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The AGN tori sizes: a remark on astro-ph/0512025 by Moshe Elitzur

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Abstract

We point out that in Granato & Danese 1994 and Granato et al. 1997 we predicted maximum observable sizes for the putative torus in NGC1068 of 10-20 pc, not "hundreds of parsecs" as stated by M. Elitzur in astro-ph/0512025.

In astro-ph/0512025 Moshe Elitzur persists with misleading statements on the results of our radiative transfer models for tori around AGN (in particular Granato, Danese & Franceschini, 1997, ApJ, 486 147, but see also Granato & Danese 1994, MNRAS, 268, 235 and Galliano et al. 2003, A&A, 412, 615). Namely, the reader gets the wrong message that we predicted sizes of hundreds of pc for objects such as NC1068 (and similar or even less luminous objects), while now high resolution mapping in the NIR and MIR give upper limits to the size of the torus of the order of a few tens of pc. This interpretation of our predictions is by far erroneous, and may lead to misuse of our results. The general conclusion of our modelling efforts has been instead that the ratio between the outer radius and the dust sublimation radius r_{out}/r_{in} should be of the order of 100-300 for typical Seyfert 1 and 2 galaxies, where the dust sublimation radius r_{in} scales with the square root of the intrinsic AGN luminosity. Expressing the luminosity in units of 10^{46} erg/s, as a rough rule of thumb we have $r_{in} \sim 0.5 L_{46}^{1/2}$. Then AGN whose luminosity is comparable to that of NGC1068 ($L_{46} \sim 0.06$), should have tori much less extended than 100 pc.

Specifically, in Granato et al (1997) we reproduced the SED of NGC1068 with a torus having an external radius of 19 pc ($r_{out}/r_{in} = 150$), and this was the largest value we ever used (previously in 1994 we used 12 pc for NGC1068). We refer the reader to Figure 1 in Granato et al. 1997, keeping in mind that the radius of 30 pc reported in that caption, already much smaller than "hundreds" pc, has to be rescaled by a factor 22/14.5, because at those times we adopted a distance for NGC1068 of 22 Mpc rather than the now standard value of 14.5. Another point to consider is that 19 pc is the size of the whole model torus, while observations at shorter and shorter wavelength picks out inner and inner regions, where the dust is hotter and hotter. To have a qualitative feeling of this, please have a look to Figure 5 of the same paper (the precise λ behavior depends on the adopted PSF and on details of the geometry that, as discussed

in Galliano et al. 2003, cannot be inferred from SED fitting alone. Also, in this paper we made the very clear point that even the size of the torus, one of the best constrained geometrical parameters by SED fitting, it is still uncertain by a factor at ~ 2).

In general, we always used in our published SED fittings of NGC 1068 tori with a ratio between the outer and inner (sublimation) radius between 30 and 150, ratios that translate into outer radii of the torus between 4 and 20 pc. However, only observations at $\lambda > 20\mu$m would not be dominated by regions substantially smaller than this.

Thus, our work should not be improperly involved in the origin of idea of > 100 pc scale tori for AGNs with luminosity comparable to that of NGC1068 (which actually seems a sort of 'media' bluff). If this has been done, it is due to superficial or biased reading of our papers, and possibly to optimistic writings of proposals for high resolution imaging, not an our fault (it is conceivable that people wanted to write that we predicted easy to see tori). Instead, we should be quoted as supporters of tori whose r_{out}/r_{in} is of the order of 100 rather than 3-10, as assumed by Pier and Krolik in their seminal works, well justified by the scanty information available at that time. Finally, we point out that the original Pier and Krolik (1993, ApJ, 418, 673) models would imply a TOTAL radius of the NGC1068 torus $< 1pc$.