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# Two-dimensional discrete-time laser model with bifurcations and Chaos

**Abdul Qadeer Khan**
*University of Azad Jammu and Kashmir, Pakistan*

We explore the local dynamics, bifurcations and chaos in a two-dimensional discrete-time laser model. It is shown that for all involve parameters, model has boundary fixed point and the unique positive fixed point under definite parmetric condition(s). Further local dynamics along with different topological classifications about fixed points have explored by linear stability theory. We also investigated the existence of prime-period and periodic points of the discrete-time laser model. It is investigated that flip bifurcation occurs about boundary fixed point, and also there exist a flip bifurcation if parameters vary in a small neighborhood of the unique positive fixed point. Further it is also explored that about unique positive fixed point, laser model undergoes a Neimark-Sacker bifurcation, and in the meantime stable invariant curve appears. Numerical simulations are implemented to validate not only obtain results but also exhibits complex dynamics of period-2,3,4,5,8 and 9. Further, Maximum Lyapunov exponents along with fractal dimension are computed numerically to validate chaotic behaviors of the laser model. Lastly, feedback control method is utilized to stabilize chaos present in the model.

## Biography

Dr. ABDUL QADEER KHAN got the Ph.D. degree at the age of 32 years from Department of Mathematics, University of Azad Jammu and Kashmir, Muzaffarabad, Pakistan. During his PhD studies, he worked in the School of Mathematical Sciences, Shanghai Jiao Tong University, Shanghai, P. R. China under HEC “INTERNATIONAL RESEARCH SUPPORT INITIATIVE PROGRAMME (IRSIP)”. Currently he is working as an Assistant Professor in the Department of Mathematics, University of Azad Jammu and Kashmir, Muzaffarabad, Pakistan. His current research interests include stability, bifurcations and control in some discrete-time mathematical models from physics, chemistry, biology, ecology etc. With in domain of research, Dr. Khan has published 82 research papers in well known reputed Journals, and moreover so for Dr. Khan has win 3 research projects from international funding agency. Dr. Khan has pupervised 25 MS students and 2 PhD students. Currently 8 Ms Students and 3 PhD students are under his supervision.

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# Fabrication and Experimental verification of energy reversible SoI-NEM switch for Adiabatic Computation and Bio-Medical Applications

**Abdulilah M Mayet**

*King Khalid Univeristy, Saudi Arabia*

In this work, I present the theoretical analysis and experimental verification of energy reversible Nano Electromechanical Switch (NEMS) for adiabatic computations and bio-medical applications. At its core, adiabatic circuits reduce power consumption significantly during logic operations using a four-phase power clock along with clever circuit arrangements which avoid the build-up of charges across a single transistor. The NEM switches can prove to be the ideal building blocks for these electronics chips as they present no leakage-current and therefore consumes very low static power. In particular, the energy reversible NEM switches can further reduce the power consumption in adiabatic circuits, since these switches conserve and reuse the mechanical bending energy stored in them in the first cycle, and for subsequent switching cycles. In this work, we have reported theoretical analysis and experimental proof of the benefits of using NEM switches (three-terminal and energy reversible, both) in place of traditional Complementary Metal Oxide Semiconductor (CMOS) transistor switches in adiabatic circuits, in terms of the energy dissipation per unit cycle of power clock for various power clock frequencies. Here, we have observed that the experimentally observed reduction in pull-in voltage (13%) for subsequent cycles of switching for energy reversible NEM switches, indicating a reduction in switching energy. It is found that the NEM switches promise to offer lower energy consumption for low-frequency operations (<100 kHz) and therefore it is recommended that it is best suited for biomedical and low-power applications.

