# SEDM Example Spectra for AGN of Various Types

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### 1 Overview

This is a guide to spectra of various spectroscopically-confirmed AGN types when viewed with the lower resolution ( $R \sim 100$ ) of the SED Machine on the Palomar 60-inch. Browse to a spectrum by clicking the above links. "SNID auto-match" refers to the robo classification pushed to the marshal based on the best-fit spectral Supernova Identification template matched during the IFU reduction pipeline. The template list used for SNID is the publicly-available BSNIPv7 (from the Berkeley Supernova Ia Program Silverman et al. 2012). QSO Templates are from SDSS DR6. Example targets were taken from the iPTF/PTF marshal courtesy of Nadia Blagorodnova (nblago@caltech.edu).

### **Revision History**

Revision	Date	Author(s)	Description
1.0	2018-05-25	SF	created

#### 2 Main Conclusions

The [OII] and [NII] doublets are often blended with H $\beta$  and H $\alpha$  due to their narrow widths—it is possible a feature at  $\lambda$ 5007 can be a noise spike (such as in Figure 13(a)), or real (as in Figure 9(a)). SNID only auto-matches to a QSO/AGN template in 2 out of 7 cases, and both successful fits are to broadline high-luminosity quasars, possibly due to there only being 5 AGN/QSO spectra in the template bank out of 328 total templates. In one case being "forced" to seek fits to Non-SN templates improves accuracy for a Seyfert spectral fit.



Figure 1: With a small number of known AGN observed with SEDM thus far, we can begin to derive a rough boundary near FWHM<sub>H $\alpha$ +N[II]</sub> ~ **125** Å (and well above the resolution limit of SEDM  $\Delta\lambda \sim 65$ Å), a threshold above which we can be confident that a quasar followed-up with SEDM is a true broadline type 1 AGN. Note that although Blazar and LINER line widths are less accurate due to lower SNR in H $\alpha$ +N[II], they are nonetheless shown for reference.

#### 3 SEDM Spectra of AGN Subtypes 3.1 Seyfert 1

#### 3.1.1 Type 1 AGN with High-Res Spectral Comparison



Figure 2: iPTF 16bco, a changing-look AGN observed after transitioning to a type 1 AGN.



3.1.2 Type 1 AGN with SNID Classification

Figure 3: iPTF 16hwl, a type 1 AGN with z = 0.085, at first gives a poor SNID match to a SN until fits are constrained to Non-SN templates only.

#### 3.2 Narrow-Line Seyfert 1



Figure 4: ZTF18aahbiav, a Narrow-line Seyfert 1 (NLS1), i.e. a Seyfert 1 with broad Balmer emission but FWHM<sub>H $\beta$ </sub>  $\leq$  2000 km/s and weak [OIII].

#### 3.3 Seyfert 1.5



Figure 5: iPTF 16gaf, a type 1.5 AGN, i.e. the strength of its H $\alpha$  and H $\beta$  are comparable.

#### 3.4 Seyfert 2

#### 3.4.1 Type 2 AGN with High-Res Spectral Comparisons



Figure 6: iPTF 17ei, a type 2 AGN.



3.4.2 Type 2 AGN with SNID Classification

(c) bbbb spectrum

Figure 7: iPTF 17ban, a type 2 AGN.

# 4 SEDM Spectra of Higher-Redshift Quasars ( $z \gtrsim 0.1$ )

#### 4.1 QSOs with High-Res Spectral Comparisons



Figure 8: iPTF 16gxt, a type 1 QSO Broadline with z = 0.17175.





Figure 9: iPTF 16fva, a QSO + Starbust Galaxy with z = 0.265.



Figure 10: iPTF 16bnb, a QSO + Starbust Galaxy with z = 0.20246.



Figure 11: iPTF 17dm, a QSO + Starbust Galaxy with z = 0.284.

## 5 SEDM Spectra of Blazars



Figure 12: iPTF 17bcm, a blazar.

## 6 SEDM Spectra of LINERs



Figure 13: ZTF18aakigxu, a LINER.

# 7 Appendix: Non-AGN SEDM Spectra

#### 7.1 Type II Supernovae



Figure 14: SEDM spectrum of ZTF18aabybkt, a type II Supernova, which can appear similar to a broadline Seyfert 1 or a TDE at the resolution of the SEDM.