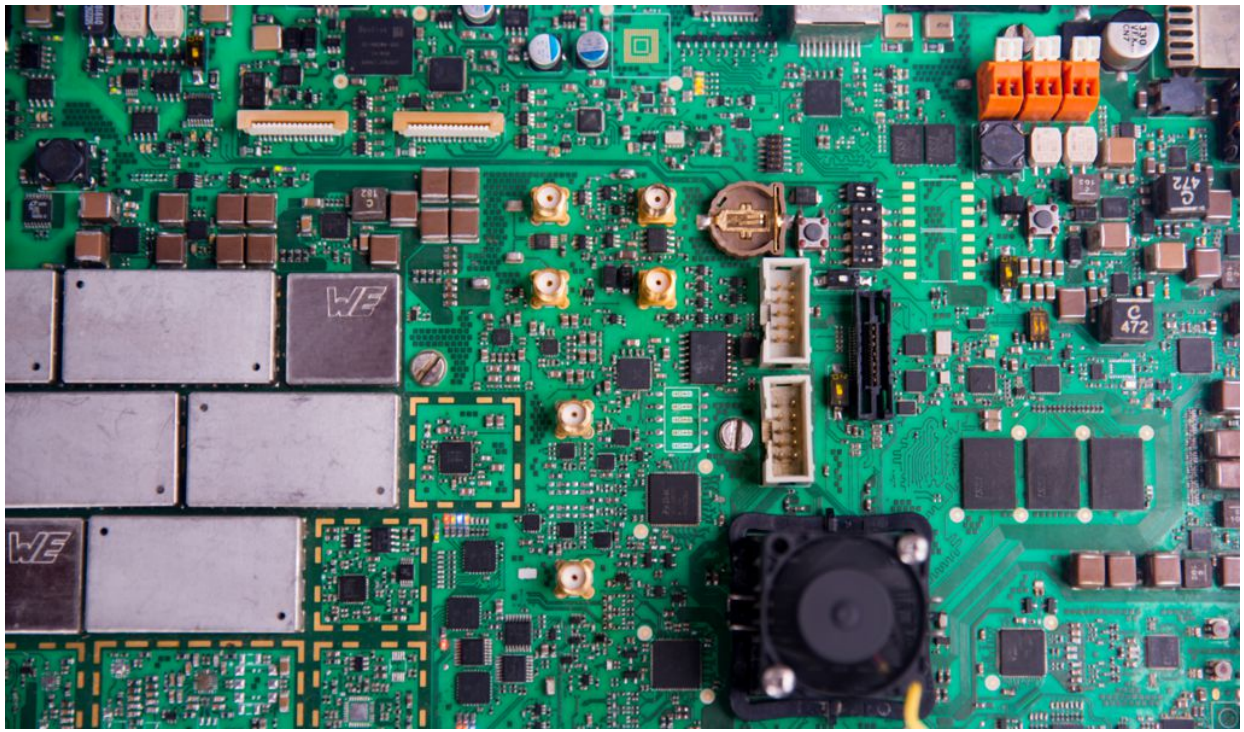
Ultra–wideband RF/FPGA rapid prototyping platform

Concept

- It is not only quality, but also time to market, that matters to our business partners.
- To meet their challenging needs, we have developed generic hardware, along with software blocks needed in typical radio frequency digital signal processing.
- Thanks to that we can develop and test prototypes swiftly, prior to the tailored hardware platform design.

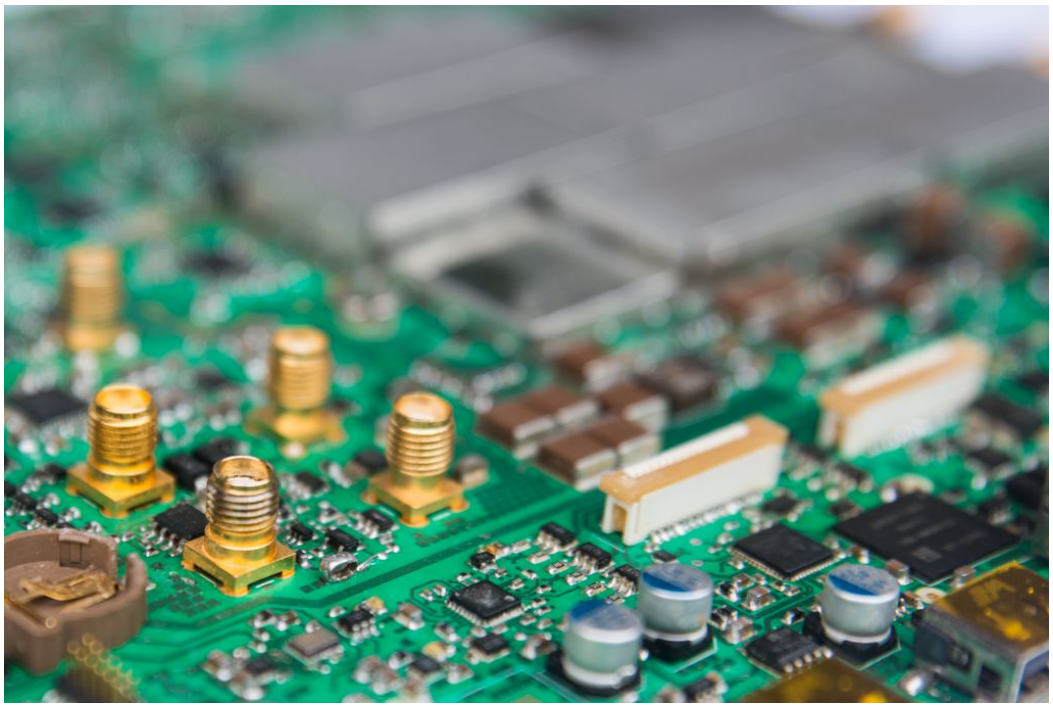


Possible applications

Possible applications of the platform:

