High Redshift AGN and Their Host Galaxies: PSF-subtraction, Coronagraphy(?) & SED-fitting.

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Outline:

(1) High-z AGN and Their Host Galaxies:

PSF-subtraction, Coronagraphy? & SED-fits.

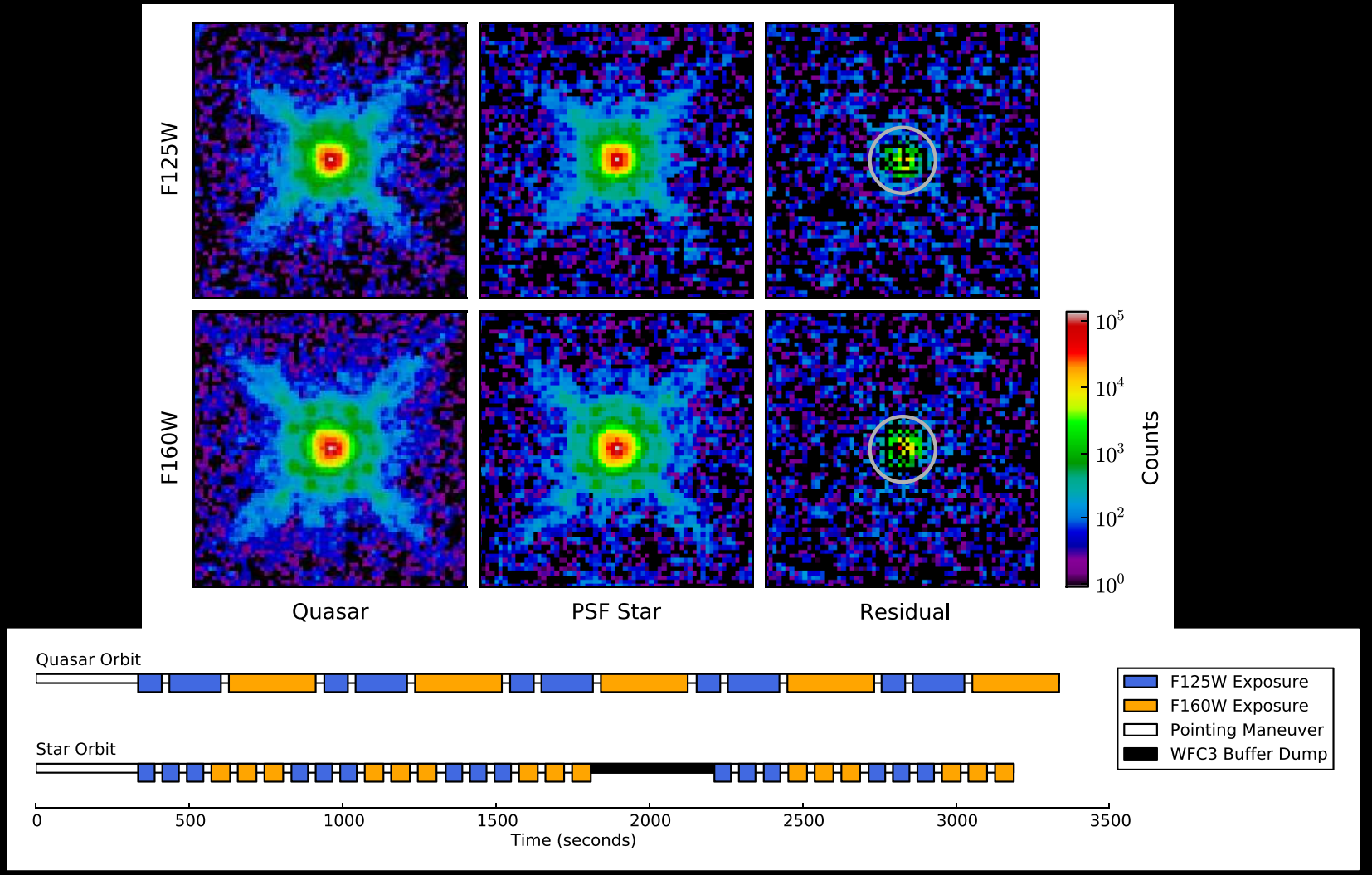
- How did Galaxy Assembly keep up with Supermassive Black-Hole Growth?

- (2) Summary and Conclusions.

Talk at the JWST GTO Workshop, May 17, 2016; National Research Council, Victoria (BC, Canada).

