

CMA 5000

Optical Transport Analysis Application Jitter and Wander Option



The compact size of the OTA Application module with its jitter and wander option, conveniently fits into the CMA 5000 Multi-Layer Network Test Platform using a small bay adapter - thus reducing cost and overall weight.



Key Features

- Ideal tool for jitter and wander analysis in a field environment
- Intuitive graphical user interface. Never have jitter and wander tests been so easy to set up and interpret
- Jitter generation and measurement at all interface rates from 1.5 Mbit/s to 2.5 Gbit/s

Modern networks need to be fine-tuned to the highest possible level to maintain the best quality of service. Synchronization problems, jitter and wander are very real potential threats for network operators and must be thoroughly evaluated and assessed during installation, commissioning and operation.

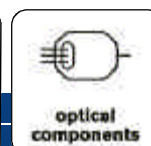
The CMA 5000 Multi-Layer Network Platform enables you to identify potential sources of trouble quickly and easily using the Jitter and Wander option for our Optical Transport Analysis (OTA) Application.

The ability to accurately measure network elements intrinsic jitter, as well as de-mapping and pointer adjustment induced jitter on tributaries, is a key feature of this option that will allow you

to securely assess the compliance of your synchronous network with international standards. Jitter tolerance and transfer test results are readily displayed and compared with industry standard pass/fail masks.

This option's testing and measuring capabilities cover the whole spectrum of applications from asynchronous tributaries 1.5, 2, 34, 45 and 140 Mbit/s up to synchronous rates 52, 155, 622 Mbit/s and 2.5 Gbit/s.

With jitter and wander analysis specifications well over ITU-T 0.172 standard on tester requirements, our module guarantees you can safely maximize network QoS and save precious time pinpointing any causes of trouble.



Interfaces and Signal Specifications¹

Key Features

- The characteristics of jitter measurements meet or exceed the requirements of ITU-T 0.171 & 0.172 and Telcordia GR.253 standards
- Easily upgradable option for OTA Module

Jitter/Wander Generation and Analysis Interfaces				OTA Modules	
Interfaces	SONET/DSn	SDH/PDH	Rate (Mb/s)	OTA 622	OTA 2.5G
Optical 1550 nm & 1310 nm ²	OC-48	STM16	2488.320	—	✓
	OC-12	STM4	622.080	✓	✓
	OC-3	STM1	155.520	✓	✓
Electrical ³	STS-3	STM1e	155.520	✓	✓
	STS-1	—	51.840	✓	✓
	—	E4	139.264	✓	✓
	—	E3	34.368	✓	✓
	—	E1	2.048	✓	✓
	DS3	—	44.736	✓	✓
	DS1	—	1.544	✓	✓

Jitter Generation

Jitter Generation Characteristics	
Tx Signals	Sinusoidal jitter generation at all bit rates included in the OTA module configuration
Amplitude Range	Up to 240 000 UI ⁴
Frequency Range	0.1 Hz to 20 MHz ⁴
Frequency Shift	Programmable frequency offset -100 ppm to +100 ppm in 1 ppm steps For PDH/T-Carrier and SONET/SDH

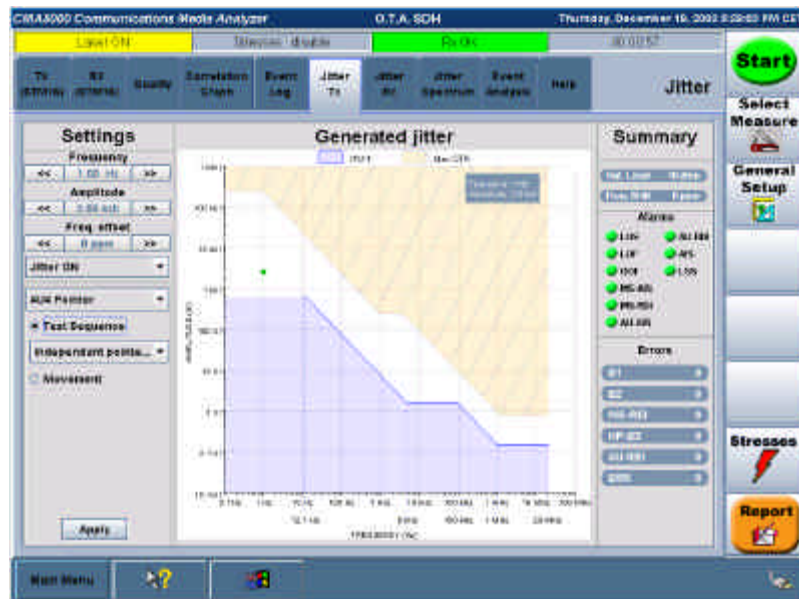
Notes:

¹ All the general specifications of the OTA modules are described in the CMA 5000 Optical Transport Analysis Application datasheet

² SC/PC connectors

³ BNC 75 Ohms connectors (except for DS1 Bantam 100 Ohms)

⁴ Depending on the OTA module configuration

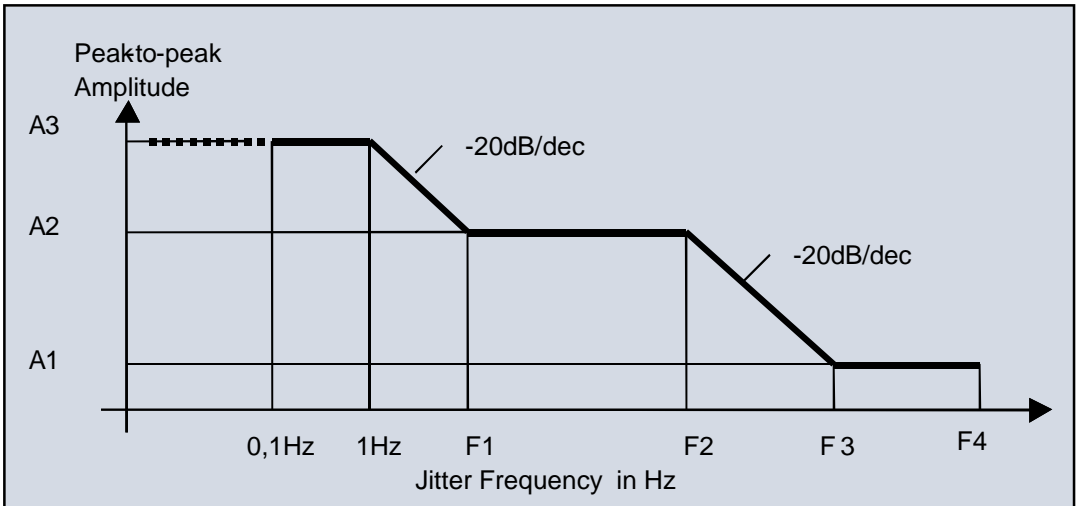


Graphical display of the generated jitter (frequency and amplitude) compared to the recommended maximum tolerance jitter mask of the equipment under test

SONET/SDH Jitter Generation Characteristics							
Interfaces	Amplitude(UI)			Frequency (KHz)			
	A3	A2	A1	F1	F2	F3	F4
OC-48/ STM16	240000	240	0.75	1	4	1.300	20000
OC-12/ STM4	60000	60	0.75	1	16	1.300	5000
OC-3/ STM1	15000	15	0.75	1	65	1.300	— ¹

Key Features

- Built-in maximum tolerable jitter masks
- Extended frequency range for jitter (starting from 0.1 Hz)



Notes:

¹ Not defined

Jitter frequency and amplitude can be programmed within the range specified above

PDH/T-Carrier Jitter Generation Characteristics							
Interfaces	Amplitude(UI)			Frequency (Hz)			
	A3	A2	A1	F1	F2	F3	F4
STS-3/ STM1e	15000	150	0.75	100	500	100K	1300K
STS1	5200	52	1	100	10000	520K	1000K
E4	15000	150	0.75	100	500	100K	3500K
E3	3500	35	1	100	10000	350K	800K
E1	200	20	1	10	1000	20K	100K
DS3	4500	45	1	100	10000	450K	800K
DS1	160	16	1	10	1000	16K	100K

