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Searching for Imprints of Circumstellar Material in the Ultraviolet Spectra of Type Ia Supernovae

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ABSTRACT
This is my abstract.

Key words: supernovae: general – supernovae: individual: SN 2014J

1 INTRODUCTION

Type Ia supernovae (SNe Ia) have relatively homogeneous luminosities, making them excellent probes of dark energy and the accelerating expansion of the universe. There are multiple theories regarding their progenitor systems, the two most widely accepted being the single-degenerate (SD) and the double-degenerate (DD) models. The former consists of a white dwarf accreting material from either a main-sequence or red-giant star until it reaches the Chandrasekhar mass limit, igniting a thermonuclear explosion. The latter consists of two white dwarfs, where one accretes material onto the other or they collide, where either will also ignite a thermonuclear explosion. However, there is still much uncertainty regarding these systems, and developing a greater understanding of the circumstellar material surrounding SNe Ia is essential in fully understanding these explosions and using them to put greater constraints on dark energy.

The Na doublet located around 5890 and 5896 angstroms has been measured and analyzed in multiple studies and has shown variability in a handful of cases. This suggests that the Na gas is within 0.5 pc (because of an ionization potential of 5.1 eV) surrounding the SN is ionized by the initial flash. Later, as the Na recombines, absorption features will begin to appear in the SNs spectrum. However, we need more information from other species with similar ionization potentials to Na in order to determine the circumstellar gas location, density, and distribution.

This work presents the first insight into the Mg II, Mg I, and Fe II absorption features found in the ultraviolet spectrum of 8 SNe Ia, and is the first attempt to probe gas other than Na I, Ca II (not useful because it has a high ionization potential), and K I (not useful because its features are remarkably weak; although a recent result by (Graham et al. 2015) does detect the weakening of the two most blueshifted components with velocities of 144 and 127 kms^{-1}). These features have rest wavelengths of 2796.35 $\AA$ and 2803.53 $\AA$ for the Mg II doublet, 2852.96 $\AA$ for the Mg I line, and 2344.21 $\AA$, 2374.46 $\AA$, 2382.76 $\AA$, 2586.65 $\AA$, and 2600.17 $\AA$ for the Fe II lines (Aldenius et al. 2006), and can be seen in in the top panel of Figure 1. With ionization potentials 7.6 eV and 7.9 eV for Mg and Fe , respectively, these ions have the potential to add additional constraints on the location of circumstellar material surrounding SNe Ia.

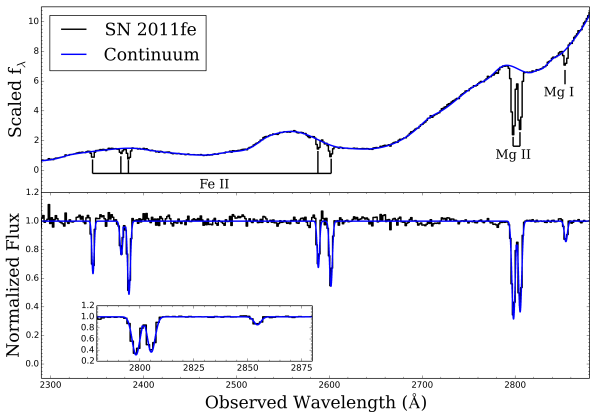

Figure 1. (Top) Maximum-brightness spectrum of SN 2011fe. The blue curve is a 3rd-order interpolated fit to the data including Gaussian profiles for the Fe II λλ2344, 2374, 2383, 2587, 2600; Mg II λλ2796, 2803; and Mg I λ2853 absorption features. (Bottom) Normalized maximum-brightness spectrum of SN 2011fe. The inset is a zoom-in showing the region near the Mg I and Mg II features.

2 OBSERVATIONS AND DATA REDUCTION

Our sample consists of all SNe Ia with at least two relatively high resolution ($R > 500$) and high signal-to-noise ratio (S/N) spectra that cover at least the Mg II doublet. This limits the sample to 8 SNe Ia, all observed by the *Hubble Space Telescope* (*HST*). With the exception of one SN,

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all spectra were obtained with the Space Telescope Imaging Spectrograph (STIS). SN 1992A was observed with the Faint Object Spectrograph (FOS). Spectra for SNe 1992A, 2011by, 2011fe, 2011iv, and 2014J were first published elsewhere (Kirshner et al. 1993; Foley et al. 2012, 2014; Foley 2013; Foley & Kirshner 2013a; **?**; **?**). All spectra were reduced in a consistent manner following standard procedures (e.g., Foley et al. 2012).

Half the sample have only two or three epochs of spectroscopy, while the other half have $\geqslant$7 epochs. Details of the SNe are presented in Table 2. A log of all observations are listed in Table 3.

In all spectra, we see clear narrow absorption features from the Mg II doublet. However, for three SNe, only lines consistent with Milky Way absporption are detected (SNe 1992A, 2011iv, and 2011ek). This is not unexpected for these objects since SNe 1992A and 2011iv have early-type hosts and SN 2011ek occurs at a projected distance of >10 kpc from its host. For the other 5 SNe Ia, we detect mesurable Mg II in at least one spectrum. For all SNe with detectable Mg II, we have also detected Mg I λ2851, and only SN 2011by, 2011fe, and 2013dy have detectable Fe II absorption.

3 ANALYSIS

With detections of several absorption features, we now detail how we make our equivalent width (EW) measurements, determine limits for undetected lines, and verify our measurements.

In order to measure the EWs of the narrow absorption features, we first fit a 3rd order b-spline to the continuum. The knots used in the interpolation are set with manually inputted breakpoints throughout the continuum between $2000 - 3000\AA$. Because this region is the only part of the spectrum that these lines are present, we place equally spaced breakpoints (one for every 10, 12, or 17 pixels, based on S/N) elsewhere in the continuum. We then generate a normalized spectrum by dividing this fit from the continuum. Because the spectral resolution is low enough where the absorption features are unresolved, we fit Gaussian parameters (height, width, and redshift) to the absorption features using a least-squares minimization. A normalized spectrum and its Gaussian fit can be seen in the bottom panel of Figure 1. Because of the low S/N of some spectra this method is preferable to a direct measurement, which can be significantly biased by the exact wavelength range chosen for integration. Then, we integrate over this Gaussian function to measure the equivalent width of each absorption feature, and use Equation 1 to determine the statistical error. σ_h and σ_w are found by taking the square root of the product of the reduced covariance and the reduced chi squared for the height and width, respectively, where the reduced covariance matrix is returned by the least squares algorithm.

$$\sigma^2_{\rm tot} = \sqrt{\pi} \times (\sigma^2_h \times w^2 + \sigma^2_w \times h^2) \quad (1)$$

For SNe 2011by, 2012cg, and 2013dy, the Milky Way Mg II λ2803 line overlaps in wavelength with the host-galaxy Mg II λ2796 line. For 11fe and 14J, both lines overlap. For these objects, we fit the entire feature (both Mg II doublets) with two Mg II doublets, one at zero velocity and the other at roughly the recession velocity of the host galaxy, simultaneously. Because of degeneracies in the fitting, we fixed each line from a given doublet to have the same shape. As a result for these objects, the EW for one Mg II line is equivalent to that of the other. However, the additional data from the overlapping line is useful for constraining parameters and improves the accuracy of the EW measurement. To make these measurements, we use the same least-squares minimization algorithm to fit for the Gaussian parameters of all four absorption features simultaneously.