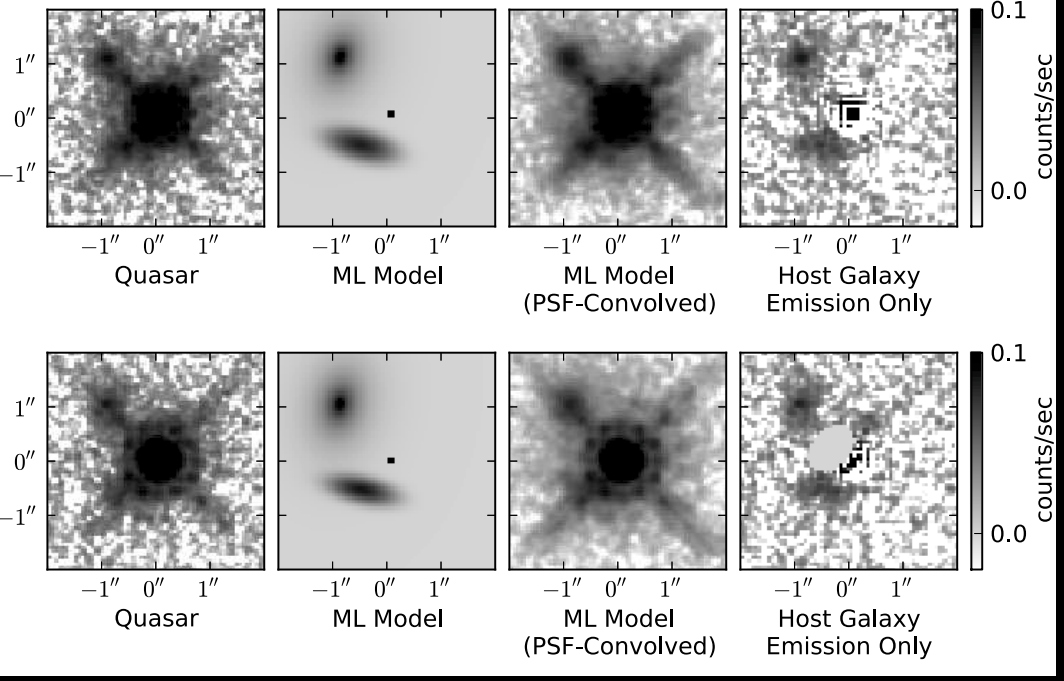
Talks are on: `http://www.asu.edu/clas/hst/www/jwst/jwsttalks/windhorst_AGNhosts16.pdf`

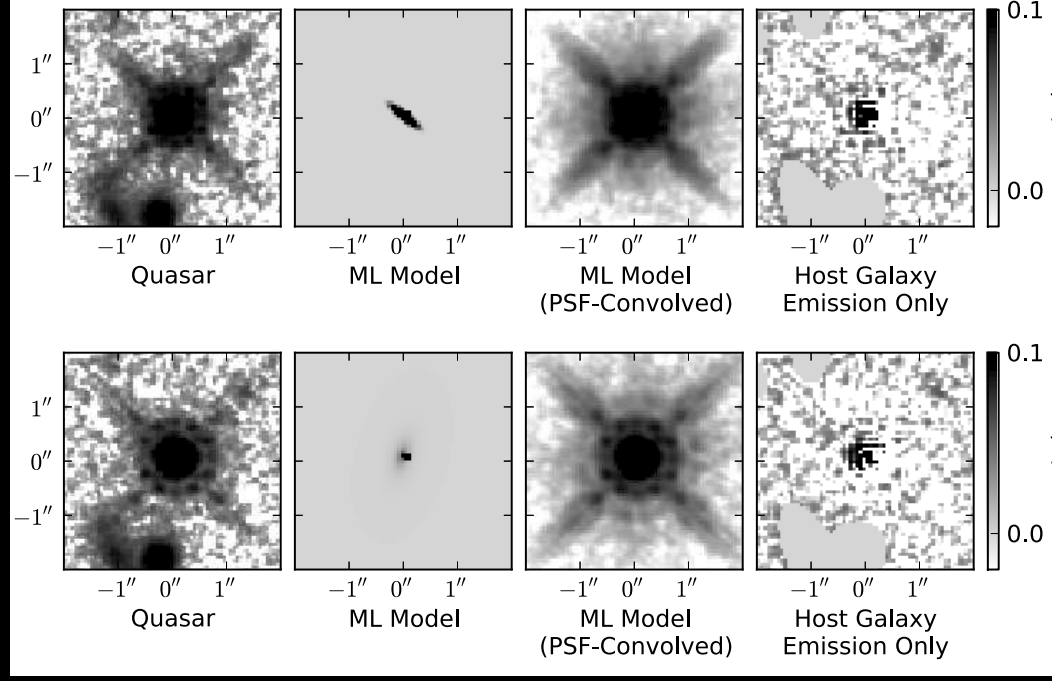
(1a) HST WFC3 observations of QSO host systems at z≃6 (age≲1 Gyr)



