Application Note

Application Software for MS2650/MS2660 Series Spectrum Analyzers

Measurement Group
Anritsu Corporation

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Various Application Software
for MS2650/MS2660 Series Spectrum Analyzer Using the PTA Function

The following items can be measured automatically using a combination of application software, peripheral equipment and options.

Software Name	Model Name
◆CDMA Cellular System Measurement Software	: MX260002A
◆PDC Measurement Software(for Base Station)	: MX260003A
◆GSM Measurement Software	: MX260004A
◆Low-power Data Communication System Measurement Software conforming to issue of Direct Spread Spectrum System	: MX261001A
◆Low-power Data Communication System Measurement Software conforming to issue of Frequency Hopping System	: MX261002A
◆CATV Measurement Software	: MX262001A
◆EMI Measurement Software	: MX264001A

PTA Application Software for MS2650/60 Series Spectrum Analyzer

Applicable Model List

PTA Application / Range	Model Type	CDMA MX260002A	GSM MX260004A	CATV MX260001A	Direct Spread MX261001A	Frequency Hopping MX261002A	EMI MX264001A	PDC MX260003A
3 GHz	MS2651A* MS2661A*	No	Yes	No	Yes	Yes	Yes	Yes
	MS2651B **MS2661B**	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	MS2661C	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8 GHz	MS2653A* MS2663A*	No	Yes	No	Yes	Yes	Yes	Yes
	MS2653B **MS2663B**	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	MS2663C	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21 GHz	**MS2665C**	Yes (Spurious: up to 8GHz)	Yes	No (No TV option)	No (Under development)	Yes (Spurious: up to 8GHz)	No (No QP option)	No (Under development)
30 GHz	**MS2667C**	Yes (Spurious: up to 8GHz)	Yes	No (No TV option)	No (Under development)	Yes (Spurious: up to 8GHz)	No (No QP option)	No (Under development)
40 GHz	**MS2668C**	Yes (Spurious: up to 8GHz)	Yes	No (No TV option)	No (Under development)	Yes (Spurious: up to 8GHz)	No (No QP option)	No (Under development)

*****Discontinued models

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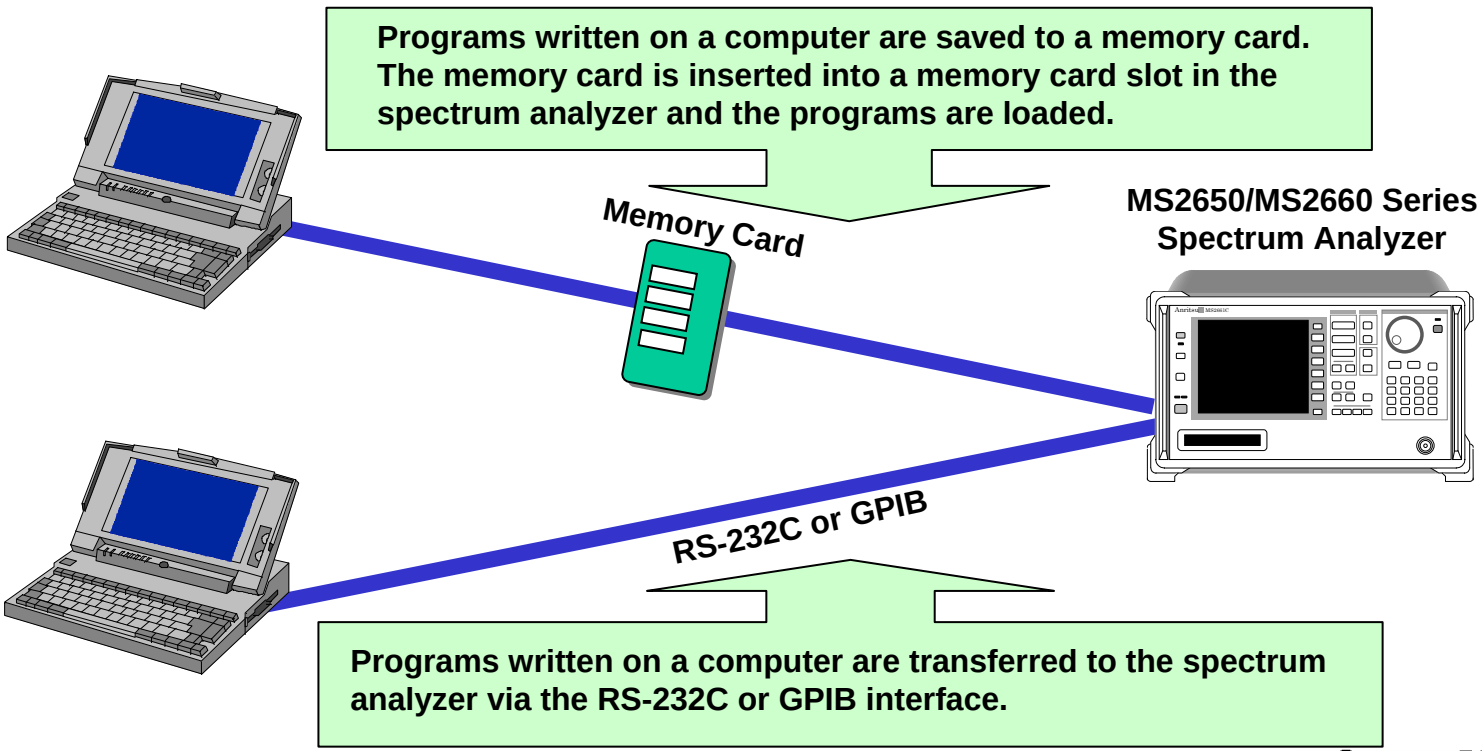
Automated measurement without external controller

The built-in microcomputer(PTA) functions which utilize the spectrum analyzer as a controller, make an external controller unnecessary.
An automated measurements system including control of other instruments is easily configured.

Two methods for loading programs



CDMA Cellular System Measurement

(Conforming to issues of TIA/EIA/IS-95, and IS-98)

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX260002A CDMA measurement software Memory card(256k-byte SRAM card) --- 1	MS2651B,MS2653B, MS2661B,MS2663B MS2661C,MS2663C --- 1* MS2665C MS2667C MS2668C Spurious measurement: up to 3GHz; MS2651B/C MS2661B/C up to 8GHz; MS2663B/C MS2665C MS2667C MS2668C *:The following option are required: Opt.04; High-speed time domain sweep Opt.06; Trigger/gate circuit	MG3671B DSG --- 1 MG0310A Modulation Unit --- 1	Printer(RS232C): EPSON-VP600 --- 1 Specified cable(J0742) --- 1

GSM Base Station Measurement

(Conforming to issues of GSM900 and DCS1800/PCS1900)

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX260004A GSM Base Station measurement software Memory card(512k-byte SRAM card) --- 1	MS2651A/B MS2653A/B MS2661A/B/C MS2663A/B/C MS2665C MS2667C MS2668C --- 1	Always required: Coaxial cable(J0114A) --- 1 Coaxial cable(J0026A) --- 1 Required for some measurement items: Attenuator --- 1 Bandpass filter --- 1 Low noise pre-amp --- 1 Coaxial cable --- required quantity	Printer: FP-850 or --- 1 EPSON-VP600, HP-2225 GPIB cable(J0007) --- 1

Low-Power Data Communication System Measurement

Mid Speed LAN

(Conforming to issues of Direct Spread Spectrum System)

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX261001A SS(DS) measurement software Memory card(256k-byte SRAM card) --- 1	MS2651A/B MS2653A/B MS2661A/B/C MS2663A/B/C --- 1 * Spurious measurement: up to 3GHz; MS2651A/B MS2661A/B/C up to 8GHz; MS2653A/B MS2663A/B/C *:The following option are required: Opt.04; High-speed time domain sweep Opt.06; Trigger/gate circuit	ML4803A or ML2430A Power Meter --- 1 MA4601A Sensor --- 1 Coaxial cable(J0104A) --- 1 Coaxial adapter(J0039) --- 1 GPIB cable(J007) --- 1 (Components required when “stop of radio burst operation” is enabled) MF1603A Frequency Counter --- 1 GPIB cable(J007) --- 1	Printer(RS232C): EPSON-VP600 --- 1 Dedicated cable(J0742) --- 1

Low-Power Data Communication System Measurement

Mid Speed LAN

(Conforming to issues of Frequency Hopping System)

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX261002A SS(HF) measurement software Memory card(256k-byte SRAM card) --- 1	MS2651A/B MS2653A/B MS2661A/B/C MS2663A/B/C MS2665C, MS2667C, MS2668C --- 1 * Spurious measurement: up to 3GHz; MS2651A/B MS2661A/B/C up to 8GHz; MS2653A/B MS2663A/B/C MS2665C MS2667C MS2668C *:The following option are required: Opt.04; High-speed time domain sweep Opt.06; Trigger/gate circuit	ML4803A or ML2430A Power Meter --- 1 MA4601A Sensor --- 1 GPIB cable(J007) --- 1 (Components required when “stop of radio burst operation” is enabled) MF1603A Frequency Counter --- 1 GPIB cable(J007) --- 1	Printer(RS232C): EPSON-VP600 --- 1 Dedicated cable(J0742) --- 1

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PDC Base Station Measurement

(Conforming to issues of RCR STD - 27)

