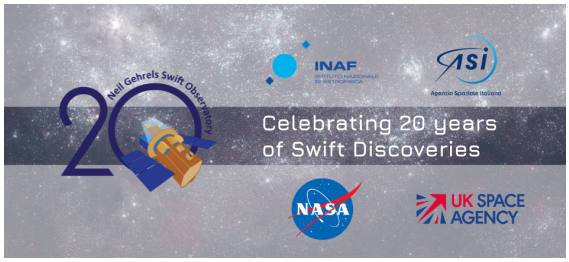

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Characterization of a peculiar Einstein Probe transient EP240408a

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We present the results of our multi-wavelength (X-ray to radio) follow-up campaign of the Einstein Probe transient EP240408a. The initial 10 s trigger displayed bright soft X-ray (0.5-4 keV) radiation with a peak luminosity of 1e49 (1e50) erg/s for an assumed redshift of z=0.5 (2.0). The Neil Gehrels Swift Observatory and Neutron star Interior Composition ExploreR discovered a fading X-ray counterpart lasting for 5 d (observer frame), which showed a long-lived (4 d) plateau-like emission before an extremely sharp powerlaw decline. The plateau emission was in excess of 1e46 (1e47) erg/s at z=0.5 (2.0). Deep optical and radio observations resulted in non-detections of the transient. Our observations with Gemini South revealed a faint potential host galaxy near the edge of the X-ray localization. The faint candidate host, and lack of other potential hosts to deep limits, implies a higher redshift origin, which produces extreme X-ray properties that are inconsistent with many known extragalactic transient classes. In particular, the lack of a bright gamma-ray counterpart, as constrained by GECam-B and Konus-Wind, conflicts with known gamma-ray bursts (GRBs) of similar X-ray luminosities. We therefore favor a jetted tidal disruption event (TDE) as the progenitor of EP240408a at high-z, possibly caused by the disruption of a white dwarf by an intermediate mass black hole. The alternative is that EP240408a may represent a new, previously unknown class of transient.

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