Quantum Technology—Impact on Computing and Communication
MÜNCHNER KREIS CONFERENCE: 07/05/2018

IBM Watson IoT Center,
Mies-van-der-Rohe-Str. 6, 80807 Munich

Summary of the conference speeches:

1. **Dr. Reger : Basics of Quantum Computing**

Dr. Reger gave a brief introduction on quantum technology. Quantum computing uses quantum systems that obey the laws of quantum physics. Quantum physics describes nature at the smallest scale of energy levels of atoms and subatomic particles. Quantum computing can provide combinatorial optimization in fields such as molecular design, artificial intelligence, and financial portfolios.

2. **Prof. Krcmar: Quantum Technology—Impact on Computing and Communication**

Prof. Krcmar gave an overview of the importance and the history of quantum computing. Application areas for quantum computers include communication, super-computing, security, optimization, and artificial intelligence. According to Gartner (2017), quantum computing is an emerging technology trend that will become useful in business applications in the next ten years.

3. **Prof. J. Dowling: Schrödinger's Web—Race to Build the Quantum Internet**

Prof. Dowling argued that we are currently in the midst of a second quantum revolution. The second quantum revolution will take the insights of the first quantum revolution, which was led in the early twentieth century by Einstein, Heisenberg, and Planck, and use them to develop new technologies. Developments in quantum technologies are expected in the fields of quantum computing, quantum cryptography, quantum internet, quantum sensing & imaging as well as in the field of quantum mechanics.

4. **Dr. Peng: Wide Area Quantum Communication**

Prof. Peng delivered insights on how quantum technology is revolutionizing communication standards. The first quantum communication satellite, which has been nicknamed Micius, was launched in 2016 and allowed scientists in Vienna and Beijing to host the first quantum-encrypted video conference. In the future, the global quantum network will grow; quantum key distribution will be the new code keeper and the code will be unconditionally safe. China is leading in this area.

5. **Dr. Ayral: Teaching how to use quantum technology**

Dr. Ayral introduced the Atos Quantum Learning Machine, a platform for researching and experimenting with quantum software. Dr. Ayral then gave a brief introduction on advanced optimization of circuits and qubit modeling for noisy simulation.

6. Dr. Elbe: Intel's approach to Quantum Computing
Dr. Elbe introduced the Intel QuTech Research Collaboration, which is primarily working on the development of quantum technology, such as secure quantum network connections and quantum computers.

7. Prof. Zbinden: Long Distance fibre based QKD Self testing QRNG
Prof. Zbinden introduced ID Quantique, a company that develops technologies and products based on quantum physics in the fields of quantum-safe security and quantum sensing. The Quantis QRNG is based on quantum physics, instant entropy, and reliability & trust.

8. Wittmann: IBM Q: An Introduction
Mr. Wittmann presented talked about IBM's quantum computing history and the latest achievements of the IBM Q Network, an initiative for building universal quantum computers for business and science.

9. Dr. Ziegler: Quantum business use cases
Dr. Ziegler presented quantum business use cases and gave an example of energy network balancing using quantum physics.

10. Dr. Houdeau: Post-Quantum Cryptography and Business Use Cases
Dr. Houdeau presented Intel's demonstrator of post-quantum cryptography on a smart card chip as well as potential threats posed by quantum computers for cryptography.

11. Dr. Loebenberger: Post Quantum Cryptography
Dr. Loebenberger, representing genua mbH, an IT company for high security firewalls, warned that as new attack vectors are rising through quantum computers, new crypto algorithms are needed.

12. Prof. Seifert: Factorization in Quantum Poly Time with Fewer Qubits
According to Prof. Seifert, the expensive quantum resource could be optimized by investing more resources in classical post measurement computing. An optimized combination of increased classical computing and clever use of Quantum Algorithms might prove very helpful.