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SUPPLEMENTARY MATERIAL: MEASURING GRAVITATIONAL-WAVE HIGHER-ORDER MODES

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ABSTRACT

Supplementary figures from Mills & Fairhurst (2020). Here we provide contours for $alpha_lm$ – the ratio of signal-to-noise ratio in the l,m multipole to the 2,2. Additionally provided are overlaps of each mode with the dominant. We consider three networks, O3, aLIGO and the Einstein Telescope.

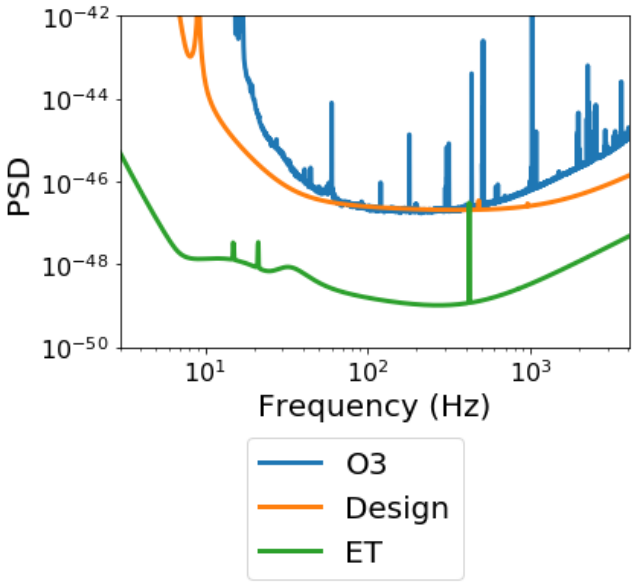

Figure 1. Power spectral density curves used in this study.

REFERENCES

Mills, J. C., & Fairhurst, S. 2020, Measuring gravitational-wave subdominant multipoles, Tech. Rep. LIGO-P2000136

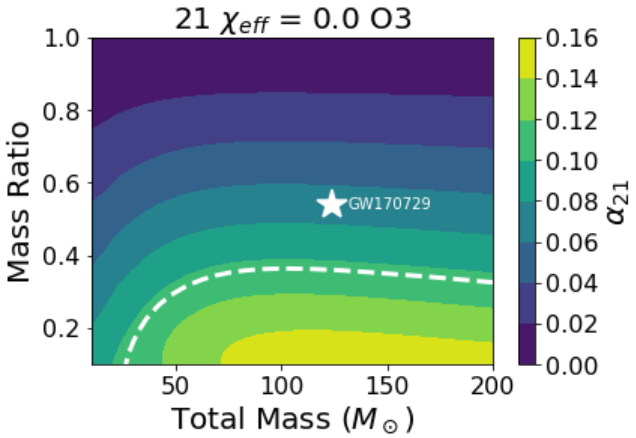

Figure 2. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

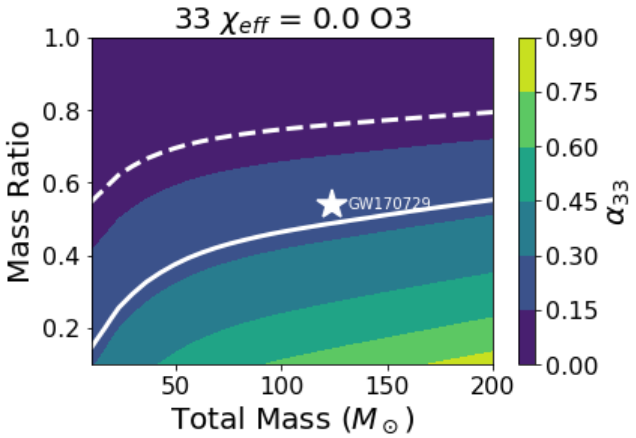

Figure 3. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (3,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

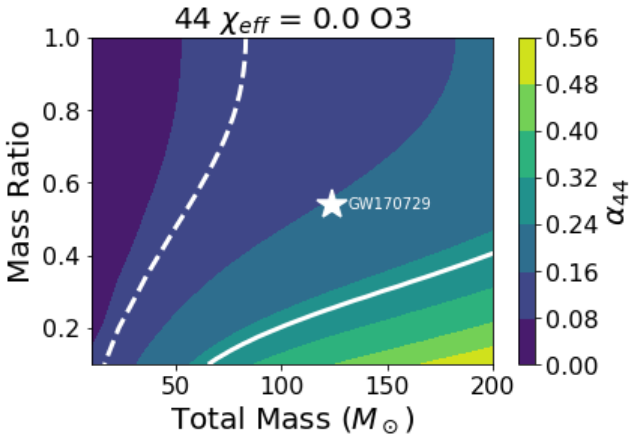

Figure 4. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (4,4) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

