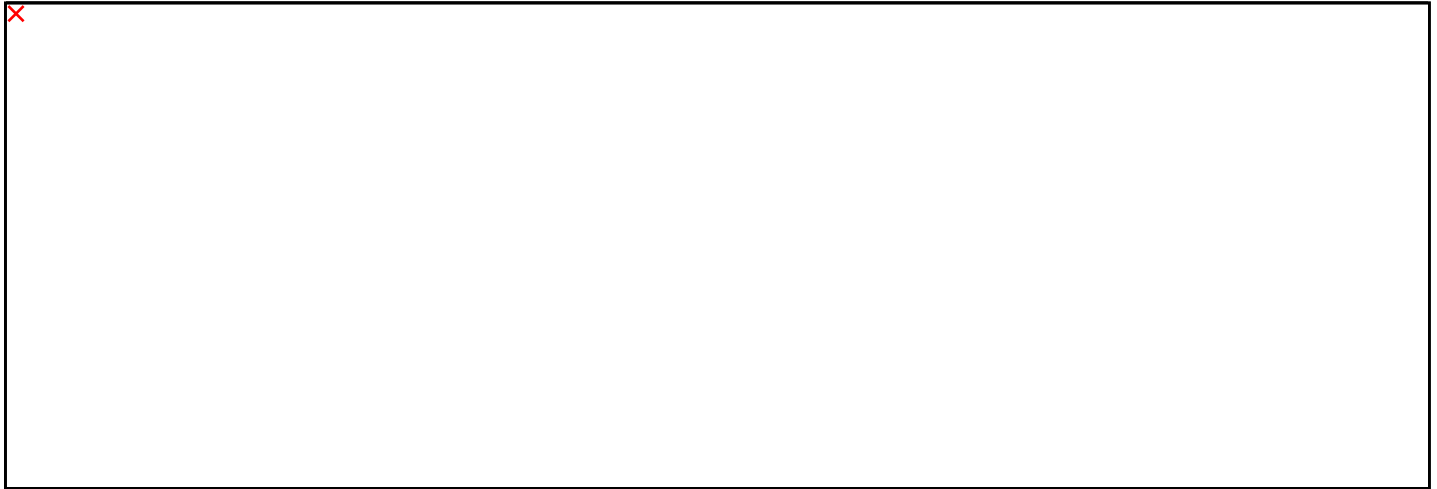


Applications of Quantum Mechanics or collectively known as Quantum Technologies



Quantum Real-Life Technology Applications are already happening. Quantum weirdness is already in your lives: if you are using your GPS, you are relying on precision atomic clocks. Secure communications powered by quantum cryptography are now available on commercial optical networks. And true Quantum Random Number Generator have gone commercial on chip, which makes them an essential tool for securing devices and their communications.

Atomic clocks exploit transition between quantum energy levels of atoms, and these levels will be strongly shaped by quantum mechanical rules.
(Source: <https://qt.eu/understand/underlying-principles/atomic-clocks/>)

Transitions between the quantum mechanical levels are used to measure time extremely accurately and without a drift. This in turn allows for very accurate location measurements based on satellite signals, that is GPS. Similar principles can be applied to securing financial transactions where a time and date are needed to be stamped. Unaccounted delays can then be investigated for possible fraud infringement.

Atomic clocks are already tested to map the earth gravitational field non-uniformities. This has application in monitoring changes in the landscape, or more profitably discovering new oil fields. Ultrasensitive quantum sensing can also be exploited in magnetic sensors based on diamond defects (NV centres) for biomedical applications.

Quantum cryptography is now commercially available, even if it is strongly evolving as we write. Important to note, is that current secure communications are possible because the communicating parties can exchange a "key" which allows them to encode a message that is only intelligible to the involved parties (who know the key), and no other. You use this every day, when you connect on the internet to https web sites. Today's methods are hard to crack, but not impossible to hack. Quantum mechanics can add important levels of security!
(Source: <https://qt.eu/understand/underlying-principles/quantum-key-distribution-qkd/>)

Random number generators are important for security, as vital means to generate cryptographic keys, but also for large scale computation simulating truly random large scale events, or more crudely if you need to generate true random events in casinos 'slot machines! (Source: <https://qt.eu/understand/underlying-principles/qrng/>)

Many foremost industries will be disrupted by Quantum Technologies; examples include: digital (machine learning, artificial intelligence, cybersecurity), pharmaceutical (drug discovery), finance (pricing, risk optimisation), industrial goods and energy (materials chemistry, compound selection), logistics, resource management and manufacturing (highly AI-efficient processes).