The Invariant Spin Field at Snake ``Resonance'' in the Single Resonance Model with a Pair of Siberian Snakes.

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The chief features of spin motion in flat proton storage rings near resonance between spin motion and vertical betatron motion are, for well separated resonances, conveniently modelled with the rotating wave approximation whereby just one Fourier harmonic in the perturbation to the spin motion is considered. This is the "single resonance model". If pairs of Siberian Snakes are then included to restrict the closed orbit spin tune to 1/2, simulations show that at certain rational vertical tunes, the polarization can be lost during acceleration. This is the so-called "snake resonance" phenomenon.

At SPIN2002 [1] we presented a detailed discussion of the meaning of the term `"spin tune". We also made the first announcement of the fact that at snake "resonances" the invariant spin field is irreducibly discontinuous.

The work presented here is a sequel in which we focus on the properties of the invariant spin field at snake "resonant" tunes and other rational tunes in order to gain a better understanding of the reasons for the loss of polarisation when accelerating proton beams near snake "resonances".

[1] D.P. Barber, R. Jaganathan and M. Vogt,
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Long Island, U.S.A., September 2002. AIP proceedings 675 (2003).
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