

Polarized Aerial Imaging by Retro-Reflection (pAIRR)

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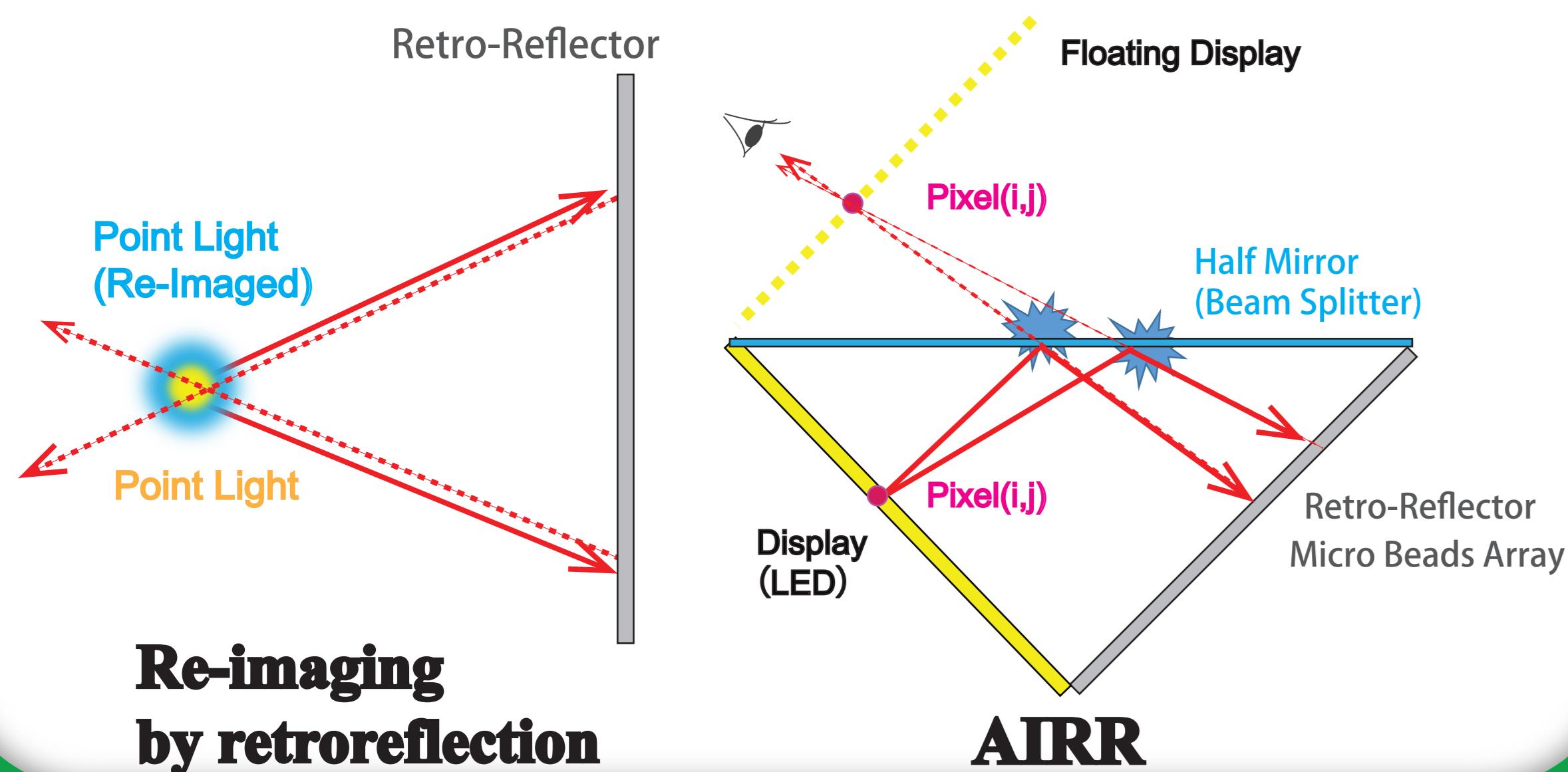
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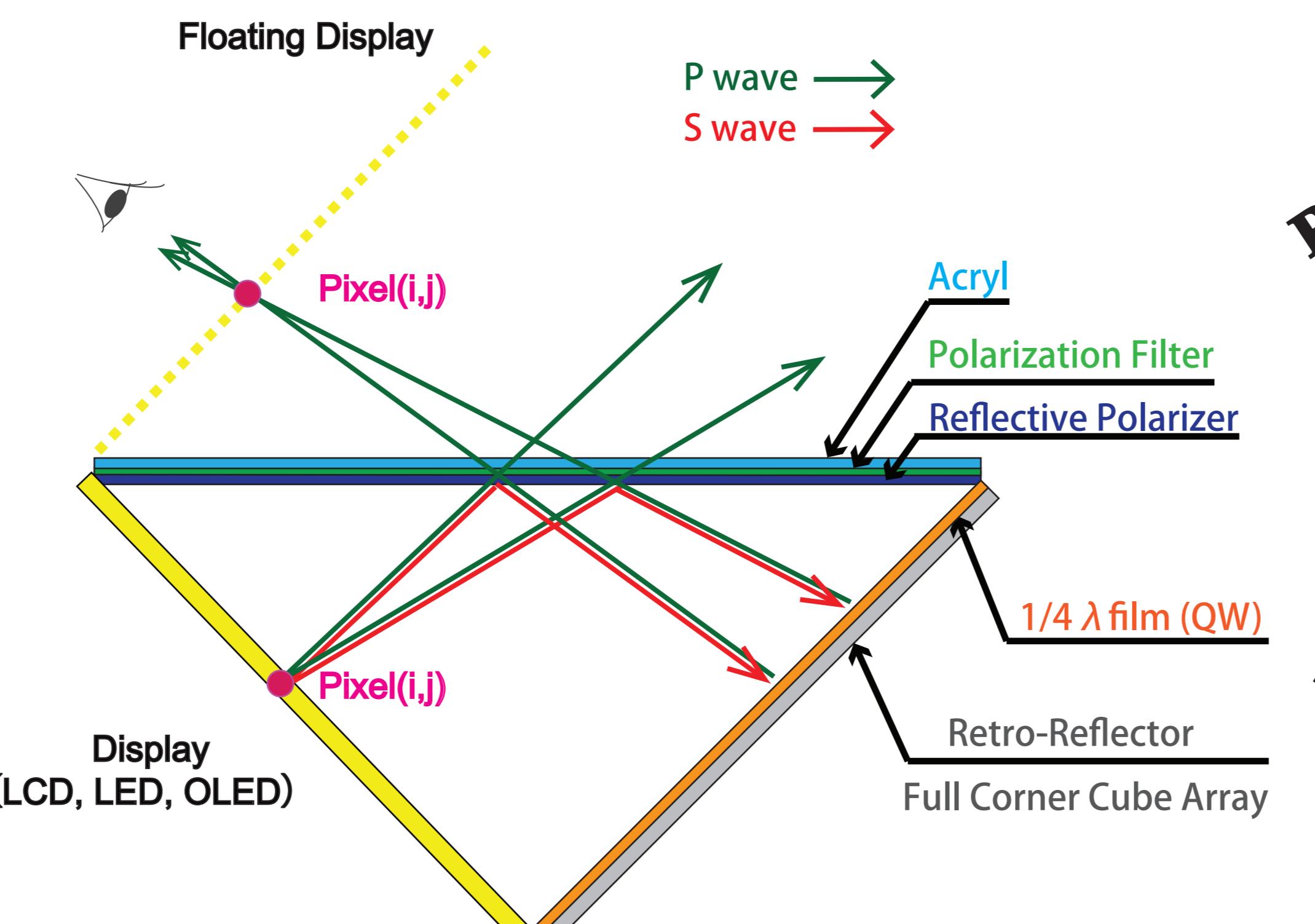
Introduction

