

SCIENTIFIC REPORT (PART 2)



EUROPEAN COMMISSION
RESEARCH DG
HUMAN POTENTIAL PROGRAMME

HIGH-LEVEL SCIENTIFIC CONFERENCES
SCIENTIFIC REPORT

Contract No

HPCFCT -1999-00129

Event No¹

2

Summary (maximum 2 pages, page 1)

Scientific Highlights:

Controlled dynamics of small quantum systems.

In a series of talks, the recent developments of experimental control and manipulation of single quantum systems were discussed. Breakthroughs in single atom manipulation and in steering of atoms above chip surfaces were reported. Invited experts from chemistry and from the physics community dealing with highly excited Rydberg states of atoms contributed with valuable insights.

Quantum measurements, entanglement.

A review was given of the very recent theoretical progress in quantifying entanglement and the resource values of entangled states. Experiments published in Nature just two weeks prior to the conference were highlighted and discussed at the conference. Progress in atomic clocks were discussed in separate talks devoted to light source and atom source technology, respectively.

Non-classical light.

Practical schemes and recent experimental results for quantum cryptography and for related practical applications of non-classical light were presented. Prospects were given for quantum computing with light fields in non-classical states.

Atoms, matter waves.

The 2001 Nobel prize in physics is awarded for Bose Einstein condensation. Much experimental and theoretical effort has been devoted to study systems beyond the simplest approximate mean field theories, mimicking the development in the 1960's of quantum optics out of classical field optics. The Quantum Optics meeting featured a number of talks with reports on eye-opening developments and new directions of research for Bose condensed systems.

Trapped Ions.

Ion traps offer a promising proposal for the demonstration of quantum computing, and this and many other possibilities for trapped ion physics were discussed in talks by leading ion trap research scientists at the conference.

Poster session.

Two poster sessions were arranged, both taking place after dinner one evening and during a full hour before lunch on the subsequent day. The experience with this format was very positive. All participants to the conference were either invited speakers, or they contributed with a poster, and the sessions were very lively with fruitful exchange of ideas.

Training.

The European Research Conference on Quantum Optics offered to its young participants a possibility to become acquainted with the newest developments and research directions in quantum optics and its related fields of physics. The presentation of posters also gave the young participants the chance to exercise their skills to present their work to both experts in their own research field, and to other young participants to whom the general outline and the key ideas should be communicated. Several contacts which may lead to future collaboration were established, confirming that this format for conferences is probably one of the most efficient ways to stimulate the mobility of young researchers, facilitated, e.g., by the various European networks.

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Summary (maximum 2 pages, page 2)**European added value (inc. networking):**

Within Europe a wide range of collaborative efforts have been stimulated within quantum optics, degenerate gasses, and quantum information, which are strongly linked activities, and with a large number of possible technological off-springs. The European Research Conference on Quantum Optics contributed to the strengthening of these efforts, both by bringing together active researchers in the field for active collaboration and dissemination of their latest research results, and by the invitation of various outsiders, bringing new concepts, applications, and avenues for future research to the attention of the community. The meeting was co-sponsored by QUIPROCON, a quantum information research network. This sponsoring was helpful and enabled the organizers to invite participants and speakers from non-EU associated states. Their participation was very beneficial, both to the quality of the scientific presentations and to the recruitment perspectives of the meeting.

Additional Information:

Due the events of September 11, some invited speakers had to cancel the attendance to the meeting at the last moment. It was possible to invite speakers with new interesting results, and excellent talks were given by participants in the meeting, who were with few days notice promoted to invited speakers.

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Event No ¹

2

Public Outreach (maximum 1 page)

The topics discussed at Quantum Optics 2001 were among the most celebrated results of physics research these years. During our meeting, the press release appeared on the Nobel prize in physics of 2001 being awarded for Bose Einstein condensation, and many other activities forming the key contents of the meeting have recently received much attention in the public by featured newspaper articles, radio and TV programmes.

The thorough discussions of these topics enable all participants to improve their performance in future public appearances, which are becoming an increasingly important part of the job as a scientist. The conference revealed a general feeling among all participants of an increased public interest in new research directions such as quantum information and Bose-Einstein condensate physics.

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