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### **Extended Lobes as Sources of High Energy Particles and Radiation**

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Extended lobes in radio galaxies and quasars are one of the largest structures in the Universe, in many cases reaching enormous sizes of a few billion parsecs ( $\sim 10^{25}$  cm). These are formed by relativistic jets emanating from the closest vicinities of supermassive black holes in the centers of active galaxies, and interacting with the ambient intergalactic medium. The physical conditions in extended lobes are hardly known, although it is established that the lobes are filled with ionized, highly magnetized, and rarefied plasma extracted predominantly from the surrounding medium of supermassive black holes. Presence of magnetic turbulence and extended shock waves in the lobes ensures efficient acceleration of plasma particles up to the very high, ultrarelativistic energies. Such energies are not, and will be not accessible in our laboratories even in a near future. In this talk I will summarize present understanding of the lobes' structure and evolution, and I will also review the recently discussed ideas and models regarding particle acceleration and generation of high-energy radiation therein. Finally, I will also discuss the current status and prospects of high-energy observations of these extreme structures, focusing especially on the X-ray and  $\gamma$ -ray domains.