

150 GODINA OD ROĐENJA NIKOLE TESLE* 150 YEARS SINCE NIKOLA TESLA'S BIRTH

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„Napredni razvoj čovekov zavisi u prvom redu od pronalazaka. To je najvažniji proizvod njegovog stvaralačkog duha. Krajnji cilj čovekov je da potpuno zavlada nad materijalnim svetom i stavi u službu čovečanstva sile prirode. U tome leži težak zadatak pronalazača, koji često ostaje bez ikakve nagrade, a često biva i pogrešno shvaćen. Ali kao naknada za to služi mu, u dovoljnoj meri, uverenje da spada u red posebno povlašćenih ljudi, bez kojih bi ljudski rod u opštoj borbi za opstanak protiv nemilosrdnih elemenata nestao sa lica zemlje, a nagrada mu je uživanje koje ima za sva vreme, dok svoje duhovne sile iskorišćava za stvaralački rad“

Nikola Tesla

“Progressive development of the man is vitally dependent on invention. It is the most important product of his creative spirit. His ultimate purpose is a complete mastery of mind over the material world, and making the forces of nature serve the needs of mankind. This is the difficult task of any inventor who is often misunderstood and unrewarded. However, he finds ample reward in the belief that he belongs to a category of specially privileged persons without whom the human race would have long ago perished in the bitter struggle for survival against merciless elements.”

Nikola Tesla

Među velikim stvaraocima koji su na prekretnici 19. i 20. veka, svojom čudesnom intuicijom uspeли да sagledaju nove naučne istine, trasiraju nove puteve i ostvare nove horizonte u svetu tehnike, istaknuto mesto pripada Nikoli Tesli.

Nikola Tesla svetski naučnik srpskog porekla, nenadmašni pronalazač i vizionar, izumitelj „elektromatnetnog točka“, „pesnik elektrotehnike“, svojim epohalnim radovima otvorio je revolucionarnu eru u oblasti elektrotehničke nauke, koja se u tom momentu tek rađala. Iz širokog spektra njegovih originalnih otkrića posebno se izdvajaju: sistem polifaznih naizmeničnih struja, do danas univerzalno prihvaćen za prenos električne energije, obrtno magnetno polje, indukcioni motor, otkrića vezana za visokofrekventne struje i njihove fenomene, otkrića na polju radiotehnike, bežičan prenos signala i mnoga druga. Oblast proizvodnje, prenosa i primene električne energije Tesla je oplodio smelim poletom svoje fantazije i bogatstvom pronalazačke misli čime je doprineo da proizvodnja električne energije i njena industrijska primena u 20. veku dobiju neslućene razmere i da električna energija postane deo života svih ljudi.

A prominent place among the greatest scientists at the turn of the 19th and 20th centuries who, with their miraculous intuition succeeded to recognize new scientific truths, pave new ways and accomplish new horizons in the technical world, belongs to Nikola Tesla.

Nikola Tesla, the scientist of Serbian nationality, visionary, the unexcelled inventor of “electromagnetic wheel”, poet of electrical engineering, has with his epochal works initiated a revolutionary era in the field of electrical engineering, the science that was being born at the time. Some of extraordinary inventions from the wide spectrum of his original inventions are: the poly-phase system of alternating currents which is today universally accepted for power system transmission, rotating electrical field, induction motor, high frequency currents and their phenomena, inventions in the area of radio-technology, wireless signal transmission, etc. Tesla “fertilized” the field of generation, transmission and application of electrical energy thanks to his bold fantasy and richness of his inventive mind, thus contributing that electrical power generation and its application in industry gain unheard-of proportions in the 20th century and become part of everyday life of all people.

Ko je zaista bio Nikola Tesla i čime je on tako mnogo zadužio čovečanstvo može se sagledati iz kratkog prikaza njegovog života i dela.

NIKOLA TESLA – ČOVEK, VIZIONAR, INŽENJER, PRONALAZAČ

Nikola Tesla je započeo svoj životni put 10. jula 1856. g. u kući naprednog srpskog pravoslavnog sveštenika u selu Smiljanu u Lici (tadašnja Vojna Krajina u Austro-Ugarskoj, danas Hrvatska). Već u toku studija tehnike u Gracu pokazao je veliko interesovanje za probleme elektrotehnike. To je bio početak jednog dugotrajnog i nemirnog lutanja za naučnim istinama. Već 1882. g., na početku svog radnog veka u Budimpešti, gde se Tesla zaposlio posle studija filozofije prirode u Pragu, dugo tražena istina vezana za ideju obrtnog magnetnog polja bila je u trenu otkrivena. Tražeći mogućnost za realizaciju te ideje, Teslu put vodi u Pariz i Strazbur, gde realizuje prvi model indukcionog motora. U Evropi Tesla nije našao uslove i finansijska sredstva za eksperimente koji bi prethodili realizaciji njegovih izuma iz oblasti elektromagnetskih tehnologija na kojima je već uveliko radio, pa zato 1884. g. Odlazi u SAD u Njujork.

Radeći u kompaniji Thomasa Edison-a, a zatim u svojoj „Tesla Electric Company“ u Njujorku, Tesla je uspeo da koncipira, teorijski razradi i praktično realizuje nov sistem prenosa električne energije, koji se temelji na primeni višefaznih naizmeničnih struja, koji je godinama usavršavao u svojim mislima. Kada su eksperimentalni rezultati potvrdili tačnost idejnih rešenja, Tesla krajem 1887. godine kod Patentne uprave SAD prijavljuje a zatim i registruje prvi 7 patenata (od ukupno 41 patenata u ovoj oblasti) koji čine jedinstveno naučno i tehničko delo pod nazivom „polifazni sistemi“. Ovi patenti su od fundamentalnog značaja za proizvodnju, prenos i upotrebu električne energije. U njima je Tesla detaljno prikazao sistem polifaznih struja i svih komponenti, različitih po koncepciji i konstrukciji, koji čine jezgro prenosa električne energije: generator, transformator, motor i sistem prenosa. Sledeće godine Tesla je ovaj sistem predstavio najuglednijim stručnjacima SAD, u čuvenom predavanju koje je održao u Američkom udruženju

Who really Nikola Tesla was and why credit goes to him for his merits to the mankind can be seen from the short account of his life and work.

NIKOLA TESLA - MAN, VISIONARY ENGINEER, INVENTOR

Nikola Tesla stepped on his life path on 10 July 1856 in the house of a progressive Serbian orthodox priest in the village of Smiljan in Lika (then Military Border in Austria-Hungary, today Croatia). During his studies in Graz he displayed great interest in electrical engineering. This was the very beginning of his long and imaginative searching for scientific truths. At the beginning of his work in Budapest, where he was employed after his philosophy studies in Prague, the truth linked with the idea of rotating magnetic field, searched for a very long time, was discovered in one instant. Looking for possibilities to materialize his ideas, Tesla left for Paris and Strasbourg, where he realized the first model of his induction motor. In Europe, he could not find adequate facilities and financial resources for his experiments that would precede his inventions in the field of electromagnetic technologies he had already worked on and, therefore, he decided in 1884 to leave for New York, the United States.

While working in Thomas Edison's company and then in his own "Tesla Electric Company" in New York, Tesla managed to design, theoretically work out and practically materialize a new electric power transmission system founded on the application of poly-phase alternating currents, which he had been perfecting in his mind for years. Once the experiments proved his preliminary ideas, Tesla registered in late 1887 his first 7 patents (out of 41 in this field) with the US Patent Administration. They constitute a unique scientific and technical work called "poly-phase system", and are of fundamental importance for generation, transmission and use of electricity. In the said patents, Tesla presented in greater detail his poly-phase system and all the relevant components, different in terms of concept and construction, which make the nucleus of the power transmission system. One year later, Tesla presented this system to the most reputed experts in the USA during his famous lecture held at the American Society

elektroinženjera u Njujorku, izazivajući divljenje prisutnih.

Otkriće obrtnog magnetnog polja, proizvedenog višefaznim naizmeničnim strujama spada u najznačajnije Tesline pronalaske, kojim je postavljen temelj savremene elektroenergetike. Po mišljenju velikog broja naučnika ovo otkriće je jedno od najvećih uspeha ljudske maštete u istoriji sveta.

Engleski profesor Reginald Kapp, u svom predavanju, održanom pri proslavi stote godišnjice Teslinog rođenja, dao je slikovitu ocenu tog izuma:

„Daleko u praistoriji anonimni genije pronašao je točak. To je bilo jedno od najkorisnijih dela koje je jedan čovek bilo kada dao svom rodu. Ovaj pronalazak bio je, možda, sasvim očigledan, ali pronalazak jednog nevidljivog točka, koji je napravljen ni od čega drugog nego od magnetnog polja, bio je daleko od očiglednog i to je ono što mi dugujemo Tesli. To je moglo da ponikne samo u jednom brilijantnom i jedinstvenom intelektu“.

Na krilima slave, a kao finale rada na polifaznom sistemu Tesla radi na praktičnoj realizaciji svog polifaznog sistema, koji je prvi put primenjen na električnoj centrali izgrađenoj na Nijagarinim vodopadima (puštena u rad 1896.g.). Za kratko vreme Teslin polifazni sistem proizvodnje, prenosa i korišćenja električne energije brzo je prihvaćen širom sveta. Samo 4 godine posle elektrane na Nijagarinim vodopadima, izgrađena je elektrana na reci Đetini i prvo električno osvetlenje se pojavilo u Užicu.