Aerial imaging by Retro-Reflection (AIRR) ¹ is a promised technique to create a wide-view floating display by bright LED display, taking advantage of the pseudo-phase-conjugation property of retro-reflection. However, it has a severe, inherent limitation of the low brightness efficiency.



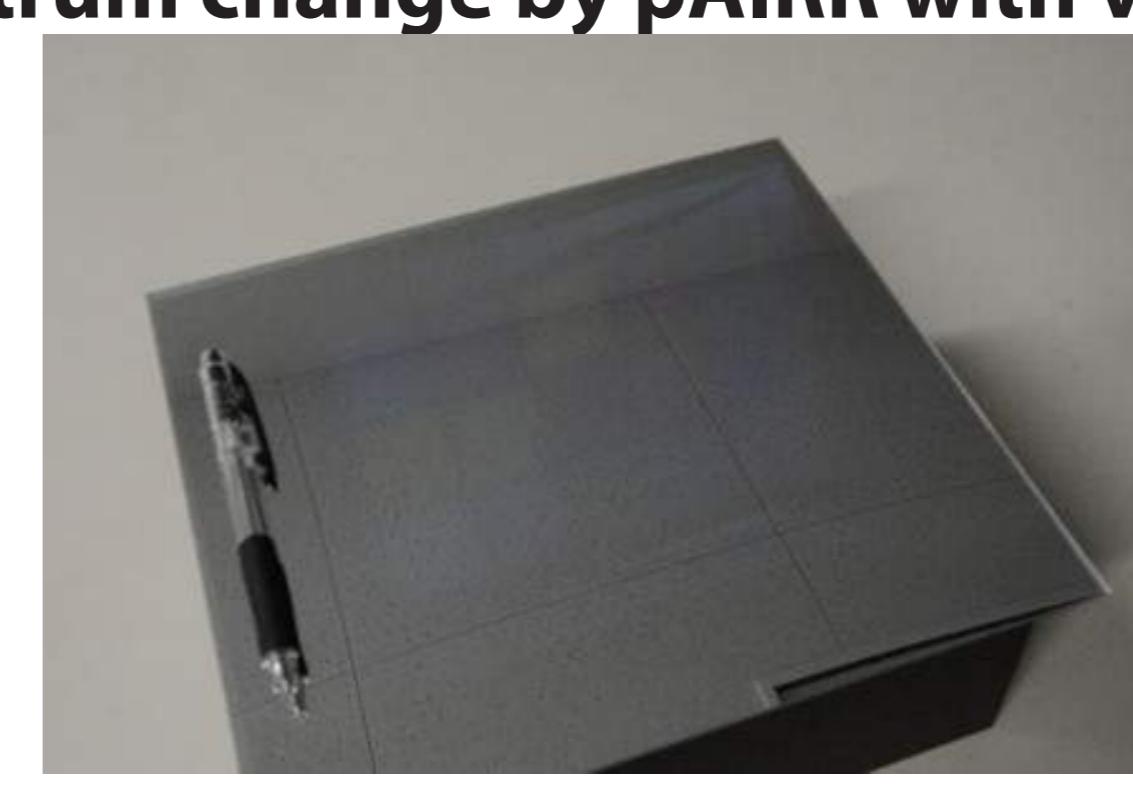
Contribution

1. We propose polarized AIRR (pAIRR) to improve the brightness efficiency ² of AIRR.
2. We have compared the brightness and spectrum change by pAIRR with various materials.

