

Feasibility of DESI: Bright Galaxy Survey

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DRAFT --- 46ffdccf --- 2018-05-22 --- NOT READY FOR DISTRIBUTION

ABSTRACT

testing

Subject headings: cosmology: observations —

1. Introduction

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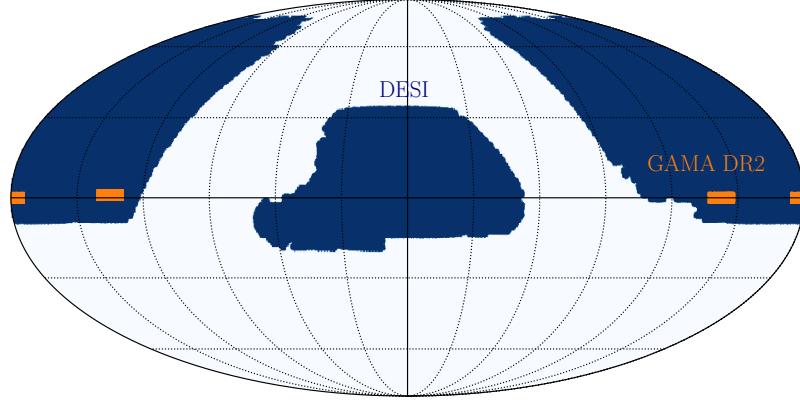


Fig. 1.— Footprint of GAMA DR2 (orange) overplotted on the DESI footprint (blue). This highlights that the GAMA galaxies are within the DESI footprint. This makes them an excellent sample to assess the feasibility of BGS.

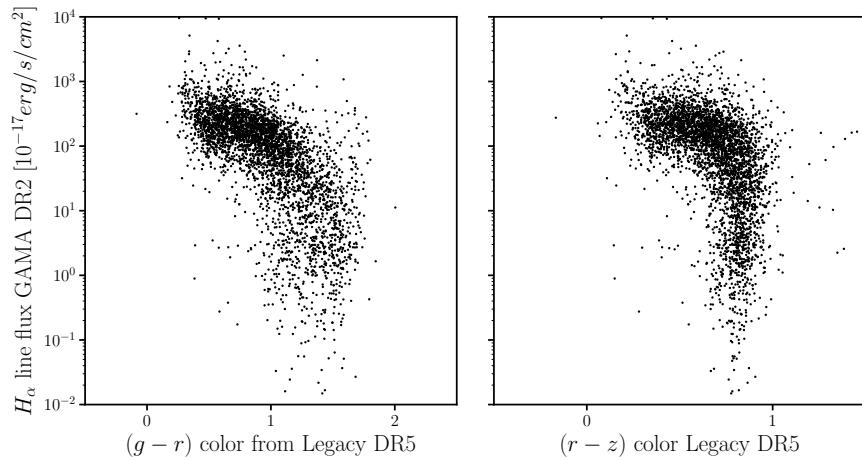


Fig. 2.— $(g - r)$ and $(r - z)$ colors to H_{α} line flux relations for galaxies that are in both the GAMA DR 2 and the Legacy survey DR 5. The $(g - r)$ and $(r - z)$ colors are calculated from the Legacy survey DR 5 model flux. Meanwhile the H_{α} line flux is from the GAMA DR 2, where they fit a Gaussian to the emission line. For convenience, the galaxy sample is downsampled by a factor of 10.

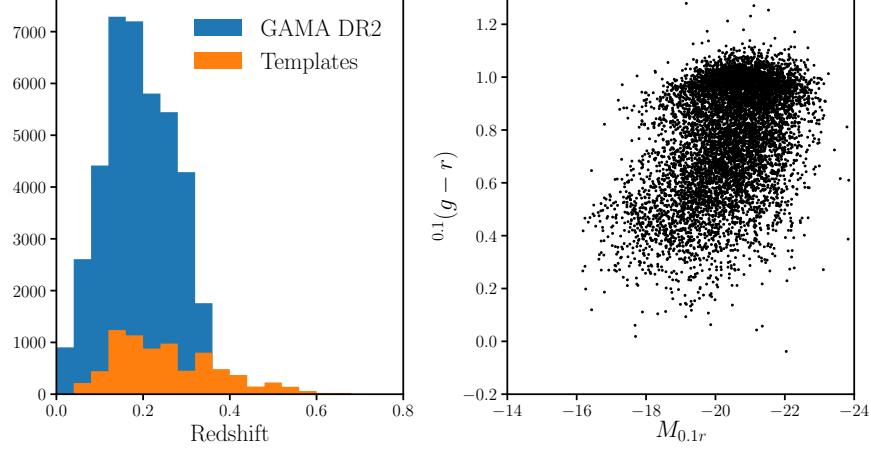


Fig. 3.— Properties of the 7636 BGS templates. The left is the redshift distribution of the templates while the right plots the M_r versus $(g - r)$ color magnitude relation of the templates. Both M_r and $(g - r)$ values are k -corrected to $z = 0.1$.

