Van der Waals interaction at finite temperature

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Dispersion forces such as van der Waals forces originate from electromagnetic field fluctuations, both quantum and thermal. One would expect a significant influence of the thermal fluctuations, e.g. in thermal vapors of Rydberg atoms, where strong van der Waals interactions have been demonstrated [1]. On the other hand, it is known that Rydberg dispersion interactions can become temperature-independent due to subtle cancellations [2]. Here, we present a general theory for the van der Waals interaction of excited atoms at finite temperature in the presence of macroscopic bodies within the framework of macroscopic quantum electrodynamics. We show limiting cases of high temperature and discuss under which conditions temperature dependence or independence can be expected.

References

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