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Optical Multi-Plug" Based Hardware Architecture For Long Distance Optical Network

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Abstract-An optical multi-plug is a multiple input and multiple output ports hardware architecture used to obtain a single channel and long-distance communication network which is possible because of the assembling (integration) of a "color glass filter" with a color sensor. On the other hand, the "color ray of light" passes through the input port and then communicates with the "color glass filter" and "color sensor" at the output port, and after filtering and matching the "color ray of light" by the "color sensor" and "color glass filter" the "color ray of light" is able to transmit through a single channel. thus the multiple "colors of light" passes through the output port of the "optical multi-plug" and after the filter, they are able to transmit via a single channel. where the different "color of light" is able to transmit by the "single channel" toward the receiver end within a particular interval of time, finally by using the "optical multi-plug" it is possible to establish the single channel long-distance and "repeater-less" communication network.

Index Terms: Optical Multi-Plug, Color Glass Filter, Color Sensor, Hardware Architecture.

I Introduction:

The present technology pertains to the field of optical communication point to point communication occurs via the optical channel, in which signal passes in the form of light from one point to another point by using single mode or multimode fiber for the optical communication where the transmission of the optical signal is faster than the other electrical or electronic mode in which signal is passed from the channel at the speed of light [1]. each of single mode fiber and multimode fiber is having various limitations such as long-distance transmission, bandwidth, data transmission rate, coupling, dispersion, interference, and aliasing. in order to overcome these problems it needs to introduce new technology such as optical multi-plug wherein the optical multi-plug is a hardware unit which is include an optical filter and 'color sensor", optical multi-plug works in such a manner that it is having multiple inputs and multiple output port with a light guide which is distributing the light signal homogeneously over a large area. So optical multi-plug having multiport and each port having a different color of light which is distributed by the optical filter and each port communicates with single-mode fiber, only one wavelength (color) is able to pass through the single-mode optical fiber. the optical multi-plug work in conjunction with single mode fiber, optical filter, light guide, and color sensor these are described below.

Light guide: It is a form of device that is used for distributing the light from the source to the particular area which requires illumination. The light guide is made of transparent material and it distributes the light homogeneously in large areas [2].

Single-mode fiber: The single-mode fiber is a type of optical fiber having single-mode fiber (core) [3] which is narrow than the multimode fiber and the diameter of the core is smaller than multimode fiber where the multimode [4] fiber letting the multiple colors of light at that time the single mode fiber only allow the single wavelength or single color light. the single mode fiber or cable is the color codded, in the single mode fiber use a single strand of glass (optical fiber) to send the data in both directions. The single mode fiber uses a single wavelength for data transmission due to which single-mode fiber having a large capacity compared to multimode fiber.

Optical filter: This is a type of filter by in which is transmit the wavelength of light for a particular range, and it is able to absorb the unrequired remaining wavelength or let pass only the required color of light and stop the other light. The optical filter is a transparent color window that allow light to travel a long distance [5] [6].

Color sensor: The color sensor [7] is the photoelectric sensor that emits light at the transmitter and detects the light reflected from the detection object. the color sensor detects the light for acknowledge the optical multi-plug having the same transmission mode at which the color light travel to the transmission medium [7]. Wherein at each medium each single mode fiber has different color lights such as red, green, and blue which are detected by the color sensor at both trans-receiver sections. Color sensor does color matching or identification in applications requiring only pass/fail output [8].

II Hardware architecture

First Stage Basic Hardware Architecture: In the First stage basic hardware structure is the optical multi-plug having multiple input and multiple output port [9] when a single incident ray of color light strike the input port then the said color light at the input port communicates to each output port and single color light passes through each output port wherein each output port connected with the different channel thus the single color light which is incident at the input port are able to travel all different channels so each channel having same color light due to which wastage of communication channel occurs during transmission.

