PART NO. 28782993	SHT. 0 OF 17	APTIV ADVANCED SAFETY & USER EXPERIENCE

DATE	SYMBOL	REVISION - UPDATE DOCUMENTATION ONLY	AUTHORITY	DR.	AP.
05JL22	A	RELEASED-PRODUCTION	1080658439	PK	BS
25AP23	C	REVISED AND REDRAWN			
		APTIV DRAWING UPDATED			
		SUPPLIER DATASHEET ADDED	1080660251	RGA	DGA
15JN23	D	SUPPLIER DATASHEET MODIFIED	1080661446	RGA	DGA

REFERENCE INFORMATION (add sheets if necessary)

NON-STANDARD DRAWING IDENTIFIER: AMO-PHA-AP001 / 28782993

NON-STANDARD DRAWING REVISION SYMBOL(S): 2023.05.08 / D
(Include revision for all sheets)

NUMBER OF NON-STANDARD DRAWING COVER SHEETS: 1

NUMBER OF NON-STANDARD DRAWING SHEETS: 16

NUMBER OF ADDITIONS TO COVER SHEET: 0

TOTAL NUMBER OF SHEETS: 17

NON-STANDARD DRAWING SOURCE (IF CSD, ENTER CUSTOMER): AMOTECH

ADDITIONAL INFORMATION:

REF ASSEMBLY P/N	APTIV	AMOTECH
	28782993	AMO-PHA-AP001

KEY CHARACTERISTICS
YES [X] NO [ ]

DR	P. KUPCZYK	DATE 05JL22
Appv	B. SCIESZKA	DATE 05JL22
Appv	J.N. FERNANDES	DATE 05JL22
Appv	M. SOLAK	DATE 05JL22

•APTIV•
ADVANCED SAFETY & USER EXPERIENCE

DOCUMENT DATA STORAGE: SIEMENS NX

FIRST USED 28777827

DWG NAME
ANT-ASSEMBLY,IHP, HEAD UNIT

PART NO 28782993

SHT. 0 OF 17

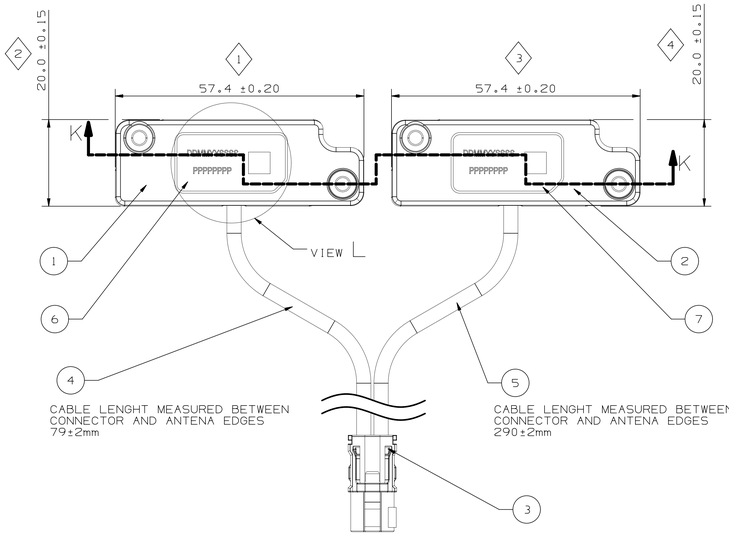
P4STDSDC, PRODUCT DRAWING

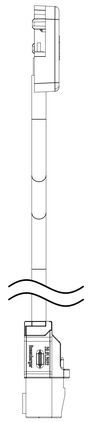
ITEM LIST		
ITEM	DESCRIPTION	QTY
1	BT ANTENNA	1
2	WI-FI ANTENNA	1
3	AMK16B-1M4Z5-D	1
4	COAXIAL DATA CABLE BT	79±2mm
5	COAXIAL DATA CABLE WI-FI	290±2mm
6	BT ANTENNA LABEL	1
7	WI-FI ANTENNA LABEL	1

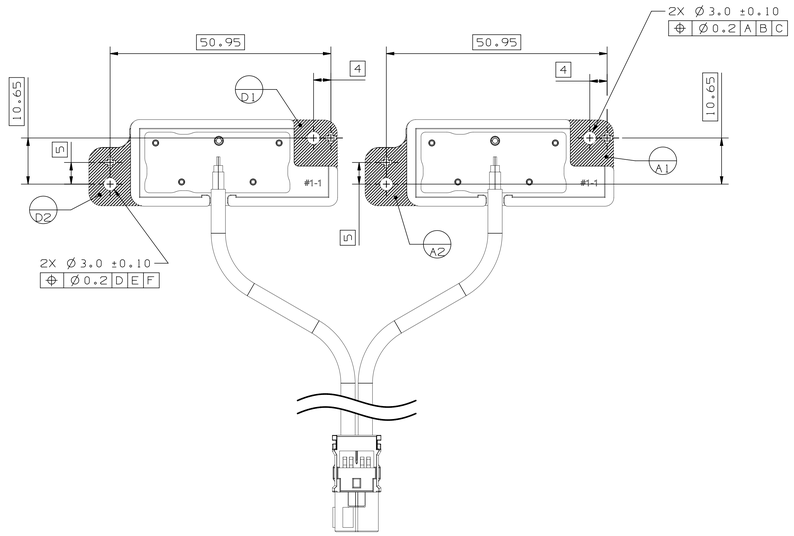
DESIGNATED CHARACTERISTICS					QCI	KPC
4		LAST NO USED	K OR O IN SYMBOL INDICATES CHECKPOINT	FIT/FUNCTION	C1	FF
4	0	TOTAL ON DRAWING				
KPC	QCI			SAFETY/COMPLIANCE		SC

NO	NO	TYPE	DESCRIPTION	RATIONALE	ZONE	SH	PTS
1		FF	LENGHT	CPK≥1.67	L14	1	1
2		FF	LENGHT	CPK≥1.67	L15	1	1
3		FF	LENGHT	CPK≥1.67	L12	1	1
4		FF	LENGHT	CPK≥1.67	L11	1	1

DWG STATUS					ZONE	REVISION HISTORY	AUTH	DR	APVD 1	APVD 2
DATE	STG	REV	N/P	CHG						
05JL22		A				IVECO IHP MY23 SERIAL COMPONNETS DRAWINGS RELEASE FOR TKO	10806 58439	PK	BS	JNF
040C22		B		1	B13	MATERIAL INFORMATION TABLE ADDED				
				2	F8	MARKING INFORMATION MODIFIED	108065 9146	MMA	BSC	JNF
25AP23		C		1	L14	KPC MOVED TO OTHER DIMENSION				
				2	L14	KPC MOVED TO OTHER DIMENSION				
				3	L12	KPC MOVED TO OTHER DIMENSION				
				4	L12	KPC ADDED				
				5	L6	DESIGNATED CHARACTERISTICS TABLE MODIFIED				
				6	M9	ITEM LIST MODIFIED				
				7	B13	MATERIAL INFORMATION TABLE MODIFIED				
				8	H15	CABLE LENGHT NOTE ADDED				
				9	H13	CABLE LENGHT NOTE ADDED	108066 0251	RGA	DGA	JNF
15JN23		D		1		SUPPLIER DATASHEET MODIFIED	108066 1446	RGA	DGA	JNF





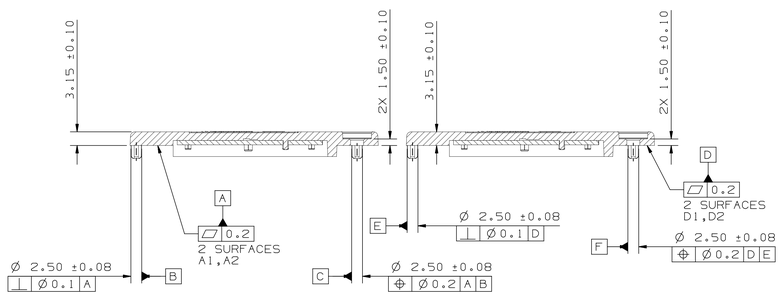


MARKING REQUIREMENTS:

MARKING MUST BE PERMANENT.
MARKING MUST BE READABLE.
MARKING SHALL BE PRE-APPROVED BY APTIV ENGINEERING.

