

3GPP LTE FDD Performance Requirement

MG3700A

Vector Signal Generator

MG3700A Vector Signal Generator

3GPP LTE FDD Performance Requirement (TS36.141 v8.3.0)



May 2010
Anritsu Corporation

Performance Requirement

Performance Requirement Measurements

TS36.141	Measurement items	Configuration		
Receiver Characteristics		MG3700A		
		Platform	MX370108A (opt)	MX370107A (opt)
8.2.1	Performance requirements for PUSCH in multipath fading propagation conditions	OK(*1,*2,*3)	OK	OK(*4)
8.2.2	Performance requirements for UL timing adjustment			Under Investigation
8.2.3	Performance requirements for HARQ-ACK multiplexed on PUSCH			OK(*4)
8.2.4	Performance requirements for High Speed Train conditions			
8.3.1	ACK missed detection for single user PUCCH format 1a	OK(*1,*2)		
8.3.2	CQI missed detection for PUCCH format 2			
8.3.3	ACK missed detection for multi user PUCCH format 1a			
8.4.1	PRACH false alarm probability and missed detection	OK(*1,*2,*3)		

NOTE:
The MX370107A does not support the Moving Propagation conditions of Annex B.

MX370108A LTE IQproducer
MX370107A Fading IQproducer

- *1: There is a limit on the maximum size of the playback waveform pattern, depending on the MG3700A built-in arbitrary waveform memory size.
Without Option 21: 256 Msamples, With Option 21: 512 Msamples
- *2: After the external reference frequency signal is input to each MG3700A and synchronized, the phase of each RF signal must be synchronized.
- *3: HARQ cannot be resent.
- *4: The MG3700A can generate combination signals (wanted signal and modulated interference signal) using two arbitrary waveform memories. The MX370107A Fading IQproducer is required to perform fading processing for waveform pattern files and for adding AWGN.

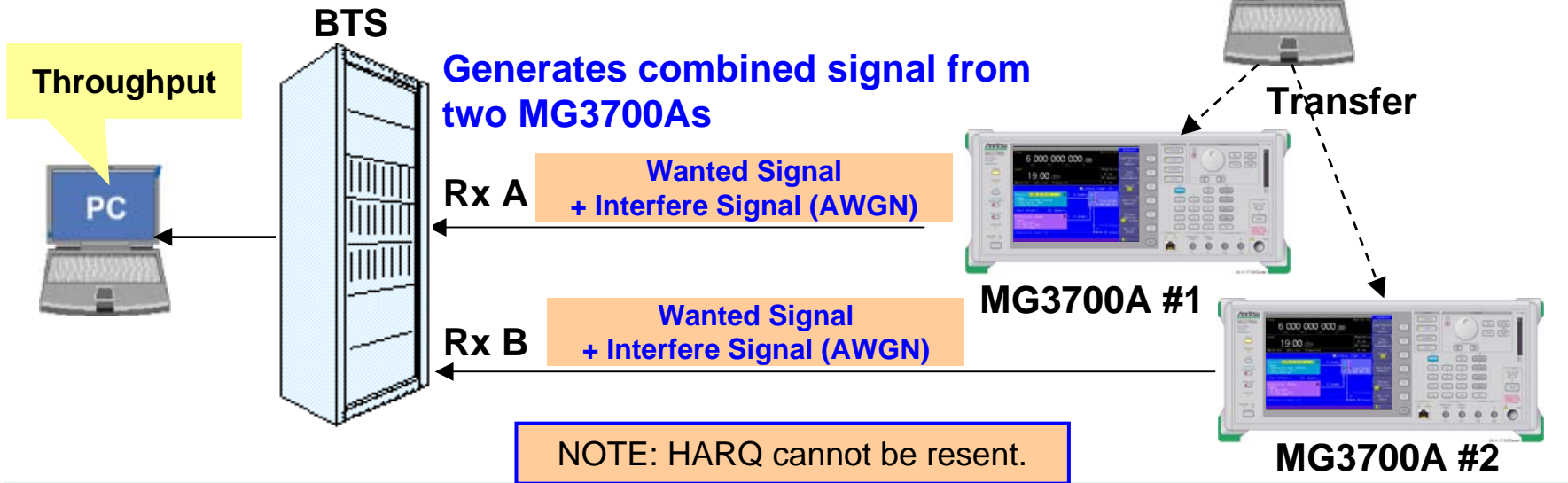
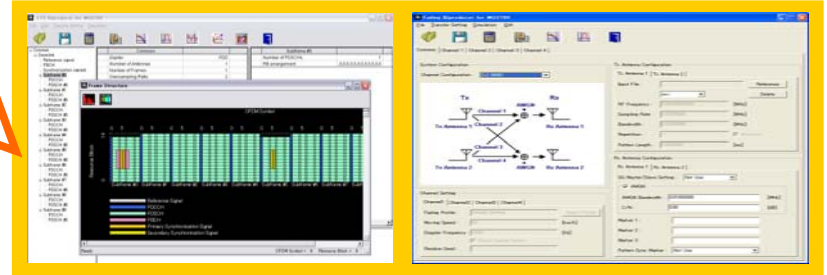
Performance Requirement

Measurement System using MG3700A

LTE IQproducer creates LTE signal patterns sent from each transmission antenna. Fading IQproducer performs fading processing for the generated signal pattern, adding AWGN, simulating the propagation environment between transmission and reception antennas, and generating the fading-processed waveform pattern files sent to each Rx.

LTE IQproducer
(option)

Fading IQproducer
(option)



Performance Requirement

8.2.1 Performance requirements of PUSCH in multipath fading propagation conditions

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-92.7dBm / 1.08MHz
3	-88.7dBm / 2.7MHz
5	-86.5dBm / 4.5MHz
10	-83.5dBm / 9MHz
15	-81.7dBm / 13.5MHz
20	-80.4dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in Table

Parameter	Value
Maximum number of HARQ transmissions	4
RV sequence	0, 2, 3, 1, 0, 2, 3, 1
Uplink-downlink allocation for TDD	Configuration 1 (2:2)

(3GPP TS36.141)

NOTE:
HARQ cannot be resent.

(3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex B.

(4) Adjust the equipment so that required SNR specified in Table 8.2.1.5-1 to 8.2.1.5-6 is achieved at the BS input.

(5) For each of the reference channels in Table 8.2.1.5-1 to 8.2.1.5-6 applicable for the base station, measure the throughput, according to annex E.

Performance Requirement

8.2.1 Performance requirements of PUSCH in multipath fading propagation conditions

Test Requirement

The throughput measured according to Procedure shall not be below the limits for the SNR levels specified in Table 8.2.1.5-1 to 8.2.1.5-6..

