Bird®

SignalHawk Handheld Spectrum Analyzer

Angle of Arrival -Defeat RF Interference

Agenda

- Introductions
- Application Overview
- Target Markets
- Product Overview
- Product Specification
- Sales Tools

About: Learn about the key features of Bird's Spectrum Analyzer with a focus on the ability to triangulate the location of an interferer.

We will cover some applications for AOA (Angle of Arrival) and some common interfering sources.

Get a better understanding of what Angle of Arrival is and why it is better than other methods in the market.

SignalHawk Family Overview

SH-60S-TC

SH-60S-TC		SH-60S-AOA
9 kHz – 6 GHz		9 kHz – 6 GHz
7.8 x 3.7 x 2.4 in		7.8 x 3.7 x 2.4 in
1.98 lb		1.98 lb
5 hour		5 hour
ACPR OBW Channel Power Phase Noise N dB Down Bandwidth FM Demodulation Field Strength GNSS Signal Quality Spectrum Masking Spectrogram/Waterfall		ACPR OBW Channel Power Phase Noise N dB Down Bandwidth FM Demodulation Field Strength GNSS Signal Quality Spectrum Masking Spectrogram/Waterfall
		Interference Analysis (Triangulation overlaid on map) *Mapping provided by OpenStreetMap*

SH-60S-AOA

SignalHawk Value Proposition

Value Proposition

The SH-60S-AOA is a compact, affordable and feature-rich spectrum analyzer allowing RF technicians to quickly and easily view, measure, and manage their spectrum and triangulate the location of an interferer based on power levels with a directional antenna

- By utilizing a natural integration of digital maps, GPS location and signal strength vectoring, the SignalHawk – AOA provides an easy-to-use interface.
- Pinpoints potential in-band interferers and “rogue” or “pirate” broadcast locations, but also perform coverage mapping and “dead spot” identification.
- When paired with an appropriate directional antenna, the small handheld form-factor with extended run-time, allows the SignalHawk to be taken to all types of remote or “off-grid” locations with an ATV or foot, to accurately pinpoint signal origination.

RF Interference Examples

- Have you ever heard stories on the news or experience yourself having issues with garage door openers? Maybe not operating at certain times of the day?
- What about those times you go to use your key fob and they were not operating, and you knew the battery is good?

- Maybe you have heard of the local police department complaining about their 2-way radios being taken down occasionally?

These are just a few examples of RF interference causing problems with a device.

What is Angle of Arrival (AOA)?

AOA stands for “Angle of Arrival”, also known as automatic direction finding.

- **AOA** is the direction from which an RF Signal is received.
- **AOA** is used to discover the location of an interfering signal, such as an unlicensed radio transmission, or other types of generators producing RF signals, disrupting lawful transmissions.
- **AOA** measurement locates and senses the direction of the arriving transmitted signal, then calculates the relative orientation or angle.
- **AOA** triangulation is when three or more measurements cross to identify the location of the unknown signal.

So why do you need AOA?

When interference occurs, unwanted radio frequency signals disrupt the use of your equipment

Interference may prevent reception altogether, may cause only a temporary loss of a signal, or may affect the quality of the sound or picture produced by your equipment.

The two most common causes of interference are transmitters and electrical equipment.
Examples:

- **Communication systems** that transmit signals capable of generating interference include amateur radios, CB radios and television stations.

- **Design flaws** such as insufficient filtering, inadequate shielding, or frayed or corroded wires may make equipment susceptible to transmitter interference.

- **Interference may be caused by equipment in your home or workplace** such as, hair dryers, electric drills, doorbell transformers, light switches, smartphone chargers, power supplies, computing devices, washing machines, clothes dryers, fluorescent lights, LED lights, or Light dimmers.

- **Electrical interference** may also be caused by power lines.

Applications of AOA?

When identifying situations where you would need the AOA functionality, here are some common interfering sources.

