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BULLKID-DM Readout Electronics

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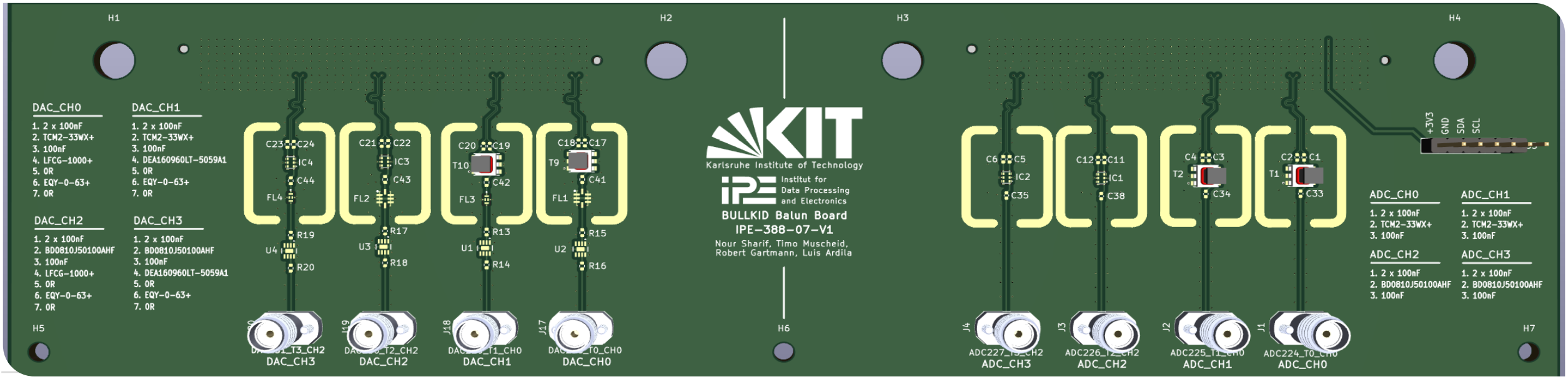
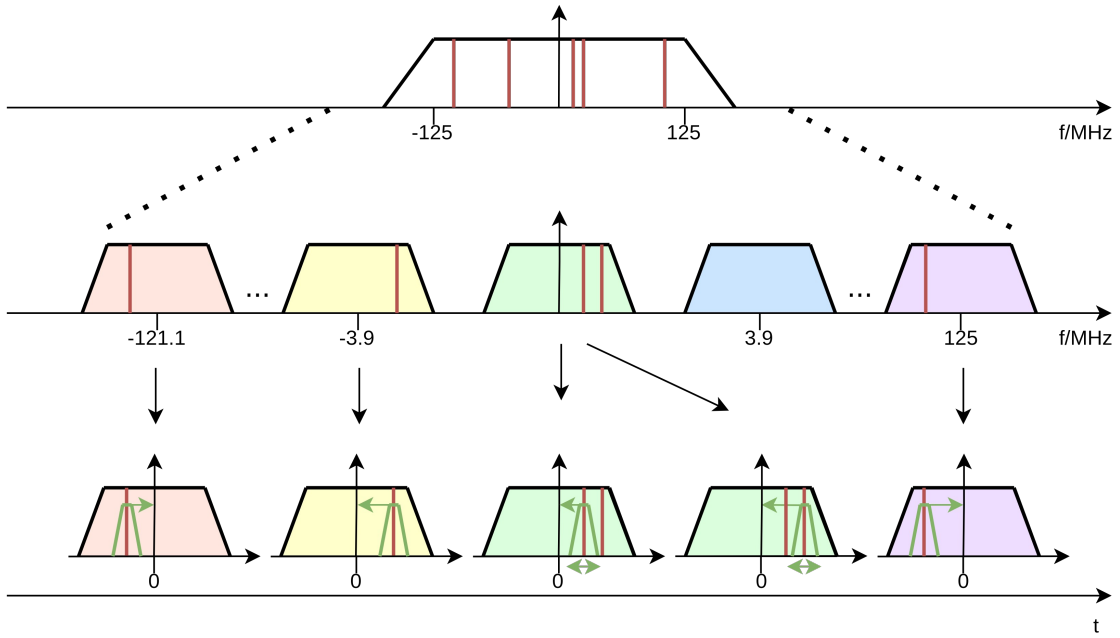


Processing chain improvements



- Channelization Version 2 successfully implemented
- Supports multiple tones in one bin
- 128 resonators (2 x 64) per wafer can be downconverted
- Upgrade to 3x64 for full-scale system easily possible

Next step: Measure crosstalk of two tones in one bin

VNA feature

- Output power of VNA adjustable in software

- Advantages:
  - No more need for external attenuators
  - Self-contained system
  - Multiple sweeps with different power to optimize readout tones?