Table 8.2.1.5-1 Test requirements for PUSCH, 1.4 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-2	30%	-3.5	
				70%	0.7	
			A4-3	70%	11.2	
		A5-2	70%	18.3		
		EVA 5Hz	A3-1	30%	-2.1	
				70%	2.4	
			A4-1	30%	5.0	
				70%	11.9	
			A5-1	70%	19.2	
			EVA 70Hz	A3-2	30%	-3.3
		70%			1.3	
		A4-3		30%	4.6	
		ETU 70Hz	A3-1	30%	-1.8	
				70%	3.0	
			ETU 300Hz	A3-1	30%	-1.6
		Extended	ETU 70Hz	A4-2	30%	5.4
					70%	14.1
				A3-2	30%	-8.0
	70%				-2.5	
	A4-3			70%	7.7	
	A5-2			70%	15.0	
	4	Normal	EPA 5Hz	A3-2	30%	-8.0
					70%	-2.5
				A4-3	70%	7.7
A5-2			70%	15.0		
EVA 5Hz			A3-1	30%	-4.4	
				70%	-0.7	
			A4-1	30%	1.9	
				70%	8.4	
			A5-1	70%	16.0	
			EVA 70Hz	A3-2	30%	-5.7
70%					-2.1	
A4-4				30%	1.4	
ETU 70Hz			A3-1	30%	-4.2	
				70%	-0.4	
			ETU 300Hz	A3-1	30%	-4.0
Extended			ETU 70Hz	A4-2	30%	2.2
					70%	10.5

(3GPP TS36.141)

Table 8.2.1.5-2 Test requirements for PUSCH, 3 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-3	30%	-3.5	
				70%	0.7	
			A4-4	70%	11.5	
		A5-3	70%	18.7		
		EVA 5Hz	A3-1	30%	-2.2	
				70%	2.4	
			A4-1	30%	4.9	
				70%	12.1	
			A5-1	70%	19.4	
			EVA 70Hz	A3-3	30%	-3.4
		70%			1.2	
		A4-4		30%	5.3	
		ETU 70Hz	A3-1	30%	-1.9	
				70%	3.0	
			ETU 300Hz	A3-1	30%	-1.6
		Extended	ETU 70Hz	A4-2	30%	5.3
					70%	14.1
				A3-2	30%	-8.2
	70%				-2.8	
	A4-4			70%	8.3	
	A5-3			70%	15.0	
	4	Normal	EPA 5Hz	A3-3	30%	-8.2
					70%	-2.8
				A4-4	70%	8.3
A5-3			70%	15.0		
EVA 5Hz			A3-1	30%	-4.4	
				70%	-0.7	
			A4-1	30%	1.8	
				70%	8.4	
			A5-1	70%	16.0	
			EVA 70Hz	A3-3	30%	-6.9
70%					-2.3	
A4-4				30%	2.2	
ETU 70Hz			A3-1	30%	-4.2	
				70%	-0.3	
			ETU 300Hz	A3-1	30%	-4.0
Extended			ETU 70Hz	A4-2	30%	2.1
					70%	10.5

(3GPP TS36.141)

Performance Requirement

8.2.1 Performance requirements of PUSCH in multipath fading propagation conditions

Table 8.2.1.5-3 Test requirements for PUSCH, 5 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-4	30%	-4.1	
				70%	-0.1	
			A4-5	70%	11.0	
				A5-4	70%	18.6
			EVA 5Hz	A3-1	30%	-2.1
					70%	2.4
		A4-1		30%	4.9	
		EVA 70Hz	A3-4	70%	12.1	
				A5-1	70%	19.2
			A3-4	30%	-3.9	
		A4-5	70%	0.5		
			30%	4.9		
		ETU 70Hz	A3-1	70%	12.9	
				30%	-1.9	
		ETU 300Hz	A3-1	70%	3.0	
				30%	-1.6	
		Extended	ETU 70Hz	A4-2	70%	3.5
					30%	5.4
	4	Normal	EPA 5Hz	A3-4	70%	14.1
					30%	-6.5
A4-5				70%	-3.2	
				A5-4	70%	8.2
EVA 5Hz				A3-1	70%	15.0
					30%	-4.5
			A4-1	70%	-0.9	
EVA 70Hz			A3-4	30%	1.8	
				A5-1	70%	8.5
			A3-4	30%	16.1	
A4-5			70%	18.1		
			30%	-8.3		
ETU 70Hz			A3-1	70%	-2.7	
				30%	1.8	
ETU 300Hz			A3-1	70%	8.9	
				30%	-4.2	
Extended			ETU 70Hz	A4-2	70%	-0.3
					30%	4.0
ETU 70Hz		A3-1	A4-2	70%	0.0	
				30%	2.2	
ETU 300Hz	A3-1	A4-2	70%	10.5		
			30%	0.0		

(3GPP TS36.141)

Table 8.2.1.5-4 Test requirements for PUSCH, 10 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-5	30%	-3.6	
				70%	0.2	
			A4-6	70%	11.4	
				A5-5	70%	18.9
			EVA 5Hz	A3-1	30%	-2.1
					70%	2.5
		A4-1		30%	4.9	
		EVA 70Hz	A3-5	70%	12.0	
				A5-1	70%	19.4
			A3-5	30%	-3.5	
		A4-6	70%	0.7		
			30%	5.1		
		ETU 70Hz	A3-1	70%	13.2	
				30%	-1.9	
		ETU 300Hz	A3-1	70%	3.0	
				30%	-1.6	
		Extended	ETU 70Hz	A4-2	70%	3.5
					30%	5.4
	4	Normal	EPA 5Hz	A3-5	70%	14.2
					30%	-6.2
A4-6				70%	-2.9	
				A5-5	70%	8.1
EVA 5Hz				A3-1	70%	15.3
					30%	-4.4
			A4-1	70%	-0.6	
EVA 70Hz			A3-5	30%	1.8	
				A5-1	70%	8.5
			A3-5	30%	16.1	
A4-6			70%	-6.1		
			30%	-2.3		
ETU 70Hz			A3-1	70%	1.3	
				30%	8.6	
ETU 300Hz			A3-1	70%	-4.2	
				30%	-0.3	
Extended			ETU 70Hz	A4-2	70%	-4.0
					30%	0.0
ETU 70Hz		A3-1	A4-2	70%	0.0	
				30%	2.3	
ETU 300Hz	A3-1	A4-2	70%	10.9		
			30%	0.0		

(3GPP TS36.141)