TABLE 1 - LABEL SPECIFICATION (LASER MARKING/LABEL)

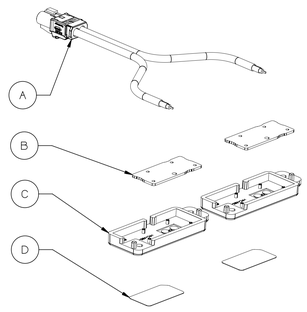
ATTRIBUTE	DESCRIPTION	FORMAT	STANDARD
HUMAN READABLE INFORMATION	APTIV P/N PPPPPPPP (REF. PER DRAWING)	CHARACTER SIZE MIN 1.2 mm	
CODE	CONTENT: "PPPPPPPPDDMMYYSSSS" - "PPPPPPPP" APTIV P/N - "DD" DAY OF ASSEMBLY - "MM" MONTH OF ASSEMBLY - "YY" THE LAST TWO DIGIT OF CALENDAR YEAR - "SSSS" SERIAL NUMBER RESET EVERY DAY TO 0001 (0001-9999)	PPPPPPPPDDMMYYSSSS	DATA MATRIX ECC200
	QUIET ZONE CIRCUMFERENCIAL	MIN. 2 CELL WIDTH	
	CELL SIZE	0.25-0.35 mm	
	SYMBOL SIZE	16 x 16 SQUARE MATRIX	
LABEL BODY	SERIAL NUMBER → DDMMYYSSSS APTIV PART NUMBER → PPPPPPPP DATA MATRIX CODE		



SECTION K - K

DETAIL L
SCALE 5:1

Material information		
NO	Description	Material
A	RF Cable	RF Cable & connector
B	Antenna	FR-4 (thickness 1mm)
C	Carrier	PC+ABS (LG LUPOY GP5008BFH)
D	Label	PolyPropylene (thickness 0.1 mm)



SCALE 1:1

UNLESS OTHERWISE SPECIFIED

THIS DOCUMENT IS IN ACCORDANCE WITH ASME Y14.5-2009.

ALL DIMENSIONS ARE IN MILLIMETERS

ZERO PLACE DECIMALS ±N/A
ONE PLACE DECIMALS ±N/A
TWO PLACE DECIMALS ±N/A
THREE PLACE DECIMALS ±N/A
ANGLES ±N/A DEGREE

REFERENCE

FIRST USED
28777827
REFERENCE
N/A
REPLACES #
N/A
REPLACED BY
N/A

FIRST ANGLE PROJECTION

DO NOT SCALE
USE MATH DATA
CAD NX V11.0

•APTIV•

		DATE
DR	P. KUPCZYK	05JL22
APVD1	B. SCIESZKA	05JL22
APVD2	J.N. FERNANDES	05JL22
APVD3	M. SOLAK	05JL22
APVD4		
APVD5		

SUBSTANCES OF CONCERN AND RECYCLED CONTENT PER APTIV 1094900

MATERIAL
-

DRAWING NAME
ANT-ASSEMBLY,IHP, HEAD UNIT

DRAWING NUMBER
28782993

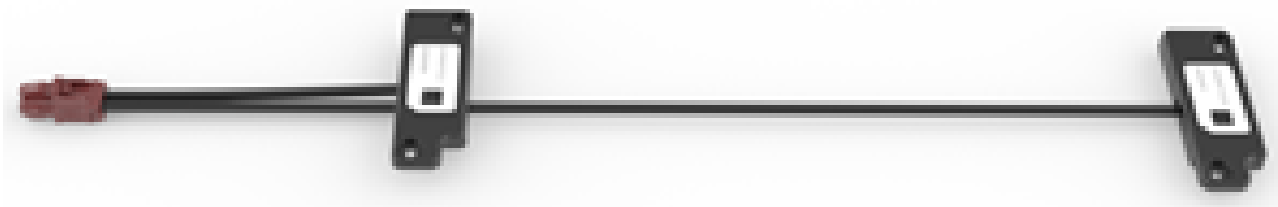
SIZE	SCALE	FRAME NO	SHEET NO	STG	REV	N/P
A0	(2:1)	1 OF 1	1 OF 1	D		

P4STDSDC, PRODUCT DRAWING

AMO
AMOTECH

DATASHEET

Type	Cable assembly antenna
Application	BT, WiFi
Customer P/N	28782993
AMOTECH P/N	AMO-PHA-AP001
Revision	1



2023. 05. 08

AMOTECH

History

Rev. No	Date	Title	Contents	Page
0	2023. 03. 23		New published	
1	2023. 05. 08		Added flammability of material	
			Added technical datasheet of connector	

