Information Meeting 2019
Market Environment

<Risk>
- Uncertainty about global economy due to struggle for technological supremacy, trade friction, and political unrest
- Slow spread of new technology

Vitalization of the market (medium to long term)

<Opportunities>
5G / IoT:
Smart devices, Infrastructures (base stations), Smart factory projects

Automotive:
xEV, Connected, Advanced safety

Economic slowdown (short term)

Business opportunities expand in the medium to long term for Murata, which has a varied product lineup, supply capability, and a broad customer base.
Automotive Market - 1

- xEV, connected cars, and advanced safety accelerate the use of electrical equipment in automobiles.
- New demand is expected for communication modules, sensors, and other components.

**Expected quantity by powertrain**

(Source: Strategy Analytics)

- FCV
- EV
- PHEV
- HEV
- Mild HEV
- Conventional

**Expected quantity by autonomous driving level**

(Based on our estimate)

- Level4
- Level3
- Level2
- Level1
- Level0

**Main product lineup**

- MLCC
- Film capacitors
- Silicon capacitors
- Power inductors
- Power supply modules, etc.

- Bluetooth modules
- PA modules
- V2X modules
- EMI suppression filters
- MLCCs, etc.

- MEMS sensors
- Ultrasonic sensors
- Timing devices
- MLCCs, etc.
Automotive Market - 2

Understanding market and technology trends
Vehicle disassembly: Component demand, design concept
Driving evaluation: Required technology and level

- Feedback to R&D
- Improved demand forecast accuracy
- Enhanced proposal ability for customers

(By our research)

<table>
<thead>
<tr>
<th>(pcs)</th>
<th>Conventional vehicles</th>
<th>HEV</th>
<th>EV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autonomous driving</td>
<td>Lv 0</td>
<td>Lv 2</td>
</tr>
<tr>
<td>Capacitors</td>
<td>3,000</td>
<td>6,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Inductors</td>
<td>300</td>
<td>600</td>
<td>600</td>
</tr>
</tbody>
</table>

Technologies required of automotive components

- High temperature guaranteed
- High heat dissipation
- High humidity guaranteed
- High temperature and high humidity guaranteed
- Use of higher-power electronic circuits
- Measures against risk of short circuit
- Long-term reliability

- Understanding market and technology trends becomes more important due to rapid technological innovation.
- High reliability and stable supply are increasingly demanded.
Although the number growth is slowing down, LTE-Advanced devices and 5G devices are expanding their shares.

Demand for components per device is expanding.

Technologies required of components
Compact and low-profile, modular, high frequency characteristics, high voltage compatible, high temperature support, low loss (HiQ)
5G also uses small cells, increasing the number of base stations.
Massive MIMO increases antennas and electronic components per base station.
Needs are growing for sensors, energy, communication networks, and solutions.

Build an infrastructure for IoT society by leveraging our extensive lineup and strength.
Product Strategy - In-vehicle Capacitors

In-vehicle MLCC market forecast (quantity basis)

- Total number of In-vehicle MLCCs
- Number of large-capacity In-vehicle MLCCs
- Automobile production

(Based on our estimate)

Trend of automotive electrification remains unchanged.
Large-capacity components are increasing especially rapidly.

In-vehicle capacitor strategy

- Stable market growth over the medium to long term
- High quality requirements

- Enhance capacities with a view to the medium to long term
- Promote smart factory projects
- Strengthen dialog with OEM and Tier 1
- Build technical barriers to entry
- Develop materials by utilizing the strength of integrated production
- Enhance the lineup

High heat-resistant film capacitors
Silicon capacitors
Automotive grade HiQ MLCCs

Number of in-vehicle MLCCs used

<table>
<thead>
<tr>
<th>(pcs)</th>
<th>GAS</th>
<th>Mild HV</th>
<th>Strong HV</th>
<th>PHEV</th>
<th>BEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powertrain</td>
<td>300-500</td>
<td>1,000-1,200</td>
<td>1,200-1,600</td>
<td>1,500-2,000</td>
<td>2,000-2,500</td>
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<tr>
<td>ADAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infotainment</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Number of in-vehicle MLCCs used (Based on our estimate)

Trend of automotive electrification remains unchanged.
Large-capacity components are increasing especially rapidly.