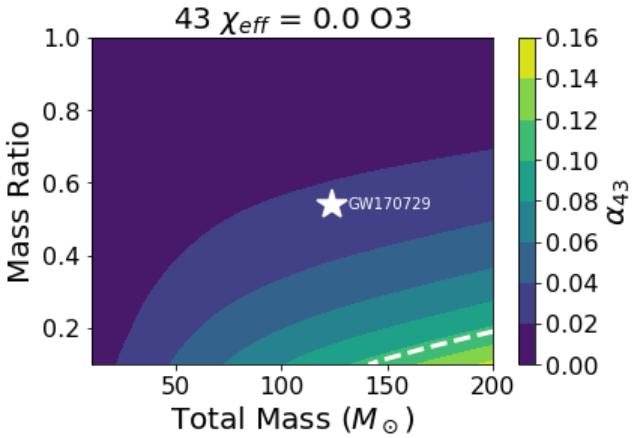

Figure 5. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (4,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

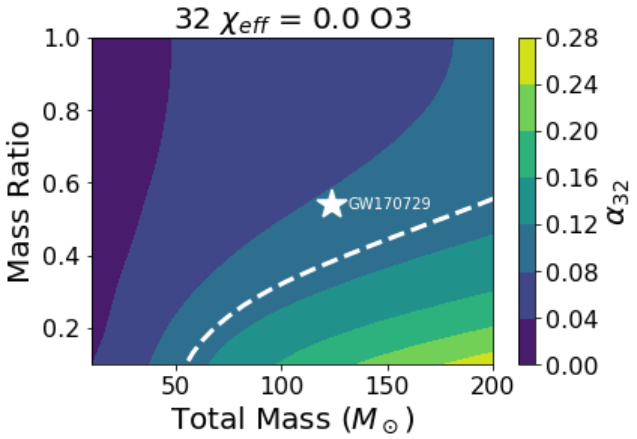

Figure 6. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (3,2) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

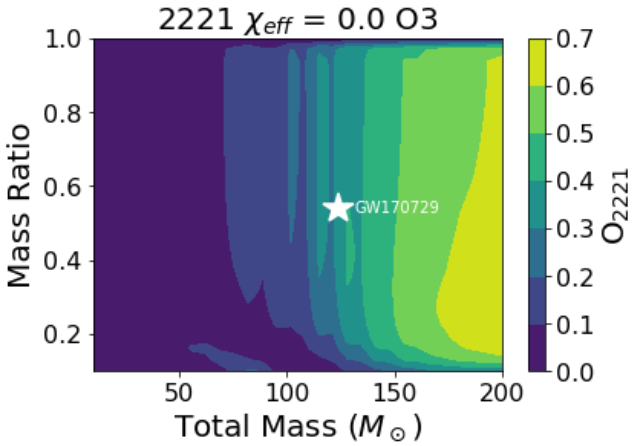

Figure 7. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (O3) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

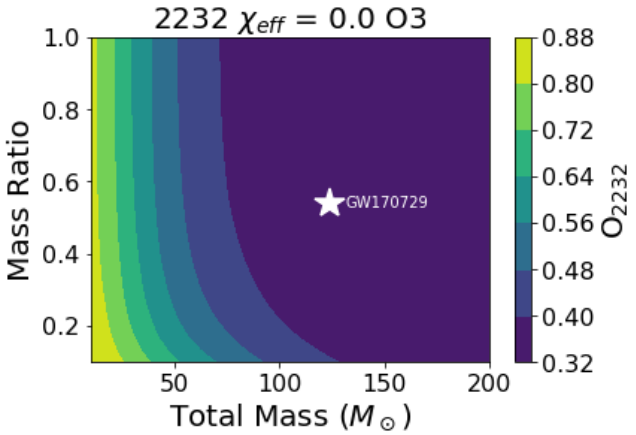

Figure 8. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (O3) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

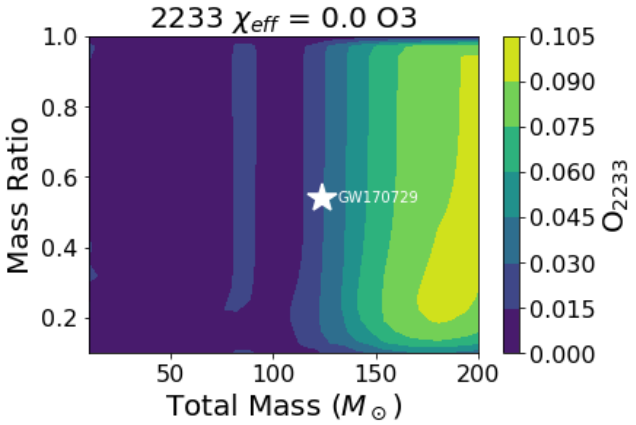

Figure 9. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (O3) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

