

Dual channel RF power meter with Ethernet connectivity

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CERN 2019



RF Power meter

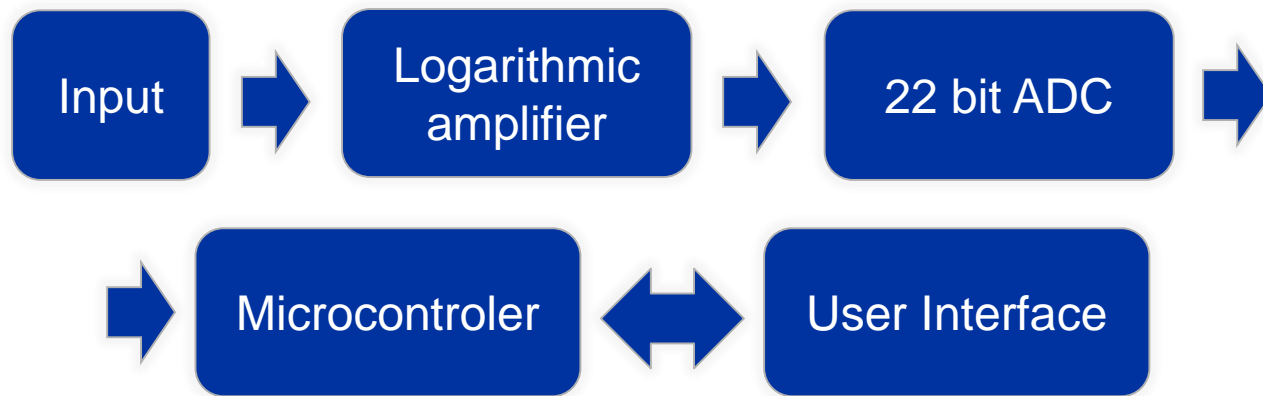
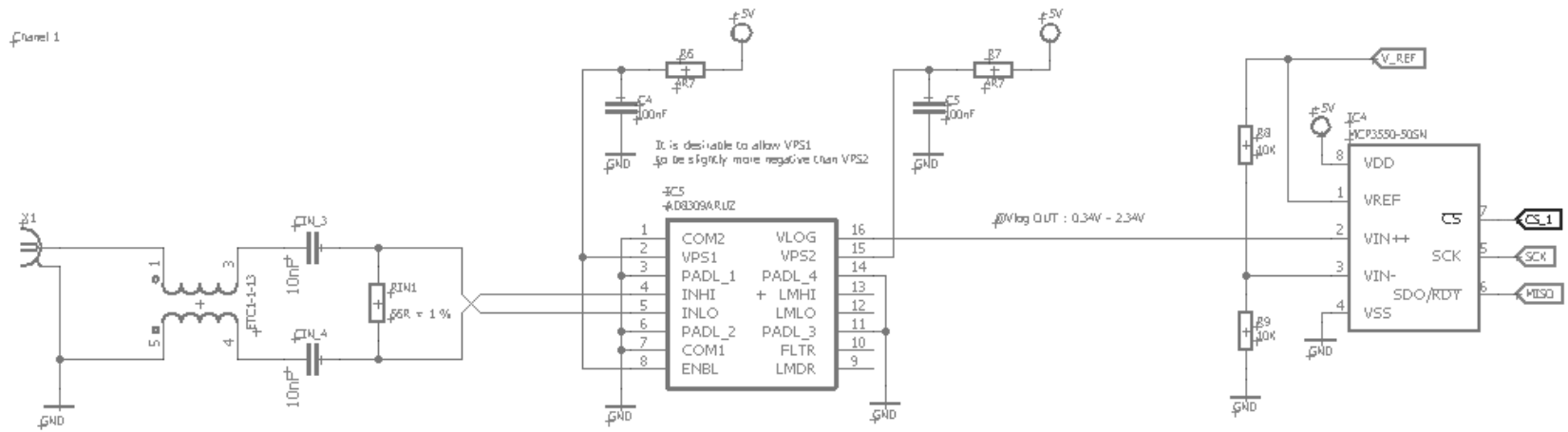
- Instrument for measuring electrical power at radio frequencies
- Contains RF front end, ADC with reference, microcontroller, user interface and Ethernet connection for remote control



Technical specifications

- Two channels (for forward and reflected wave)
- Frequency range: 100MHz to 500MHz
- Input power range: -78dBm to +22 dBm
- Full remote control using Ethernet
- SCPI commands to read, measure and set the instrument
- User interface – 16x2 LCD backlit display

