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CHAIRPERSON'S MESSAGE

Our university is coming out with another issue of the flagship journal, Journal of Indian Research.

The current issue contains essay from a serving IPS officer in the state of Assam, an empirical study on cultural globalization in the city of Dhaka, study on anti-concern efficiency of silibinin found in the milk thistle plant, novel antenna for 5G network and use of ICT in education sector. The papers are varied and useful for policy makers as well as researchers. I compliment the editorial team for carrying the issue in spite of several limitations. I take this opportunity to invite papers carrying novel, workable ideas for consideration of the editorial Board. A river can not flow smoothly if streams get blocked. The scholars and students are the streams and the water of scholarship should not dry down. For maintaining the quality of journal, the catchment area of scholars ought to widen.

Kindly do send well- researched papers at jir@mewaruniversity.org.

Wishing the academic community Happy Hindu New Year (V.S.2079)!



Dr. Ashok Kumar Gadiya
Chairperson, Mewar University

The war in Europe has put the international system at risk of breakdown. While Russia's fear of NATO at its doorstep is legitimate, invasion of a sovereign country can never be justified. Ukraine has been an attractive destination for international student, more particularly for medical courses. Nearly 18000 Indian student have returned back to India and staring at a blank future. No city in Ukraine remain unstruck by the missile attacks. The critical infrastructures have been intentionally targeted. There is no sight of end to war in near future. Russia intends to cover Neo-Russia in east and South-east Ukraine. This will force European countries as well as the US to support an insurgency movement in occupied Ukraine. The siege of Ukraine will be akin to Soviet invasion of Afghanistan. It might take a couple of years, but the retreat of Russia from Ukraine is certain. A protracted conflict will keep away the foreign students including thousands of Indian students.

War not only damages the present but also the aspirations of the future generation. Global military industry complex spends billions on war games and security studies. What is required is narrative of 'peace'. 'Peace Studies' should be promoted by the universities. The focus should not be on segmented and fractured identities, but cooperation, celebration and shared destiny of mankind. In the current issue of the journal, we are carrying a ground reality based essay on conflict in the northern Myanmar. I wish we can receive papers on sociology of living in peaceful societies. Such documentation can help in finding new visions to steer the mankind beyond the current predicament.

– **Niraj Kumar**
Honorary Editor-in-chief

INSURGENCY OF NARCO-DIPLOMACY IN NORTHERN MYANMAR: AN EMERGING GLOBAL THREAT

Satyaraj Hazarika*

ABSTRACT

The highlands between the trijunction of India-Myanmar-China and India-Myanmar-Bangladesh have huge ungoverned space. The region is home to several insurgent groups. The jade mines of Kachin state and the drug economy of the neighbouring Shan state in Myanmar, fuels the protracted insurgency. Recent military takeover in Myanmar complicates the situation further with the different groups sharing competing and conflicting interest vis-à-vis military junta. This paper looks at the operations of different insurgent groups in Northern Myanmar, particularly in Kachin state. The paper further recommends to closely watch the groups outside the umbrella of ceasefire with the government of India.

Keywords: EAOs (Ethnic Armed Organizations), Insurgency, Kachin, Kaladan, Manipur, Nagaland, Rakhine, Shan, ULFA, Walong, yaba pills.

INTRODUCTION

The Christian Kachins reside in the north of Myanmar sharing borders with India at the trijunction at Walong, where China's border also meet. For fifty years the Kachin guerrillas are fighting against the Myanmar army in a war of attrition, with no peace in sight. In the geopolitical chessboard of South East Asia, Kachin, a landlocked state, is sandwiched between two Asian heavy- weight nations, India and China, often with shifting alliances. Myitkyina straddles the Ledo road that connects the Indian town of Ledo, in Assam with Kunming, the capital of Yunnan province of China.

The formation of KIO (Kachin Independence Organization) in 1960, is the brainchild of ZauSeng and LamungTu Jai. But the credit for creating the political movement and eventually the Kachin insurgency goes to Kachin war hero NawSeng, who was in China since the year 1951. ZauSeng took guidance from NawSeng in exile.

For his services in routing the Japanese by British Gen Slim's Fourteenth Army, the Northern Kachin Levies (NKL) of whose officer NawSeng was, awarded the Burma Gallantry

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medal twice. In January, 1945 . the British formed the 1st Kachin Rifles after the war out of the soldiers of the NKL .

It was a difficult time for the nascent Burmese state after the British left the country on January 4, 1948, with the formation of Karen National Union and the KNDO(Karen National Defence Organization) in April of the previous year. The assassination of Aung San(July 19, 1947) who negotiated the transfer of power from Britain to independent Burma even before independence, was bad news for the hill tribes of Burma.U Nu succeeded Aung San as the first Prime Minister of Burma. The Karen commander of Burma Army, Gen Smith Dun was replaced by Ne Win as Commander-in-Chief. The removal of the Karen Army Chief and the subsequent riots in which the predominantly Karens dominated; the 1st, 2nd, and 3rd Battalions became restive as Burmans began to attack Karen settlements in the delta region of Burma. Two of the battalions revolted, but Ne Win and his loyal 4th Burma Rifles put the revolt down in the suburbs of Rangoon.The revolt also made the other hill tribes uneasy.

On February 16, 1949 Captain NawSeng of 1st Kachin Rifles took his entire battalion and joined forces with the 1st Karen Rifles. But the combined Karen and Kachin forces were defeated near Meiktila by April 1949. By the year 1960, Burmese government under U Nu could stabilize the country, and NawSeng withdrew to the hills north of Hsenwi, in northern Shan state.

Kachin Independence Army (KIA)

Founded on February 5, 1961 the KIA was the handiwork of three brothers-ZauSeng, ZauTu and Zau Dan. The Kachins consist of six groups: Jinghpaw, Lachid, Lhaovo, Lisu, Rawang and Zaiwa. The Jinghpaw dominates the social and cultural life, and the nationalist elements of the Kachin society. The NDA-K was formed in 1989 and it became a BGF (Border Guarding Force) under Zankhung Ting Ying, who engineered the first split of KIO in 1968 to join the BCP (Burma Communist Party). The NDA-K was finally dissolved in 2009, which during its BGF role profited from the cross-border timber trade at Kambaiti and Pangwa, the group's base area. But the fissure within KIA developed as the second group emerged. It was based in Shan State. The 4th Brigade led by MahtuNaw was founded in 1990.The ousting of KIA camps near Indian border by Tatmadaw (Myanmar Army) in 1992, led BrangSeng to sue for peace in the year 1994.The first ceasefire was inked. Tatmadaw formed a militia from the 4th Brigade of KIA that is located in the Shan state and it is better known as Kaungkha militia. With the Rawangs, who are residents of Putao and Nawnngmun towards the Arunachal Pradesh border, in the year 2011, the Tatmadaw formed an EAO (Ethnic Armed Group) known as Rebellion Resistance Force (now known as People's Militia Force). The group is based in Khaunglanphu, and used as a counter-weight to the KIA in Kachin state. Similar groups of Lisu sprang up in Myitkyina that were supporting the Tatmadaw's offensive against the KIA in the year 2016 and clearly shows which side the wind is blowing in the Kachin state.

In the 1960s, KIA gave access to Naga and Mizo rebels through its territory. The Naga and Mizo militancy peaked due to the ideologically motivated foreign- returned insurgents.

Since the year 1988, the KIO came closer to New Delhi.The ULFA (United Liberation Front of Assam) and NSCN-IM (National Socialist Council of Nagaland-Isaac Muivah)was

denied sanctuary soon after rapprochement, that resulted in Indian Army to launch Ops Bajrang in Assam in November 1990. Subsequently Ops Rhino was launched in September 1991 that dismantled the ULFA from their bases close to Myanmar border, as well as in Arunachal Pradesh.

KIA is with the Northern Alliance of UWSA (United Wa State Army), MNDA (Myanmar National Democratic Alliance Army), TNLA (Ta-ang National Liberation Army), NDAA (National Democratic Alliance Army) and Arakan Army. Out of this alliance all the EAO are from Shan State, but Arakan Army is from Rakhine State, which lies in the coastal Myanmar, near India's Mizoram.

All the Shan State EAOs are heavily invested in the drug trade, with UWSA being the most important. UWSA has a large standing army too. In 1984, the KIO had banned opium poppy cultivation in Kachin State. Increasing political pressure on KIO to accept the BGF proposal was the reason of the breakdown of the 17-year old ceasefire. As KIA came under pressure, it supported the formation of new armed groups-the TNLA (Ta-ang National Liberation Army) and Arakan Army equipping and training them in Laiza since 2009. These groups increased conflict in northern Shan State, aligning with like-minded armed groups. Similar pressure tactics was put on MNDA in Laukkaing, the capital of Kokang, famous for its notorious casinos on the Chinese border, with an attack in August 2009. Later, the MNDA chief Peng Jia Sheng fled to China.

New Conflict Situation in Kachin State

The Tatmadaw broke the ceasefire with KIA. Later, a truce was implemented that saw peace from 1994 for seventeen long years. The current flare up of conflict is part of the recent political developments in Myanmar from February 2021. The centre of the unfolding clash is the Hpakant jade mines, between Tatmadaw and KIA, with other EAOs fishing in between. If the Kachin timber and jade is out of bounds for Tatmadaw and their intermediaries like UWSA and AA from Myitkyina, northern Kachin areas and Hpakant, it will sap at the very base of the financial interest of Myanmar army.

Since February 1, 2021 when Myanmar military junta organized another coup, from March onwards the KIA stepped up attack on military positions that are aimed at stopping the jade mining in the Kachin state. This area denial attacks by KIA will seriously affect the jade trade that profits both the state and the KIA.

Just like KIA trained ULFA in 1980, it has trained the Bisheswar Singh-led PLA (People's Liberation Army) of Manipur in 1985. PLA surfaced as a secessionist organization in 1978. The PLA is in the spotlight with the ghastly ambush on an Assam Rifles convoy on November 13, 2021 in which the life of Col Viplav Tripathi, the Commanding Officer of 46 Assam Rifles, his wife, son and five other soldiers were lost. The incident happened in the Indian state of Manipur at Sekhan village of Churachandpur district. The place of incidence is close to Chin Hills of Myanmar.

Indian border with Myanmar is 1643- km long that begins at Walong, in Arunachal Pradesh in the north at the trijunction of India, China and Myanmar's Kachin state. The border

ends at Parva in Lawngtlai district of Mizoram state, at the trijunction of India, Myanmar and Bangladesh.

Through this lightly manned border, insurgents groups of Assam, Manipur and Nagaland trained by KIA ingress through Kachin, Sagaing, Chin and Rakhine state of Myanmar to India. From the 1960s to late 1980s these groups fought low-intensity warfare with Indian security forces. Ceasefire between governments of India with NSCN-IM in 1997, brought peace to Nagaland state. Nagaland shares international borders with Myanmar.

The two-decade old Mizoram insurgency of MNF (Mizo National Front) ended in the year 1986. Manipur state, sharing borders with Sagaing and Chin state of Myanmar, has groups like PLA, which are still not onboard for the ceasefire with the Indian government. The beginning of 2014 saw Arakan Army operating from Chin state from their northern bases close to Chinese border, complicating the drug and insurgent activities in Manipur. The Arakan Army then started to target the Kaladan Multi-Modal Project, an Indian strategic interests in Rakhine province. Rakhine is incidentally the home turf of Arakan Army. Recently Arakan Army extended their support to the junta like UWSA, SSPP (Shan State Progressive Party) political party of SSA-N (Shan State Army-North).

With the KIA and the Kachin insurgency beginning to bare its fangs once again, with the junta government in power, the KIO has voiced their opposition to the junta takeover from the civilian democratically elected government. Their opposition resonates with the Bamar public opinion in the Irrawaddy delta. But that does not change the dynamics of the Kachin conflict. And like the other EAOs of the Northern Alliance it is not any richer with weapon as the UWSA or AA secures from their patrons, that includes Manpads (surface to air missiles) to name a few.

CONCLUSION

Between the jade mines of Kachin state and the drug economy of the neighbouring Shan state's Golden Triangle in Myanmar, the protracted insurgencies continue to thrive. Both the state and EAOs (Ethnic Armed Organizations) are locked in a vortex of conflict, with the state responding by forming militias to control the EAOs. One such militia is KDA or Kaungkha militia, based in Shan state that is involved in drug trade with supplylines to Manipur state in North East India. The Kaungkha militia is supplying meth or yaba pills to Arakan Army, that is swarming the NEI (North East India) and Bangladesh with tablet methamphetamine. During the past decades of 1970s and 1980s, it was Kachins who shaped the future guerrilla armies of North East India (NEI). Currently, the Kachin militias form the backbone of Tatmadaw and its war with EAOs. The new found official identity has given the militias much needed impunity to indulge in drug trafficking. The cost of Myanmar's low-intensity war against the Kachins and Shan insurgents, both of which have interest in jade and drugs respectively, presents NEI with a security conundrum, as the latest Churachandpur ambush by PLA shows.

The EAOs like UWSA, AA, MNDAA, NDAA use the ceasefire with the state and forge alliance with government militias like Kaungkha, to keep the informal drug economy running into billion of dollars. Therfater ethnic insurgents fund their standing armies out of the booming meth trade of which Myanmar, is largest producer in the world. The yaba pills and heroin are

pouring into North East India. The militant groups both across the spectrum, in ceasefire or in conflict mode, benefit by the drug trade, like the Shan State groups.

The Kachin and Shan State imbroglio in northern Myanmar presents not just a security threat to India but it is a global threat. The EAOs are hand-in-glove with mafia organizations like Sam Gor or Chinese triads who are trafficking meth and precursor chemicals to Amsterdam and New Mexico. Militias like Kaungkha, are producing methyl fentanyl, which is many times lethal than heroin, that is eventually finding its way to the US.

The no-holds-barred approach by the State as far as these EAOs, BGF and militias are concerned is creating a global threat to democracy.

RECONCILING INTERESTS: PEOPLE, PLANET AND POLITICS

*Ananya Dhanuka**

ABSTRACT

This paper concerns with the ways the climate change models are constructed, and how these models address the socio-political factors impacting the people of the world. Further, the paper seeks to understand the ways politicians create and implement climate policies. In light of this, the paper suggests remedies and recommendations which might guide climate policy makers in reconciling conflicting interests of politics, planet and humanity.

Keywords: Decarbonization, Conference of the Parties (COP), Dynamic Integrated model of Climate and the Economy (DICE), Intergovernmental Panel on Climate Change (IPCC), Regional Integrated model of Climate and the Economy (RICE), United Nations Framework Convention on Climate Change (UNFCCC).

INTRODUCTION

The year 2021 has been very significant for the planet. It saw the release of the Sixth report of Intergovernmental Panel on Climate Change (IPCC), raising an alarm bell on the present state and forecasted future of the environment. It also saw the world leaders coming together for the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC), discussing and deliberating upon the climate finance, decarbonization commitments, Net Zero Targets, and ambitious push for clean alternative energy.

Despite the constant discussion and ever-increasing awareness, the tangible benefit expected to accrue from these negotiations has been negligible. The COP26 concluded with the promise of \$100 billion in the green fund. Contrast this with the fact that India alone requires over \$10 trillion to meet the Net Zero target set for 2070.

It is quite disconcerting to see the systematic failure of global politics to act upon the needs of the environment. Studies show that postponing a global agreement to 2020 possibly raised global mitigation costs by at least about half and a further delay of such decision-making to 2030 renders ambitious climate targets infeasible to achieve (Jacob *et al.*, 2012). Thus, it

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becomes necessary to undertake a detailed study to dig deeper and find the root cause in order to answer why politics continues to fail the targets decided; and why is it that even though people understand the urgency of the situation, no action is visible.

This paper presents a perspective that is often overlooked. It is the realisation that while climate change models (which are utilised while setting these targets) rely on scientific research and technological development, they often overlook the agents that lie at the root of successful implementation—the people and the politicians.

Therefore, the objective of this paper is to carry out a systematic study to understand firstly, how these climate change models are constructed, incorporating scientific and social variables. However, it is visible that these models are not free from caveats, technical, ethical and political. For the purposes of this article, we would focus on understanding how these address the socio-political factors impacting the people of the world, who stand at the receiving end of the climate policies ensuing from these models. It is also pertinent to understand how politicians create and implement climate policies, while keeping in mind that they are also cogs in our intricate society, acting in self-interest. Finally, as we understand the restrictions and roadblocks put forth by the intricate interaction of these elements, we move towards suggesting remedies and recommendations which could guide policy makers in reconciling conflicting interests of people, planet and politicians.

THE PLANET

The first step towards deciphering the cause of failure is to understand its origin. Therefore, it is important to discuss the mechanism through which these targets come to exist in the first place. These targets are based on predictive forecasting models which incorporate a wide gamut of variables to provide an achievable estimate. The models used in climate change research are referred to as Integrated Assessment Models (IAMs). It is an interdisciplinary research methodology that constructs mathematical equations of socio-economic relations, along with incorporating environmental science elements (Nordhaus, 2013a). IAMs have undisputedly revolutionised climate change research and economic modelling. They reflect complex interactions and provide for the causal impact of economic activity on the environment, such as emissions, atmospheric concentrations, etc., which, in turn, have a spillover effect on human and natural systems.

These models are intrinsically economic models, guiding policy decisions that would help countries achieve climate targets such as Net-Zero by incorporating least cost, high-efficiency processes, working in a given environment, over a couple of years. Naturally then, these dynamic models necessarily include technological advancements and their impact on achieving these targets on time. There are two main models which are heavily utilised in climate research—Dynamic Integrated model of Climate and the Economy (DICE) and the Regional Integrated model of Climate and the Economy (RICE)—contributed by William Nordhaus, who won the Nobel Prize in Economic Sciences in 2018. DICE incorporates the economics of climate change from the perspective of neoclassical economic growth theory. Factors such as investments in capital, education, and technologies act as inputs to help determine how to reduce consumption today in order to increase consumption in the future. The RICE model

has the same basic economic foundation but provides for regional variation based on diverse geophysical structures that may exist (Nordhaus, 2013b).

It is clear that inferences drawn from these models are extremely significant in policy making; and these inferences are directly contingent upon the variables put into the model. Who decides these inputs and how are these decided? The fact is that this decision largely depends on the choice of the modellers—which leads to socio-political repercussions. Economic IAMs attempt to include social cost of carbon (SCC) or discount for societal costs of mitigation and adaptation, but if the determination of the SCC is variable from one researcher to the next, then are these models equitable, just and universally applicable?

Critics, therefore, claim that scientific uncertainty, which is inherent in the construction of IAMs, is “*met with arbitrary assumptions and ethical uncertainty with normatively indefensible judgments, causing model results to be inherently biased and motivated by political interests.*” (Beck and Krueger, 2016). This is exactly the concern that this paper seeks to analyze in detail, while understanding the complex interplay of social norms and political incentives in climate action.

THE PEOPLE

People lie on the receiving end of climate policies formulated through IAMs. Then, it does not seem surprising that it is necessary to understand two major things—how would people respond to climate policies, and how would they be impacted by these policies.

To answer the first question, we must understand the premise while working with humans: while economic models continue to rely on the shockingly simple assumption that people are ‘rational optimizers’, the truth could not be further away from that. Adapting to a sustainable lifestyle demanded by climate change is a massive behavioural challenge for humans. The reasoning is rooted not only in common knowledge, but is backed by studies in psychology, sociology and behavioural economics. People inherently suffer from inertia i.e. display reluctance to shift from their traditional lifestyle, even if they are aware of the environmental impact caused by some of these practices. This is in addition to external constraints like limited knowledge, complex procedures, high financial costs and delayed feedback. This is even more pertinent to address since intention to adopt alternative sources of energy has various degrees of response: some people do not know about better sources, some know about the sources and yet choose not to invest in superior sources; and some who know and actively invest in these sources. Most people lie on the second level—they know about better practices and yet do not have sufficient willingness to adopt a better lifestyle for the sake of the environment.

Why are we mentioning social constraints that seem obvious and have been heavily spoken about in public discourse? Because while discussions and deliberations focus on ‘awareness campaigns’, the scientific models that devise long-run targets fail to accommodate for the time it takes to instil social and behavioural change. Our models are optimistic about the rate at which humans adapt to new technologies and that is one feather that adds to their cap of imminent and consistent failure. The real world is constrained by limited information and vested interests, leading to complicated computational implications for models like IAMs. But if models do not reflect the true state of society, how can society replicate the goals dreamt by

these models?

The second question is concerned with the impact on the people due to climate policies and the response is by far the most important argument in this article. The fact is that *Climate policy creates Winners and Losers*. Let's take for example, decarbonization as a policy objective. Price adjustments in the form of carbon tax changes prices prevailing in the market. While carbon tax as a policy has proved to have some impact in reducing emissions, it has also exacerbated inequalities in the society. Neoclassical economic theory on free markets has often suggested that winners and losers emerge as a natural consequence of short-term adjustments. As prices adjust, both producers and consumers are impacted and for the worse. Small producers in developing countries pay for historically unequal emissions produced by industrialized nations; while low-income consumers suffer from high cost of living. The argument is not to say that Carbon Tax is bad in principle and should not be implemented; rather, it is that implementation of climate policies imposes high social costs, which is difficult for developing countries to sustain. The benefits of reduced emissions is not a visible, tangible benefit and therefore lacks a feedback loop for people who face the brunt, making it even more difficult to ensure effective enforcement of the much needed policy. Global climate change research must then accommodate for these inherent psychological constraints and control for intrinsic human motivations while suggesting future course of actions. It might be a Herculean task, but it would be realistic in presenting the world as it is. This realization helps us reconcile the contradiction between environmental intent and environmental action. While people want to protect the environment, in the trade-off between tangible financial incentives and the intangible benefit of a better world, the former wins each time.

THE POLITICIANS

People face the consequences of policies created by politicians. So naturally, the logical next step is to understand the incentives of politicians and how climate models incorporate their self-interest. This discussion leads to a unique interaction between the political economy of the 21st century with environmental action. The IAMs fail to incorporate the fact that global climate change does not occur in a political-vacuum. Continued political disagreements can raise the cost of decarbonization by delaying policy action. Studies have also shown how variations in the quality of governance affect the size and allocation of policy costs.

To continue with decarbonization, suppose a policymaker is required to focus on decarbonization of the automobile industry, but hosts the biggest car-producing factory in their constituency; this poses a political dilemma where vested interest in being re-elected to power will more often than not, supersede climate consciousness (Peng *et al.*, 2021). This example can easily be scaled up to find parallels in international negotiations at the climate summits such as COP 26. Politicians from small developing countries rise to power on the promise of economic growth, fuelled by rapid industrialization which relies on heavy utilisation of fossil fuels.

The construction of IAMs therefore must incorporate power relations which exist in society and influence response to climate policy. Political willingness to take action can have a tremendous impact on the world's environmental future. On one side, climate-driven policy

initiatives can lead to targets being met before the deadline, while politics-driven policies will fail the coming generations yet again. This includes factors like strength of political will, and stability of political structure in a particular country. If people in a country are stuck in a prolonged civil war, the climate agenda will be on the far bottom of the list of urgent concerns to address.

THE POLICY

In light of this in-depth discussion, it becomes pertinent to address how researchers, scientists and policymakers will be impacted by arguments put forth here. Researchers must examine the trade-offs between these agents and the need for urgent climate action. It is of essence to create models which can more closely reflect the real world, to ensure better policy decisions. Our creation of the conundrum encourages us to call for politically durable strategies. As the quality of our models improves, through inclusion of dynamic variables, climate policies would become better. This will equip our politicians to make achievable promises and ensure a better future for the environment.

IAMs are no doubt important tools for understanding the implications and policy aspects of climate change. They have fundamentally transformed the way economists and environmentalists approach climate policy. However, it is now necessary to ensure that IAMs become reliable, accurate and provide for values of climate justice, social inequalities, intrinsic motivations and reflect the true state of the world.

CONCLUSION

Climate policy analysis and modelling is one of the most challenging scientific themes in this decade. It plays a crucial role in determining the future of our world in an extremely literal sense, while at the same time has a significant impact on all aspects of human life as we know it. In our discussion, we have attempted to understand how climate models come into existence in the status quo and the various variables that are considered in their creation. These mathematically complex computations continue to remain economic models based upon idealistic foundations of human life. This result encourages us to explore the limitations of IAMs from the context of socio-political agents influenced and impacted by climate change—the people. We see that people suffer from behavioural and psychological biases, which restrict their ability to adopt sustainable technologies. This contrasts with rational assumptions incorporated in IAMs which lead to an optimistic timeline required to instil behavioural change. Further, we realise that even the best climate policies which have proven to be effective in achieving their ‘environmental’ objectives, suffer from social costs—leading to winners and losers. This result forces us to discuss economic inequalities and high costs of production, often borne by consumers and producers in developing nations. In the trade-off between self-interest and collective interest, self-interest always tends to win and as such the environment suffers. This discussion of intrinsic motivation is necessary since, again, IAMs assume human beings to be inherently utilitarian and altruistic agents. Next, we have addressed politicians as one of the key actors, as writers of climate policy, driven by political interests. IAMs present models of socio-political interactions in a vacuum without incorporating contrasts between opposing political and environmental objectives. Finally, after an exhaustive deliberation of intricate

interaction between people and politics, we have undertaken the Herculean task of providing a mechanism to reconcile interests. While it is difficult to change the behavioural structures of agents, modifying models and policies is still achievable. Intrinsic trade-offs between people, planet and politics must find an equilibrium for the sake of the future generations.

IAMs have several limitations and we have only discussed a few. If researchers find a method to incorporate dynamic factors like those discussed in this article, IAMs would continue to be the gold standard for evidence-based climate policy analysis and formulation. If we succeed in creating such robust models as envisioned in this paper, then climate negotiations, promises and targets set in the climate summits will cease to be false hopes. They would instead be future realities.

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CULTURAL GLOBALIZATION AND ITS STIMULUS ON URBAN YOUTH: A SOCIOLOGICAL STUDY AMONG UNIVERSITY STUDENTS IN BANGLADESH

*Rasel Hussain**

ABSTRACT

The purpose of this quantitative study is to illustrate the influence of globalization on cultural traits among young people, with a focus on the underlying function of cultural globalization. To achieve the study's goal, an online survey was conducted in 2020 among students from six top public and private institutions in Dhaka, with a sample size of 300 students studying at the Bachelor and Master level. The core issue of the study focuses on the concept of globalization as a process that transforms local cultures and impacts people's lives, particularly the young communities in their towns. The current discussion on cultural globalization and its effects on behaviors, choices, norms, values, dietary habits, dress patterns, and the notion of sexuality is being molded and altered by the process, gathering, and access to information, media, and other accessible societal institutions. This study documented those global values. Consumerism have a large-scale impact on urban youth, resulting in many changes in their lifestyle and preferences, as well as cultural orientation; traditional cultural values are no longer identical among them, instead their lifestyle has greatly diminished and assimilated into Western-Indian norms.

