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Red Pitaya HAMlab can be used for:

- **Software defined radio transceiver 160-6m 10W**
- **Oscilloscope**
- **Spectrum analyzer**
- **Logic analyzer**
- **Vector network analyzer / antenna analyzer**
- **Bode analyzer**

HAMlab

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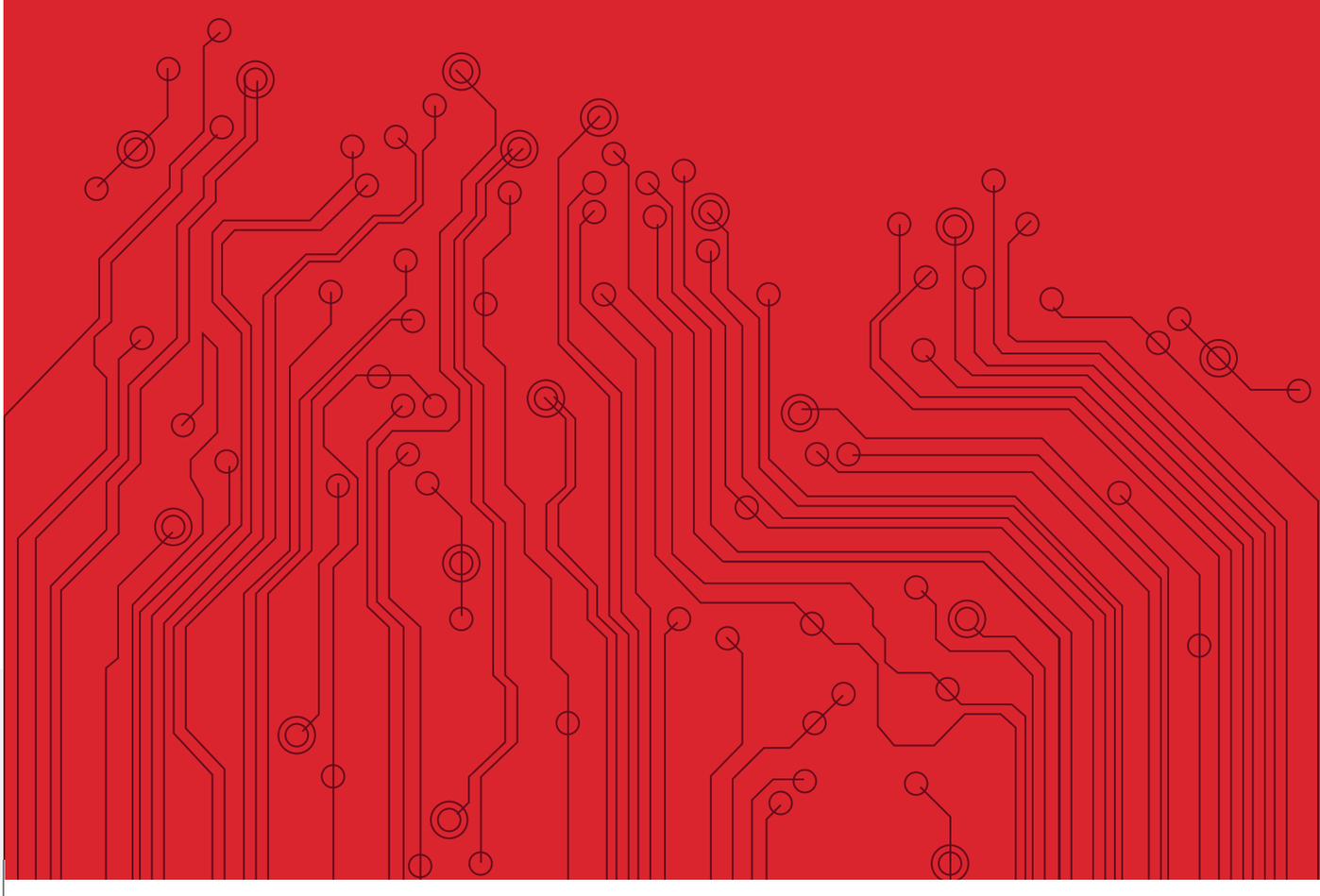
# HAMlab

