Z105a ALMA lensing cluster survey (ALCS) and follow-up observations using SUBARU

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The ALMA lensing cluster survey (ALCS) is an on-going cycle-6 large program to observe high magnification regions of 33 lensing clusters. The ALCS covers 88 arcmin^2 in total, to a depth of 80 μJy (1.2 mm, 1 σ), achieved by using a 15-GHz-wide spectral scan, to enlarge the survey volume of line-emitting galaxies. The sample comes from the best-studied massive clusters also imaged in HST programs, i.e., CLASH, HFF, and RELICS. In this presentation, we will describe the survey design, the current status of the survey, highlights of some selected initial outcomes, and roles of SUBARU to unveil the nature of ALCS sources. Emphasis will be placed on magnified ALMA sources without HST counterparts, i.e., intrinsically-faint, HST-dark ALMA sources. These sources have faint IRAC counterparts, and the measured 1.2-mm to IRAC flux ratios suggest these are very distant ($z > 4 - 6$) galaxies and/or forming massive galaxies at $z \sim 4$, which are often completely invisible even in the deepest WFC3/HST images. Deep K-band imaging using MOIRCS and SWIMS will be crucial for unveiling the nature of these sources, because the 4000 Å break is shifted reward of K-band, making that band crucial for age measurements of HST-dark galaxies. Deep K-band images will also improve the accuracy in the SED analysis to estimate stellar mass.