MX370104A/MX269904A
Multi-carrier IQproducer

MG3710A
Vector Signal Generator

MS269xA/MS2830A
Signal Analyzer
MG3710A Vector Signal Generator
MS269xA-020, MS2830A-020/021 Vector Signal Generator option for MS269xA/MS2830A Signal Analyzer

MX370104A/MX269904A
Multi-carrier IQproducer
Product Introduction

MG3710A
Vector Signal Generator

MS269xA
Signal Analyzer

MS2830A
Signal Analyzer

Version 1.00

ANRITSU CORPORATION
What is Multi-carrier IQproducer?

Multi-carrier IQproducer is PC software for generating multi-carrier waveform patterns for modulation signals and tone signals for various communications methods.

The MG3710A supports five functions, including generation of combination files using the Baseband Signal Combine option (Opt-048/078 required).

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<table>
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<th>Option necessary to use created patterns</th>
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*Required when combining AWGN generator signals
What is Multi-carrier IQproducer?

Multi-carrier IQproducer runs under Windows installed in the MG3710A, MS2690A/91A/92A-020 and MS2830A-020/021. It outputs modulation signals by selecting generated waveform patterns.

- Generating waveform patterns using Multi-carrier IQproducer => The main frame requires a license.
  The unlicensed software will run on the PC to test waveform pattern generation but an unlicensed SG cannot output signals because it does not recognize the waveform patterns.

- Generating waveform patterns using EDA Tools (C, MATLAB, Microwave Office) => Free license

• MATLAB® is a registered trademark of The MathWorks, Inc.
• Windows® is a registered trademark of Microsoft Corporation in the USA and other countries.
Main screen

The main screen for selecting the “Multi-purpose”, “Adjust Rate”, “W-CDMA(DL)”, “Baseband Combination” and “Multi-Standard Radio” functions is displayed. Each parameter can be set from the screen by selecting each function.

Note: [Multi-purpose] and [W-CDMA(DL)] are supported only by the MS269xA and MS2830A.

*Read the “MX3701xxA IQproducer” and “MX269xxxA series Software” brochure for detail parameter setting range.
Multi-purpose function

Generates multi-carrier waveform patterns based on waveform patterns and tone signals. It generates signals with up to 32 carriers as one waveform pattern (Depending on the Freq. Offset and waveform pattern combination, sometimes signals for up to 32 carriers cannot be set.) Gain, frequency offset, initial phase and initial delay for carriers can be set too.

Example) LTE FDD BW-20MHz x 3carriers
Multi-purpose function

First, set the Tone or wvi File parameters for each component. Check the corresponding Tone checkbox to select Tone. Next, set the Gain, Freq. Offset, Delay, and Phase parameters.

See next page
Multi-purpose function

Multi-carrier Setup is the function to generate Tone signals or waveform pattern signals at given frequency intervals.

![Multi-carrier Setup Window]

**Carrier Allocation**

- **Symmetry Allocation**
  - Carrier Spacing: 1.000000 MHz
  - Initial Frequency Offset: 0.000000 MHz
  - Carrier Number: 1
  - Power Step: 0.00 dB
  - Phase Step: 0 deg
  - Delay Step: 0 sample

**Series Allocation**

- Center
- Initial Frequency Offset
- Carrier Spacing
Adjust Rate function

Converts two waveform patterns with different sampling rates into two waveforms patterns with same sampling rate. The initial phase and delay for two carriers can be set.

Note:
In some cases, the baseband combine function and adjust rate function cannot combine the sampling rate depending on conditions.

Additionally, the baseband combine function (Opt-048/078) converts the rates of the waveform pattern rates in memory A and B and combines them to match the sampling rate, helping reduce the Adjust rate setup time.
Adjust Rate function

**Over Sampling and Max Freq. Relationship of Offset (SG)**

If you convert the sampling frequencies of the waveform patterns of Component1 and Component2 using this function, waveform patterns Component1_m and Component2_m having an identical sampling frequency (Resampling Rate) will be generated.

Resampling Rate displays the value obtained by multiplying Minimum Adjusted Sampling Rate by the set value of Over Sampling. Here, the Minimum Adjusted Sampling Rate is the minimum sampling frequency that can be converted by the sampling frequency conversion.

If using MG3710A:
The Max Freq. Offset (SG) is always ±80 MHz.
However, sometimes signal dropouts and loopback distortion might occur when the output modulation frequency exceeds the equipment modulation band. When using frequency offset, ensure that the used frequency band does not exceed the modulation band.
W-CDMA (DL) function

This function is used to create a waveform pattern by setting any of the 4 or 5 carriers of the W-CDMA Downlink ON/OFF, as well as by setting the Clipping Method, Clipping Reference Level, and Clipping Ratio.