Posle niza osporavanja od savremenika koji su podržavali primenu jednosmerne struje (među njima su bili i velikani elektrotehnike tog doba – lord Kelvin, T. Edison i dr.) ovo je bila velika Teslina pobeda. Osećajući da na polju polifaznih sistema i električnih mašina industrijske primene ne može više otkriti bilo šta fundamentalno, Tesla se svom energijom svog stvaralačkog duha prebacuje na nove, do tada nepoznate oblasti primenjene elektrotehnike. Posvetio se originalnim radovima u oblasti visokofrekventne tehnike koji su kao nikad pre toga u korenu izmenili život ljudi i duboko zakoračili u budućnost čovečanstva. Tesla je preskočio svoje vreme.

of Electrical Engineers in New York, causing admiration of the auditorium.

The discovery of the rotating magnetic field, produced by the poly-phase AC currents was one of Tesla's most important inventions, which laid a foundation of modern electrical energy. For most scientists this invention was one of the greatest successes of human imagination in the world history.

On the occasion of Tesla's 100-year birth anniversary, English Professor Reginald Kapp qualified this invention as follows:

“Many years ago in pre-history, an anonymous genius invented the wheel. That was one of the biggest benefits ever given by a man to his fellows. This invention was perhaps rather obvious, but the invention of an invisible wheel made of nothing but a magnetic field was far from the obvious and that is what we owe to Tesla. It could only spring from a brilliant and unique intellect”.

Encouraged by the triumph, Tesla engaged in practical realization of his poly-phase system which was for the first time applied to the power plant built on the Niagara Falls (put into operation in 1896). Over a short time, Tesla's poly-phase system for generation, transmission and application of electricity was accepted all over the world. In Serbia, only 4 years after the Niagara Falls, a power plant at the river Djerdap was built and the first electric light appeared in the town of Užice.

After the strong opposition coming from contemporary scientists who propagated the use of DC (e.g. Lord Kelvin, T. Edison etc.), Tesla gained a great victory. Feeling that no fundamental invention in the field of industrial application of electrical machines can be additionally found, Tesla shifted all the energy of his creative spirit to completely new, by then unknown, fields of electricity application. He turned to the field of high frequency technics, and his original works changed fundamentally the human life making big steps into the future of the mankind. Tesla went beyond his time.

Teslin inventivni duh naslutio je da struje visoke frekvencije skrivaju mnoge osobine koje su neuočljive na niskim frekvencijama i da će njihovo upoznavanje doprineti boljem razumevanju zakona prirode, a tehnika izvući nove primene koje će koristiti čovečanstvu. Teslina plodna i široka delatnost u oblasti naizmeničnih struja visokih napona trajala je godinama i donela važne rezultate koji su mu doneli svetsku slavu. Jedan od najznačajnijih Teslinih pronađenja u oblasti struja visoke frekvencije je svakako otkriće principa radiotehnike i praktična realizacija bežičnog prenosa signala putem radija. S druge strane, pronađenje generatora struja visokih frekvencija, poznatog u nauci kao „Tesla transformator“ pružio je naučnicima vremena novo i vrlo značajno sredstvo za eksperimentalni naučni rad, čime je značajno doprineo ubrzanim razvoju elektrotehnike.

Rezultati Teslinog rada na ovom području bili su vrlo plodni i dalekosežni. Iz njih su se razvile nove grane elektrotehnike: radiotehnika, telekomanda, tehnika luminescentnog osvetljenja, elektroterapija, elektrotermija i dr. Za pionirski rad u ovoj oblasti Tesla je dobio prvu zlatnu medalju Franklinovog instituta.

Iz oblasti visoko-frekventnih struja i visokih napona Tesla je registrovao veliki broj patenata a 1891 i 1892. održao je predavanja: U

Tesla's inventive spirit felt that high frequency currents have performances that do not exist at low frequencies and that their better studying and understanding would clarify the natural laws to the benefit of the mankind. Tesla's fruitful and broad-range activity in the field of alternative currents and high voltages was long lasting and entailed important results and a world-wide great glory to him. One of the most important Tesla's inventions in the field of high frequency currents was the practical realization of wireless signal transmission by the radio. On the other hand, the invention of the high frequency current generator, known as "Tesla transformer", gave to the science of that period significant means for experiments and scientific work, contributing to an accelerated development of electrical engineering.



Nikola Tesla sa svojim veštačkim dnevnim svetлом
Nikola Tesla with his artificial daylight

The results of Tesla's work in this field were very fruitful and far-reaching. New electrical engineering branches have developed from Tesla's work: radio-technology, tele-control, luminescent lighting technology, electrotherapy, electro-heat technology, etc. For his pioneer work in this field, Tesla was awarded the first golden medal of The Franklin Institute.

In the field of high frequency currents and high voltages, Tesla registered many patents and held lectures in 1891 and 1892 in the American In-

Američkom udruženju elektroinženjera u Njujorku, Kraljevskom institutu u Londonu i Francuskom društvu za fiziku u Parizu.

Da bi nastavio istraživanja i realizovao svoje ideje bežičnog prenosa energije („možda i većih snaga električne energije“) Tesla osniva svoju laboratoriju u Kolorado Springsu, na visini od 2000 m, sa gigantskim generatorima struja visokih frekvencija i visokih napona. Izvodeći čuvene eksperimente morao je da reši i čitav niz veoma složenih tehničko-tehnoloških problema. Ipak, Teslina ideja o globalnom sistemu prenosa električne energije bežičnim putem nije bila dokazana u njegovo vreme, ali ni sve do danas.

Na početku 20. veka, posle značajnih otkrića u oblastima polifaznih struja, struja visokih frekvencija i radija, Tesla je bio na vrhuncu slave.

Po povratku u Njujork, Tesla započinje izgradnju nove laboratorije na Long Ajlandu u blizini Njujorka sa željom da realizuje sistem „svetske telegrafije“. Zbog nesporazuma i finansijskih poteškoća, sve napušta i počinje istraživanja iz oblasti mehanike fluida. Iz ove oblasti prijavljuje svoj poslednji patent 1916. g.

Teslin životni put, koji je po njegovom priznanju bio „neprekidno treperenje između agonije neuspeha i blaženstva uspeha“ završio se u belini sobe hotela New Yorker u Njujorku, na Božić 7. januara 1943. g. Iza njega su ostali brojni radovi, predavanja, više stotina patenata, hiljade stranica objavljenih i neobjavljenih

stitute of Electrical Engineers in New York, the London Royal Institute and in the French Physicists Society in Paris.

In order to continue his researches and realize his ideas concerning wireless power transmission, Tesla built his laboratory in Colorado Springs at an altitude of 2000 m, with large generators for high frequency currents and high voltages. While making experiments, he had to solve many highly complex technical-technological problems. Nevertheless, Tesla's idea about a global electric power wireless transmission was neither proved during his lifetime nor has been until the present day.

In early 20th century, after important inventions in the field of poly-phase currents, high frequency currents and radio-technology, Tesla was at the peak of his glory.

After his return to New York, he started the building of a new laboratory on the Long Island, near New York, wishing to realize the system of “global telegraphy”. Due to financial problems, he gave up the idea and began researches in the field of fluid mechanics registering his last patent in this field in 1916.

Tesla's life, constantly oscillating between the agony of failure and the blessing of success, ended in a “New Yorker” hotel room on Christmas, 7 January 1943. His numerous works, lectures, hundreds of patents, thousands of pages of both published and unpublished material remained after him and are



beležaka, koje se zajedno sa njegovom urnom čuvaju u Muzeju Nikole Tesle u Beogradu, Srbija.

Nikola Tesla je dao toliki broj radova širokog spektra da se smatra najvećim tehničarem i pronalazačem svih vremena. O Teslinom stvaralaštvu napisane su čitave biblioteke knjiga i njihov broj se sa razvojem civilizacije koja obilno koristi Teslina otkrića, sve više povećava, dopunjene novim sadržajima a u kojima se sa današnjeg stepena nauke i tehnike ocenjuje Teslin doprinos.

Svojom inventivnošću Nikola Tesla je prevazilazio svoje savremenike, koji su mu se čudili i u isto vreme divili. Mali broj njih shvatio je dalekosežnost njegovih otkrića. Ipak, naučna javnost mu je odala zaslужeno priznanje. Dodeljeni su mu počasni doktorati na brojnim univerzitetima u Evropi i Americi, članstvo u naučnim institutima, dobitnik je Edisonove i Frenklinove medalje i 56 diploma.

Januara 1976. uvršćen je u Dom slavnih u SAD. Najveće m e d u n a r o d n o priznanje Tesla je dobio od M e d u n a r o d n e e l e k t r o t e h n i č k e komisije koja je jedinici magnetne indukcije dala ime T E S L A (T). Tako je Tesli kao jedinom naučniku iz grupe slovenskih naroda pripala čast da njegovo ime, uz imena Kulona, Ampera, Volte, Faradeja, Herca, Maksvela uđe u elektrotehničku praksi. Na taj način učinjena je velika čast Nikoli Tesli, koji je za sva vremena obezbedio časno mesto u panteonu opšte slovenske slave.