## Biography

Abdulilah Mayet is an assistant professor at King Khalid University, teaching courses in Nanofabrication and FPGA for AI. He is also the director of the engineering college research center and consultant at the artificial intelligence center (AIC). He has joined King Abdullah University of science and technology (KAUST) and got his master's and doctoral degrees in electrical engineering in the field of microelectronics and doctoral research focused on innovating and fabricating new fully amorphous metal (patented) to fabricate nanoscale MEMS devices (NEMS), with a co-advisor from Cornell University. He earned his bachelor's degree from King Fahd University of Petroleum and Minerals (FUPM). He has a research collaboration with the University of California Irvine and Cornell University.

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# Quantum-Relativity

**Benedict Michal Josef Campbell-Biezanek**
*Researcher, UK*

In about 1921, following careful astronomical observations taken by Sir Arthur Eddington at Principe in 1919, Albert Einstein finally accepted that his General Theory of Relativity was correct. Einstein then realized that his Special Theory of Relativity must be nonsense because the relativistically invariant definition of the metre must be 1/c seconds, but space and time are definitely not the same thing, therefore c may not have a value of unity. Einstein subsequently declared the whole subject of relativity to be beyond him and unfathomable, but nobody (except for myself aged nine-years-old at the time) wanted to know that. Einstein then declined into relative obscurity and in 1955, he died a deeply unhappy man while presumably still worrying over this puzzle.

In 1972, Clauser and Freedman confirmed the obvious facts about quantum entanglement and the consequent instant action at a distance. In 1980, the CIPM finally threw the towel in a defined the metre as 1/c seconds. But c may not be unity. What is the solution to this great puzzle? The answer turns out to be TOO EASY, but people want the solution to be too hard, but it isn't even hard at all, therefore, they cannot solve such an easy puzzle with all of their hard solutions.

In Quantum-Relativity we must regard history as moving backwards in time from an ever-static present. The proper units for time are the imaginary historic depth in i-seconds. The proper relativistically invariant value for c is 1/-1i. That is the solution to the puzzle. If you would like a longer explanation and a proof, there are about 100-pages of tutorial notes and diagrams on my website at https://www.gnqr.co.uk/ . The proper value for c-squared is minus one. Therefore, there is no contradiction between Einstein's Special Theory of Relativity and his General Theory of Relativity and Einstein died while worrying about nothing at all.

## Biography

Dr. Benedict Michal Josef Campbell-Biezanek is 72-years-old; he is happily married (but also happily separated) with four sons and ten grandchildren. The author discovered the key solution that led to what he only now calls (The Gauss-Newton) Quantum-Relativity at nine years of age. It was too great a burden for a nine-year-old to deal with and the author decided to leave the issue until later in his life. The author became an electrical engineer with his own company designing and manufacturing highly specialized electronic instruments for the energy industry. In 2007, the author sold his company and at the age of 57, he took up the full-time theoretical work that led, as a mere byproduct of that overall work, to the development of what he now names as (The Gauss-Newton) Quantum-Relativity.

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# Photobiomodulation therapy improves quality of life, wound healing and pain scores of Diabetic Patients from Brazilian Public Hospital

**Camila Squarzoni Dale**
*University of Sao Paulo, Brazil*

**Background:** Diabetic Foot ulcers represents 40-70% of non-traumatic lower limb amputations with great socioeconomic impact and high morbidity and mortality and losses on quality of life. Conventional treatments are restricted, painful and usually uneffective. Photobiomodulation (PBM) is a low-cost therapy which promotes analgesia and tissue repair in diabetic patients (DP).

**Aim:** Evaluate PBM-effect son wound healing, pain and quality of life of DP from the University Hospital of USP/BR. Methods: transversal and interventional study including 14 DP submitted to clinical evaluation, pain (BPI, DN4 and McGill), quality of life (HADS and PCS) screening before, immediately after and 6 months after 14 applications of PBM therapy (660 nm, 1.4 J, 2x/week).

