

Active electrodes for measuring the electrical bioimpedance

Metshein, Margus Info- ja kommunikatsioonitehnoloogia doktorikooli IKTDK seitsmenda aastakonverentsi artiklite kogumik : 15.-16. novembril 2013, Haapsalu 2013 / p. 57-60 : ill

Alternatives of measurement of electrical bioimpedance of the body with the aim to determine the cardiac and respiratory activity

Metshein, Margus BEC 2014 : 2014 14th Biennial Baltic Electronics Conference : proceedings of the 14th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 6-8, 2014, Tallinn, Estonia 2014 / p. 197-200 : ill

An Analysis of Arterial Pulse Wave Time Features and Pulse Wave Velocity Calculations Based on Radial Electrical Bioimpedance Waveforms in Patients Scheduled for Coronary Catheterization

Lotamõis, Kristina; Uuetoa, Tiina; **Krivošei, Andrei; Annus, Paul; Metshein, Margus; Rist, Marek; Margus, Sulev; Min, Mart; Tamberg, Gert** Journal of Cardiovascular Development and Disease 2025 / art. 237 <https://doi.org/10.3390/jcdd12070237>

Automatic detection of real and imaginary parts of electrical impedance with single synchronous demodulation channel

Annus, Paul; Priidel, Eiko; Land, Raul; Metshein, Margus; Krivošei, Andrei; Min, Mart; Ratassepp, Madis; Märten, Olev 8th European Medical and Biological Engineering Conference : Proceedings of the EMBEC 2020, November 29 - December 3, 2020 Portorož, Slovenia 2021 / p. 151-157 https://doi.org/10.1007/978-3-030-64610-3_18 [Conference Proceedings at Scopus](#) [Article at Scopus](#)

Availability and variations of cardiac activity in the case of measuring the bioimpedance of wrist

Metshein, Margus; Annus, Paul; Land, Raul; Min, Mart; Aabloo, Alvo 2018 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2018) : proceedings 2018 / 5 p. : ill <https://doi.org/10.1109/I2MTC.2018.8409684>

Body fat proportion estimation by the segmental bioelectrical impedance analysis of forearm

Metshein, Margus; Tuulik, Varje-Riin; Tuulik, Viiv; Min, Mart; Kumm, Monika; Annus, Paul; Märten, Olev 2024 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024 / 5 p <https://doi.org/10.1109/I2MTC60896.2024.10560671> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Correlation between electrical bioimpedance and pressure waveform in radial artery and in mechanical pulsating pipe system

Metshein, Margus; Annus, Paul; Land, Raul; Rist, Marek; Min, Mart; Märten, Olev 2020 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2020), May 25-29, 2020, Dubrovnik, Croatia : proceedings 2020 <https://doi.org/10.1109/I2MTC43012.2020.9128972>

Coupling and electrodes

Metshein, Margus Bioimpedance and Spectroscopy 2021 / p. 3-50 : ill <https://doi.org/10.1016/B978-0-12-818614-5.00010-2> <https://ebookcentral.proquest.com/lib/tuee/reader.action?docID=6644985&pg=48>

Detection of cracks in a sawblade by eddy current measurements

Märten, Olev; Land, Raul; Metshein, Margus; Abdullayev, Anar; Vennikas, Henri; Le Moullec, Yannick 2024 19th Biennial Baltic Electronics Conference (BEC) 2024 / 6 p <https://doi.org/10.1109/BEC61458.2024.10737981> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Detection of surface defects in metals : a case study

Märten, Olev; Land, Raul; Metshein, Margus; Abdullayev, Anar; Vennikas, Henri; Le Moullec, Yannick; Rist, Marek Proceedings of the Estonian Academy of Sciences 2025

A device for measuring the electrical bioimpedance with variety of electrode placements for monitoring the breathing and heart rate