Next step: Work on automated resonator search algorithm

Multi-line readout

Configuration command:

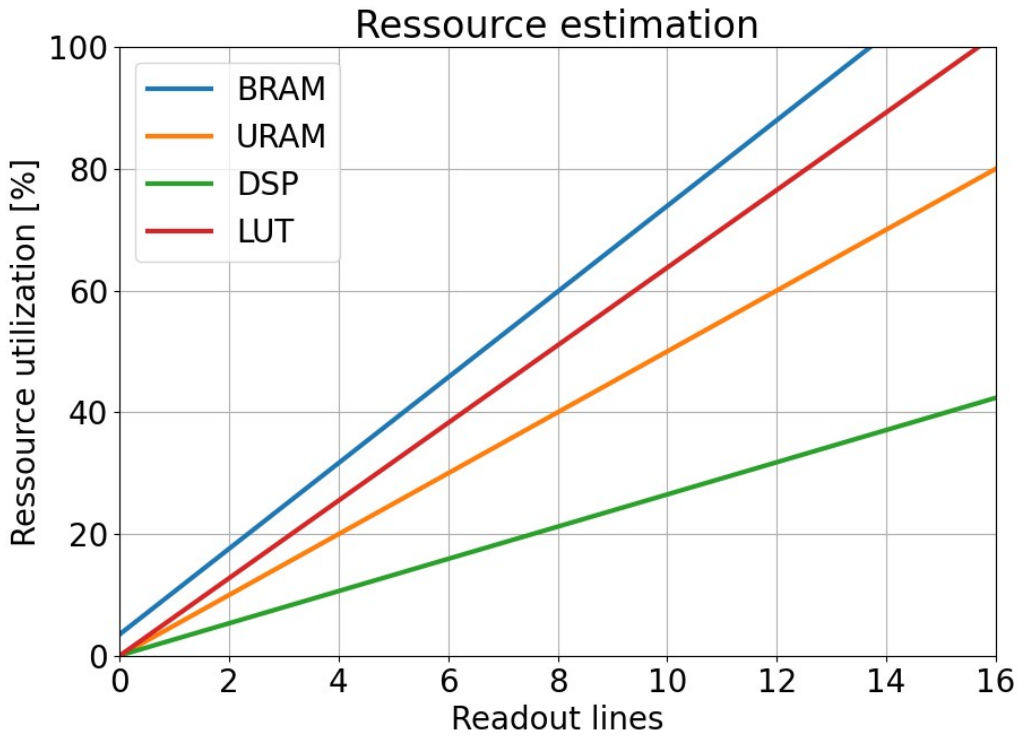
```
wafers[0].setup_mux(resonators_0.csv)
```

- Reads carrier tone information
- Generates frequency comb
- Stores required metadata
- Performs downconversion

- Capability for multi-line readout implemented on all software layers
- Simplification of calibration routine -> One command to set up readout
- New data-class for resonators to store meta-data