**Results:** Most of DP presented foot sensitivity and history of amputation. 42.8% of DP presented wounds >12 months with lower limbs symptoms as numbness (57.1%), burning (63.3%) and tingling (57.1%) with worsening of symptoms at night (57.1%). After PBM, total or partial wound retraction (p=0.001) were obtained, with permanent recovery in 71.4% of DP even after 6 months. A decrease in pain impact were observed (41%, p=0.050), improving patient´s social relationships (p=0.068), added to significant reduction in neuropathic pain scores (p=0.031) and albeit not significant, PBM slightly improved emotional aspects of DP. Wilcoxon test (p<0.05, SPSS).

**Conclusion:** PBM therapy promoted significative and permanent wound retraction and improved quality of life and pain screening of DP, reinforcing the use of this adjuvant tool in the clinical treatment of painful symptoms and in the wound healing process of DP.

**Keywords:** photobiomodulation; low level laser; diabetic neuropathy, wound healing

## Biography

I am an Associate Professor at the Departament of Anatomy of the University of São Paulo working mostly on the effects of complimentary therapies for pain treatment. In this aspect we have been working on the effects and mechanisms envolved on the analgesia induced by photobiomodulation in experimental models of dental hypersensitivity and also we have been working on an experimental model of diabetic neuropathy that was recently published at J Biophotonics. 2018; this data supported the use of photobiomodulation on diabetic patients so now we are working on a project that evaluates the effects and mechanisms involved on photobiomodulation-induced analgesia in those patients. Moreover, to work on human subjects lead us to develop another project that aims to understand the different pain pattern of neuropathic pain-diabetic patients, through exteroeptive evaluation using quantitative sensory testing.

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# Local Microstructure Control of amorphous alloys by utilizing ultrashort pulsed laser for improvement of machinability

**Chieko Kuji**

*Tohoku University, Japan*

Amorphous alloys have excellent soft magnetic properties due to their non-crystalline structure, thus they are expected to be used as motor core materials. On the other hand, due to their high strength and toughness resulting from their unique amorphous structure, they are difficult to machine causing high machining resistance and severe tool wear. The authors propose a new method to overcome this difficulty in machinability by heat-treating the alloy to slightly precipitate crystals, which reduces the tough mechanical properties and improves machinability1. However, crystallization of the entire alloy would also lessen the excellent soft magnetic properties, so it is necessary to crystallize only targeting local areas that contribute to machining. In this study, ultrashort pulsed lasers, which have few thermal effects, were purposely tried for heat treatment to perform localized heat treatment while suppressing thermal diffusion. Next, the microstructure after laser irradiation was examined by electron microscopy to determine whether the ultrashort pulsed laser could be used for heat treatment. Finally, machining tests were conducted to investigate how the machinability of the locally heat-treated samples changed. This research was partly supported by JSPS KAKENHI, grant number 20H02021. The author is also grateful to Professor T. Kuriyagawa, Professor H. Soyama, Professor M. Mizutani, and Assistant Professor K. Shimada for advising on machining tests. The author wishes to thank Professor T. J. Konno and Dr. K. Takenaka for evaluating the microstructure.

## Biography

Chieko Kuji completed her PhD from Tohoku University in March 2022 while working for a company as an engineer. She is currently an assistant professor at the Department of Finemechanics, Graduate School of Engineering, Tohoku University. Her major research fields are (i) microstructural evaluation and machining of amorphous alloys[1], (ii) structural analysis of materials[2], and (iii) development of new dental treatment methods using powder jet machining.[3, 4]

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# Red Laser Exposure as innovative technique for development of fermented dairy products

**Fouad M. F. Elshaghabee**
*Cairo University, Egypt*

Probiotics are vital for manufacturing of functional fermented dairy products that are popular dairy foods in many countries. The health benefits of probiotics are mainly attributed to their bioactive metabolites. An innovative technique is used in order to enhance the activities of the probiotics as well as quality of fermented milk. Three red laser dosages, at the wavelength of 632.7 nm, were applied to Lacticaseibacillus casei (L.) NRRL-B-1922 before the fermentation of skim milk. The results revealed that levels of lactose fermentation, organic acids profile, proteolytic activity and total antioxidant capacity were significantly increased [1]. By application of laser treated L. casei in manufacturing of Labneh, the results showed an enhancement in levels of the two major flavor compounds (acetaldehyde and diacetyl) as well as the overall acceptability of Labneh.

