J. DIFFERENTIAL GEOMETRY
52 (1999) 327-374

ON THE QUANTUM EXPECTED VALUES OF INTEGRABLE METRIC FORMS

JOHN A. TOTH

1. Introduction

Let (M^n, g) be a compact, real-analytic, Riemannian manifold, P_0 a first order, self-adjoint, real-analytic, elliptic pseudodifferential operator with principal symbol,

$$H(x,\xi) = \sqrt{g^{ij}(x)\xi_i\xi_j}$$

generating geodesic flow. We will assume that P_0 is quantum integrable; that is, there exist $n-1$ first order, jointly elliptic, real-analytic, classical pseudodifferential operators $P_1, ..., P_{n-1}$ such that, for all $i, j = 0, 1, ..., n-1$,

$$[P_i, P_j] = 0. \tag{1}$$

Given the Hamilton vector field,

$$\Xi_H = \sum_{j=1}^{n} \frac{\partial H}{\partial \xi_j}\frac{\partial}{\partial x_j} - \frac{\partial H}{\partial x_j}\frac{\partial}{\partial \xi_j},$$

we denote the associated geodesic flow by $\exp t\Xi_H : C^\infty(S^*M) \to C^\infty(S^*M)$. Suppose γ is a simple, periodic orbit of $\exp t\Xi_H$ (i.e., a

Received June 21, 1999. Partialy supported by NSERC Grant OGP0170280 and FCAR Grant NC-1520.

1991*Mathematics Subject Classification.* Primary 58FO7, 58G25; Secondary 33E10.