Hardware diagram



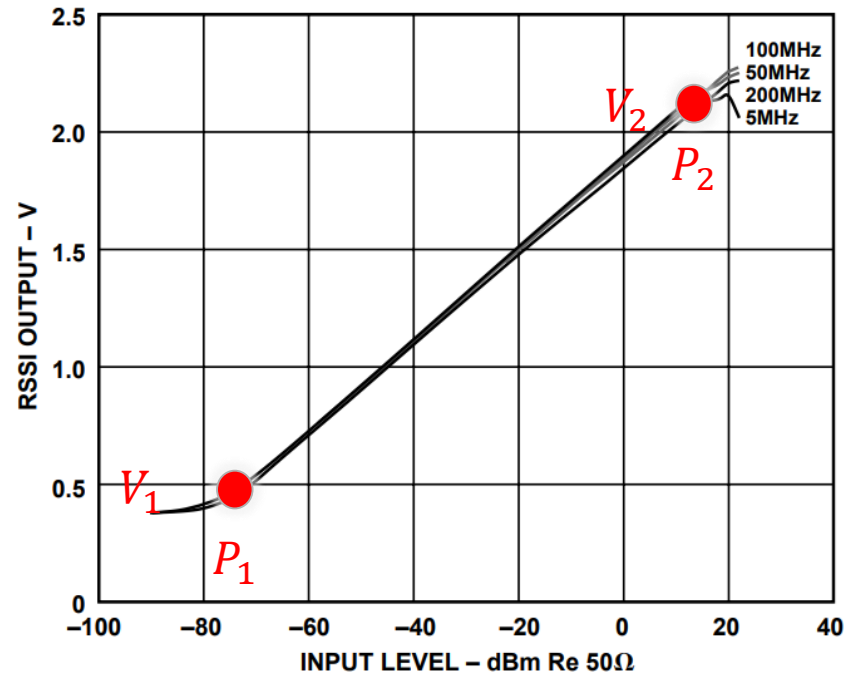
Analog to digital conversion

- ADC outputs raw 22 bit value
- For power conversion we use formula:

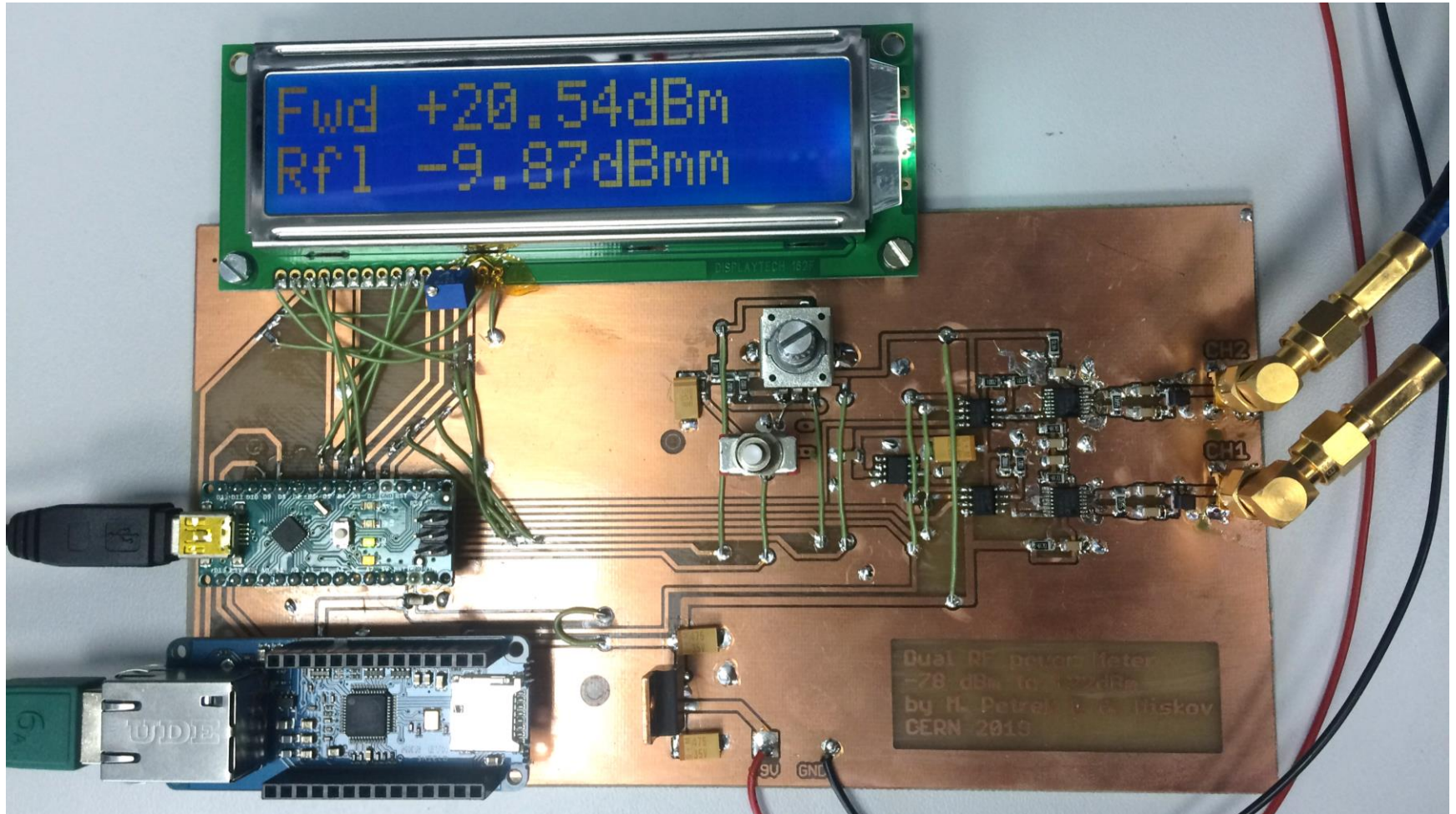
$$P_{in} = \frac{ADC_{value} - offset}{slope}$$

