**Optimum Range for Tactical Radios in DTDMA**

Applicable Release: NetSim v13.3.17 or higher.

Applicable Version(s): Pro

Project download link: See Appendix-1. The URL has the configuration files (scenario, settings, and other related files) of the examples discussed in this analysis for users to import and run in NetSim.

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# Transmission Range: HF Band

**Scenario:**

Chart

Description automatically generated

**Application Properties:**

|  |  |
| --- | --- |
| Application Properties |  |
| Application Method | Unicast |
| Application Type | CBR |
| Transport Protocol | UDP |
| Packet Size(bytes) | 1460 |
| IAT (micro sec) | 20000 |

**Formula to Calculate Packet Error Rate:**

## Case 1: Receiver sensitivity = -95 dBm, path loss exponent = 3.5

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -95 |
| TX Power (W) | 20 |
| Band | HF-Band |
| Lower Frequency (MHz) | 3 |
| Upper Frequency (MHz) | 23 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.5 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate FEC- True |
| 40000 | 0.23 | 0.00 |
| 41000 | 0.23 | 0.00 |
| 42000 | 0.23 | 0.00 |
| 43000 | 0.23 | 0.00 |
| 44000 | 0.23 | 0.00 |
| 45000 | 0.23 | 0.00 |
| 45100 | 0.23 | 0.00 |
| 45200 | 0.23 | 0.00 |
| 45300 | 0.23 | 0.00 |
| 45400 | 0.23 | 0.00 |
| 45500 | 0.00 | 0.00 |
| 45600 | 0.00 | 0.00 |

Table 1 :Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 2: Receiver sensitivity = -100 dBm, path loss exponent = 3.5

**Settings**:

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -100 |
| TX Power (W) | 20 |
| Band | HF-Band |
| Lower Frequency (MHz) | 3 |
| Upper Frequency (MHz) | 23 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.5 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate FEC- True |
| 50000 | 0.23 | 0.00 |
| 51000 | 0.23 | 0.00 |
| 52000 | 0.23 | 0.00 |
| 53000 | 0.23 | 0.00 |
| 54000 | 0.23 | 0.00 |
| 55000 | 0.23 | 0.00 |
| 56000 | 0.23 | 0.00 |
| 57000 | 0.23 | 0.00 |
| 58000 | 0.23 | 0.00 |
| 59000 | 0.23 | 0.00 |
| 60000 | 0.23 | 0.00 |
| 61000 | 0.23 | 0.00 |
| 62000 | 0.23 | 0.00 |
| 63000 | 0.23 | 0.00 |
| 63100 | 0.23 | 0.00 |
| 63200 | 0.00 | 0.00 |
| 63400 | 0.00 | 0.00 |

Table 2:Throughput (Mbps) and Packet Error Rate vs. Distance (m)

## Case 3: Receiver sensitivity = -105 dBm, path loss exponent = 3.5

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -105 |
| TX Power (W) | 20 |
| Band | HF-Band |
| Lower Frequency (MHz) | 3 |
| Upper Frequency (MHz) | 23 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Path loss Exponent | 3.5 |

**Results**:

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 80000 | 0.23 | 0.00 |
| 81000 | 0.23 | 0.00 |
| 82000 | 0.23 | 0.00 |
| 83000 | 0.23 | 0.00 |
| 84000 | 0.23 | 0.00 |
| 85000 | 0.23 | 0.00 |
| 86000 | 0.23 | 0.00 |
| 87000 | 0.23 | 0.00 |
| 87100 | 0.23 | 0.00 |
| 87200 | 0.23 | 0.00 |
| 87300 | 0.23 | 0.00 |
| 87400 | 0.23 | 0.00 |
| 87500 | 0.23 | 0.00 |
| 87600 | 0.23 | 0.00 |
| 87700 | 0.23 | 0.00 |
| 87800 | 0.00 | 0.00 |
| 87900 | 0.00 | 0.00 |

Table 3:Throughput (Mbps) and Packet Error Rate vs. Distance (m)

