X62a　Improving Photometric Redshift constraints for $> 10,000$ simulated galaxies at $z = 1.5 − 5.5$ with the ULTIMATE-Subaru Medium-Band filters

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The ULTIMATE-Subaru project is designing four new medium-band (MB) filters spanning $2 − 2.5\,\mu m$ to provide high – spatial-resolution imaging for intermediate- and high-redshift galaxy studies. To quantify their scientific impact, we have built a library of over 10,000 model galaxies at $1.5 < z < 5.5$ using `BAGPIPES`, with diverse physical properties including stellar ages, dust attenuation. These setups cover young starburst galaxies, typical star-forming galaxies, dusty galaxies, and quiescent galaxies. We test multiple filter configurations that combine ULTIMATE-Subaru MBs with existing and future facilities including HSC, JWST, Roman. Both "wide" surveys with minimal filter sets and "deep" surveys with extensive filter coverage are simulated. Photometric redshifts are then computed with the photometric redshift code: EAzY for each configuration.

Across all situations, adding the ULTIMATE-Subaru MB filters improves photometric-redshift accuracy by at least a factor of ~ 2, compared to setups without the MBs. The largest benefits appear for galaxies whose strong rest-frame optical emission lines (e.g., Hα at $z = 2 − 2.7$, [O III] at $z = 2.9 − 3.9$) enhance one of the new MBs, significantly improving redshift localization. Quiescent galaxies at $z = 4.4 − 5.2$ also benefit substantially, as the MB coverage captures the Balmer break and sharply reduces redshift degeneracies. These results demonstrate the scientific values of incorporating ULTIMATE-Subaru into future wide and deep extragalactic surveys.