## THE CLASSICAL DERIVATION OF THE REMNANT MASS OF A QUASI-BINARY BLACK HOLE.

## ALEXIS ZAGANIDIS

ABSTRACT. In the present article, we classically derive an analytic formula of the Remnant Mass of a Quasi-Binary Black Hole. The Quasi Black Hole concept comes from a Theory Of Everything we have developed few years ago.

From the Quasi Black Hole concept from the Theory Of Everything we have developed previously, the radial distribution of a quasi black hole is the following :

(1) 
$$r = \frac{2 G M(r)}{c^2}$$

(2) 
$$M(r) = \frac{c^2}{2 G} r$$

The symmetric radial distribution is the following :

(3) 
$$\frac{d M(r)}{dr} = 4\pi r^2 \rho(r)$$

(4) 
$$\rho(r) = \frac{1}{4\pi r^2} \frac{d M(r)}{dr}$$

(5) 
$$\rho(r) = \frac{c^2}{8\pi \ G \ r^2}$$

The classical derivation of the gravitational binding of a quasi black hole is :

(6) 
$$U = -\int_{0}^{R} \frac{G M(r) 4\pi r^{2} \rho(r)}{r} dr$$

(7) 
$$U = -\int_{0}^{R} \frac{c^{2}}{2 G} \times \frac{c^{2}}{2} dr$$

(8) 
$$U = -\frac{c^2}{4 G}r$$

(9) 
$$U = -\frac{1}{2} M c^2$$

(10)

An immediate corollary of that formula derivation is : the merging of a quasi-binary black hole into a radial symmetric quasi black hole does not emit gravitational waves and does not loose mass.

Date: December 12, 2023.

From the concept of a quasi-black hole from the Theory Of Everything that we developed previously, to avoid any singularities of the spacetime metric, the probability of the paths of the quantum particles corresponding to these singularities is zero and the gravity can have a repulsive behavior in this case. Therefore, the merging of a quasi-binary black hole into a radial symmetric quasi black hole may not happen if that process create singularities into the the spacetime metric.

A very relevant criteria from the Theory Of Everything we have developed previously is : for any spacelike hypersurfaces and for any spatial geometric sphere with radius  $\tilde{r}$  inside them, the mass  $\tilde{m}(\tilde{r})$  contained in that spatial geometric sphere should be smaller or equal to  $\frac{c^2}{2 G} R$ .

We can apply that relevant criteria by considering a spatial geometric sphere at the median point of a quasi-binary black hole and derive the minimal distance between both quasi black holes to avoid any singularities of the spacetime metric.

The first relevant case is to derive the mass function  $\tilde{m}(\tilde{r})$  at the median point of both identical quasi black holes with radius R = 1, with G = c = 1 and a spatial separation  $d_0/2 = \cot(2/3)$ .

The ordinate  $\tilde{h}$  of the intersection between the spatial geometric sphere with radius  $\tilde{r}$  and one of the unit quasi black hole is:

(11) 
$$h^2 + x_1^2 = \tilde{r}^2$$

(12) 
$$h^2 + x_2^2 = R^2$$

(13) 
$$x_1 + x_2 = d_0/2$$

$$(14) R = 1$$

The analytic solution h of that set of equation is :

(15) 
$$h = \frac{\sqrt{4 \ \tilde{r}^2 \ R^2 - (\tilde{r}^2 + R^2 - d_0^2/4)^2}}{d_0}$$

Therefore, the mass  $\tilde{m}(\tilde{r})$  contained in that spatial geometric sphere is :

(16) 
$$\tilde{m} = 4\pi H \left( \frac{d_0^2}{4} + R^2 - \tilde{r}^2 \right) \int_{\sqrt{R^2 - h^2}}^{R} dh' \int_{0}^{\sqrt{R^2 - h'^2}} \frac{r \, dr}{8\pi \left( h'^2 + r^2 \right)}$$

(17) 
$$+4\pi H \left(\tilde{r}^2 - d_0^2/4 - R^2\right) \int_{-R}^{\sqrt{R^2 - h^2}} dh' \int_{0}^{\sqrt{R^2 - h'^2}} \frac{r \, dr}{8\pi \left(h'^2 + r^2\right)}$$

(18) 
$$+4\pi \int_{\sqrt{\tilde{r}^2 - h^2}}^{\tilde{r}} dh' \int_{0}^{\sqrt{\tilde{r}^2 - h'^2}} \frac{r \, dr}{8\pi \left( \left( d_0/2 - h' \right)^2 + r^2 \right)}$$

The second relevant case is to derive the mass function  $\tilde{m}(\tilde{r})$  at the median point of two different quasi black holes with radius  $R_1 = 1$  and  $R_2 = \log (e - 1)$ , with G = c = 1 and a unit spatial separation d/2 = 1. The radius ratio of the quasibinary black hole is  $\xi_0 = R_2/R_1 = \log (e - 1)$ .

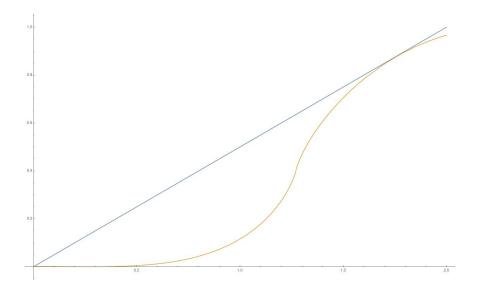


FIGURE 1. The abscissa is the radius of the spatial geometric sphere centered at the origin. The ordinate is the mass  $\tilde{m}(\tilde{r})$  contained inside the spatial geometric sphere of radius  $\tilde{r}$  from both unit quasi black hole of radius 1 and centered at  $(x, y) = (\pm d/2, 0)$ .