- Radar (PESA, FMCW)
- Real–time spectrum analyzer with no gaps in time and thus no missed events
- Powerful vector signal generator and analyzer
- 5G signal analysis; and many other

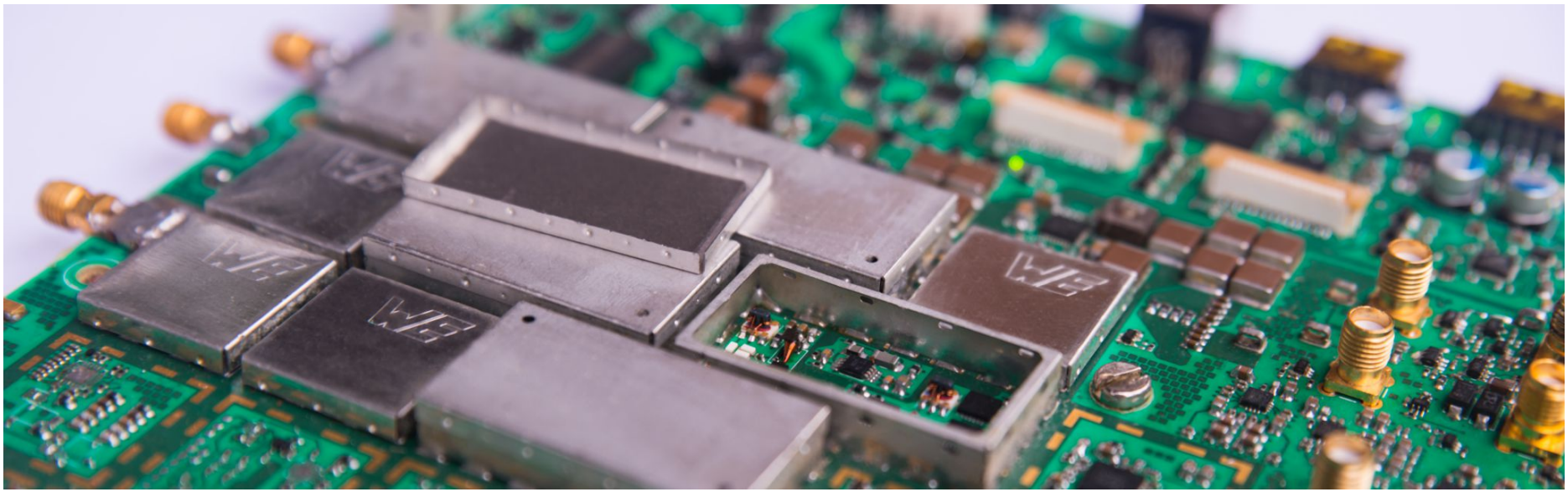
Get in touch with our R&D department via info@kompa.eu to discuss how we can solve your RF problem.



