

# Measure differential inclusions - existence and continuous dependence results

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## Abstract

We discuss existence and continuous dependence properties of solutions set of measure differential inclusions

$$\begin{aligned} dx(t) &\in G(t, x(t))d\mu(t), \\ x(0) &= x_0. \end{aligned} \tag{1}$$

where  $G : [0, 1] \times \mathbb{R}^d \rightarrow \mathcal{P}_{kc}(\mathbb{R}^d)$  is a regulated or bounded variation multifunction and  $\mu$  is a Borel measure.

The significance of our study is proved by the remark that a result of continuous dependence of the solution set on the measure allows one to approximate the solutions of this problem with general measures by solutions of much simpler problems, with convenient measures (for instance discrete measures, as in numerical analysis).

First, by applying a selection principle for bounded variation multifunctions provided by S.A. Belov and V.V. Chistyakov, we prove the existence of solutions with specific properties and a continuous dependence result under bounded variation assumptions on the right-hand side.

Next, we prove a selection principle for regulated multifunctions and apply it to obtain a result concerning the existence of solutions with special features, as well as the continuous dependence of the set of these solutions with respect to the measure driving the inclusion.

## References

- [1] S.A. Belov, V.V. Chistyakov, A Selection Principle for Mappings of Bounded Variation. *J. Math. Anal. Appl.*, 249: 351–366, 2000.
- [2] B. Satco, Continuous dependence results for set-valued measure differential problems. *Electr. Jour. Qualit. Th. Diff. Equat.* 79: 1–15, 2015.