The ordinate  $\tilde{h}$  of the intersection between the spatial geometric sphere with radius  $\tilde{r}$  and the unit quasi black hole is:

(19) 
$$h_1^2 + x_1^2 = \tilde{r}^2$$

(20) 
$$h_1^2 + x_2^2 = R^2$$

(21) 
$$x_1 + x_2 = R_1$$

$$(22) R_1 = 1$$

The ordinate  $\tilde{h}$  of the intersection between the spatial geometric sphere wit radius  $\tilde{r}$  and the smaller quasi black hole is:

(23) 
$$h_2^2 + x_1^2 = \tilde{r}^2$$

(24) 
$$h_2^2 + x_2^2 = R_2^2$$

(25) 
$$x_1 + x_2 = R_2$$

(26)

The analytic solution  $\tilde{h}$  of that set of equation is :

(27) 
$$h_1 = \frac{\sqrt{4 \ \tilde{r}^2 \ R_1^2 - \tilde{r}^4}}{2 \ R_1}$$

(28) 
$$h_2 = \frac{\sqrt{4 \ \tilde{r}^2 \ R_2^2 - \tilde{r}^4}}{d \ R_2}$$

Therefore, the mass  $\tilde{m}(\tilde{r})$  contained in that spatial geometric sphere is :

$$(29) \quad \tilde{m} = 2\pi \ H \left( 2 \ R_1^2 - \tilde{r}^2 \right) \int_{\sqrt{R_1^2 - h_1^2}}^{R_1} dh' \int_0^{\sqrt{R_1^2 - h'^2}} \frac{r \ dr}{8\pi \ (h'^2 + r^2)} (30) \qquad + 2\pi \ H \left( \tilde{r}^2 - 2 \ R_1^2 \right) \int_{-R_1}^{\sqrt{R_1^2 - h_1^2}} dh' \int_0^{\sqrt{R_1^2 - h'^2}} \frac{r \ dr}{8\pi \ (h'^2 + r^2)} (31) \qquad + 2\pi \int_{\sqrt{\tilde{r}^2 - h_1^2}}^{\tilde{r}} dh' \int_0^{\sqrt{\tilde{r}^2 - h'^2}} \frac{r \ dr}{8\pi \left( (R_1 - h')^2 + r^2 \right)} (32) \qquad + 2\pi \int_{\sqrt{\tilde{r}^2 - h_1^2}}^{\tilde{r}} dh' \int_0^{\sqrt{\tilde{r}^2 - h'^2}} \frac{r \ dr}{8\pi \left( (R_1 - h')^2 + r^2 \right)} (33) \qquad + 2\pi \int_{\sqrt{\tilde{r}^2 - h_1^2}}^{\tilde{r}} dh' \int_0^{\sqrt{\tilde{r}^2 - h'^2}} \frac{r \ dr}{8\pi \left( (R_1 - h')^2 + r^2 \right)}$$

(32) 
$$+ 2\pi H (2 R_2 - \tilde{r}) H (2 R_2^2 - \tilde{r}^2) \int_{\sqrt{R^2 - h_2^2}}^{R_2} dh' \int_{0}^{\sqrt{R_2^2 - h'^2}} \frac{r \, dr}{8\pi (h'^2 + r^2)} \sqrt{\frac{R^2 - h'^2}{R^2 - h'^2}} \frac{r \, dr}{R^2 - h'^2}$$

(33) 
$$+ 2\pi H (2 R_2 - \tilde{r}) H (\tilde{r}^2 - 2 R_2^2) \int_{-R_2}^{\sqrt{R_2^2 - h_2^2}} dh' \int_{0}^{\sqrt{R^2 - h'^2}} \frac{r \, dr}{8\pi (h'^2 + r^2)}$$

(34) 
$$+ 2\pi H (2 R_2 - \tilde{r}) \int_{\sqrt{\tilde{r}^2 - h_2^2}}^{r} dh' \int_0^{\sqrt{r} - h} \frac{r dr}{8\pi \left( (R_2 - h')^2 + r^2 \right)}$$

$$(35) \qquad + H\left(\tilde{r} - 2 R_2\right) R_2/2$$

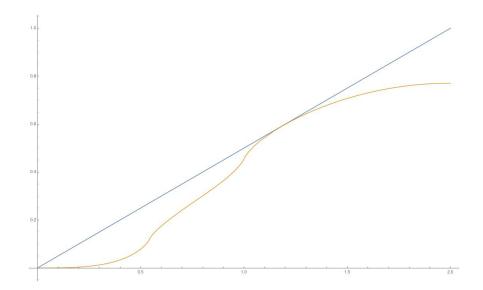


FIGURE 2. The abscissa is the radius of the spatial geometric sphere centered at the origin. The ordinate is the mass  $\tilde{m}(\tilde{r})$ contained inside the spatial geometric sphere of radius  $\tilde{r}$  from a quasi unit black hole of radius  $R_1 = 1$  and centered at (x, y) =(-1, 0) and from a quasi black hole of radius  $R_2$  and centered at  $(x, y) = (R_2, 0)$ . The mass  $\tilde{m}(\tilde{r})$  contained in that spatial geometric sphere should be smaller than  $\tilde{r}/2$  to avoid any singularities of the spacetime metric.