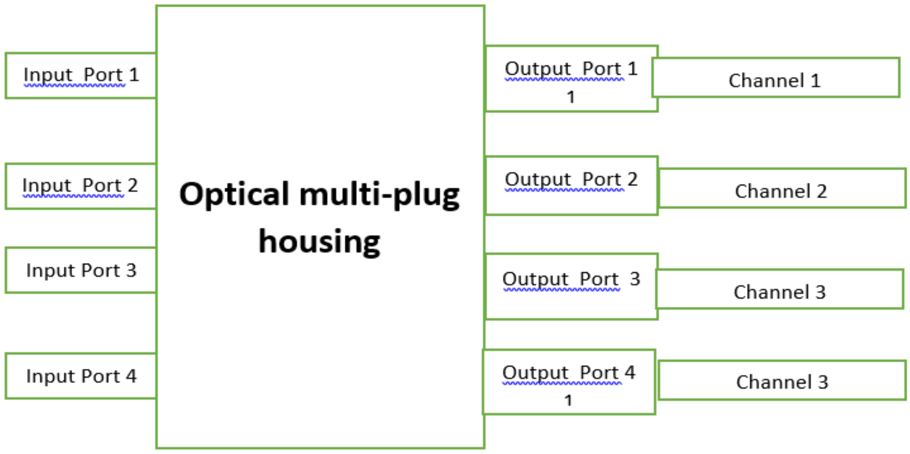

Figure 1 First stage basic hard ware architecture optical multi-plug

Second Stage Basic Hardware Architecture : The second stage basic hardware structure is similar to the First Stage Basic Hardware architecture but it provides differences in the result where the second stage basic hardware architecture includes an additional color glass filter [6] at each output port due to which at each output port is having color marking which may be given as port 1 is red color ,port 2 as blue color ,port 3 having yellow color this is the reason that it is easy to recognize each port by a different color. furthermore, each single output port is connected with a single core (optical channel) so each color of light is able to directly communicate with the output port which is having same color glass filter for similar input incident rays of light [10], and when the incident ray of light recognizes by the same color glass filter then the ray of light pass through the desired channel so according to hardware structure each output port connected to the different channel so each output port having the different channel and utilize entire bandwidth.

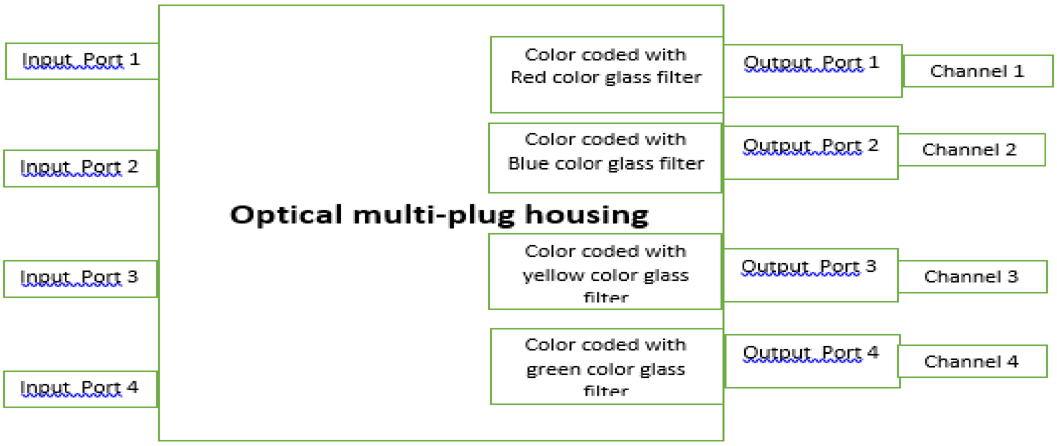

Figure 2 Second stage basic hardware architecture

Third Stage Basic Hardware Architecture: Third stage hardware structure is similar to 2nd and 1st stage hardware structure but it is having some advancements in hardware structure which provide additional advantages such as single channel use to transmit data which is not possible by 1st and 2nd stage hardware structure. In the third stage hardware structure additionally include a “color sensor “which is used to permit the ray of light to travel along the single channel (core) [7] [3]. And in other words to say that color sensors are arranged in all output ports and the said color sensor are able to work in conjunction with the color glass filter [6], wherein if the incident ray light is the "red color" then that "red color light" has only able to communicate with the output port which is having the "red color glass filter" as well as a "red color sensor" thus the red color light reaches to the channel, but if the "red color light" communicates with other color glass filter so the sensor detects different color which is different then the color glass filter according to this condition sensor unit is not allowed to pass the light ray through the channel.