## Features



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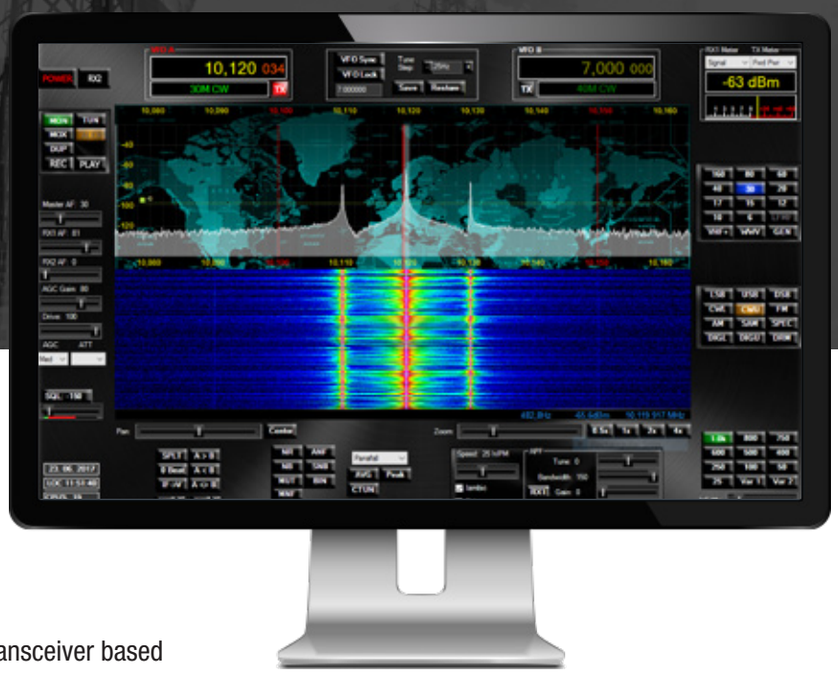
# SDR transceiver




## HAMlab

**HAMlab** is a Software Defined Radio Transceiver based on the latest available technologies with 160m-10m band coverage and 10W of output power.

- SDR + measurement instruments
- Rugged steel housing
- LDMOSFET 10W Linear amplifier (160M-6M)
- 1Gsps Ethernet interface
- Software selectable 2 antenna ports with BNC and SO 239 UHF connectors
- Direct connections for a Morse key
- Direct microphone connection with PTT
- Headphones and line out audio low latency connection
- Accessories connection with PTT OUT, PTT IN and serial interface
- Built-in high performance software selectable low noise preamp 15/30dB and - attenuators 12dB/24dB/36dB
- Supports 2 fully independent receivers
- Cooper cooling system
- Works with Power SDR HAMlab edition software available for WINDOWS
- AM, FM, RTTY, CW, LSB, USB, DIGITAL modes available (limited only by the application software)

