RFcreations
...a different perspective

mini-moreph.

Industry's smallest USB powered, wideband Bluetooth® 5.4 Protocol Analyser platform. Fully featured despite its tiny size, and fully upgradable, due to the moreph SDR core! Runs on Windows, macOS and Linux. With concurrent capture of BR/EDR, BLE, LE Audio, Channel Sounding, IEEE 802.15.4, and the Qualcomm, QBHSL & MediaTek, mHDTV1.0, High Speed Protocols. With a powerful automation API, advanced features as standard and the comprehensive, configurable blueSPY GUI, put it in your pocket today!

KEY FEATURES:

- **CONCURRENT WIDEBAND CAPTURE**
  - BR/EDR, BLE, Qualcomm QBHSL, MediaTek mHDTV2.0, IEEE 802.15.4, LE Audio and CS (Single/Dual/+++ Mode options).
  - Simultaneous RX &TX over the entire 2.4GHz ISM band.
  - Live or post-capture decryption.
  - Custom 2.4 GHz PHY's available upon request.

- **ADVANCED FEATURES**
  - **TRUE WIFI PACKET TIIMNG** for timestamping WiFi packet arrival on all 13 channels simultaneously.
  - **AUTONOMOUS CAPTURE.**
  - **LC3 AUTODETECT.**
  - **T$_o$ TIMING.**
  - audiopod. RFcreations audio latency measurement accessory.

- **CHANNEL SOUNDING (CS) CAPTURE**
  - Capture all CS Sync and Tone packets.
  - CS Sync packets are timestamped to 10 ns precision.

- **ADVANCED LOGIC ANALYSIS**
  - Up to 16 logic channel option.
  - Configurable voltage threshold and hysteresis.

- **SMALL & PORTABLE**
  - 90mm X 78mm X 20mm footprint.
  - USB powered.

- **BLUESPY GUI and API**
  - blueSPY Protocol Analyser GUI and Automation API included with a perpetual licence that runs natively on Windows, macOS and Linux.
  .

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OVERVIEW:

mini-moreph is a wideband Bluetooth Protocol Analyser platform that when integrated with the blueSPY Protocol analysis application offers multiple configuration options, to solve 'real world' test challenges, in the lab, in production test and in the field. Based on the moreph software defined radio (SDR), it can perform wideband capture of the entire 2.4GHz ISM band, simultaneously capturing and decoding multiple wireless technologies. It has full PHY support for Bluetooth™ (BR/EDR), BLE, LE Audio, Channel Sounding, Qualcomm® High Speed Link, (QHSL), MediaTek mHDT V2.0 and 802.15.4 and has the flexibility to offer customized PHY options on request. Built-in spectrum analysis, up to 16 logic analyser channels and the ability to monitor all 13 WIFI channels simultaneously. Packed with advanced features as standard and only weighing 110g it is a very powerful addition to your development toolkit.

ADVANCED FEATURES:

CHANNEL SOUNDING (CS)

BlueSPY includes full support for Channel Sounding, capturing all CS Sync and Tone packets and analysing CS Procedures at both the protocol level and the PHY level. CS Sync packets are timestamped to 10 ns precision, and the relative phases and phase stability of CS Tone packets are measured and analysed using a fully phase-coherent receiver. If the CS parameters are visible to blueSPY (either through LL traffic, or through HCI capture/import in the case of Test procedures), the configuration is fed into the DRBG and steps/subevents/events are analysed for timing accuracy, and for any errors in the generation of AAs, channel maps, payloads etc. If the CS parameters are not available, the packets can be filtered on RSSI, AAs, channels etc to show the relevant CS steps.

AUTONOMOUS CAPTURE MODE'

Is a portable standalone option, with the addition of a USB battery and SD card in the mini-moreph storage extension slot, capture without a host or to facilitate unattended capture is simple.

TRUE WIFI PACKET TIMING

For co-existence monitoring you need to know when the WiFi packets arrive in relation to the Bluetooth packets. mini-moreph monitors all 13 WIFI channels simultaneously and as BlueSPY detects WiFi packets using the same receiver chain as the Bluetooth the clocks are synchronized, thus guaranteeing perfect alignment of the WiFi and Bluetooth timestamps.

