UHF spectrum sensing with VESNA

Tomaž Šolc

*Department of Communication Systems,
Jožef Stefan Institute, Ljubljana, Slovenia*

tomaz.solc@ijs.si

IJS

UHF spectrum sensing expansion

Sensor Node Expansion for spectrum sensing in the UHF and VHF bands has been developed specifically for research into heterogeneous spectrum sharing and cognitive radio applications in the TV-band whitespaces. It is based on a cheap and compact multi-standard TV silicon tuner design which allows it to be deployed in large sensor networks for distributed sensing applications.

NXP TDA18219HN silicon tuner
integrated RF tracking filter,
image-rejection mixer,
IF selectivity,
gain control,
low-IF output

42 – 870 MHz RF input
1.7, 6, 7, 8, 10 MHz channel
5.9 dB noise figure
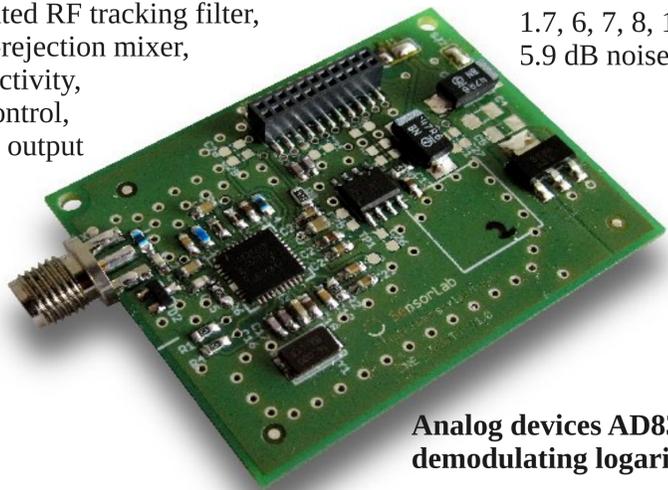
**Analog devices AD8307
demodulating logarithmic amplifier**

±1 dB linearity
92 dB dynamic range

VESNA wireless sensor network platform

VESNA is Jožef Stefan Institute's flexible platform for the development of wireless sensor networks. It is based on a high-performance microcontroller and a modular radio interface and is designed to meet requirements of diverse applications.

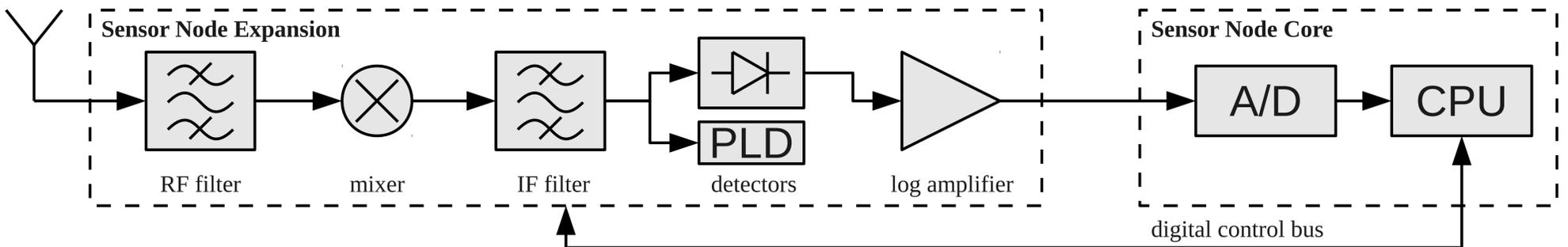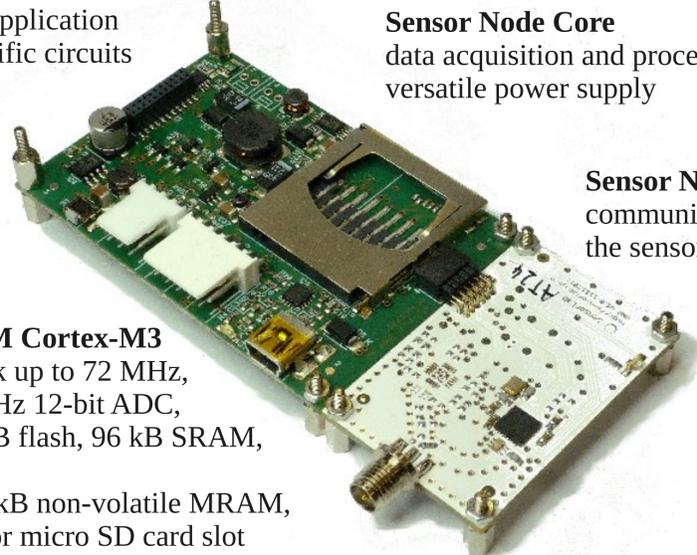**Expansion connector**
for application
specific circuits