# SDR receiver pre-selectors

## Optional

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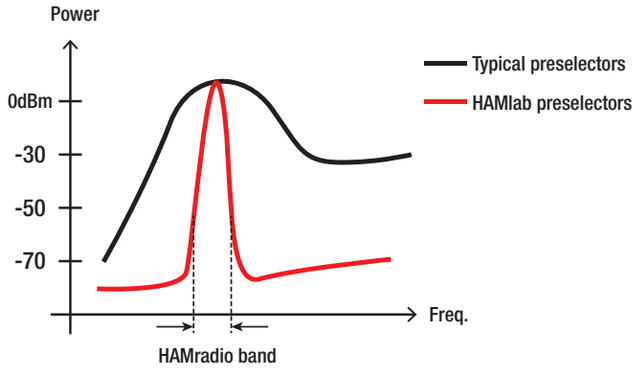
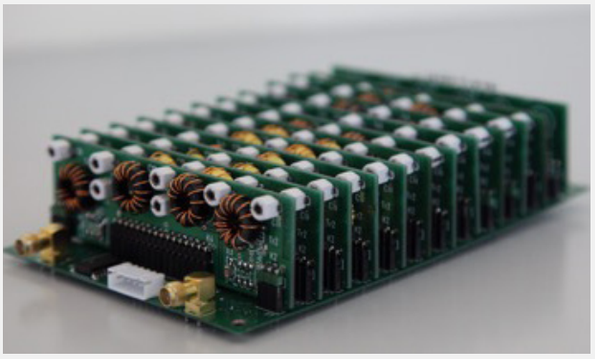
**Pre-selectors** can be optionally used with **HAMlab** to greatly improve receiver performances.



- Amateur Band Preselector Coverage: 160m,80m,60m, 40m,30m.20m,17m,15m,12m,10m,6m
- Possibility to add custom filters: user is able to install own filter modules

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# Other Applications

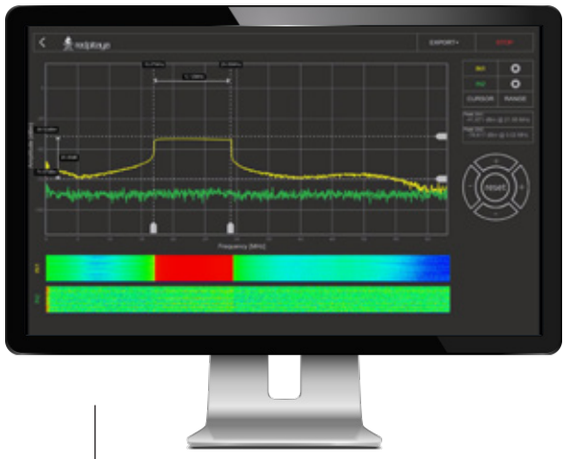
Test & Measurement applications running on a credit card sized SoC (FPGA+CPU) based Open SW source **DAQ platform**

## Oscilloscope & Signal Generator

- 2 channel Oscilloscope
- 50MHz of Bandwith
- 14 bits of resolution
- 16k samples memory depth
- +-1V to +-20V input range
- AC/DC input coupling
- External trigger

## Spectrum Analyzer

- 2 channel
- 62,5MHz of Bandwith
- 14 bits of resolution
- 16k DFT buffer
- Dynamic range -70/80 dBm
- Inputs noise level
- <-100/-119 dBm
- DC Input coupling



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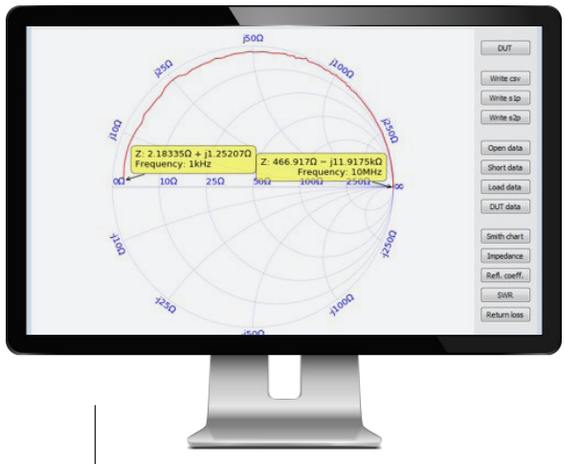
## Logic Analyzer PRO

- Channels: 8
- Sampling rate (Max): 125Msps
- Max. Input freq: 50MHz
- Supporte bus protocols: I2C, UART, SPI
- Input voltage: 2.5V – 5.5V
- Overload protection: integrated
- Trigger types: Level, Edge, Pattern
- Level tresholds: 0.8V (low), 2.0V (high)
- Input impedance: 100k, 3pF