T_O TIMING OPTION

blueSPY includes proprietary T_O timing functionality which enables full capture of isochronous traffic from the initial occurrence without any breaks even if the link key is not known at the start of the capture.

LC3 AUTODETECT

LC3 audio received in blueSPY can optionally be decoded using user-specified audio parameters; the proprietary autodetect algorithm can help you choose which parameters to use. This can help either if the configuration sent OTA was missed due to interference, or if the sender has specified one configuration but encoded the audio using a different one.
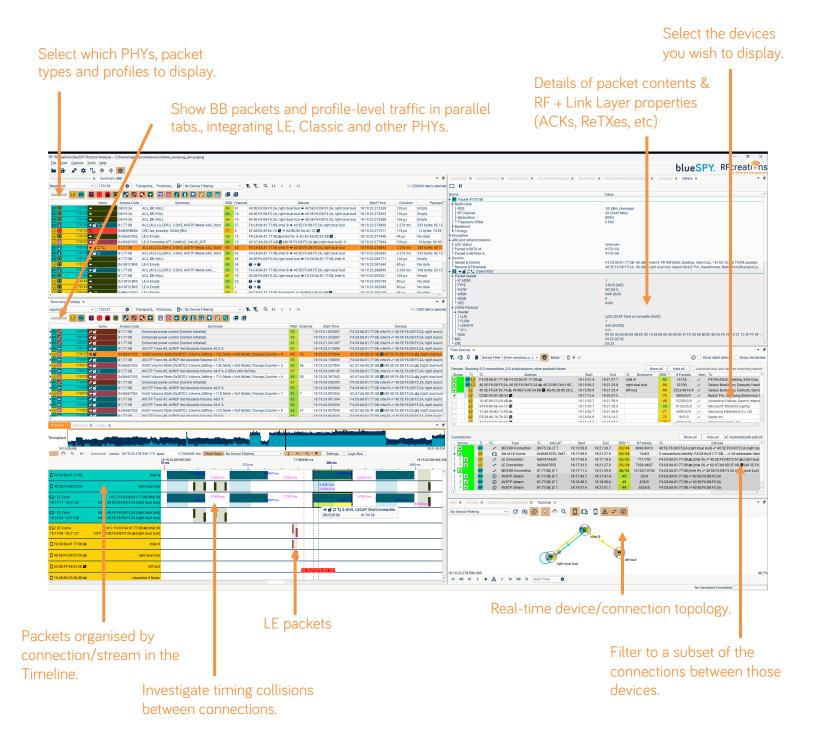
AUDIOPOD

audiopod offers an industry first! A USB powered audio measurement tool which integrates seamlessly with the mini-moreph and moreph30 protocol analysers to generate and record audio over a variety of analogue and digital interfaces. Each audio stream is timestamped using the same clock as the protocol analyser, allowing the audio streams to be aligned with Bluetooth packets and displayed in the blueSPY GUI. This timestamping enables a variety of audio latency measurements to be made, including end-to-end, between-channel, and on-air packets to captured audio streams. This is a must-have to ensure compliance with the presentation delay requirement of the LE audio specification.

Please see the audiopod Product Brief for further information.

INTEGRATION WTH blueSPY:

Select which PHYs, packet types and profiles to display.

Show BB packets and profile-level traffic in parallel tabs., integrating LE, Classic and other PHYs.

Select the devices you wish to display.

Details of packet contents & RF + Link Layer properties (ACKs, ReTXes, etc)

Packets organised by connection/stream in the Timeline.

LE packets

Investigate timing collisions between connections.

Real-time device/connection topology.

Filter to a subset of the connections between those devices.

blueSPY.

blueSPY is the RFcreations protocol analyser GUI which runs on both the mini-moreph and moreph30 hardware platforms under Windows, Linux or macOS. It offers users comprehensive and intuitive views enabling them to rapidly identify potential issues and solve their development or production challenges.

- Where did it all go wrong? The blueSPY Dashboard helps you quickly spot the moment at which your testing failed, by highlighting important events and any errors or rejected operations.

- Making decryption easy: all user-provided keys are tried (with both endiannesses) on all connections; automatic cracking of LE connections using insecure pairing, or connections using debug keys; keys seen in HCI packets are automatically imported and used.

