



www.tactron.de



Products for Aeronautical Communications

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Bird manufactures products which address a number of key issues for Aeronautical communications:

- Live remote monitoring of transmitter RF power output and antenna performance in multi-channel and trunked radio networks
- Test equipment for commissioning, maintenance and fault-finding of ground-to-air radios, airborne radios, repeaters, antennas, antenna combiners and transmission cables
- Distributed Antenna Systems for extending or enhancing coverage in challenging RF environments such as passenger terminals, road tunnels and airport service areas
- Antenna system components; duplexers, combiners, multicouplers, isolators and active components

The problem – how to *efficiently* monitor the performance of a number of transmitters, transmission lines and antennas at many remote sites?

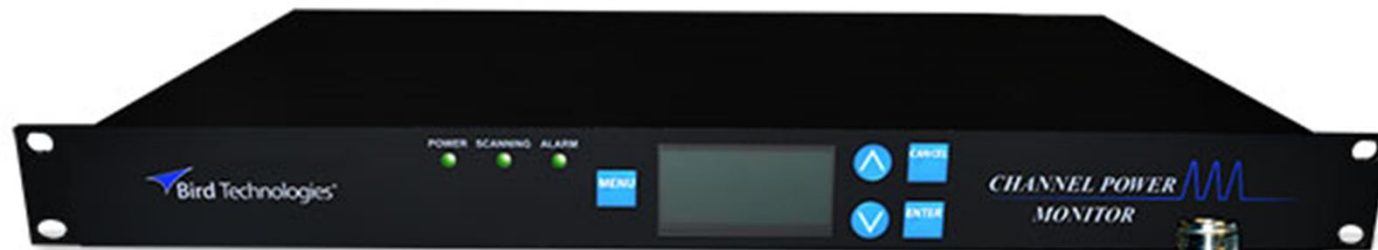


ACMI – Antenna and Cable Monitor

- Provides alarm if antenna or cable fails
- High and/or low power alarm
- Works with any modulation scheme
- PTT input to avoid false alarm triggering
- Available for 118-138, 136-225MHz, 225-520MHz, 470-960MHz or 960-2400MHz
- Integral directional coupler, -63dB
- Serial version supports alarm outputs to onboard LED, relay contacts and PC software
- IP-enabled version supports alarm outputs to onboard LED, relay contacts, HTML to web browser, Email from onboard SMTP, and SNMP using supplied MIB
- 5V analogue outputs for forward and reflected power



The solution – Bird’s Channel Power Monitor can monitor up to 32 transmitters and/or antennas per unit, with no limit on number of units per site, or number of sites per network. Monitors forward power, reverse power and VSWR on each transmission line. Alarms on reduced RF power, increased VSWR or decreased VSWR



500W VHF/UHF directional sensor for Land Mobile Radio



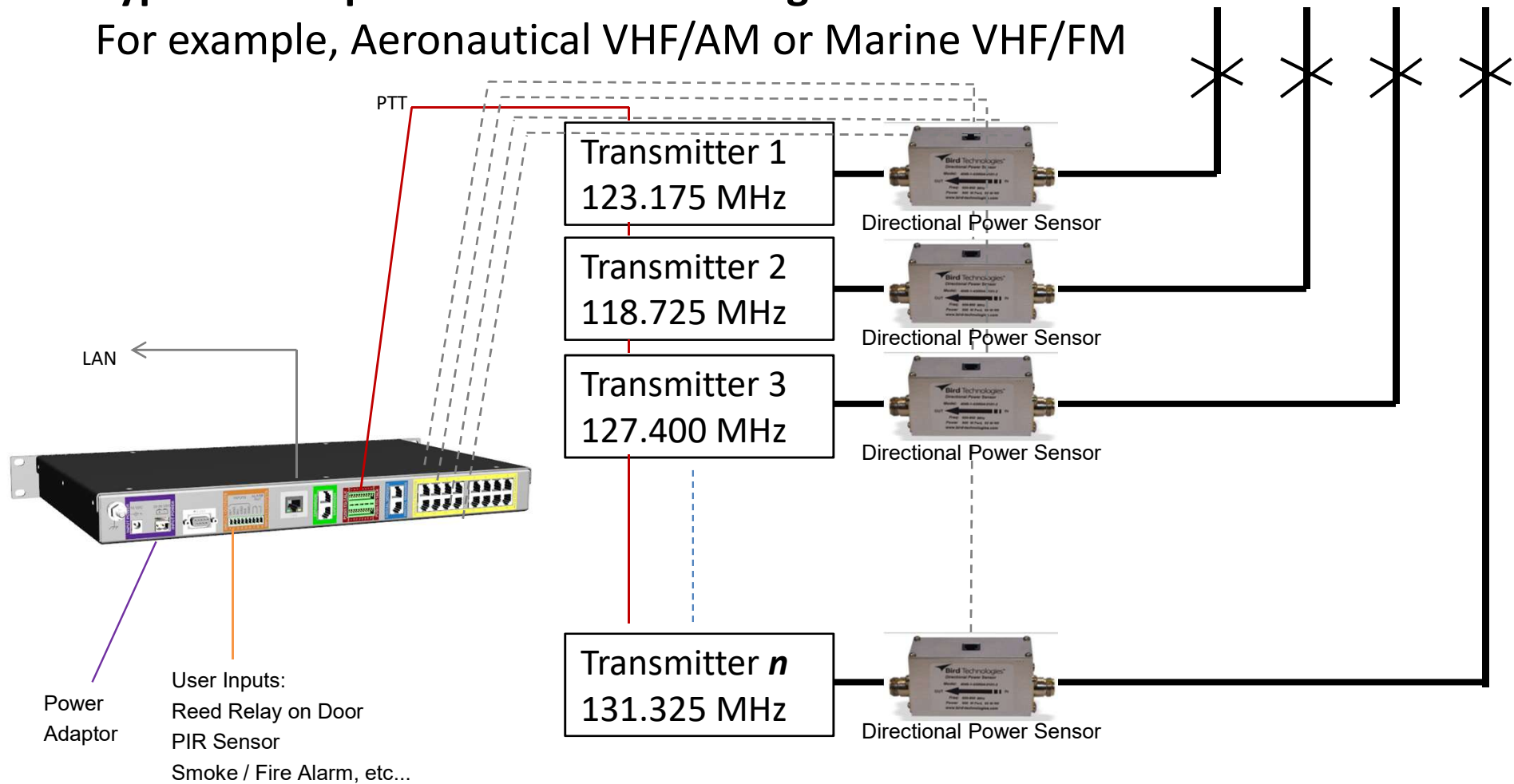
100W VHF/UHF non-directional sensor for Land Mobile Radio



VHF/UHF broadcast sensors for rigid transmission lines, 7/8 inch to 6 1/2 inch, up to 50kW

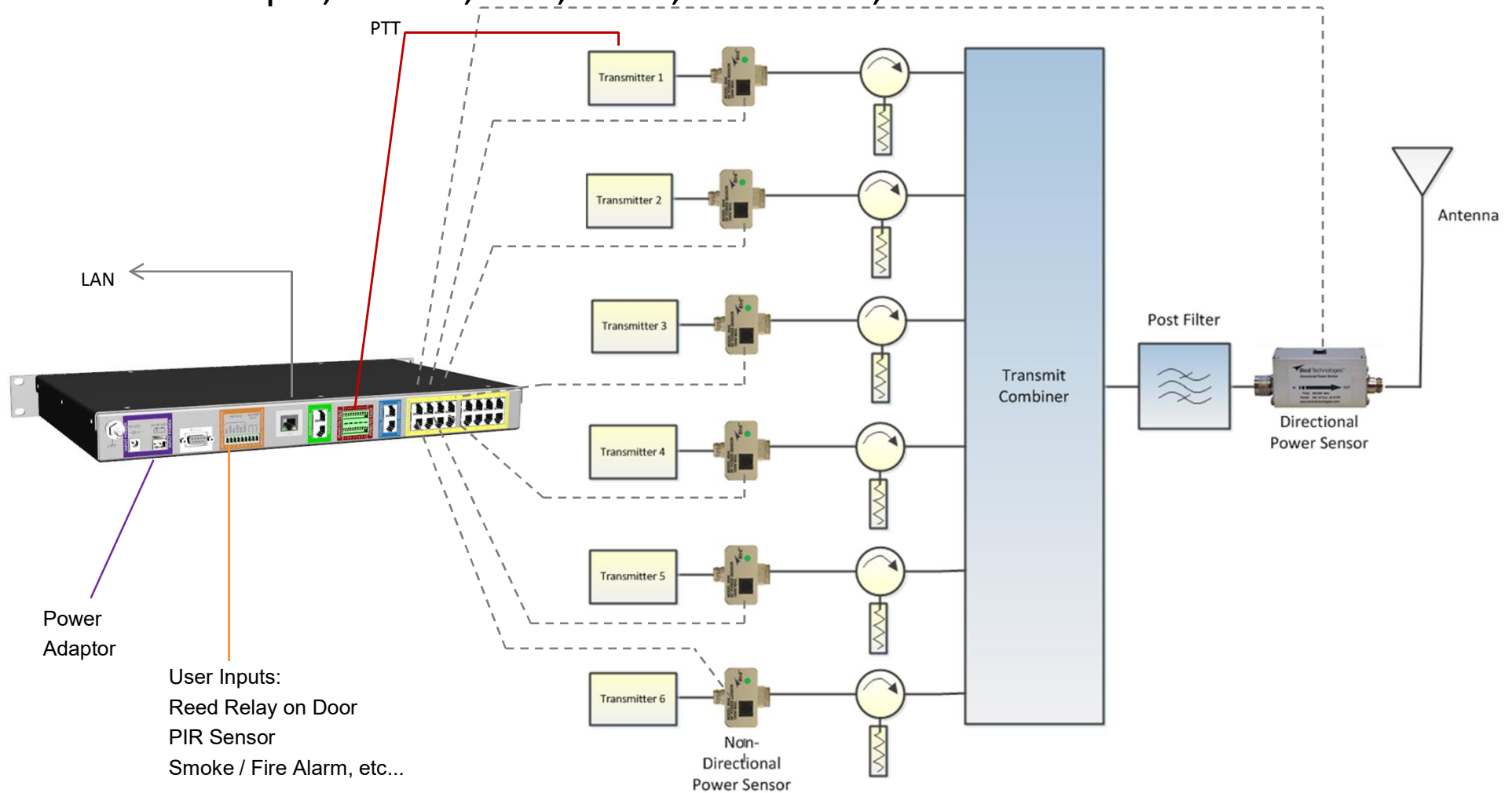
Typical Example of CPM in an Analogue Radio Network

For example, Aeronautical VHF/AM or Marine VHF/FM



Typical Example of CPM in a “Trunked” Radio System

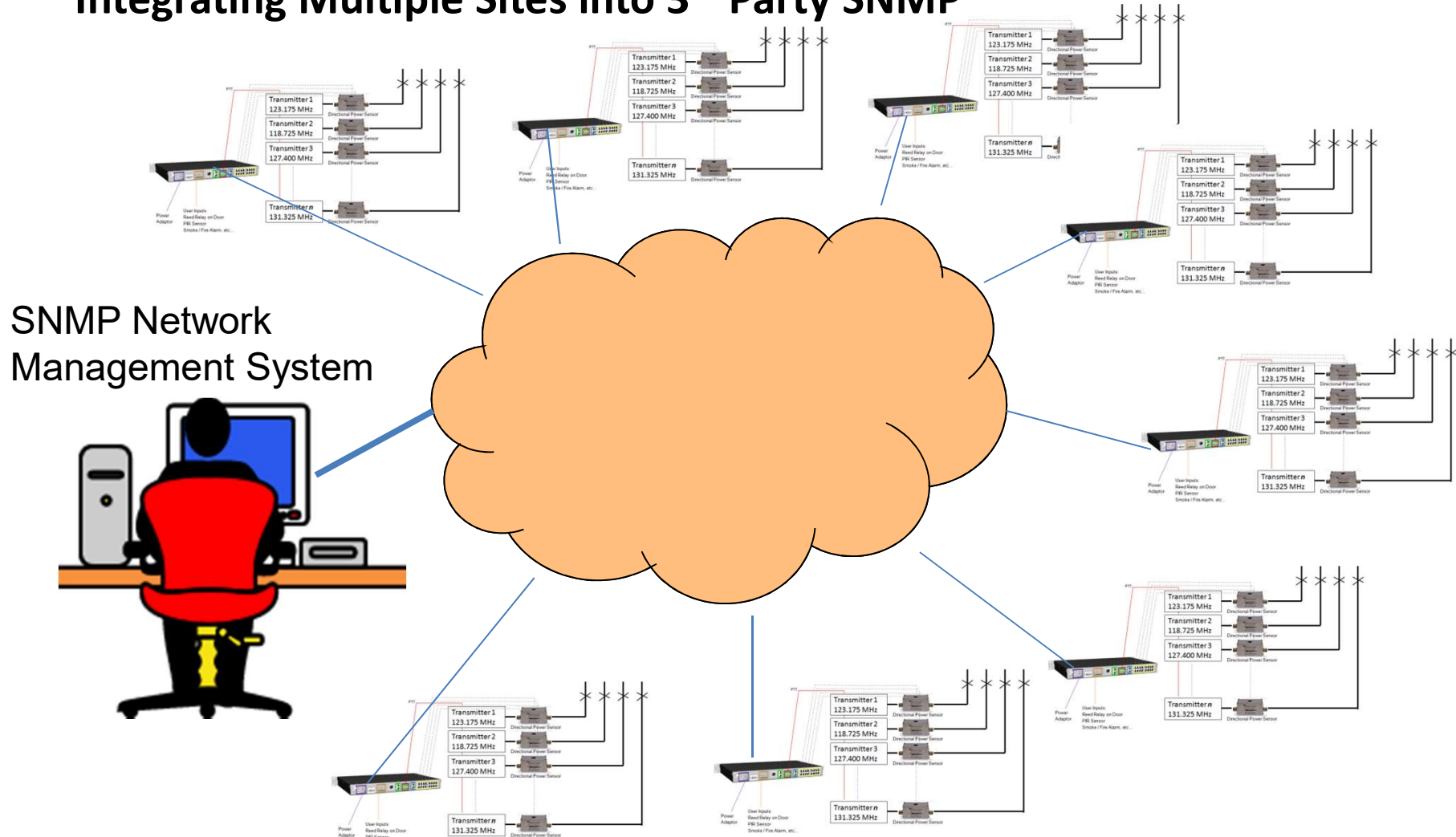
For example, TETRA, P25, DMR, MPT1327, etc...



