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Electron Cyclotron Maser Emission in Coronal Arches and Solar Radio Type V Bursts

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Solar radio type V bursts were classified as a special spectral class based on their moderately long duration, wide bandwidth, and sense of polarization opposite of associated type III bursts. However, type V bursts are also closely related to the preceding type III bursts. They have an approximately equal source height and the same dispersion of position with frequency. Electron cyclotron maser (ECM) instability driven by beam electrons has been used to explain type III bursts in recent years. We propose ECM emission as the physical process of type V solar radio bursts. According to the observed properties of type V and III bursts, we propose that energetic electrons in excited type V continuum are trapped in coronal loops, which are adjacent to the open field lines traced by type III electrons. With the proposed magnetic field configuration and the ECM emission mechanism, the observed properties of type V bursts, such as long duration, wide bandwidth, and opposite sense of polarization can be reasonably explained by our model.

References

Aschwanden, M. J., & Benz, A. O. 1988, ApJ, 332, 466
Chen, Y. P., Zhou, G. C., Yoon, P. H., & Wu, C. S. 2002, PhPl, 9, 2816
Dulk, G. A., Suzuki, S., & Gary, D. E. 1980, A&A, 88, 218
Howard, T. A., & DeForest, C. E. 2012, ApJ, 746, 64
Kuznetsov, A. A., & Tsap, Yu. T. 2007, SoPh, 241, 127
Nitta, N. V., & DeRosa, M. L. 2008, ApJL, 673, L207
Robinson, R. D. 1978, SoPh, 56, 405
Robinson, R. D. 1985, in Solar Radiophysics, ed. D. J. McLean & N. R. Labrum(Cambridge: Cambridge Univ. Press), 385
Schmahl, E., & Hildner, E. 1978, SoPh, 55, 473
Sheeley, N. R., Jr., & Golub, L. 1979, SoPh, 63, 119
Stewart, R. T., & Vorpahl, J. 1977, SoPh, 55, 111
Stupp, A. 2000, MNRAS, 311, 251
Syrovatskii, S. I. 1982, SoPh, 76, 3
Treumann, R. A. 2006, A&ARv, 13, 229
Wang, D. Y. 2004, ChA&A, 28, 404
Winglee, R. M., & Dulk, G. A. 1986a, ApJ, 310, 432
Winglee, R. M., & Dulk, G. A. 1986b, ApJ, 307, 808
Wu, C. S., Yoon, P. H., & Li, Y. 2000, ApJ, 540, 572
Wu, D. J., & Tang, J. F. 2008, ApJ, 677, L125
Yoon, P. H., Wu, C. S., & Wang, C. B. 2002, ApJ, 576, 552
Zhao, R. Y. 1995, Ap&SS, 234, 125
Zheleznyakov, V. V., & Zaitsev, V. V. 1968, SvA, 12, 14

Figure 1

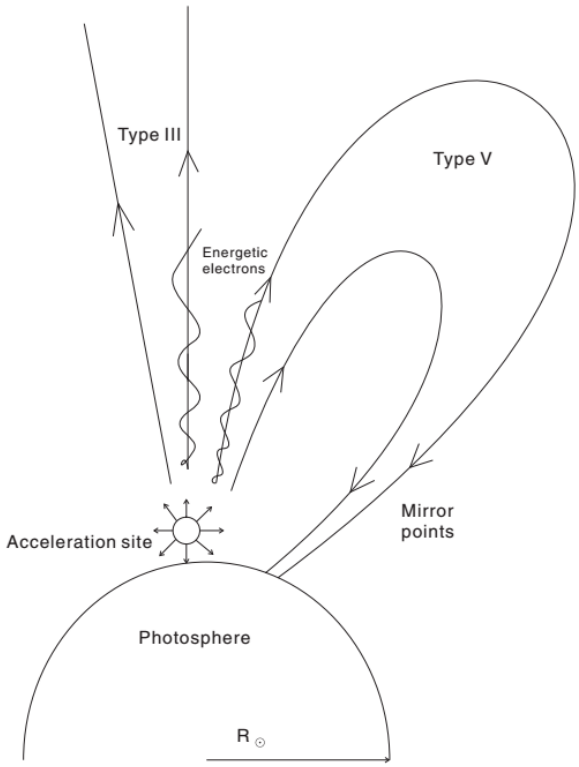

Figure 1. Proposed configuration of source regions of type V solar radio bursts. The coronal loop is adjacent to the open field lines which are traced by type III electrons. It is suggested that the energetic electrons trapped in the loop excite cyclotron maser emission and produce the type V continuum.