The Market by Radio Versions and Device Types

Bluetooth LE – Fastest Growing Radio Version

Annual shipments of single-mode Bluetooth® LE devices will nearly match those of dual-mode annual device shipments by 2027.

Peripherals Drive Growth

- 1.5B Bluetooth LE Single Mode devices to ship in 2023
- 97% of all Bluetooth devices will include LE by 2027
The Solution Areas

- Audio Streaming
- Data Transfer
- Location Services
- Device Networks
Audio Streaming
Audio Streaming — Market and Applications

- Enabled by Classic Audio today
- LE Audio enables new use cases

### Annual Bluetooth® Audio Streaming Device Shipments

<table>
<thead>
<tr>
<th>Year</th>
<th>Shipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>1.03</td>
</tr>
<tr>
<td>2019</td>
<td>1.16</td>
</tr>
<tr>
<td>2020</td>
<td>1.18</td>
</tr>
<tr>
<td>2021</td>
<td>1.27</td>
</tr>
<tr>
<td>2022</td>
<td>1.56</td>
</tr>
<tr>
<td>2023</td>
<td>1.66</td>
</tr>
<tr>
<td>2024</td>
<td>1.67</td>
</tr>
<tr>
<td>2025</td>
<td>1.67</td>
</tr>
<tr>
<td>2026</td>
<td>1.74</td>
</tr>
<tr>
<td>2027</td>
<td></td>
</tr>
</tbody>
</table>

6% CAGR

Data Source: ABI Research, 2020

### Parts to consider
- RS9116
- RS9116W

### Primary Devices
- Speakers
- Headphones
- Car Infotainment

### Sample Emerging Devices
- TVs
- Hospital Beds
- Wearables
LE Audio – Exploring new paradigms

- Both classic and LE Audio will be supported for foreseeable future
- Driven by need to work with installed base

Audio Sharing | Unmute your world | Hear your best

Sample Devices for LE Audio

- Smart Watches
- Headphones
- Hearing Aids
- TVs

Auracast for Public Locations

- Airports
- Conferences
- Bars / Gyms
Data Transfer
Data Transfer – Market and Applications

- Bluetooth® AR/VR devices are set for significant growth
- Factory automation seeing higher adoption with emergence of predictive maintenance

**Annual Bluetooth® Data Transfer Device Shipments**

<table>
<thead>
<tr>
<th>Year</th>
<th>Shipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>0.68</td>
</tr>
<tr>
<td>2019</td>
<td>0.76</td>
</tr>
<tr>
<td>2020</td>
<td>0.89</td>
</tr>
<tr>
<td>2021</td>
<td>1.01</td>
</tr>
<tr>
<td>2022</td>
<td>1.10</td>
</tr>
<tr>
<td>2023</td>
<td>1.26</td>
</tr>
<tr>
<td>2024</td>
<td>1.41</td>
</tr>
<tr>
<td>2025</td>
<td>1.56</td>
</tr>
<tr>
<td>2026</td>
<td>1.72</td>
</tr>
<tr>
<td>2027</td>
<td></td>
</tr>
</tbody>
</table>

1.87 BILLION annual shipments

11% CAGR

**Primary Devices**
- Smart Watches / Fitness Devices
- Portable Medical Devices
- PC Peripherals

**Sample Emerging Devices**
- Factory Automation
- AR / VR
- Power Tools

**Parts to consider**
- RS9116
- RS9116W
- xG24
- xGM240S
- xGM240P
- xG21
- xGM210P
- xG27
- xG22
- xGM220P
- xGM220S
Data Transfer Technology Stack & What’s Next

- **High Data Throughput**
  - Different PHY (RF and Modem) being considered
  - Will change Link Layer and Host stack.
  - Expected to support up to 8Mbps
  - Enables faster firmware updates, streaming larger media

- **Higher Frequency Bands**
  - Supporting Bluetooth on other unlicensed bands (5 & 6 GHz)
  - Higher data throughput, lower latency, greater positioning accuracy.
  - Decongest 2.4 GHz band

---

## Improvements in v5.4

- **LE GATT Security Levels Characteristic**
  - Enables pre-check of GATT server conditions, enables better user experience

- **Advertising Coding Selection**
  - Allows the host to select the value of the coding parameter for extended advertising.