So what is Channel Power Monitor?

- Provides real-time monitoring of multiple transmitters and antennas
- 16 analogue inputs which support
 - Non-directional sensors for monitoring transmitters prior to the antenna combiner
 - Directional sensors for monitoring antennas, combiners and transmission lines, or for systems where each transmitter has its own antenna
- 2 digital (RS-485) inputs supporting up to 32 digital directional sensors
- User-friendly display on “local” unit
- Built-in web server allows monitoring with web browser or Android app
- Supplied with MIB, allowing remote management with any SNMP version 2 management system
- Alarm on reduced power output, increased VSWR and reduced VSWR
- Multiple alarm functions
 - Red alarm light on panel
 - Red alarm bars on web browser and Android app
 - SNMP traps to external devices
 - Alarm relay to external devices (lamps, klaxons, etc...)
 - Three “user” inputs for external sensors (door reed relays, PIR, smoke detectors, etc...)
- Data recording allows early diagnosis and repair of failing components
- AC supply with 24V station battery backup

Integrating Multiple Sites into 3rd Party SNMP



Sensor Configuration

User can name each channel, alphanumerically

Bracknell Marina

Analog Sensor Settings							
Name	Enable/Disable	Max Power	PTT	Min VSWR Alarms	Max VSWR Alarms	Min Power Alarms	
156.800 Calling	<input checked="" type="checkbox"/>	500	Normally Open	1.1	1.8	3	
156.375 Coastguard	<input checked="" type="checkbox"/>	500	Normally Open	1.1	1.8	3	
157.850 Marina	<input checked="" type="checkbox"/>	500	Normally Open	1.1	1.8	3	
Channel 4	<input type="checkbox"/>	100	Disable	1	1	0	
Channel 5	<input type="checkbox"/>	100	Disable	1	1	0	
Channel 6	<input type="checkbox"/>	100	Disable	1	1	0	

User can define which of the analogue (0-4V) and digital (RS-485) sensor channels are monitored and displayed

User can define FSD of the sensors, allowing use of any Bird analogue (0 to 4V) power sensors

PTT inputs allow switched channels to be monitored for power output only when PTT is active. User can define sense of PTT switching

Channels equipped with directional sensors (for example, 4045) to alarm if pre-defined maximum VSWR is exceeded, or if pre-defined minimum VSWR threshold is reached

User can define an alarm condition in the event that forward power falls below pre-defined threshold

System Configuration

Bracknell Marina

Analog Sensors

Digital Sensors

System Configuration

Save Settings

User Input Settings

Name	Enable/Disable	Default State	Alarm
Radio Cabin Door	<input checked="" type="checkbox"/>	Normally Closed	■
Radio Cabin PIR	<input checked="" type="checkbox"/>	Normally Open	■
Radio Cabin Smoke	<input checked="" type="checkbox"/>	Normally Open	■

SNMP Target IP: Channel Power Monitor 192.168.1.5

Site Name: Bracknell Marina

Logging: Download Log File Delete Log File Not Logging 5 seconds

Alarm Output Relay: Reset Alarm Auto Reset

Configuration File: Import Export

User can name the three auxiliary inputs, alphanumerically

User can specify IP address of SNMP management system

User can name the site

Configuration can be exported to, or imported from host PC

User can define whether the alarm relay is self-resetting or requires manual reset

User can specify the type and frequency of event logging

User can define whether auxiliary inputs are enabled or disabled

User can specify whether auxiliary inputs are "normally open" or "normally closed"

©2017 Bird

Examples of Web Browser On-Screen Alarms (1)

Bracknell Marina			
Sensors			
Name	FWD Power	REFL Power	VSWR
156.375 Coastguard	0	0	1
157.850 Marina	0	0	1
156.800 Calling	5.22	0.82	2.31
4042 Sensor Channels			
User Inputs			
Radio Cabin Door	Normally Closed		■
Radio Cabin PIR	Normally Open		■
Radio Cabin Smoke	Normally Open		■

Firmware Rev: 2.55 Webpage Rev: 2.35

High antenna VSWR on channel 3. The preset threshold of 2.0:1 has been exceeded.

Sensors		
Name	FWD Power	RE
156.375 Coastguard	0	0
157.850 Marina	0	0
156.800 Calling	0	0

Failed transmitter on Channel 2. The PTT line has been activated, but there is no RF (the threshold was set to >3W)

Examples of Web Browser On-Screen Alarms (2)

Bracknell Marina			
Sensors			
Name	FWD Power	REFL Power	VSWR
156.375 Coastguard	0	0	1
157.850 Marina	0	0	1
156.800 Calling	4.35	0	1
4042 Sensor Channels			
User Inputs			
Radio Cabin Door	Normally Closed		■
Radio Cabin PIR	Normally Open		■
Radio Cabin Smoke	Normally Open		■

Firmware Rev: 2.55 Webpage Rev: 2.35

The VSWR on channel 1 has fallen below the minimum threshold. This may be an early sign of moisture ingress into the coaxial cable.

The radio cabin door sensor has also been activated. Possible intruder?

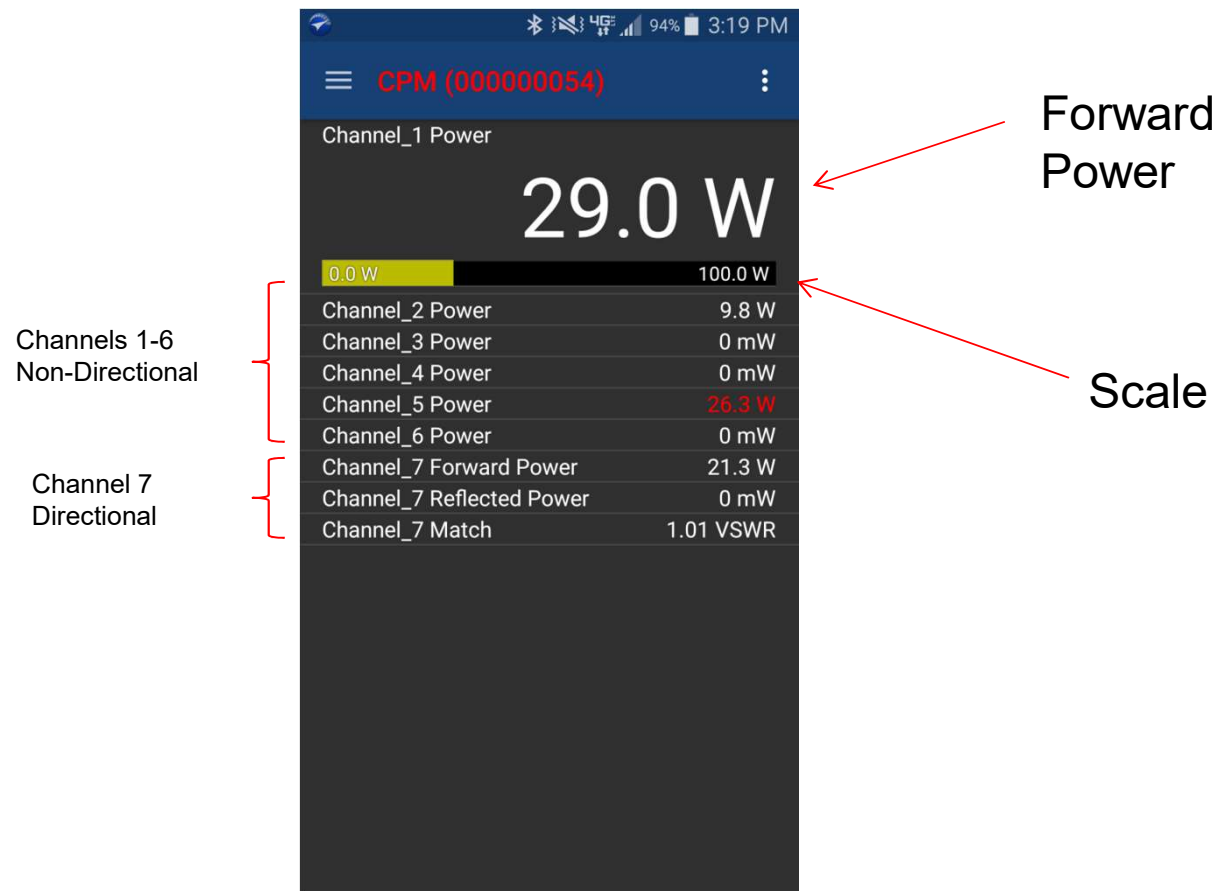
User Inputs		
Radio Cabin Door	Normally Closed	■
Radio Cabin PIR	Normally Open	■
Radio Cabin Smoke	Normally Open	■

Firmware Rev: 2.55 Webpage Rev: 2.35

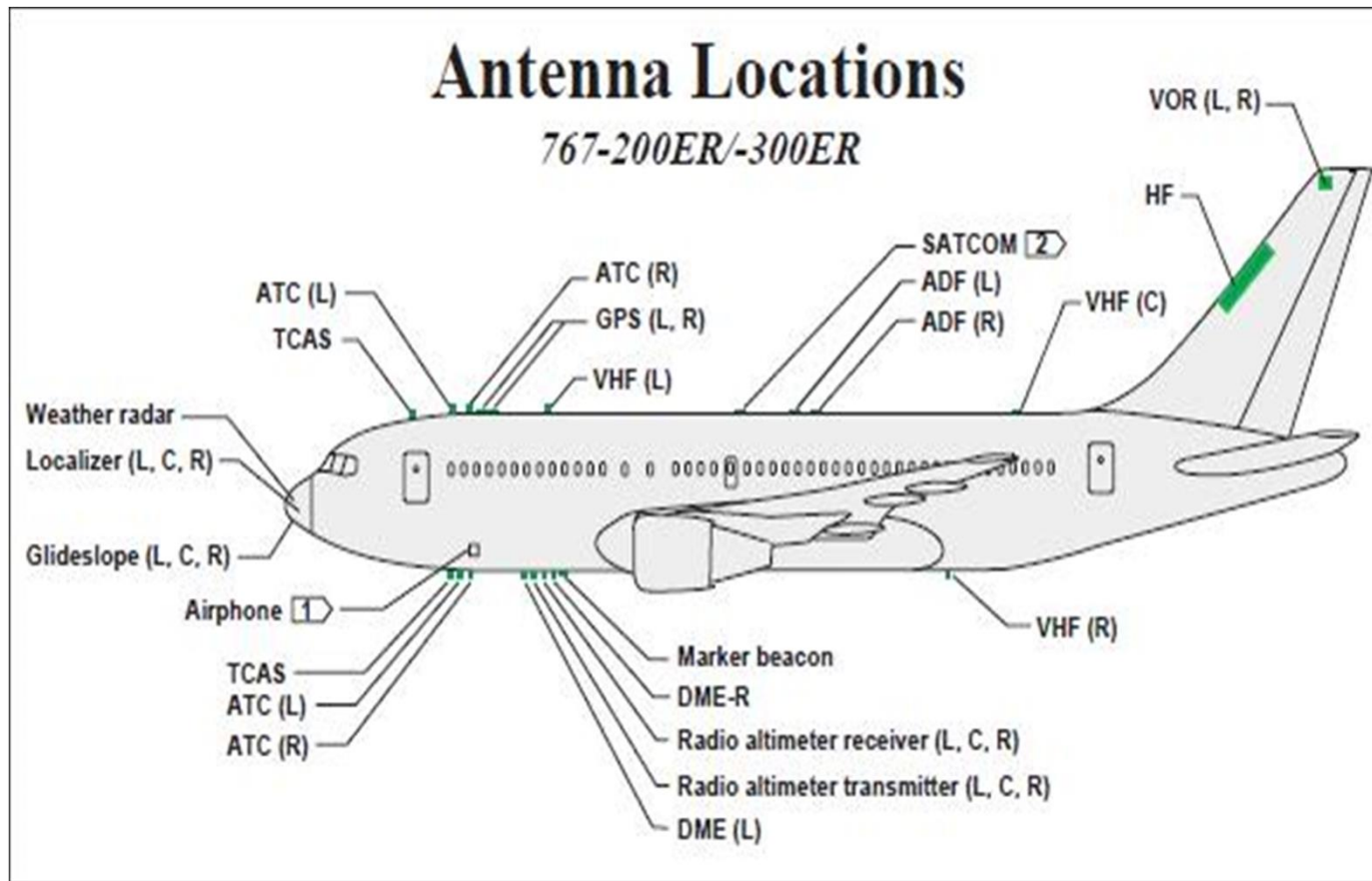
The radio cabin door and radio cabin PIR sensors have been activated. Intruder!

