





# MHF<sup>®</sup> Series - Micro RF Coaxial Connectors








Click the photos below to get more detailed product information.

Product name		MHF <sup>®</sup> I LK	MHF <sup>®</sup> I	MHF <sup>®</sup> I	MHF <sup>®</sup> III
Appearance					
		MHF I with mechanical lock	Best Insertion Loss	Most Cable O.D. options	low profile 1.60 mm
Plug part number		-	20767-001R	20278-112R-**	20609-002R
Receptacle part number			20279-001E-** (3 pads) 20441-001E-01 (4 pads)		20369-001E-**
Maximum height (mm)		2.9	3.0	2.5	1.6
Outside dimension of receptacle (mm)			3.0 x 3.0		2.0 x 2.0
Coax O.D. (Center Conductor AWG)	2.00 mm (26)		●		
	1.80 mm (30)	●		●	
	1.37 mm (30)	●		●	
	1.32 mm (32)	●		●	
	1.13 mm (32)	●		●	
	0.95 mm (33)				
	0.81 mm (33)				
	0.81 mm (36)	●		●	●
	0.64 mm (36)				●
	0.48 mm (38)				
Frequency		DC - 9 GHz			DC - 6 GHz
VSWR (L=100mm)	DC - 3GHz	1.3 max.(PLUG) /1.3 max.(RECE)			1.3 max.
	3GHz - 6GHz	1.5 max.(PLUG) /1.4 max.(RECE)			1.5 max.
	6GHz - 9GHz	1.9 max.(PLUG) /1.8 max.(RECE)		1.6 max.(PLUG) 1.8 max.(RECE)	-
	9GHz - 12GHz	-			
	12GHz - 15GHz	-			
Service temp. (Celsius)	-40 degree - 90 degree				
Characteristic impedance	50ohm				
Rated voltage	AC60V				
Contact resistance	20m ohm max.				
Withstand voltage	AC200V/min				
Insulation resistance	500M ohm min./DC100V				

# MHF<sup>®</sup> Series - Micro RF Coaxial Connectors








Click the photos below to get more detailed product information.

Product name		MHF <sup>®</sup> 4L LK	MHF <sup>®</sup> 4L	MHF <sup>®</sup> 4L	MHF <sup>®</sup> 4L	MHF <sup>®</sup> 4
Appearance						
		MHF 4L with Mechanical lock	Best Insertion Loss and VSWR	Industry Standard for M.2	Industry Standard for M.2	low profile 1.20 mm
Plug part number		-	20632-001R-37	20565-001R-13	20572-001R-08	20611-001R
Receptacle part number		20449-001E-**(MHF 4) 20579-001E(MHF 4L)				
Maximum height (mm)		2.0	1.7	1.4	1.2	1.2
Outside dimension of receptacle (mm)		2.0 x 2.0				
Coax O.D. (Center Conductor AWG)	2.00 mm (26)					
	1.80 mm (30)					
	1.37 mm (30)	●	●			
	1.32 mm (32)					
	1.13 mm (32)			●		
	0.95 mm (33)			●		
	0.81 mm (33)					
	0.81 mm (36)				●	●
	0.64 mm (36)				●	
0.48 mm (38)						
Frequency		DC – 12 GHz (MHF 4L Plug x MHF 4L Rece) , DC – 9 GHz (MHF 4L Plug x MHF 4 Rece)				DC - 9 GHz
VSWR (L=100mm)	DC - 3 GHz	1.3 max.				
	3 GHz - 6 GHz	1.4 max.		1.45 max	1.5 max.	
	6 GHz - 9 GHz	1.5 max.		1.6 max.	-	
	9 GHz - 12 GHz	1.6 max.		1.9 max.	-	
	12 GHz - 15 GHz			-		
Service temp. (Celsius)		-40 degree - 90 degree				
Characteristic impedance		50ohm				
Rated voltage		AC60V				
Contact resistance		20m ohm max.				
Withstand voltage		AC200V/min				
Insulation resistance		500M ohm min./DC100V				

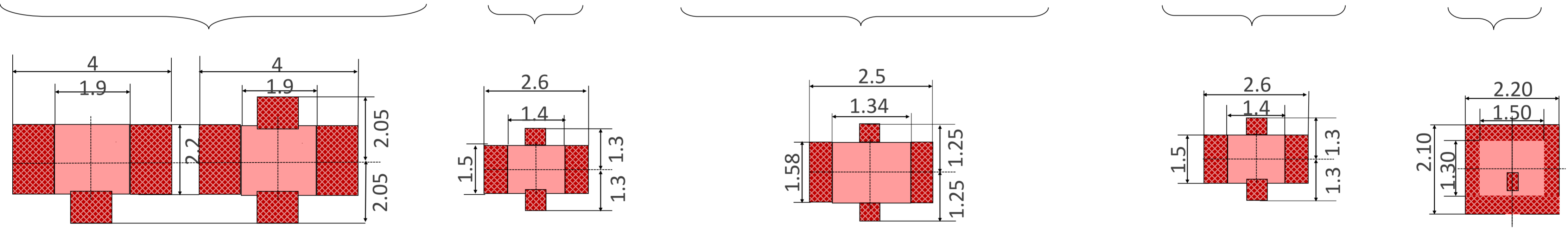
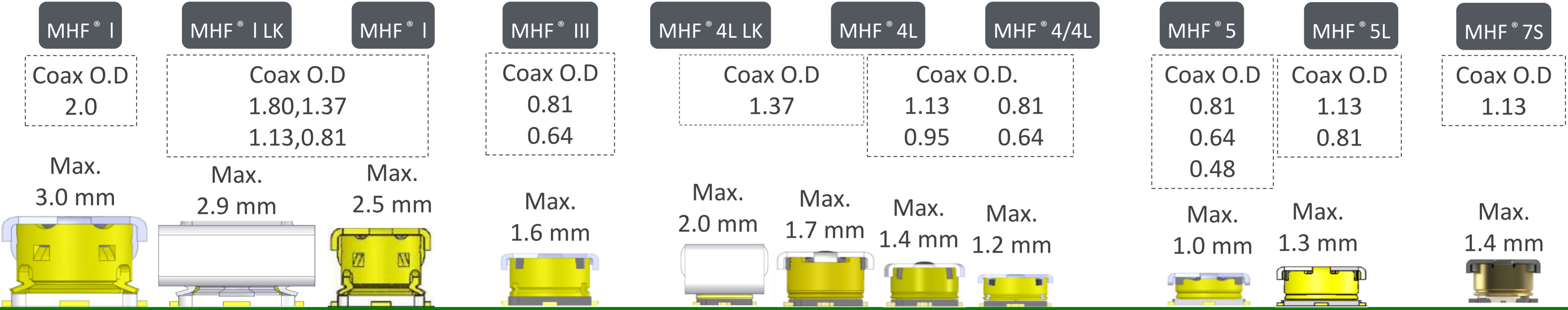
# MHF® Series - Micro RF Coaxial Connectors



Click the photos below to get more detailed product information.

Product name		MHF® 5L	MHF® 5L	MHF® 5	MHF® 5	MHF® 7S
Appearance						
		Improved Insertion Loss and VSWR through 15GHz	Improved Insertion Loss and VSWR through 15GHz	low profile 1.00 mm	low profile 1.00 mm	Unique shielded design increases EMC performance
Plug part number		20668-001R-13	20714-001R-81	20711-001R-81	20615-002R-48	20980-001R-13
Receptacle part number		20566-001E-01				20981-001E-02
Maximum height (mm)		1.3		1.0		1.4
Outside dimension of receptacle (mm)		2.0 x 2.0				2.0 x 2.0
Coax O.D.(Center Conductor AWG)	2.00 mm (26)					
	1.80 mm (30)					
	1.37 mm (30)					
	1.32 mm (32)					
	1.13 mm (30)					
	1.13 mm (32)	●				●
	0.95 mm (33)					
	0.81 mm (33)		●			
	0.81 mm (36)			●		
	0.64 mm (36)			●		
0.48 mm (38)					●	
Frequency		DC - 15GHz		DC - 12GHz		DC - 15GHz
VSWR (L=100mm)	DC - 3GHz	1.3 max.				1.3 max.
	3GHz - 6GHz	1.4 max.		1.5 max.		1.35 max.
	6GHz - 9GHz	1.5 max.		1.6 max.		1.4 max.
	9GHz - 12GHz	1.5 max.		1.7 max.	1.6 max.	1.45 max.
	12GHz - 15GHz	1.6 max.		-		1.5 max.
Service temp. (Celsius)	-40 degree - 90 degree					
Characteristic impedance	50ohm					
Rated voltage	AC60V					
Contact resistance	20m ohm max.					
Withstand voltage	AC200V/min					
Insulation resistance	500M ohm min./DC100V					




# Micro RF coax connector : Foot pattern









MHF<sup>®</sup> I Rece 3Pad    MHF<sup>®</sup> I Rece 4Pad    MHF<sup>®</sup> III Rece    MHF<sup>®</sup> 4/4L Rece    MHF<sup>®</sup> 5/5L Rece    MHF<sup>®</sup> 7S Rece

# MHF<sup>®</sup> Accessories: SMA Adapters









## SMA Adapters for MHF<sup>®</sup> Plugs

Type	For electrical performance check		For voltage check
Appearance (Reference)			
Durability (cycles)	3 K		10 K
MHF <sup>®</sup> I, I LK Plug	90193-001	-	90194-001
MHF <sup>®</sup> III Plug	90285-001	-	90286-001
MHF <sup>®</sup> 4, 4L, 4L LK Plug	-	90449-001	90449-003-01
MHF <sup>®</sup> 5, 5L Plug	90543-0001	-	90586-0001
MHF <sup>®</sup> 7S Plug	91255-0001	-	91245-0001

## SMA Adapters for MHF<sup>®</sup> Receptacles

Type	For electrical performance check	High cycle series				
		Normal	Narrow pitch		Detachable	
		Probe	Adaptor cable (Attach to probe)	Probe	Adaptor base (Attach to probe)	Probe
Appearance (Reference)						
Durability (cycles)	500	10 K	100	10 K	200 K	10 K
MHF <sup>®</sup> I Receptacle	90193-002	90539-001	90577-0100 (Cable: 100 mm)	90575-0001	90684-0001	90416-001
MHF <sup>®</sup> III Receptacle	90285-002	90491-001		-		-
MHF <sup>®</sup> 4, 4L Receptacle	90449-002	90698-0001	90577-0350 (Cable: 350 mm)	90576-0001		90683-0001
MHF <sup>®</sup> 5 Receptacle	90543-0002	90793-0001		90847-0001	90690-0001	
MHF <sup>®</sup> 7S Receptacle	91256-0001	-	91197-0300	91145-0001	-	-

# MHF<sup>®</sup> Accessories: Hand Tool

Type	Mating/Unmating Tool	Unmating Tool	Mating Tool	Mating/Unmating Tweezer		Locking/Unlocking Tool		Unlocking Tool
Appearance (Reference)								
MHF I Plug	90224-0001 90885-0001 (*)	90192-001	-	-	-	-	-	-
MHF I LK Plug	-	-	-	-	91026-0001	-	91492-0001	-
MHF III Plug	-	90287-001	-	90501-001	-	-	-	-
MHF 4 Plug	90435-001	-	-	90482-001	-	-	-	-
MHF 4L Plug	90609-0001 (**) 90873-0001 (***)	-	-	90616-0008 90615-0013	-	-	-	-
MHF 4L LK Plug	-	-	-	-	-	91166-0001	91493-0001	-
MHF 5 Plug	90612-0001	-	90624-0001	-	-	-	-	-
MHF 7S Plug	91186-0001	-	-	-	-	-	-	-
MHF-TI Plug	-	-	-	-	-	-	-	91097-0001

Note




(\*): 90885-0001 is for 20767-001R

(\*\*): 90609-0001 is for 20572-001R-08 and 20565-001R-13

(\*\*\*): 90873-0001 is for 20632-001R-37

# MHF<sup>®</sup> Accessories: RF Switch

## SMA Adapters for MHF<sup>®</sup> Switch

Type	Cable probe	High cycle series	
	Friction lock	Normal probe	Floating probe
Appearance (Reference)			
Durability (cycles)	1 K	10 K	200 K
MHF <sup>®</sup> -SW23	90582-0300 (Cable: 300 mm)  90582-0400 (Cable: 400 mm)	90604-0001	90605-0001

