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Observations of small-scale magnetic fields in solar flares

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It is believed that the photospheric magnetic fields have a fine structure with a characteristic scale of $\sim$100km. This fine structure cannot be directly observed but can be studied by comparing magnetic field measured using spectral lines with similar formation depths but different Lande factors (i.e. different magnetic sensitivity).

In the present work the magnetic field structure in the flaring photosphere is studied using the I$\pm$V Stokes profiles of the FeI 5247.1Å, CrI 5247.7Å, FeI 5250.2Åand FeI 5250.6Ålines. It is shown that the picture of Zeeman splitting in flares is substantially different from those observed in sunspots. Namely, the splitting $\Delta\lambda$ measured as function of distance from the line centre λ_c in flares is very non-uniform and has several maximums. It has been concluded, that the observed line profiles may be explained by the model of magnetic field with two-component structure. The best fit for the observational data is provided by the model with weak ambient field penetrated by small-scale flux tubes with strong $\sim$ 4 - 7kG magnetic field and with almost zero turbulent velocities.