In addition to the statistical uncertainties determined during the Gaussian fitting, we estimated the systematic uncertainties, mostly resulting from uncertain continuum placement, through a Monte Carlo simulation. For each realization of the Monte Carlo simulation, we shift the nominal wavelength of the b-spline breakpoints and recreate the normalized continuum. The amplitudes of the shifts are chosen such that the continuum is not obviously incorrect for 95% of 500 sample trials. We then measure the EWs of each line with the new normalized spectrum. The scatter in the resulting distribution of EW measurements was used to determine the systematic uncertainty. The statistical and systematic uncertainties were combined for our total uncertainty.

In some spectra, we do not detect any resolvable absorption. In such cases, we determined the magnitude necessary for each Fe and Mg absorption feature to be detected within the noise of a specific normalized spectrum. In SN 1992A, 2011ek, and 2011iv, we only detect absorption consistent with Milky Way measurements, and we cannot detect certain features in some other spectra from the other SNe, which are represented in Table 4 as values without uncertainty values. To find these values, we determined the 3-σ limit with Equation 2 (Leonard & Filippenko 2001).

$$W_\lambda(3\sigma) = 3\Delta\lambda\Delta I\sqrt{\frac{W_{\rm line}}{\Delta\lambda}}\sqrt{\frac{1}{B}}, \quad (2)$$

, where ΔI is the RMS fluctuations of the normalized flux and B is the number of bins per resolution element (2). Because the width of the line is at the resolution of the spectrum, $\Delta\lambda$ (the spectral resolution is 2 or 3 pixels) and $W_{\rm line}$ (the estimated width of the feature) are the same.

Finally, we determine if any variability in these features would be detected within the resolution of our data by convolving the Na absorption features from SN 2006X to the resolution of our data ($.008\AA$ per pixel to $1.5\AA$ per pixel). This process involves scaling the redder Na ($5889.95\AA$) line to the wavelength of both of the Mg II features and placing it into a normalized spectrum, creating a synthesized Mg II doublet. We then shift this to a velocity scale and perform a convolution on the data using an AstroPy function that uses a Gaussian kernel with a size of 1.5 Å. We then take the convolved data and rebin it to the pixel size of the data for our SNe (1.38 or 1.5 Åper pixel). Using the same process as making our prior measurements, we look for variability over time. Because the Na in SN 2006X data has already been confirmed to change by (**?**), we were able to determine that we will detect any possible variability in our data.

Using these convolved spectra, we add in random noise based on the RMS of the spectra

Table 1. Equivalent Width vs. Dust Reddening

SN	MgII (2796.35 Å)	MgII (2803.53 Å)	$A_{V(MW)}$ (mag)	E(B-V)$_{host}$ (mag)
$SN1992A$			0.047	0.00
$SN2011by$			0.038	0.012
$SN2011ek$			0.979	0.18
$SN2011fe$			0.024	0.008
$SN2011iv$			0.031	0.011
$SN2012cg$			0.057	0.18
$SN2013dy$			0.421	$0.206 \pm .005$
$SN2014J$			0.435	1.2

4 RESULTS

These are my results, seen in Figure **??**.

In our best measurements to date, we do not detect any significant change in any of the absorption features, consistent with studies of optical features for SN 2011fe (Patat et al., 2013) and SN 2014J (Welty et al., 2014; Goobar et al., 2014, Foley et al., 2014). We therefore do not detect a large amount of CSM along our line of sight.

5 DISCUSSION

We also show the equivalent width values we measured for each SNe with the corresponding reddening data for both the Milky Way and the host galaxy in Table 1. Each A_V value was taken from the NASA/IPAC Extragalactic Database and the $E(B_V)$ values were found in (Kirshner et al. 1993), (Foley & Kirshner 2013b), (Silverman et al. 2012), (Foley & Kirshner 2013b), (Foley et al. 2012), (Silverman et al. 2012), (Pan et al. 2015), and (Goobar et al. 2014) for SN 1992A, SN 2011by, SN 2011ek, SN 2011fe, SN 2011iv, SN 2012cg, SN 2013dy, and SN 2014J, respectively.

6 FUTURE WORK

Future work goes here.

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Table 2. SNe Properties

SN	Host Galaxy	Host Galaxy Redshift (z)	Host Galaxy Velocity (km s^{-1})	Right Ascension	Declination	Distance Modulus
$SN1992A$	$NGC1380$	0.006261	1877	$03h36m27.4s$	$-34d57m31s$	31.72
$SN2011by$	$NGC3972$	0.002843	852	$11h55m45.5s$	$+55d19m32s$	32.01
$SN2011ek$	$NGC918$	0.005027	1507	$02h25m48.9s$	$+18d32m00s$	32.33
$SN2011fe$	$M101$	0.000804	241	$14h03m05.8s$	$+54d16m25s$	29.06
$SN2011iv$	$NGC1404$	0.006494	1947	$03h38m51.3s$	$-35d35m32s$	$31.39(Galaxy)$
$SN2012cg$	$NGC4424$	0.001458	437	$12h27m12.8s$	$+09d25m13s$	30.9
$SN2013dy$	$NGC7250$	0.003889	1166	$22h18m17.6s$	$+40d34m10s$	$30.68(Galaxy)$
$SN2014J$	$M82$	0.000677	203	$09h55m42.1s$	$+69d40m26s$	27.57