Jitter Measurement

Key Features

- Simultaneous analysis of jitter peak +, peak -, peak to peak and RMS in each measurement band
- Graphical presentation of jitter amplitude results versus time
- Professional reports

Notes

¹ RMS: Root Mean Square

² At 20 dB/dec

Jitter Analyzer Characteristics	
Rx Signals	Jitter measurement at all bit rates included in the OTA module configuration Signal Qualification ensures that the incoming signal is in acceptable operating range before starting a jitter measurement, by checking: <ul style="list-style-type: none"> • Optical/electrical power • Frequency shift (up to 100 ppm)
Alarms and Errors Analysis	Alarms and errors are analyzed in real time during the jitter measurement: <ul style="list-style-type: none"> • SDH alarm events: LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, HP-RDI, TU-AIS, LP-RDI, AIS, LSS, HITS • SONET alarm events: LOS, LOF, OOF, AIS-L, RDI-L, AIS-P, RDI-P, AIS-V, RDI-V, AIS, LSS, HITS • SDH error events: B1, B2, MS-REI, B3, V5, HP-REI, LP-REI, LSS • SONET error events: B1, B2, REI-L, REI-P, V5, REI-V, LSS
Optical Sensitivity	The optical input power must be in the range of -8 to -13 dBm for accurate measurement
Measurement Ranges	Amplitude: <ul style="list-style-type: none"> • Peak to Peak: 0 to 128 UI p-p • RMS¹: 0 to 64 UI rms Maximum resolution: <ul style="list-style-type: none"> • Peak to Peak: 0.001 UI p-p • RMS¹: 0.001 UI rms
Built-in Filters	Range from 10 Hz to 20 MHz <ul style="list-style-type: none"> • High-Pass filters at 20 dB/dec for HP1, HP2 and HPrms • Low pass filters at 60 dB/dec for LP
Amplitude Results	<ul style="list-style-type: none"> • Positive Peak, Negative Peak, Peak to Peak, RMS¹ • Current and maximum values are displayed in numerical or graphical form

Jitter Measurement Filters Characteristics				
Interfaces	HP1 Hz (20dB/dec)	HP2 KHz (20dB/dec)	LP KHz (60dB/dec)	HPrms KHz (20dB/dec)
OC-48/STM16	5000	1000	20000	12
OC-12/STM4	1000	250	5000	12
OC-3/STM1	500	65	1300	12
STS-3/STM1e	500	65	1300	12
STS-1	100	20	400 ²	12
E4	200	10	3500	12
E3	100	10	800	12
E1	20	HighQ/0.7 LowQ/18	100	12
DS3	10	30	400 ²	12
DS1	10	8	40 ²	12

Filters with frequency break points

Jitter Hits	
The jitter measurement counts the number of seconds with hits (jitter exceeding a user specified threshold)	
Results	'Hit second' count is displayed numerically Each second with a jitter hit is recorded in the 'Event Log' file

Jitter Tolerance	
An optimized algorithm increases jitter amplitude until occurrence of an error in the received signal. A fast tolerance mode is also available. It allows a more rapid assessment of the jitter performance of the system under test.	
User Selectable Mask	The jitter Tolerance measurement is automatically performed and compared with predefined standard masks: <ul style="list-style-type: none"> • PDH: ITU-T G.823 low and high Q masks • T-Carrier: ITU-T G.824 and Telcordia GR.499 masks, category 1 and 2 • SDH: ITU-T G.825 masks • SONET: Telcordia GR.253 masks Independent transmit and receive tributaries can be selected
Results	The results are displayed in a graph with masks or a table with a clear PASS/FAIL message

