

# Method for calculating the quasi normal mode of Kerr BH

$$\left[ \frac{\partial^2}{\partial r^2} + \frac{q_0(r)\omega^2 + q_1(r)\omega + q_2(r)}{\Delta^2} \right] \tilde{R}_{lm} = 0$$

$$\tilde{R}_{lm} = \Delta^{(s+1)/2} R_{lm}, \Delta = r^2 - 2Mr + a^2,$$

$$q_0 = (r^2 + a^2)^2 - a^2\Delta$$

$$q_1 = -4amMr - iaA_1\Delta + 2is[r\Delta - M(r^2 - a^2)]$$

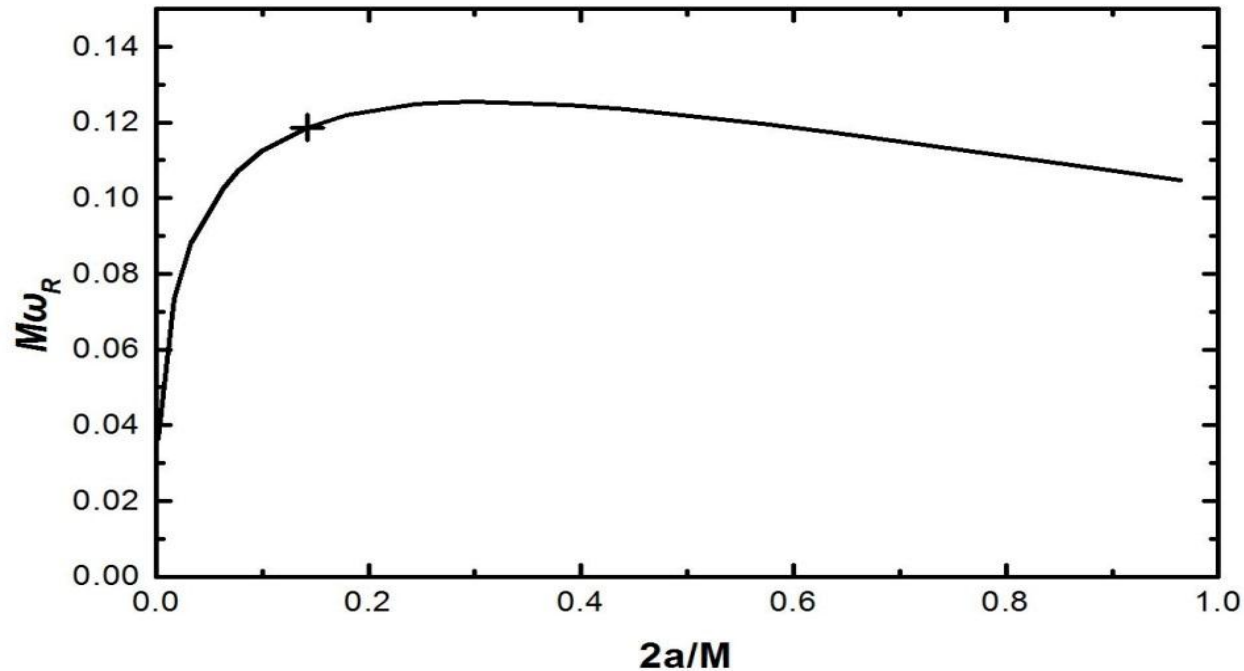
$$q_2 = -m^2(\Delta - a^2) - \Delta(s + A_0) + M^2 - a^2 - s(M - r)[2iam + s(M - r)]$$

## The quasi normal mode:

$$\omega = -m\hat{\omega}, \hat{\omega} = \delta_m / \delta_0, \text{ and:}$$

$$\delta_0 = -2i \int_{C_{r,0}} \frac{\sqrt{q_0}}{\Delta} dr, \delta_m = 2i \int_{C_{r,0}} \frac{Mar}{\Delta\sqrt{q_0}} dr$$

# Possible charge forming mechanism



The real part of the quasi normal mode frequency multiplied by mass versus the angular momentum to mass ratio is plotted. The cross point has the minimum surface area and  $J=2$ , which corresponds to the minimum Kerr black hole in the Planck scale.

# Possible charge forming mechanism

1.  $4\ln 3$  is the minimum area. We set the spin of this minimum Kerr black hole to be 2.
2. For a spin 2 kerr black hole with  $4\ln 3$ , we get its minimum mass is  $4.15m_{pl}$ .
3. The real part of the quasi normal mode energy is  $E = \hbar\omega = \sqrt{\frac{k}{G}} e_r c^2$ .  $\sqrt{\frac{k}{G}} e_r$  has the dimension of mass, and its effect is equivalent to mass.  
we get  $e_r = 5.356e - 19c = \frac{e}{3} \times [1 + (\sim 2.8\%)]$
4. 2.8‰ may be due to the vacuum polarization.
5.  $e/3$  is the charge unit, as found in quark.
6. Charge might also mean energy.

# The preon model

- Current preon model lacks a dynamical framework, and does not have explanation of either rishons or Helons, and does not tell where the triplets comes from.
- Use two numbers, that is, the magnetic momentum quantum number and the area triplet number to give the preon model.
- $$M_{irr}^2 = \frac{1}{2} \left( M^2 + \sqrt{M^4 - J^2} \right)$$
$$\Delta M = M - M_{irr}$$
- For this minimum Kerr BH, the extracted energy is much less than the energy of quasi normal mode that corresponds to  $e/3$ . So, either extracted zero energy or absorb energy.
- one electron state with charge  $-3e$ , one neutrino state with no charge, three quark states with  $-e$ , and three quark states with  $2e$ . These give the charges of standard model quarks and leptons, and adding these states together equals zero

# The preon model

charge	$ka1$	$ka2$	$ka3$	colors
-e	+2	+2	+2	1
0	0	0	0	1
+2e/3	-2	-2	0	3
	-2	0	-2	
	0	-2	-2	
-e/3	+2	0	0	3
	0	+2	0	
	0	0	+2	

Eight states are formed from two numbers of  $ka$  and  $km$ .  $ka1$ ,  $ka2$ , and  $ka3$  are three degenerate states, which can be related with black hole area triplet. Adding these 8 states together gives zero extracted energy.

Report on a possible mechanism of charge forming, by Tongsheng Xia