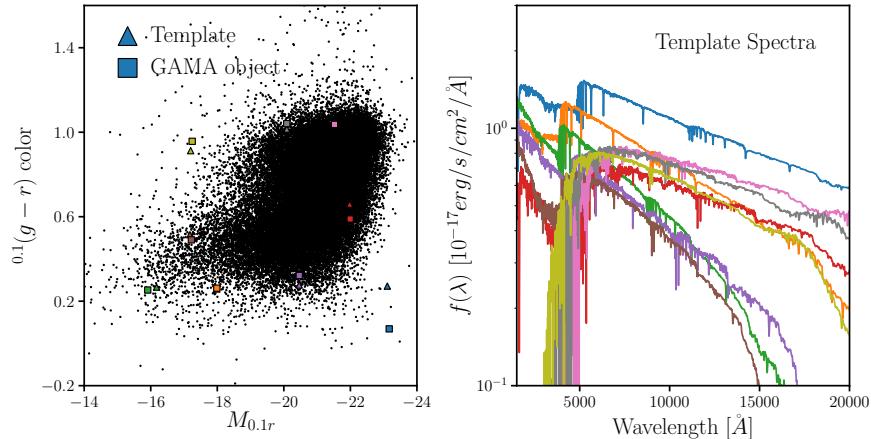


Fig. 4.— A handful of GAMA DR2 galaxies are randomly selected then matched to templates with the closest redshift, r band absolute magnitude ($M_{0.1,r}$), and $^{0.1}(g - r)$ color. The left panel plots the $M_{0.1,r}$ to $^{0.1}(g - r)$ color relation of the GAMA DR2 galaxies with the randomly selected galaxies highlighted (square). The matched templates are marked with same color (triangle). In the right panel, spectra for the match templates are plotted in the same color.

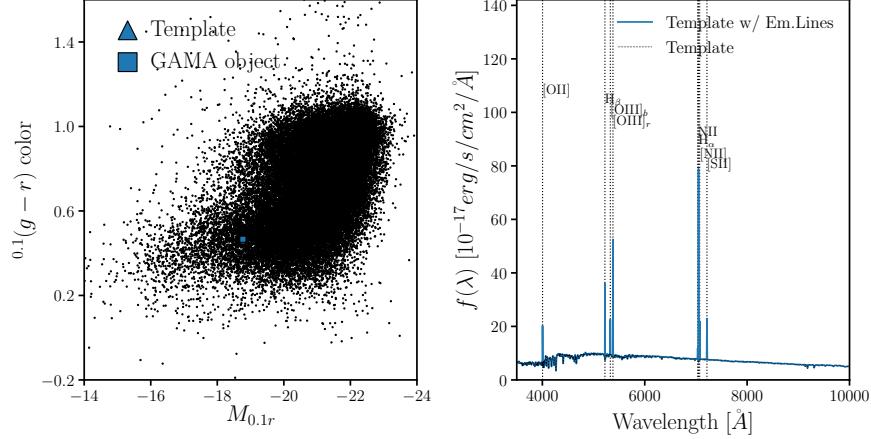


Fig. 5.— BGS template spectrum with added emission lines. The template is selected to match the redshift, r band absolute magnitude ($M_{0.1,r}$), and $^{0.1}(g - r)$ color of a randomly selected GAMA DR2 galaxy. The added emission lines use the measured line flux and line width from GAMA DR2. In left panel, the randomly selected GAMA galaxy (square) is plotted with the $M_{0.1,r}$ to $^{0.1}(g - r)$ color relation of the GAMA DR2 galaxies. In the right panel, the template spectrum with added emission line is plotted in blue. For the reference the template spectrum is included in black dashed.

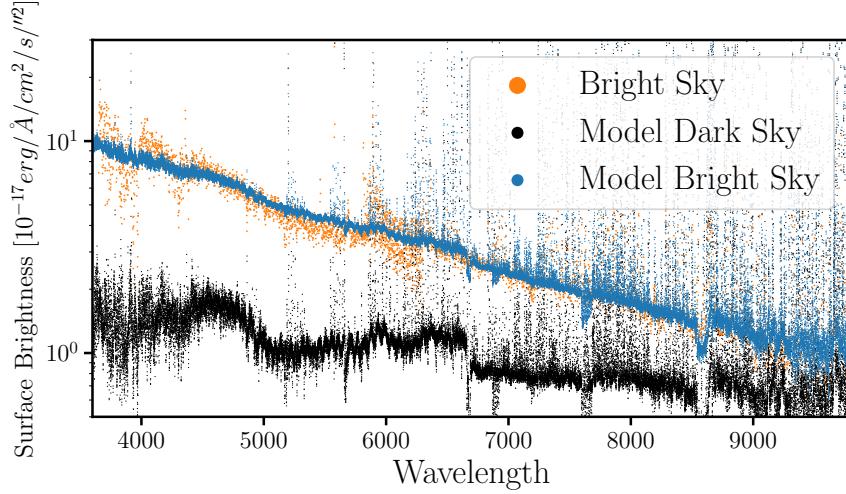


Fig. 6.— The model bright sky surface brightness (blue) show good agreement with the measured bright sky surface brightness from BOSS (orange), provided by Parker. The model bright sky is derived from fitting the residual surface brightness between the BOSS bright sky and the default DESI pipeline dark sky model (black).

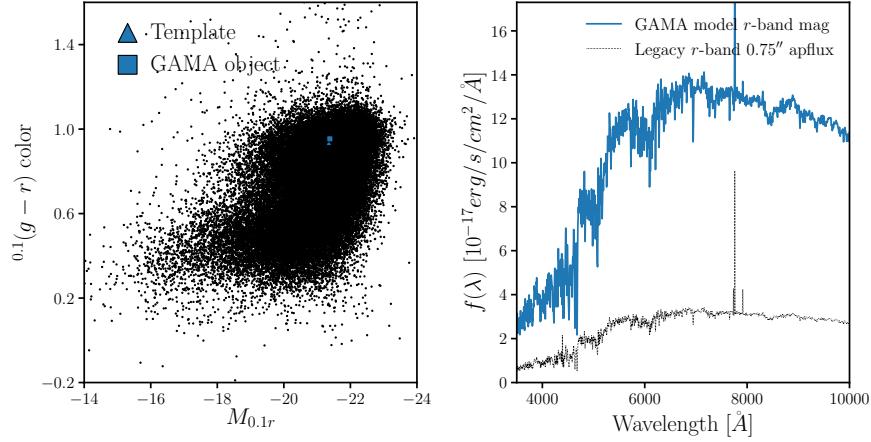


Fig. 7.— Template spectra normalized by the r -band magnitude derived from Legacy survey $0.75''$ aperture fluxes compared to the r -band model magnitude from GAMA DR2. By normalizing the source (template) spectra by the aperture flux, we can bypass the fiberloss pipeline.

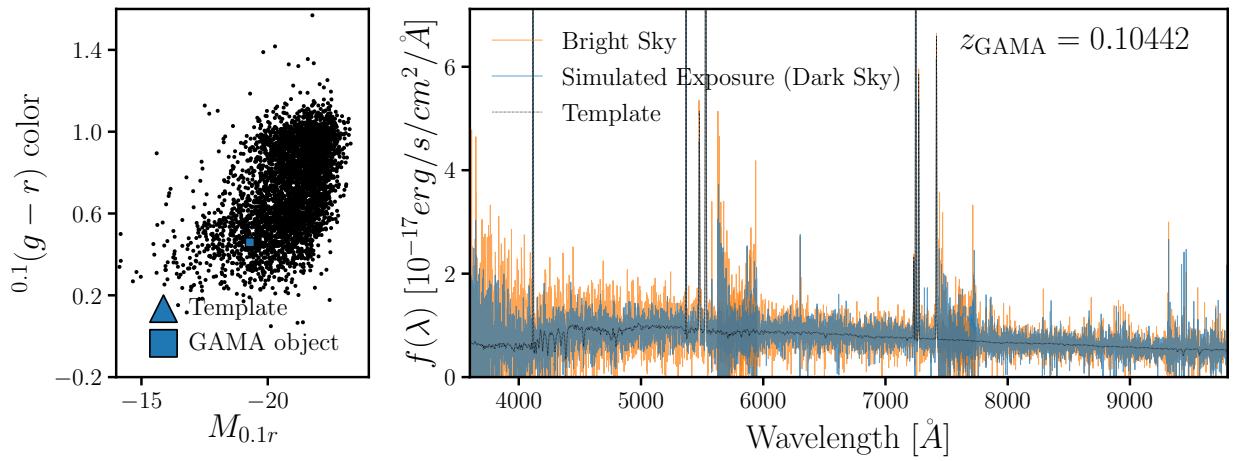


Fig. 8.— Simulated exposure of source spectrum derived from GAMA emission line added template spectrum, noramlized by Legacy survey r -band aperture flux with sky spectrum derived from model dark (blue) and bright (orange) sky surface brightness (Figure 6).