OBELEŽAVANJE 150 GODINA OD ROĐENJA NIKOLE TESLE

Nastavljujući tradiciju proslave značajnih jubileja vezanih za Teslin život i rad, Srbija ima i posebnu obavezu zbog njegovog srpskog porekla i njegove lične želje da se njegova lična zaostavština i

being kept together with his urn in the Nikola Tesla Museum in Belgrade, Serbia.

In view of the immense number of different inventions in the world of electricity, Nikola Tesla is deemed to be one of the greatest technicians and inventors ever born. Numerous books have been published about Tesla's work and their number is permanently increasing. They are also expanded by new contents which assess Tesla's contribution from the point of view of the present-day level of science and technology.

With his innovativeness, Tesla had far exceeded his contemporaries who admired and at the same time were surprised at him. Just few of them understood his far-reaching inventions. Still, the scientific community paid him a deserved tribute – honorary doctorates were awarded to him by numerous universities in Europe and America, and membership granted in scientific institutions. He was also awarded Edison's and Franklin's medals, and 56 diplomas.



Diploma počasnog doktorata Tehničkog fakulteta Univerziteta u Beogradu
Diploma of the honorary doctorate from the Faculty of Engineering, University of Belgrade

In January 1976, Nikola Tesla was elected to the Hall of Fame of Great Inventors. The greatest honor to Tesla was, however, granted by International Electrotechnical Commission which named the unit for magnetic induction after him TESLA (T). Thus, Tesla's name as the only scientist of all Slavic nations joined the famous names like Coulomb, Ampere, Faraday, Herz, Maxwell, and entered into the electrical engineering practice. He secured the honorary place in the Pantheon of general Slav Glory.

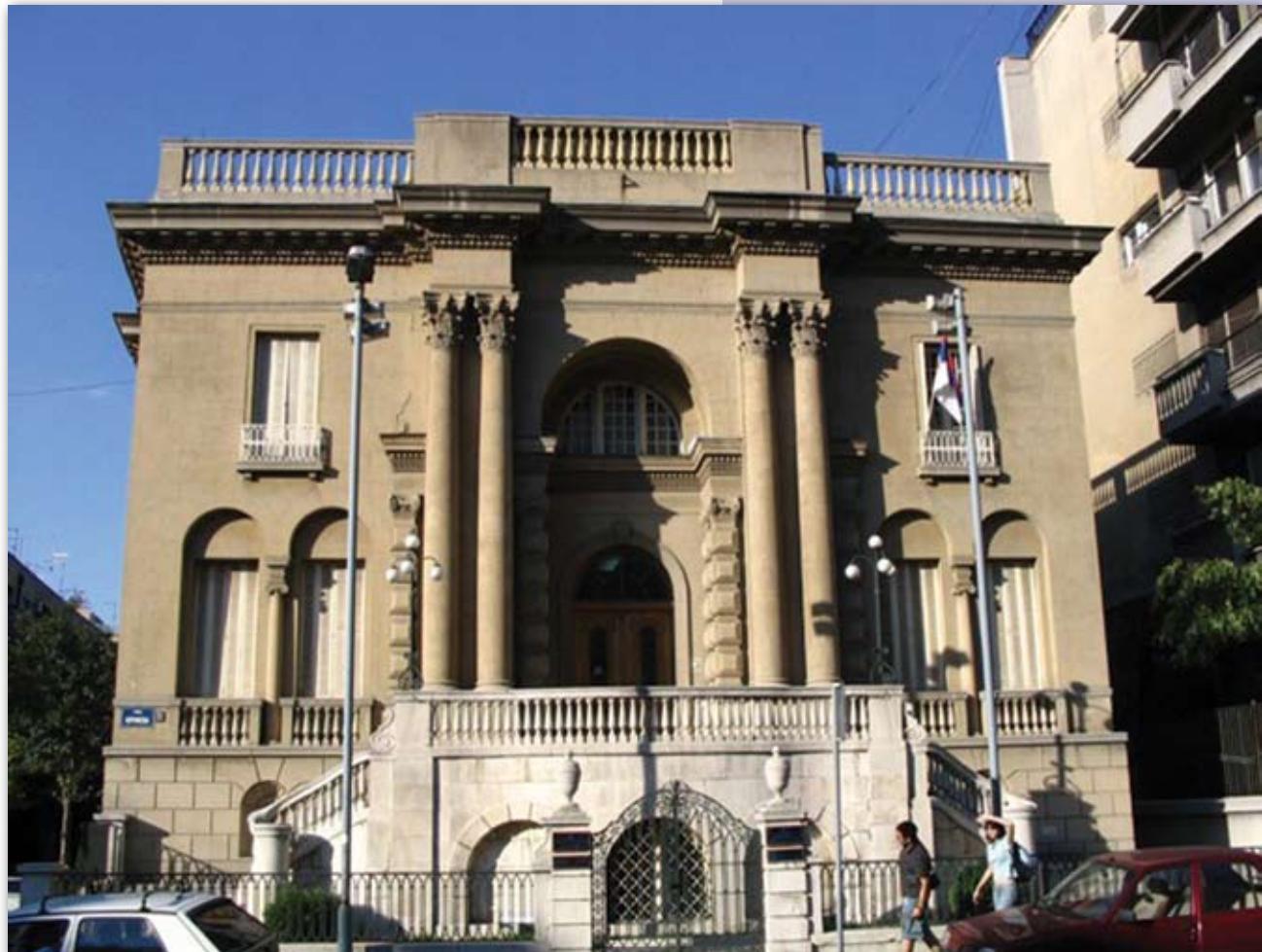
MARKING OF THE 150TH ANNIVERSARY OF NIKOLA TESLA'S BIRTH

Continuing the tradition of jubilee celebrations held on the occasion of important anniversaries dedicated to Tesla's life and work, Serbia has a

urna čuvaju u Beogradu (Srbija) u Muzeju Nikole Tesle.

Vlada Republike Srbije proglašila je 2006. godinu godinom Nikole Tesle. Obeležavanje ju-

distinguished role due to his Serbian nationality and his personal wish that his heritage and his urn be kept in the Nikola Tesla Museum in Belgrade, Serbia.



*Muzej Nikole Tesle, Beograd, Srbija
Nikola Tesla Museum, Belgrade, Serbia*

bileja odvijaće se pod pokroviteljstvom Vlade Republike Srbije koja je formirala Odbor za proslavu i usvojila Program obeležavanja jubileja. U realizaciji Programa uključene su društvene naučne i obrazovne institucije Srpska akademija nauka, stručne asocijacije koje deluju u oblastima Teslinog stvaralaštva, posebno one koje nose Teslino ime, JUKO CIGRE, privredne i humanitarne organizacije.

Proslavljujući jubilej 150 godina od rođenja Nikole Tesle, mi ne pokušavamo da time uvećamo njegovu nedostižnu slavu, nego želimo da damo izraz našem ponosu što je iz ove naše sredine iznikao jedan genije čije će ime ostati zvezak zabeleženo svetlim slovima u istoriji nauke i tehnike.

The Government of the Republic of Serbia has proclaimed the year 2006 as Tesla's year. A Committee has been set up and a jubilee Program was adopted. The Program will be carried out by social, scientific expert and educational institutions, the Serbian Academy of Arts and Science, institutes called after Nikola Tesla, JUKO CIGRE, economic and humanitarian organizations.

The Program celebrating the 150th anniversary of Nikola Tesla's birth is not intended to raise his unachievable fame. The only wish is to express the pride that such a genius is an offspring of our nation whose name will be forever inscribed with brilliant letters in the history of science and technology.

GENERALNI SEKRETAR CIGRE G. JEAN KOWAL UČESTVOVAO JE U OBELEŽAVANJU 150 GODINA OD ROĐENJA NIKOLE TESLE

SECRETARY GENERAL CIGRE Mr. JEAN KOWAL TOOK PART IN THE CELEBRATION PROGRAMME OF NIKOLA TESLA 150th BIRTH ANNIVERSARY

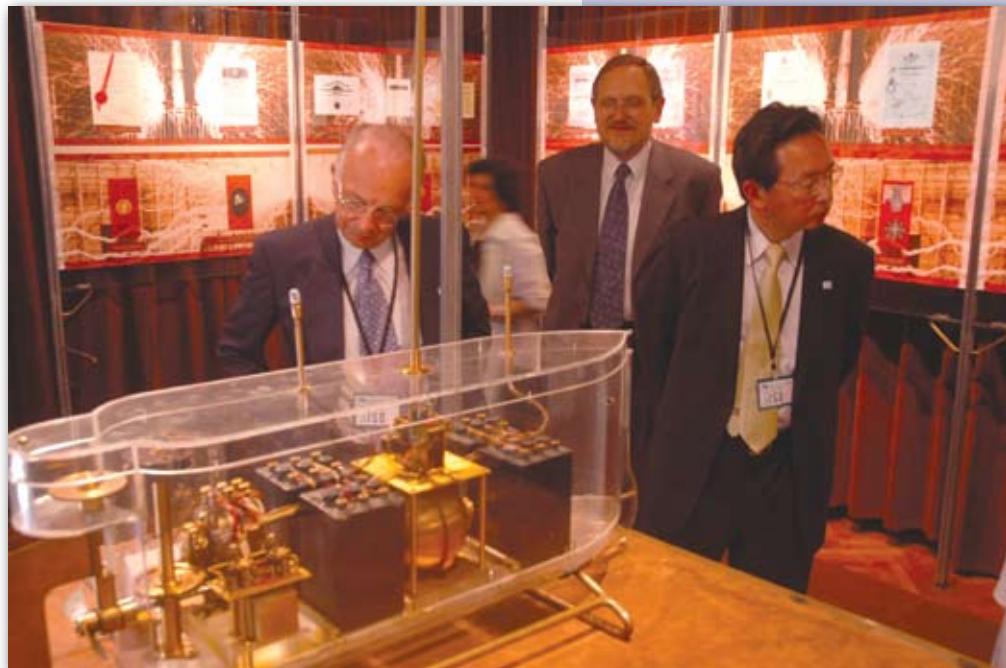
Na poziv Odbora za obeležavanje 150 godina od rođenja Nikole Tesle, pod pokroviteljstvom Vlade Republike Srbije, Generalni sekretar CIGRE g. Jean Kowal pozvan je da poseti Beograd u periodu od 9-11. jula 2006. i učestvuje u Programu obeležavanja velikog jubileja.

