

# Probing the Genesis of Supermassive Black Holes: Emerging Perspectives from JWST and Expectation toward New Wide-Field Survey Observations

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## Unveiling heavily obscured SMBH growth at $z>3$

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Heavily obscured AGN in the early universe are an important population that represent an early, violent growth phase of SMBHs and their host spheroidal components. We performed a MIPS 24 $\mu$ m search for  $z>3$  heavily obscured AGN in the XMM-LSS and COSMOS fields, focusing on their strong rest-frame NIR emission originating from AGN hot dust. As a result of the selection, approximately 90% of the selected sources were not detected by the deep X-ray surveys in these fields. SED fitting analysis of all selected candidates revealed that the AGN bolometric luminosities reach  $\log(L_{\text{bol}}) \sim 46\text{--}48$ , indicating that they are heavily obscured and host SMBHs in a vigorous growth phase. The estimated cosmic SMBH growth rate, including heavily obscured AGN, significantly exceeds previous X-ray study estimates. In addition, current available archival JWST high-resolution images (COSMOS-Web, PRIMER) showed the diverse morphology of their hosts, particularly favoring clumpy structures. These results emphasize the critical role of obscuration in early SMBH growth and how next-generation wide-field surveys and multi-wavelength facilities can uncover these hidden populations, enhancing our understanding of the cosmic accretion history in the early universe.

**Presenter:** MATSUMOTO, Naoki (Tohoku U)