Monitoring CPM with an Android Phone

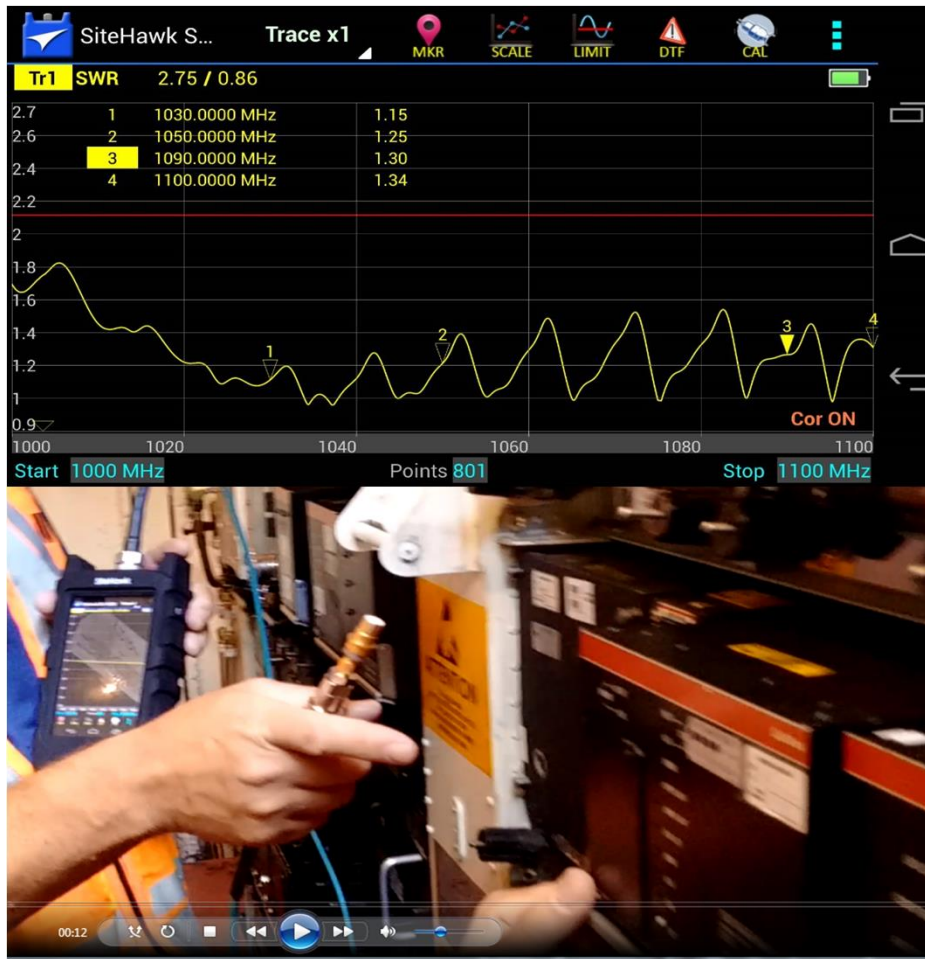
CPM can also be monitored with a (free) app, which may be downloaded from the Google Play Store:



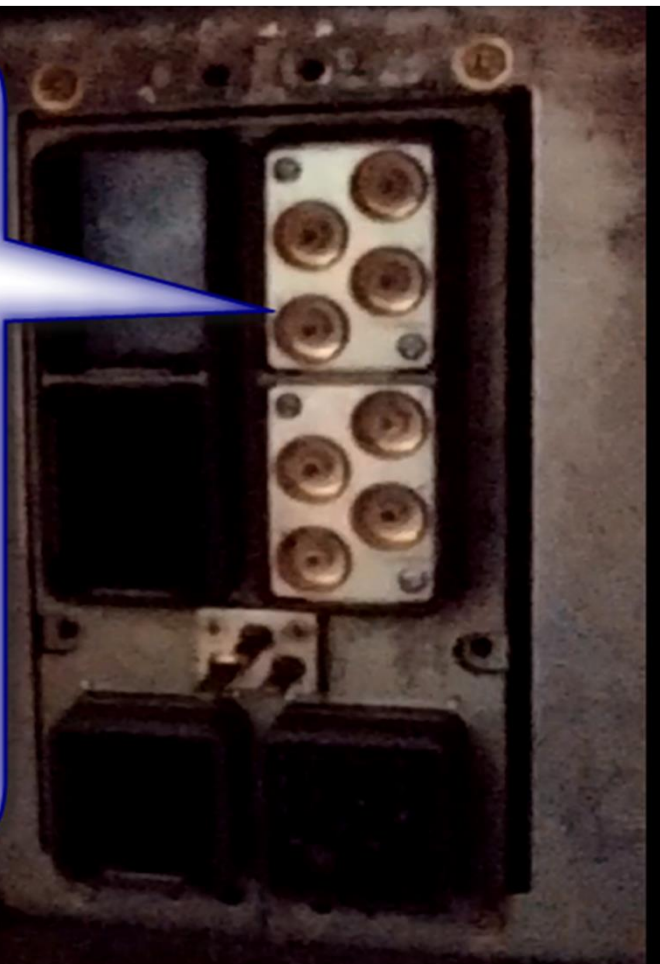
The problem – how to *rapidly and accurately* test multiple antenna and cable systems in a complex airframe?



Example 1 – testing TCAS antenna system with SiteHawk



TCAS Processor removed from EE rack. Facilitates quick testing of all 6 antenna elements. Gives quick Go/No-Go of all 6 circuits and distance to fault if failed. Normally, the tech is not able to test the cables or antennas. Hard to isolate with 6 separate circuits.



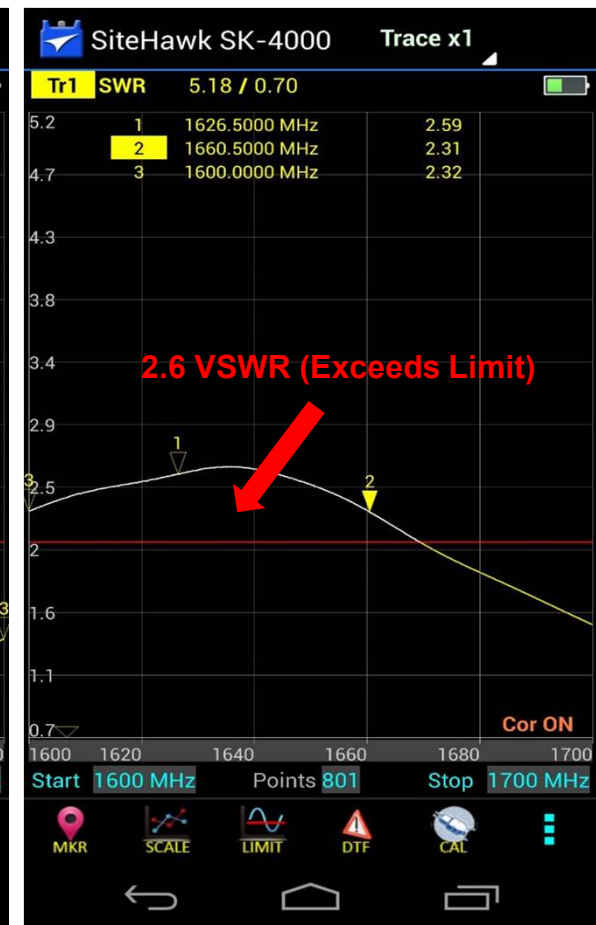
Example 2 – locating a SatCom fault with SiteHawk

SiteHawk used to identify a faulty transmit antenna.
VSWR exceeds pre-defined threshold of 2:1

RECEIVE FREQ



TRANSMIT FREQ



SiteHawk

- Compact, self-contained and user-friendly Frequency Domain Reflectometer
- Rapid diagnosis of antenna, combiner and transmission line problems
- Visual display of VSWR, Return Loss, Cable Loss and Distance-to-Fault
- Wide frequency range, 1 to 4500MHz
- Long battery life, typically 10 hours between recharges
- Also functions as precision RF power meter with optional sensor
- 3 year warranty