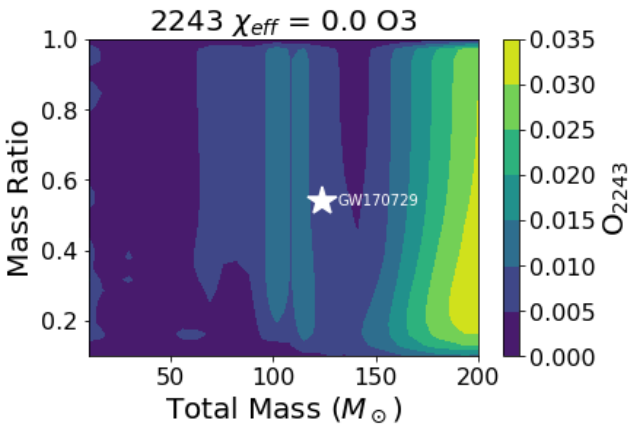

Figure 10. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (O3) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

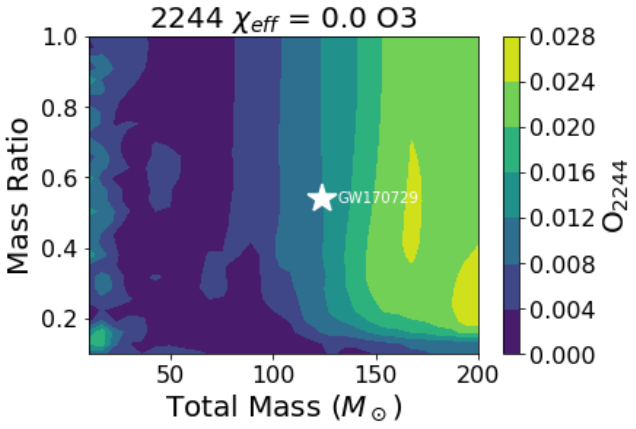

Figure 11. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (O3) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

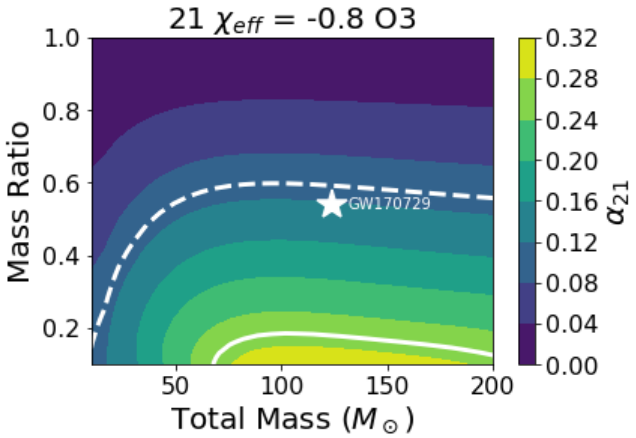

Figure 12. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = -0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.

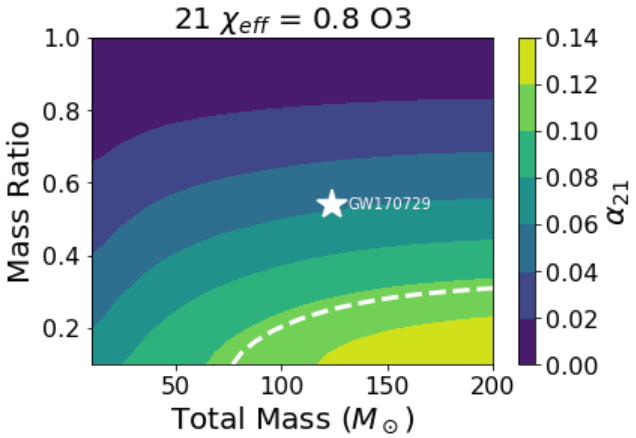

Figure 13. Ratio of the signal-to-noise ratio in Advanced LIGO (O3) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.