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1. Specification

1.1 Electrical Specifications

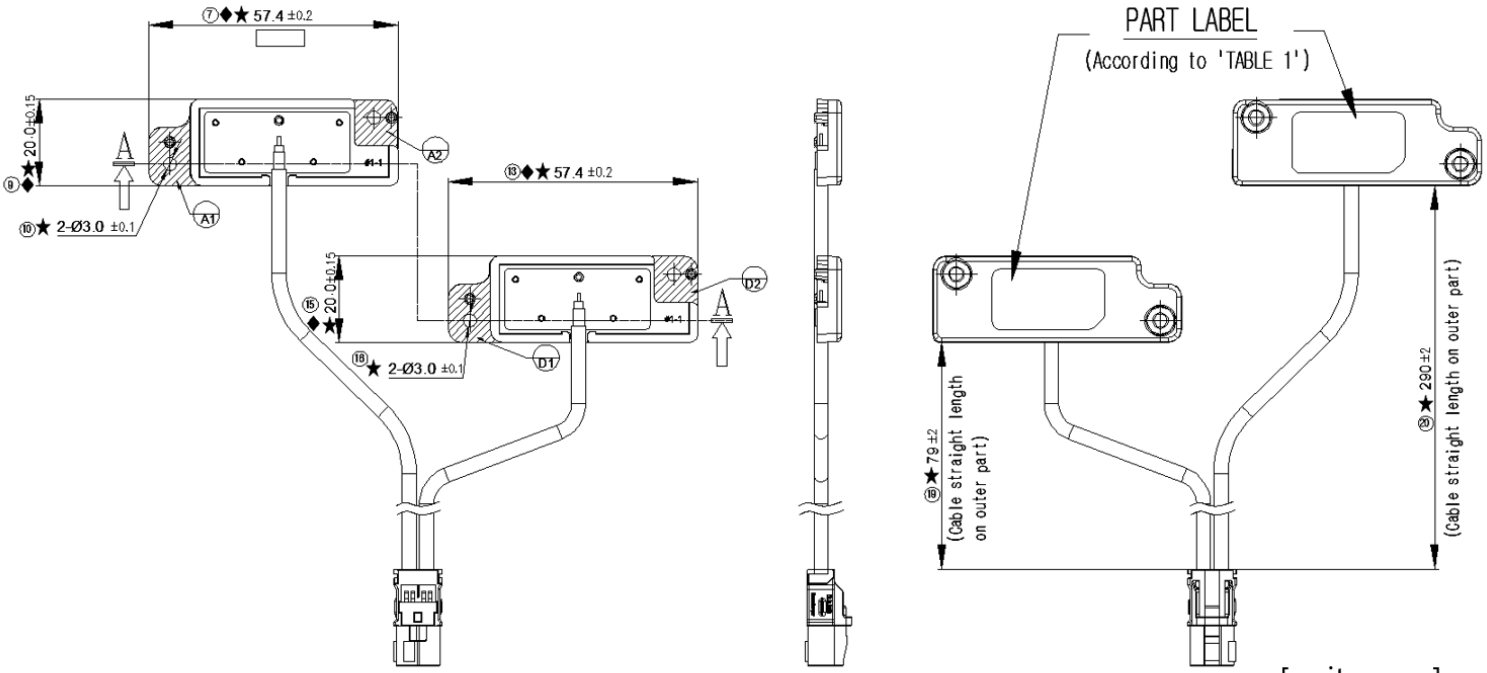
No	Item		Specification		Remark
1	Operating Frequency [MHz]	BT	2400 ~2485		Measured data [SET]
		WiFi	2400 ~ 2485		
			5150 ~ 5850		
2	VSWR	BT	Max 3:1 @2600 ~ 2685 MHz		Measured data [Measurement Jig]
		WiFi	Max 3:1 @2500 ~ 2585 MHz		
			Max 3:1 @5150 ~ 5850 MHz		
3	Average Gain [dBi]	BT	2.4 GHz band	Typ. -4.7	Measured data [SET]
		WiFi	2.4 GHz band	Typ. -3.4	
			5 GHz band	Typ. -4.9	
4	Peak Gain [dBi]	BT	2.4 GHz band	Typ. 1.6	
		WiFi	2.4 GHz band	Typ. 1.8	
			5 GHz band	Typ. 1.5	
5	Polarization		Linear		
6	Impedance [Ω]		Nominal 50		

1.2 Mechanical Specifications

No	Item		Specification	Remark
1	Dimensions (L x W x H)		57.4 x 20 x 5.7 mm	Housing
2	Cable	BT	Leoni Dacar 302-4, 79 mm, Black	
		WiFi	Leoni Dacar 302-4, 290 mm, Black	
3	RF connector		Rosenberger HFM connector, Code D	
3	Unit weight		18.6 g	

1.3 Appearance & material

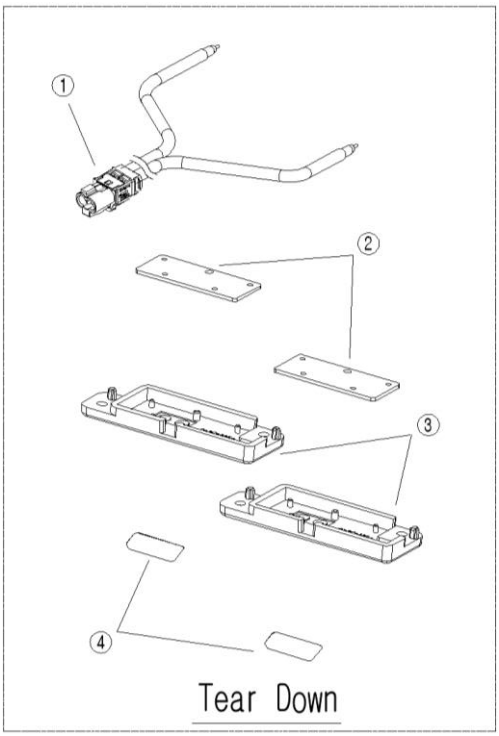
- Drawing



[unit : mm]

- Material information

No	Description	Material	Flammability
①	RF Cable	Dacar302-4 Cable	ISO14572
	Connector	HFM connector	-
	Housing	PBT GF20	UL94 HB
②	PCB	FR4	UL94 V0
③	Carrier	PC+ABS	UL94 V0
④	Label	Polypropylene	-



- Product label information

[A]	DD	MM	YY	SSSS
	Date	Month	Year	Serial number

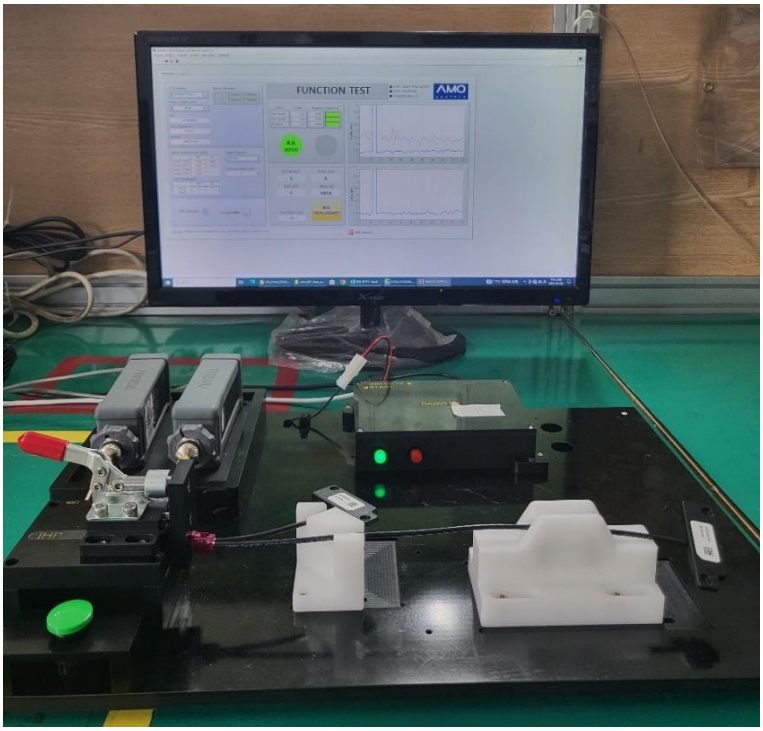
[B] Customer P/N

[C] Data Matrix Code : [B]+[A]

