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Analysis of the coronal electron acceleration region in an eruptive solar flare

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One of the most prominent and informative eruptive event of the current $24^{\rm th}$ solar cycle was the partially disk-occulted solar flare of 2010 November 3. This event was observed in plenty of details by a number of space and ground-based observatories. Here we concentrate on detailed analysis of its coronal source of energy release and electron acceleration observed by the RHESSI in the range of hard X-ray (HXR) emission, as well as by the AIA/SDO and SVTO in the ranges of EUV and microwave emissions, respectively. It is shown that in the rise phase of the flare impulsive burst, which concurred with formation of an erupting plasmoid, the observed spatially integrated microwave emission can be adequately interpreted by the gyrosynchrotron emission of nonthermal electron population with the power-law spectral index $\delta \approx 3.2 \pm 1.1$. This is consistent, within the estimated errors, with the spectral index of nonthermal electrons, which emit from the extended coronal HXR source observed by the RHESSI. Preliminary evidences are given in favour of this coronal source is associated with the wake of erupting plasmoid, possibly with a quasi-vertical current sheet. If it is assumed that the total number N of nonthermal electrons per cm^3 is the same both in the microwave source and in the extended coronal HXR source, *viz* $10^{5.6} \lesssim N \lesssim 10^{6.7}$ cm^{-3}, than magnetic field in the source region is estimated to be within the range of $15 \lesssim B \lesssim 30$ G. The situation is changing at the burst peak and especially during its decay phase, when the coronal type II radio burst appeared (according to the NRH observations) near the leading edge of erupting plasmoid – the microwave spectra can not be longer approximated by only the function, which corresponds to the gyrosynchrotron emission of a single population of nonthermal electrons in a homogeneous source. Most probably, contribution of the gyrosynchrotron emission of thermal electrons or some plasma emissions becomes significant at this time. It is also shown that the total magnetic energy within the coronal source of electron acceleration ($\sim 10^{30} - 10^{31}$ erg) is comparable but still a little bit larger, than the summary energy, which was released during the entire flare impulsive burst. This is consistent with the standard concept of eruptive solar flares, and gives evidences that our calculations are correct with a high probability.