Early science with ELTs (EASE)
Proceedings IAU Symposium No. 347, 2018
Norbert Przybilla, Karen Pollard, Annalisa Calamida, eds.

DOI: 00.0000/X000000000000000X

Characterization of high z quasars in the ELTs era.

Renato Falomo[1], Simona Paiano[1], Daniela Fantinel[1] and Michela Uslenghi[2]

[1] INAF Osservatorio Astronomico di Padova,
Vicolo Osservatorio 5 Padova 35122, Italy
email: renato.falomo@inaf.it

[2]INAF-IASF Milano

Abstract. We investigate the capabilities of the generation of large telescope equipped with adaptive optics assisted imagers to characterize the properties of high redshift quasars and their host galaxies. Base on the presently expected instrument performances we found that the first light imager MICADO, together with the MCAO module Maory, designed for the E-ELT are very well suited to afford these studies.

Keywords. (galaxies:) quasars: general, instrumentation: adaptive optics

1. Introduction

After more than 50 years since the discovery of quasars, the role of the powerful nuclear actvity in the centers of massive galaxies is still little understood. On the other hand the discovery that virtually all massive galaxies host a super massive black hole in their centers indicates that an important link is in place between the processes of formaKon of galaxies and the presence of their massive BHs. In order to explore this link it is needed to measure both the mass of the central BH and the properties of its host galaxy over a significant cosmic time (see e.g. Decarli et al (2010).

This can be done using the properties of quasars and their host galaxies and requires exceptional observing capabilites in terms of sensitvity and spatial resolution. They are well accomplished by the expected performances of MICADO@E-ELT

2. Simulations

We investigate the capabilities of MICADO@EELT imaging (Davies et al 2018) to characterize the morphology of the host galaxy of QSOs and to derive possible signature of interactions. The simulations are performed using the Advanced Exposure Time Calculator (AETC) tool (http://aetc.oapd.inaf.it/). To simulate the host galaxies of the QSO we consider images of low redshift galaxies secured by HST ACS as template and add a point source to include the active nucleus. The galaxy template is convolved with the PSF and then scaled to the flux and angular size that is expected for a QSO at a given redshift including cosmological and evolutionary effects.. For comparison we also performed similar simulations as would be obtained by NIRCam on board of JWST using the specifications given in http://jwstetc.stsci.edu/etc/) and by a MCAO system (alike MAD@VLT) on an 8-m ground telescope for the same targets and same observational conditions (see also Falomo et al (2015) and Paiano et al 2017.

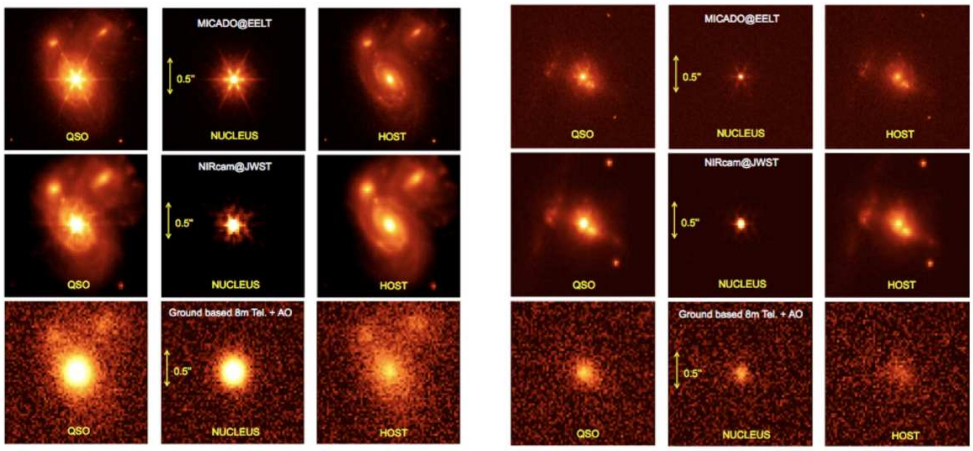

Figure 1. LEFT: Simulated images (Ks band; 2h exp) of a QSO at z=1 as imaged by MICADO@EELT (top) and compared with those expected using NIRcam@JWST (middle) and by a ground-based 8m telescope equipped with AO (alike MAD@VLT;). The QSO (leT panels) is composed by a nucleus (middle panels) of Ks=18 and a host galaxy (right panels) of Ks=19 and size Re=0.3 arcsec. For the host galaxy the image template of NGC 6050 (the brightest galaxy and its companions) is used. RIGHT: Similar to the case in the left but for a QSO observed in Ks band with 3h exp. The nucleus is of Ks=21 and a host galaxy of Ks=21 and size Re=0.1 arcsec. For the host galaxy the image template of NGC 1309 was used with in addition two faint companions (Ks=21.5) at a distance of 0.15 and 0.35 arcsec from the nucleus

3. Conclusions

Quasars represent the best targets to explore the connection between the formation of massive galaxies and their central black holes. Because of their high luminosity they can be studied at large distance and allow us to investigate the phase of galaxy-BH formation at very early epochs . This requires extraordinary capabilities in terms of sensitvity and angular resolution to be able to characterize the properties of the tiny host galaxies of distant QSO. The first light imager MICADO, together with the MCAO module Maory, designed for the E-ELT are very well suited to afford these studies.

References

Decarli, R. Falomo, R. Treves, A.,et al . 2010 MNRAS 402 2453
Davies, R et al 2018 , arXiv:1807.10003.
S. Paiano, R. Falomo , et al 2017, Proc. AO4ELT5, Tenerife.
Falomo, R., HARMONI workshop Oxford (UK) E4rly EELT science: Spectroscopy with HARMONI, June 2015.