Table 3. Observing Log

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
			SN 1992A				
1992*Jan*24	4.98	*FOS/RD*	*MIRROR*	40	*Y0VQ*0101*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*FOS/RD*	*MIRROR*	40	*Y0VQ*0102*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*FOS/RD*	*G*160*L*	1499.99	*Y0VQ*0103*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*FOS/RD*	*G*270*H*	1499.99	*Y0VQ*0104*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*FOS/RD*	*G*400*H*	999.99	*Y0VQ*0105*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*GHRS*	*MIRROR* − *N*2	0.2	*Z0VQ*0506*T*	*KIRSHNER*	4016
1992*Jan*24	4.98	*GHRS*	*G*270*M*	3916.8	*Z0VQ*0508*T*	*KIRSHNER*	4016
1992*Mar*04	44.83	*FOS/RD*	*MIRROR*	0.49	*Y0WA*0201*T*	*KIRSHNER*	4022
1992*Mar*04	44.83	*FOS/RD*	*G*160*L*	1349.99	*Y0WA*0202*T*	*KIRSHNER*	4022
1992*Mar*04	44.83	*FOS/RD*	*G*160*L*	1349.99	*Y0WA*0203*T*	*KIRSHNER*	4022
1992*Mar*04	44.83	*FOS/RD*	*G*270*H*	1349.99	*Y0WA*0204*T*	*KIRSHNER*	4022
1992*Mar*04	44.83	*FOS/RD*	*G*270*H*	1349.99	*Y0WA*0205*T*	*KIRSHNER*	4022
1992*Mar*04	44.83	*FOS/RD*	*G*400*H*	1800	*Y0WA*0206*T*	*KIRSHNER*	4022
1992*Nov*05	289.58	*FOS/RD*	*MIRROR*	145.45	*Y*1670101*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*160*L*	1999.98	*Y*1670102*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*160*L*	1999.98	*Y*1670103*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*160*L*	1999.98	*Y*1670104*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*270*H*	1999.98	*Y*1670105*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*270*H*	1999.98	*Y*1670106*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*270*H*	1999.98	*Y*1670107*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*400*H*	1999.98	*Y*1670108*T*	*KIRSHNER*	4252
1992*Nov*05	289.58	*FOS/RD*	*G*400*H*	1999.98	*Y*1670109*T*	*KIRSHNER*	4252
			SN 2011by				
2011*Apr*30	−9.31	*STIS/CCD*	*MIRVIS*	4.1	*OBND*08*D*2*Q*	*ELLIS*	12298
2011*Apr*30	−9.31	*STIS/CCD*	*G*430*L*	2262.9	*OBND*08010	*ELLIS*	12298
2011*Apr*30	−9.31	*STIS/CCD*	*MIRVIS*	4.1	*OBND*13*D*9*Q*	*ELLIS*	12298
2011*Apr*30	−9.31	*STIS/NUV* − *MAMA*	*G*230*L*	8300	*OBND*13010	*ELLIS*	12298
2011*May*09	−0.52	*STIS/CCD*	*MIRVIS*	4.1	*OBND*10*CZQ*	*ELLIS*	12298
2011*May*09	−0.52	*STIS/CCD*	*G*430*L*	2262.9	*OBND*10010	*ELLIS*	12298
2011*May*09	−0.52	*STIS/CCD*	*MIRVIS*	4.1	*OBND*14*DEQ*	*ELLIS*	12298
2011*May*09	−0.52	*STIS/NUV* − *MAMA*	*G*230*L*	5316	*OBND*14010	*ELLIS*	12298
			SN 2011ek				
2011*Aug*12	−3.32	*STIS/CCD*	*MIRVIS*	4.1	*OBND*36*A*1*Q*	*ELLIS*	12298
2011*Aug*12	−3.32	*STIS/CCD*	*G*430*L*	2100	*OBND*36010	*ELLIS*	12298
2011*Aug*12	−3.32	*STIS/CCD*	*MIRVIS*	4.1	*OBND*41*APQ*	*ELLIS*	12298
2011*Aug*12	−3.32	*STIS/NUV* − *MAMA*	*G*230*L*	8077	*OBND*41010	*ELLIS*	12298
2011*Aug*19	3.53	*STIS/CCD*	*MIRVIS*	4.1	*OBND*38*ZZQ*	*ELLIS*	12298
2011*Aug*19	3.53	*STIS/CCD*	*G*430*L*	2220	*OBND*38010	*ELLIS*	12298
2011*Aug*19	3.53	*STIS/CCD*	*MIRVIS*	4.1	*OBND*42*A*6*Q*	*ELLIS*	12298
2011*Aug*19	3.53	*STIS/NUV* − *MAMA*	*G*230*L*	5198	*OBND*42010	*ELLIS*	12298
			SN 2011fe				
2011*Aug*28	−13.11	*STIS/CCD*	*MIRVIS*	2.1	*OBND*43*MFQ*	*ELLIS*	12298
2011*Aug*28	−13.11	*STIS/CCD*	*G*430*L*	1200	*OBND*43010	*ELLIS*	12298
2011*Aug*28	−13.11	*STIS/CCD*	*G*750*L*	1002	*OBND*43020	*ELLIS*	12298
2011*Aug*28	−13.11	*STIS/CCD*	*G*750*L*	50	*OBND*43030	*ELLIS*	12298
2011*Aug*28	−13.11	*STIS/CCD*	*MIRVIS*	2.1	*OBND*48*MSQ*	*ELLIS*	12298
2011*Aug*28	−13.11	*STIS/NUV* − *MAMA*	*G*230*L*	5400	*OBND*48010	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*MIRVIS*	30.1	*OBND*44*RWQ*	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*G*430*L*	578	*OBND*44010	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*G*430*L*	578	*OBND*44020	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*G*750*L*	410	*OBND*44030	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*G*750*L*	410	*OBND*44040	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*G*750*L*	50	*OBND*44050	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/CCD*	*MIRVIS*	30.1	*OBND*49*SLQ*	*ELLIS*	12298
2011*Aug*31	−10.04	*STIS/NUV* − *MAMA*	*G*230*L*	2200	*OBND*49010	*ELLIS*	12298
2011*Sept*03	−6.91	*STIS/CCD*	*MIRVIS*	20.1	*OBND*45*SJQ*	*ELLIS*	12298

Table 3 (cont'd)