Performance Requirement

8.2.1 Performance requirements of PUSCH in multipath fading propagation conditions

Table 8.2.1.5-5 Test requirements for PUSCH, 15 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-8	30%	-3.9	
				70%	-0.2	
				70%	11.9	
			A5-8	70%	19.4	
				A3-1	30%	-2.2
					70%	2.4
		70%	12.0			
		EVA 5Hz	A4-1	30%	4.8	
				70%	12.0	
				70%	19.3	
			A3-8	30%	-3.9	
				70%	0.3	
				70%	4.8	
		A4-7	70%	13.5		
			A3-1	30%	-1.9	
				70%	3.0	
		70%		-1.6		
		ETU 300Hz	A3-1	70%	3.5	
				30%	5.5	
				70%	14.2	
		Extended	ETU 70Hz	A4-2	30%	5.5
	70%				14.2	
	70%				14.2	
	4	Normal	EPA 5Hz	A3-8	30%	-6.6
70%					-3.2	
70%					8.2	
A4-7				70%	15.6	
				A5-8	70%	15.6
					A3-1	30%
70%			-0.6			
70%			1.8			
EVA 5Hz			A4-1	70%	8.5	
				70%	16.3	
				70%	16.3	
			A5-1	70%	16.3	
				A3-8	30%	-6.4
					70%	-2.7
70%			1.3			
EVA 70Hz			A4-7	70%	9.1	
				70%	9.1	
				70%	9.1	
			A3-1	30%	-4.2	
				70%	-0.4	
				70%	-0.4	
ETU 70Hz		A3-1	30%	-4.0		
			70%	0.0		
			70%	0.0		
ETU 300Hz	A3-1	30%	2.2			
		70%	2.2			
		70%	10.7			
Extended	ETU 70Hz	A4-2	30%	2.2		
			70%	10.7		
			70%	10.7		

(3GPP TS36.141)

Table 8.2.1.5-6 Test requirements for PUSCH, 20 MHz Channel Bandwidth

Number of RX antennas	Cyclic prefix	Propagation conditions (Annex B)	FRC (Annex A)	Fraction of maximum throughput	SNR [dB]	
2	Normal	EPA 5Hz	A3-7	30%	-3.6	
				70%	0.2	
				70%	12.1	
			A4-8	70%	20.3	
				A5-7	70%	20.3
					A3-1	30%
		70%	2.4			
		70%	4.9			
		EVA 5Hz	A4-1	30%	4.9	
				70%	12.1	
				70%	19.3	
			A5-1	70%	19.3	
				A3-7	30%	-3.5
					70%	0.8
		70%	4.8			
		EVA 70Hz	A4-8	70%	13.6	
				A3-1	30%	-1.8
					70%	3.0
			ETU 70Hz		A3-1	70%
				70%		3.5
				70%		5.3
	ETU 300Hz	A3-1	30%	5.3		
			70%	14.2		
			70%	14.2		
Extended	ETU 70Hz	A4-2	30%	5.3		
			70%	14.2		
			70%	14.2		
4	Normal	EPA 5Hz	A3-7	30%	-6.2	
				70%	-2.9	
				70%	8.1	
			A4-8	70%	16.5	
				A5-7	70%	16.5
					A3-1	30%
		70%	-0.7			
		70%	1.8			
		EVA 5Hz	A4-1	70%	8.5	
				70%	16.2	
				70%	16.2	
			A5-1	70%	16.2	
				A3-7	30%	-6.1
					70%	-2.3
		70%	1.3			
		EVA 70Hz	A4-8	70%	9.2	
				70%	9.2	
				70%	9.2	
			A3-1	30%	-3.8	
				70%	-0.3	
				70%	-0.3	
	ETU 70Hz	A3-1	30%	-4.0		
			70%	0.0		
			70%	0.0		
ETU 300Hz	A3-1	30%	2.2			
		70%	2.2			
		70%	10.6			
Extended	ETU 70Hz	A4-2	30%	2.2		
			70%	10.6		
			70%	10.6		

(3GPP TS36.141)

Performance Requirement

8.2.2 Performance requirements for UL timing adjustment

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-92.7dBm / 1.08MHz
3	-88.7dBm / 2.7MHz
5	-86.5dBm / 4.5MHz
10	-83.5dBm / 9MHz
15	-81.7dBm / 13.5MHz
20	-80.4dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in Table

Parameter	Value
Maximum number of HARQ transmissions	4
RV sequence	0, 2, 3, 1, 0, 2, 3, 1
Uplink-downlink allocation for TDD	Configuration 1 (2:2)
Subframes in which PUSCH is transmitted	For FDD: subframe #0, #2, #4, #6, and #8 in radio frames For TDD: Subframe #2, #3, #7, #8 in each radio frame
Subframes in which sounding RS is transmitted (Note 1)	For FDD: subframe #1 in radio frames For TDD: UpPTS in each radio frame

Note 1. The configuration of SRS is optional.

(3GPP TS36.141)

NOTE:
HARQ cannot be resent.

Performance Requirement

8.2.2 Performance requirements for UL timing adjustment

- (3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex B.
- (4) Adjust the equipment so that required SNR specified in Table 8.2.2.5-1 is achieved at the BS input.
- (5) For each of the reference channels in Table 8.2.2.5-1 applicable for the base station, measure the throughput, according to annex E.

NOTE:
The MX370107A does not support the Moving Propagation conditions of Annex B.

Performance Requirement

8.2.2 Performance requirements for UL timing adjustment

Test Requirement

The throughput measured according to Procedure shall not be below the limits for the SNR levels specified in Table 8.2.2.5-1.

Table 8.2.2.5-1 Test requirements for UL timing adjustment

Number of RX antennas	Cyclic prefix	Channel Bandwidth [MHz]	Moving propagation conditions (Annex B)	FRC (Annex A)	SNR [dB]
2	Normal	1.4	Scenario 1	A7-1	13.7
			Scenario 2	A8-1	-1.6
		3	Scenario 1	A7-2	14.0
			Scenario 2	A8-2	-1.2
		5	Scenario 1	A7-3	13.8
			Scenario 2	A8-3	-1.3
		10	Scenario 1	A7-4	14.4
			Scenario 2	A8-4	-1.5
		15	Scenario 1	A7-5	14.6
			Scenario 2	A8-5	-1.5
		20	Scenario 1	A7-6	14.5
			Scenario 2	A8-6	-1.5

(3GPP TS36.141)

NOTE:

The MX370107A does not support the Moving Propagation conditions of Annex B.

Performance Requirement

8.2.3 Performance requirements for HARQ-ACK multiplexed on PUSCH

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-92.7dBm / 1.08MHz
3	-88.7dBm / 2.7MHz
5	-86.5dBm / 4.5MHz
10	-83.5dBm / 9MHz
15	-81.7dBm / 13.5MHz
20	-80.4dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and details presented in chapter 8.2.3.1.

(3) The multipath fading emulators shall be configured according to ETU70 channel model defined in Annex B.2.

