

Tauberian theorems for p -adic distributions and asymptotics of p -adic oscillating singular integrals

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The notion of quasi-asymptotics at infinity and at zero adapted to the case of p -adic distributions (generalized functions) are introduced, and p -adic analogs of Tauberian theorems for distributions are proved [1]. We show that some properties of Vladimirov's pseudo-differential operator D^α are connected with a prototype of the Tauberian type theorem.

We study asymptotical behavior of some p -adic oscillating integrals. We also calculate asymptotics of the integrals $\int_{\mathbb{Q}_p} P\left(\frac{\log_p^m |x|_p}{|x|_p}\right) \chi_p(tx) \varphi(x) dx$ and $\int_{\mathbb{Q}_p} \pi_\alpha(x) \log_p^m |x|_p \chi_p(tx) \varphi(x) dx$, as $|t|_p \rightarrow \infty$, $m = 1, 2, \dots$, $\alpha \in \mathbb{C}$. Here $P\left(\frac{\log_p^{m-1} |x|_p}{|x|_p}\right)$ and $\pi_\alpha(x) \log_p^m |x|_p$ are associated homogeneous distributions of degree $\pi_0(x) = |x|_p^{-1}$ and $\pi_\alpha(x) \neq \pi_0(x)$, respectively, and order m (see [2], [3]), where $\pi_\alpha(x) = |x|_p^{\alpha-1} \pi_1(x) \pi_1(x)$, and $\chi_p(x)$ are a multiplicative, a normed multiplicative, and an additive characters of the field \mathbb{Q}_p , respectively, $\varphi(x) \in \mathcal{D}(\mathbb{Q}_p)$.

[1] A. Yu. Khrennikov, V. M. Shelkovich, *Distributional asymptotics and p -adic Tauberian and Shannon-Kotelnikov theorems*, Report 04118, Dec 2004, School of Mathematics and System Engineering, Report from MSI, Växjö University, Sweden, pp.22.

[2] S. Albeverio, A. Yu. Khrennikov, V. M. Shelkovich, *Associated homogeneous p -adic generalized functions*, Dokl. Ross. Akad. Nauk, **393**, no. 3, (2003) 300–303. English transl. in Russian Doklady Mathematics., **68**, no. 3, (2003), 354–357.

[3] S. Albeverio, A. Yu. Khrennikov, V. M. Shelkovich, *Nonlinear problems in p -adic analysis: Algebras of p -adic distributions*, (to appear in Izvestia Akademii Nauk, Seria Math., no. 2, 2005.)

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