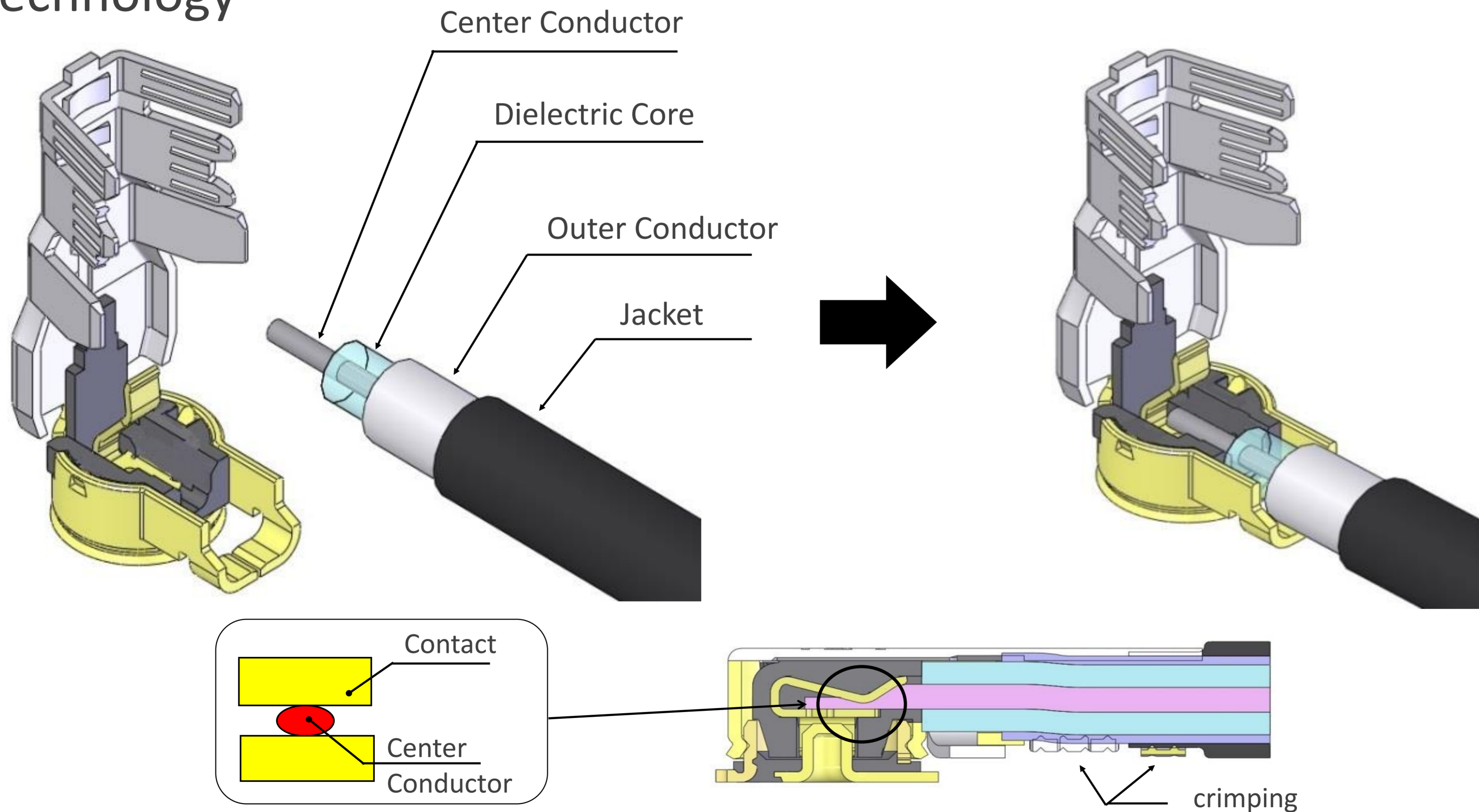


# MHF<sup>®</sup> Harnesses



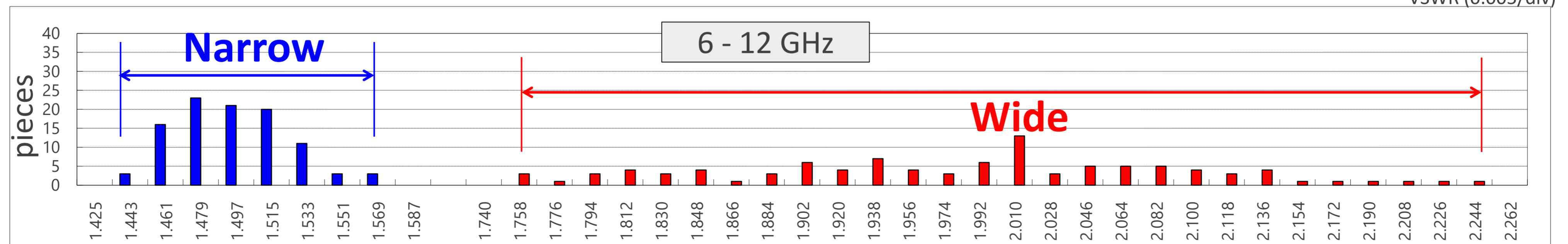
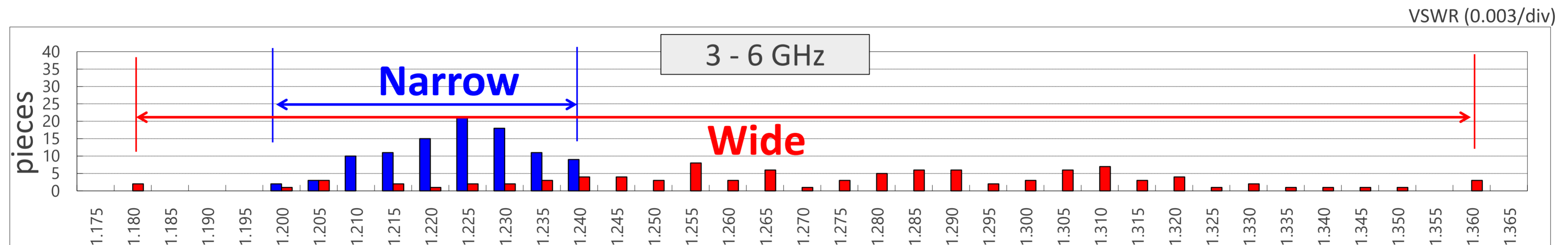
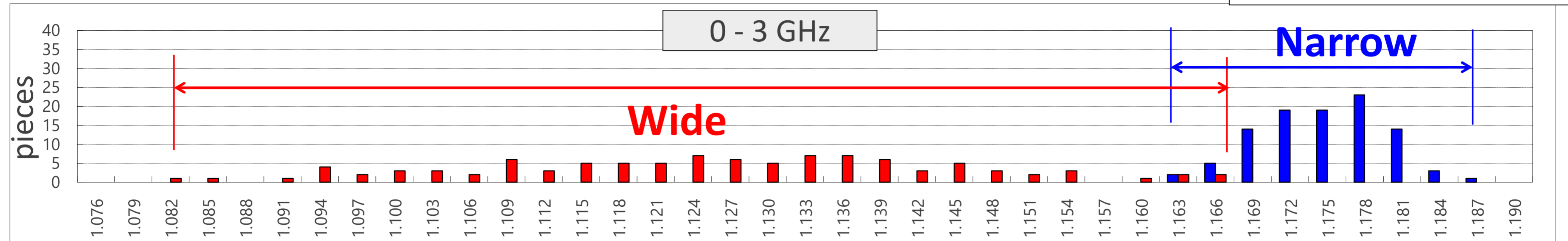
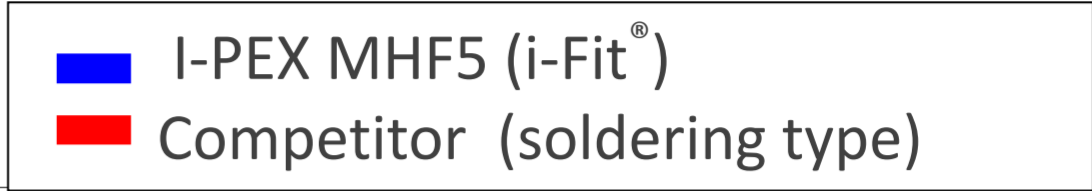
# Micro RF coax connector : Cable crimp termination technology

i-Fit<sup>®</sup> Technology



# Solder-less crimp “i-Fit<sup>®</sup>” advantage versus soldering types

i-Fit<sup>®</sup> offers consistently tight range of performance



VSWR S11 Histogram

# Solder-less crimp “i-Fit<sup>®</sup>” advantage versus manual soldering types

Significantly reduced tact time with i-Fit<sup>®</sup>

		I-PEX MHF "i-Fit <sup>®</sup> "	Manual Soldering
Tact time	Cable strip	Same tact time	
	Termination	<b>6</b> seconds/ea.	<b>30</b> seconds/ea.
Qty of cable assemblies a worker can make per month		105,600 assemblies	21,120 assemblies
# of operator needed	1M cable assemblies/mo	10	48
	2M cable assemblies/mo	19	95

\*Calculated based on operation hours of 22days/mo (8hours/day)

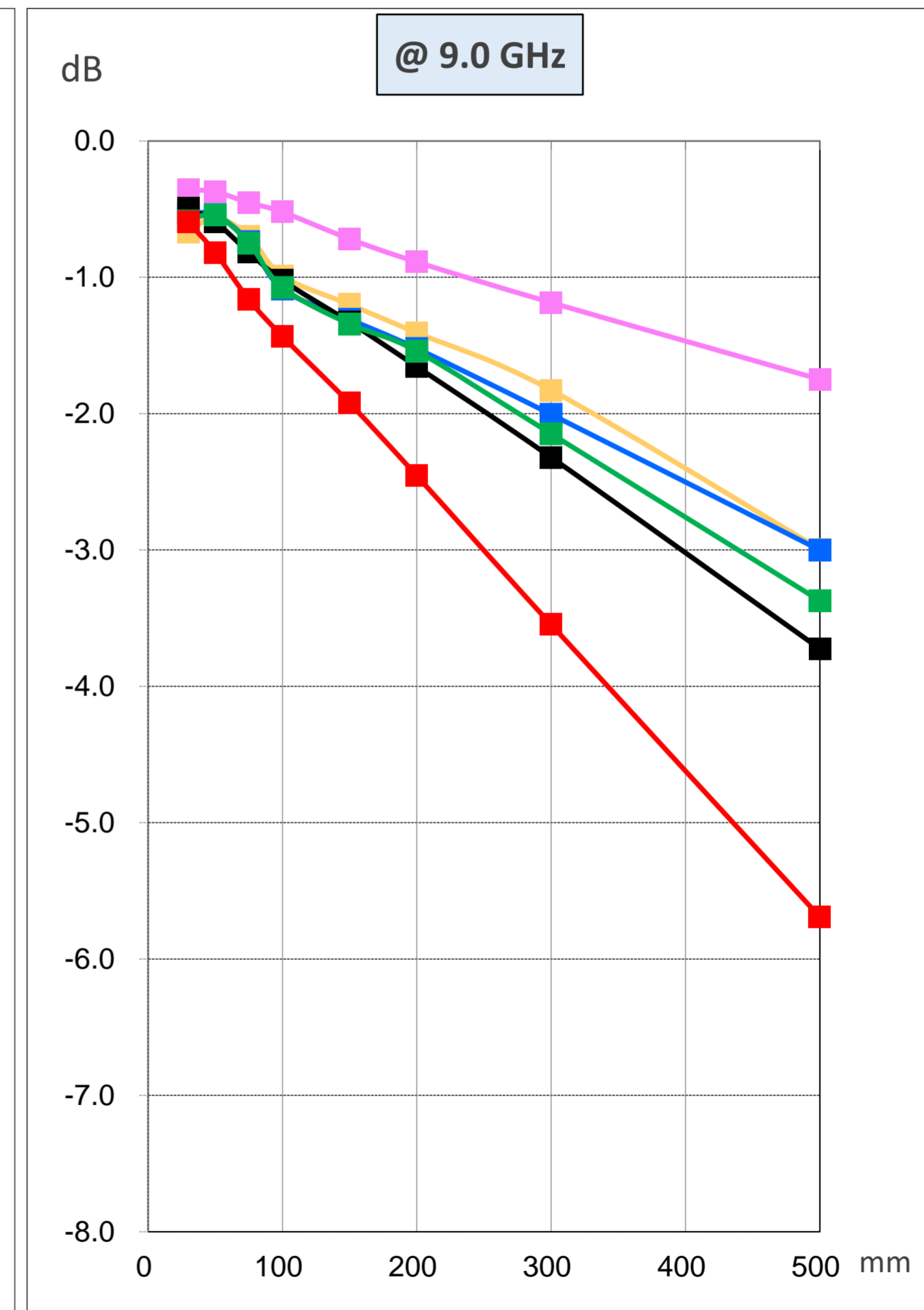
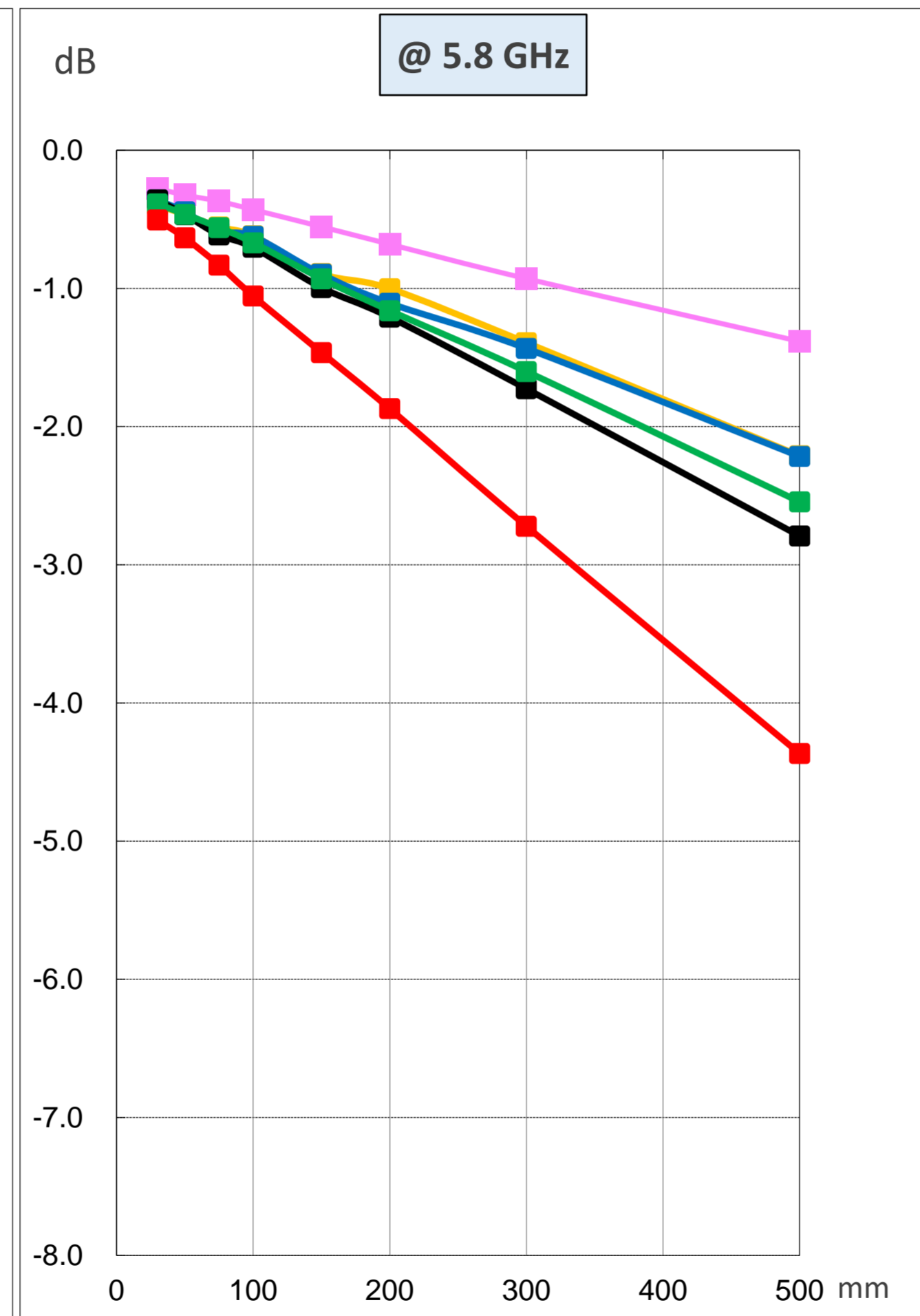
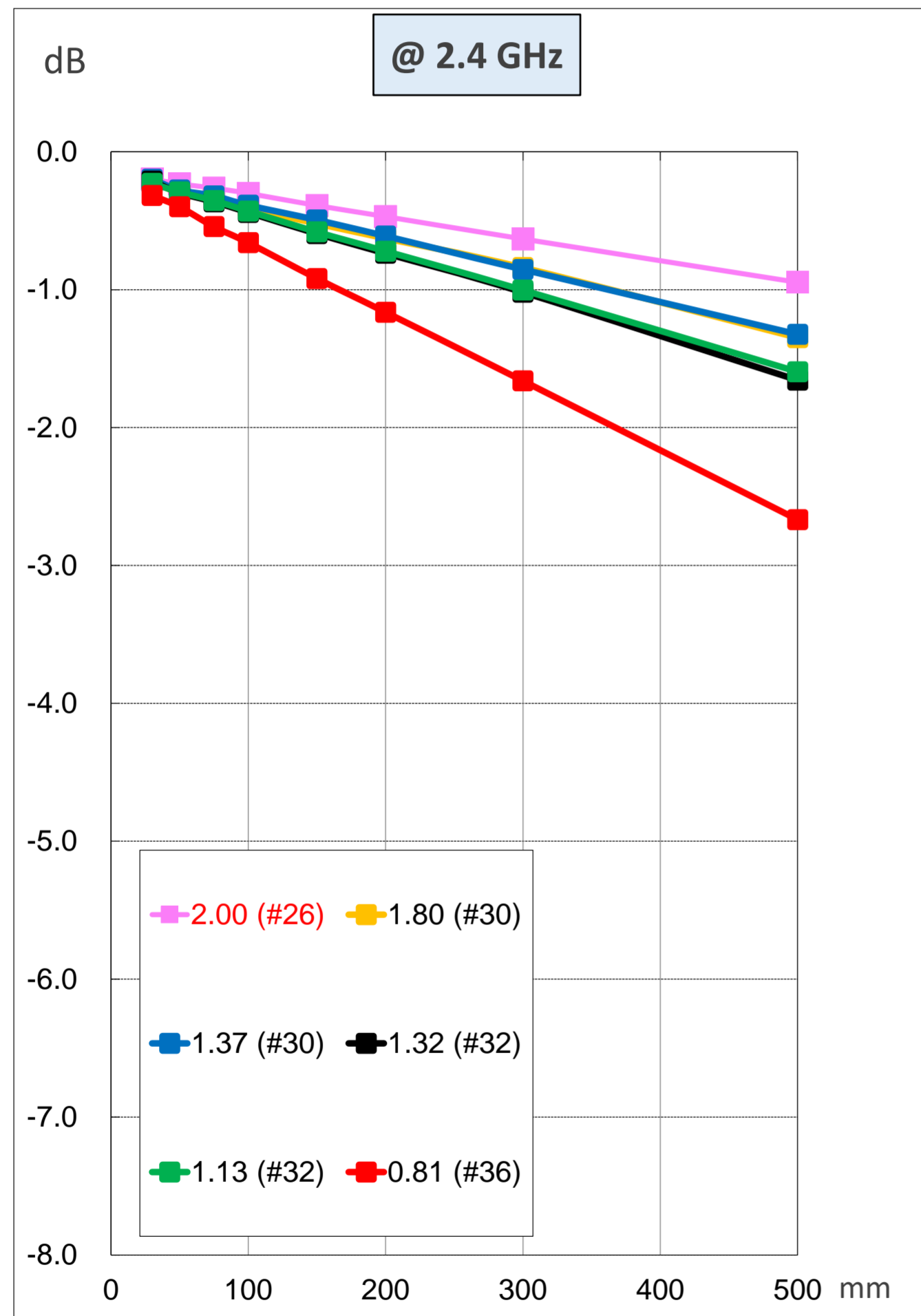