- Careful contemporaneous orbital PSF-star subtraction: Removes most of "OTA spacecraft breathing" effects (Mechtley ea 2012, ApJL, 756, L38).
- PSF-star (AB≃15 mag) subtracts z=6.42 QSO (AB≃18.5) nearly to the noise limit: NO host galaxy detected 100×fainter (AB≳23.5 at r≳0.″3).

(1a) WFC3: Detection of one QSO Host System at z≃6 (Giant merger?)

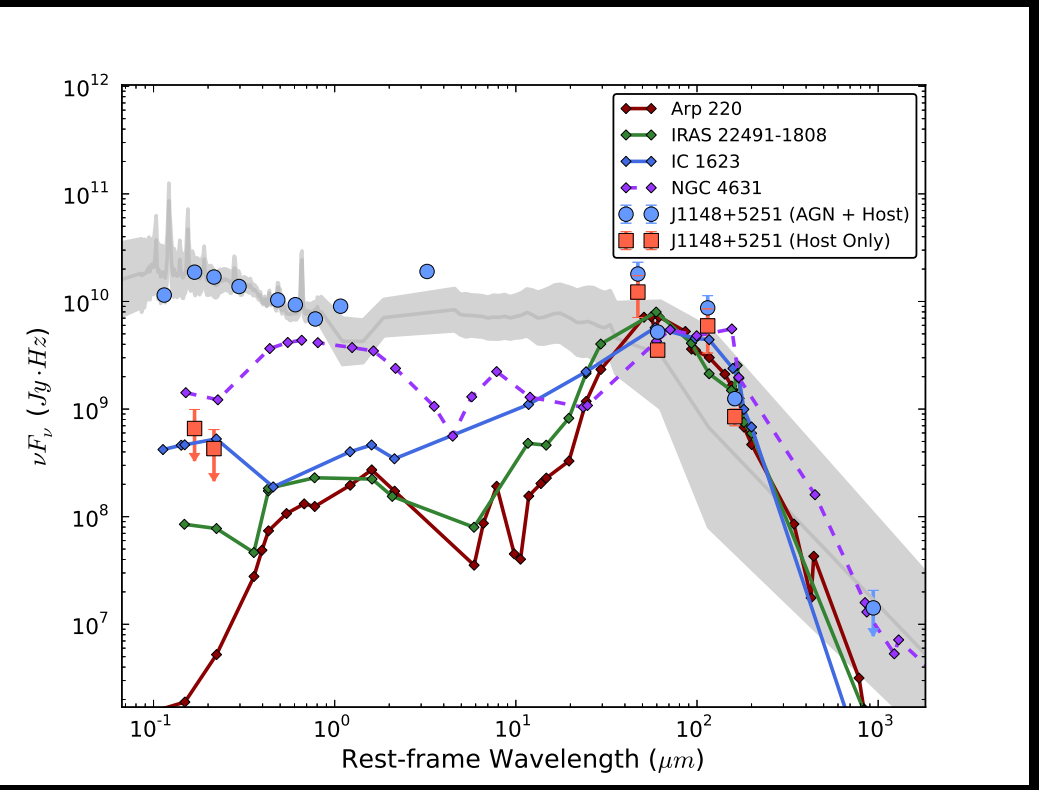


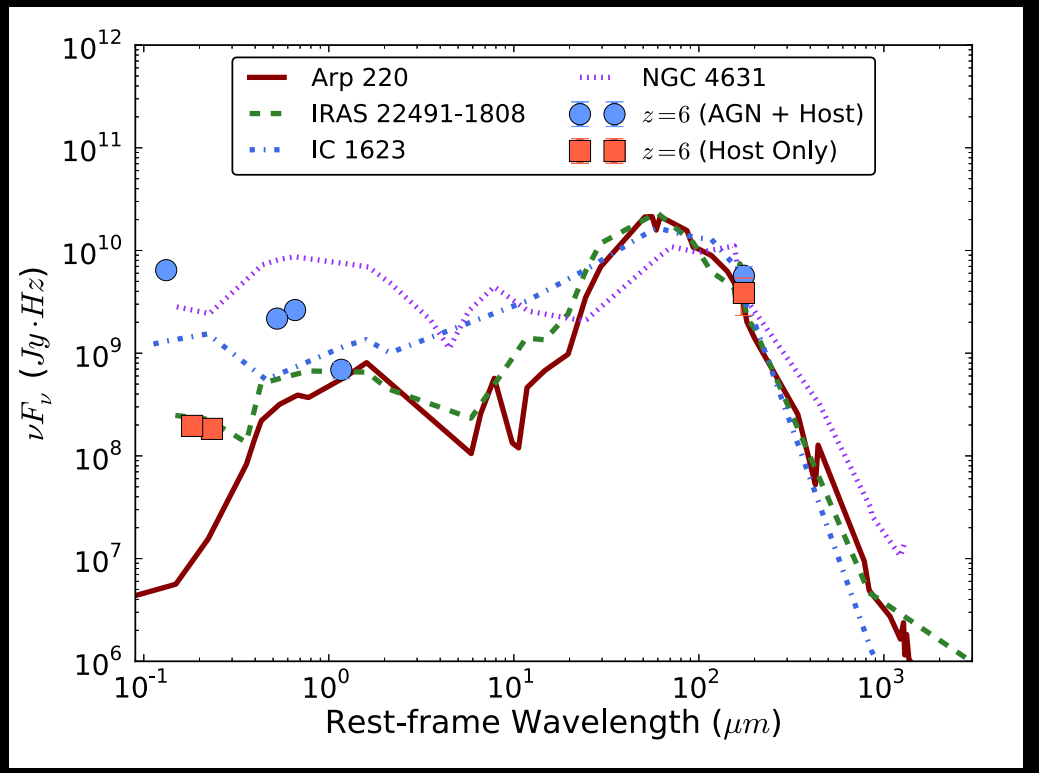


- Markov Chain Monte Carlo posterior model of observed PSF-star + Sersic light-profile. Gemini AO images to pre-select PSF stars (Mechtley^{+} 2014).
- First detection out of four z≃6 QSOs [2 more to be observed].
- One z≃6 QSO host galaxy: Giant merger morphology + tidal structure?

- Same J+H structure! Blue UV-SED colors: (J–H)≃0.19, constrains dust.
  - IRAS starburst-like SED from rest-frame UV–far-IR, $A_{\boldsymbol{FUV}}$∼1 mag.
- $M_{\boldsymbol{AB}}^{\boldsymbol{host}}$(z≃6)$\lesssim$–23.0 mag, i.e., ∼2 mag brighter than L*(z≃6).

