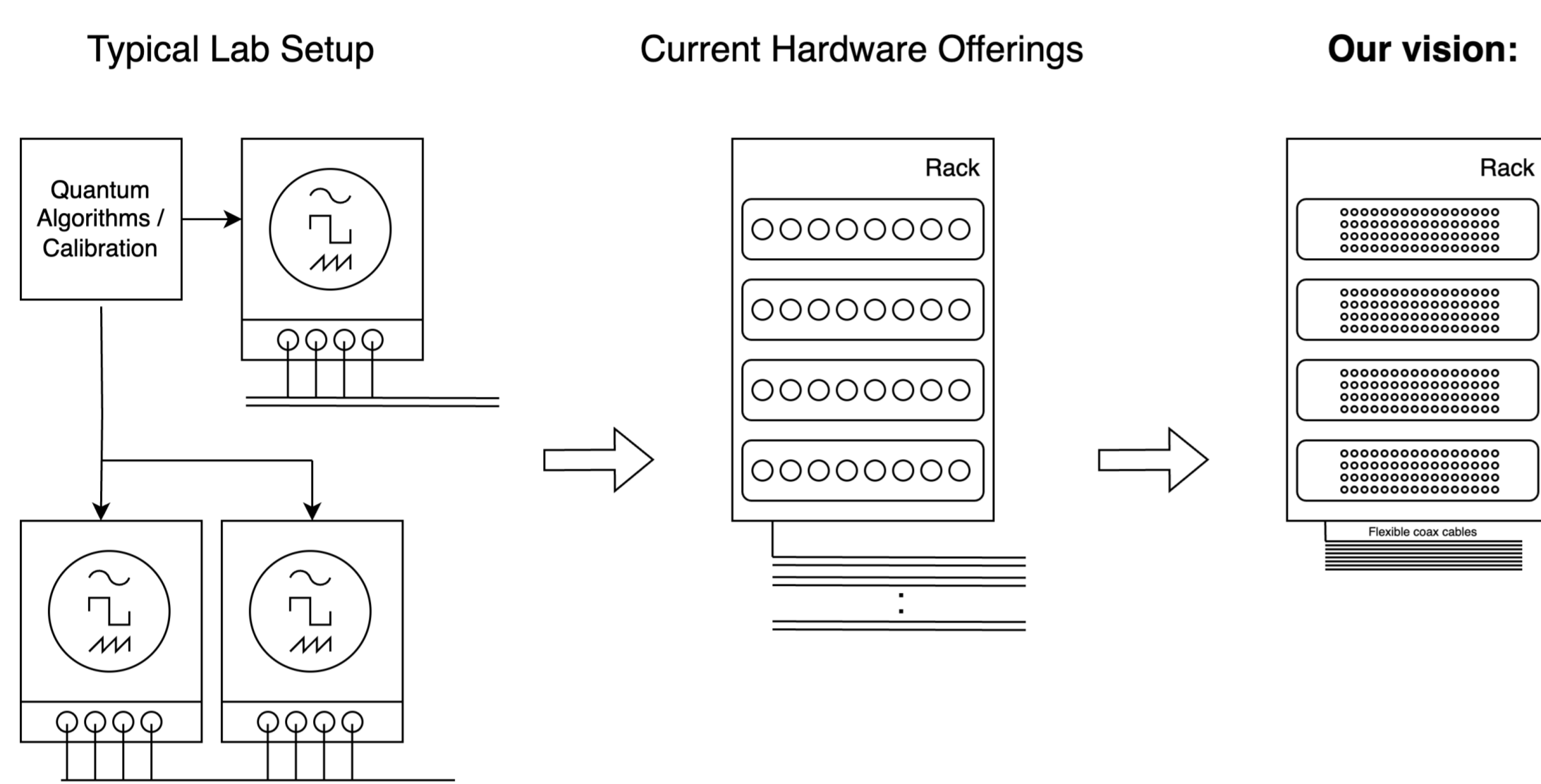


Enabling technologies

Control systems for cryogenic and trapped atoms QC

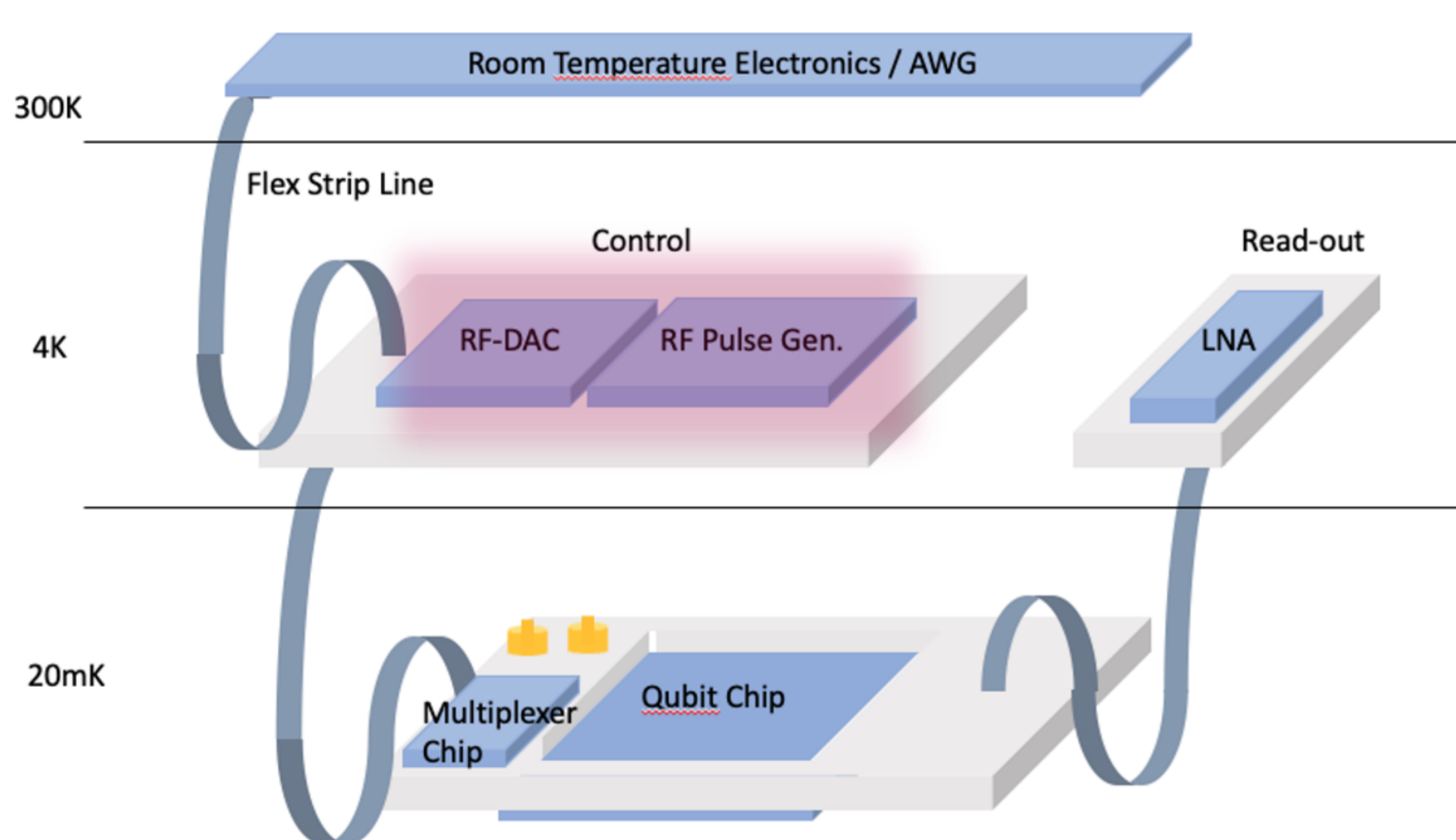
1 Cryogenic QC

Enabling scalable quantum computers with super-conducting qubits



Room temperature control electronics:

- Typical laboratory measurements work with multiple arbitrary waveform generators for a few qubits
- Currently available hardware extends the control space to approx. 10 qubits per device
- Our aim is to integrate and miniaturize the control electronics on chips to enable qubit numbers > 100 in one device



Cryogenic control electronics:

- In the long term, qubit numbers of far more than 1000 must be targeted
- The aim is to fully integrate the AWGs on ASICs and place them in the cryostat, as close as possible to the QPU, for low heat input and low thermal noise
- Superconducting flexible cables developed by us enable the low-loss transmission of a large number of channels

2 Trapped Atoms QC

Enabling scalable quantum computers with qubits in trapped atoms based on multi-channel FPGA technologies

We offer multi-channel signal generation devices, software and electronics for mid-term trapped atoms quantum computer demonstrators with up to several hundreds of qubits.