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
2011*Sept*03	−6.91	*STIS/CCD*	*G*230*LB*	1320	*OBND*45010	*ELLIS*	12298
2011*Sept*03	−6.91	*STIS/CCD*	*G*430*L*	195	*OBND*45020	*ELLIS*	12298
2011*Sept*03	−6.91	*STIS/CCD*	*G*750*L*	195	*OBND*45030	*ELLIS*	12298
2011*Sept*03	−6.91	*STIS/CCD*	*G*750*L*	50	*OBND*45040	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*MIRVIS*	20.1	*OBND*46*ODQ*	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*230*LB*	530	*OBND*46010	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*230*LB*	530	*OBND*46020	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*430*L*	80	*OBND*46030	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*430*L*	80	*OBND*46040	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*750*L*	80	*OBND*46050	*ELLIS*	12298
2011 Sept 07	−2.95	*STIS/CCD*	*G*750*L*	80	*OBND*46060	*ELLIS*	12298
2011*Sept*07	−2.95	*STIS/CCD*	*G*750*L*	50	*OBND*46070	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*MIRVIS*	20.1	*OBND*47*G*5*Q*	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*230*LB*	530	*OBND*47010	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*230*LB*	530	*OBND*47020	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*430*L*	80	*OBND*47030	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*430*L*	80	*OBND*47040	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*750*L*	80	*OBND*47050	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*750*L*	80	*OBND*47060	*ELLIS*	12298
2011*Sept*10	0.04	*STIS/CCD*	*G*750*L*	50	*OBND*47070	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*MIRVIS*	20.1	*OBND*50*LMQ*	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*230*LB*	415	*OBND*50010	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*230*LB*	415	*OBND*50020	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*430*L*	80	*OBND*50030	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*430*L*	80	*OBND*50040	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*750*L*	70	*OBND*50050	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*750*L*	70	*OBND*50060	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/CCD*	*G*750*L*	50	*OBND*50070	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/FUV − MAMA*	*G*140*L*	2680	*OBND*50080	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/FUV − MAMA*	*G*140*L*	2930	*OBND*50090	*ELLIS*	12298
2011*Sept*13	3.25	*STIS/FUV − MAMA*	*G*140*L*	2930	*OBND*500*A*0	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*MIRVIS*	30.1	*OBND*51*DRQ*	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*230*LB*	500	*OBND*51010	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*230*LB*	500	*OBND*51020	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*430*L*	80	*OBND*51030	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*430*L*	80	*OBND*51040	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*750*L*	70	*OBND*51050	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*750*L*	70	*OBND*51060	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/CCD*	*G*750*L*	50	*OBND*51070	*ELLIS*	12298
2011*Sept*19	9.15	*STIS/NUV − MAMA*	*G*230*L*	2720	*OBND*51080	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*MIRVIS*	40.1	*OBND*52*S*6*Q*	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*G*430*L*	600	*OBND*52010	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*G*430*L*	600	*OBND*52020	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*G*750*L*	190	*OBND*52030	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*G*750*L*	190	*OBND*52040	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/CCD*	*G*750*L*	50	*OBND*52050	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/NUV − MAMA*	*G*230*L*	1350	*OBND*52060	*ELLIS*	12298
2011*Oct*01	20.69	*STIS/NUV − MAMA*	*G*230*L*	1350	*OBND*52070	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*MIRVIS*	0.9	*OBND*53*X*3*Q*	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*G*430*L*	660	*OBND*53010	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*G*430*L*	660	*OBND*53020	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*G*750*L*	310	*OBND*53030	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*G*750*L*	310	*OBND*53040	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/CCD*	*G*750*L*	50	*OBND*53050	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/NUV − MAMA*	*G*230*L*	1500	*OBND*53060	*ELLIS*	12298
2011*Oct*07	26.69	*STIS/NUV − MAMA*	*G*230*L*	1500	*OBND*53070	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/CCD*	*MIRVIS*	1.1	*OBND*54*AVQ*	*ELLIS*	12298

Table 3 (cont'd)

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
2011*Oct*21	40.45	*STIS/CCD*	*G430L*	610	*OBND*54010	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/CCD*	*G430L*	610	*OBND*54020	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/CCD*	*G750L*	420	*OBND*54030	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/CCD*	*G750L*	420	*OBND*54040	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/CCD*	*G750L*	50	*OBND*54050	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/NUV − MAMA*	*G230L*	1500	*OBND*54060	*ELLIS*	12298
2011*Oct*21	40.45	*STIS/NUV − MAMA*	*G230L*	1500	*OBND*54070	*ELLIS*	12298
			SN 2011iv				
2011*Dec*11	0.6	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*11*SWQ*	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/NUV − MAMA*	*G230L*	2200	*OBWR*11010	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/NUV − MAMA*	*G230L*	1350	*OBWR*11020	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/CCD*	*G430L*	100	*OBWR*11030	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/CCD*	*G430L*	100	*OBWR*11040	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/CCD*	*G750L*	100	*OBWR*11050	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/CCD*	*G750L*	100	*OBWR*11060	*FOLEY*	12592
2011*Dec*11	0.6	*STIS/CCD*	*G750L*	50	*OBWR*11070	*FOLEY*	12592
2011*Dec*15	5.41	*STIS/CCD*	*MIRVIS*0.3	*OBWR*12*B*1*Q*	*FOLEY*	12592	
2011*Dec*15	5.41	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*12010	*FOLEY*	12592
2011*Dec*15	5.41	*STIS/CCD*	*G430L*	100	*OBWR*12020	*FOLEY*	12592
2011*Dec*15	5.41	*STIS/CCD*	*G750L*	100	*OBWR*12030	*FOLEY*	12592
2011*Dec*15	5.41	*STIS/CCD*	*G750L*	50	*OBWR*12040	*FOLEY*	12592
2011*Dec*20	10.15	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*13*MBQ*	*FOLEY*	12592
2011*Dec*20	10.15	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*13010	*FOLEY*	12592
2011*Dec*20	10.15	*STIS/CCD*	*G430L*	100	*OBWR*13020	*FOLEY*	12592
2011*Dec*20	10.15	*STIS/CCD*	*G750L*	100	*OBWR*13030	*FOLEY*	12592
2011*Dec*20	10.15	*STIS/CCD*	*G750L*	50	*OBWR*13040	*FOLEY*	12592
2011*Dec*24	13.99	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*14*NFQ*	*FOLEY*	12592
2011*Dec*24	13.99	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*14010	*FOLEY*	12592
2011*Dec*24	13.99	*STIS/CCD*	*G430L*	100	*OBWR*14020	*FOLEY*	12592
2011*Dec*24	13.99	*STIS/CCD*	*G750L*	100	*OBWR*14030	*FOLEY*	12592
2011*Dec*24	13.99	*STIS/CCD*	*G750L*	50	*OBWR*14040	*FOLEY*	12592
2011*Dec*28	17.82	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*15*Q*0*Q*	*FOLEY*	12592
2011*Dec*28	17.82	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*15010	*FOLEY*	12592
2011*Dec*28	17.82	*STIS/CCD*	*G430L*	100	*OBWR*15020	*FOLEY*	12592
2011*Dec*28	17.82	*STIS/CCD*	*G750L*	100	*OBWR*15030	*FOLEY*	12592
2011*Dec*28	17.82	*STIS/CCD*	*G750L*	50	*OBWR*15040	*FOLEY*	12592
2012*Jan*01	21.72	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*16*ODQ*	*FOLEY*	12592
2012*Jan*01	21.72	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*16010	*FOLEY*	12592
2012*Jan*01	21.72	*STIS/CCD*	*G430L*	100	*OBWR*16020	*FOLEY*	12592
2012*Jan*01	21.72	*STIS/CCD*	*G750L*	100	*OBWR*16030	*FOLEY*	12592
2012*Jan*01	21.72	*STIS/CCD*	*G750L*	50	*OBWR*16040	*FOLEY*	12592
2012*Jan*09	29.52	*STIS/CCD*	*MIRVIS*	0.3	*OBWR*17*AIQ*	*FOLEY*	12592
2012*Jan*09	29.52	*STIS/NUV − MAMA*	*G230L*	1400	*OBWR*17010	*FOLEY*	12592
2012*Jan*09	29.52	*STIS/CCD*	*G430L*	100	*OBWR*17020	*FOLEY*	12592
2012*Jan*09	29.52	*STIS/CCD*	*G750L*	100	*OBWR*17030	*FOLEY*	12592
2012*Jan*09	29.52	*STIS/CCD*	*G750L*	50	*OBWR*17040	*FOLEY*	12592
			SN 2012cg				
2012*June*04	2.5	*STIS/CCD*	*MIRVIS*	0.5	*OBXB*92*E*9*Q*	*GOOBAR*	12582
2012*June*04	2.5	*STIS/CCD*	*G230LB*	856	*OBXB*92010	*GOOBAR*	12582
2012*June*04	2.5	*STIS/CCD*	*G230LB*	856	*OBXB*92020	*GOOBAR*	12582
2012*June*04	2.5	*STIS/CCD*	*G430L*	156	*OBXB*92030	*GOOBAR*	12582
2012*June*04	2.5	*STIS/CCD*	*G430L*	156	*OBXB*92040	*GOOBAR*	12582
2012*June*18	16.37	*STIS/CCD*	*MIRVIS*	0.5	*OBXB*93*ELQ*	*GOOBAR*	12582
2012*June*18	16.37	*STIS/CCD*	*G230LB*	856	*OBXB*93010	*GOOBAR*	12582
2012*June*18	16.37	*STIS/CCD*	*G230LB*	856	*OBXB*93020	*GOOBAR*	12582
2012*June*18	16.37	*STIS/CCD*	*G430L*	156	*OBXB*93030	*GOOBAR*	12582
2012*June*18	16.37	*STIS/CCD*	*G430L*	156	*OBXB*93040	*GOOBAR*	12582