## Case 4: Receiver sensitivity = -110 dBm, path loss exponent = 3.7

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -110 |
| TX Power (W) | 20 |
| Band | HF-Band |
| Lower Frequency (MHz) | 3 |
| Upper Frequency (MHz) | 23 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Path loss only |
| Path loss Model | Log Distance |
| Path loss Exponent | 3.5 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 45000 | 0.23 | 0.00 |
| 47000 | 0.23 | 0.00 |
| 49000 | 0.23 | 0.00 |
| 51000 | 0.23 | 0.01 |
| 53000 | 0.22 | 0.06 |
| 55000 | 0.15 | 0.41 |
| 57000 | 0.01 | 0.99 |
| 57500 | 0.00 | 1.00 |
| 58000 | 0.00 | 1.00 |
| 58500 | 0.00 | 1.00 |
| 59000 | 0.00 | 1.00 |

Table 4:Throughput (Mbps) and Packet Error Rate vs. Distance (m)

# Transmission Range: VHF Band

**Scenario:**

Chart

Description automatically generated

## Case 1: Receiver sensitivity = -90 dBm, pathloss exponent = 2.9

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | VHF-Band |
| Lower Frequency (MHz) | 30 |
| Upper Frequency (MHz) | 50 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.1 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 15000 | 0.23 | 0.00 |
| 16000 | 0.23 | 0.00 |
| 17000 | 0.23 | 0.00 |
| 18000 | 0.23 | 0.00 |
| 18100 | 0.23 | 0.00 |
| 18200 | 0.00 | 0.00 |
| 18300 | 0.00 | 0.00 |
| 18400 | 0.00 | 0.00 |
| 18500 | 0.00 | 0.00 |

Table 5:Throughput (Mbps) and Packet Error Rate vs. Distance (m)

## Case 2: Receiver sensitivity = -95 dBm, path loss exponent = 3

**Settings**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | VHF-Band |
| Lower Frequency (MHz) | 30 |
| Upper Frequency (MHz) | 50 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.1 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 20000 | 0.23 | 0.00 |
| 21000 | 0.23 | 0.00 |
| 22000 | 0.23 | 0.00 |
| 23000 | 0.23 | 0.00 |
| 24000 | 0.23 | 0.00 |
| 25000 | 0.23 | 0.00 |
| 26000 | 0.23 | 0.00 |
| 26100 | 0.23 | 0.00 |
| 26200 | 0.23 | 0.00 |
| 26300 | 0.00 | 0.00 |
| 26400 | 0.00 | 0.00 |
| 26500 | 0.00 | 0.00 |

Table 6:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 3: Receiver sensitivity = -100 dBm, path loss exponent = 3.1

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | VHF-Band |
| Lower Frequency (MHz) | 30 |
| Upper Frequency (MHz) | 50 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.1 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 35000 | 0.23 | 0.00 |
| 36000 | 0.23 | 0.00 |
| 37000 | 0.23 | 0.00 |
| 38000 | 0.23 | 0.00 |
| 38100 | 0.00 | 0.00 |
| 38200 | 0.00 | 0.00 |
| 38300 | 0.00 | 0.00 |
| 38400 | 0.00 | 0.00 |
| 38500 | 0.00 | 0.00 |

|  |  |
| --- | --- |
|  |  |
|  |  |

Table 7:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 4: Receiver sensitivity = -105 dBm, path loss exponent = 3.1

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | VHF-Band |
| Lower Frequency (MHz) | 30 |
| Upper Frequency (MHz) | 50 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.1 |

**Results**:

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 75000 | 0.23 | 0.00 |
| 76000 | 0.23 | 0.00 |
| 77000 | 0.23 | 0.00 |
| 78000 | 0.23 | 0.00 |
| 79000 | 0.23 | 0.00 |
| 79100 | 0.23 | 0.00 |
| 79200 | 0.23 | 0.00 |
| 79300 | 0.23 | 0.00 |
| 79400 | 0.23 | 0.00 |
| 79500 | 0.00 | 0.00 |
| 79600 | 0.00 | 0.00 |

Table 8:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 5: Receiver sensitivity = -110 dBm, path loss exponent = 3.1

