

Navian Marketing Report

Mid-term outlook for the Front End Module and high-frequency component market

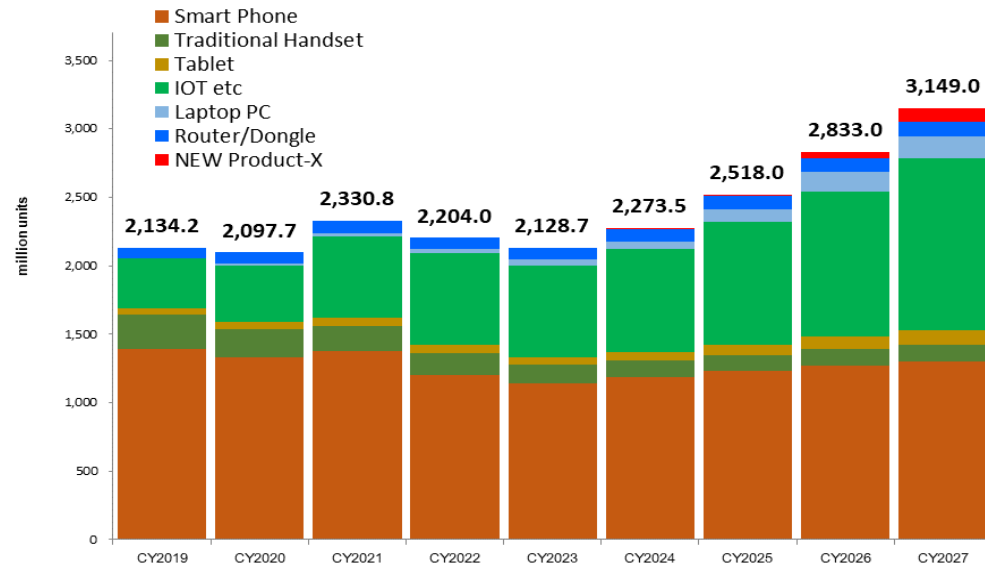
RF Devices/Modules for Cellular 2023-2024

Released on May 22, 2024

Front End Modules & RF Components in this report

- ①Front end Module (ASM・RX Module・TX Module・PAiD・PAMiD・FEMiD・Multiplexer・Antenna Multiplexer・5G TX Module/PAMiF・AIP・mmW Module) ②Antenna Switch (For Main RF・For RX Diversity) ③Power Amplifier Module ④Duplexer (SAW/BAW/TF-SAW) ⑤Band Pass Filter (SAW/BAW/TF-SAW/LTCC for Sub 6GHz/IPD for Sub 6GHz) ⑥TCXO

Cellular Terminal Shipment Forecast by Product Type



New Product X

The burgeoning field set to lead the next generation of cellular terminals. The ongoing transition to 5G, including 5G Redcap, is also expected to boost demand for the RFFE market.



Cellular PC/Tablet

Cellular adoption in Tablet and Notebook PC will become full scale as 5G becomes widely used. It should become the adrenaline shot which will stimulate the Tablet and Notebook PC market.



Cellular IOT

The burgeoning field set to lead the next generation of cellular terminals. The ongoing transition to 5G, including 5G Redcap, is also expected to boost demand for the RFFE market.



Smart phone

Although the growth of the cellular market has slowed down due to its maturation, the adoption of 5G, WiFi, and NTN (satellite communication) is driving increased complexity in RFFE (Radio Frequency Front-End).



Cellular V2X

The adoption rate of Cellular V2X is currently around 50%, but is expected to reach 100% in the future. The transition to 5G will intensify in 2-3 years. It is classified under the category of IoT.



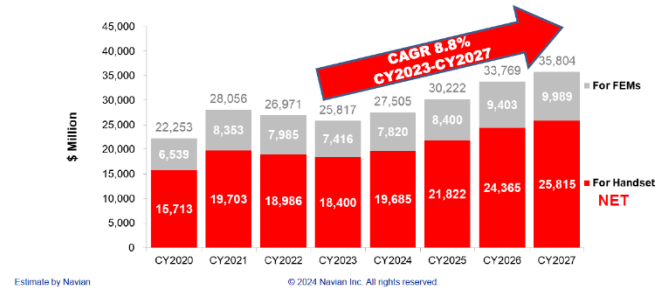
Cellular Wearable Devices

Products with cellular functionality such as smartwatches. No examples of 5G yet. An increase in RFFE content is unlikely due to the form factor.