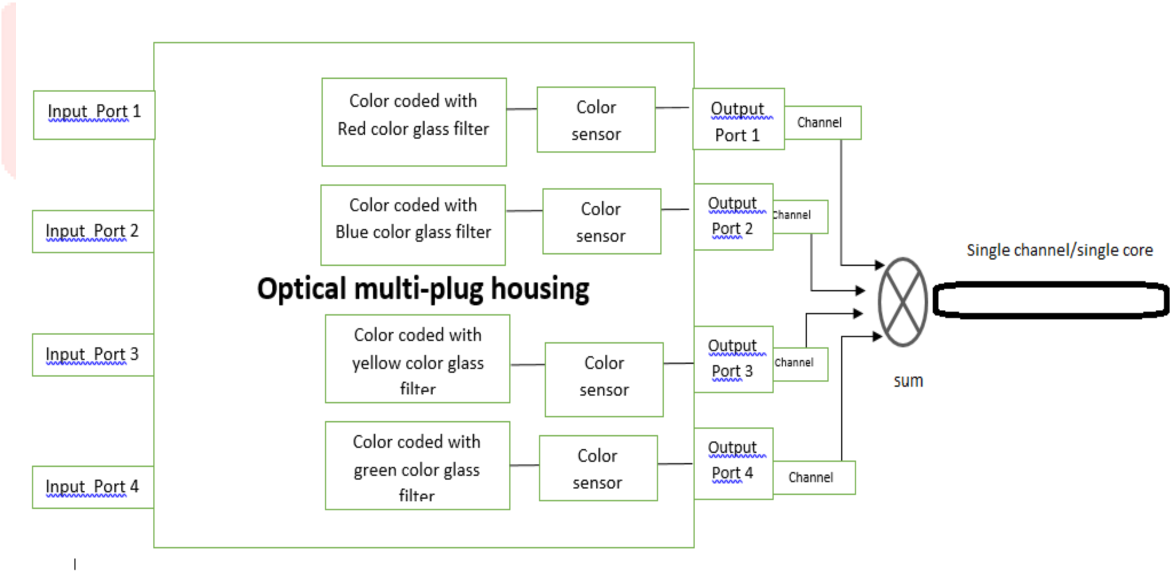

Figure 3 Third stage basic hardware architecture

As per the Third stage of basic hardware architecture, there are various input and output ports are available in the hardware structure and each out or input port has a "color glass filter" [6] that works in conjunction with the "color sensor" [7] and connected to the single core channel, and the device working principle is also similar as when the incident ray of light fall at the input port so the ray of light spread to all output ports, wherein at each output port include "color glass filter" as well as "color sensor" .and when the light ray communicates the output port, it means a color light ray matches with a "color glass filter" and "color sensor" so each output port is having different color glass filter [6]. hence only a single output port may have the same color of light by which incident light can pass and match and travel through the channel.

According to the above given all three basic hardware structures in which first disclose the first stage of basic hardware structure where the input and multiple outputs are provided so multiple channels are used to transmit the single "color of light" thus it required multiple output channels used to transmit single wavelength due to which wastage of multiple channels occur, to avoid wastage of the multiple channels it needs to adept Second stage basic hardware structure. where the markings are provided in form of color coding [11] at each output port by using different "color glass filters" this is the reason that a single ray of color light at the input is processed with the single marked output, where the same "color glass filter" communicates with the same input "color of light" hence it constructs a medium in which the single input ray of colored light communicates with the output port which has the same "color glass filter" [6] and the ray of light after passing through the "color glass filter" directly passes through a single channel [3] and in another word we can say single input communicate with the single output channel.