In both cases, the mass  $\tilde{m}(\tilde{r})$  contained in that spatial geometric sphere should be smaller than  $\tilde{r}/2$  to avoid any singularities of the spacetime metric.

From the final distance between both quasi lack holes derived by the linear interpolation of the two previous cases, we can classically derive the remnant mass of the quasi-binary black hole from the lost mass between the final remnant mass and the initial quasi-binary black hole mass :

$$(36) \Delta M \ c^{2} = (M_{1} + M_{2} - M_{3}) \ c^{2} = (37) \frac{G \ M_{1} \ M_{2}}{C_{GR} \ \left(\frac{2 \ G \ M_{1}}{c^{2}} + \frac{2 \ G \ M_{2}}{c^{2}}\right) \left(H \ (\xi_{0} - \xi) + H \ (\xi - \xi_{0}) \left(d_{0}/2 + (1 - d_{0}/2) \ \frac{1 - \xi}{1 - \xi_{0}}\right)\right)} (38) C_{GR} = 4\pi/5 (39) d_{0}/2 = \cot (2/3) (40) \xi_{0} = log \ (e - 1) (41) \xi = min \ (M_{1}, M_{2}) \ /max \ (M_{1}, M_{2}) (42)$$

To perfectly match the list of gravitational wave observations, we need to introduce the constant  $C_{GR} = 4\pi/5$  to the previous classical derivation in order to take in account the effects of general relativity.  $C_{GR} = 4\pi/5$  is chosen in order to have a unit median GW ratio (the median GW ratio is the 42th-43th GW ratio over the 85 GW ratio in total) for the ratios between the theoretical lost masses and the observed lost masses. Only 7 Gravitational Waves Events (GW Events) are far from the theoretical ratios of which 5 of them involve very light masses (a light mass is more close to a neutron star than a quasi black hole) :

Er	numeration						atio Lost Mass Theoretical/Observed
	1	GW200322	34.	14.	53.	-5.	-0.364814
	2	GW200115	5.7	1.5	7.8	-0.6	-0.364047
	3	GW170817	1.27	0.72	2.8	-0.81	-0.102791
	4	GW190620	57.	36.	87.	6.	0.642191
	5	GW200308	36.4	13.8	47.4	2.8	0.657346
	6	GW190521	85.	66.	142.	9.	0.666715
	7	GW190828	32.1	26.2	54.9	3.4	0.671427
	8	GW200114	78.	70.	140.	8.	0.700833
	9	GW200105	8.9	1.9	10.4	0.4	0.720005
	10	GW200224	40.	32.5	68.6	3.9	0.728951
	11	GW190706	67.	38.	99.	6.	0.732176
	12	GW191222	45.1	34.7	75.5	4.3	0.73931
	13	GW190519	66.	41.	101.	6.	0.740365
	14	GW190727	38.	29.4	63.8	3.6	0.744721
	15	GW190521	42.2	32.8	71.	4.	0.74488
	16	GW190517	37.4	25.3	59.3	3.4	0.756084
	17	GW170729	50.6	34.3	80.3	4.6	0.756436
	18	GW200128	42.2	32.6	71.	3.8	0.783311
	19	GW191230	49.4	37.	82.	4.4	0.787759
	20	GW200208	51.	12.3	61.	2.3	0.792536
	21	GW200129	34.5	28.9	60.3	3.1	0.794129
	22	GW190602	69.	48.	111.	6.	0.795325
	23	GW200112	35.6	28.3	60.8	3.1	0.813636
	24	GW170823	39.6	29.4	65.6	3.4	0.815921
	25	GW200219	37.5	27.9	62.2	3.2	0.821259
	26	GW190424	39.5	31.	67.1	3.4	0.821511
	27	GW150914	35.6	30.6	63.1	3.1	0.821919
	28	GW200311	34.2	27.7	59.	2.9	0.8378
	29	GW170814	30.7	25.3	53.4	2.6	0.840808
	30	GW190701	53.9	40.8	90.2	4.5	0.841978

