An asymptotic of a certain Riemann–Hilbert problem under singular deformation of a domain

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The Riemann–Hilbert problem is considered in a decagonal domain G on complex plane, which is an exteriour of a system Γ of cuts Γ_j with excluded infinity. The sought analytic function $\mathcal{F}$ satisfies to the boundary condition $\mathrm{Re}(h\,\mathcal{F}) = c$ on Γ, where h and c are prescribed piece–wise constant functions; $\mathcal{F}$ is continuous in $\overline{G}\setminus\{\infty\}$ and satisfies to a certain growth condition at infinity. The solution $\mathcal{F}$ has been constructed in analytic form. Asymptotics for function $\mathcal{F}$ have been found for two limit cases of geometry of Γ; first case corresponds to $|\Gamma_j| \to \infty$, and second case to $|\Gamma_j| \to 0$ for some numbers j. The Riemann–Hilbert problem under consideration originates from magnetic hydrodinamics, in model [1]–[4] of the effect of magnetic field reconnection in Solar flares. The model includes a current layer and shock–waves attached to its end–points. The constructed solution $\mathcal{F}$ and its asymptotics possess clear physical meaning. For construction the asymptotics we used an approach [2], [5] and asymptotics for Schwarz — Christoffel integral parameters, that have been found in [3].

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