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | VHF-Band |
| Lower Frequency (MHz) | 30 |
| Upper Frequency (MHz) | 50 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 3.1 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 115000 | 0.23 | 0.00 |
| 117000 | 0.23 | 0.00 |
| 119000 | 0.23 | 0.00 |
| 121000 | 0.23 | 0.00 |
| 123000 | 0.23 | 0.00 |
| 125000 | 0.23 | 0.00 |
| 127000 | 0.23 | 0.00 |
| 129000 | 0.23 | 0.01 |
| 131000 | 0.23 | 0.02 |
| 133000 | 0.23 | 0.03 |
| 135000 | 0.22 | 0.06 |
| 137000 | 0.21 | 0.12 |
| 139000 | 0.19 | 0.22 |
| 141000 | 0.16 | 0.36 |
| 143000 | 0.12 | 0.58 |
| 145000 | 0.06 | 0.82 |
| 147000 | 0.02 | 0.95 |
| 149000 | 0.00 | 0.99 |
| 151000 | 0.00 | 1.00 |
| 153000 | 0.00 | 1.00 |
| 155000 | 0.00 | 1.00 |

Table 9:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

# Transmission Range: UHF-Band

**Scenario:**

Chart

Description automatically generated

## Case 1: Receiver sensitivity = -90 dBm, pathloss exponent = 2.7

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | UHF-Band |
| Lower Frequency (MHz) | 300 |
| Upper Frequency (MHz) | 320 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.7 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 5000 | 0.23 | 0.00 |
| 6000 | 0.23 | 0.00 |
| 7000 | 0.23 | 0.00 |
| 7100 | 0.23 | 0.00 |
| 7200 | 0.23 | 0.00 |
| 7300 | 0.23 | 0.00 |
| 7400 | 0.23 | 0.00 |
| 7500 | 0.23 | 0.00 |
| 7600 | 0.23 | 0.00 |
| 7700 | 0.23 | 0.00 |
| 7800 | 0.00 | 0.00 |
| 7900 | 0.00 | 0.00 |

Table 10:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 2: Receiver sensitivity = -95 dBm, path loss exponent = 2.7

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | UHF-Band |
| Lower Frequency (MHz) | 300 |
| Upper Frequency (MHz) | 320 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.7 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate FEC- True |
| 5000 | 0.23 | 0.00 |
| 6000 | 0.23 | 0.00 |
| 7000 | 0.23 | 0.00 |
| 8000 | 0.23 | 0.00 |
| 9000 | 0.23 | 0.00 |
| 10000 | 0.23 | 0.00 |
| 11000 | 0.23 | 0.00 |
| 11100 | 0.23 | 0.00 |
| 11200 | 0.23 | 0.00 |
| 11300 | 0.23 | 0.00 |
| 11400 | 0.23 | 0.00 |
| 11500 | 0.23 | 0.00 |
| 11600 | 0.23 | 0.00 |
| 11700 | 0.23 | 0.00 |
| 11800 | 0.23 | 0.00 |
| 11900 | 0.00 | 0.00 |
| 12000 | 0.00 | 0.00 |

Table 11:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 3: Receiver sensitivity = -100 dBm, path loss exponent = 2.7

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) |  |
| TX Power (W) | 20 |
| Band | UHF-Band |
| Lower Frequency (MHz) | 300 |
| Upper Frequency (MHz) | 320 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.7 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 10000 | 0.23 | 0.00 |
| 11000 | 0.23 | 0.00 |
| 12000 | 0.23 | 0.00 |
| 13000 | 0.23 | 0.00 |
| 14000 | 0.23 | 0.00 |
| 15000 | 0.23 | 0.00 |
| 16000 | 0.23 | 0.00 |
| 17000 | 0.23 | 0.00 |
| 18000 | 0.23 | 0.00 |
| 18100 | 0.23 | 0.00 |
| 18200 | 0.00 | 0.00 |
| 18300 | 0.00 | 0.00 |

|  |  |
| --- | --- |
|  |  |
|  |  |

Table 12:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 4: Receiver sensitivity = -105 dBm, path loss exponent = 2.7

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | UHF-Band |
| Lower Frequency (MHz) | 300 |
| Upper Frequency (MHz) | 320 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.7 |