Signal processing platform – digital and analog components

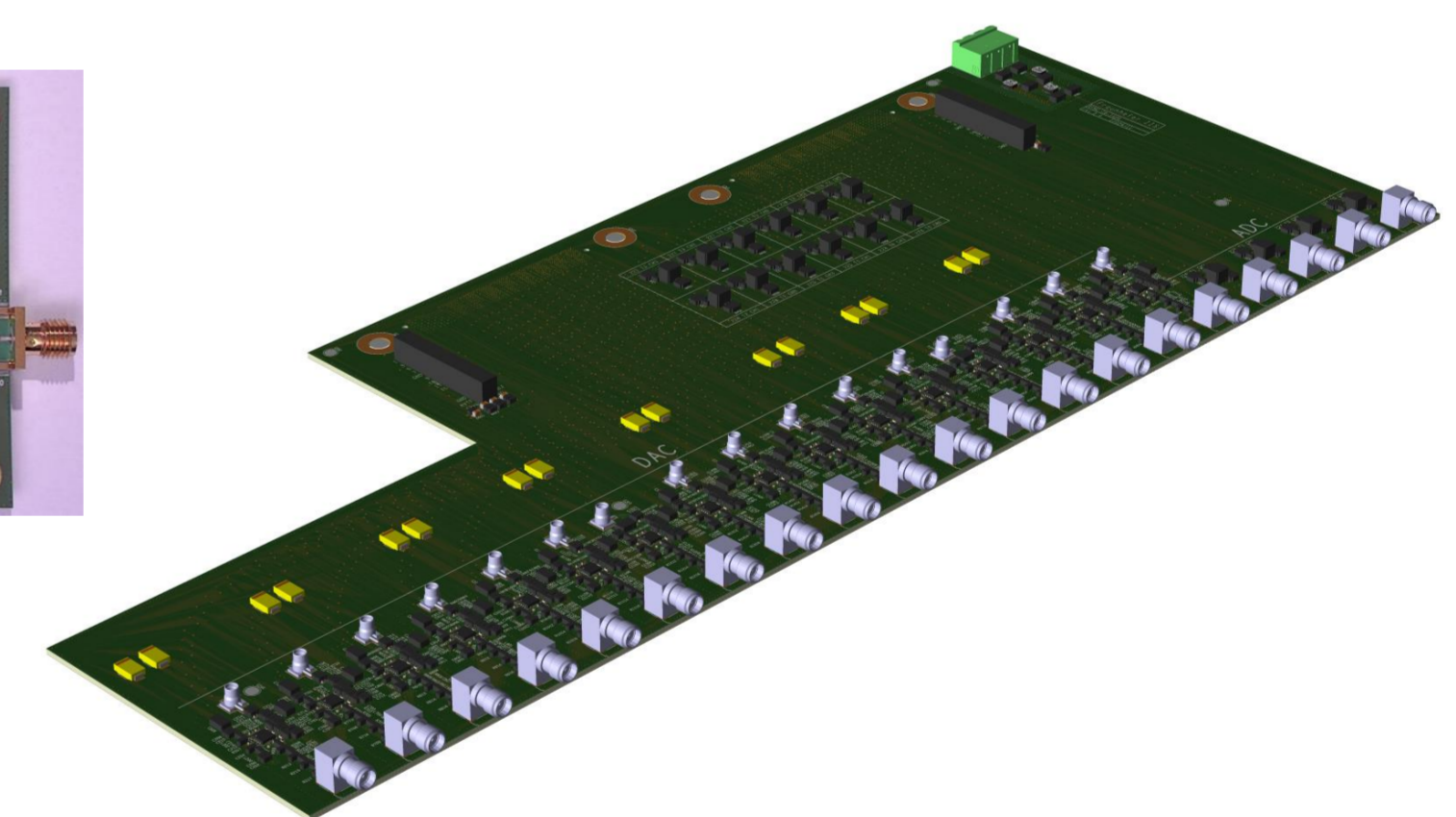
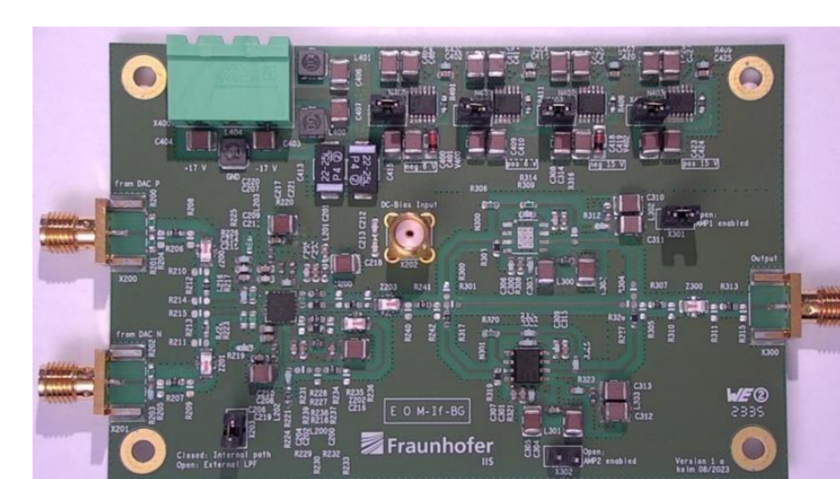
Digital - latest Xilinx RF-SoC FPGA devices:

- Integrated 16x DAC & 16x ADC
- Arbitrary signal generation with up to 5 GS/s
- Integrated ARM processing system with Linux OS
- System fully remote controllable with Python API



Analog – modularized high-performance electronics:

- Design and manufacturing of interface electronics & PCBs
- Multi-channel passive coupling for optical modulators (AOM)
- Multi-channel active coupling for photonic ICs (PIC)
- Reference oscillator and trigger input control



Arbitrary signal generation for QC experiments:

- Individually time-controllable AWG units with complex-valued memory, interpolation and complex amplitude/phase-scaling for gate pulse generation
- Individually time-controllable multi-tone frequency generators with amplitude and frequency sweep capabilities for multi-channel optical tweezers for atom sorting or shuttling

