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## MULTIPOINT PROBLEM FOR SCHRÖDINGER TYPE EQUATIONS WITH GENERAL ELLIPTIC PART

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**Abstract.** The existence, uniqueness, regularity properties and Strichartz type estimates for the solution of multipoint problem for linear and nonlinear Schrödinger equations with general elliptic leading part are obtained.

**Key Word:** Schrödinger equations, elliptic operators, local solutions, Strichartz type inequalities, regularity properties of PDE

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## 1 Introduction

Consider the multipoint problem for nonlinear Schrödinger equations (NLS)

$$i\partial_t u + Lu + F(u) = 0, \ x \in \mathbb{R}^n, \ t \in [0, T],$$
 (1.1)

$$u(0,x) = \varphi(x) + \sum_{k=1}^{m} \alpha_k u(\lambda_k, x), \text{ for a.e. } x \in \mathbb{R}^n,$$
(1.2)

where L is an elliptic operator defined by

$$Lu = \sum_{i,j=1}^{n} a_{ij} \frac{\partial^2 u}{\partial x_i \partial x_j}, \ a_{ij} \in \mathbb{R},$$
(1.3)

*m* is an integer,  $\lambda_k \in (0, T]$ ,  $\alpha_k$  are complex numbers, *F* is a nonlinear operator and u = u(t, x) is an unknown function.

Note that for  $\alpha_1 = \alpha_2 = ... \alpha_m = 0$  the multipoint problem becomes usual Cauchy problem. If  $F(u) = \lambda |u|^p u$  in (1.1) we get the multipoint problem nonlinear equation

$$i\partial_t u + Lu + \lambda |u|^p u = 0, \ x \in \mathbb{R}^n, \ t \in [0,T],$$
 (1.4)