1067-58-1088 **K. D. Elworthy*** (kde@maths.warwick.ac.uk), Maths Institute, Warwick University, Coventry, CV4 7AL, England. *Vanishing of L^2 harmonic one-forms on based path spaces of Riemannian manifolds.*

Following Len Gross's work on abstract Wiener spaces and their potential theory in the late 1960's the natural calculus for analysis on path spaces with diffusion measures has been based on differentiation in the directions of so-called "Bismut tangent spaces" . Malliavin calculus type techniques were extended to this situation through work of Gross's ex-student Bruce Driver in the 1990's, to give a theory of Sobolev spaces and scalar potential theory. In general the "Bismut tangent bundle" is not integrable leading to difficulties in setting up a Hodge Laplacian for L^2 forms. An approach to this was suggested by the author and Xue-Mei Li, with a detailed treatment for one-forms in 2008. Recently, work by the author with his student Yuxin Yang has provided a proof of vanishing of first L^2 cohomology groups in this context, with corresponding vanishing of L^2 harmonic one-forms. This proof will be described, demonstrating a pleasing interplay between the differential geometry of the Bismut tangent spaces and the temporal structure of the underlying path space. The proof, together with the unsurprising vanishing, might be considered to justify the definition of exterior derivative proposed in the earlier work with Xue-Mei Li. (Received September 18, 2010)