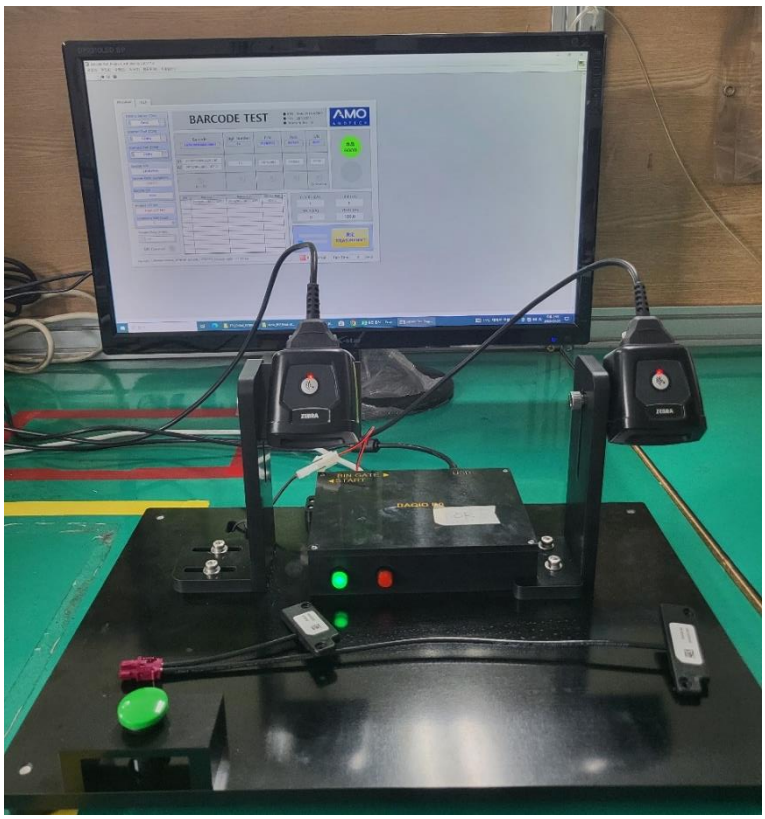
2. Measurement

2.1 Measurement System

- Performance test system

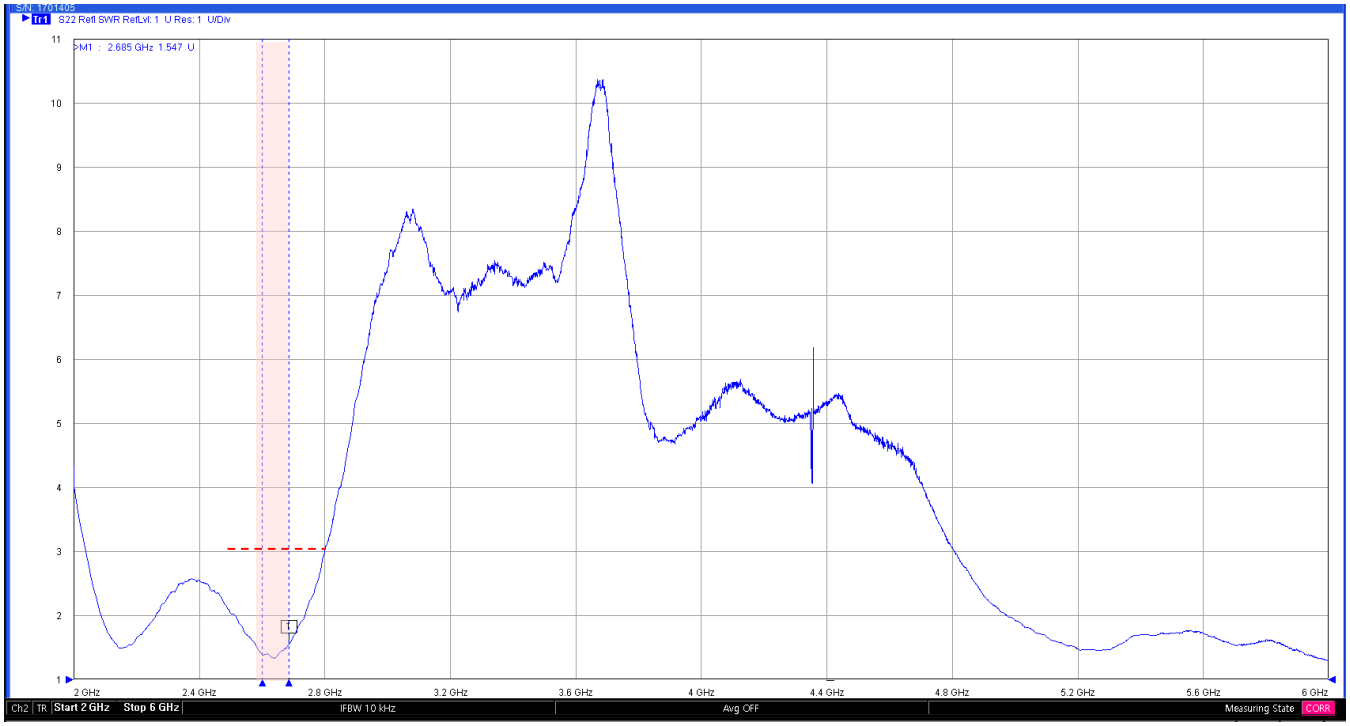


- Label test system



2.2 Measured VSWR Data

- Measured VSWR of BT antenna in measurement jig

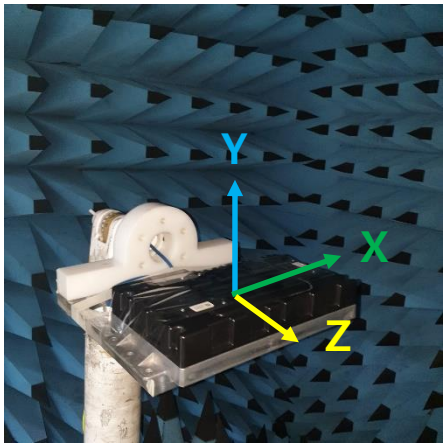


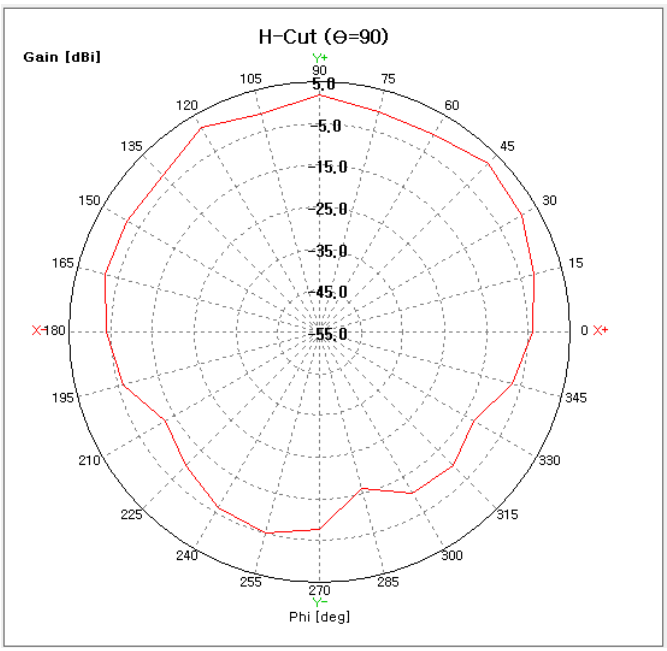
- Measured VSWR of WiFi antenna in measurement jig