In conclusion, A significant improved in the fermentation profile of tested L. casei strain which reflects on the quality of final product. Therefore, the employment of photobiomodulation process might be a potential application at industrial scale.

**Keywords:** Photobiomodulation, probiotics, functional foods, sensory evaluation, antioxidant

## Biography

Fouad M. F. Elshaghabee is an associate professor and Acting Deputy Head of Dairy Science Department, Faculty of Agriculture, Cairo University, Egypt. In 2014, he obtained his Ph.D. from Max Rubner-Institute, Kiel University, Germany. The field his Ph.D. study was nutritional sciences and house-hold economics. He has more than 18 years' experience in the field of higher education. His research focuses on development of probiotic dairy foods and food safety. He has published more than 20 research articles and 3 book chapters.

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# Correlation between surface texture and internal defects in laser powder bed fusion additive manufacturing

**Hideki Kyogoku**
*Kindai University, Japan*

Additive manufacturing is an essential technology in digital manufacturing and has been widely applied in various fields. However, because the intrinsic properties of the laser powder bed fusion (PBF-LB) process lead to the generation of defects in manufactured products, the development of a real-time monitoring and feedback control technology is demanded to assure the final product quality and process repeatability. Therefore, we focuced on the correlation between the surface-texture parameters and density or internal defects, which is yet to be quantitatively investigated in a systematic manner, to predict th egeneration of defects. This study aims to investigate the correlation between the surface texture and internal defects or density of PBF-LB parts, thereby providing guidelines for the development of an in-situ monitoring and feedback control system capable of preventing defect occurrence in PBF-LB parts. In this study, PBF-LB specimens are fabricated under various power and scan-speed conditions using a PBF test bench. CSI equipment (Zygo newview9000) was used to determine the ISO25178-6 areal surface-texture parameters for the fabricated specimens. Consequently, the density and 35 areal surface-texture parameters of 121 manufactured specimens were determined. Using a statistical method, a strong correlation was revealed between the areal surface texture parameters and density or internal defects in the within specimens. In particular, the parameters Svk, Sk, Sq, and Sdq demonstrate a strong correlation with specimen density. Therefore, in-situ monitoring of these areal surface-texture parameters can facilitate their use as control variables in the feedback system to prevent defect generation during the PBF-LB process.

## Biography

Hideki Kyogoku has completed his Doctor of Engineering degree in Mechanical Systems Engineering from Tokyo Institute of Technology in 1989. He is a Professor of Fundamental Technology for Next Generation Research Institute and the director of the Advanced Additive Manufacturing Research Center at Kindai University. He worked at The University of Texas at Austin as a visiting research associate during 2001-2002. He serves as the Project Leader of Technology Research Association for Future Additive Manufacturing (TRAFAM) from 2014. He has published more than 100 papers in reputed journals and has been serving as an editorial board member of repute.

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# Elastic property of sickle cell anemia and sickle cell trait red blood cells

**Horace Crogman**
*California State University, USA*

We introduce a model for better calibration of the trapping force using an equal but oppositely directed drag force acting on a trapped red blood cell (RBC). We demonstrate this approach by studying RBCs' elastic properties from deidentified sickle cell anemia (SCA) and sickle cell trait (SCT) blood samples. A laser trapping (LT) force was formulated and analytically calculated in a cylindrical model. Using this trapping force relative percent difference, the maximum (longitudinal) and minimum (transverse) radius rate and stiffness were used to study the elasticity. The elastic property of SCA and SCT RBCs was analyzed using LT technique with computer controlled piezo-driven stage, in order to trap and stretch the RBCs. For all parameters, the results show that the SCT RBC samples have higher elastic property than the SCA RBCs. The higher rigidity in the SCA cell may be due to the lipid composition of the membrane, which was affected by the cholesterol concentration. By developing a theoretical model for different trapping forces, we have also studied the elasticity of RBCs in SCT (with hemoglobin type HbAS) and in SCA (with hemoglobin type HbSS). The results for the quantities describing the elasticity of the cells consistently showed that the RBCs in the SCT display lower rigidity and higher deformability than the RBCs with SCA.

