The reduction of a double covering of a Mumford curve

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The technique of analytic reductions is one of the main tools in the study of curves over a non-archimedean valued field. In [2] a theorem is given which describes such a reduction for an unramified abelian covering of a Mumford curve.

In this paper we prove a similar theorem for two-sheeted coverings of a Mumford curve which are possibly ramified. We aply the theorem to determine the reduction in the case that the underlying curve has genus two.

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Notations The fiels k is supposed to be algebraically closed and complete with respect to a non-archimedean absolute value. The residue field $\bar{k}$ has characteristic different from 2.

1 The reduction of a double covering

We study a double covering $\phi : X \to Y$ where X and Y are non-singular projective curves defined over k. The morphism ϕ is ramified in the points of $S = \{p_1, \cdots, p_n\} \subset Y$.

We assume Y to be a Mumford curve. This means that Y has a finite admissible covering $\mathcal{U} = (U_i)_{i \in I}$ such that each affinoid set U_i is isomorphic to an affinoid subset of $\mathbf{P}^1(k)$.
The covering can be chosen such that the corresponding analytic reuction $r : Y \to \bar{Y}$ has the following properties, (cf. [1]) :

a) each irreducible component of $\bar{Y}$ is a non-singular projective curve over the residue field $\bar{k}$ with genus zero;

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