Gravitational Waves and Electromagnetic Radiations from Dyon-Dyon Bound Systems

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Overview

- Binary black hole system inspiralling in, generates Gravitational Waves.
- Consider a black hole having both electric and magnetic charges, *Dyonic Black hole*.
- A binary system consisting of dyonic blackholes, interacting *electromagnetically and gravitationally*.
- In our project we have analysed the fields and power of electromagnetic and gravitational radiation.

Results

Charges : $q_2 = \sqrt{G} m_2 1.0 \times 10^{-5}$, $g_1 = hc/(4\pi q_2)$

Parametes						Results		
m_1	m_2	$r_1/R_{\rm BH}$	$r_2/R_{\rm BH}$	$E\,(\rm erg)$	$l\,(\rm g\,cm^2\,s^{-1})$	$\omega\,(\rm rad\,s^{-1})$	$P_{em}\,(\rm erg\,s^{-1})$	$P_{\rm GW}\,(\rm erg\,s^{-1})$
$29.0\,M_\odot$	$36.0\,M_\odot$	20.6	617.4	-4.0×10^{52}	6.1×10^{52}	40.0	2.5×10^{40}	1.5×10^{50}
5.0×10^{26}g	5.0×10^{26}g	18.6	557.4	-3.9×10^{44}	3.4×10^{36}	7.0×10^{9}	5.7×10^{40}	4.2×10^{50}
2.9×10^{21}g	3.6×10^{22}g	34.4	1031.7	-1.2×10^{39}	2.6×10^{27}	2.8×10^{13}	3.2×10^{37}	6.8×10^{46}
1.0×10^{15}g	1.0×10^{16}g	33.8	1013.4	-4.3×10^{32}	2.4×10^{14}	1.0×10^{20}	5.2×10^{37}	1.2×10^{47}

Charges : $q_2 = \sqrt{G} m_2 1.0 \times 10^{-3}$, $g_1 = hc/(4\pi q_2)$

Parametes						Results		
m_1	m_2	$r_1/R_{\rm BH}$	$r_2/R_{\rm BH}$	$E\,(\rm erg)$	$l\,(\rm g\,cm^2\,s^{-1})$	$\omega\,(\rm rad\,s^{-1})$	$P_{em}\,(\rm erg\,s^{-1})$	$P_{\rm GW}\,(\rm erg\,s^{-1})$
5.0×10^{26}g	6.0×10^{26}g	20.3	608.1	-3.5×10^{44}	4.4×10^{36}	5.0×10^{9}	2.8×10^{44}	1.7×10^{50}

Charges : $q_2 = \sqrt{G} m_2 1.0 \times 10^{-3}$, $g_1 = hc/(4\pi e), e = 4.8 \times 10^{-10}$esu

Parametes						Results		
m_1	m_2	$r_1/R_{\rm BH}$	$r_2/R_{\rm BH}$	$E\,(\rm erg)$	$l\,(\rm g\,cm^2\,s^{-1})$	$\omega\,(\rm rad\,s^{-1})$	$P_{em}\,(\rm erg\,s^{-1})$	$P_{\rm GW}\,(\rm erg\,s^{-1})$
10^{16}GeV	10^{20}g	38.0	682.0	-1.1×10^{6}	4.7×10^{-9}	5.0×10^{17}	1.0×10^{6}	9.1×10^{-9}

Summary and Conclusions

- We have calculated the analytic solutions for dynamics of dyon-dyon interaction.
- We discussed electromagnetic interaction due to electric and magnetic charge. Here we have calculated electric field and power of electromagnetic wave for general dyon pairs.
- In last we considered gravitational interaction due to masses of dyons, where we have described the GW ‘+’ as well as ‘x’ polarization and its power. Our GW power matches with Peters and Mathews when electric charges and magnetic monopoles are zero.
- Currently, we are working on the back-reaction problem of Dyon-Dyon interaction for bound systems.

Thank You