furthermore, the Third stage's basic hardware architecture is similar to the second stage's basic hardware structure but it additionally includes the "color sensor" which is arranged with the "color glass filter" at each output port [6] [7]. the color sensor is able to work in conjunction with the "color glass filter", where the "color sensor" detects the color light that is similar to the color glass filter and after detecting the same color of light it lets pass only the detected light and stop the other color light which is not same as the color glass filter. the other color light and mixing of the color light at the output port are possible only in 1st and 2nd stage hardware architecture, but in 3rd stage hardware architecture, multiple input color light which is passing through a "color glass filter" and the color sensor is travel through single output channel, in other words, can say that multiple input wavelength (color light) travel along the single output channel without distorted the signal.

However there are some issues arises like:

1) How optical multi-plug hardware architecture use to provide long distance communication network?
2) Why color sensor is necessary in hardware architecture in optical multi-plug.
3) Why marking and color coding required at the each output/input port?
4) What are the limitation of optical multi-plug due to which communication not possible?

To resolve these issues the multi-plug hardware has been proposed.

III Methodology:

The present technology relates to the multichannel/single channel optical network by applying the “optical multi-plug” [12] [13] due to using the "optical multi-plug” it is possible to transmit large data sets simultaneously through each communication channel such as single mode fiber (core) is used to the "long-distance transmission".

The optical multi-plug [12] introduces between the transmitter and receiver section which is connected through an optical cable, and "optical multi-plug" [13] establishes the connection between transmitter and receiver by using a "multi-plug structure". in which include “optical multi-plug housing" which is having multiple input and multiple output port and each port of the optical multi-plug is behave as a trans-receiver, where each input port may include a "multimode fiber" or transmission unit, and at each output port is arranged with the color glass filter (optical filter) [6] before each channel (core) of the optical cable.

By using the multi-core optical cable each core is assembled with the “color glass filter” and color sensor due to which each core (single-mode fiber) [3] having a different color for the different channels, such as single mode fiber is able to carry the color light of red, green, blue and many more over the different channel and transfer signal from transmitter to the receiver by using the single channel for the single color of light.

The optical multi-plug is a hardware unit which is having multiple in-put and multiple output ports each output port having the one core (single-mode fiber) which is assemble with optical filter ("color glass filter") and color sensor so “multiple cores" is used as a "multiple channels" for transmitting the data, and each "optical multi-plug" can behave as a node (junction) in the network where each "single-mode fiber" is work as the channel which behaves as the trunk in the network [3]. The present optical multi-plug is able to develop a network in which distortion less transmission occurs and interference in the signal and aliasing also avoid.

There is the multiple operation are perform to identify the result obtain by performing the various function all operation are perform below in the experimental truth table which is given below that shown in the experimental table 1 where we analyses the single input and single output.

Experimental truth table:1

Single Input /single output			
Input Color Wavelength	Glass color Filter	Sensor color Detector	Output
Red	RED	Red	Pass
Red	YELLOW	NA	NA
Red	BLUE	NA	NA
Red	GREEN	NA	NA
Red	VOILET	NA	NA
Red	ORANGE	NA	NA

As per the given experimental truth table 1, The single input color of light provide which is “Red” in the color, and the given red color wavelength has passed through various different "color glass filters" at the output port, which may include the red, green, yellow, blue and violet color of light. The color filter work in conjunction with a color sensor" according to which when the input color is red and the "color glass filter" has color also red so color detected by the color sensor is red and this is the single condition in which the sensor allows to pass the red color wavelength along to the optical core [6] [7].

In another condition perform by the experimental truth table 1, According to which there is a single input wavelength (RED) is available as an input and the same red color wavelength passes through the various different "color glass filters" such as red, green, yellow, blue and many more, so when the red color wavelength passes through different "color glass filter" then the output color at the output port is not same as “color glass filter” and color are not matched, so the "color sensor" is not able to match with the desired color, hence this is the reason that the "color sensor" is not let pass the color light at the output where each output port is associated with a single core [3].