Proslava je započela 9. jula posetom diplomatskog kora, predstavnika Vlade Srbije i zvanica Muzeju Nikole Tesle u Krunskoj ulici gde je kustos pokazao jedinstvene eksponate iz života i rada velikog genija.

Prelaskom u Stari dvor, zvanice su prisustvovale otvaranju izložbe „Teslin čudesni svet elektriciteta“. U Dvoru je kralj Aleksandar Obrenović primio slavnog naučnika za vreme njegove jedine posete Beogradu 1892. godine. Izložba sa eksponatima – panoima prvi put urađenim za ovaj jubilej ostavila je zapažen utisak na zvanice.

Na velikoj sceni Narodnog pozorišta u Beogradu u okviru Programa, prisustvovao je svetskoj premijeri multimedijalne opere „Ljubičasta vatra“ po libretu Mirjam Zajdel. Muziku za

Secretary General CIGRE Mr. Jean Kowal was invited to visit Belgrade from July 9 to July 11 to visit Belgrade, by the Board for the celebration of 150th Anniversary of Nikola Tesla's birth under the chairmanship of the Serbian Prime Minister, and to take part in the celebration Programme.



Poseta Generalnog sekretara CIGRE g. Jean Kowala Muzeju Nikole Tesle u Beogradu
09. jula 2006. godine

Secretary General CIGRE Mr. Jean Kowal visiting Nikola Tesla Museum in Belgrade
on July 9th 2006.

The celebration began on the 9th of July with a visit to the Nikola Tesla Museum in the Krunska Street where the guide showed the Government, the diplomatic bodies representatives and all invited persons the unique pieces belonging to the genius scientist.

Coming to the Old Court, the exhibition „Tesla's Magic Electricity World“ was opened. At this Court, the king Aleksandar Obrenović received the celebrated scientist during his only visit to Belgrade in 1892. The exhibition with panels, created for this Jubilee, impressed the visitors.

At the Great Stage of the National Theatre in Belgrade, following the celebration Programme, Mr. Kowal attended the first performance of the multimedia opera „Violet Fire“. The text for this opera was written by Mirjam Zajdel. Music for

ovo delo o Teslinim njujorkškim delima komponovao je Džon Gibson u režiji Teri O Rajlija. Scena je bila impresivna ispunjena video projekcijama bogatom kostimografijom i uz dominantno prisustvo bele golubice Tesline inspiracije, koja mu je pomogla da se seti trenutaka otkrića obrtnog magnetnog polja zahvaljujući kojem je nastao prenos električne energije naizmeničnom strujom. Igra bele golubice i glas Dragane Tomić – sopran, dočarali su komunikaciju između Tesle i njegove golubice.

Generalnom sekretaru CIGRE g. Jean Kowalu, na prijemu u Ministarstvu rударства i energetike, Predsednik JUKO CIGRE g. Radomir M. Naumov i kopredsednik Odbora za obeležavanje ovog jubileja, uručio je specijalno priznanje za zasluge na polju elektroenergetike sa likom Nikole Tesle u izlivenom reljefu, kao i za ovu priliku izrađeno bibliografsko izdanje (numerisano brojem 14) čestitki povodom 75. rođendana Nikole Tesle 1931.

G. Kowal se toplo zahvalio i doda da CIGRE u svom radu na svetskom nivou na razvoju znanja i širenju informacija iz oblasti velikih električnih mreža, koristi neprekidno već 85 godina Tesline pro-nalaske.

U nastavku je održana konferencija za novinare na kojoj je g. Kowal odgovorio na pitanja koja su se odnosila na modele restrukturiranja elektroprivreda u svetu naglasivši ulogu CIGRE u

this piece about Tesla's New York days was composed by John Gibson, directed by Terry O'Raily. The stage itself was impressive, with plenty of video effects, rich costumes and with dominant presence of white dove - Tesla's inspiration, helping him to remember how he discovered rotating magnetic field thanks to which AC electric power transmission has been realised. The dance of the white dove and Dragana Tomić's voice – soprano, has reflected the communication between Tesla and his dove.

At the reception held at the Ministry of Mining and Energy, Chairman JUKO CIGRE Mr. Radomir M. Naumov, and co-president of the Republic Committee for the celebration of this Jubilee, handed to the Secretary General Mr. Jean Kowal a special award for the contribution to the electricity sector with Nikola Tesla portrait in brass, as well as a bibliographic edition (bearing No 14) comprising greetings for Tesla's 75th birth-

day in 1931.

Mr. Kowal thanked warmly adding that CIGRE has been using Tesla's inventions for 85 years already working at the international level on development and the spreading of knowledge in the field of large electric systems.

Later on, a press conference was held and Mr. Kowal answered the questions which mainly referred to electric power industries restructuring models throughout the world, emphasizing the



Predsednik JUKO CIGRE g. Radomir M. Naumov i Generalni sekretar CIGRE g. Jean Kowal prilikom uručivanja specijalnog priznanja povodom obeležavanja 150 godina od rođenja Nikole Tesle, 10. jula 2006. godine u Ministarstvu rudarstva i energetike, Beograd

Chairman JUKO CIGRE Mr. Radomir M. Naumov during the handing ceremony of the special award for the contribution to the electricity sector to the Secretary General CIGRE Mr. Jean Kowal during the celebration of Nikola Tesla's 150th birth Anniversary, Ministry of mining and energy, Belgrade, July 10. 2006

pogledu aktuelnog i tačnog informisanja o ovim događanjima u elektroenergetskom sektoru.

Posle razgledanja znamenitosti grada, g. Kowal je prisustvovao otkrivanju spomenika Nikoli Tesli na Aerodromu u Beogradu koji nosi njegovo ime i prisustvovao Svečanoj akademiji povodom obeležavanja Jubileja u Sava Centru.

Sledećeg dana u Narodnoj banci Srbije, 150-godišnjica je obeležena izložbom novčanica, prikazivanjem poštanske marke i novom kovanom novčanicom sa likom Tesle.

Povod za odlazak u Novi Sad u Maticu srpsku bila je promocija knjige „Nikola Tesla i Matica srpska“. U knjizi su korišćeni trezori kulturne baštine kojima raspolaže Matica srpska i autor Božidar Kovaček se opredelio za dokumentaristički pristup i reprodukciju izvornog materijala.

Svoje zadovoljstvo zbog učešća u Programu obeležavanja Jubileja i impresioniranost velikim naučnikom, g. Kowal je izrazio u svom pismu, koje je uputio Sekretarijatu JUKO CIGRE, rečima:

Poštovani,

Želeo bih da se zahvalim svima, a posebno Ministru g. Naumovu, što me je pozvao na proslavu obeležavanja 150 godina od rođenja Nikole Tesle. Zaista sam impresioniran uticajem Nikole Tesle na celokupno srpsko društvo; on to zaslužuje, ali je to bilo izvan onoga šta sam ja mogao da zamislim.

Svi su bili tako ljubazni, predusretljivi, a dobrodošlica je bila tako topla; ja ću sačuvati divnu uspomenu na ova tri dana. Mnogo se zahvaljujem upućujući čestitke za sve što ste postigli.

Najlepše želje svima.

Jean Kowal

CIGRE role in topical and correct informing in the electricity sector.

After sightseeing around Belgrade, Mr. Kowal attended the unveiling and consecration of the Monument to Nikola Tesla at the Airport in Belgrade which was renamed into Nikola Tesla Airport. In the evening the Central Ceremony was held at Sava Centre.

On the next day, in the National Bank of Serbia, the Jubilee was celebrated by the opening of an exhibition of Tesla commemorative and circulation coins, commemorative stamps and commemorative album.

The reason for travelling to Novi Sad was the visit to Matica Srpska where a book „Nikola Tesla and Matica Srpska“ was presented. The cultural treasure of Matica Srpska was used for the book and the author Mr. Božidar Kovaček decided to choose a documentary approach and reproduction of the original documents.