Keywords: Bangladesh, Cultural Globalization, Cultural Impact, Dhaka, Urban Youth.

INTRODUCTION

Twenty-first century is marked by huge technological development, information flow, easy communication with every corner of the world, rapid development in medical technology, easy migration all over the world, satellite technology, spread of transnational and multinational corporations, rise of liberalism, economic integration, and cultural assimilation and so on. The satellite cable technology has reached every corner of the world and its cultures, values, beliefs are becoming an open book for the people world across. All of these indicators illustrate that a massive process has been taking place and tying everyone in a single bundle within a submerged process. This process is termed as 'globalization'. Scholars around the world are trying to identify and analyse the true nature and impact of globalization from different

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perspectives. For an example, the conflict of globalization and anti-globalization along with the consequences of modernity (Baten, 2008; Smith, 2005; Thompson, 2005; Giddens, 1990, 2009), countries in the era of globalization (Lechner, 2004; Kalam, 2002), the role of media (Shamsher & Abdullah, 2012; Willnat, 2002; McChesney, 2005; McLuhan, 1964), impact of globalization and technological advancement on cultural identity and youth (Nidoo, 2007; Tomlinson, 2006, 2005, 1999; Suoronta, 2004; Robertson, 1994, Wee, 1999) and other studies are prominent and all these studies have focused to find out the impact of globalization in different parts of the world.

Giddens (1991) stated that globalization brings every one of the world on a single platform which makes individuals, groups and nations interdependent on each other. Local and distant social forms and events are becoming more stretched and social relations are becoming more intensified which link distant localities in a way that the local practices are getting shaped by the events occurring thousands of miles away. Albrow (1992) stated that globalization brings the human beings in a comprehensive community and thus the economic, political and cultural forms of globalization work in the present world as all of these are interconnected and interlinked. Taking the advantage of this platform, the dominant cultures are influencing the marginal cultures to absorb the dominant one through attractive and continuous media exposure using advanced technologies. As a result, the national cultures are losing appeal and audiences. The world communities become our next-door neighbor. Thus, Appadurai (1996) stated that culture is not regarded as a substance but a dimension of phenomenon that embodied difference as culture should not be seen as property of individuals and groups but as a heuristic device that can accept the differences. According to Akande (2002), due to the impact of globalization around 22,000 indigenous cultures are now undergoing extinction and scholars estimate that as many as 90% of the world's languages would disappear in the next century. Living in a global village, we share our moments like joys and sorrows with the rest of the world using different media. Since everyone has the access to every corner of the world, their culture either virtually or in person open the door of interchange and thus cultural aggression and cultural assimilation are taking place. The most important far reaching effect of cultural globalization in Bangladesh is the commercialization of culture. Thus the production and consumption of cultural goods and services become the part of commodities, along with the essentials of social life such as marriage and family life, religion, work and leisure as well. Thus culture; whether it is music, food, clothes, art, sports, and images of age, masculinity or femininity; everything has become a product that is sold in the market place and as a result the Bangladeshi culture is changing its reality (Huda, 2005). Cultural trends, dress pattern, food habit, life style, music, beliefs and values are in exchange. In this process the western culture are dominant over other cultures. Throughout the process of interchange, the youth (18-25 years old) group of population is the more visible group of people who are highly willing to replace their tradition either in subconscious or unconscious way with the foreign culture as they are active in different activities either in online or offline mode. They also think that, to cope with the modern world and to keep them up-to-date, they have to maintain the latest cultural trend. On the other hand, the old generation are not that much willing to compromise with their own tradition. It is the urban area which is more and more connected with the globalized world as most of the advancement; economic, technological or cultural are taking place in the urban areas rather than

happening in the rural areas. Since the youth group of population are more and more interested about better opportunities and life style so they are migrating from the rural areas to the urban areas either in search of job or for better educational opportunities.

With the introduction of cable TV and internet, the younger generation of Bangladesh has become reckless. Huda (2004) opined that, State– regulated Bangladesh Television (BTV) was the only dominant medium of entertainment for an extended twenty-eight years (1964-1992). Bangladesh Television (BTV) ended its monopoly power with the penetration of Satellite TV in 1992. Bangladesh government put their steps into the global media environment in 1992 by becoming the client of the entertainment bazaar. And this has been reflected in the study of Zia (2007). As he found that, the easy access to satellite channels, low cost and a huge interest of television viewership for entertainment purpose created the rapid demand of satellite television across the classes all over the world and viewers have access to a variety of channels from local to foreign, which provided them an opportunity to enjoy all types of programs broadcast across the world. On the same line, Shamsher and Abdullah (2012) in their research found that, 95% of their respondents opined that it is the satellite cable TV which play the pivotal role for the exposure to the foreign culture as it is available and easiest means available at their hand. And in spite of choosing local television programs people are mostly watching Indian channels like Star Plus, Sony TV, Star Jolsha ,while some choose HBO, National Geography, ESPN and other western television program. All of these have influenced their food consumption pattern, taste of music and dressing style, and sexual behavior. Thus, Zahid (2007) stated, these media sources expose viewers to new information about the outside world and other ways of life, which may affect attitudes and behaviors as well as the overall culture. The study further revealed that, most of the respondents are getting integrated with Western ‘Fast Food’ compared with traditional foods and people nowadays prefer trendy clothes, Western movies and music. Watching TV is mostly the way in which the respondents pass their leisure time. A large number of people, mostly youth are very close to their school and college friends, compared to their family members, and they discuss mostly about sex, fashion and show-biz world whenever they meet. The effect of satellite TV, internet and social media on the youth is very reflective through their tastes and likings of food habit, dress style, language preferences, taste of music, thinking, values, choosing role model etc. and they love to keep them up-to-date with those attributes in styles. Sheng (2004) argued that, globalization, urbanization and the changes they made, bring tremendous changes and transformation in the values, culture and everyday lives of young people. And it helps to develop international youth culture and facilitated practices of western culture. And thus, these youth group of population started challenging the traditional authority and culture. On the same ground Barber (1995) opined that, the global reach of American culture and consumer products offer huge and complex collection of images, and values to inhabitants around the world which create a uniform world culture beside the loss and demolishing of an important cultural feature which is cultural diversity.

In the era of globalization, the world is acting like a war zone and now people are not in competition within national boundaries. To survive and more into the next step everyone has to be the part of the competition with everyone else beyond border and nation state. Most of

the cultural aspect including food habit (burger, sandwich, pizza, fried chicken, French fries, hotdog, pastries etc), dress pattern (Suit, Pants, trousers, T-Shirt, Shirts, or Jeans), fondness for music (Western, English, Hip-hop, Metal, Band, Rock etc.), language preferences (English instead of Bangla) and concept of sexuality (Extra marital affairs, live together, Pre-marital relationship etc.) and other aspects are being blended in the era of globalization around the world and so in Bangladesh. Zahid (2007) found that, the extramarital and pre-marital relations as well as living together are highly acceptable among the youth group of population. Thus, with an oral commitment or without any commitment, they love to engage in physical relationship within a very short time and some of them engaged within one week of their affair and others also expected to enter into such relations within a very short time. The study also reveals that the usual places of making physical contact are own home, friend's home, at campus, restaurant, park, coaching center or any solitary place far from the city.

There is no doubt that local cultures are being modified by globalization, specifically by the introduction of global media, free market economics, democratic institutions, increased length of formal schooling, and delayed entry into marriage and parenthood. These changes greatly alter the countries traditional cultural practices and beliefs. Such changes may lead less to a bicultural identity than to a hybrid identity, combining local culture and elements of the global culture (Giddens, 1979, 1984, 1990, 1991; Lukes, 2003; Hermans & Kempen, 1998).

Bangladesh has a rich culture and the Bangladeshi culture is the identity of Bangladeshi people. With the integration of globalization, modernization and network based society now the youth group of population started adopting the foreign mostly Western and Indian cultural practices they feel interested and thus they value the western or fast food rather than traditional food, traditional dress pattern rather than western dress pattern, western music rather than traditional one, cultural values rather than global values and their traditional conception of sexuality has also changed which creates a threat to Bangladeshi cultural practices. This research is an attempt to explore the impact of globalization and modernization on the cultural practices of urban educated youth (University students) group of population and to identify the agencies and actors of changes.

Research questions, objectives and methodology

The central research question of this paper is -

How globalization impact the Culture (food habit, dress pattern, choices of music and sexuality and so on) of Bangladeshi educated youth group of population?

And to find out the answer of this central research question the following objectives are also aimed to be explored- the changing patterns of cultural aspects among the youth students, the inter-linkage of globalization and changing pattern of culture, changing nature of culture among the public and private university students, the extent of influences of western culture in Bangladeshi culture and how the process of bollywoodization and westernization is taking place among the Bangladeshi youth group of people.

The study has been conducted following quantitative method of study and 300 students (Male and Female) studying in bachelor and master's level in 6 different leading educational

institutes of Bangladesh, 3 public universities (Dhaka University, Jagannath University and Jahangirnagar University) and 3 private universities (BRAC University, East West University and American International University) have been selected for the survey purposes divided in equal ratio. To divide the respondents in equal ratio and number stratified sampling procedure has been carried out and thus from each university we took 50 respondents, 25 Male and 25 Female for the survey. The data has been analyzed using special software, 'Statistical Package for Social Sciences (SPSS). The ethical issues were taken into account in full manner throughout the study period including consent of the participants.

Theoretical Grounds of the Research

Globalization, as a process accompanied with technological advancement along with widespread communication through internet, satellite channels is changing the nature of the world on a rapid scale. Every nation and every person is now incorporated with the system to join the mainstream of development. Thus the traditional culture, beliefs, values and practices are under threat due to the development of world culture. This system is giving benefit for the dominant culture to enrich their culture but creating crisis of existence for the marginal cultures. In this era nothing is personal, everything is global.

Cultural homogeneity is some form of cultural imperialism. It is the growth of national influence of a particular culture in a given area. Thus, Ritzer (2003) defines globalization of culture as-

“the transnational expansion of common codes and practices (heterogeneity) or as a process in which many global and local cultural inputs interact to create a kind of pastiche or blend, leading to a variety of cultural hybrids (homogeneity)

Ritzer (2003,p.539)

Globalization has led to changes in cultural values and norms among the Bangladeshi people as a result the concept of premarital sex, abortion, cohabitation that were regarded as sin and forbidden task previously is now becoming accepted and being practiced by many young people in Bangladesh. Giddens has stated how the culture is being constructed and influenced in the following ways-

“A society’s culture constitutes both intangible aspects- the belief, ideas and values which form the context of culture and tangible aspects- the objects, symbols or technology which represent the content”... “Values and norms work together to shape how members of a culture behave within their surroundings”

Giddens (2003,pp.22-23)

During the advancement of modernity, the self-identity is being shaped in a new way with a broadened outlooks and it works as a reflexive project. Today in Bangladesh, the way some people look or identify themselves is different when compared to the previous generations.

Regarding the understanding of the traditional form of identity, Giddens’ statement is more accurate:

“Identity relates to the understandings people hold about who they are and what is meaningful to them; like gender, sexual, orientation, nationality or ethnicity and social class”

Giddens (2002,p.29)

Thus, the changes in self-identity from inherited traditional point of view to modern societies is under shift and the shift is very reflective among the youth. The subjective individual culture is a dead project in the era of modernity and with the pace of globalization, everyone is shifting towards developing a new form of identity that is global in nature. Simmel (1907/1978) stated that, individual mind is reaching the forms and content of its own development only by distancing themselves further from that culture and developing its own. Thus, the subjective culture is dying over individual objective culture (means of transport, product of science, technology, language, arts, legal system, moral codes and ideas).

The rise of new means of consumption like McDonalds and other shopping malls like mega malls, cyber shops, super malls, and cruise lines theme parks, have changed the eating habits of people. Ritzer (2007) opined that the rationality ought to be a necessary tool for operation of organizations. But he however feared that increased rationalization could result in increased control over individual action, stifling charisma and tradition, and giving man just few alternatives to choose what, how and when a person can carry out duties. The features of rationality are seen in Bangladesh when trying to look at the fast-food restaurants. Now instead of people to be served on the tables by the front-of-house staff, the customers find themselves standing in queues to have their food from counter. In addition, they even go as far as cleaning their tables after meals. The development of fast-food restaurants has turned to include the customers in the line of production. This is because, the customers have no other alternatives rather than making sure, they fill their stomachs. Here, they learn to follow the rules applied by the fast-food restaurants like McDonald and KFC.

The forms and practices of intimate relationship are trending towards a new height in the era of modernity and globalization. Giddens in his work *“The Transformation of Intimacy”* (1993), showed the nature of changing intimate relationship in the modern society. Although in the pre modern society the basis of marriage was financial ability to make a family but now it becomes a part of sexual attraction or romantic love. In the late 18th century the form of love was romantic or passionate and it was an equal relationship based on mutual attraction. Now in the most recent phase of modernity the previous form of romantic love is taking different shape and there is evolution of plastic sexuality. This opens the door for greater choices. The developed method of contraception have freed women to many extents for having intimate relationship. The emerging concept of ‘auto-gratification of carnal desire’ plays a crucial role in this context which one can term as sexual reflexivity. With the emergence of plastic sexuality, the previous form of romantic love is replaced by confluent love. This type of love is active and contingent and thus the divorce rate and separation are also on rise. Many among the young generation are running and adapting themselves with the forms of plastic sexuality as well as making confluent love rather than romantic one.

Instead of wearing traditional costumes “lungi and Panjabi” for men and ‘sari’ for women which are decorated with bright, lively colors and symbols such as hearts, bluebirds, doves,

daisies, tulips, and other natural scenarios, now people specially the youth are wearing casual dresses like jeans, T-shirt, suits-coats, sports shoes, westerns. Consequently, Bengali culture is being replaced by the dominant cultures like the American and Indian culture.

Appadurai (1996) viewed that homogenization of culture points to the formation of a global consumer culture in the era of late capitalism, The Americanization of the world reflects such homogenization. The homogenization of culture is proceeding strongly through various aspects of life as fashion, language, music, media, and film industries and slightly through commercial products as fast food restaurant, e.g. McDonald, Coca-Cola, etc. which are universally used. The global reach of American culture products offers huge and complex collection of images, and values to inhabitants around the world. Such homogenization could create a uniform world culture beside the loss and diminishing of an important cultural feature which is cultural diversity.

SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

The study has been carried out in six tertiary educational institutes of the country, three each from public and private, situated in the capital city, Dhaka. Among the respondents, 150 of them were from public university and 150 from private universities maintaining equal sex ratio (25 male: 25 female from each university) as well. The respondents comprised of Bachelors (70%) and Master's level (30%). Their age gap is also visible and thus the mean age of the respondents were 23 and overall nearly 50% of the respondents belong to the age category of 22-24 years. During the period of interview, 55% of the respondents from public universities were unmarried and single, 30% were in a relationship, 13% of them were married and only 2% were having a troubled marital life or divorced or separated. The number for private universities are as follow: 40% unmarried and single, 45% in a relationship, 10% were married and 5% of them in separation or divorced.

TASTE OF DRESS PATTERN, SHOPPING TRENDS OF THE RESPONDENTS AND INFLUENCING FACTORS

There was a sharp difference regarding the dress pattern of public and private university students. This is happening not only due to their varying perception towards culture or modernity, but the economic status of these respondents influenced their taste of dress pattern and shopping trends. Among the respondents of public universities most of the female respondents wear *salwar* and *kamij* at home, at university, in the wedding party and while outing with friends. Although some respondents prefer wearing *sari*, *lehenga* and specially designed dresses in wedding and birthday parties instead of *salwar* and *kamij*. In terms of male, majority prefer to wear jeans- pant, T-shirt and shirt. They also prefer to wear suits, pants, *panjabi*, *pajama* and jeans in the wedding and in parties as well. On the other hand among the private universities respondents, most of them argued that they prefer specific party dress doth for male and female respondent such as *sari* or other types of western dresses. And at university and other places, most of the male and female wear jeans, shirt, suits, T-shirt. At home, female respondent usually wear T-shirt, skirt, jeans or leggings. In terms of male respondent, most of them usually wear three quarter pant and T-shirt at home. For outing with friends, they usually wear casual dress or any type of comfortable dresses.

Majority of the respondents (60%) of public universities buy their dresses from multiple sources such as street market, permanent open market, neighborhood shop and alike places. Another 30% buy their dress from shopping mall at devalued or undervalued prices and another 10% are buying their clothes from permanent markets and branded shops. On the other hand, among the private university students, 40% respondents buy their dresses from branded shop, 25% from shopping mall at undervalued and devalued prices, 15% respondent argued about shopping from abroad, 12% from permanent open market and 8% from street markets.

Overall nearly 40% of the respondents claimed that they buy their dresses according to their personal choices, 23% of them were influenced by the fashion world, 17% followed their favorite actors of Dalywood, Bollywood and Hollywood actors and actresses, 10% are influenced by peer group, 8% have been influenced by multiple sources and the remaining 2% choose their dress pattern following their neighbor and political persons.

Among the respondents, around 70% of the public university students agreed that their taste of dress is being influenced because of the present trend of globalization and modernization and 30% of them think that there is no relationship between globalization, modernization and changing patterns of dress pattern. On the other hand, among the respondents from private universities, 90% respondents think that Bangladeshi dress pattern is under threat as their dress pattern and taste of dress is being influenced by globalization and modernization and only 10% respondent don't see any correlation in this regard.

EATING PATTERNS AND PREFERENCES OF RESTAURANTS

Traditionally it is the customs of Bangladeshi family to eat together at home and people use to eat their own cooked food but scenes are changing with the development and transition of society from one stage into another. Majority of the public university students (80%) who are staying at hostel or nearby mess take their three meals starting from breakfast to dinner at the canteen, cafeteria and mess inside the campus and nearby hotels and restaurants of the campus as they found it less expensive; whereas others (10%) mostly women sometimes cook by themselves. Another 10% are eating at the mess cooked by the house maid on the basis of meal system. But sometimes to celebrate the achievement or different events like birthday they visit different popular restaurants within their affordability to have the taste of desi, Thai, Indian or Chinese foods as they don't have the opportunity to taste these foods most of the times. On the other hand the public university students, who are staying with their family members, love to eat outside at least two meals- breakfast and lunch. They have the opportunity to taste Thai, Chinese and Indian food at their university canteen or cafeteria as most of them can afford these and they also frequently visit nearby popular restaurants to celebrate different occasions. Their taste of food as well as the preferences of food are also different than that of public university students due to their socio-economic status.

PREFERENCES AND REFLECTION OF MUSIC BY THE RESPONDENTS

Globalization, modernization, satellite television and internet facilities brought huge changes in the preferences of music among the youth group of population. The traditional and cultural music are being replaced by English, Hindi, rock and metal music. The usages of musical instruments are also being changed. Instead of using traditional tools, now more and

more electronic devices are being used. Overall 25% of the respondents are fond of western or English music, 40% like Hindi, 20% like band and metal rock music, 10% prefer Rabindro-Nazrul and Indian Bangla songs, 5% like classical and folk music. 40% of respondent think that aestheticism is reflected by the type of music people like, 33% think that social status is reflected by the types of music one hears, 17% vote for class position and 10% argued about personality factor that is related with what type of music they usually hear.

RESPONDENTS' STAND REGARDING INTIMACY AND PREMARITAL RELATIONSHIP

The traditional society of Bangladesh consider love and premarital relationship as a sinful activity. But their conception has started changing gradually due to the integration and connection of people with the broader world brought about by internet, satellite television and so on. Thus, many a things are being normalized among the youth group of population although the elder group of people mostly remain in their old habits and thought. Among the public university students, 40% support premarital relationship and the number for private university students are nearly 70%. 43% of the public university students think that people fulfill their carnal desires with their loved one and the number is 55% regarding the private university students who think that love affair is the way to fulfill sexual desires. The respondents argued that their sexual knowledge is being influenced by different sources of which 37% by Western movies, 25% by friends, 26% by pornography, 3% by female magazine and 9% respondent mentioned about multiple sources of gathering such kind of knowledge. The respective figure for private university students are 42%, 23%, 28%, 3% and 6%. Thus, they are being engaged with auto-gratification, usages of contraception, drug addiction and pornography.

Table 1: Preferences of Relationship and Sexuality

Supporting Pre-Marital relationship/Affair			Support Physical contact in Love			
<i>Study Area</i>	<i>Yes</i>	<i>No.</i>	<i>Yes</i>	<i>No.</i>	<i>Total</i>	
Public Universities	40.0	60.0	43.0	57.0	100%	
Private Universities	70.0	30.0	55.0	45.0	100%	
Sources of Sexual Knowledge						
<i>Study Area</i>	<i>Western movies</i>	<i>Friends</i>	<i>Female magazine</i>	<i>Pornography</i>	<i>Multiple sources</i>	<i>Total</i>
Public Universities	37	25	3	26	9	100%
Private Universities	40	23	3	28	6	100%
Supporting extra marital relationship			Support live together			
<i>Study Area</i>	<i>Yes</i>	<i>No.</i>	<i>Yes</i>	<i>No.</i>	<i>Total</i>	
Public Universities	30	70	15.0	85.0	100%	
Private Universities	40	60	30.0	70.0	100%	

The concept of intimacy among the young generation of Bangladesh is transforming in different forms. Previously most of the affairs used to get converted into marriage and the formation of family and besides that marriage was not the matter of sexual attraction but financial ability to maintain a family. But nowadays most of the marriage is not derived by financial ability rather than sexual attraction and youth are also being involved in the live-in relationship. With the development of plastic sexuality the forms of love relationship turn from romantic love to confluent love. In romantic love, marriage is the permanent binding of husband and wife. But in confluent love, the situation is not the same. Nowadays couples are staying together until they feel it is necessary. Otherwise, they get separated and these things are playing role in the increase in divorce rate as well as extra-marital relationship in Bangladesh.

RESPONDENT'S PREFERENCES OF MARRIAGE PATTERN AND CONCEPTION REGARDING EXTRA MARITAL RELATIONSHIP AND LIVE – IN RELATIONSHIP

Arranged marriage is the one and only form of marriage practiced in the traditional and cultural societies of Bangladesh and thus the love affair is not seen in a positive manner most of the time. But with the passages of time the conception and acceptance of multiple forms of marriage are increasing in Bangladesh society and is fueling among the youth. Overall 65% of the respondents are in support of love marriage, whereas only 30% support arranged marriage and 5% want to remain single. The extra- marital relationship are also being normalized among the youth in Bangladesh society. Around 30% of the respondents from public universities support extramarital relationship whereas the number is 40% from private universities. On the other hand, 15% of the respondents from public universities and 30% from private universities support live-in relationship and thinks it is the demand of time. Thus, the conception of transformation of intimate relationship is not fully applicable in Bangladesh society since religiosity still plays an important role in the formation of social values and norms. Here, females are not allowed to break the marital relationship even when they don't like to stay together and the marital relationship are not functioning well.

But to avoid the social ostracization, after years of living under the same roof, they attempt to seek the extramarital relationship without breaking the family.

NATURE OF RELATIONSHIP OF RESPONDENTS WITH FAMILY MEMBERS

The traditional society of Bangladesh value family life mostly as they consider family is the first and last place that builds the ties with family members and outsiders. Family is the main foundation of socialization. Among the respondents from public universities, 70% of the respondents, mostly female students (85%) stated that they have a regular contact with their family members as they are staying mostly in the rural areas whereas 25% of them have contact with their family members twice a week and 10% of the respondent opined that they talk when it's required. 5% of them are staying with their family members. On the other hand, among private university students, 70% of them are staying with their family members and those who are staying without family members, 25% of them are in regular contact with their family members and 5% maintain contact when it seems necessary.

CONCLUSION

The survey deals with the effects of cultural globalization in Bangladesh. The question of social change, in a country with a young population and where, as elsewhere in the world, modernity takes on the garb of the westernism as well as of “richer” neighbors (such as India in the case of Bangladesh), urbanity and certain lifestyles is a fascinating subject. The process of cultural globalization is transmitting the ideas, meanings, practices and values around the world which broaden and intensify the social relations and thus common patterns of consumption is being diffused by the platforms like internet, popular media, movement of people and satellite technology. Thus, the national culture is losing its appeal and the popular global culture is taking the place which helps in the process of the replacement of the traditional belief, norms, values and practices in the long run and affects the lives specially the youth communities in their localities as they are quick learner. Thus, the behaviors, choices, norms, values, food habits, dress pattern, musical preferences and concept of sexuality are being shaped and reshaped with the process, collection and access to information, media, and other available structures of the society. Cultural globalization has large-scale impact on the urban youth and thus a lot of changes on their lifestyle and preferences have been documented. The traditional cultural values are no longer identical among them instead their lifestyles have been under flux and assimilating into western and Indian norms, values, and practices.

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THE VEDIC TIME SYSTEM: AN EXPLANATORY STUDY

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ABSTRACT

The Vedas are 'Apaurusheya' i.e., 'not authored by humans'. The wisdom and various principles mentioned therein are laid down directly by the Supreme for the welfare of mankind. This knowledge is then handed over by the Supreme to the Sun and then to the Manu and so on'. The concept of time, as mentioned in the Vedas, is a unique phenomenon and it surpasses the modern way of calculation. The Vedic concept of time was then further explained by many sages in subsequent Vedic literature. In modern times, we are more focused on gross numbers which are used for practical purposes. However, according to the Vedic time system, the time has a multi-dimensional concept. Hence, both formless and gross concepts of time are defined. This paper explains the Vedic time system with various Vedic references and compares it with the modern time system.

Keywords: Kāla (Time), Vedic time system, astrological & astronomical time calculation, Kalpa, Manu, Mahāyuga, Yuga, Varsha (Year), Māsa (Month), Paksha, Ahorātra (Day-Night), Ghati, Pala, Vipal, Prāṇa, Truti etc.

INTRODUCTION

The Vedic Time System is regarded as a multi-dimensional category. There are various inferences and references of 'Kāla' (time) in the Vedic literature. The word 'Kāla' is most generally referred a synonym of 'time'. There are two major types of 'Kāla' in *Surya Siddhanta*.

लोकानामन्तकृत्कालःकालोऽन्यःकलनात्मकः।

सद्विधास्थूलसूक्ष्मत्वात्मूर्तश्चामूर्तरुच्यते॥²

lokānāmantakṛtkālahkālō'nyahkalanātmakaḥ।
sadvidhāsthūlasūkṣmatvātmūrtaścāmūrtarucyate॥

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It means that there is one 'Kāla' (time) which is used for mankind and another one is used for calculation. The 'Kāla' which is used for calculation is also of two types, namely 'Murta' or 'Sthula' (embodied or gross) which is used for practical purposes and 'Amurta' or 'Sukshma' (formless or subtle).

