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Unusual Long and Luminous Optical Transient in the Subaru Deep Field

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We present observations of SDF-05M05, an unusual optical transient discovered in the Subaru Deep Field (SDF). The duration of the transient is $>\sim 800$ d in the observer frame, and the maximum brightness during observation reached approximately 23 mag in the i' and z' bands. The faint host galaxy is clearly identified in all 5 optical bands of the deep SDF images. The photometric redshift of the host yields $z \sim 0.6$ and the corresponding absolute magnitude at maximum is ~ -20 . This implies that this event shone with an absolute magnitude brighter than -19 mag for approximately 300 d in the rest frame, which is significantly longer than a typical supernova and ultra-luminous optical transients. The total radiated energy during our observation was 2×10^{52} erg. The light curves and color evolution are inconsistent with all known typical supernova types. We suggest that the transient may be either a unique and peculiar supernova or a new type event at intermediate redshift.