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Semiclassical Theory of the Structure of the Hydrogen Spectrum in Near-Perpendicular Fields: EBKM Quantization and Description of Monodromy[1] CHRIS SCHLEIF, JOHN DELOS, William & Mary — At the 2007 DAMOP meeting we presented a talk describing the spectrum of hydrogen atoms in near-perpendicular electric and magnetic fields. We displayed a number of previously unrecognized structures in the spectrum, most of which are connected with a classical phenomenon called "monodromy." At this meeting we wish to present the underlying theory which produced these results. We show that the construction of approximate classical actions by the obvious methods leads to variables that have discontinuous derivatives. Smooth continuation of these "primitive" action variables leads to action variables that are multivalued. We show how these multivalued actions lead to defects in the quantum spectrum. We also present a few correlation diagrams which show how quantum eigenvalues evolve from one region of near-perpendicular parameter space to another. Finally we consider the near perpendicular spectra of non-hydrogenic atoms via quantum defect theory.

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