In his letter addressed to the JUKO CIGRE Central Office, Mr. Kowal expressed the satisfaction for taking part in the celebration Programme and his admiration for the great scientist, with the following words:

Dear All,

I would like to thank everybody, and especially Minister Naumov, for having invited me for the celebration of the 150th anniversary of Nikola Tesla birth. I was really impressed by the impact of Nikola Tesla on the whole Serbian Society; he deserves it, but it was well beyond what I could imagine.

Everybody was so kind, so attentive to our needs, and the welcome was so warm! I will keep a marvellous image of these three days. Thanks a lot and congratulations for what you achieved!

With my best regards to everyone,

Jean Kowal

NAJVEĆE PRIZNANJE NAUČNIKU NIKOLI TESLI – DODELJIVANJE JEDINICE ZA MAGNETNU INDUKCIJU (T) U MEĐUNARODNOM SISTEMU JEDINICA (SI)

THE GREATEST RECOGNITION TO THE SCIENTIST NIKOLA TESLA – AWARD OF THE UNIT FOR MAGNETIC INDUCTION (T) IN THE INTERNATIONAL SYSTEM OF UNITS (SI)

Gordana Spaić

KRATAK SADRŽAJ

Rad opisuje razloge i rezultate koji su doveli do najvećeg priznanja koje jedan naučnik može da dostigne - da njegovo ime Tesla bude dato jedinici u oblasti elektriciteta i magnetizma u Međunarodnom sistemu jedinica (SI). Opisane su teškoće na putu od predloga do konačnog usvajanja, preko raznih tehničkih i ekspertske komiteta Međunarodne elektrotehničke komisije (IEC) i Međunarodnog komiteta za tegove i mere (CIPM). Navedeni su neki primeri korišćenje jedinice „tesla“.

ABSTRACT

The paper describes the reasons and results that led to the greatest recognition that a scientist can achieve, his name Tesla given to a unit in the field of electricity and magnetism in the International System of Units (SI). The difficulties on the way from a proposal to its final adoption, through different Technical and Experts Committees of the International Electrotechnical Commission (IEC) and of the International Committee on Weights and Measures are described. Some examples for the usage of the „tesla“ unit are mentioned.

UVOD

Veliki jubilej, 150 godina od rođenja Nikole Tesle, koji proslavlja celo čovečanstvo i obeležava izložbama, koncertima, pozorišnim predstavama, izdavanjem poštanskih marki, postavljanjem spomenika, izdavačkom delatnošću itd., potstaklo je našu najveću asocijaciju u oblasti elektrotehnike - JUKO CIGRE da ovaj broj Informatora posveti Nikoli Tesli skromnim prilogom, iako o Nikoli Tesli postoje napisani tomovi. Daje se pregled Teslinog stvaralaštva na polju elektroenergetike i ukazuje se na priznanja koja kruniše davanje imena „tesla“ jedinici u oblasti elektriciteta i magnetizma u Međunarodnom sistemu jedinica (SI). Najveće priznanje Nikoli Tesli dodeljeno je 1960. godine odlukom 11. generalne konferencije za tegove i mere, imenom „tesla“ (T) nazvana je jedinica za magnetnu indukciju u Međunarodnom sistemu jedinica (SI).

INTRODUCTION

The great jubilee 150 years since Nikola Tesla's birth, celebrated by all of mankind was characterized by exhibitions, concerts, theatre performances, postal stamps editing, the unveiling and consecration of monuments, and different editing activities etc. This stimulated our biggest association in the field of electricity - JUKO CIGRE to dedicate this Newsletter to Nikola Tesla with this modest paper, although there are tomes written about Tesla. As recognition there is an overview of Tesla's scientific work in the field of electricity, and the award of giving the name "tesla" to the unit in the field of electricity and magnetism in the International System of Units (SI) is elaborated. The greatest recognition to Nikola Tesla was given in 1960 by the decision of the 11th General Conference on Weights and Measures, to give the name "tesla" and symbol (T) to the magnetic induction unit in the SI.

1. TESLINO STVARALAŠTVO

Ova 2006. godina, protiče u znaku obeležavanja 150. godišnjice rođenja Nikole Tesle, rođenog u pravoslavnoj srpskoj porodici, pa je tako po nacionalnosti Srbin koji je živeo i stvarao u Americi i postao američki državljanin, tj. kako kažu Amerikanci američko-srpski genije.

Dalekosežna je važnost Teslinih otkrića naročito ako se zna da se celokupna industrijska proizvodnja tada zasnivala na upotrebi vodene pare i uglja.

Glavni rezultati Teslinog rada kondenzovani su u preko 100 najznačajnijih patenata njegovih pronađaka patentiranih u Patentnim zavodima SAD, Velike Britanije i Kanade. Ti patenti se mogu svrstati u sledećih 8 oblasti: obrtno magnetno polje; motori i generatori; transformacija i prenos električne energije; rasveta; visoko-frekvenčni uređaji i regulatori; radio; telemehanika; turbine i slična oprema.

Stotine članaka u raznim časopisima, 39 000 dokumenata tehničke i naučne dokumentacije i 68 knjiga je napisano o Tesli. U Muzeju Nikole Tesle u Beogradu čuva se 56 diploma iz perioda 1873-1939. godine. U knjizi Diplome Nikole Tesle koju je 2006. godine objavio Muzej Nikole Tesle, uz diplome su izložene pojedina pisma koja su u vezi sa njima, u cilju tumačenja razloga za ukazivanje počasti, ali i da pokažu šta su takve počasti značile samom Tesli. Na taj način se lakše može sagledati vreme u kome je živeo i stvarao veliki pronađač i istraživač, ali i odjeci njegovog rada među savremenicima.

Od više stotina Teslinih pronađaka daje se osvrt na tri iz oblasti elektroenergetike koja su promenila svet.

Obrtno magnetno polje je Tesla otkrio u Budimpešti 1882. godine genijalnim rešenjem pomoću dve ili više naizmeničnih struja iste frekvencije, koje vremenski zakašnjavaju jedna za drugom za određeni deo perioda, a protiču kroz kalemove koji su međusobno prostorno pomereni. Uporedo sa otkrićem obrtnog magnetnog polja, Tesla teorijski razrađuje i konцепцију svog indupcionog motora. Trebalo je da protekne punih pet godina posle otkrića obrtnog magnetnog polja da bi Tesla 1887. prijavio Patentnom

1 TESLA'S SCIENTIFIC WORK

The year 2006 comes as a sign of celebration of the 150 years since Nikola Tesla's birth. Born in a Serbian orthodox family, he had Serbian nationality and by living in America he became an American citizen, as people often said, he was an American-Serbian genius.

The importance of Tesla's inventions is even greater if one knows that the whole industrial production was based on the use of coal and vapor in this period.

The main results of Tesla's work were condensed into over 100 important patents of his inventions registered with USA, Great Britain and Canadian Patent Administrations. Those patents could be organized into the following 8 fields: rotating magnetic field; motors and generators; transformation and electric power transmission; lighting; high frequencies devices and regulators; radio; telemecanics; turbines and similar equipment.

Hundreds of articles in different magazines, 39000 technical and scientific documents and hundred of books were written about Tesla. In the Nikola Tesla Museum in Belgrade 56 diplomas from the period of 1873-1939 have been kept. In the book "Nikola Tesla's Diplomas" issued in 2006 by the Nikola Tesla Museum, a number of chosen letters which are in connection with them, were published to show what certain awards meant to Tesla himself. This allows us therefore to more easily understand the period of time the great inventor and researcher lived in, as well as the response to his work among the contemporaries.

Out of hundreds of Tesla's inventions, three of them in the field of electricity that changed the world, are mentioned here.

The rotating magnetic field, which Tesla discovered in 1882 in Budapest with the aid of two or more alternating currents of the same frequency, which were on a time delay one after another for a certain part of period, flowing through the coils dislocated in space. Parallel to the discovery of the rotating magnetic field, Tesla worked on his induction motor concept. Five years after the discovery of his rotating magnetic field, Tesla

zavodu SAD prvu seriju od 7 fundamentalnih patenata koji se odnose na otkriće obrtnog magnetnog polja proizvedenog višefaznim strujama, i to pronalazak: indukcionog motora, višefaznog motora, generatora i transformatora i vezu trougao-zvezda kao i ostale bitne elemente višefaznog sistema za proizvodnju, prenos, distribuciju i korišćenje električne energije.

Pored ovih sedam osnovnih patenata, u toku 1888. i 1889. godine podnosi Patentnom zavodu još 34 patenata, kojim zaokružuje svoje grandiozno delo, svoj višefazni sistem. U ovim dopunskim patentima, Tesla posebno razrađuje trofazni sistem pomoću tri i četiri provodnika.

Teslin čudno jednostavan indukcioni motor je zadivio svet ne samo zato što je rešio problem ekonomičnog i dobrog motora već i zato što je omogućio da se električna energija naizmenične struje može lako pretvoriti u koristan rad, što je zahvaljujući upotrebi transformatora omogućilo ekonomičan prenos energije na velike udaljenosti i dovelo do pobede Teslinog višefaznog sistema nad sistemom jednosmerne struje. Teslin sistem proizvodnje, prenosa, distribucije i korišćenja električne energije pomoću trofaznih naizmeničnih struja koristi se i danas bez bitnih izmena.

