# Partial frequency redistribution in cyclotron lines of neutron stars.

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We present a summary of our analysis [1, 2] of the frequency redistribution effects during the resonance (cyclotron) scattering of photons by electrons in a magnetized plasma. We point out the principal role of this effects on the transfer of radiation in the atmospheres of compact stars with strong magnetic fields. Especially they are important if multiple scattering dominates over absorption of photons which is common for wide range of neutron stars. We estimate analytically and numerically (using Monte-Carlo simulations) the rate of frequency redistribution and show that is a very pronounced effect despite the fact that it is strongly inhibited with respect to usual Doppler redistribution which takes place in the case of atomic or ion spectral lines. Statistically, the redistribution of photons out of the cyclotron line results in a boosted probability of their escape from a large optical depth. As our simulations show, the emerging radiation is gathered over a large interval of optical depths, spanning one or two orders of magnitude. Potentially, this causes all sorts of inhomogeneities to show up in the resulting spectrum in a more pronounced way, and the radiation transfer equation in these situations should be solved over a range of optical depths sufficiently large to capture the origin of the major part of outgoing photons. Escape of photons from the cyclotron line greatly affects both the lines profile and the characteristic optical depth, from where the outgoing radiation originates. Through this, the spectral redistribution of gyroresonant photons changes the radiation pressure on the atmospheric plasma, what makes it one of the key phenomena which need to be included in the studies of radiation transfer in the atmospheres of neutron stars.

## References

[1] M. A. Garasev, E. V. Derishev, Vl. V. Kocharovsky & V. V. Kocharovsky, *MNRAS* 459, 1847 (2016)

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