Institution of Electronics and Telecommunication Engineers

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A Quarterly News Letter

SIGNAL

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CHAIRMAN'S MESSAGE

Mr. P. S. Biswas

It is a matter of pride and pleasure that we are able to publish the 4th edition of 16th volume of the News Letter of IETE Kolkata Center, "SIGNAL"(Volume 16, No. 4) in this difficult period.

But it is a hardly a compensation for the mega events that we missed because of the lockdown. I am particularly referring to the Eastern Zonal Seminar. Our every preparation was in the final stage, to hold the seminar on 29th -30th of March. About 30+ articles for publication were reviewed and kept ready. Good amount of work was done to prepare the infrastructure. But the virus struck a blow to everything. We may stage it in the month of May, if everything gets back to normal.

Please note that the IETE, Kolkata website has been revamped to a new and better look (WWW.ietekolkata.org). We shall look forward to your comments on this site. Also, we will appreciate discussions on the articles published in this issue in the mentioned pages of the website(link:www.ietekolkata.org).

I wish you all best in this difficult time. Stay well, stay safe.

Partha S Biswas.

Chairman, IETE Kolkata Center

Members

EVENTS

A ONLINE "VOICE OVER POWERPOINT PRESENTATION COMPETITION"

IETE Student Forum , Electronics and Communication Department of Narula Institute of Technology organized a online "Voice Over PowerPoint Presentation Competition" on 12th April,2020 at 4pm ,through the Zoom Application. The topic given was to make voice-over PowerPoint presentation on COVID-19 and its Challenges. The COVID-19 or Coronavirus disease is an infectious disease caused by a new virus marked as a pandemic disease. The Students of IETE Student Forum with the coordinators, and Head, ECE Department have taken the initiative to organize this competition during the period of quarantine #Gharpe-Padai CoronaSeLadai. Participants presented the PowerPoint presentation within the given time in ZOOM Plat form . The session was very much informative. The session came to an end by the vote of thanks given by our teachers and members of the organizing committee. Thus, the competition was successfully conducted for the day. The Winners and runners were congratulated by everyone at the end of the session. The session came to an end by the vote of thanks given by our teachers and members of the organizing committee.

Fight Against CORONA— Stay Home, Stay Safe

EDITOR'S COLUMN

Dr. Jyotsna Kumar Mandal

The IETE Kolkata Center organizing various activities during last two years. Two such Mega Events were scheduled in this month. One is collaborative Programme, the International Conference ICCIC 2020 scheduled during 21-22 March 2020 at IETE Kolkata Center and the other mega activity is ISF Convention/Zonal Seminar/International Conference IOTWR 2020, selected papers from which scheduled to be published in the International Journal of Hybrid Intelligence, Inderscience. This event was scheduled during 28-29 March 2020. Due to the present situation the ICCIC 2020 and the Student Convention/Zonal Seminar/International Conference IOTWR 2020 have been post-poned. The next date will be announced based on prevailing situation. Inconvenience is regretted.

The website of the IETE Kolkata Center has been restructured by replacing old web site. Now, all activities are visible and reflected properly under various sections of this new look web site (www.ietekolkata.org). There is a separate segment on the home page of the website where all newly published issues of "SIGNAL" are available and our esteem members are welcome to down-load any issue freely.

On behalf of the members of EC, IETE Kolkata Center I would like to thanks to all mbers and my scholars for taking positive role to reactivate the News Letter. Hope this issue (Vol 16, No 4) will be a useful material with technical and activity contents of IETE Kolkata Center to the esteem members of IETE Kolkata Center, publishing of which was stopped since 2005. I would like to request our es-teem members to participate in writing technical auricles into this newsletter.

Esteem members will be happy to know that IETE Student Forum(ISF) has been initiated by the In-stitute of Rahara Ramkrishna Mission with 40 members.

We are also planning to open other ISF Centers at Belur Ramkrishna Mission Vidyapith and Naren-drapur Ramkrishna Mission Vidyapith.

ISF centers have already opened at Adamas University and Brainware Universoty. So, more insti-tutes are being associated with their ISF within the umbrella of IETE Kolkata Center.

Hope this issue will be a good technical material to all.

I wish you all best in this difficult situation. Stay well, stay safe.

Best wishes

Jyotsna Kumar Mandal

Secretary, IETE Kolkata Centre

Editor, SIGNAL

Electromagnetic Radiation: Its ill effects to the society and measures for protection

Partha Pratim Sarkar , Department of Engineering & Technological Studies, University of Kalyani.

Presently cell phone communication has become the basic necessity of our society. Though it started its journey around twenty years back, the demand of cell phone technology in the society has taken tremendous leap. This ever increasing demand led to the uncontrolled and unmonitored installation of cell phone base stations especially in densely populated areas. This has resulted in radiation of huge amount of microwave energy throughout our environment. Generally in urban areas the use of microwave oven is increasing day by day. Its radiation is also harmful for the human being. Generally most of us look for the convenience of our daily life. But most of the people are not aware that we are paying for this at the cost of our own health and of our loved ones. This alarming situation has also been reported by Prof. Girish Kumar of IIT, Bombay [1]. Regarding this he submitted a report to Department of Telecommunication, Govt. of India. Prof. Girish Kumar has mentioned the risk of harmful effects not only to human beings but also to the ecology as a whole. Microwave radiation can damage the placental barrier due to presence of high water content in the amniotic fluid protecting the fetus. A large number of birds like pigeons, sparrows, swans die each year due to interference from the cell tower radiations. A reduction in wheat and corn yield in the fields near high EMF lines has also been reported. From different survey reports scientists in this field have come to know that microwave radiation may harm mental health of human being. This radiation may also cause hormonal imbalance. Given the seriousness of the issue preventive steps should be taken immediately. Though it has been recommended to regulate the power emission of the base stations and increase the number of base stations, its financial implication is high. A better alternative is the use of Frequency Selective Surfaces (FSS). FSSs are electromagnetic filters which filter in or reflect the electromagnetic waves based on the frequency of the waves. Properly designed FSS and construction of buildings using it shall be helpful in preventing the ill effects from the radiation of waves. For example in hospitals, where use of mobiles is in-general prohibited, the walls of the ward of specific patients may be constructed with a layer of FSS. This shall prevent the mobile signal from entering the area and thus the ailing patients can be protected from the radiations. Properly designed FSS can also be used in agriculture in rural areas which shall prevent the radiation from the cell towers but shall allow crops from getting sunlight which is an essential element to the crops. The FSS could be designed or modified as per the requirements. It is possible to fabricate it using metal sheets, using metal films, on transparent glass, on flexible sheets, etc. The designer may also select the frequency band to pass it through or to reflect from it. It is also possible for a designer to design absorber type FSS. The possible combination is extremely large. Each combination shall address different problems. The ongoing research work in the field of FSS has ushered in a new hope for solution to the menace of radiation not only from cell towers but from other sources also.

Frequency Selective Surface is a two dimensional periodic structure as depicted in Fig. 1. It is a periodic array consisting of conducting patches on a dielectric material or aperture elements within a metallic screen (Fig. 2, Fig. 3). Similar to the traditional frequency filter, the FSS may have band pass or band reject spectral behavior depending upon the array element type (i.e. patch or aperture) [2, 3]. Transmitted and reflected electric field vs. frequency plots for aperture type and patch type arrays are shown in figure 4 and 5. It is observed that maximum transmission occurs at resonating frequency in case of aperture type elements. Below and above the resonating frequency transmission gradually decreases and finally becomes zero. It is also observed that minimum reflection occurs at resonating frequency and below and above the resonating frequency reflection gradually increases and finally reflection coefficient becomes one. Totally reverse situation arises for patch type FSS. As a whole aperture type FSS has specific band pass property and patch type FSS has specific band rejection property in spectral domain.

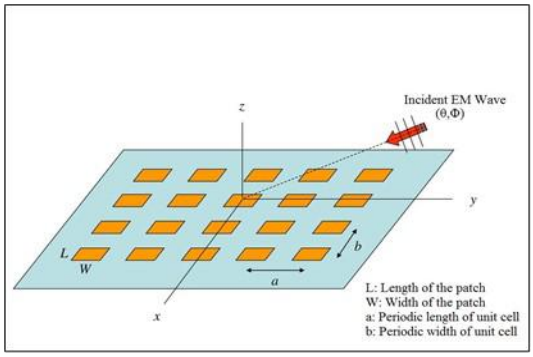

Fig. 1. A Two Dimensional Array of FSS

Very recently designers are designing another type FSS. In a specific spectral band both transmission and reflection are very low (Fig. 6). This FSS acts as an absorber in the specific band.

Now depending upon the requirement, scientists or engineers may design band pass, band reject or absorber type FSS structures which may be single layer or multi layer. This may be designed to operate in a particular band or in multi bands. Also designers have to consider other two factors. One is roll off and another is flatness of the curve. Roll off determines selectivity and flatness determines stability throughout the operating band (Fig. 7).

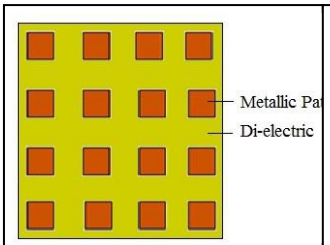

Fig.2.
Patch type Frequency Selective Surface

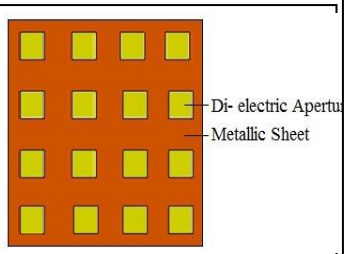

Fig.3.
Aperture type Frequency Selective Surface

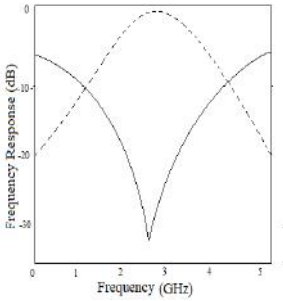

Fig.4.
Frequency response of Patch type FSS

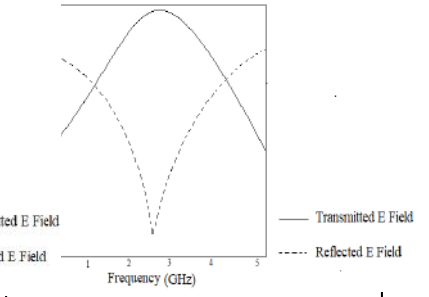

Fig.5.
Frequency response of Aperture type FSS

Contd.. Now we are taking a specific example. Working frequency of microwave oven is 2.4 GHz. If at the time of cooking this microwave signal comes out of the microwave oven chamber that will be harmful for human being and also cooking efficiency will be decreased. Previously door of microwave oven was made of traditional glass. So, harmful effect was there. Presently, door of microwave oven is made of FSS which reflects 2.4 GHz microwave signal and transmits all other frequencies. By using this door of FSS, 2.4 GHz microwave cannot go out of microwave oven chamber. So there is no harmful effect. Also cooking efficiency will not be decreased. As all other frequencies may transmit through it including visible frequencies, cooking inside microwave oven may be easily observed and monitored by someone without any harmful effect (figure 8). In a patient ward of hospital or even in our residences window screens may made of FSS which will not allow to enter electromagnetic radiation of high strength at the time of relax or sleeping. At busy time window screens made of FSS may be removed to allow this radiation so that mobile phone can work properly. This will minimize the harmful effect of electromagnetic radiation. Similarly affected agriculture fields and affected big trees may be covered by FSS screen which will allow rain, air, sunlight but bar harmful electromagnetic wave. At the same time Govt. authority should make rule to regulate power of cell phone tower. Modern technology cannot be denied. But its ill effects may be removed or minimized if all these steps are taken properly.

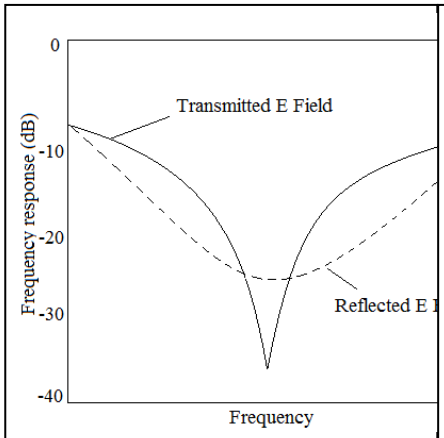

Fig.6. Frequency plots of Transmitted and Reflected E field for Frequency Selective Surface as absorber.

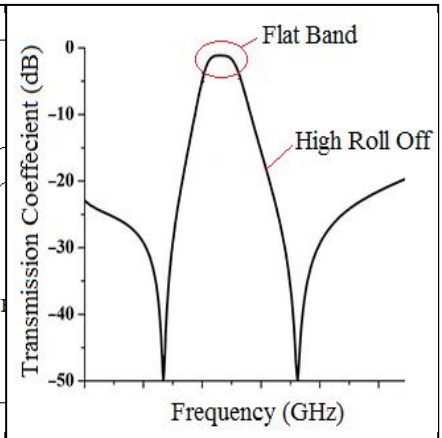

Fig.7. Frequency response of Transmitted E field of high roll off and flat band Frequency Selective Surface.

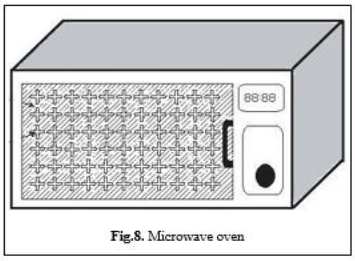

Fig.8. Microwave oven

References

[1] G. Kumar,. "Cell Tower Radiation." Mumbai, December (2010).

[2] B.A. Munk, Frequency Selective Surfaces, Design and Theory, New Jersy, Wiley, 2000.

[3] T.K. Wu, "Frequency Selective Surface and Grid Array", Jhon Wiley & Sons.Inc., Nework,1995, ISBN 0-471-31189-8.

GLIMPSES A ONLINE "VOICE OVER POWERPOINT PRESENTATION COMPETITION"

12th April, 2020 At of Narula Institute of Technology

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Kolkata Centre.

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