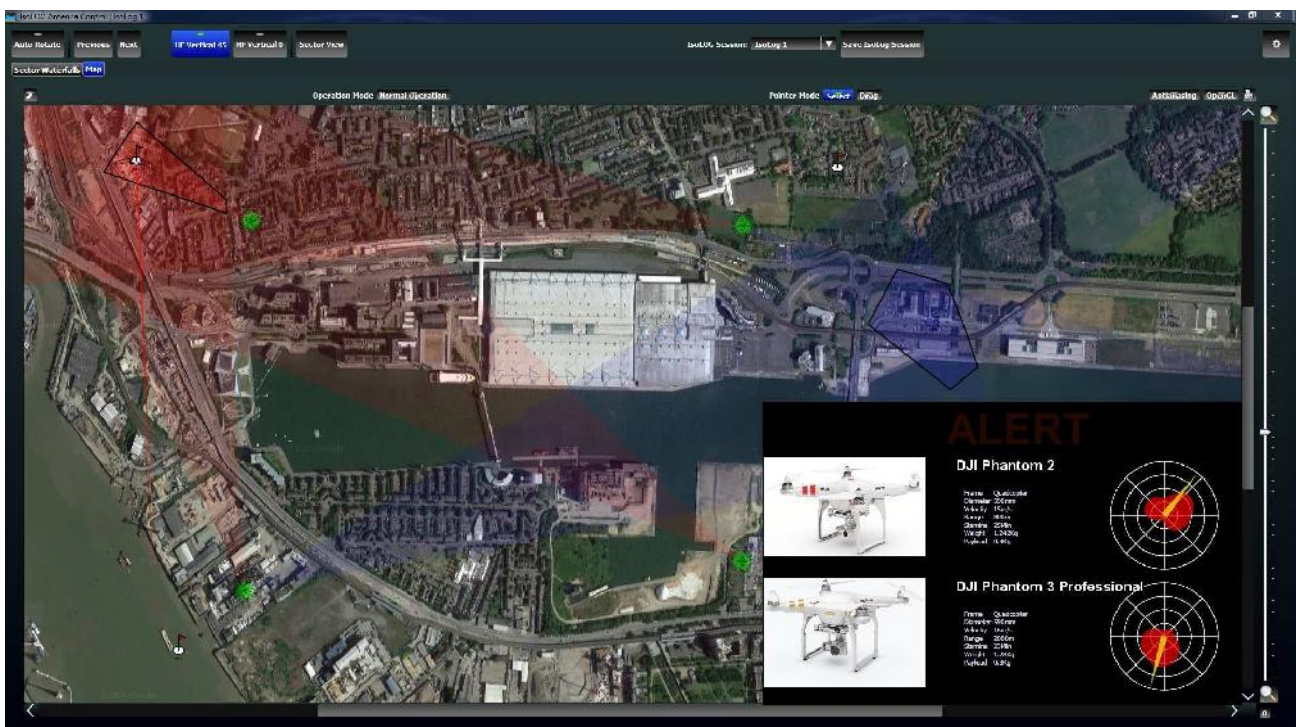
The Aaronia DDS already gives an alarm as soon as a remote control is turned on, so even before the drone is in the air. Countermeasures can therefore be initiated at an early stage.

- ◆ **Tracking the drone owner**

Since the Aaronia Drone Detector detects both the drone via its downlink signals as well as the remote control, the direction of both can be tracked immediately. When 3 or more systems are used, the exact position can be determined via triangulation.

### Made in Germany

The Aaronia Drone Detector is developed, individually manufactured and calibrated in Germany. This guarantees highest standards.



This picture shows the map view of the Aaronia DDS, with direction and position of the drone (red) and the operator (blue).

The DDS shows even the type of detected drone and can handle an unlimited number of drones simultaneously.



## System exceptional performance in high dens ISM area

System is able to separate targeted RC link from other signals within a dense signal scenario (Wi-Fi, Bluetooth®..)

### ♦ Automatic threat notification/alarm triggering

Alarm is triggered when known UAV rf signals are detected.

When alarm is generated operator can see notification and hear sound \* visual and acoustically.

Also alarm can be sent as sms message to predefined groups of users (mobile phones), or as XML over IP.

### ♦ Extendable profile database - threat library

Smart-Trigger-Pattern-Database or STPD

A constantly expanding database. Optional upgrades are available via Internet. Furthermore, the user can add custom pattern recordings to their database for specialized use via the "Teach-In-Function".

### ♦ Highly automated workflow

User workload is reduced due to automatic processing workflow

### ♦ Open interfaces

Open interface for system integrators. It can be integrated into third-party solutions or existing systems .



### ♦ Video link interception (optional)

When a video link is transmitted by the drone (e.g. via Wi-Fi, PAL/NTSC), this can be intercepted and displayed to the operator.