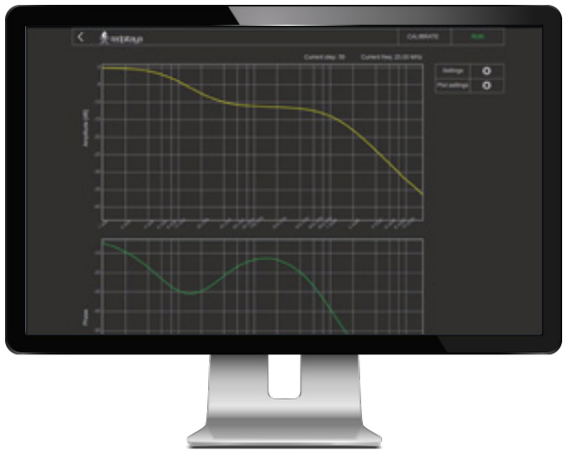
## Vector network analyzer / antenna analyzer

- Frequency range: DC - 60MHz
- Ready to measure
- Antenna SWR, impedance, reflection measurements
- Characteristics of capacitors, coils, crystals



# Bode Analyzer

- Frequency span: 1Hz-50MHz
- Frequency resolution: 1Hz
- Excitation signal amplitude: 0-1V
- Excitation signal DC bias: 0-0.5V
- Resolution: 14 bit
- Max. Nr. Of steps/measurement: 1000
- Max. In. Amplitude: +-1V/+-20V



Works with Linux, Windows and MAC.

**No software installation required!**

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**NOTE:** Acquired data is compressed therefore the size of data than can be captured depends on activity of signal on LA inputs. For I2C, SPI & UART signals 1MS is typical sample depth. All instrumentation applications are WEB based and don't require the installation of any native software. Users can access them via a browser using their PC running any popular operating systems (MAC, Linux, Windows).

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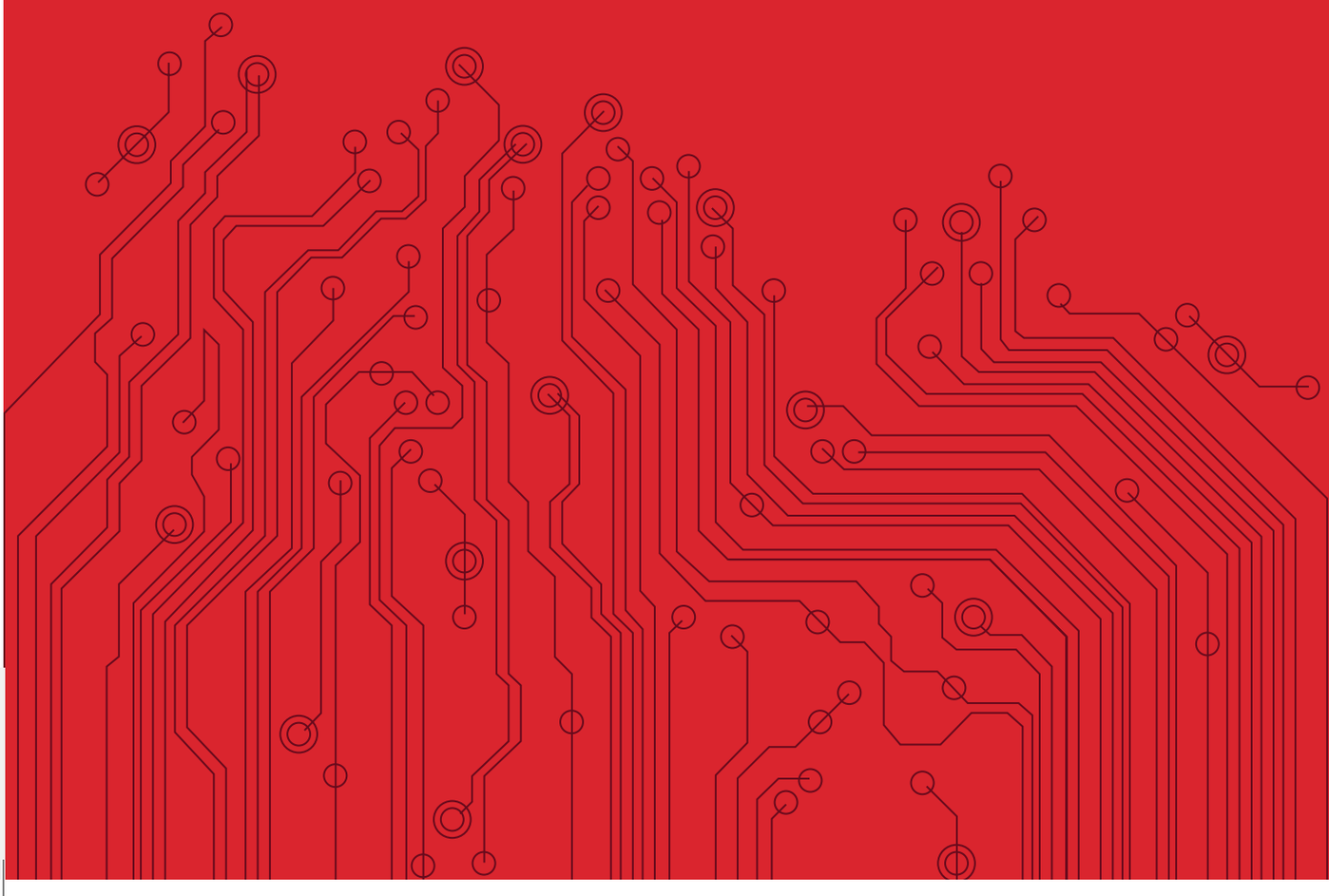
# HAMlab

