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Wentao Fan and **Farzad Fathizadeh*** (farzadf@caltech.edu), Department of Mathematics, Mail Code 253-37, Caltech, 1200 E. California Blvd., Pasadena, CA 91125, and **Matilde Marcolli**. *Modular forms in the spectral action of Bianchi-IX gravitational instantons.*

In a succession of papers, physicists and mathematicians have achieved an explicit parameterization of Bianchi-IX gravitational instantons in terms of theta functions with characteristics. By exploiting the latter, in this talk, I will shed light on a rationality phenomena in the spectral action of $SU(2)$ -invariant Bianchi-IX metrics. This will be done by showing that for the instantons, each term in the expansion of their spectral action gives rise to a modular form of weight 2 that can be written explicitly in terms of well-known modular forms, namely the Eisenstein series and the modular discriminant. An elegant proof of the rationality result will also be presented, which is based on expressing Seeley-de Witt coefficients as noncommutative residues of Laplacians. This talk is based on joint works with Wentao Fan and Matilde Marcolli. (Received August 15, 2016)