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Ratio of photon anisotropic flow

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The anisotropic flow of direct photons produced in relativistic heavy ion collisions is known to be dominated by the thermal radiations. The non-thermal contributions dilute the photon anisotropic flow by adding extra weight factor in the v_n calculation. The discrepancy between experimental photon anisotropic flow data and results from theoretical model calculations is not well understood even after significant developments in the model calculations as well as in the experimental analysis methods.

We show that the ratio of photon v_n can be a potential observable in this regard by minimizing the non-thermal contributions and the ratio along with the individual flow parameters could be valuable to constrain the initial state as well as to understand the photon anisotropic flow from heavy ion collisions better [1].

The photon v_2/v_3 is found to be larger for peripheral collisions than for central collisions and the p_T dependent behavior of the ratio is found to be different from the individual flow parameters. The ratio is found to be sensitive to the initial conditions of the model calculation at different p_T regions compared to the individual anisotropic flow parameters.

The v_1/v_2 (and v_1/v_3) shows a completely different p_T dependent nature compared to v_2/v_3 of photons. An experimental determination of photon v_1/v_n is expected to confirm the range of thermal contribution. In addition, the v_1/v_n is found to be less sensitive to the initial formation time compared to v_2/v_3 . However, v_1/v_n is expected to be much more sensitive to the final freeze-out temperature as photon v_1 does not depend strongly on the value of T_f .

[1] R. Chatterjee and P. Dasgupta, arXiv: arXiv:2106.15922

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