## Biography

Horace Crogman has completed his PhD at the age of 33 years from University of Arkansas and postdoctoral studies from Universite de Bourgogne, Dijon France. He is assistant professer of Physics at California State University, Dominguez Hills,. He has published more than 20 papers in reputed journals and has been serving as an editorial board member of repute.

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# JAYNSTEIN Æ Model

**Jay Robles Pecharroman**
*Scientist, USA*

Being a scientist of the new age is like remembering the future, something within the reach of those of us with an open mind and sometimes contrary to the general thinking of the Human Being, based on the memory only of the past. So much so, that designing the new model that goes beyond the atom does not consist of the mental work of a theoretical physicist, rather it consists of reverse engineering from the meditation state. Innovating is remembering but applying to the future solutions to future problems. If I were to describe what I mean in a single sentence, I could say: Superfluidity and superconductivity are believed to exist within stars, in the case of Æ Ion Quantum Science, within the balance of the twelve vertices of the Star Icosahedron to create The Light Quanta. The fundamental principles that best define my research towards the new Æ or æther model are: 1 JAYNSTEIN EsE Equation. Considering energy as a simple matter of volume. 2 Æ Algorithm. Transforming volume or energy. 3 Æ Sphere. A volume in balance is the base of The Light Quanta. With these ingredients, I will allow myself to delve into the best-kept secrets of the Multiverse that will lead me towards the correct definition of the new model of the Æ or æther, which I have baptized the JAYNSTEIN Æ Model.

## Biography

I am the Founder & CEO of JAYNSTEIN LLC, in which I am enjoying my true passion as a researcher in the development of a new JAYNSTEIN Æ Model* in which I worked since 2012 in my own Startup, after left Microsoft Corporation. Awarded as the Best Young Scientist in 2021 in the International Conference of Optics, Lasers & Photonics in Osaka, Japan, and invited Keynote Speaker in August in Tokyo, Japan as the result of my contribution with my research and articles.

From the beginning of my background, I have been working in the technology sector in which I collaborated for some of the most important technology corporations in Europe and America. These amazing experiences provided me the knowledge to lead and develop my own Startups between California and Arizona. I founded my first Startup in Palo Alto, CA creating an Educational App for children to go out and enjoy nature, due to the impact on health that this generates. Later in 2020, I founded another Startup in Mesa, AZ to create the JAYNSTEIN Æ Model, and continue looking for new challenges in 2022.

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# Review of New Unitary Quantum Theory

**Leo Georgy Sapogin**
*Technical University(MADI), Russia*

This article describes a model of Unitary Quantum Field theory where the particle is represented as a wave packet. The frequency dispersion equation is chosen so that the packet periodically appears and disappears without form changings. The envelope of the process is identified with a conventional wave function. Equation of such a field is nonlinear and relativistically invariant. With proper adjustments, they are reduced to Dirac, Schrödinger and Hamilton-Jacobi equations. A number of new experimental effects have been predicted both for high and low energies. Fine structure constant (1/137) was determined in 1988, masses of numerous elementary particles starting from electron were evaluated in 2007 with accuracy less than 1 % . 2 pentaquarks, θ^+barion, Higgs boson and particle 28 GeV were discovered 11 years later, all of them were evaluated with high accuracy before.

