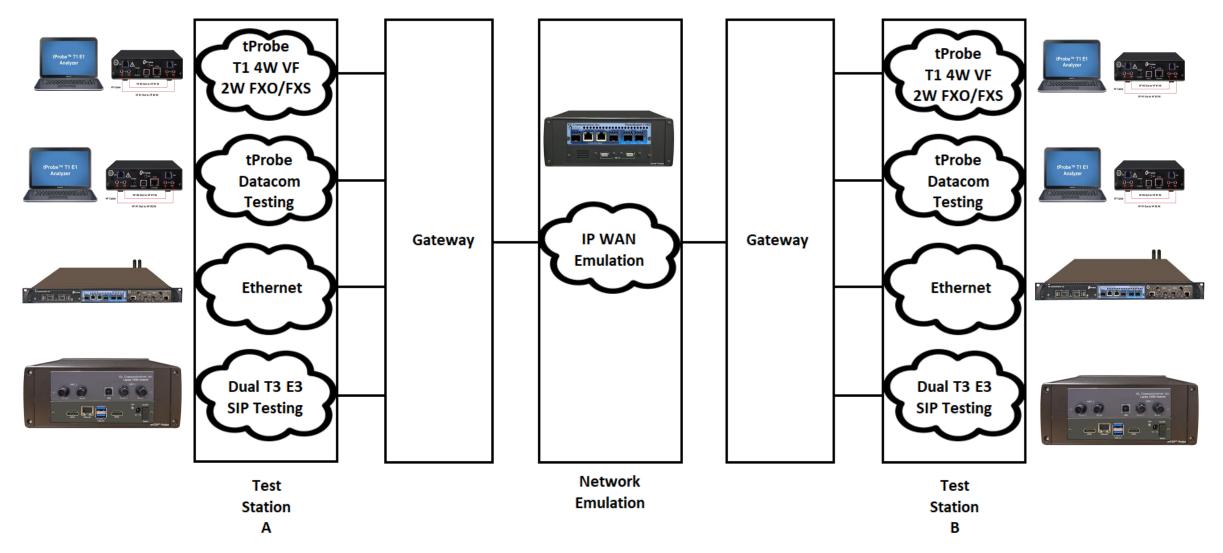
Voiceband Measurements Using 4-Wire VF and 2-Wire FXO FXS Interfaces for VG3 and VG6

GL Communications Inc.

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Overall Scope of FENS Testing





Connecting 4-Wire VF Ports on tProbe™ in Self Test

- The test procedure requires tProbe™ T1 Analyzer and optional MAPS™ APS Emulator licenses
- tProbe T1 Analyzer should be installed on the system
- Cross-connect VF ports with VF audio cables as shown below for self test





Connecting 2-Wire FXO FXS Ports on tProbe™ in Self Test

- The test procedure requires tProbe™ T1 Analyzer and optional MAPS™ APS Emulator licenses
- tProbe T1 Analyzer should be installed on the system
- Cross-connect FXO FXS ports with RJ-45 cable as shown below for self test





Invoking tProbe[™] T1 Analyzer

Invoke tProbe T1 Analyzer from the shortcut icon



created on the desktop or from the following path C:\Program Files\GL Communications Inc\tProbe T1 Analyzer\UsbNGT1.exe

💆 T1 tProbe Analyzer 6	54-bit								- 🗆 X
File Config View N	Aonitor Intrus	iveTest S	pecial Appl	cations Wi	ndow Help				
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x Port Framing □ 1 ESF (19) 2 ESF (19) <		oopback oopback		rminate rminate	Internal Internal	On On	Normal Normal	<- Double-click to change values	
									Card 1 💌
	T1/E1 Ala	rms							VF (Audio)
Reset	All Ports	#1	#2						– Tx (VF In)
Sync Loss Bipolar Violation	×	· · ·	X					www.gl.com	Gain(dB) 0.0 dB
Carrier Loss Frame Error	- X	÷.	<u>></u>	tI	Probe™	T1	Analyz	er	TS
Blue Alarm		`	`	1.000					
Yellow Alarm	Н	. H	 Image: A second s			-	Ornete		
AIS		 Image: A second s	 Image: A second s						
							(Januar)		□ Insert
I	T1/E1 Stati	stics				6 6 E 🗖			□ Speaker
Frequency (Hz)		1543999						the second s	· ·
Level (dBdsx)		0.115			OT	Francisco			- Rx (VF Out)
BPV Errors		0	0					enue - Third Floor	Gain(dB) 0.0 dB
CRC Errors		0	0	Course	nunications Inc.	Gaithers	burg, MD 2087	78, USA	0.0 08
Frame Errors		0	0	Comu	numeanons inc.				
Transmit Under Run		0	0	a second	Copyright @ 201	8 GL Comm	unications Inc. All	rights reserved.	TS T:
Receive Over Run		0	0						
==Bit/Frame Clock Slip==									
									🔽 Drop 📔 :
									🗖 Speaker
T	1/E1 Alarms	Logging		_					Set 0-dB
Ready									T1/E1 Sync Info
								I	



