Gravitational-Wave Transient Catalog 2 Compact Binary Coalescences from the first part of the third Observing Run (O3a)

GW190408_181802	▶ -		\rightarrow	\rightarrow	HLV	BBH
GW190412	-			- \	HLV	BBH
GW190413_052954					HLV	BBH
GW190413_134308			\rightarrow		HLV	BBH
GW190421_213856			\rightarrow		HL	BBH
GW190424_180648	~		\rightarrow		L	BBH
GW190425			\blacktriangleright	ŀ	LV	BNS
GW190426_152155	♦		\checkmark	♦-	HLV	BBH/NSBH
GW190503_185404	\sim		\rightarrow	\sim	HLV	BBH
GW190512_180714	\diamond		\rightarrow	\rightarrow	HLV	BBH
GW190513_205428	\diamond		\sim	\rightarrow	HLV	BBH
GW190514_065416	\rightarrow		$ \longrightarrow $		HL	BBH
$GW190517_055101$	\diamond		\rightarrow	\leftarrow	HLV	BBH
$GW190519_153544$	\rightarrow		\rightarrow		HLV	BBH
GW190521	\sim		$ \longrightarrow $		HLV	BBH
GW190521_074359	\diamond		\diamond	\checkmark	HL	BBH
$GW190527_092055$	\leftarrow		$ \longrightarrow $		HL	BBH
$GW190602_{175927}$	\leftarrow		\rightarrow		HLV	BBH
$GW190620_030421$	\leftarrow		\rightarrow		LV	BBH
$GW190630_185205$	\diamond		\rightarrow	\diamond	LV	BBH
$GW190701_{203306}$	\leftarrow		$ \longrightarrow $	\leftarrow	HLV	BBH
$GW190706_{222641}$	\leftarrow		$ \rightarrow $		HLV	BBH
$GW190707_093326$			~	\diamond	HL	BBH
$GW190708_{232457}$	\leftarrow		→	\diamond	LV	BBH
$GW190719_{215514}$			$ \rightarrow $		HL	BBH
$GW190720_000836$			\leftarrow	~	HLV	BBH
$GW190727_060333$	\rightarrow		\rightarrow		HLV	BBH
$GW190728_064510$			\leftarrow	↔	HLV	BBH
GW190731_140936	\leftarrow		\rightarrow		HL	BBH
GW190803_022701	←		\rightarrow		HLV	BBH
GW190814	+	♦	\rightarrow	4	LV	BBH/NSBH
GW190828_063405	♦		\rightarrow	\rightarrow	HLV	BBH
GW190828_065509			\rightarrow	-	HLV	BBH
GW190909_114149					HL	BBH
GW190910_112807	~				LV	BBH
GW190915_235702					HLV	BBH
GW190924_021846				◆	HLV	BBH
GW190929_012149					HLV	BBH
GW190930_133541				—	HL	BBH
(0 50 100	0.0 0.5 1.0 -	-1 0 1	0 3 6		
	m_1/M_{\odot}	q	$\chi_{ ext{eff}}$	$D_{\rm L}/{ m Gpc}$		

The 39 new events reported in the catalog are listed above with their primary mass in solar masses, m_1/M_{\odot} , mass ratio, $q = m_2/m_1$, effective spin perpendicular to the orbital plane, χ_{eff} , and distance, D_L .

Also listed are the detectors that observed each event (*H: Hanford, L: Livingston, V: Virgo*) and the most likely source classification (*BBH: Binary Black Hole, BNS: Binary Neutron Star, NSBH: Neutron Star Black Hole*).

Gravitational - Compact Binary C first part of the thi	Wave Tran Coalescences rd Observing	from the Run (O3a)	LIG			
Observing period: 1st April to 1st October 2019 15:00 False Alarm Rate (FAR) thre Mean event rate: ~3 events	2019 15:00 UTC UTC shold: 2 per year every 2 weeks	More than 3 times as many detect Gravitational-Wave Transient C 5 real-time GW search pipelines 4 'exceptional' events previously	ctions as in atalog 1 operating y published			
33 low latency GCN alerts – 7 alert retractions + 13 new offline events reported for the first time = 39 catalog events from O3a						
Events of Note						
GW190521	1 Most massive binary system with total mass = 157.9 M_{\odot}					
GW190425Least massive system & Closest eventTotal Mass = $3.4 M_{\odot}$; Distance = 0.16 Gpc						
GW190426_152155 Second lowest total mass (M = 7.2 M_{\odot}), NSBH or BBH						
GW190814	Most extreme mass ratio q = 0.11, NSBH or BBH					
GW190924_021846	Least massive de	finite BBH system with total Mass = ²	13.9 M _⊙			
GW190514_065416	Lowest effective s	pin perpendicular to orbital plane: χ_{ϵ}	_{eff} = -0.16			
GW190517_055101	Highest effective sp	in perpendicular to the orbital plane:	X _{eff} = 0.53			
GW190909_114149	Most distant event Luminosity distance = 4.77 Gpc; Redshift = 0.75					
GW190412	First event with evid Aside from GW1	ence of higher multipole mode cor 90814, most unequal mass ratio: q =	ntribution • 0.28			
 Four events (GW190519 GW190706_222641) have GW190521 is the most p Closest event, GW19042 Most unequal mass event golf ball. 	GWTC-2 F 9_153544, GW19052 /e total black hole r owerful gravitation 25, i s still more than ht, GW190814 , is like	un Facts 21, GW190602_175927 and masses that likely exceed 100 sol al-wave event ever observed. 800 billion times more distant that e comparing the weight of a socce	ar masses. an Pluto. er ball and a			