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX260003A PDC Base Station measurement software Memory card(256 KB SRAM card) --- 1	MS2651A/B MS2653A/B MS2661A/B/C MS2663A/B/C --- 1	Always required: Coaxial cable(J0114A) --- 1 Coaxial cable(J0026A) --- 1 Required for some measurement items: Attenuator --- 1 Bandpass filter --- 1 Low noise pre-amp --- 1 Coaxial cable --- required quantity	Printer: FP-850 or --- 1 EPSON-VP600, HP-2225 GPIB cable(J0007) --- 1

EMI Measurement

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX264001A EMI measurement Memory card(256k bytes SRAM card) --- 1	MS2651A/B MS2653A/B --- 1* MS2661A/B/C MS2663A/B/C *: The following options are necessary Opt.08: Preamplifier Opt.10: Centronics Interface Opt.12: QP detector	Always required: MH648A Preamplifier --- 1	Printer(RS232C): EPSON-VP600 --- 1 Special cable(J0742) --- 1

CATV Measurement

Configuration of equipment

Software	Applicable Model Type	Recommended components for combination	Components required to obtain a hard copy
MX262001A CATV measurement Memory card(256k KB SRAM card) --- 1	MS2651B MS2653B MS2661B/C MS2663B/C --- 1* *: The following options are necessary Opt.01: Reference crystal Oscillator Opt.06: Trigger/gate circuit Opt.07: AM/FM demodulator Interface Opt.16 or 21: Television monitor	When measuring weak signal: Opt.08:Preamplifier --- 1 Opt.02:Narrow resolution Bandwidth --- 1	Printer(RS232C): EPSON-VP600 --- 1 Special cable(J0742) --- 1

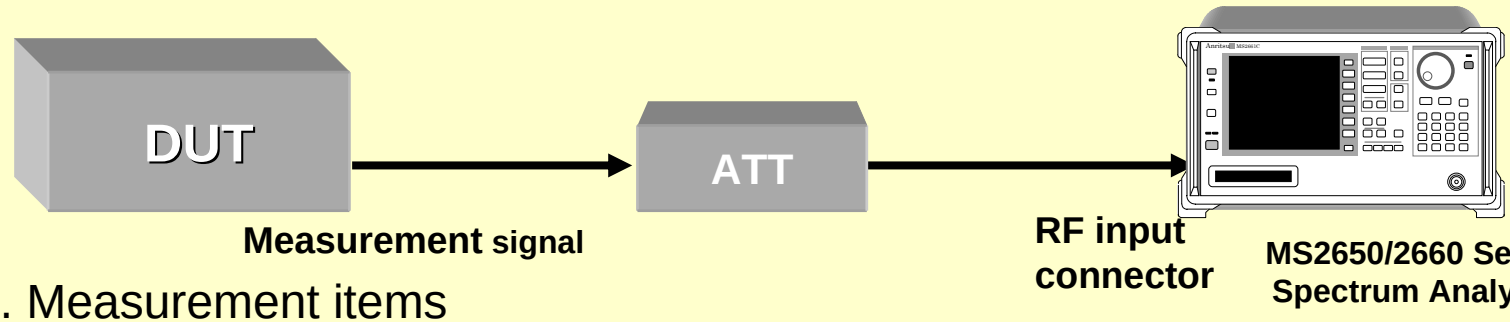
MX260002A CDMA Cellular System Measurement Software

Measurement items of automatic measurement system

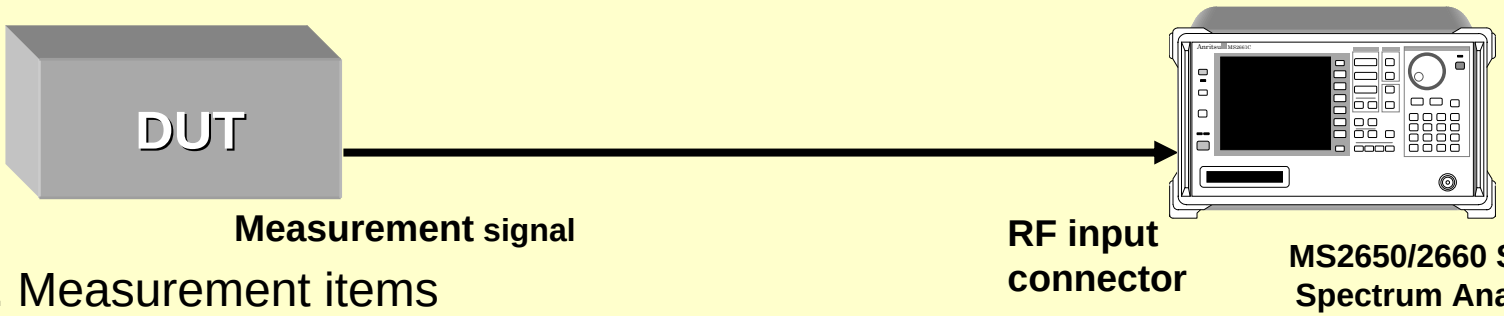
Measurement items	Measurement conditions	Display of measurement result
1.Channel power	Use the channel power (in the 1.23MHz band) measurement function.	Channel power (dBm)
2.occupied bandwidth	Use the occupied bandwidth measurement function.	Occupied bandwidth (MHz)
3.Adjacent channel leakage power	Use the adjacent channel measurement function.	Adjacent channel power (dB) (Pass/fail)
4.Gated power	Trigger Int or Ext selectable. (The ESTM is used as a trigger at Ext.)	On-Off ratio (dB) Right edge (Pass/Fail) Burst (Pass/Fail) Falling edge (Pass/Fail)
5.time response of open loop power control	The ESTM signal output from the base-station simulator is required as a trigger.	Time response (Pass/Fail)
6.Tx spurious		In-band spurious (Standby output power)(Pass/Fail) In-band spurious (Power on)(Pass/Fail) Out-band spurious (dB,dBm)
7.Rx spurious		Spurious (dBm)

MX260002A CDMA Cellular System Measurement Software

Connecting and setting-up system



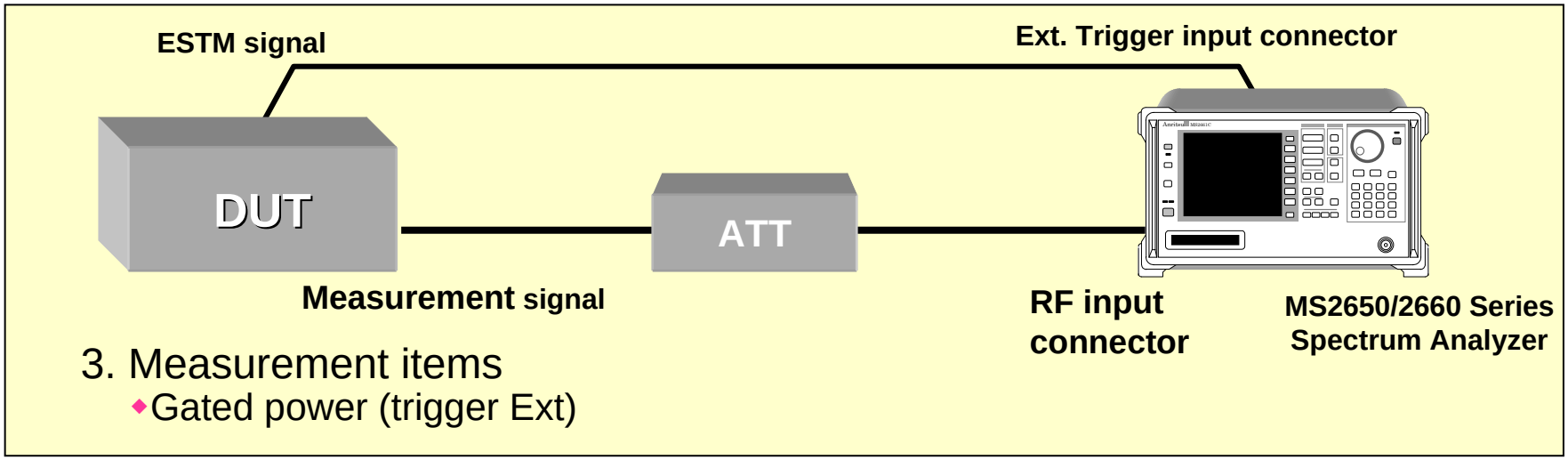
1. Measurement items
   - Channel power
   - Occupied bandwidth
   - Adjacent channel leakage power
   - Gated power(for trigger Int)
   - Tx spurious (other than standby power)