Carrier Type:
- Test Model 1 16DPCH,
- Test Model 1 32DPCH,
- Test Model 1 64DPCH,
- Test Model 5 2HS-PDSCH,
- Test Model 5 4HS-PDSCH,
- Test Model 5 8HS-PDSCH

Clipping Method:
- Non,
- Vector(pre-filter),
- Vector(post-filter),
- Scalar(pre-filter),
- Scalar(post-filter)

Clipping Reference:
- Peak Power,
- RMS Power
**Clipping Method:**
Specify the clipping method. As shown in Figure, both pre-filter and post-filter perform clipping before and after filtering. For Vector, the size of $\sqrt{(I^2 + Q^2)}$ is clipped using the set value. For Scalar, the sizes of $I$ and $Q$ are clipped using the set value. For Non, clipping is not performed.

**Clipping Reference:**
Select the reference for clipping processing. When Peak Power is selected, the maximum value of $\sqrt{(I^2 + Q^2)}$ is the reference (100%). When RMS Power is selected, the RMS value $\sqrt{(I^2 + Q^2)}$ of before clipping processing is the reference (0 dB).
Baseband Combination function

Creates combination file to use with baseband combine function (Opt-048/078) that outputs two signals, such as wanted + interference signals from one RF port, and sets two waveform patterns, frequency offset and level ratio at the same time. Selecting a previously created combination file supports batch settings. The modulation signal, AWGN, and tone signal can be selected as interference signals. The AWGN option (Opt-049/079) is required to use AWGN.
Multi-Standard Radio function

Generates W-CDMA・LTE-FDD・LTE-TDD・GSM multi-carrier signals for evaluating Multi-Standard Radio Tx characteristics. Using the baseband combine function (Opt-048/078) outputs signals simultaneously from one RF connector.

Test Configurations

TC1a [UTRA(FDD) multi-carrier]
TC1b [UTRA(TDD) multi-carrier]
TC2 [E-UTRA multi-carrier]
TC3a [UTRA(FDD) + E-UTRA]
TC3b [UTRA(TDD) + E-UTRA]
TC4a [UTRA(FDD) + GSM]
TC4b [E-UTRA + GSM]
TC4c [UTRA(FDD) + E-UTRA + GSM]
Multi-Standard Radio function

Multi-Standard Radio (Tx) function

E-UTRA Setting

Multi-Standard Radio (Tx) function

GSM Setting
## Multi-Standard Radio function

### Test Configuration by Band Category

<table>
<thead>
<tr>
<th>Test Configuration</th>
<th>BC1</th>
<th>BC2</th>
<th>BC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC1a (UTRA (FDD) multicarrier)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC1b (UTRA (TDD) multicarrier)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>TC2 (E-UTRA multicarrier)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC3a (UTRA (FDD) + E-UTRA)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC3b (UTRA (TDD) + E-UTRA)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>TC4a (UTRA (FDD) + GSM)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC4b (E-UTRA + GSM)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC4c (UTRA (FDD) + E-UTRA + GSM)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### Display Tab by Test Configuration

<table>
<thead>
<tr>
<th>Test Configuration</th>
<th>UTRA Setting</th>
<th>E-UTRA Setting</th>
<th>GSM Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC1a (UTRA (FDD) multicarrier)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>TC1b (UTRA (TDD) multicarrier)</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>TC2 (E-UTRA multicarrier)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC3a (UTRA (FDD) + E-UTRA)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC3b (UTRA (TDD) + E-UTRA)</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TC4a (UTRA (FDD) + GSM)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>TC4b (E-UTRA + GSM)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TC4c (UTRA (FDD) + E-UTRA + GSM)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Multi-Standard Radio function

**TC1a (UTRA(FDD) multicarrier)**
TC1a (UTRA(FDD) multicarrier) is the UTRA FDD multicarrier signal allocated as follows. The number of the allocatable carriers within RF Bandwidth is applied on this allocation. Carriers are allocated alternately; on the lowest position, the highest position, next to the lowest position, next to the highest position and so on as follows.

**TC1b (UTRA(TDD) multicarrier)**
TC1b (UTRA(TDD) multicarrier) is the TDD version of TC1a (UTRA (FDD) multicarrier). All the same except for F_offset, RAT, and Carrier Spacing.

**TC2 (E-UTRA multicarrier)**
TC2 (E-UTRA multicarrier) is the multi-carrier signal consisting of E-UTRA and the carriers are allocated as follows. The number of the allocatable carriers within RF Bandwidth is applied on this allocation. Carriers are allocated sequentially from the highest position of RF Bandwidth.
Multi-Standard Radio function

TC3a (UTRA(FDD) + E-UTRA)

TC3a (UTRA(FDD) + E-UTRA) is the multi-carrier signal consisting of UTRA FDD and E-UTRA and the carriers are allocated as follows. The number of the allocatable carriers within RF Bandwidth is applied on this allocation. UTRA FDD carriers are allocated from the Low side and E-UTRA carriers from the High side. Carriers are allocated alternately; on the lowest position, the highest position, next to the lowest position, next to the highest position and so on as follows.