Invoking GL Server

Start GL Server

- Open the WCS Server: **Special** ٠ Applications → Windows Client Server (WCS) \rightarrow WCS Server
- WCS server allows automation of ٠ voiceband testing measurements

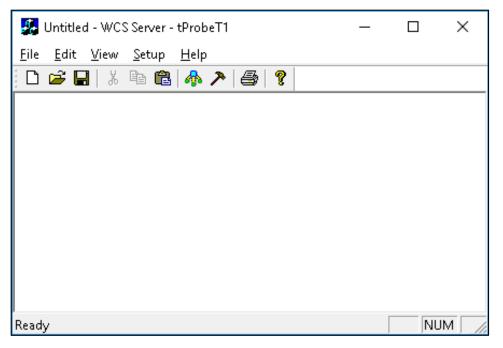
💆 T1 tProbe Analyzer 64						– 0 ×
File Config View M	Ionitor IntrusiveTest	Special Applications Window Help				
× Port Framing □ 1 ESF (193	Loopback	Protocol Analysis	>		Set all cards as selected	
1 ESF (193 2 ESF (193	E) No Loopbac E) No Loopbac		>	Normal Normal	<- Double-click to change values	
		Windows Client Server (WCS)	>	WCS Server		
		Record / Playback File	>	WCS Client		
		Synchronous Trunk Record/Playback		Dual VF Tx/Rx		
		Dial Digits	>			
		Call Capture & Analysis	>			Card 1 🗨
	T1/E1 Alarms	Physical Layer Testing	>			VF (Audio)
Reset	All Ports #1	Echo Test Solutions	>			- Tx (VF In) Gain(dB)
Sync Loss Bipolar Violation			>			0.0 dB
Carrier Loss	<u> </u>	Facility Data Link	>			тз + [:
Frame Error Blue Alarm	- <u> </u>	AudioBridge, StripChart	>			
Yellow Alarm						
AIS	• •	Voice Quality Assessment				
т.	1/E1 Statistics	Multiplex/Demultiplex				🗌 Insert 📔 :
		Recv Multiframe Streaming over UDP				🗖 Speaker
Frequency (Hz) Level (dBdsx)	15439	72 0.058				- Rx (VF Out)
BPV Errors		0 0				Gain(dB) 0.0 dB
CRC Errors Frame Errors						+
Transmit Under Run		0 0				TS 🕁
Receive Over Run ==Bit/Frame Clock Slip==		0 0				
						I Drop I :
						🗖 Speaker
T1/E	1 Alarms Logging	•				Set 0-dB
Alarm Logging C:\Prog		ations Inc\tProbe T1 /				VF imped./Mic⊣
						600 -
	Graph					
Online Graph Offline	e Graph					Drop&Insert TSs
Enable Event Graph						Enable Start Stop
Launch WCS Server						T1/E1 Sync Info



GL Server Settings

Start GL Server

- Listen Port = 17080 for T1 (17090 for E1)
- Messaging = Binary
- Version = 4
- Click OK to start GL server



Start GL Server	—		×				
Listen Port 17080 <default> Restore Default</default>		ОК					
 Server is Invisible Messaging Send / Receive Binary Messages Send / Receive ASCII Messages 							
Vers	ion						
C Send / Receive Vers	ion 3 Mes	sages					
 Send / Receive Version 	ion 4 Mes	sages					
🔽 Use These Settings u	intil Furthe	r Notice					
🔽 Start Server Automati	cally At Ar	halyzer Sta	rt-Up				

Communications

Invoke MAPS[™] APS Emulator (Client)

- From the tProbe T1 Analyzer, select ٠ Special Applications \rightarrow Protocol **Emulation** \rightarrow **MAPS APS Emulator** to invoke MAPS APS Emulator (client)
- This client passes commands to the ٠ WCS server

