# Anomalous effect in Schumann resonance phenomena observed in Japan, possibly associated with the Chi-chi earthquake in Taiwan

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**Abstract**

Schumann resonance phenomena have been monitored at Nakatsugawa (near Nagoya) in Japan since 1999, and we have observed a very anomalons effect in the Schumann resonance, possibly related to a large earthquake (Chi-chi earthquake) in Taiwan on 21 September, 1999. The anomaly is characterized mainly by the unusual enhancement at the fourth harmonic and a significant frequency shift (~1.0Hz) from the conventional value at this harmonic on the $B_y$ magnetic field component sensitive to the waves propagating in the N-S meridian plane. The association of this anomaly in the Schumann resonance phenomena at Nakatsugawa is likely to be related with the large Chi-chi earthquake in Taiwan on 21 September because of the following reasons. First, this anomaly is taking place about one week to a few days before the Chi-chi earthquake (The similar anomaly in the Schumann resonance is again reconfirmed for one more large earthquake in December, 2003 with a lead time of about one week). Secondly, the goniometric direction finding for this anomalous Schumann resonance indicates the azimuthal direction toward Taiwan (or South America). Also, the Q-bursts simultaneously observed are found to exhibit the main frequency just around this fourth harmonic. A possible generation mechanism of this anomaly is suggested in terms of the wave interference in such a way that the

noise source is lightning in the South America (Amazon) and the wave reflection from the perturbation in Taiwan.