The above experimental table shows the experiment based on the “and” operation, where the two inputs have the same color so the output obtain is also having a similar color which can be also detected by the "color sensor" having the same color detection furthermore, it can be also said that to perform the “AND” operation there should be a state that input "color of light" and output color of light should be same by involving the "color glass filter".

There is a number of experiment need to conduct which identify the behavior of the experimental setup which is determined in the above experimental truth table 1 for single input and single output operation, but the experiments are not limited to a single input and output hence further proceed the experiment which is conducting by the multiple input and multiple outputs shown in the below experimental truth table 2.

Experimental truth table 2

Multiple Input And Multiple Output			
Input Light	Output Port Glass color Filter	Sensor color Detector	Out Put
RED	RED	RED	PASS
RED	YELLOW	NA	
RED	BLUE	NA	
RED	GREEN	NA	
YELLOW	RED	NA	

YELLOW	YELLOW	YELLOW	PASS
YELLOW	BLUE	NA	
YELLOW	GREEN	NA	
BLUE	RED	NA	
BLUE	YELLOW	NA	
BLUE	BLUE	BLUE	PASS
BLUE	GREEN	NA	
GREEN	RED	NA	
GREEN	YELLOW	NA	
GREEN	BLUE	NA	
GREEN	GREEN	GREEN	PASS

As per the above experimental truth table 2, there is the “optical multi-plug” are arranged between the input and output and each optical multi-plug has multiple input port and multiple output port wherein each input and output port arrange with the “color glass filter” and due to which each input having "color glass filter" can directly communicate to each output "color glass filter” [12] [6]. And when the "color of light" of both the input port and the out port having similar as per the given above experimental truth table, then there are the multiple input port and each input may have a "color glass filter" and it may also be possible that the input color light can proceed with or without "color glass filter” which has arranges at the input port.

In addition according to the experimental truth table 2 in condition one, when the red color light fall to the input ports of the optical multi-plug and each input port having a different "color glass filter”, so when the incoming red color light passes through the input port which is having the same red "color glass filter" so the color of the incoming red color light not changed, and than that color light able to communicate with the output ports where are the same arrangement present like input port. and at each output port associated with the "color glass filter" having different color of light, hence the incident "red color light" communicated to each "color glass filter" having different color due to which the output color light is not matched to red light, but simultaneously red incident light also communicate with "red color glass filter" this is the reason that both incident color light and red color glass filter are same in the color due to which a color sensor which is disposed at the output port is the sense the desired red color light and allow to pass along the output core.

As per the above discussion according to the experimental truth table 2 the "optical multi-plug" allow to pass the light using color sensor, when both "input color light" at the input port and "output color light" at the output port similar, which is detected by the color sensor, where the "color sensor" within the optical multi-plug can detect the single color light which is similar as the incident light at input port and allow the proceed the further stage, wherein the single core cable is allow the "single color of light" to pass through the single channel [3]. furthermore There are the some condition proceed when the color sensor not allow to pass the wavelength along the core which are discuss below in condition 1, and condition 2.

Condition 1

In the first condition according to the experimental truth table 2 ,when the incoming ray of light in the input port is may be different which is consider as a yellow for the data analysis so the operation perform in two different condition where as per the condition 1, at the input port the incoming ray of light is yellow in color and the said light is communicate through the input port with the "color glass filter" arranged at the input port .wherein the given "color glass filter" in the input port is not in the yellow color, due to which color is change after passing through the "color glass filter", and the same that unknown color light which pass through input port via color glass filter also fall at second "color glass filter" at output port ,where the second time color conversion occur due to the "color light" pass through the second "color glass filter", hence the "color sensor" which is work in conjunction with "color glass filter" which is arrange at the output port that is not able to sense the yellow color light so sensor not allow to pass the light along the core [6] [7].