Report Sample

RF Devices / Modules Market Forecast - For FEMs / For COB -

- The previously-shown data of market size forecast double-counts the demands of Antenna Switch, Duplexer, BPF, and PAM for FEM, as well as Multiplexer for FEM.
- Market size (for Handset) in 2023 which excludes these double-counts was 18,400.2 million dollars (YoY 96.9%).
- Market size in 2027 is expected to grow to 25,815.2 million dollars.
- CAGR from 2023 will be 8.8%.
- Meanwhile, demand size for products for FEM was 7,416.4 million dollars (YoY 92.9%), and will be 9,985.5 million dollars in 2026.
- CAGR from 2023, for products for FEM, will be 7.7%, which is lower than the 8.8% CAGR for handsets.

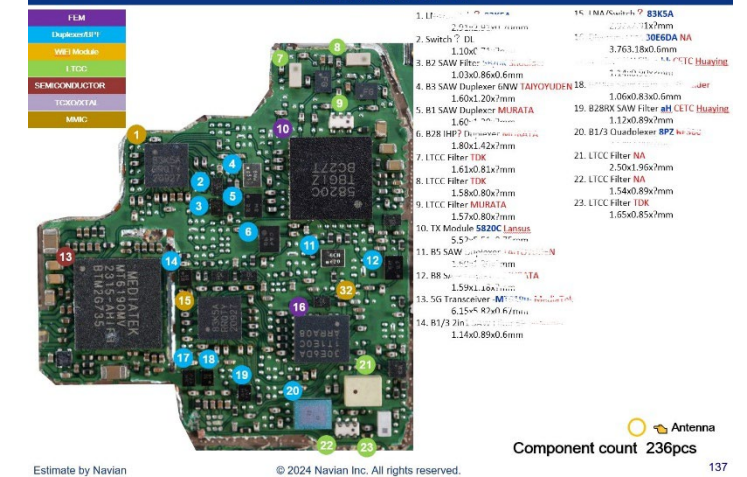


Estimate by Navian

© 2024 Navian Inc. All rights reserved.

171

itel Power 55 RF Section-1



Estimate by Navian

© 2024 Navian Inc. All rights reserved.

137

NTN for Mobile service Outline-1/2

- NTN (Non Terrestrial Networks) services for mobile devices such as smartphones are drawing attention.
- As for typical network, it is satellite communication service.
- Currently, satellite communication services using NTN frequencies are being put to practical use in Apple's iPhone and some HUAWEI smartphones.
- Aside from this, satellite communication services using existing Cellular frequencies are expected to be commercialized in the near future.

Cellular Operator/Satellite	Smartphone OEM/Satellite
Satellite communication service provided by Cellular operator and satellite operator using existing Cellular frequencies.	Satellite communication service between smartphone manufacturers like Apple and HUAWEI and satellite operators using NTN's dedicated frequencies.
Band1 Space X/KDDI	n254 Globalstar/Apple
Band2 Space X/T-Mobile	n256 Tiantong/HUAWEI
Band3 AST/Rakuten	L-Band Beidu/HUAWEI

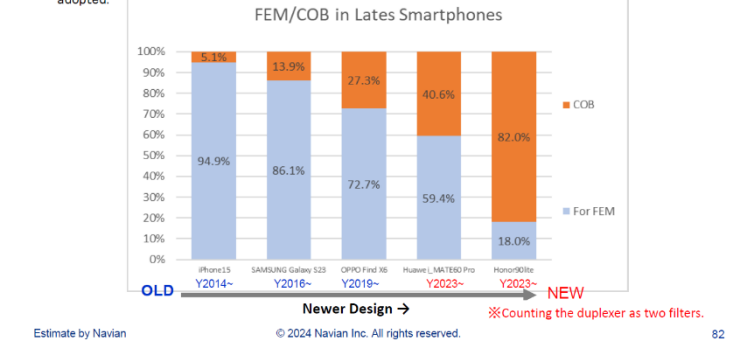
Estimate by Navian

© 2024 Navian Inc. All rights reserved.

50

Filter demand by FEM/COB in Latest 5G Smartphones

- Traditional 5G smartphones, led by the iPhone, mainly adopt FEM based on PAMiD.
- As a result, with the spread of 5G, the demand for filters is expanding for FEMs.
- However, the latest Chinese models from HUAWEI and Honor show an increasing trend in the adoption of discrete.
- In the HONOR 90 lite, the use of PAMiD has been discontinued, and a discrete-based RF design has been adopted.



Estimate by Navian

© 2024 Navian Inc. All rights reserved.