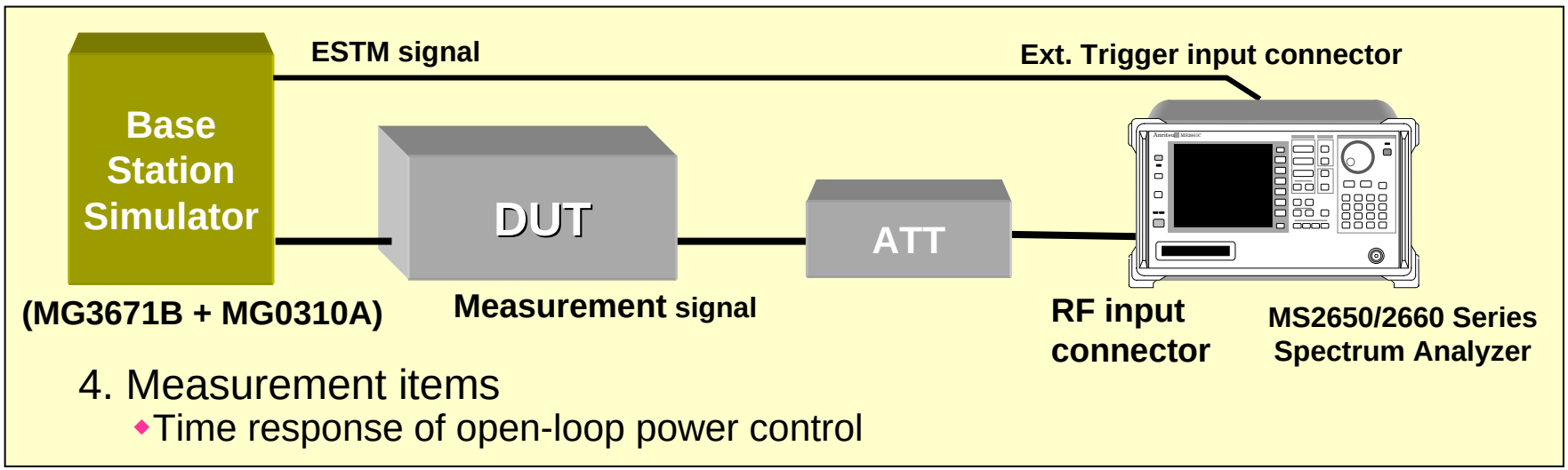
2. Measurement items
   - Tx spurious(standby power)
   - Rx spurious

MX260002A CDMA Cellular System Measurement Software

Connecting and setting-up system



3. Measurement items
   - Gated power (trigger Ext)



4. Measurement items
   - Time response of open-loop power control

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■ MX260004A GSM Base Station Measurement Software

◆Measurement items of automatic measurement system

Transmitter

Measurement items	Monitor item	Recommendation		Measurable/ Not Measurable	SFH support
		GSM11.21	J-STD		
Phase error		6.2	5.3.8	Not	
Frequency error		6.2	X	Not	
Mean transmitted RF carrier power		6.3	5.3.3	Measurable	Yes
Transmitted RF carrier power versus time		6.4	5.3.7.1	Measurable	None
Adjacent channel power	Spectrum due to modulation	6.5.1	5.3.4.1	Measurable	Partial support
	Spectrum due to switching transients	6.5.2	5.3.4.2	Measurable	Partial support
Spurious emissions from the transmitter		6.6	5.3.5	Measurable	Partial support
Intermodulation attenuation		6.7	5.3.9.1	Measurable	None
Intra Base Station System intermodulation attenuation		6.8	5.3.9.2	Measurable	None

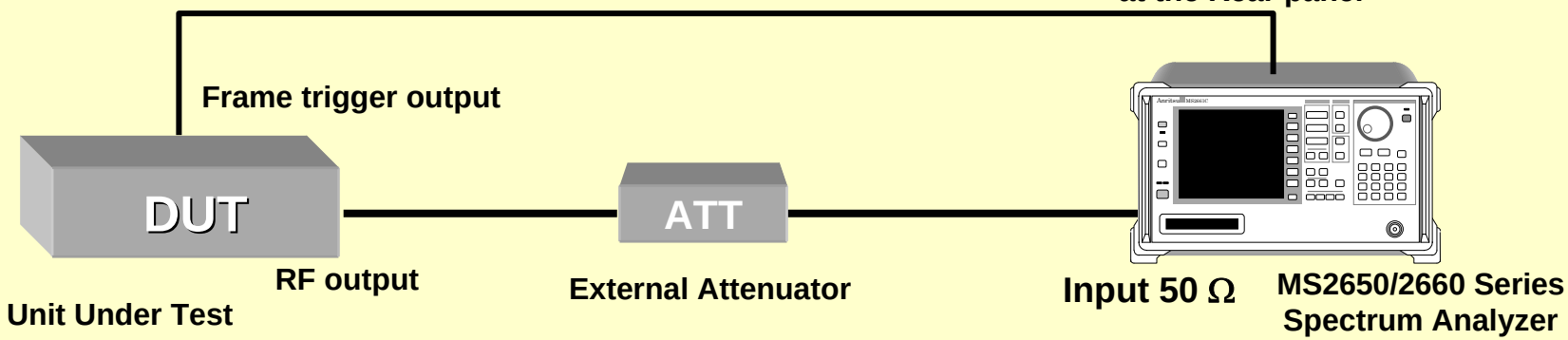
Receiver

Measurement items	Monitor item	Recommendation		Measurable/ Not Measurable	SFH support
		GSM11.21	J-STD		
Spurious emissions from the receiver antenna connector		7.9	5.4.4	Measurable	

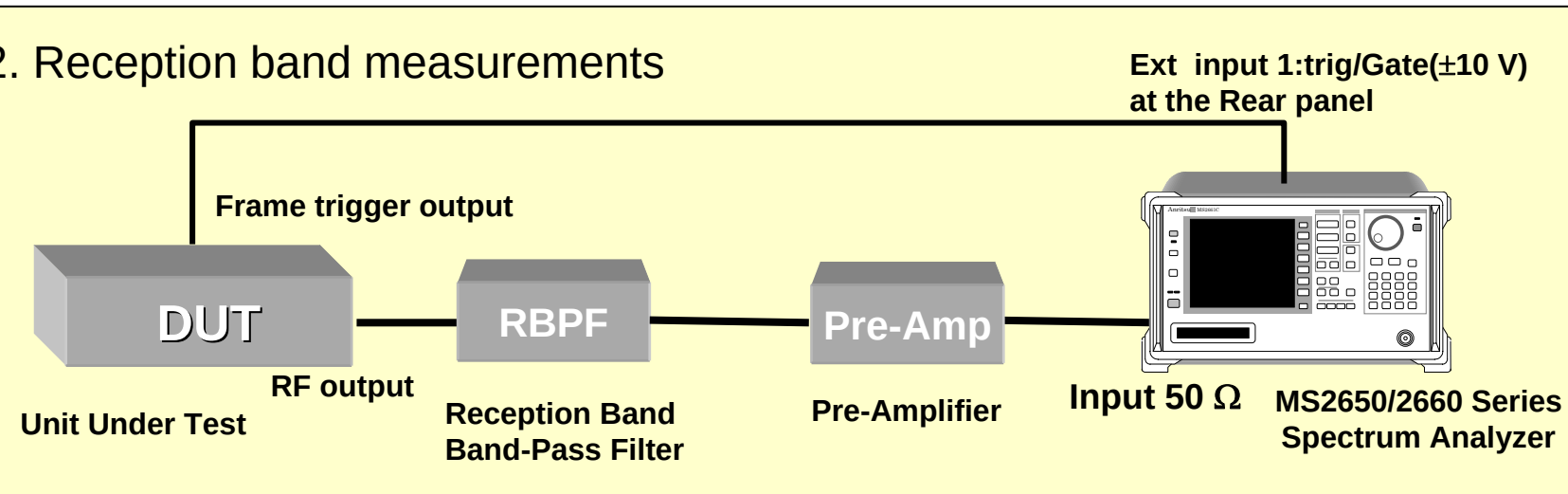
MX260004A GSM Base Station Measurement Software