31	GW190421	Primary Mass   40.6	Secondary Mass 31.4	Remnant Mass   68.6	Lost Mass Observed 3.4	Ratio Lost Mass Theoretical/Observ 0.84243
32	GW190421 GW190910	40.6	35.6	75.8	3.4	0.84245
32		43.9	35.6 61.		3.7	0.843042
33	GW200220	37.	20.8	141.	2.8	
	GW190719					0.864057
35	GW190731	41.5	28.8	67.	3.3	0.869275
36	GW191216	12.1	7.7	18.87	0.93	0.881222
37	GW190413	45.4	30.9	72.8	3.5	0.892817
38	GW200209	35.6	27.1	59.9	2.8	0.894614
39	GW190803	37.3	27.3	61.7	2.9	0.898656
40	GW191109	65.	47.	107.	5.	0.906182
41	GW190527	36.5	22.6	56.4	2.7	0.909079
42	GW191204	11.9	8.2	19.21	0.89	0.922816
43	GW190413	33.4	23.4	54.3	2.5	0.925346
44	GW170809	35.2	23.8	56.4	2.6	0.930461
45	GW191105	10.7	7.7	17.6	0.8	0.931449
46	GW200208	37.8	27.5	62.5	2.8	0.942148
47	GW190708	17.6	13.2	29.5	1.3	0.950151
48	GW190503	43.3	28.4	68.6	3.1	0.953161
49	GW190408	24.5	18.3	41.	1.8	0.954554
50		38.9	27.9	64.	2.8	
50 51	GW200220		27.9	64. 13.3	2.8	0.966873
51	GW190924	8.9 35.3	5. 24.4	13.3		0.969727
	GW190915				2.5	0.975181
53	GW151226	13.7	7.7	20.5	0.9	0.995287
54	GW170818	35.5	26.8	59.8	2.5	0.997725
55	GW191113	29.	5.9	34.	0.9	1.00198
56	GW190630	35.1	23.7	56.4	2.4	1.00482
57	GW190707	11.6	8.4	19.2	0.8	1.01103
58	GW191126	12.1	8.3	19.6	0.8	1.04285
59	GW200302	37.8	20.	55.5	2.3	1.04602
60	GW190513	35.7	18.	51.6	2.1	1.04815
umeration	GW Event Name	Primary Mass	Secondary Mass	Remnant Mass	Lost Mass Observed	Ratio Lost Mass Theoretical/Obser
numeration 61	GW Event Name   GW190728	Primary Mass   12.3	Secondary Mass   8.1	Remnant Mass   19.6	Lost Mass Observed 0.8	Ratio Lost Mass Theoretical/Obser 1.05921
umeration 61 62	GW Event Name	Primary Mass   12.3 31.	Secondary Mass 8.1 20.1	Remnant Mass   19.6 49.1	Lost Mass Observed 0.8 2.	Ratio Lost Mass Theoretical/Obser
umeration 61 62 63	GW Event Name   GW190728	Primary Mass   12.3 31. 23.3	Secondary Mass 8.1 20.1 12.6	Remnant Mass   19.6 49.1 34.5	Lost Mass Observed 0.8 2. 1.4	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.07443
umeration 61 62	GW Event Name   GW190728 GW170104	Primary Mass   12.3 31.	Secondary Mass 8.1 20.1	Remnant Mass   19.6 49.1	Lost Mass Observed 0.8 2.	Ratio Lost Mass Theoretical/Obser 1.05021 1.05476
umeration 61 62 63	GW Event Name GW190728 GW170104 GW190512	Primary Mass   12.3 31. 23.3	Secondary Mass 8.1 20.1 12.6	Remnant Mass   19.6 49.1 34.5	Lost Mass Observed 0.8 2. 1.4	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.07443
umeration 61 62 63 64	GW Event Name   GW190728 GW170104 GW190512 GW170608	Primary Mass   12.3 31. 23.3 10.9	Secondary Mass 8.1 20.1 12.6 7.6	Remnant Mass 19.6 49.1 34.5 17.8	Lost Mass Observed 0.8 2. 1.4 0.7	Ratio Lost Mass Theoretical/Obser 1.05021 1.05476 1.07443 1.07743
umeration 61 62 63 64 65	GW Event Name GW190728 GW170104 GW190512 GW170608 GW191215 GW190412	Primary Mass   12.3 31. 23.3 10.9 24.9	Secondary Mass 8.1 20.1 12.6 7.6 18.1	Remnant Mass   19.6 49.1 34.5 17.8 41.4	Lost Mass Observed 0.8 2. 1.4 6.7 1.6	Ratio Lost Mass Theoretical/Obser 1.65821 1.65476 1.07443 1.07743 1.08591 1.09745
umeration 61 62 63 64 65 66	GW Event Name GN190728 GN170104 GN190512 GN170608 GW191215 GN190412 GN190828	Primary Mass   12.3 31. 23.3 10.9 24.9 29.7	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4	Remnant Mass   19.6 49.1 34.5 17.8 41.4 37.	Lost Mass Observed 0.8 2. 1.4 6.7 1.6 1.1	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.07743 1.07743 1.08591 1.09495 1.09854
umeration 61 62 63 64 65 66 67 68	GW Event Name GW190728 GW170104 GW17010512 GW170688 GW191215 GW190412 GW190828 GW200202	Primary Mass   12.3 31. 23.3 10.9 24.9 29.7 24.1 10.1	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3	Remnant Mass   19.6 49.1 34.5 17.8 41.4 37. 33.1 16.76	Lost Mass Observed 0.8 1.4 0.7 1.6 1.1 1.2 0.64	Ratio Lost Mass Theoretical/Obser 1.65621 1.65476 1.07443 1.0743 1.08591 1.09495 1.09854 1.09854
umeration 61 62 63 64 65 66 67 68 69	GW Event Name GN190728 GN170194 GN190512 GN190628 GN191215 GN190828 GN190828 GN200202 GN190720	Primary Mass   12.3 31. 23.3 10.9 24.9 29.7 24.1 10.1 13.4	Secondary Mass 8.1 12.6 7.6 18.1 8.4 16.2 7.3 7.8	Remnant Mass 49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4	Lost Mass Observed 6.8 2. 1.4 6.7 1.6 1.1 1.2 0.64 0.8	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.08591 1.09495 1.09956 1.09956
umeration 61 62 63 64 65 66 67 68 69 70	GW Event Name GW190728 GW170104 GW190512 GW190512 GW190512 GW190412 GW190828 GW290202 GW290202 GW290720 GW290225	Primary Mass 12.3 31. 23.3 10.9 24.9 29.7 24.1 10.1 13.4 19.3	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3 7.8 14.	Remnant Mass 19.6 49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4 32.1	Lost Mass Observed 0.6 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2	Ratio Lost Mass Theoretical/Obser 1.65621 1.65476 1.67443 1.67443 1.68591 1.69854 1.09854 1.09966 1.10692 1.1218
