PROPOSED DESIGN TO MINIMIZE IMPACT OF MOBILE PHONE ON HUMAN HEALTH: ANDLINE

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Abstract- The use of cellular phones has increased fiercely since the early 1980's. Cellular phone usage and its technology have become prominent since past four decades theconcerns about health have also increased along with growing use of cellular phones. Several possible adverse health effects due to use of cellular phones have been reviewed by many authors and several expert groups. They have recommended for further investigation and research to find solutions to limit the prolonged use of cellular phones, so exposure of humans to undue radiations will be restricted. The idea proposed in this paper is about designing the device Andline which can serve as anone of the possible solution to minimize effects on human health due to prolong use of cellularphones which radiates in electromagnetic spectrum, RF exposure on humans can be minimized by keeping handset away from our bodyso that tissues does not absorb heatradiated by the device, Andline is a device which can be designed to keep away cellular phones from human body, which is improvedform of conventional Landline set.It should be interfaced with mobile handsetwhich operates on android. Some additional features can be provided with this interfacing device like connecting peripherals onto the device through USB ports. The peripherals to be connected are keyboard, mouse, pendrive etc., and these peripherals can be used while texting, playing games and for many more functionseven though the call is in progress.

Keywords- ANDLINE, USB, cellular phone, RF-EMF(Radio Frequency-Electromagnetic Feild), mobile handset.

I. INTRODUCTION

Cellular phones are microwave devices emitting low level of electromagnetic radiations. On 31st May 2011 the IARC (International Agency for Research on Cancer) at WHO have said that Radio Frequency-Electromagnetic Field (RF-EMF) from cellularphonesthat radiates electromagnetic fields which are non-ionizing in similar range and forms a part of Group 2B, i.e. a possible human carcinogen[1,2]. Another analysis from many authors have ascertained that brain tumor risk is significantly increased for those who are using cellular phones for more than aperiod of ten years.

A study by many groups at Sweden has shown that users who are using cellular phones before attaining the age of twenty have four-fold rise in threat for ipsilateralglioma, Known that the reserves to take care of disorders that may arenot universally available and are in short of supply. After analyzing these reports and other theories put forth before the IARC, a final agreement was made by the plenary sessions of the experts participating in the meetings held at Lyon in France during May 2011, they were evaluatingthe carcinogenic effects of RF-EMF on humans.

The decision made by them was based on two sets of observations on human control-case studies given by Hardell group from Sweden and another by the IARC Interphone study contributed by eleven nations. They provided results on positive associations between exposure to RF-EMF emitted from wireless mobile phones and brain tumorslike Glinoma and Acoustic neuroma.The final decision was voted among the scientists, those who were participants. Majority of them voted in the favor that RF-EMF radiation to be a 'possible carcinogenic'.

This topic about the health and safety due to of RF (radio frequency) electromagnetic energy or radiation has been inspected almost for 60 years as of now.

There are two guidelines which are quoted as standards are International Commission on Non-Ionizing Radiation Protection(ICNIRP) guidelines for restricting human exposure, published in 1998[3], and another guidelines by Institute of Electrical and Electronics Engineers (IEEE) standard for safety levels with reverence to Human Exposure to RF-EMF, which was announced in 2005 [4]. Various types of versions of these guidelines and standards were released and published by many national territories and bodiesand were assured about the safety norms of human health associated to exposure from cellular phone emitting RF-energy have been adopted.The United States has adopted certain rules set by the Federal Communications Commission (FCC) pertainingto the RF exposure limit for mobile phones in 1996[5]. These rules are built on a recommendationpublished by the National Council on Radiation Protection and Measurement (NCRP) and IEEE.

