2022

Contents

What is Bandwidth? (Bandwidth and Signal Processing) 6:26 Video

https://www.youtube.com/watch?v=whUkZUORix0&feature=youtu.be

Coax vs Fiber

https://www.thefoa.org/tech/fo-or-cu.htm White Paper

So the phone system is mostly fiber optics beyond the short subscriber link. Fiber links offer over 1,000 times as much bandwidth over distances over 100 times further. Specifically, you can have:

	Distance	Bandwidth	Voice Channels
Copper	2.5 km	1.5 Mb/s	24
Fiber	200 KM	2.5+ Gb/s	32,000 +

Note: Bandwidth here is defined as bits/second M = 10^6 G =10^9

Analog Bandwidth

http://www.showorks.com/aboutbandwidth.htm White Paper

In analog systems, bandwidth is expressed in terms of the difference between the highest-frequency signal component and the lowest-frequency signal component. These frequencies are measured in the number of cycles of change per second, or hertz therefore analog bandwidth is expressed in hertz (Hz).

As an example, consider the typical telephone (POTS) where the **audio signals are limited to the 300 to 3300 Hz range.** A total of 3 kHz bandwidth is required to transmit this signal. If we are sufficiently clever we can manage to encode data onto this bandwidth with about 10 bps/Hz and get a modem to transmit data at 28.8 kbps.

An analog television (TV) broadcast video signal is limited by the FCC to a **bandwidth of six megahertz (6 MHz) -- some 2,000 times as wide as a telephone voice signal.**

Speed, Bandwidth & Distance White Paper

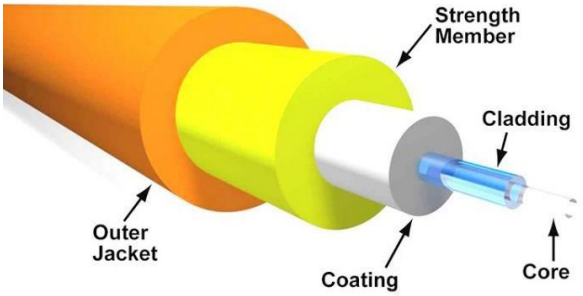
https://community.fs.com/blog/the-difference-between-fiber-optic-cable-twisted-pair-and-cable.html

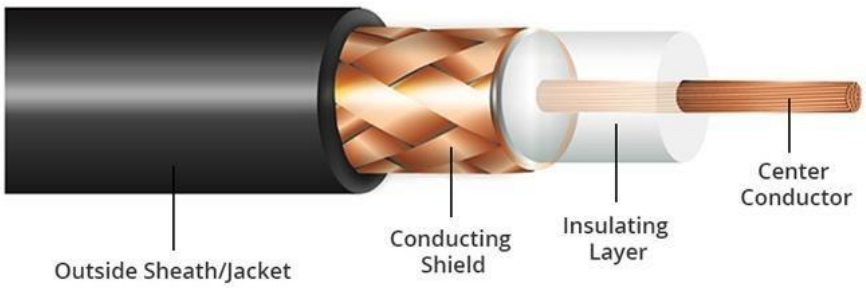
Fiber, Coax, Twisted Pair

Coaxial cable and twisted pair cable are copper or copper-based wire surrounded by insulation with other materials. Both of them can transmit television, telephone and data with electrical signals. While fiber optic cable can deliver the same types of signals with much wider bandwidth, faster speed and higher frequencies. It's made of very thin, pliable tubes of glass or plastic.

Cable Type	Speed	Bandwidth	Distance
Fiber optic cable	10/100/1000Mbps, 10/40/100/200Gbps	Up to 4700MHz	Up to 80km
Twisted pair cable	Up to 10Gbps	Up to 4700MHz	Up to 100m
Coaxial cable	—	750MHz (default)	Up to 500m

Coax Design





Early long-distance submarine telegraph cables exhibited formidable electrical problems. Unlike modern cables, the technology of the 19th century did not allow for in-line repeater amplifiers in the cable. Large voltages were used to attempt to overcome the electrical resistance of their tremendous length but the cables' distributed capacitance and inductance combined to distort the telegraph pulses in the line, reducing the cable's bandwidth, severely limiting the data rate for telegraph operation to 10–12 words per minute.