## Biography

Sapogin Leo Georgy (1936). Full Professor Sapogin now lives in Moscow, Russia. He began in 1954 to study in Taganrog Radio-technical University and graduated (Dept. of solid state physics) in 1959. He served during his military service from 1959 to 1972 at Ministry of Defence as the scientific adviser. Candidate of science (1966). He maintained (1971) the doctor degree in Leningrad State University. In 1972 to 1985, he was the Head of Theoretical Department in Russia Academy of Science. Since 1985 till present he is the Head of Physical Department of Technical University – MADI. He is the author (or coauthor) of numerous (over 200) published scientific articles, 4 books, school supplies. He obtained (with V.Boichenko), first, very important scientific result: calculating (with accuracy more 0.3%) of the electrical electron charge and of the fine structure constant -1/137. He published (2005) in USA and Russia (together with Prof. Yu.Ryabov and V.Boichenko) the book named “Unitary Quantum Theory and New Source of Energy”. Together with Ryabov he calculated mass spectrum of elementary particles and mass bozon Higgs - 131.7 GeV. Full Professor L.Sapogin - academic of Russian Academy of Natural Science and World Academy of Complex Safety. His biography is included in collection books of Who’s Who in the World (2006), of International Biographic Centre, Cambridge (2009) and of American Biographical Inst. (2009).

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# Photobiomodulation at 660 nm activates signal transduction pathways in diabetic wounded cells in vitro

**Nicolette Nadene Houreld**

*University of Johannesburg, South Africa*

A common debilitating and life-threatening complication of diabetes mellitus (DM) includes chronic diabetic foot ulcers (DFUs). At a molecular and cellular level these cells display decreased cell proliferation and migration often due to disturbances in signal transduction pathways involved in the wound healing process. Photobiomodulation (PBM) induces cellular photochemical and photophysical responses and has been shown to facilitate and hasten the wound healing process under hyperglycemic conditions. This study investigated the effect of PBM at 660 nm on cellular migration, proliferation, and survival through activation of the PI3K/AKT and Ras/MAPK signaling pathway in a diabetic wounded fibroblast cell model. Cells were irradiated at a wavelength of 660 nm with a fluence of 5 J/cm2 (power output density 11 mW/ cm2; energy 45.4 J). Unirradiated cells served as controls (0 J/cm2). Cellular migration rate, proliferation and survival was determined at 24 and 48 h post-irradiation. Proteins and receptors involved in the PI3K/AKT and Ras/MAPK signaling pathway were evaluated, as were the growth factors VEGF and bFGF as activators of the pathways respectively. Diabetic wounded cells exposed to PBM at 660 nm with 5 J/cm2 exhibited a faster migration rate, and increased proliferation and cell survival with increased VEGF and bFGF levels, as well as activation of the PI3K/AKT and Ras/MAPK pathways. These results illustrate the effectiveness of PBM at 660 nm in activating cellular pathways in deficient diabetic wounded cells to speed up the healing process of such cells, and has shown that PBM could be advantageous in the treatment of chronic DFUs.

## Biography

Prof. Nicolette Houreld completed her PhD and postdoctoral studies from the University of Johannesburg. She is currently a Professor and the DST-NRF SARChI Deputy Chair-holder: Laser Applications in Health in the Laser Research Centre, Faculty of Health Sciences, University of Johannesburg. Her research interests lie in the areas of photobiomodulation and diabetic wound healing, where she investigates the molecular and cellular effects of photobiomodulation and laser tissue interaction. She is currently a C1 NRF rated scientist with a Scopus H-index of 24. She has published more than 100 papers in reputed journals and book chapters, has supervised numerous postgraduate stduents and is the president-elect for the World Association for photobiomoduLation Therapy (WALT).

