Analysis and discretization of measure valued optimal control problems governed by the linear wave equation

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This talk is concerned with the analysis and discretization of control problems governed by the linear wave equation. In particular we are interested in point-wise controls with smooth time-dependent coefficients. Such controls are of great interest in the field of inverse problems or actuator placement. A direct optimization of the positions and coefficients of the point sources leads to a non convex optimization problem. In our approach these controls are realized within two different measure spaces involving space and time. The resulting control problem is convex. These two spaces differ from each other in the sense that one allows for moving point sources and the other one not. For the analysis of the control problem new regularity results for linear wave equation with measure valued data are proven. These results are used to show existence of controls and to derive optimality conditions. Furthermore the talks deals with the space-time finite element discretization of such problems. This discretization scheme results in well-known time-stepping schemes for the linear wave equation. Finally an outlook on finite element error estimates is given.