Build a stable supply system

Strengthen technological development capabilities

Respond to a wide range of customer needs

Aim to expand business in the automotive market with our competitive advantage in production and technology.
Product Strategy - Consumer Capacitors

Expected number of Consumer MLCCs demanded
With the launch of 5G, the quantity demanded will increase year by year.
(Based on our estimate)

- Smartphone
- Memory & Storage & Server
- Base station

Changes of capacitance of MLCCs for smartphones
Power consumption is still increasing, maintaining demand for smaller MLCCs with larger capacitance.
(Based on our estimate)

- High-End
- Middle-Class
- Low-End

MLCC characteristics required for 5G

**Changes with 5G**
- Higher functionality of modules
- Use of larger batteries
- Shift to Massive MIMO
- Increased small cells

**Technology trends**
- Increased power consumption
- Requirements for high-density mounting
- Higher internal environmental temperature
- Increased output from PA

**Required characteristics**
- Small and large-capacity
- Low loss characteristics
- High voltage compatible
- High temperature guaranteed
- Low loss characteristics

Provide new value to customers with product development capabilities, quality, and supply capabilities even in 5G technology innovation!
Product Strategy - SAW Filters

Expected number of filters demanded

Introduction of 5G accelerates modularization
(Based on our estimate)

Discrete  Module

The total demand for filters is expected to increase mainly for those for modules.

SAW filter business strategy

- Downsizing needs for higher-density mounting
- Increased demand intended for using on modules
- Changes in the competitive environment

Business environment

Strategies

- Differentiate with high power durability
- Downsizing and combination
- I.H.P and XBAR technologies

Strengthen technological development capabilities

Strengthen efforts to improve productivity

- Promote smart factory projects
- Improve the yield

New products

Develop the world's smallest SAW duplexer and filter, and start mass production.

Differentiate from competitors with superior characteristics and downsizing, and strengthen cost competitiveness.
Product Strategy - MetroCirc™

Features of MetroCirc™
- High frequency characteristics
- Highly multilayered
- Low water absorbency
- Flexibility

MetroCirc™ sales expansion strategy

Market expansion
- Strengthen collaboration with other businesses
- Develop new customers based on existing applications
- Develop new applications with 5G as a keyword
- Develop modules using MetroCirc™ as the substrate

Utilizing the characteristics of MetroCirc™, aim for customer value creation and continuous growth with unique products!

High frequency characteristics of MetroCirc™
(Based on our estimate)

Superior characteristics in the millimeter wave band differentiates MetroCirc™ from competing products.

Graph:
- Transmission loss [dB/100mm] vs. Frequency [GHz]
- MetroCirc™ superior to MPI

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Product Strategy - RF modules

RF module technology trends

Keywords in 5G

Higher frequency (Sub-6GHz・mmW)
MIMO
Uplink Carrier aggregation
Dual Connectivity

5G uses advanced communication technology. More sophisticated modules are required.

Expected number of 5G devices

(Source: TSR 「201910 TSR mobile phone market」)

5G-compatible modules are added while middle-class devices are more and more modularized.

Murata's design and manufacturing capabilities and extensive lineup of components. --> Realize the characteristics, size, quality, cost, and speed that will be chosen by our customers.
Make a commitment to achieve profitability in FY 2021

Strengthen business foundation
✔ Slim down fixed costs
- Realize cost structure suitable for business scale
- Prioritize projects and concentrate technical resources

Review our portfolio
✔ For mobile devices
- Enter the small secondary battery business

✔ For power tools
- Strengthen competitiveness in existing fields
- Expand business into new fields

Develop new products
✔ Industry-leading all-solid-state battery
- Target the wearable market where safety and durability are required
- Expand the lineup by utilizing our lamination, material, and other technologies

〇: We have an advantage in lamination and chemical technologies. We have developed and launched new products.
▲: The market for power tool components is currently slowing down. However, it is still expanding in the medium to long term.
×: Mobile device components are especially difficult to differentiate technologically, and therefore is still in the red, recording impairment loss.
Product Strategy - EMI / Sensor

**Inductors**
- Market needs
  - Higher-density mounting inside communication devices
  - Increased use of electrical equipment in automobiles

- Strength
  - Low loss characteristics
  - Downsizing
  - High reliability

**Sensor**
- Market needs
  - Sensors utilizing ceramic material technology
    - Temperature sensor
    - Ultrasonic sensor
    - Infrared sensor

- Strength
  - Sensors utilizing microfabrication technology
    - Acceleration sensor
    - Gyro sensor
    - Magnetic sensor

Meet market needs with our original technology and extensive lineup.

Realize a lineup of compact and high-performance products based on Murata’s technology cultivated over many years.

Fuse together Murata's microfabrication technology and technologies obtained through M&A.

- Develop business for applications requiring high accuracy and high reliability.

**EMI suppression filters**
- Market needs
  - Increased need for noise countermeasures following advances in xEV and autonomous driving technology

- Strength
  - Downsizing
  - High temperature support
  - High frequency support

Provide optimal solutions for various applications.

Meet needs in various markets such as automobiles, wearables, medical care, and healthcare.
Product Strategy - New Business

IoT Solution

Sensor Data Platform “NAONA”  Worker safety monitoring system  Wireless sensing solution

Provide “information” we obtained, as a service, to help customers solve problems.