(4) Adjust the equipment so that required SNR specified in Table 8.2.3.5-1 is achieved at the BS input during the ACK transmissions.

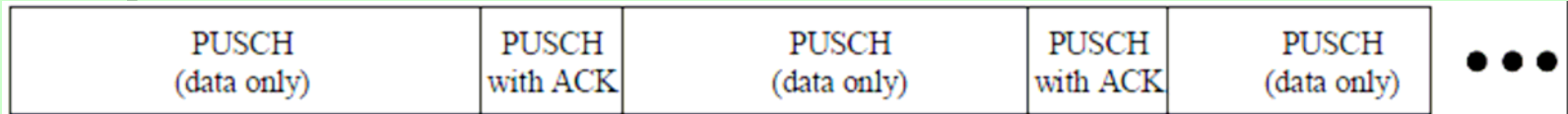
(5) The signal generator sends a test pattern on one of RE's where HARQ-ACK information can be multiplexed on PUSCH with the pattern outlined in figure.

The following statistics are kept: the number of ACKs detected during data only transmissions and the number of missed ACKs during PUSCH with ACK transmission.

NOTE: HARQ cannot be resent.

Performance Requirement

8.2.3 Performance requirements for HARQ-ACK multiplexed on PUSCH



(3GPP TS36.141)

Test Requirement

The fraction of falsely detected ACKs measured according to Procedure shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.2.3.5-1.

Table 8.2.3.5-1 Test requirements for HARQ-ACK multiplexed on PUSCH

Number of RX antennas	Cyclic Prefix	Propagation conditions (Annex B)	Channel Bandwidth [MHz]	FRC (Annex A)	$I_{offset}^{HARQ-ACK}$	SNR [dB]
2	Normal	ETU70	1.4	A.3-1	8	7.2
				A.4-3	5	14.4
			3	A.3-1	8	7.2
				A.4-4	5	13.5
			5	A.3-1	8	7.1
				A.4-5	5	13.1
			10	A.3-1	8	7.2
				A.4-6	5	12.9
			15	A.3-1	8	7.3
				A.4-7	5	12.7
			20	A.3-1	8	7.1
				A.4-8	5	12.6

(3GPP TS36.141)

Performance Requirement

8.2.4 Performance requirements for High Speed Train conditions

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-92.7dBm / 1.08MHz
3	-88.7dBm / 2.7MHz
5	-86.5dBm / 4.5MHz
10	-83.5dBm / 9MHz
15	-81.7dBm / 13.5MHz
20	-80.4dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in Table

Parameter	Value
Maximum number of HARQ transmissions	4
RV sequence	0, 2, 3, 1, 0, 2, 3, 1
Uplink-downlink allocation for TDD	Configuration 1 (2:2)
Subframes in which PUSCH is transmitted	For FDD: subframe #0 and #8 in radio frames for which SFN mod 4 = 0 subframe #6 in radio frames for which SFN mod 4 = 1 subframe #4 in radio frames for which SFN mod 4 = 2 subframe #2 in radio frames for which SFN mod 4 = 3 For TDD: Subframe #2 in each radio frames
Subframes in which PUCCH is transmitted (Note1, Note 2)	For FDD: subframe #5 in radio frames For TDD: Subframe #3 in each radio frame

Note 1. The configuration of PUCCH (format 2) is optional.
Note 2. The SNR values per antenna shall be set to [-4.5 dB and -1.5 dB] for Scenario 1 and 3, respectively.

(3GPP TS36.141)

NOTE:
HARQ cannot be resent.

Performance Requirement

8.2.4 Performance requirements for High Speed Train conditions

- (3) The channel simulators shall be configured according to the corresponding channel model defined in Annex B.3.
- (4) Adjust the equipment so that required SNR specified in Table 8.2.4.5-1 is achieved at the BS input.
- (5) For each of the reference channels in Table 8.2.4.5-1 applicable for the base station, measure the throughput, according to annex E.

Performance Requirement

8.2.4 Performance requirements for High Speed Train conditions

Test Requirement

The throughput measured according to Procedure shall not be below the limits for the SNR levels specified in Table 8.2.4.5-1.

Table 8.2.4.5-1 Test requirements for High Speed Train conditions

Channel Bandwidth [MHz]	FRC (Annex A)	Number of RX antennas	Propagation conditions (Annex B)	Fraction of maximum throughput	SNR [dB]
1.4	A3-2	1	HST Scenario 3	30%	-1.2
				70%	2.2
		2	HST Scenario 1	30%	-3.6
				70%	-0.3
3	A3-3	1	HST Scenario 3	30%	-1.8
				70%	1.9
		2	HST Scenario 1	30%	-4.2
				70%	-0.7
5	A3-4	1	HST Scenario 3	30%	-2.3
				70%	1.6
		2	HST Scenario 1	30%	-4.8
				70%	-1.1
10	A3-5	1	HST Scenario 3	30%	-2.4
				70%	1.5
		2	HST Scenario 1	30%	-5.1
				70%	-1.2
15	A3-6	1	HST Scenario 3	30%	-2.4
				70%	1.5
		2	HST Scenario 1	30%	-4.9
				70%	-1.1
20	A3-7	1	HST Scenario 3	30%	-2.4
				70%	1.5
		2	HST Scenario 1	30%	-5.0
				70%	-1.1

(3GPP TS36.141)

Performance Requirement

8.3.1 ACK missed detection for single user PUCCH format 1a

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-89.7 dBm / 1.08MHz
3	-85.7 dBm / 2.7MHz
5	-83.5 dBm / 4.5MHz
10	-80.5 dBm / 9MHz
15	-78.7 dBm / 13.5MHz
20	-77.4 dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to TS 36.211.

(3) The multipath fading emulators shall be configured according to the corresponding channel model defined in Annex B.

(4) Adjust the equipment so that the SNR specified in Table 8.3.1.5-1 is achieved at the BS input during the ACK transmissions.

(5) The signal generator sends a test pattern with the pattern outlined in figure. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.

NOTE: HARQ cannot be resent.



(3GPP TS36.141)

Performance Requirement

8.3.1 ACK missed detection for single user PUCCH format 1a

Test Requirement

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in Table 8.3.1.5-1.

