

Cold atoms in Cracow

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I will shortly present the role Professor Gawlik played in the development of cold atom physics in Cracow and in Poland.

Then I will focus on our realization of a plasmonic dipole mirror for cold atoms based on a metallic grating coupler. In this case a cloud of atoms is reflected by the repulsive potential generated by surface plasmon polaritons (SPPs) excited on a gold grating by a 780 nm laser beam. Experimentally and numerically determined mirror efficiency is close to 100%. The intensity of SPPs above a real grating coupler and the classical atomic trajectories, are computed.

Using the dipole mirror, we have determined the absolute value of the surface plasmon polariton (SPP) intensity, reaching 90 times the intensity of the excitation laser beam. With an infrared camera we have also directly measured thermo-plasmonic effects accompanying SPPs excitation on gold submicron structures [1], [2].

References

- [1] T. Kawalec, D. Bartoszek-Bober, R. Panaś, J. Fiutowski, A. Pławecka, H.-G. Rubahn, *Opt. Lett.* **39**, 2932 (2014).
- [2] T. Kawalec, A. Sierant, R. Panaś, J. Fiutowski, D. Bartoszek-Bober, L. Józefowski, H.-G. Rubahn, *Plasmonics* **13**, 639 (2018).

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