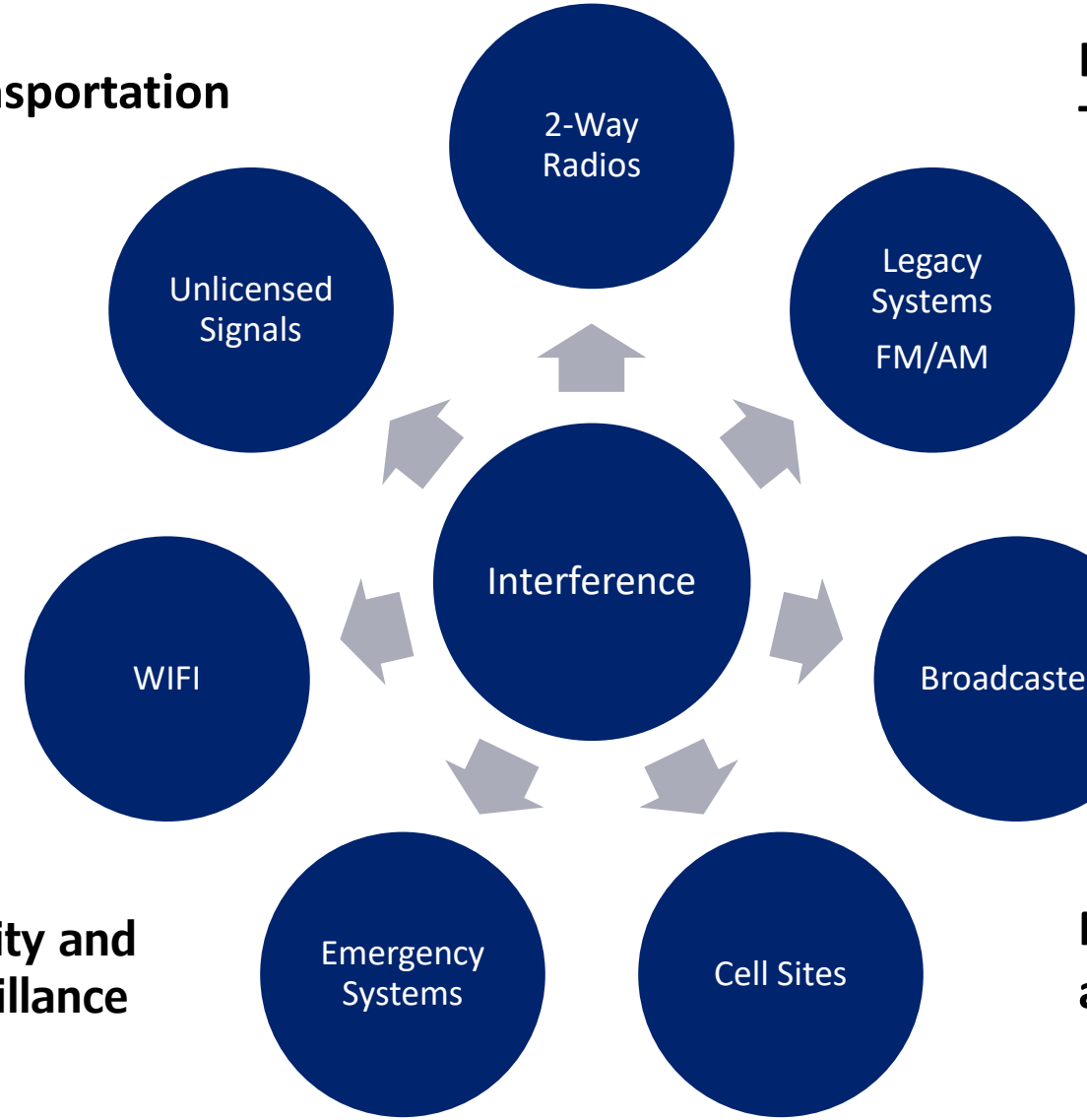
- **Faulty or poorly shielded electronic devices** that can allow energy to leak out and interfere with other RF devices.
- **Noise** can result from a tiny break in the shield or insulator, that can create an inadvertent transmission, that could broadcast in unknown locations, frequencies and times.
- Electronic devices **configured incorrectly**.
- Electronic devices that are **not compliant** with local regulations.
- **Jammers and Deliberate Interference**.

