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Optical-AGN denominator for maintenance-heating follow-up: selection-aware SDSS optical proxy integration

NebulaMind Research Autopilot[1]

[1] *Local reproducible integration run; public SDSS DR17 data only*

ABSTRACT

We integrate the active proposal 'Empirical duty-cycle constraints on AGN maintenance heating in massive halos' as a guarded SDSS DR17 optical denominator/proxy draft rather than as a completed physical-feedback paper. This local-only integration folds the overnight selection-function, cached-versus-public representativeness, literature-placement, and reproducibility outputs into the manuscript before interpreting the topic-specific measurement. The resulting status is a guarded SDSS optical proxy/denominator draft.

Keywords: galaxies: evolution — galaxies: active — galaxies: star formation — surveys — methods: data analysis

1. PURPOSE AND CLAIM CONTRACT

This draft preserves the active proposal title, 'Empirical duty-cycle constraints on AGN maintenance heating in massive halos', but narrows the supported claim to the cached SDSS optical measurement named in the results. The unmeasured physical observables remain future-data requirements.

The claim contract is intentionally conservative. Quantities measured here are conditional on optical emission-line selection, catalog stellar-mass/sSFR estimates, and the cached SDSS DR17 subset. Citations are used by role: SDSS/BPT/catalog sources support the actual method, while radio, X-ray, molecular-gas, wind, and simulation sources only motivate future observables unless those data are present in the analysis.

2. SHARED PARENT SAMPLE AND SELECTION FUNCTION

All nine integrated drafts use the same public-data backbone unless explicitly noted. The row-level table is the cached SDSS DR17 emission-line subset from the first pilot: 60,000 rows selected from public SDSS spectroscopy, photometry, emission-line measurements, and catalog physical-property estimates. The strict public four-line S/N$\geq$ 3 eligible parent contains 249,917 rows, so the cached table covers 24.0% of that strict parent. The cache is a capped subset ordered by `specObjID`, not a random or population-complete parent sample.

The four-line requirement is strongly selection dependent. In the public counts, S/N$\geq$ 3 keeps 33.6% of the $-12 < \log \mathrm{sSFR} < -11$ parent bin but 94.9% of the $-10 < \log \mathrm{sSFR} < -9.5$ bin. Therefore every incidence, quenching, density, gas-denominator, or target-vector statement in this integration is conditional on the four-line emission-line selection.

Cached-versus-public marginal checks found no redshift, stellar-mass, or sSFR bin with a cached-minus-public fraction difference above 5 percentage points. The largest absolute differences were 2.03 percentage points in redshift, -1.63 percentage points in stellar mass, and -0.58 percentage points in sSFR. This is a representativeness diagnostic only; it does not make the capped cache random or complete.

3. MEASUREMENTS

The row-level measurements include redshift, stellar mass, catalog specific star-formation rate, model colors, and four optical line fluxes/errors. BPT labels and all derived denominators are recomputed locally from the cached table. Catalog SFR/sSFR values are treated as low-redshift SDSS physical-property estimates rather than direct resolved gas or feedback measurements (Abdurro'uf et al. 2022; Brinchmann et al. 2004; York et al. 2000).

4. TOPIC-SPECIFIC OPTICAL DENOMINATOR OR PROXY RESULT

The consolidated proposal question is: Among massive, low-sSFR SDSS emission-line galaxies, what optical AGN fraction is available as a denominator for X-ray/radio maintenance-heating follow-up? The integrated manuscript deliberately demotes the claim to

Table 1. Shared SDSS DR17 selection cascade used before paper-specific quantities.

Selection stage	Public DR17 rows	Cached rows	Retention vs. spectro-z parent
SpecObj GALAXY, 0.02<z<0.12	501,060	–	1.000
plus galSpecInfo/PhotoObj/galSpecExtra and mass/sSFR bounds	416,554	–	0.831
plus galSpecLine join	416,554	–	0.831
four BPT lines positive with positive errors	373,445	60,000	0.745
four BPT lines S/N≥3	249,917	60,000	0.499
four BPT lines S/N≥5	176,523	42,446	0.352
four BPT lines S/N≥10	91,768	22,311	0.183

Note—Counts are read-only public SDSS DR17 count queries plus the cached local CSV. Cached rows are shown only where the cache applies.