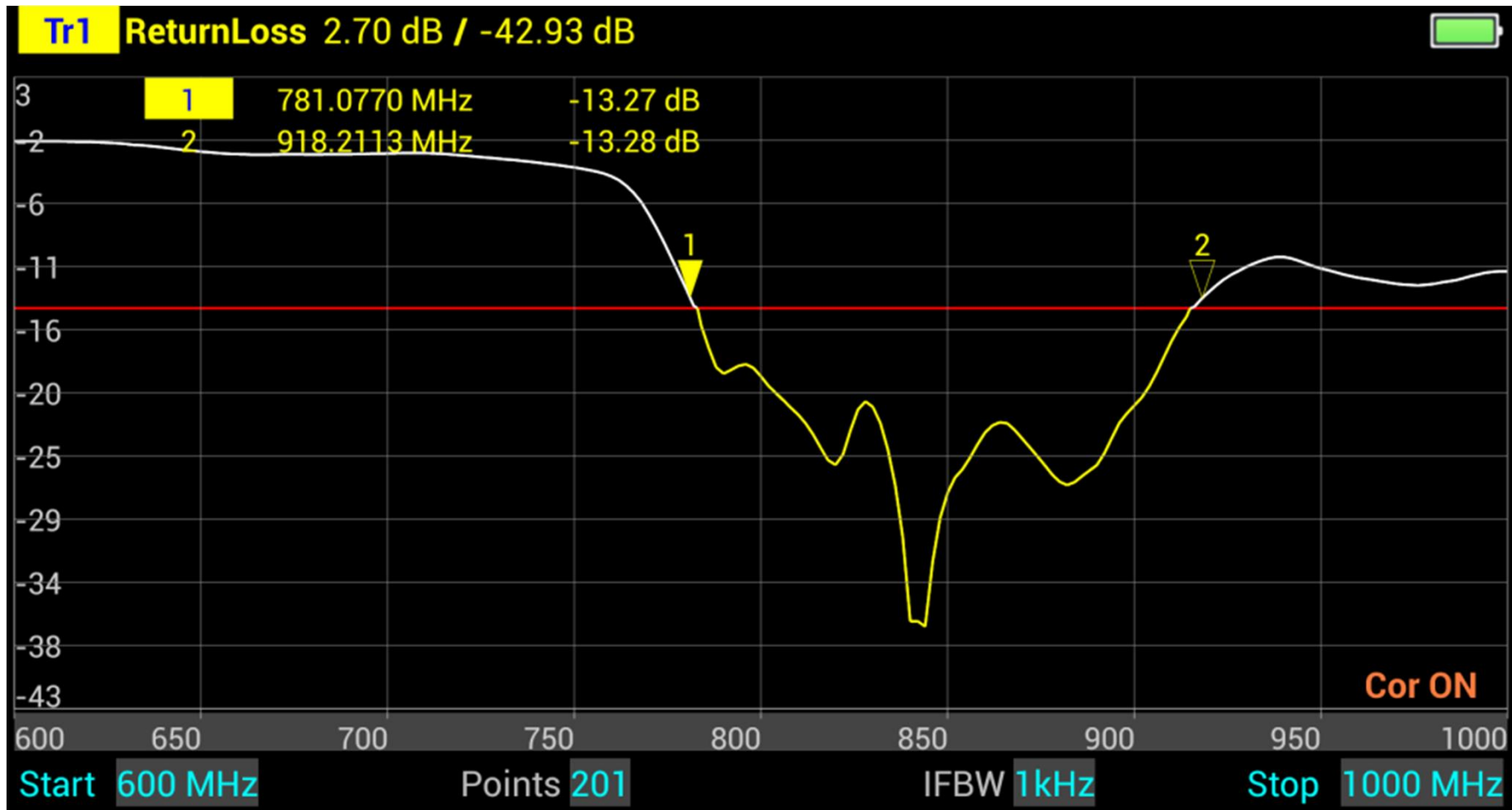


SiteHawk

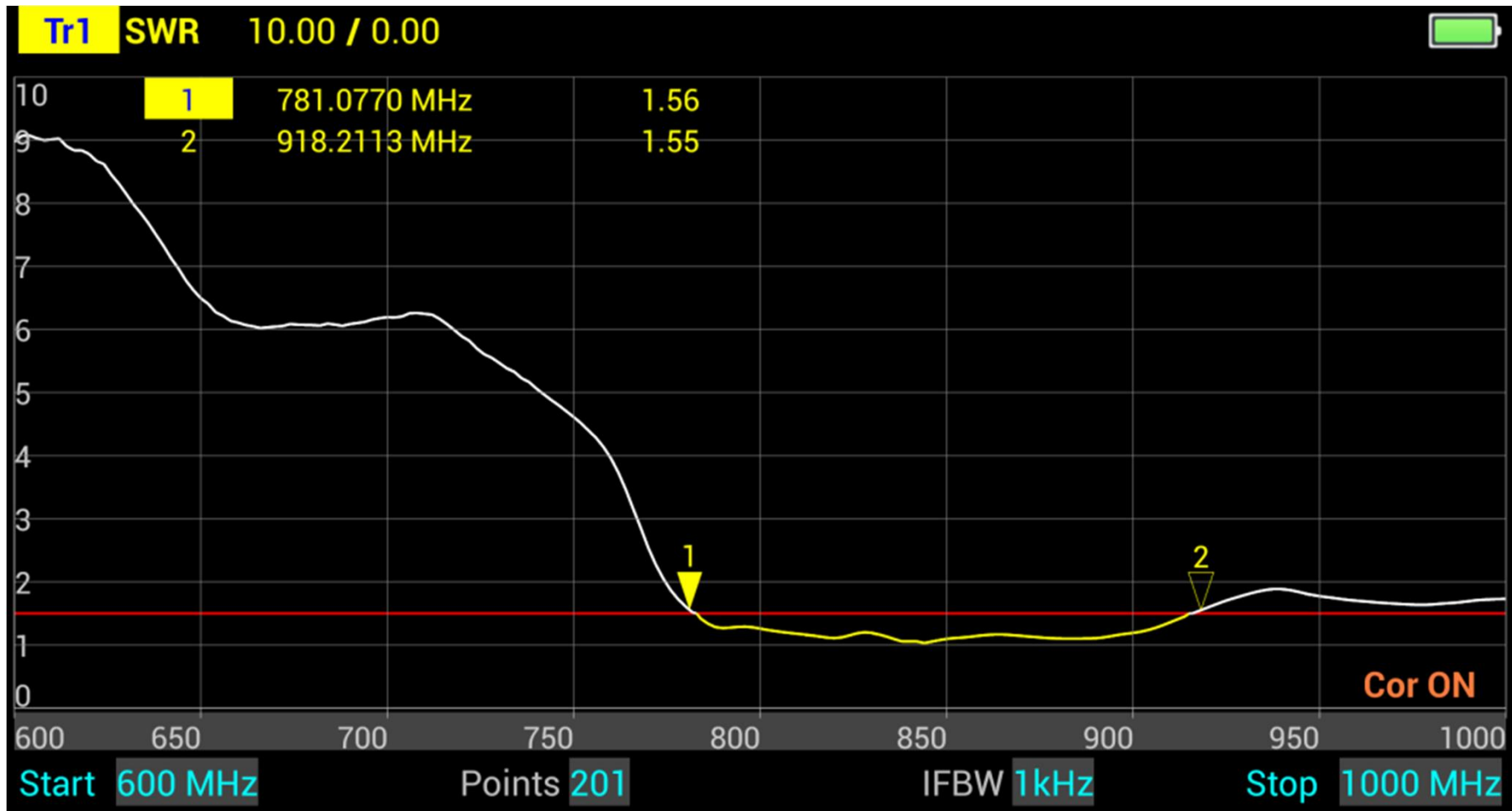
- USB, WiFi and Bluetooth interfaces, for sharing files with other devices
- Scans can be exported at CSV (for analysis in Excel, for example), or in proprietary S1P format for post processing with (free) SiteHawk PC software
- Screenshots can be exported as jpg or png



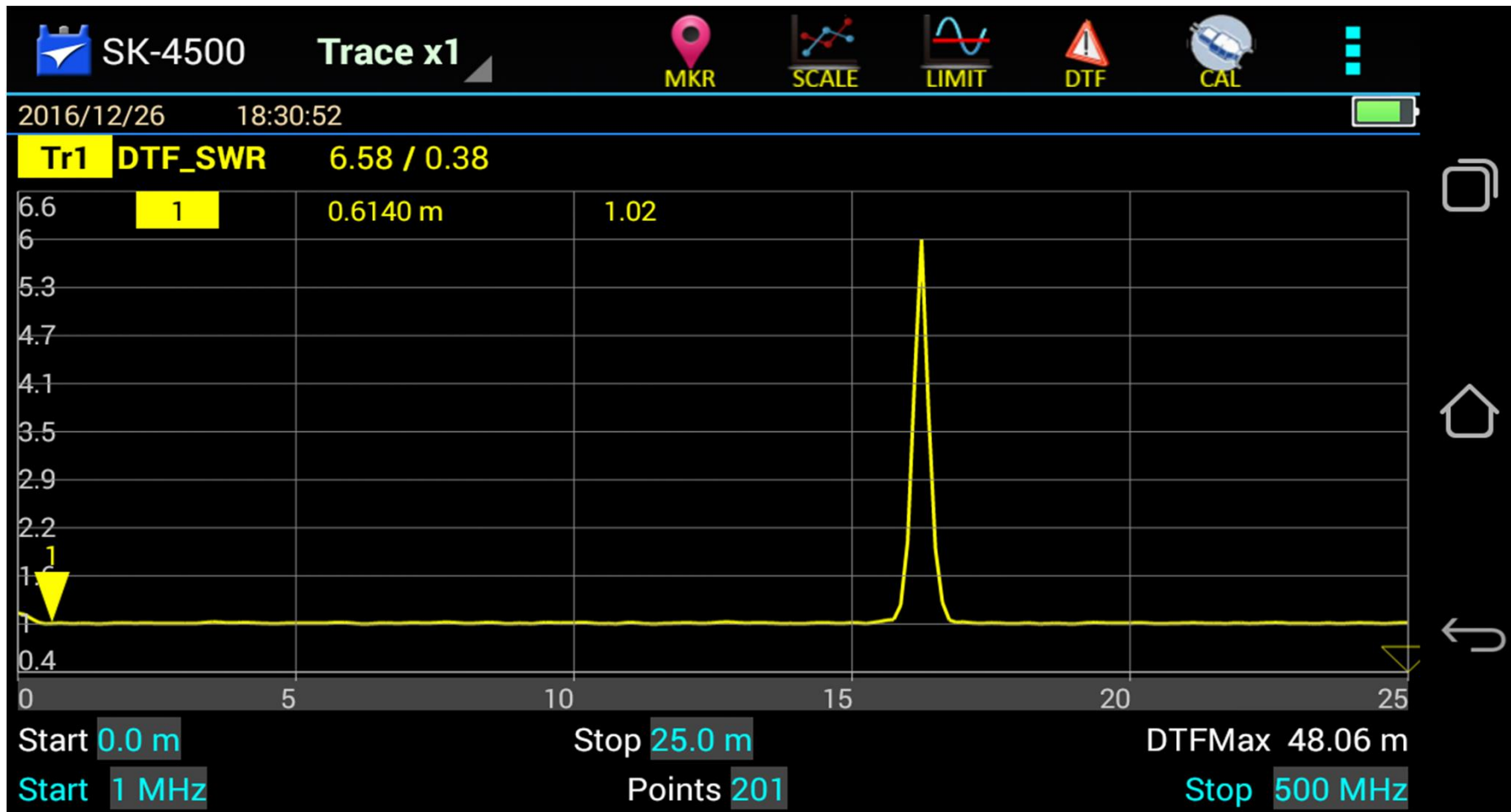
SiteHawk – Return Loss Measurement



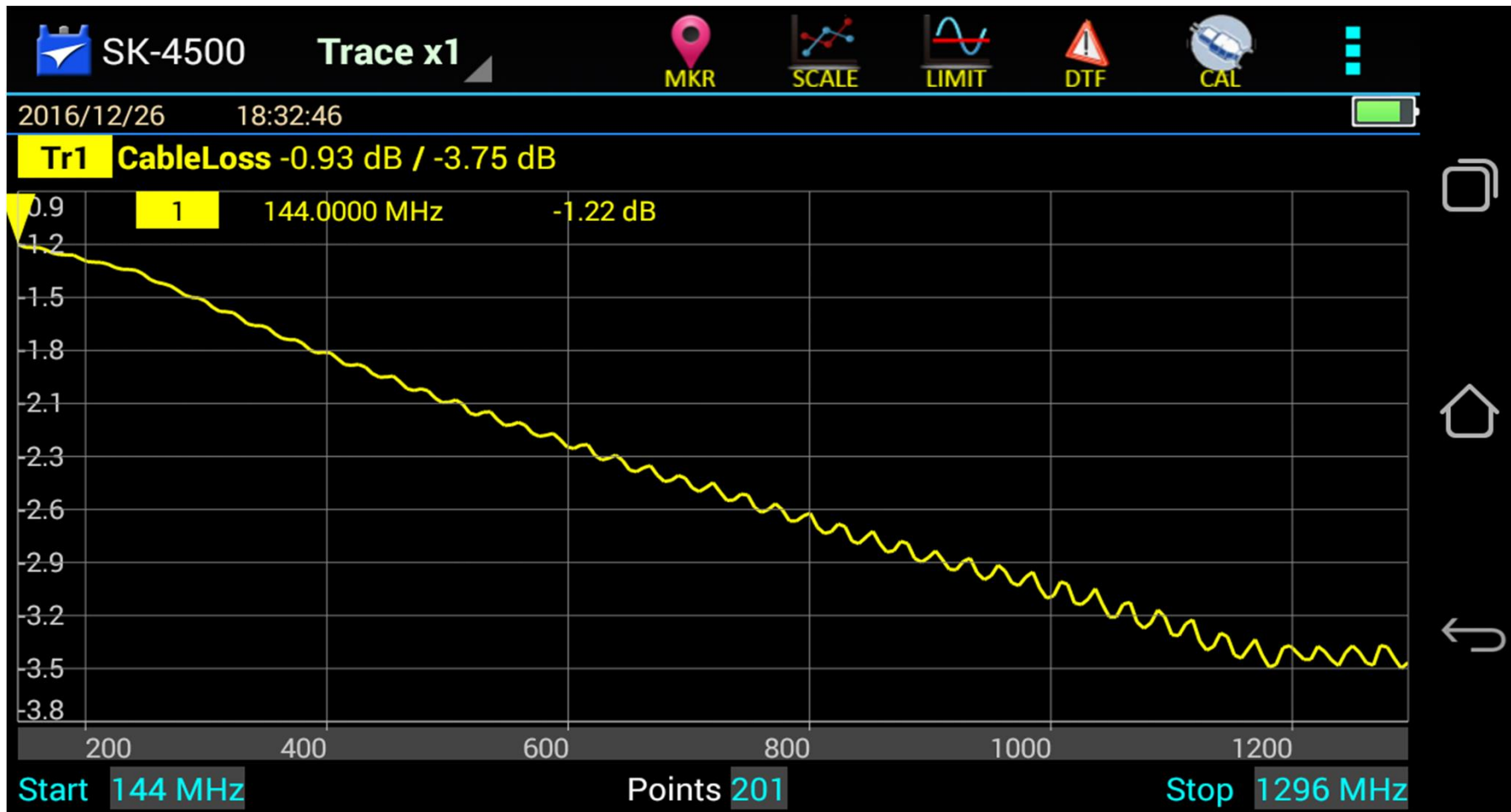
SiteHawk – VSWR Measurement



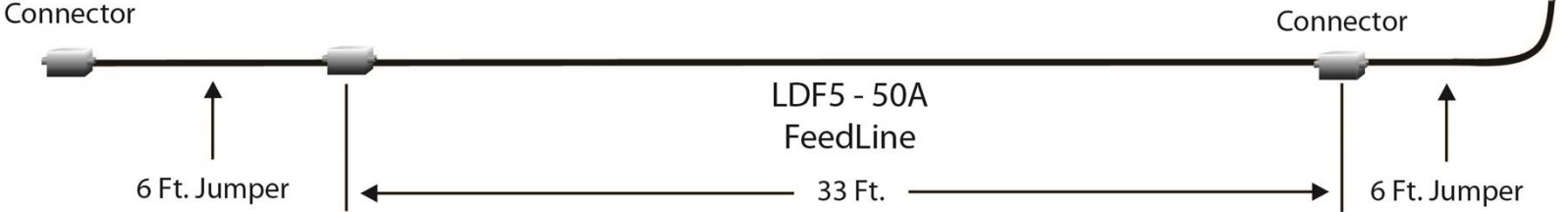
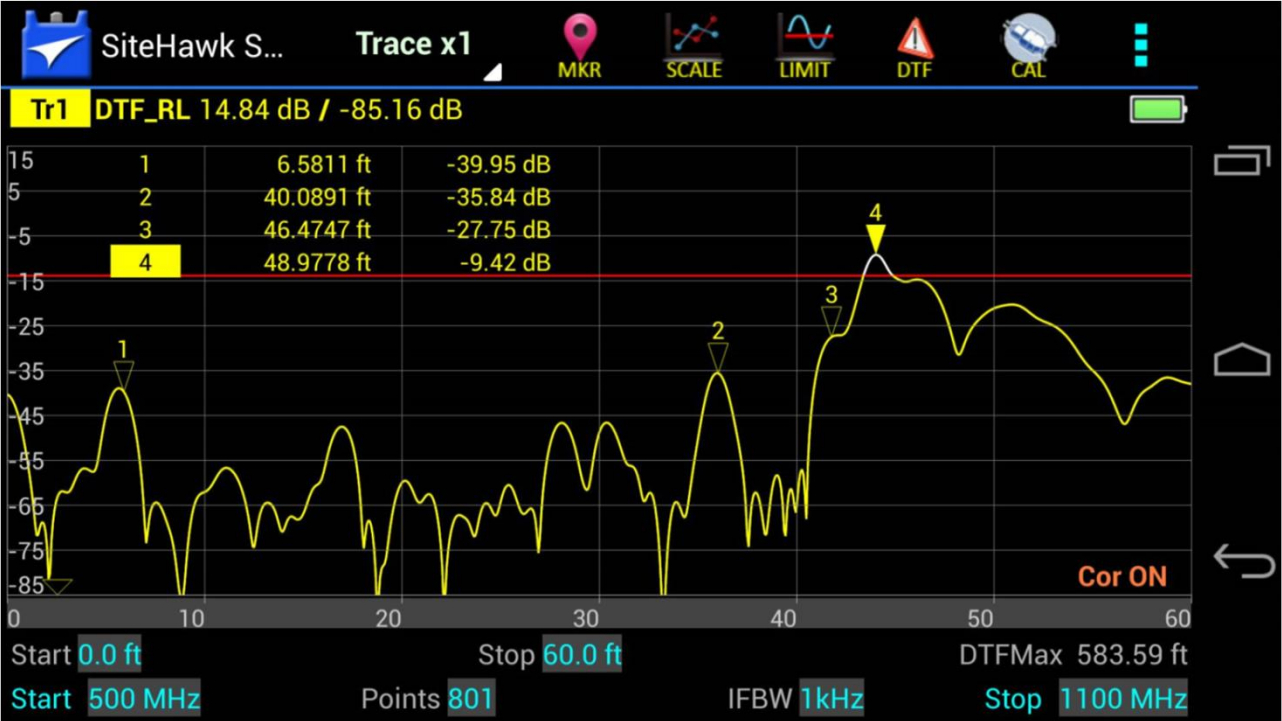
SiteHawk – Distance to Fault Measurement



SiteHawk – Cable Loss Measurement



SiteHawk – Distance to Fault Measurement shows joints in cable



SiteHawk – What’s in the box?