- Live playback of decoded OTA audio; display of decoded audio in Timeline, linked to the source packets; export of either decoded audio, or the (decrypted) bytes from the OTA packets for external analysis.

- Unified Summary combining LE, BR/EDR, QHS, etc in time order, with powerful filtering and searching to find the packets you need.

- Capture QBHSL and other proprietary PHYs, fully integrated analysis displays them as if they were Bluetooth.

- Export analysed Bluetooth traffic to CSV/YAML for external analysis; load the open-format PCAPNG files into Wireshark to combine with non-Bluetooth or proprietary traffic; feed your debug/logging messages into our injection API to display integrated with air packets in the Summary.

- Import HCI from Btsnoop logs (including merging into a live capture) and import GATT database files from Android.

- Display logic analyser lines (and UART, SPI, I2S), on-air packets and decoded audio in a single Timeline, with tools to measure times between any pair of events or in a free cursor mode.

- Spectrum view combines background power measurements, OTA packets (filtered or with all shown) and channel statistics (channel usage, channel error rates).

- Add coloured columns highlighting packets matching a particular search/filter.

- Topology diagram showing which LE, Classic, and dual mode devices are communicating with each other

- Filter devices by Address, Name, or IRK; save filters for later use, create multiple filters, and use them in different tabs simultaneously.

- Powerful automation API allowing programmatic analysis of packets and higher-level transactions during live capture, as well as starting/stopping/segmenting capture and adding link keys.

TECHNICAL SPECIFICATION:

Supported standards	Bluetooth 5.4 and previous 802.15.4
Supported Bluetooth Phys	BR (GFSK) 2-EDR (π/4-QPSK) 3-EDR (8PSK) LE 1Mbps uncoded (GFSK) LE 2Mbps uncoded (GFSK) LE s=2 coded (GFSK) LE s=8 coded (GFSK) QUALCOMM QHSBL MediaTek mHDT V1.0
Detection times	BR/EDR on single packet with up to one sync word error LE on reception of one uncorrupted packet
Monitored channels	BR/EDR simultaneous monitoring of all 79 channels LE simultaneous monitoring of all 40 channels
Basic measurements	Packet arrival time with 250ns resolution RSSI with 1dB resolution LAP address for all BR/EDR packets Access address for all LE packets AdvA for LE advertising packets

Advanced measurements	NAP/UAP/LAP extracted from all FHS packets Vendor ID, manufacturing string & device name extracted from LE advertising packets
Language support	C dll or shared library Python
Supported hosts	Windows 7 or higher Linux macOS
Power	USB-C 5V 4.5W maximum, 3.5W typical
PCB dimensions	82mm x 60mm
Enclosure	90mm x 78mm x 20mm 110g
Connectors	SMA for RF USB-C for host RFC digital port – connection to audiopod.
Frequency range	2395MHz – 2485MHz
Noise figure	5dB @ maximum sensitivity
Receiver gain	32dB gain control range Automatic gain control
Receiver bandwidth	90MHz instantaneous bandwidth
Receiver maximum input	+27dBm
Transmitter output power	+3dBm maximum
Transmitter bandwidth	90MHz instantaneous bandwidth
Frequency accuracy	±0.28ppm over temperature ±1 ppm over first year ±3 ppm over 20 years
Environmental	Operating temperature range 0°C to 45°C. Operating relative humidity 0% to 90% non-condensing
Regulatory approvals	EN61326-1:2013 (EMC and immunity) EN55011:2009 (Radiated emissions for ISM band equipment) EN55032:2012 (EMC emissions) CFR 47 Pt 15 B (Unintentional radiation - FCC)

WHAT'S IN THE BOX:

- 1 mini-moreph blueSPY.
- 1 Robust storage/travel wallet.
- 1 Antenna, orange.
- 1 USB-A to USB-C cable, orange, 1m.

If a blueSPY PRO option has been purchased:
- 1 Logic Probe Pod.
- 1 Hirose to Hirose cable, black, 300mm.
- 1 Logic Cable, MK18.
- 1 Set of EZ Clips (16 grey, 1 red & 1 black).

CONTACT RFCREATIONS TODAY TO FIND OUT MORE AND SEE OUR DIFFERENT PERSPECTIVE!

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