

## The quantum illusionist: a game with correlations between Gaussian states

*Friday, 22 June 2012 10:30 (30 minutes)*

M.Genovese,<sup>1</sup> G. Brida,<sup>1</sup> I. P. Degiovanni,<sup>1</sup> A. Meda,<sup>1</sup> S. Olivares,<sup>2</sup> M.G. A. Paris<sup>2</sup>

<sup>1</sup> INRIM, Strada delle Cacce 91, I-10135 Torino, Italy

<sup>2</sup> Dipartimento di Fisica, Università degli Studi di Milano, I-20133 Milano, Italy

Optical correlations at the quantum level represent a resource for the development of technologies overcoming the limits of the classical physics, with very promising opportunities for future widespread applications [1, 2]. These results, besides paving the way to new technologies, also permit deeper insights in quantum world. Here we will show, both theoretically and experimentally an innovative scheme that exploits correlations between Gaussian beams of light: the optical illusionist game. In the game, an “illusionist” asks the public to measure correlations between two uncorrelated light beams, excited in the same Gaussian state [3], mixed in a beam splitter (BS). Both in the presence and in the absence of the BS, no correlations arise between them. However, the illusionist can identify the presence of the BS, by means of a correlation measurement, when the public is asked to insert the BS behind the illusionist’s back. Here we unveil the trick and the physics that explain these counterintuitive correlations of quantized light.

### References

[1] Bouwmeester, D., et al. The Physics of Quantum Information: Quantum Cryptography, Quantum Teleportation, Quantum Computation (2000).

[2] Genovese, M. Research on hidden variable theories: A review of recent progresses. Phys.Rep.413,319-396 (2005).

[3] Ferraro, A. et al. Gaussian States in Quantum Information (2005)

**Presenter:** Dr GENOVESE, marco (INRIM)

**Session Classification:** Part V