Name and surname:	**Krzysztof Sośnica**
Academic Degree:	prof. dr hab. inż. (Prof.)
Institute/Department:	Institute of Geodesy and Geoinformatics
e-mail address:	krzysztof.sosnica@upwr.edu.pl
ORCID:	0000-0001-6181-1307
UPWr Base of Knowledge - link:	https://bazawiedzy.upwr.edu.pl/info.seam?affil=&ps=20&id=UPWrbd14633e36ae4108a4aefde1c1e25350&lang=en&pn=1&cid=104487
Researchgate:	https://www.researchgate.net/profile/Krzysztof-Sosnica
Personal website / Working group website:	https://www.igig.up.wroc.pl/en/
Participation in projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	EArth's Gravity fieLd Evolution (EAGLE) PI: prof. dr hab. inż. Krzysztof Sośnica Number (MSHE code): UMO-2021/42/E/ST10/00020 Duration: 1.07.2022 - 30.06.2027 Multi-GNSS Precise Point Positioning with stochastic clock modeling PI: prof. dr hab. inż. Krzysztof Sośnica Number (MSHE code): UMO-2021/43/O/ST10/00096 Duration: 1.10.2022 - 30.09.2027 Fundamental techniques, models and algorithms for a Lunar Radio Navigation system PI: prof. dr hab. inż. Krzysztof Sośnica (UPWr) Number (MSHE code): European Space Agency, ESA AO/1-10712/21/NL/CRS Duration: 7.10.2021 - 7.04.2023 Integrated terrestrial reference frames based on SLR measurements to geodetic, active LEO, and GNSS satellites PI: prof. dr hab. inż. Krzysztof Sośnica Number (MSHE code): National Science Center, UMO-2019/35/B/ST10/00515 Duration: 18.06.2020 - 17.06.2024 Determination of Global Geodetic Parameters using the Galileo Satellite System PI: prof. dr hab. inż. Krzysztof Sośnica Number (MSHE code): National Science Center, UMO-2018/29/B/ST10/00382 Duration: 2.01.2019 - 1.01.2022 General Relativistic Effects in the orbits of Galileo Satellites PI: dr hab. inż. Krzysztof Sośnica, prof. uczelni Number (MSHE code): European Space Agency, ESA Contract No. 4000130481/20/ES/CM Duration: 1.04.2020 - 1.03.2021 Innovative Methods of the Troposphere Delay Modeling for Satellite Laser Ranging Observations PI: prof. dr hab. inż. Krzysztof Sośnica Number (MSHE code): National Science Center, UMO-2015/17/B/ST10/03108 Duration: 15.02.2016 - 14.02.2020
Do you plan to engage support of second supervisor or auxiliary supervisor?	YES
	Auxiliary supervisor
Name and surname:	Tomasz Kur
Academic Degree:	dr inż. (Dr.)
Faculty, Institute/Department:	Institute of Geodesy and Geoinformatics
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UPWr Base of Knowledge - link or most important publications from last 3 year (JCR) / patents from last 3 years (maximum 5):	https://bazawiedzy.upwr.edu.pl/info.seam?id=UPWRc6677b58e71c4db2845fcdace89bc74f&affil=&lang=en
Researchgate:	
Personal website / Working group website:	
Projects in last 5 years (chronological; with distinction into PI (kierownik) and RF (wykonawca)):	RF: Integrated terrestrial reference frames based on SLR measurements to geodetic, active LEO, and GNSS satellites Number (MSHE code): National Science Center, UMO-2019/35/B/ST10/00515 Duration: 18.06.2020 - 17.06.2024 RF: BALTIC+ Geodetic SAR for Baltic Height System Unification and Baltic Sea Level Research European Space Agency (ESA), grant number 4000126830/19/I-BG
PhD topic:	Simulations for future lunar missions – orbit parameters and geodetic reference frames
Research discipline in Doctoral School:	Civil Engineering, Geodesy and Transport

Short description of the research problem to be solved in the PhD (minimum 1000 characters):	Currently, we are witnessing a technological race associated with the future exploration of the Moon and other celestial bodies. By 2030, over 400 missions to the silver globe are planned by various countries and space agencies, with the construction of permanent bases. The European Space Agency (ESA) does not intend to stay out of the mainstream in the race for expansion to other celestial bodies. The European response to the demand for safe landing, surface takeoff, and navigation on the Moon is the Moonlight program. As part of the program, the construction of a constellation is planned, initially consisting of four satellites orbiting the Moon. One satellite will differ from the others as it will not only perform navigation tasks but also provide telecommunications for future unmanned missions and astronauts moving on the lunar surface. The satellites will move along eccentric orbits, with the apocenter located near the southern pole, while swiftly passing over the northern pole where the pericenter will be located. NASA and ESA are planning to build a lunar station near the southern pole due to the discovery of water ice in permanently shadowed craters in that area. The goal of the PhD study is to simulate future missions for the Moon in terms of the positioning accuracy. Different orbital configurations (inclination, semi-major axis, eccentricity), different numbers of satellites, and orbital accuracies shall be tested. Moreover, the positioning quality and reliability should be tested for a different number of lunar orbiters and distribution amongst the orbital planes. The impact of the quality of determined orbits and the quality of the clock receiver with a Kalman filter will be investigated. Finally, the impact of the geodetic lunar reference frames defining the orientation, origin, and scale, as well as the selenoid model and relativistic corrections on the consistent positioning should be tested.
Professional skills for PhD candidate (e.g. master program, specializations, softwares, language, analytical techniques, minimum 500 characters):	Completed master's studies in the field of engineering and technical sciences or exact and natural sciences, e.g. geodesy, computer science, physics, mathematics, astronomy, space and satellite engineering or a related discipline, Proficiency in programming in a selected language (e.g. C ++, Perl, Fortran, Python), Experience in advanced data analysis or numerical modeling, Scientific achievements, including publications or speeches at scientific conferences, will be an additional advantage, Fluency in English (spoken and written), Ability to work independently in a defined time regime, to present complex results in international forms in a concise and accessible way.
a) Project title:	Fundamental techniques, models and algorithms for a Lunar Radio Navigation system (ATLAS)
b) Agreement number:	European Space Agency, ESA AO/1-10712/21/NL/CRS
c) Number of months in the project to support PhD student (in months; starting from 1st of October 2024):	0
Project website:	