

Shielded or unshielded network cables

A matter of choice, electromagnetic environment, and
compatibility

October 2020

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1 Introduction

All electric and electronic devices emit electromagnetic energy, also referred to as radio frequency emissions or RF emissions. RF emissions are a byproduct of electrical or magnetic activity. Unfortunately, the emissions from one device can interfere with other devices and could potentially cause problems. Interference can lead to data loss, picture quality degradation on monitors and cameras and can cause other equipment to malfunction. This is generally titled electromagnetic interference or EMI problems.

Electromagnetic compatibility (EMC) refers to the ability of equipment to function satisfactorily without disturbing other equipment in that environment. For example, any system connected to the alternating current (AC) mains power line must be immune to transient surges; the degree of immunity depends on the application.

EMC requirements concern two basic concepts: emissions and immunity (susceptibility). Immunity is a measure of how good a system is at rejecting interference from other devices. Both emission and immunity are factors that need to be taken into consideration before determining how a product shall be installed in an existing environment.

2 Shielded versus unshielded network cables

There are advantages and disadvantages of shielded twisted-pair (STP) cables and unshielded twisted-pair (UTP) cables. Though STP cables and UTP cables are inherently different in design and manufacture, their purpose should be the same, which is to provide reliable connectivity of electronic equipment. In this paper, we make the simplification to allow different types of shielded or screened cables (FTP, S/FTP, SF/UTP) to be addressed as shielded twisted pair cable or STP.

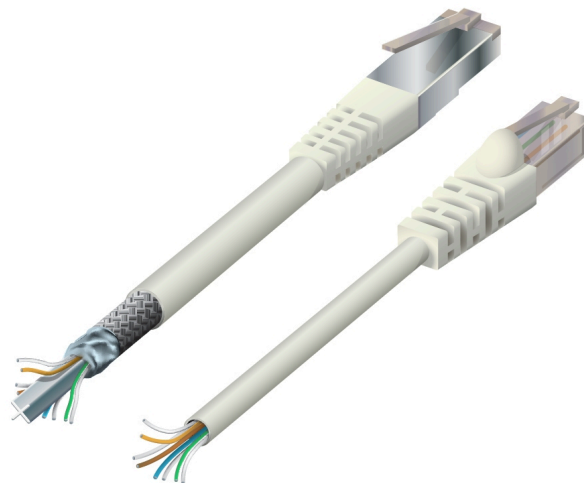


Figure 1. Left: shielded twisted-pair cable (STP). Right: unshielded twisted-pair cable (UTP).

STP cables have additional shielding material that is used to reduce external interference. The shield also reduces the emission at any point in the path of the cable. UTP cables provide much less protection against such interference and the performance is often degraded when interferences or disturbances are present. Both types of cables, however, have some protection to interference due to the twisted pair design of the conductors.

The drawback of STP cables is that they will increase the total cost of an installation. STP cables are more expensive due to the shielding, which is an additional material that goes into every meter of the cable. The shielding also makes the cable heavier and stiffer. Thus, it is more difficult to handle.

3 Two digital device classes

Federal Communications Commission (FCC) designates digital devices which are unintentional radiators into two major classes. Whether a product is tested to Class A or B limits for emissions is determined by the environment in which the product will be used.

Class A digital devices are marketed for use in a commercial, industrial or business environment.

Class B digital devices are marketed for use in residential areas.

Class B devices are tested to comply with harder emission requirements than Class A devices. However, FCC encourages manufacturers to comply with Class B limits even if the product is marketed for use in a commercial, industrial, or business environment.

Note that the FCC rules about Class A and Class B devices refer to RF emission only. A Class A product has lower requirements for RF emission due to the higher level of radio frequency interference already present in a commercial, industrial, or business environment than a Class B product, which is intended for use in a residential environment.

4 Immunity

Immunity is a measure of the ability of electronic products to tolerate the influence of electrical energy (radiated or conducted) from other electronic products and electromagnetic phenomena.

The requirements for a product to withstand electrical disturbances or interference are the opposite of RF emission requirements. That is, the immunity requirements are higher in an outdoor, industrial, or similar environment, than in a residential environment.

5 Shielded or unshielded cables with Axis network cameras

A selected range of Axis products has undergone extensive RF emission tests with the result that the user can choose between using unshielded, UTP, network cables and fulfill the Class A RF emission limits, or using shielded, STP, network cables and fulfill the Class B RF emission limits.

Our recommendation is to deploy an STP network cable in demanding electrical environments. Examples of demanding indoor environments are where the network cable is located in parallel with electrical mains supply cables or where large inductive loads such as motors or contactors are in close vicinity to the camera or its cable.

It is also mandatory to use an STP cable where the camera is used outdoors or where the network cable is routed outdoors.

Most indoor surveillance deployments are done with an unshielded twisted-pair cable and that will be sufficient to fulfill the regulatory requirements for the US market. The UTP network cable will provide lower cable costs. Since it is less bulky and allows a simpler termination of the connector, it is also easier to handle. These may all be principal factors for a customer.

About Axis Communications

Axis enables a smarter and safer world by creating solutions for improving security and business performance. As a network technology company and industry leader, Axis offers solutions in video surveillance, access control, intercom, and audio systems. They are enhanced by intelligent analytics applications and supported by high-quality training.

Axis has around 4,000 dedicated employees in over 50 countries and collaborates with technology and system integration partners worldwide to deliver customer solutions. Axis was founded in 1984, and the headquarters are in Lund, Sweden