1. Raziskovalna organizacija (*Research organisation)*:

Univerza v Ljubljani, *Fakulteta za elektrotehniko*

2. Ime in priimek mentorja (*Name and surname of a mentor*):

Janko Drnovšek

3. Področje znanosti iz šifranta ARRS (*Primary research field*):

2.15 Meroslovje

4. Kontaktni e-naslov mentorja (*Contact of a mentor)*:

janko.drnovsek@fe.uni-lj.si

5. Kratek opis programa usposabljanja (*Short description of the program)*:

Mladi raziskovalec(-ka) bo raziskovalno delo opravljal(-a) v Laboratoriju za metrologijo in kakovost na Fakulteti za elektrotehniko Univerze v Ljubljani, ki se znanstveno-raziskovalno ukvarja s področji teorije merjenj, elektromagnetnih meritev, termometrije, merjenja vlažnosti, biomedicinskih merjenj, preskušanj naprav in analize merilne negotovosti. Vpet bo v raziskovalni program Metrologija in kakovost (P2-0225, 2015-2019) ter v tekoče raziskovalne projekte s področja termometrije, akustike, ultrazvoka, senzorjev in merjenj. Seznanil se bo z teoretičnimi osnovami in koncepti merjenja temperature, tehnikami obdelovanja električnih, akustičnih, ultrazvočnih in drugih signalov, programiranja, načrtovanja in analize elektro-akustičnih in ultrazvočnih ter senzorskih sistemov. Cilj raziskovalnega dela mladih raziskovalcev bo zasnova, implementacija in ovrednotenje novega merilno-senzorskega sistema, ki temelji na akustičnih in ultrazvočnih principih. Potrditev hipotez bo v največjem delu na področju merjenja temperature. Akustična termometrija predstavlja primarno metodo merjenja temperature in temelji na fizikalni relaciji med temperaturo in hitrostjo zvoka v plinu. Zaradi zahtevnosti (oprema, materiali, izdelava) je manj primerna za implementacijo v praksi. V primerjavi z obstoječimi tradicionalnimi načini merjenja temperature, kjer merimo spremembo upornosti (platinasti uporovni termometri) ali generirano termonapetost (termočleni) gre pri akustični termometriji za merjenje sprememb akustičnih in ultrazvočnih karakteristik, funkcionalno odvisnih od sprememinjanja temperature. Zaradi svoje zasnove in principa delovanja mora akustično/ultrazvočni termometer izkoriščati najnovejše tehnike in tehnologije ter omogočati bistveno bolj enostavno zagotavljanje sledljivosti. Merjenje temperature bo na tak način možno tudi v okoljih, kjer je uporaba standardnih platinastih uporovnih termometrov omejena, npr. zaradi ionizirajočiega sevanja, elektromagnetnih valovanj iz okolice, korozivne atmosfere, velikega prostora merjenja, zahtevanega sterilnega okolja. Raziskovalno delo bo dodatno vključevalo tudi merjenje biološkega vpliva ultrazvoka na človeka. Od kandidata se pričakuje, da bo vpisal študij III. stopnje Elektrotehnika na UL FE, da ima znanje s področja ustreznih programskih orodij ter osnov programiranja, ima izkušnje z eksperimentalnim delom v elektrotehniki, s poudarkom na zajemanju, obdelavi in interpretaciji frekvenčnih signalov in je suveren pri komunikaciji v angleškem jeziku.

Young researcher will carry out research work in the Laboratory of Metrology and Quality at the

Faculty of Electrical Engineering, University of Ljubljana. Laboratory research activities are primarily related to the development of new measurement techniques, electromagnetic measurements, thermometry, moisture and humidity measurements, biomedical measurements, electric safety testing methods and measurement uncertainty analyses.
The young researcher will take part in the research programme Metrology and Quality (P2-0225, 2015-2019) and in ongoing research projects in the field of thermometry, acoustics, ultrasound, sensors and measurements. He will be acquainted with the theoretical basics and concepts of temperature measurements, electrical, acoustical, ultrasonic and other signal processing techniques, programming, design and analysis of electro-acoustic, ultrasonic and sensor systems.

The aim of the young researchers work will be design, implementation and evaluation of a new sensory-measurement system based on acoustic and ultrasonic principles. Confirmation of hypotheses will be in the field of temperature measurement. Acoustic thermometry represents the primary method of temperature measurement and is based on a physical relation between the temperature and the speed of sound in gas. The system is less suitable for implementation in practice due to the system complexity (equipment, materials, construction). In comparison with traditional methods of temperature measurement, which measure the change in resistance (platinum resistance thermometers) or generate voltage (thermocouples) the acoustic measurement principle measures changes in acoustic and ultrasonic properties in relation to the temperature. Due to its design and principles of operation acoustic / ultrasonic thermometer shall implement the latest techniques and technologies and ensure easy calibration traceability. Temperature measurement will be in this way also possible in environments where the use of standard platinum resistance thermometers is limited, for example, due to the ionising radiation, due to electromagnetic radiation from the environment, in corrosive atmosphere, large areas measurements, aseptic environment requirements. Research work will also include evaluation of biological effects of ultrasound on humans.

The candidate is expected to be enrolled in 3rd cycle Doctoral study programme at the UL FE, to have knowledge of relevant software and programming basics, has experience in experimental work in electrical engineering with a focus on acquisition, processing and interpreting frequency signals and is fluent in English communication.