Metshein, Margus 2015 26th Irish Signals and Systems Conference (ISSC) : Institute of Technology Carlow, Ireland, June 24-25, 2015 2015 / [4] p. : ill <http://dx.doi.org/10.1109/ISSC.2015.7163748>

A DSP-based EBI, ECG and PPG measurement platform

Abdullayev, Anar; Rist, Marek; Märten, Olev; Metshein, Margus; Larras, Benoit; Frappe, Antoine; Gautier, Antoine; Min, Mart; John, Deepu; Cardiff, Barry; Krivošei, Andrei; Annus, Paul IEEE transactions on instrumentation and measurement 2023 / art. 2007808, 8 p <https://doi.org/10.1109/TIM.2023.3320771> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

DSP-based electrical impedance tomography device: implementation and experiments

Abdullayev, Anar; Rist, Marek; Metshein, Margus; Märten, Olev 2025 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) 2025 / 6 p <https://doi.org/10.1109/I2MTC62753.2025.11079140>

A DSP-based impedance measurement device

Abdullayev, Anar; Märten, Olev; Rist, Marek; Metshein, Margus; Min, Mart; Annus, Paul 2022 18th Biennial Baltic Electronics Conference (BEC) 2022 / 5 p <https://doi.org/10.1109/BEC56180.2022.9935588>

A DSP-based multichannel EBI measurement device

Abdullayev, Anar; Rist, Marek; Krivošei, Andrei; Metshein, Margus; Land, Raul; Märten, Olev 2024 IEEE International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024

<https://doi.org/10.1109/I2MTC60896.2024.10560714> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Electrical bioimpedance analysis for evaluating the effect of pelotherapy on the human skin : methodology and experiments

Metshein, Margus; Tuulik, Varje-Riin; Tuulik, Viuu; Kumm, Monika; Min, Mart; Annus, Paul Sensors 2023 / art. 4251

<https://doi.org/10.3390/s23094251> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Electrical bioimpedance based monitoring of cardiac and respiratory activity : positioning of capacitive electrodes for wearable human monitoring device

Metshein, Margus; Parve, Toomas International journal of bioelectromagnetism 2015 / p. 64-74 : ill

Electrode optimization for bioimpedance based central aortic blood pressure estimation

Metshein, Margus; Kõiv, Hip; Annus, Paul; Min, Mart World Congress on Medical Physics and Biomedical Engineering 2018 : June 3–8, 2018, Prague, Czech Republic (Vol. 2) 2018 / p. 497-501 https://doi.org/10.1007/978-981-10-9038-7_92 [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

[Article at WOS](#)

Electrode placement configuration variations with the aim of monitoring the rate of breathing and pulse by the means of electrical bioimpedance

Metshein, Margus Doctoral School in Information and Communication Technology : proceedings of doctoral session of BEC 2014 : October 6-8 2014, Laulasmaa 2014 / p. 7-10 : ill

Electrode placement strategies for the measurement of radial artery bioimpedance : simulations and experiments

Pesti, Ksenija; Metshein, Margus; Annus, Paul; Kõiv, Hip; Min, Mart IEEE transactions on instrumentation and measurement

2021 / 10 p. : ill <https://doi.org/10.1109/TIM.2020.3011784> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Elektrilise bioimpedantsi mõõtmistest ravimuda mõju hindamiseks inimese nahale

Metshein, Margus Tervisedenduse ja Rehabilitatsiooni Kompetentsikeskuse ravimuda valdkonna toimetised. 2 2019 / lk. 82-96 : ill

https://terekk.ee/wp-content/uploads/Toimetised-Il-parand_t%C3%A4isresolutsiooniline.pdf

Evaluation of two-electrode system configurations for forearm arteries bioimpedance measurement

Metshein, Margus; Pesti, Ksenija; Lapsa, Didzis; Annus, Paul; Janeliukstis, Rims; Elsts, A.; Märten, Olev 2024 IEEE

International Instrumentation and Measurement Technology Conference (I2MTC) : proceedings 2024 / 6 p