### ♦ Auto counter-measure for known uav/drone

When remote controls with known profiles are detected, an automatic notification of threats within a defined detection area can be auto jammed with jammer that can effectively disrupt the radio link to a drone which will force the drone into failsafe mode so that it will either land immediately or return to its point of origin. Besides the selectivity the jammer is highly directional and only jams in the direction of the incoming UAV.



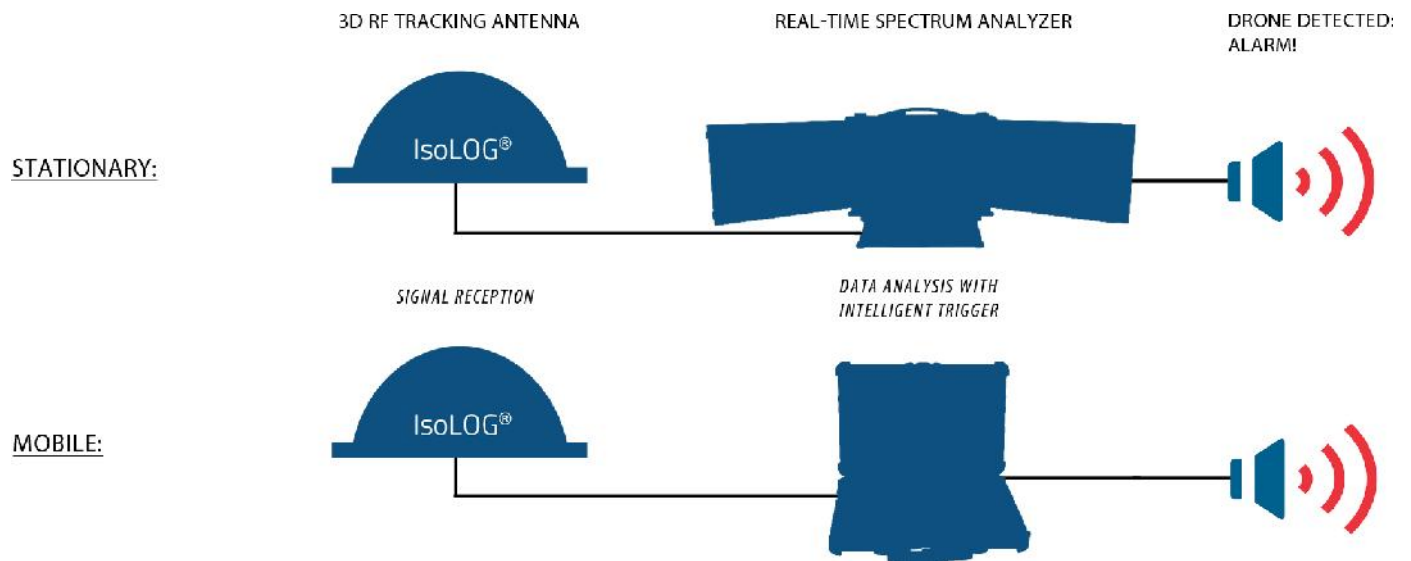
## Early warning

Reliable interception of short-duration signals with a signal duration as low as 350 microseconds, even in the densely occupied ISM frequency bands.

The radio-link establishment, take-off and climb usually take between 20 and 30 seconds, depending on the drone model. This can take significantly longer if the operator performs a full systems-check.