Table 8.3.1.5-1 Required SNR for single user PUCCH format 1a demodulation tests

Number of RX antennas	Cyclic Prefix	Propagation Conditions (Annex B)	Channel Bandwidth / SNR [dB]					
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
2	Normal	EPA 5	-1.9	-3.3	-4.2	-4.8	-4.7	-4.5
		EVA 5	-3.9	-4.5	-4.5	-4.4	-4.5	-4.5
		EVA 70	-4.3	-4.6	-4.6	-4.5	-4.6	-4.5
		ETU 300	-4.4	-4.5	-4.3	-4.4	-4.6	-4.6
	Extended	ETU 70	-3.6	-3.7	-3.5	-3.7	-3.6	-3.7
4	Normal	EPA 5	-7.3	-7.8	-8.1	-8.3	-8.3	-8.4
		EVA 5	-8.2	-8.5	-8.5	-8.2	-8.3	-8.3
		EVA 70	-8.3	-8.4	-8.4	-8.2	-8.4	-8.2
		ETU 300	-8.1	-8.3	-8.1	-8.1	-8.3	-8.2
	Extended	ETU 70	-7.3	-7.5	-7.3	-7.5	-7.4	-7.4

(3GPP TS36.141)

Performance Requirement

8.3.2 CQI missed detection for PUCCH format 2

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-89.7 dBm / 1.08MHz
3	-85.7 dBm / 2.7MHz
5	-83.5 dBm / 4.5MHz
10	-80.5 dBm / 9MHz
15	-78.7 dBm / 13.5MHz
20	-77.4 dBm / 18MHz

(3GPP TS36.141)

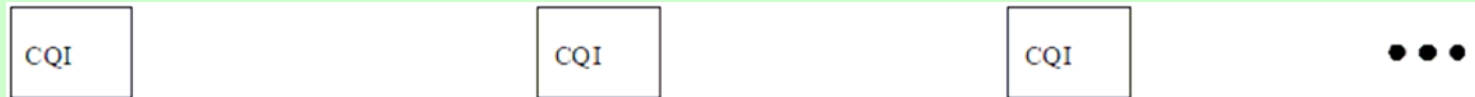
(2) The characteristics of the wanted signal shall be configured according to TS 36.211.

(3) The multipath fading emulators shall be configured according to the corresponding channel model defined in Annex B.

(4) Adjust the equipment so that the SNR specified in Table 8.3.2.5-1 is achieved at the BS input during the CQI transmissions.

(5) The signal generator sends a test pattern with the pattern outlined in figure. The following statistics are kept: the number of missed CQIs.

NOTE: HARQ cannot be resent.



(3GPP TS36.141)

Performance Requirement

8.3.2 CQI missed detection for PUCCH format 2

Test Requirement

The fraction of falsely detected CQIs shall be less than 1% and the fraction of correctly detected CQIs shall be larger than 99% for the SNR listed in Table 8.3.2.5-1.

Table 8.3.2.5-1 Required SNR for PUCCH format 2 demodulation tests

Number of RX antennas	Cyclic Prefix	Propagation Conditions (Annex B)	Channel Bandwidth / SNR [dB]					
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
2	Normal	ETU 70	-3.3	-3.8	-3.6	-3.8	-3.8	-3.8

(3GPP TS36.141)

Performance Requirement

8.3.3 ACK missed detection for multi user PUCCH format 1a

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-89.7 dBm / 1.08MHz
3	-85.7 dBm / 2.7MHz
5	-83.5 dBm / 4.5MHz
10	-80.5 dBm / 9MHz
15	-78.7 dBm / 13.5MHz
20	-77.4 dBm / 18MHz

(3GPP TS36.141)

(2) In multi user PUCCH test, four signals are configured: one wanted signal and three interferers, which are transmitted via separate fading paths using relative power settings presented in Annex A.9.

All signals are transmitted on the same PUCCH resources, with different PUCCH channel indices, as presented in Annex A.9.

The characteristics of the all signals (i.e. wanted and all interferers) shall be configured according to 36.211.

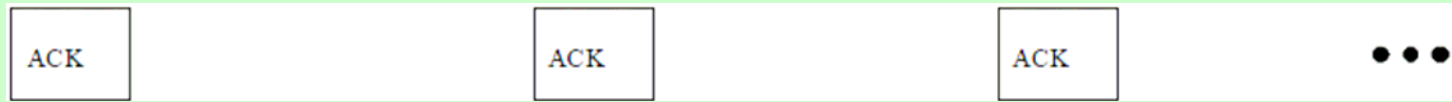
(3) The multipath fading emulators shall be configured according to ETU70 propagation conditions defined in Annex B.

(4) Adjust the equipment so that the SNR specified in Table 8.3.3.5-1 is achieved at the BS input during the ACK transmissions on the wanted signal.

Performance Requirement

8.3.3 ACK missed detection for multi user PUCCH format 1a

(5) The signal generator sends a test pattern with the pattern outlined in figure 8.3.3.4.2-1. This statement is valid for all signals, i.e. wanted and all interferers. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs on the wanted PUCCH signal.



(3GPP TS36.141)

Test Requirement

The fraction of falsely detected ACKs on the wanted signal shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in Table 8.3.3.5-1.

Table 8.3.3.5-1 Required SNR for multi user PUCCH demodulation tests

Number of RX antennas	Cyclic Prefix	Propagation Conditions (Annex B)	Channel Bandwidth / SNR [dB]					
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
2	Normal	ETU 70	-3.5	-3.8	-3.8	-4.0	-4.0	-3.8

(3GPP TS36.141)

Performance Requirement

8.4.1 PRACH false alarm probability and missed detection

Procedure

(1) Adjust the AWGN generator, according to the channel bandwidth, defined in table

Channel bandwidth [MHz]	AWGN power level
1.4	-89.7 dBm / 1.08MHz
3	-85.7 dBm / 2.7MHz
5	-83.5 dBm / 4.5MHz
10	-80.5 dBm / 9MHz
15	-78.7 dBm / 13.5MHz
20	-77.4 dBm / 18MHz

(3GPP TS36.141)

(2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in Annex A.

(3) The multipath fading emulators shall be configured according to the corresponding channel model defined in Annex B.

(4) Adjust the frequency offset of the test signal according to Table 8.4.1.5-1 or 8.4.1.5-2.

(5) Adjust the equipment so that the SNR specified in Table 8.4.1.5-1 or 8.4.1.5-2 is achieved at the BS input during the PRACH preambles.

(6) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated as illustrated in figure. The preambles are sent with certain timing offsets as described below. The following statistics are kept: the number of preambles detected in the idle period and the number of missed preambles.

NOTE: HARQ cannot be resent.