2 Ti tProbe Analyzer 64-bit		cial Amplications Mindow, Holp				_	0)	×
File Config View Monif × Port Framing □ 1 ESF (193E) 2 ESF (193E) < <th>tor IntrusiveTest Sp Loopback No Loopbac No Loopbac T1/E1 Alarms All Ports #1</th> <th>ecial Applications Window Help Protocol Analysis Protocol Emulation Windows Client Server (WCS) Record / Playback File Synchronous Trunk Record/Playback Dial Digits Call Capture & Analysis Physical Layer Testing Echo Test Solutions MCBERT, HDLC, TRAU Facility Data Link</th> <th>> } > k > ></th> <th>Cross-port MAPS - ISDN MAPS - SS7 MAPS - SS7/ISUP MAPS GSM Abis In MAPS GSM A Inte MAPS - MAP Emu MAPS - MAP Emu MAPS - CAS Emul MAPS - CAS CLI S MAPS - CAP Emu MAPS - FXOFXS E</th> <th>erface Emulator ulator onformance lator Server lator</th> <th></th> <th>Card 1 VF (Audio) Tx (VF In) Gain(d 0.0 dB TS TS 0 </th> <th><u> </u></th>	tor IntrusiveTest Sp Loopback No Loopbac No Loopbac T1/E1 Alarms All Ports #1	ecial Applications Window Help Protocol Analysis Protocol Emulation Windows Client Server (WCS) Record / Playback File Synchronous Trunk Record/Playback Dial Digits Call Capture & Analysis Physical Layer Testing Echo Test Solutions MCBERT, HDLC, TRAU Facility Data Link	> } > k > > > > > > > > > > > > > > > > >	Cross-port MAPS - ISDN MAPS - SS7 MAPS - SS7/ISUP MAPS GSM Abis In MAPS GSM A Inte MAPS - MAP Emu MAPS - MAP Emu MAPS - CAS Emul MAPS - CAS CLI S MAPS - CAP Emu MAPS - FXOFXS E	erface Emulator ulator onformance lator Server lator		Card 1 VF (Audio) Tx (VF In) Gain(d 0.0 dB TS TS 0 	<u> </u>
	1/E1 Statistics 154399 0.34 0 0 0 0	AudioBridge, StripChart Voice Quality Assessment Multiplex/Demultiplex Recv Multiframe Streaming over UD U 0 0	p	MAPS - INAP Emu MAPS - ISDN Con MAPS - APS Emul MAPS - GPRSGB II MLPPP Emulator CAS Emulator ISDN Emulator SS1 Dialer MFR Emulator	ulator formance Emulator		□ Insert □ Speaker -Rx (VF Out)- Gain(d 0.0 dB + TS □ ↓ V Drop □ Speaker	HB)
T1/E Alarm Logging C:\Program Online Graph Offline Graph Enable Event Graph	Graph	Inc\tProbe T1 Analyzer\		IMA Emulator			Set 0-dB	▼ TSs pp



Procedure for 4-Wire VF Voiceband Measurement Test



Protocol Selection 4-Wire VF

- Protocol Selection window is prompted after invoking **MAPS™ APS Emulator**, select the following:
 - Protocol Standard APS
 - Protocol Version None
 - Node VF
- Click **OK** to continue

Protocol Selection	×
Protocol Standard	APS 💌
Protocol Version	None
Node	VF FX0 FXS VF E&M
Transport	- OK



Configure Testbed in MAPS™ APS Emulator

- By default, it will display Testbed Setup window
- Observe that default Testbed Setup is displayed.
 Verify the highlighted settings to get started with the testing
- Click on **Start** to start the Testbed setup

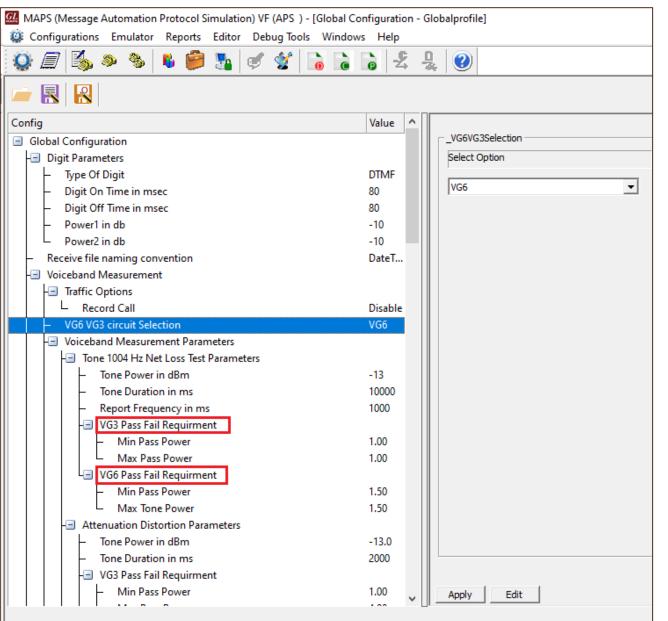
🔐 MAPS (Message Automation Protoc	ol Simulation) VF (APS	S) - [Testbed Setup - TestBedDefault]
🔝 Configurations Emulator Repo	rts Editor Debug To	ools Windows Help
🎯 🖉 🎼 🗣 🦠 🕒 🖡) 📰 🗹 🔮	
🗀 🔒 🛃 🔛		
Config	Value	🔽 Enable
Configurations		
GL Server Configuration		
- Interface	T1	
 WCS Listener Port 	17080	
Server IP Address	127.0.0.1	
- Port Configuration		
L T1E1 Port Configuration	2	
- T1E1 Port Configurati		
Port Number	1	
L T1E1 Port Configurati		
L Port Number	2	
- Database Connection Param		
 Enable Connect To Datab 	Enable	
 Database IP Address 	192.168.12.81	
 Database Port 	20019	
Database Probe Name	APS_248	
L End User Configurations	VF_Profiles.xml	