i-Fit<sup>®</sup> Semi-Auto crimp tool :

I-PEX has sold over 1,000 units of i-Fit crimping tool.  
These are working in many antenna / harness makers around the world.

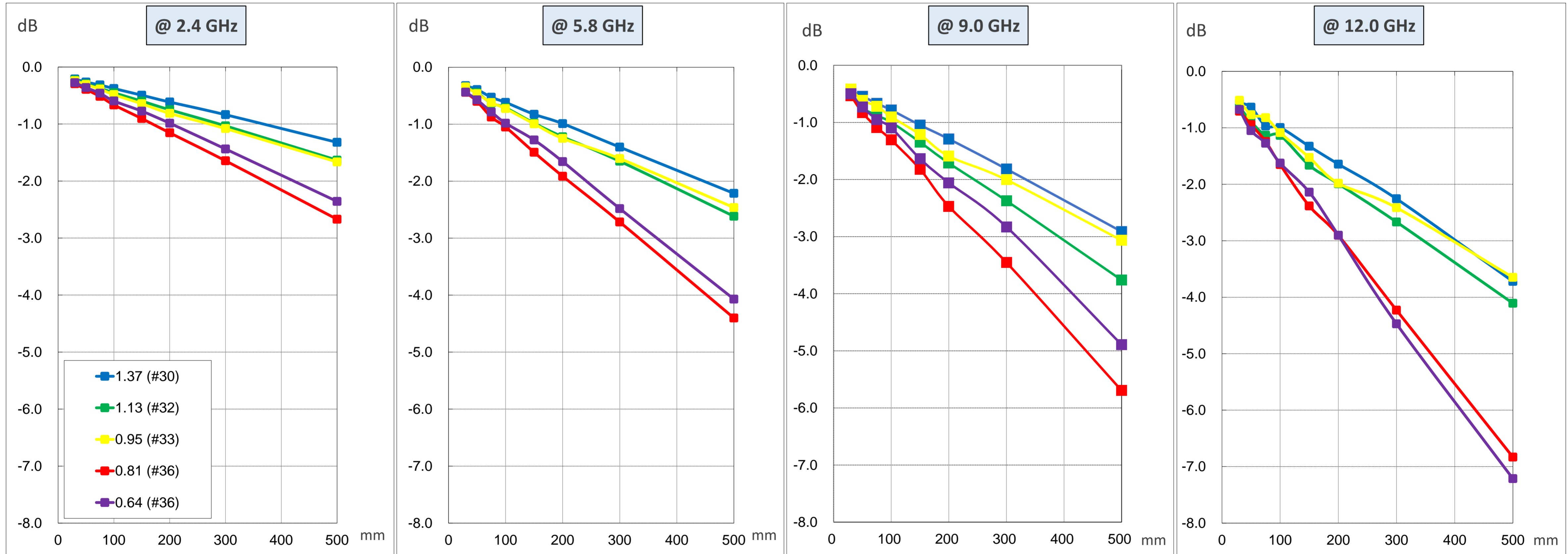
# Cable insertion loss (MHF<sup>®</sup> I)

Harness Length (mm) vs Insertion Loss (S21)



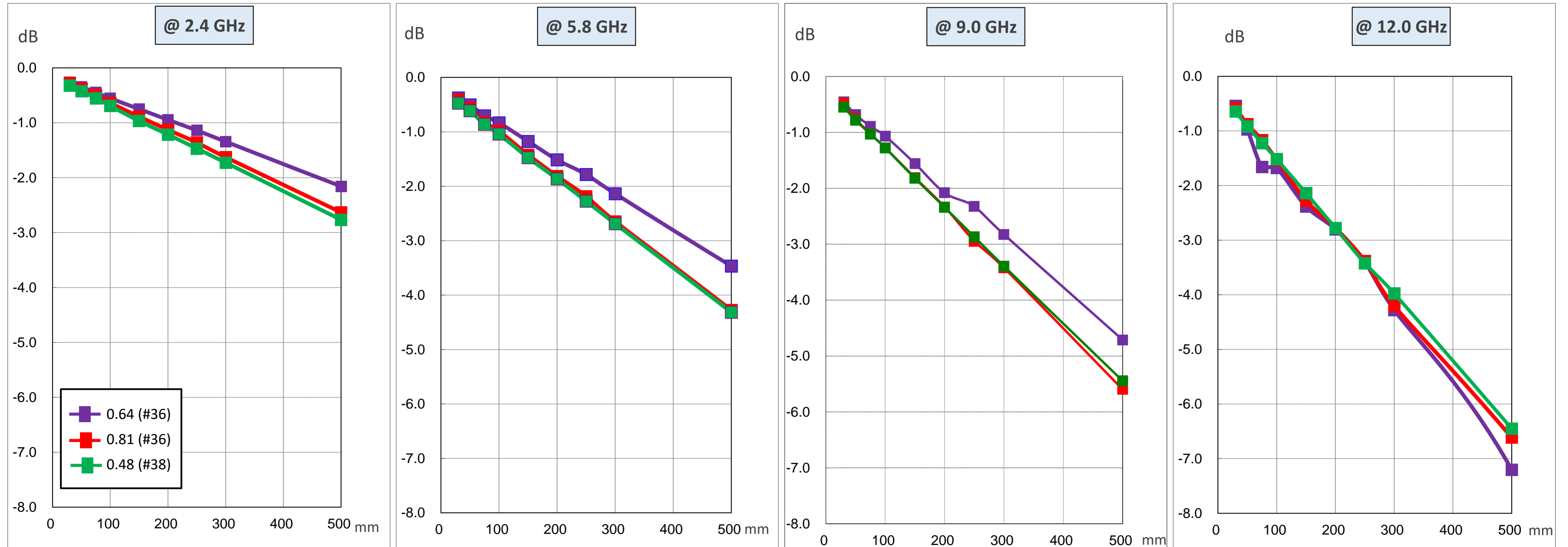
# Cable insertion loss (MHF<sup>®</sup> 4L)

Harness Length (mm) vs Insertion Loss (S21)