umeration 61 62 63 64 65 66 67 68 69 70 71	GW Event Name GN190728 GN170194 GN190512 GN170608 GN191215 GN190828 GN200202 GN190720 GN200225 GN200225 GN200216	Primary Mass   12.3 11. 23.3 10.9 24.9 29.7 24.1 10.1 13.4 19.3 51.	Secondary Mass 8.1 20.1 12.6 7.6 18.1 10.2 7.3 7.3 7.8 14. 30.	Remnant Mass   49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4 32.1 78.	Lost Mass Observed 6.8 2. 1.4 6.7 1.6 1.1 0.64 6.8 1.2 3.	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.08591 1.09854 1.09956 1.10602 1.1218 1.12502
umeration 61 62 63 64 65 66 67 68 69 70 71 72	GW         Event         Name           GW199728         GW170184           GW199128         GW199122           GW1991215         GW199228           GW296226         GW296226           GW296225         GW296226           GW199514         GW199514	Primary Mass   12.3 31. 23.3 10.9 24.9 29.7 24.1 10.1 13.4 19.3 51. 39.	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4	Remnant Mass   19.6 49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4 32.1 78. 65.	Lost Mass Observed 0.6 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 2.4	Ratio Lost Mass Theoratical/Obser 1.05621 1.054743 1.07443 1.08547 1.08591 1.08955 1.08954 1.08956 1.10692 1.1218 1.12692 1.1248
umeration 61 62 63 64 65 66 67 68 69 70 71 72 73	GW Event Name Gw199728 Gw199728 Gw199512 Gw199512 Gw199512 Gw199612 Gw199612 Gw199720 Gw209226 Gw209216 Gw209216 Gw199519	Primary Mass   12.3 31. 23.3 16.9 24.9 24.7 24.1 16.1 13.4 19.3 51. 39. 81.	Secondary Mass 8.1 20.1 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24.	Remnant Mass   19.6 49.1 34.5 17.8 41.4 33.1 16.76 20.4 32.1 78. 65. 102.	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 0.64 0.8 1.2 3. 2.4 3.	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.049551 1.09854 1.09996 1.12692 1.1218 1.12692 1.12427 1.13517
umeration 61 62 63 64 65 66 67 70 70 70 71 72 73 74	<ul> <li>GW Event Name GW190728 GW170164 GW190512 GW190512 GW190412 GW190828 GW200225 GW200225 GW200225 GW200225 GW200226 GW190514 GW190514</li> </ul>	Primary Mass   12.3 31, 23.3 24.9 29.7 24.1 10.1 13.4 19.3 51, 39, 81, 11.8	Secondary Mass   8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9	Remnant Mass   19.6 49.1 34.5 17.8 41.4 33.1 16.76 20.4 32.1 78. 65. 162. 19.	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7	Ratio Lost Mass Theoratical/Obser 1.05921 1.05743 1.07743 1.05743 1.08591 1.08954 1.08956 1.08956 1.10996 1.1208 1.1218 1.1247 1.13517 1.15593
umeration 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75	GW         Event Name           GN199728         GN199728           GN199512         GN19512           GN199512         GN199512           GN199428         GN299226           GN199729         GN2992926           GN199512         GN199528           GN2992926         GN2992926           GN199519         GN199539           GN199599         GN191103           GN191264         GN191264	Primary Mass   12.3 31. 23.3 16.9 24.9 24.7 24.1 16.1 13.4 19.3 51. 39. 81. 11.8 27.3	Secondary Mass 8.1 20.1 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9 19.3	Remnant Mass   19.6 49.1 34.5 17.8 41.4 33.1 16.76 20.4 32.1 78. 65. 102. 19. 45.	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7 1.6	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.09851 1.09956 1.09956 1.12692 1.1218 1.12692 1.13517 1.15593 1.15931
umeration 61 62 63 64 65 66 67 68 69 70 70 71 72 73 74 73 74 75 76	GW         Event         Name           GH199736         GH199736           GH199512         GH199512           GH199512         GH199622           GH199726         GH199726           GH299514         GH199514           GH199514         GH199514           GH199514         GH199514           GH199514         GH199514	Primary Mass   12.3 31 24.9 24.9 24.1 10.1 13.4 19.3 51. 39. 81. 11.8 27.3 12.3	Secondary Mass   8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9 19.3 7.8	Remnant Mass   19.6 49.1 34.5 37. 33.1 16.76 20.4 32.1 78. 65. 102. 19. 45. 19.4	Lost Mass Observed 0.8 2.4 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7 1.6 0.7 1.6 0.7	Ratio Lost Mass Theoratical/Obser 1.05021 1.05446 1.0743 1.085501 1.08854 1.08854 1.08965 1.16996 1.1218 1.1218 1.1247 1.13517 1.13573 1.14401 1.1296
umeration 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77	GW Event Name GW199728 GW170104 GW199512 GW170608 GW191215 GW199612 GW199612 GW199628 GW200202 GW199720 GW200216 GW199514 GW19959 GW19959 GW199120 GW191120	Primary Mass   12.3 31. 23.3 16.9 24.9 24.7 24.1 10.1 13.4 19.3 51. 39. 81. 11.8 27.3 12.3 10.7	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 10.2 7.3 7.8 14. 30. 28.4 7.9 19.3 7.8 6.7	Remnant Mass   19.6 49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4 32.1 78. 65. 192. 19. 45. 19.4 16.8	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7 1.6 0.7 0.6 0.7 0.6	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.09851 1.09956 1.09956 1.12692 1.1218 1.12692 1.13517 1.15593 1.18401 1.18906 1.22021
