

Prof. dr. Davorin Samek
Prof. dr. Mustafa Busuladžić
Prof. dr. Dario Faj

VIJEĆU PRIRODNO-MATEMATIČKOG FAKULTETA

UNIVERZITETA U SARAJEVU

Predmet: Izvještaj Komisije za pripremanje prijedloga za izbor nastavnika u zvanje vanrednog profesora za oblast "Medicinska fizika" na Odsjeku za fiziku Prirodno-matematičkog fakulteta Univerziteta u Sarajevu – 1 izvršilac

Na osnovu člana 106. Zakona o visokom obrazovanju (Službene novine Kantona Sarajevo, broj: 33/17), člana 92. Statuta Univerziteta u Sarajevu, prijedloga Vijeća Odsjeka za fiziku od 21.09.2018. godine i Odluke Vijeća Prirodno-matematičkog fakulteta Univerziteta u Sarajevu sa 35. sjednice, održane 24.09.2018. godine, Rješenjem Dekana Prirodno-matematičkog fakulteta Univerziteta u Sarajevu broj: 01/06-2100/2-2018 od 24. 09. 2018. godine imenovani smo u Komisiju za pripremanje prijedloga za izbor NASTAVNIKA u zvanje **VANREDNOG PROFESORA** za oblast "**Medicinska fizika**" na Odsjeku za fiziku Prirodno-matematičkog fakulteta Univerziteta u Sarajevu –1. izvršilac imenovana je **Komisija** u slijedećem sastavu:

- 1. Dr. sc. Davorin Samek, redovni profesor** na Veterinarskom fakultetu Univerziteta u Sarajevu, uža naučna oblast: „Biofizika“, predsjednik;
- 2. Dr. sc. Mustafa Busuladžić, vanredni profesor** na Medicinskom fakultetu Univerziteta u Sarajevu, uža naučna oblast: „Medicinska fizika“, član;
- 3. Dr. sc. Dario Faj, redovni profesor** Medicinskog fakulteta Sveučilišta Josipa Jurja Strossmayera u Osijeku, uža naučna oblast: „Medicinska fizika“, član.

Komisija je dobila zadatak da na osnovu prijave kandidata na Konkurs/Natječaj objavljen 04.09.2018. godine u dnevnom listu „Dnevni avaz“, na web-stranici Fakulteta i na web-stranici Univerziteta u Sarajevu, Izvoda iz Zakona o visokom obrazovanju Kantona Sarajevo(Službene novine Kantona Sarajevo, broj:33/17), Izvoda iz Statuta Univerziteta u Sarajevu i Podsjetnika za pisanje referata za izbor nastavnika i saradnika Univerziteta u Sarajevu, podnese izvještaj sa prijedlogom Vijeću Prirodno-matematičkog fakulteta u Sarajevu u roku koji ne može biti duži od 45 dana od isteka roka za podnošenje prijave na konkurs, odnosno najkasnije do 03.11.2018.godine.

Na raspisani Konkurs/Natječaj objavljen 04.09.2018. godine u dnevnom listu „Dnevni avaz“, na web-stranici Fakulteta i na web-stranici Univerziteta u Sarajevu prijavio se jedan kandidat **dr. sc. Adnan Beganović**, docent, šef Službe za zaštitu od zračenja i medicinsku fiziku Kliničkog centra Univerziteta u Sarajevu i vanjski saradnik na Odsjeku za fiziku, Prirodno-matematičkog fakulteta Univerziteta u Sarajevu.

Uz prijavu kandidat je priložio:

- izvod iz matične knjige rođenih;
- uvjerenje o državljanstvu;
- biografija;
- bibliografiju;
- ovjerene kopije diploma matičnog fakulteta;
- ovjerenu kopiju Odluke o izboru u zvanje docenta;
- dokaze o doprinosu u podizanju nastavnog i naučno-istraživačkog kadra;
- dokaz o učešću u projektima;
- kopije objavljenih radova;
- objavljenu knjigu;
- biografiju i bibliografiju na CD-u.