Cellular phones are even accused to have many other effects on human body such as:

1. Thermal effects[3]
2. Non-thermal effects[7]
3. Blood-Brain barrier effects [8]
4. Cognitive effects[9]
5. Electromagnetic hypersensitivity[10]
6. Geno toxic effects[11]

7. Sleep and EEG effects[12]
8. Behavioral effects[13]
9. Sperm count and Sperm quality[14]

Cellular phone stands a prominent technology being used nowadays and here to stay at least till the turn of this century. It is up to us to understand this technology to safeguardthe users from the probable harmful effects caused due prolonged use of cellular phone. Exposure of radiation decreases significantly for every inch we keep phone away from our body.
In a Survey conducted at various technical institutes for making awareness of effects of cellular phones on human health certain questionnaire was formulated and asked orally to the students.

Can we do this!

1. Avoid prolonged usage of cellular phones.
2. Don't talk, text only.
3. Use the speakerphone always.

Cellular phonehave become a part of our life which couldn't be parted away, how this can be done is the common answer given to us during survey, so need arises to think of a solution contradicting the harsh effects of cellular phones.Limit the usage of phone a humbleanswer but here the question arises, limit up to what extent, how much usage is acceptable.Don't talk, text only, would it not be rude to answer back using a text,not talking is killing the sole purpose of the cellular phone technology itself.Use the speakerphone all the time certainly not having any problem sharing the contents of conversation with the people in surroundings[15].

II. PROPOSED DESIGN

The device is designed to interface with mobile handset to receive calls from our cellular phone. This device will allow the user to continue with their calls as usual with greater degree of freedom, simultaneously achieving reduction inradiations on human body from the cellular phone by not physically using the cellular phone for answering callsbut by simply interfacing it to the device.
The working principle of the device is to make and receive a call from the mobile handset which delivers a considerably less amount of radiations. Hence, the mobile handset will be away from our head and we can continue with our callsthrough the receiver of older land line phones. This makes the device userfriendly as users have used it in past and the exposure of radiation is minimized.
The device can be interfaced with mobile handset by connecting 3.5 mm audio jack of cellular phone with it shown in below figure marked as H.Output USB Ports marked as A and B are used for charging the mobile handset when docked and for using additional features of our cellular phone if required respectively. Input USB ports marked as C, D, and E are connected to external peripherals like mouse, keyboard and pendrive. Port F is 3.5mm input port connected to secondary speakers for listening music and most important push button switch marked as G is for answering/rejecting the calls. The calls are answered by sending three simultaneous digital pulses of small voltages to cellular phones by pressing push button switch.Alternativefacility is made to use devicewirelessly to provide certain mobility and degree of freedom to the user. The device is connected with low power Bluetooth trans-receiver module, to turn this on while call is in progress a push button is used so the user can have a mobility of about 10 meters.