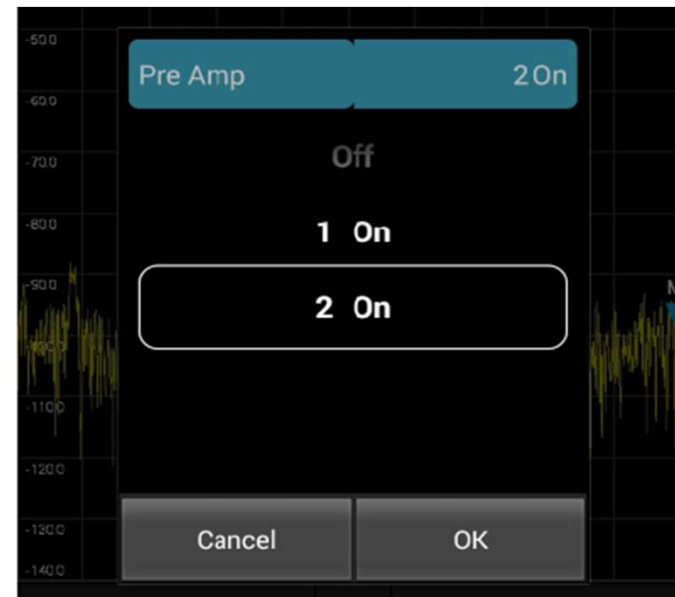
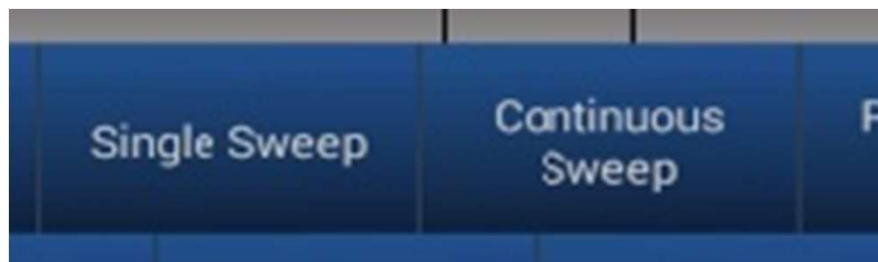
SignalHawk

- Self-contained handheld spectrum analyzer
- Rugged, drop-tested to MIL specs
- 10MHz to 4.2GHz
- 10Hz to 5MHz bandwidth
- Fast, accurate and sensitive; -135dBm noise floor, 66dB dynamic range
- Channel Power, Occupied Bandwidth and Adjacent Channel Power measurements
- Long battery life, 5.5 hours per charge
- 5.5 inch, 1280x720 pixel display
- Touchscreen, can “zoom in” with fingertips
- Sweep time 1.1ms to 1600s
- Integral WiFi and Bluetooth allow filesharing with other devices
- Also functions as precision RF power meter with optional sensor

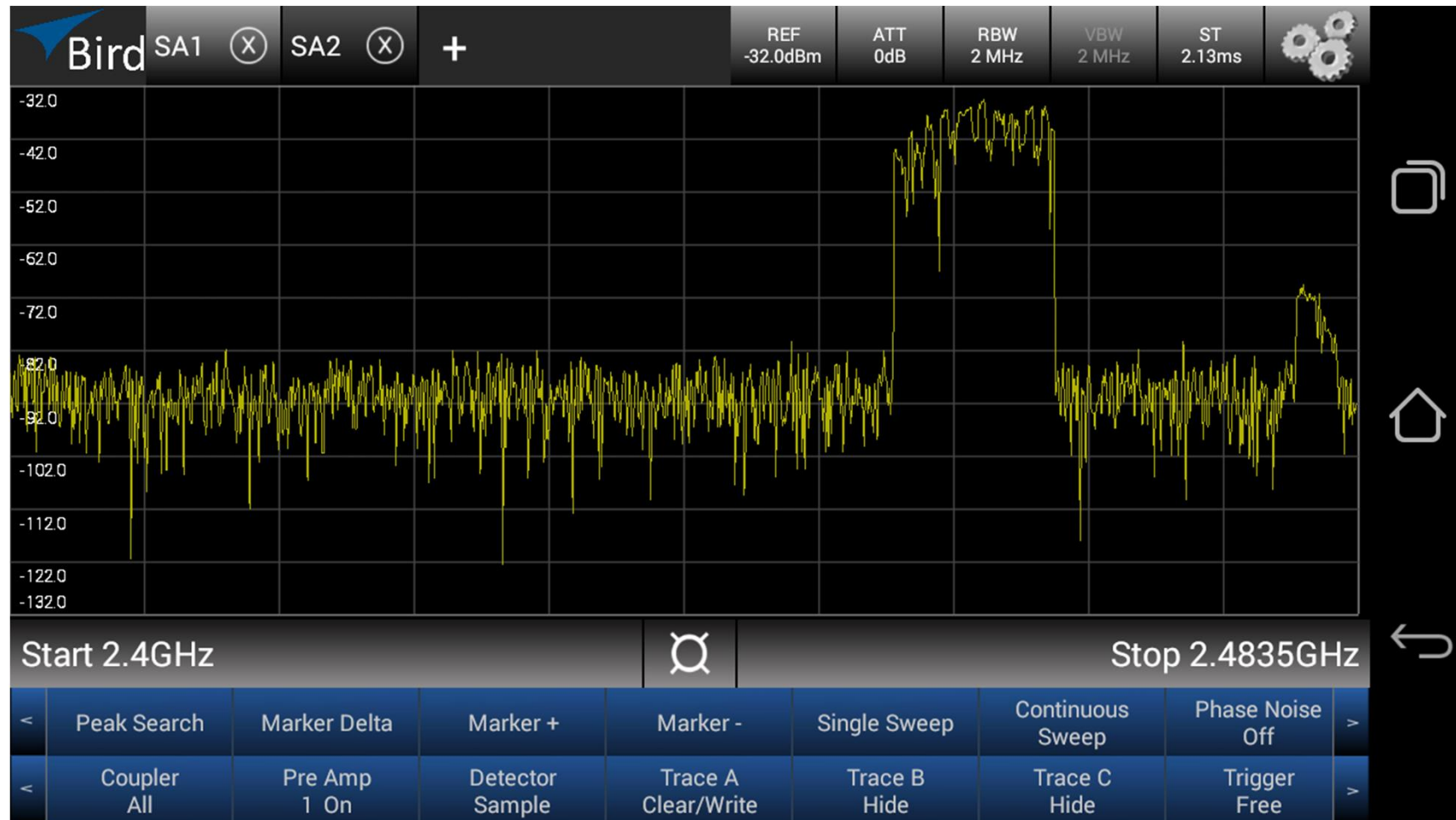


SignalHawk

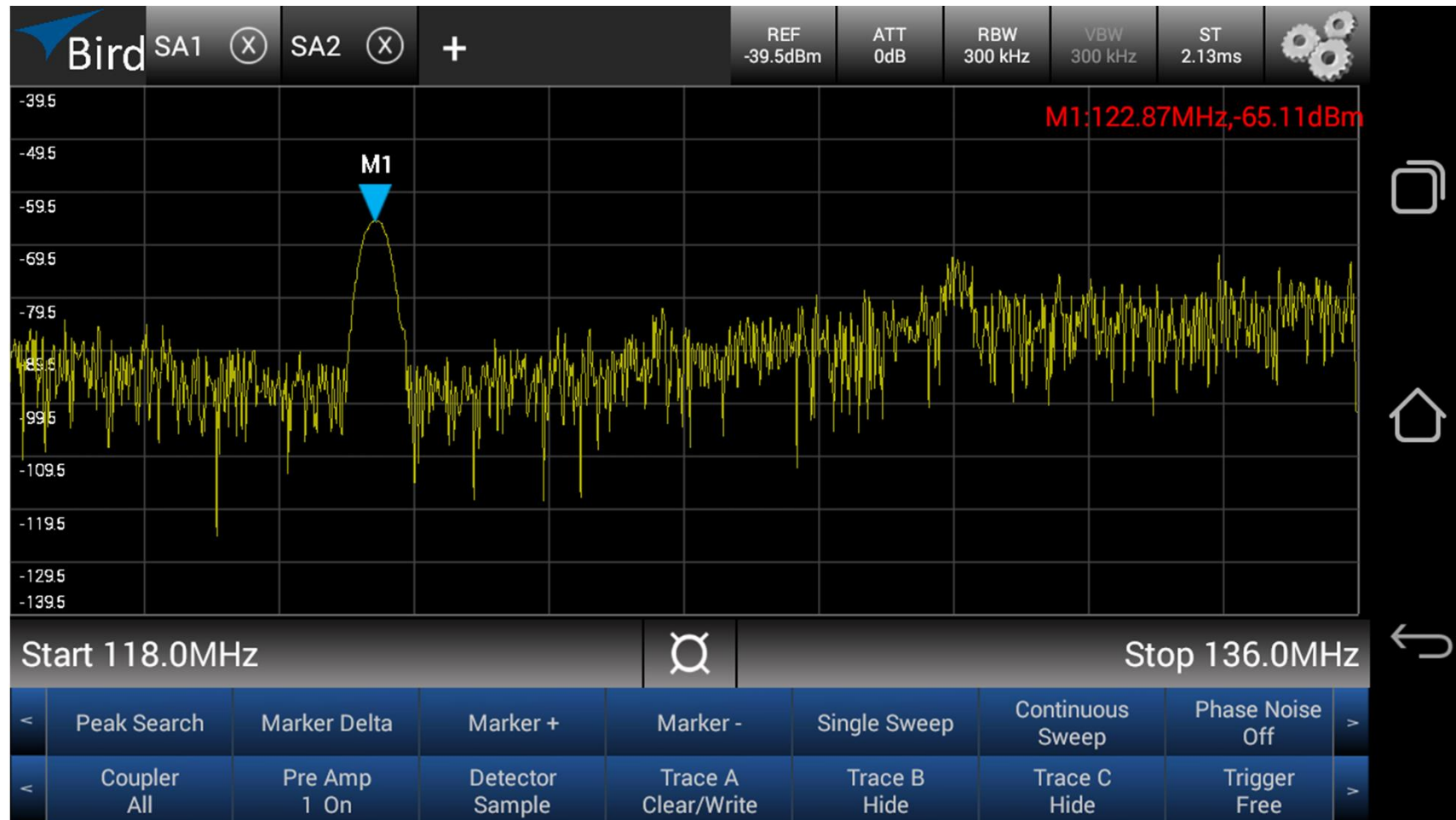
- Up to 4 tabbed windows, each of which is configurable individually
- Continuous Sweep or Single Sweep modes. Keep tapping single sweep to update
- Selectable Preamp, 0, +10 or +20dB



SignalHawk – Screen Capture (.jpg or .png)

