



## **The high accuracy model of the 19 July 2012 solar flare: kinetic description, calculations of X-Ray and microwave emission**

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The limb white-light solar flare M7.7 class was observed at the 19 July 2012 at 05:58UT by RHESSI, GOES and SDO with high spectral, spatial and temporal resolution. These new data make possible to test modern models of solar flares. The flare, which considered here, locates in the picture plane, so we will see two different hard X-ray sources: footpoint and above-the-loop-top. The loop was observed in white-light and microwave wavelengths. The key part of the presented work is high accuracy kinetic model, which describes behavior of electrons in the target – solar flare loop. We interpret the footpoint source in approximation of the thick target model with reverse current and above-the-loop-top source – in the thin target approximation. The microwave spectrum in the range from 1 to 50 GHz was calculated. Our results fit well the observational data, particularly so important parameter as hard X-Ray spectral index. But intensity of emission of the coronal source was estimated incorrect, it was low than observed. This problem can be solved by taking into account effects of particles acceleration in the collapsing magnetic trap, when fast electrons receive additional energy without changing the index of their energy spectrum. In the result we have flux  $\sim 5 \cdot 10^{10}$  erg cm<sup>-2</sup> s<sup>-1</sup> for electrons with energies more than 15 keV, that  $\sim 5$  times larger than in the case classical thick target model. Accordingly, so high flux of electrons to the Chromosphere provides effective heating of the cold plasma in the target, but the reverse current electric field restricts depth of the electron penetration. Received in this work estimates may be used for interpretation of the solar flare optical source formation and evolution.