TC3b (UTRA(TDD) + E-UTRA)

TC3b (UTRA(TDD) + E-UTRA) is the TDD version of TC3a (UTRA(FDD) + E-UTRA). All the same except for F_offset, RAT and Carrier Spacing.
Multi-Standard Radio function

**TC4a (UTRA (FDD) + GSM)**

TC4a (UTRA (FDD) + GSM) is the multi-carrier signal consisting of UTRA FDD and GSM and the carriers are allocated as follows. GSM carriers are allocated on the Low and High sides and an UTRA FDD carrier at the center of RF Bandwidth. Then follows allocation of GSM carriers.

**TC4b (E-UTRA + GSM)**

TC4b (E-UTRA + GSM) is the multi-carrier signals consisting of E-UTRA and GSM and the carriers are allocated as follows. The GSM carriers are allocated on the Low and High sides and an E-UTRA carrier at the center of RF Bandwidth. Then follows allocation of GSM carriers.

**TC4c (UTRA (FDD) + E-UTRA + GSM)**

TC4c (UTRA (FDD) + E-UTRA + GSM) is the multi-carrier signal consisting of UTRA, E-UTRA, and GSM and its carriers are allocated as follows. GSM carriers are allocated on the Low and High sides and an UTRA and an E-UTRA carriers at the center of RF Bandwidth. Then follows allocation of GSM carriers. The allocation of UTRA and E-UTRA is decided by setting the initial frequency offset portion of the carrier.
Waveform Generation: Calculation

After setting parameters, click the [Calculation] icon to generate the waveform pattern.

Generates waveform pattern

Generates waveform pattern

File export destination folder
Name of waveform pattern package
31 characters max.
Name of waveform pattern file
20 characters max.
Comment on screen
38 characters max. per line
Calculation & Load & Play

After setting parameters, click the [Calculation] icon to generate the waveform pattern.

Calculation:
Generates a waveform pattern after parameters are set.

Calculation & Load:
After waveform generation is finished, the created waveform pattern is loaded into the MG3710A waveform memory.

Calculation & Play:
After waveform generation is finished, the created waveform pattern is loaded and selected at the MG3710A waveform memory.
File size of waveform patterns

The presence/absence of the ARB Memory Expansion (option) and Baseband Signal Combination Function (option) is selected. Selecting the ARB Memory Expansion (option) and the Baseband Signal Combination Function (option) generates a bigger waveform pattern, while selecting the Baseband Signal Combination Function (option) generates a waveform pattern. If an uninstalled option is selected, sometimes the created waveform pattern may not be usable. Set the combination of installed options based on the following setting items.

<table>
<thead>
<tr>
<th>Items</th>
<th>Combinations of Options</th>
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<tr>
<td>Memory 64M samples</td>
<td>None</td>
</tr>
<tr>
<td>Memory 64M samples × 2</td>
<td>Option 48 and Option 78</td>
</tr>
<tr>
<td>Memory 256M samples</td>
<td>Option 45 or Option 75</td>
</tr>
<tr>
<td>Memory 256M samples × 2</td>
<td>Option 45 and Option 48 or Option 75 and Option 78</td>
</tr>
<tr>
<td>Memory 1024M samples</td>
<td>Option 46 or Option 76</td>
</tr>
<tr>
<td>Memory 1024M samples × 2</td>
<td>Option 46 and Option 48 or Option 76 and Option 78</td>
</tr>
</tbody>
</table>

The maximum size of the generated waveform pattern for each of the setting items is shown below.

<table>
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<tr>
<th>Items</th>
<th>Maximum Size</th>
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<tr>
<td>Memory 64M samples</td>
<td>64M samples</td>
</tr>
<tr>
<td>Memory 64M samples × 2 (With Option 48, 78)</td>
<td>128M samples</td>
</tr>
<tr>
<td>Memory 256M samples</td>
<td>256M samples</td>
</tr>
<tr>
<td>Memory 256M samples × 2 (With Option 48, 78)</td>
<td>512M samples</td>
</tr>
<tr>
<td>Memory 1024M samples</td>
<td>512M samples</td>
</tr>
<tr>
<td>Memory 1024M samples × 2 (With Option 48, 78)</td>
<td>512M samples</td>
</tr>
</tbody>
</table>
File size of waveform patterns

**MS2830A:**

Select whether the ARB memory expansion option 256Msamples is installed.

Selecting With Option27 (Memory 256M samples) supports creation of larger waveform patterns. If the ARB memory expansion option is not installed, the generated waveform pattern may not be able to be used. Waveform patterns cannot be created with a size greater than 64M samples when Without Option27 (Memory 256M samples) is selected. Select either according to the presence of ARB memory expansion option.

<table>
<thead>
<tr>
<th>Model</th>
<th>Items</th>
<th>ARB Memory Expansion</th>
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<tr>
<td>MS2830A</td>
<td>With Option27 (Memory 256M samples)</td>
<td>1 GB</td>
</tr>
<tr>
<td></td>
<td>Without Option27 (Memory 256M samples)</td>
<td>256 MB</td>
</tr>
</tbody>
</table>

**MS269xA:**

ARB Memory Expansion (option) is not available for MS269xA. Only Memory 256M samples, 1 GB is available.