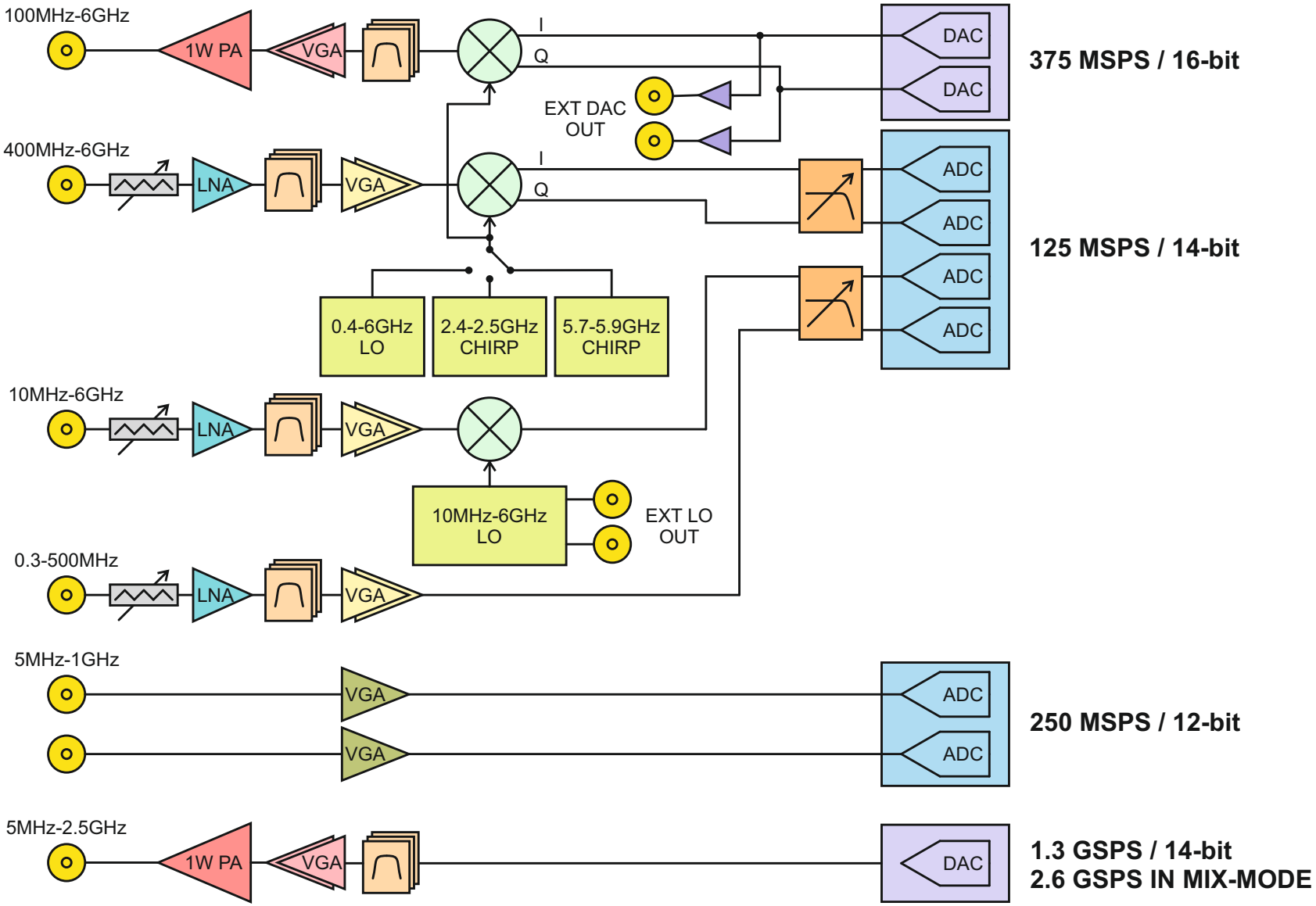
Analog subsystem features

The key features of the analog system:

- **Ultra–wideband** operation (several MHz up to 6GHz with no external components)
- Powerful local oscillators, supporting fast frequency hopping or linear frequency sweeping (chirping)
- Embedded 1W output amplifiers
- Switched filters for operation in common RF bands
- Advanced clock generation and distribution (all components are fully synchronized)



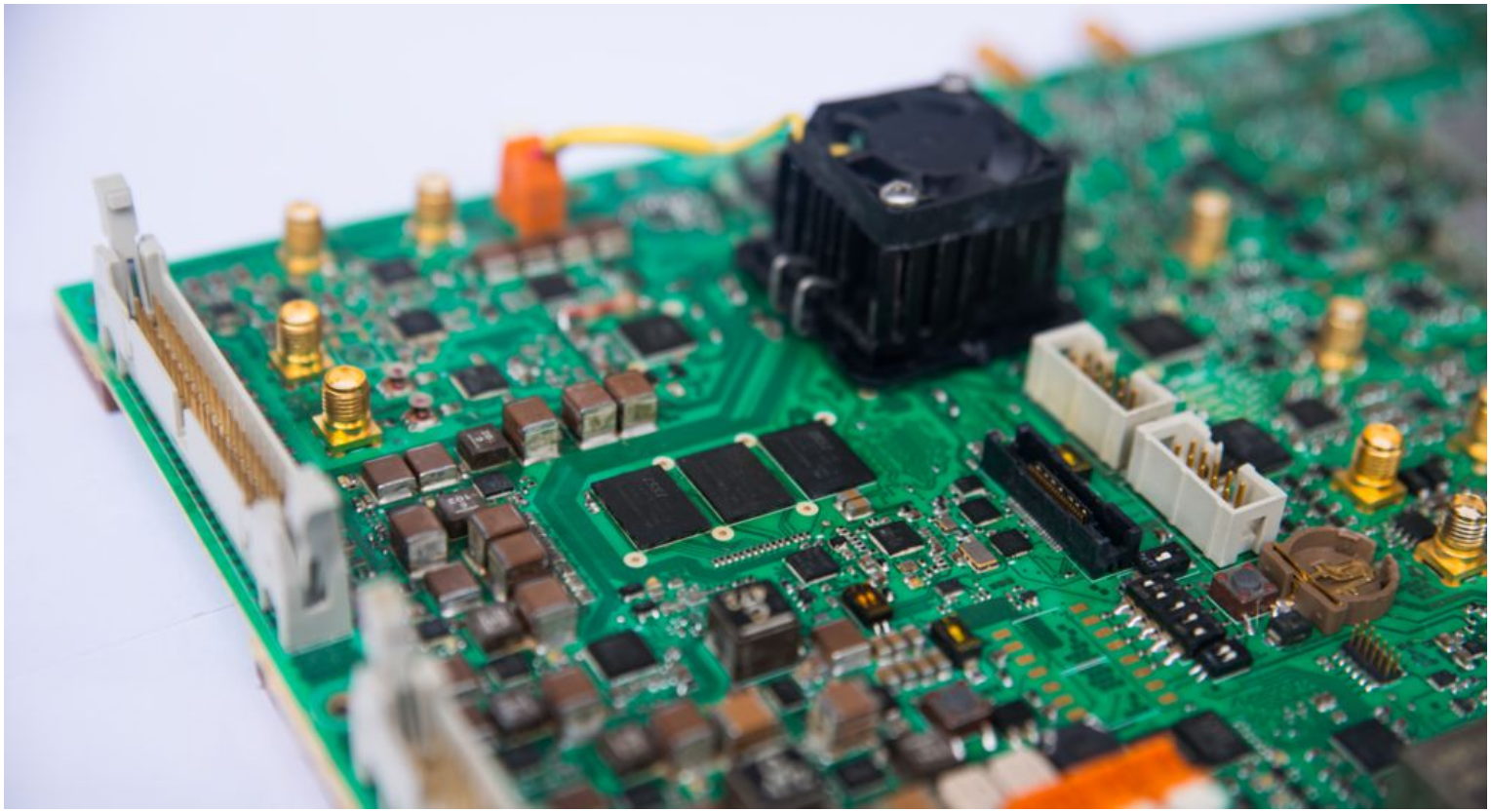
Analog subsystem schematic



Digital subsystem features

The digital subsystem includes:

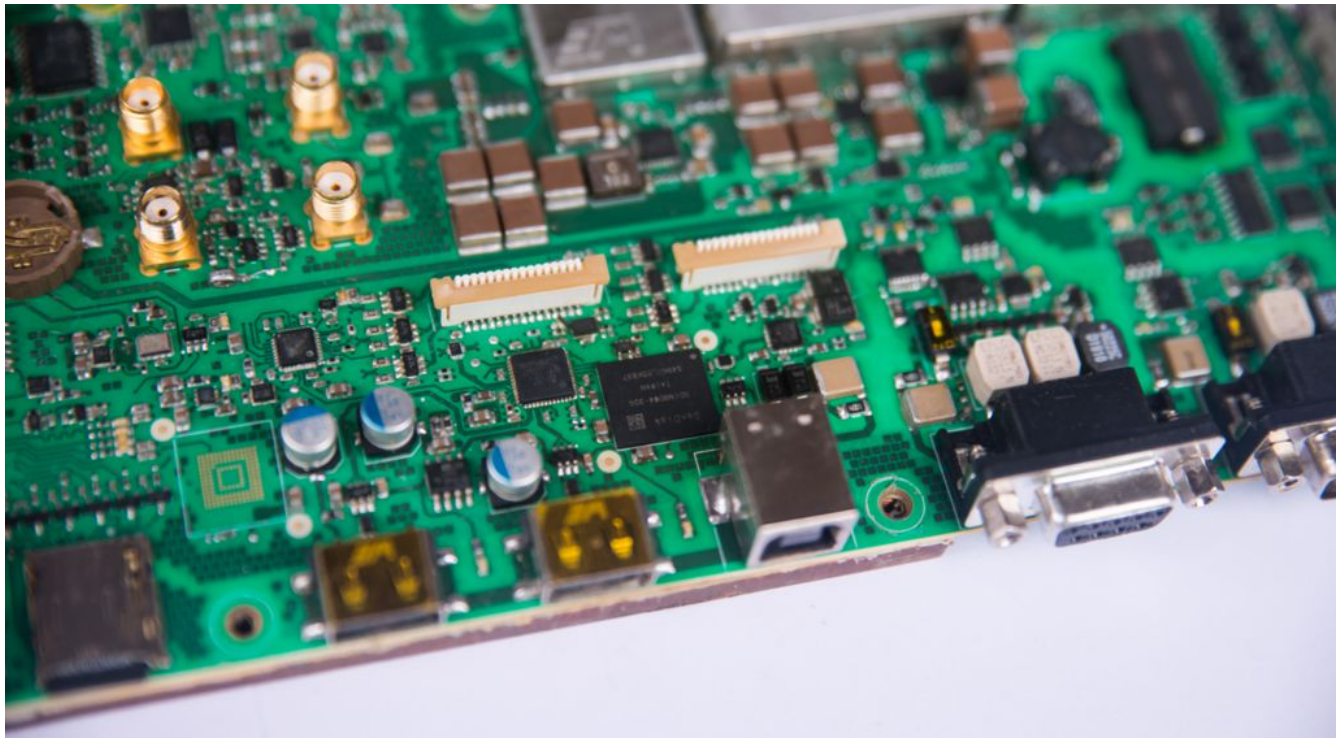
- **FPGA and dual–core ARM** (5CSEMA5F31I7N)
- 2GB DDR3 SDRAM + ECC
- Embedded 64GB SSD for data storage
- Gigabit Ethernet



Digital subsystem features

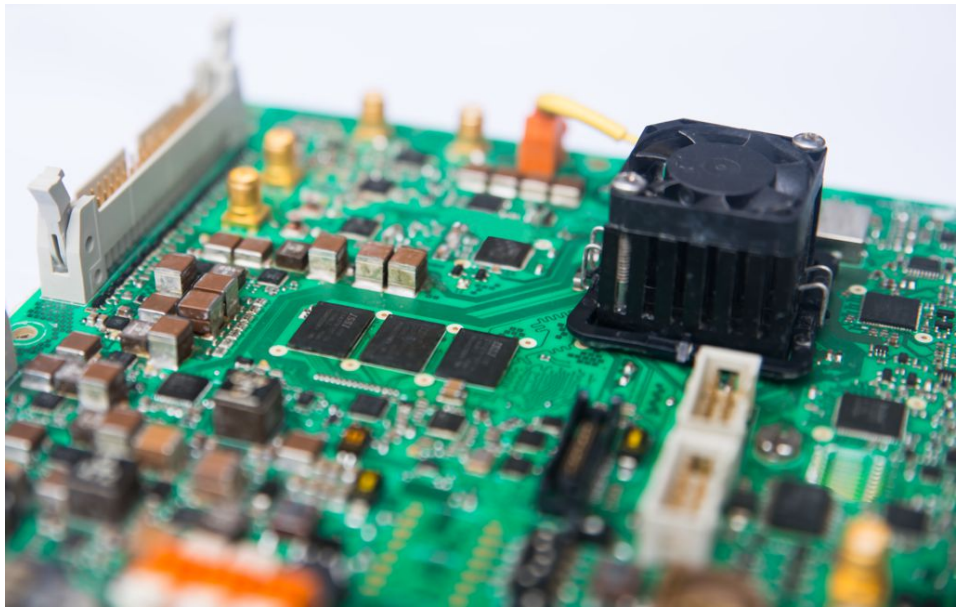
The digital subsystem includes:

- 1024x768px VGA video output
- digital audio in/out
- CAN, RS485, RS232
- MEMS gyroscope/accelerometer
- Stereo camera interface



Other features

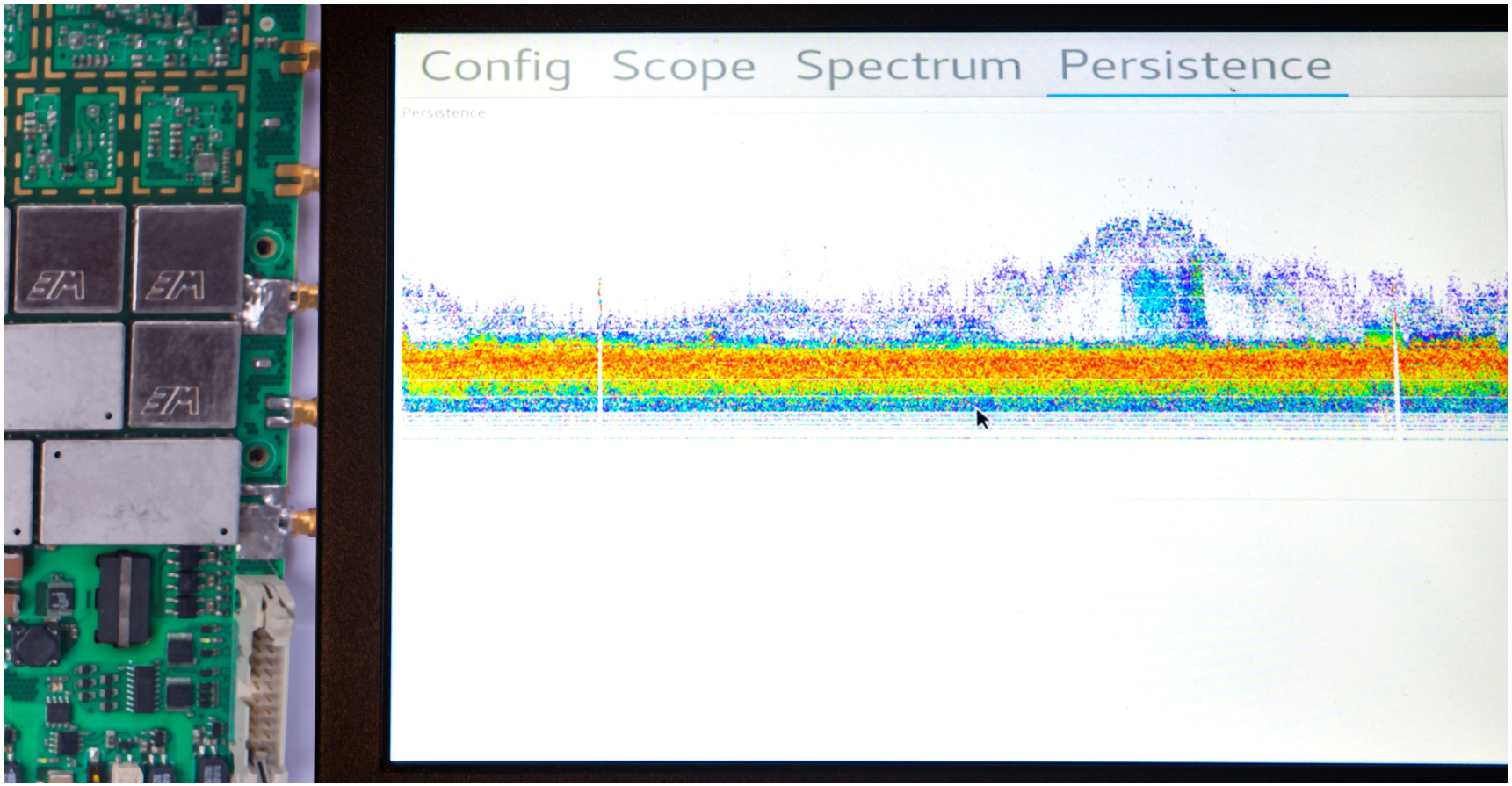
- **Our bespoke Linux OS.** No power–down caused filesystem errors, etc.
- **Graphic user interface** supporting input devices such as USB keyboard, mouse and touchscreen.
- Low-noise, spread-spectrum power supplies.
- Industrial temperature range components only (-40°C to 85°C)
- **Variety of expansion interfaces** allowing control of extension boards, e.g.:
  - higher frequency up/down conversion
  - signal multiplexing, conditioning and measurement
  - phased array antennas



Example application #1 – persistence spectrum analyzer

The analyzer works in the 2.4–2.5GHz band and includes:

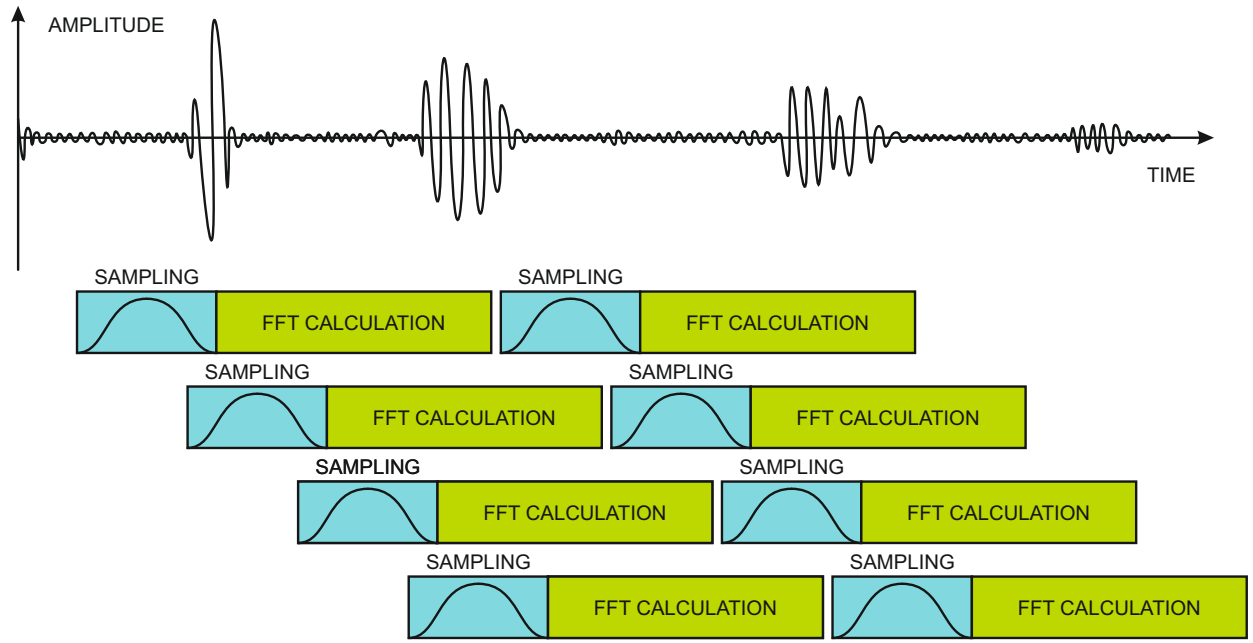
- Analog downconversion and IQ demodulation.
- 125MSPS IQ signal sampling.
- 14 FFTs working in parallel with overlapping sampling windows, i.e. **no processing gaps in time and thus no missed events**.



Example application #1 – persistence spectrum analyzer

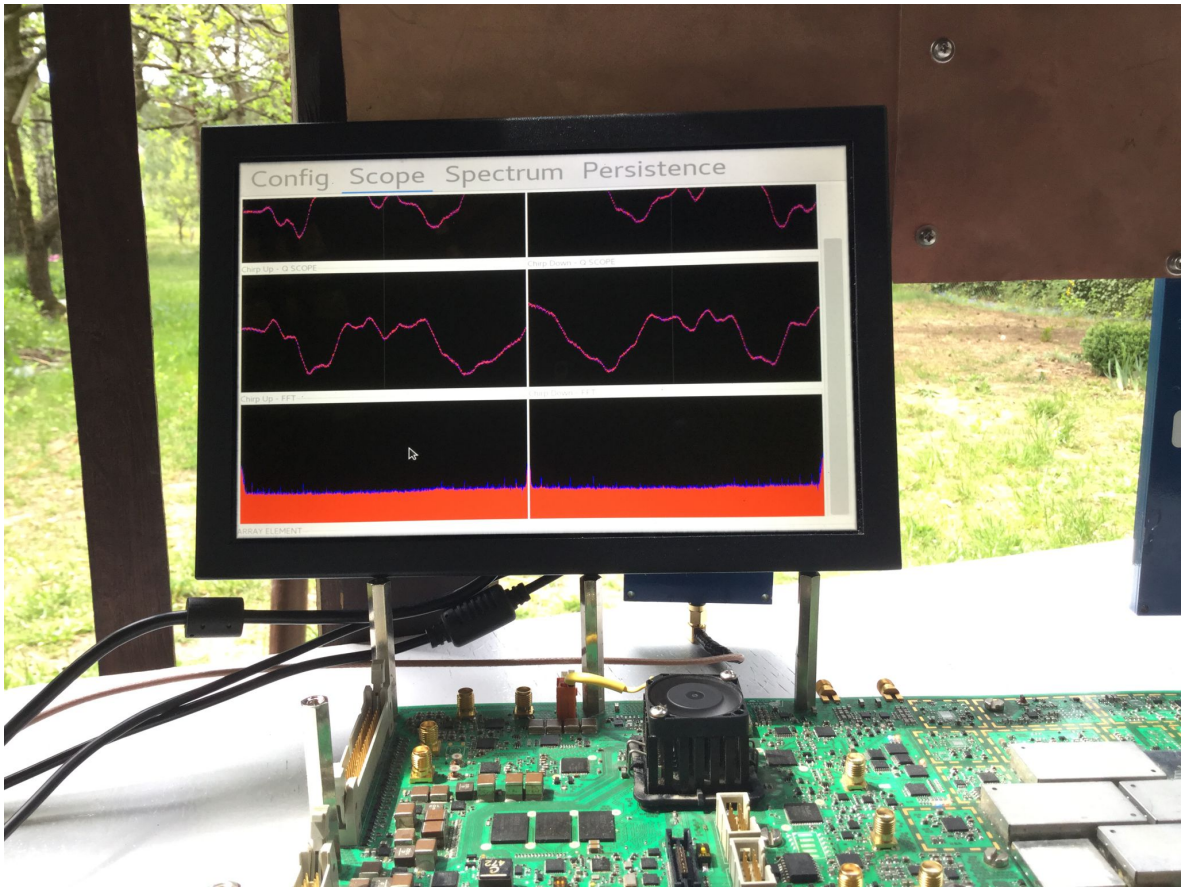
Each of the 14 FFTs utilizes:

- 1024 points frequency resolution
- 100MHz calculation clock
- Pipelined architecture
- Four 27x27 bit multipliers performing operation in every clock cycle
- In place operation (no double memory used)
- 16-bit, pipelined sin/cos DDS



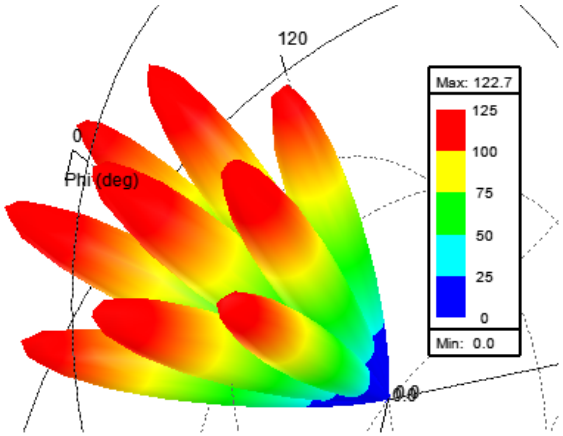
Example application #2 – frequency modulated radar

- Operates in 2.45GHz or 5.8GHz band (S-band or C-band).
- Performs high-precision, 4096 points FFT on each pulse.
- Pulse–synchronized scope–plots and FFT results are displayed.
- Spurious spectrum is measured before each pulse and filtered out from the received signal.



Example application #2 – 5.8GHz phased array antenna

- The antenna utilizes wideband Vivaldi type elements.
- The field is circularily polarized.
- The beam can be electronically steered by using phase shift.



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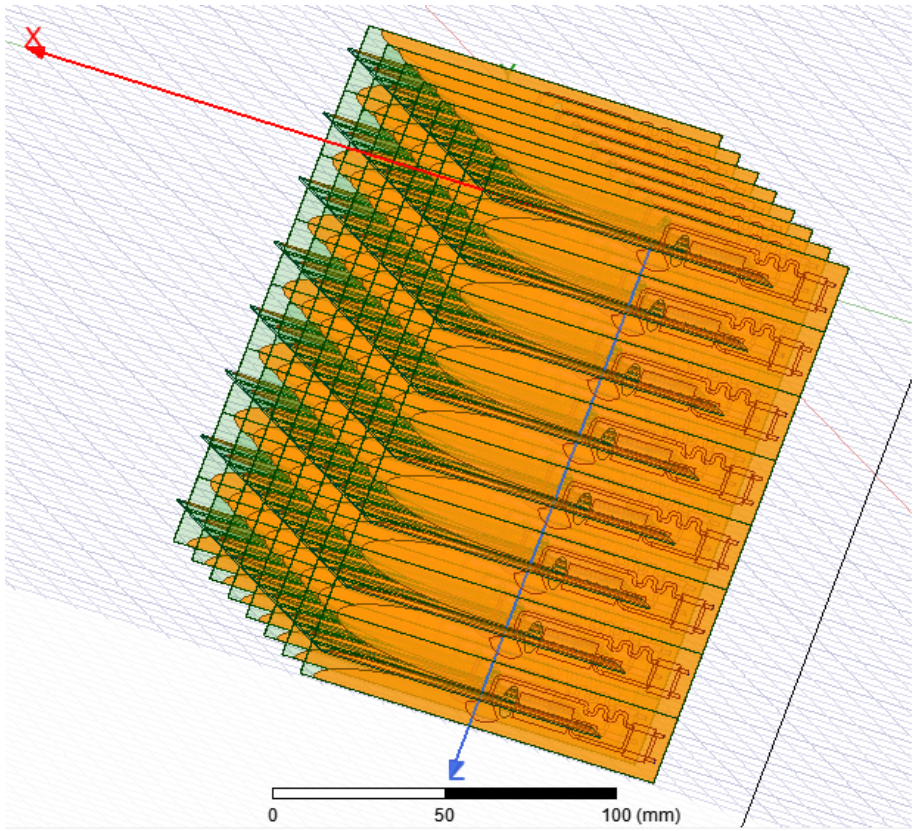
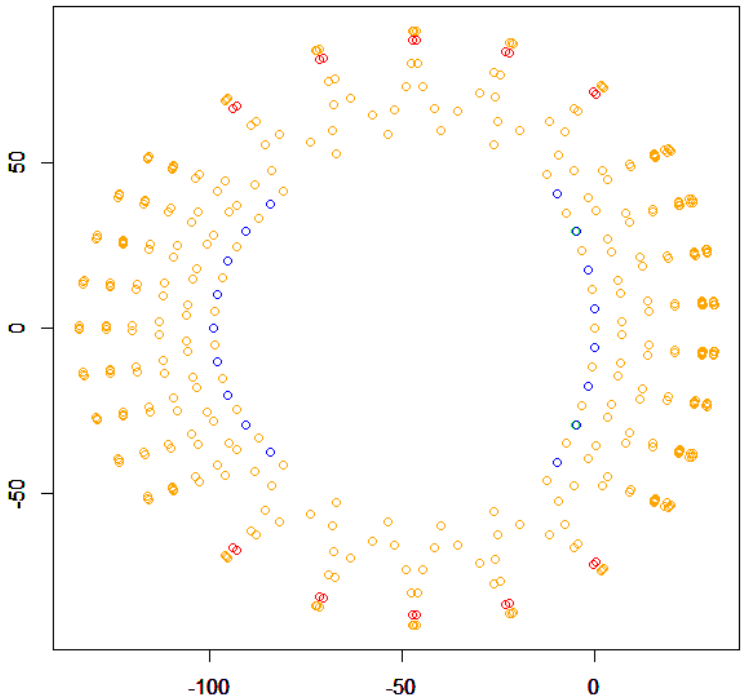
Startup Program