The word 'Kāla' is also connected to the Lord Shiva as he is referred to as 'Mahākāla'. To understand the formless or subtitle Kāla, *Atharva Veda*³ says

कालो अश्वो वहति समरश्मिः सहस्राक्षो अजरो भूरिरेताः।
तमा रोहन्ति कवयो विपश्चितस्तस्य चक्रा भुवनानि विश्वा ॥

kālo aśvo vahati saptaraśmiḥ sahasrākṣo ajaro bhūriretāḥ।
tamā rohanti kavayo vipāścitastasya cakrā bhuvanāni viśvā ॥

'Kāla'(time) refers to a horse (aśva, aśva = without future, i.e., continuous flowing energy) flowing continuously with seven types of rays and thousands of axes and who is always young and extremely powerful. The wise men understand the nature of this horse (time). In other verses of 53rd Sukta, the Kāla has also been referred to as the creator, the preserver and the destroyer.

The word 'Kāla'(time) has also been frequently used in the Brāhmanas⁴. In *Satpatha Brahmana*, it is referred to as the sense of the moment. The more general division of the time (Kāla) is done into three major parts, namely past (Bhuta), present (Bhavatah) and future (Bhavisyatah). The other division of the time is done into Ahan (day), Paksha (a lunar fortnight), Māsa (a month), Samvatsara (a year or a period that the Sun takes to reenter the sign of Aries in the zodiac), muhurta (48 minutes) and a larger time interval of Yuga(epoch) etc.

The concept of space and time is very important in astronomy and astrology. The *Rga Veda*⁵ says

द्वादशारं नहि तज्जरायुर्वर्ति चक्रं परि द्यामृतस्य।
आ पुत्रा अग्ने मिथुनासो अत्र सप्त शतानि विंशतिश्च तस्थुः॥

dvādaśāraṃ nahi tajjarāya varvarti cakraṃ pari dyāmṛtasya।
ā putrā agne mithunāso atra sapta śatāni viṃśatiśca taśthuh।

The circle with 12 parts (refers to a solar year having 12 months) is everlasting, i.e., it neither has a beginning nor any end. It further says that it has 720 sub-parts (referring to 360 days and 360 nights). Hence, it is the power of the Supreme.

Initially, a Vedic year was referred to as a solar year (not a lunar year) and later it was slightly improved and a solar year of 365/366 days was defined. It was first known to Jyotish and sage Garga.

Taitriya Samhita divided one year into six seasons, i.e., a season comprises two months each:

मधुश्चमाधवश्चवासंतिकावृतशुक्रश्चशुचिश्चग्रेष्मावृतू,
नभश्चनभस्यश्चवार्षिकावृतूषश्चोर्जश्चशारदावृतू,
सहश्चसहस्यश्चहैमंतिकावृतूतपश्यश्चशैशिरावृतू॥6

madhuścamādhavaśvavāsaṃtikāvṛtūśukraścaśuciśvagraiśmāvṛtū,
 nabhaścanabhasyaścavārśikāvṛtūīśaścorjaścaśārādāvṛtū,
 sahaścasahasyaścahaimaṃtikāvṛtūtapāścatapasyaścaśaiśīrāvṛtull

It means that one year has six seasons, i.e., a season of two months each. In Madhu-Madhav (March-April) months, Vasant (spring) season; during Shukra-Shuchi (May-June) months, Grisham (summer) season; during Nabh-Nabhasya (July-August) months, Varsha (Rainy) season; during Isha-Urja (September-October) months, Sharada (autumn) season, during Saha-Sahasya (November-December) months, Hemant (pre-winter) season; during Tapa-Tapasya (January-February) months, Shishir (winter) season.

Sage Lagdha mentioned in his scripture *Vedanga Jyotisha*⁷ that a cycle of 5 years constitutes a Yuga. Sage Ragnatha mentions in *Surya Siddhanta*⁸ that the age of a 'Kalpa' (consists of 14 Manus having 71 Mahāyuga each and 15 Junctions) is 4.32 billion solar years.

This large number of solar years constituting the Mahāyuga is given to the common factor divided from the revolutions of planets in that period in *Surya Siddhanta*⁹. These are as follows:

Planets	Bhagana
Moon	57753336
Mars	2296832
Mercury	17937060
Jupiter	364220
Venus	7022376
Saturn	146568

One of the most spectacular results of the *Rgvedic* studies is the evolution of the Hindu calendar. The time reckoned in terms of five components called Panchanga of time, namely Tithi (lunar day), Vāra (day of the week), Nakshatra (constellation), Yoga (derived out of longitudes of Sun and Moon) and Karana (a half of tithi), each with its specific effects in terms of benefic or malefic. Still, in modern times, many publishers are circulating such Panchanga ahead of every year because people still use them to find out benefic time for various festive, social, religious, meteorological, agricultural and other events.

The Hindu calendar is fully based on the movements of heavenly bodies. The sages of Vedic times had recognized five types of years, viz. the solar year, the lunar year, the Savana year (360 days), the nakshatra year and the Brahaspatyam year (calculated based on the movement of Jupiter).

According to many ancient scriptures (in Purusha Sukta of R̥ga Veda, in Yajur Veda, *Vishnu Purana*, Bhagvada etc.), the Brahma emerged out of the navel of the Supreme. The Brahma is responsible for creating and destroying the universe cyclically. According to *Vishnu Purana*, the life of Brahma is 100 divine years called Mahakalpa. According to *Surya Siddhanta*¹⁰, the Brahma creates 14 Manus everyday (Brahma's Day) one by one, who then create and control the humans. So, there are 14 Manus in one divine day called Kalpa of Brahma. The life of each Manu is called Manvantara and it has 71 eras of 4 quarters each. Each quarter has four Yugas

(epoch) – Krta or Satya, Treta, Dvapara and Kali.

The following are the complete calculations of Vedic units of time and periods:

Krati = 34,000 of a second.

Truti = 300 of a second (time taken to tear apart the softest petals of a lotus).

100 Trutis = 1 Lub

30 Lub = 1 Nimesh (a blink of an eye).

27 Nimesh = 1 Guru Akshar (time needed to pronounce a guru alphabet).

10 Guru Akshar = 1 Prana (time taken to breath gently, usually 4 seconds).

6 Prana= 1 Vighatika or Vipal.

60 Vighatika = 1 Ghatika or Dand.

60 Ghatika = 1 day and night (Ahoratri).

According to another system, the division of time is

1 day or 24 hours = 60 Ghatis (also called Pala or Kala).

1 Ghati = 60 Vighati (also called Vipala or Vikala).

1 Vighati = 60 Lipta

1 Lipta = 60 Vilipta

1 Vilipta = 60 Para

1 Para = 60 Tatpara

In Astrology, the birth time was used to be recorded in Ghati and Vighatis. Its conversion is as follows:

5 Ghatis = 2 hours (1 Ghati = 24 minutes).

5 Vighati = 2 minutes (1 Vighati = 24 seconds).

Another system of time at micro level is:

60 Tatparas = 1 Paras.

60 Paras = 1 Vilipta.

60 Vilipta = 1 Lipta.

60 Lipta = 1 Ghatika (Danda).

60 Ghatika = 1 Day & Night.

Hence, there are 46,65,60,000,00 Tatparas in a day and night.

The large Vedic units are in Yugas or eras/epochs. According of Vedic literature, their calculation by *Surya Siddhanta*¹¹ is as follows:

Sata Yuga = 17,28,000 Years ($432000 \times 4=1728000$)

Treta Yuga = 12,96,000 Years ($432000 \times 3=1296000$)

Dwapar Yuga	= 8,64,000 Years ($432000 \times 2=864000$)
Kali Yuga	= 4,32,000 years.
1 Mahayuga	= 4,320,000 years (the total period of 4 Yugas).
71 Mahayuga	= 1 Manvantara ($43,20,000 \times 71 = 30,67,20,000$ Years)
14 Manvantara	= 1 Kalpa (4,294,080,000 Years)

The earth remains submerged in the water for the period equivalent to Satyug before the start of each Manvantara. It also remains submerged in the water for the same number of years after the completion of the last Manvantara, hence having a total of 15 Sandhis (junctures) in total.

1 Kalpa	= 14 Manvantaras + 15 Sandhis
14 Manvantara	= 4,294,080,000
15 Sandhis	= 2,59,20,000 ($1728000 \times 15=25920000$)
1 Kalpa	= 4,320,000,000 years.

One day & night of Brahma = $4320000 \text{ Mahayuga} \times 100 = 432000000 \text{ Years}$.

Since the one moment in the life of Brahma is considered to be of our 100divine years, therefore the life of Brahma in 100 years will be

$$4,32,00,00,000 \times 360 \times 100 = 1,555,200,000,000 \text{ Years}$$

The present age of the cosmos, according to the Vedic System, is as follows:

- 1) The time elapsed till the start of current Manvantara
 - There are 14 Manvantaras altogether. At present, we are passing through the 7th Manvantara (Vaivasvata Manvantara).
 - One Manvantara consists of 71 Mahayug, out of which 27 Mahayug (of 7thManvantara) have already passed. We are passing through the initial phase of the Kali Yuga of the 28th Mahāyuga.
 - As mentioned above, 1 Manvantara is of 30,67,20,000 Years.
 - Till the start of 7th Manvantara, the creation has witnessed 7 pralaya (1 before the start of 1st and subsequent 6 Manvantaras). Pralaya is the event when the earth submerges into the water for a period equivalent to Satyuga, i.e., 17,28,000 years. It means that the creation till the start of the 7th Manvantara has witnessed 12,096,000 years ($17,28,000 \times 7=12096000$) in water. Thus, 1,852,396,000 years ($1840300000 + 12096000=1852396000$) have elapsed from the start of Kalpa to the beginning of 7th Manvantara.
- 2) The time elapsed till the start of the current Mahayuga
 - 27 Mahayuga have passed, each consisting of 43,20,000 years.
 $4320000 \times 27 = 116640000$ years have passed,
 Total ($1852396000 + 116640000 = 1969056000$) years.

3) The time that has elapsed till Kaliyuga

- In 28th Mahayuga, following three yugas have elapsed

Sata Yuga = 17,28,000 Years.

Treta Yuga = 12,96,000 Years.

Dvapara Yuga = 8,64,000 Years.

Total = 38,88,000 Years.

So, Kaliyuga came into existence approximately 38,88,000 years after the start of this 28th Mahāyuga.

4) Kali Yuga started on Bhadrapada, Krishna Paksha, 13th day, in Vyatipaata yoga at midnight, in the Ashlesha Nakshatra. The time elapsed in the existing Kaliyuga is 5122 (till Vikram Samvat 2078 or 2021 AD of Gregorian calendar or Shaka 1943).

Sum of all the three eras (Yuga) is the Sum of 27 Mahāyuga and Manvantara + the period of Kali Yuga till date. Kalpa consist of 4,32,00,00,000 years and out of these 1,97,29,49,101 years have passed. Therefore, the earth's existence, according to the calculations devised by our ancient sages, comes up to 1,97,29,49,101 years to date. It is interesting to note that according to scientific calculations, the age of the cosmos is estimated between 15 and 20 billion years.

CONCLUSION

There are various theories about the age of Vedas but Hindu scriptures have themselves defined it that it starts with the advent of the creation. The Vedic literature that was created thereafter, like Samhitas, Vedangas, Puranas, Smritis etc. was created by sages to explain it in a more detailed and understandable way. This paper has established that the time concept of Vedic literature is still valid and parallel with the calculations of modern science.

ENDNOTES

1. Bhagvada Gita 4.1
2. Sūrya Siddhānta 1-10
3. Atharvaveda 1 9.53.1
4. Śatapatha Brāhmaṇa 1.7.3.3
5. Ṛgveda Saṃhitā 1.164.11
6. Taitirīya Saṃhitā 4-4-11
7. Vedāṅga Jyotiṣa śloka 1-5-28
8. Sūrya Siddhānta, Madhyamādhikāra, śloka 21
9. Sūrya Siddhānta, Madhyamādhikāra, śloka 28-33
10. Sūrya Siddhānta, Madhyamādhikāra, śloka. 21
11. Sūrya Siddhānta, Madhyamādhikāra, śloka 15-16

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IN-VITRO ANTI-CANCER EFFICIENCY OF SILIBININ AGAINST U7MG GLIOBLASTOMA CELLS

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ABSTRACT

Glioblastoma is grade IV tumor with poor prognosis due to its high proliferative and migration behavior. Glioblastoma attack the glial cells, which are nurse cells that provide nourishment to the other cells in the brain. Silibinin is a bioactive flavonoid present in fruits and vegetables reported to suppress migration in numerous cancer cells. In the present study, the effects of Silibinin were investigated in glioma cells namely, U87MG. The results showed that Silibinin significantly inhibited the cell viability. Further, the anti-cancer potential was shown by decrease in growth and proliferation at low micromolar concentrations. Also, there was considerable increase in the percent dead cells. A distinct modification in the cell morphology was observed in U87MG cells treated with Silibinin. These findings suggested that Silibinin has anti-cancer role leading to suppression of growth of glioma cells.

Keywords: MTT, proliferation, Silibinin, Trypan blue, U87MG.

INTRODUCTION

Glioblastoma multiforme (GBM) or gliomas is a grade IV highly malignant and fast growing tumor attacking the glial cells [1]. Glioblastoma is a rare but fatal disease whose risk of diagnosis increases with age and accounts for nearly one-half (49%) of all malignant tumors in all ages combined, and non-malignant meningioma, which accounts for more than one-half

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proliferation, and migration. The findings of present study may pave new roads in understanding use of Sb phytochemicals in the treatment of glioma.

MATERIALS AND METHODS

Materials and Reagents

Silibinin, dimethyl sulfoxide (DMSO), trypan blue reagent (0.4%) were obtained from St. Louis, MO, USA. MTT 3-(4, 5-dimethylthiazol2-yl)-2, 5-diphenyl tetrazolium bromide (MTT) were from Invitrogen (Carlsbad, CA, USA).

Cell culture and culture conditions

The human glioblastoma cell line U87MG was purchased from the NCCS, Pune. It was routinely maintained in modified eagle's medium (MEM) with glutamine supplemented with 10% fetal bovine serum, 1% penicillin-streptomycin solution. All the drug stocks were prepared in DMSO. All the drug treatments were performed without glutamine conditions.

MTT assay for cell viability

Approximately 8000 cells/well of U87MG were seeded in 96 well plates and treated with different concentration of phytochemicals from 2.5 to 100 μ M and DMSO in control in without glutamine media for 48 hours. Absorbance was measured at 570 nm in microplate reader as described earlier (Synergy H1 Hybrid Reader, BioTek, USA) [10].

Trypan blue dye exclusion assay

Approximately 1×10^5 per 60 mm cells were seeded, treated with either DMSO alone or desired concentrations of Silibinin for 48 hours. After trypsinization, cells mixed 10 μ L (0.4%) trypan blue. Live and dead cells were counted using a phase contrast microscope (Zeiss, Germany) as described earlier [13].

Study of Morphological Alterations

After 48 hours of incubation of U87MG cells with treatment of all the drugs, cells were viewed using an inverted microscope (Zeiss, Germany) under 100 X objectives. The images were then compared to assess the effect of various treatments on the morphology of cells.

Statistical analysis

Statistical analyses were undertaken using GraphPad Prism version 6.0. Experiments were repeated two to three times. Student t-test was done to indicate the statistical analysis. The differences were considered significant when $p < 0.05$ and indicated in the figures. For densitometry analysis, ImageJ software was used.

RESULTS AND DISCUSSION

Silibinin inhibits cell viability of U87MG glioma cells

U87MG cells were treated with different concentrations ranging from 2.5 to 100 μ M of Sb (**Figure 2**) for 48 hours and checked for cell viability in glutamine conditions. For assessing cell viability, MTT assay was performed. The respiring and viable cells have mitochondrial dehydrogenase enzyme which reduces the yellow color to purple color formazon crystals.

The intensity of the color correlates with proper functioning of the mitochondria suggesting the presence of viable cells and hence cytotoxicity of the phytochemical on the cells can be measured [13]. Sb significantly inhibited the viability of U87MG cells in a dose dependent manner at 48 hours (**Figure 2**). Based on the screening studies, the effective doses for Sb (25, 50 and 100 μ M) were taken for the further experiments.

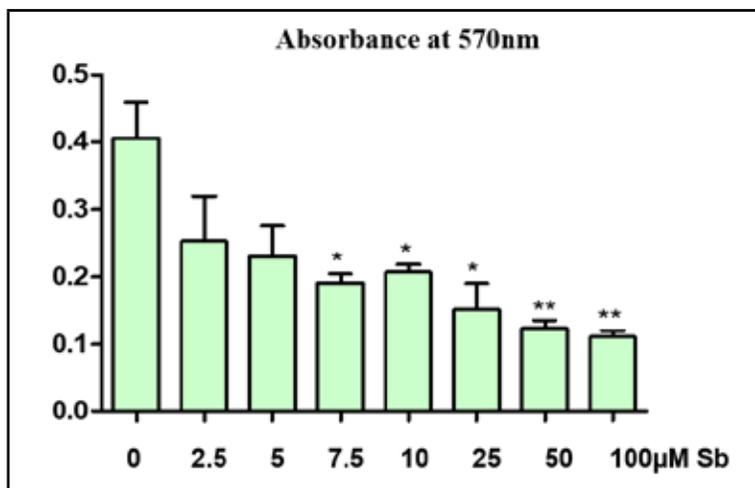


Figure 2: Effect of Silibinin (Sb) on cell viability on U87MG cells. Cells were treated with the indicated concentration of 0-100 μ M of Sb for 48 hours. The data are presented as means for triplicate samples for each treatment. Student's t-test was done. Bars;SE;*P<0.05;P<0.01 vs. the control.

Since ages, Silibinin has been used as hepatoprotective agents an effect which has been attributed to antioxidant properties [14]. It has many additional health benefits as clinical studies have shown that it can act as a chemopreventive agent on many cancer types, can target cyclin dependent pathways and cause cell cycle arrest [15], and promote tumor apoptosis. There was no report demonstrating the effect of Silibinin on U87MG glioma growth and proliferation. So in the present study we investigated the effects of Silibinin on U87MG.

Silibinin inhibits cell growth and increases cell death in U87MG cells

The anti-cancer efficiency of any compound can be assessed by checking its effect on cell death and proliferation. To evaluate the effects of Sb on the growth of human cancer cells, the growth inhibitory potential of these compounds was determined in human glioblastoma U87MG cells. After the screening studies and deciding the doses and time-point, we next performed the trypan blue assay to check the effect of Sb on cell growth and death. Dye exclusion methods are routinely used to measure cell viability, with trypan blue exclusion test being one of the most common procedures. Trypan blue is a vital stain. The test is based on the principle that live cells have integral undamaged functional membrane and hence do not take the dye, whereas dead cells have broken damaged cell membrane so take the dye from the surrounding medium. Non-viable cells have distinct blue colour when observed under microscope, whereas viable cells are visible as unstained. This results in the ability to

distinguish between viable and non-viable cells [16]. The cells were treated with 25, 50 and 100 μM of Sb for 48 hours in minimum essential media.

For Sb, a significant dose dependent decrease was found in live cell number control to 66.7 % for 50 μM (<0.05) and 40.3% at 100 μM (<0.001)(**Figure 3B**). The total cell number also decreases considerably to 66.7% and 45.1% (<0.001)(**Figure 3A**). There was increase in percent dead cells from control 0.5% to 4% (< 0.001) (**Figure 3C**).

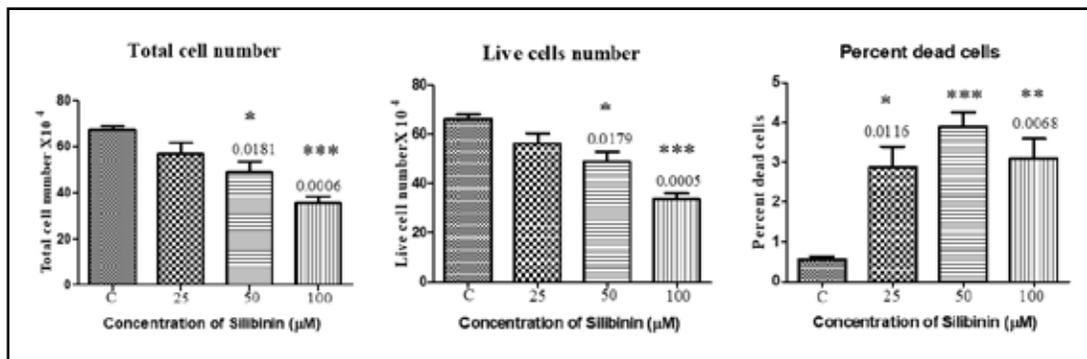


Figure 3 : Disease in Cell Number

Morphological analysis of Silibinin on U87MG cells

In U87MG cell line, control cells treated with DMSO alone showed a branchy, elongated, slender and clustered polygonal shape which are seen as aggregated cells, and considered as the normal cell growth effect as observed under the light microscope. The most visible changes in cell morphology were observed after treatment with Sb (50 μM) (**Figure 4A**) and Sb (100 μM) (**Figure 4B**) after 48 hour. After Sb treatment the cell morphology changed markedly to round, shrunken, branching between cells disappeared and showed a decrease in their number in proliferation (**Figure 4C**) and increase in dead cells as compared to control (**Figure 4D**).

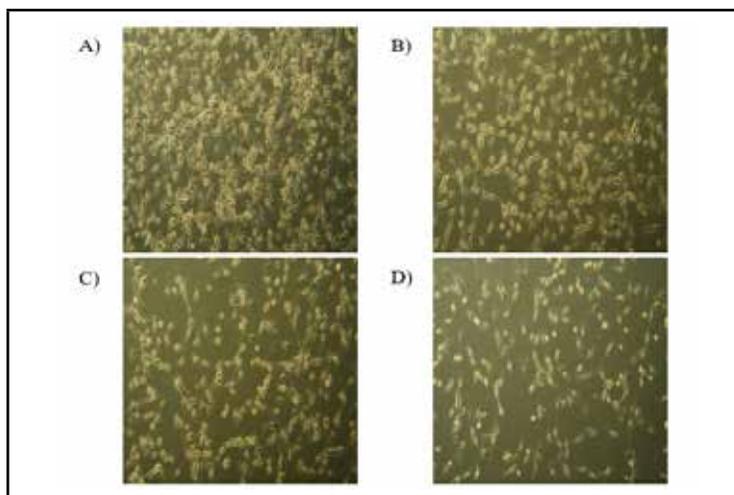


Figure 4 : Change in Cell Morphology

CONCLUSION

The current study focuses on the role of Silibinin on growth in the glioblastoma (GBMs) cells. We checked the effect of Silibinin on U87MG cells, a grade IV glioblastoma cell line. There was a dose-dependent decrease in the live cell number and increase in the percent dead cells as shown by trypan blue dye exclusion assay. When seen in microscope, we could observe that there were morphological changes in the cells which are the indicators of cells dying in the presence of Sb. Further studies are needed to check the cause of decrease in the cell proliferation. Overall, this is a preliminary study of Silibinin on U87MG cells showing it as a potential candidate for anti-cancer therapy.

ACKNOWLEDGMENTS

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COMPARISON OF SINGLE SLOT, SRR LOADED DUAL-BAND ANTENNA WITH DOUBLE SLOT DUAL-BAND ANTENNA FOR 5 G NETWORK

*Jitendra Vaswani**
*Archana Agarwal***
*Mohd. Gulzar Ali****

ABSTRACT

This paper presents comparison between single slot, SRR loaded dual-band antenna and a double slot dual-band antenna designed for sub-6GHz band of fifth generation mobile communication services. The values of IEEE gain, radiation efficiency and envelope correlation coefficient are better in case of double slot antenna and it further covers WLAN band for high speed internet facilities.

Keywords: 5-G, antenna, bandwidth, communication, envelope correlation coefficient (ECC), frequency, radiation.

INTRODUCTION

Antennas are inseparable element for wireless communication. Different antennas like horn antenna, patch antenna, dipole antenna are available in the market. Slot antennas are very popular among the researchers as these can be designed by engraving the surface of most substrates.

A planar UWB antenna is proposed that has notch for sub-6GHz band by cutting out U-shaped slot in the radiating patch [1]. A dual-band slot antenna in mm-wave range is presented in [2], that is simulated on low permittivity substrate with the gain of more than 5.6 dB. A multi-band slot antenna is suggested for 5G communication system with MIMO antenna design on FR-4 substrate. The proposed antenna has high gain, good efficiency and sufficient bandwidth to be used as MIMO antenna for 5G mobile phones[3]. SAR level for hand and head of human are also calculated and its effect has been studied. Slot antenna design for 32

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GHz and 42 GHz band of 5G is proposed. The shape of the slot implemented is elliptical with sectored radiating patch[4].

Four element slot antenna is presented for sub-6 GHz band of 5G Communication systems. The dual-band characteristic is obtained by designing the SRRs and higher bandwidth is obtained by merging of two closely spaced band[5]. The antenna has good diversity performance in terms of ECC and MEG. In another design of four element slot antenna, dual band characteristics is obtained by etching two squared slots in the ground plane[6]. This antenna also has high gain and good radiation efficiency along with better diversity performance.

As the design, type and size of the antennas mentioned in [5] and [6] are similar, so comparison between both the antennas is presented in the paper. A table showing the similarities and differences is presented so that one can easily compare the antennas based on their characteristics.

ANTENNA COMPARISON

The antennas that are being compared are identical in shape of the substrate. The substrate used in the antenna design is FR-4 with the only difference in the thickness of the substrate. The thickness of substrate in [5] is 0.8mm and in [6] is 1.6 mm. The unit cell structure of both antennas is shown in Fig. 1. In [5] there is one slot for radiation, that has been loaded with SRRs (split ring resonator) to get dual-band performance while in [6], there are two slots to get antenna resonating at two bands.