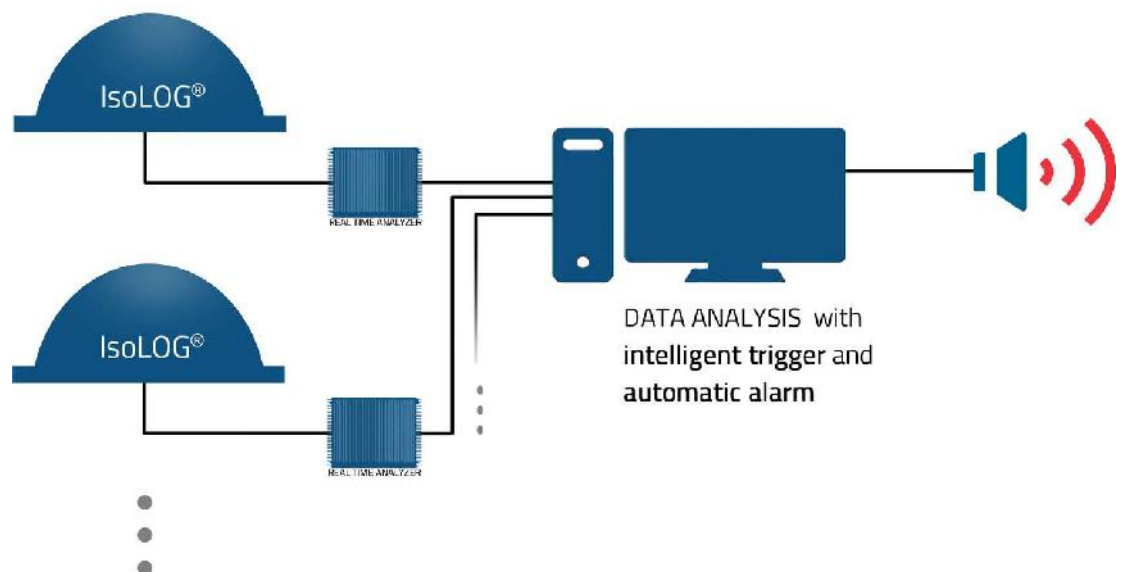


# Single Side Solution



The single side solution is ready to use within a few minutes only. Based on a stationary or mobile Spectrum Analyzer (RF Command Center or XFR V5 PRO, see page 6) and the 3D direction finding antenna IsoLOG 3D, this solution is the first choice for surveillance of small areas, e.g. a house.

# Multiple Sides Solution



The multi solution consists of several antennas (IsoLOG 3D) and analyzers (Spectran V5 ODB - Outdoor analyzer), coupled together to one centralized monitoring PC which manages all systems simultaneously. The advantage of the multi solution is the possibility to triangulate the signals. This leads to a very high tracking accuracy. Furthermore, the multi solution can combine an unlimited number of receivers, thus it's suitable to protect very large areas e.g. industry plants, stadiums, government buildings etc.

# System specification

## Aaronia drone detection system

Frequency range	
Standard	20MHz to 6GHz
FHSS/DSSS/WiFi detection	Yes
VLF/SHF antenna extender to 9KHz/20GHz	Yes (optional)

Detection	
Detection type	RF detection
Detection range	Extremely high coverage (at least 1 km)
False alarm rate	Without false alarms*
FHSS signal interception	Yes, signal time >350µs
Signal detection congested ISM band	Yes

Counter-Measures	
Jamm UAV control signal	Yes
Output power	500mW up 2x2W

Software	
Detection of UAV	Yes
Identification of UAV	Yes (database)
Evidence recording	Yes
UAV jamming	Yes
UAV operator direction and location	Yes
Alarm notification	Yes (visual,sound,email,sms,xml)
Identification/Classification	Automatic * predefined list and rules
UAV Video link recording	Supported by upgrade option
Highly automated workflow	Yes
Open interfaces	Integration to third party solutions
Auto-jam option	All identified UAV in profile database
UAV threat database	Smart-Trigger-Pattern-Database

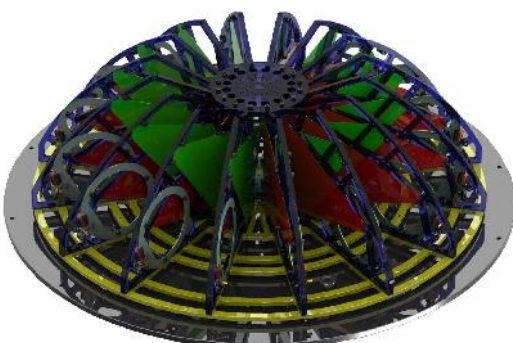
Without false alarms\* by birds,baloons, fly kits etc.



# Hardware Part 1 (Antenna)

## IsoLOG 3D 80

## IsoLOG 3D 160 (higher accuracy)



OR

**8 sectors with 16 antennas**  
Frequency range: 20MHz to **6 GHz**

**16 sectors with 32 antennas**  
Frequency range: 20MHz to **6 GHz**

Frequency range	
Standard	20MHz to 6GHz
VLF Extender to 9kHz (option)	Yes
SHF Extender to 20GHz (option)	Yes

Frequency range	
Standard	20MHz to 6GHz
VLF Extender to 9kHz (option)	Yes
SHF Extender to 20GHz (option)	Yes

Additional Options	
Internal GPS receiver	Yes
Internal low noise pre-amplifier	Yes (included)
Customized color (RAL table)	Yes
8x horizontal LPDA's in addition	Yes

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Internal GPS receiver	Yes
Internal low noise pre-amplifier	Yes ( included)
Customized color (RAL table)	Yes
8x horizontal LPDA's in addition	Yes

Mechanical & environmental	
Power	via included PoE adapter
Operating temperature	-30 to +60°C (-22 to 140°F)
Storage temperature	-40 to +70°C (-40 to 158°F)
Dimensions	950 x 950 x 300mm
Weight	approx. 20kg
RF Output	N (50Ohm)
Warranty	2 years