Example application #2 – 5.8GHz microwave lens

- The lens is mathematically described and optimized in the R language.
- The FEM simulations were used to verify performance.
- Iteratively, the mathematical optimization was corrected with the FEM results to achieve best performance.
- We have found that much different designs should be tailored to operate in the TX and RX modes.



Example application #2 – 5.8GHz TX lens

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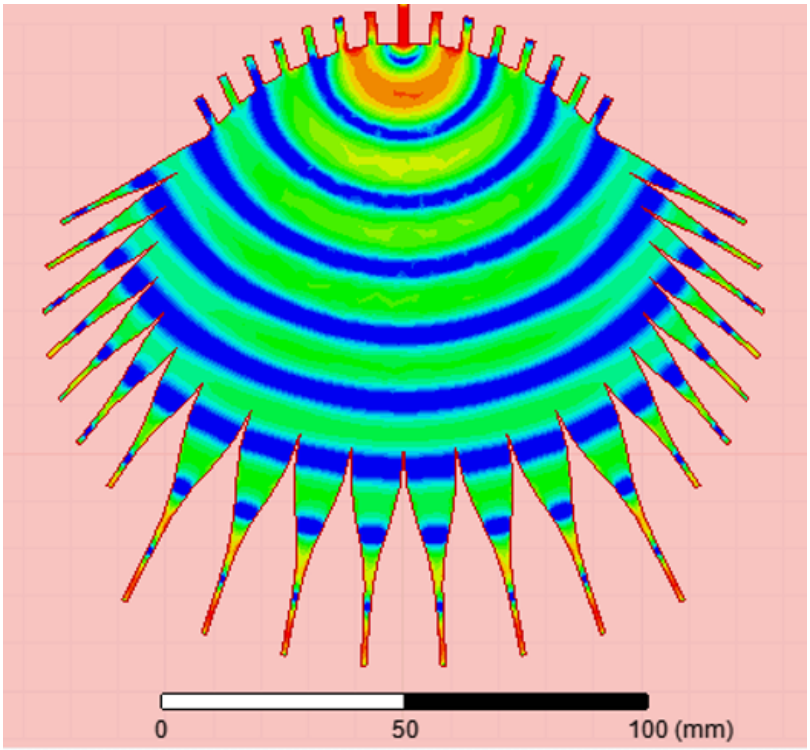
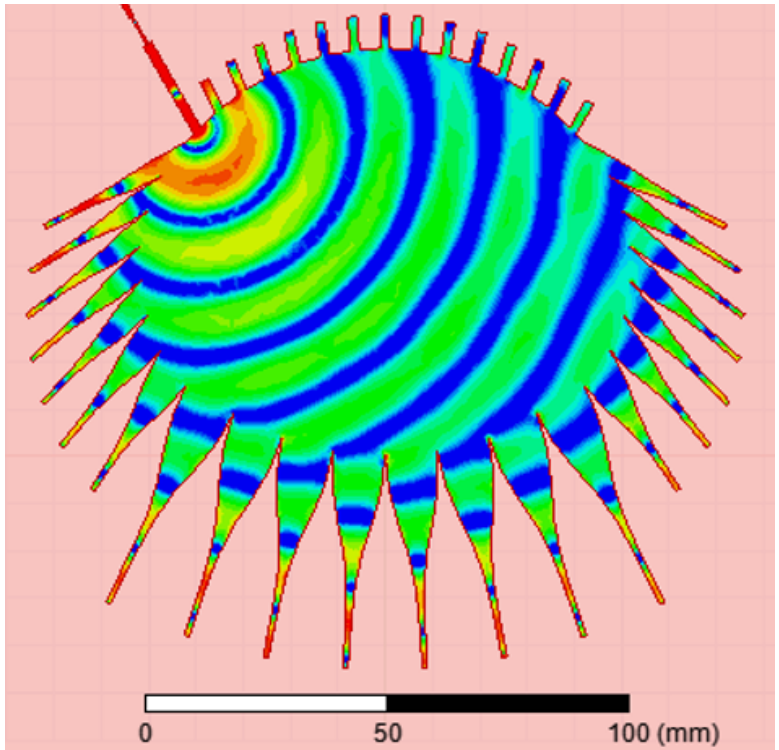
Startup Program





Example application #2 – 5.8GHz RX lens

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Startup Program