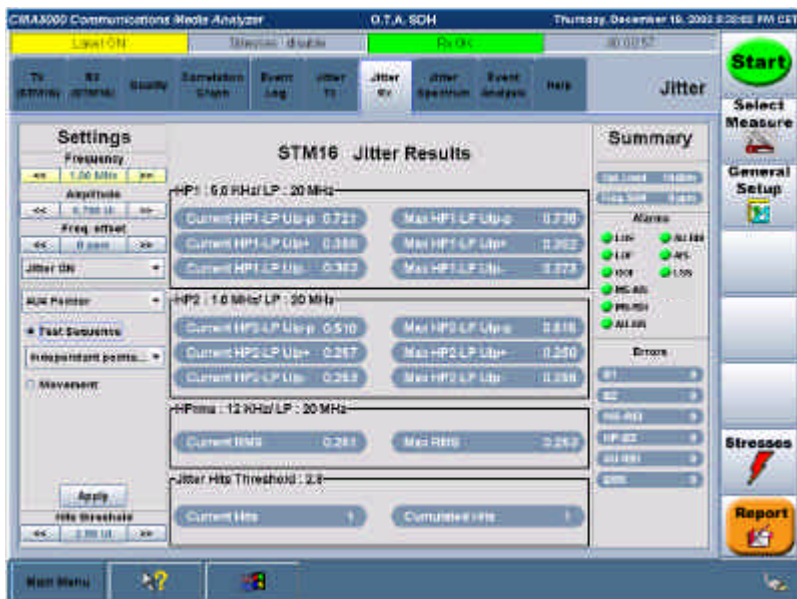
Key Features

- Automatic jitter tolerance and transfer function measurements
- Graphical results are displayed according to ITU-T / Telcordia templates
- User programmable or ITU-T G.783 pointer movement sequences to analyse pointer and mapping jitter
- Quick appraisal of jitter spectral content

Jitter Transfer	
Jitter Transfer measurement defines the ratio between the output jitter amplitude and the input jitter amplitude versus the jitter frequency for a given bit rate	
Jitter Transfer Pass Masks	Jitter Transfer measurement is automatically performed and compared with ITU-T G.741, G.742, G.783 and Telcordia GR.253, GR.499 specifications
Frequency	Up to 20 MHz
Results	The results are displayed in tabular format or plotted on a graph showing the gain versus frequency. The pass mask is displayed on the graph as well as the results

Jitter Pointer Analysis	
Compliance with recommendation ITU-T G.783. Pointer sequences are programmable	
Results	The unit generates pointer sequences and simultaneously analyzes the output jitter of the device under test. Results are displayed in a numerical or graphical form

Jitter Spectrum Measurement	
The instrument shows every second the spectral content of the detected jitter in the measurement bandwidth. The dynamic range is at least 40dB and the scale of the display is log-log.	



All errors, alarms and jitter information are presented simultaneously on one easy to read display

Wander Generation

Key Features

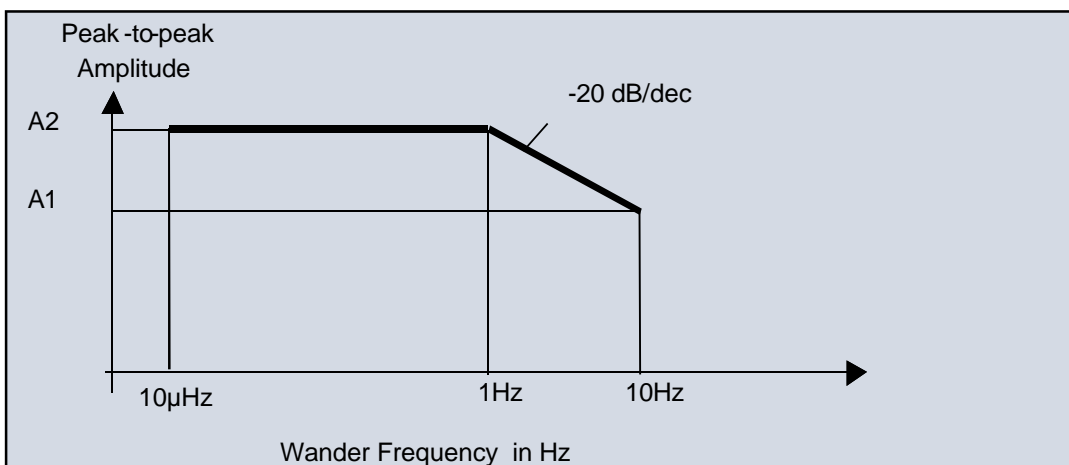
- Built-in wander masks
- Wander generation at all implemented bit rates

