■ Scientific Justification

Actively accreting supermassive black holes, i.e. quasars, are known to exist at very high redshift, when the Universe was much less than a billion years old. However, we currently do not know how these first supermassive black holes (SMBHs) formed. From estimates of the black hole mass, it is seen that SMBHs with $> 10^9$ $M_\odot$ exist less than a billion years after the Big Bang. Current models (e.g. Thispaper (2012); Thispaper (2012), Thispaper (2012)) suggestion either direct collapse black holes (DCBHs) or Population III stars could be the progenitors of the very-high redshift SMBHs.

We propose to obtain MIRI imaging, coronagraphy and spectroscopy of all known $z \geq 6.8$ quasars. MIRI covers 4.9-28.8μm thus granting access to the optical/near-IR 0.63-3.7μm rest-frame at $z = 6.8$.

The Science Case includes:
• How did the first SMBHs form?
• What are the BH masses from multiple lines (including rest-frame Balmer)?
• What are the host galaxy properties of $z > 6.8$ quasars?
• What is the stellar content of the quasars host galaxy? Does the Magorrian relation hold at very high-z?
• Is there evidence for (major) merging?
• What is the environment of the $z > 6.8$ quasars?
• Whats the optical/near-IR spectral slope for the highest redshift quasars?
• Are the $z > 6.8$ luminous quasars different from 'regular AGN' detected in the JWST Deep Fields?
• What are the details of the Reionization Epoch?

These questions directly address two of the four *JWST* science themes (The End of the Dark Ages: First Light and Reionization; and Assembly of Galaxies) No telescope or observatory in the midterm future will be able to access wavelengths longer than 5μm to these sensitivies.

Building on the very high redshift quasar catalog in the infrared from Ross & Cross (2020, MNRAS accepted) and from Dr. Sarah Bosmans current list: there are 20 objects with $z \geq 6.80$.

MIRI coronagraphy is a capability unique to JWST.

Some other key things to note: The JWST GTO teams are already looking at $z > 6.70$ quasars. However, only quasar J1342+0928 at $z = 7.54$ is currently being observed by MIRI. Pretty obviously(!!) I would strongly suspect other teams will be looking at the very high-redshifts quasars. A **key point** here is not to directly compete with those observations, but moreover, complement them. As such, our team has a *a zero proprietary period* making the data immediately accessible from a webpages (e.g. github.com/d80b2t/JWST_Cycle1) The GTO and ERS programs already have the targets and instruments and modes that they are going to be using. One could then start to build-up on that arguing that youll never have the lambda ¿5um space-based data again any time again soon, and Generating a sample for a large number (all) of the currnently known $z > 6.7$ quasars is exactly what JWST was built for, and this will tremendously legacy value. This could/would be suggested as a multi-cycle program (though not necessarily explicitly as that I dont think this category is implemented yet). Using the Cycle 1+GTO+(ERS?) data as type of Pilot program, observing maybe ∼5-10 objects in total first, and letting that guide observations in future cycles.

■ Technical Justification

■ Special Requirements (if any)

■ Justify Coordinated Parallel Observations (if any)

■ Justify Duplications (if any)

■ Analysis Plan (AR only)