Puštanjem u pogon elektrane na Nijagari 1896. godine, proizvedena električna energija koja je prenošena dvo-faznim naizmeničnim sistemom pod visokim naponom dograda Bufaloudaljenog 37 km od vodopada, i drugoj fazi izgradnjom trofaznog sistema još višeg napona ostvaren je model za gradnju elektrana na izvoristima energije.

Zahvaljujući poznanstvu Nikole Tesle i profesora Đordja Stanojevića koji je bio jedan od njegovih domaćina kada je Tesla 1892. godine posetio Beograd, u tadašnjoj Srbiji se počelo sa izgradnjom prvih hidroelektrana i sa primenom

registered the first series of 7 fundamental patents to the USA Patent Administration in 1887: induction motor, polyphase motor, generator and transformer as well as connection triangle-star and the other elements of the polyphase system for production, transmission, distribution and use of electricity.

Beside these seven fundamental patents, during 1888 and 1889 Tesla registered the next 34 patents and completed his genius masterpiece, his polyphase system. In supplementary patents, Tesla finalized his three phase polyphase system with three and four conductors.

Tesla's miraculously simple induction motor admired throughout the world not only for solving the problem of an economical and good motor, but also for enabling an easy transformation of AC electrical energy into mechanical work. Thanks to the use of a transformer, an economical power transmission on large distances led to the victory of Tesla's polyphase system over the monophase system. Tesla's electrical energy production, transmission and distribution system is still used today without essential modifications.

Commissioning the power plant on the Niagara Falls in 1896, the produced electric energy was transmitted at high voltage by a two phase alternating system to the town of Buffalo, 37 km away from the Falls and a model for building electric power plants at the generation place was set up.



Akademski slikar Miodrag D. Jelić, Tesla u Beogradu
Academic painter Miodrag D. Jelić, Tesla in Belgrade

Thanks to the friendship between Nikola Tesla and professor Djordje Stanojević, who was one of his hosts while visiting Belgrade in 1892, the building of small hydro power plants began at the principle of an alternating current. Professor Djordje Stanojević

naizmeničnih struja. U Beogradu je 1894. godine, profesor Đorđe Stanojević objavio prvu knjigu o Teslinim izumima. Na Đetinji kod Užica 1900. godine, samo četiri godine posle puštanja u rad elektrane na Nijagarinim vodopadima, upravo zaslugom tog poznanstva, sagrađena je prva srpska hidroelektrana na Teslinim principima.

Profesor Stanojević je takođe radio na elektrana na Vučjanskem potoku na Nišavi, na Crnom Timoku, na Vlasini, Moravici i na Peku.

2. DODELJIVANJE NAZIVA „TESLA“ I SIMBOLA (T) JEDINICI ZA MAGNETNU INDUKCIJU U MEĐUNERODNOM SISTEMU JEDINICA (SI)

U godini obeležavanja 150 godina od rođenja Nikole Tesle, potsećamo se kako je ime Nikole Tesle ovekovećeno preko međunarodne jedinice za gustinu magnetnog fluksa (magnetne indukcije) koja je dobila ime „tesla“.

Na svojoj IV sednici, Jedanaesta generalna konferencija za tegove i mere 18. oktobra 1960. godine, izglasala je Rezoluciju 12, kojom je odlučila da se jedinica magnetne indukcije u Međunarodnom sistemu jedinica (SI) nazove „tesla“ sa oznakom T. Ovo je najveće međunarodno naučno priznanje kojim je Nikoli Tesli podignut trajan spomenik, tako što je njegovo ime ušlo u sva zakonodavstva sveta, u skladu sa devizom Metarske konvencije „za sva vremena i za sve narode“. Time je učinjena čast i svim slovenskim narodima, jer je prvi put jedno slovensko ime stalo ravnopravno uz imena Njutna, Faradeja, Kelvina, Ampera, Volta, Herca, Henrika, Vata i drugih.

Posle predloga svoje Sekcije za električne i magnetne veličine, savetodavni komitet za nomenklaturu na zasedanju u Ševeningenu 1935. godine, doneo je odluku da prihvati pod nazivom: „Đordijev sistem“, sistem sa četiri osnovne jedinice: metar, kilogram, sekunda a četvrta koja bi bila izabrana kasnije.

Na istom zasedanju prihvaćen je naziv weber (Wb) za jedinicu magnetskog fluksa, kao i nazivi jedinica za električno polje volt po metru, za magnetsku indukciju weber po kvadratnom metru i za zapreminsку gustinu energije džul po kubnom metru.

edited his first book on Tesla's inventions in 1894 in Belgrade. At the river Djetinja near Uzice in 1900, only four years after the electric power plant on Niagara Falls, thanks to this friendship, the first Serbian electric power plant was built on Tesla's principles.

Professor Stanojevic also worked on electric power plants on the rivers Nisava, Crni Timok, Vlasina, Moravica and Pek.

2 GIVING THE NAME „TESLA“ AND THE SYMBOL (T) TO THE MAGNETIC INDUCTION UNIT IN THE INTERNATIONAL SYSTEM OF UNITS (SI)

In the year of celebration, 150 years since Nikola Tesla's birth, we are reminded of the procedure by which Tesla achieved the greatest honor. This was through the international unit for the magnetic flux density (magnetic induction) whose name became "tesla".

At the IV Session, the Eleventh General Conference on Weights and Measures, in October 18. 1960 the Resolution 12 was brought, by which it was decided that the magnetic induction unit in the International System of Units be named "tesla" with the symbol (T). This was the greatest international award by which a permanent monument was erected to Tesla, and his name was entered into the legislation of countries all over the world, according to the saying of the Meter Convention "for all times and for all nations". An honor was given to all the Slav nations, because for the first time, a Slav name stood equally with the names Newton, Faraday, Ampere, Volta, Hertz, Henry, Watt etc.

After the proposal of it's Session for electrical and magnetic quantities, the Advisory Committee for Nomenclature, in Shaveningen in 1935, made a decision to accept Giorgi's System with four basic units: meter, kilogram, second and the forth unit to be chosen later.

At the same session, the name Weber (Wb) was accepted for the magnetic flux unit, and the name volt per meter for electric field, weber per square meter for magnetic induction and joule per cubical meter for the energy density.

U Torkveju 1938. godine pored ostalog Tehnički komitet 24 (TC 24) IEC za električne i magnetne veličine i jedinice je predložio da se jedinici sile dodeli naziv „njutn“.

Drugi svetski rat je prekinuo međunarodni rad TC 24 sve do 1950. godine kada se u Parizu nastavio rad i kada su donete važne odluke. Za četvrtu osnovnu jedinicu predložen je amper, usvojena je totalna racionalizacija SI sistema, a nacionalnim komitetima je preporučeno da ponovo razmotre pitanje racionalizacije veličina ili jedinica. Imenovan je komitet eksperata da definitivno prostudira metod racionalizacije.

Definitivno je za jedinicu sile usvojen naziv „njutn“ i istovremeno je dat zadatak nacionalnim komitetima da daju ime nekog naučnika za jedinicu magnetne indukcije, kako bi se zamenio naziv veber po kvadratnom metru u SI sistemu.

Profesori elektrotehničkog fakulteta u Beogradu koje su predvodili prof. Pavle Miljanić i prof. Aleksandar Damjanović, podneli su predlog sa obrazloženjem da se jedinicu magnetne indukcije dodeli naziv „tesla“, koji su predlog potom branili i odbranili na zasedanju Komiteta eksperata TC 24.

U Opatiji 1953. godine, na drugom zasedanju Komiteta eksperata prisustvovali su prof. Pavle Miljanić, član Komiteta; prof. Aleksandar Damjanović, predsednik Jugoslovenskog elektrotehničkog komiteta (JEK); Profesori Beogradskog Elektrotehničkog fakulteta Vladislav Jovanović, Vladimir Petrović i Miodrag Ranojević.

Komitet eksperata je odlučio da zamoli Sekretarijat TC 24 da konsultuje nacionalne komitete sa ciljem saznanja o saglasnosti oko izbora naziva „tesla“ za jedinicu gustine magnetskog fluksa u SI sistemu. Profesoru Miljaniću je stavljeno u zadatku da pripremi propratni tekst koji se prenosi u celini:

„Tekaća definicija gustine magnetnog fluksa je gustina po jedinici površine tako da izraz Wb/m^2 (veber po kvadratnom metru) može da izgleda dovoljan da označi jedinicu u Đordjevom sistemu (MKSA). Druga definicija je zasnovana na zakonu koji opisuje pojavu indukcije, a koja daje jedinicu Vs/m^2 (voltsekunda po kvadratnom

In Torquay in 1938, among other proposals, the International Electrotechnical Commission, Technical Committee 24 (IEC TC 24) for electrical and magnetic units, proposed that the name “newton” should be given to the unit for force.

The Second World War interrupted the international TC 24 work until 1950, when in Paris it was continued, making important decisions. For the fourth basic unit, “ampere” was proposed, a complete rationalization of SI, and National Committees were recommended to review the matter of rationalization of quantities and units. A Committee of experts was established to study the method of rationalization definitely.

Finally, the name “newton” was accepted for the force unit and at the same time, National Committees were asked to give the name of a scientist for the magnetic induction unit, instead of weber per square meter in the SI.