Table 3 (cont'd)

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
			SN 2013dy				
2013*July*21	−6.17	*STIS/CCD*	*MIRVIS*	0.3	*OCB*101*HWQ*	*FOLEY*	13286
2013*July*21	−6.17	*STIS/NUV − MAMA*	*G*230*L*	2200	*OCB*101010	*FOLEY*	13286
2013*July*21	−6.17	*STIS/NUV − MAMA*	*G*230*L*	1418	*OCB*101020	*FOLEY*	13286
2013*July*21	−6.17	*STIS/CCD*	*G*430*L*	336	*OCB*101030	*FOLEY*	13286
2013*July*21	−6.17	*STIS/CCD*	*G*750*L*	336	*OCB*101040	*FOLEY*	13286
2013*July*21	−6.17	*STIS/CCD*	*G*750*L*	50	*OCB*101050	*FOLEY*	13286
2013*July*25	−2.09	*STIS/CCD*	*MIRVIS*	0.3	*OCB*102*F*7*Q*	*FOLEY*	13286
2013*July*25	−2.09	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*102010	*FOLEY*	13286
2013*July*25	−2.09	*STIS/CCD*	*G*430*L*	64	*OCB*102020	*FOLEY*	13286
2013*July*25	−2.09	*STIS/CCD*	*G*750*L*	64	*OCB*102030	*FOLEY*	13286
2013*July*25	−2.09	*STIS/CCD*	*G*750*L*	50	*OCB*102040	*FOLEY*	13286
2013*July*27	−0.37	*STIS/CCD*	*MIRVIS*	0.3	*OCB*103*OJQ*	*FOLEY*	13286
2013*July*27	−0.37	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*103010	*FOLEY*	13286
2013*July*27	−0.37	*STIS/CCD*	*G*430*L*	64	*OCB*103020	*FOLEY*	13286
2013*July*27	−0.37	*STIS/CCD*	*G*750*L*	64	*OCB*103030	*FOLEY*	13286
2013*July*27	−0.37	*STIS/CCD*	*G*750*L*	50	*OCB*103040	*FOLEY*	13286
2013*July*29	1.61	*STIS/CCD*	*MIRVIS*	0.3	*OCB*104*B*1*Q*	*FOLEY*	13286
2013*July*29	1.61	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*104010	*FOLEY*	13286
2013*July*29	1.61	*STIS/CCD*	*G*430*L*	64	*OCB*104020	*FOLEY*	13286
2013*July*29	1.61	*STIS/CCD*	*G*750*L*	64	*OCB*104030	*FOLEY*	13286
2013*July*29	1.61	*STIS/CCD*	*G*750*L*	50	*OCB*104040	*FOLEY*	13286
2013*Aug*01	4.85	*STIS/CCD*	*MIRVIS*	0.3	*OCB*105*Z*2*Q*	*FOLEY*	13286
2013*Aug*01	4.85	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*105010	*FOLEY*	13286
2013*Aug*01	4.85	*STIS/CCD*	*G*430*L*	64	*OCB*105020	*FOLEY*	13286
2013*Aug*01	4.85	*STIS/CCD*	*G*750*L*	64	*OCB*105030	*FOLEY*	13286
2013*Aug*01	4.85	*STIS/CCD*	*G*750*L*	50	*OCB*105040	*FOLEY*	13286
2013*Aug*05	8.76	*STIS/CCD*	*MIRVIS*	0.3	*OCB*106*BUQ*	*FOLEY*	13286
2013*Aug*05	8.76	*STIS/NUV − MAMAG*230*L*	1382	*OCB*106010	*FOLEY*	13286	
2013*Aug*05	8.76	*STIS/CCD*	*G*430*L*	64	*OCB*106020	*FOLEY*	13286
2013*Aug*05	8.76	*STIS/CCD*	*G*750*L*	64	*OCB*106030	*FOLEY*	13286
2013*Aug*05	8.76	*STIS/CCD*	*G*750*L*	50	*OCB*106040	*FOLEY*	13286
2013*Aug*09	12.36	*STIS/CCD*	*MIRVIS*	0.3	*OCB*107*ZGQ*	*FOLEY*	13286
2013*Aug*09	12.36	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*107010	*FOLEY*	13286
2013*Aug*09	12.36	*STIS/CCD*	*G*430*L*	64	*OCB*107020	*FOLEY*	13286
2013*Aug*09	12.36	*STIS/CCD*	*G*750*L*	64	*OCB*107030	*FOLEY*	13286
2013*Aug*09	12.36	*STIS/CCD*	*G*750*L*	50	*OCB*107040	*FOLEY*	13286
2013*Aug*11	14.38	*STIS/CCD*	*MIRVIS*	0.3	*OCB*108*NEQ*	*FOLEY*	13286
2013*Aug*11	14.38	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*108010	*FOLEY*	13286
2013*Aug*11	14.38	*STIS/CCD*	*G*430*L*	64	*OCB*108020	*FOLEY*	13286
2013*Aug*11	14.38	*STIS/CCD*	*G*750*L*	64	*OCB*108030	*FOLEY*	13286
2013*Aug*11	14.38	*STIS/CCD*	*G*750*L*	50	*OCB*108040	*FOLEY*	13286
2013*Aug*15	18.22	*STIS/CCD*	*MIRVIS*	0.3	*OCB*109*R*2*Q*	*FOLEY*	13286
2013*Aug*15	18.22	*STIS/NUV − MAMA*	*G*230*L*	1382	*OCB*109010	*FOLEY*	13286
2013*Aug*15	18.22	*STIS/CCD*	*G*430*L*	64	*OCB*109020	*FOLEY*	13286
2013*Aug*15	18.22	*STIS/CCD*	*G*750*L*	64	*OCB*109030	*FOLEY*	13286
2013*Aug*15	18.22	*STIS/CCD*	*G*750*L*	50	*OCB*109040	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/CCD*	*MIRVIS*	0.3	*OCB*110*EBQ*	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/NUV − MAMA*	*G*230*L*	2200	*OCB*110010	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/NUV − MAMA*	*G*230*L*	1418	*OCB*110020	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/CCD*	*G*430*L*	336	*OCB*110030	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/CCD*	*G*750*L*	336	*OCB*110040	*FOLEY*	13286
2013*Aug*17	21.17	*STIS/CCD*	*G*750*L*	50	*OCB*110050	*FOLEY*	13286
			SN 2014J				
2014*Jan*26	−6.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*150*EZQ*	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/NUV − MAMA*	*G*230*L*	2235	*OCB*150010	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/NUV − MAMA*	*G*230*L*	2807	*OCB*150020	*FOLEY*	13286