2.3 Measured data of Radiation Gain

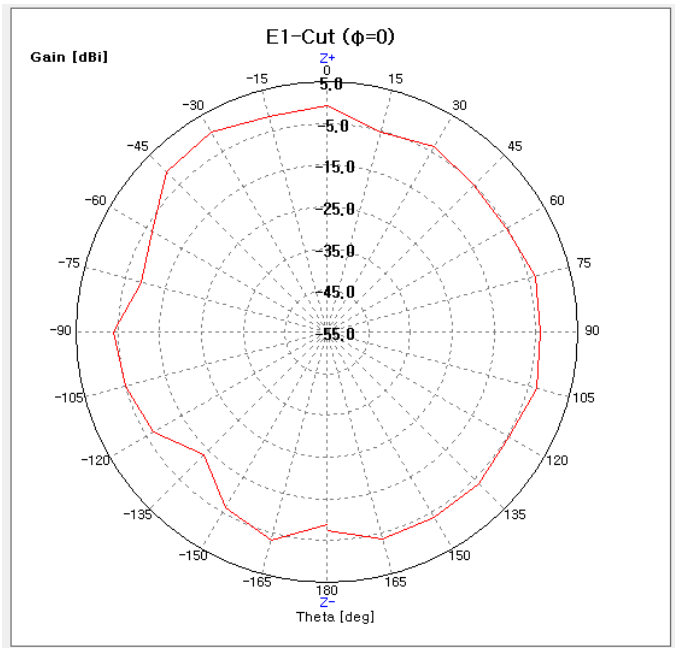
- BT antenna gain table on the SET

Frequency [MHz]	Efficiency [%]	Avg. Gain [dBi]	Peak Gain [dBi]
2400	34.01	-4.68	0.99
2442	44.01	-3.56	1.69
2485	40.72	-3.90	1.94

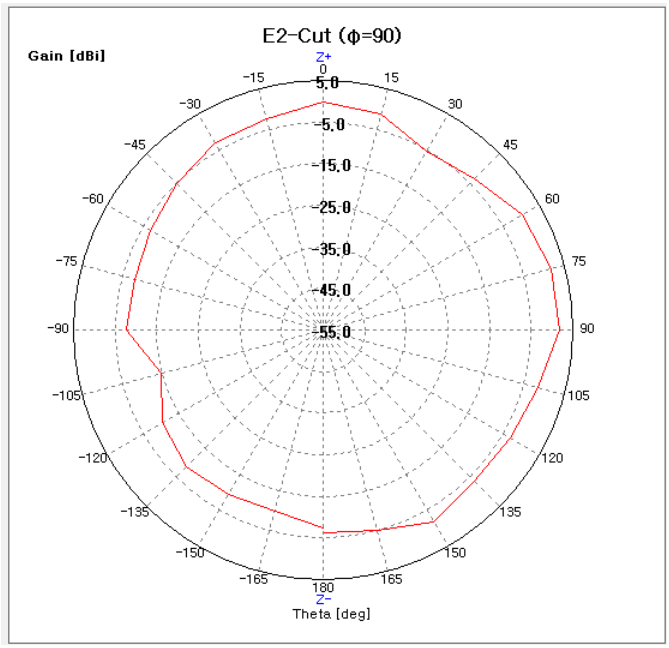




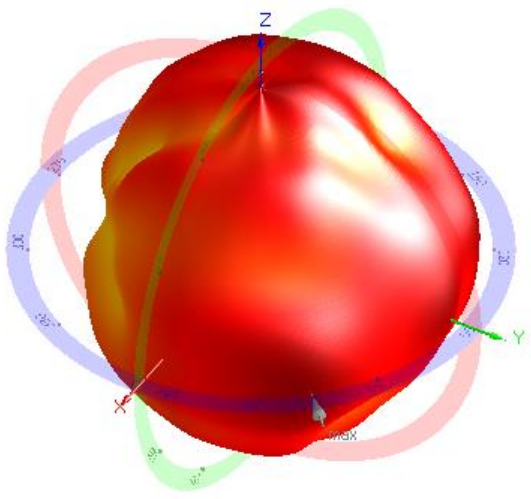
XY plane @2442 MHz



ZX plane @2442 MHz



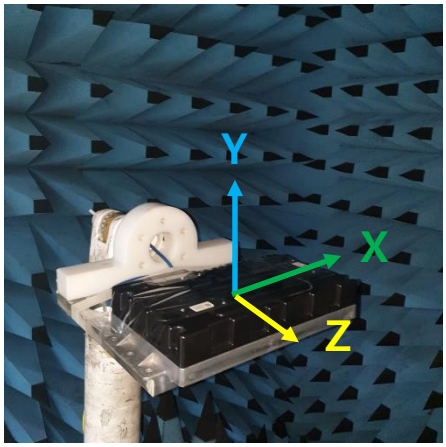
YZ plane @2442 MHz

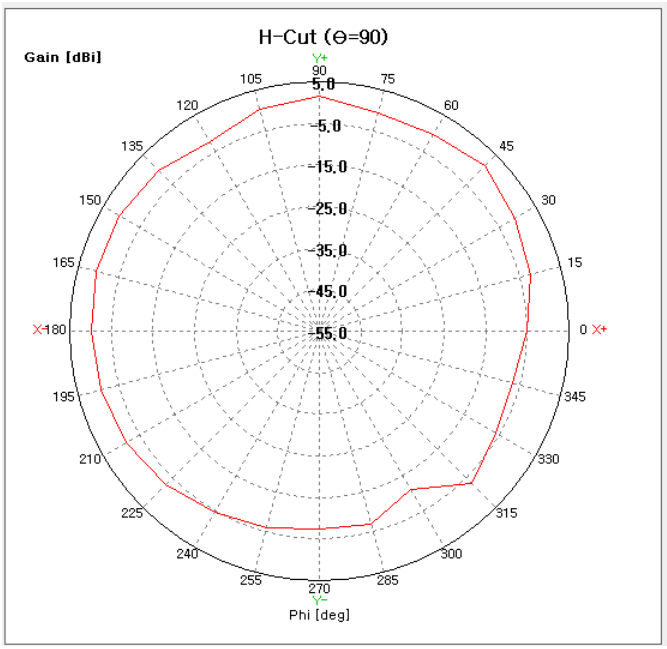


3D radiation pattern @2442 MHz

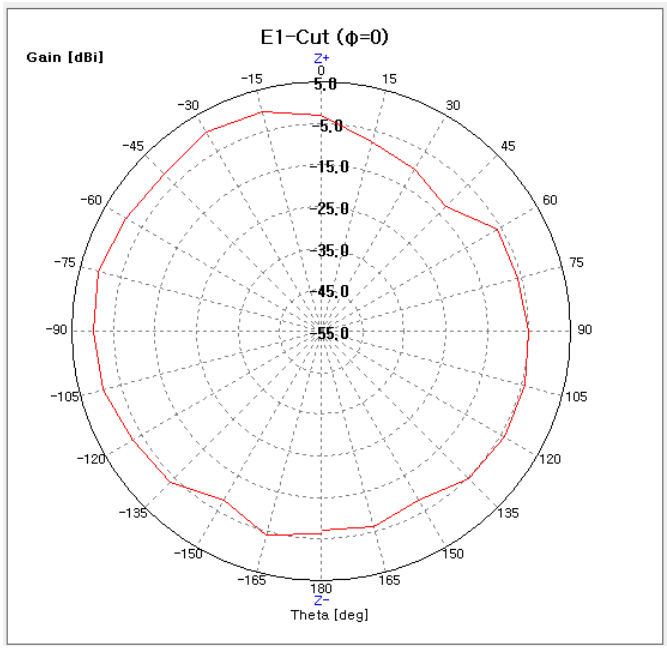
- WiFi Antenna gain table on the SET

Frequency [MHz]	Efficiency [%]	Avg. Gain [dBi]	Peak Gain [dBi]
2400	45.24	-3.44	1.86
2442	56.77	-3.14	1.95
2485	47.05	-3.27	1.85

