

Referee response:

1) The limit  $\alpha \rightarrow 0$  (a continuous potential).

In the limit of a continuous potential, equation (35) is no longer valid.

If  $n$  is the lowest integer such that the  $n$ -th derivative of the potential is discontinuous at the surface of the star, then, as shown in Zhang eq. (4.5), the reflection coefficient is instead a function of this discontinuity.

If the potential is  $C$ -infinity and had no maximum (i.e. no light ring,  $R > 3M$ ) we would not expect broad resonance type modes.

2) Does  $R$  play a role in the WKB expansion? What is the magnitude of dropped terms?

As in Mohamed's comments,  $R$  enters into the approximation argument in eqs (30) and (31), which then gives the sinusoidal approximation of eq (37) which we use in the Wronskian evaluated at the surface of the star. Thus, we must have  $M/R$  small.

3) Qualitative argument for the number of Regge poles to take into account for CAM theory to be accurate? And argument for neglecting background integrals?

Agree with Mohamed's comments. This quotation from Nussenzweig's book seems relevant, if only to back up Mohamed's point that it is surprising the background integral is negligible for the BH and UCO cases.

"Within a geometrically illuminated region, the wave function can no longer be dominated by residue series contributions. One expects to find dominant asymptotic contributions from geometrical-optic paths, which we know to be associated with stationary-phase points on the real  $\lambda$  axis [cf. (6.5)]. Thus, in the CAM method, different transformations are required in different regions." Page 50 Nussenzweig.

I think to answer the referees question would require a deeper understanding of the CAM theory than we currently have, and possibly high-frequency / semiclassical analysis.