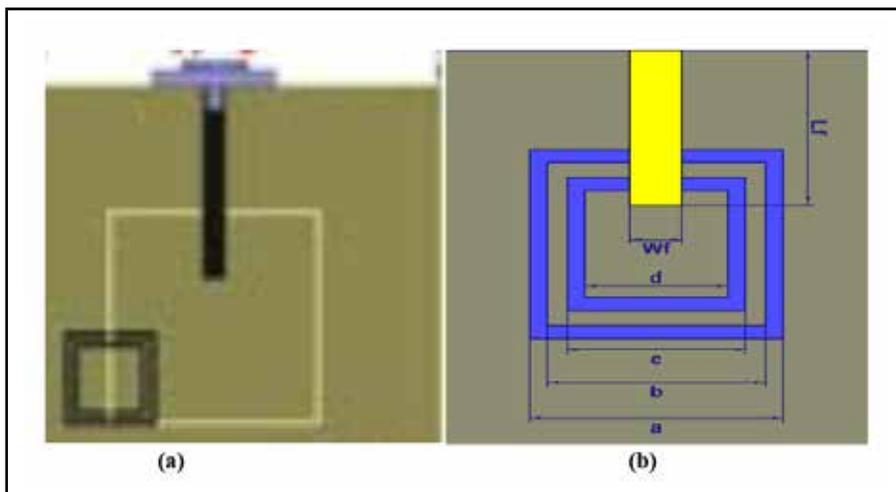


Figure 1: Unit cell structure of the compared antennas (a) Sarkar (b) Vaswani

Both the antennas are designed with four elements placed at four corners of the substrate such as the orientation of the adjacent elements is perpendicular to each other, so that the polarization is also perpendicular between them. This also improves the isolation between the antenna elements. Transparent antenna design of both the antennas is shown in Fig. 2.

The S-parameters for both designs are shown in Fig. 3. The band of operation for [5] is 3.15 GHz and the other band extends from 3.56 to 4 GHz. So the bands placed close to each

other. The spacing between the bands for [6] is more as compared to [5]. The antenna in[6] resonates at 3.6 GHz and 5.5 GHz. It can also be noticed that the isolation in [6] is slightly better than [5].

The variation of radiation efficiency with frequency for antenna [6] is given in Fig. 4. The radiation efficiency for [6] is more than 60% for the 3.6 GHz band and even reaches more than 70% in the 5.5 GHz band. While for the antenna [5], the efficiency varies between 59 to 67%.

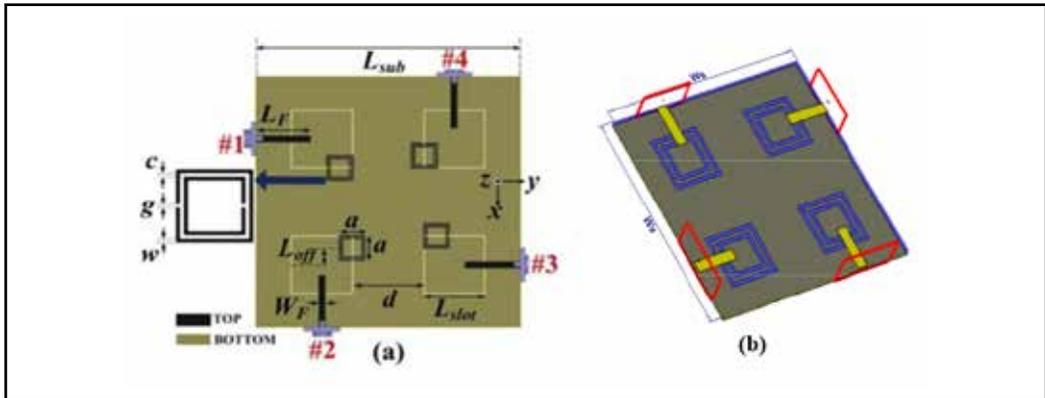


Figure 2: Complete Design of the antennas (a) Sarkar (b) Vaswani

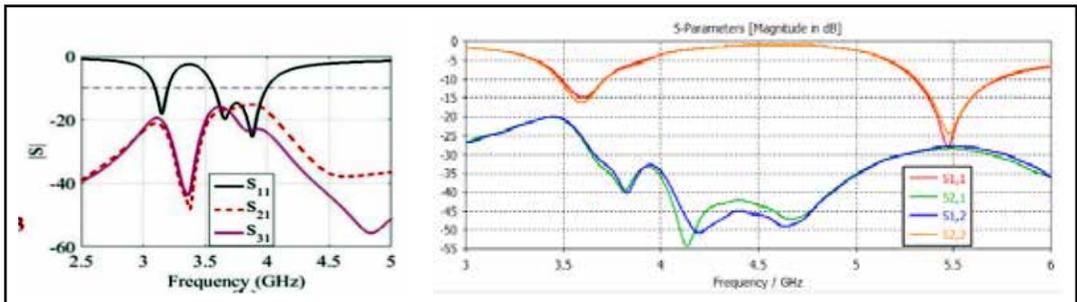


Figure 3: S-Parameters of the antennas (a) Sarkar (b) Vaswani

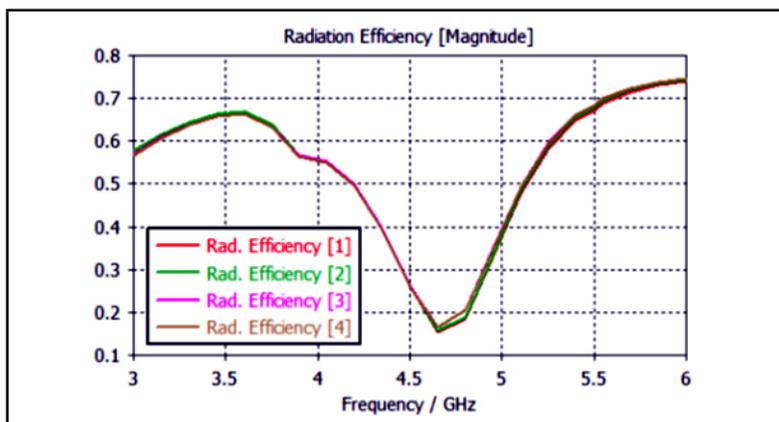


Figure 4: Radiation efficiencies of the Antenna [6]

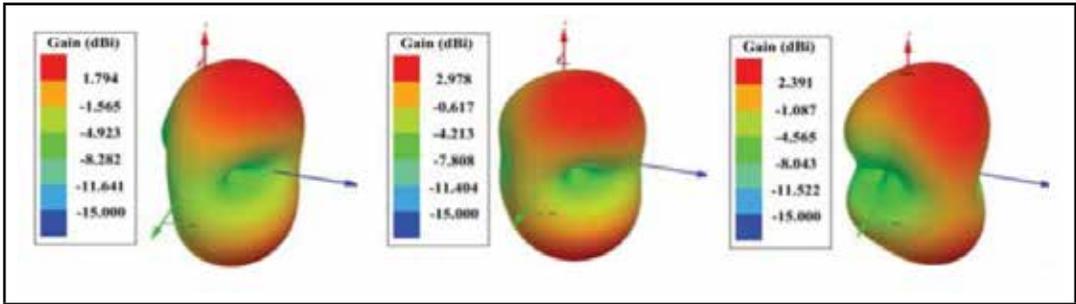


Figure 5: Gain of antenna [5] at 3.15 GHz, 3.66 GHz and 3.88 GHz

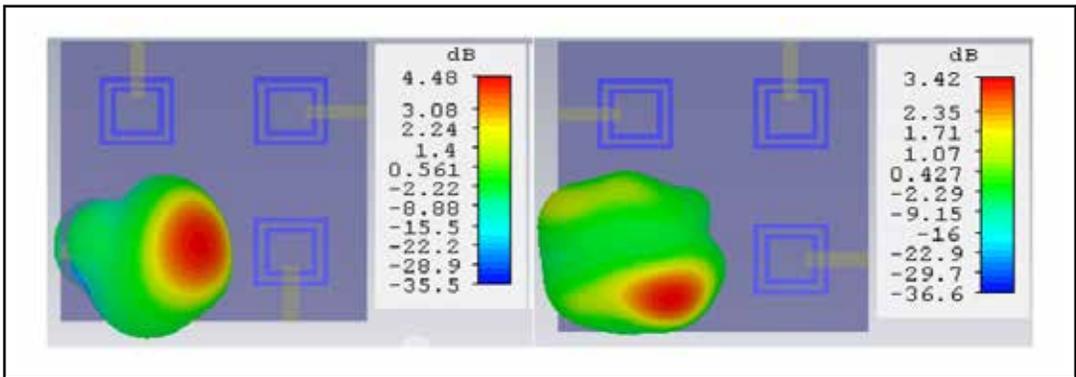


Figure 6: Gain of antenna [6] at 3.6 GHz and 5.5 GHz

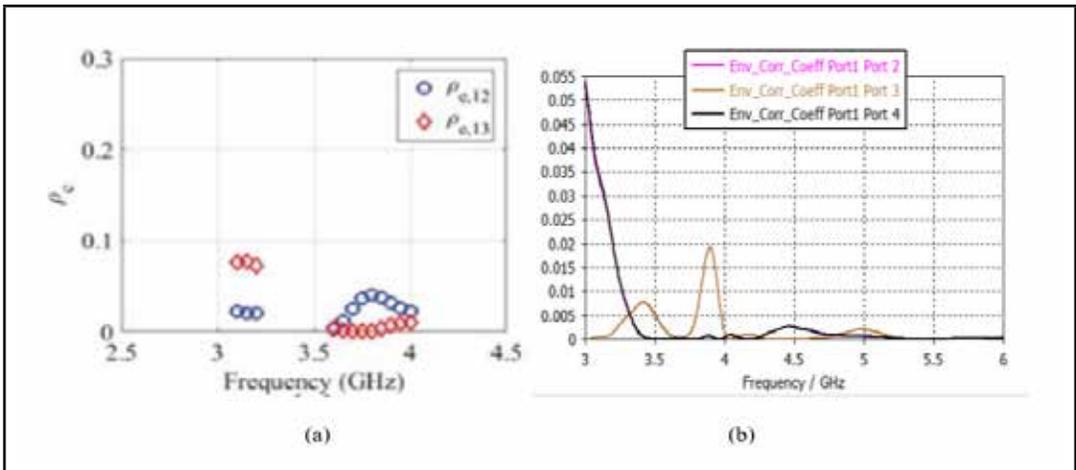


Figure 7: ECC vs Frequency of the antennas (a) Sarkar (b) Vaswani

The gain for antenna in [5] is shown in Fig. 5 for the mentioned operating frequencies of the antenna and varies from 1.794 dBi to 2.978 dBi. Since all elements are identical and placed in symmetry, so the gain is same for all. Fig. 6 shows the gain of antenna [6]. The gain of the antenna at 3.6 GHz is 4.48 dBi and 3.42 dBi at 5.5 GHz, nearly 1.5 dBi more than the antenna in [5].

The other discussed parameter is envelope correlation coefficient (ECC). As depicted in the Fig.7. The maximum value of ECC is 0.02 for antenna [6] and for antenna [5], it is close to 0.09 in the same operating range of frequencies.

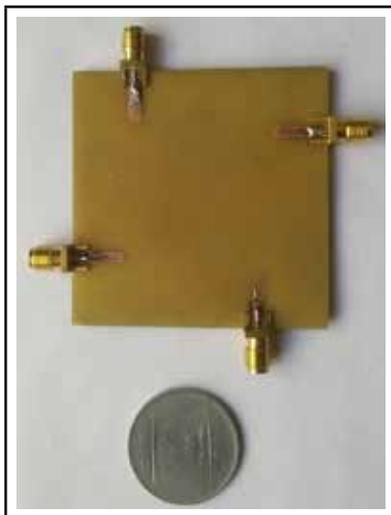


Fig. 8: The fabricated slot antenna's front view

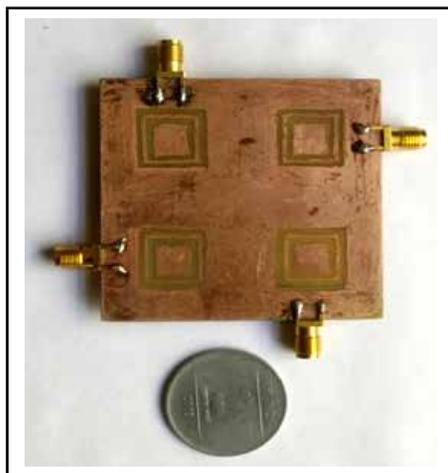


Fig. 9: The fabricated antenna's back view

Fig. 8 and Fig. 9 show the fabricated antenna's front and rear view. The antenna is fabricated using PCB designing procedure and chemical etching in lab. The testing of the antenna will be done in near future and the unit cell shown in Fig. 1(b) will be used to design more antennas in days to come.

RESULTS AND DISCUSSION

The comparison of the antenna [5] and the antenna [6] is summarized in tabular form in Table I. It can be said that antenna [6] is better than the antenna [5] is terms of gain, efficiency and envelope correlation coefficient (ECC).

Table 1: Parameter Comparisons of Antennas

Parameter	Sarkar	Vaswani
Band	3.2 and 3.6 GHz	3.6 GHz and 5.5 GHz
Isolation	17 dB	20 dB
Gain	1.794 to 2.978 dBi	4.48 dBi
Radiation Efficiency	59 to 67%	60 to 70%
ECC	<0.09	<0.02

CONCLUSION

From the comparison of the antennas at various parametric levels, it can be said that the antenna [6] gives better performance than antenna [5]. The comparison is justified as both the antennas are of same dimensions and similar type. The antenna has been fabricated and the experimental results are expected to be in agreement.

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COMPARATIVE ANALYSIS OF OPTICAL TRANSMISSION SYSTEM USING DCF-UNIFORM FBG BASED TECHNIQUES WITH NRZ AND RZ MODULATION

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ABSTRACT

In this paper, we propose a single-channel optical transmission system using hybrid dispersion compensation techniques in three different (pre-, post-, and symmetrical) configurations. Dispersion compensation techniques reduced the pulse broadening effects of the transmitted signal that is known as Inter Symbol Interference (ISI). To overcome ISI, Uniform FBG and Dispersion Compensation Fiber (DCF) schemes are modeled, analyzed, and compared to investigate the performance of the optical transmission system. The proposed system is designed for 10 Gbps using non-return-to-zero (NRZ), and return-to-zero (RZ) modulation format with an optical amplifier over a channel length of 100 km single-mode fiber (SMF) and 20 km dispersion compensation fiber with a loop span of two, so that the overall channel length is 240 km. At the transmitter side, different input sequences as PN, FCC, and Walsh codes are used as data sequences in the data generator. Performance of the designed system is analyzed and compared using Optisystem 17.0 simulator in terms of bit error rate (BER), quality factor (Q-factor) and eye-diagram by varying input power (mW), modulation formats (NRZ/RZ), and input sequence like PN, FCC, and Walsh code. It is observed during analysis that Walsh codes provide a higher value of Q factor and a low value of BER for the proposed system models.

Keywords: Amplifier, Attenuation, BER, Dispersion Compensation Fiber (DCF), dispersion, modulation, Inter Symbol Interference (ISI), non-linear effect, Non-Return to Zero (NRZ), Optisystem, optical fibre, Q-factor, refractive index, telecommunication, transmitter, Uniform FBG.

INTRODUCTION

Recently, in the telecommunication sector, the demand for optical fiber technology is increasing day by day due to large bandwidth, high data rate, reliable and low-cost optical

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communication links[1].

Normally the transmission in an optical system is mainly affected when different wavelength signals are transmitted over an optical fiber. Due to the variations in the core and cladding refractive index, these optical signals travel at different speeds. Therefore, optical signals overlap after traveling a long distance through fiber. Hence the broadening of pulse that is also known as Inter Symbol Interference (ISI) effect causes dispersion and losses in transmitted signals which lead to an error signal at the receiver end [2]. Therefore, attenuation, non-linearity, and dispersion are the major factor that affects optical transmission networks. To overcome the attenuation problem, an erbium-doped fiber amplifier (EDFA) is introduced as shown in Figure 1. EDFA is the most frequently used optical amplifier. It works on a low loss 1550 nm wavelength window of silica-based fiber[3]-[5]. The non-linear effect can also be avoided using appropriate power levels.

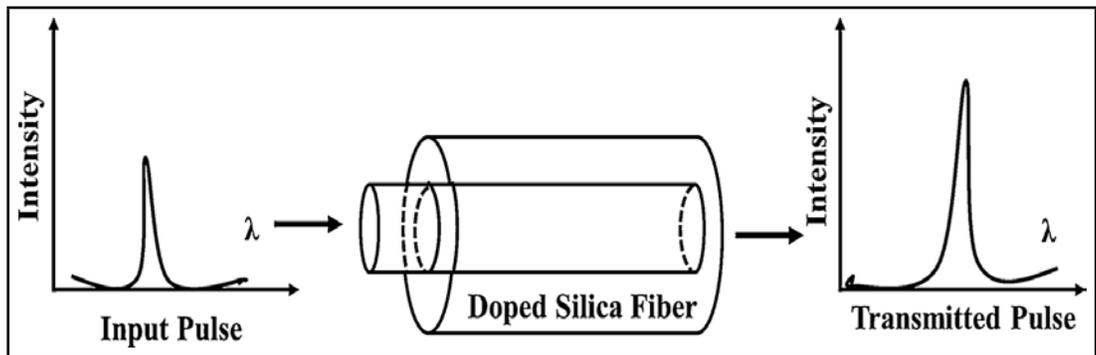


Figure 1: Basic Principle of EDFA

In optical transmission system, dispersion is the key issue that limits the long distance and high speed optical fiber communication[6]-[8]. Out of the other problems, dispersion affect the system most and difficult to overcome[9].

To overcome the dispersion issues, various techniques are suggested such as Dispersion Compensation Fiber (DCF)[10], Dispersion Compensating Filter[11]-[12] and Fiber Bragg Grating (FBG)[13]. Out of these, the DCF and FBG are most efficient dispersion compensation techniques. In DCF, a negative dispersion coefficient special fiber is introduced to compensate the effect of positive dispersion in an optical fiber communication link[14]. Various authors have investigated the detailed design characteristics, applications, choice of optimum length and operating conditions of DCF as an effective dispersion compensator[15]-[19]. It is concluded from literature that DCF technique is simple, reliable and easy to upgrade installed fiber links, but it increases non-linear effects as well as cost of fiber communication systems[20].

To overcome the challenges of the DCF techniques, FBG is suggested to compensate dispersion in fiber networks. The FBG significant importance for design, testing and estimation of dispersion compensator. Therefore, FBG is characterized with insignificant non-linear effects, low loss, cost competence and high competence for working in optical transmission systems[21]. The dispersion compensation using FBG is proposed by Qullette[22], and Williams[23]. An FBG is a distributed Bragg reflector developed in a short fragment of optical

fiber that reflects specific wavelengths of light and transmits all others. This is accomplished by making an intermittent variety within the refractive profile of the fiber core, which creates reflection for a selected wavelength[24]. By changing the refractive index profile and grating period, Fiber Bragg grating can be divided into uniform FBG and ideal dispersion compensation FBG. In uniform Fiber Bragg grating, unvarying grating periods are used [25]. Uniform means the grating period and index of refraction is constant throughout the length of the grating. The basic principle of uniform FBG is shown in the Figure 2.

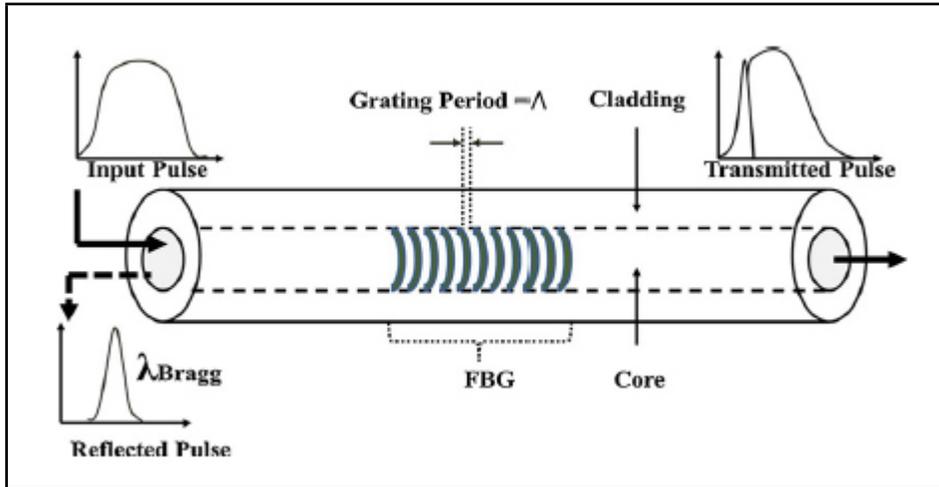


Figure 2: Basic Principle of Uniform FBGs

The data transmission format must be a factor when analyzing the performance of optical communication systems, because it deals directly with the system output. Non-return to zero (NRZ) and Return to zero (RZ) are two very common modulation techniques, which are used to modulate optical pulses in optical networks[26]. In optical fiber communication, basically, PN Code sequences generated by Pseudo-Random Bit Sequence generator are used to generate a digital sequence. For the analysis in this paper, the other two codes FCC and Walsh codes are used. The FCC codes are often designed by using tridiagonal matrix property, at any given number of users and weights. Walsh-Hadamard (WH) codes[27] are binary orthogonal and might easily be generated from Hadamard matrices. The orthogonal sequences generated from Hadamard matrices are called Walsh-Hadamard matrices[28]-[29].

The proposed work presents the performance analysis of an optical transmission system with Uniform FBG and DCF techniques for 10 Gbps optical link with 240 km of single-mode fiber. DCF and Uniform FBG are used in three configurations pre-, post-, and symmetrical along with the optical fiber i.e. SMF.

The optimized parameters of SMF, as well as uniform FBG, are identified and after simulation, performance parameters of the proposed models are analyzed and compared with previously reported works with DCF-Ideal Dispersion Compensation FBG (IDCFBG) as a dispersion compensation technique. Finally, it can be observed that the presented work improves the performance of the proposed model by reducing dispersion through the Uniform

FBG-DCF technique. The designed optical configurations are modeled and simulated using the Optisystem 17.0 simulator.

In this paper, the whole analysis of dispersion compensation is based on comparing the value of the Q factor and BER using NRZ and RZ modulation techniques with PN, FCC, and Walsh input sequence code at the transmitter side by varying CW laser input power from 1 mW to 10 mW.

PROPOSED SYSTEM MODEL

A single channel optical transmission system is designed to evaluate and compare the performance based on DCF-Uniform FBG dispersion compensation techniques. The proposed model is simulated by Optisystem 17.0 software through using NRZ and RZ modulations, different input sequence, and different input power in three different configurations to investigate how dispersion affected the performance of optical transmission system at 10 Gbps data rate. The fundamental block diagram of proposed system model is shown in Figure 3.

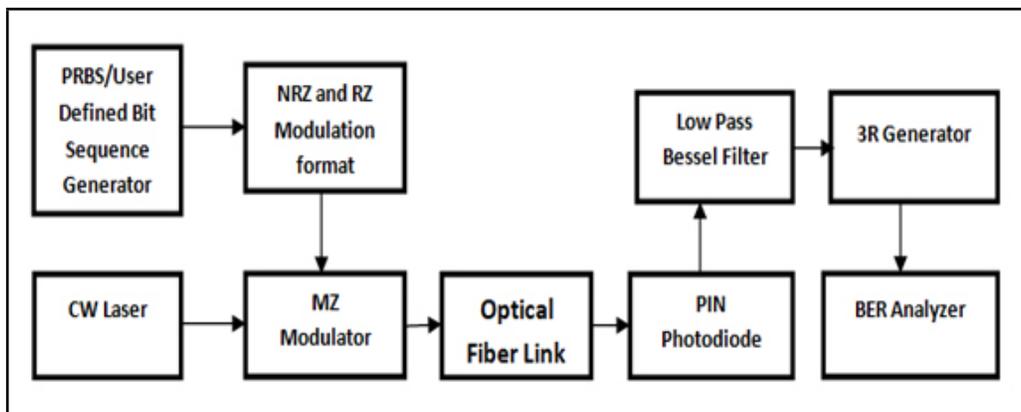


Figure 3: Experimental setup of the proposed system model

At the transmitter side, to produce the pseudo-random bit sequences and user-defined bit sequences, both pseudo-random and user-defined bit sequence generators are used at data rate of 10 Gbps. To convert binary data into electrical pulse, non-return to zero (NRZ) and return to zero (RZ) pulse generator are used. Continuous Wave (CW) laser and Mach-Zehnder (MZ) modulator having 30 dB extinction ratios are used to modulate the CW laser signal. Central frequency of 193.1 THz is selected for CW laser according to recommendation of ITU-TG.694.1.

The optical input signal is spread over a single optical fiber consisting of SMF, DCF with Uniform FBG and optical amplifiers. The parameters of SMF, DCF and Uniform FBG are preferred in such a way to produce best possible performance. The length of SMF and DCF are 100 km and 20 km respectively with a span of two loops. Therefore, total transmission length of channel is 240 km. The position of DCF and SMF with Uniform FBG are preferred according to the dispersion compensation techniques used and relocated at the time of simulations to analyze value of Q factor and BER of the optical link. This can be achieved in pre-, post-, and symmetrical compensation configuration as shown in the Figure 4.

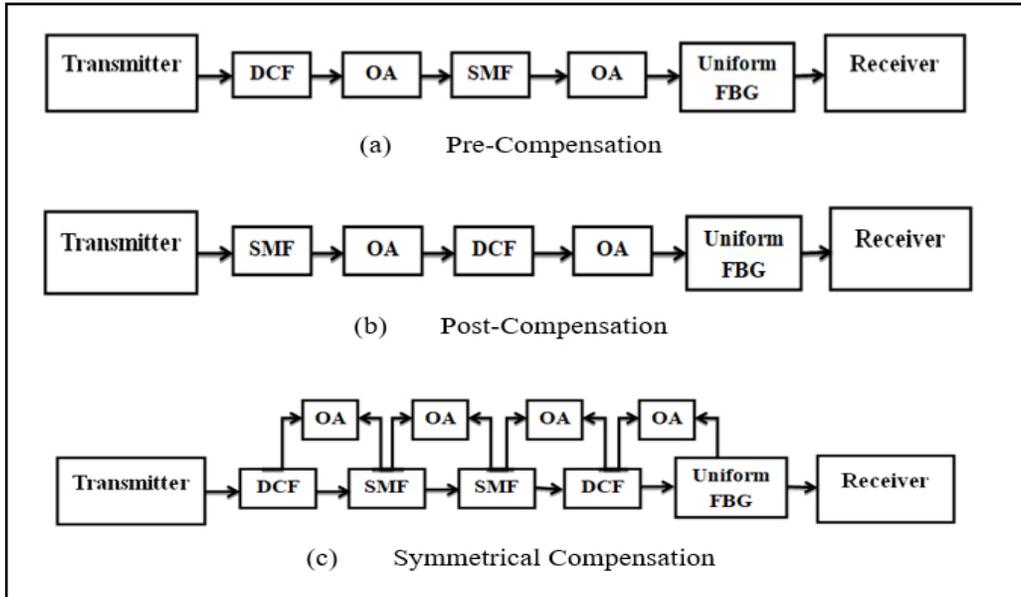


Figure 4: Optical fiber link configurations for the proposed system model

- Pre-compensation: In the pre-compensation scheme, DCF is placed before the SMF along with optical amplifier and Uniform FBG.
- Post-compensation: In the post-compensation scheme, DCF is placed after SMF along with optical amplifier a Uniform FBG.
- Symmetrical-compensation: In the symmetrical compensation scheme, DCF is placed before and after the SMF along with optical amplifier, a Uniform FBG.