umeration 61 62 63 64 65 66 67 70 70 70 71 72 73 74 73 73 75 76 77 78	<ul> <li>GW Event Name</li> <li>GW 199738</li> <li>GW 1907164</li> <li>GW 190512</li> <li>GW 190512</li> <li>GW 190512</li> <li>GW 190726216</li> <li>GW 190514</li> <li>GW 190529</li> <li>GW 190514</li> <li>GW 190529</li> <li>GW 19120514</li> <li>GW 190529</li> <li>GW 191203</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 191204</li> <li>GW 200316</li> </ul>	Primary Mass   12.3 31.3 24.9 24.9 24.1 10.1 13.4 10.3 51. 39. 81. 11.8 27.3 12.3 10.7 13.1	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 14. 30. 28.4 24. 7.9 19.3 7.8 6.7 7.8 6.7 7.8	Remnant Mass   19.6 49.1 34.5 17.8 41.4 41.4 41.4 41.7 20.4 32.1 78. 65. 19. 45. 19. 45. 19.4 16.8 20.2	Lost Mass Observed 0.8 2. 14 0.7 1.1 1.1 1.2 0.64 0.8 1.2 3. 0.7 1.6 0.7 0.6 0.7 0.6	Ratio Lost Mass Theoratical/Obser 1.85011 1.85445 1.8743 1.8743 1.89531 1.8945 1.8945 1.8945 1.18956 1.1218 1.1218 1.1247 1.13517 1.13517 1.13593 1.18401 1.20281 1.20281 1.20281
umeration 61 62 63 64 65 66 67 70 71 72 73 74 75 76 77 78 79	GW Event Name GW199728 GW170104 GW199512 GW170608 GW191215 GW199612 GW199612 GW199628 GW200202 GW199720 GW200216 GW199514 GW19959 GW19959 GW199120 GW191120	Primary Mass   12,3 31, 23,3 10,9 24,9 29,7 24,1 10,1 13,4 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 13,1 12,3 10,7 13,1 12,3 10,7 13,1 12,3 10,7 13,1 12,5 13,1 12,5 13,1 13,	Secondary Mass 8.1 20.1 12.6 7.6 18.1 10.2 7.3 7.8 14. 28.4 7.9 19.3 7.8 19.3 7.8 6.7 7.8 14.3 14.4 19.3 19.5	Remnant Mass   19.6 49.1 34.5 17.8 41.4 33.1 16.76 20.4 32.1 75. 65. 102. 19. 45. 19. 45. 19. 45. 19. 41.6.8 20.2 41.7	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 3. 2.4 3. 2.4 3. 1.4 0.64 0.7 1.6 0.7 0.6 0.7 1.6 0.7 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.07743 1.07743 1.09854 1.09956 1.12692 1.1218 1.12593 1.13517 1.15593 1.18401 1.18906 1.20211 1.24491 1.27679
umeration 61 62 63 64 65 66 67 70 70 70 71 72 73 74 73 73 75 76 77 78	<ul> <li>GW Event Name</li> <li>GW 199738</li> <li>GW 1907164</li> <li>GW 190512</li> <li>GW 190512</li> <li>GW 190512</li> <li>GW 190726216</li> <li>GW 190514</li> <li>GW 190529</li> <li>GW 190514</li> <li>GW 190529</li> <li>GW 19120514</li> <li>GW 190529</li> <li>GW 191203</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 190529</li> <li>GW 191204</li> <li>GW 191204</li> <li>GW 200316</li> </ul>	Primary Mass   12.3 31.3 24.9 24.9 24.1 10.1 13.4 10.3 51. 39. 81. 11.8 27.3 12.3 10.7 13.1	Secondary Mass 8.1 20.1 12.6 7.6 18.1 8.4 14. 30. 28.4 24. 7.9 19.3 7.8 6.7 7.8 6.7 7.8	Remnant Mass   19.6 49.1 34.5 17.8 41.4 41.4 41.4 41.7 20.4 32.1 78. 65. 19. 45. 19. 45. 19.4 16.8 20.2	Lost Mass Observed 0.8 2. 14 0.7 1.1 1.1 1.2 0.64 0.8 1.2 3. 0.7 1.6 0.7 0.6 0.7 0.6	Ratio Lost Mass Theoratical/Obser 1.85011 1.85445 1.8743 1.8743 1.89531 1.8945 1.8945 1.8945 1.18956 1.1218 1.1218 1.1247 1.13517 1.13517 1.13593 1.18401 1.20281 1.20281 1.20281
numeration 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79	GW Event Name GN199728 GN170124 GN199512 GN170608 GN199512 GN199612 GN199612 GN199628 GN200226 GN200226 GN200226 GN199514 GN199539 GN199539 GN191204 GN19959 GN191204 GN19959 GN191204 GN19959 GN191204 GN19959 GN191204 GN19959 GN191204 GN19059 GN191204 GN19059 GN191204 GN19059 GN191204 GN19059 GN191204 GN19059 GN191204 GN19059	Primary Mass   12,3 31, 23,3 10,9 24,9 29,7 24,1 10,1 13,4 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 10,1 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 11,5 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 12,3 10,7 13,1 12,3 10,7 13,1 12,3 10,7 13,1 12,3 10,7 13,1 12,5 13,1 12,5 13,1 13,	Secondary Mass 8.1 20.1 12.6 7.6 18.1 10.2 7.3 7.8 14. 28.4 7.9 19.3 7.8 19.3 7.8 6.7 7.8 14.3 14.4 19.3 19.5	Remnant Mass   19.6 49.1 34.5 17.8 41.4 33.1 16.76 20.4 32.1 75. 65. 102. 19. 45. 19. 45. 19. 45. 19. 41.6.8 20.2 41.7	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 3. 2.4 3. 2.4 3. 1.4 0.64 0.7 1.6 0.7 0.6 0.7 1.6 0.7 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6	Ratio Lost Mass Theoretical/Obser 1.05921 1.05476 1.0743 1.0743 1.09851 1.09956 1.09956 1.12692 1.1218 1.12692 1.13517 1.15593 1.15933 1.18401 1.18906 1.22021 1.24491 1.27679
umeration 61 62 63 64 65 66 66 69 70 70 71 72 73 74 73 74 75 76 77 78 79 80	<ul> <li>GW Event Name GW190728</li> <li>GW190728</li> <li>GW170144</li> <li>GW170512</li> <li>GW190512</li> <li>GW1908412</li> <li>GW190828</li> <li>GW208202</li> <li>GW1907205</li> <li>GW208215</li> <li>GW208215</li> <li>GW1907205</li> <li>GW1901215</li> <li>GW1901205</li> <li>GW19</li></ul>	Primary Mass   12.3 311 23.3 10.9 24.9 24.1 10.1 13.4 10.3 51. 39. 81. 11.8 27.3 12.3 10.7 13.1 28.3 23.3	Secondary Mass 8.1 201 12.6 7.6 18.1 18.4 14. 30. 28.4 24. 7.9 19.3 7.8 6.7 7.8 14.8 13.3 7.8 14.3 19.3 7.8 14.3 19.3 7.8 19.3 7.8 10.2	Remnant Mass   19.6 49.1 34.5 17.8 41.4 41.4 33.1 16.76 20.4 32.1 78. 65. 19. 45. 19.4 16.8 20.2 41.7 35.7	Lost Mass Observed 0.8 2. 14 0.7 1.1 1.1 1.2 0.64 0.8 1.2 3. 0.7 1.6 0.7 1.4 0.7 1.4 1.2	Ratio Lost Mass Theoretical/Obser 1.65821 1.65476 1.67433 1.69591 1.69591 1.69854 1.69856 1.10895 1.1285 1.1285 1.1285 1.12862 1.12862 1.12481 1.15896 1.22081 1.22779 1.22419 1.53951
