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Magneto-electric control of toroidic moments in multiferroic LiCoPO4 JUDIT ROMHNYI, Max Planck Institute for Solid State Research, Heisenbergstrasse 1, D-70569 Stuttgart, Germany, VILMOS KOCSIS, ISTVN KZSMRKI, Department of Physics, Budapest University of Technology and Economics, 1111 Budapest, Hungary, KARLO PENC, Institute for Solid State Physics and Optics, Wigner Research Centre for Physics, Hungarian Academy of Sciences, P.O.B. 49, H-1525 Budapest, Hungary — In addition to the three widely known forms of ordering, elastic, electric and magnetic orders, a new so called ferrotoroidic phase has been recently observed.[1] The toroidic moment is asymmetric under both time reversal and space inversion symmetries allowing ferrotoroidic materials to exhibit intrinsic magneto-electric effect. Possibility to control magnetic properties using electric field makes such materials desirable for applications. We discuss the magneto-electric control of toroidic moments in the multiferroic material, $LiCoPO_4$. Based on symmetry arguments we derive microscopic model for induced polarization and 'toroidization'. Using multiboson approach we investigate the experimentally observed magnon absorption spectrum following different magneto-electric poling processes. We reproduce the mono-domain ferrotoroidic state established by magneto-electric poling, as well as unconventional optical properties, such as the unidirectional light transmission, emerging in magnon spectrum of $LiCoPO_4$. [1] Bas B. Van Aken et al, Nature 449, 702-705 (11 October 2007), Anne S. Zimmermann et al, Nature Communications 5, Article number: 4796

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