**Results**:

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 20000 | 0.23 | 0.00 |
| 21000 | 0.23 | 0.00 |
| 22000 | 0.23 | 0.00 |
| 23000 | 0.23 | 0.00 |
| 24000 | 0.23 | 0.00 |
| 25000 | 0.23 | 0.00 |
| 26000 | 0.23 | 0.00 |
| 27000 | 0.23 | 0.00 |
| 27100 | 0.23 | 0.00 |
| 27200 | 0.23 | 0.00 |
| 27300 | 0.23 | 0.00 |
| 27400 | 0.23 | 0.00 |
| 27500 | 0.23 | 0.00 |
| 27600 | 0.23 | 0.00 |
| 27700 | 0.23 | 0.00 |
| 27800 | 0.23 | 0.00 |
| 27900 | 0.00 | 0.00 |
| 28000 | 0.00 | 0.00 |

Table 13:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 5: Receiver sensitivity = -110 dBm, path loss exponent = 2.7

**Settings**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | UHF-Band |
| Lower Frequency (MHz) | 300 |
| Upper Frequency (MHz) | 320 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.7 |

**Results**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC- True |
| 25000 | 0.23 | 0.00 |
| 26000 | 0.23 | 0.00 |
| 27000 | 0.23 | 0.00 |
| 28000 | 0.23 | 0.00 |
| 29000 | 0.23 | 0.00 |
| 30000 | 0.23 | 0.00 |
| 31000 | 0.23 | 0.01 |
| 32000 | 0.23 | 0.03 |
| 33000 | 0.20 | 0.13 |
| 34000 | 0.16 | 0.37 |
| 35000 | 0.06 | 0.82 |
| 36000 | 0.01 | 0.99 |
| 37000 | 0.00 | 1.00 |
| 38000 | 0.00 | 1.00 |

Table 14:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

# Transmission Range: L-Band

**Scenario:**

Chart

Description automatically generated

## Case 1: Receiver sensitivity = -90 dBm, pathloss exponent = 2.4

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | L-Band |
| Lower Frequency (MHz) | 1000 |
| Upper Frequency (MHz) | 2000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 16000 | 0.23 | 0.00 |
| 17000 | 0.23 | 0.00 |
| 18000 | 0.23 | 0.00 |
| 19000 | 0.23 | 0.00 |
| 20000 | 0.23 | 0.00 |
| 21000 | 0.23 | 0.00 |
| 22000 | 0.23 | 0.00 |
| 22100 | 0.23 | 0.00 |
| 22200 | 0.23 | 0.00 |
| 22300 | 0.23 | 0.00 |
| 22400 | 0.23 | 0.00 |
| 22500 | 0.23 | 0.00 |
| 22600 | 0.23 | 0.00 |
| 22700 | 0.23 | 0.00 |
| 22800 | 0.00 | 0.00 |
| 22900 | 0.00 | 0.00 |
| 23000 | 0.00 | 0.00 |

Table 15:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 2: Receiver sensitivity = -95 dBm, path loss exponent = 2.4

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | L-Band |
| Lower Frequency (MHz) | 1000 |
| Upper Frequency (MHz) | 2000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 30000 | 0.23 | 0.00 |
| 31000 | 0.23 | 0.00 |
| 32000 | 0.23 | 0.00 |
| 33000 | 0.23 | 0.00 |
| 34000 | 0.23 | 0.00 |
| 35000 | 0.23 | 0.00 |
| 36000 | 0.23 | 0.00 |
| 36100 | 0.23 | 0.00 |
| 36200 | 0.23 | 0.00 |
| 36300 | 0.23 | 0.00 |
| 36400 | 0.23 | 0.00 |
| 36500 | 0.23 | 0.00 |
| 36600 | 0.23 | 0.00 |
| 36700 | 0.00 | 0.00 |
| 36800 | 0.00 | 0.00 |

Table 16:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 3: Receiver sensitivity = -100 dBm, path loss exponent = 2.5

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | L-Band |
| Lower Frequency (MHz) | 1000 |
| Upper Frequency (MHz) | 2000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 35000 | 0.23 | 0.00 |
| 36000 | 0.23 | 0.00 |
| 37000 | 0.23 | 0.00 |
| 38000 | 0.23 | 0.00 |
| 38100 | 0.23 | 0.00 |
| 38200 | 0.00 | 0.00 |
| 38300 | 0.00 | 0.00 |
| 38400 | 0.00 | 0.00 |