Wander Generation Characteristics	
Tx Signals	Sinusoidal wander generation at all bit rates included in the OTA module configuration
Amplitude Range	Up to 100 μ s ¹
Frequency Range	10 μ Hz to 10Hz ¹
Frequency Shift	Programmable frequency offset (only with internal clock reference) -100 ppm to +100 ppm in 1 ppm steps For PDH/T-Carrier and SONET/SDH

SONET/T-Carrier Wander Generation Characteristics			
Interfaces	Bit Rate Mbit/s	A2 in UI From 10 μ Hz to 1Hz	A1 in UI at 10Hz
OC-48	2488.320	240 000	24 000
OC-12	622.080	60 000	6000
OC-3	155.520	15 000	1500
STS-3	155.520	15 000	1500
STS-1	51.840	5200	520
DS3	44.736	4500	450
DS1	1.544	160	16

Note:

¹ Depending on the OTA module configuration



Wander amplitude mask for SONET/SDH

SDH/PDH Wander Generation Characteristics			
Interfaces	Bit Rate Mbit/s	A2 in UI From 10 μ Hz to 1Hz	A1 in UI at 10Hz
STM16	2488.320	240 000	24 000
STM4	622.080	60 000	6000
STM1	155.520	15 000	1500
STM1e	155.520	15 000	1500
E4	139.264	15 000	1500
E3	34.368	3500	350
E1	2.048	200	20

Wander Measurement

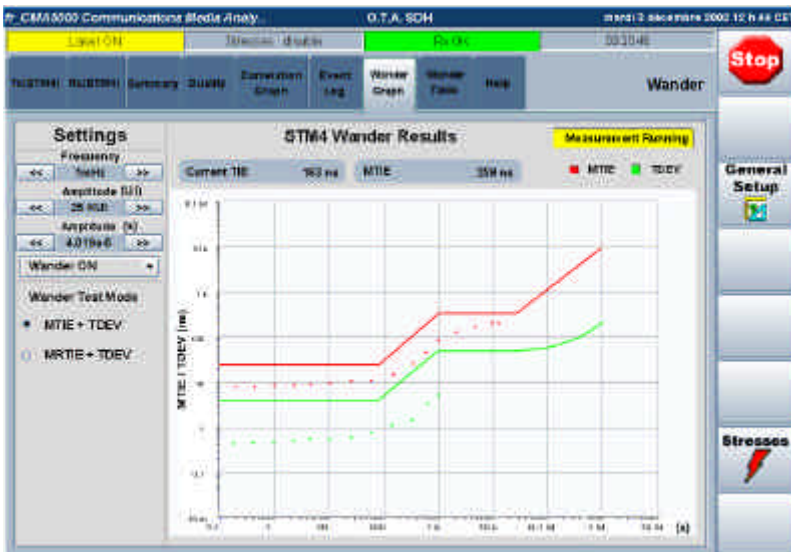
Wander Analyzer Characteristics	
Rx Signals	Wander measurement at all bit rates in SONET/SDH included in the OTA module configuration Signal Qualification ensures that the incoming signal is in acceptable operating range before starting a wander measurement, by checking: <ul style="list-style-type: none"> • Optical/electrical power • Frequency shift (up to 100 ppm)
Alarms and Errors Analysis	Alarms and errors are analyzed in real time during the jitter measurement <ul style="list-style-type: none"> • SDH alarm events: LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, HP-RDI, TU-AIS, LP-RDI, AIS, LSS • SONET alarm events: LOS, LOF, OOF, AIS-L, RDI-L, AIS-P, RDI-P, AIS-V, RDI-V, AIS, LSS • SDH error events: B1, B2, MS-REI, B3, V5, HP-REI, LP-REI, LSS • SONET error events: B1, B2, REI-L, REI-P, V5, REI-V, LSS
TIE (Time Interval Error)	Sample rate up to 100/s Low pass filter at 10 Hz
MTIE (Maximum Time Interval Error)	Measurement range: from 1µs up to 1s Resolution: 1 ns
MRTIE (Maximum Relative Time Interval Error)	If the reference clock is unavailable when analysing wander signals, the MTIE analysis may have a superimposed frequency offset. This offset is removed in MRTIE analysis.
TDEV (Time DEVIation)	Measurement range: 10 ⁵ ns Resolution: 0.1 ns
Reference Clock Signal	<ul style="list-style-type: none"> • External: for wander analysis with OTA modules, it is recommended to provide a reference clock with very high accuracy ^{1&2} • Internal frequency: stratum 3 (10MHz)
Results	TIE, MTIE, MRTIE, TDEV are displayed in a graphical and tabular result presentation Calculation of MTIE and TDEV are in real time Frequency offset is displayed Graphical mode is user adjustable with cursor and zoom In/Out

