



EU Carrier News Tech Tip: LTE Signal Quality – It's Not Just About RSSI

For years we have all been relying on RSSI - Received Signal Strength Indicator or Indication – for reporting signal strength. RSSI is shown on pretty much any RF device, including Wi-Fi adapters and ZigBee devices. Many 2G/3G (i.e., UMTS/HSPA) devices will also report Ec/Io which is a better indicator of signal quality; however, Ec/Io is less commonly used and not as well understood as RSSI.

LTE uses three new metrics to help indicate signal quality:

- Reference Signal Received Power: RSRP indicates the signal strength and is roughly analogous to RSSI.
- Reference Signal Received Quality: RSRQ describes the signal quality and is similar to Ec/Io.
- Signal to Interference and Noise Ratio: SINR (also called SNR) indicates the throughput capacity of the channel. As the name implies, SINR is the strength of the signal divided by the strength of any interference or background noise.

This chart, which I extracted from our [Migration to LTE whitepaper](#) will allow you to categorize the values. The white paper includes as well a chart for 3G RSSI and Ec/Io.

RF Conditions	RSRP (dBm)	RSRQ (dB)	SINR (dB)
Excellent	≥ -80	≥ 10	≥ 20
Good	-80 to -90	-10 to -15	13 to 20
Mid Cell	-90 to -100	-15 to -20	0 to 13
Cell Edge	≥ -100	≥ -20	≥ 0

With the Digi TransPort router, you can easily see this information either via the WebUI or as well via the Command Line Interface using the modemstat command.

Here is an example output that shows already the complexity:

```
modemstat ?  
Outcome: Got modem status OK:  
Time: 24 Sep 2014 20:37:18  
SIM status: Ready (PIN checking disabled)  
Signal strength: -69 dBm  
Radio technology: LTE  
Signal quality (LTE): RSSI -69 dBm, RSRP -100 dBm, RSRQ -14 dB, SNR -1.8 dB
```

Good or bad? RSSI is excellent. But... the signal QUALITY is actually POOR. This is likely because I am some distance away from the transmitter. It's also possible something is interfering with the signal, such as a building or other obstructions between the device and the tower. And it shows in the performance, which is much slower than it should be with good signal.

Here is an output from my WR11 on my desk:

```
ss367138>modemstat ?  
Outcome: Got modem status OK:  
Time: 23 Sep 2015 14:31:33  
SIM status: Ready (PIN checking disabled)  
Signal strength: -65 dBm  
Radio technology: LTE  
Signal quality (LTE): RSSI -65 dBm, RSRP -94 dBm, RSRQ -9 dB, SINR 12.8 dB
```

Performance is much better in this case!

Bottom line: Signal QUALITY is directly proportional to performance (yep, this statement still hasn't changed back to 2G days). Move the cellular device where it gets a better signal or use better antennas (and yes, use two identical antennas).

As the Signal Quality is not static, we provide several options to track and react.

- Configure the router to write the signal quality every x minutes into the eventlog.
- Use Digi Remote Manager to get reports about Signal quality
- Use SNMP or send the Eventlog via email or FTP to your own system
- In Python you can create your own logic

Please contact Michael.Pohl@digicom.de if you want to know more.