82

RF Devices/Modules For Cellular 2023-2024 English version -CD-ROM (PDF file & Excel file)-

- Released date May 22 2024
- Report format 296 SLIDES (PDF file)
PDF file of report/Excel data
- Price ◆Section license 380,000JPN
◇Corporate license 690,000 JPN
If you will share our reports between different sections/departments or subsidiaries and affiliated companies, you need to purchase the corporate license.
- Method of order
 - BY Attached FAX ORDER FORM Fax. +81-3-5303-1304
 - BY Email order@navian.co.jp with your information as same as FAX ORDER FORM
- PAYMENT Please Bank Transfer in Japanese Yen to the bank account of the Navian, Inc.
The report's bill will be sent with the report.
Payment term is within 1 month after you receive the report.
- PUBLISHER Navian Inc. <http://www.navian.co.jp>
<mailto:info@navian.co.jp>
2-18-2, Zenpukuji, Suginami-ku, Tokyo 167-0041 JAPAN
Tel.+81-3-5303-1303/Fax. +81-3-5303-1304

Phase1. Cellular Terminal Shipment Forecast**I. Cellular Terminal ShipmentAND Update**

1. Cellular Terminal Variation & Definition
2. Cellular Terminal Annual Shipment History CY2001-CY2024
3. Annual Cellular Terminal Shipment Trend by Product Type
4. Annual Cellular Terminal Shipment Trend by Cellular Standard
5. Annual Cellular Terminal Market Share Trend CY2020-CY2024
6. Key Terminal Manufacturer Annual Shipment History CY2020-CY2024
7. Cellular Terminal Shipment by Maker & Cellular Standard History CY2020-CY2024

II. 5G Situation & Topics

1. Cellular Terminals Classification For 5G
2. 5G Specifications Comparison to LTE
3. Detailed 5G Specifications
4. 5G Application Trend
5. 5G standardization History & Schedule
6. 5G standardization Release15 & Release16
7. Cellular IOT vs Non Cellular IOT
8. 5G Frequency Band Plan
9. Wireless Frequency Band Standard Organization
10. 5G Frequency Band Plan
11. Detailed Sub 6GHz Frequency Band Plan
12. 5G Smartphone Shipment CY2020-CY2024
13. Outline of 5G Smartphone Venders
14. 5G Smartphone Shipment by destination
15. 5G Shipment CY2020-CY2024 by Brand
16. 5G Product Shipment by Platform
17. 5G RF Front End Circuit
18. Conventional FEM for Sub 6GHz
19. Main Players FEM and Main RF components for Sub 6GHz

III. Cellular Terminal Shipment Forecast –CY2027

1. Cellular Terminal Forecast by Product
2. Cellular Terminal Forecast by Standard
3. 5G Cellular Terminal Forecast by Band Group
4. Forecast of Sub 6GHz Band Combination
5. Increasing FDD bands for EN-DC
6. 3G/4G/5G Band Plan Update
7. Diversity/MIMO Forecast
8. Multi-band GNSS(GPS) for High-end Smartphone
9. Multi-band GNSS Forecast
10. **NTN** for Mobile service Outline
11. Mobile **NTN** Device forecast
12. Cellular Terminal Forecast by Product & Standard
13. Cellular Terminal Forecast by Standard & Frequency
14. Cellular Terminal Forecast in Detail
15. Future Market Opportunities by Standard in CY2027

Phase 2. RFFE LATEST Trend & NEW RF Technologies**& RFFE Potential****I. RFFE Design Outline**

1. How will Sub 6GHz RFFE Change from 4G to 5G?
2. 5G RFFE ESTIMATION by Platform
3. Detailed 5G NR RFFE Estimation for Full Specification
4. 5G RFFE ESTIMATION EN-DC Combination Examples
5. Sub 6GHz Co-Existence with WiFi
6. What's Dual Uplink?

II. Cellular RF Platform Forecast –CY2027

1. 5G RF Platform share Trend

2. 5G Platform Forecast

3. 3G/4G/5G Total Platform Forecast

III. Latest band plan & Filter Technology Trend

1. 3G/4G/5G Band Plan
2. Detailed Sub 6GHz – Sub 7GHz Frequency Band Plan
3. 5G Frequency Band Plan
4. 5G-Advanced Frequency Band Plan(WRC23)
5. Allocation of RF Filter Technologies
6. Overview of RF Filter Technology
7. **TF-SAW** Outline and Major Suppliers
8. Bonding Methods and Process Flow
9. **Major Bonding Makers**
10. New Filter Technology for 6GHz-10GHzDetailed Table of RF Components and FEMs