Next step: Test multi-line readout on demonstrator stack

Full-scale firmware ressource estimation

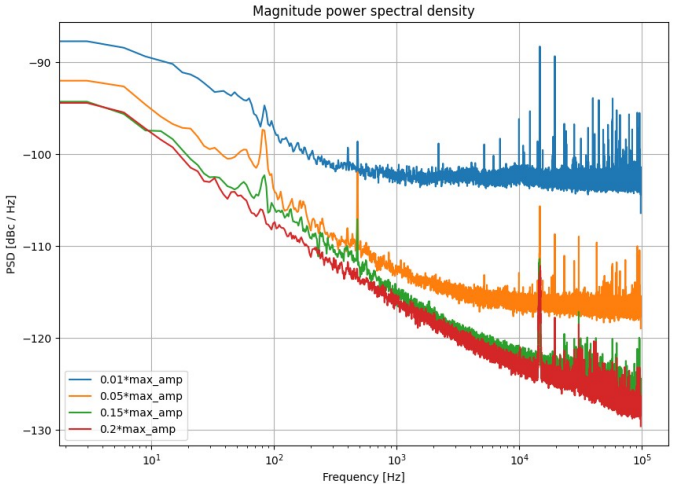


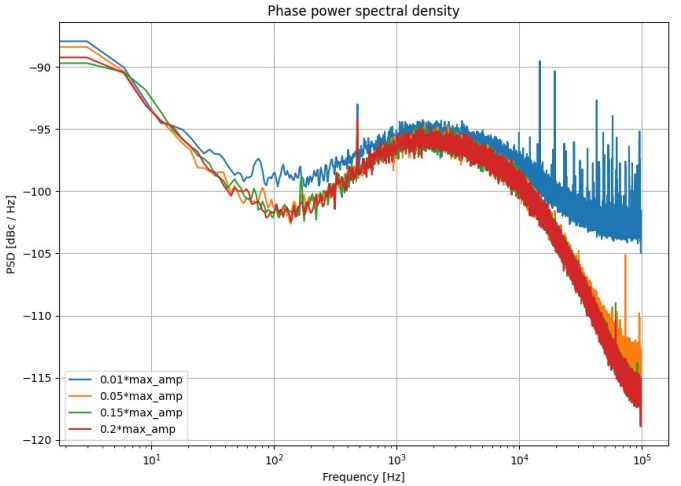
- DSP utilization adequate
  - Headroom for more complex filters
- Memory utilization too high
  - Move modules to URAM
  - Reduce buffer size
- LUT utilization too high
  - Goal: < 80% to meet timing reqs
  - Approach:
    - Increase clock rate
    - Add pipelining
    - Optimize firmware modules

Noise evaluation

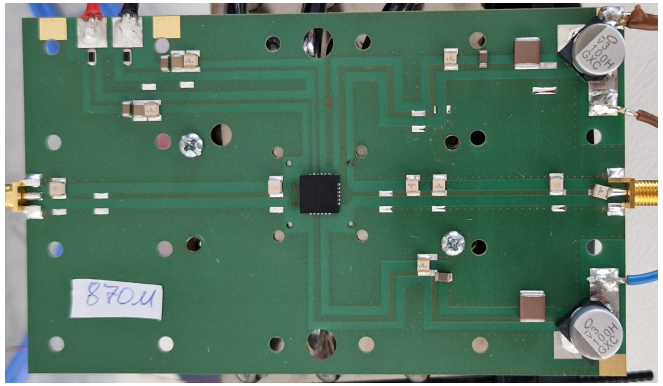
- Noise measurement performed with a single tone and varying amplitude
- In both cases (phase, magnitude) noise decreases with increasing power
- First measurements show, that number of resonators has no effect

Next step: Further evaluation needed





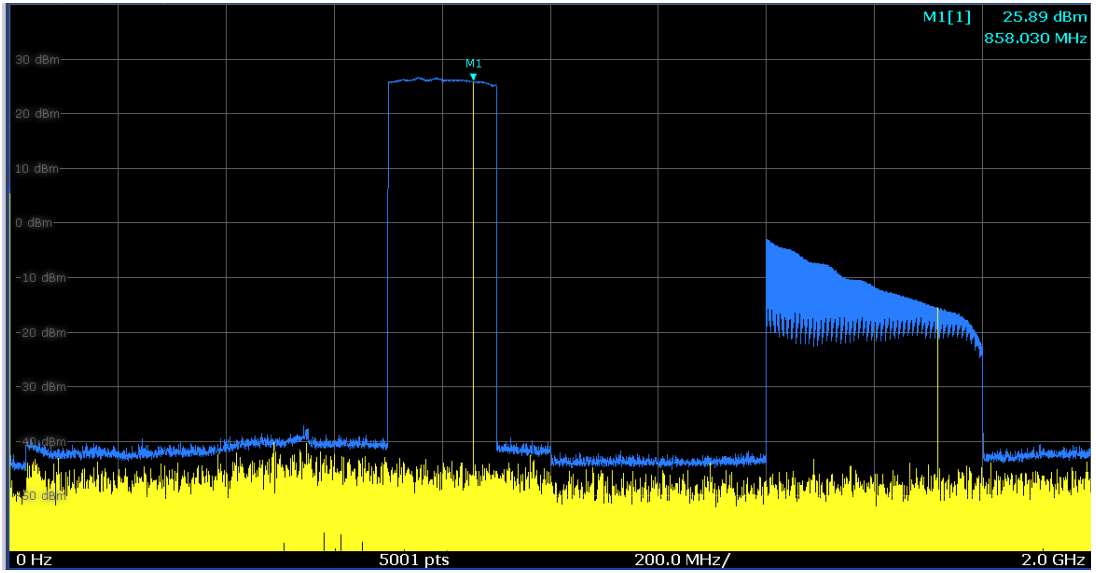
Amplifier evaluation



Assembled Eval-Board for MW71C915NT1 amplifier

~40 dB amplification

Frequency sweep:



- Harmonics above 1GHz
- Can be attenuated with Lowpass-Filter

Next step: Attach Amp to BULLKID-DAQ to evaluate intermodulation products

Other news

- Two more frontend boards assembled
  - Backup-Board for Rome?
  - Pisa group interested?
  - Setup at LNGS?
- Talk on DAQ at LTD accepted
- Implementation of advanced trigger types ongoing
- Measurement to test new features on demonstrator planned for next week