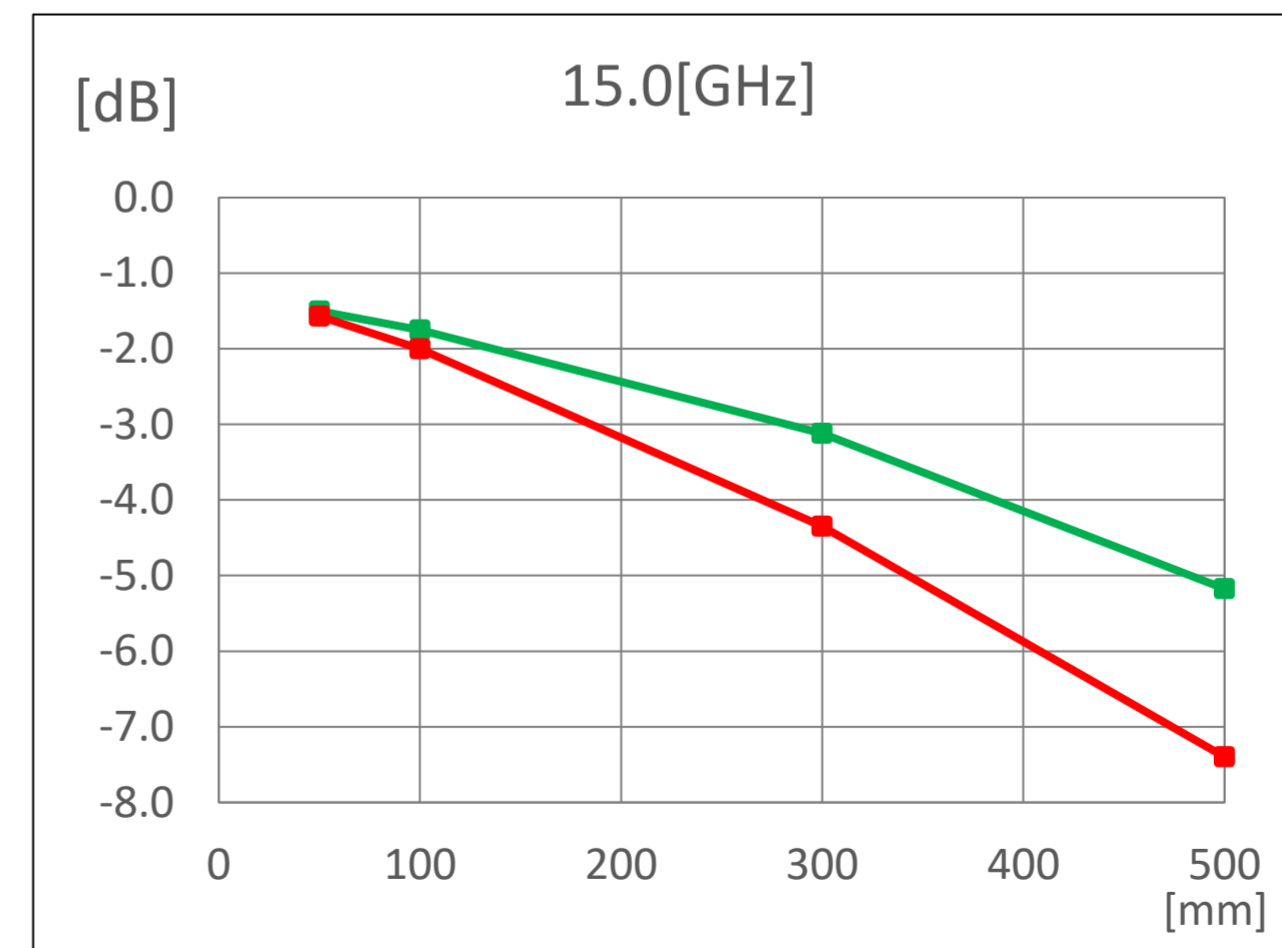
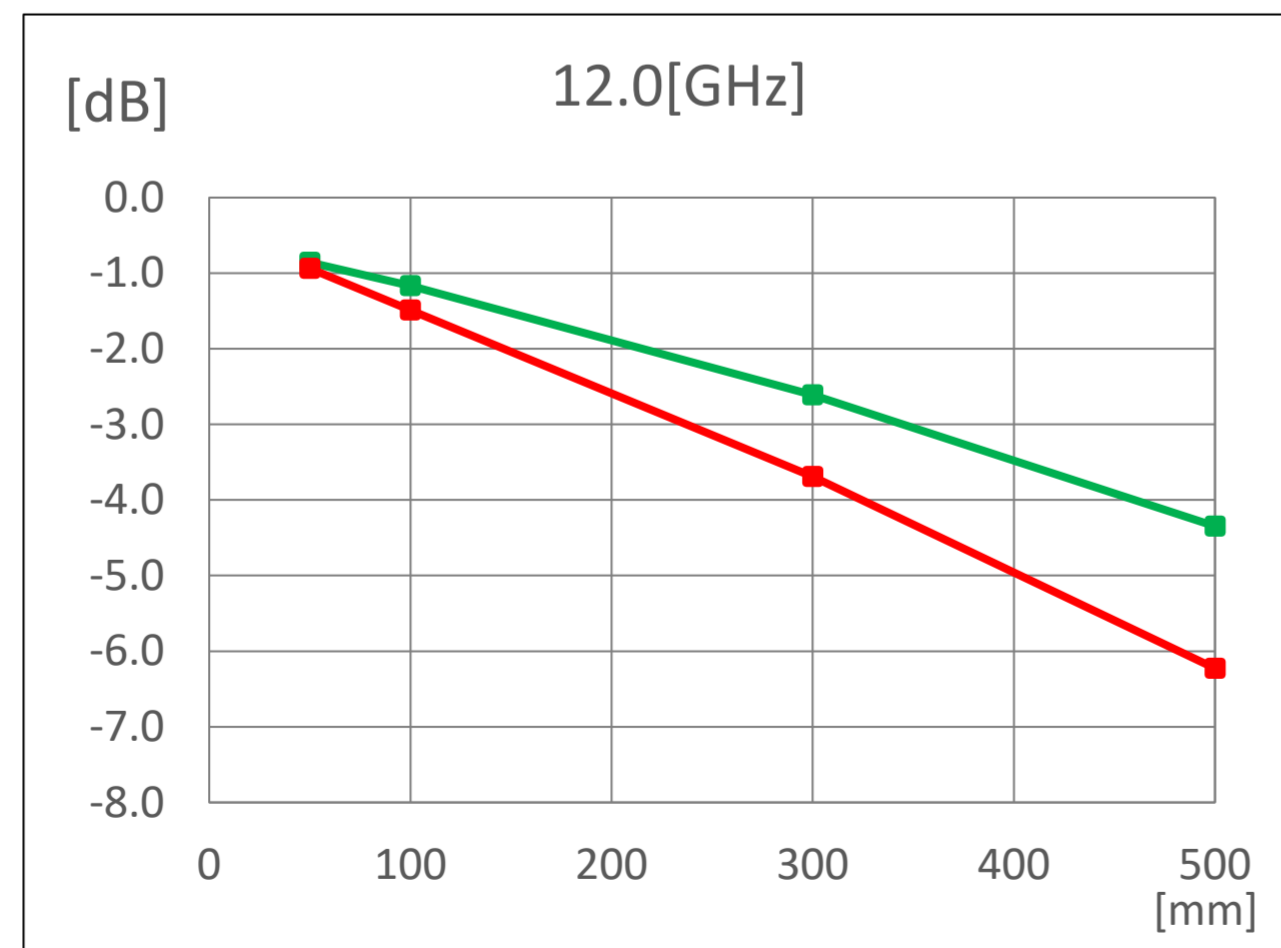
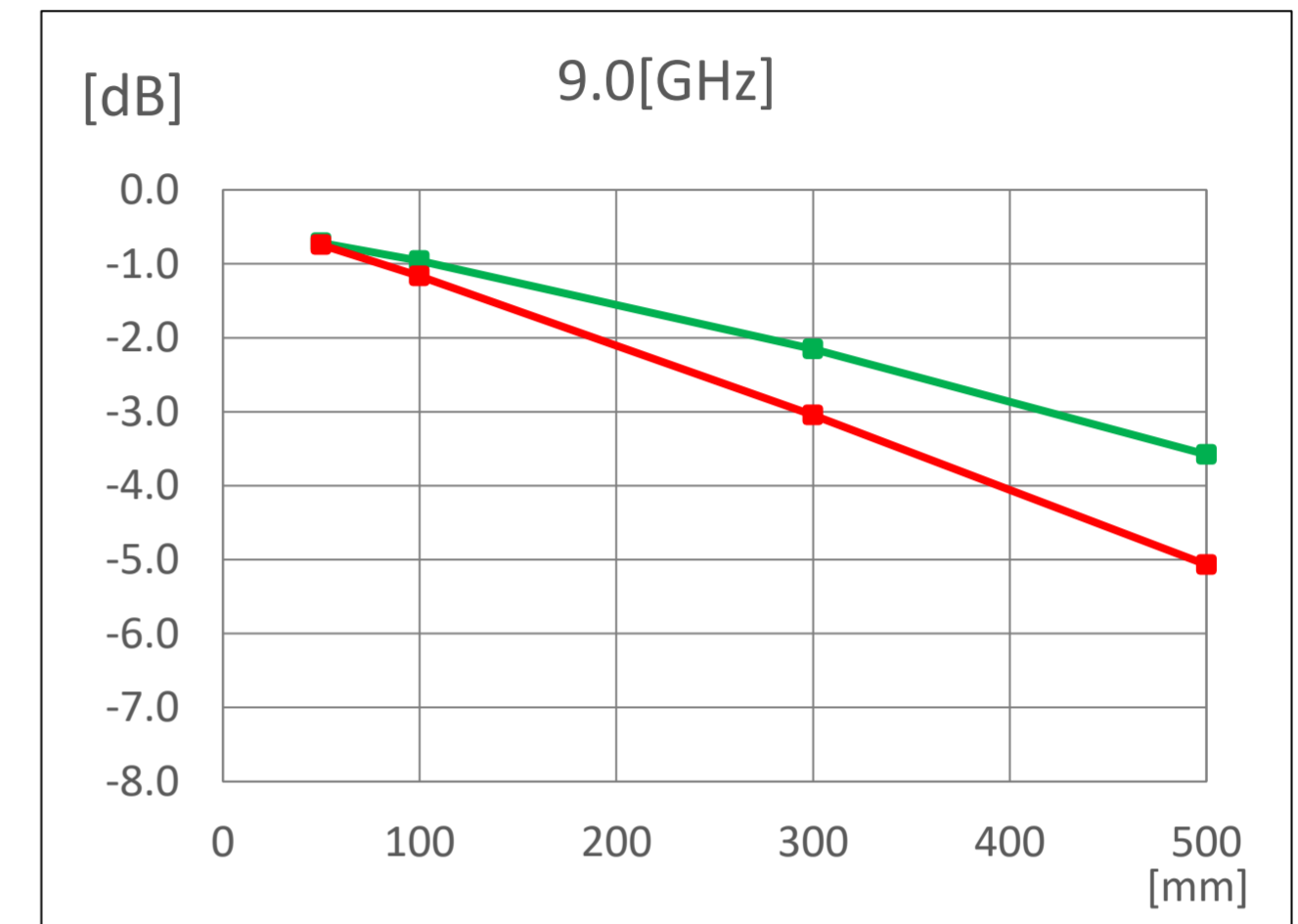
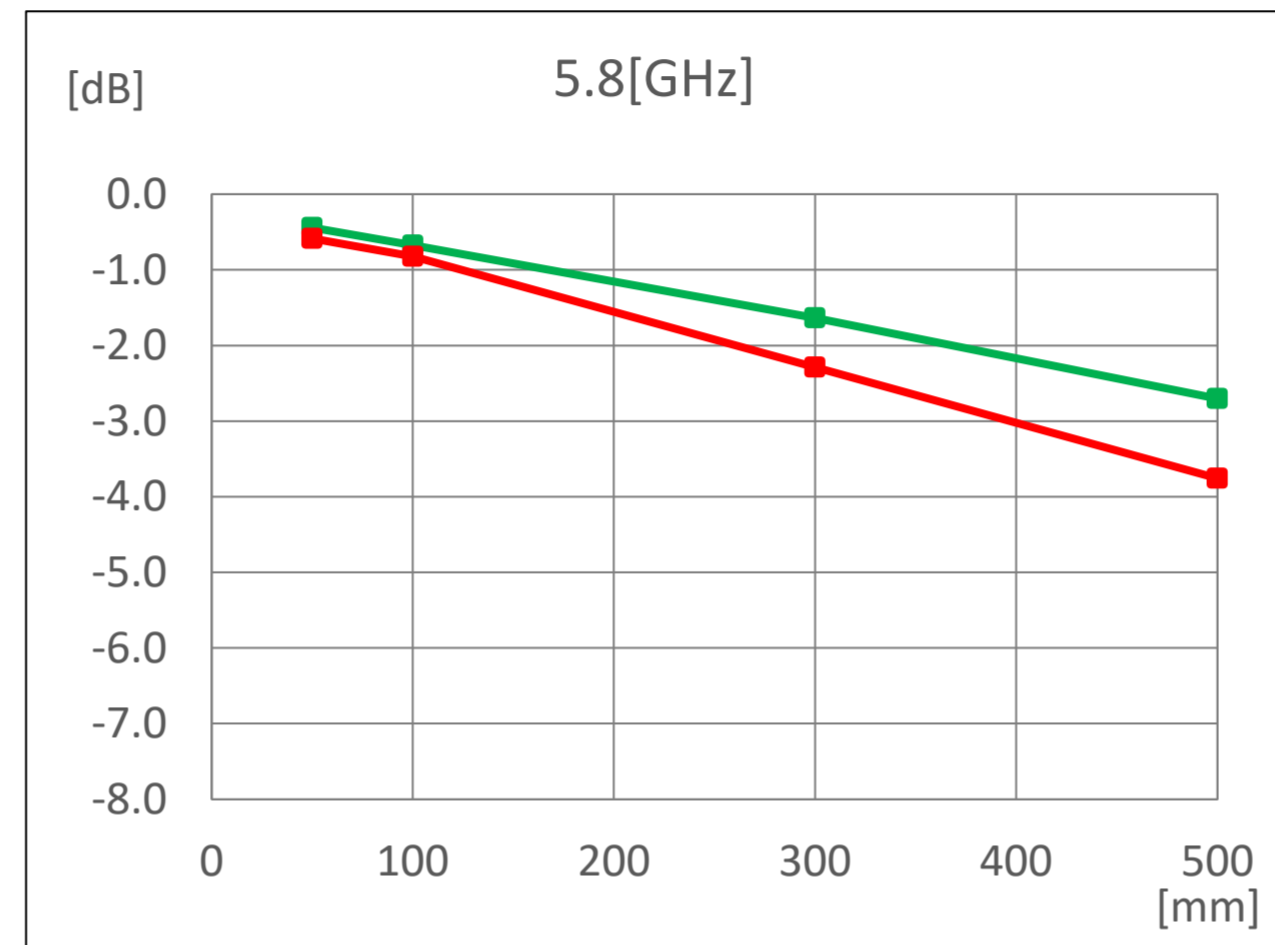
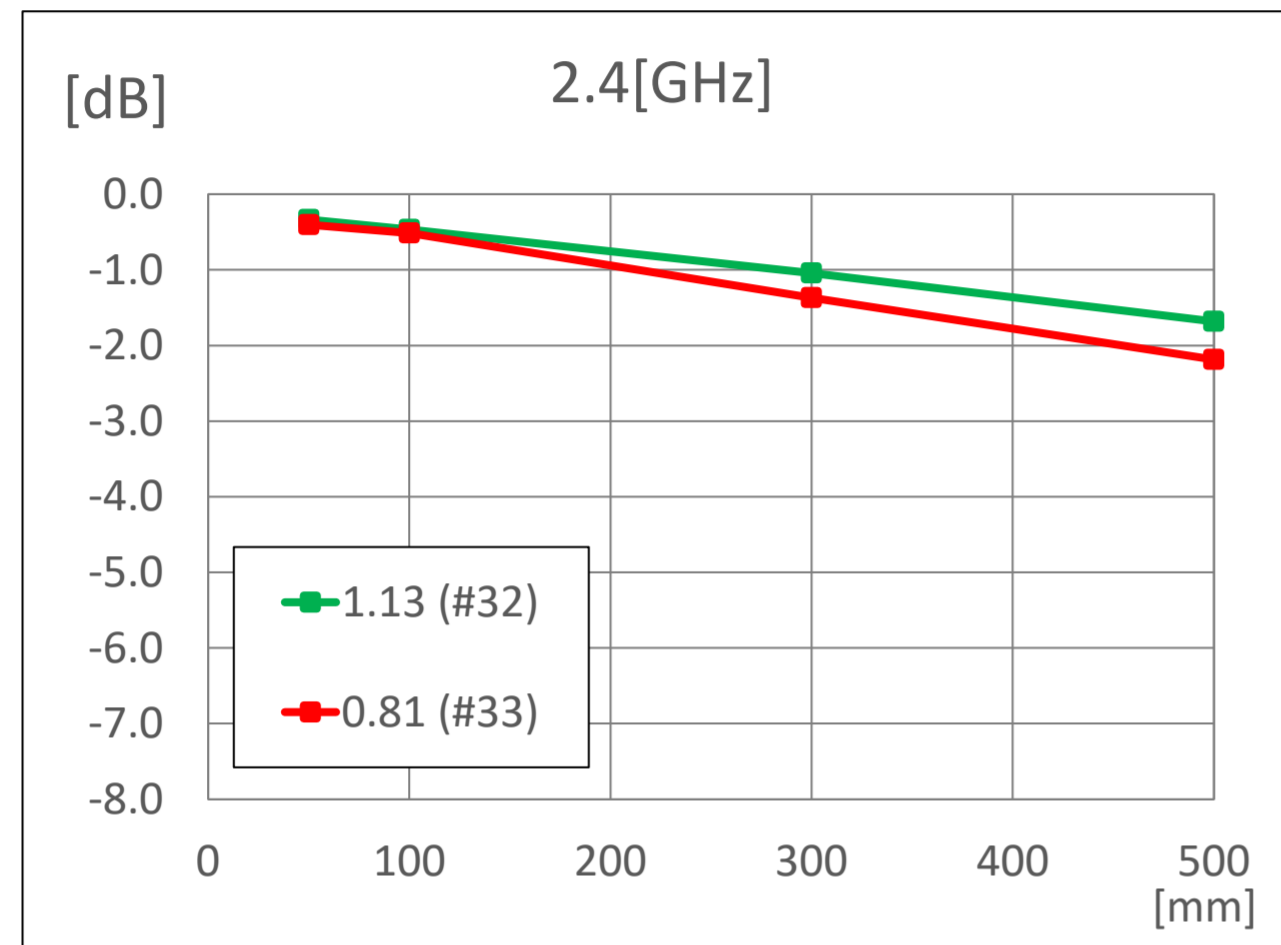
# Cable insertion loss (MHF<sup>®</sup> 5)