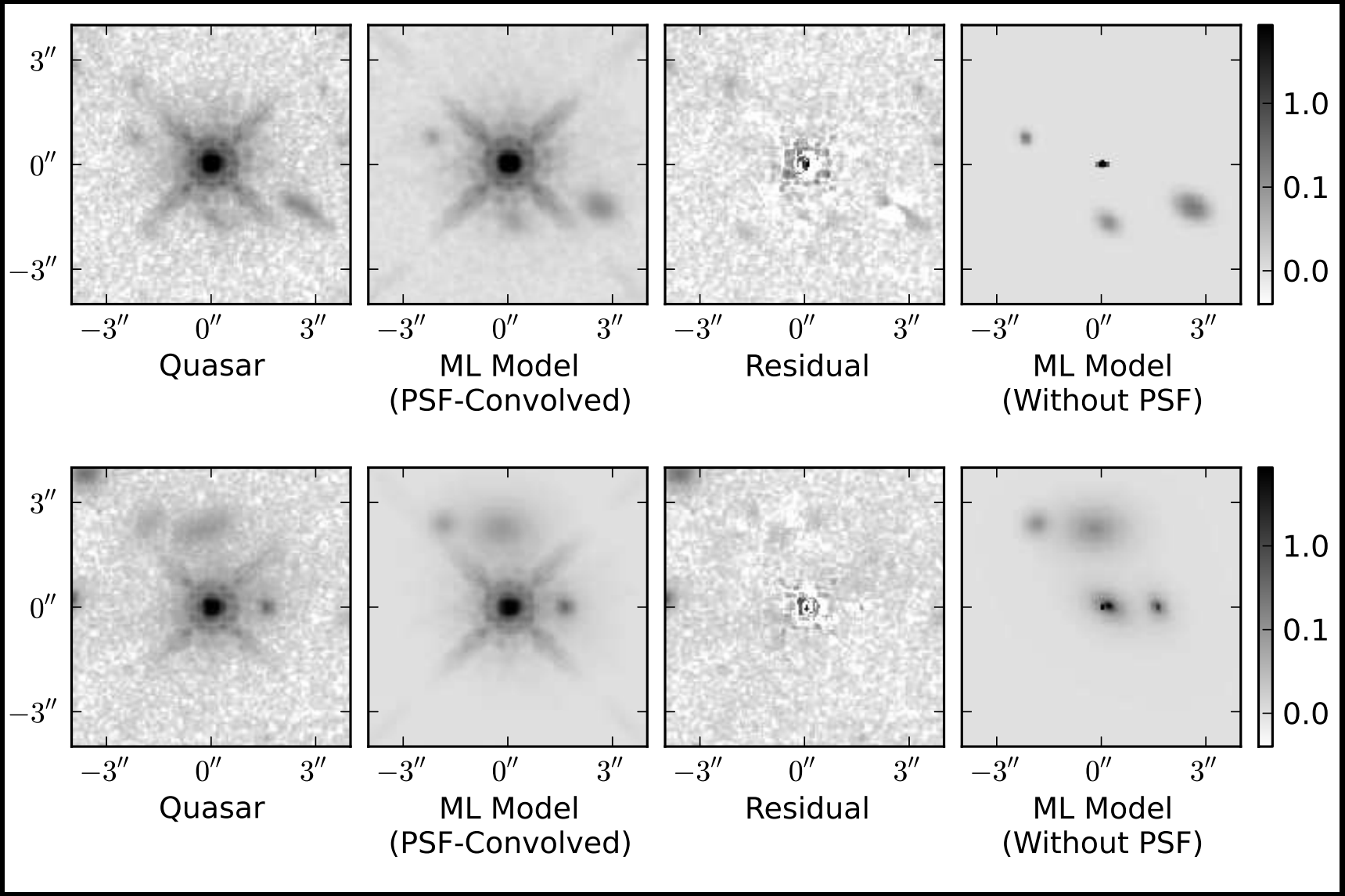
(1a) HST WFC3 observations of dusty QSO host galaxies at z≃6





- Blue dots: z≃6 QSO SED, Grey: Average radio-quiet SDSS QSO spectrum at z≳1 (normalized at 0.5μ). Red: z≃6 host galaxy (WFC3+submm).
- Nearby fiducial galaxies (starburst ages≲1 Gyr) normalized at 100μm: [LEFT] Rules out z=6.42 spiral or bluer host galaxy SEDs for 1148+5251. (U)LIRGs & Arp 220s permitted (Mechtley et al. 2012, ApJL, 756, L38). [RIGHT] Detected QSO host has IRAS starburst-like SED from rest-frame UV–far-IR, A_{FUV}(host)∼1 mag (Mechtley 2013 PhD; et al. 2016).
- JWST (+Coronagraphs?) can do this ≳10× fainter: will do 2 in GTO time.

(1b) WFC3 observations of QSO host galaxies at z≃2 (evidence for mergers?)



- Markov Chain Monte Carlo posterior model of observed PSF-star + Sersic light-profile: merging neighbors (some with tidal tails?; Mechtley, M., Jahnke, K., Windhorst, R. A., et al. 2016, astro-ph/1510.08461).
- JWST (+Coronagraphs?) can do this $\gtrsim$10× fainter: in restframe V for z$\gtrsim$6.

Conclusions re. JWST Observations of z$\gtrsim$6 Host Galaxies

(1) JWST studies of the host galaxies of AGN at z$\gtrsim$6 will require:

• Consideration of the likely very dusty host galaxy nature, given the limited fraction of faint host system detections with WFC3 IR at z$\gtrsim$6.

• Given the likely small host galaxy sizes ($\boldsymbol{r_{hl}}$), *very careful contemporaneous PSF subtraction* may work better than Coronagraphy.

(2) Purpose of this Conference: Coordinate closely with MIRI (G. Rieke et al.) and other GTO teams (NIRISS) an optimal plan to observe host galaxies of AGN at z$\simeq$2–6.

This IDS GTO team will likely do two QSO's at z$\gtrsim$6 and two at z$\sim$2.

SPARE CHARTS