In a fiber optic cable, each strand is less than a tenth as thick as a human hair and can carry something like 25,000 **telephone calls**, so an entire **fiber-optic** cable can easily carry several million **calls**.

High Speed Cable Design

(12) **United States Patent**
Gundel et al.

(10) **Patent No.: US 9,627,106 B2**
(45) **Date of Patent: Apr. 18, 2017**

(54) **HIGH DENSITY SHIELDED ELECTRICAL CABLE AND OTHER SHIELDED CABLES, SYSTEMS, AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/298,369**

(22) Filed: **Oct. 20, 2016**

(65) **Prior Publication Data**

US 2017/0040088 A1 Feb. 9, 2017

Related U.S. Application Data

(63) Continuation of application No. 15/235,138, filed on Aug. 12, 2016, now Pat. No. 9,502,154, which is a (Continued)

(51) **Int. Cl.**
H01B 9/02 (2006.01)
H01B 11/20 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***H01B 11/203*** (2013.01); ***H01B 7/0838*** (2013.01); ***H01B 7/0861*** (2013.01); ***H01B 11/002*** (2013.01); ***H01B 11/1891*** (2013.01)

(58) **Field of Classification Search**
CPC H01B 7/0823; H01B 11/1891; H01B 11/1895; H01B 11/002

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(57) **ABSTRACT**

A shielded cable includes adjacent first and second conductor sets. Each conductor set includes two or more insulated conductors. The first conductor set also includes a ground conductor that generally lies in the plane of the insulated conductors of the first conductor set. At least 90% of the periphery of each conductor set is encompassed by a shielding film. First and second non-conductive polymeric films are disposed on opposite sides of the cable and form cover portions substantially surrounding each conductor set, and pinched portions on each side of the cable. When the cable is laid flat, the distance between the center of the ground conductor of the first conductor set and the center of the nearest insulated conductor of the second conductor set is $\sigma 1$, the center-to-center spacing of the insulated conductors of the second conductor set is $\sigma 2$, and $\sigma 1/\sigma 2$ is greater than 0.7.

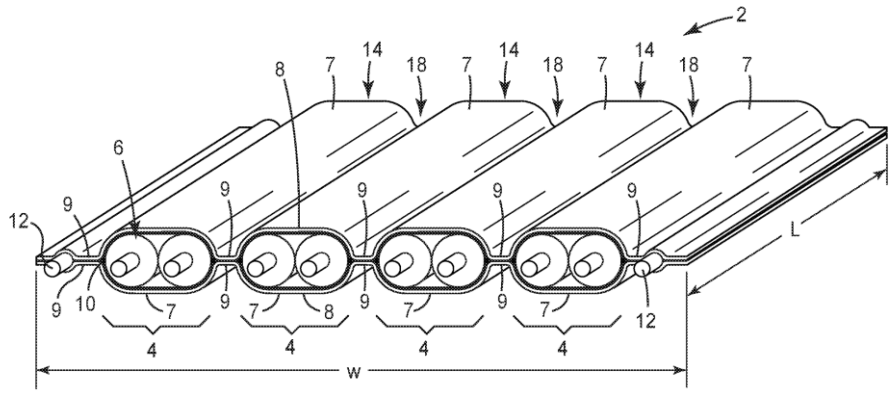

FIG. 1

Vector Analyzer for High Speed Cable

$ 135,000.00 Device to have bandwidth to test cables. To 20 GHz.

What is Bandwidth? - Christmas Lectures with David Pye

39,154 views Oct 12, 2018 7:43

A physical demonstration of Bandwidth using water, laser light and radio waves. Demonstrations of AM and FM in time and in Frequency.

https://www.youtube.com/watch?v=4HfRVun0MCk&t=32s