IV. Consideration of transition from FEM based to COB (Discret) based

1. **RFFE tend to expand COB (Discrete)**
2. Cellular Terminal Market Forecast
3. Filters & TCXO in 21 IOT Modules
4. IoT drives the spread of 4G and 5G
5. High-end Smartphones continue to adopt PAMiD,
while Middle/Low-end sees an expansion discrete-based RFFE?
6. Filter demand by FEM/COB in Latest 5G Smartphones
7. Filters by Technology in Latest 5G Smartphones
8. Filters in Latest 5G Smartphones
9. Promising fields & Customers Shift to COB (Discrete) from FEM

V. Noticeable Smartphones Teardown

1. iPhone15 -A3089- JAPAN Model
 - a. RF block diagram
 - b. Teardown pictures
2. Galaxy S23 SC-51D
 - a. RF block diagram
 - b. Teardown pictures
3. HUAWEI MATE 60 Pro
 - a. RF block diagram
 - b. Teardown pictures
4. Honor 90 Lite
 - a. RF block diagram
 - b. Teardown pictures
5. OPPO Find X6
 - a. RF block diagram
 - b. Teardown pictures

VI. 6GHz RFFE Examples and Aanalysis

1. Sub 6GHz RFFE of Huawei MATE20X5 EVR-AN00
2. Sub 6GHz RFFE of Xiaomi Mi Mix 3 5G M1810E5GG
3. Sub 6GHz RFFE of OPPO Reno3 5G
4. Sub 6GHz RFFE of SAMSUNG GALAXY S20+ 5G SC-52A
5. Sub 6GHz RFFE of Apple iPhone12Pro A2406
6. Sub 6GHz RFFE of SAMSUNG GALAXY S21 Ultra SC-52B docomo
7. Sub 6GHz RFFE of Apple iPhone13Pro A2483
8. Sub 6GHz RFFE of iPhone14 Pro MAX USA
9. Sub 6GHz RFFE of Fibocom FM650-CN(5G IOT Module)
10. Xiaomi Redmi Note 12 Pro 5G
11. HUAWEI MATE 60 Pro

Phase3. RF Devices / Modules Market Status & Forecast**I. RF Devices / Modules Total Market Forecast CY2020-CY2027**

1. RF Devices / Modules in This Report
2. RF Devices / Modules Total Market Forecast Detail Data

3. RF Devices / Modules Total Market Forecast - For FEMs / For COB (Discrete) -

4. RF Devices / Modules Total Market Forecast - Except overlap -

5. RF Devices / Modules Total Market Forecast Detail Data - Except overlap -

6. RF Devices / Modules For Cellular Market Share Breakdown -CY2019-CY2024

II. Front End Module & Sub Front End Module Market Forecast CY2027

1. Front End Module/ Sub Front End Module Variation & Circuit Examples
 - a. Outline of PAMiD
 - b. Multiplexer: Quadplexer Example & Outline
 - c. Antenna Multiplexer Outline
 - d. Front End Module & Sub Front End Module Variation & Outline
 - e. Front End Module & Sub Front End Module Usage
 - f. FEM Trend & Future Estimation
 - g. Usage of Front-End Module by Customer
 - h. Enter the RFFE market one after another

2. FEM Market Forecast

- a. FEM Supply-chain
- b. Front End Module Market Trend & Forecast by Product Type
- c. Front End Module Market Trend & Forecast by Product Type: Detail Data
- d. Front End Module Market Trend & Forecast by For Apple/For Others 1/2
- e. Sub Front End Module Market Trend & Forecast by Product Type
- f. Sub Front End Module Market Forecast: Detailed Data

3. Antenna Switch Module

- a. Antenna Switch Module Market Size Trend & Forecast by Product Type
- b. Antenna Switch Module Market Forecast: Detailed Data
- c. ASM Market Share Trend

4. TX Module

- a. TX Module Market Size Trend & Forecast by Product Type
- b. TX Module Market Share Trend

5. FEMiD

- a. FEMiD Module Market Size Trend & Forecast by Product Type
- b. FEMiD Market Forecast: Detailed Data
- c. FEMiD Market Share Trend
- d. FEMiD Market Share Breakdown per Product Type

6. PAMiD

- a. PAMiD Market Size Trend & Forecast by Product Type
- b. PAMiD Market Forecast DATA
- c. PAMiD Market Share Trend 1/2
- d. PAMiD Supply chain
- e. PAMiD Suppliers Outline
- f. PAMiD Market Share Breakdown per Product Type

7. 5G TXM(PAMiF)

- a. Outline of 5G TX Module
- b. 5G TXM(PAMiF) Market Forecast
- c. 5G TXM(PAMiF) Market Share Trend
- d. 5G TXM(PAMiF) Market Forecast DATA

