Project Proposal [not started yet...]
AGN/Host properties of IR-pure AGN

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In collaboration with
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IR counterparts of BAT AGN

- 3-500 um IR data from WISE, AKARI, IRAS, and Herschel
  (see Ichikawa+17 for more details)

- 601/606 MIR (, NIR) and 402/606 FIR counterparts

- Suitable for the AGN dust/host galaxy studies

- IR Data is already public. [Link](http://iopscience.iop.org/0004-637X/835/1/74/suppdata/apjaa5154t1_mrt.txt)
SED Decomposition in IR bands

- SED Decomposition is done using simple AGN/(SB+stellar) templates
  (see Mullaney+11 and Ichikawa+19 for more details)

\[ f_{\text{AGN}}^{\text{(MIR)}} = 0.56; \quad f_{\text{AGN}}^{\text{(IR)}} = 0.26 \]

- NGC5995 (ID=783, z = 0.025)

Host galaxy

AGN dust

Ichikawa+19
SED Decomposition in IR bands

☑ SED Decomposition is done using simple AGN/(SB+stellar) templates (see Mullaney+11 and Ichikawa+19 for more details)

☑ SED decomposition: 587/606 sources

☑ Disentangling AGN/host galaxy (SB+stellar) component

=> AGN IR emission w/o host galaxy contamination
Comparison with high-spatial resolution observations

High spatial resol. obs. (Asmus+14,+15)

\[ L_{12\mu m}^{(\text{Asmus})} \geq L_{12\mu m}^{(\text{K17})} \]
Comparison with high-spatial resolution observations

☑ SED Decomposition works well!

High spatial resolution obs.

☑ SED decomposition reproduces $L_{12\mu m}$ of 0.’3-0.’7 scale high spatial resolution observations (Asmus+14;15)
IR-Pure AGN candidates
IR-Pure AGN candidates

We found 9 “IR-pure AGN” candidates

MCG-05-23-016 (ID=472, z = 0.0085)  
\[ f_{\text{AGN}}^{\text{MIR}} = 0.98; f_{\text{AGN}}^{\text{IR}} = 0.95 \]
IR-Pure AGN candidates

We found 9(+4) “IR-pure AGN” candidates

☑ FIR (up to ~100um) is dominated by AGN torus emission
☑ IR-pure AGN shows the SED w/ $f_{22\mu m} > f_{70\mu m} > f_{160\mu m}$
9 IR-Pure AGN candidates

- Mrk335 (ID=6, z = 0.026)
  \( f_{\text{AGN}}^{\text{IR}} = 0.99; f_{\text{AGN}}^{\text{MIR}} = 0.96 \)

- Fairall9 (ID=73, z = 0.047)
  \( f_{\text{AGN}}^{\text{IR}} = 0.98; f_{\text{AGN}}^{\text{MIR}} = 0.91 \)

- Mrk704 (ID=449, z = 0.029)
  \( f_{\text{AGN}}^{\text{IR}} = 0.99; f_{\text{AGN}}^{\text{MIR}} = 0.95 \)

- MCG-05-23-016 (ID=472, z = 0.0085)
  \( f_{\text{AGN}}^{\text{IR}} = 0.98; f_{\text{AGN}}^{\text{MIR}} = 0.95 \)

- Mrk417 (ID=519, z = 0.033)
  \( f_{\text{AGN}}^{\text{IR}} = 0.98; f_{\text{AGN}}^{\text{MIR}} = 0.91 \)

- IIS2010 (ID=663, z = 0.034)
  \( f_{\text{AGN}}^{\text{IR}} = 0.98; f_{\text{AGN}}^{\text{MIR}} = 0.9 \)

- Mrk841 (ID=753, z = 0.036)
  \( f_{\text{AGN}}^{\text{IR}} = 0.98; f_{\text{AGN}}^{\text{MIR}} = 0.92 \)

- Mrk290 (ID=774, z = 0.03)
  \( f_{\text{AGN}}^{\text{IR}} = 0.99; f_{\text{AGN}}^{\text{MIR}} = 0.94 \)

- ESO103-035 (ID=988, z = 0.013)
  \( f_{\text{AGN}}^{\text{IR}} = 0.96; f_{\text{AGN}}^{\text{MIR}} = 0.91 \)
AGN properties of IR pure-AGN

Some QSOs show similar SED. Are IR pure-AGN very bright?

☑ $L_{IR,AGN}$, $\lambda_{Edd}$ vs. $M_{BH}$ of IR pure-AGN

☑ Almost similar distribution w/ the parent sample
Their SF luminosity is smaller than the average
IR-Pure AGN candidates

We found 9(+4) “IR-pure AGN” candidates

- M\(_{BH}\), L\(_{14-150\text{keV}}\) distribution is similar with the parent sample (\(<\log M_{BH}> = 7.8, <\log L_{14-150}> = 43.7\))
- FIR (up to \(~100\mu m\)) is dominated by AGN torus emission

Suggesting weaker SF activities in the host
good candidates of final stage AGN?
What is the next step?

IR-pure AGN are interesting candidates in the phase where \textit{AGN is (still) active, but the host is quenching}.

- SF quenching is actually happening in IR pure AGN?
  1. molecular gas reservoir (gas mass)
  2. location in SFR vs. M*

- Do IR-pure AGN have any feedback signatures?
  1. optical spectral feature
IR-pure AGN contain low molecular gas?

CO (2-1) emission is non-detection for (at least one) IR-pure AGN

☑ BASS molecular gas sample could cover most of IR-pure AGN?

☑ Gas mass In BASS DR2? (Koss+ or Shimizu+?)
Are IR-pure AGN in the main-sequence?

Where are the location of IR-pure AGN in SFR vs $M_*$ sequence?

☑ Small SFR/$M_*$ would be expected for IR-pure AGN

Shimizu+14
Where are the location of IR-pure AGN in SFR vs M* sequence?

- Small SFR/M* would be expected for IR-pure AGN

Shimizu+14

Locus of pure-IR AGN?
Do IR-pure AGN have (ionized) outflow?

Optical spectra give us the (ionized) outflow through [OIII]5007.

☑ BASS already covers optical spectra, the outflow feature might be easily checked?
Can we see some AGN luminosity decline?

ALLWISE+NEOWISE covers W1 (3.4um) and W2 in the last 8 yrs

☑ Do we see any variabilities for IR-pure AGN?
☑ Seems very ambitious, but worth to see…

Ichikawa+19b
What we will do

In order to work on the AGN/host properties of pure-IR AGN, we will check

☑ SFR vs. $M^*$
☑ molecular gas mass
☑ outflow properties

In order to achieve them, we need

☑ optical spectra with outflow feature
☑ $M^*$, molecular gas mass $\leq$ BASS team already has the dataset?
Appendix
Their SF luminosity is smaller than the average