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Two Lemmas on Formal Power Series

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Abstract: Let L be a local field and \tilde{L} the completion of the maximal unramified extension of L . In this short note, we prove (I) the sequences $(1^{\text{prime}}) 0 \rightarrow \{\mathcal{O}\}_L \rightarrow [[X_1, \dots, X_n]] \rightarrow \{\mathcal{O}\}_{\tilde{L}} \rightarrow 0$ and $(2^{\text{prime}}) 1 \rightarrow \{\mathcal{O}\}_L \rightarrow [[X_1, \dots, X_n]] \rightarrow \{\mathcal{O}\}_{\tilde{L}} \rightarrow 0$ are exact, where θ_L is the Frobenius automorphism over L applied on the coefficients of $\{\mathcal{O}\}_{\tilde{L}}$, and θ_L^{-1} respectively denotes the mapping $\alpha \mapsto \alpha^{\theta_L^{-1}}$ for (1^{prime}) and $\varepsilon \mapsto \frac{\varepsilon^{\theta_L^{-1}}}{\varepsilon}$ for (2^{prime}) ; (II) $\{\mathcal{C}\}^{\text{circ}}(\tilde{L}, h)$ being the group the Coleman power series of degree 0, the sequence $1 \rightarrow \{\mathcal{C}\}^{\text{circ}}(L, h) \rightarrow \{\mathcal{C}\}^{\text{circ}}(\tilde{L}, h) \rightarrow 1$ is exact, where $\{\mathcal{C}\}^{\text{circ}}(L, h) = \{\mathcal{O}\}_L[[X]]^{\wedge} \cap \{\mathcal{C}\}^{\text{circ}}(\tilde{L}, h)$

Key Words: Formal power series, Local fields, Formal groups, Lubin-Tate theory, Coleman power series.

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