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Fractionally Charged Excitations in Optical Emission Spectroscopy

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We discuss recent experiments and theory of the signatures of fractionally charged excitations in optical emission spectroscopy of two dimensional electrons subjected to a high magnetic field [1]. We show that the two flux quanta in a composite fermion interacting with an exciton lead to filling factor dependent features in optical emission spectrum symmetric around filling factor $1/2$ while fractionally charged excitations lead to fractionally charged exciton. In the vicinity of the incompressible filling factor $1/3$ state we observe a doublet structure in the emission line, corresponding to excitations of the incompressible fluid. At filling factors lower than $1/3$, corresponding to the transition to a compressible, metallic state, a new emission line appears which is attributed to the fractionally charged quasi-exciton. These observations are supported by extensive numerical calculations of the emission spectrum of finite number of electrons and holes on a Haldane sphere.

[1] M. Byszewski, B. Chwalisz, D.K. Maude, M.L. Sadowski, M. Potemski, T. Saku, and Y. Hirayama, S. Studenikin, D. G. Austing, A.S. Sachrajda, and P. Hawrylak, *Nature Physics* 2, 239 (2006).