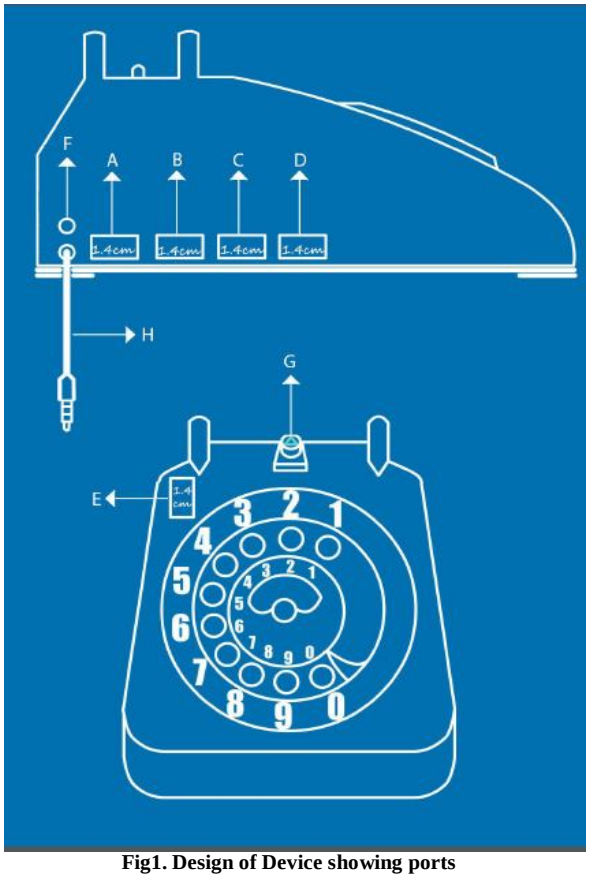

Fig1. Design of Device showing ports

III. CIRCUITS INSIDE THE DEVICE

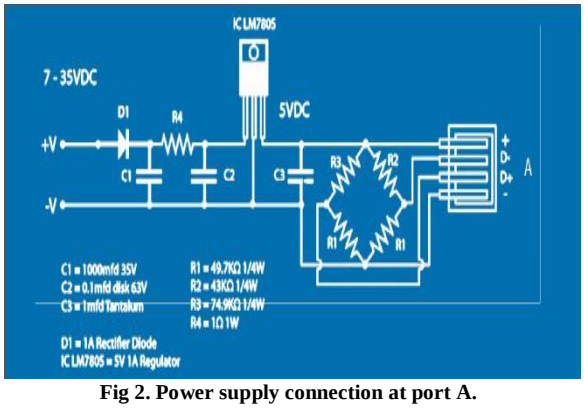

Fig 2. Power supply connection at port A.

The above circuit is placed inside the device which provides 5 volts regulated DC used to charge the cellular handset through USB port A.

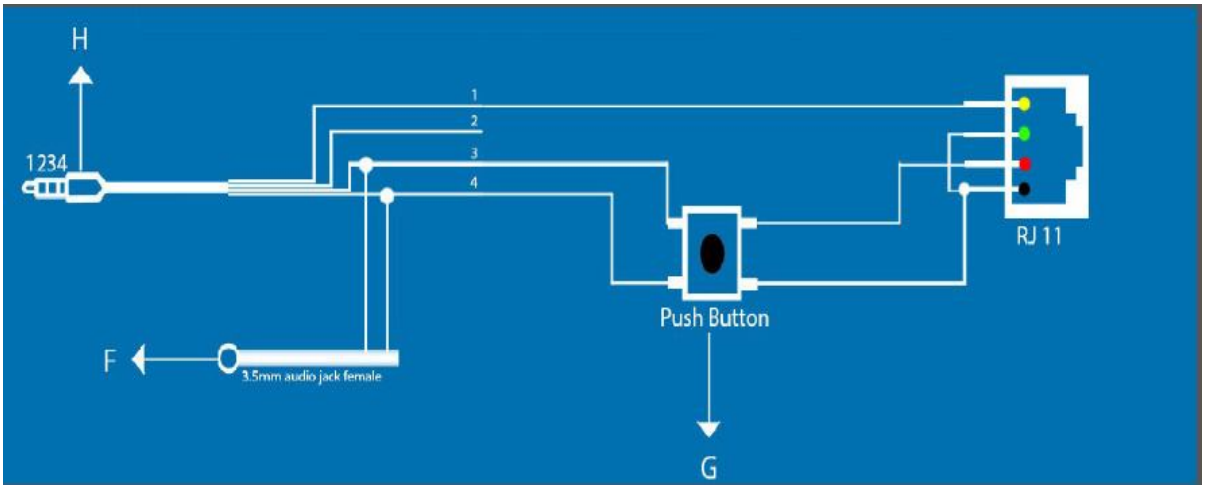

Fig 3. Configurations of 3.5mm jack with push button and secondary speakers

The Male 3.5mm input jack is marked by H in the design, it consists of 4 wiresand connections made with RJ 11.

TABLE I CONNECTIONS OF RJ 11

Wire Number	Connection
1	Left Speaker
2	Right Speaker
3	Microphone
4	Ground

The push button is marked by G, wire 2, 3 and 4 are connected to jack via push button,left speaker is directly connected to the pin 1of RJ 11 shown by yellow color, pin 2 and 4 are shorted shown by green and black color, pin 3 shown by red color is connected to push button, for connecting secondary speaker female output jack is taken additionally from wire 3 and 4 of male jack marked by F.

