Massive Stellar Populations at Reionization-Era Metallicities with Ultra-Deep HST/COS Spectroscopy

Scientific Category:	Galaxies and the IGM
Scientific Keywords:	Dwarf Galaxies, Emission-Line Galaxies, Galaxy Formation and Evolution, Stellar Populations
Instruments:	COS
Proprietary Period:	6 months

Proposal Size: Medium UV Initiative: Yes

Orbit Request	Prime	Parallel
Cycle 26	40	0

Abstract

The first glimpse of the spectral properties of z~7-10 galaxies has recently emerged. Deep UV spectra have revealed intense emission from nebular CIII] and CIV, implying a hard radiation field that is rarely seen at lower redshifts. Unfortunately, we are currently unprepared to interpret these features, owing to shortcomings in our understanding of the radiation field powered by low metallicity stellar populations. Recent work with HST/COS in the local universe has provided a way forward, unveiling four nearby metal poor galaxies with UV nebular line spectra approaching those seen at z>7. The discovery of these galaxies opens the door for the first comprehensive investigation of the low metallicity stellar populations that likely dominate at z>7. Here we propose to obtain ultra-deep (10 orbit) COS/G160M spectra capable of measuring stellar photospheric and wind absorption features in these four galaxies. The data will provide the first quantitative constraints on the metallicity of massive stars required to power the hard radiation fields implied by the nebular lines and will allow us to investigate whether the stellar metallicity (sensitive to iron) departs from the metallicity of the nebular gas (sensitive to oxygen) in the extreme UV line emitters. Using new spectral tools, we will simultaneously fit the stellar absorption features and nebular lines, providing a powerful stress test of population synthesis models at low metallicity. If this UV spectral database is not obtained while COS is still functioning, the interpretation of reionization era galaxy spectra will be severely jeopardized throughout the JWST era.