Ingo A. Wieck

**Explicit symplectic packings:**
**Symplectic tunnelling and new maximal constructions**

Thesis abstract

Ever since their discovery distinguished symplectic geometry from volume geometry, embedding obstructions lie at the core of this important field of research. They lead to symplectic invariants like the ball packing widths, which can be implicitly computed for some important manifolds in four dimensions. But explicit constructions were often lacking, although they are necessary to develop a geometric understanding of the packing obstructions that arise.

The main part of this thesis discusses methods that admit the construction of explicit packings. The previously established approaches of *deformation* and *wrapping* are shortly reviewed and thoroughly analyzed to determine their potential and limitations. With the introduction of *symplectic tunnelling*, a new and effective method is subsequently developed.

As an application of these methods, explicit solutions are constructed for specific packing problems. With one exception, solutions are given for all open problems for which a packing obstruction had been found by implicit computations. Besides many constructions for ruled symplectic manifolds, the outstanding result of the thesis is the construction of the long-sought maximal 7- and 8-packings for the four-dimensional symplectic ball, which the method of tunnelling affords.

For the larger audience, the extensive introductory chapter embarks on a foray into mathematical folklore to discuss packing-related topics from ‚everyday' Euclidean geometry, including *kissing numbers* and the Kepler, Honeycomb, Foam, Sausage and DoubleBubble conjectures.

334 pages
164 colour illustrations