POLOIDAL MAGNETIC FIELDS IN GALACTIC CENTRAL REGIONS

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We discuss the origin of the observed strong poloidal fields B_Z in the central regions of galaxies which have gaseous rings. In the context of galactic disk dynamo models only weak poloidal fields but strong toroidal fields result ($B_\phi > B_Z$). Therefore we tie the strength of the poloidal fields to the central activity and apply known and tested ideas rigorously. A battery process on galactic scales is discussed which ensures the existence of a large scale magnetic field in the inner galactic region. The frozen-in field may be amplified by $\vec{v} \times \vec{B}$ compression and turbulent stretching; the resulting field is poloidal. The central activity provides a nonaxisymmetric flow field which, just as the $\alpha - \omega$ dynamo produces mostly $B_\phi > B_Z$, can produce $B_Z \geq B_\phi$.
This model explains the structure and strength of the magnetic field in starburst galaxies like M82 (Lesch et al., 1989).

References

Lesch, H., Crusius-Wätzel, A., Schlickeiser, R., Wielebinski, R. (1989)
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