Contribution ID: **2** Type: **not specified**

Quantum Communications in space using satellites

Thursday, 23 October 2014 10:10 (40 minutes)

Quantum Communications (QC) on planetary scale require complementary channels including ground and satellite links. Here we report QC, e.g. the faithful transmission of qubits, from Space to ground by exploiting satellite corner cube retroreflectors acting as transmitter in orbit. Qubit pulses are sent at 100 MHz repetition rate and are reflected back at the single photon level from the satellite, thus mimicking a QKD source on Space. Synchronization is performed by using the bright SLR pulses at repetition rate of 10 Hz allowing for sub-nanosecond qubit arrival identification, with a factor of ten improvement with respect to the technique based on orbital parameters exploited in the first demonstration of the single photon exchange with satellites. From the link budget, the mean photon number of the state leaving the satellite has been estimated to be of the order of unity. We demonstrate the achievement of QBER of 3.7% (from LARETS satellite) and 6,7 % (from STARLETTE satellite), suitable for QKD applications. On the base of these findings, we envisage a two-way QKD protocol exploiting modulated retroreflectors that necessitates a minimal payload on satellite thus facilitating the expansion of Space QC and Quantum Physics tests in Space. Indeed, quantum communication in space give the opportunity of testing quantum physics in new environment and probing the laws of nature at large distance, beyond the capabilities of purely earth-based laboratories. The generation and distribution of entanglement, the "characteristic trait of quantum mechanics", between two distant locations is crucial from the point of view of fundamental physics and for Quantum Information protocols. In a long term vision, experiments on quantum entanglement and quantum superposition in space are the starting point for fundamental tests on the relation between quantum phenomena and gravitation. On this base we also review possible tests of Quantum Physics in space.

Presenter: VALLONE, G. (INFN Padova)