



Perytons™ Multi-Channel Analysis

Background

The 802.15.4 PHY defines 16 possible channels in the 2.4GHz band. A 802.15.4 Personal Area Network (PAN) will typically use one of these 16 channels. A network will choose a channel either by user configuration or automatically according to channel noise level.

A device looking to join a network should look for it in a process called scan (unless it is manually pre-configured with the channel number). In a passive scan the device scans the channels and on each of them looks for a beacon transmission with the right PAN ID. In an active scan, the device transmits a beacon request message on each channel, and waits for the network coordinator to respond.

Analyzing 802.15.4 network(s) with a conventional, single channel analyzer

A typical single-channel analyzer is capable of capturing only one of the 16 possible channels. The user needs to set the analyzer to the right channel, or the analyzer should actively or passively look for it.

While this may be satisfactory for debugging a single network with a predefined channel, this is a severe limitation when analyzing multiple networks or dynamic environments with dynamic channel assignments. For example, two networks that currently use two separate channels but have some interaction in between them (e.g. mutual interference, or data transfer between them by using one of the devices as a relay) can't be simultaneously analyzed by a traditional analyzer. Similarly, an "active scan" captured by a single channel analyzer will only show occasional transmissions on the channel currently monitored by the analyzer .

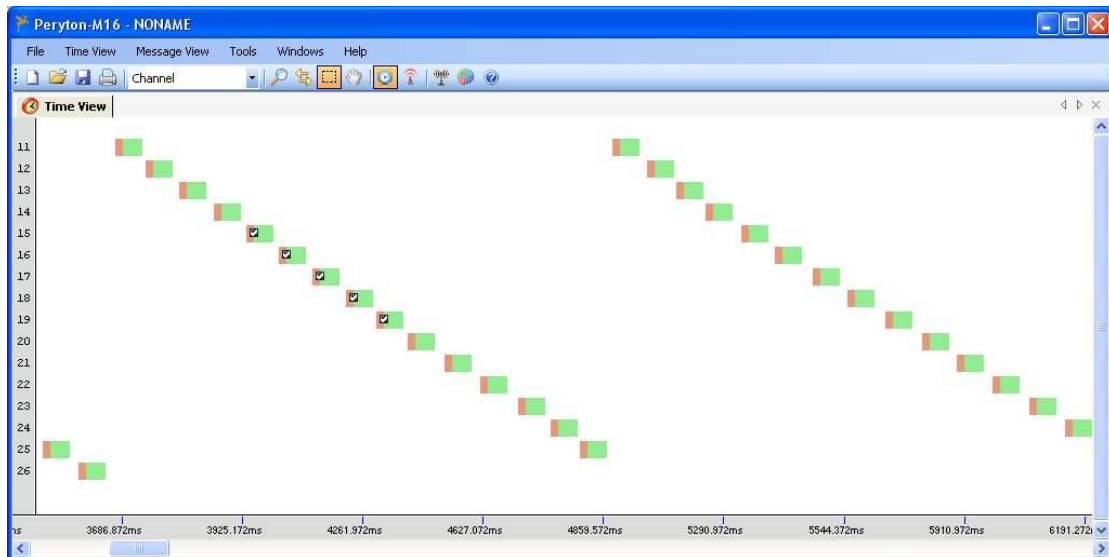
This is also a limitation for certification labs that need to make sure the device under test follows the exact rules defined by the standard. With a single channel analyzer one can't make sure the device under test doesn't transmit on a wrong channel, or doesn't correctly implement active scan. A common workaround is to use a spectrum analyzer to make sure the device is not transmitting out of channel. While this maybe satisfactory when testing one device in the lab, it doesn't help in a multiple-device environment because the message content is essential to identifying the problematic device and the scenario which caused the erroneous transmission.

Analyzing 802.15.4 networks with a Perytons multi-channel analyzer

The Perytons analyzer is the only analyzer on the market that is capable of simultaneously capturing data from multiple channels. This allows the analyzer to capture all 802.15.4 traffic in the 2.4GHz band.

With this feature the analyzer can capture single-network data without prior knowledge of the channel selected by the network, and it can just as easily captures data from multiple networks, displaying dynamic channel allocation processes such as active scan and immediately identifying devices that transmit on the wrong channel.

The following plot shows an active scan in the Perytons analyzer Time-View window.



The use of 802.15.4 USB dongles as RF receivers keeps the multi-channel analyzer compact and easy to carry by a field technician. The following pictures demonstrate a 7 channel capturing kit.

