

DATASHEETS

Modulation data speed (RF data rate, Gross data rate) is typically listed in data sheets without any detailed specification. It is often misinterpreted as Network performance. In reality, **Modulation data speed is always reduced by the overhead** created mainly by the protocol on Radio channel.

When comparing different products it is very important to understand that you will never get datasheet speed in practice!

NETWORK PERFORMANCE

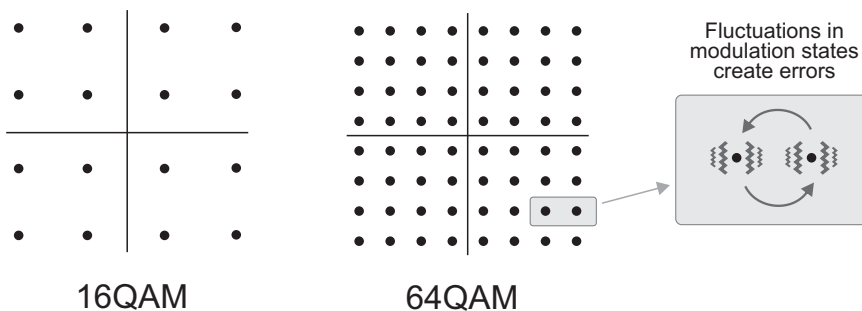
Data sheet listings of Modulation data speed is like the quoted top speed of your car. But the top speed of your car has little impact on your daily travel time to and from work. Travel time is dependent on traffic flow management in the city (Radio protocol), levels of congestion (traffic load from SCADA app), catching green lights (optimization), aggressive driving (collisions) and double journeys (repeating packets). Since all of these factors are in a constant state of flux, travelling time varies and most importantly, has minimum dependence on the top speed of the car (Modulation data speed).

The best measurement to express Network performance and how many packets/bytes (number of cars) will be delivered in a given period (cars arriving on time) is **Network throughput (Bytes/sec)**. However, as a number of factors affect this value, it must be measured in real time and is constantly subject to change!

Network throughput (User data speed) is the only parameter that is relevant to the user – Modulation data speed is virtually irrelevant!

HIGHER MODULATIONS

Higher modulations increases Data speed but also increases errors.



Higher modulation states place the states closer together creating higher interference sensitivity, producing a higher chance of errors and higher overhead to solve these errors.

- **64QAM** requires **heavier FEC** (Forward Error Correction)
- FEC may not resolve issues with multi path propagation or RSS instability
- **ACM** (Adaptive Coding and Modulation) generates significant **overhead**, especially on unstable links
- **64QAM** is only effective over very **short distances** unaffected by multi path propagation with excellent signal strength and clear line of sight

On true non line of site over longer distances RipEX with 16DEQAM will work reliably, but 64QAM will not!



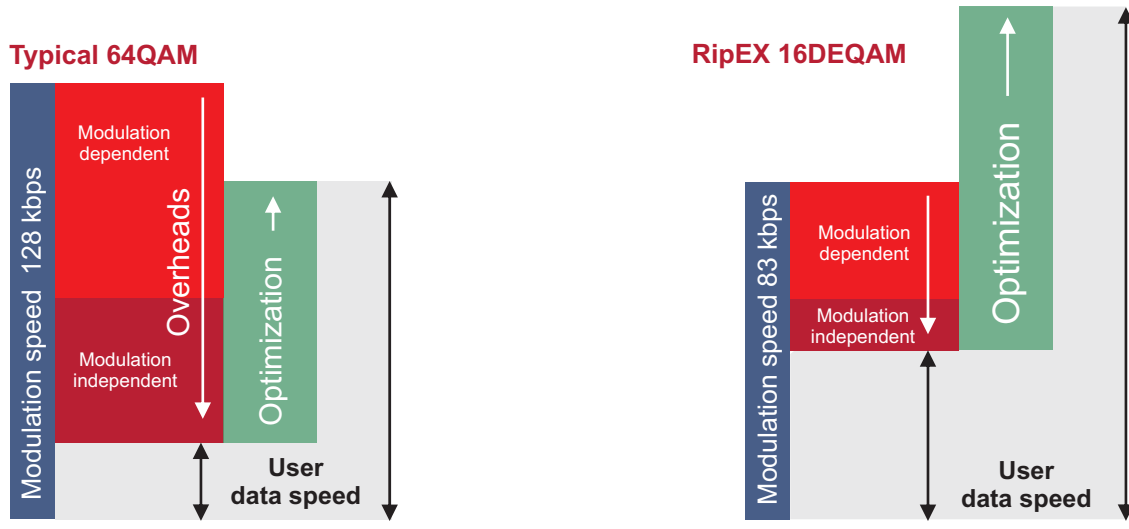
Radio modem & Router

- Native IP device
- 1× ETH, 2× COM, 1× USB
- Sleep & Save modes
- 0.1–10 watts, – 40 to +70 °C
- WiFi management
- SW feature keys
- Backup routes
- Fast remote access

Applications

- Polling, Report-by-exception, Mesh
- SCADA & Telemetry
- Water Oil & Gas
- Electricity
- Smart grid
- POS & ATM
- Lottery
- Weather

PRACTICAL TEST



To scale based on test results

RADIO CHANNEL OVERHEADS

These always reduce Data speed

Modulation dependent

The higher the modulation, the higher the overhead

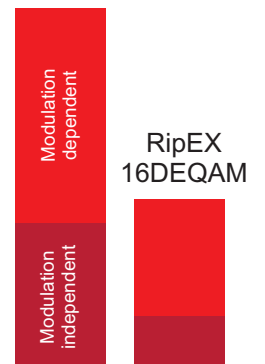
- Physical layer (e.g. Rx/Tx Switching time, Synchronization, FEC...)
- Data integrity (repeated packets because of CRC anomalies, low RSS, multipath propagation...)
- 16DEQAM used in RipEX is more robust; its overhead is significantly lower than 64QAM which has 4 times more states

Modulation independent

Most critical network throughput factor is efficiency of Radio protocol; it varies greatly in different modems

- Radio channel access (LBT, access algorithm...)
- Collision avoidance (channel sharing - CSMA, TDMA...)
- Collision resolving (acknowledgement and retransmissions...)
- Tests prove that RipEX has the most effective Radio protocol on the market with the lowest overhead

Typ. 64QAM



OPTIMIZATION

Can enable increase of Data speed over 200%

- Compression effectiveness is dependent on data compressibility
- TCP/IP header compression + TCP/IP redundant packet elimination
- Stream compression; libraries of data repeated inside packets (only pointers transmitted)
- Short packets combined for transmission reducing number of packets on the link



CONCLUSION

- Data speeds declared in Datasheets never define Network performance. Network throughput from field tests should be used
- Highest degradation of Data speed comes from Radio protocol overheads
- Higher modulation, even with ACM, have a limited impact on Network throughput or can't be used at all

Never rely purely on declared Data speed in datasheets. Always ask for field test results for your specific application to realise Network throughput (User data speed)!