

The subclass of extremal black holes with vanishing horizon area, extremal vanishing horizon (EVH) black holes, is considered and shown that in the near-horizon limit they generically lead to geometries with AdS_3 factors. Here we explore the idea that a generic extremal black hole may be viewed as excitations around the corresponding EVH black holes by focusing on the EVH black holes in $U(1)^3$ 5d gauged supergravity. We show that there are BPS or non-BPS EVH black hole and, although in both cases an AdS_3 throat appears in the near-horizon limit, the two cases show different behavior which we discuss in some detail. We argue that non-trivial dynamics of near-EVH black holes can be captured by excitations around these AdS_3 geometries, the BTZ black holes. For the latter we study certain double scaling limits by scaling another parameter of the system simultaneously with taking the near-horizon near-EVH limits. The double scaling limits in terms of dual 4d $\mathcal{N} = 4$ $U(N)$ Yang-Mills theory translates into certain large N limits, while focusing on specific sectors containing operators of large R-charge, which is somewhat similar to what happens when one takes the BMN limit of $\mathcal{N} = 4$ Yang-Mills theory. We then argue for a 2d CFT description for the two BMN-type sectors corresponding to BPS and non-BPS EVH black holes.