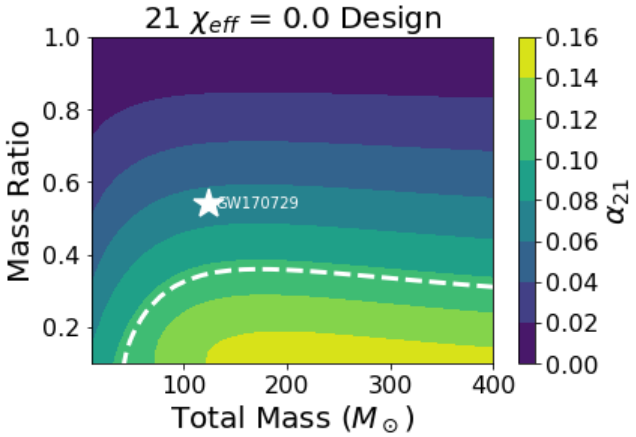

Figure 14. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

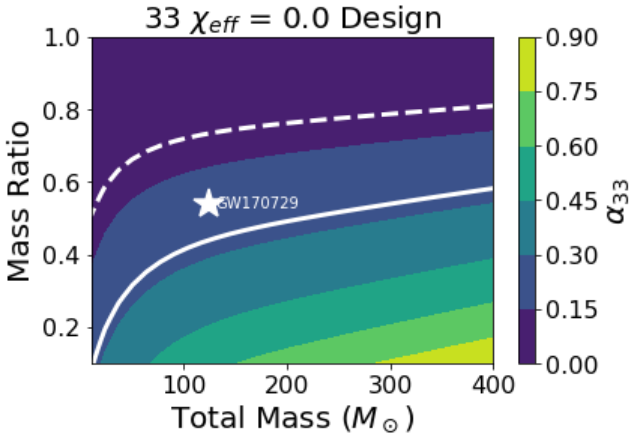

Figure 15. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (3,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

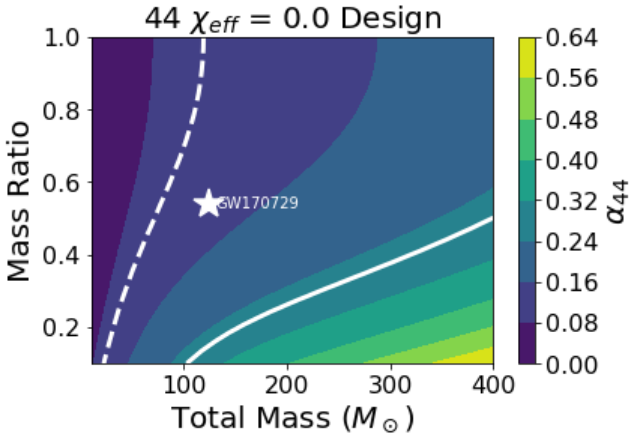

Figure 16. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (4,4) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

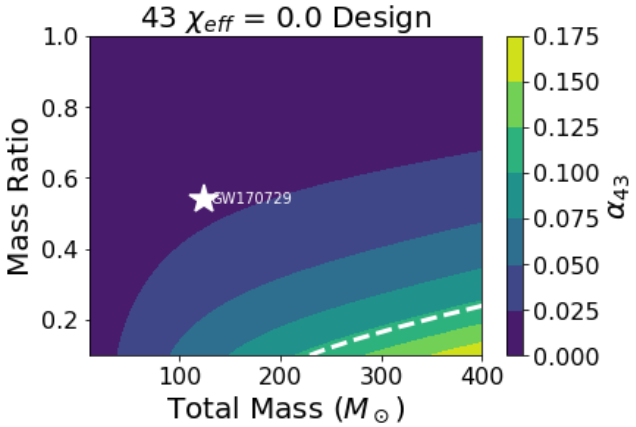

Figure 17. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (4,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

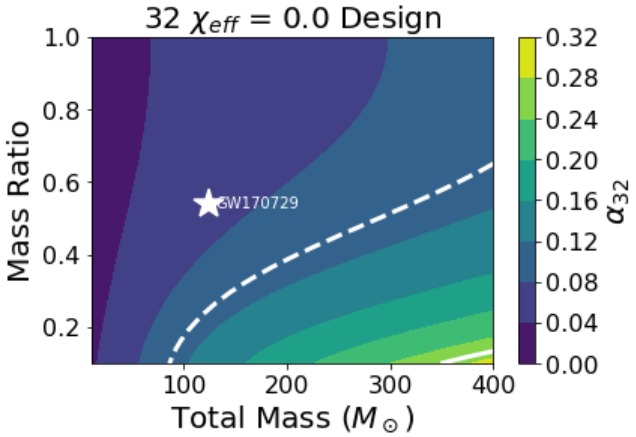

Figure 18. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (3,2) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