Harness Length (mm) vs Insertion Loss (S21)



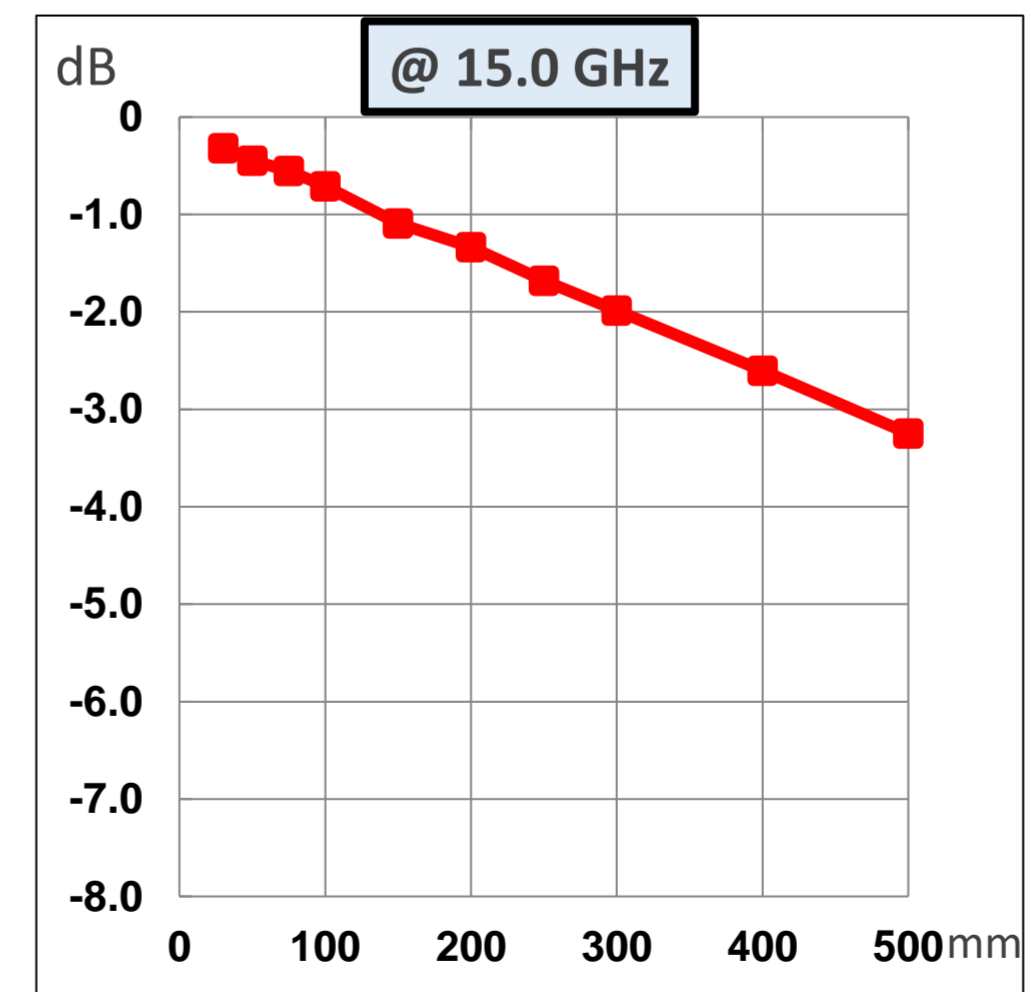
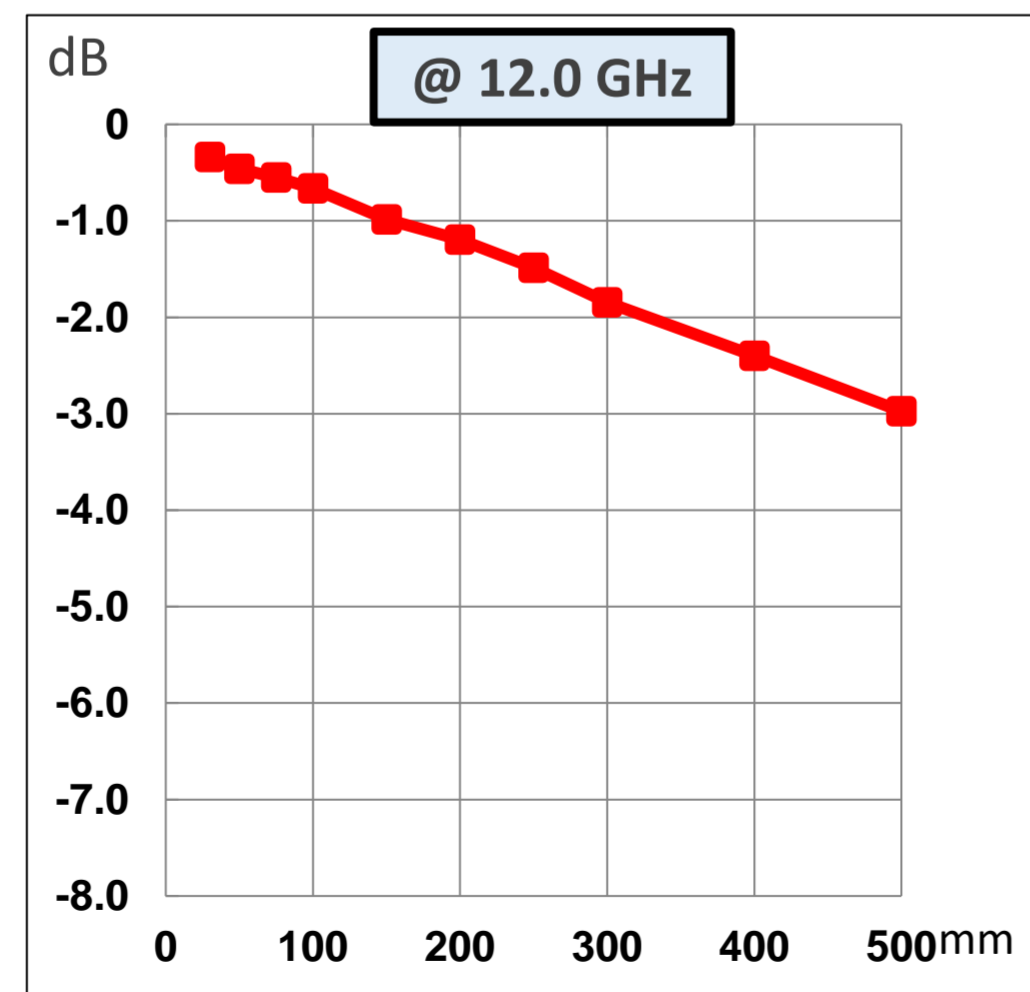
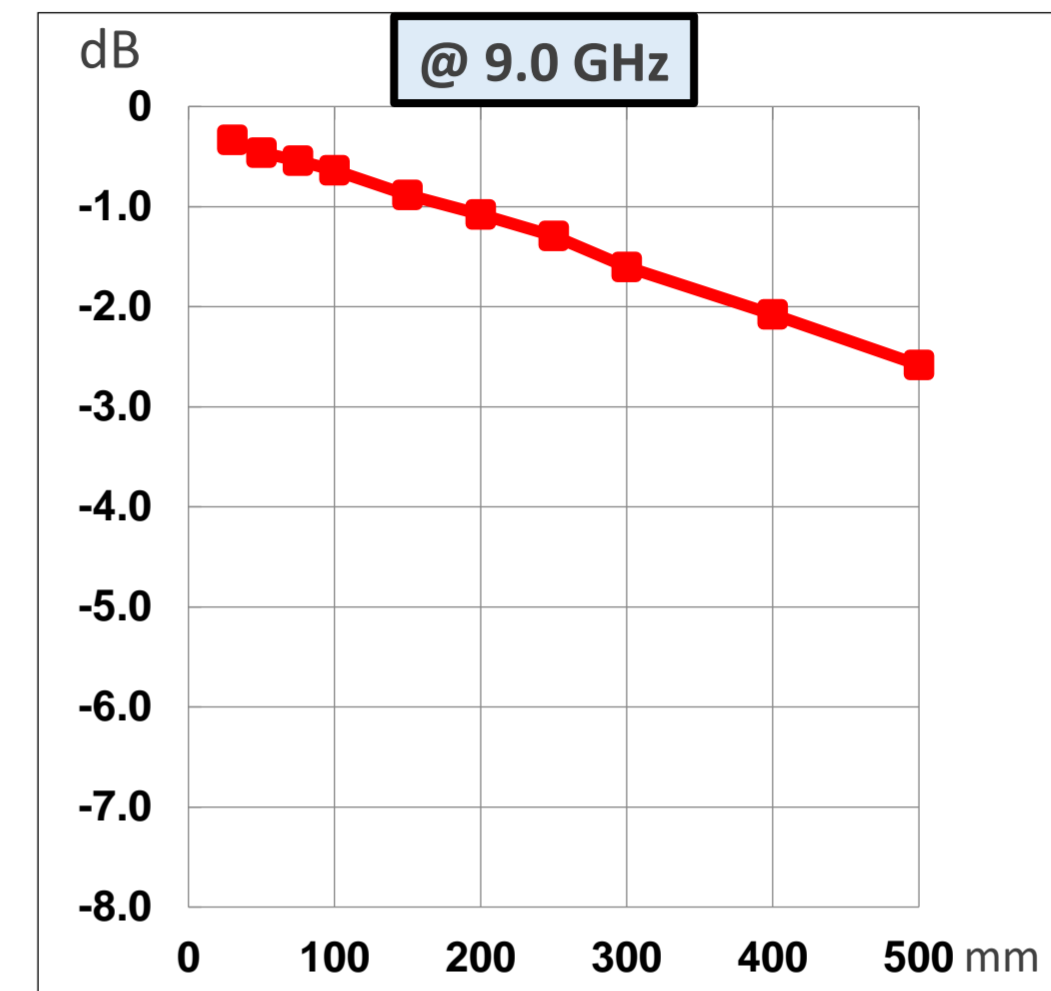
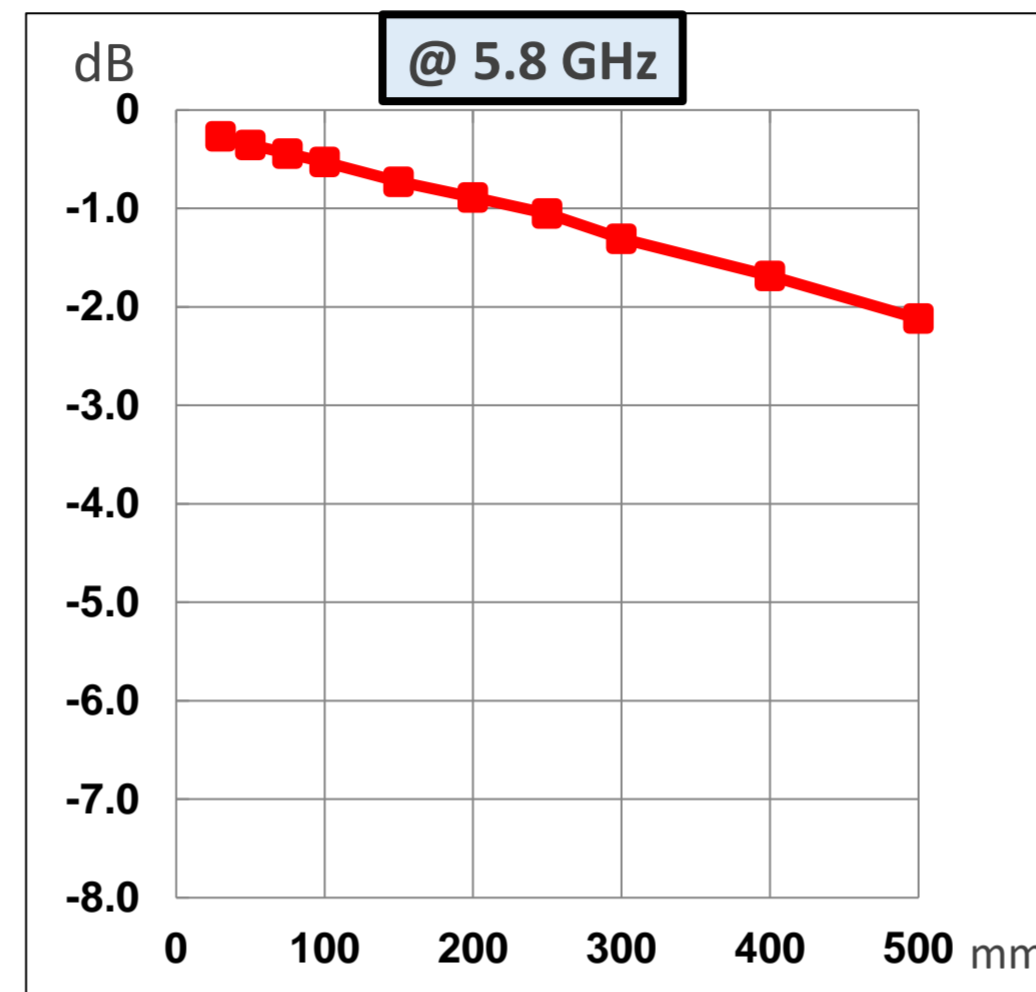
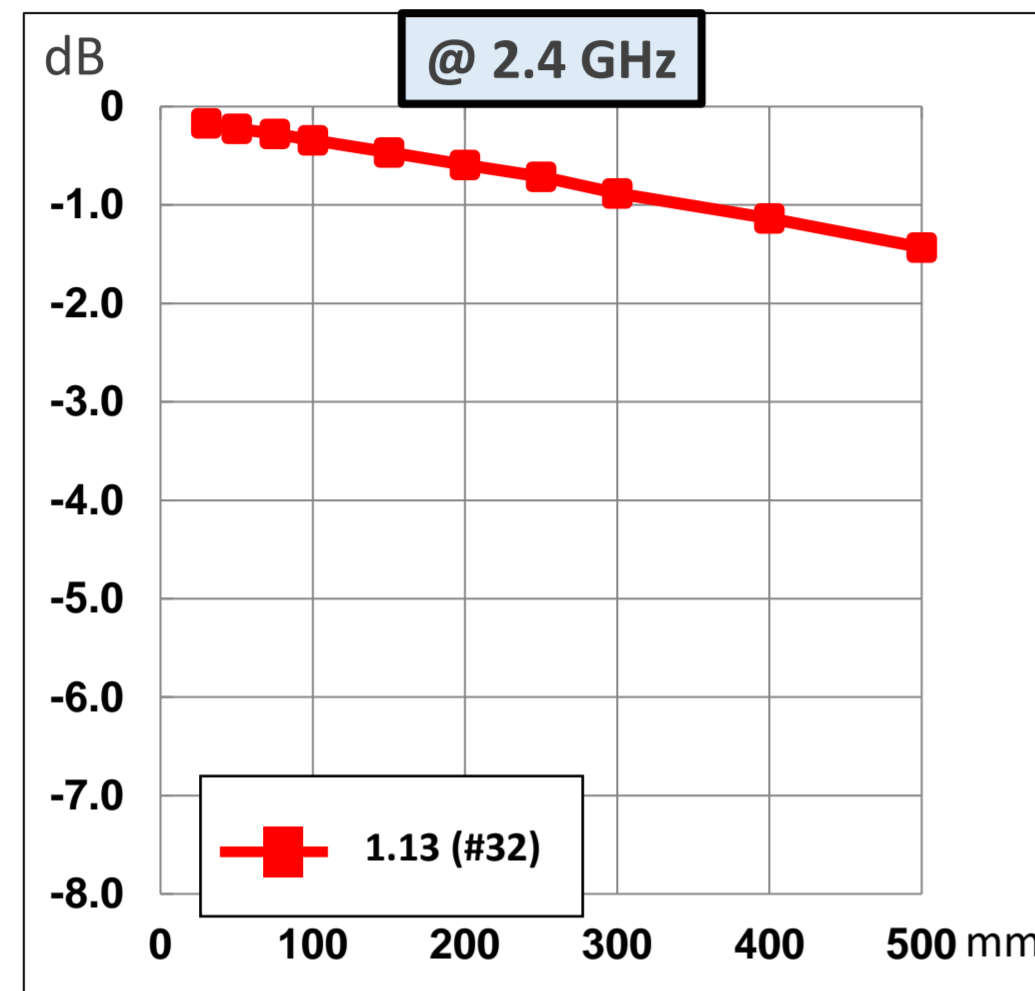
# Cable insertion loss (MHF<sup>®</sup> 5L)

