



Sorry, there is not much too this one yet, so it might only make sense to me. Make sure you look over the textbook and powerpoint about this subject. - Joe

## Galaxies with Active Nuclei

### Radio Galaxy:

- (Core-Halo – energy from small central object, no lobes) (Head-Tail, lobes trail behind a compact object)
- Radio Emission: → not just 21-cm radiation from cold neutral hydrogen but also synchrotron radiation.
- G.E. Lab 1945 – accelerate electron to  $v \sim c$  → want a curved path “synchrotron” uses strong magnetic field to accelerate and curve the electron’s path.....curving e’s  $v \sim c$  emit photons which are called “synchrotron radiation.”
- Therefore, in radio galaxies synchrotron radiation, strong magnetic fields, e’s  $v \sim c$ , thus the energy to create this situation is huge!!! There must be a very violent process occurring. The amount of energy cannot be accounted for by normal stellar properties, not even trillions of stars crammed closely together will produce enough energy!
- X-Rays: Optical Part. Thermal → very hot matter  $T \sim 10^6 K$  → Active Galactic Nucleus = AGN.
- No radio lobes → Seyfert Galaxy (Spiral) B.L.Lac (Elliptical)

### Quasars:

1963 ordinary spectral lines, redshifted to  $v \sim c$ , thus they are extremely distant in time and place. They are way out there and very remote. Some radio lobes center on “star like point” (quasi-stellar objects)

$v = H_0 \times d$  → remote → luminous up to  $10^3 L_{gal}$  → in the past! And they must be small compact objects because they can vary in brightness in a short (1 hour) period of time!

## Cosmic Light-Bulb

- Turn on/off (small)
- Turn on/off (large)
- How to get so much energy from such a small volume?
- Monsterous Blackholes.
- Why in past ? (Higher food supply? → very bright?)
- Now: monsters are still lurking but we only see the ones still feeding on nearby stars.
- Do all galaxies have supermassive black holes? Do all galaxies produce or form around these blackholes? Do they see us as a quasar?