

Abstract Submitted
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LIGO-Virgo binary black holes in the pair-instability mass gap

BRENDAN O'BRIEN, University of Florida — By probing the population of binary black hole (BBH) mergers detected by LIGO-Virgo, we can infer properties of the underlying black hole formation channels. A mechanism known as pair-instability (PI) supernova is expected to prevent the formation of black holes from stellar collapse with mass greater than $\sim 40 - 65 M_{\odot}$ and less than $\sim 120 M_{\odot}$. Any BBH merger detected by LIGO-Virgo with a component black hole in this gap, known as the PI mass gap, likely originated from an alternative formation channel. Here, we identify outlier BBH events of the population of binaries which consist of black holes produced by stellar evolution. If the PI mass gap lower boundary exists between $40 - 65 M_{\odot}$, we firmly establish GW190521 as an outlier to this stellar-mass BBH population [p-value $< 0.01\%$]. If the lower boundary of the PI mass gap is a sharp cutoff at $40 M_{\odot}$, we find two BBH events — GW190521 [p-value $< 0.01\%$] and GW190706₂₂₂₆₄₁ [p-value $\approx 1\%$] — — — *to be outliers of this population. Excluding these two events, we find the remaining detected BBH events to be con-*

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