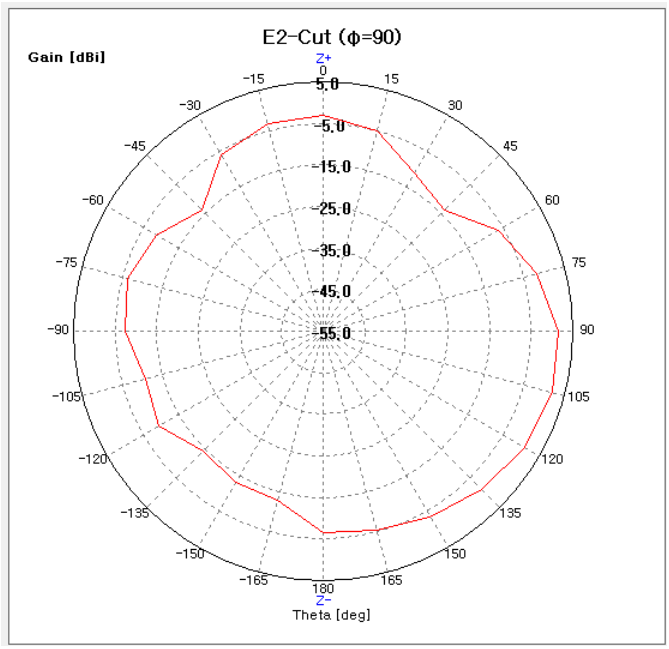




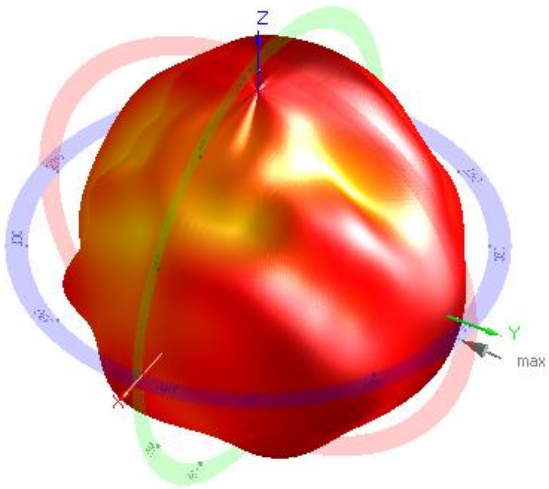
XY plane @2442 MHz



ZX plane @2442 MHz



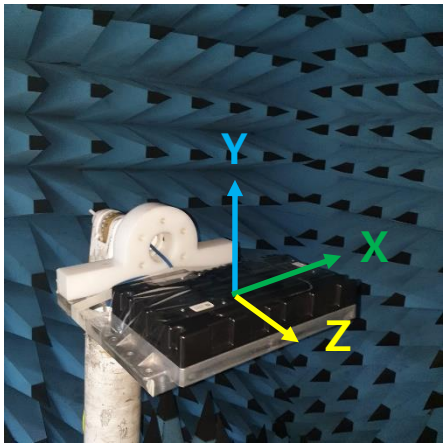
YZ plane @2442 MHz

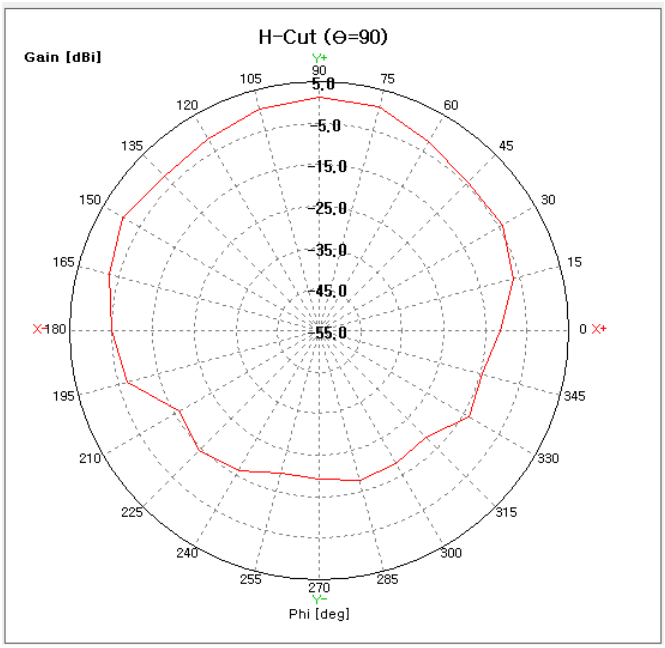


3D radiation pattern @2442 MHz

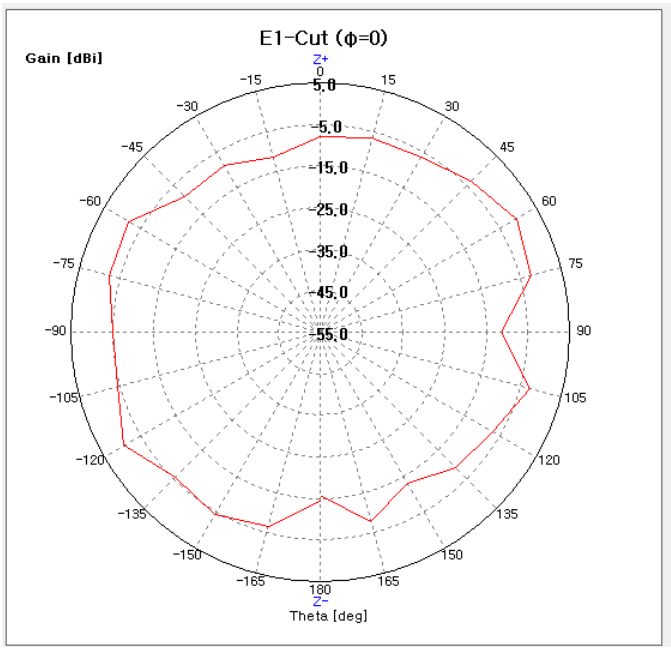
- WiFi Antenna gain table on the SET

Frequency [MHz]	Efficiency [%]	Avg. Gain [dBi]	Peak Gain [dBi]
5150	31.87	-4.97	1.85
5500	34.47	-4.63	2.22
5850	33.11	-4.80	1.71