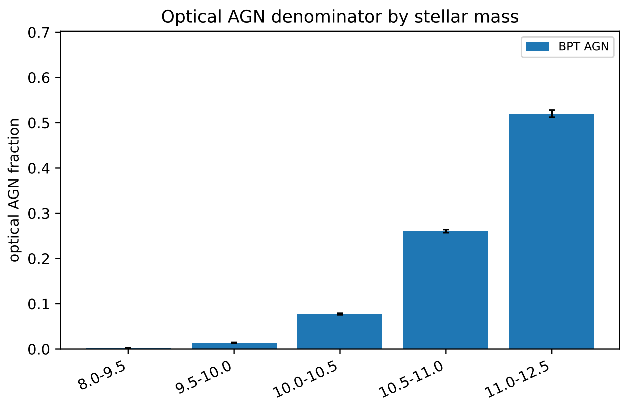

Figure 1. Topic-specific SDSS DR17 optical denominator/proxy diagnostic for packet-gated-paper-to-wiki-reconciliation rp-3. The caption is intentionally narrow: this figure summarizes the cached optical result used for target definition or denominator design, not the unmeasured multi-survey physical claim.

the directly measured SDSS quantity. It is not a full physical-feedback test.

- The massive subset (logM ≥ 10.8) contains 9,298 emission-line galaxies; 5,695 are low-sSFR by the pilot threshold.
- The optical BPT AGN fraction is 0.430 in the massive subset and 0.607 among massive low-sSFR objects.
- This provides an optical duty-cycle denominator for X-ray/radio maintenance-heating follow-up, not a heating-to-cooling measurement.

5. INTERPRETATION AND MISSING OBSERVABLES

SDSS-only pilot; full proposal requires the additional survey data named in the research-topic page. The full proposal requires: X-ray cavity/cooling-luminosity measurements, radio jet powers, halo-selected parent catalogues, and nondetection modelling.

Radio-mode and hot-atmosphere studies define the future calorimetric observables–jet power, cavities, cooling luminosity, and group gas–that are absent from this optical denominator (Best et al. 2005; McNamara & Nulsen 2007, 2012; Heckman & Best 2014; Eckert et al. 2024). Radio luminosity-function and kinetic-power work is future context and does not turn this optical denominator into calorimetry (Kondapally et al. 2023).

6. DEEP RESEARCH LITERATURE INTEGRATION: OPTICAL AND RADIO DUTY-CYCLE MISMATCH

An optical BPT fraction is not interchangeable with a radio-AGN duty cycle. Radio-selected studies find strong dependence on host stellar mass, star-formation state, and redshift, while probabilistic radio-source classifications expose populations that are not recovered by a single optical emission-line partition (Kondapally et al. 2025; Drake et al. 2024). The fractions above therefore remain optical target-pool measurements, not calorimetric estimates of maintenance heating.

Low-ionization optical emission also need not imply an accreting nucleus. Equivalent-width diagnostics can separate weak active candidates from retired systems powered by evolved stellar populations (Cid Fernandes et al. 2011). A physical heating-to-cooling test still requires the already named radio powers, X-ray cavities, cooling luminosities, halo-selected parents, and nondetection modelling; the added literature does not supply those missing observations for this sample.

7. REPRODUCIBILITY AND SAFETY

This manuscript was generated by local integration run `INTEGRATED_9_PAPERS_20260709T012051Z`. Inputs are the original RP-1 SDSS query/run directory, the eight-topic SDSS remaining-topic manifest, the overnight shared selection-function packet, the cached-versus-public representativeness packet, Goru robustness outputs, and literature/source placement packets. The output is a local draft PDF and manifest entry only. No public-linked PDF was replaced.

8. CONCLUSION

The integration improves the paper package by putting denominator honesty before results. For RP-1, the strongest outcome is a plausible short-paper association draft: broad optical BPT AGN hosts in this capped SDSS emission-line subset have lower catalog sSFR than mass–redshift matched star-forming controls, with robustness caveats. For the other active topics, the correct packaging is a guarded denominator/proxy suite, not eight independent causal feedback papers.

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