

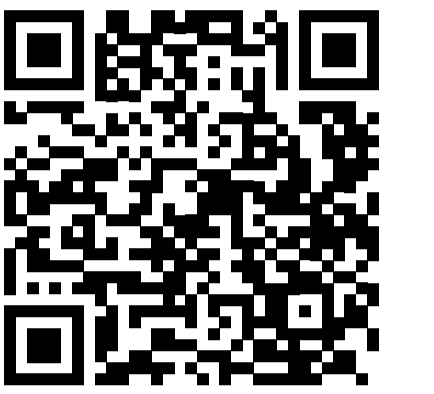
Quantum Computer in the Solid State

Rosenberger

Subproject: **T4-1 Cryogenic Electromagnetic Environment**

Helmut Reiter

Rosenberger Hochfrequenztechnik GmbH & Co. KG, 83413 Fridolfing / Germany



State-of-the-Art of Technology

In cryogenic applications, the wiring of manipulation and readout channels are usually done in separate wiring.

At Rosenberger, such connectors and cable assemblies have been processed as single connectors often SMA and SMP series are used which are proven solutions in high-frequency applications.

Driven by previous customer inquiries, Rosenberger has already processed NbTi and stainless steel cables with promising results. These were single cables soldered in non-grouped connectors.

For processing multiport connectors, special equipment is required. The uniform and controlled heating of the parts to be soldered is a technological challenge. Due to the exotic and expensive material prices, such as NbTi, industry adoption is minimal.

Scientific and Technical Goals

Rosenberger is researching the feasibility of miniaturized, multiport connectors as a connectivity solution suitable for flat ribbon conductors based on polyimide and additive cables. These connectors are suitable for applications in high vacuum and at extremely low temperatures.



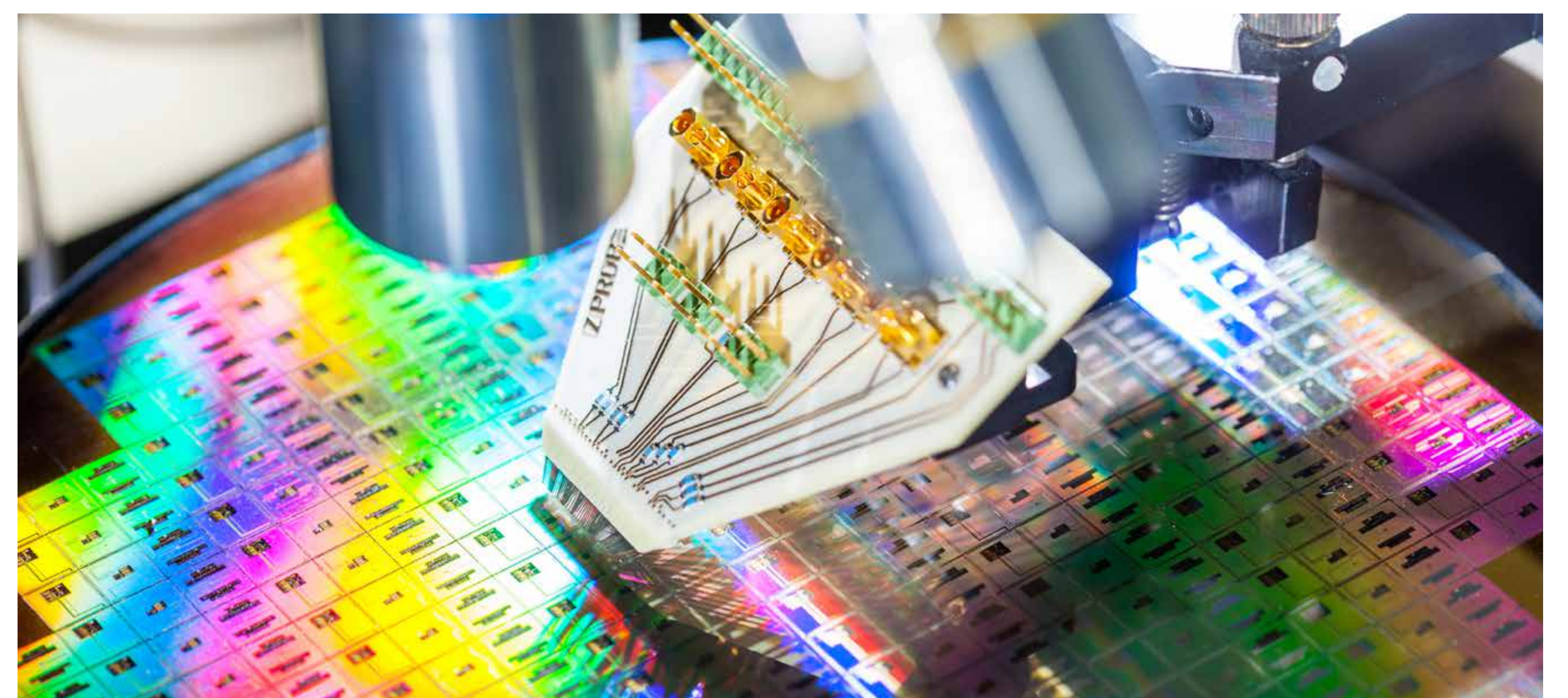
SMP cable assemblies from Rosenberger for cryogenic applications

- Connectors with approx. 80 channels suitable for the flat cable solution introduced by the partners Supracon and LPKF.
- Connectors suitable for Rosenberger manufactured coaxial flat ribbon cables.
- Development of suitable flange feedthroughs.
- Research and development of practicable flat ribbon coaxial cables produced by additive technology.
- Pitch of the channels on the cable < 1 mm with minimal expansion in the attachment area.
- Materials with low thermal conductivity
- Capability in the millikelvin range
- Excellent RF properties up to 12 GHz

Novelty and Attractiveness of the Solution Approach

The cabling as researched and developed in this subproject has several features that exceed the properties of previous solutions for use in quantum computers:

- Better cooling of the inner conductors by using other materials instead of PTFE.
- Significantly higher packing density with the introduction of ribboned cables.
- Previous compensation loops are no longer needed as the ribboned cables come with a high bending flexibility.



Rosenberger probe with ultra-fine pitch contactors for direct wafer level probing

SPONSORED BY THE