numeration 61 62 63 64 65 66 68 69 70 71 72 73 74 75 6 77 77 78 79 80 81 82	GW         Event         Name           GH199728         GH199728           GH199724         GH199524           GH199524         GH19954           GH199726         GH199726           GH199726         GH199628           GH299412         GH199628           GH299514         GH199514           GH199514         GH199514           GH199519         GH199516           GH19951103         GH191129           GH299515         GH191129           GH191129         GH191129           GH208316         GH191129           GH208316         GH191129           GH208316         GH191129           GH208316         GH19208210	Primary Mass   12.3 31.1 23.3 10.9 24.9 29.7 29.7 29.7 29.7 29.7 29.7 10.1 10.4 10.3 51. 39. 81. 11.8 27.3 10.7 13.1 28.3 23.3 46. 24.1	Secondary Mass 8.1 20.1 12.6 7.6 13.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9 19.3 7.8 6.7 7.8 14.8 13.6 28. 2.8.3	Remnant Mass   19.6 49.1 31.5 17.8 41.4 41.4 33.1 16.76 20.4 32.1 78. 65. 19. 19. 45. 19. 45. 19. 45. 20.2 41.7 26.7 26.7 26.7	Lost Mass Observed 0.8 2. 1.4 0.7 1.1 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7 1.6 0.7 1.4 1.2 0.7 1.4 0.7 0.6 0.7 1.4 1.2 0.2 3. 0.7 0.5 0.7 0.4 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.7 0.5 0.7 0.7 0.5 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Ratio Lost Mass Theoretical/Obser 1.85921 1.85476 1.87443 1.87443 1.87491 1.89854 1.89854 1.89854 1.10692 1.128 1.128 1.128 1.128 1.128 1.12895 1.15593 1.18401 1.22811 1.22811 1.22419 1.22419 1.23951 2.02542
umeration 61 62 63 64 65 66 67 68 69 70 71 72 73 74 73 74 75 76 77 78 80 81 82 83	GN Event Name GN190728           GN190728           GN170124           GN170124           GN190512           GN190202           GN190202           GN190202           GN190728           GN200210           GN190514           GN190514           GN190514           GN190514           GN190514           GN190514           GN190514           GN190514           GN190514           GN200316           GN19099           GN200306           GN151012           GN190999           GN200306           GN1909814	Primary Mass   12,3 31, 23,3 10,9 24,9 29,7 24,1 16,1 13,4 19,3 51, 39, 81, 11,8 27,3 12,3 12,3 12,3 40,9 29,7 24,9 20,7 24,9 20,7 24,9 20,7 24,9 20,7 24,9 20,7 24,9 20,7 24,9 20,7 21,3 21,4 21,3 21,4 21,3 21,4 21,3 21,3 21,4 21,3 21,5	Secondary Mass 8.1 29.1 12.6 7.6 18.1 18.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9 13.3 7.8 14. 31.6 28.4 2.6 7.8 14.8 13.6 28.4 2.6 7.8 14.8 13.6 28.4 2.5 2.5 9 2.6 2.6 2.6 2.6 2.6 2.6 2.6 2.6	Remnant Mass   19.6 49.1 34.5 17.8 41.4 37. 33.1 16.76 20.4 32.1 78. 65. 102. 119.4 19.4 19.4 19.4 19.4 19.4 19.4 19	Lost Mass Observed 0.8 2. 1.4 0.7 1.6 1.1 1.2 0.64 0.8 1.2 3. 0.7 1.6 0.7 0.6 0.7 0.6 0.7 1.4 1.2 2. 0.2 0.4 0.8 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Ratio Lost Mass Theoretical/Obser 1.65821 1.65476 1.07443 1.085491 1.08591 1.08854 1.08854 1.08986 1.1208 1.1218 1.12692 1.1248 1.15503 1.15503 1.15903 1.2079 1.22679 1.22419 1.53951 2.02542 2.25558
umeration 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 77 77 78 79 80 81 82	GW         Event         Name           GH199728         GH199728           GH199724         GH199524           GH199524         GH19954           GH199726         GH199726           GH199726         GH199628           GH299412         GH199628           GH299514         GH199514           GH199514         GH199514           GH199519         GH199516           GH19951103         GH191129           GH299515         GH191129           GH191129         GH191129           GH208316         GH191129           GH208316         GH191129           GH208316         GH191129           GH208316         GH19208210	Primary Mass   12.3 31.1 23.3 10.9 24.9 29.7 29.7 29.7 29.7 29.7 29.7 10.1 10.4 10.3 51. 39. 81. 11.8 27.3 10.7 13.1 28.3 23.3 46. 24.1	Secondary Mass 8.1 20.1 12.6 7.6 13.1 8.4 10.2 7.3 7.8 14. 30. 28.4 24. 7.9 19.3 7.8 6.7 7.8 14.8 13.6 28. 2.8.3	Remnant Mass   19.6 49.1 31.5 17.8 41.4 41.4 33.1 16.76 20.4 32.1 78. 65. 19. 19. 45. 19. 45. 19. 45. 20.2 41.7 26.7 26.7 26.7	Lost Mass Observed 0.8 2. 1.4 0.7 1.1 1.1 1.2 0.64 0.8 1.2 3. 2.4 3. 0.7 1.6 0.7 1.4 1.2 0.7 1.4 0.7 0.6 0.7 1.4 1.2 0.2 3. 0.7 0.5 0.7 0.4 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.5 0.7 0.7 0.5 0.7 0.7 0.5 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Ratio Lost Mass Theoretical/Obser 1.85921 1.85476 1.87443 1.87443 1.87491 1.89854 1.89854 1.89854 1.10692 1.128 1.128 1.128 1.128 1.128 1.12895 1.15593 1.18401 1.22811 1.22811 1.22419 1.22419 1.23951 2.02542