8. AIP(Antenna In Package) for Millimeter Wave

- a. AIP(Antenna In Package) Market Forecast
- b. AIP(Antenna In Package) Market Share Trend

9. mmW Module

- a. mmW Module Market Forecast
- b. mmW Module Market Share Trend

10. Diversity FEM

- a. Diversity FEM Market Size Trend & Forecast by Product Type
- b. Diversity FEM Market Forecast: Detailed Data
- c. Diversity FEM Market Share Trend
- d. Diversity FEM Supply chain

11. Multiplexer

- a. Multiplexer Market Size Trend & Forecast by Band Combination
- b. Multiplexer Market Size Trend & Forecast by Product Type
- a. Multiplexer Market Size Trend & Forecast for COB or For FEMs
- b. Multiplexer Market Size Trend & Forecast by Duplexer Type
- c. Multiplexer Market share Trend
- d. Market Share Breakdown per Product Type

12. Antenna Multiplexer

- a. Antenna Multiplexer Outline
- b. Antenna Multiplexer Market Size Trend & Forecast by Product Type
- c. Antenna-Multiplexer Market Forecast: Detailed Data
- d. Antenna-Multiplexer Market Share Trend
- e. Antenna-Multiplexer Market Share Breakdown per Product Type

III. Antenna Switch

1. Total Market Size Trend & Forecast
2. Antenna Switch for Main RF Market Size Trend & Forecast
3. Antenna Switch for Diversity Market Size Trend & Forecast
4. Antenna Switch for Main RF Market Share Trend
5. Antenna Switch for RX Diversity Market Share Trend
6. Annual Antenna Switch for Main RF Market Share Breakdown per Product Type
7. Annual Antenna Switch for Diversity Market Share Breakdown per Product Type

IV. Power Amplifier Module

1. Market Size Trend & Forecast by Product Type
2. M/M PAM Type & Outline
3. Multi-band/Multi-mode PAM Market Size Trend & Forecast by Product Type
4. Power Amplifier Module Market Forecast Detailed Data -Quantity-
5. Power Amplifier Module Market Forecast Detailed Data -Quantity-
6. PAM TOTAL Market Share Trend
7. Single PAM Market Share Trend
8. Multi-band/Multi-mode PAM Market Share Trend
9. Power Amplifier Module Market Share Breakdown per Product Type

V. Duplexer

1. Duplexer Market Size Trend & Forecast by Product Type
2. Duplexer Market Size Trend & Forecast for FEMs
3. Duplexer for FEMs
4. Duplexer usage by Band Duplexer
5. Market Size Trend & Forecast by Band
6. Duplexer Market Forecast Data table
7. Duplexer Market Share Trend
8. Duplexer Supply chain
9. Duplexer Market Share Breakdown per Product Type CY2017-CY2020

VI. Band Pass Filter

1. Application & Classification
2. Band Pass Filter Market Size Trend & Forecast by Application
3. Band Pass Filter Market Size Trend & Forecast by Product Type
4. Band Pass Filter Market Size Trend & Forecast for FEMs
5. Band Pass Filter Market Size Forecast by Application/Technology
6. Band Pass Filter Market Size Forecast by Technology/Application
7. BPF Market Share Trend
8. Filter (Duplexer & BPF) Suppliers Outline
9. Low Performance Filter (IPD/LTCC) manufacturers
10. Filter marketAnalysis -for FEM/for COB-
11. **Chinese SAW Filter Maker Market Share Trend**

VII. TCXO

1. Market Size Trend & Forecast by Application TCXO
2. TCXO Market Share Trend

ORDER FORM

ATTN: NAVIAN INC.
Fax : +81-3-5303-1304

RF Devices/Modules For Cellular 2023-2024 English version

Report title	Price	Initial
RF Devices/Modules For Cellular 2023-2024 English version - Section license -	JPY380,000	
RF Devices/Modules For Cellular 2023-2024 English version - Corporate license -	JPY690,000	

YOUR P.O. NUMBER	<i>For our invoice referencing purpose.</i>
------------------	---

If you will share our reports between different departments or subsidiaries and affiliated companies, you need to purchase the corporate license.

Date of order	(YYYY)	/ (MM)	/ (DD)
First name		Last name	
Company			
Job title		Department	
Address			
State/Province		Zip code	Country
Contact Phone		FAX	
E-mail	@		

Authorizing Signature

Signature Date

CONTACT

ATTN: Yoshiyasu Andoh

E-mail: andoh@navian.co.jp

Navian Inc.

2-18-2, Zenpukuji, Suginami-ku, Tokyo 167-0041, Japan

Phone: +81-3-5303-1303

Fax: +81-3-5303-1304