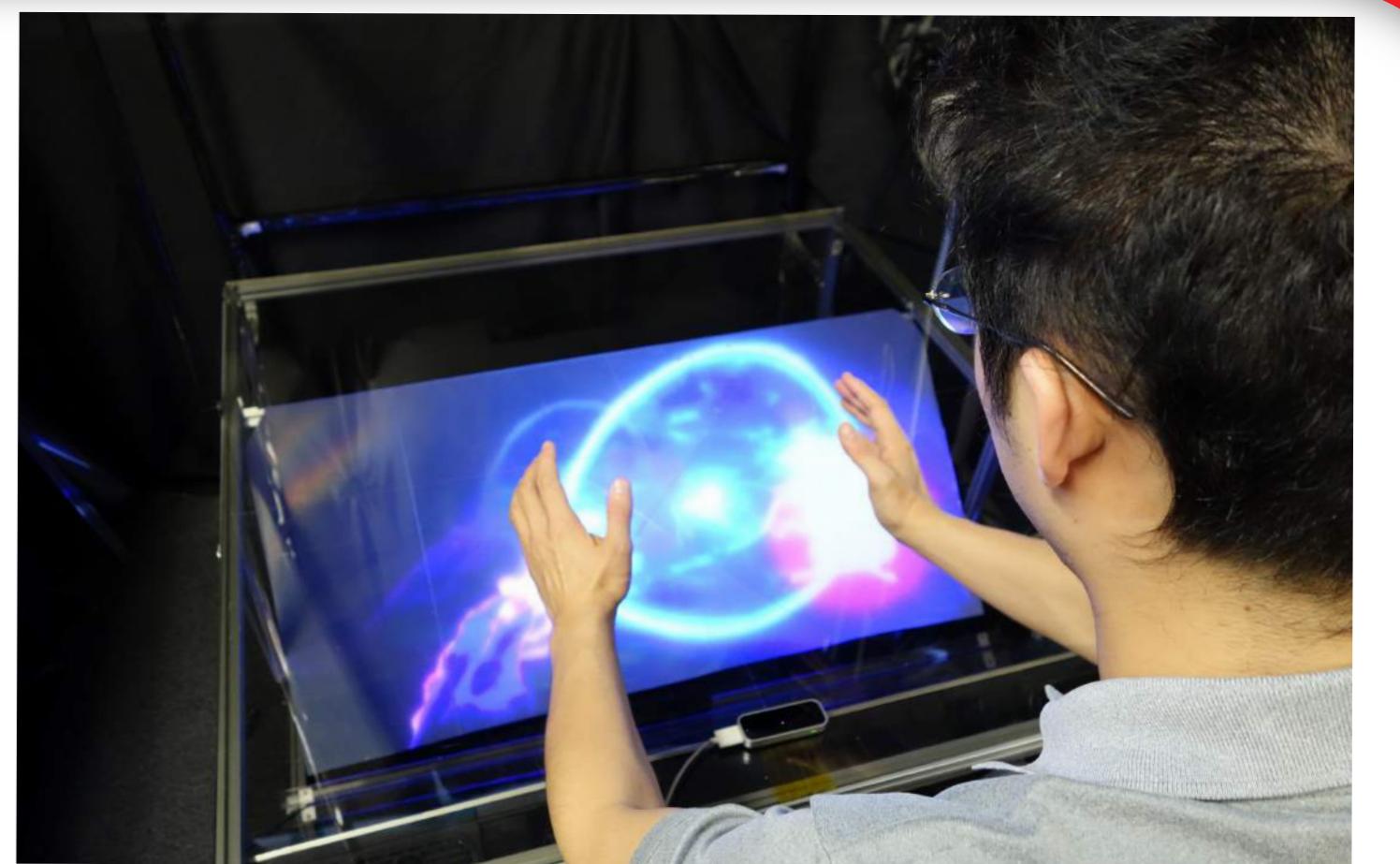


Proposed Design (pAIRR)