<https://doi.org/10.1109/I2MTC60896.2024.10561178> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Feasibility of utilizing air gapped toroidal magnetic cores for detecting pulse wave in radial artery

Metshein, Margus; Pesti, Ksenija; Min, Mart; Annus, Paul; Märten, Olev 2020 17th Biennial Baltic electronics conference,

Tallinn, Estonia, October 6-8, 2020 : proceedings 2020 / 5 p. : ill <https://doi.org/10.1109/BEC49624.2020.9277197>

Fiducial point estimation solution for impedance cardiography measurements

Märten, Olev; Metshein, Margus; Abdullayev, Anar; Larras, Benoit; Frappe, Antoine; Gautier, Antoine; Saeed, Maryam; John, Deepu; Cardiff, Barry; Krivošei, Andrei; Annus, Paul; Rist, Marek 2022 IEEE International Instrumentation and Measurement

Technology Conference (I2MTC) 2022 / Code 180602 <https://doi.org/10.1109/I2MTC48687.2022.9806596> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

[Article at WOS](#)

Flexible inductive coils for wearable cardiorespiratory activity monitoring [Online resource]

Metshein, Margus; Annus, Paul; Min, Mart BEC 2018 : 2018 16th Biennial Baltic Electronics Conference (BEC) : proceedings of the 16th Biennial Baltic Electronics Conference, October 8-10, 2018 2018 / 4 p. : ill <https://doi.org/10.1109/BEC.2018.8600990>

Hankel matrix based algorithm for cardiac pulse wave base and peak lines Correction

Krivošei, Andrei; Min, Mart; Annus, Paul; Märten, Olev; Metshein, Margus; Lotamõis, Kristina; Rist, Marek IEEE International Workshop on Medical Measurement and Applications (MEMEA) 2022 / 6 p <https://doi.org/10.1109/MeMeA54994.2022.9856564>

Hardware imitation of the varying bioelectrical impedance for testing the device for measurement of the impedance of human trunk by using a JFET

Metshein, Margus 21st 2016 International Conference on Applied Electronics : Pilsen, 6-7 September 2016 2016 / p. 173-176 : ill <https://doi.org/10.1109/AE.2016.7577267>

The impedance cardiography device : patent application

Märten, Olev; Abdullayev, Anar; Metshein, Margus; Gautier, Antoine; Frappe, Antoine; Krivošei, Andrei; Rist, Marek; Annus, Paul; Larras, Benoit; John, Deepu; Cardiff, Barry 2023 <https://www1.epa.ee/patent/kirjeldus/P202200004.pdf>

[https://worldwide.espacenet.com/publicationDetails/originalDocument?](https://worldwide.espacenet.com/publicationDetails/originalDocument?CC=US&NR=2023320606A1&KC=A1&FT=D&ND=3&date=20231012&DB=&locale=en_EP)

[CC=US&NR=2023320606A1&KC=A1&FT=D&ND=3&date=20231012&DB=&locale=en_EP](https://worldwide.espacenet.com/publicationDetails/originalDocument?CC=US&NR=2023320606A1&KC=A1&FT=D&ND=3&date=20231012&DB=&locale=en_EP)

Impedance cardiography signal processing with Savitzky-Golay and frequency sampling kernels

Märtens, Olev; Metshein, Margus; Tamberg, Gert; Abdullayev, Anar 2022 18th Biennial Baltic Electronics Conference (BEC) 2022 / 5 p <https://doi.org/10.1109/BEC56180.2022.9935597>

Improved PWM-based sinewave generation : example of the impedance measurement

Abdullayev, Anar; Annus, Paul; Krivošei, Andrei; Metshein, Margus; Märtens, Olev; Rist, Marek Automatic control and computer sciences 2023 / p. 449-458 <https://doi.org/10.3103/S0146411623050024> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Lock-in integration for detection of tiny bioimpedance variations [Online resource]