Markets

Transportation

Aviation

Security and Surveillance



IT & Telecommunication

Land Mobile Radio

Military-Aerospace and Defense

Personas-AOA Real Life example

Name: Joel, Communication Site Manager

Segment: Railway

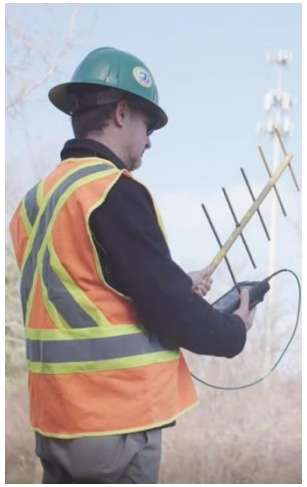
Age:55 years old

Education: BS Degree EE Engineering

Objective: Perform field inspections to ensure compliance with the safety policies and procedures, and approved work methods in reference to communication

SignalHawk AOA Features

- Identifies the presence of an interfering signal with the spectrum analyzer.
- Combining mapping technology and GPS, AOA allows the user to pinpoint the location of the interfering signal.
- AOA uses a technique called Triangulation where signal strength measurements are recorded at 3 or more locations.
- Easy-to-use interface to pinpoint potential in-band interferers.
- External directional antenna required (not included).
- For signals between 9 kHz and 6 GHz.
- Portable, battery-powered and rugged for remote locations.

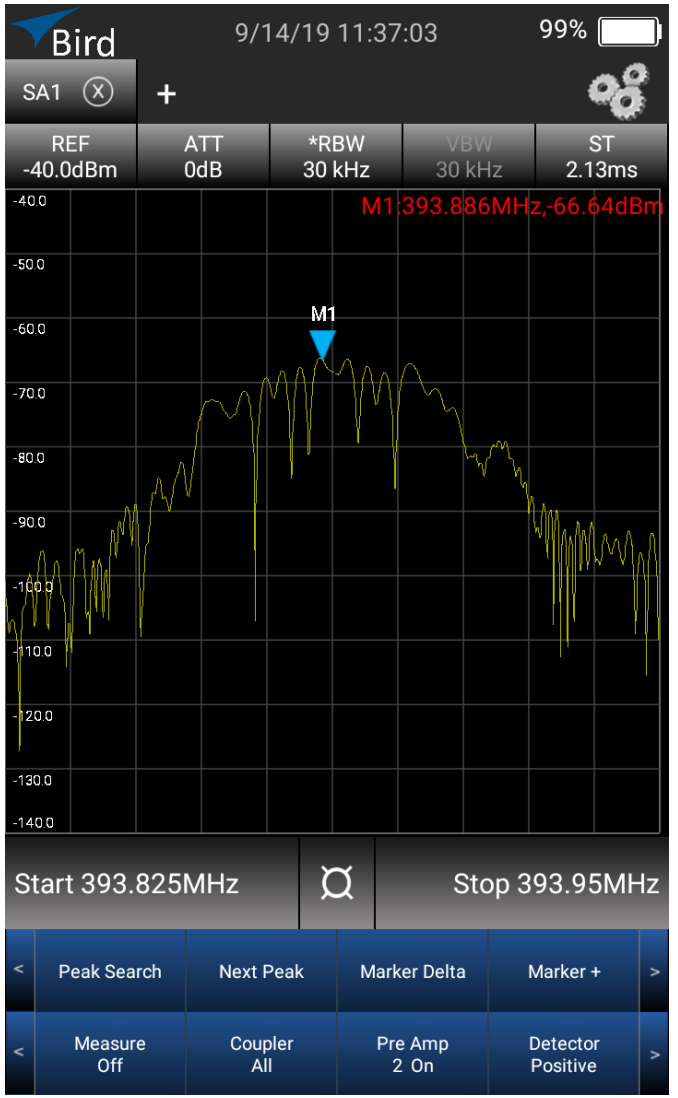


What are some Tips?

- The frequency of the interfering signal must be identified on a spectrum analyzer.
- It is very important that the antenna and SH-60S-AOA be oriented in the same direction.
- You must have an antenna that is matched to the frequency of interest, preferably a directional antenna

Identifying the Signal

- Ensure that GPS and WIFI are enabled, and connected to the internet.
- Identify the signal of interest
- Place a marker on the signal.
- Zoom in and center the signal of interest by narrowing the frequency range.
- TIP – Be sure to use a directional antenna appropriate to the frequency of interest.



