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Detection of Schumann Resonance Transient Phenomena and Higher Schumann Resonance Eigenmodes at Modra Observatory

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At the University observatory in Modra-Piesky (17.27 E, 48.37 N, 531 m a.s.l.) regular monitoring of Schumann resonance (SR) field components has been performed (with very short interruptions only) for more than 4 years. The experimental set-up and data processing methodology is shortly described. During this period, a number of transient event recordings were collected and analysed. In the experimental part of this contribution, we show several cases of the observed SR transient phenomena (Q-bursts) and associated frequency spectra - obtained from the vertical electric as well as the horizontal magnetic field components - with the emphasis on higher eigenmodes (in the $\sim 40 - 100$ Hz frequency range). These spectra, processed from short time intervals, exhibit differences in peak frequencies between E and H field components.

In the second part of this contribution, we try to calculate the frequencies of SR eigenmodes - especially for higher ones ($5 < n < 10$) . Calculations are based on isotropic, although radially dependent ionospheric conductivity profiles ("spherical-shells" model). These calculations were performed (by Runge-Kutta integration) separately for both TM-type (Hr = 0) and TE-type (Er = 0) modes. The TE-modes are often claimed as practically absent in the natural SR field, but their contribution is very dependent on the excitation conditions. Therefore, it seems to be not quite relevant to exclude them a priori. Model calculations show that peak eigenfrequencies for TM- and TE-type modes (namely for higher mode number n) may differ in non-negligible extent. The observed difference in the short-intervals frequency spectra of Q-bursts in the electric and magnetic field component (shown in the first part of contribution) can be, at least partially, attributed to this fact.