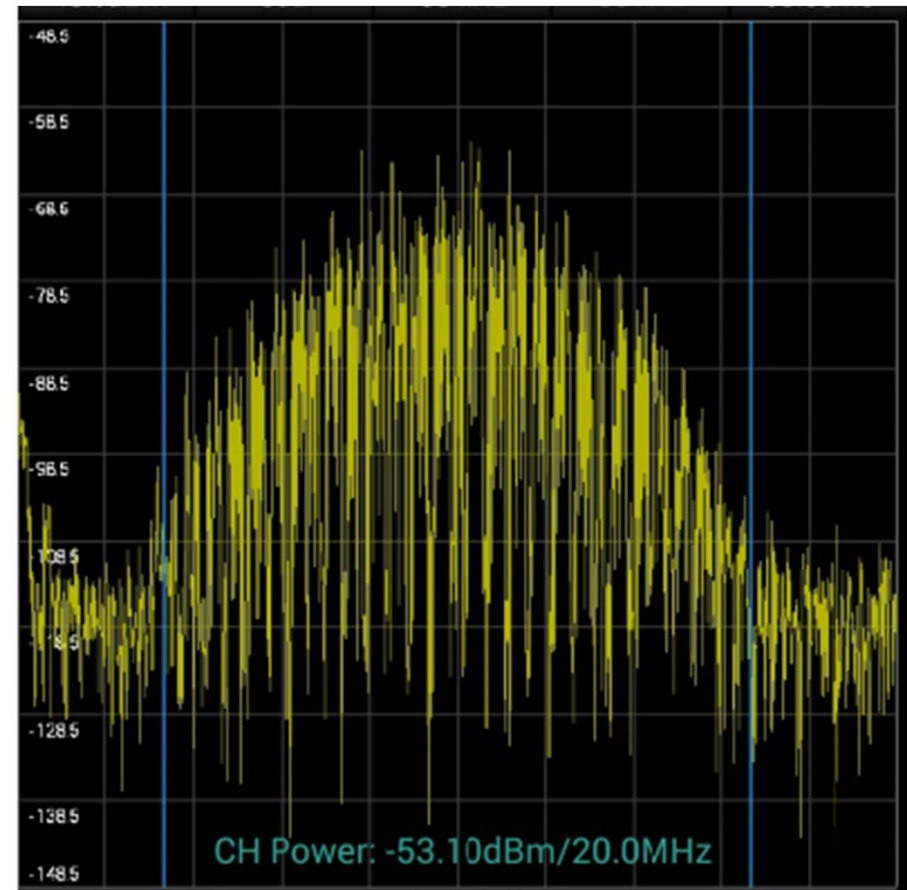


SignalHawk – Peak Search Function



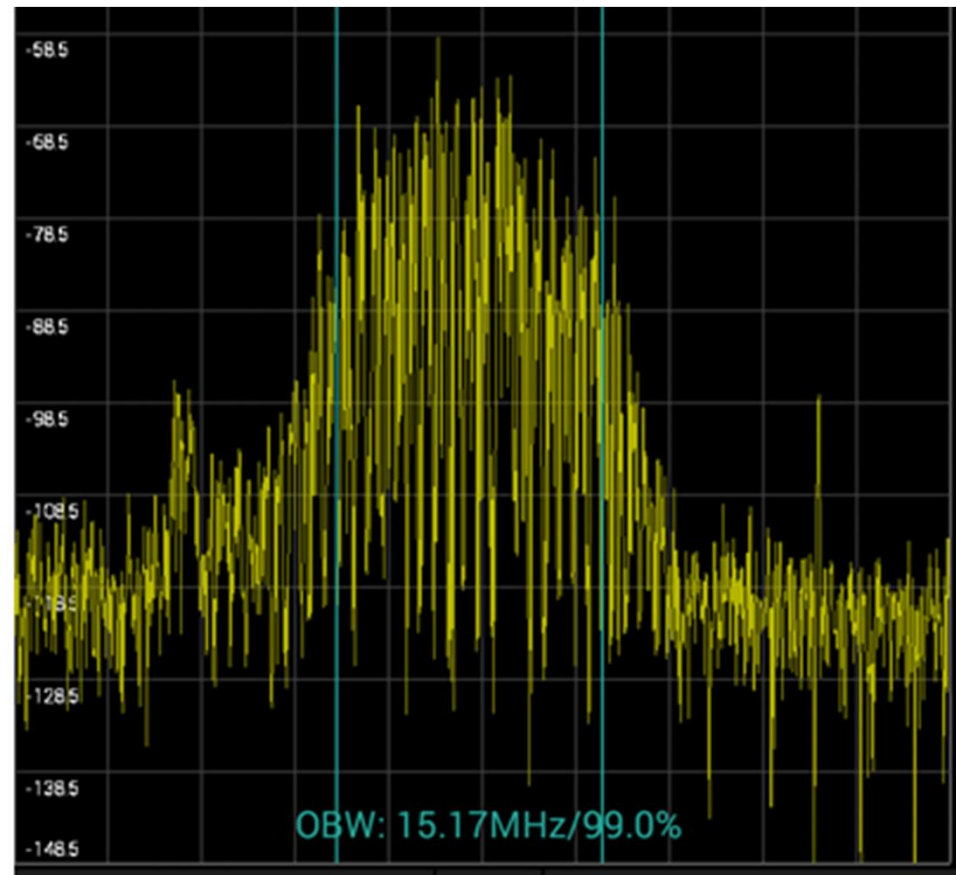
SignalHawk – Channel Power Measurement

- Accessible from the Measure menu (select Ch Power)
- Shows total power in the channel (dBm or Watts) and the spectral density (dBm/Hz or Watts/Hz)
- Measured band will be marked with blue vertical lines



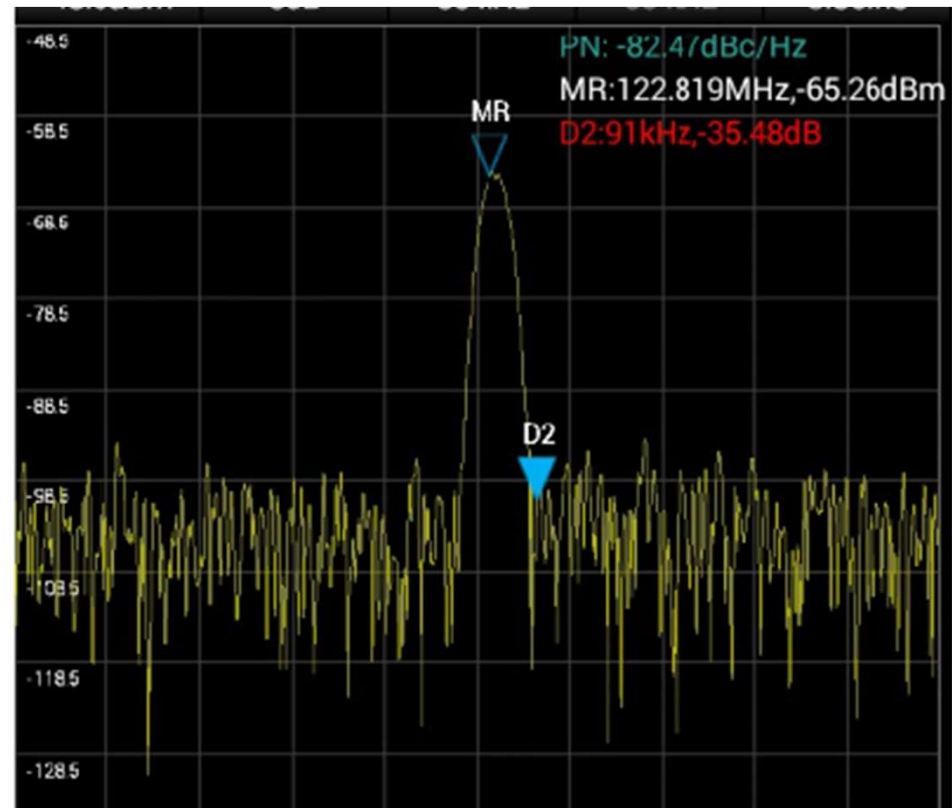
SignalHawk – Occupied Bandwidth Measurement

- Accessible from the Measure menu (select OBW)
- Shows bandwidth of a user-specified percentage of the displayed frequency span
- Measured band will be marked with blue vertical lines



SignalHawk – Phase Noise Measurement

- Use markers to display the carrier power and the offset frequency
- Phase noise is displayed in dBc/Hz



SignalHawk – What’s in the box?



SignalHawk PC

- Lightweight spectrum analyser, uses your laptop PC as a display
- USB interface to a Windows application
- 100kHz to 3.6GHz
- Fast, accurate and sensitive; -135dBm noise floor, 66dB dynamic range
- Waterfall display

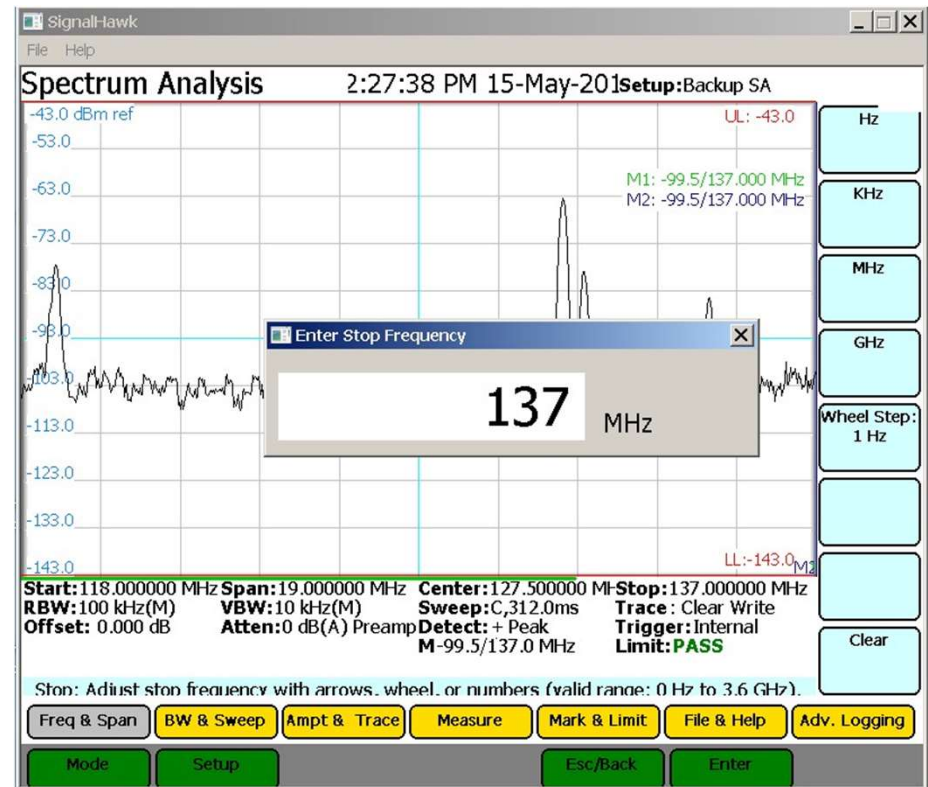
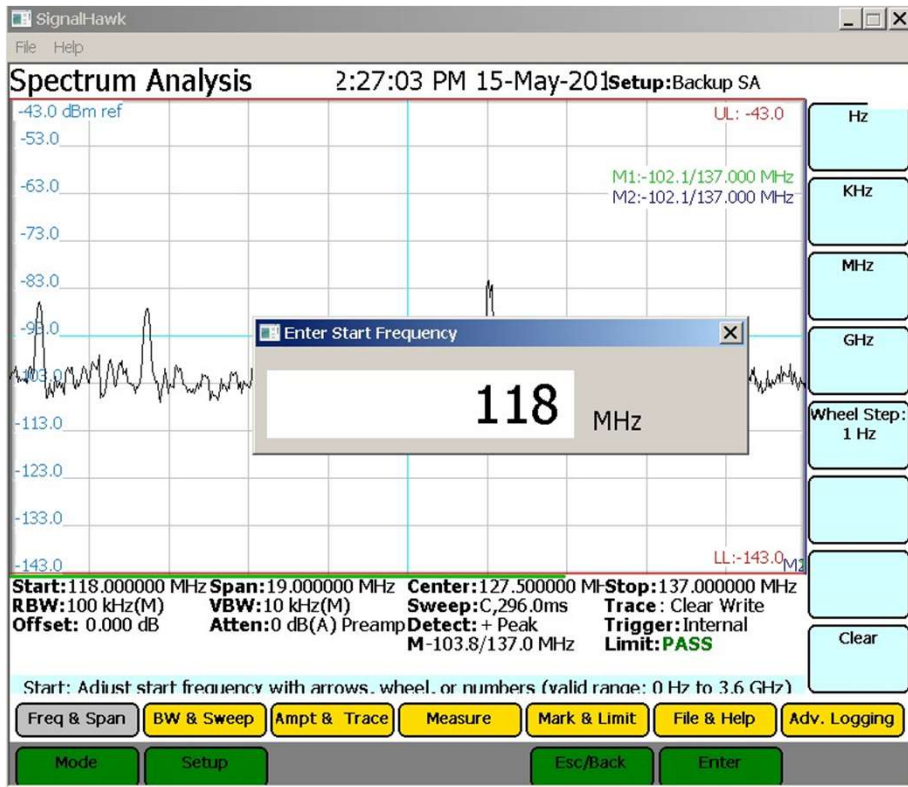