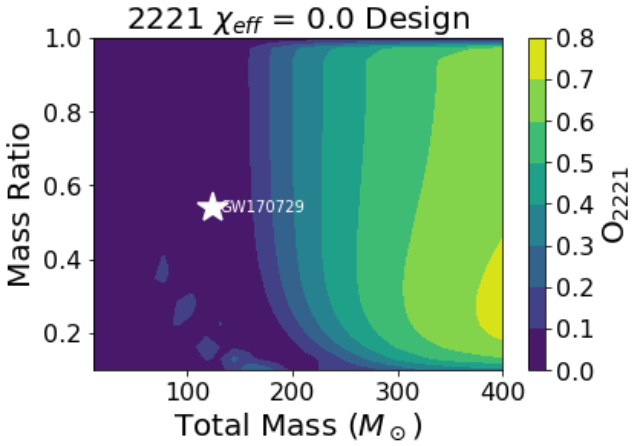

Figure 19. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (Design) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

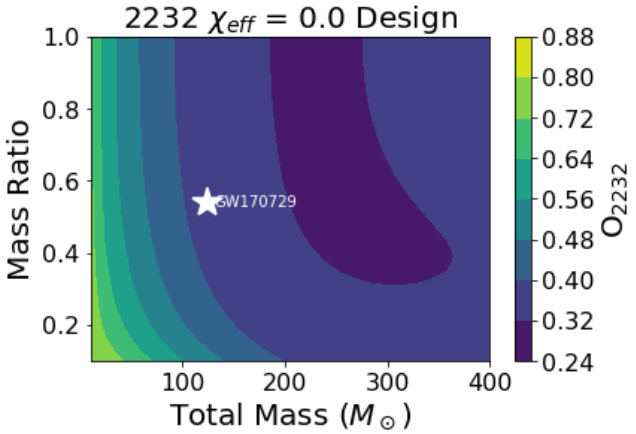

Figure 20. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (Design) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

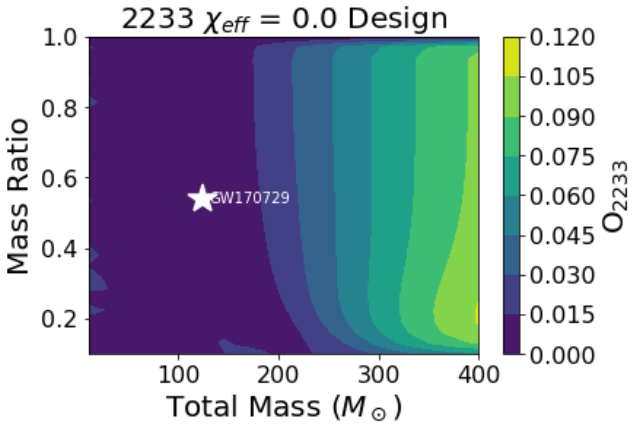

Figure 21. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (Design) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

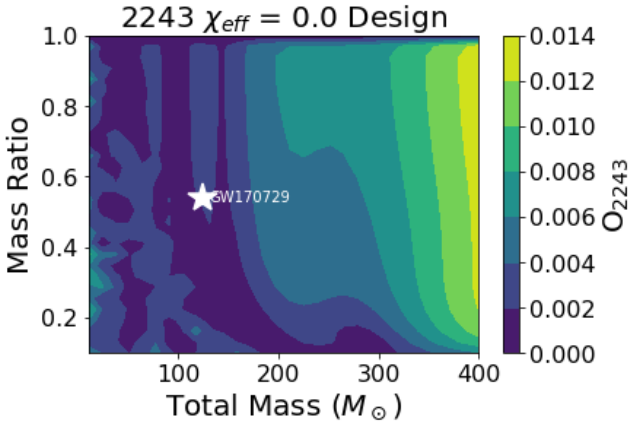

Figure 22. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (Design) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

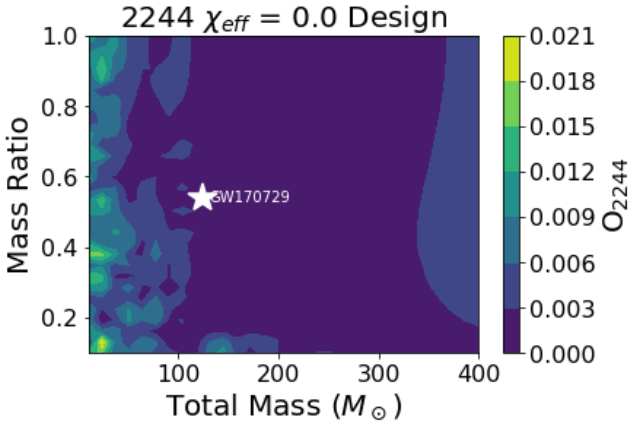

Figure 23. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in Advanced LIGO (Design) as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

