

**The conference is supported by the
National Laboratory for Health Security project
RRF-2.3.1-21-2022-00006**

Existence and multiplicity of solutions of Stieltjes differential equations

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We investigate a first order non-linear boundary value problem

$$u'_g(t) + b(t)u(t) = f(t, u(t)), \quad t \in [0, T]$$

with linear boundary conditions

$$u(0) = u(T) + k B(u),$$

where k is a constant and B is a linear functional. Note that boundary conditions extend the periodic case.

We use techniques from Stieltjes calculus and fixed point index theory to show the existence and multiplicity of solution.