Priidel, Eiko; Annus, Paul; Metshein, Margus; Land, Raul; Märtens, Olev; Min, Mart BEC 2018 : 2018 16th Biennial Baltic Electronics Conference (BEC) : proceedings of the 16th Biennial Baltic Electronics Conference, October 8-10, 2018 2018 / 4 p. : ill <https://doi.org/10.1109/BEC.2018.8600965>

A method and device for synthesizing binary waveforms : patent application

Märtens, Olev; Abdullayev, Anar; Metshein, Margus; Rist, Marek; Annus, Paul; Krivošei, Andrei 2024 https://worldwide.espacenet.com/publicationDetails/originalDocument?FT=D&date=20250115&DB=EPODOC&locale=en_EP&CC=EE&NR=202300017A&KC=A&ND=5 https://worldwide.espacenet.com/publicationDetails/originalDocument?FT=D&date=20241219&DB=EPODOC&locale=en_EP&CC=US&NR=2024421805A1&KC=A1&ND=4

Modelling and simulation of arterial blood pulsation via bioimpedance = Arteriaalse verepulsatsiooni modelleerimine ja simuleerimine bioimpedantsi kaudu

Pesti, Ksenija 2021 https://www.ester.ee/record=b5436843*est <https://digikogu.taltech.ee/et/Item/7fe2bc87-aa1a-4214-9971-fc938313bd28> <https://doi.org/10.23658/taltech.34/2021>

Noninvasive measuring of breathing and pulse of a human by the means of electrical bioimpedance

Metshein, Margus Proceedings of the 8th Annual Conference of the Estonian National Doctoral School in Information and Communication Technologies : December 5-6, 2014, Rakvere 2014 / p. 75-78 : ill

Non-standard electrode placement strategies for ECG signal acquisition

Metshein, Margus; Krivošei, Andrei; Abdullayev, Anar; Annus, Paul; Märtens, Olev Sensors 2022 / art. 9351 <https://doi.org/10.3390/s22239351> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Observations concerning the results of capacitive monitoring of breathing and heart rate by the means of electrical bioimpedance

Metshein, Margus The 10th International Conference on Bioelectromagnetism : proceedings 2015 / [4] p. : ill

On the possibility of detecting the electrical bioimpedance of human body by using non-contact electrodes in capacitive connection

Metshein, Margus; Gordon, Rauno BEC 2016 : 2016 15th Biennial Baltic Electronics Conference : proceedings of the 15th Biennial Baltic Electronics Conference : Tallinn University of Technology, October 3-5, 2016, Tallinn, Estonia 2016 / p. 171-174 : ill http://www.ester.ee/record=b2150914*est

On-Desk Model-Based Study for Evaluating the Effect of Squeezing the Arteries in the Forearm on the Bioimpedance and Pressure of Blood

Metshein, Margus; Annus, Paul; Land, Raul; Rist, Marek; Min, Mart; Lotamõis, Kristina; Märtens, Olev Journal of sensors 2023 / art. 5710835 <https://doi.org/10.1155/2023/5710835> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Photoplethysmography as an alternative to impedance cardiography-based hemodynamic feature point detection

Metshein, Margus; Annus, Paul; Abdullayev, Anar; Krivošei, Andrei; Land, Raul; Märtens, Olev 2024 19th Biennial Baltic Electronics Conference (BEC) 2024 / 5 p <https://doi.org/10.1109/BEC61458.2024.10737936> [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

PLL-based extraction of the cardiac component from the bio-impedance signal

Märtens, Olev; Min, Mart; Annus, Paul; Land, Raul; Krivošei, Andrei; Metshein, Margus 2018 IEEE International Instrumentation and Measurement Technology Conference (I2MTC 2018) : proceedings 2018 / 6 p. : ill <https://doi.org/10.1109/I2MTC.2018.8409848>

PPG and bioimpedance-based wearable applications in heart rate monitoring – a comprehensive review

