

The Problem with Precession

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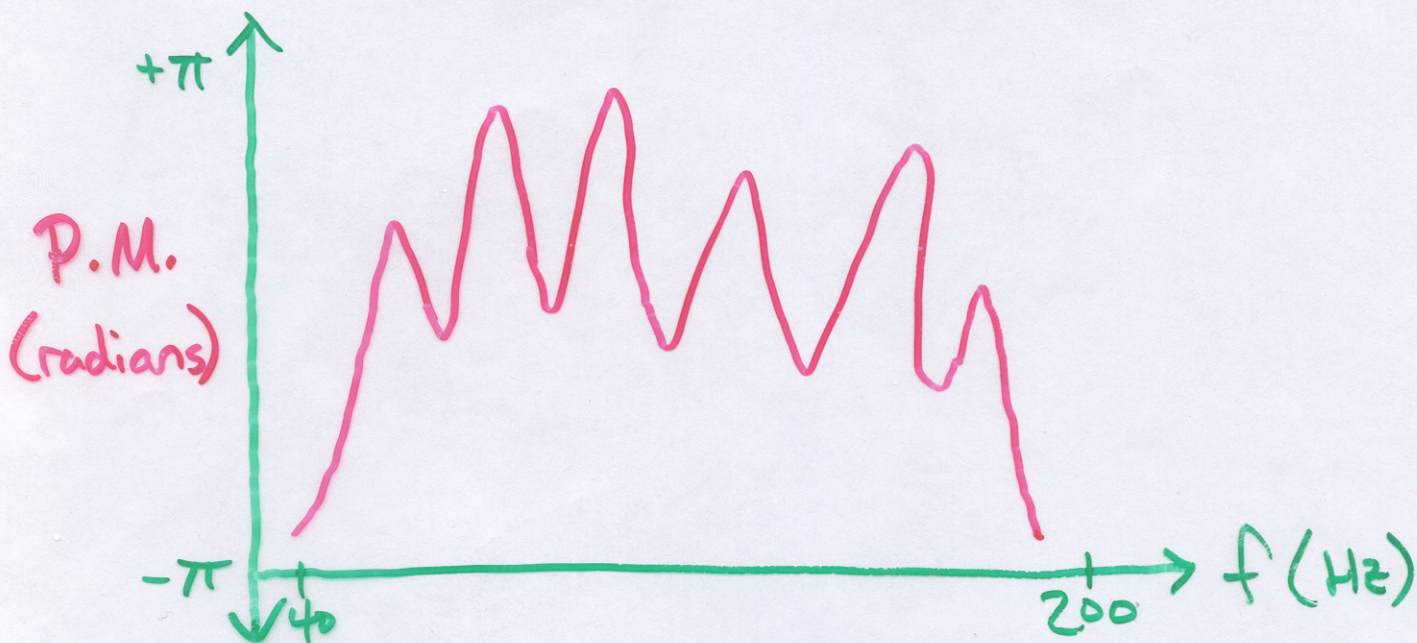
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L40.G010143-00-2

What
are we worried about?

Not so much monotonic phase effects
or amplitude modulation
as phase modulation ...



... leads/lags no-spin signal by up to $\frac{1}{2}$ cycle,
 ≈ 20 precessions in LIGO-J band.

$$\text{Mock P.M.} = A \cos(Bf^{-2/3}) + C \sin(Bf^{-2/3})$$

[Apostolatos '95, '96]

How much

S/N do we lose ...?

(What's the fitting factor?)

... if we use no-spin templates?

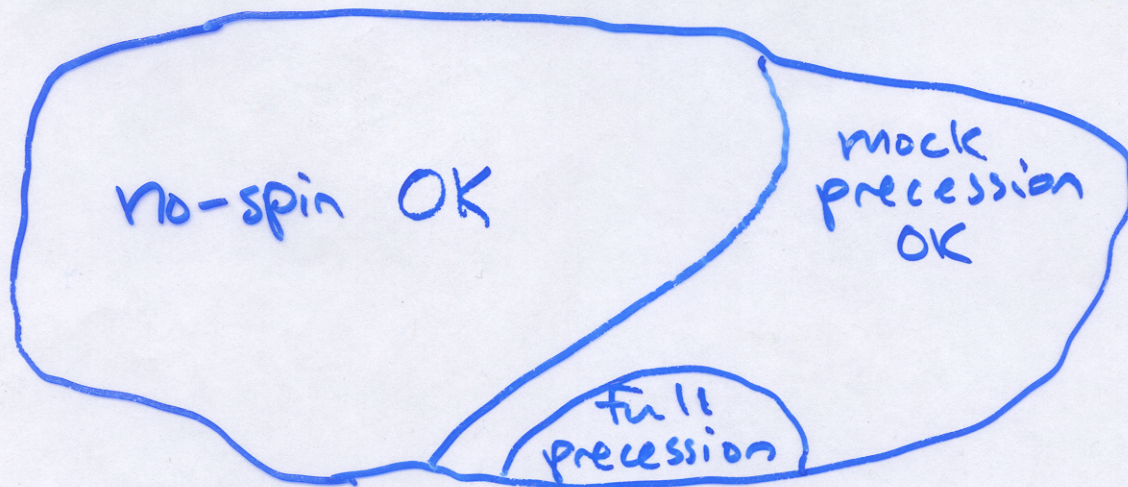
... if we use mock-precession templates?

Apostolatos '96: up to 50%, 10%
(i.e. 90% vs 30% of event rate)

... but that was only 3 values of m 's, S 's
and parameter space is huge! (≈ 11 dimensions)

Full exploration underway:

[Cardiff, Apostolatos, Kalogera, Vecchio] and many CPUs



All 3 regions exist, but where? Hope that full precession corners of space are unlikely.

How many
templates do we need?

Even mock precession templates are expensive:

[Apostolatos, Owen, Vecchio]

Multiply no-spin # of templates by $10^5 - 10^6!$

(3 "spin" parameters don't correlate w/masses)

Most templates come from a few "expensive" angles -
leaving them out reduces by $\approx 10 \dots$

Brute force search is still unfeasible.

(BH/NS costs more than no-spin search!)

Precession has to be treated as late stage in

- hierarchical search (begun w/no-spin templates)
- offline?
- fast chirp transform?