## Future Features

- **High Data Throughput**
  - Different PHY (RF and Modem) being considered
  - Will change Link Layer and Host stack.
  - Expected to support up to 8Mbps
  - Enables faster firmware updates, streaming larger media

- **Higher Frequency Bands**
  - Supporting Bluetooth on other unlicensed bands (5 & 6 GHz)
  - Higher data throughput, lower latency, greater positioning accuracy.
  - Decongest 2.4 GHz band
Location Services
Location Services - Market and Applications

- Key enabler for real-time time location services across multiple use cases
  - Indoor navigation, asset tracking, digital key, item finding

### Annual Bluetooth® Location Services Device Shipments

**NUMBERS IN MILLIONS**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
<th>2026</th>
<th>2027</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipments</td>
<td>68</td>
<td>133</td>
<td>190</td>
<td>196</td>
<td>208</td>
<td>262</td>
<td>317</td>
<td>379</td>
<td>434</td>
<td></td>
</tr>
</tbody>
</table>

- **515 MILLION** annual shipments
- **20% CAGR**

### Primary Devices

- Asset Tags
- Beacons
- Locators

### Sample Emerging Devices

- Building Access
- Automotive Access
- Power Tools

### Parts to consider

- xG24
- xGM240S
- xGM240P
- xG27
- xG22
- xGM220P
- xGM220S
Positioning Services Technology & Future Features

- **Received Signal Strength Indication**
- **Angle of Arrival/Departure**
- **High Accuracy Distance Measurement**
  - Being worked on in the SIG work groups
  - More accurate, secure and reliable
  - Much Simpler deployment & hence better user experience
  - Ecosystem support building

- **Channel Sounding**
  - Core Specifications Feature
  - Multiple techniques for distance estimation
    - Phase based (PBR) and Round trip time (RTT)
  - Security in built in the specification

Attend “BT-202 Bluetooth HADM: Perfecting Location Services”
Device Networks
Device Networks - Market and Applications

- Fasting growing solution area
- 2.63x growth from 2023-2027

ESLs drive a more gratifying & cohesive omnichannel experience

Parts to consider:
- xG24
- xGM240S
- xGM240P
- xG21
- xGM210P
- xGM27
- xG22
- xGM220P
- xGM220S

Primary Devices

Networked Lighting Control

Light Sources
Light / Occupancy Sensors
Control Devices

Sample Emerging Devices

ESLs
HVAC Systems
Temp / Humidity Sensors
Device Networks Technology

**Key Enhancements to Bluetooth Mesh**
- Mesh Protocol with multiple new features (v1.1)
  - Remote Provisioning
  - Certificate Based Provisioning
  - Subnet bridging
  - Directed Forwarding
- New Models
  - Mesh binary large object transfer model
  - Device Firmware Update
- Networked Lighting Control Profiles
  - 6 specifications for different devices

**New Features Enabling ESL**
- Periodic Advertisement with Responses
  - Bidirectional mode with sub-events
  - Enabling “Synchronized” mode network
  - Upto 32K peripherals in the network
- Encrypted Advertisement
  - Standardized way of communicating encrypted data in adv, scan response and EIR
  - Key exchange through encrypted & authenticated ACL
  - CCM algorithm used for encryption and authentication
- ESL Profile
  - Defines characteristics and commands for ESL
  - Defines the different states and state transitions

Attend “BT-201 Features and Benefits of the New Bluetooth Mesh Standard”

Attend “BT-203 Bluetooth 5.4: Everything You Need to Know”
Conclusions

Bluetooth growing significantly across all four solution areas

- Device networks (21% CAGR)
- Location Services (20% CAGR)
- Data Transfer (11% CAGR)
- Audio (6% CAGR)

Significant new developments enabling newer use cases and devices

- Mesh Protocol
- ESL
- HADM
- High Throughput
- Higher Bands
- LE Audio

GSDK 4.3.0 supports mesh protocol, ESL & HADM

Silicon labs has a rich portfolio of ICs, Modules, Software and Tools to support all the Bluetooth needs of our customers
Thank you!