For DCF based systems, additional amplifier is required to reduce the loss of DCF itself. At the receiver side to detect the optical signal, a PIN detector is used along with a low pass electrical Bessel filter and Eye/BER analyzer along with 3R generator. The all component parameters related to SMF, DCF and Uniform FBG are tabulated in Table 1, 2 and 3 respectively.

Table 1: Single Channel Optical System Parameters

PARAMETERS	VALUE
Bit Rate(Gb/s)	10
Sequence Length	1024
Samples/bit	32
Sample Rate (Hz)	3.2e+011
Number of Samples	32768
CW Laser frequency (THz)	193.1
CW Laser Power (mW)	1 to 10
Reference Wavelength (nm)	1550

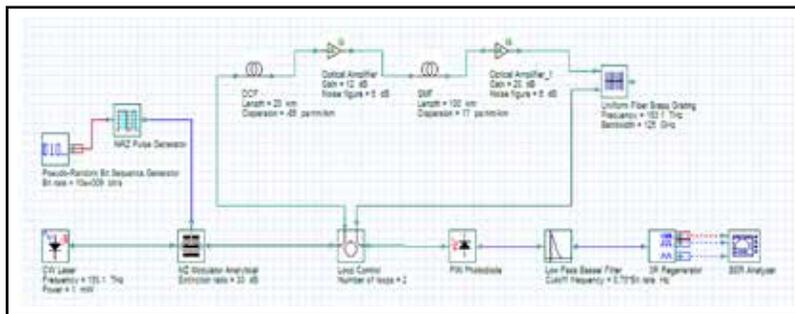
Table 2: Fiber parameters

PARAMETERS	SMF	DCF
Length (km)	100	20
Dispersion (ps/nm/km)	17	-85
Dispersion Slope	0.075	-0.3
Attenuation	0.2	0.6
First Order Dispersion coefficient(ps2/km)	-20	-20
Differential Group Delay(ps/nm)	0.5	0.5
Nonlinear refractive index(m2/w)	2.6e-20	2.6e-20

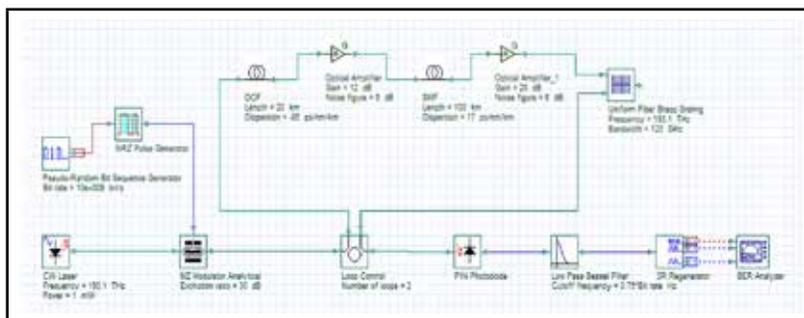
Table 3: Uniform FBG parameters

PARAMETERS	VALUE
Frequency (THz)	193.1
Bandwidth (GHz)	125

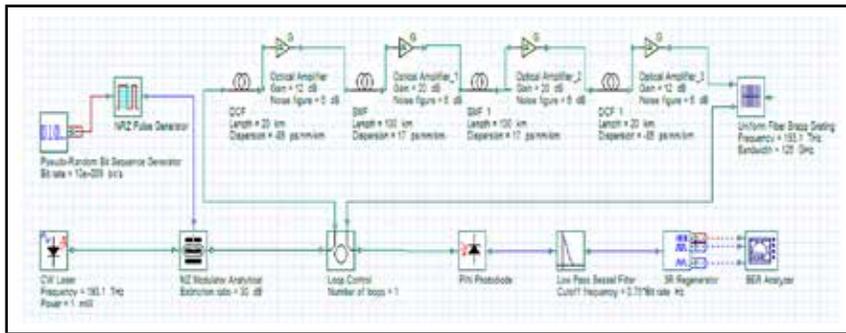
In this paper, DCF with Uniform FBG-based dispersion compensation techniques for three configurations using NRZ and RZ modulations with three different types of input sequences are implemented. Figure 5 and Figure 6 shows the experimental setup for the Pre-, Post-, and Symmetrical DCF with Uniform FBG techniques for NRZ and RZ modulations respectively using PN code generated by PRBS generator.



(a) Pre-DCF with Uniform FBG

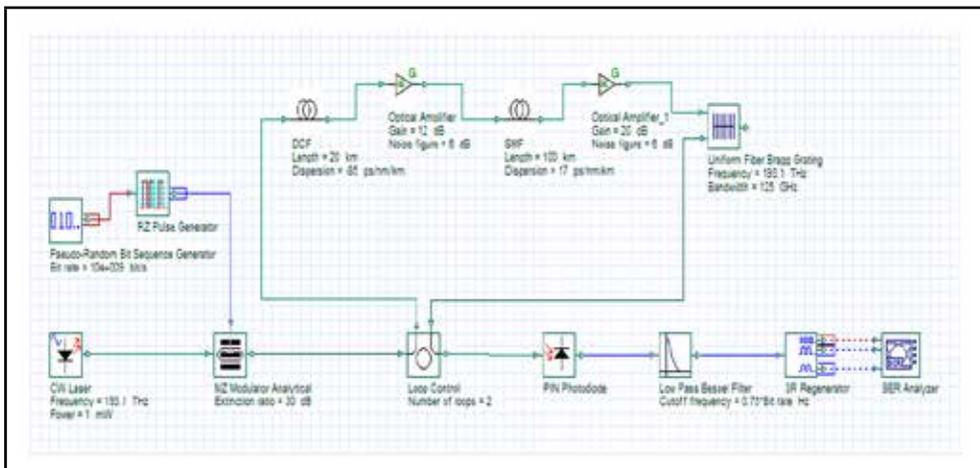


(b) Post-DCF with Uniform FBG

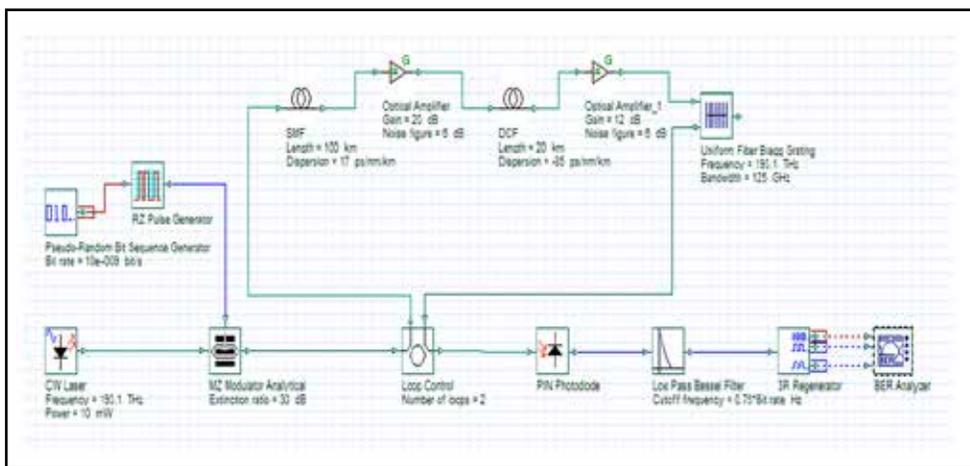


(c) Symmetrical DCF with IDCFBG

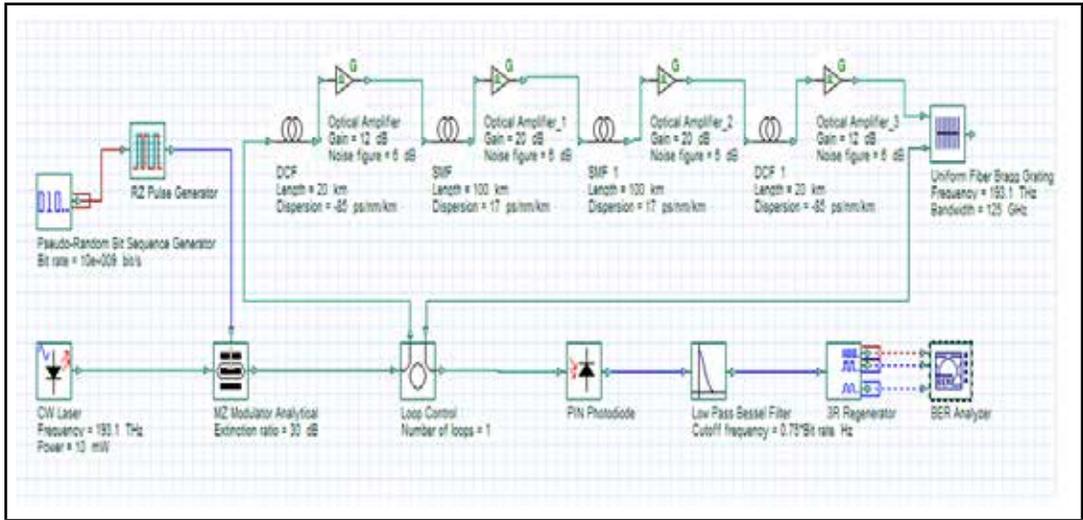
Figure 5 Simulation setup for (a) Pre (b) Post and (c) Symmetrical DCF with Uniform FBG compensation using NRZ modulation



(a) Pre-DCF with Uniform FBG



(b) Post-DCF with Uniform FBG



(c) Symmetrical DCF with Uniform FBG

Figure 6: Simulation setup for (a) Pre- (b) Post- and (c) Symmetrical DCF with Uniform FBG compensation using RZ modulation.

For the next simulation setup to apply FCC and Walsh code, PRBS generator is replaced by the user defined bit sequence generator in the entire Figure 5 and 6, where 16 bits of FCC Codes (0110111001010001) and Walsh codes (0110011001100110) are used for the simulation.

RESULTS AND DISCUSSIONS

Before discussion on results, it is necessary to point out that our key concern is to analyze and compares the performance of single channel optical transmission system using DCF-Uniform FBG technique for pre-, post-, and symmetrical configuration using NRZ and RZ modulations with different input sequence applied to the data generator by varying input power. The performance of the proposed models is simulated on Optisystem 17.0 simulator. Quality factor (Q-factor) and bit error rate (BER) are measured using BER Analyzer. For enhanced optical fiber communication system, $Q > 6$ and $BER \leq 10^{-9}$ are the acceptable values. Therefore, higher value of Q-factor and lower value of BER authenticate the low dispersion and better performance of optical transmission system.

Effect on Q-factor by varying input power

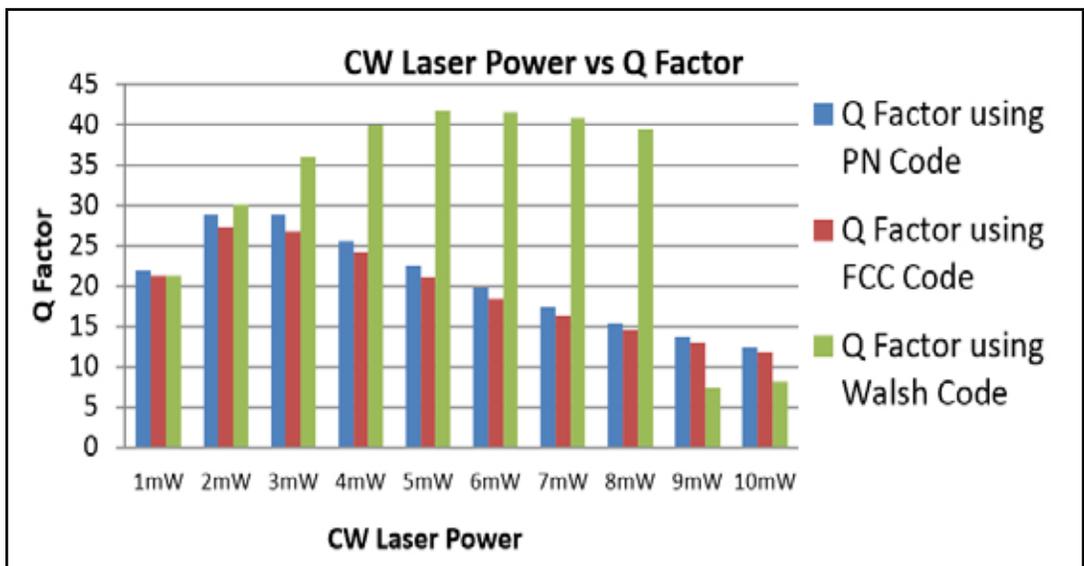
This section provides the performance of proposed optical transmission system model by obtaining value of Q-factor with varying input power from 1 mW to 10 mW for three configurations of the proposed model using NRZ and RZ modulations with different input sequence like PN, FCC and Walsh codes.

The value of Q-factor for the proposed model using NRZ modulation is shown in the Table 4. Highest value of Q-factor was 41.6897 at 5 mW for pre-configuration, Q-factor of 51.7953 at 8 mW for post-configuration and Q-factor of 63.4228 at 10 mW for symmetrical configuration with Walsh code.

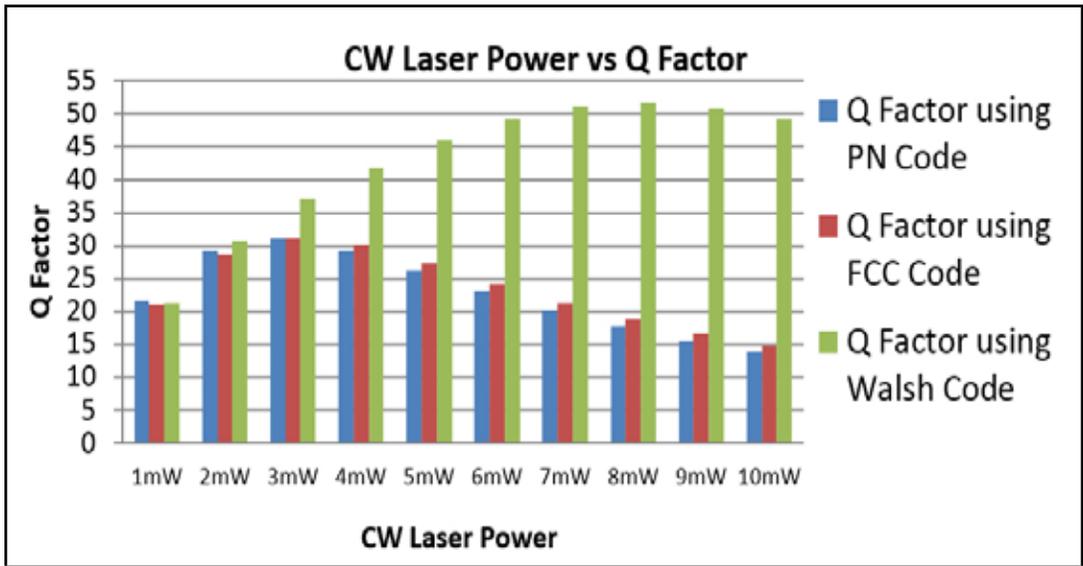
Table 4: Q factor versus Input Power for NRZ modulation

Power	Pre-DCF with Uniform FBG			Post-DCF with Uniform FBG			Symmetrical DCF with Uniform FBG		
	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code
1mW	21.9479	21.3501	21.3038	21.6118	21.1728	21.3286	20.1938	19.9787	20.0312
2mW	28.9038	27.3941	30.0188	29.1894	28.5976	30.609	29.1652	28.6638	28.8147
3mW	28.8197	26.8417	36.0527	31.0576	31.0744	37.1928	35.7248	34.8648	35.2207
4mW	25.6111	24.2009	39.9049	29.2866	30.0837	41.7537	40.5011	39.2999	40.4048
5mW	22.5649	21.1743	41.6897	26.2668	27.388	45.9345	43.5304	42.0587	45.2892
6mW	19.7678	18.5152	41.602	23.0588	24.2815	49.1384	44.8959	44.5204	49.7507
7mW	17.3786	16.383	40.7455	20.1771	21.3464	51.2463	45.9734	46.216	53.837
8mW	15.3979	14.5649	39.4055	17.7062	18.8053	51.7953	46.4464	46.9881	57.5565
9mW	13.7495	13.0424	7.46676	15.6365	16.622	50.8798	46.0155	46.823	60.7897
10mW	12.3707	11.7574	8.22286	13.8958	14.7796	49.0689	44.8115	45.8425	63.4228

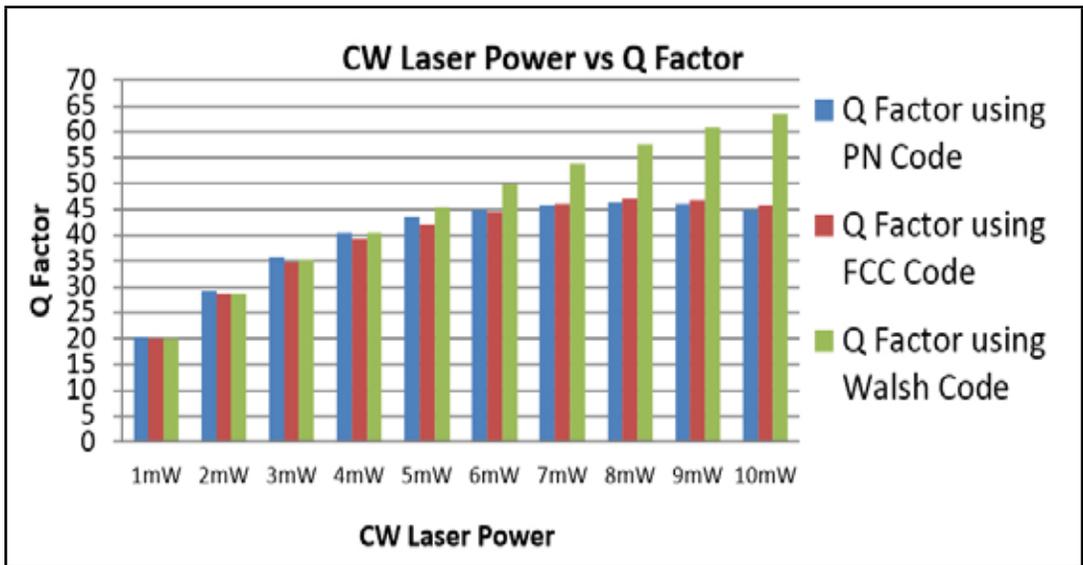
A comparative graph between Q-factor and CW laser power ranges from 1 mW to 10 mW is drawn as shown in the Figure 7 for the pre-, post- and symmetrical configuration of the proposed model using NRZ modulation.



(a) Pre-DCF with Uniform FBG Configuration



(b) Post-DCF with Uniform FBG Configuration



(c) Symmetrical DCF with Uniform FBG Configuration

Figure 7: Q factor versus Transmitted Power for (a) Pre-, (b) Post-, and (c) Symmetrical DCF with Uniform FBG configuration using NRZ modulation

From the graph, it can be concluded that when the Walsh code is used as input sequence, it gives the higher values of Q-factor as compared to PN and FCC codes at particular value of input power.

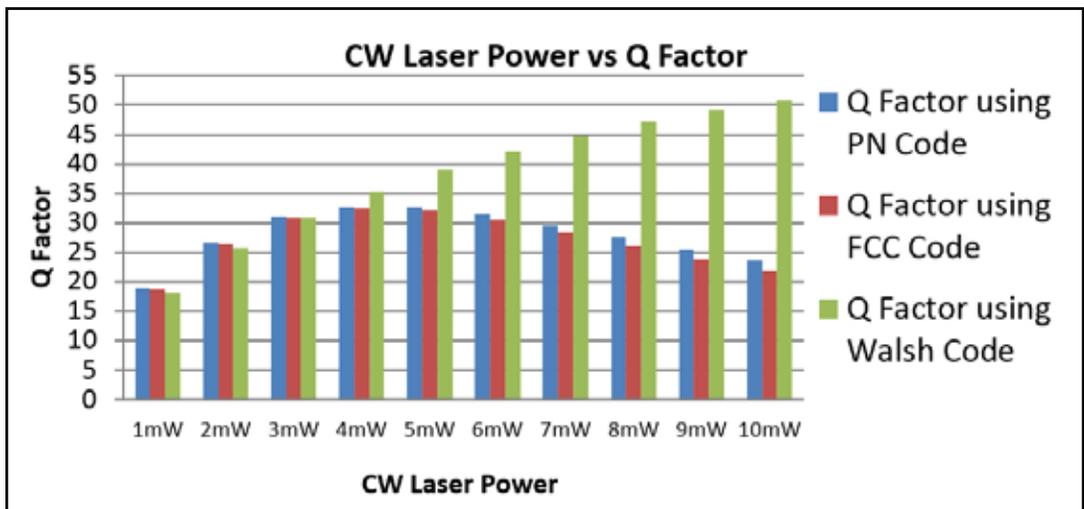
The value of Q-factor for the proposed model using RZ modulation is shown in the Table 5. It provides the highest value of Q-factor of 50.8243 for pre-configuration, Q- factor of

54.3489 for post-configuration and Q-factor of 52.8758 for Symmetrical at 10 mW input power with Walsh code.

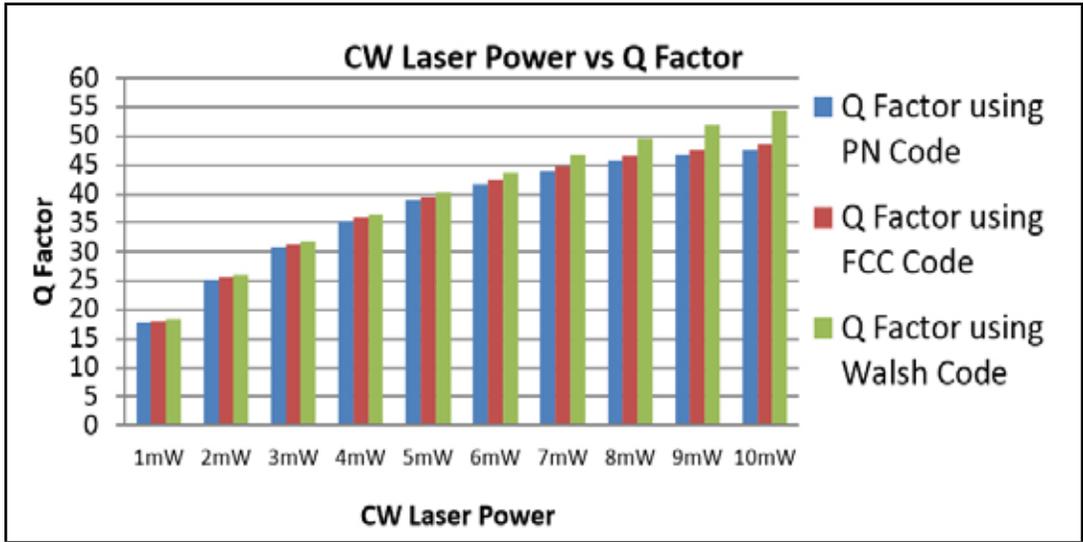
Table 5: Q factor versus Input Power for RZ modulation

Power	Pre-DCF with Uniform FBG			Post-DCF with Uniform FBG			Symmetrical DCF with FBG		
	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code	Q Factor using PN Code	Q Factor using FCC Code	Q Factor using Walsh Code
1mW	18.9399	18.6472	18.2279	17.6815	18.0131	18.3778	17.7362	17.4959	17.5906
2mW	26.6446	26.4153	25.6932	25.291	25.6586	26.1156	25.3242	24.9246	25.1722
3mW	31.0811	30.8809	30.9403	30.884	31.3426	31.8621	30.8424	30.2528	30.8574
4mW	32.8222	32.5618	35.2987	35.3318	35.8804	36.462	35.038	34.2997	35.4936
5mW	32.7433	32.2512	38.9581	38.9291	39.5423	40.2671	38.0958	37.2782	39.3558
6mW	31.4866	30.5752	42.102	41.7849	42.4824	43.7065	40.1849	39.2858	42.6475
7mW	29.6669	28.4008	44.815	44.0447	44.7283	46.7632	41.3525	40.4041	45.5679
8mW	27.6137	26.0034	47.1753	45.6997	46.5296	49.5204	41.7993	40.8365	48.1236
9mW	25.5693	23.808	49.1736	46.7896	47.6622	52.0314	41.7583	40.605	50.5366
10mW	23.659	21.851	50.8243	47.4969	48.5224	54.3489	41.1854	40.1008	52.8758

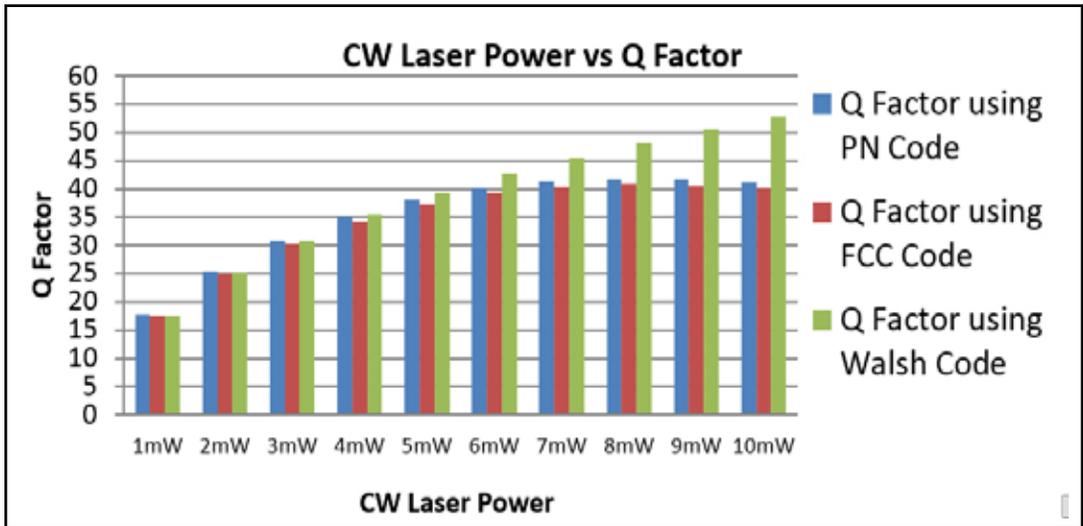
A comparative graph is also drawn for the same proposed model using RZ modulation as shown in Figure 8. From this graph, it is concluded that Walsh code provides the higher value of Q-factor as compared to PN and FCC codes.



(a) Pre-DCF with Uniform FBG Configuration



(b) Post-DCF with Uniform FBG Configuration



(c) Symmetrical DCF with Uniform FBG Configuration

Figure 8: Q-factor versus Transmitted Power for (a) Pre-, (b) Post-, and (c) Symmetrical DCF with Uniform FBG Configuration using RZ modulation

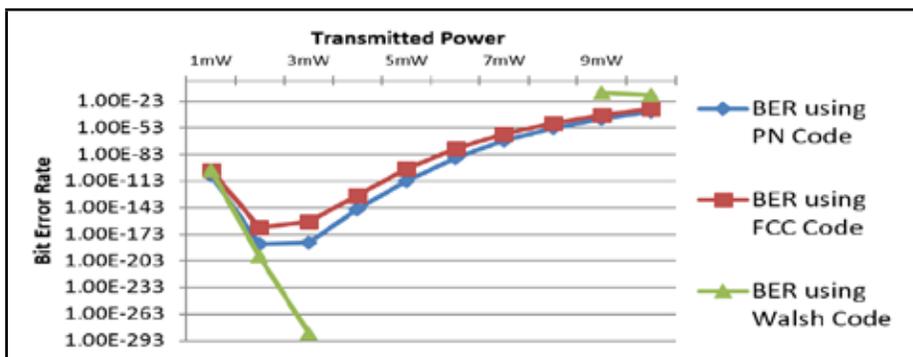
Effect on BER by varying input power

This section provides the performance of proposed optical transmission system model by obtaining value of BER with varying input power. The obtained value of BER by varying the input power for the proposed model using NRZ modulation is given in Table 6. It provides the lowest value of BER of 0 from 4 mW to 8 mW for pre-, and post -configuration and from 4 mW to 10 mW for symmetrical configuration with Walsh code.

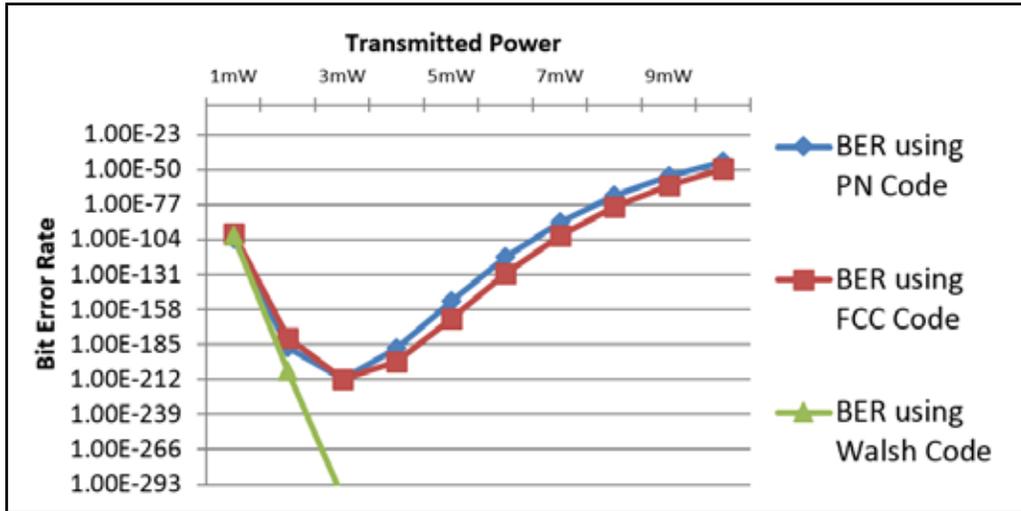
Table 6: BER versus Input Power for NRZ modulation

Power	Pre- DCF with Uniform FBG			Post- DCF with Uniform FBG			Symmetrical DCF with Uniform FBG		
	BER using PN Code	BER using FCC Code	BER using Walsh Code	BER using PN Code	BER using FCC Code	BER using Walsh Code	BER using PN Code	BER using FCC Code	BER using Walsh Code
1mW	2.82E-107	1.20E-101	3.24E-101	4.38E-104	5.62E-100	1.90E-101	3.41E-91	2.61E-89	9.00E-90
2mW	3.15E-184	9.40E-166	1.74E-198	8.10E-188	2.20E-180	2.74E-206	1.58E-187	3.19E-181	4.14E-183
3mW	3.45E-183	3.13E-159	3.90E-285	2.67E-212	1.59E-212	2.63E-303	4.72E-280	7.36E-267	2.80E-272
4mW	3.31E-145	6.26E-130	0	5.42E-189	2.81E-199	0	0	0	0
5mW	2.71E-113	4.65E-100	0	1.61E-152	1.34E-165	0	0	0	0
6mW	1.59E-87	4.43E-77	0	4.16E-118	1.08E-130	0	0	0	0
7mW	3.42E-68	7.16E-61	0	5.36E-91	1.47E-101	0	0	0	0
8mW	4.90E-54	1.34E-48	0	1.30E-70	2.38E-79	0	0	0	0
9mW	1.52E-43	2.04E-39	4.02E-14	1.42E-55	1.68E-62	0	0	0	0
10mW	1.14E-35	1.92E-32	9.79E-17	2.34E-44	6.97E-50	0	0	0	0

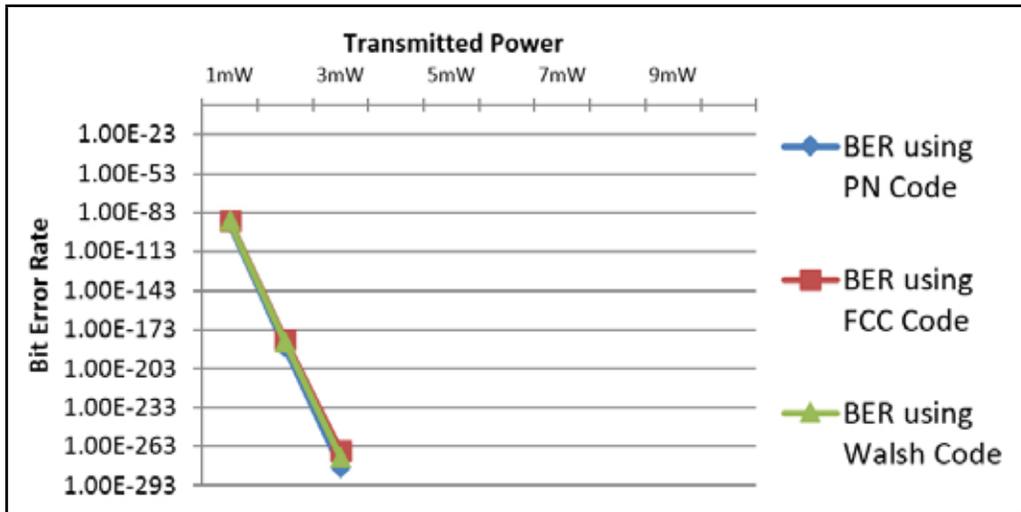
A comparative graph is drawn between BER and CW laser power that ranges from 1 mW to 10 mW as shown in the Figure 9 for the pre-, post-, and symmetrical configuration.



(a) Pre- DCF with Uniform FBG Configuration



(b) Post- DCF with Uniform FBG Configuration



(c) Symmetrical DCF with Uniform FBG Configuration

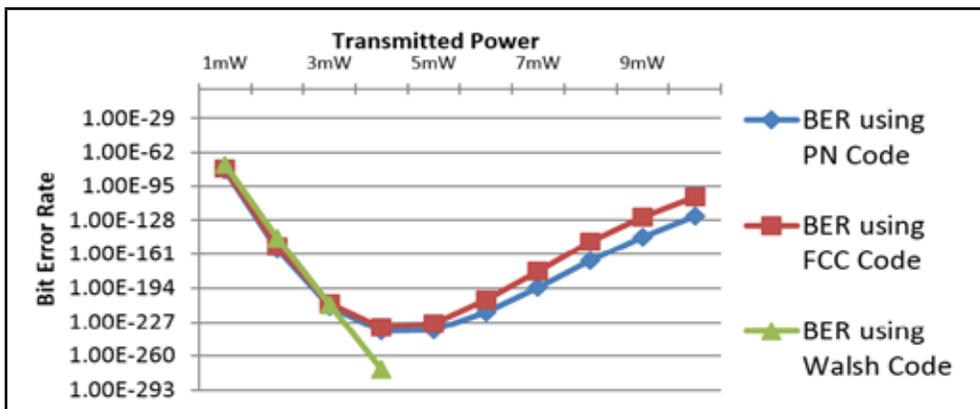
Figure 9: BER versus Transmitted Power for (a) Pre-, (b) Post-, and (c) Symmetrical DCF with Uniform FBG configuration using NRZ modulation

From the graph, it is concluded that when the Walsh code is used as input sequence, it gives the lower values of BER as compared to PN and FCC codes at particular value of input power.

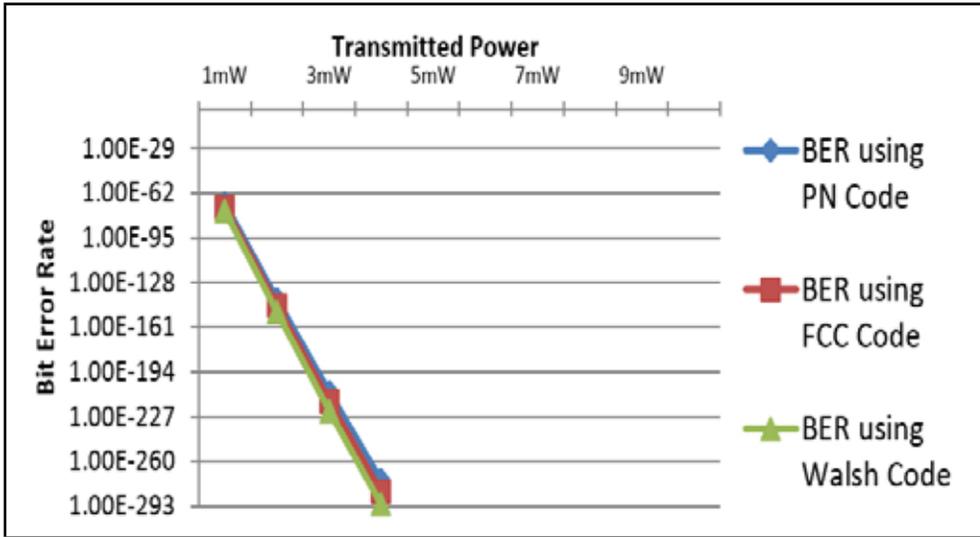
The value of BER obtained by varying the input power for the proposed model using RZ modulation is given in Table 7. It provides the lowest value of BER of 0 from 5 mW to 10 mW for pre-configuration with Walsh code, from 5 mW to 10 mW for post-configuration with PN,FCC and Walsh codes and from 6 mW to 10 mW with PN, FCC codes and from 5 mW to 10 mW with Walsh code for symmetrical configuration.

Table 7: BER versus Input Power for RZ modulation

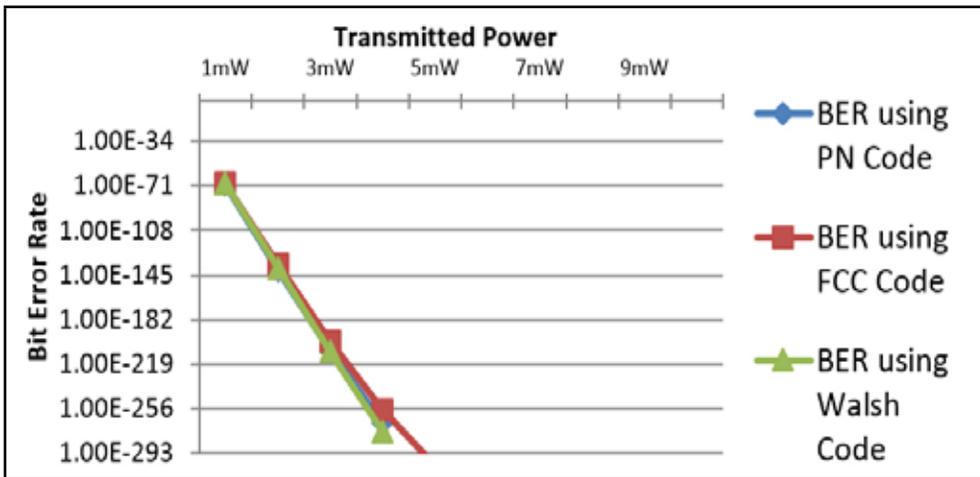
Power	Pre-DCF with Uniform FBG			Post-DCF with Uniform FBG			Symmetrical DCF with Uniform FBG		
	BER using PN Code	BER using FCC Code	BER using Walsh Code	BER using PN Code	BER using FCC Code	BER using Walsh Code	BER using PN Code	BER using FCC Code	BER using Walsh Code
1mW	1.69E-80	4.19E-78	9.80E-75	1.81E-70	4.88E-73	6.42E-76	6.99E-71	4.86E-69	9.24E-70
2mW	6.38E-157	2.79E-154	4.32E-146	1.22E-141	1.04E-145	7.59E-151	5.25E-142	1.24E-137	2.51E-140
3mW	1.33E-212	6.45E-210	1.10E-210	6.00E-210	3.78E-216	2.82E-223	2.13E-209	1.44E-201	1.35E-209
4mW	8.65E-237	4.33E-233	1.99E-273	5.92E-274	1.93E-282	1.42E-291	1.78E-269	2.37E-258	1.88E-276
5mW	1.19E-235	1.02E-228	0	0	0	0	4.50e-318	1.11E-304	0
6mW	4.11E-218	7.76E-206	0	0	0	0	0	0	0
7mW	6.28E-194	5.81E-178	0	0	0	0	0	0	0
8mW	2.31E-168	1.33E-149	0	0	0	0	0	0	0
9mW	1.01E-144	8.25E-126	0	0	0	0	0	0	0
10mW	2.85E-124	2.28E-106	0	0	0	0	0	0	0



(a) A comparative graph for the same proposed model using RZ modulation is drawn as shown in Figure 10. Pre-DCF with Uniform FBG Configuration



(b) Post-DCF with Uniform FBG Configuration

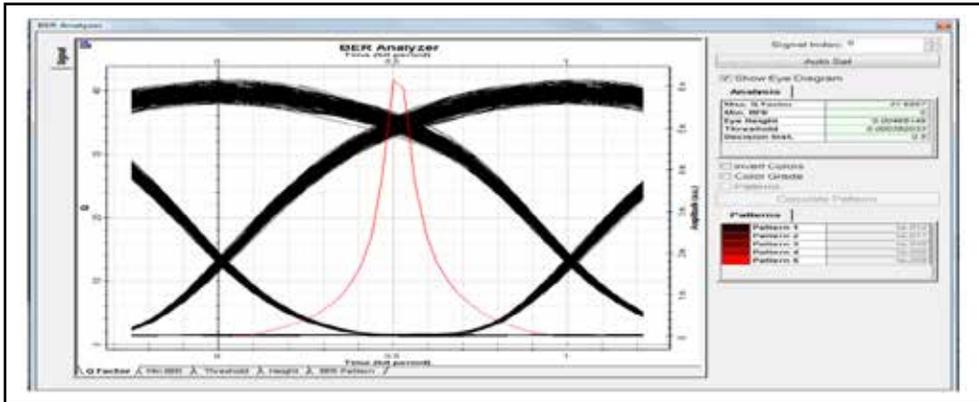


(c) Symmetrical DCF with Uniform FBG Configuration

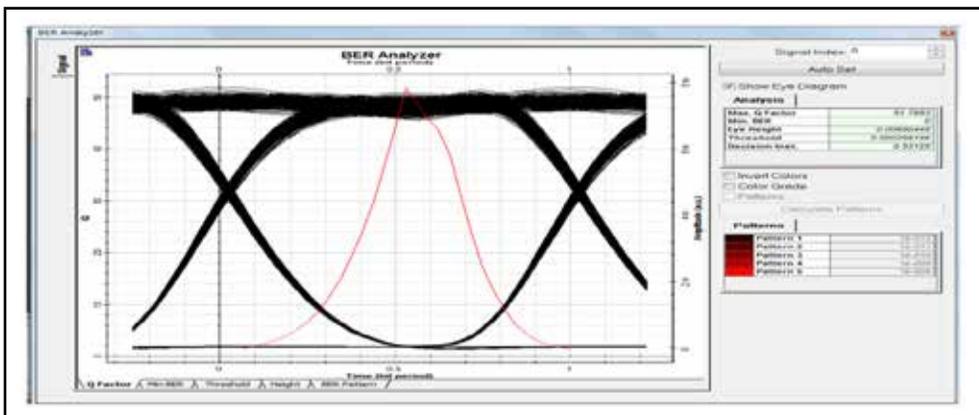
Figure 10: BER versus Transmitted Power for (a) Pre-, (b) Post-, and (c) Symmetrical Uniform FBG compensation technique using RZ modulation

BER Diagram

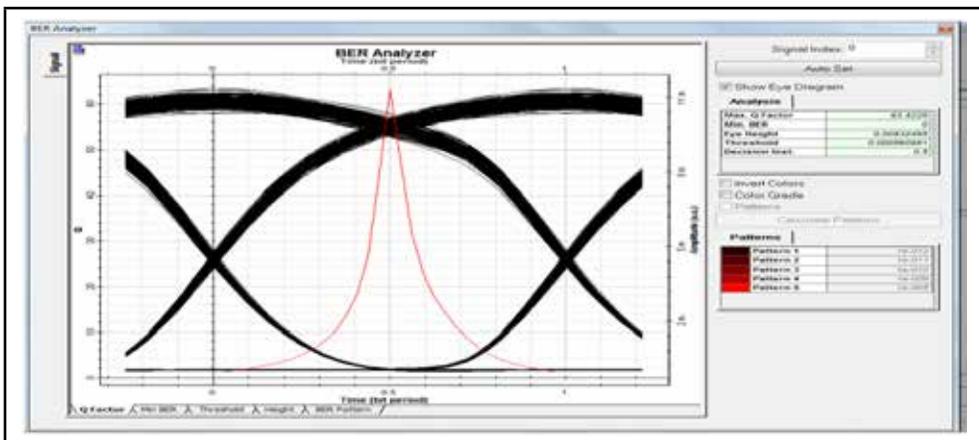
In this section, different eye diagrams are evaluated from the BER analyzer for the proposed model with different values of input power for NRZ and RZ modulations with different input sequence. The higher opening of eye or eye height in eye diagram is the parameter for the better performance of optical fiber link. Figure 11 and 12 shows the Eye diagram or BER diagram for pre-, post- and Symmetrical DCF with IDCFBG configurations using NRZ and RZ modulation for those values of input power and input sequence code in which we are getting the higher value of Q factor and minimum value of BER.



(a) Q-factor= 41.6897 and BER= 0 at 5 mw

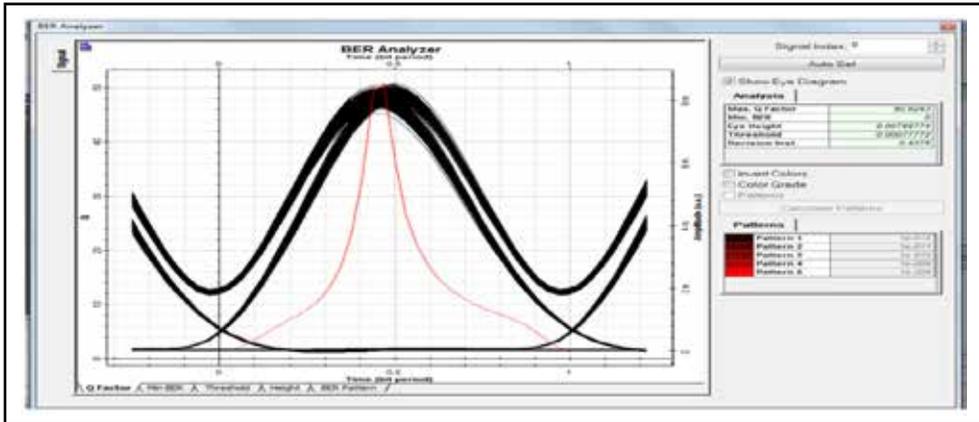


(b) Q-factor= 51.7953 and BER= 0 at 8 mw

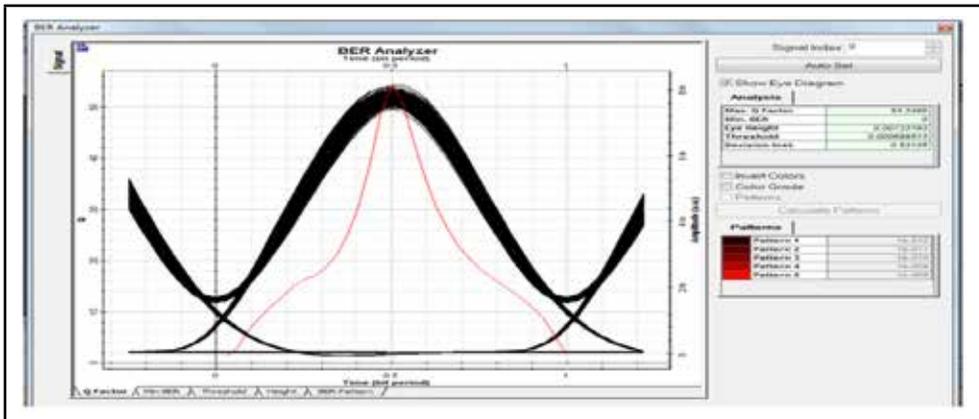


(c) Q-factor= 63.4228 and BER= 0 at 10 mw

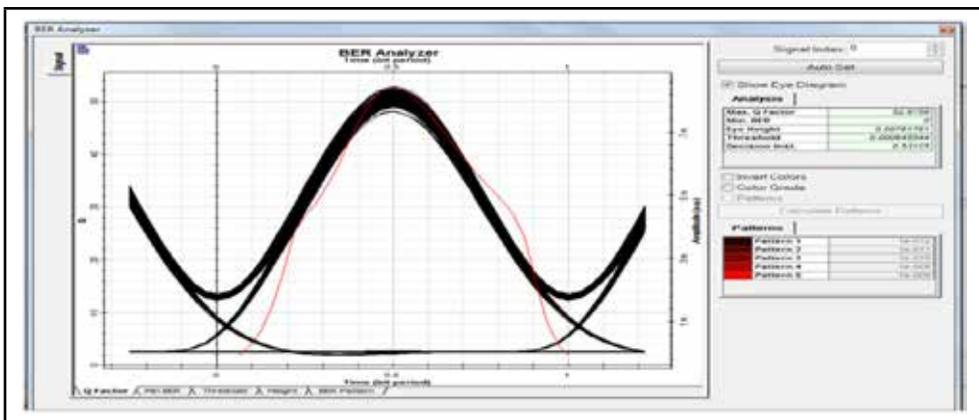
Figure 11: BER analyzer diagram for (a) Pre-, (b) Post-, and (c) Symmetrical DCF with Uniform FBG configuration using NRZ modulation with Walsh code



(a) Q-factor= 50.8243 and BER= 0 at 10 mW



(b) Q-factor= 54.3489 and BER= 0 at 10 mW



(c) Q-factor= 52.8758 and BER= 0 at 10 mW

Figure 12: BER analyzer diagram for (a) Pre-, (b) Post-, and (c) Symmetrical DCF with Uniform FBG configuration using RZ modulation for Walsh code

From the above eye diagrams, it can be concluded that the quality of eye opening of received signal is much clear by using the proposed model with Walsh code and provides the better performance for the dispersion compensation.

CONCLUSION AND FUTURE SCOPE

This work is completely focused on performance analysis of optical transmission system using DCF-Uniform FBG techniques having optical amplifier in order to compensate the dispersion phenomena. The performance parameters of 240 km optical link is investigated in terms of Q factor, BER and eye diagram for NRZ and RZ modulation formats with PN, FC and Walsh codes by varying the input CW laser power. From the analysis, it is concluded that when Walsh codes are used as user-defined input data sequence it gives the highest value of Q factor at 63.4228 and BER at 0 when the proposed model is used in symmetrical configuration with NRZ modulation at 10 mW. It is also concluded from the result analysis that when Walsh codes are used, it gives the highest value of Q factor and BER as compared to PN and FCC codes. In future, the proposed techniques can be applied by replacing uniform FBG by other dispersion compensator with DCF to compensate dispersion effects.

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ANALYSIS OF VOLTAGE AND CURRENT RELATED POWER QUALITY IN HYBRID SOLAR P-V /WIND SYSTEM USING UPQC

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*Monish Wakambam***

*Suraj Kumhar****

ABSTRACT

The real problems in diminution of power quality occurs due to the rapid growth of non-linear load that leads to sudden decrease of source voltage for a few seconds i.e sag, swell, harmonics in source and load current, voltage unbalance etc. All these problems can be compensated by using Unified Power Quality Controller (UPQC) and the operation of UPQC depends upon the available voltage across capacitor present in DC link. If the capacitor voltage is maintained constant then it gives satisfactory performance. The proposed research is basically on designing of Photo Voltaic (PV) /Wind energy fed to the DC link capacitor of UPQC so as to maintain proper voltage across it and operate the UPQC for power quality analysis. The said model is simulated in Matlab and results are verified by using FFT analysis. The proposed PV/ Wind energy-UPQC is design in Matlab simulation for reduction of voltage sag, swell, interruption of voltage, harmonics in load current and compensation of active and reactive power.

Keywords: Capacitor, diode, efficiency, Photo Voltaic, resistance, Unified Power Quality Controller (UPQC), voltage, wind turbine.

INTRODUCTION

The use of electricity is increasing very rapidly, so the necessity of renewable energy-based source is required for interconnection to the distribution network. The main drawbacks of the renewable sources are that the power generation is not continuous and it is season-based. To overcome these disadvantages, numbers of renewable sources are to be interconnected. The

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compensation principle and different control strategies of the UPQC in detail and performance of UPQC is examined by considering a diode rectifier feeding an RL load (non-linear load) that acts as a source of harmonics. The theory, modeling and application of a unified power quality conditioner has been described by [4]. The coordinated and integrated control of solar PV generators with the maximum power point tracking (MPPT) control and battery storage control to provide voltage, frequency (V-f) and P-Q control, respectively, with PV generator and battery storage support to an islanded Microgrid. Femia *et al.* have developed a scheme for maximum power point tracking (MPPT) of solar PV system using perturb and observe method. Gaeid *et al.* have designed a unified power quality conditioner (UPQC) including a series and a shunt active power filter (APF) to compensate harmonics in both the distorted supply voltage and non-linear load current. In the series, there is APF control scheme and a proportional-integral (PI) controller. Meanwhile a PI controller is designed in the shunt APF control scheme to relieve harmonic currents produced by non-linear loads. The major disadvantage of UPQC is that it cannot compensate the voltage interruption but proposed method can perform all the function as UPQC can and also compensate the voltage interruption.

PV/ WIND ENERGY INTEGRATED UPQC CIRCUIT AND ITS FUNCTIONS

We propose the design and development of a PV/Wind energy-UPQC system. By using instantaneous d-q control theory techniques along with PI and hysteresis band controller, the mitigation of voltage sag and swell under different balance and unbalanced load conditions are simulated. The use of a PV array and wind energy for retaining fixed DC link voltage is another distinguishing feature of the PV/Wind energy-UPQC system. With these functions, the proposed method is suitable for connecting at PCC. The proposed configuration with UPQC is shown in Figure 1. There is voltage interruption reimbursement and active power injection to the Point of Common Coupling (PCC) in addition to the other regular UPQC operation.

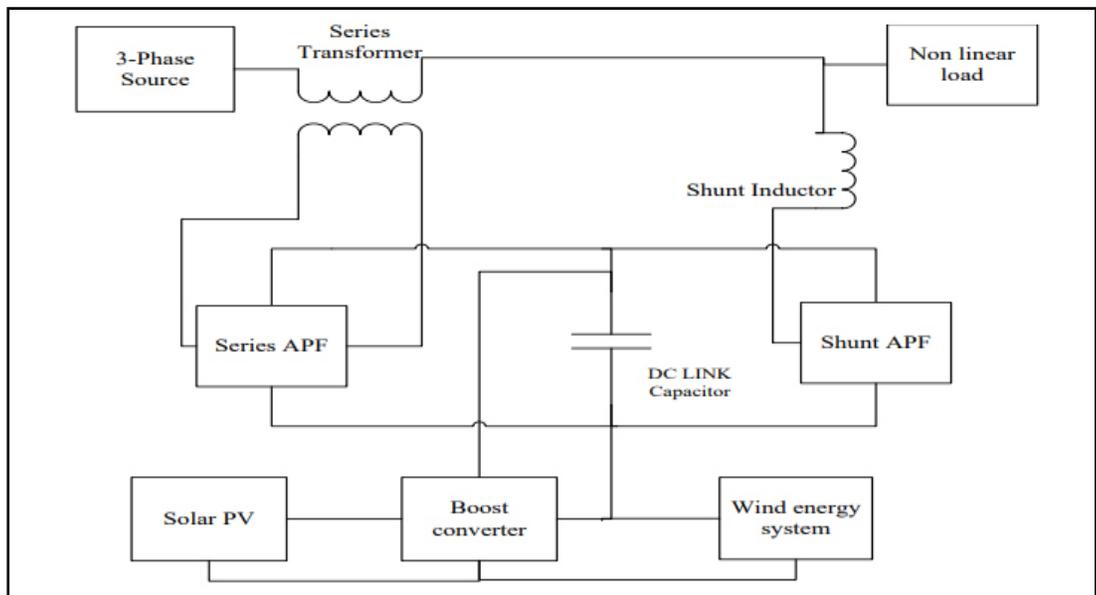


Figure 1: Basic Block diagram for PV/ Wind energy - UPQC system

Modeling of Solar PV

Solar photo-voltaic system works on the principle that when a light energy falls on solar cell, it converts the same to electrical energy. Figure 2 shows an equivalent model of solar PV system representing single diode model. It consist of a photo current I_{ph} which depends on temperature and irradiation, the series resistance represents the internal resistance due to which current 'I' flows and the shunt resistance describe the flow of I_{sh} which is a leakage current.

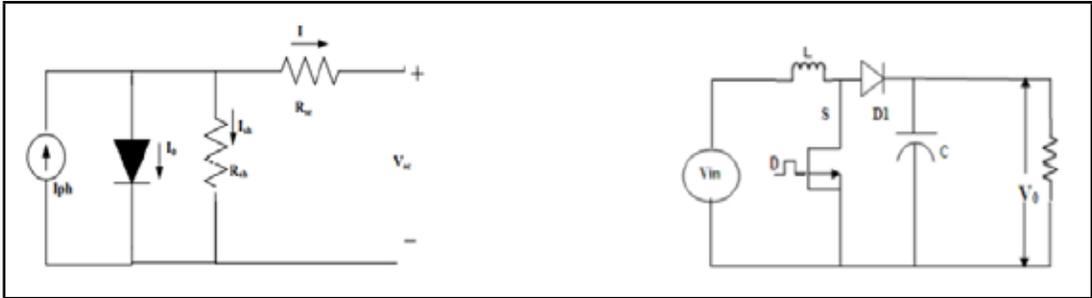


Figure 2:Solar cell single diode model Figure 3: Basic circuit for Boost converter

The load current, photo current and other equation are summed up below:

$$I = I_{ph} - I_0 - I_{sh} \tag{1}$$

$$I_{ph} = [I_{sc} + K_i(T_k - T)] \times \frac{G}{1000} \tag{2}$$

$$I_{RS} = \frac{I_{sc}}{[\exp(q \times V_{oc} / N_s \times k \times A \times T) - 1]} \tag{3}$$

$$I_0 = I_{RS} \left[\frac{T}{T_r} \right]^3 \exp \left[\frac{q \times E_{g0}}{Ak} \left\{ \frac{1}{T_r} - \frac{1}{T} \right\} \right] \tag{4}$$

$$I_{PV} = N_p \times I_{ph} - N_p \times I_0 \left[\exp \left\{ \frac{q \times V_{PV} + I_{PV} R_{se}}{N_s \times AkT} \right\} - 1 \right] \tag{5}$$

Where,

I_{pv} -Diode photo current

I_0 -Reverse saturation current of diode

V_{pv} -Diode voltage

V_{oc} -Open circuit voltage

R_{se} -Series Resistance

R_{sh} -Shunt resistance

MPPT

The solar panel efficiency is increased by the use of the MPP technique. The MPPT is the application of maximum power transfer theorem which says that the load will receive maximum power when the source impedance is equal to load impedance. The MPPT is a

device that extracts highest power from the solar cell and changes the duty ratio of boost converter so as to match the load impedance to the source.

P and O MPPT

There are many method of MPPT out of which P & O technique is mostly used by the researcher due to its simplicity and cost effectiveness. This method works on an algorithm that first PV panel terminal voltage and current are calculated and related value of power is measured denoted by $P(k-1)$. The detailed algorithm is shown in flow chart at Figure 4 which describes the algorithm for designing the MPP system using P&O by Matlab simulation.

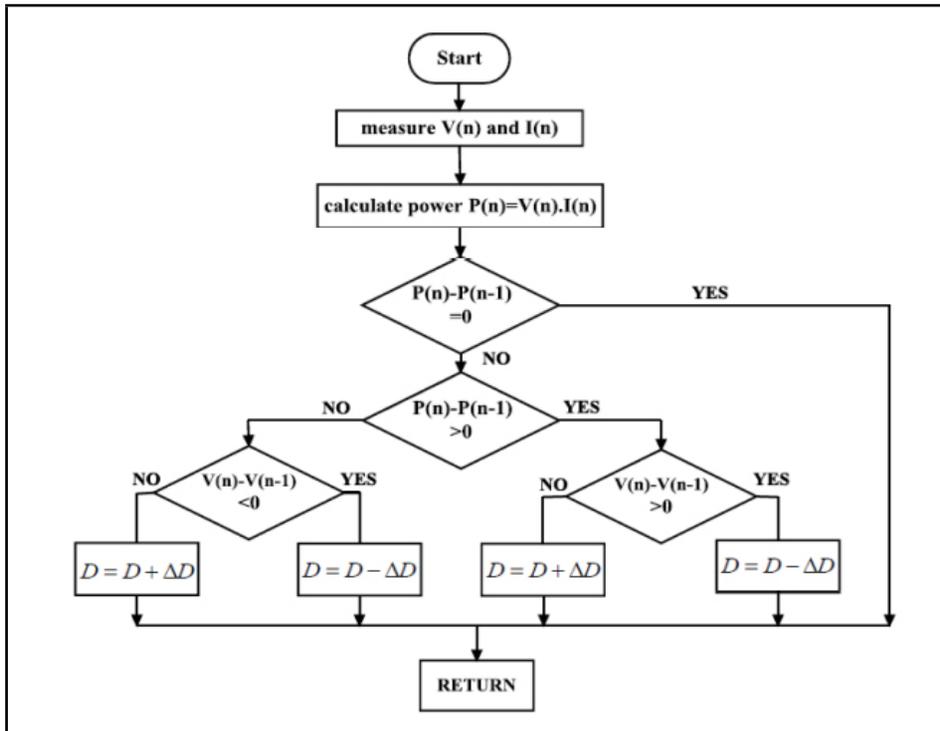


Figure 4: Flowchart of P & O MPPT algorithm

DC/DC Step up Converter

A step up DC/DC converter is a boost converter which increases the solar voltage to desired output voltage as required by load. The configuration is shown in Figure 4 which consists of an inductor L, switch S, diode D1, capacitor C for filter, load resistance R and DC input voltage V_m . When the switch S is turned ON by using switching pulse, the boost inductor stores the energy fed from the input voltage source. During this time, the load current is maintained by the charged capacitor so that the load current should be continuous. During the switch off period, the input voltage and the stored inductor voltage will appear across the load hence the load voltage is increased. The load voltage depends upon whether switch S is in ON or OFF mode and this depends upon the duty ratio D. The switch conducts with a duty ratio D and then the output DC voltage is given by equation 6:

$$\frac{V_o}{V_s} = \frac{1}{1-D} \tag{6}$$

The minimum value of duty cycle D_{min} and maximum value of duty cycle D_{max} used for a zero-loss boost converter is given by the following equation:

$$D_{max} = 1 - \frac{V_{in-min}}{V_o} \times \eta \tag{7}$$

Where, D_{max} is the maximum duty ratio required to keep the converter in Continuous Conduction Mode (CCM)

$$D_{min} = 1 - \frac{V_{in-max}}{V_o} \times \eta \tag{8}$$

Where, D_{min} is the minimum duty cycle required to keep the converter in CCM

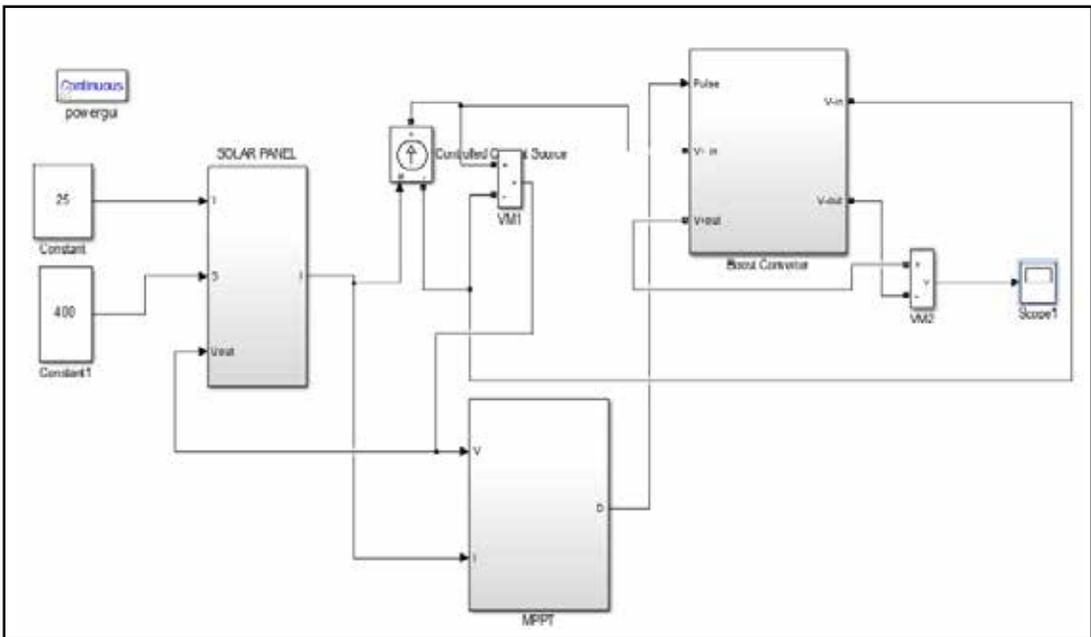


Figure 5: Simulation of Solar PV with MPPT and Boost converter

Matlab/Simulation of PV System

In general, the efficiency of a PV unit is extremely low; therefore it is essential to operate it at the peak power point so that the highest power can be provided to the load irrespective of continuously varying environmental conditions. This improved power makes it well again for the use of the solar PV unit. A DC/DC converter which is located next to the PV unit extracts maximum power by matching the impedance of the circuit to the impedance of the PV unit. Impedance matching is possible by changing the duty ratio of the boost converter. The simulation of solar PV with P&O MPPT and Boost converter is shown in Figure 5.

The P-V and I-V characteristic of PV module is shown in Figure 7 and Figure 6.

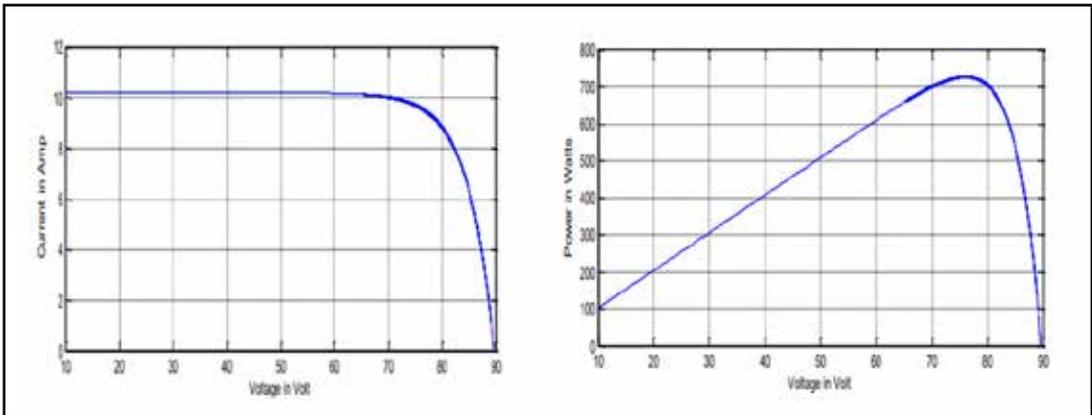


Figure 6: I-V Characteristics of PV module Figure 7: P-V Characteristics of PV module

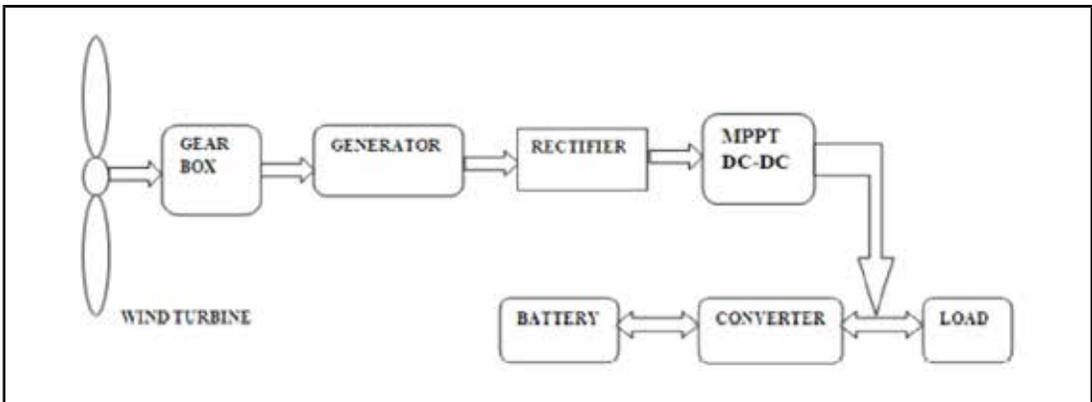


Figure 8: Wind energy system block diagram

WIND ENERGY SYSTEM

The diagram shown in Figure 8 is the basic wind energy conversion system model. The wind kinetic energy IS first converted to rotational motion and by the use of gear box it matches the speed of turbine and generator. The function of generator is to convert the mechanical energy of turbine to electrical energy. A rectifier is used to convert the AC voltage to DC and a battery is connected in such a way that it can be charged in both the way i.e. a bidirectional converter is used to charge the battery.

Modeling of Wind Turbines

The kinetic energy of wind is converted to rotational motion i.e. wind power to mechanical power conversion is done with the help of wind turbine blade in contact with wind speed. So different equations are given for power generation from wind.

$$P_m = \frac{1}{2} \pi \rho C_p(\lambda, \beta) R^2 V^3 \tag{9}$$

Where, P_m – Mechanical power, ρ –Air density, β –Pitch angle, R –Blade Radius–Speed of the wind λ is the tip-speed ratio, given by $\lambda = \Omega R / V$. Where, Ω - Rotor speed of rotation (in rad/sec) and C_p can be expressed as the function of the tip-speed ratio (λ)

$$C_p = \frac{1}{2} \left(\frac{116}{\lambda_1} - 0.4\beta - 5 \right) \exp \frac{-165}{\lambda_1} \tag{10}$$

$$\lambda_1 = \left(\frac{1}{\frac{1}{\lambda + 0.089} - \beta^3 + 1} \right) \tag{11}$$

where C_p –Power coefficient of turbine and λ_1 –Any constant

Permanent Magnet Synchronous Generator (PMSG)

In case of (PMSG) permanent magnet synchronous generator, the magnetic field is stationary and the flux is produced by permanent magnet not by electromagnet, therefore a separate supply is not required for creation of magnetic field and the field flux remain constant. Another advantage of PMSG is that there is no requirement of slip ring. All other construction remains same as that of normal synchronous generator. The e.m.f induced in a synchronous generator.

$$E = 4.44 \Phi_m t f \tag{12}$$

Where, f - Frequency in Hz, Φ_m - maximum flux in Wb and t - Number of turns. The simulation of wind turbine with generator and rectifier is shown in Figure 9.

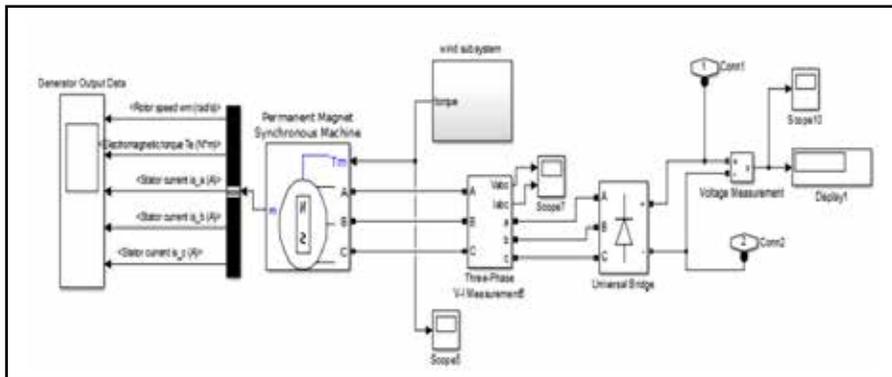


Figure 9: Simulation of wind system with PMSG and Rectifier

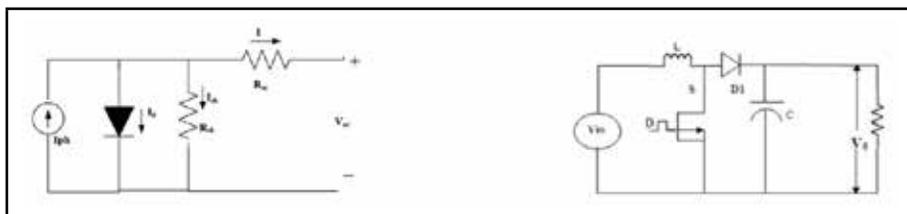


Figure 10: Block diagram of UPQC

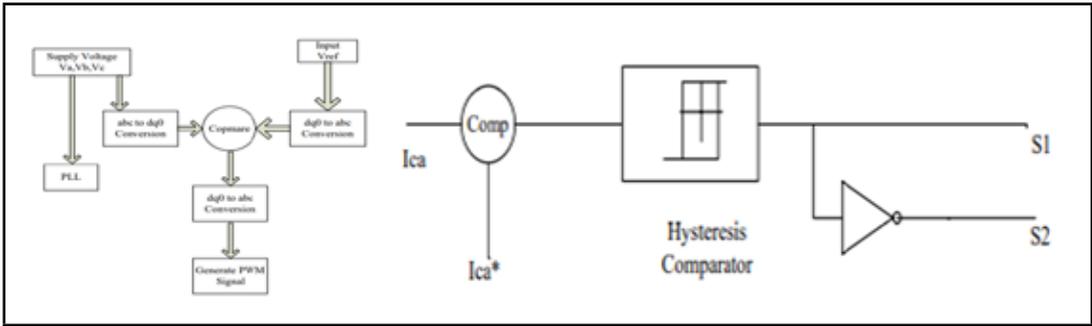


Figure 11: Control scheme of series Active Filter Figure 12: Principle of hysteresis current controller

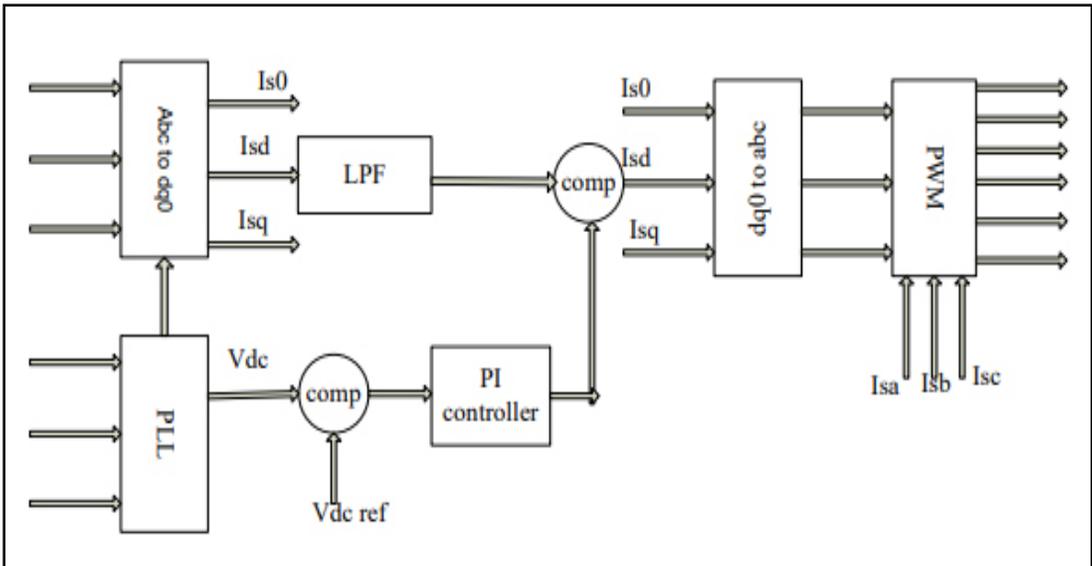


Figure 13: Control scheme of Shunt Active Power Filter

CONTROL STRATEGIES OF THE UPQC SYSTEM

There are several control strategies available to find out the reference values of the voltage and the current of UPQC. Figure 10 shows the block diagram for control strategies of UPQC system. The concept of instantaneous active power (p) and reactive power (q) and its application in shunt filter reference current generation, the synchronous reference frame theory, the fuzzy logic control (FLC) for the control of UPQC method are some of the above mentioned control strategies. Based on the above discussion, d-q theory with hysteresis current control mode is suitable for parallel mode operation of UPQC system and d-q theory with PWM voltage control mode is suitable for interruption mode operation. The hysteresis control method is simple to implement and it has enhanced system stability, increased reliability and mitigates power quality problems.

Control Scheme of Series Active Filter

The block diagram for series APF control scheme is shown in Figure 11 where Park’s

transformation method is used for generation of unit vector signal. The actual voltage and the reference are converted to $dq0$ from abc coordinates and both are compared in $dq0$ reference frame. After the comparison both are again converted to abc reference frame. From PLL (phase locked loop), θ can be generated which is required for Park's transformation and inverse Park's transformation. The switching pulses required for VSI conduction are generated from the comparison of selected output voltage (V_c^*) with the sensed series APF output voltage (V_c) in a hysteresis voltage controller.

Control Scheme for Shunt Active Power Filter

To eliminate the harmonics, the equal amount of harmonic compensating current is injected in opposite phase w.r.t the harmonic current. The control scheme shown in Figure 13 includes the transfer of source current from a-b-c to d-q frame. In non-linear load, the source current includes both oscillating as well as dc component. The dc component is only positive sequence component but the oscillating component includes positive, negative and zero sequence components. To maintain the DC link voltage, this active filter will absorb some active power from the power system. The shunt active filter eliminates the harmonics component present in the source current & make the source current wave form pure sinusoidal by acting as a current controlled voltage source inverter.

Design of Shunt Apf

- a. *DC link capacitor*: The active and reactive power flow to the system is provided by the link capacitor when it is required.
- b. *Voltage source inverter*: The electronics device which converts direct current to alternating current when PWM signal is given to the gates of its IGBT or GTO etc. Here the main function of the VSI is to compensate the source current harmonics present by injecting the equal and opposite compensating current to the system.
- c. *Hysteresis Current Controller*: Hysteresis current controller shown in Figure 12 generates PWM signal by comparing the reference signal w.r.t to the actual signal the figure below shows the generation of PWM signal by comparing the two current signals.

SIMULINK MODEL OF SOLAR PV/WIND ENERGY-UPQC SYSTEM

Result Analysis

The simulink models of PV/Wind energy-UPQC are simulated in Matlab which is shown in Figure 14. It consist of series APF, shunt APF, solar PV, wind energy and boost converter. The simulation result shown in Figure 15 is without series filter where voltage sag is clearly shown from 0.1sec. to 0.3sec. When the series active filter injects voltage from 0.1sec.to 0.3sec shown in Figure 16, the load voltage is compensated to actual value as shown in Figure 17. The Figure 18 shows the simulation result load current before compensation and Figure 19 shows the harmonics content i.e. 16.6% by using FFT analysis. When the shunt active filter injects current from 0.1sec.to 0.4sec as shown in Figure 20, the load current harmonics is reduce to2.33% as shown in the FFT analysis in Figure 22 for which the load current is nearly sinusoidal as shown in Figure 21.

