Trilliant 1 Watt SecureMesh Radio Module Relaxation Factor

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The Trilliant SecureMesh 1 Watt Radio Module will not transmit for more than 4.35ms over a 43.5ms time period. The justification is based upon the following conditions:

1) Transmit packet size 131 bytes maximum, for 4.19ms transmission duration.
2) Data rate 250kbps.
3) Each radio waits for acknowledgement prior to retransmission.
4) Acknowledgement is 5 bytes, or 0.16ms transmission duration.
5) Maximum number of hops per mesh network is 10.

Documentation is justified as below:

Example 1 – Trilliant SecureMesh Network – Source to Destination Requires Ten Hops

Typical broadcast over a large network (10 radios) includes:

A) Message is transmitted by the initiating radio (first hop). Total transmit time is 4.19ms.
B) Transmission time to the destination radio (10th hop- assuming no retries), requires an additional 37.71ms.
C) Acknowledgement from destination radio to initiating radio requires 1.6 ms, assuming no retries.

Large network, No Retries
Transmit time: 4.19ms
Total on time: 43.5ms
Total on time per radio (Tx packet plus Ack Packet): 4.35ms
Total percentage on time per radio/best case: 10.00 per cent

Note: The Large Network, No Retries offers the highest utilization. A ten-hop mesh network will typically require retries which reduce the throughput of the system. Retries will effectively reduce the duty cycle of the radios.

Network Topology

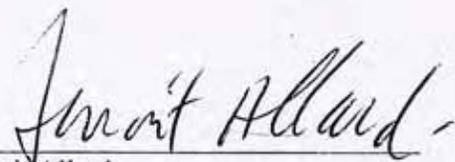| Initiating Radio	Radios 2-9	Destination Radio (Hop 10)

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Average (Relaxation) Factor

Average Factor = $20 * \text{Log10}$ (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies 4.35ms X 2 = 8.7 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

Average Factor = $20 * \text{Log10}$ (8.7 / 100 ms) = -21.2 dB

A relaxation factor of allowable dB would be allowable for this product

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