SignalHawk Rackmount

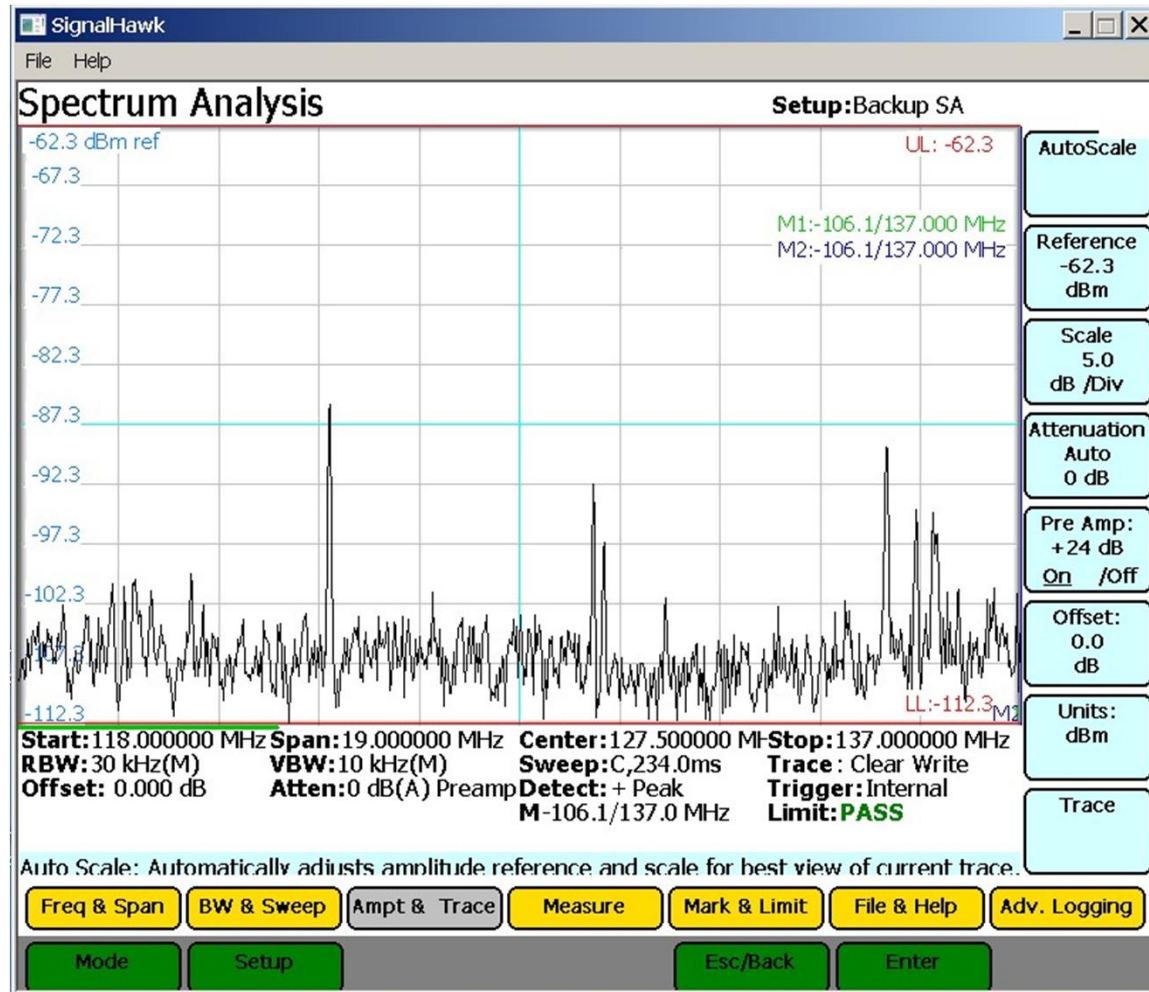
- 19" x 2RU Rackmounted spectrum analyser, with integral PC
- Remote access via IP, multiple sites can be monitored
- 100kHz to 3.6GHz
- Fast, accurate and sensitive; -135dBm noise floor, 66dB dynamic range
- Waterfall display
- Now available with Advanced Spectrum Logging
 - Logs Spectrum Traces for days or weeks
 - Review recorded traces using spectrum analyzer
 - Configurable set up for an automated test plan to record frequencies of interest



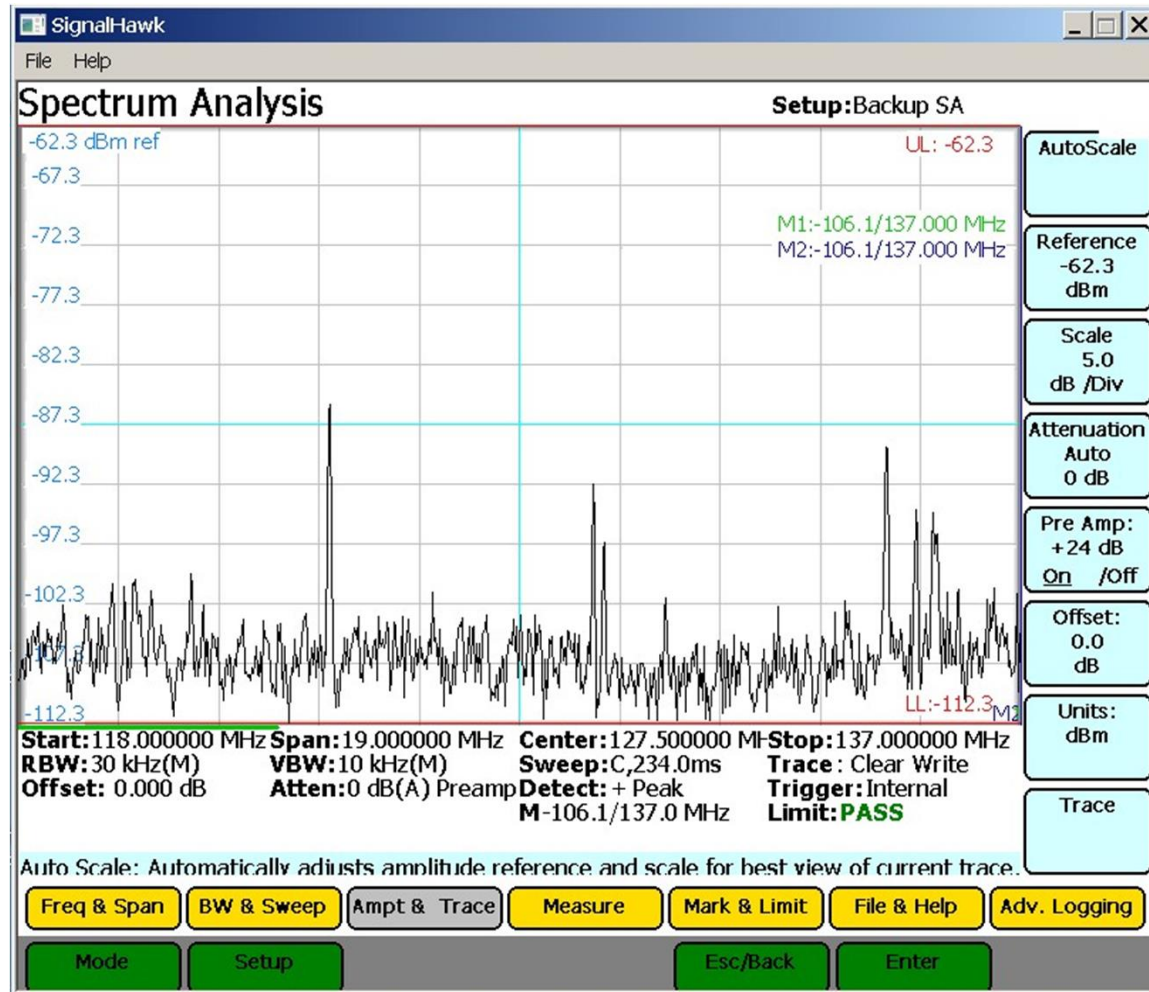
SignalHawk PC and Rackmount – Setting Frequency Limits



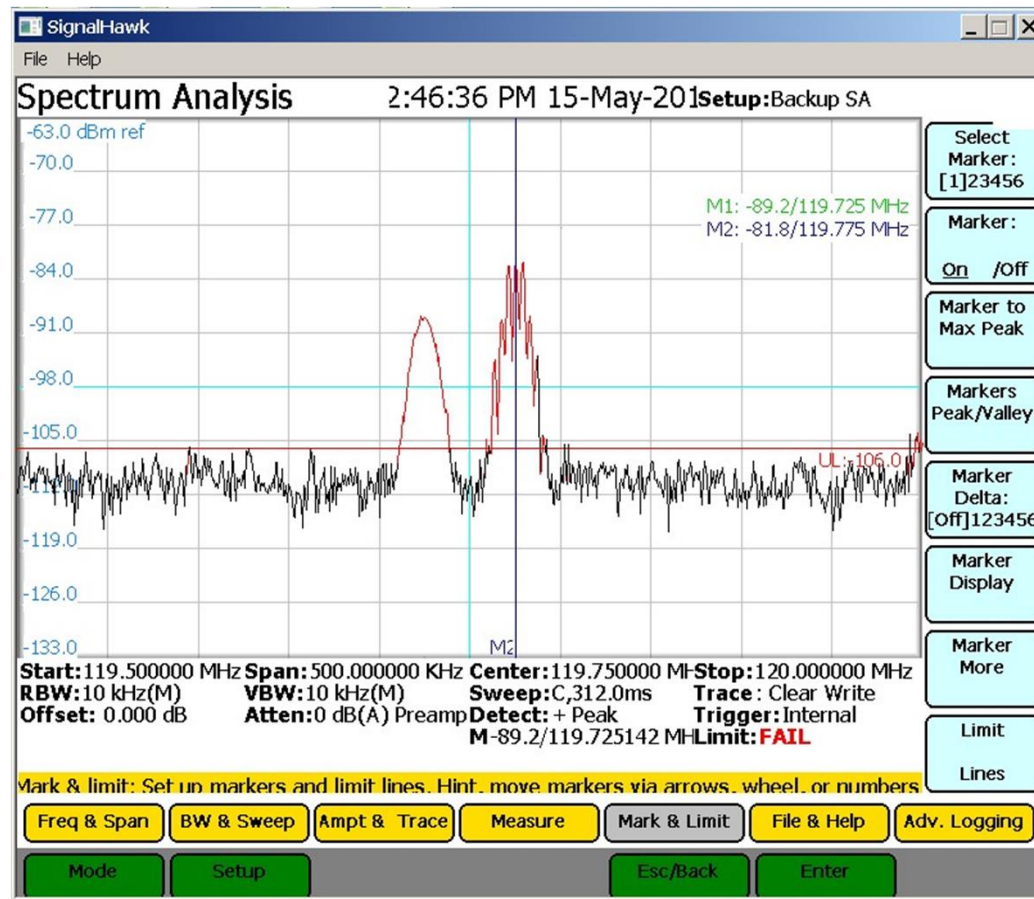
SignalHawk Rackmount – Spectrum 118-137MHz, 20km West of LHR



SignalHawk Rackmount – Spectrum 118-137MHz, 20km West of LHR

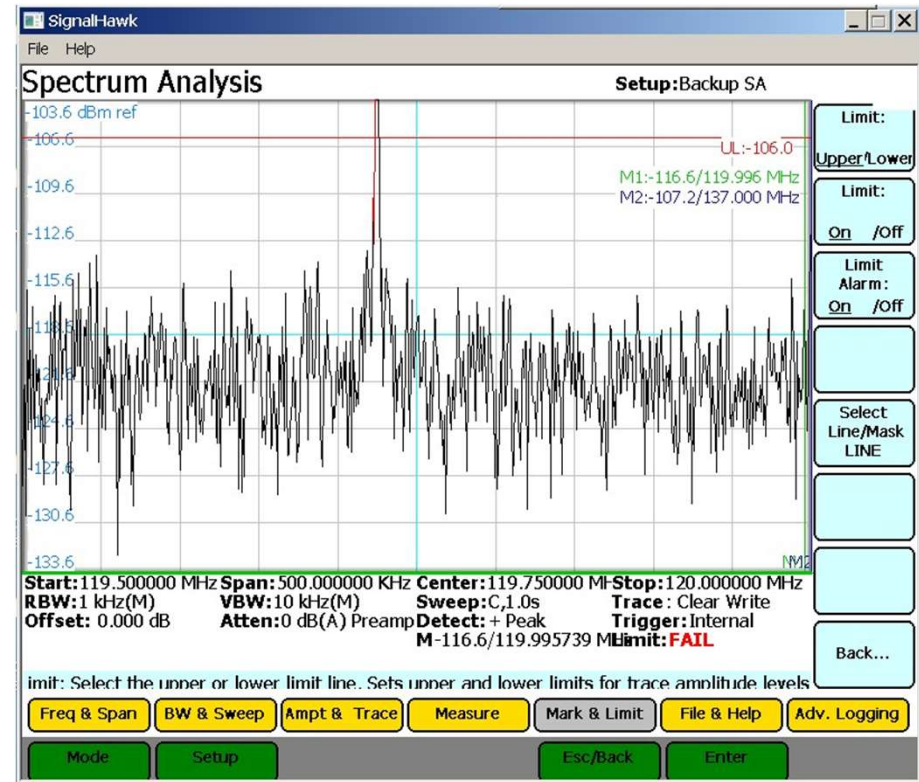
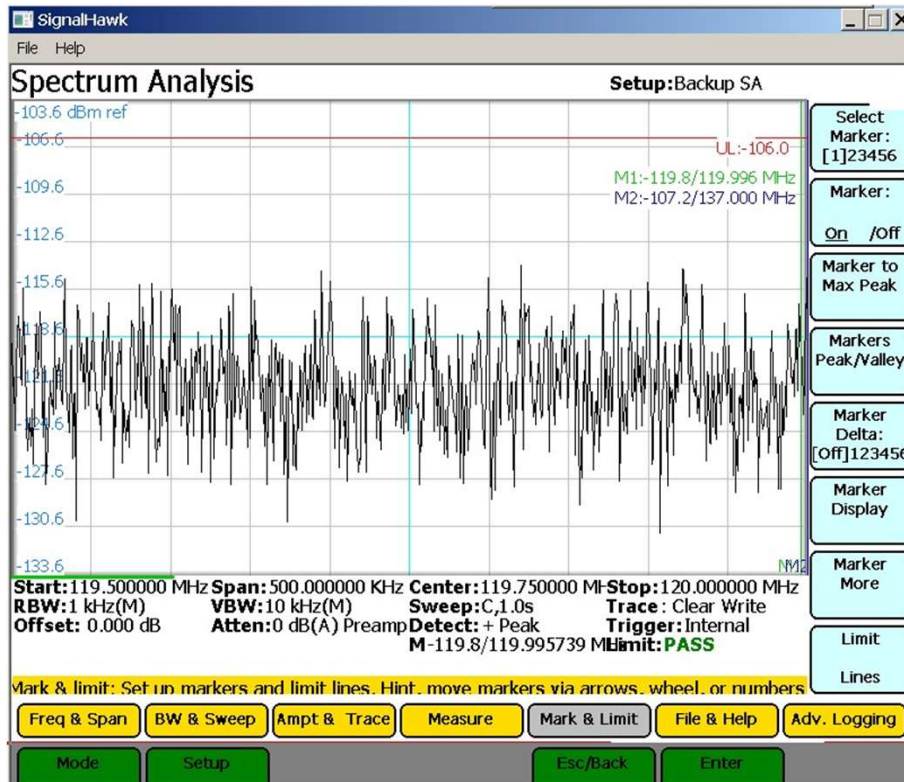