Lapsa, Didzis; Janeliukstis, Rims; **Metshein, Margus;** Selavo, Leo Applied sciences 2024 / art. 7451 <https://doi.org/10.3390/app14177451> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Quantization of the response signal differences for the electrical bioimpedance measurement

Annus, Paul; Land, Raul; Priidel, Eiko; Metshein, Margus; Min, Mart; Märtens, Olev EMBEC & NBC 2017 : joint conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC), Tampere, Finland, June 2017 2018 / p. 290-293 : ill <https://doi.org/10.1007/978-981-10-5122->

Realization and evaluation of the device for measuring the impedance of human body for detecting the respiratory and heart rate

Metshein, Margus; Parve, Toomas; Annus, Paul; Rist, Marek; Min, Mart Elektronika ir elektrotehnika = Electronics and electrical engineering 2017 / p. 36-42 : ill <https://doi.org/10.5755/j01.eie.23.3.18330> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Research and implementation of electrical bioimpedance measurement solutions = Elektrilise bioimpedantsi mõõtmise lahenduste uurimine ja teostus

Abdullayev, Anar 2025 https://www.ester.ee/record=b5761789*est <https://digikogu.taltech.ee/et/Item/226117d6-34fd-4039-8abb-fad105fca61c> <https://doi.org/10.23658/taltech.70/2025>

Sensor-location-specific joint acquisition of peripheral artery bioimpedance and photoplethysmogram for wearable applications

Metshein, Margus; Abdullayev, Anar; Gautier, Antoine; Larras, Benoit; Frappe, Antoine; Cardiff, Barry; Annus, Paul; Land, Raul; Märten, Olev Sensors 2023 / art. 7111 <https://doi.org/10.3390/s23167111> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Signal acquisition and algorithm design for bioimpedance-based heart rate estimation from the wrist

Lapsa, Didzis; **Metshein, Margus; Krivošei, Andrei; Janeliukstis, Rims; Märten, Olev; Elsts, Artis** Applied sciences 2024 / art. 9632 <https://doi.org/10.3390/app14219632> [Journal metrics at Scopus](#) [Article at Scopus](#) [Journal metrics at WOS](#) [Article at WOS](#)

Study of electrode locations for joint acquisition of impedance- and electro-cardiography signals

Metshein, Margus; Gautier, Antoine; Larras, Benoit; Frappe, Antoine; John, Deepu; Cardiff, Barry; Annus, Paul; Land, Raul; Märten, Olev 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC) Oct 31 - Nov 4, 2021 : virtual conference 2021 / p. 7264-7267 : ill <https://doi.org/10.1109/EMBC46164.2021.9629504> [Conference Proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Towards a wearable device for capacitive monitoring of electrical bioimpedance of human body

Metshein, Margus; Parve, Toomas The 10th International Conference on Bioelectromagnetism : proceedings 2015 / [2] p. : ill

Uue ajastu diabeediravi

Vaaks, Eveliis; **Metshein, Margus** Trialoog 2025 <https://trialoog.taltech.ee/uue-ajastu-diabeediravi/>

Variation of cardiac and respiratory waveform on human thorax in the case of inductive coupling

Metshein, Margus; Annus, Paul; Land, Raul; Krivošei, Andrei; Ojarand, Jaan; Aabloo, Alvo; Min, Mart EMBEC & NBC 2017 : joint conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC), Tampere, Finland, June 2017 2018 / p. 671-674 : ill https://doi.org/10.1007/978-981-10-5122-7_168 [Conference proceedings at Scopus](#) [Article at Scopus](#) [Article at WOS](#)

Wearable solutions for monitoring cardiorespiratory activity = Kehal kantavad vahendid kardiorespiratoorse aktiivsuse jälgimiseks

Metshein, Margus 2018 <https://digi.lib.ttu.ee/i/?9961> https://www.ester.ee/record=b5140297*est