Belgrade Electrotechnical Faculty professors directed by prof. Pavle Miljanic and prof. Aleksandar Damjanovic, made a proposal with an explanation for giving the name “tesla” to the magnetic induction unit, and defended it at the Experts Committee TC 24 Session.

In Opatija in 1953, at the second meeting of Experts Committee, prof. Pavle Miljanic, Committee member, prof. Aleksandar Damjanovic, president of the Jugoslav Electrotechnical Committee (JEK), Belgrade Electrotechnical Faculty professors Vladislav Jovanovic, Vladimir Petrovic and Miodrag Ranojevic were present.

The Experts Committee decided to ask the TC 24 Secretariat to consult with National Committees about the support for the choice of the name “tesla” for the density of magnetic flux (magnetic induction) unit in the SI. Professor Miljanic was to prepare the text which is given below:

“The definition for the magnetic flux density is the density per unit surface so that expression Wb/m^2 (weber per square meter) may seem sufficient for the unit in Giorgi’s System (MKSA). The other definition is based on the law describing the induction phenomena, and gives the unit Vsm^2 (volt second per square

metru). Međutim, definicija data u drugom izdanju Međunarodnog Elektrotehničkog Rečnika (Izraz 05-25-035) zasniva se na zakonu sile F kojoj je izložen provodnik dužine l , kroz koji teče struja I , ako se nalazi u polju gustine magnetnog fluksa B . Ova definicija je neposrednija i vodi predstavljanju jedinice u Đordževom sistemu izrazom N/mA (njutn/meter amper) koja je, s obzirom da je čine tri jedinice, predugačka i nepodesna u nastavi, a nepodesna je i onim osobama koje je u svom radu mnogo upotrebljavaju.

Dakle, sama po sebi nastala je potreba-kao što se osetilo u elektromagnetnom sistemu CGS, u kome je jedinica gustine magnetnog fluksa gaus – za novim nazivom za jedinicu magnetne indukcije Đordževom sistemu“.

U Filadelfiji 10. i 11. septembra 1954. godine na osnovu saglasnosti nacionalnih komiteta, IEC TC 24 je odlučio da podnese sledeću rezoluciju na usvajanje nacionalnim komitetima da se usvoji naziv „tesla“ za jedinicu gustine magnetnog fluksa u Đordževom sistemu, što su nacionalni komiteti ratifikovali šestomesečnim glasanjem.

Povodom predstojeće proslave stogodišnjice rođenja Nikole Tesle u Beogradu 10. jula 1956. godine, na predlog Sogge-a, predsednik IEC dr Danšit, u ime Akcionog komiteta predaje sledeću poslanicu odboru za proslavu:

„Aкциони комитет IEC је председник IEC, као његов лични представник на промовисању Теслине стогодишњице, пренос топле поштраве IEC свима који су се окупили да се подсете на великог Теслу.“

Увек се са осећањем дубоког поштовања и дивљења памти Тесла у свету електрике. IEC је врло свестан да је његов данашњи рад на међunarодном усаглашавању на полju електричног тока веома важан од фундаменталног научног рада Николе Тесле.

IEC је врло срећан да је та чинjenica ове године обећана постигнутом сагласношћу да свetska јединица gustine magnetnog fluksa u Đordževom sistemu nazove „tesla“.“

meter). However, the definition given in the second edition of the International Electrotechnical Vocabulary (term 05-25-035) is based on the law by which the conductor having the length l through which current I flows is exposed to a force F , if it is placed in a field whose magnetic flux density is B . This definition is more direct and leads to the presentation of the unit in Giorgi's System by the expression N/mA (Newton per meter ampere), which is, being composed of three units, too long and impractical in teaching, and it is not convenient for the ones who use it often in their work.

Hence, the need appeared naturally-similar to the magnetic flux density unit gaus in the Electromagnetic System CGS-for a new name for magnetic induction unit in Giorgi's System. ”

It was reported that the decision of the IEC Technical Committee 24 in Philadelphia September 10 and 11 1954 to recommend the adoption of the name “tesla” for the unit of magnetic flux density in the Giorgi System had now been ratified by the National Committees under Six Months Rule.

In view of the celebration of the centenary of the birth of Nikola Tesla, which was to be held in Belgrade in July, 1956 and which Dr. Dunsheath will attend, it was decided on the proposal of Mr. Sogge that the President of the IEC should convey the following message on behalf of the Commission to the Nikola Tesla centenary Committee:

“The Committee of Action of the IEC desires the President of the IEC as its personal representative at the Tesla Centenary Celebration to convey to all who are there assembled, the warm greetings of the IEC on this occasion in commemoration of the great Tesla.

It is always with a sense of profound respect and admiration that the name Tesla is remembered throughout the electrical world and the IEC is very mindful that its work today for international agreement in the electrical field is dependent in a very large measure on the fundamental scientific work of Nikola Tesla.

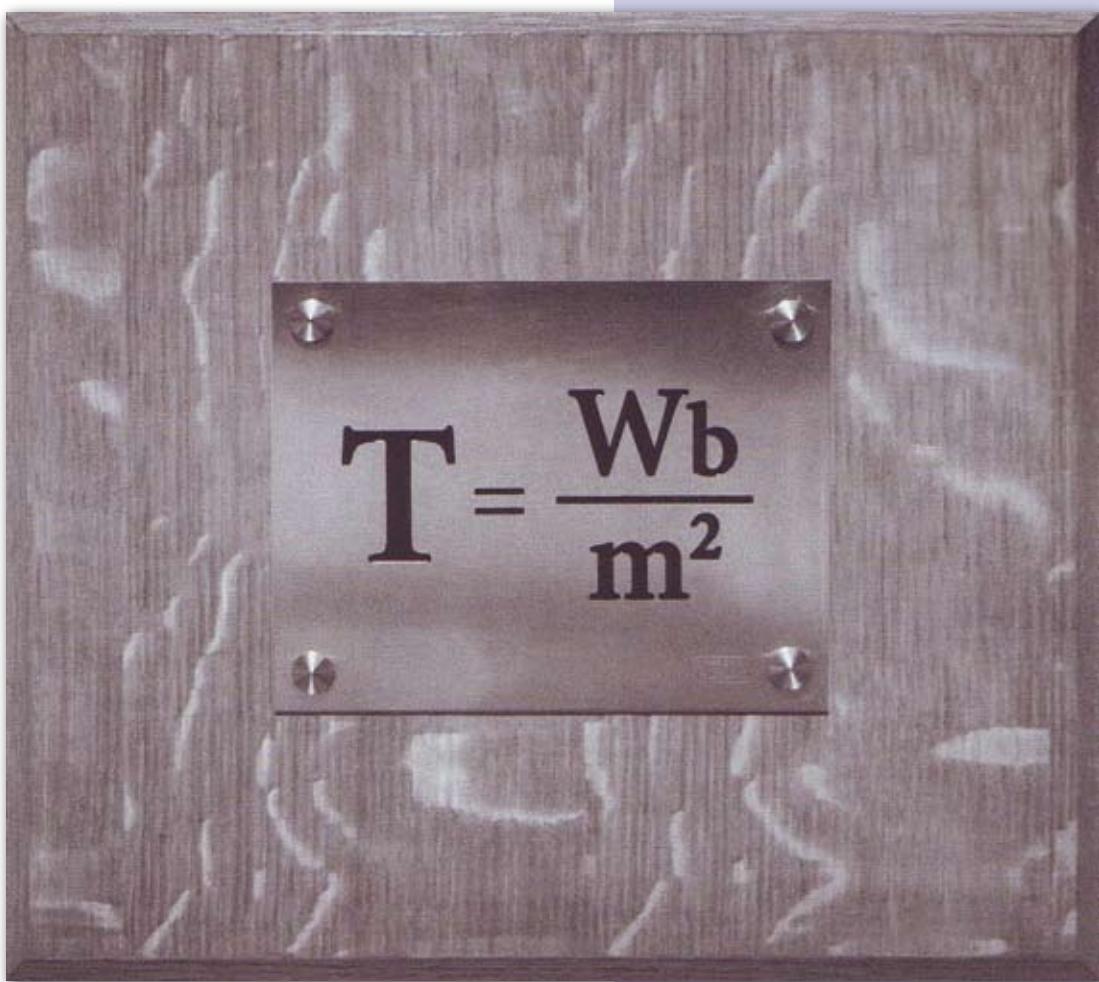
The IEC is very happy that this fact has been marked this year by the agreement they have reached for the world unit of magnetic flux density in the Giorgi system to be called the “tesla”. ”

U Minhenu 1954. na zasedanju Akcionog komiteta IEC prihvaćeno je jednoglasno da se naziv „tesla“ usvoji za jedinicu magnetne indukcije. Time je dalji put ka usvajanju nastavljen preko Međunarodnog komiteta za tegove i mere (CIPM).

Predlog IEC da se naziv „tesla“ usvoji za jedinicu magnetske indukcije, CIPM je razmatrao 1956 i podneo isti na usvajanje 11. Generalnoj konferenciji CIPM, koja se sastaje svake četvrte godine i njene su odluke konačne i obavezne za sve potpisnice konvencije. Konačno, na 11. Generalnom zasedanju CIPM u Parizu od 11. do 20. oktobra 1960. godine koje je okupilo 34 države – potpisnice Metarske konvencije, podnet je predlog i doneta odluka za naziv „tesla“ za jedinicu magnetske indukcije. Od predloga do usvajanja jedinice „tesla“, prošlo je 10 godina, što govori o ozbilnosti i značaju donošenja takvih odluka.

