ON THE [OIII] EMISSION OF PG 1501+106

G. M. Van Heerde
Sterrewacht Leiden
Postbus 9513
2300 RA LEIDEN

ABSTRACT. Narrow-band imaging of PG 1501+106 revealed no extra-nuclear [OIII] emission above a level of ~ 20 μJy. The disagreement with the result of Boroson et. al., 1982 (who detected 40 μJy) can be explained by assuming a slight difference in angular size between the broad and narrow line emitting regions.

1. INTRODUCTION AND OBSERVATIONS

To investigate the nature of emission line regions in the nebulosity surrounding low-redshift QSOs we started a narrow-band imaging survey to determine the morphologies (if present) of emission line regions surrounding a sample of low-redshift QSOs. We included in our survey a source (PG 1501+106) of which a published spectrum indicated the presence of [OIII] emission at a distance of a few arcsec from the nucleus (Boroson et. al., 1982).

The observations of PG 1501+106 (= Mkn 841; z = 0.036) were obtained 17 April 1985 at ESO, La Silla using the ESA/PCD at the 2.2m telescope. The PCD (Photon Counting Detector) has been described in detail by di Serego Alighieri et. al., 1985. We obtained two 1800 sec narrow-band (~ 40 A FWHM) exposures : one centred on [OIII]λ5007 and one on the nearby emission-line free continuum (5080 A in the rest frame of the QSO).

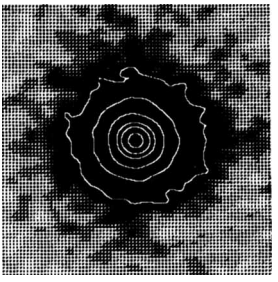

Fig.1 [OIII] image

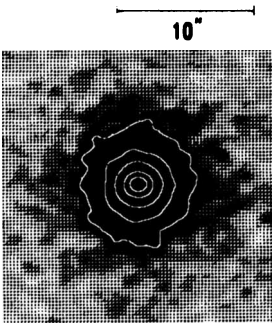

Fig.2 Continuum image

2. DISCUSSION OF THE RESULTS

After careful aligning both reduced images (see Fig.1 and 2) the continuum image is subtracted from the line image. The resulting image (Fig.3) does not show (as we had hoped) the type of very extended

G. Swarup and V. K. Kapahi (eds.), Quasars, 345–346 .

[OIII] emission that has been found surrounding a number of QSOs (Stockton and MacKenty, 1984; di Serego Alighieri et. al., 1984). On the contrary the deviation from a point source is very small. To derive an upper limit to the extra-nuclear [OIII] emission we scaled and subtracted a point source from the pure [OIII] image (Fig.4). The mismatch between [OIII] and star image is probably largely due to a residual of the geometrical distortion (unavoidable in image tubes) causing a slight deviation from the axial symmetry. Note, however, that the wings have disappeared leaving just a noise background outside the central area.

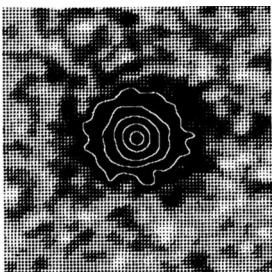

Fig.3 Pure [OIII] image (continuum subtracted)

Boroson et. al.,1982 reported the detection of extra-nuclear [OIII] emission of PG 1501+106. The flux detected within the 8.1 arcsec^2 slit (indicated in Fig.4) was 2.4 x 10^{-15}ergs cm^{-2}s^{-1} which would correspond to 40 μJy (= 40 x 10^{-29}ergs cm^{-2}s^{-1}Hz^{-1}) flux within our filter bandwidth. In the area covered by the slit we measure a flux of -11 ± 15 μJy. In spite of the uncertainty in subtracting a point source we feel confident to give an upper limit of ~ 20 μJy . A possible explanation of the disagreement in the two results is the following.

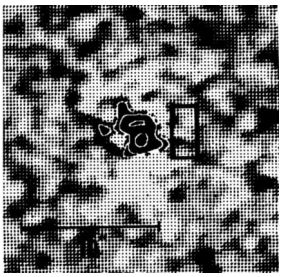

Fig.4 Residual [OIII] image (point source subtracted)

The nebulosity spectrum was obtained by subtraction of a carefully defined fraction of the nuclear spectrum from the raw nebulosity spectrum which was severely contaminated by scattered nuclear light. This fraction was determined to completely remove the broad component of Hβ which is known to be of nuclear origin (the Broad Line Region or BLR is typically less than a parsec in size). But also is known that the Narrow Line Region (NLR) is typically a few hundred parsecs across which at the distance of PG 1501+106 corresponds to a few tenth to one arcsec.

The fraction of the emission from such a NLR that is scattered into the off-nuclear slit will be larger than that from the BLR. So we propose that the flux detected by Boroson et. al. is scattered light from the NLR which has an angular size of a few tenths of an arcsec. From Fig.4 it is obvious that this interpretation is consistent with our result but that we cannot make a statement about the angular extent of the extra-nuclear emission.

3. REFERENCES

Boroson, T.A.; Oke, J.B. and Green, R.F., 1982, Ap.J., **263**, 32
di Serego Alighieri, S.; Perryman, M.A.C. and Macchetto, F., 1984, Ap.J., **285**, 567
di Serego Alighieri, S.; Perryman, M.A.C. and Macchetto, F., 1985, Astron. Astroph., **149**, 179
Stockton, A. and MacKenty, J.W., 1983, Nature, **305**, 678

https://doi.org/10.1017/S0074180900152969 Published online by Cambridge University Press