Healthcare
- Components
  - Capacitors for Medical Devices
  - Metal mesh Devices
- Medical equipment
  - Electronic moxibustion
- Solutions
  - Fatigue stress meter
  - Vios Monitoring System

Energy
- Components
- Solutions
  - Vios Monitoring System
- Energy
  - Olivine type iron phosphate lithium ion battery (FORTELION)
  - Home storage battery system
  - Industrial storage battery system

Create new value for medical and healthcare with original products.

Promote the use of renewable energy with storage battery systems that pursue unique safety technologies.
Mid-term Direction 2021

- Economic slowdown is a risk to achieving sales targets on time.
- Adhere to profitability targets by improving productivity and reviewing fixed costs.
- Make capital investments at the right time.

Assumed foreign exchange: 110 YEN / USD
Mid-term Direction 2021 - Strengthening Monozukuri capabilities

**Smart factory projects**

<table>
<thead>
<tr>
<th>Data utilization</th>
<th>Automation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Abnormal sign monitoring</td>
<td>- Robot</td>
</tr>
<tr>
<td>- AI image classification</td>
<td>- AGV</td>
</tr>
<tr>
<td>- Predictive maintenance</td>
<td>- Work arrangement system</td>
</tr>
<tr>
<td>- Individual piece trace</td>
<td>- Automatic machine</td>
</tr>
</tbody>
</table>

**ICT platforms**

- Unify information among factories and with suppliers and outsourcing contractors
- Develop new sensing technologies
- Develop new data collection interfaces

**Secure production spaces**

- **Japan Fukui**
  - Completed in December 2019
  - Produces MLCC

- **Japan Yasu**
  - Completed in November 2020
  - Produces electrode materials

- **China Wuxi**
  - Completed in December 2019
  - Produces MLCC

- **Finland**
  - Completed in March 2020
  - Produces MEMS sensors

Also scheduled to be completed in Shimane (for MLCC), Okayama (for raw materials), Malaysia (for inductors), and Yokohama (as a development base).

Realize dramatic productivity improvement through “Connection and Automation”!
Opportunity aspect: Solve social issues through business

- Highly efficient components that contribute to strengthening climate change policies
- Miniaturized components that promote sustainable use of resources

Risk aspect: Address social issues in business processes

Environmental
- Strengthening climate change policies
- Sustainable use of resources
- Prevention of pollution and management of chemical substances

Social
- Safe and secure workplace and healthy management
- Respect for human rights and diversity
- Coexistence with local communities

Governance
- Fair business transactions
- Information security
- Business continuity management (BCM)

- Identify priority issues (materialities) and reflect them in business management.
- Incorporated into multiple indexes as a company actively engaged in ESG.
Net Sales and New Products Ratio on sales/R&D expense and R&D ratio on sales

**Net Sales and New Products Ratio on sales**

- **Fiscal year 2018**
  - R&D expense: 101.6 billion yen
  - R&D Ratio on sales: 6.5%

- **Fiscal year 2019 (estimate)**
  - R&D expense: 102.0 billion yen
  - R&D Ratio on sales: 6.8%

**R&D expense and R&D Ratio on sales**

- Fiscal year 2018
  - R&D expense: 101.6 billion yen
  - R&D Ratio on sales: 6.5%

- Fiscal year 2019 (estimate)
  - R&D expense: 102.0 billion yen
  - R&D Ratio on sales: 6.8%
M&A / Business Alliance

Mergers & acquisitions of energy, medical, and wireless communication businesses for further growth.
Our basic policy of profit distribution to shareholders is to prioritize the sharing of gains through payment of dividends, and to steadily raise them by increasing profit per share.
This report contains forward-looking statements concerning Murata Manufacturing Co., Ltd. and its group companies' projections, plans, policies, strategies, schedules, and decisions. These forward-looking statements are not historical facts; rather, they represent the assumptions of the Murata Group (the “Group”) based on information currently available and certain assumptions we deem as reasonable. Actual results may differ materially from expectations due to various risks and uncertainties. Readers are therefore requested not to rely on these forward-looking statements as the sole basis for evaluating the Group. The Company has no obligation to revise any of the forward-looking statements as a result of new information, future events or otherwise.

Risks and uncertainties that may affect actual results include, but are not limited to, the following: (1) economic conditions of the Company's business environment, and trends, supply-demand balance, and price fluctuations in the markets for electronic devices and components; (2) price fluctuations and insufficient supply of raw materials; (3) exchange rate fluctuations; (4) the Group's ability to provide a stable supply of new products that are compatible with the rapid technical innovation of the electronic components market and to continue to design and develop products and services that satisfy customers; (5) changes in the market value of the Group's financial assets; (6) drastic legal, political, and social changes in the Group's business environment; and (7) other uncertainties and contingencies.

The Company undertakes no obligation to publicly update any forward-looking statements included in this report.
Thank you