- Where:

- $Slope = \frac{V_2 - V_1}{P_2 - P_1}$
- $Offset = V_1 - P_1 * Slope$

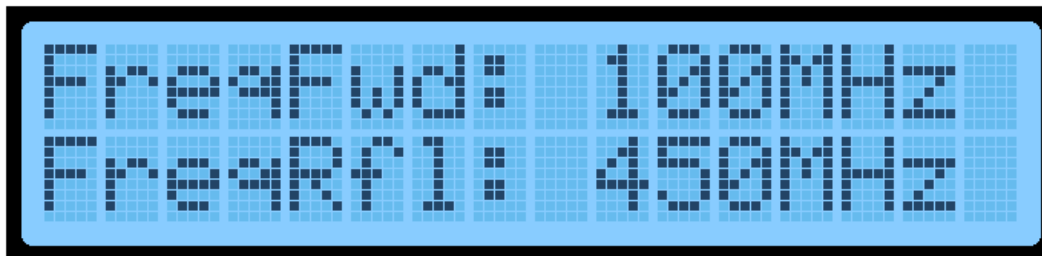


Manufacturing



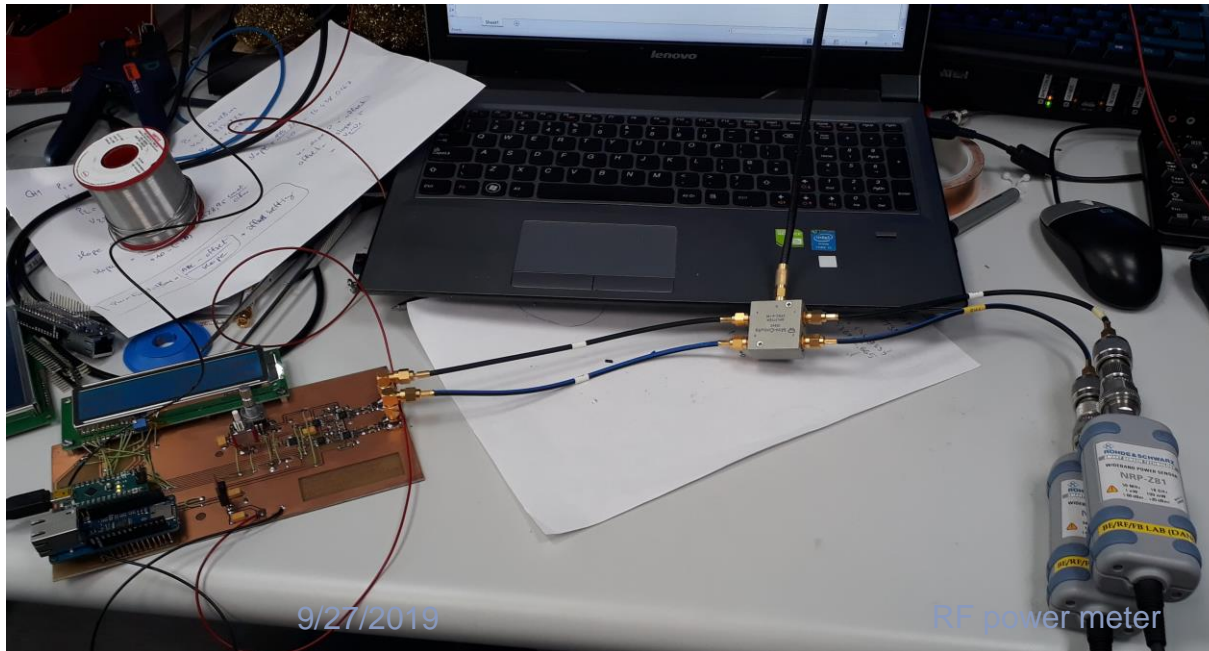
User interface

- We use 16x2 character display which works in 5 modes
- 1. mode: Power measurement in dBm
- 2. mode: Power measurement in Watts
- 3. mode: Standing wave ratio and reflection loss measurement
- 4. mode: configuration of input offset
- 5. mode: configuration of input frequency



Calibration

- The device was calibrated using R&S SMA100B RF generator and R&S NRP2 as a reference RF power meter
- We have calibrated the device in 50MHz steps and stored the values in EEPROM



Conclusion

- In past two weeks we have managed to design, manufacture, test and calibrate functional prototype of RF power meter
- We have learned a lot about RF, design, use of very sophisticated measurement instruments or team work
- The CERN was very inspirational experience and it motivated us to learn more about electronics

Thank you for your attention