Komisija je pregledala dostavljeni materijal kandidata dr. sc. Adnana Beganovića i shodno Podsjetniku za pisanje referata i zakonskim propisima, podnosi slijedeći

I Z V J E Š T A J

1. Opći podaci kandidata

| | |
|-----------------------------------------|------------------------------------------------------------------------------------------------------|
| Ime i prezime: | Adnan Beganović |
| Stecheni akademski stepen: | doktor fizičkih nauka Prirodno-matematički fakultet Univerziteta u Sarajevu, Odsjek za fiziku, 2011. |
| Zvanje u kojem se kandidatkinja nalazi: | docent, izbor 2014. |

2. Biografski podaci

2.1. Mjesto i datum rođenja

Zenica, 25.03.1978. godine

2.2. Tok obrazovanja

- 1997. završio srednju školu Nantucket High School na Nantucketu, MA, SAD.
- 2002. diplomirao na Prirodno-matematičkom fakultetu, Univerziteta u Sarajevu i stekao zvanje diplomirani fizičar.
- 2009. odbranio magistarski rad na Prirodno-matematičkom fakultetu Univerziteta u Tuzli i stekao naučni stepen magistar fizičkih nauka.

2013. odbranio doktorsku disertaciju „Kožne doze kod perfuzije kompjuteriziranom tomografijom“ pod mentorstvom prof. dr. Davorina Sameka i stekao naučni stepen doktora fizičkih nauka.

2.3. Znanje stranih jezika

engleski – odlično poznavanje jezika

2.4. Kretanje u službi

- 2016–danas šef Službe za zaštitu od zračenja i medicinsku fiziku Kliničkog centra Univerziteta u Sarajevu
2014. docent na Prirodno-matematičkom fakultetu Univerziteta u Sarajevu (nepuno radno vrijeme)
- 2009–2016. šef Odsjeka za radiodijagnostičku i nuklearnomedicinsku fiziku Službe za medicinsku fiziku i radijacionu sigurnost Kliničkog centra Univerziteta u Sarajevu
- 2002–2009. fizičar u dijagnostičkoj i interventnoj radiologiji na Institutu za radiologiju Kliničkog centra Univerziteta u Sarajevu.

3. Radovi kandidata

3.1 Radovi u naučnim časopisima

Do izbora u zvanje docenta

1. Muhogora, W. E., Ahmed, N. A., Almosabihi, A., Alsuwaidi, J. S., Beganovic, A., Ciraj-Bjelac, O., Kabuya, F. K., Krisanachinda, A., Milakovic, M., Mukwada, G., et al. (2008). Patient doses in radiographic examinations in 12 countries in asia, africa, and eastern europe: initial results from iaea projects. *American Journal of Roentgenology*, 190(6):1453–1461
2. Bašić, B., Beganovic, A., Samek, D., Skopljak-Beganovic, A., and Gazdic-Šantic, M. (2010). Ten years of monitoring the occupational radiation exposure in bosnia and herzegovina. *Radiation protection dosimetry*, 139(1-3):400–402
3. Beganovic, A., Kulic, M., Spužić, M., Gazdic-Šantic, M., Skopljak-Beganovic, A., Drljevic, A., Džanic, S., Bašić, B., and Lincender, L. (2010). Patient doses in interventional cardiology in bosnia and herzegovina: first results. *Radiation protection dosimetry*, 139(1-3):254–257
4. Muhogora, W., Ahmed, N., Alsuwaidi, J., Beganovic, A., Ciraj-Bjelac, O., Gershan, V., Gershkevitch, E., Grupetta, E., Kharita, M., Manatrakul, N., et al. (2010). Paediatric CT examinations in 19 developing countries: frequency and radiation dose. *Radiation protection dosimetry*, 140(1):49–58 2011.
5. Ciraj-Bjelac, O., Beganovic, A., Faj, D., Ivanovic, S., Videnovic, I., and Rehani, M. (2011b). Status of radiation protection in interventional cardiology in four east european countries. *Radiation protection dosimetry*, 147(1-2):62–67
6. Beganovic, A., Bašić, B., Gazdic-Šantic, M., Kulic, M., Spužić, M., Skopljak-Beganovic, A., Drljevic, A., and Samek, D. (2011). Occupational and patient exposure in interventional cardiology in bosnia and herzegovina. *Radiation protection dosimetry*,