In Munich in 1954 at the IEC Action Committee meeting the name “tesla” was adopted for the magnetic induction unit. In this way, further adoption was continued through the International Committee on weights and measures (CIPM).

The IEC proposal to adopt the name “tesla” for the magnetic induction unit, was discussed in 1956 and submitted by CIPM for approval at the 11. General Conference, having Sessions each fourth year, whose decisions are final and obligatory for all the members. Finally, at the 11th General Session of CIPM in Paris from the 11th to 20th of October, 1960, in the presence of 34 countries Meter convention members, the proposal was submitted and the decision was made that the name “tesla” be given to the magnetic induction unit. It took 10 years from the proposal to the adoption of the unit “tesla”, and this fact speaks about the seriousness and importance of making such decisions.



Jedinica „tesla“, $1 \text{ T} = 1 \text{ kg} \cdot \text{s}^2 \cdot \text{A}^{-1} = 1 \text{ N} \cdot \text{A}^{-1} \cdot \text{m}^{-1} = 1 \text{ Wb} \cdot \text{m}^{-2}$
„tesla“ unit, $1 \text{ T} = 1 \text{ kg} \cdot \text{s}^2 \cdot \text{A}^{-1} = 1 \text{ N} \cdot \text{A}^{-1} \cdot \text{m}^{-1} = 1 \text{ Wb} \cdot \text{m}^{-2}$

3. NEKI PRIMERI KORIŠĆENJA JEDINICE „TESLA“

Jedinica tesla je mera koncentracije magnetnog polja, broja linija polja po kvadratnom metru. Jedinica jedan tesla je velika jedinica iznosi 10 000 gausa (Gs), jedinica CGS sistema. Svi medicinski uređaji za magnetnu rezonancu su baždareni u jedinicama od 0,5 do 1 T. U spoljašnjem prostoru magnetna indukcija se kreće između 0,1 i 10 μ T (10^{-10} T i 10^{-8} T). Na 50° zemljine geografske širine magnetna indukcija iznosi 58 μ T ($5,8 \times 10^{-5}$ T) a na ekvatoru na geografskoj širini 0° iznosi 31 μ T ($3,1 \times 10^{-5}$ T).

U magnetnom polju velikog potkovičastog magneta, magnetna indukcija iznosi 1 mT (0,001 T). Sunčeve pege imaju 10 T a najjače kontinualno magnetno polje ikad proizvedeno u laboratoriji (u Tallahassee, SAD) ima magnetnu indukciju 45 T. Najjače pulsirajuće magnetno polje ikada dobijeno nedestruktivnim metodama u laboratoriji na univerzitetu u Osaki ima magnetnu indukciju 80 T. Najjače (pulsirajuće) magnetno polje ikada dobijeno (sa eksplozivima) u laboratoriji u Rusiji, Sarov, ima magnetnu indukciju 2800 T. Maksimalna teoretska magnetna indukcija neutronske zvezde i svake poznate pojave iznosi 10^{13} T.

3 SOME EXAMPLES FOR USAGE OF THE “TESLA” UNIT

The “tesla” unit is the measure of concentration of magnetic field, number of field lines per square meter. One “tesla” is a big unit and makes 10 000 gauss (Gs), the unit in CGS system. All medical devices for magnetic resonance are calibrated in “tesla” units from 0,5 to 1 T. In the outer space magnetic flux density is between 0,1 and 10 μ T (10^{-10} T and 10^{-8} T). At the latitude of 50° magnetic induction is 58 μ T ($5,8 \times 10^{-5}$ T) and on the equator at the latitude of 0° 31 μ T ($3,1 \times 10^{-5}$ T).

In the magnetic field of a huge horseshoe magnet, magnetic induction is 1 mT (0,001 T). Sunspots have 10 T while the strongest continuous magnetic field yet produced in a laboratory (in Tallahassee, USA) has the magnetic induction 45 T. The strongest pulsed magnetic field yet obtained by non-destructive methods in a laboratory in Osaka University has a magnetic induction of 80 T. The strongest pulsed magnetic field ever obtained with explosives in a laboratory in Russia, Sarov, has the magnetic induction of 2800 T. The maximal theoretical magnetic induction of a neutron star and therefore for any known phenomenon is 10^{13} T.

LITERATURA/REFERENCES

- [1] ELEKTROTEHNIKA Godina 30-1981 br. 11 – Savez mašinskih i elektrotehničkih inženjera i tehničara Jugoslavije
- [2] Prof. dr Jovan Surutka: Teslin prilog elektrotehnici (sa svečane akademije povodom 120. godišnjice rođenja Nikole Tesle, održane u Srpskoj akademiji nauka i umetnosti 13. decembra 1976. godine, ELEKTROTEHNIKA, 1977. br. 3.
- [3] Srđan R. Spiridonović: Usvajanje naziva „tesla“ za Međunarodnu jedinicu magnetne indukcije. Peta Međunarodna konferencija, Beograd 1996.
- [4] Prof. dr Vladimir Muljević: Život i delo Nikole Tesle. Energija, god. 55 (2006). br. 2.
- [5] Diplome Nikole Tesle, Muzej Nikole Tesle, Beograd, 2006.



СРБИЈА И ЦРНА ГОРА
МИНИСТАРСТВО ЗА УНУТРАШЊЕ
ЕКОНОМСКЕ ОДНОСЕ
ЗАВОД ЗА СТАНДАРДИЗАЦИЈУ
Број 5413/1-40-01/2008
18 АРК 2008 200__ године
БЕОГРАД

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Међународна електротехничка комисија (IEC, International Electrotechnical Commission) је најстарија међународна организација за стандардизацију, која ове године слави стогодишњицу оснивања. Поводом тога, почетком марта ове године на презентацију IEC-а на Интернету постављена је кратка, интерактивна, електронска енциклопедија „Techline”, у којој се, поред осталог, налазе и научници и проналазачи који су дали најзначајније доприносе развоју електротехнике и електронике – од Талеса у античкој Грчкој до наших савременика. У вези с тим, са посебним задовољством вас обавештавамо да су, захваљујући залагању Завода за стандардизацију (који је пуноправни члан IEC-а од 1953. године и у тој организацији има статус Националног комитета Србије и Црне Горе) и подршци неколико најугледнијих домаћих институција, предузећа и организација, у поменуту енциклопедију уврштени **Никола Тесла**, **Михаило Пупин** и **Ђорђе Станојевић**. Тиме је, поред осталог, Завод за стандардизацију дао и свој скроман допринос прослави 150. годишњице рођења Николе Тесле.

Прилози на енглеском језику о Тесли, Пупину и Станојевићу налазе се на адреси <http://www.iec.ch/100years/techline/> и доступни су свеукупној светској јавности без икаквих ограничења (корисничких имена и лозинки, регистрације и сл.).

Реализација пројекта „Techline” започела је 2005. године под радним насловом „IEC Hall of Fame” (у преводу: IEC-ова дворана славе). На молбу Завода за стандардизацију да учествују у реализацији тог пројекта на нивоу Србије и Црне Горе одазвале су се следеће институције: Српска академија наука и уметности (САНУ), Електротехнички институт „Никола Тесла”, ЈУКО CIGRÉ, Музеј Николе Тесле и ЈП Електропривреда Србије. Зато, поред достављања обавештења о исходу акције, ову прилику користимо да се посебно захвалим ЈУКО CIGRÉ на учешћу у поменutoј акцији и подршци коју је при томе пружио Заводу за стандардизацију.

С поштовањем,



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International Electrotechnical Commission (IEC) is the oldest organization for standardization which is celebrating this year 2006 it's centenary since it's foundation. For that reason, at the beginning of March this year, a short interactive electronic encyclopedia "Techline" was put at the Internet presentation, where among the others, scientists and inventors who gave the most important contribution to the development in the field of electrical engineering and electronics, beginning with Tales from the ancient Greece up to nowadays. Having this in mind, we are glad to inform you that, thanks to the Standardization Institution being an IEC member since 1953 and having the role of an IEC National Committee, and thanks to the support of several most distinguished domestic institutions enterprises and organizations, Nikola Tesla, Mihajlo Pupin and Djordje Stanojevic were put into the encyclopedia. So the Standardization Institution gave its modest contribution to the celebration of 150 years since Nikola Tesla's birth.

At the address <http://www.iec.ch/100years/techline/> the text about Tesla, Pupin and Stanojevic in English is available to the whole world's users without any barriers (user names, passwords, restrictions etc).

The project "Techline" commenced in 2005 under the little "IEC Hall of Fame". The invitation for cooperation in the realization of this project, according to the invitation of the Standardization Institution was accepted by: Serbian Academy of Arts and Science, Electrotechnical Institute "Nikola Tesla", JUKO CIGRE, Nikola Tesla Museum and Electric Power Industry of Serbia. Giving this information about the results of these activities, we would like to thank JUKO CIGRE for taking part in the mentioned activities and for the support to the Standardization Institution.

With best regards

Director
Miodrag Perovic BSC