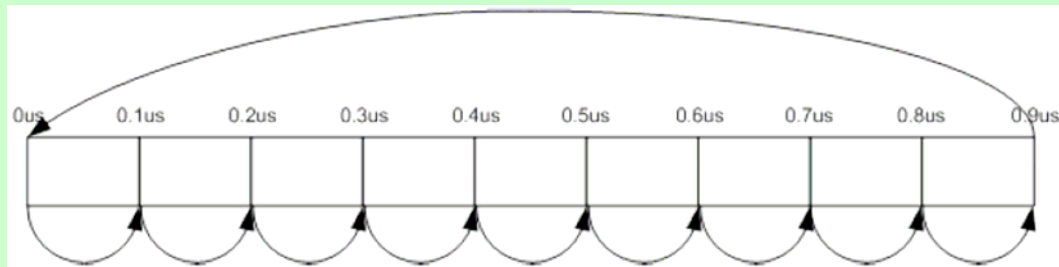
Performance Requirement

8.4.1 PRACH false alarm probability and missed detection



(3GPP TS36.141)

The timing offset base value is set to 50% of N_{cs} . This offset is increased within the loop, by adding in each step a value of $0.1\mu s$, until the end of the tested range, which is $0.9\mu s$. Then the loop is being reset and the timing offset is set again to 50% of N_{cs} . The timing offset scheme is presented in Figure



(3GPP TS36.141)

Performance Requirement

8.4.1 PRACH false alarm probability and missed detection

Test Requirement

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in Table 8.4.1.5-1 and 8.4.1.5-2.

Table 8.4.1.5-1 PRACH missed detection test requirements for Normal Mode

Number of RX antennas	Propagation conditions (Annex B)	Frequency offset	SNR [dB]				
			Burst format 0	Burst format 1	Burst format 2	Burst format 3	Burst format 4
2	AWGN	0	-13.9	-13.9	-16.1	-16.2	-6.9
	ETU 70	270 Hz	-7.4	-7.2	-9.4	-9.5	0.5
4	AWGN	0	-16.6	-16.4	-18.7	-18.5	-9.5
	ETU 70	270 Hz	-11.5	-11.1	-13.5	-13.3	-4.5

(3GPP TS36.141)

Table 8.4.1.5-2 PRACH missed detection test requirements for High speed Mode

Number of RX antennas	Propagation conditions (Annex B)	Frequency offset	SNR [dB]			
			Burst format 0	Burst format 1	Burst format 2	Burst format 3
2	AWGN	0	-13.8	-13.9	-16.0	-16.3
	ETU 70	270 Hz	-6.8	-6.7	-8.7	-8.9
	AWGN	625 Hz	-12.1	-12.0	-14.1	-14.1
	AWGN	1340 Hz	-13.1	-13.2	-15.2	-15.4
4	AWGN	0	-16.6	-16.3	-18.6	-18.5
	ETU 70	270 Hz	-11.2	-10.8	-13.1	-13.1
	AWGN	625 Hz	-14.6	-14.3	-16.5	-16.5
	AWGN	1340 Hz	-15.6	-15.2	-17.5	-17.5

(3GPP TS36.141)

Performance Requirement

Appendix

Performance Requirement

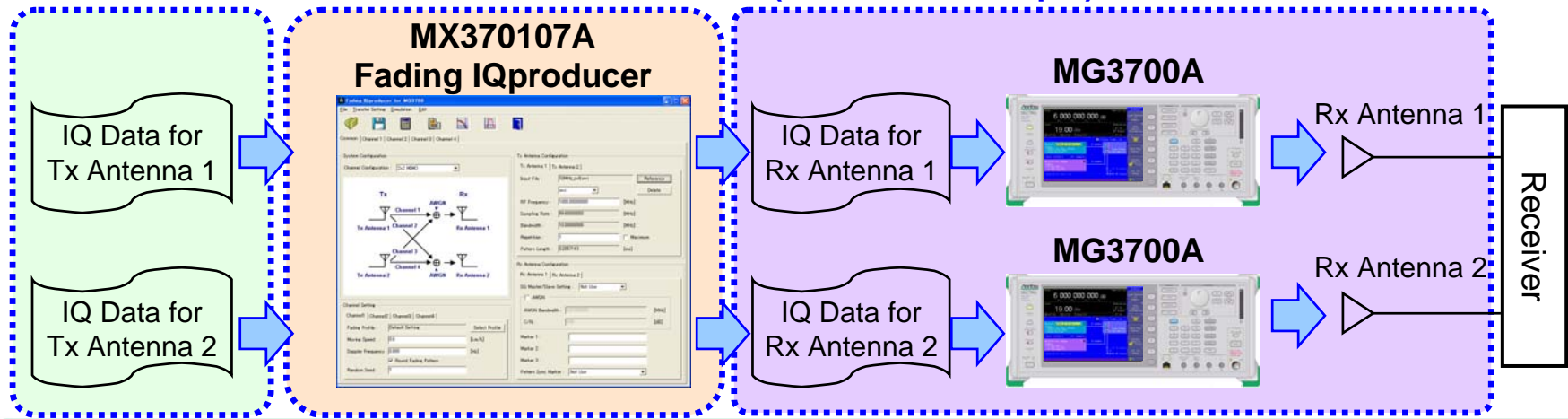
Product Positioning

- What is Fading IQproducer?

Basic information



Evaluation of Fading Environment using MG3700A (2x2 MIMO Example)