Harness Length (mm) vs Insertion Loss (S21)



# Cable insertion loss (MHF<sup>®</sup> 7S)

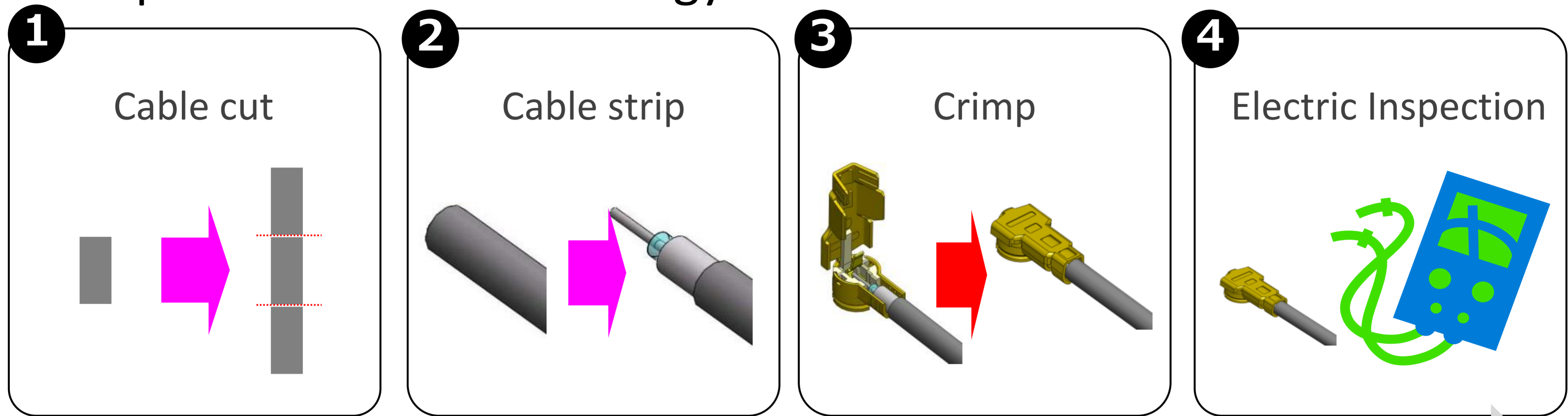
Harness Length (mm) vs Insertion Loss (S21)





# Yes, I-PEX provides harness assemblies!




## ...And they are made with Fully Automated Machines and our patented i-Fit<sup>®</sup> technology!!!



**Fully Automated Process**



# Cable clamp and surface mount clip for grounding

		Grounding clamp 3mm length	Grounding clamp 6mm length	Clip for grounding clamp MP-A series
Appearance (Reference)				
Coax O.D. (Center Conductor AWG)	1.37 mm (30)	●	●	● MP-A04 (P/N 3224-0001)
	1.13 mm (32)	●	●	● MP-A02 (P/N 3182-0001)
	0.81 mm (36)	●	●	● MP-A01 (P/N 3096-0001)
	0.64 mm (36)	●	●	● MP-A03 (P/N 3186-0001)

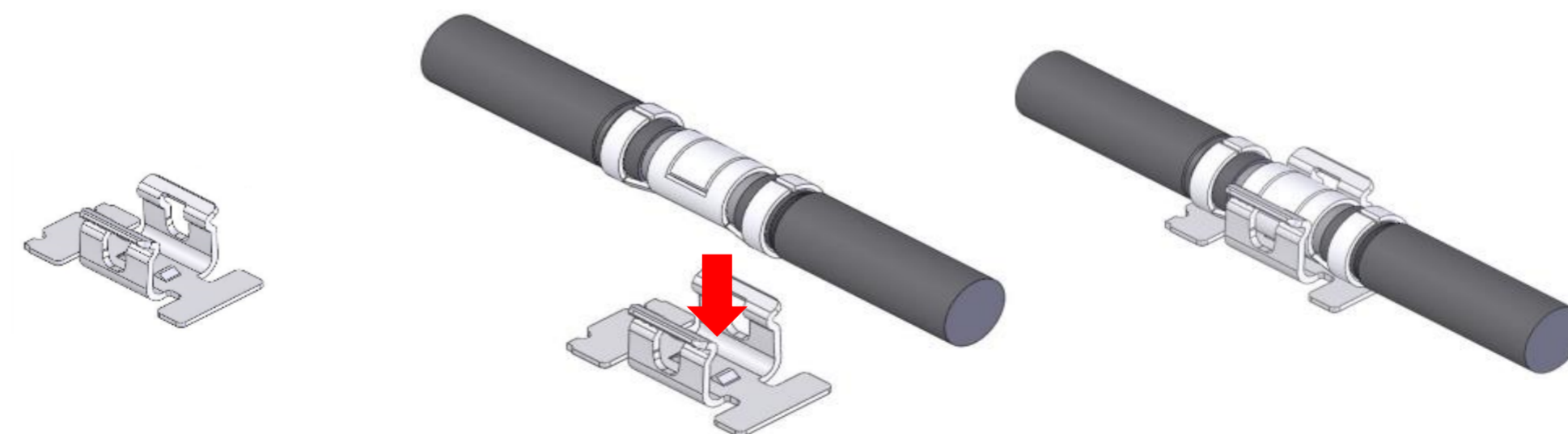
## Minimum distance between clamps



A	B	C
12mm min.	10mm min.	10mm min.

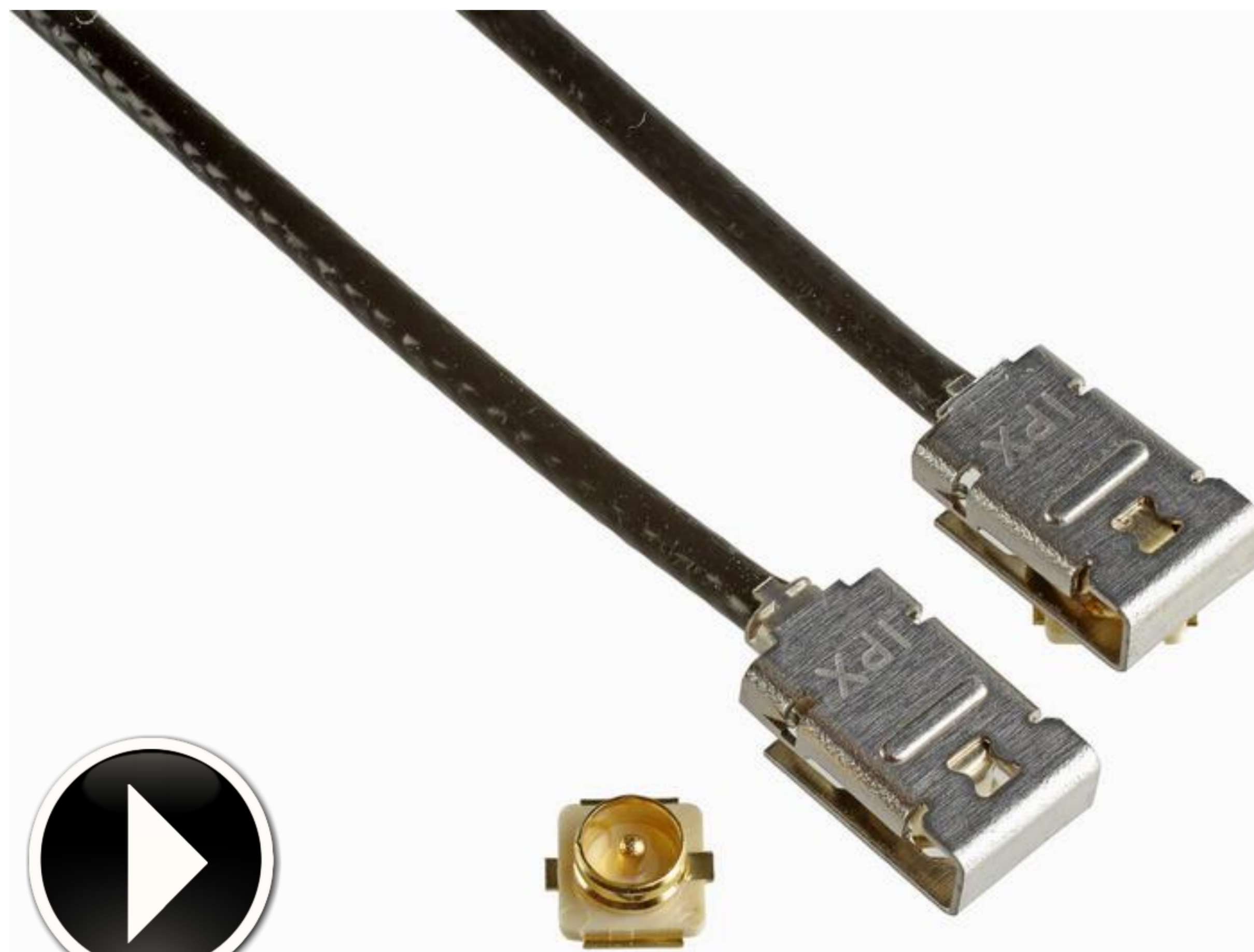
\*Depending on the harness specifications, this condition may not apply. Please contact our sales for details.