Table 3 (cont'd)

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
2014*Jan*26	−6.5	*STIS/NUV − MAMA*	*G*230*L*	2807	*OCB*150030	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/NUV − MAMA*	*G*230*L*	1724	*OCB*150040	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/CCD*	*G*430*L*	300	*OCB*150050	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/CCD*	*G*750*L*	200	*OCB*150060	*FOLEY*	13286
2014*Jan*26	−6.5	*STIS/CCD*	*G*750*L*	50	*OCB*150070	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*151*JRQ*	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*151010	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*151020	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/CCD*	*G*430*L*	160	*OCB*151030	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/CCD*	*G*750*L*	100	*OCB*151040	*FOLEY*	13286
2014*Jan*28	−4.5	*STIS/CCD*	*G*750*L*	50	*OCB*151050	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*152*SXQ*	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*152010	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*152020	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/CCD*	*G*430*L*	160	*OCB*152030	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/CCD*	*G*750*L*	100	*OCB*152040	*FOLEY*	13286
2014*Jan*30	−2.5	*STIS/CCD*	*G*750*L*	50	*OCB*152050	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*153*CVQ*	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*153010	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*153020	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/CCD*	*G*430*L*	160	*OCB*153030	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/CCD*	*G*750*L*	100	*OCB*153040	*FOLEY*	13286
2014*Feb*01	−0.5	*STIS/CCD*	*G*750*L*	50	*OCB*153050	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*154*M*5*Q*	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*154010	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/NUV − MAMA*	*G*230*L*	153.66	*OCB*154020	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/CCD*	*G*430*L*	160	*OCB*154030	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/CCD*	*G*750*L*	100	*OCB*154040	*FOLEY*	13286
2014*Feb*04	2.5	*STIS/CCD*	*G*750*L*	50	*OCB*154050	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/CCD*	*MIRVIS*	0.3	*OCB*155*IRQ*	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*155010	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*155020	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/CCD*	*G*430*L*	160	*OCB*155030	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/CCD*	*G*750*L*	100	*OCB*155040	*FOLEY*	13286
2014*Feb*08	6.5	*STIS/CCD*	*G*750*L*	50	*OCB*155050	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/CCD*	*MIRVIS*	0.3	*OCB*156*DBQ*	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*156010	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*156020	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/CCD*	*G*430*L*	160	*OCB*156030	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/CCD*	*G*750*L*	100	*OCB*156040	*FOLEY*	13286
2014*Feb*10	8.49	*STIS/CCD*	*G*750*L*	50	*OCB*156050	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/CCD*	*MIRVIS*	0.3	*OCB*157*S*6*Q*	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*157010	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*157020	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/CCD*	*G*430*L*	160	*OCB*157030	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/CCD*	*G*750*L*	100	*OCB*157040	*FOLEY*	13286
2014*Feb*13	11.49	*STIS/CCD*	*G*750*L*	50	*OCB*157050	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/CCD*	*MIRVIS*	0.3	*OCB*158*S*9*Q*	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/NUV − MAMA*	*G*230*L*	2255	*OCB*158010	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/NUV − MAMA*	*G*230*L*	1747	*OCB*158020	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/CCD*	*G*430*L*	160	*OCB*158030	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/CCD*	*G*750*L*	100	*OCB*158040	*FOLEY*	13286
2014*Feb*16	14.49	*STIS/CCD*	*G*750*L*	50	*OCB*158050	*FOLEY*	13286
2014*Feb*26	24.05	*STIS/CCD*	*MIRVIS*	0.3	*OCB*159*IAQ*	*FOLEY*	13286
2014*Feb*26	24.05	*STIS/NUV − MAMA*	*G*230*L*	2235	*OCB*159010	*FOLEY*	13286
2014*Feb*26	24.05	*STIS/NUV − MAMA*	*G*230*L*	2807	*OCB*159020	*FOLEY*	13286
2014*Feb*26	24.05	*STIS/NUV − MAMA*	*G*230*L*	2807	*OCB*159030	*FOLEY*	13286

Table 3 (cont'd)

UT (date)	Phase (days)	Instrument	Grating	Exposure Time (sec)	Dataset	PI	Proposal ID
2014*Feb*26	24.05	$STIS/NUV-MAMA$	$G230L$	1724	$OCB159040$	$FOLEY$	13286
2014*Feb*26	24.05	$STIS/CCD$	$G430L$	300	$OCB159050$	$FOLEY$	13286
2014*Feb*26	24.05	$STIS/CCD$	$G750L$	200	$OCB159060$	$FOLEY$	13286
2014*Feb*26	24.05	$STIS/CCD$	$G750L$	50	$OCB159070$	$FOLEY$	13286
2014*Feb*26	24.05	$STIS/CCD$	$MIRVIS$	0.3	$OCB160JZQ$	$FOLEY$	13286
2014*Feb*26	24.05	$STIS/NUV-MAMA$	$G230L$	2255	$OCB160010$	$FOLEY$	13286