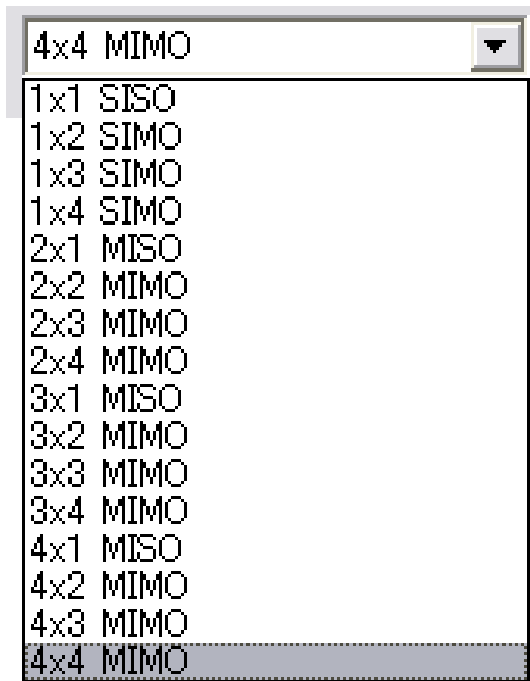


Slide 26

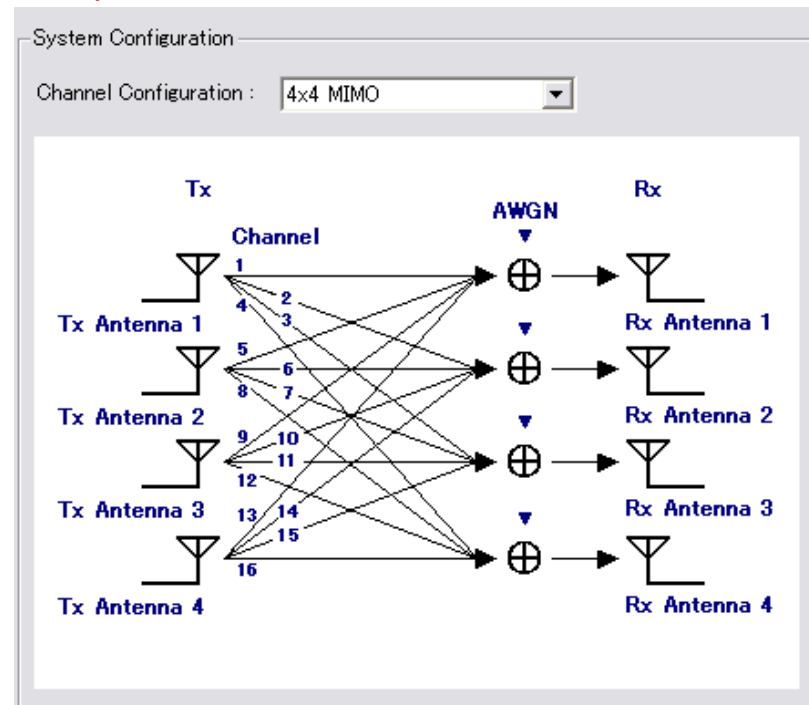
Performance Requirement

Product Positioning

- MIMO channels:
1x1, 1x2, 1x3, 1x4, 2x1, 2x2, 2x3, 2x4, 3x1, 3x2, 3x3, 3x4,
4x1, 4x2, 4x3, 4x4



Sample: 4x4 MIMO

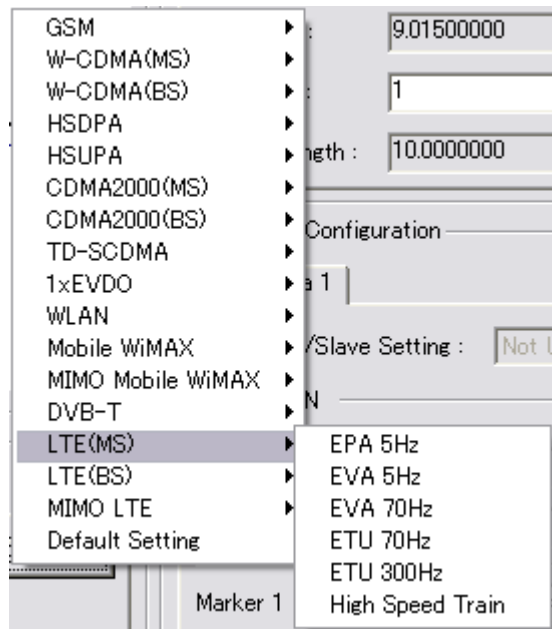


Performance Requirement

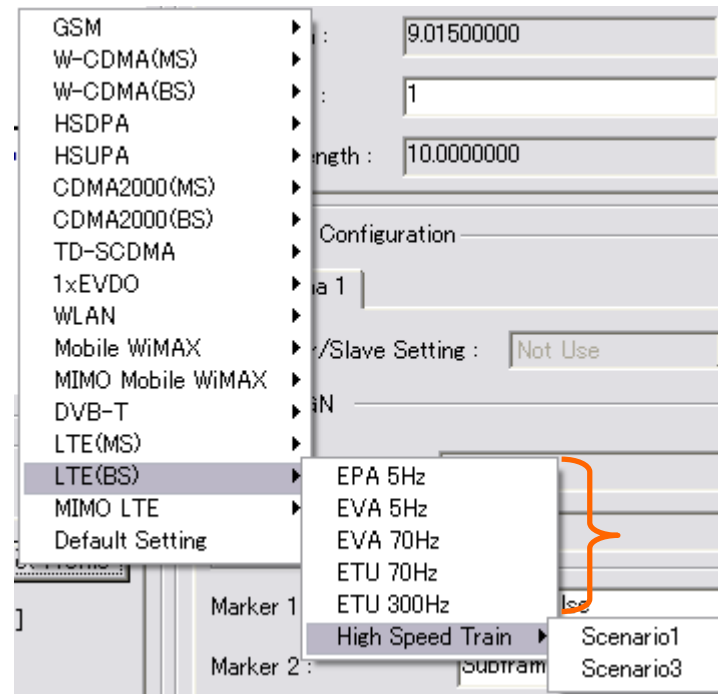
Product Positioning

- LTE Profiles(1/2)

LTE (MS)



LTE (BS)

