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Efficiency Studies of Binary Neutron Star Inspiral Template Banks

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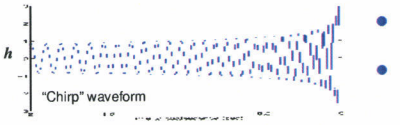
Binary Neutron Star Inspirals

- Stars form tight orbits, radiating away GW's.
- Orbit shrinks, frequency and amplitude of emitted GW's increase, and stars eventually collide.



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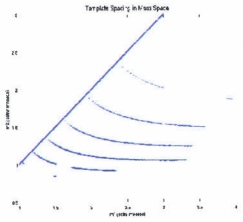
Matched Filtering

- Waveform is known accurately for range of 1-3 solar masses.
- Masses are the only intrinsic parameters.
- Theoretical waveforms, or templates, are placed in 2-D mass space so that any real signal will have a loss in SNR of no more than 3%.



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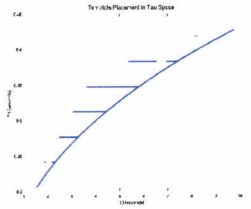
Tau Space

- We work in tau space.
- The tau coordinates are chirp times.

$$\tau_0 = \frac{5}{256\left(\Pi f_{low}\right)^{8/3} m^{5/3} \eta}$$

$$\tau_3 = \frac{1}{256\left(\Pi^2 f_{low}^5\right)^{1/3} m^{2/3} \eta}$$



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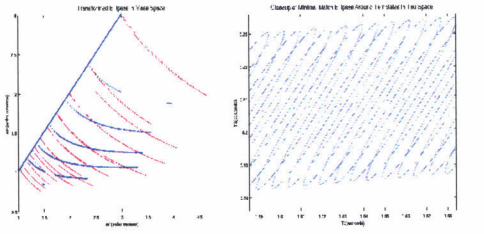
Constant Mismatch



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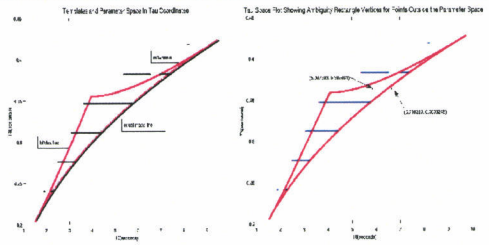
Laying Out the Bank in Tau Space



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Test of Hexagonal Bank