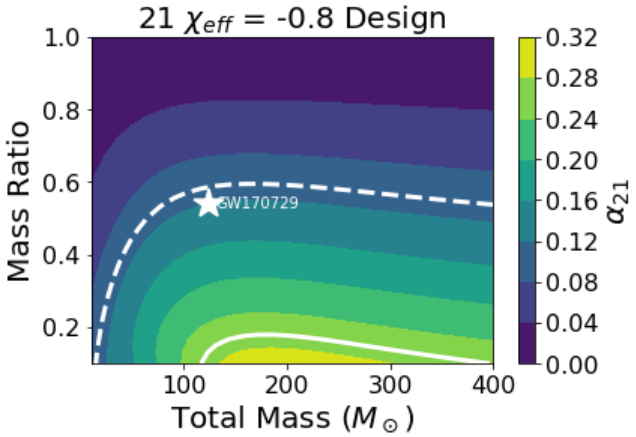

Figure 24. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = -0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.

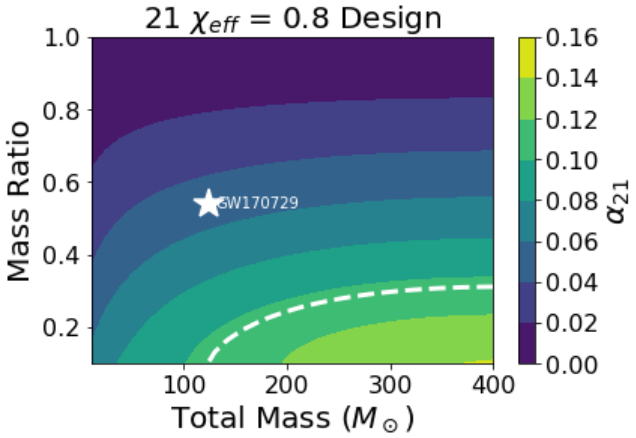

Figure 25. Ratio of the signal-to-noise ratio in Advanced LIGO (Design) of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.

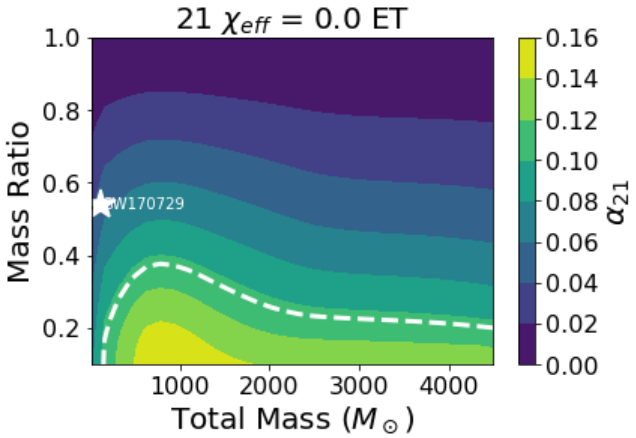

Figure 26. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

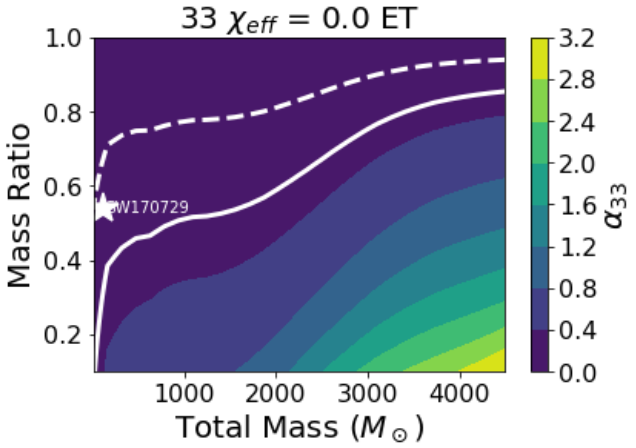

Figure 27. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (3,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

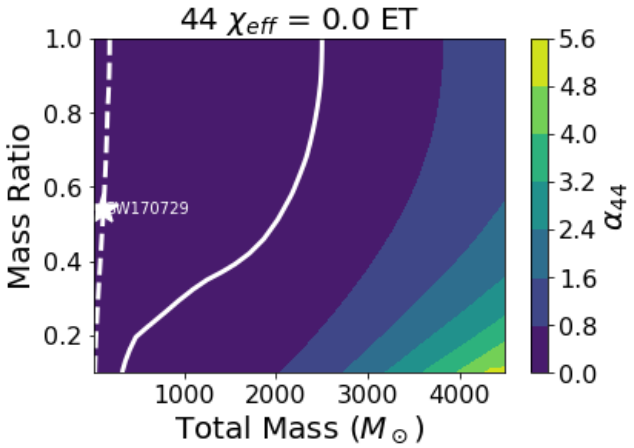

Figure 28. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (4,4) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