Connecting and setting-up system

1. Transmission band measurements



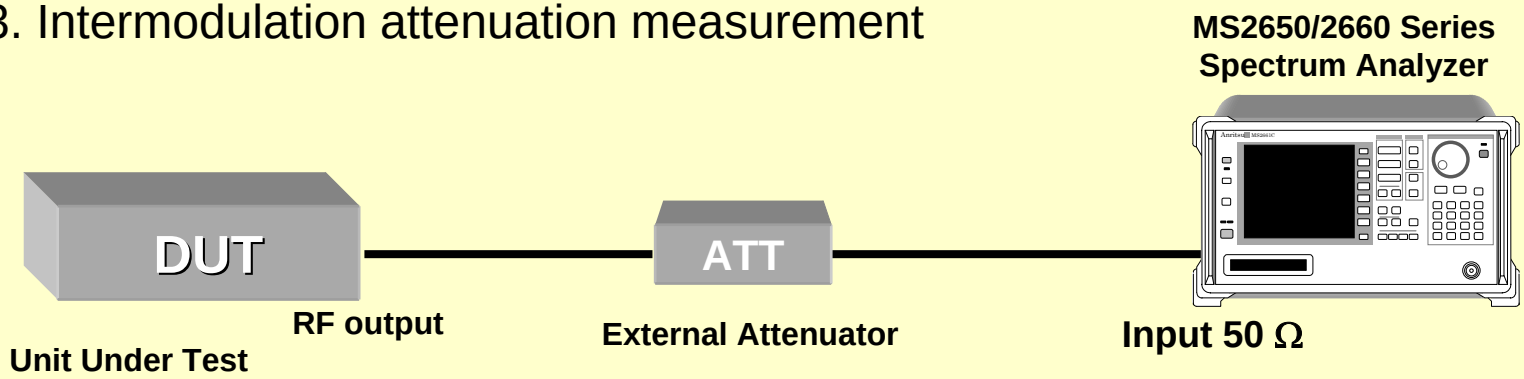
2. Reception band measurements



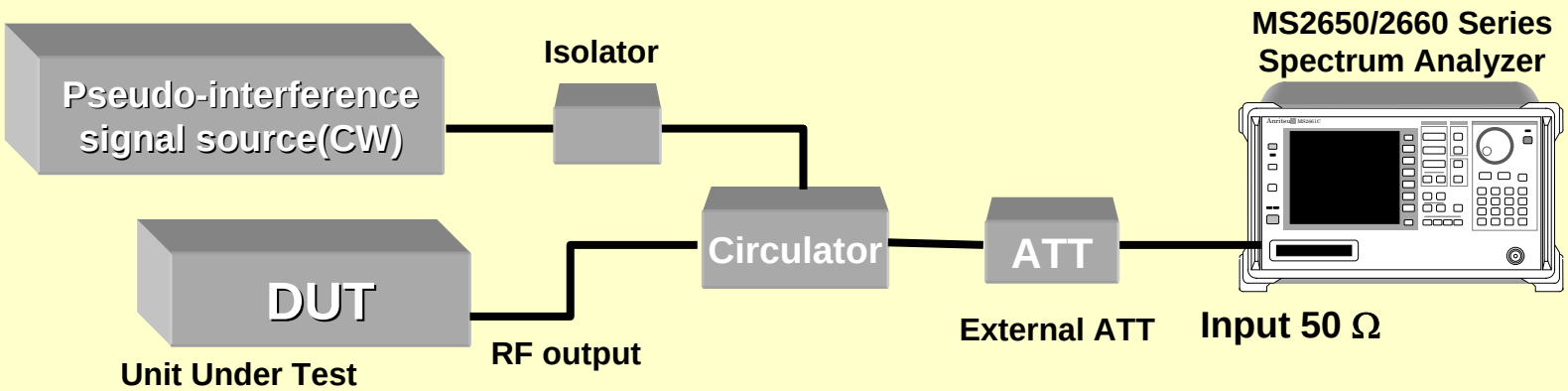
MX260004A GSM Base Station Measurement Software

Connecting and setting-up system

3. Intermodulation attenuation measurement



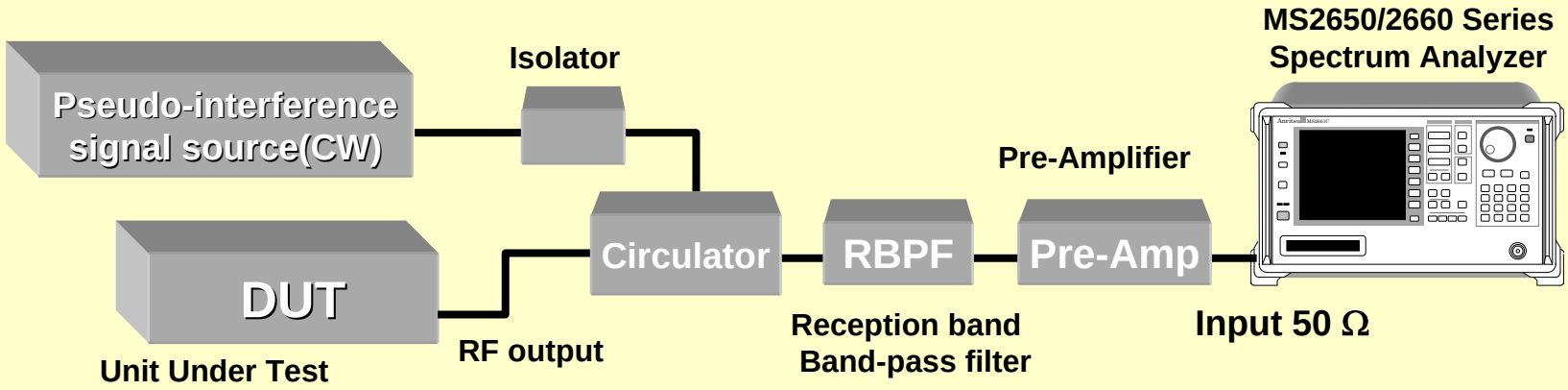
4. Intermodulation attenuation measurement for transmission band



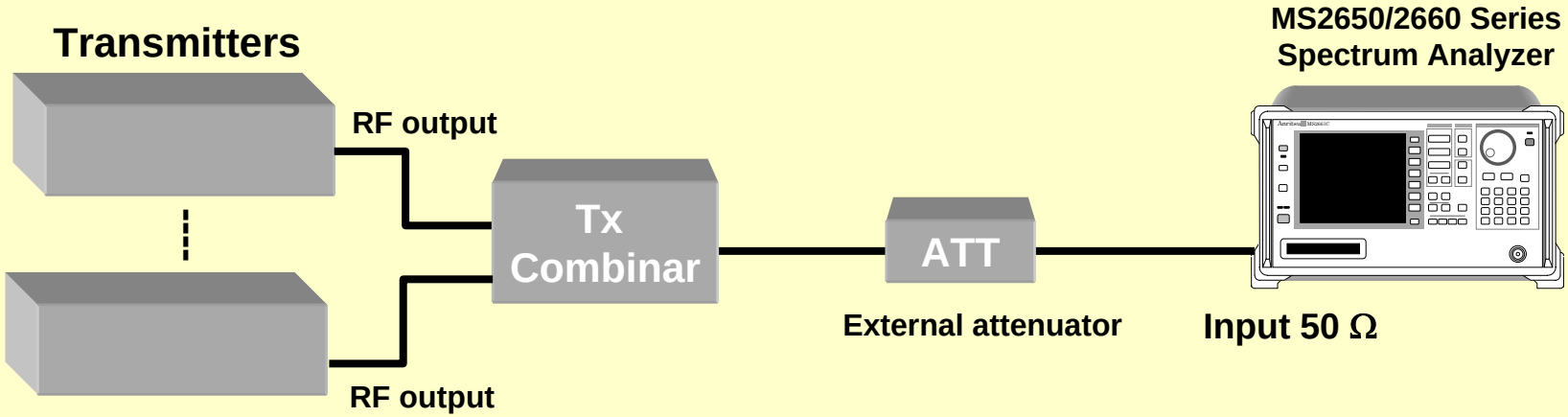
■ MX260004A GSM Base Station Measurement Software

◆Connecting and setting-up system

5. Intermodulation attenuation measurement for reception band



6. Intra BSS intermodulation attenuation measurement for transmission band



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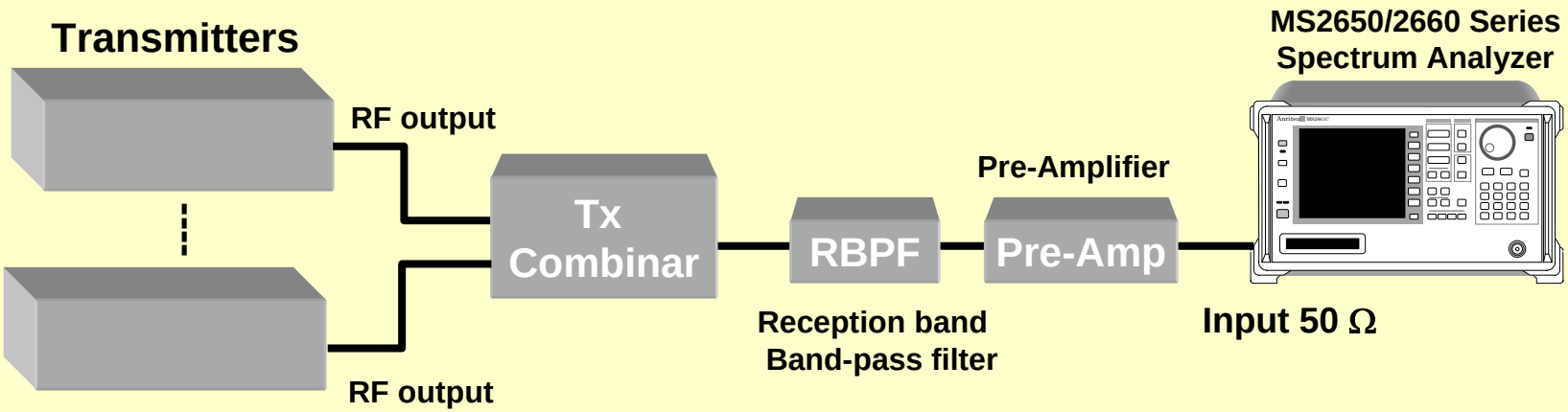
MX260004A GSM Base Station Measurement Software