In figure below Port B is connected to the USB provided on the devicewhere one end of it is connected to the U1 ADuM4160 IC and the other to cellular phone.The IC is a digital Isolatormanufacturedusing I-coupler technology.

The digital isolator is a 16 pin IC which has track of direction of data flow and data is sent on packet basis. The Isolator is isolatingeach port of USB which acts as a separate individual ports. These ports are C, D, and E used as input ports.An isolator is powered by USB bus voltage (V_{BUS1} and V_{BUS2}).The pull up capacitor pulls up signal voltage to voltage level nearly equal to high and V_{DD1}requires bypass capacitor. PDEN is a pull up downstream enable as it is connected to high signal it pulls up signal by $V_{DD1}$and SPU is select speed upstream. If it is high it provides high speed slew rate, timing and logic conventions, whereas if it is low then it provides low slew rate, timing and logic conventions. Pins 6, 7, 10 and 11 are four I/O ports used as data lines in upstream mode and downstream modes respectively. PIN used for upstream pull up enable is not usedso it is grounded. Similar functions are performed by SPD which is speed select downstream buffer. To achieve high speed slew rate we connectthis pin to V_{DD2}which is high. $V_{DD2}$is the power side for Bus side 2, connected similarly to that of bus side 1.U1 ADuM4160 is interfaced with AT 43301 which is basically a De-Multiplexerwhich separates many outputs. These separated outputs are ports C,D and E which are connected to external peripheral devices like keyboard, mouse and pendrive.

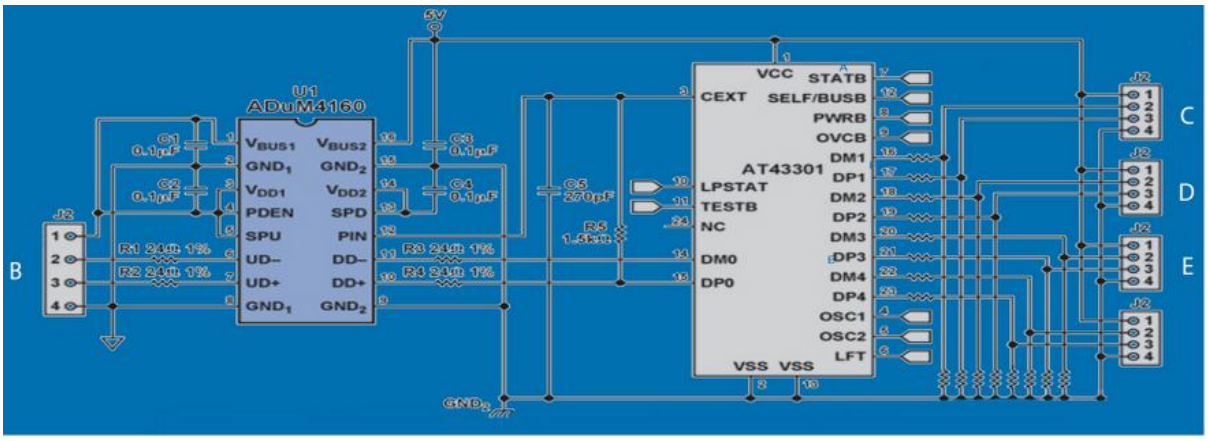

Fig 4. Connections of ports using Isolator and De-Multiplexer

IV. FUTURE SCOPE

The proposed design has be investigated for minimizing the impact of RF exposure on human body, by fabricating device and using it for calling and receiving calls from the device by not physically using cellular phones for various age groups of healthy peoples, the samples of their EEG and ECG will be collected and will be compared along with the samples of EEG and ECG by using cellularPhones in 2G, 3G modes and to find deviation in parameters from normal values.

CONCLUSION

The idea proposed in this design may reduce impact of RF exposure and is designed to have many features of an android handset. The android handset can be used for multitasking. The proposed design ANDLINE can keepmobile handset away from head as well as body,as long as call is in progress, whereas body absorbs lesser amount of heat so thatheating of tissues of head is minimized, as mobile handset is physically away from body during the call.

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