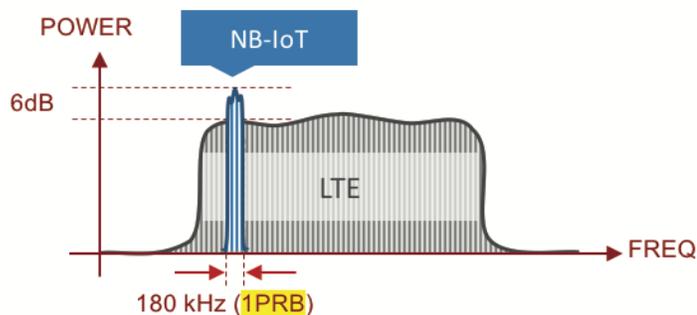


Certifying and Maintaining In-band NB-IoT for Wireless Networks

One of the fastest ways to implement the Narrowband Internet of Things (NB-IoT) standard is to add In-band into the existing spectrum of a LTE network. This is done as a software upgrade and uses 180 kHz or one Physical Resource Block (PRB) within the LTE broadband carrier spectrum.

While this makes certification and implementation quick, it is prone to internal interference than any other method currently available. Technicians must carefully check three main items during certification, and check them regularly during maintenance, to make sure service is running at peak performance.

- 1) **Minimum Power Boosting:** Since NB-IoT uses the same spectrum as a LTE network, the power levels for In-band must be boosted to a minimum of +6 dB above the average power levels for the LTE and NB-IoT broadband carrier. Only one PRB can be boosted +6 dB for in-band operation mode.



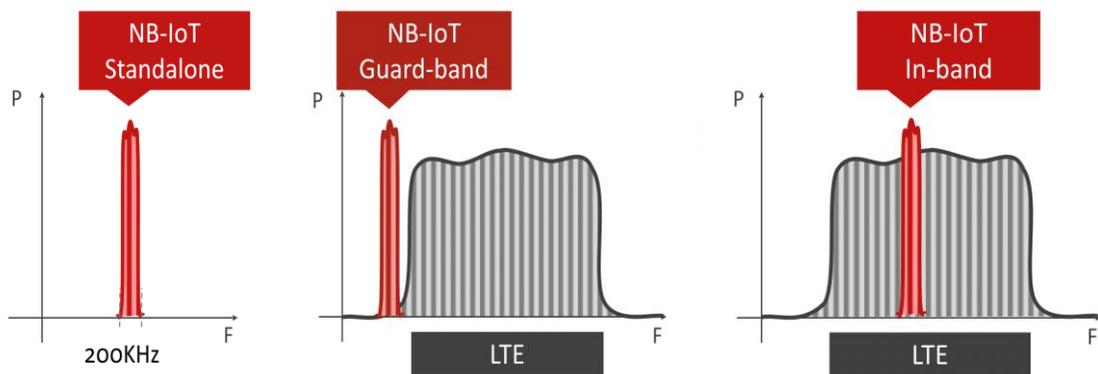
- 2) **Error Vector Magnitude (EVM):** EVM is the difference between the ideal transmitted signal and the actual signal being received (tested). EVM is a very useful indicator of signal quality. The 3GPP standards specify a Narrowband Reference Signal (NRS) modulation requirement of $EVM \leq 17.5\%$, which can be easily validated with a dedicated analysis view on testing units.

- 3) **Frequency Error Measurement:** The frequency error measurement tests to ensure that the NB-IoT frequency hasn't shifted into another adjacent frequency. This is a common cause of service degradation. There will always be a small amount of frequency shifting due to excessive power levels, as an example, but frequency errors must not exceed ± 0.1 PPM.

These three items must be tested on a routine basis as In-band NB-IoT is susceptible to slight changes in the spectrum that can degrade service for either IoT or LTE or both. To learn more about how this is possible, and gain an in-depth look at In-band deployments, read the white paper [Practical Guide for Field Testing NB-IoT](#).

Short on time? Read the blog post [3GPP NB-IoT Deployment and Optimization Challenges](#).

In-band is currently the most popular form of implementing NB-IoT, but Standalone and Guard-band are gaining popularity. Read the application note [Narrowband Internet of Things \(NB-IoT\) Cell Advisor700B Series](#) for more information.



Products Used for Testing:

[CellAdvisor Base Station Analyzer](#)