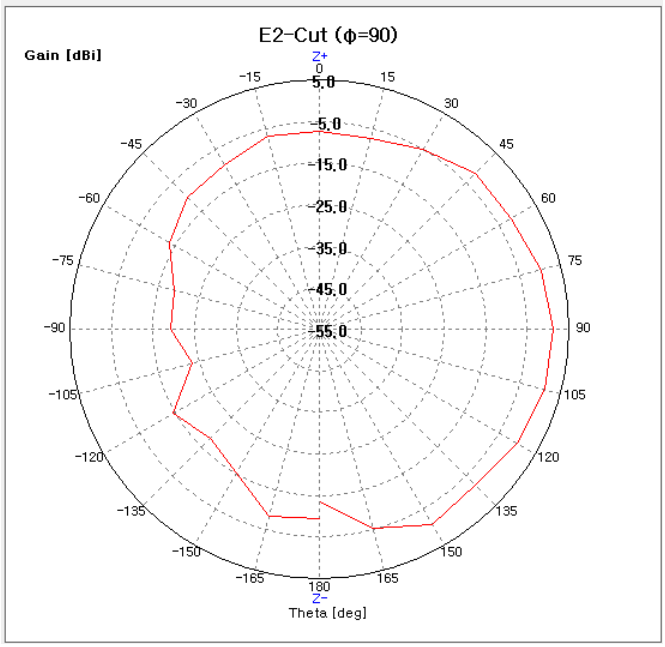




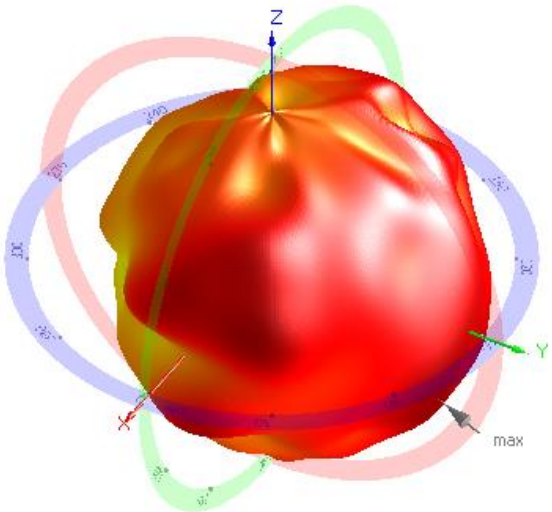
XY plane @5500 MHz



ZX plane @5500 MHz



YZ plane @5500 MHz

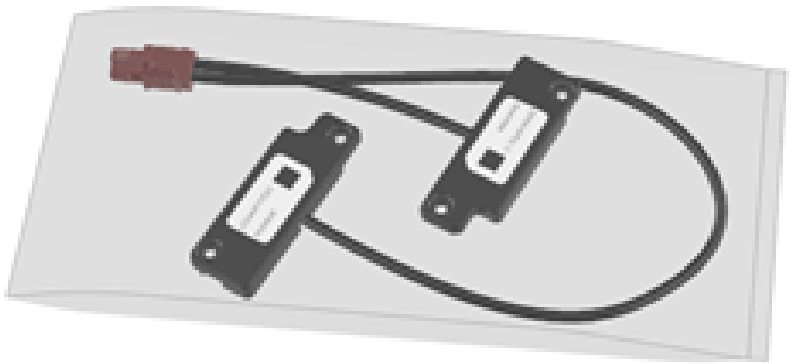


3D radiation pattern @5500 MHz

3. Packaging

3.1 Unit Packing

- Size : 250 x 80 mm
- Material : PET
- Quantity : 1 pcs / bundle

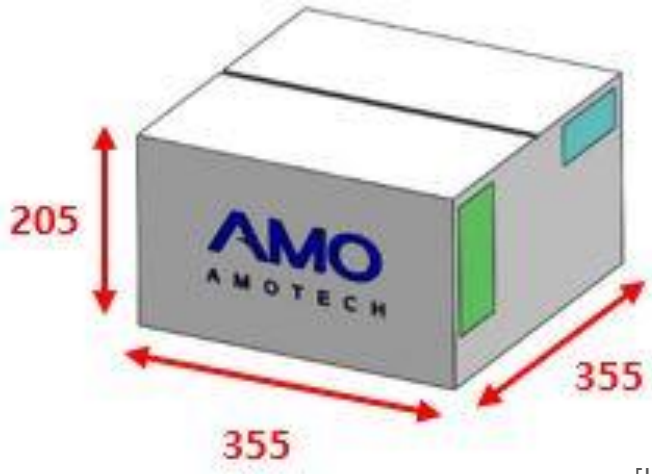


3.2 Tray

- Tray size : 355 x 168 x 30 mm
- Material : PS (Black)
- Quantity : 16 pcs / tray

3.3 Carton box

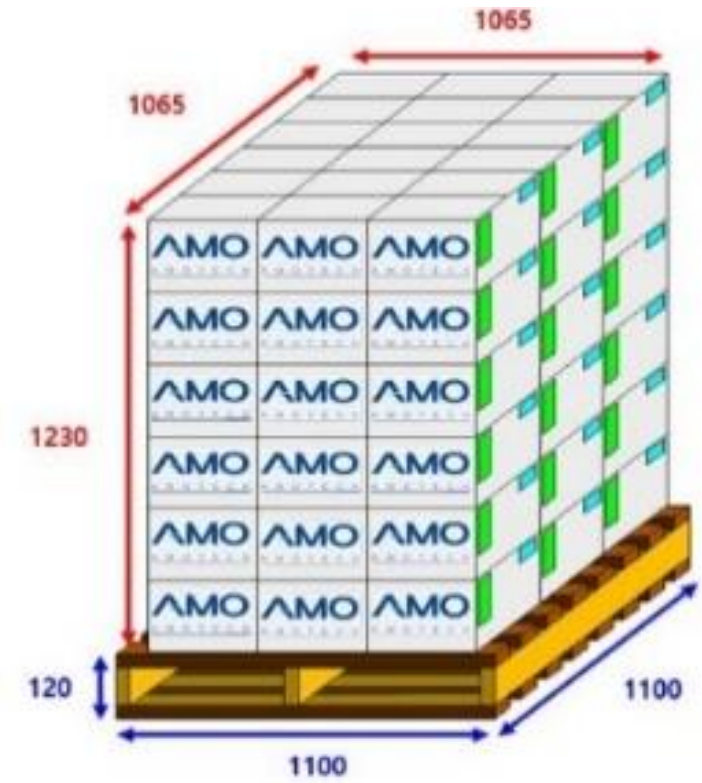
- Box size : 355 x 355 x 205 mm
- Quantity : 192 pcs / box



[Unit : mm]

3.4 Pallet

- Pallet size : 1,100 x 1,100 x 1350 mm
- Quantity : 10,368 pcs / pallet



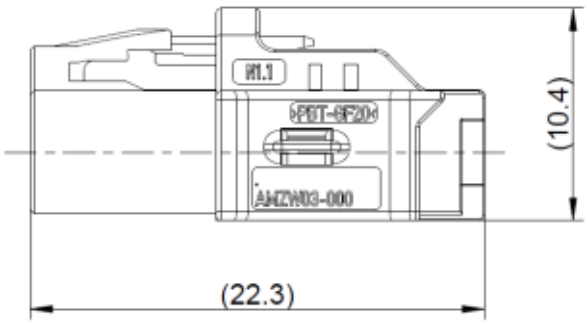
[Unit : mm]

