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# Synergy with CO/[CII] Line Intensity Mapping

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This subchapter will describe cross-correlation sciences and synergy with the SKA1-low 21-cm EoR surveys enabled by other programs, in particular promising line intensity mapping surveys of CO rotational lines, [CII] and Ly-$\alpha$ emissions during reionization are discussed.

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## 1. Introduction

While the distribution of neutral hydrogen mapped by SKA1-low provides an excellent and unique view of the reionization process over a large range of redshifts, detecting sources responsible for reionization directly sheds light on the crucial stage of galaxy formation and complements our understanding of EoR. Extremely deep imaging with the Hubble Space Telescope (HST) has begun to probe the very bright end of the UV luminosity functions at $z > 6$ [1, 2], with improvements expected with the James Webb Space Telescope (JWST). In the sub-mm, ALMA has detected individual high redshift, luminous objects known from existing surveys (e.g., [3]). However, observations that are aimed at detecting individual galaxies at $z > 6$ are difficult and time consuming, and neither of these space-borne facilities nor ALMA is expected to resolve the majority of sources responsible for reionization at $z > 8$ [4]. Approaches which can access the entire luminosity function of reionizing sources are needed.

Line Intensity Mapping has emerged as a promising technique that is sensitive to the integrated light produced by faint galaxies: instead of resolving individual sources, one measures on larger spatial scales the collective emission from an ensemble of sources, while retaining the spectral thus redshift information. This allows efficient redshift surveys that probe the integrated luminosity function of sources and provide three-dimensional information to study star formation activities at EoR.

## 2. CO

## 3. CII

## 4. Ly-$\alpha$

## 5. Paths to Phase 2

## 6. Summary

## References

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