SignalHawk Rackmount – Using Markers



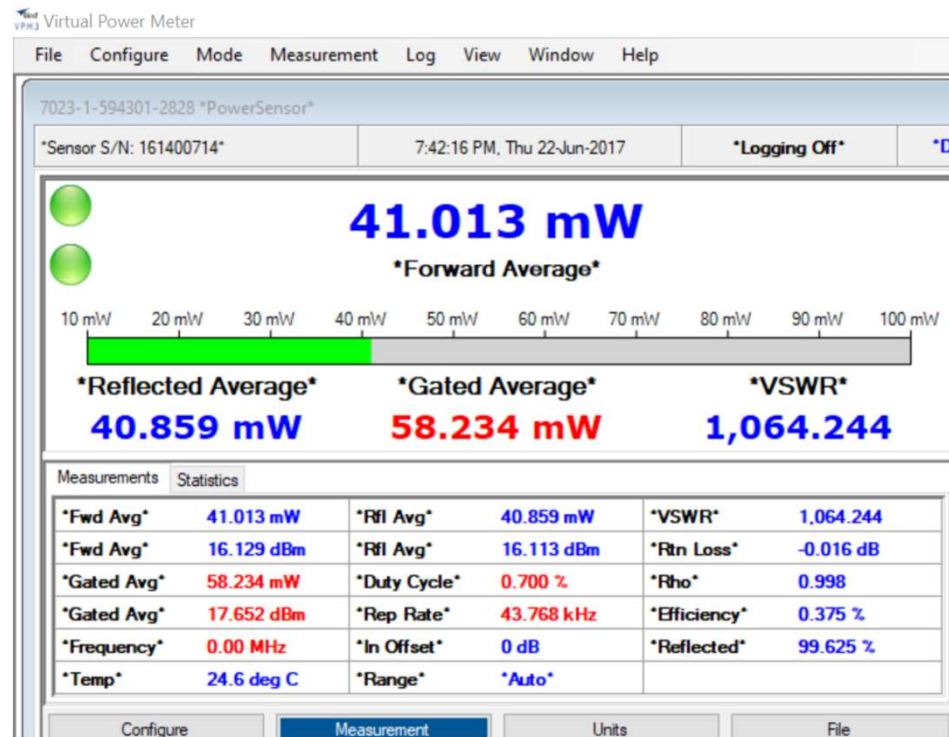
Heathrow Approach, 119.725MHz and Heathrow Departure, 119.775

SignalHawk Rackmount – Setting Limits – Pass and Fail



Bird VPM3 Virtual Power Meter

- Identifies multiple sensors simultaneously, and displays data from each along with its serial number
- Works with most Bird USB field sensors, including 7020, 5012D, 5014, 5015, 5015EF, 5016D, 5017D, 5018D, 5019D, 7020, 7022 and 7023
- Free download from Bird website



Bird RF Meter App

- Automatically detects sensor and opens the app
- Identifies multiple sensors simultaneously, and displays data from each along with its serial number
- Requires USB OTG Cable
- Works with most Bird USB field sensors, including 7020, 5012D, 5014, 5015, 5015EF, 5016D, 5017D, 5018D, 5019D, 7020, 7022 and 7023
- Available for free download from the Google Play Store



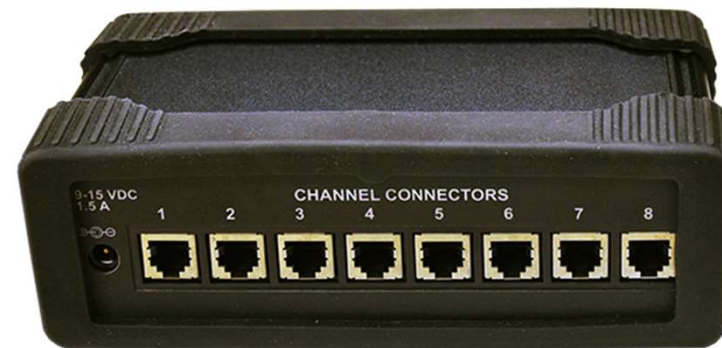
Wideband Power Sensor

- Works with VPM3 (Windows), Bird RF Power Meter App (Android), SiteHawk SK-4500TC, SignalHawk SH-42S, 4421, 4422 and 5000XT
- 6 versions:
 - 5012D, 350MHz to 4GHz, 150mW to 150W average, 400W peak
 - 5016D, 350MHz to 4GHz, 25mW to 25W average, 60W peak
 - 5017D, 25MHz to 1000MHz, 500mW to 500W average, 1.3kW peak
 - 5017D-AV, 100MHz to 1300MHz, 500mW to 500W average, 1.3kW peak
 - 5018D, 150MHz to 4GHz, 100mW to 25W average, 60W peak
 - 5019D, 25MHz to 1000MHz, 100mW to 100W, 260W peak
- 5017D-AV is aimed at the Aviation market, and covers all frequencies from VOR (108-118MHz) to TACAN and DME (900MHz to 1.3GHz)
- NIST traceable accuracy to 4%

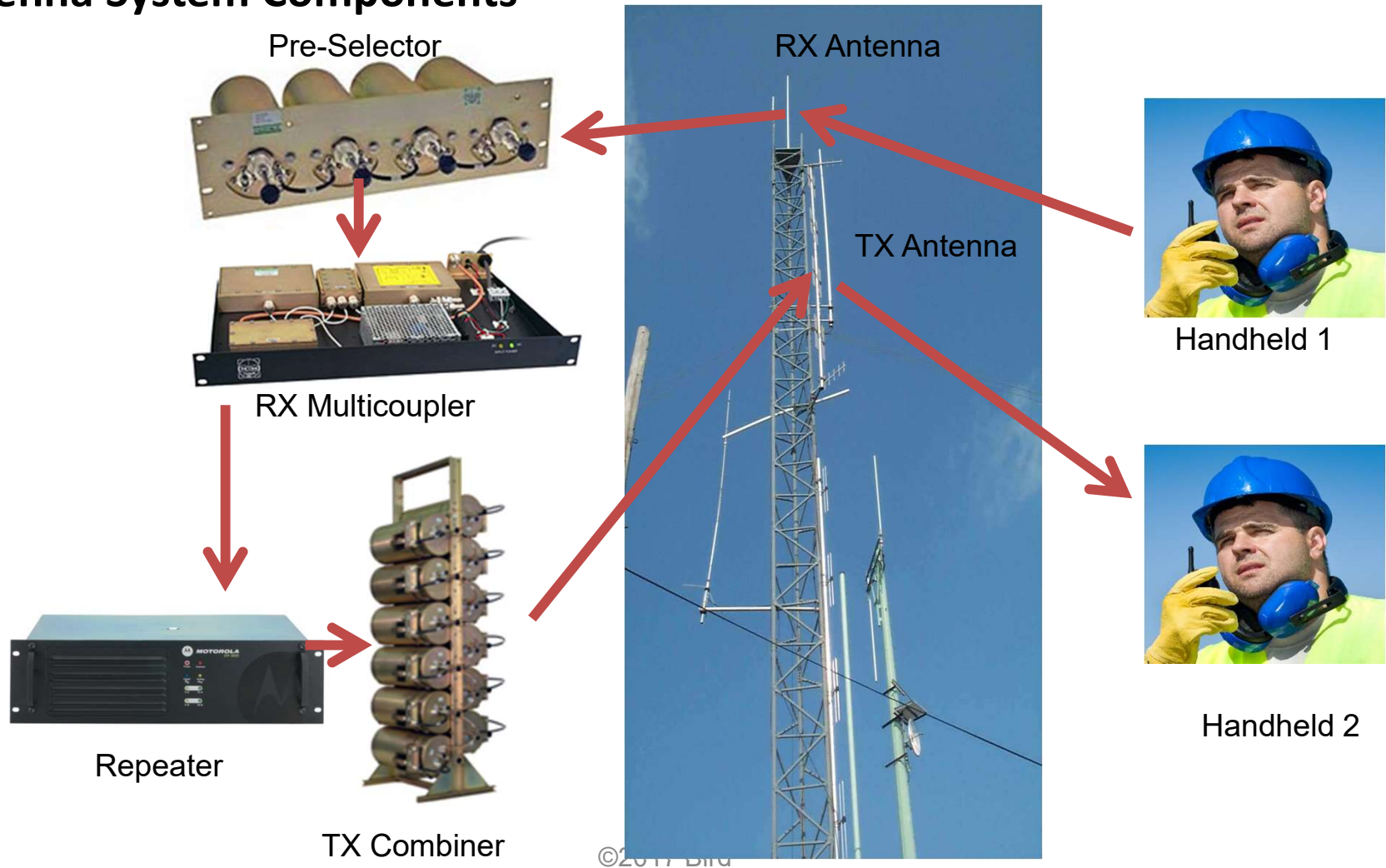


3140 Multi-Channel Monitor

- Monitors up to 8 separate radios, switch-selectable from front panel
- Uses 4044 or 4045 sensors for VHF, UHF or 700/800MHz
 - 4044 non-directional sensor, 100W FSD
 - 4045 directional sensor, 500W FSD forward power, 50W FSD reflected power
- Sensors have less than 0.1dB insertion loss, so ideal for permanent installation at a trunked or multi-channel radio site

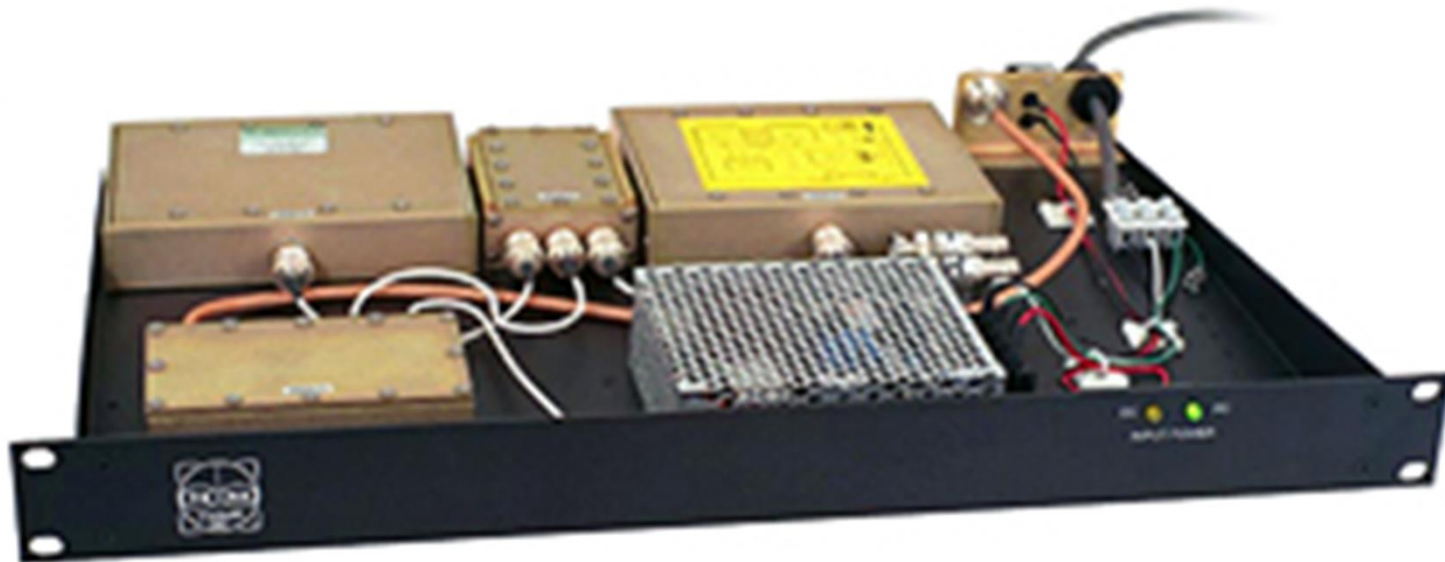


Antenna System Components



Antenna System Components – Receive Multicoupler

- Provides amplification for low-level received signals
- Splits signal from one antenna to several receivers
- VHF, UHF or 700/800/900MHz
- 4, 8, 12 or 16 ports
- BNC or N Connectors

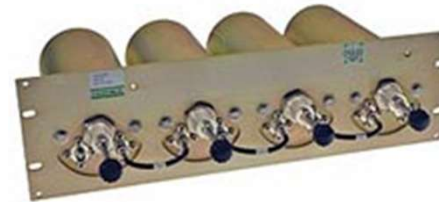


Antenna System Components – Pre-Selector

- Passes only the required range of frequencies
- Prevents receiver de-sensing or overload by strong out-of-band signals
- Wide range of frequency and pass-band options
- Bird offers comb-line or cavity types



8-resonator Preselector



Cavity Preselector

Antenna System Components – Transmit Combiner

- Combines multiple transmit signals onto a single antenna
- Provides additional transmit noise filtering to protect co-sited receivers
- Wide range of frequency and pass-band options
- Bird offers comb-line or cavity types



Hybrid Transmit Combiner



Star Junction
Transmit Combiner



T-Pass Transmit
Combiner

Antenna System Components – Duplexers

- Combines a single transmitter and single receiver onto a single antenna
- Provides additional transmit noise filtering, and protects receiver from de-sensing and overload
- Wide range of standard offerings according to frequency requirements