147(1-2):102–105

7. Bašić, B., Beganovic, A., Skopljak-Beganovic, A., and Samek, D. (2011). Occupational exposure doses in interventional procedures in bosnia and herzegovina. *Radiation protection dosimetry*, 144(1-4):501–504
8. Ciraj-Bjelac, O., Beganovic, A., Faj, D., Gershan, V., Ivanovic, S., Videnovic, I. R., and Rehani, M. M. (2011a). Radiation protection of patients in diagnostic radiology: Status of practice in five eastern-european countries, based on iaea project. *European journal of radiology*, 79(2):e70–e73
9. Vassileva, J., Rehani, M. M., Al-Dhuhli, H., Al-Naemi, H. M., Al-Suwaidi, J. S., Appelgate, K., Arandjic, D., Bashier, E. H. O., Beganovic, A., Benavente, T., et al. (2012). IAEA survey of pediatric CT practice in 40 countries in Asia, Europe, Latin America, and Africa: Part 1, frequency and appropriateness. *American Journal of Roentgenology*, 198(5):1021–1031
10. Ciraj-Bjelac, O., Avramova-Cholakova, S., Beganovic, A., Economides, S., Faj, D., Gershan, V., Grupetta, E., Kharita, M., Milakovic, M., Milu, C., et al. (2012). Image quality and dose in mammography in 17 countries in africa, asia and eastern europe: Results from iaea projects. *European journal of radiology*, 81(9):2161–2168
11. Beganovic, A., Sefic-Pašić, I., Skopljak-Beganovic, A., Kristic, S., Šunjic, S., Mekic, A., Gazdic-Šantic, M., Drljevic, A., and Samek, D. (2013). Doses to skin during dynamic perfusion computed tomography of the liver. *Radiation protection dosimetry*, 153(1):106–111

Nakon izbora u zvanje docenta

12. Pašić, I. S., Pašić, A., Kristic, S., Beganovic, A., Carovac, A., Džananovic, A., Lincender, L., and Zubovic, S. V. (2015). Possibilities of differentiation of solitary focal liver lesions by computed tomography perfusion. *Medicinski Glasnik*, 12(2) 1

Kratak opis rada: Aim of the study was to evaluate possibilities of computed tomography (CT) perfusion in differentiation of solitary focal liver lesions based on their characteristic vascularization through perfusion parameters analysis. Prospective study was conducted on 50 patients in the period 2009-2012. Patients were divided in two groups: benign and malignant lesions. The following CT perfusion parameters were analyzed: blood flow (BF), blood volume (BV), mean transit time (MTT), capillary permeability surface area product (PS), hepatic arterial fraction (HAF), and impulse residual function (IRF). During the study another perfusion parameter was analyzed: hepatic perfusion index (HPI). All patients were examined on Multidetector 64-slice CT machine (GE) with application of perfusion protocol for liver with i.v. administration of contrast agent. In both groups an increase of vascularization and arterial blood flow was noticed, but there was no significant statistical difference between any of 6 analyzed parameters. Hepatic perfusion index values were increased in all lesions in comparison with normal liver parenchyma. Computed tomography perfusion in our study did not allow differentiation of benign and malignant liver lesions based on analysis of functional perfusion parameters. Hepatic perfusion index should be investigated in further studies as a parameter for detection of possible presence of micro-metastases in visually homogeneous liver in cases with no lesions found during standard CT protocol

13. Đedovic, E., Gazibegovic-Busuladžić, A., and Beganovic, A. (2015). Fractal analysis of digital mammograms. *Folia Medica Facultatis Medicinae Universitatis Saraeviensis*, 50(1)
Kratak opis rada: It has been shown that fractal analysis is useful in image processing, texture analyses and texture image segmentation. It is important to clearly detect edges of breast masses, and precisely locate individual microcalcification in mammograms. We

present practical help in that area by fractal analysis, using the concept of fractional Brownian motion. It can be shown that there is a correlation between specific quantitative result of such analysis (Hurst coefficient) and the type of breast mass or tumor.

14. Ceric, Š., Ceric, T., Šadija, A., Hadžiahmetovic, M., Agic, S., Beganovic, A., and Kucukalic- Selimovic, E. (2015). Risk assessment of patients with differentiated thyroid cancer comparing ames and eortc prognostic scoring systems with evaluation of tumour size significance. *Medical Journal*, 21(3)

