Re: Polarizability of a Schwarzschild black hole

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"Crown−Horned Snorkack" <chornedsnorkack@hushmail.com> wrote in message
news:3174978b.0411270421.6e934d35@posting.google.com...
> *Suppose that a strictly Schwarzschild black hole (zero electric*
> *monopole charge, zero spin) is subjected to electrostatic or*
> *magnetostatic field.*
>
> *A black hole has no hair. Does it mean that its electric and magnetic*
> *dipole moments must be exactly zero and remain exactly zero in*
> *presence of howsoever strong external static fields?*
>
> *Now suppose that there is a slowly changing electromagnetic field,*
> *such that its wavelength is far in excess of the Schwarzschild radius,*
> *and its phase relationships are such that it is linearly rather than*
> *elliptically polarized, thus it carries no angular momentum and cannot*
> *convert the Schwarzschild black hole into a Kerr one even if absorbed.*
>
> *How can a black hole remove energy from an electromagnetic field*
> *unless it has internal electric and magnetic dipole moments?*
>
> *Obviously, if the wavelength of the field were much less than the*
> *Schwarzschild radius, the hole would have to absorb quite specific*
> *rays and gravitationally deflect the others in quite specific manner.*

The gravitational field of a Schwarzschild black hole originates from a massive central point, but mass in a Kerr (rotating) black hole is distributed in a rotating ring centered about the axis of rotation. The gravitational field is represented by mass monopole and quadrupole moments.

In analogy with the mass distribution of a Kerr BH, one might guess that, in a static electric field, the mass of a Schwarzschild BH might be distributed between two oppositely charged points, the axis through the points being aligned with the electric field. This would create a mass quadrupole moment as well as an electric dipole moment.

In order to achieve charge separation, one could allow positively

charged matter to fall towards one hemisphere of a BH whilst negatively charged mass falls towards the opposite hemisphere. The electric dipole and the mass quadrupole moments of this arrangement both decrease with time as the two oppositely charged massive bodies fall towards the BH in the presence of an externally applied electric field.

Another point is that energy gravitates, and a static electric field contains energy density, (e0 / 2) E^2, where E is the electric field strength. The gravitational field of the BH would attract and concentrate the energy of the external electric field into a shape similar to that generated by an electric dipole moment.

[Old Man]