Key Features

- Built-in calculation and presentation of the MTIE, TDEV and MRTIE wander performance parameters
- Internal stratum 3 clock used when no external reference available

Note:

- ¹ No external reference clock source is required for jitter measurement
- ² External 2 MHz - 75 Ohms BNC connector
External 1.5 MHz - 100 Ohms Bantam connector



Real-time graphical presentation of MTIE/TDEV results

Ordering Information

Key Features

- Future-proof solution with a complete list of
 - module upgrades and
 - module options
 to adapt to your evolving network requirements (contact your NetTest Representative for details)

Notes:

¹ Must be ordered with the 5625-000-OTA

² Must be ordered with the 5622-000-OTA

Each module is shipped with:

- One optical patchcord with SC/PC connectors
- One BNC 75 Ohms cable
- One optical fix 10 dB attenuator SC/PC connectors

General Information

- CMA 5000 platform information is detailed in the CMA 5000 platform specifications sheet
- OTA module information is detailed in the Optical Transport Analysis (OTA) Application
- Warranty option: 1 year standard
- Calibration cycle: 2 years

CMA 5000 OTA 2.5G Module

Order Number	Description
5625-000-OTA	CMA 5000 OTA 2.5G module Test module for T-Carriers/PDH and SONET/SDH technologies up to 2.5 Gbit/s It provides: <ul style="list-style-type: none"> • Optical interfaces at 1310 nm and 1550 nm for OC-3/12/48 and STM1/4/16 • Electrical interfaces for DS1, DS3, STS1, STS3 and E1, E3, E4, STM1
5625-100-OTA	Concatenation software for OTA 2.5G module
5625-300-OTA	Option Jitter and Wander full package Tx (generation) & Rx (analysis) Jitter and Wander package up to 2.5 Gbit/s ¹
5625-350-OTA	Tx (generation) only Jitter package up to 2.5 Gbit/s ¹

CMA 5000 OTA 622 Module

Order Number	Description
5622-000-OTA	CMA 5000 OTA 622 module Test module for T-Carriers/PDH and SONET/SDH technologies up to 622 Mbit/s It provides: <ul style="list-style-type: none"> • Optical interfaces at 1310 nm and 1550 nm for OC-3/12 and STM1/4 • Electrical interfaces for DS1, DS3, STS1, STS3 and E1, E3, E4, STM1
5622-100-OTA	Concatenation software for OTA 622 module
5622-300-OTA	Option Jitter and Wander full package Tx (generation) & Rx (analysis) Jitter and Wander package up to 622 Mbit/s ²
5622-350-OTA	Tx (generation) only Jitter package up to 622 Mbit/s ²



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