Remember

- Before you can use any feature be sure to download your map
- A minimum of 3 vectors should be performed for more precise location of the area of uncertainty
- Note: densely populated areas will be more difficult to pinpoint due to building interference
- The result of triangulation is to help narrow down the target area
- Process is very easy even for the untrained technician

Frequently Asked Questions

Q: How does the SignalHawk know what direction you are pointing the antenna to in order to locate the direction on the map?

Q: If you have a directional antenna in one hand, and the SignalHawk in the other, does the GPS in the SignalHawk give you the direction it's pointed, or does the directional antenna?

Q: Does the software assume both are pointed in the same direction and therefore you should point both in the same direction?

A: The answer is the same for all 3 questions. There is an internal electronic compass inside the SignalHawk that is used. It is very important that the test port is aligned in the same direction.

Frequently Asked Questions

Q: I am inside a building and I can't get a lock on the GPS. What can I do?

A: The SignalHawk needs outdoor line-of-sight to GPS satellites, (there is limited use indoors). It may also take 30 seconds to 2 minutes to lock to the satellites. Be patient.

Q: What type of antenna should be used with this system?

A: The recommendation is to use a directional antenna that covers the frequency range of the signal of interest.

Comparison

	SH-60S-TC	SH-60S-AOA
Frequency range:	9kHz - 6GHz	9kHz - 6GHz
Battery life:	4 hours	4 hours
Dimensions:	197 x 93 x 61	197 x 93 x 61
Weight:	0.9kg	0.9kg
USB Interface:	✓	✓
WiFi Interface:	✓	✓
Bluetooth Interface:	✓	✓
RF Power Meter with Optional Sensors:	✓	✓
10Hz - 5MHz Resolution Bandwidth:	✓	✓
Measurement Range:	DANL - +20dBm	DANL - +20dBm
DANL with pre-amp off, 1GHz:	-129dBm/Hz	-129dBm/Hz
DANL with pre-amp on, 1GHz:	-168dBm/Hz	-168dBm/Hz
Channel Power Measurement:	✓	✓
Adjacent Channel Power Ratio:	✓	✓
Phase Noise:	✓	✓
N dB Down Measurements:	✓	✓
Occupied Bandwidth:	✓	✓
Spectrogram Display:	✓	✓
Field Strength Measurements:	✓	✓
FM Demodulation:	✓	✓
CNSS (GPS) Signal Quality:	✓	✓
Spectrum Masking and Limit Lines:	✓	✓
Angle of Arrival for interference hunting:		✓

Both models come with analyzer, hard case, soft case, AC Adapter, stylus, USB drive, and USB adapter (3-year warranty)

Summary of Offering

Better

All the same features of the SH-42S-TC has, plus higher frequency coverage and spectrogram (waterfall) display

Additional built in functions:
FM demodulation
GNSS Signal Quality
Field Strength
Spectrum Masking

SH-60S-TC

$7,962

Best

All the same features of the SH-60S-TC has

Plus, interference analysis and triangulation functionality to locate source of interferers

SH-60S-AOA

$10,455

Please note the SH-42S-TC Analyzer has been discontinued

Competitive Overview

SH-60S-AOA

9 kHz – 6 GHz

7.8 x 3.7 x 2.4 in

1.98 lb.

5 hour

ACPR
OBW
Channel Power
Phase Noise
N dB Down Bandwidth
FM Demodulation
Field Strength
GNSS Signal Quality
Spectrum Masking
Spectrogram/Waterfall

Rohde & Schwartz

Complex Feature set
High price >$25K

Possible Gaps

- Does not come with an Antenna
- Other competitors include Anritsu, Keysight and Tektronix –we all compete in the same space

Sales Tools

Prospecting Toolkit

- Datasheet
- Training Webinar
- Outbound Marketing
- Target Advertising

Points of Differentiation

- Questions to Ask
- Sales Video

Customer Meeting Tools

- Product Overview
- Data Sheet
- Application Notes
- Product Demos
- WebEx Training

Thank you

Any Questions?