



# The Geometric and Arithmetic Volume of Shimura Varieties of Orthogonal Type (CRM Monograph)

*Fritz Hörmann*

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## **The Geometric and Arithmetic Volume of Shimura Varieties of Orthogonal Type (CRM Monograph)**

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This book outlines a functorial theory of integral models of (mixed) Shimura varieties and of their toroidal compactifications, for odd primes of good reduction. This is the integral version, developed in the author's thesis, of the theory invented by Deligne and Pink in the rational case. In addition, the author develops a theory of arithmetic Chern classes of integral automorphic vector bundles with singular metrics using the work of Burgos, Kramer and Kühn. The main application is calculating arithmetic volumes or "heights" of Shimura varieties of orthogonal type using Borcherds' famous modular forms with their striking product formula--an idea due to Bruinier-Burgos-Kühn and Kudla. This should be seen as an Arakelov analogue of the classical calculation of volumes of orthogonal locally symmetric spaces by Siegel and Weil. In the latter theory, the volumes are related to special values of (normalized) Siegel Eisenstein series. In this book, it is proved that the Arakelov analogues are related to special derivatives of such Eisenstein series. This result gives substantial evidence in the direction of Kudla's conjectures in arbitrary dimensions. The validity of the full set of conjectures of Kudla, in turn, would give a conceptual proof and far-reaching generalizations of the work of Gross and Zagier on the Birch and Swinnerton-Dyer conjecture. Titles in this series are co-published with the Centre de Recherches Mathématiques.

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