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White noise analysis, filtering equation and the index theorem for families.

**Abstract**

Bismut has pointed out the relation between filtering theory and the index theorem for families. We give an interpretation of the heuristic expressions used by Bismut as an Hida distribution (by using Chen forms instead of Wiener chaos) with values in the space of  $L^2$  forms of the loop space on the basis manifold endowed with a convenient measure. The link with the Index theorem for families is kept as in the heuristic works of Bismut.