Kratak opis rada: Thyroid cancers are the most common malignant tumours of the endocrine system. Some controversies are still present in treatment of differentiated thyroid carcinoma (DTC) and optimal prognostic scoring system that should be used for treatment of these patients. The aim of the study is comparison of AMES and EORTC prognostic systems in risk assessment of patients with DTC. The special attention was given to evaluation of tumour size parameter and its relation with disease progression. Study was observational and patients were retrospectively analyzed by age, gender, histological type, tumour size, extrathyroidal invasion, lymph nodes involvement, presence of distant metastasis and presence of progression of disease in follow up period. In this clinical study we included 59 patients with DTC who were treated and/or followed at the Clinic of Nuclear Medicine, University Clinical Centre University of Sarajevo. All patients were treated for DTC from 2005 to 2010 and were followed at least for 5 years. Regarding tumour size when patients were separated in two groups based on tumour size (T1 + T2 one group and second group T3 + T4) we found significant results of $p=0.03$ in favour of first group compared to progression of disease. Patients with presence of extrathyroidal invasion had significant correlation with progression of disease, $p= 0.01$. AMES and EORTC scoring systems for risk assessment in differentiated thyroid carcinoma patients are both valuable tools. We recommend AMES scoring system as we found tumour size as very important prognostic variable. Extrathyroidal invasion of tumour is also strongly correlated with progression of patients with differentiated thyroid carcinoma.

15. Beslic, N., Sadija, A., Milardovic, R., Ceric, T., Ceric, S., Beganovic, A., Kristic, S., and Cavaljuga, S. (2016). Advantages of combined PET-CT in mediastinal staging in patients with non-small cell lung carcinoma. *Acta Informatica Medica*, 24(2):99

Kratak opis rada: Precise mediastinal lymph node staging in patients with non-small cell lung carcinoma (NSCLC) provides important prognostic information and it is obligatory in treatment strategy planning. 18Fluoro-deoxy-glucose (18F-FDG) positron emission tomography - computerized tomography (PET-CT) based on detection of metabolic activity showed superiority in preoperative staging of lung carcinoma. Total number of 26 patients diagnosed with NSCLC were included in this retrospective, cross-sectional study. Status of mediastinal lymph nodes was assessed in all patients comparing contrast enhanced CT and 18F-FDG PET-CT findings. We found in our study that 50% of patients had different N stage on contrast enhanced CT comparing to 18F-FDG PET-CT findings. Among the total number of patients which had different nodal status on PET-CT comparing to CT alone, we found in our study that 54% of patients had change in further therapy protocol after PET-CT change of nodal stage. Combined PET-CT which offers advantages of both modalities is excellent method for nodal (N) staging, so it is recommended in initial staging in patients with NSCLC. PET-CT used preoperatively for mediastinal nodal staging has significant impact on further therapy planning and also has an consequential impact on health system savings.

16. Redžic, M., Beganovic, A., Civa, L., Jašić, R., Skopljak-Beganovic, A., and Vegar-Zubovic, S. (2017). Quality control of angular tube current modulation. In *CMBEBIH 2017*, pages 563–567. Springer, Singapore

Kratak opis rada: Automatic exposure control (AEC) techniques in computed tomography (CT) have been defined as automatic modulation of tube current in the x–y plane (angular AEC), along the z-axis (z-axis AEC) or both (combined AEC), according to the size and attenuation characteristics of the body region being scanned. These techniques should provide constant image quality while lowering the radiation dose to patients. Although AEC is an important feature of all modern CT units, standard methodology for quality control of AEC does not exist. Aim of the paper was to provide reliable quality control (QC) method for AEC techniques used in CT. Change of tube current during the CT examination happens only if the scan projection radiogram (SPR) shows different size and attenuation characteristics of the object being scanned. In order to maintain repeatability of the modulation we used standard polymethyl methacrylate (PMMA) dosimetry phantom, placed with flat side along the z-axis. After SPR was taken, phantom was removed, and CT solid-state detector was placed in the isocenter. Measurements were performed in axial mode, one slice only, for different positions along the z-axis. Dose rates measured in the isocenter, that are proportional to tube current, were found depending on the phantom geometry. In the phantom center the width of rectangle is the same as the diameter of the cylindrical phantom (32 cm), while height corresponds to the cylinder thickness (15 cm). Results show that during the rotation the current is highest when the tube is positioned at the x-axis, and lowest when tube is crossing the y-axis. However, when the detector is moved to position $z = 14.1$ cm, tube current (air kerma rate) does not change during the rotation. The methodology presented in this study could be used as a basis for defining the QC procedure for TCM. The results are consistent with the expected outcomes.

