

## 3.4 Other funding

As possible applications of QIST become likely to appear in the near future, start-ups have begun to emerge. The main interest so far is in quantum cryptography, in particular Quantum Key Distribution.

The oldest European company is IdQuantique, spin-off from the university of Geneva in 2001. Several new appeared recently: [SmartQuantum](#) [1], created in 2004 in Lagnon, France, [Outools](#) [2] in Munich, Germany. Other competing start-ups for early adopters on the market are [MagiQ](#) [3], [Optemax](#) [4], and [Qinetiq](#) [5] from the USA. These companies are mostly spin-off of QIST research groups, funded through the usual start-up scheme: university incubators at the early stage of their existence, then business angels or hedge funds to sustain them beyond their first years of existence. They mainly develop commercial fibered QKD systems, but most of them admit that there is no real market for such system yet. There is however already a small but active market for Quantum-based Random Number Generators ([IdQuantique](#) [6]).

Quantum computing has also aroused interest for possible commercial applications. However the investment required and the timescale for developing a commercial quantum computer are much larger than for a QKD system. There is no start-up interested in developing a quantum computer in Europe so far, the only example known being in Canada, where one company ([D-Wave](#) [7]) has been created in 1999.

Several very large companies have also interest in QIST, with a focus on applied system research and components. In Europe, the main companies involved are Toshiba (UK), Thalès (France), France Telecom (France), Philips (Netherlands), Pirelli (Italy), Hitachi (UK) Hewlett-Packard (UK). Worldwide, companies such as IBM and NEC are also involved in QIST. The companies either have their own lab (Toshiba, HP, IBM), and/or can alternatively fund research groups (Philips). It has proven practically impossible to obtain reliable information about the amount of investment in QIST by these companies.

Another interesting source of funding is the [European Space Agency \(ESA\)](#) [8]. Several 50 k€ feasibility studies on Quantum Communication in space were successfully completed since 2002 and one experimental terrestrial 200 k€ study over 144 km horizontal free-space link is ongoing. Within ESA's science program, the proposal Space-QUEST (to place a QKD terminal onboard the International Space Station) was rated as 'outstanding'. Several European industries submitted proposals to develop a prototype engineering model of a faint laser and entangled photon source with a total budget of 600 k€. In the second half of 2008 a study on the feasibility of a QKD system on various future satellite missions is expected with 300k€. So far more than 1Mio€ have been spent on the different studies under evaluation at the time this report was made. But the overall budget for the Space-QUEST project, if it is accepted, would be approximately 80 M€ until 2014, with approximately 20% devoted to basic research. If successful, this would make ESA a major funding source for QIST in Europe.

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### Links:

- [1] <http://www.smartquantum.com>
- [2] <http://www.qutools.com/welcome/>
- [3] <http://www.magiqtech.com/MagiQ/Home.html>
- [4] <http://www.optemax.com/>
- [5] <http://www.qinetiq.com/global.html>
- [6] <http://www.idquantique.com/>
- [7] <http://www.dwavesys.com/>

[8] <http://www.esa.int/esaCP/index.html>