

On the regularity of the optimal shapes for a class of integral functionals

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Abstract. This talk will be dedicated to shape optimization problems of the form

$$\min \left\{ J(\Omega) : \Omega \subset D \right\},$$

where D is a given bounded open set and J is a shape functional of integral type, that is,

$$J(\Omega) = \int_{\Omega} j(x, u_{\Omega}) dx + |\Omega|,$$

where $g : D \times \mathbb{R} \rightarrow \mathbb{R}$ is a fixed function and u_{Ω} is the solution to

$$-\Delta u_{\Omega} = f(x) \quad \text{in } \Omega, \quad u_{\Omega} \in H_0^1(\Omega),$$

where $f : D \rightarrow \mathbb{R}$ is another fixed function.

We will discuss the simplest case

$$j(x, u) = -g(x)u,$$

and we will show that (when f and g are comparable) the optimal sets are smooth in dimension $d = 2, 3$ and 4 .