## Detailed Hardware Specifications

for HAMlab 160-6 10W



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# HAMlab 160-6 10W Specifications

| SDR specifications: | **HAMlab 160-6 10W 10W** |
|---|---|
| **Highlights** | |
| Architecture: | direct sampling / internal high performance 14-bit A/D and D/A 125 Msps converters (no sound card required) |
| Band coverage: | All band receiver and 160-6m transmitter |
| Transmit power: | up to 10 W |
| Wideband Frequency Coverage: | 25 kHz - 62.25 MHz |
| Connection to PC: | 1 Gbit ethernet or WIFI connection |
| Software: | Power SDR HAMlab edition |
| Phones and MIC connection: | available on the front panel |
| Secondary Rx and Tx channel: | available through back panel BNC connectors (RX2 IN, XVTX) |
| CW key and paddle input: | available through front panel jack connector |
| **Receiver Specifications** | |
| Architecture: | Direct Digital Sampling |
| ADC Sampling Rate: | 125Msps |
| ADC Resolution: | 14 bits |
| Wideband Frequency Coverage: | 25 kHz - 62.25 MHz |
| MDS (min. detectable signal): | MDS (typ)@ 500Hz BW |
| Preamp OFF at 14MHz | -113dBm |
| Preamp +15dB at 14MHz | -130dBm |
| Preamp +30dB at 50MHz | -135dBm |
| Preselectors: | More MDS measurements. |
| | Available as add-on module (comming soon) |
| | User can also connect own preselectors/filters |
| **Transmitter Specifications** | |
| Architecture: | Direct Digital Up-conversion |
| TX DAC Sampling Rate: | 125 Msps |
| TX DAC Resolution: | 14 bits |
| RF Output Power: | up to 10 W CW and SSB at @ 13.8 V input voltage (max. 15 V) |
| Transmitter Frequency Range: | 160 - 10 m (amateur bands only)* |
| Low Pass PA Filter Bands: | 160m / 80 m / 40 m / 30m / 20 m / 17m / 15m / 12m / 10m / 6 m |
| | (possibility to changed it to any range 1.8 - 50 MHz) |
| Emission Modes Types: | A1A (CWU, CWL), J3E (USB, LSB), A3E (AM), F3E (FM), DIGITAL (DIGU, DIGL) |
| | DIGITAL (DIGU, DIGL) |
| 3rd-Order IMD: | better than -35 dB below PEP @ 14.2 MHz 10 Watts PEP |
| Cooling: | copper heat spreader |