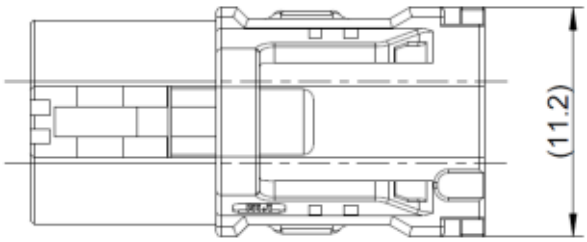
4. Reliability Test Conditions

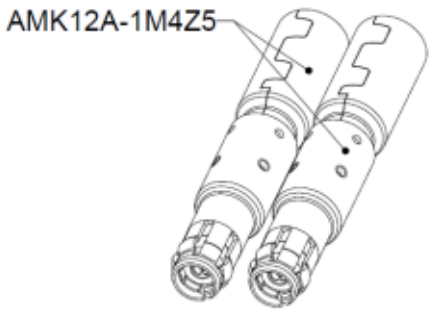
No	Item	Test Condition	Test Requirements
1	High temperature storage	1. Temperature : +85 ℃ 2. Time : 504 hours	1. No visual damage 2. Within electric spec (VSWR)
2	Low temperature storage	1. Temperature : -40 ℃ 2. Time : 24 hours	1. No visual damage 2. Within electric spec (VSWR)
3	Temperature cycling	1. Step 1 : +85 ℃, 20 min Step 2 : -40 ℃, 20 min 2. Number of cycle : 200	1. No visual damage 2. Within electric spec (VSWR)
4	Humidity	1. Step 1 : -10 ℃, 24 hours Step 2 : +65 ℃, 24 hours 2. Humidity : 93 %RH 3. Number of cycle : 10	1. No visual damage 2. Within electric spec (VSWR)
5	Free fall (=drop)	1. Drop height : 1 m 2. Impact surface : concrete 3. Test cycle : for each of 3 DUTs one drop in both direction of each dimensional axis (1st DUT : ±X, 2nd DUT : ±Y, 3rd DUT : ±Z)	1. No visual damage 2. Within electric spec (VSWR)
6	Vibration	1. Step : 5-55-5 Hz 1octave/min 2. Amplitude = 1.5 mm 3. Acceleration = 2 g 4. Hold time = 2 hours 5. Direction : Z direction (up & Down)	1. No visual damage 2. Within electric spec (VSWR)

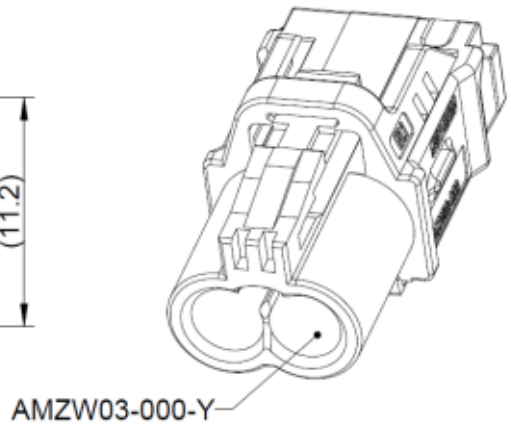
5. Technical Datasheet of Rosenberger HFM Connector

Technical Data Sheet	Rosenberger
HFM® High-Speed FAKRA Mini — STRAIGHT JACK w. HOUSING	**AMK16B-1M4Z5-Y**









All dimensions are in mm

Interface

According to	RN_108-02

Documents

Assembly instruction	acc. component data sheet AMK12A-1M4Z5

Material and plating

Connector parts	
contact	acc. component data sheet AMK12A-1M4Z5
housing	acc. component data sheet AMZW03-000-Y

Rosenberger Hochfrequenztechnik GmbH & Co. KG
P.O.Box 1260 D-84526 Tittmoning Germany
www.rosenberger.de

Tel. : +49 8684 18-0
Email : info@rosenberger.de

Technical Data Sheet	Rosenberger
HFM® High-Speed FAKRA Mini — STRAIGHT JACK w. HOUSING	**AMK16B-1M4Z5-Y**

Electrical data

Impedance	50 Ω
Frequency	DC to 15 GHz
Return loss	≥ 25 dB, DC to ≤3 GHz ≥ 20 dB, >3 GHz to ≤6 GHz ≥ 15 dB, >6 GHz to ≤12 GHz ≥ 12 dB, >12 GHz to ≤15 GHz
Insertion loss	$\leq 0.1 \times \sqrt{f(GHz)}$ dB
Insulation resistance	≥ 1x10³ MΩ
Center contact resistance	≤ 15 mΩ
Outer contact resistance	≤ 5 mΩ
Test voltage	≤ 800 V rms
Working voltage	≤ 60 V DC
Power current	≤ 1 A DC

- Limitations are possible due to the used cable type -
- Measurement procedure according to RN_107-1 -

Mechanical data

Mating cycles	≥ 25
Engagement force	≤ 30 N*
Disengagement force	≥ 2 N
Retention force latch	≥ 110 N
Retention force primary lock	≥ 80 N
Retention force secondary lock	≥ 80 N
Coding efficiency	≥ 150 N

** according to USCAR 25 Rev. 3 and the tests specified in USCAR 17 Rev.5 TG-G*

Environmental data

Temperature range	-40°C to +105°C
Thermal shock	ISO 20860-2 clause 9.2
Temperature and humidity	ISO 20860-2 clause 9.3
Vibration and mechanical shock	ISO 20860-2 clause 9.1
Dry heat	ISO 20860-2 clause 9.4
RoHS	compliant

- Limitations are possible due to the used cable type –

Tooling

acc. component data sheet AMK12A-1M4Z5

Suitable cables

acc. component data sheet AMK12A-1M4Z5

Packing

Standard (optional)	N/A
Weight, calculated	2.6 g +/- 2%

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Technical Data Sheet		Rosenberger
HFM® High-Speed FAKRA Mini	STRAIGHT JACK w. HOUSING	**AMK16B-1M4Z5-Y**

Coding

Part Number must be accomplished by codification

Coding		Color	RAL	Part-Number-RT
	A	black	sim. 9005	AMK16B-1M4Z5-A
	B	white	sim. 9010	AMK16B-1M4Z5-B
	C	blue	sim. 5012	AMK16B-1M4Z5-C
	D	bordeauxviolet	sim. 4004	AMK16B-1M4Z5-D
	E	green	sim. 6017	AMK16B-1M4Z5-E
	F	brown	sim. 8011	AMK16B-1M4Z5-F
	G	grey	sim. 7036	AMK16B-1M4Z5-G
	H	light pink	sim. 3015	AMK16B-1M4Z5-H*
	J	beige	sim. 1001	AMK16B-1M4Z5-J*
	K	curry	sim. 1027	AMK16B-1M4Z5-K*
	N	pastel green	sim. 6019	AMK16B-1M4Z5-N*
	Z	waterblue	sim. 5021	AMK16B-1M4Z5-Z
		traffic purple	sim. 4006	secondary lock

*on request

For the installation of the electrotechnical equipment, particular electrotechnical expertise is required.

Draft	Date	Approved	Date
K. Unterwieser	10.12.21	T. Miedl	16.02.22

Rev.	Engineering change number	Name	Date
100	21-v405	M. Thaler	16.02.22

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