Condition 2

In the second condition according to the experimental truth table 2 where multiple input and multiple output ports are provided as per the present condition disclosed, but the experiment fails the transmission of the data along the single-core fiber for long-distance communication, which shows according to the experimental truth table 2 the incoming color light is yellow and that yellow light communicates at the input port where the input port includes the "color glass filter" which is also similar as the yellow color this is the reason that the yellow color light successfully passes through the input port, but the same yellow color light passes through the second "color glass filter" and that said second "color glass filter" is not the similar color such as yellow, due to which when the yellow color of the incoming light passes through the different color glass filter so the output color becomes different which is not able to detect by the sensor because of the sensor are only pass the color of light which is same as the "color glass filter" hence there is the two-stage clarification required to pass the signal through the single-core optical cable [6] [7].

According to the above experimental table 1 and table 2, the output color of light along the core is only obtained. when the incoming color of light at the input port and the detected color at the "color glass filter" on the output are the same, but to perform the desired operation it is also necessary to satisfy the reverse condition. in which there are multiple input "color of light" wavelengths are present and a single color in "color glass filter" at all output the "color glass filter" is used, so each input and output port having the same color glass filter and the further analysis is performed the reverse experimental truth table 3 which are mentioned below:

Reverse Experimental truth table 3

Single Input And Single Output			
Input color Light	Output Port Glass color Filter	Sensor color Detector	Output Color
RED	YELLOW	NA	NA
YELLOW	YELLOW	YELLOW	PASS
BLUE	YELLOW	NA	NA
GREEN	YELLOW	NA	NA
VOILET	YELLOW	NA	NA
ORANGE	YELLOW	NA	NA

As per the above given experimental truth table 3, there are a number of different colors of input light incident at the first section of the input port [10], and all incoming light are having different wavelengths, and each incoming light having a different "color of light" [10] which communicates with the "color glass filter", wherein the all "color glass filters" which are arranged in the housing of the optical multi-plug is similar in the single color, as well as all the "color sensor" which is arranged with the "color glass filter" are also detected single given "color of light" due to which only single color of the light which is similar to the "color glass filter" allowed by the "color sensor" to pass, in according to the reverse experimental truth table 3 given above there is the number of input incoming color lights such as red, yellow, blue, green, violet, and orange are comes at the input ports, and according to the experiment all the input ports include the single "yellow color glass filter" when the other red color light the fall on the input port which is passing through the "yellow color glass filter" so the light gets converted to other color and that said converted light which is having different color is again fall on the output port and where again yellow color glass filter available hence when the light passes through second color glass filter it again convert to another color which is not yellow and sensor only able to sense color which is present at the color glass filter hence the red input wavelength which is converted by both color glass filter at input and output port is not permitted by the sensor to pass along the single core fiber [6] [7] [3].

In another condition needs to satisfy for passing the data along the core [3] only when the condition satisfies in the reverse experimental truth table 3. In which the "yellow color light" ray falls at the input port as well as the output port, and the "color glass filter" is also provided at both the input port and the output port are yellow in the color, so when the light passes through both "color glass filters" having yellow color at the input port and yellow color at the output port filter this is the reason that light is not able to convert into another color light it would be the same as the input, and in other words, to say that the output light which is passed through input "color glass filter" and also the output of "color glass filter" is same after passing through the "color glass filter" and sensor detect the same color light and let pass to the single core cable [3] [6] [7].

Reverse Experimental truth table 4

Multiple Input And Multiple Output			
Input Color Light	Output Port Glass Color Filter	Sensor Color Detector	Output Color
RED	RED	RED	PASS
YELLOW	RED	NA	NA
BLUE	RED	NA	NA
GREEN	RED	NA	NA
RED	YELLOW	NA	N A
YELLOW	YELLOW	YELLOW	PASS
BLUE	YELLOW	NA	NA
GREEN	YELLOW	NA	NA
RED	BLUE	NA	NA
YELLOW	BLUE	NA	NA
BLUE	BLUE	BLUE	PASS
GREEN	BLUE	NA	NA

