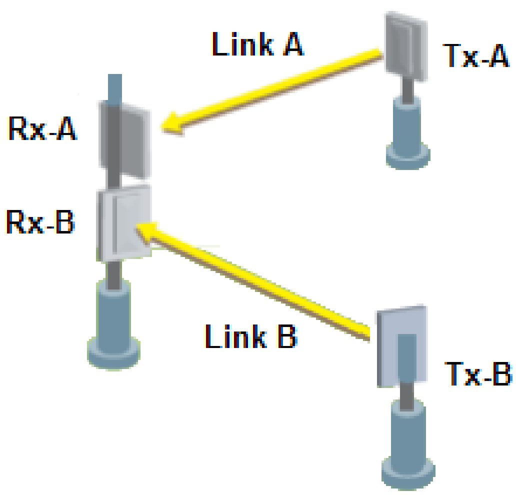
Introduction: How you can save yourself from self-inflicted interference

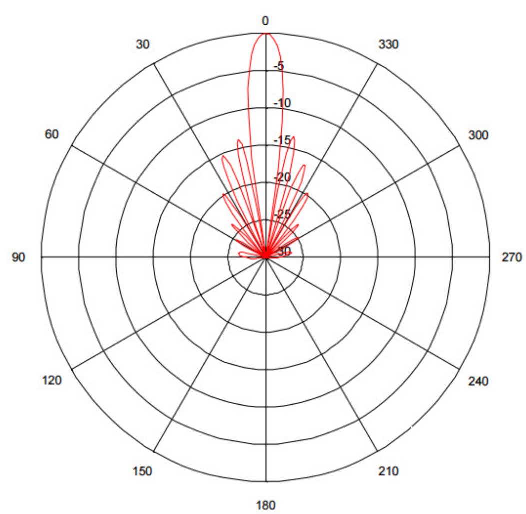
Many wireless deployment scenarios involve multiple links being co-located at a single site. For enterprises, it may be your headquarters building. For ISPs, it could be the tower where many base stations are installed. Network operators managing multiple links all have to face the issue of avoiding self-interference, i.e. minimize the reception of unwanted signals from other radios in your deployment. In fact, the problem is getting more attention due to the arrival of 80MHz channel bandwidth, which precludes the option of using different channels to avoid interference. As with many RF issues, this problem will not go away - the trick is to minimize it so it does not degrade the performance of your wireless network.

ATPC is one method that can help by limiting transmit power levels at their optimum points. Find out the details how this can be done from case studies below.

Case #1: Links with equal distances

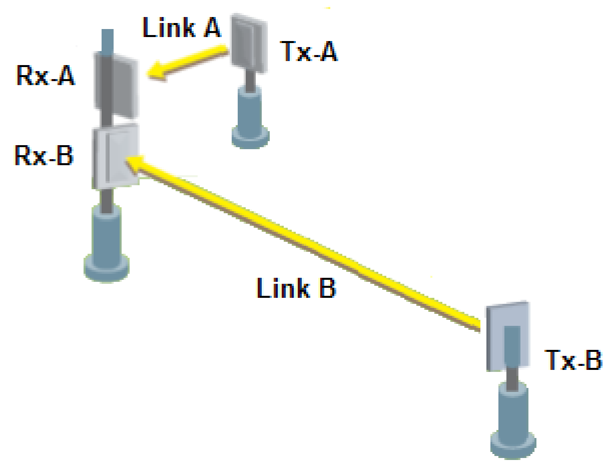
Consider a simple case of two separate PTP links deployed at the same location. Let's assume that the operating conditions are equal for both links and the antennas at the hub site are at an angle of 30 degrees (diagram below, left). A typical antenna pattern shows that the response is down by 20 dB at 30 degrees off the center (diagram below, right). This means that the antenna response to the unwanted signal from Transmitter A received at Receiver B is lower by 30dB that the wanted signal from Transmitter B received by Receiver B. This separation usually provides sufficient isolation of two signals and both links can operate in good condition.





Case #2: Links with unequal distances

However, a deployment case where there is a large difference in link distances may not be protected the same way by antenna patterns. The free space path losses for a 1-mile link and a 10-mile link are 112dB and 132dB, respectively. This means that at Antenna B, the received signal level (RSL) from Transmitter A is higher by 20dB than that from Transmitter B. Thus, the 30 dB isolation provided by the antenna pattern at 30 degree angle, discussed in Case #1, is now reduced to only 10 dB due to the difference in RSL, potentially disrupting the receiver performance for Link B.



ATPC Solution

The way to take care of this problem is to automatically adjust the Tx power so that an optimum received signal level is maintained for all links. Receivers are programmed to maintain a pre-configured level of RSL and checks for deviation from that level. If the case of deviation, receivers will request the remote transmitter to adjust its power until the desired RSL can be achieved. This task at the receiver is performed periodically to maintain the optimum RSL consistently over time.

In Case #2 above, because Link A is so short, the RSL will be excessively high over the level needed to maintain a good RF connection. It will not provide a better performance for Link A but it will negatively affect Link B. ATPC will automatically lower the Tx power level upon detecting excessive RSS at any receiver. Thus, the RSS will be at the same optimum level for all receivers and you can fully reply on isolation provided by the antenna gain, regardless of link distances.

Of course, you can extend the usefulness of ATPC to more complicated case of multiple PTP or base station deployment where link distances can vary quite a bit among many different remote units. The protection provided by APTC will ensure that the RSL at the central site always remain the same regardless of changing and growing deployment cases.

ATPC will also provide adjustment of Tx power to increase the long-term reliability of the link operation. Tx power levels can vary due to radio aging over time and the RF link condition can change short-term seasonally or due to other factors that affect the link path. ATPC will adaptively adjust the Tx power to maintain the same link conditions over the long run.