## References

- A. Zaganidis, "The last update of the Source Files of the present article: The Classical Derivation of the Remnant Mass of a Quasi-Binary Black Hole." https://drive.google.c om/drive/folders/17ogu0ydWPTauSgjNomIY22qCnSpIpJwC?usp=sharing.
- [2] A. Zaganidis, "An introduction to the n-irreducible sequents and the n-irreducible number.," viXra, 2017.
- [3] A. Zaganidis, "A New Robust Theory of Everything with Expected 10-100 ppb Anomalies in some Gravitational Experiments depending on the Ratio Neutron-Proton.," viXra, 2020.
- [4] Wikipedia. https://en.wikipedia.org/wiki/Sequent\_calculus.
- [5] Wikipedia. https://en.wikipedia.org/wiki/Theory\_of\_everything.
- [6] Wikipedia. https://en.wikipedia.org/wiki/List\_of\_gravitational\_wave\_observations.
- [7] Wikipedia. https://en.wikipedia.org/wiki/Gravitational\_wave.
- [8] Wikipedia. https://en.wikipedia.org/wiki/Binary\_black\_hole.
- [9] Wikipedia. https://en.wikipedia.org/wiki/Black\_hole.
- [10] Wikipedia. https://en.wikipedia.org/wiki/Schwarzschild\_metric.
- [11] Wikipedia. https://en.wikipedia.org/wiki/Hypersurface.
- [12] S. M. Carroll, "Lecture notes on general relativity," 1997.