3.2 Recenzirani udžbenici i knjige

Nakon izbora u zvanje docenta

1. „Fizika jonizirajućeg zračenja II: Radiometrija i dozimetrije“, Prirodno-matematički fakultet Univerziteta u Sarajevu, ISBN: 978-9926-453-08-4, Adnan Beganović, Davorin Samek, 2018.

3.3 Učešće u naučnoistraživačkim projektima

Kandidat je u Prijavi dostavio dokaze o učešću u sljedećim projektima Međunarodne agencije za atomsku energiju (IAEA):

Prije izbora u zvanje docenta

1. BOH6013: Strengthening Radiotherapy Physics Units to Meet the Requirements of International Standards (2012–2013) – voditelj projekta, Advan Drljević;

Nakon izbora u zvanje docenta

2. Projekat Međunarodne agencije za atomsku energiju BOH9005: Strengthening Radiation Protection in Medicine (2014–2015) – voditelj projekta, Advan Drljević;
3. Projekat Međunarodne agencije za atomsku energiju BOH6015: Establishing National Diagnostic Reference Levels in Diagnostic Radiology (2016–2018) – voditelj projekta, Advan Drljević.

4. Nastavno-pedagoški rad

4.1 Nastava za studente I i II ciklusa studija

U periodu od 2007. do 2013. godine dr. sc. Adnan Beganović je kao asistent ili stručnjak iz prakse učestvovao u izvođenju predmeta Medicinska radijaciona fizika I i II, Fizika u radiodijagnostici I i II, Fizika u nuklearnoj medicini I i II.

U periodu od 2014. godine do danas, kao docent bio je odgovorni nastavnik na predmetima za studente I i II ciklusa studija:

- Medicinska radijaciona fizika I i II (Prirodno-matematički fakultet);
 - Fizika u radiodijagnostici I i II (Prirodno-matematički fakultet);
 - Uređaji za dobijanje slike u medicinskoj fizici (Prirodno-matematički fakultet),
- a na sljedećim predmetima držao je praktične vježbe:
- Fizika u radioterapiji I i II (Prirodno-matematički fakultet);
 - Fizika u nuklearnoj medicini I i II (Prirodno-matematički fakultet).

4.2 Mentorstvo

Mentor je tri završna rada na II ciklusu studija na Odsjeku za fiziku Prirodno-matematičkog fakultetu u Sarajevu:

1. Samra Stabančić, „Procjena efektivne doze kod kompjuterizirane tomografije cijelog tijela“ (2016);
2. Mahira Redžić, „Ugaona modulacija anodne struje kod kompjuterizirane tomografije“ (2017);
3. Lejla Čiva, „Proizvod KERMA-e i površine polja kod kompjuterizirane tomografije“ (2018).

PRIJEDLOG SA OBRAZLOŽENJEM

Na osnovu podataka u priloženoj dokumentaciji predviđenoj Konkursom, koju je dostavio **dr. sc. Adnan Beganović, docent**, kao jedini kandidat za izbor u zvanje **vanrednog profesora** za oblast **Medicinska fizika**, na Odsjeku za fiziku Prirodno-matematičkog fakulteta Univerziteta u Sarajevu, a konsultujući Zakon o visokom obrazovanju i Statut Univerziteta u Sarajevu, te pridržavajući se Podsjetnika za pisanje referata za izbor nastavnika i saradnika Univerziteta u Sarajevu, **Komisija** je zaključila da prijavljeni kandidat:

- ima naučni stepen doktora nauka iz oblasti za koju se bira;
- u zvanju docenta je proveo pet godina, a nakon izbora u zvanje docenta:
 - objavio je 5 radova u naučnim časopisima koji su citirani u nekoj od relevantnih međunarodnih baza podataka;
 - koautor je jednog recenziranog univerzitetskog udžbenika;
 - uspješno učestvovao u naučnoistraživačkim projektima;
 - ima nastavno-pedagoško iskustvo;
 - mentor je tri uspješno odbranjena rada završnog II ciklusa na Prirodno-matematičkom fakultetu.

i ispunja sve uslove za izbor u zvanje vanrednog profesora u skladu sa članom 96. tačka e) Zakona o visokom obrazovanju („Sl. Novine Kantona Sarajevo“, broj: 33/17).

Osijek, Sarajevo, 28.10.2018. godine

KOMISIJA

Prof. dr. Davorin Samek

Prof. dr. Dario Faj

Prof. dr. Mustafa Busuladžić