Table 17:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 4: Receiver sensitivity = -105 dBm, path loss exponent = 2.5

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | L-Band |
| Lower Frequency (MHz) | 1000 |
| Upper Frequency (MHz) | 2000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results**:

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC – True |
| 55000 | 0.23 | 0.00 |
| 56000 | 0.23 | 0.00 |
| 57000 | 0.23 | 0.00 |
| 58000 | 0.23 | 0.00 |
| 59000 | 0.23 | 0.00 |
| 60000 | 0.23 | 0.00 |
| 60100 | 0.23 | 0.00 |
| 60200 | 0.23 | 0.00 |
| 60300 | 0.23 | 0.00 |
| 60400 | 0.23 | 0.00 |
| 60500 | 0.23 | 0.00 |
| 60600 | 0.00 | 0.00 |
| 60700 | 0.00 | 0.00 |

Table 18:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 5: Receiver sensitivity = -110 dBm, path loss exponent = 2.5

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | L-Band |
| Lower Frequency (MHz) | 1000 |
| Upper Frequency (MHz) | 2000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 60000 | 0.23 | 0.00 |
| 62000 | 0.23 | 0.00 |
| 64000 | 0.23 | 0.00 |
| 66000 | 0.23 | 0.00 |
| 68000 | 0.23 | 0.01 |
| 70000 | 0.23 | 0.03 |
| 72000 | 0.21 | 0.09 |
| 74000 | 0.18 | 0.24 |
| 76000 | 0.12 | 0.53 |
| 78000 | 0.05 | 0.89 |
| 80000 | 0.00 | 0.99 |
| 80500 | 0.00 | 1.00 |
| 81000 | 0.00 | 1.00 |

Table 19:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

# Transmission Range: S-Band

**Scenario:**

Chart

Description automatically generated

## Case 1: Receiver sensitivity = -90 dBm, pathloss exponent = 2.1

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -90 |
| TX Power (W) | 20 |
| Band | S-Band |
| Lower Frequency (MHz) | 2000 |
| Upper Frequency (MHz) | 4000 |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.1 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 20000 | 0.23 | 0.00 |
| 21000 | 0.23 | 0.00 |
| 22000 | 0.23 | 0.00 |
| 23000 | 0.23 | 0.00 |
| 24000 | 0.23 | 0.00 |
| 25000 | 0.23 | 0.00 |
| 25100 | 0.23 | 0.00 |
| 25200 | 0.23 | 0.00 |
| 25300 | 0.23 | 0.00 |
| 25400 | 0.23 | 0.00 |
| 25500 | 0.23 | 0.00 |
| 25600 | 0.23 | 0.00 |
| 25700 | 0.23 | 0.00 |
| 25800 | 0.23 | 0.00 |
| 25900 | 0.00 | 0.00 |
| 26000 | 0.00 | 0.00 |

**Table 20:**Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 2: Receiver sensitivity = -95 dBm, path loss exponent = 2.2

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -95 |
| FEC | True |
| Band | S-Band |
| General | |
| Mobility | No Mobility |
| RF Propagation ion | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.2 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 20000 | 0.23 | 0.00 |
| 21000 | 0.23 | 0.00 |
| 22000 | 0.23 | 0.00 |
| 23000 | 0.23 | 0.00 |
| 24000 | 0.23 | 0.00 |
| 25000 | 0.23 | 0.00 |
| 26000 | 0.23 | 0.00 |
| 27000 | 0.23 | 0.00 |
| 27100 | 0.23 | 0.00 |
| 27200 | 0.23 | 0.00 |
| 27300 | 0.23 | 0.00 |
| 27400 | 0.23 | 0.00 |
| 27500 | 0.23 | 0.00 |
| 27600 | 0.00 | 0.00 |
| 27700 | 0.00 | 0.00 |

Table 21:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 3: Receiver sensitivity = -100 dBm, path loss exponent = 2.4

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -100 |
| FEC | True |
| Band | S-band |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Pathloss Exponent | 2.4 |