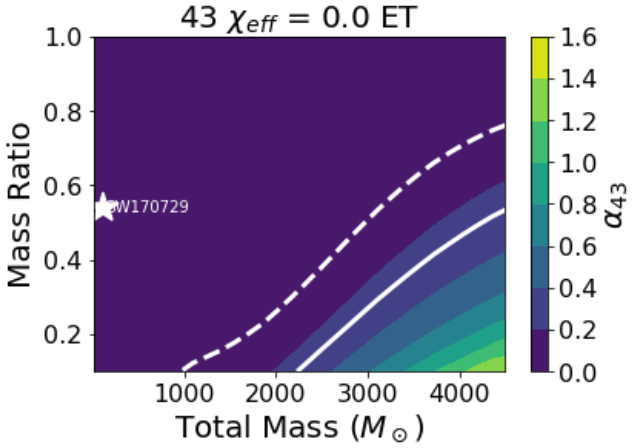

Figure 29. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (4,3) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

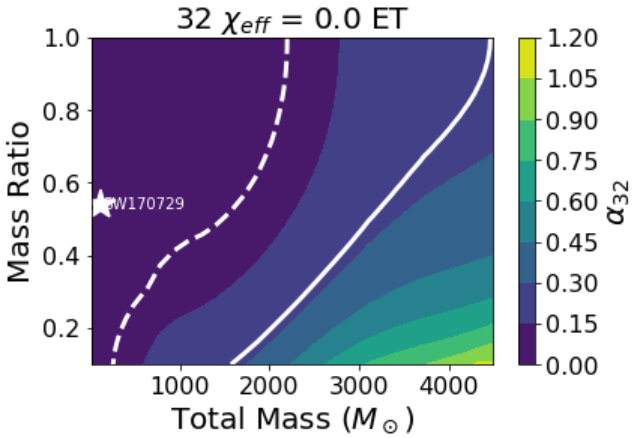

Figure 30. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (3,2) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

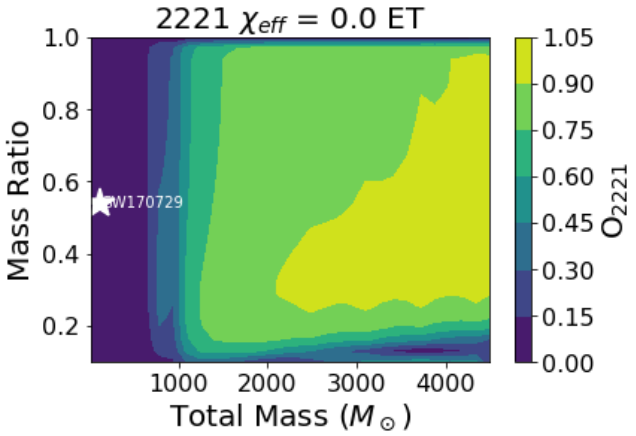

Figure 31. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in the Einstein Telescope as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.0$. Contour levels are chosen to maximise the resolution of feature on this plot.

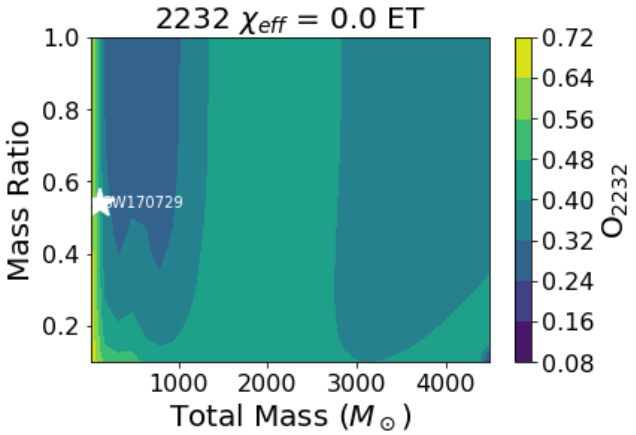

Figure 32. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in the Einstein Telescope as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

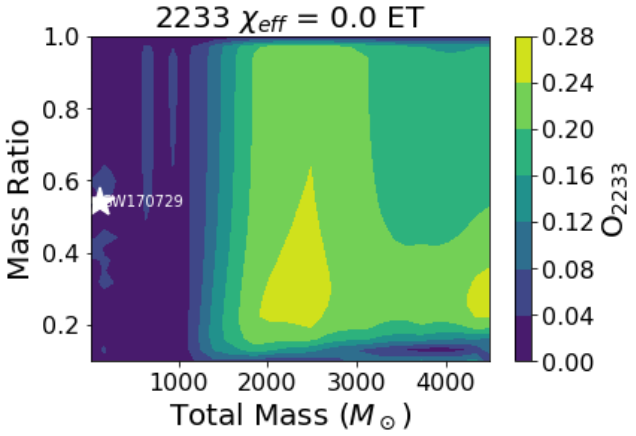

Figure 33. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in the Einstein Telescope as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