Connecting and setting-up system

7. Intra BSS intermodulation attenuation measurement for reception band



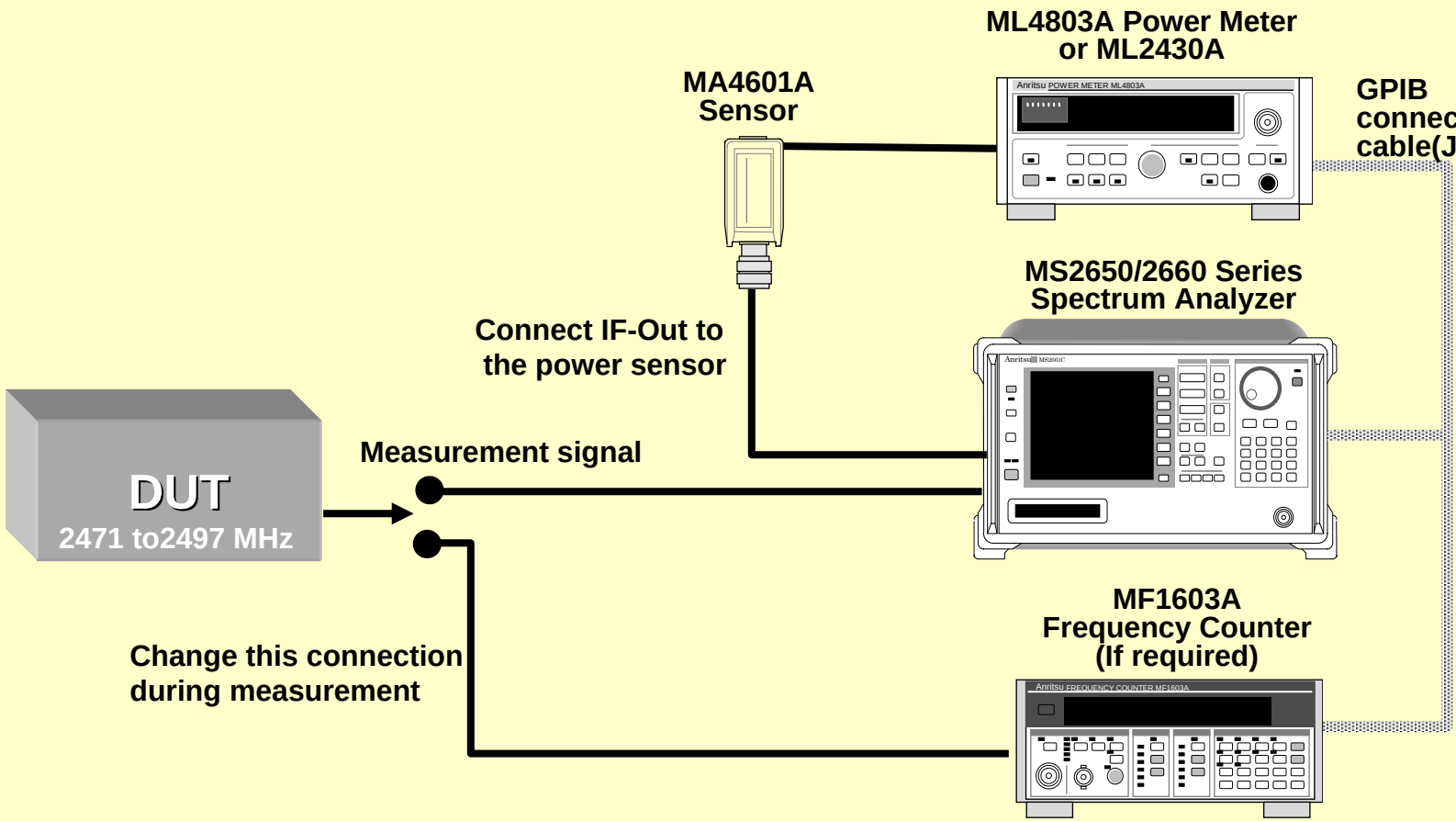
■ MX261001A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Direct Spread Spectrum System

◆Measurement items of automatic measurement system

Measurement items	Measurement conditions	Display of measurement result
1.Frequency deviation	Burst operation stop enabled ->Use the MS2650/MS2660 frequency count function. Burst operation stop disabled ->Use the MF1603A Frequency Counter.	Carrier frequency: [MHz] Deviation from specification value: [ppm]
2.Antenna power deviation	Power meter and spectrum analyzer methods enabled Power Meter method: MS2650/MS2660, and ML4803A or ML2430A used Spectrum Analyzer method: MS2650/ MS2660 used	Average power: [mW/MHz] Deviation from rated value: [%] Spread bandwidth measurement: [MHz]
3.Intensity of in-band spurious emission	Use the measurement function of MS2650/ MS2660 to measure the average power in burst.	Spurious frequency: [MHz] Spurious level: [uW] Pass/Fail judgment
4.Occupied frequency bandwidth	Use the measurement function of MS2650/MS2660 to measure the occupied frequency bandwidth.	Occupied frequency bandwidth: [MHz]
5.Out-of-band spurious emission of receiver	Use the MS2650/MS2660..	Out-of-band spurious frequency: [MHz] Out-of-band spurious level: [uW] Pass/Fail judgment

MX261001A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Direct Spread Spectrum System

Connecting and setting-up system



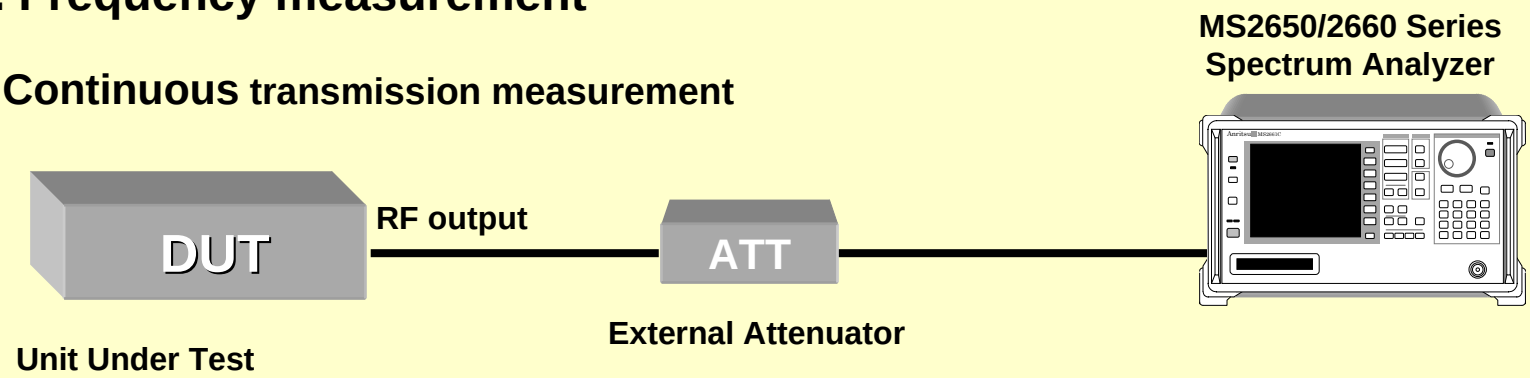
Connect all the ground terminals of all the measuring instrument to the ground terminal or chassis of the DUT.

MX261001A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Direct Spread Spectrum System

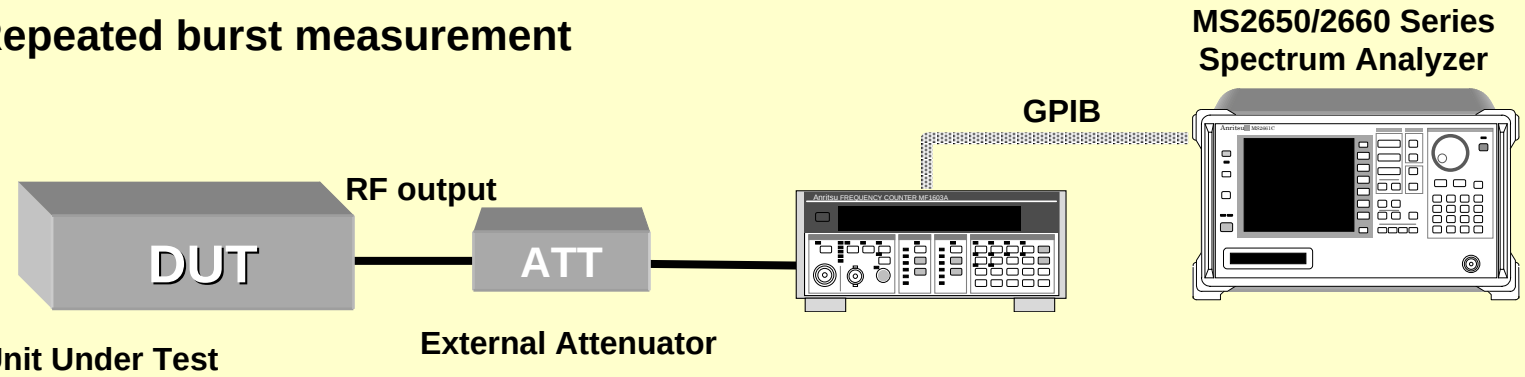
Connecting and setting-up system

1. Frequency measurement

Continuous transmission measurement



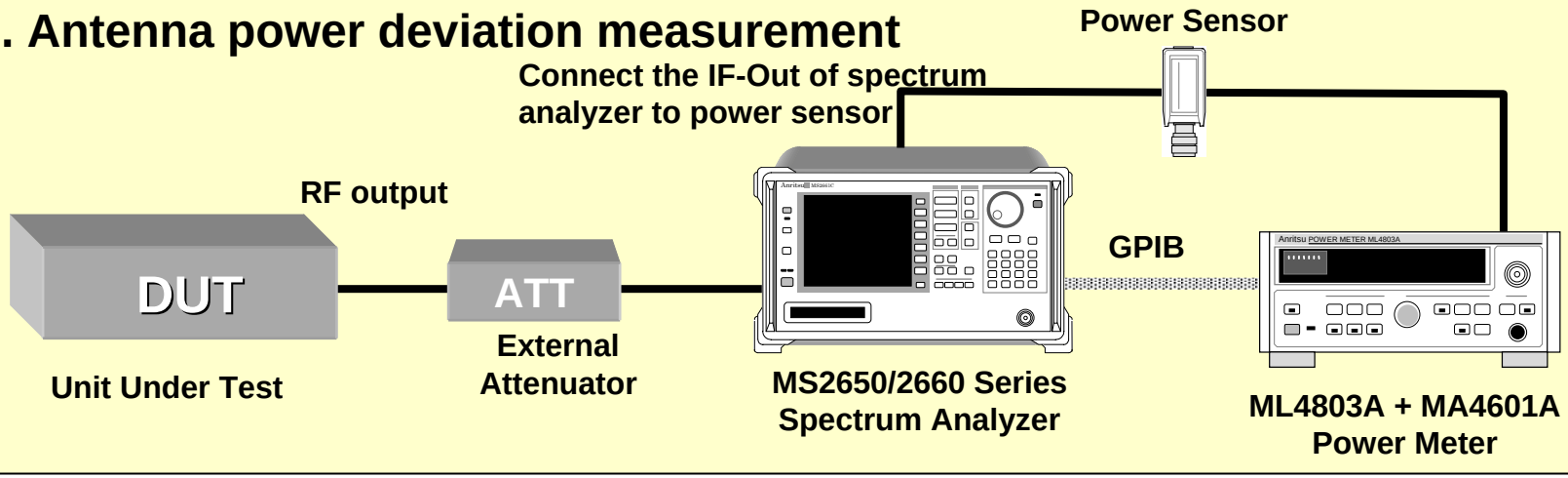
Repeated burst measurement



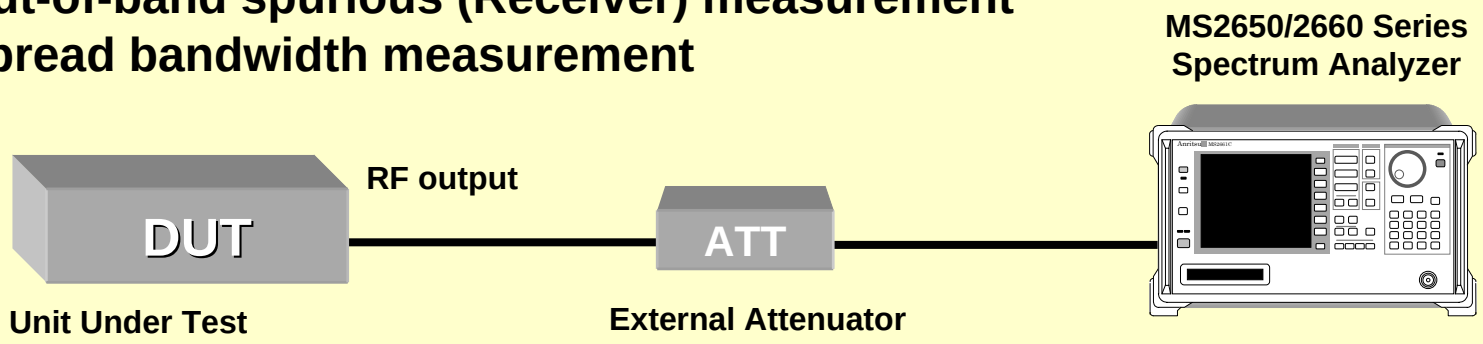
MX261001A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Direct Spread Spectrum System

Connecting and setting-up system

2. Antenna power deviation measurement



3. Occupied bandwidth measurement
4. In-band spurious emission intensity measurement
5. Out-of-band spurious (Receiver) measurement
6. Spread bandwidth measurement



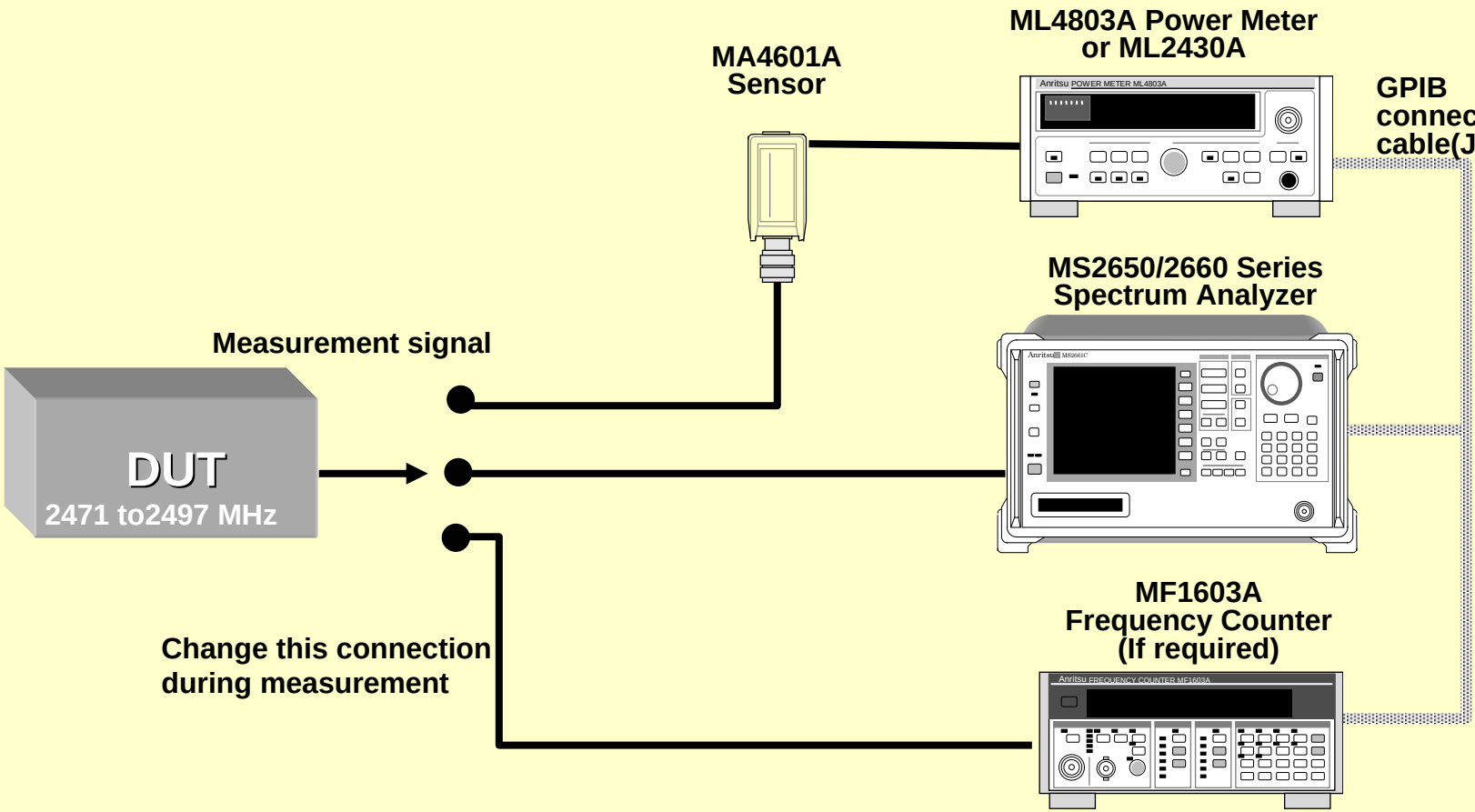
■ MX261002A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Frequency Hopping System

◆Measurement items of automatic measurement system

Measurement items	Measurement conditions	Display of measurement result
1.Frequency deviation	Burst operation stop enabled ->Use the MS2650/MS2660 frequency count function. Burst operation stop disabled ->Use the MF1603A Frequency Counter.	Carrier frequency: [MHz] Deviation from specification value: [ppm]
2.Antenna power deviation	Use the ML4803A or ML2430A Power Meter	Average power: [mW/MHz] Deviation from rated value: [%]
3.Intensity of in-band spurious emission	Use the measurement function of MS2650/ MS2660 to measure the average power in burst.	Spurious frequency: [MHz] Spurious level: [uW] Pass/Fail judgment
4.Occupied frequency bandwidth	Use the measurement function of MS2650/MS2660 to measure the occupied frequency bandwidth.	Occupied frequency bandwidth: [MHz]
5.Out-of-band spurious emission of receiver	Use the MS2650/MS2660..	Out-of-band spurious frequency: [MHz] Out-of-band spurious level: [uW] Pass/Fail judgment

MX261002A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Frequency Hopping System

Connecting and setting-up system



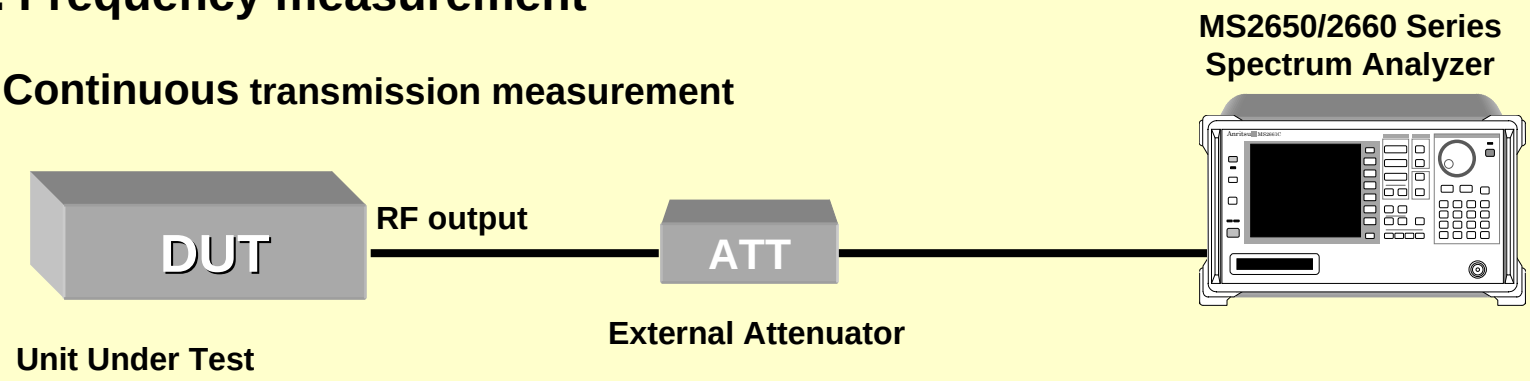
Connect all the ground terminals of all the measuring instrument to the ground terminal or chassis of the DUT.

