Bluetooth Physical Layer and Transmitter Measurements

POSTER
### Basic Data Rate

<table>
<thead>
<tr>
<th>Modulation</th>
<th>Data Rate</th>
<th>Frequency (MHz)</th>
<th>Channel 1</th>
<th>Channel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFSK</td>
<td>1 Mb/s</td>
<td>-20 kHz to 75 kHz</td>
<td>Power Class 2: 0.125 mW (-5 dBm)</td>
<td>Power Class 1: P_{TX} ≤ 4 dBm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ASTM Emission Limits &amp; Tags</td>
<td>Emission assured over the range of frequencies where f_{TX} ≤ 20 MHz and n=0, 1, 2... to 9</td>
<td></td>
</tr>
</tbody>
</table>

**Bluetooth Low Energy Data Rate**

- **Modulation**: GFSK
- **Data Rate**: 1 Mb/s

### Enhanced Data Rate

<table>
<thead>
<tr>
<th>Modulation</th>
<th>Data Rate</th>
<th>Frequency (MHz)</th>
<th>Channel 1</th>
<th>Channel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>n/4-DPSK</td>
<td>2 Mb/s</td>
<td>-20 kHz to 75 kHz</td>
<td>Power Class 2: 0.125 mW (-5 dBm)</td>
<td>Power Class 1: P_{TX} ≤ 4 dBm</td>
</tr>
</tbody>
</table>

**Bluetooth Low Energy Data Rate**

- **Modulation**: GFSK
- **Data Rate**: 1 Mb/s

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### Low Energy Data Rate

<table>
<thead>
<tr>
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<th>Channel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFSK</td>
<td>3 Mb/s</td>
<td>-20 kHz to 75 kHz</td>
<td>Power Class 2: 0.125 mW (-5 dBm)</td>
<td>Power Class 1: P_{TX} ≤ 4 dBm</td>
</tr>
</tbody>
</table>

**Bluetooth Low Energy Data Rate**

- **Modulation**: GFSK
- **Data Rate**: 1 Mb/s

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### Transmitter Measurements

#### Coexistence with WLAN Channels

- **Channel Allocation**
  - 802.11 Channel 1: 2.412 GHz
  - 802.11 Channel 2: 2.417 GHz
  - 802.11 Channel 3: 2.422 GHz
  - 802.11 Channel 4: 2.427 GHz

#### Spectrum Mask and Power Spectrum

- **Basic Rate In-Band Emission and Adjacent Channel Power**
- **Data Packets**
  - Every data packet consists of an access code, a header, and a payload. An EDR packet also contains a guard time, and a sync word between the header and the payload.
  - Guard Time: ranges between 4.75 µs - 5.25 µs
  - Sync Word: 11 symbols

#### Packet Information

- **Basic Rate Packet**
  - Access Code: 72 bit
  - Header: 54 bit
  - Payload: 6,72/16 bit

- **Enhanced Data Rate Packet**
  - Access Code: 72 bit
  - Header: 54 bit
  - Guard Time: 4.75 - 5.25 µs
  - Sync: 11 bytes
  - Payload: 0,16/16 bit

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### Bluetooth Physical Layer and Transmitter Measurements

#### At ± 500 kHz - 20 dBc

- **Bluetooth Low Energy Transmitter Spectrum Mask**
- **Low Energy Test Packet**
  - Total Packet Duration = 217 µs
  - Header: ≤ 255 bytes
  - Payload: CRC
  - CRC: 24 bit

#### At ± 2 MHz - 20 dBm

- **Low Energy Link Packet**
  - Header: ≤ 27 bytes
  - CRC: 24 bit
  - CRC: PDU

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### Modulation Characteristics

- **GFSK**
- **n/4-DPSK**
- **EDR Power Control**

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