Table 4. Measurements of Observed SNe

UT (days)	Phase (d)	Fe II (2344.22 Å)	FeII (2374.46 Å)	FeII (2382.76 Å)	FeII (2586.65 Å)	FeII (2600.17 Å)	MgII (2796.35 Å)	MgII (2803.53 Å)	MgI (2852.96 Å)
					SN 1992A				
19920124.21	4.98	0.51	1.09	1.26	1.61	1.51	0.52	0.25	0.55
19920304.31	44.83	1.74	0.97	1.35	1.73	2.62	1.18	1.15	2.92
19921105.59	289.58	6.16	33.14	27.6	4.85	5.47	2.71	2.4	2.25
					SN 2011by				
20110430.56	−9.31	0.0	0.0	0.0	0.0	0.0	$1.39^{+0.01}_{-0.02}$	$1.37^{+0.01}_{-0.02}$	$0.74^{+0.28}_{-0.28}$
20110509.38	−0.52	$0.47^{+0.01}_{-0.01}$	$0.86^{+1.35}_{-0.43}$	$0.4^{+0.66}_{-0.02}$	$1.3^{+0.15}_{-0.16}$	$1.25^{+0.65}_{-0.67}$	$2.21^{+0.07}_{-0.06}$	$2.83^{+0.1}_{-0.08}$	$0.61^{+0.26}_{-0.26}$
					SN 2011ek				
20110812.56	−3.32	10.1	17.25	21.41	5.98	4.28	1.97	2.01	0.76
20110819.45	3.53	41.69	6.19	4.93	47.57	22.72	1.77	2.5	1.29
					SN 2011fe				
20110828.17	−13.11	$1.52^{+0.39}_{-0.39}$	$0.13^{+0.02}_{-0.04}$	$1.41^{+0.72}_{-0.72}$	$0.59^{+0.27}_{-0.27}$	$1.08^{+0.03}_{-0.03}$	$2.72^{+0.09}_{-0.09}$	$2.59^{+0.07}_{-0.07}$	$0.39^{+0.03}_{-0.03}$
20110831.27	−10.04	$1.24^{+0.01}_{-0.01}$	$1.68^{+0.11}_{-0.11}$	$2.11^{+0.22}_{-0.22}$	$1.29^{+0.02}_{-0.02}$	$1.16^{+0.03}_{-0.03}$	$2.72^{+0.1}_{-0.1}$	$1.99^{+0.31}_{-0.31}$	$0.37^{+0.11}_{-0.11}$
20110903.43	−6.91	$1.28^{+0.02}_{-0.02}$	$0.96^{+0.16}_{-0.16}$	$1.92^{+0.26}_{-0.26}$	$1.35^{+0.23}_{-0.23}$	$1.86^{+0.01}_{-0.01}$	$2.94^{+0.28}_{-0.28}$	$2.61^{+0.4}_{-0.4}$	$0.68^{+0.12}_{-0.12}$
20110907.42	−2.95	$1.48^{+0.03}_{-0.03}$	$0.73^{+0.02}_{-0.02}$	$1.85^{+0.0}_{-0.0}$	$1.38^{+0.29}_{-0.29}$	$1.79^{+0.15}_{-0.15}$	$3.0^{+0.26}_{-0.26}$	$2.74^{+0.45}_{-0.45}$	$0.61^{+0.17}_{-0.17}$
20110910.44	0.04	$1.24^{+0.13}_{-0.13}$	$0.73^{+0.1}_{-0.1}$	$1.68^{+0.02}_{-0.02}$	$1.48^{+0.26}_{-0.26}$	$1.56^{+0.01}_{-0.01}$	$2.86^{+0.17}_{-0.17}$	$2.64^{+0.03}_{-0.03}$	$0.67^{+0.15}_{-0.15}$
20110913.68	3.25	$1.85^{+0.07}_{-0.07}$	$1.3^{+0.23}_{-0.22}$	$2.0^{+0.22}_{-0.22}$	$1.89^{+0.05}_{-0.04}$	$1.31^{+0.12}_{-0.12}$	$2.9^{+0.06}_{-0.06}$	$2.11^{+0.28}_{-0.28}$	$0.39^{+0.01}_{-0.01}$
20110919.63	9.15	$1.25^{+0.02}_{-0.02}$	$0.68^{+0.02}_{-0.02}$	$1.72^{+0.01}_{-0.01}$	$1.09^{+0.16}_{-0.16}$	$1.53^{+0.14}_{-0.14}$	$2.76^{+0.08}_{-0.08}$	$2.56^{+0.18}_{-0.18}$	$0.48^{+0.0}_{-0.0}$
20111001.27	20.69	$1.49^{+0.07}_{-0.07}$	$0.89^{+0.02}_{-0.02}$	$2.03^{+0.24}_{-0.24}$	$1.19^{+0.2}_{-0.2}$	$1.27^{+0.23}_{-0.23}$	$2.61^{+0.22}_{-0.22}$	$2.19^{+0.01}_{-0.01}$	$0.54^{+0.0}_{-0.0}$
20111007.32	26.69	$2.15^{+0.07}_{-0.09}$	$0.54^{+0.2}_{-0.2}$	$1.26^{+0.1}_{-0.1}$	$1.08^{+0.01}_{-0.01}$	$1.24^{+0.01}_{-0.01}$	$2.27^{+0.04}_{-0.04}$	$2.62^{+0.37}_{-0.37}$	$0.77^{+0.01}_{-0.01}$
20111021.2	40.45	$0.74^{+0.3}_{-0.3}$	$0.43^{+0.17}_{-0.17}$	$1.26^{+0.2}_{-0.2}$	$1.91^{+0.4}_{-0.4}$	$2.22^{+0.5}_{-0.5}$	$2.54^{+0.02}_{-0.02}$	$2.45^{+0.12}_{-0.12}$	$0.84^{+0.02}_{-0.02}$
					SN 2011iv				
20111211.1	0.6	0.09	0.3	0.06	0.24	0.14	0.24	0.07	0.05
20111215.94	5.41	0.26	0.36	0.38	0.45	0.21	0.25	0.07	0.2
20111220.72	10.15	0.37	0.47	0.33	0.29	0.26	0.41	0.26	0.31
20111224.58	13.99	0.49	0.39	0.72	0.49	0.45	0.34	0.3	0.18
20111228.44	17.82	0.77	1.16	1.13	1.06	0.49	0.67	0.35	0.32
20120101.36	21.72	1.07	0.88	1.02	0.65	0.61	0.74	0.41	0.73
20120109.21	29.52	1.22	0.83	0.67	0.55	0.88	0.82	0.81	0.62
					SN 2012cg				
20120604.5	2.5	1.18	0.76	1.13	0.86	0.36	$1.32^{+0.01}_{-0.02}$	$1.32^{+0.01}_{-0.02}$	$0.91^{+0.28}_{-0.28}$
20120618.4	16.37	2.45	1.42	1.09	0.81	1.12	$1.93^{+0.01}_{-0.01}$	$1.92^{+0.01}_{-0.01}$	$1.31^{+0.33}_{-0.33}$
					SN 2013dy				
20130721.5	−6.17	$2.59^{+1.02}_{-1.02}$	$2.26^{+1.15}_{-0.06}$	$2.25^{+1.62}_{-0.05}$	$2.25^{+1.02}_{-0.05}$	$1.94^{+0.83}_{-0.04}$	$1.51^{+0.0}_{-0.0}$	$1.51^{+0.0}_{-0.0}$	$0.93^{+0.13}_{-0.13}$
20130725.61	−2.09	$2.28^{+0.93}_{-0.93}$	0.62	0.65	$1.32^{+0.31}_{-0.09}$	$1.31^{+0.23}_{-0.09}$	$1.19^{+0.07}_{-0.06}$	$1.08^{+0.05}_{-0.05}$	$0.76^{+0.08}_{-0.09}$
20130727.34	−0.37	$0.87^{+0.02}_{-0.02}$	$1.22^{+0.04}_{-0.04}$	$1.22^{+0.04}_{-0.04}$	$0.88^{+0.06}_{-0.06}$	$0.86^{+0.06}_{-0.05}$	$1.23^{+0.05}_{-0.9}$	$1.17^{+0.05}_{-1.11}$	$0.56^{+0.23}_{-0.23}$
20130729.32	1.61	$0.89^{+1.4}_{-0.11}$	$1.26^{+0.11}_{-0.1}$	$1.26^{+0.11}_{-0.1}$	$0.92^{+0.18}_{-0.18}$	$0.89^{+0.12}_{-0.16}$	$1.37^{+0.24}_{-0.2}$	$1.37^{+0.24}_{-0.2}$	$0.4^{+0.21}_{-0.21}$
20130801.59	4.85	0.0	0.0	0.0	$1.46^{+0.07}_{-0.06}$	$1.13^{+0.04}_{-0.04}$	$1.45^{+0.02}_{-0.03}$	$1.45^{+0.02}_{-0.03}$	$0.71^{+0.09}_{-0.09}$
20130805.51	8.76	$1.03^{+0.74}_{-0.73}$	$1.35^{+0.42}_{-0.36}$	$1.34^{+0.39}_{-0.36}$	$1.73^{+0.99}_{-0.99}$	$0.62^{+0.09}_{-0.07}$	$1.45^{+0.3}_{-0.3}$	$1.41^{+0.26}_{-0.28}$	$0.6^{+0.23}_{-0.23}$
20130809.11	12.36	$2.78^{+0.87}_{-0.87}$	$2.98^{+0.13}_{-0.13}$	$3.79^{+1.6}_{-1.6}$	$1.25^{+0.94}_{-0.09}$	$1.16^{+0.89}_{-0.1}$	$1.24^{+0.18}_{-0.61}$	$1.24^{+0.18}_{-0.61}$	$1.12^{+0.5}_{-0.51}$
20130811.15	14.38	0.0	0.0	0.0	$4.09^{+0.43}_{-0.49}$	$2.81^{+0.29}_{-0.3}$	$2.51^{+0.03}_{-0.1}$	$1.9^{+0.03}_{-0.17}$	$0.6^{+0.12}_{-0.13}$

