Role of PN approximations in EMRI calculations

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Outline

- Calculating gauge invariant quantities
  - consistency can be shown
- Calculating waveforms for 10^5 orbits?
  - no change to do 10^5 orbits numerically
- Discussion

Gauge invariant quantities

- omega
- uuh^R
- u^t
- Last two related
- Need at least two to make a comparison, such as with post-Newtonian results
- ISCO shifts (comparison still to come)

uuh (or u^t) vs omega

- Numerically: C=27.677+/-0.005
  - have numerical data for different r
  - must "create" a power series in 1/r
- Analytically: C=21/3-41/32*pi^2
  - Limited # terms in 1/r; many in m/M
- Curiosity: e-omega*j vs E-omega*J
  - Known pN function consistency suggested

Waveforms

- Not there yet
- Getting close(?)
- May evolve a few orbits
- Can we extrapolate to thousands of orbits?
- When do second order effects become important?

Discussion

- Who claims he/she is bent on computing waveforms? Don't we already have kluges?
- Who expects to produce LISA-valuable results in his/her lifetime? eg, MiSaTaQuWa?
- What can be reasonably achieved in the lifetime of the youngest person in this room? Clearly, a few orbits! How do we use them?

Notes (and Names?)

- When do higher order (eg 4) PN results compete with 2nd order perturbations?
  - At r~6000M for m/M~10^-6
- Can we use SF results to produce delta(Phi)?
  - 1st order ~ 0.35*0th order in 1PN phase
  - need phase error ~10^(-7) for m/M~10^(-6) to compete with 1PN for R>50M