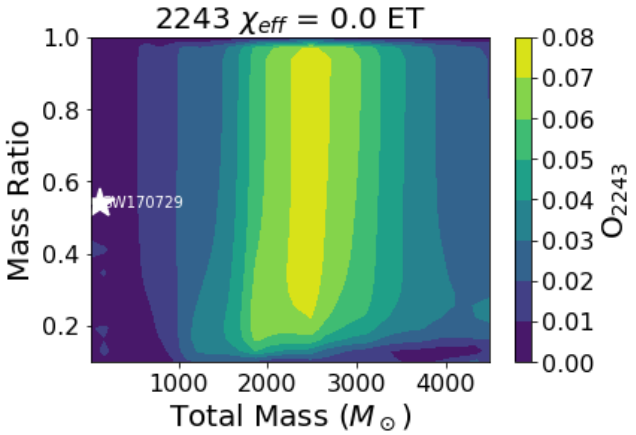

Figure 34. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in the Einstein Telescope as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

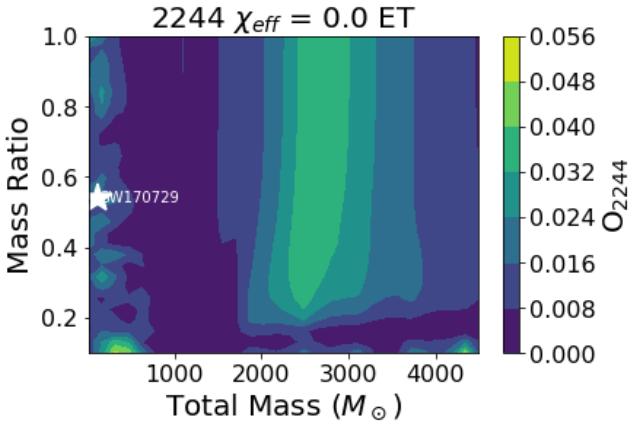

Figure 35. Absolute value of the noise-weighted inner product between the l,m = (2,2) the l,m = (2,2) multipole in the Einstein Telescope as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, χ_{eff} = 0.0. Contour levels are chosen to maximise the resolution of feature on this plot.

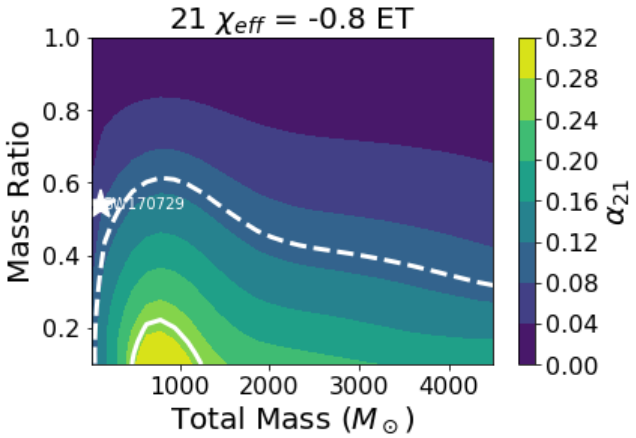

Figure 36. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = -0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.

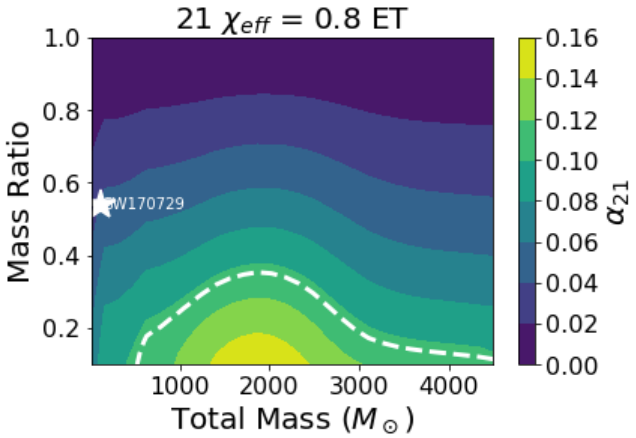

Figure 37. Ratio of the signal-to-noise ratio in the Einstein Telescope of the l,m = (2,1) to the l,m = (2,2) multipole as a function of mass ratio and total mass ($M_\odot$) for an overhead system viewed edge-on with spins parallel to the orbital angular momentum, $\chi_{eff} = 0.8$. Contour levels are chosen to maximise the resolution of feature on this plot.