According to the experimental truth table 4, In which conduct multiple operation and analyses the result given by the optical multi-plug where analyses the operation perform in as per experimental truth 4 , in which consider the multiple logic operation in case first. where the multiple light ray [10] incoming at the input port such as red, yellow blue and green according experimental truth table, and said "color of light" is communicate with the "color glass filter" which is the similar in color at the each port [6] .At the output the result obtain by only the single output port having the resultant "color of light" which is same as the "color glass filter". IN the present operation as per the experimental truth table 4, in the first case the multiple "color of light" incoming at the input port of "optical multi-plug" and said optical multi-plug include the multiple "color glass filter" at the each output port which is having the same color [6]. In first condition it consider that "color glass filter" which is arrange at the each output port that is " red in color" hence multiple input "color light" ray incoming on the input port which is communicate direct to the all output port in which red color glass filter is arrange so according to truth table [6]. If the yellow color light incoming on input and said yellow light communicate to the output port which is having "red color glass filter" so due to this yellow incoming light is not matched with the "red color glass filter" and sensor part are only able to detect the light which is having the 'similar color" as a "color glass filter" so it is not possible to get output from the sensor unit and also can say that sensor unit not allow to pass the light having different color which not same as color glass filter [7] [6].

According to experimental truth table 4, In above section it is discuss that condition for not passing the light through the optical multi-plug, but in the another experiment is perform the operation in which output is detected by the optical multi-plug. In this given condition the "red color light" incoming in the input port and at next stage that "red color of light" is communicate with the output port , where the output port include "red color glass filter" and "color sensor" unit and that "color sensor" is present which is able to detect red color light which is similar as the "color glass filter" , hence the "red color light" which is incoming in the input port that is directly communicate with the output port so the "color sensor" which is arrange with the output port detect the "red color light" , and the incoming "red color light" and "color glass filter" both are in the same color so output at the sensor unit also detect the red color light, because of the "color sensor" is work in the conjunction with "color glass filter" this is the reason that the output port "red color light" is able to pass and proceed along with the single core cable [7] [6] [3].

IV Result and discussion

The present study describes the findings about the optical multi-plug which includes multiple input and output ports and each port is associated with the hardware architecture according to which each input port communicates with the input channel and the output port communicates with the output channel. and the given output channel is having a single core (single-mode fiber) [3] and due to passing the signal (light) [10] using "single-mode fiber" hence the signal(light) is transmitted to longer distances and also able to establish a "long-distance communication network" without using the "repeaters", and this type of long-distance network is only possible when it is using the hardware architecture that includes "input ports" where the different color of light fall at the "color glass filter" [10] [6]. which is used to divide different colors of light when the light passes through a "color glass filter" as well as the "color sensor", and the "color sensor" is able to work in conjunction with a "color glass filter" and with "output ports" which means when the color light passes through both the "color glass filter" and "color sensor" after filtering this light is arrives at the "single mode fiber" at the output port, thus the single-mode fiber is able to carry a single color of light to longer distances which is not possible without using "color glass filter" and "color sensor" in hardware architecture [6] [7].

The optical multi-plug comprises a color glass filter and color sensor both are the necessary component of the "hardware architecture" of the optical multi-plug and each of the "color glass filter" and "color sensor" works simultaneously where if an incoming "color light" and "color glass filter" are similar in color then the "color sensor" detect the same color of light which are filtered through a " color glass filter" and further proceed to communicate with output channel, but if "color glass filter" and "color sensor" are not included in the optical multi-plug so without any operation performed by the color sensor the detection unit let pass all color of light [6] [7] [10], which passes through an input port and all color lights are merged at the output port, and due to this resultant produce different color of light an output port which is distorted, because the "color sensor" not only detect the color but also stop the undesired color light thus this is the reason that color sensor necessary part optical multi-plug [7] [10].

As per the experimental truth table, 1 shows that at the input port, the input color of light is Red (color of light is red) Red light passes through the "Red color glass filter" at the input port and then the output, and at the output port after passing through the "red color glass filter" is also red so "color sensor" detects the Red light. because the sensor unit is pre-instructed that it has to detect and pass the only color of the light which is similar as "color glass filter" hence the "color glass filter" directs the red color of light to the single mode fiber [3] where it can transmit to longer distance so the "color glass filter" and "color sensor" are a necessary part of the "optical multi-plug" which is used to direct the color of light to a particular output port [6] [7].