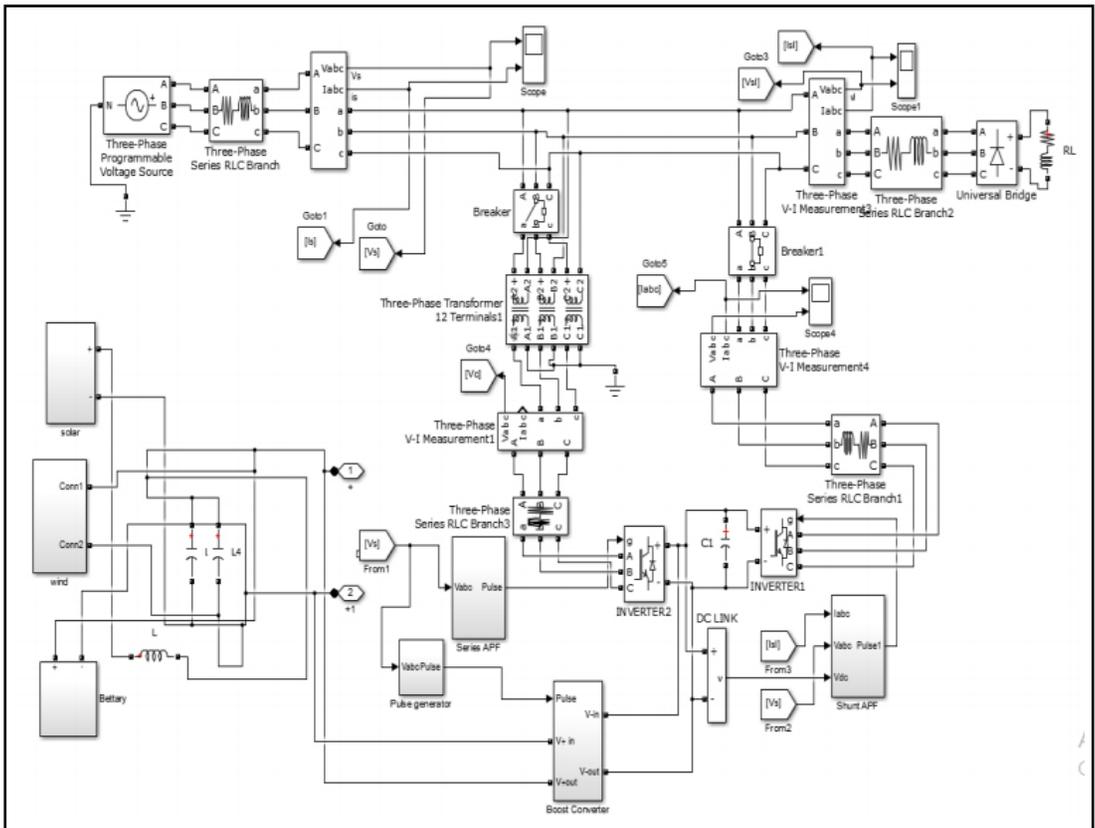


Figure 14: Simulation of PV/Wind –UPQC system

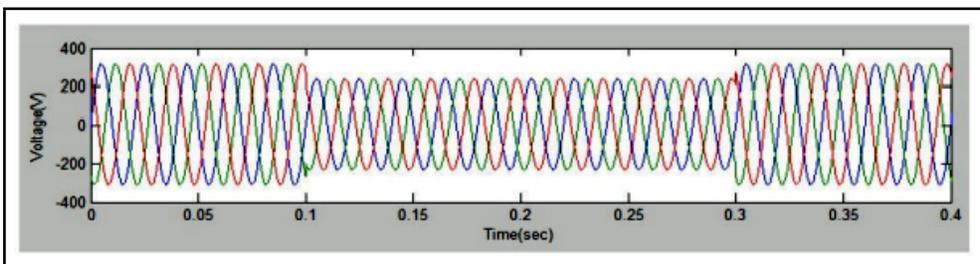


Figure 15: Load Voltage without SAF

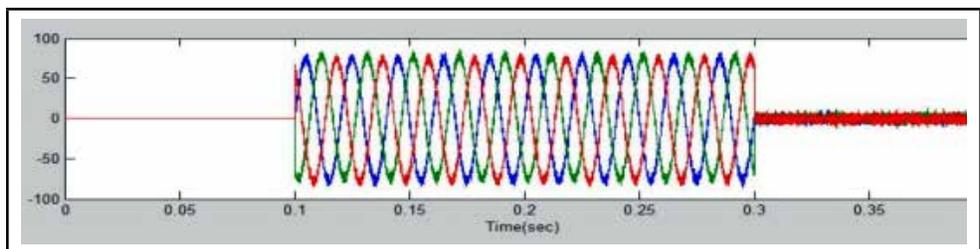


Figure 16: Injected Voltage

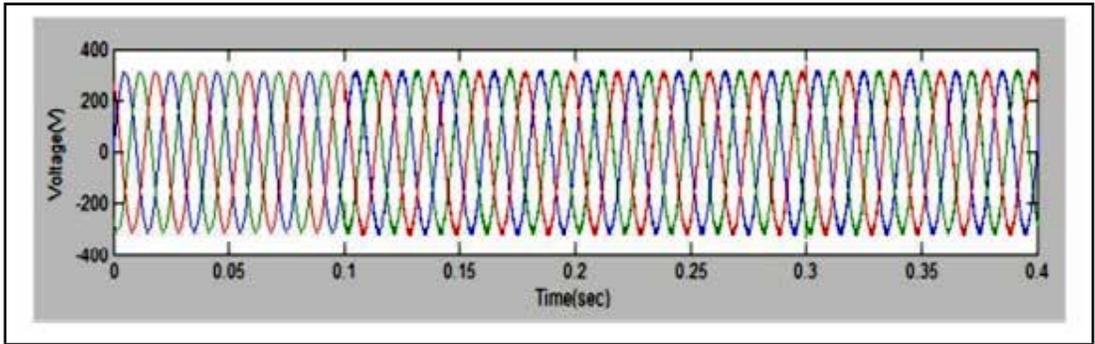


Figure 17: Load Voltage with SAF

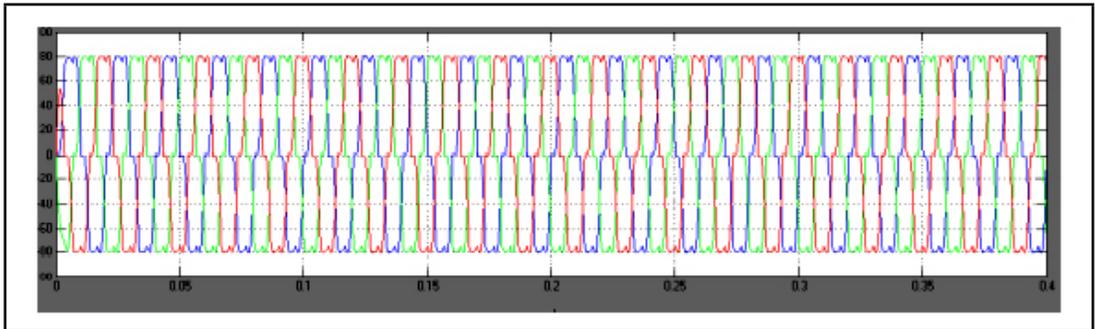


Figure 18: Load current before compensation

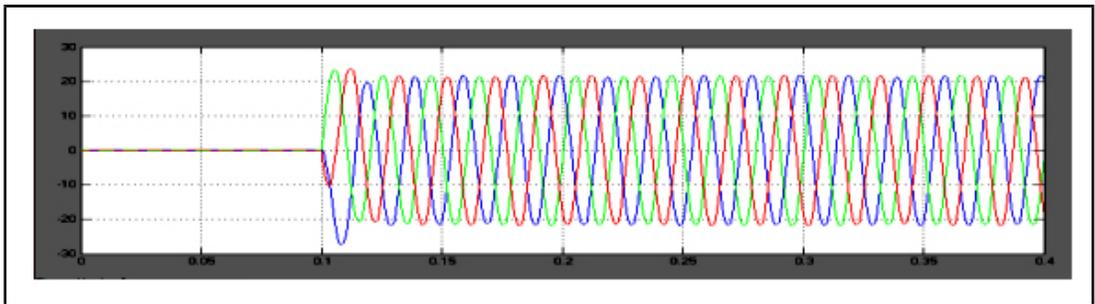


Figure 19: Current Injected by shunt active filter

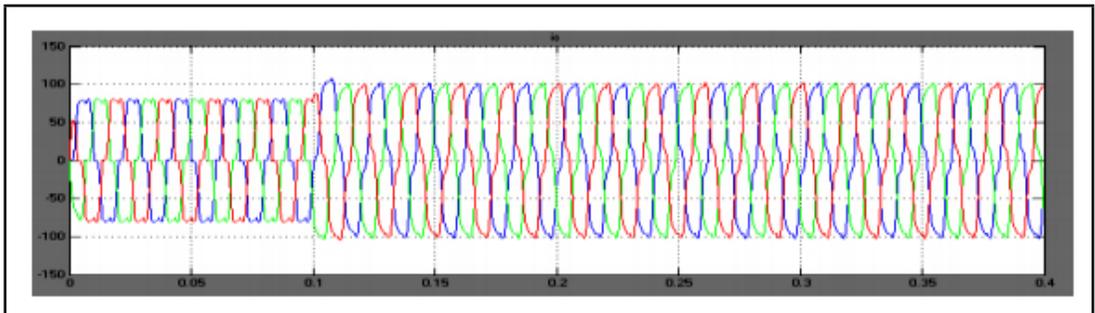


Figure 20: Load current with shunt APF

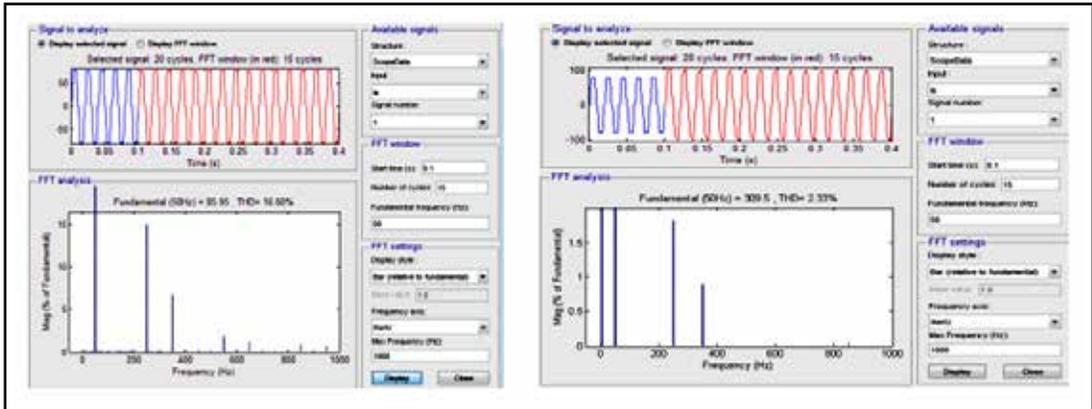


Figure 21: Harmonics analysis without shunt APF Figure 22: Harmonics analysis with shunt APF

CONCLUSION

The advantage of Photo Voltaic / Wind energy System is to retain a constant voltage of 700 volts across the DC-Link capacitor. In this work the solar PV with boost converter output is obtaining 700V and Wind energy with boost converter output is also 700V and simulation of PV/ Wind energy -UPQC maintains constant voltage of 700V when Sag, Swell and Interruption occur. It also reduces the harmonics content to 2.33% if any nonlinear load is associated. Hence the proposed scheme can regulate active and reactive power injection to the grid and compensate voltage interruption in addition to the other usual operation of UPQC.

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EMERGING RESEARCH TRENDS IN TEACHER EDUCATION

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*Ishrat Naaz***

ABSTRACT

Teacher Education is a program that is designed to equip future teachers with the required set of knowledge, attitude and skills. Teacher Education is a dynamic field of study. It changes with the changing needs of the students, society, trends and technology. However, this change must be brought through proper research to get the maximum benefit of the change. In India, the research on teacher education has gained attention after the independence to enable the teacher education programs to respond dynamically to the challenges of this field. The scope of teacher education is very broad and the scope of research in this field is therefore also wide. Research on teacher education should not be carried out in one framework. Teacher education is defined by the problems discussed, including teachers, students, teacher education foundations, teaching-learning methods, teaching-learning environment, curriculum, assessment and evaluation etc. This paper is an attempt to study the various emerging research trends in the field of teacher education.

Keywords: Research Trends, Teacher Education, Teaching-Learning Environment, Teaching-Learning Process.

INTRODUCTION

The National Council for Teacher Education has defined teacher education as, “A program of education, research and training of persons to teach from pre-primary to higher education level”. Teacher education programs in India are stage-specific in line with the stage-specific education such as pre-primary, primary, secondary and higher education. The main objective of teacher education is to prepare reflective teacher so as to deal with the everyday challenges in the classroom situation. Though, teacher education programs are not very new in India but for a developing country like India where the scenario is changing every minute, the teacher education program must be evolving to accommodate the changes in the Indian education system. In India the research in teacher education gained attention

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after the independence to enable the teacher education programs to respond dynamically to the challenges of this field.

RESEARCH IN TEACHER EDUCATION

Research in teacher education is the scientific study that deals with the attributes related to the teaching-learning process, teacher, students or the institutions. It can be inspection of education, teaching-learning processes, students' behaviour or teacher attitude etc. Like any other research, educational research includes the quest for answers to the unsolved problems in the field of education. Researches are viewed as the facets that empower the individuals to bring out improvements and innovations in their responsibilities and functions.

Importance of Research in Teacher Education

Teacher plays the central role in our education system. Teacher education is a program that is designed to equip future teachers with the required set of knowledge, attitude and skills. Thus, teacher education has a direct impact not only on the teaching learning process but also on the students. Teacher education is a dynamic field of study. It changes with the changing needs of the students, society, trends and technology. However, this change must be bringing through proper research to get the maximum benefit of the change. Research in teacher education as in the other disciplines is vital for providing useful and reliable knowledge through which the teaching-learning process can be made more effective.

DIVERSITY IN RESEARCH IN TEACHER EDUCATION

Teacher education is a multidisciplinary field. The scope of teacher education is very broad and thus the scope of research in this field is also broad. Teacher education research cannot be encapsulated within a single paradigm.

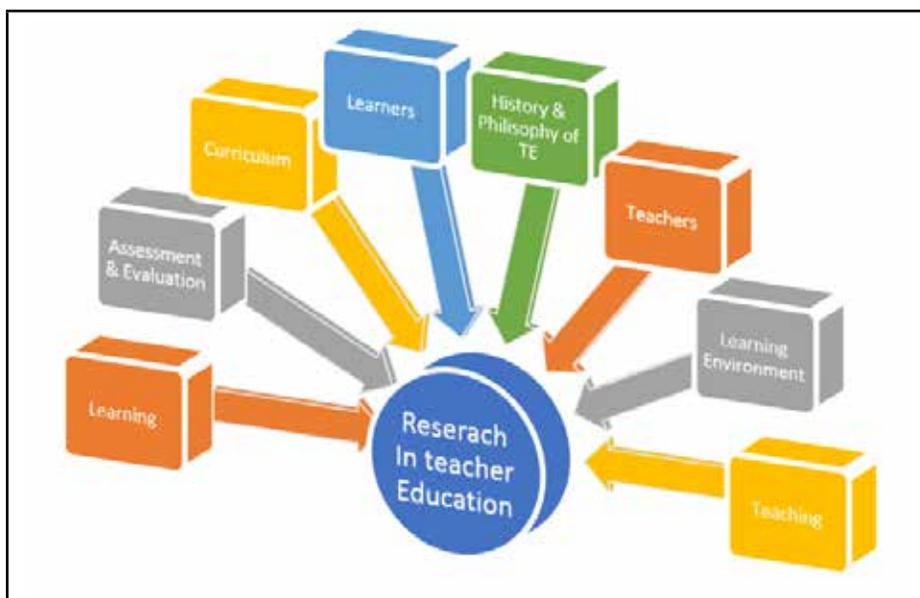


Figure 1: Diversity of Research in Teacher Education

Figure 1 deliberates the various scope of teacher educations such as teachers, students, teacher education foundations, teaching-learning methods, teaching-learning environment, curriculum, assessment and evaluation etc.

With the changing trends of education and changing roles of teachers the research trends likewise changes. Researches that are currently in trends in the field of teacher education are Philosophical Foundation, ICT in Teacher Education, Teacher ethics, Teachers Attitude towards online teaching and sustainability in education and pre-service teachers as shown in the Figure 2.

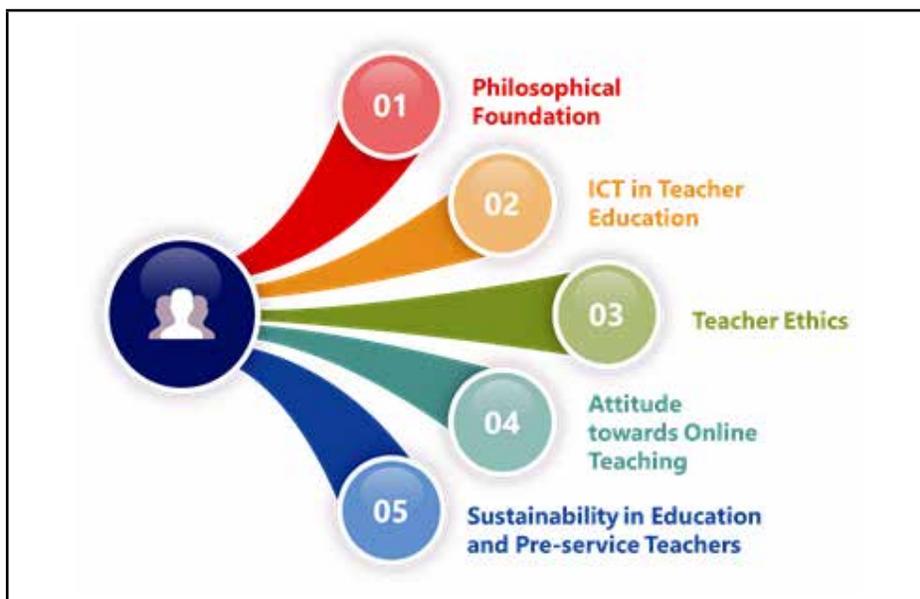


Figure 2: Emerging Trends in Teacher Education

Philosophical Foundation

Education is the medium for progress of human civilization. The educational question that arises, ultimately find answers in the philosophy of life. Philosophy provides the aim and objective of education and education help to realise the values of philosophy. Thus philosophy and education are closely inter-related with each other. J.S. Ross rightly says: “*Philosophy and education are like the two sides of the same coin; the one is implied by the other; the former is the contemplative side of life, while the latter is the active side.*”

Therefore, philosophical foundation is one of the most researched trends in teacher education.

Reflection of Indian and Western Philosophy in Modern Education

Dash (2018) compares the Gandhian philosophy and the philosophy of Vivekananda according to the relevance in the present education. This futuristic study takes into account the education scenario from the year 2018 to the year 2028. According to Gandhian philosophy, in the modern India, literacy is not enough, and it is not the end of the education. Whereas,

Swami Vivekananda advocates the Indianisation of the education. He also emphasised on the mass education and that without mass education, no country can become a developed country. As per Gandhian philosophy, a teacher must have originality and must be able to inculcate self-confidence in students, that a teacher must have freedom to adopt his own way of teaching. But Vivekananda thought “true teacher is he who can immediately come down to the level of the students and transfer his soul to the student’s soul”. A teacher must be able to understand his students and for this a teacher needs a pure heart and soul. At the same time a teacher must be a lifelong learner. Both Gandhi and Swami Vivekananda emphasis on a national system of education irrespective of any diversity. Westbrook (2018) conducted a research on how Dewey’s philosophy of experiential learning can be applied to online learning. One should make the online learning module in such a way that it is illustrative and engages more sense of the students in order to provide a concrete learning. The emphasis should be on giving meaningful assignment that make the learning experiences genuine and joyful. Alam (2019) studied Sir Syed Ahmed Khan’s ideas of modern education. Sir Syed believed that education is the instrument that can change the mindset of people. He also emphasised that upliftment of masses is possible through education and there must be a link between traditional and modern education.

ICT in Teacher Education

According to UNESCO, “ICT is a scientific, technological and engineering discipline and management technique used handling information, its application and association with social, economic and cultural matters” (UNESCO,2002).

The aspect of the classrooms is changing every day. The teacher education organizations should prepare the pre-service teachers to keep up with the skills. ICT is not only a crucial instrument for teachers in their classroom work, but it also provides them prospects for their own professional progress.

Jadhav (2011) has done a research in Bhopal on ICT and teacher education. He discusses about the current scenario of integrating ICT in teacher education and it is noted that curricular activities are not so widespread as to turn the prospective teacher into a learning facilitator. The prospects of developing student teachers through current curricular strategies for ICT-based teaching learning seem to be disappointing. Yadav (2016) has done a research on the significance of ICT in teacher education. His paper discusses several approaches of ICT and how it can be beneficial for pre-service teachers. However, the paper can be more helpful if it incorporates the way of integrating ICT in teacher education. The technique to develop techno-based pedagogies can be proved useful for the teacher educators. Somashekhara, M. and Jagannath K. Dange. (2016) studied the possibilities of ICT in teacher education. Their paper discusses various aspect in which ICT can be integrated into the integral activities of teacher education. It gives an insight how ICT helps in making a quality teacher. ICT must not be treated only as a subject, but it must be treated as a skill.

Teacher’s Ethics

Teacher is an integral part of the educational system and the place that a teacher holds in the education system and the society together with his moral principle requires use of certain

ethics from which his professional privileges and commitments are generated. A teacher's professional relationship not only depends upon his/her professionalism but also on his/her personal moral values.

Ayeni & Adeleye (2014) studied on teacher education and social ethics. Both found that teachers need proper training in order to fulfil the social need especially in terms of morals. This is a descriptive paper using case study. If we integrate the moral social ethics as a part of the teacher education programs, it will help the student-teacher to deal with various dilemma related to ethics. Naaz (2015) conducted a research on student-teacher perception of professional ethics. It shows that the professional ethics must be compatible with the persons' morality and that the moral and value education plays a significant role in strengthening the professional ethics for student-teachers. Sawhney (2015) studied the professional ethics and commitment in the teacher education. Teacher's education institutes must be held accountable to the society. And the teacher must follow the ethics industriously. However, the commitment is more related to the aptitude of the teacher so the admission into the teacher education program must follow a process so that only those candidates will take admission who have a genuine interest in the teaching profession. The study shows that a teacher must encourage equality in the classroom. The most important thing is that a teacher must be aware that his/her own personal, political views should not affect the students of his/her class. Teaching is not just a profession like other profession. It impacts many lives on daily basis. So, the code of ethics must be followed rigorously, and it should be a part of the teacher's education so as to inculcate these ethics among the student-teachers.

Attitude towards Online Teaching

As the world gets tormented by the COVID-19, all the sectors including education has got affected abruptly. However, the education sector has not shut down completely. In this pandemic, technology came to the rescue and now online learning is the proper instrument. For the past few years, distance learning evolved as a new way of learning. Distance learning has developed in the last few years as a modern form of learning. There is no way that it would replace the conventional way of learning, but when it comes to reaching the masses, it is easier. To make online learning successful fully depends upon the teacher's attitude towards the tool. Various researches have been done in this area in the last few months around the globe.

Rama (2020) conducted research in Bali to study the attitude of science teachers towards the online learning. Science is a practical subject and it is quite difficult for a teacher to give hands-on experience to students in the online classes. Tyagi (2020) conducted a research in Chandigarh to study the attitude of university teachers towards online learning. This study was about the different strata of teachers e.g. government/private, male / female to gauge whether teachers are in favour of online teaching or not. Another research was conducted by Mardiana (2020) in Indonesia on the lecturer's attitude towards the online teaching. The most common findings in all three researches was that though teachers have a positive attitude towards the online learning, but they strongly feel the lack of training to take online classes effectively. Teachers feel that the institutes must provide workshops so that the teaching can be more effective, and the learning outcome

can be improved.

Sustainability in Education and Pre-Service Teachers

Sustainability is a process of utilizing the natural resources in a way that it will not affect the future requirements. The agenda is to be saving the resources for the next generation. Sustainability can be achieved only with a change in the mindset. To achieve this mindset, change-education is probably the only tool. ESD i.e. Education for Sustainable Development is the way to empower the people to achieve sustainability.

ESD inspires people to actively participate in the creation of ‘a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainable future and for positive social transformation’ (UNESCO, 2005, p. 6).

Lahiri (2017) studied education for sustainability according to the NCFTE 2009. The study found that NCFTE is consciously crafted to aware the pre-service teachers about the global environment. In India, ESD is still a distant dream. Firstly, the teacher education must include the practical activities so that teachers can inculcate the value of sustainability. Secondly, to get the optimum result, in-service teachers must be trained for the same. Brandt & Barth (2020) conducted a study on the 4 Cs of learning in pre-service teacher education for sustainability. The four forms of connection (the 4 Cs) i.e. personal, professional, social, and structural are impactful in order to the student-teacher learning of sustainability. This is a research-based paper based on experiment done on 100 pre-service teachers and four instructors. Azcárate (2020) studied the perception of pre-service teachers on ESD. The study shows that the pre-service teachers have positive attitude towards the sustainable development goals, but the training is lacking. From all these research papers, one thing is clear that the pre-service teachers are going to educate the future generation and thus they need training on ESD so that they can pass the same knowledge to the next generation. This type of program must be a part of teacher education.

CONCLUSION

Schreurs & Dumbraveanu (2014) found that the recent trends in education shows the paradigm shifts from traditional teacher-centric education to learner-centric education. Gone are those days when teaching-learning process were determined by “what is taught”. Now it’s, “how it is taught”. To improve the quality of education, it is very important to connect the teacher education to classroom learning. The last few decades have seen a greater shift from teacher training to teacher education, not only in the content and structure, but also the whole aspect of teacher education programs. Study shows that teacher education is considered as a field of insufficient research. Teacher educators and teachers need to involve in research, in order to keep themselves up-to-date with the newest developments in their field and to gain knowledge about effective pedagogical and instructional techniques. Research on teacher education have greater benefit for the education system as a whole and teachers specifically. It will also help in improving the learning outcomes of learners, for the fact that every research conducted in teacher education will lead to improve the quality of teachers.

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