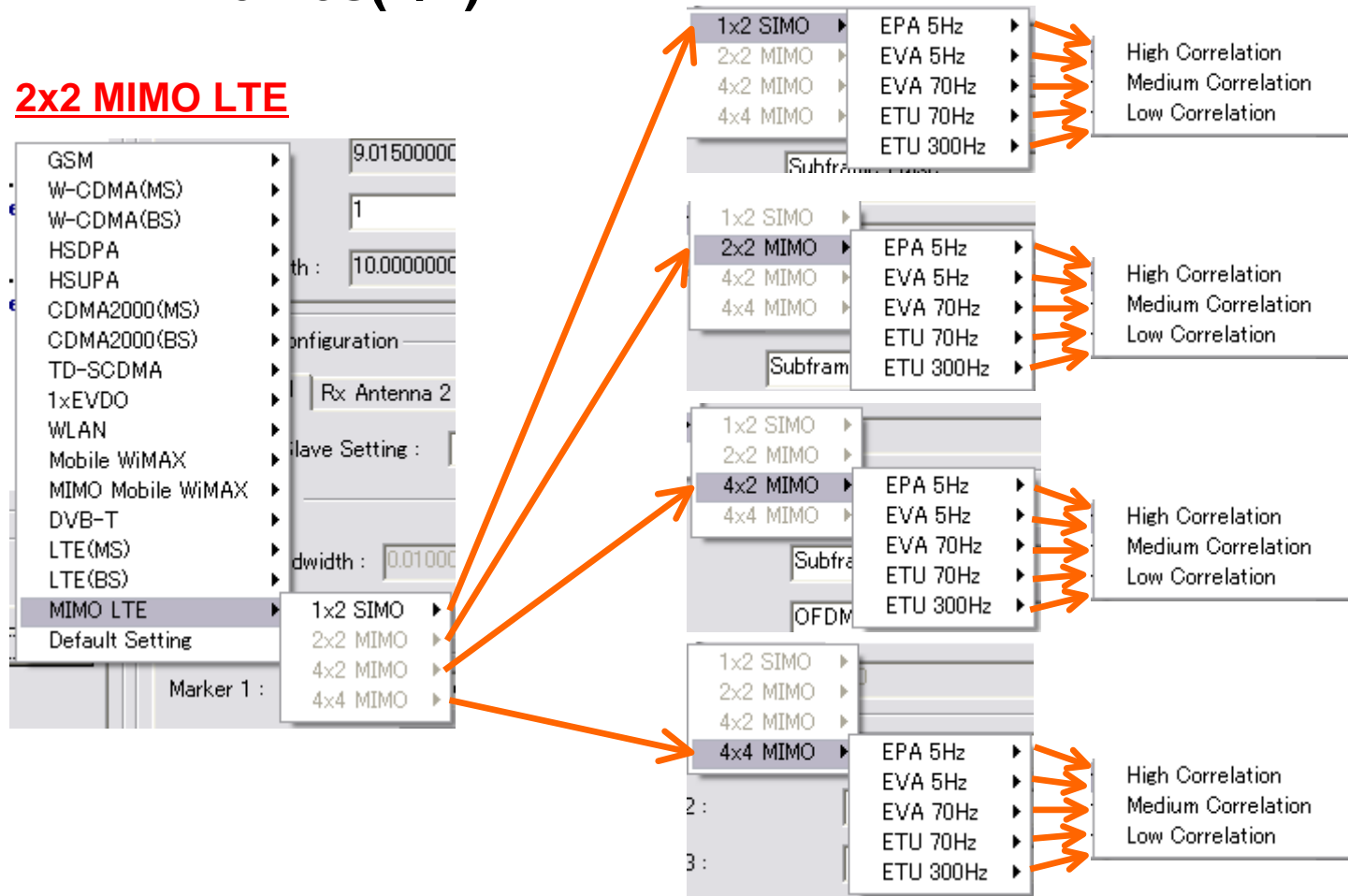


Performance Requirement

Product Positioning

- LTE Profiles(2/2)

2x2 MIMO LTE



Note

Anritsu Corporation

5-1-1 Onna, Atsugi-shi, Kanagawa, 243-8555 Japan
Phone: +81-46-223-1111
Fax: +81-46-296-1238

• U.S.A.

Anritsu Company

1155 East Collins Blvd., Suite 100, Richardson,
TX 75081, U.S.A.
Toll Free: 1-800-267-4878
Phone: +1-972-644-1777
Fax: +1-972-671-1877

• Canada

Anritsu Electronics Ltd.

700 Silver Seven Road, Suite 120, Kanata,
Ontario K2V 1C3, Canada
Phone: +1-613-591-2003
Fax: +1-613-591-1006

• Brazil

Anritsu Eletrônica Ltda.

Praça Amadeu Amaral, 27 - 1 Andar
01327-010 - Bela Vista - São Paulo - SP - Brasil
Phone: +55-11-3283-2511
Fax: +55-11-3288-6940

• Mexico

Anritsu Company, S.A. de C.V.

Av. Ejército Nacional No. 579 Piso 9, Col. Granada
11520 México, D.F., México
Phone: +52-55-1101-2370
Fax: +52-55-5254-3147

• U.K.

Anritsu EMEA Ltd.

200 Capability Green, Luton, Bedfordshire, LU1 3LU, U.K.
Phone: +44-1582-433200
Fax: +44-1582-731303

• France

Anritsu S.A.

12 avenue du Québec, Bâtiment Iris 1- Silic 638,
91140 VILLEBON SUR YVETTE, France
Phone: +33-1-60-92-15-50
Fax: +33-1-64-46-10-65

• Germany

Anritsu GmbH

Nemetschek Haus, Konrad-Zuse-Platz 1
81829 München, Germany
Phone: +49-89-442308-0
Fax: +49-89-442308-55

• Italy

Anritsu S.p.A.

Via Elio Vittorini 129, 00144 Roma, Italy
Phone: +39-6-509-9711
Fax: +39-6-502-2425

• Sweden

Anritsu AB

Borgafjordsgatan 13, 164 40 KISTA, Sweden
Phone: +46-8-534-707-00
Fax: +46-8-534-707-30

• Finland

Anritsu AB

Teknobulevardi 3-5, FI-01530 VANTAA, Finland
Phone: +358-20-741-8100
Fax: +358-20-741-8111

• Denmark

Anritsu A/S (Service Assurance)

Anritsu AB (Test & Measurement)
Kirkebjerg Allé 90, DK-2605 Brøndby, Denmark
Phone: +45-7211-2200
Fax: +45-7211-2210

• Russia

Anritsu EMEA Ltd.

Representation Office in Russia

Tverskaya str. 16/2, bld. 1, 7th floor.
Russia, 125009, Moscow
Phone: +7-495-363-1694
Fax: +7-495-935-8962

• United Arab Emirates

Anritsu EMEA Ltd.

Dubai Liaison Office

P O Box 500413 - Dubai Internet City
Al Thuraya Building, Tower 1, Suit 701, 7th Floor
Dubai, United Arab Emirates
Phone: +971-4-3670352
Fax: +971-4-3688460

• Singapore

Anritsu Pte. Ltd.

60 Alexandra Terrace, #02-08, The Comtech (Lobby A)
Singapore 118502
Phone: +65-6282-2400
Fax: +65-6282-2533

• India

Anritsu Pte. Ltd.

India Branch Office

3rd Floor, Shri Lakshminarayan Niwas, #2726, 80 ft Road,
HAL 3rd Stage, Bangalore - 560 075, India
Phone: +91-80-4058-1300
Fax: +91-80-4058-1301

• P.R. China (Hong Kong)

Anritsu Company Ltd.

Units 4 & 5, 28th Floor, Greenfield Tower, Concordia Plaza,
No. 1 Science Museum Road, Tsim Sha Tsui East,
Kowloon, Hong Kong
Phone: +852-2301-4980
Fax: +852-2301-3545

• P.R. China (Beijing)

Anritsu Company Ltd.

Beijing Representative Office

Room 2008, Beijing Fortune Building,
No. 5, Dong-San-Huan Bei Road,
Chao-Yang District, Beijing 100004, P.R. China
Phone: +86-10-6590-9230
Fax: +86-10-6590-9235

• Korea

Anritsu Corporation, Ltd.

8F Hyunjuk Building, 832-41, Yeoksam Dong,
Kangnam-ku, Seoul, 135-080, Korea
Phone: +82-2-553-6603
Fax: +82-2-553-6604

• Australia

Anritsu Pty. Ltd.

Unit 21/270 Ferntree Gully Road, Notting Hill,
Victoria 3168, Australia
Phone: +61-3-9558-8177
Fax: +61-3-9558-8255

• Taiwan

Anritsu Company Inc.

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan
Phone: +886-2-8751-1816
Fax: +886-2-8751-1817

Please Contact:

