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Metric spaces with the small ball property.

ABSTRACT. A metric space (M, d) is said to have the *small ball property* (*sbp*) if for every $\varepsilon_0 > 0$ it is possible to write M as a union of a sequence $(B(x_n, r_n))$ of closed balls such that the r_n are smaller than ε_0 and $\lim r_n = 0$. We study permanence properties and examples, the main results of this paper are the following:

1. Bounded convex closed sets in Banach spaces have the *sbp* only if they are compact.
2. Precisely the finite dimensional Banach spaces have the *sbp*. (More generally: a complete metric group has the *sbp* iff it is separable and locally compact.)
3. Let B be a boundary in the bidual of an infinite-dimensional Banach space. Then B does not have the *sbp*. In particular the set of extreme points in the unit ball of infinite dimensional reflexive Banach spaces fails to have the *sbp*.

The talk is based on a joint work with Vladimir Kadets.