Table 4 (cont'd)

UT (days)	Phase (d)	Fe II (2344.22 Å)	FeII (2374.46 Å)	FeII (2382.76 Å)	FeII (2586.65 Å)	FeII (2600.17 Å)	MgII (2796.35 Å)	MgII (2803.53 Å)	MgI (2852.96 Å)
20130815.01	18.22	3.43	1.11	1.11	$0.68^{+0.37}_{-0.31}$	$0.52^{+0.28}_{-0.23}$	$2.76^{+0.53}_{-0.64}$	$1.9^{+0.63}_{-0.73}$	0.5
20130817.94	21.17	0.0	$1.2^{+4.59}_{-0.07}$	$0.72^{+4.6}_{-0.06}$	$0.88^{+0.57}_{-0.32}$	$0.88^{+0.9}_{-0.02}$	$2.19^{+0.71}_{-0.19}$	$2.19^{+0.55}_{-0.19}$	$0.85^{+0.17}_{-0.17}$
					SN 2014J				
20140126.6	−6.5	22.91	71.66	8.98	2.95	4.78	$2.91^{+0.11}_{-0.11}$	$3.08^{+0.36}_{-0.36}$	$1.76^{+0.21}_{-0.21}$
20140128.44	−4.5	14.58	10.42	17.73	3.61	2.71	$1.93^{+0.37}_{-0.36}$	$1.79^{+0.19}_{-0.2}$	$1.86^{+0.32}_{-0.32}$
20140130.49	−2.5	25.6	70.23	33.27	18.53	5.69	$3.44^{+0.72}_{-0.73}$	$2.63^{+0.77}_{-0.77}$	$1.91^{+0.07}_{-0.08}$
20140201.61	−0.5	36.94	5.79	16.11	4.5	4.5	$4.14^{+0.23}_{-0.23}$	$4.16^{+0.2}_{-0.22}$	$1.27^{+0.5}_{-0.5}$
20140204.73	2.5	13.69	18.55	27.71	26.99	6.6	$2.59^{+1.11}_{-1.11}$	$2.71^{+0.09}_{-0.09}$	$1.99^{+0.95}_{-0.95}$
20140208.53	6.5	32.54	17.55	19.11	6.31	4.21	$4.34^{+0.16}_{-0.16}$	$2.73^{+0.18}_{-0.2}$	$1.61^{+0.08}_{-0.11}$
20140210.44	8.49	22.71	6.14	8.1	9.39	4.09	$2.95^{+0.1}_{-0.1}$	$2.72^{+0.15}_{-0.15}$	$0.96^{+0.07}_{-0.07}$
20140213.29	11.49	93.92	73.85	21.53	16.75	60.77	$3.34^{+0.64}_{-0.63}$	$2.64^{+0.32}_{-0.34}$	$2.87^{+0.74}_{-0.75}$
20140216.41	14.49	15.36	12.76	13.15	12.21	16.73	$2.77^{+0.57}_{-0.58}$	$2.81^{+0.22}_{-0.25}$	$1.2^{+0.21}_{-0.22}$
20140226.07	24.05	15.99	67.91	69.71	19.14	10.51	$5.74^{+0.57}_{-0.59}$	$5.79^{+0.95}_{-0.96}$	$3.46^{+0.26}_{-0.26}$