**Results:**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 15000 | 0.23 | 0.00 |
| 16000 | 0.23 | 0.00 |
| 17000 | 0.23 | 0.00 |
| 18000 | 0.23 | 0.00 |
| 18100 | 0.23 | 0.00 |
| 18200 | 0.23 | 0.00 |
| 18300 | 0.23 | 0.00 |
| 18400 | 0.23 | 0.00 |
| 18500 | 0.23 | 0.00 |
| 18600 | 0.23 | 0.00 |
| 18700 | 0.23 | 0.00 |
| 18800 | 0.23 | 0.00 |
| 18900 | 0.23 | 0.00 |
| 19000 | 0.00 | 0.00 |

|  |  |
| --- | --- |
|  |  |
|  |  |

Table 22:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 4: Receiver sensitivity = -105 dBm, path loss exponent = 2.4

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -105 |
| FEC | True |
| Band | S-Band |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Pathloss only |
| Pathloss Model | Log Distance |
| Path loss Exponent | 2.4 |

**Results**:

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps)  FEC- True | Packet Error Rate  FEC – True |
| 25000 | 0.23 | 0.00 |
| 26000 | 0.23 | 0.00 |
| 27000 | 0.23 | 0.00 |
| 28000 | 0.23 | 0.00 |
| 29000 | 0.23 | 0.00 |
| 30000 | 0.23 | 0.00 |
| 30100 | 0.23 | 0.00 |
| 30200 | 0.23 | 0.00 |
| 30300 | 0.23 | 0.00 |
| 30400 | 0.23 | 0.00 |
| 30500 | 0.23 | 0.00 |
| 30600 | 0.23 | 0.00 |
| 30700 | 0.00 | 0.00 |
| 30800 | 0.00 | 0.00 |

Table 23:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

## Case 5: Receiver sensitivity = -110 dBm, path loss exponent = 2.4

**Settings:**

|  |  |
| --- | --- |
| PHY Layer- DTDMA | |
| Bandwidth (KHz) | 100 |
| Data Symbol Rate (KBd) | 100 |
| Receiver Sensitivity (dBm) | -110 |
| FEC | True |
| Band | S-Band |
| General | |
| Mobility | No Mobility |
| RF Propagation | |
| Channel characteristics | Path loss only |
| Path loss Model | Log Distance |
| Path loss Exponent | 2.4 |

**Results**

|  |  |  |
| --- | --- | --- |
| Distance (m) | Throughput (Mbps) FEC- True | Packet Error Rate  FEC – True |
| 30000 | 0.23 | 0.00 |
| 31000 | 0.23 | 0.00 |
| 32000 | 0.23 | 0.00 |
| 33000 | 0.23 | 0.00 |
| 34000 | 0.23 | 0.01 |
| 35000 | 0.23 | 0.02 |
| 36000 | 0.22 | 0.04 |
| 37000 | 0.21 | 0.12 |
| 38000 | 0.17 | 0.28 |
| 39000 | 0.12 | 0.58 |
| 40000 | 0.04 | 0.91 |
| 41000 | 0.00 | 0.99 |
| 42000 | 0.00 | 1.00 |
| 43000 | 0.00 | 1.00 |

Table 24:Throughput (Mbps) and Packet Error Rate vs. Distance (m).

**Discussion**

* When FEC is set to TRUE it attempts to correct packet errors. However, FEC can only correct up to a certain BER limit. Therefore, once BER starts to take impact FEC will start correcting errors. Here one can notice that the throughput drops for FEC-False, while FEC-True allows the system to maintain a throughput level.
* After a certain point, the BER is too high, and throughput is zero since all packets are errored. At this stage FEC cannot correct the errors. Hence throughput with FEC-True also falls to 0.

# Appendix 1: Download Link

The configuration files (scenario, settings, and other related files) of the examples discussed in this analysis are available for users to import and run in NetSim.

Users can download the files from NetSim’s git-repository.

Link: <https://github.com/NetSim-TETCOS/FEC_Transition_Points_Different_Bands_in_DTDMA_v13.2.35/archive/refs/heads/main.zip>

1. Click on the link given and download the folder.
2. Extract the zip folder. The extracted project folder consists of one NetSim Experiments file, namely *Optimum-Range-for-Tactical-Radios-in-DTDMA\_v13.3.17.netsimexp*
3. Import per steps given in section 4.9.2 in NetSim User Manual

All the experiments can now be seen folder wise within NetSim > Your Work.