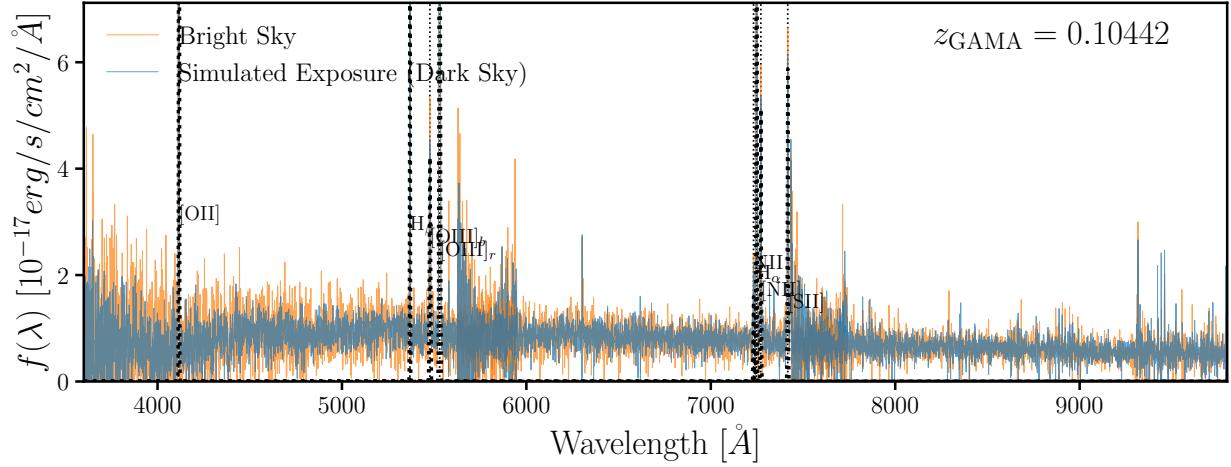


Fig. 9.— We mark the emission line wavelengths for the same exposure simulation as Figure 8.

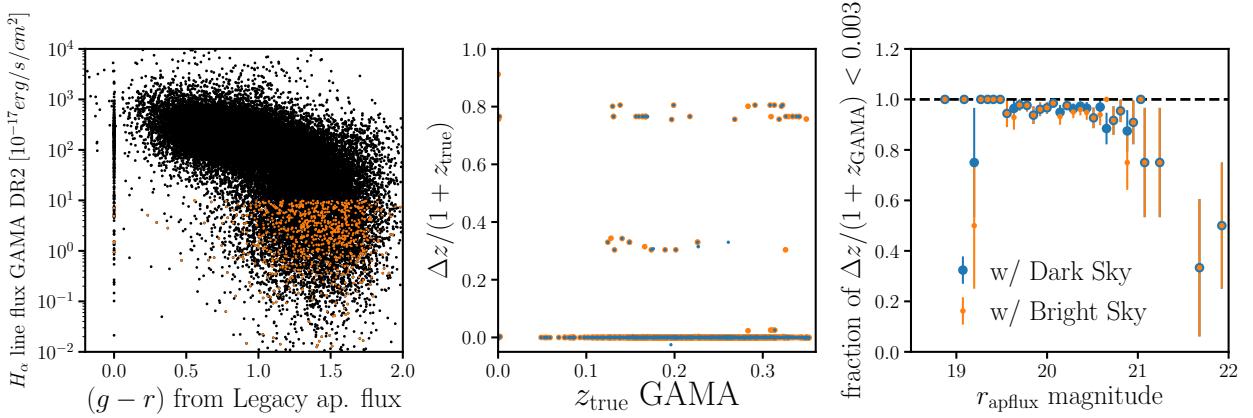


Fig. 10.— Redshift measurements, using `redrock`, of simulated exposed spectra of GAMA galaxies with faint H α emission line flux (highlighted in orange). We simulated exposures using dark (blue) and bright (orange) sky models. The right panel plots the redshift success rate, defined as $\Delta z/(1 + z) < 0.003$, as a function of $r_{\text{ap.flux}}$ -band magnitude. As expected, the redshift success rate is lower for fainter galaxies and lower for simulated spectra with bright sky.