MX261002A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Frequency Hopping System

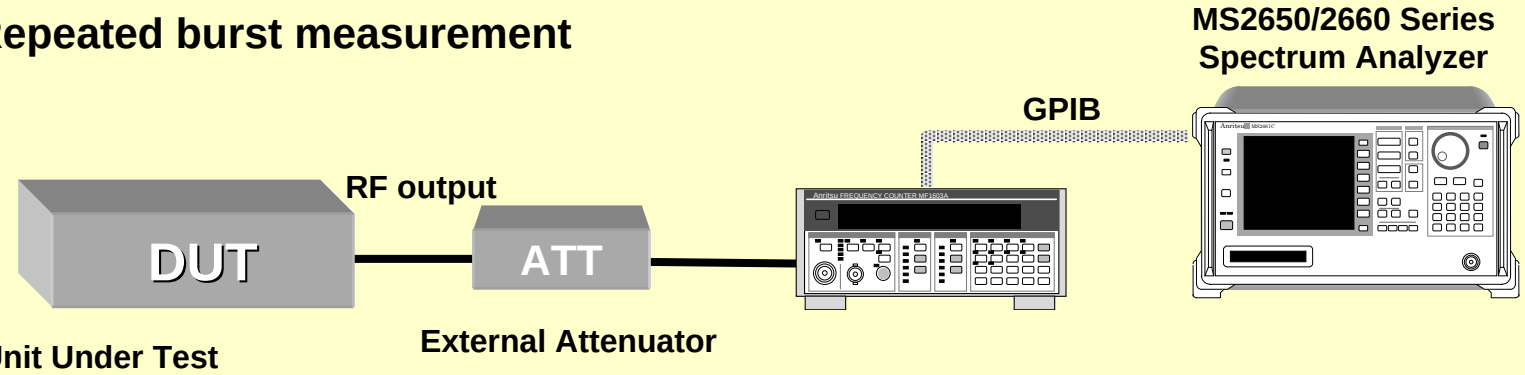
Connecting and setting-up system

1. Frequency measurement

Continuous transmission measurement



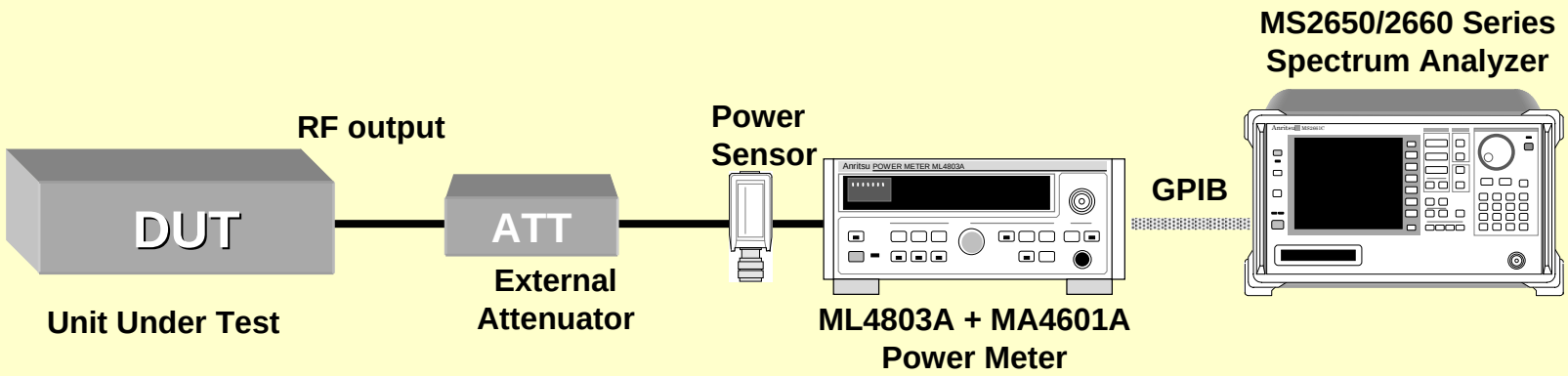
Repeated burst measurement



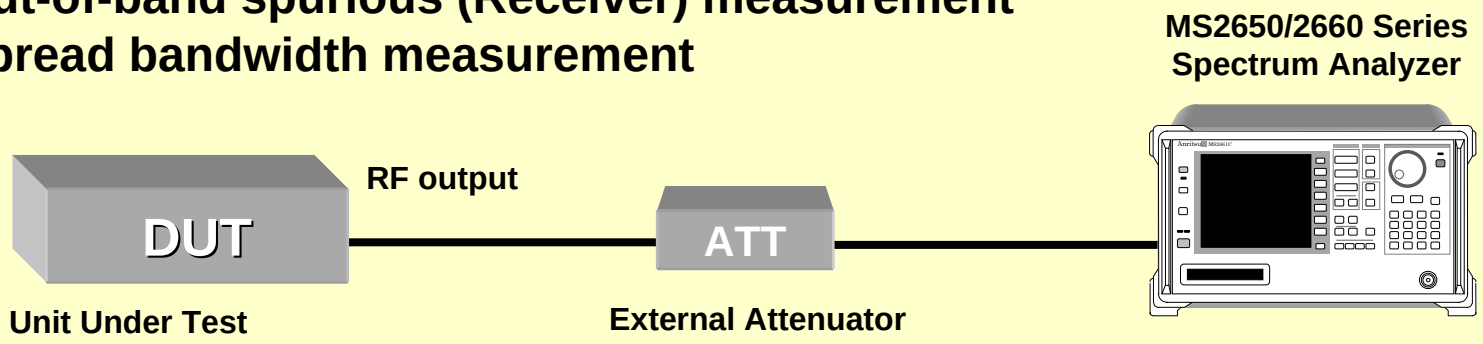
■ MX261002A Low-Power Data Communication System Measurement Software (Mid Speed NAN) conforming to issue of Frequency Hopping System

◆Connecting and setting-up system

2. Antenna power measurement



3. Occupied bandwidth measurement
4. In-band spurious emission measurement
5. Out-of-band spurious (Receiver) measurement
6. Spread bandwidth measurement



MX264001A EMI Measurement Software

Operation items (Measurement items)

1. **Pre-measurement**

   (Peak-hold measurement)

2. **Automatic evaluation measurement**

   (QP or Average measurement)

3. **Manual evaluation measurement**

   (QP or Average measurement)

4. **Input/Edit mode**

   (Antenna factor, Specification line, Level Frequency coefficient)

5. **Calibration mode**

   (Spectrum Analyzer calibration)

MX264001A EMI Measurement Software

The MX264001A EMI measurement software memory card contains the following programs and data files:

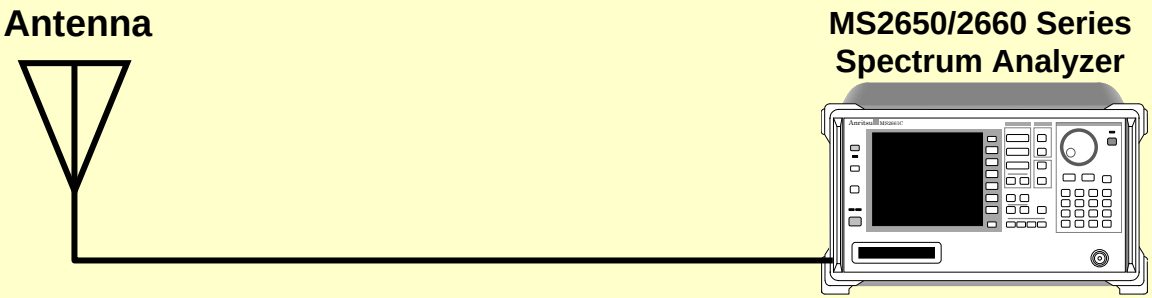
File Name	Use
EMI.IMG	**Main program for the EMI measurement.**
%ANT01.DAT **%ANT02.DAT** **%ANT03.DAT** **%ANT04.DAT** **%ANT05.DAT**	Initialization data file of arbitrary registration antenna factor that ca be input and edited by users. %ANT01 and %ANT02 are data files that correspond to the USER1 antenna data and USER2 antenna data, respectively.
%LMT01.DAT **%LMT02.DAT** **%LMT03.DAT** **%LMT04.DAT** **%LMT05.DAT**	Initialization data file of arbitrary registration specification line data that can be input and edited by users. %LMT01 and %LMT02 are data files corresponding to the specification line data USER1 and USER2, respectively.
%COR01.DAT **%COR02.DAT** **%COR03.DAT** **%COR04.DAT** **%COR05.DAT**	Initialization data file of arbitrary registration level frequency correction cofficient that can be input and edited by users. %COR01 and %COR02 are data files corresponding to the specification line data USER1 and USER2, respectively.

