Poster Session #E
Astrophysics and Gravitational Waves

E11

GW190521 formation via three-body encounters in young massive star clusters

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GW190521 is the most massive binary black hole (BBH) merger observed to date. This catastrophic event, which happened ~ 4.53 Gpc away from us, gave birth to a ~ 140 Msun black hole falling in the still unexplored intermediate-mass black hole (IMBH) regime. The origin of GW190521 is still matter of debate: several hints may favor a dense stellar environment as a birthplace. In my presentation, I will discuss the impact of three-body encounters on the formation of GW190521-like systems in young ($<$100 Myr) massive ($10^3 - 3 \times 10^4$ Msun) star clusters. I will show the results of 10^5 dynamical interactions between a BBH and a massive BH simulated with post-Newtonian terms up to the 2.5 order, and a relativistic kick prescription for merger remnants. Particular importance will be given to the discussion of our initial conditions. All the resulting BBHs from the simulations have, on average, higher total and chirp masses and lower mass ratios than the initial conditions, and have eccentricities close to one. Moreover, dynamical encounters increase the number of massive ($>$60 Msun) BBH mergers from $\sim 0.3\%$ up to $\sim 2.5\%$ and the number of IMBH binary mergers from $\sim 0.1\%$ up to $\sim 0.6\%$. About 11% of the simulated BBH mergers have the components in the same mass range as GW190521; three of these binaries are second-generation BBHs. This leads to a merger rate density of $\sim 0.2 Gp^{-3} yr^{-1}$ for systems like GW190521.