Sensor Node Core
data acquisition and processing,
versatile power supply

Sensor Node Radio
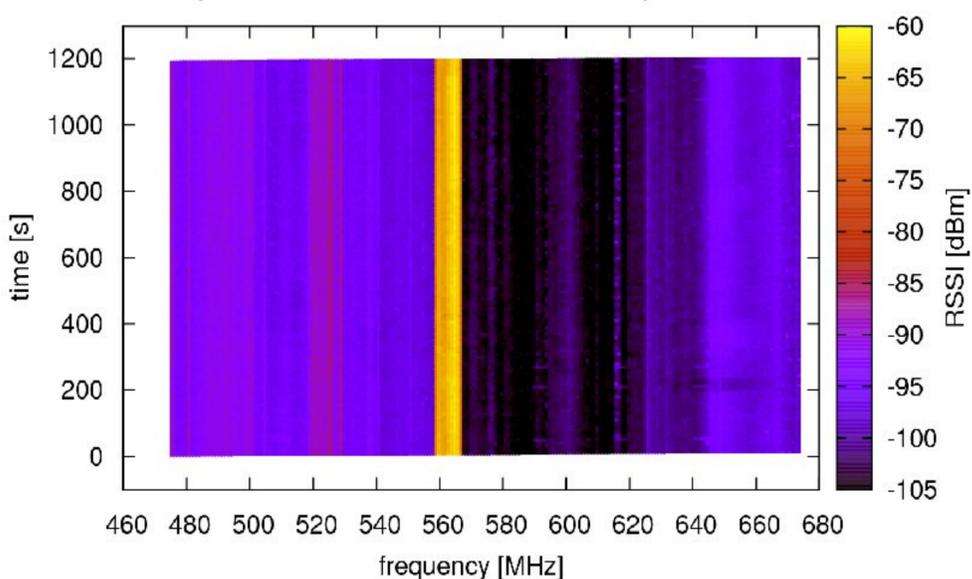communication within
the sensor network

ARM Cortex-M3
clock up to 72 MHz,
1 MHz 12-bit ADC,
1 MB flash, 96 kB SRAM,

128 kB non-volatile MRAM,
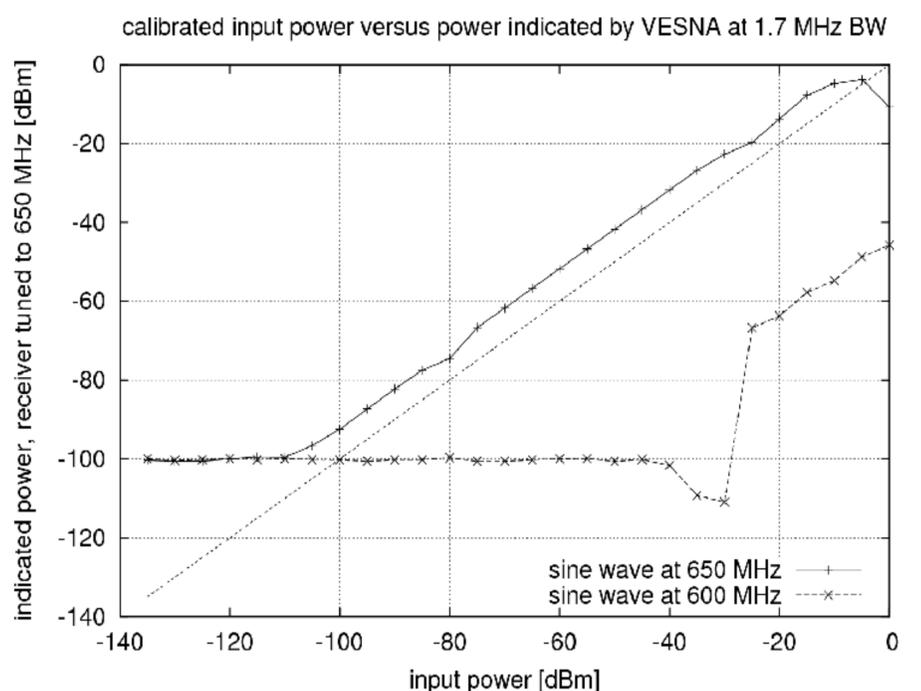SD or micro SD card slot

USB 2.0 and RS-232 interface

Sensor Node Expansion

RF filter — mixer — IF filter — detectors — PLD — log amplifier

Sensor Node Core

A/D — CPU

digital control bus

VESNA spectrum sensor, Slovenian DVB-T multiplex A at 562 MHz

VESNA spectrum sensing application

Firmware running on the microcontroller exposes a common serial line interface to one or more energy-detection receivers connected to VESNA. Hardware-specific capabilities are abstracted in the form of sensing profiles describing supported frequency spans, channel bandwidths and sweep times. Sensing data can be processed on-line or stored for later analysis.

calibrated input power versus power indicated by VESNA at 1.7 MHz BW

sine wave at 650 MHz
sine wave at 600 MHz

Acknowledgements

VESNA spectrum sensing application source code has been released under GPL.
https://github.com/sensorlab/vesna-spectrum-sensor