MX264001A EMI Measurement Software

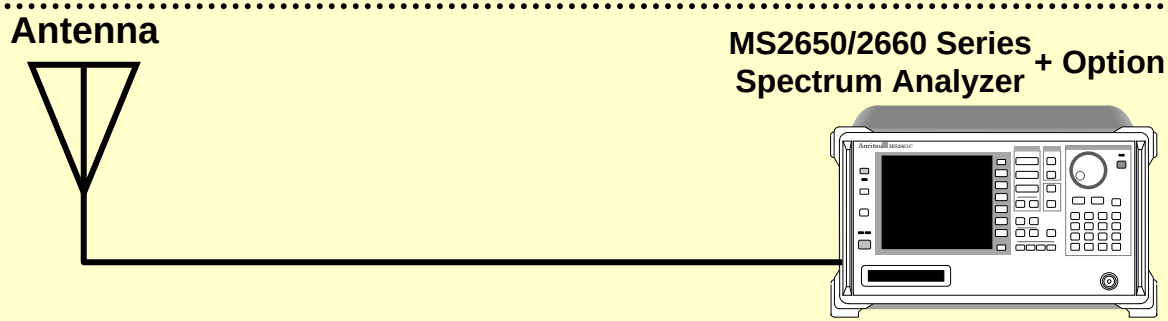
Connecting and setting-up system

EMI Measure System Menu

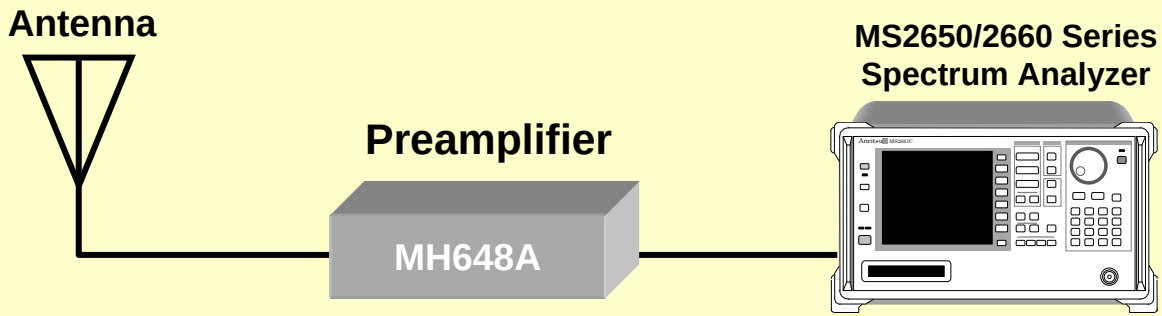
1. Spectrum Analyzer Only



2. Spectrum Analyzer with Opt.08 (Pre-Amp)



3. Spectrum Analyzer + MH648A Preamplifier



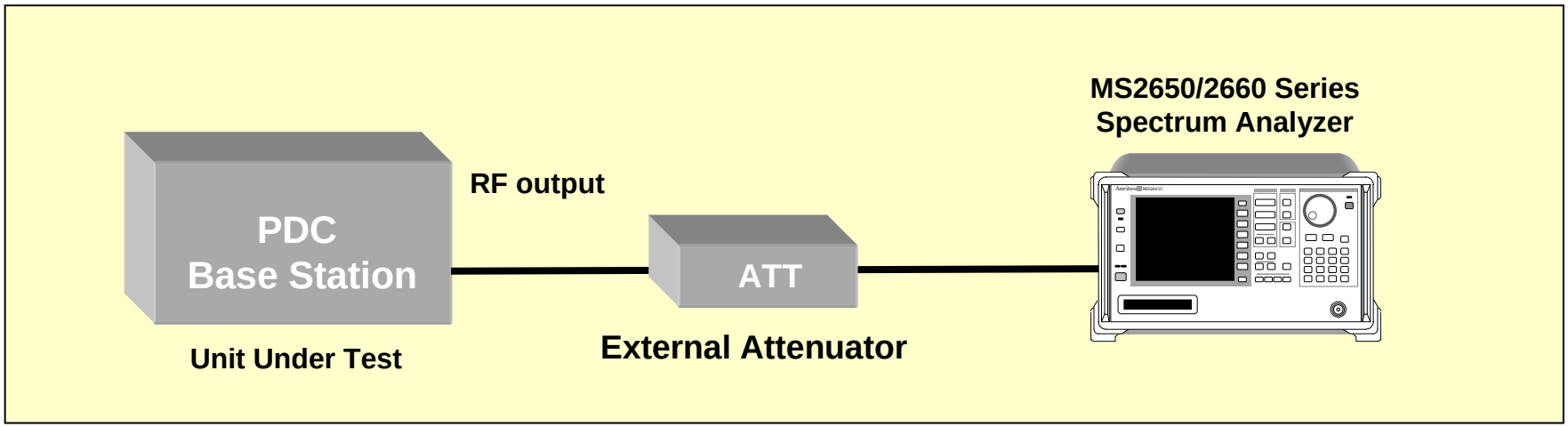
MX260003A PDC Base Station Measurement Software

Measuring items

1. Frequency Measurement
2. Channel Power Measurement
3. Harmonics Measurement
4. Near Carrier Spurious Emission Measurement
5. In-Band Spurious Emission Measurement
6. Out-of-Band Spurious Emission measurement
7. Occupied Bandwidth Measurement
8. Adjacent Channel Power Measurement
9. Power Measurement

■ MX260003A PDC Base Station Measurement Software

◆Connecting and setting-up system



MX262001A CATV Measurement Software (for Analog Systems)

Modes of Measurement

1. **Measure Mode**

   (Formal measurements)

2. **Survey Mode**

   (Every day maintenance mode)

3. **Surveiller Mode**

   (Long time period observation mode)

MX262001A CATV Measurement Software (for Analog Systems)

1. Measure Mode (Formal measurements)

Item	Measurement type-Auto/Semiautomatic; Dynamic Range	User selectable limits & Values	Other details	Comments
Carrier power and VA	Automatic	Max VA(db) Min VA(dB) Vpk Rel(dB)	Vpk Rel-With Rel to Max peak in measurement set.	All limits are backed up in memory card.
Carrier to Noise Ratio	Automatic & Semiautomatic > 45dB	NBW in MHz	In semiautomatic mode User sets the empty channel.	Auto warning for system limited measurement with less than 40dB C/N(4MHz)
Carrier Frequency	Automatic	Max Fp Min Fp Count resolution	For pilots or TV carriers.	Limits & Resolution are backed up in memory card
Carrier Amplitude	Automatic	Max Pp Min Pp	For Pilots or TV carriers.	Limits backed up in memory card
Cross modulation	Semiautomatic > 65dB			Carrier's modulation is switched off(3Sec) during measurement of cross modes
Composite Triple Beat	Semiautomatic > 70dB			Carrier switched off (20Sec +Measurement time if CTB present) during measurement.
Depth of Modulation	Automatic	Line Number		
Hum and LF Distortion	Automatic Better than 0.5%			Results in dB and % formats.

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2. Survey Mode (Every day maintenance mode)

Item	Measurement type- Auto/Semiautomatic; Dynamic Range	User selectable limits & Values	Other details	Comments
All Channel VAP	Automatic	Max VA(dB) Min VA(dB) Vpk Rel(dB)	.Vpk Rel-With Rel to Max peak in measurement set.	All limits are backed up in memory card.
All Channel VAF	Automatic	VF limit(kHz) AF limit(kHz)	AF s tolerance to ideal Value. e.g.5.5MHz ± AF	
Frequency Response	Visual Comparison			3 Sets of Ref spectrums/Map are backed up in memory card
Show All Channels	Automatic Switching	Pre-amp Attenuator Time interval	Sound Level set in Set Other Param menu.	Limits backed up in memory card
All channel Amplitude	Automatic	Max Pp Min Pp	For Pilots or TV carrier.	Limits backed up in memory card
All Channel Frequency	Automatic	Max Fp Min Fp Count resolution	For Pilots or TV carrier.	Limits & Resoln are backed up in memory card.
Show Single Channel		Pre-amp Attenuator Time interval	Sound Level set in Set Other Param menu.	Parameters shared with Show All Chnls
Co-Channel interference	Automatic > 50dB with Zone On	Zone sweep	Zone sweep for wide dynamic range.	
Inter modulation & Ext Beat	Semiautomatic > 45dB in Band with Zone On > 60dB in Adj. empty Chnl with Zone On	Zone sweep FM Monitor AM Monitor	Zone sweep for wide dynamic range.	

MX262001A CATV Measurement Software (for Analog Systems)

3. Surveillance Mode (Long time period observation mode)

Item	Measurement type-Auto/Semiautomatic	User selectable limits & Values	Other details	Comments
Single Channel Frequency		Freq. Indicator Templates Count Resoln	Max & Min Values and wave form & time.	
Single Channel Amplitude		Amplitude indicator Templates	Max & Min Values and wave form & time.	
Single Channel Frequency & Amplitude		Freq. & Ampl indicator Templates	Max & Min Values of Freq. & Ampl and Amplitude wave form & time.	
Group of Channels - Amplitude		Ref Pilot select	Waveforms at Max & Min of Pilot selected and time.	