Clips are packaged in tape and reel for surface mount.

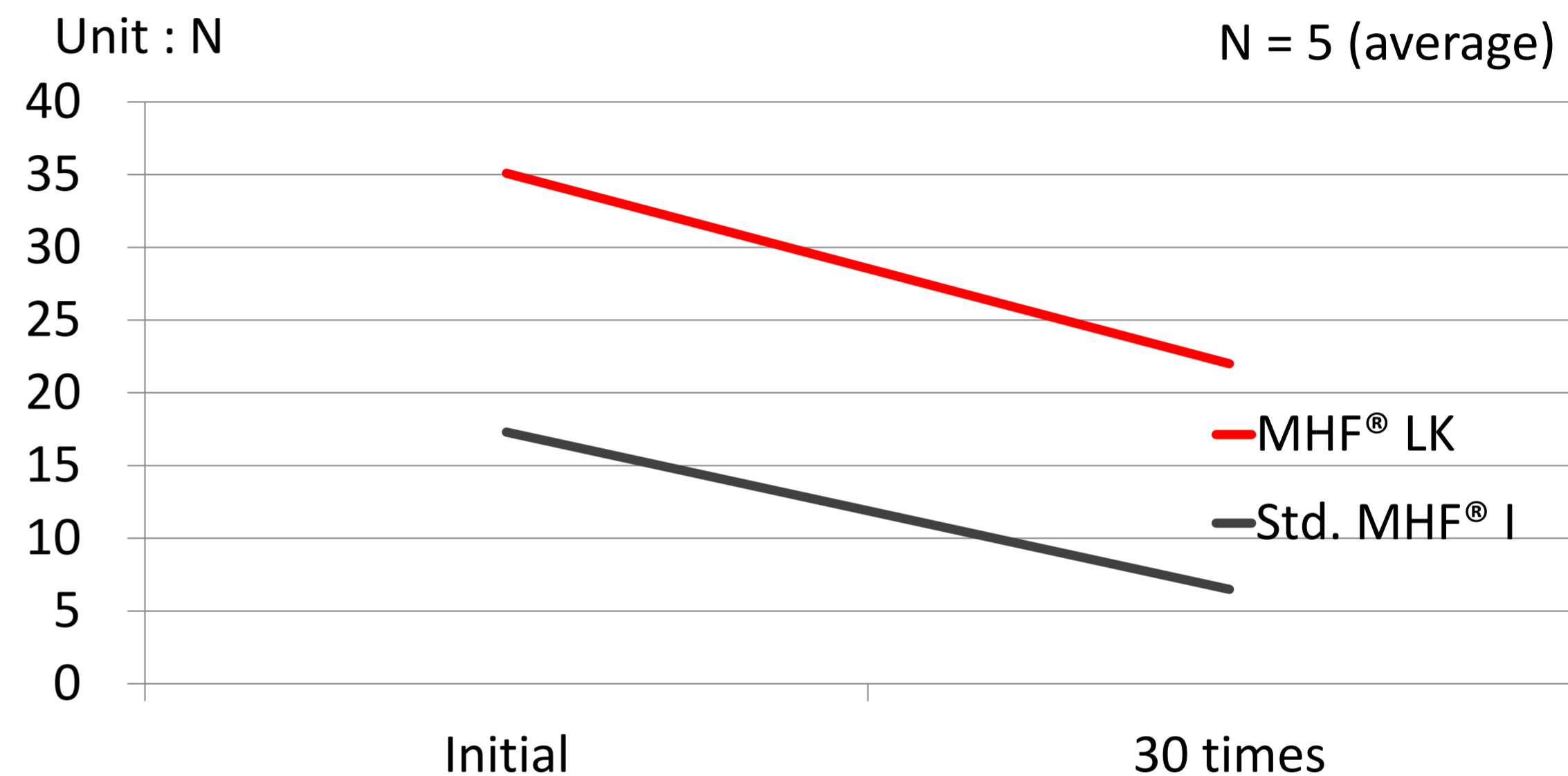


# MHF<sup>®</sup> I LK

Built-in locking function for MHF I



## Disengagement Force Comparison




Series	MHF <sup>®</sup> I LK		Standard MHF <sup>®</sup> I	
	Initial	30 times*	Initial	30 times
SPEC.	20 MIN.	10 MIN.	5 MIN.	3 MIN.

\* Reference Value

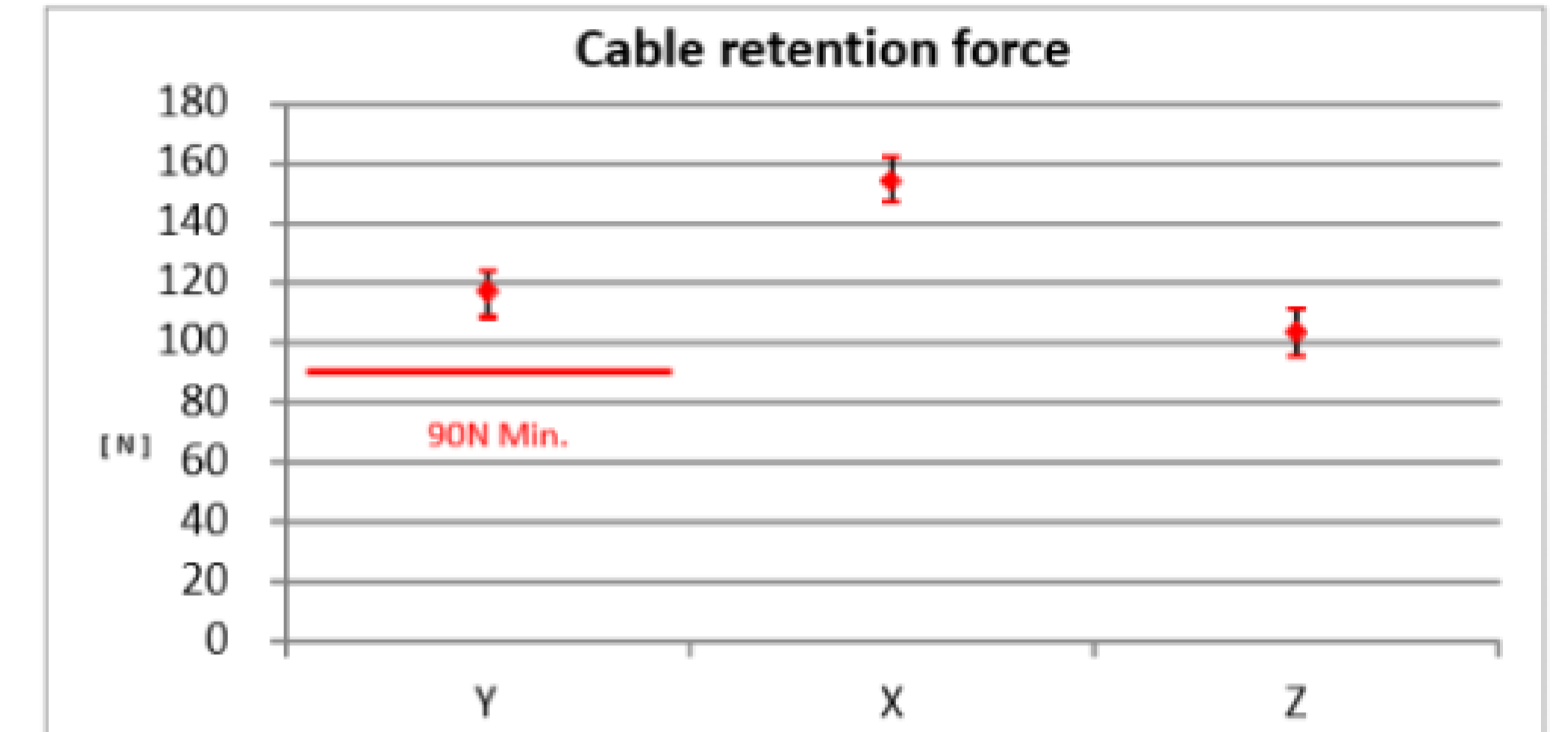
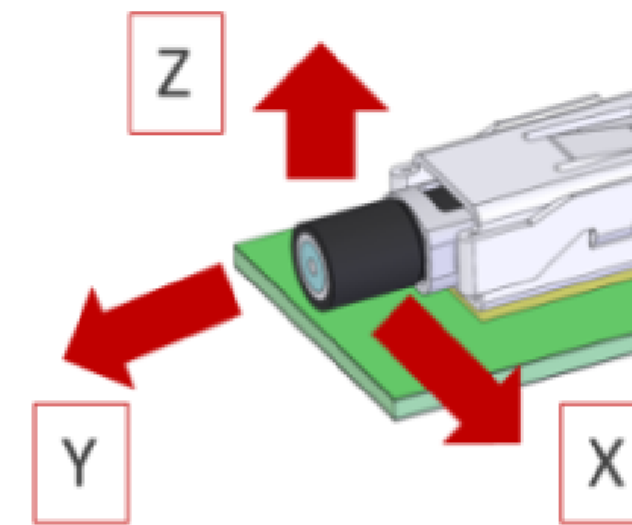
# MHF<sup>®</sup>-TI

Click the photo below to get more detailed product information.