The "optical multi-plug" are used to provide a single output channel to pass the multiple "color of light" where the optical multi-plug is "hardware architecture" in which each input and output port is color-coded, and each color-coded port is connected with the "color glass filter" and "color sensor" at the output section so each color-coded output port is similar color as the "color glass filter" which is detected by the "color sensor" and hence multiple output "color of light" is able to pass through the single channel when it was passed through the color codded output port which is verified by color glass filter and sensor [6] [7] [11].

According to the hardware architecture of optical multi-plug a single color of light passes through the channel at a single interval of time, so the only a single channel [3] is required to transmit the different colors of light such as Red, yellow, blue, and many other "colors of light". But there are some limitations due to which the optical multi-plug is not able to provide a communication network, because of the according to findings when using the "white color light" at the input port so at that time the "white color light" passes through each output port simultaneously [10], and because each output includes "color glass filter" and "color sensor" so when the "white light" easily passes through the "color glass filter" then converted to a similar color as "color glass filter" and that converted light is detected by using the "color sensor" [6] [7]. thus at each output port of the optical multi-plug using the "color sensor" are let pass the white light which was converted by a "color glass filter" so at the output channel all wavelengths (color light) merge and the output has distorted because all color of the light pass at the same interval of time due to color sensor let to pass the further channel [3].

The present technology is applying the "optical multi-plug" which uses multiple different channels is using to transmit the signal of different wavelengths (color of light) [10], and each wavelength has a different color which is passing through each core (single-mode fiber) [3], and due to passing the color of light through single-mode fiber the signal is able to transmit a longer distance, as well as repeater less transmission occurs, because of the fewer switches and repeater required. and the "single-mode fiber" channels [3] include the higher bandwidth with fast transmission of the signal therefore The single-mode cable hardware architecture is less expensive and works in conjunction with an optical multi-plug which is having multiple ports, hence low cost and long-distance communication networks establish such as LAN and MAN [14].

V Conclusion

The optical multi-plug is used to provide the long-distance transmission of data by using a single channel and multichannel transmission modal, in which multiple different colors of light can be able to transmit through the single optical channel [3] according to its hardware architecture where the multiple input and output port are present, and each output port is color-coded by using "color glass filter" and "color sensor" [11] [6] [7], and the single core/channel is connected with each of the output ports and another word to say that each output port is connected with a single core cable [3] so when the light ray incoming on the output port which was passed through the "color glass filter" and the "color sensor" then it is transmitted through the single channel, so the single channel is able to carrying the multiple colors of light at different intervals of time hence the single color of light is able to transmit through a single channel/core without distortion and use the complete channel at a particular duration of time, the single core is able to carry "color light" at a long distance [3] [10]. And transmission of data is possible by using both single channel and multiple channels but in "multiple channels" transmission the number of channels is wasted because of transmitting the single color of light via multiple different channels. but when using a "single channel" the multiple set of data (wavelength/color of light) is transmitted through the single channel at a particular interval of time this is the reason the "wastage of channels" is prevented by using the hardware architecture [3].

Furthermore, in the given hardware architecture of optical multi-plug using the single-core (channel) so only a single channel is used to transmit the data at a particular interval of time and the data set is in the form of light so the transmission of the data occurs in the speed of light and distortion less, because of using the complete channel for any single color of light in the single interval so intermixing is not possible between the color of light [3] [10]. Thus by using hardware architecture that includes a "color sensor" [7] and "color glass filter" [6] the transmission of the "color of light" made possible fast, distortion-less as well as without using the repeater, in other words, to say that by using optical multi-plug it is possible to establish a long-distance and fast communication network without using repeaters which is able to transmit the color of light in point-to-point or multipoint that can be used to develop LAN and MAN network topologies [14]

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