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# Biophotonics, Genetics, and evolutionary role of Bio-Antenna Arrays

**Sergey V. Petoukhov**
*Mechanical Engineering Research Institute of RAS, Russia*

The presentation is devoted to the author's results concerning an important role of biophotonic crystals and bio-antenna arrays in molecular-genetic system and genetically inherited physiological structures. As it is known, inherited sets of mutually coordinated biophotonic crystals determine species patterns on butterfly wings, peacock feathers, and on other animal bodies. These inherited sets of biophotonic crystals can be considered as one of the wide number of examples of inherited bio-antenna arrays. A few arguments exist that photonic crystals and bio-photonic arrays are important for functioning of molecular-genetic systems.

Modern technics widely uses antenna arrays, including nano-antenna arrays. Antenna arrays combine many separate antennas into a single coordinated ensemble with unique emergent properties, due to which antenna arrays are widely used in devices of medicine, astrophysics, avionics, hydro-location, etc. The author presents pieces of evidence of using wonderful emergent properties of bio-antenna arrays in the inherited physiological organization including molecular genetics. Some examples of inherited bio-antenna arrays with their electromagnetic and acoustical activities are considered: complex faceted eyes of insects; echolocation of dolphins and other animals; electroreception of some fishes, etc. The received biological and algebraic results allowed putting forward the author's doctrine of energy-information evolution based on bio-antenna arrays and their wave functioning. This new topic about the biological meaning of emergent properties of antenna arrays includes problems of biological evolution, the origin of the genetic code, biological self-organization, biophotonics, which are discussed. Additional information is available on the author's website http://petoukhov.com/.

## Biography

S.V. Petoukhov has completed his PhD at the age of 27 years from Moscow Physical-Technical Institute and postdoctoral studies from the Institite of Crystalography of Russian Academy of Sciences. He is a chief of Laboratory of biomechanical systems in Mechanical Engineereing Research Institute of RAS in Moscow. He is Laureate of the State prize of the USSR. In 2012, the Chinese government included S.V.Petoukhov in the official “List of Outstanding Scientists in the World” and financed his visit and lectures in China. He is the author of 7 books and more than 200 other scinetific works. His website http://petoukhov.com/.

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# Coherent Perfect Absorption of a Transparent Polymer Film on a transparent substrate utilizing Total Internal Reflection by Grazing Incidence

**Takayoshi Kobayashi**
*The University of Tokyo, Japan*

In the present study, we have demonstrated that CPA is realized for a nearly transparent sample in the visible range, with a single dielectric layer sandwiched by semi-infinite dielectric layers. This configuration is one of the simplest configuration for CPA. A transparent PVP film sandwiched between MgF2 and the air makes the FP resonator with TIR at the interface with air. Collimated whit light incident from the side of the substrate nearly-normal incidence with transmittance >92.6% dip in the transmission spectrum from the opposite side. The required conditions for CPA in this configuration of a single-layer thin film are: (I) transparent thin film must have tiny absorption, (II) n1>n0>n2, where n0,n1,and n2 are the refractive indices of the substrate, thin film, and surrounding medium, and (III) grazing-incidence configuration. (II) is constructed in such a way that light can enter the thin film(TF) when incident from the substrate side, and large reflectivity at the substrate-TF interface as well as TIR at the TF-surrounding medium interface are realized. The grazing-incidence requirement of (III)is because of the approximate CPA condition. For transparent materials, absorbance q is ~zero, requiring reflection at interface between n0 and n1 |r01|~1. Although the reflectance increases with difference in n, grazing incidence allows |r01|~1 to be possible, even when Δn is small. Therefore, there are many other candidates of substrate-thin film combinations of transparent dielectric materials that can make CPA feasible for future applications and study not only with the combination of solid-solid, but also with that of solid-liquid or liquid-liquid.

## Biography

Takayoshi Kobayashi has completed his PhD at The University of Tokyo (UT), Reseacher at Riken, an emeritus professor of the UT, Guest professors of Tokyo University of Science, University of Electro-Communications, Director of Advanced Ultrafast Laser Center of National Chiao-Tung University, He has published >650 papers in reputed journals and has been serving as a Chief Editor of Applied Sciences.