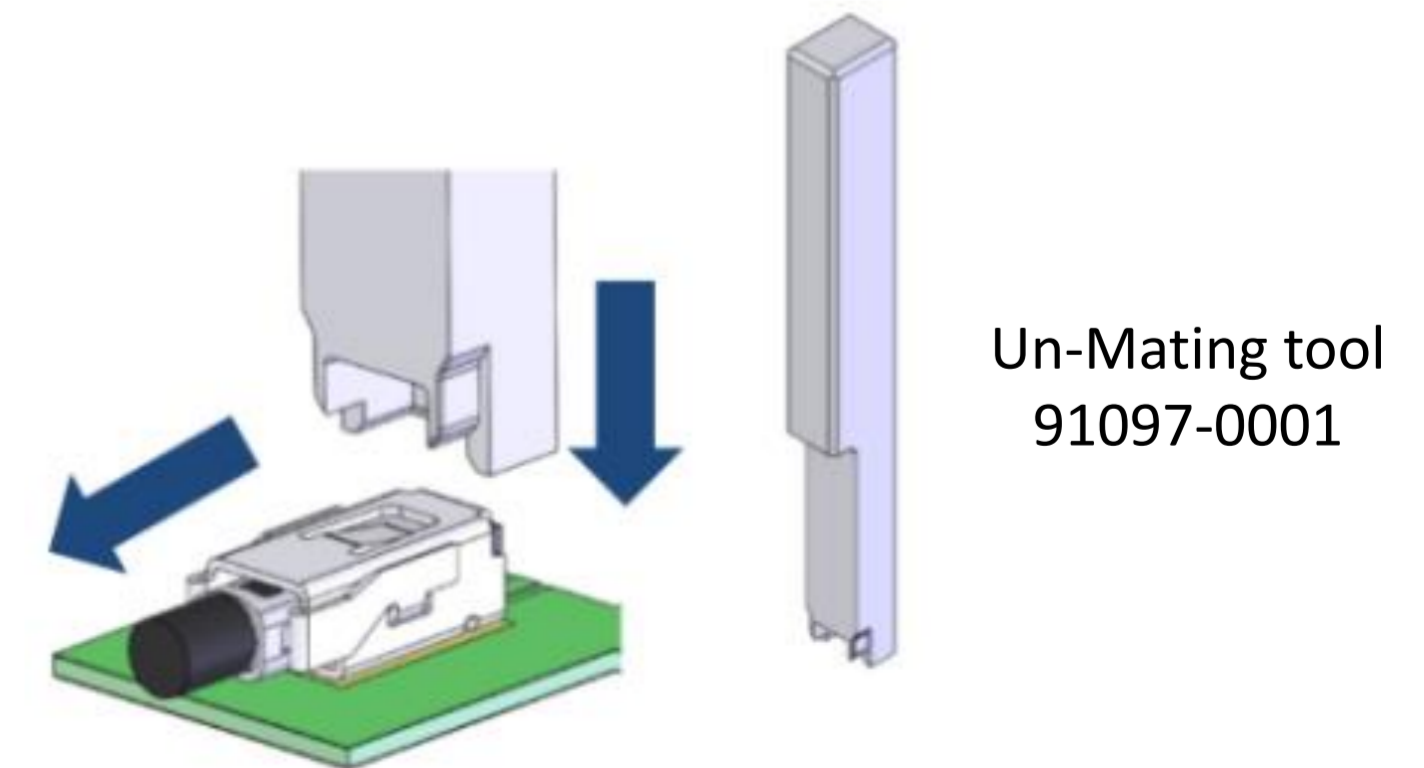
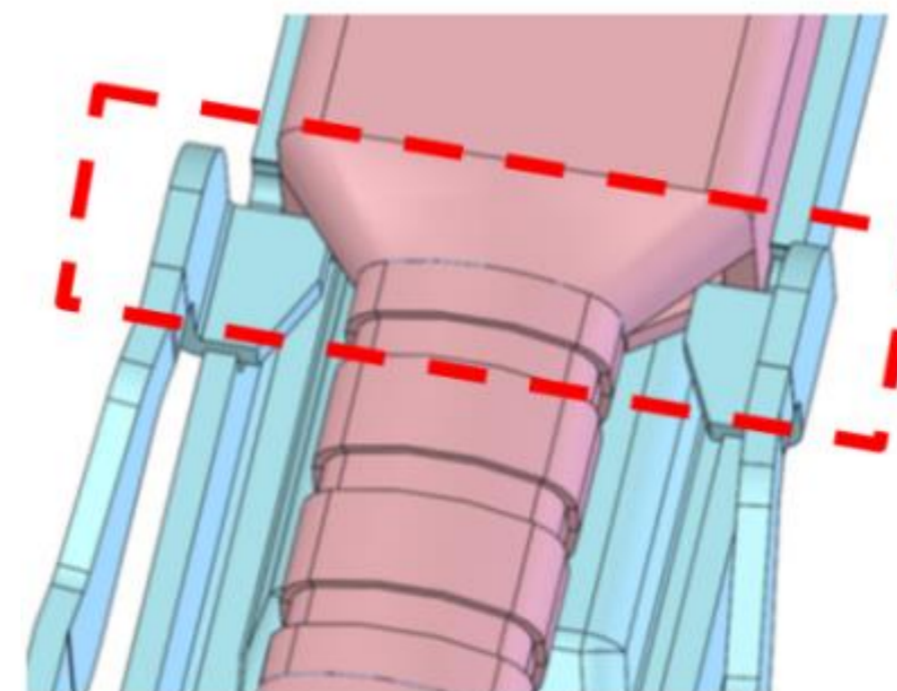
Product name		MHF <sup>®</sup> -TI
Appearance		
	Robust SMT connector for automotive telematics antenna	
Plug part number	20859-001R-01	
Receptacle part number	20860-001E-01	
Maximum height (mm)	3.65	
Outside dimension of receptacle (mm)	9.4 x 5.18	
Coax O.D. (Center Conductor AWG)	3.00 mm (24)	
	2.80 mm (26)	
Frequency	DC - 6GHz	
VSWR (L=100mm)	DC – 6GHz	1.5 max.
Service temp. (Celsius)	-40 degree ~ +105 degree	
Characteristic impedance	50ohm	
Rated voltage	AC60V	
Contact resistance	20 m ohm max.	
Withstand voltage	AC200V/min	
Insulation resistance	500M ohm min./DC100V	
Automotive Standards	USCAR-2 (*)	

Note : (\*) Rev.6 - 5.4.6 (Vibration), 5.6.1 (Thermal Shock), 5.6.2 (Temp. & Humidity Cycle), High Temp. Exposure & Life (5.6.3) evaluation passed

## High retention force (90N minimum)



## Permanent mechanical lock with tactile indication of secure contact










# RF Switch

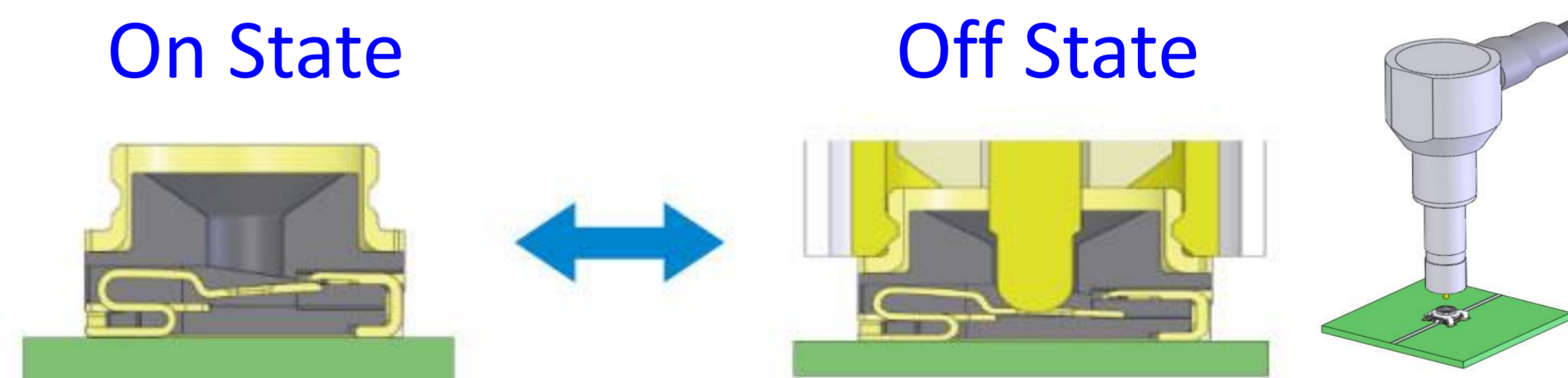
## MHF<sup>®</sup>-SW Series

# RF Switch: MHF<sup>®</sup>-SW23 & Accessories

Click the photos below to get more detailed product information.


Product name		MHF <sup>®</sup> -SW23
Feature		
		<b>Contaminant discontinuity resistant design</b> <b>2.3 x 2.3 mm footprint</b>
Part number		20549-001E/-01
Dimension (mm)		2.3 x 2.3 x 1.35 (H)
Rated power		2W max.
Frequency		DC - 11.0GHz
V.S.W.R.	DC - 3.0GHz	1.2 max. (DC - 2.5GHz)
	3.0GHz - 6.0GHz	1.3 max. (2.5 - 6.0GHz)
	6.0GHz - 11.0GHz	1.5 max.
Insertion loss	DC - 3.0GHz	0.15 dB max. (DC - 2.5GHz)
	3.0GHz - 6.0GHz	0.20 dB max. (2.5 - 6.0GHz)
	6.0GHz - 11.0GHz	0.40 dB max.
Isolation	DC - 3.0GHz	20 dB Max. (DC - 2.5GHz)
	3.0GHz - 6.0GHz	15 dB max.
	6.0GHz - 11.0GHz	12 dB max.
Service temp. (Celsius)		-40 degree ~ +85 degree
Characteristic impedance		50 ohm
Contact resistance	Signal contact	100m ohm
	Ground contact	100m ohm
Insulation resistance		DC100 1000M ohm min :Initial 10M ohm min :After test
Withstand voltage		AC 100V: 1min

Product name		MHF <sup>®</sup> -SW23		
Appearance				
Manual probe		Friction lock	90582-**** *(0300/0400)	
		Mechanical lock	-	
Durability		-	1K Cycles	
Probe	High cycle	without floating		90604-0001
		Durability		10K Cycles
		with floating		90605-0001
Durability			200K Cycles	

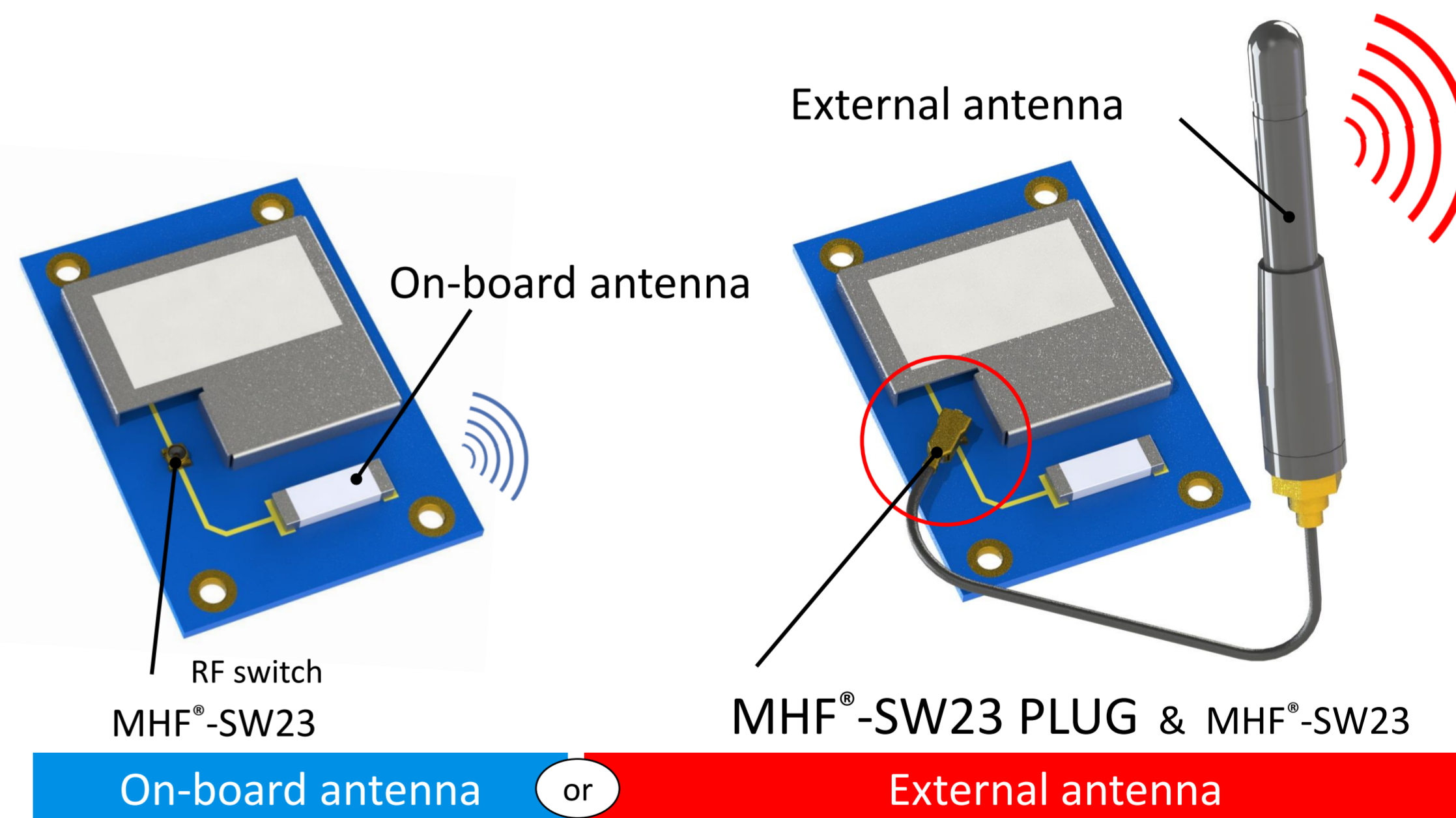


# Micro RF Coaxial Connector for RF switch : MHF<sup>®</sup>-SW23 plug

Click the photo below to get more detailed product information.

Product name		MHF <sup>®</sup> -SW23 Plug
Appearance		
		Mating with switch connector
Plug part number		20851-001R
Switch connector part number		20549-001E/-01 (MHF <sup>®</sup> -SW23)
Maximum height (mm)		3.7
Outside dimension of switch connector		2.3 x 2.3
Coax O.D. (Center Conductor AWG)		1.13 mm (32)
Frequency		DC - 6GHz
VSWR (L=100mm)	DC - 3GHz	1.4 max.
	3GHz - 6GHz	1.6 max.
Rated power		2W max.
Service temp. (Celsius)		-40 degree ~ +85 degree
Characteristic impedance		50ohm
Contact resistance	Signal contact	100m ohm max.
	Ground contact	100m ohm max.
Insulation resistance		DC100 1000M ohm min :Initial 10M ohm min :After test
Withstand voltage		AC200V/min






## Flexibility to choose on-board antenna or external antenna







# 2.4 mm RF CONNECTOR



Click the photos below to get more detailed product information.

Product name	2.4 mm RF CONNECTOR CONVERSION ADAPTER PLUG TO PLUG	2.4 mm RF CONNECTOR CONVERSION ADAPTER JACK TO JACK	2.4 mm RF CONNECTOR CONVERSION ADAPTER PLUG TO JACK	2.4 mm RF CONNECTOR END LAUNCH ADAPTER FOR PCB (PLUG)	2.4 mm RF CONNECTOR END LAUNCH ADAPTER FOR PCB (JACK)
Appearance					
Part number	50201-0001	50201-JJ01	50201-0J01	50202-0001	50202-J001
Type	Conversion adapter			End Launch adapter	
	Plug to Plug	Jack to Jack	Plug to Jack	Plug	Jack
Frequency	DC~50GHz				

Product name	2.4 mm RF CONNECTOR ADAPTER FOR PCB (INNER LAYER)	2.4 mm RF CONNECTOR ADAPTER FOR PCB (OUTER LAYER)	2.4 mm RF CONNECTOR TERMINATION ADAPTER (PLUG)	2.4 mm RF CONNECTOR TERMINATION ADAPTER (JACK)
Appearance				
Part number	50203-J001	50204-J001	50205-0001	50205-J001
Type	Panel mount adapter		Termination adapter(Nonreflective terminator)	
	Jack	Jack	Plug	Jack
Frequency	DC~50GHz			



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