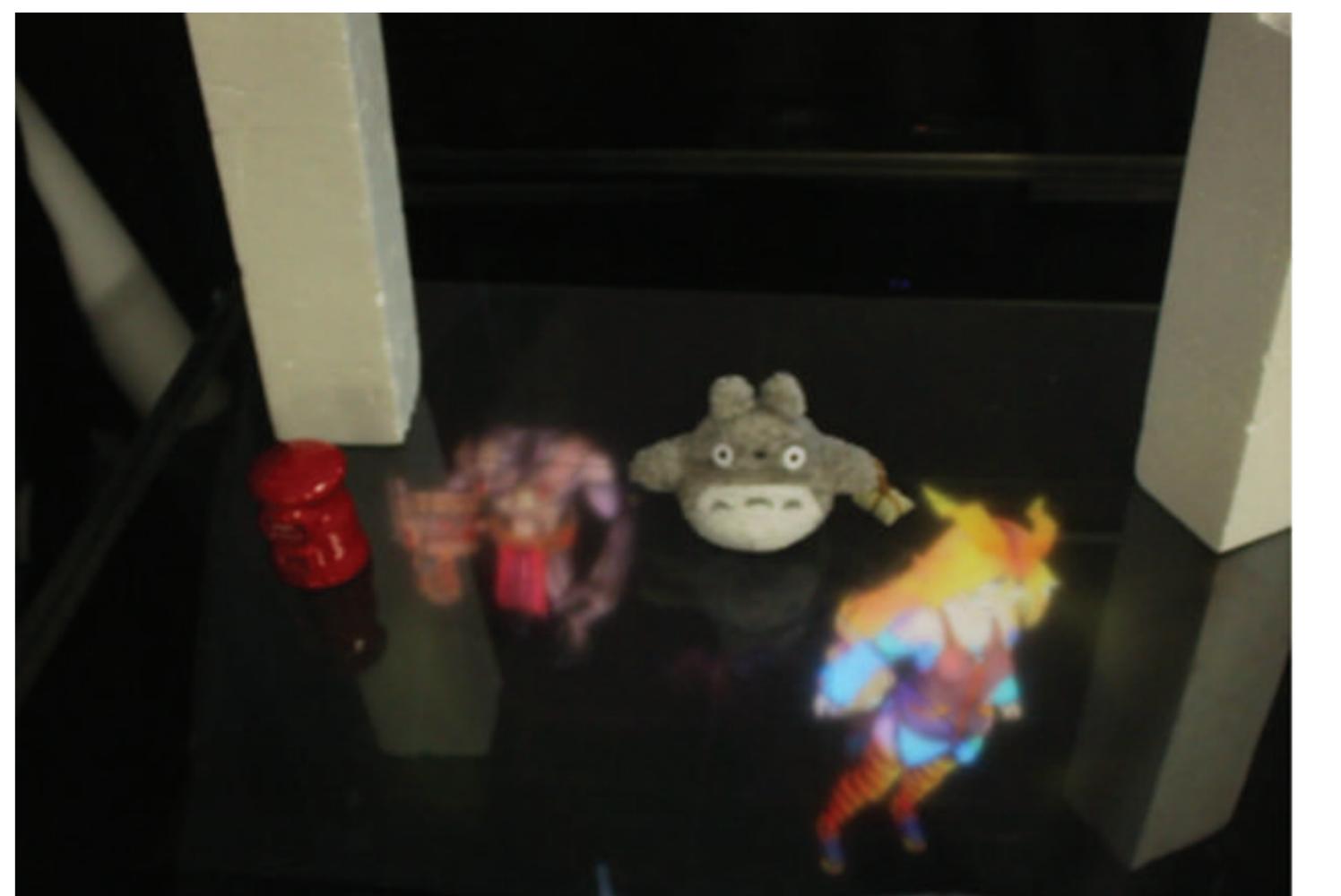
Redesign



Application

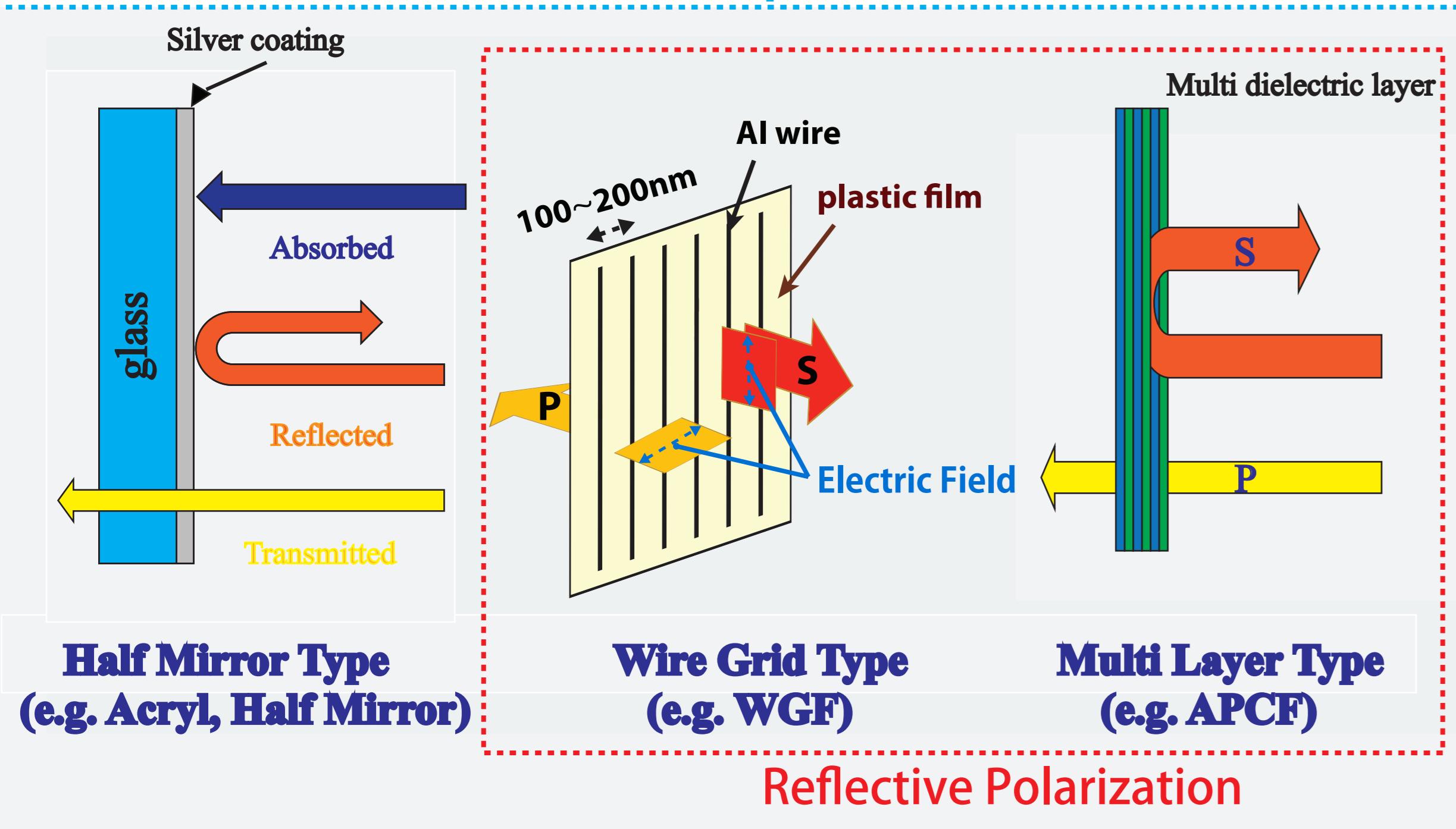


Scalability

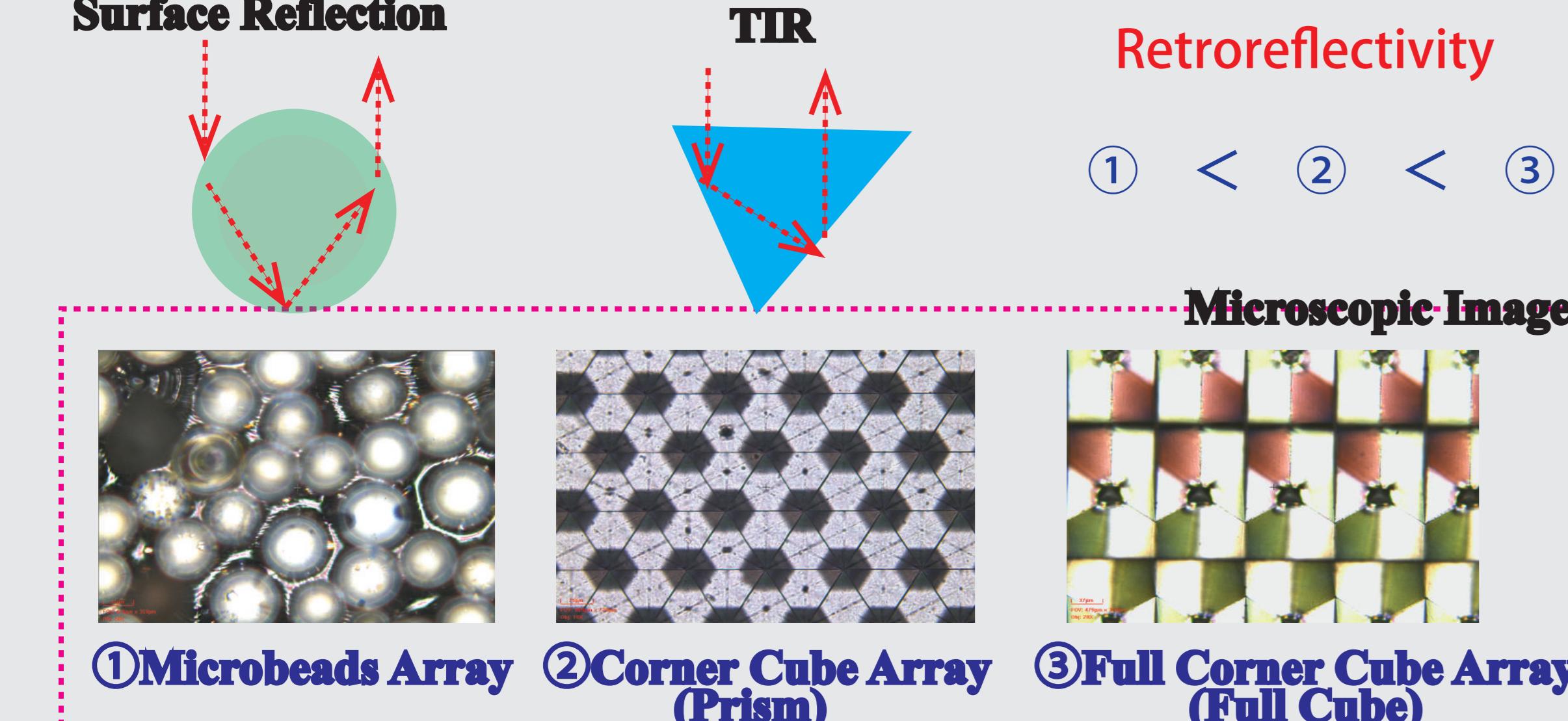


Experimental Materials

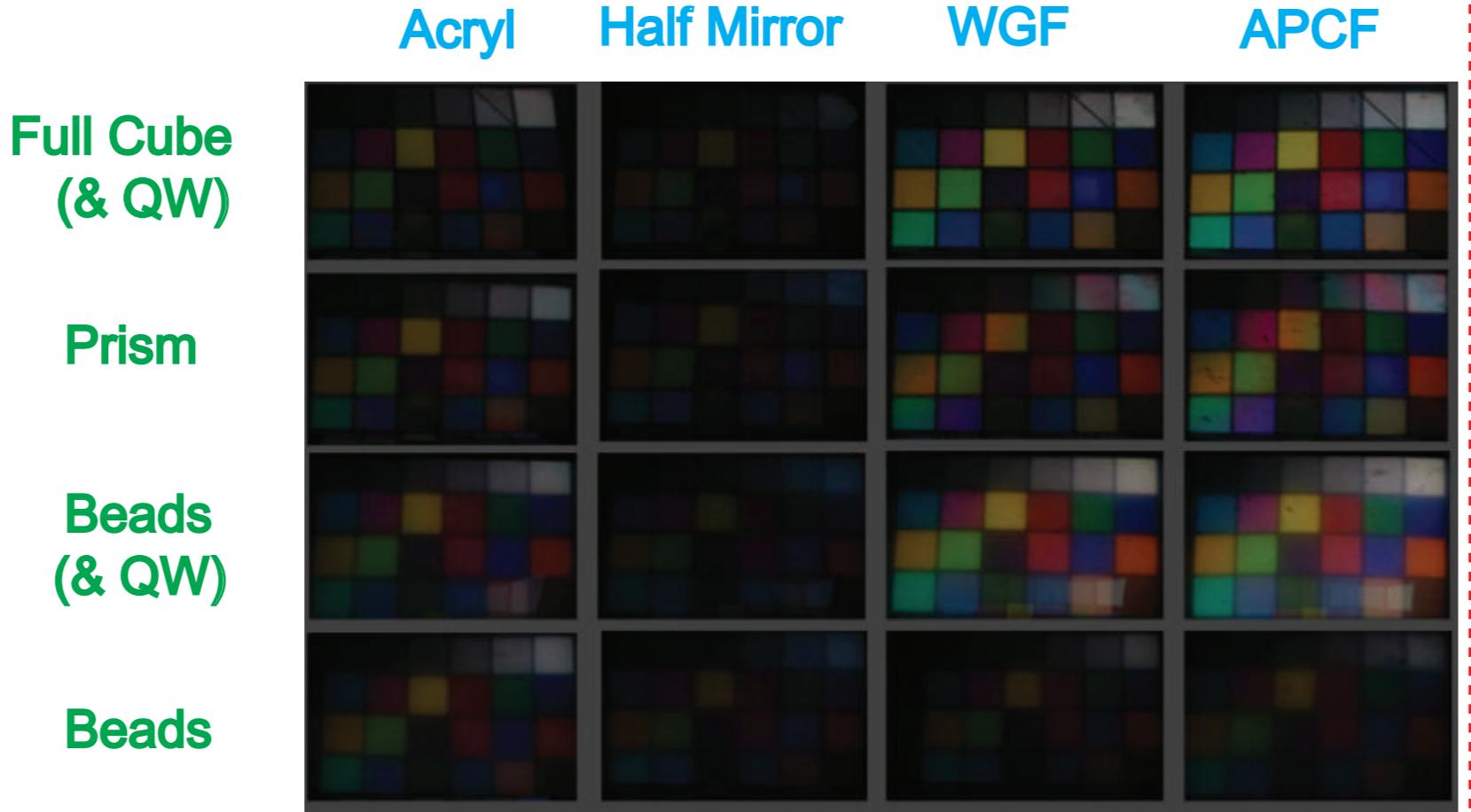
Beam Splitter



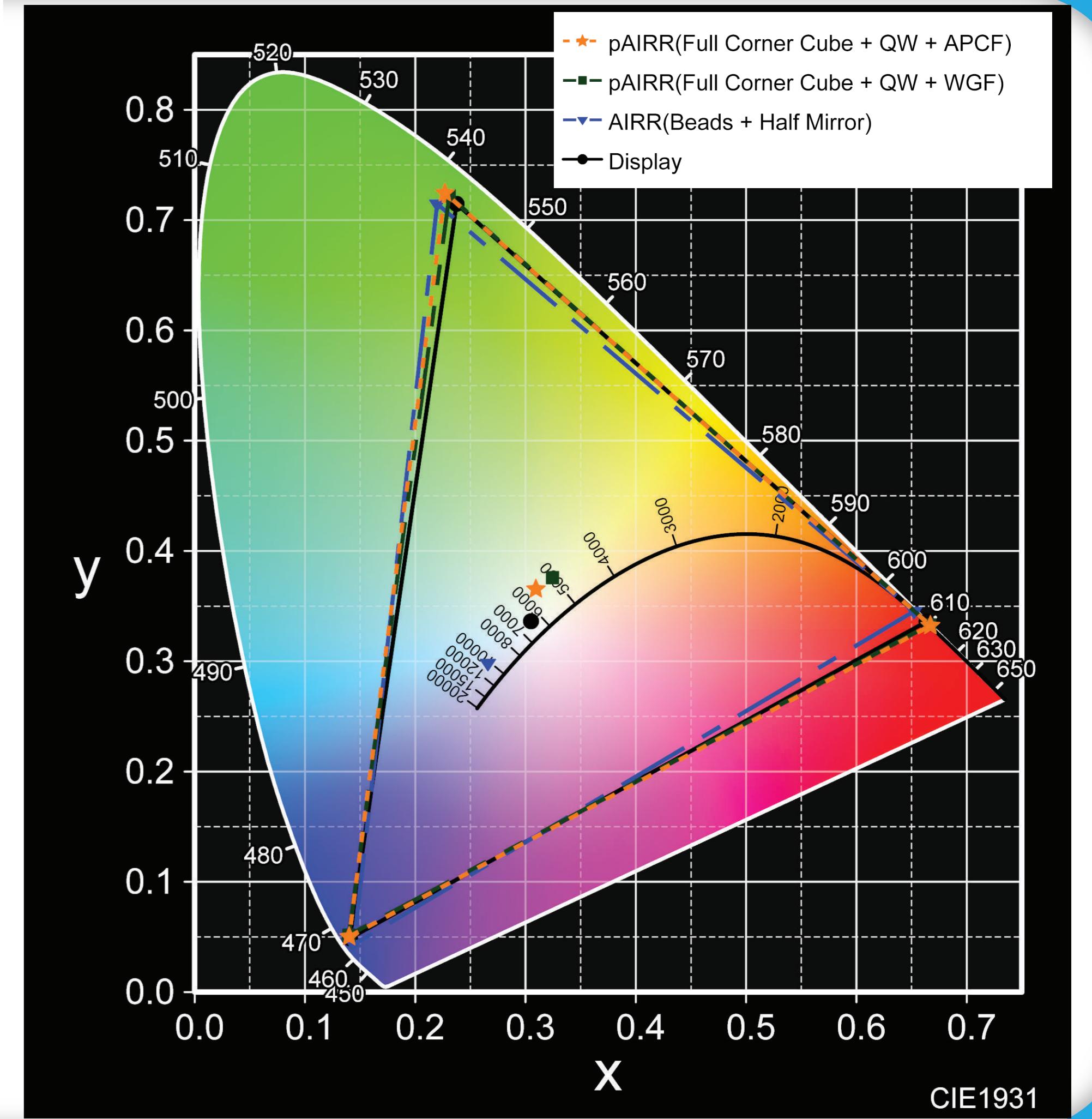
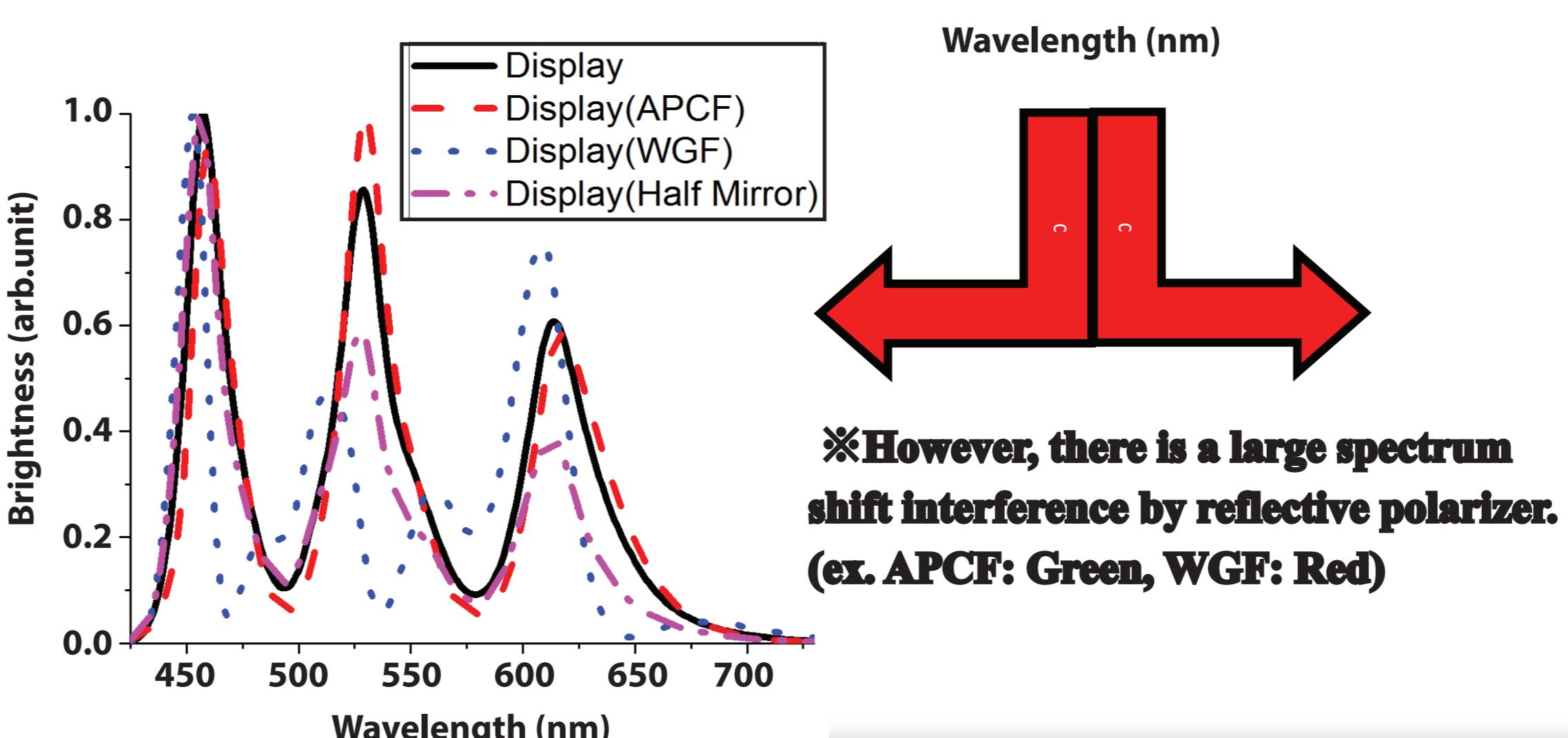
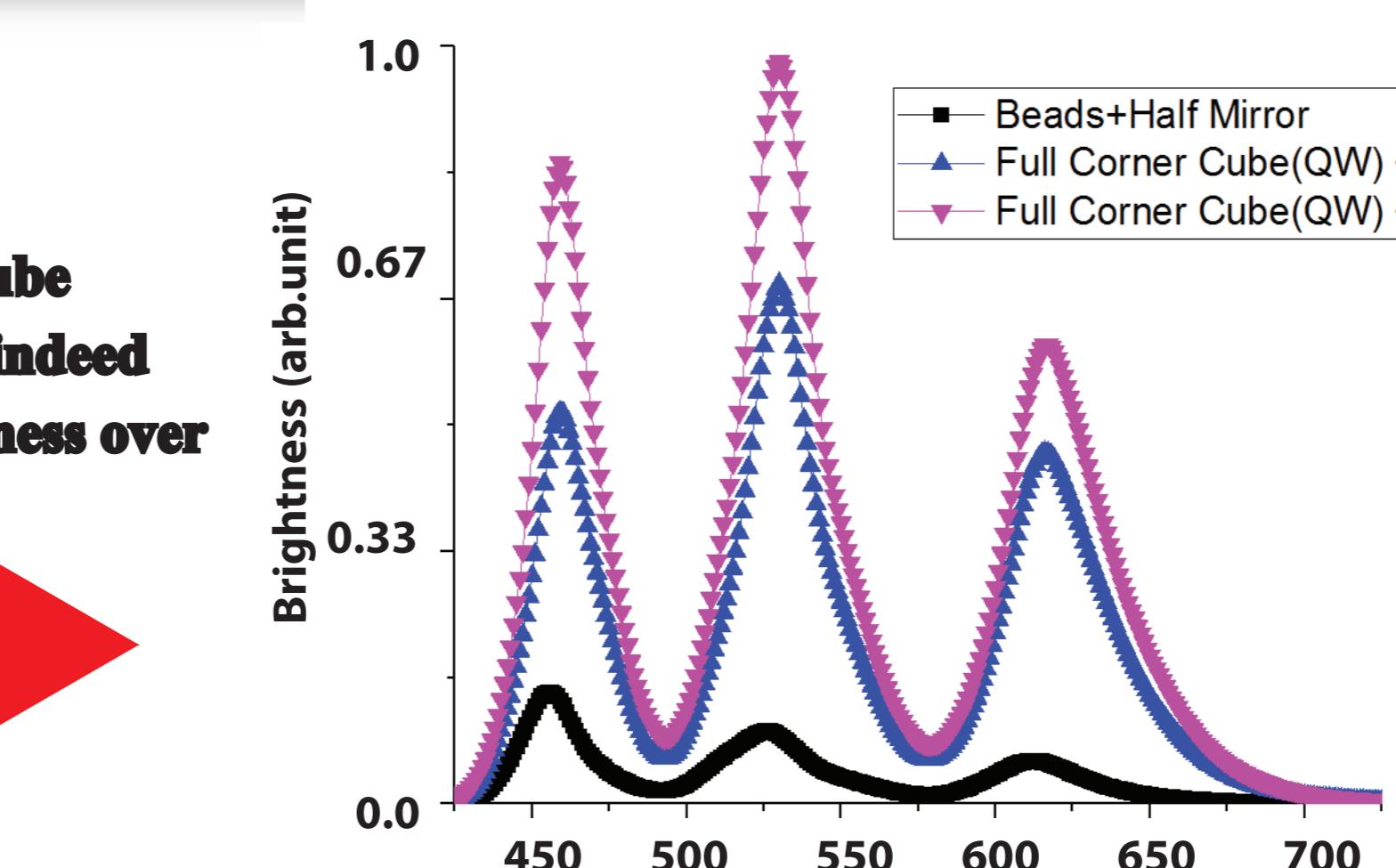
Retro-reflector



Experimental Results



*pAIRR by Full Cube with APCF or WGF indeed improves the brightness over wide color range.



Conclusion

1. We have proposed polarized Aerial Imaging by Retro-Reflection (pAIRR) and improved the efficiency more than twice of the conventional AIRR.
2. We have compared the brightness and color spectrum of pAIRR with 16 combinations of retro-reflector and beam splitter, and found APCF with Full Corner cube and Quater Wave film is the brightest. We also confirmed the reflective polarizers influence the color spectrum of the pAIRR.

References

1. H. Yamamoto, Y. Tomiyama, and S. Suyama, Opt. Express 22, 26919 (2014).
2. Y. Tokuda, A. Hiyama, M. Hirose, and T. Large, Proc. IDW'14, 21, 818-819 (2014).