**NOTE:** 6m operation is also possible when per-selector module is installed

| SDR specifications: | **HAMlab 160-6 10W 10W** |
|---|---|

## General Specifications

| | |
|---|---|
| Antenna Connector: | ANT1 and ANT2 available on SMA connectors Included one cable with SMA to SO-239 UHF |
| Antenna Impedance: | 50 Ohm Unbalanced |
| RF Output Power: | up to 10 W CW and SSB at 13.8 V input voltage (max. 15 V) |
| Maximum Interconnect Cable Length Ethernet: | 100 meters (328 feet), Category 5 cable |
| Power connector: | PowerPole Anderson connector |

| Measurement instruments specifications: | **HAMlab 160-6 10W 10W** |
|---|---|

## Oscilloscope

| | |
|---|---|
| Input channels | 2 |
| Input channels connector | BNC |
| Bandwidth | 50 MHz |
| Resolution | 14 bit |
| Memory depth | 16384 Samples Max. |
| Sampling Rate | 125 MS/s |
| Input range | +/- 1 V or +/- 20 V |
| Input coupling | AC/DC |
| Minimal Voltage Sensitivity | ±0.244 mV / ±2.44 mV |
| External Trigger connector | BNC |
| Input coupling | AC/DC |

## Signal generator

| | |
|---|---|
| Output channels | 2 |
| Output channels connector | BCN |
| Bandwidth | 50 MHz |
| Resolution | 14 bit |
| Signal buffer | 16384 Samples Max. |
| Sampling Rate | 125 MS/s |
| Output range | +/- 1V |
| Frequency Range | 0 - 50 MHz |
| Output impedance | 50 ohm |
| External Trigger connector | BNC |

| Measurement instruments specifications: | **HAMlab 160-6 10W 10W** |
|---|---|

## Spectrum analyzer

| | |
|---|---|
| Input channels | 2 |
| Input channels connector | BNC |
| Bandwidth | 0 - 62 MHz |
| Dynamic Range | -80dBm |
| Input noise level | < -119 dBm/Hz |
| Input range | +/- 1V |
| Frequency Range | 0 - 50 MHz |
| Input impedance | 1 MΩ / 10 pF |
| Spurious frequency components | -90 dBFS Typically |

## Logic analyzer

| | |
|---|---|
| Input channels | 8 |
| Max. sample rate | 125 MS/s |
| Fastest input signal | 50 MHz |
| Supported protocols: | I2C, SPI, UART |
| Input voltage levels | 2.5 V - 5.5 V |
| Threshold: | 0.8 V for logic low |
| | 2.0 V for logic high |
| Input impedance | 100 kohm 3 pF |
| Sample depth | 1 MS (typical*) |
| Trigger resolution | 8 ns |
| Min. detectable pulse length | 10 ns |

| General Electrical specifications: | **HAMlab 160-6 10W 10W** |
|---|---|
| Power Requirements: | +13.8 V DC nominal ± 15 % (Transmitter output specified at 13.8 V DC) |
| Power Consumption: | 2 A |

| Mechanical specifications: | **HAMlab 160-6 10W 10W** |
|---|---|
| Height: | 100 mm |
| Width: | 340 mm |
| Depth: | 215 mm |
| Weight: | 5 kg |
| Operating temperature: | -10*C to +50*C |

## HAMlab system architecture

SDR block diagram