Mechanical & environmental	
Power	via included PoE adapter
Operating temperature	-30 to +60°C (-22 to 140°F)
Storage temperature	-40 to +70°C (-40 to 158°F)
Dimensions	950 x 950 x 300mm
Weight	approx. 20kg
RF Output	N (50Ohm)
Warranty	2 years



# Hardware Part 2 (Spectrum Analyzer)

XFR V5 PRO (portable)

RF Command Center (stationary)



OR

Real-Time Outdoor Spectrum Analyzer (IP65 rated) with fully featured PC and Drone Detection Software

Real-Time RF Command Center with fully featured PC and Drone Detection Software

Frequency range	
Standard	20MHz to 20GHz

Frequency range	
Standard	20MHz to 20GHz

Technical specs	
Real-time bandwidth	160 / 175MHz
Minimum Event Duration for 100% POI	20µs (optionally 1µs)
GPS	Inbuilt
Trigger with automated alarm	Yes

Technical specs	
Real-time bandwidth	160 / 175MHz
Minimum Event Duration for 100% POI	20µs (optionally 1µs)
GPS	Optional
Trigger with automated alarm	Yes

Mechanical & environmental	
Operation mode	via battery or power supply
Operating temperature	-20 to +60°C
Storage temperature	-40 to +70°C
Dimensions	41x32x12cm
Weight	8,5kg
Country of Origin	Germany
Warranty	2 years

Mechanical & environmental	
Operation mode	via power supply only
Operating temperature	0 to +45°C
Storage temperature	-10 to +60°C
Dimensions	54x28x37cm (monitors closed)
Weight	25kg (34kg with rollcase)
Country of Origin	Germany
Warranty	2 years

# References

## Cross-Section of Aaronia Clients

### Government, Military, Aeronautic, Astronautic

- ♦ NATO, Belgium
- ♦ Department of Defense, USA
- ♦ Department of Defense, Australia
- ♦ Airbus, Germany
- ♦ Boeing, USA
- ♦ Bundeswehr, Germany
- ♦ NASA, USA
- ♦ Lockheed Martin, USA
- ♦ Lufthansa, Germany
- ♦ DLR, Germany
- ♦ Eurocontrol, Belgium
- ♦ EADS, Germany
- ♦ DEA, USA
- ♦ FBI, USA
- ♦ BKA, Germany
- ♦ Federal Police, Germany
- ♦ Ministry of Defense, Netherlands

### Research/Development, Science and Universities

- ♦ MIT - Physics Department, USA
- ♦ California State University, USA
- ♦ Indonesien Institute of Science, Indonesia
- ♦ Los Alamos National Laboratory, USA
- ♦ University of Bahrain, Bahrain
- ♦ University of Florida, USA
- ♦ University of Victoria, Canada
- ♦ University of Newcastle, United Kingdom
- ♦ University of Durham, United Kingdom
- ♦ University Strasbourg, France
- ♦ University of Sydney, Australia
- ♦ University of Athen, Greece
- ♦ University of Munich, Germany
- ♦ Technical University of Hamburg, Germany
- ♦ Max-Planck Institute for Radio Astronomy, Germany
- ♦ Max-Planck-Institute for Nuclear Physics, Germany
- ♦ Research Centre Karlsruhe, Germany

### Industry

- ♦ APPLE, USA
- ♦ IBM, Switzerland
- ♦ Intel, Germany
- ♦ Shell Oil Company, USA
- ♦ ATI, USA
- ♦ Microsoft, USA
- ♦ Motorola, Brazil
- ♦ Audi, Germany
- ♦ BMW, Germany
- ♦ Daimler, Germany
- ♦ Volkswagen, Germany
- ♦ BASF, Germany
- ♦ Siemens AG, Germany
- ♦ Rohde & Schwarz, Germany
- ♦ Infineon, Austria
- ♦ Philips, Germany
- ♦ ThyssenKrupp, Germany
- ♦ EnBW, Germany
- ♦ CNN, USA
- ♦ Duracell, USA
- ♦ German Telekom, Germany
- ♦ Bank of Canada, Canada
- ♦ NBC News, USA
- ♦ Sony, Germany
- ♦ Anritsu, Germany
- ♦ Hewlett Packard, Germany
- ♦ Robert Bosch, Germany
- ♦ Mercedes Benz, Austria
- ♦ Osram, Germany
- ♦ DEKRA, Germany
- ♦ AMD, Germany
- ♦ Keysight, China
- ♦ Infineon Technologies, Germany
- ♦ Philips Semiconductors, Germany
- ♦ Hyundai Europe, Germany
- ♦ VIAVI, Korea
- ♦ Wilkinson Sword, Germany
- ♦ IBM Deutschland, Germany
- ♦ Nokia-Siemens Networks, Germany



Made in Germany

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