11



Procedure to Load and Configure the Global Profile

- Global Profiles is used to configure test parameters for all VF lines
- On the MAPS Client main GUI, select Configurations →
 Global Configuration
- Click on open icon and select GlobalProfile_VBM_FENS and click on OK
- In the Global configuration window, select the required test. Test parameters can be configured for all the tests
- VG6 or VG3 circuit can be selected. The selection will be applied for all the tests
- VG6 and VG3 Pass/Fail Requirement are configured in Global profiles for all the tests. User can edit the Pass/Fail criteria





Procedure to Load and Configure Global Profile (Contd.)

- Auto Measurement Test parameters allow users to automate voiceband measurement tests and select which test(s) to run. Call disconnects automatically upon completion
- After making changes to Global Profile, Click on Apply icon
- Close the Global Profile window

🔐 MAPS (Message Automation Protocol Simulatio	n) VF (APS) - [Global Configuration - Globalprofile]
Configurations Emulator Reports Editor	Debug Tools Windows Help
Q 🖉 🚳 💩 🦠 📔 🧕	🥩 🔮 🚡 🗟 🔓 🔽 💂 🞯
Config	Value ^
- Min Pass ower	1.00EnableAutoVBM
Max Pass Power	1.00 Select Option
VG6 Pass Fail Requirment	
 Min Pass Power 	0.00 False
Max Pass Power	1.50
 VQT Parameters 	
 Reference File 	C:\VQT_Reference\VQuad_Aut
 Degraded File Path 	C:\VQT_Degraded\1u\
 VQT Server IP Address 	127.0.0.1
One Way Delay Measurement	Enable
- Auto Measurement Test	
Enable Auto Measurement	False
 Disconnect Call on Test Completi 	Enable
 Tone 1004 Hz Net Loss 	Enable
 Attenuation Distortion 	Enable 504-2504 Hz
 Three Tone Slope 	Enable
 – CNN Test 	Enable
 Intermodulation Distortion 	Enable
 Group Delay 	Disable
 Phase Jitter 	Disable
 Impulse Noise 	Enable
 Signal to Noise Test 	Enable
	Enable
 Log Results 	Enable
Log Path	MAPS\APS\VF\Log\Voiceband
L VQT Parameters	
 VQT Database Path 	\\127.0.0.1\DataImport\VQT.mdb
L VQT Type	POLQA Apply Edit



Initialisat

Procedure to Start MAPS™ APS VF

- Click on **Start All** button to start both VF_Originating.gls and VF_Terminating.gls
- Observe that both the scripts are started (indicating Green color) and the VF_Originating status is displayed as "Select Voiceband Measurement Test"
- Now, user clicks on the required test button. For example, click on 'Impulse Noise' button to run the Impulse Noise test

	essage Automation Protocol Simulatio rations Emulator Reports Editor	그는 것 것 것 것		Default]						8 50	Close
Q	🐝 🧆 🗞 📕 🕌	I 🔮		, 🕐							Close
Ľ		8 क									
SrNo	Script Name	Profile	Call Info	Script Execution	Status		Events	Events Profile	Result	Total Iterations	Completed
1	VF_Originating.gls	Port01	1,1	Stop	Select Voiceband Measurement	Test	OutboundReleaseCall		Pass	1	
2	VF_Terminating.gls	Port02	2,1	Stop	Ready for Voiceband Measurer	ment	InboundReleaseCall		Pass	1	C
<											>
Add	Delete Insert Refresh Start	Start All	Stop 🔽 Stop All 🔽	Abort Abort All		1004 Hz Net Loss	I I NIN	IMD Group Delay	Phase Imp Jitter Noi		VQT



Procedure to Perform Voiceband Measurement Tests

- The VF_Originating.gls and VF_Terminating.gls will set up a call between Port01 and Port02
- VF_Originating.gls script has the options to perform various voiceband measurement tests
- Click on any of the voiceband measurement test buttons to start a test. Note the

VF_Originating.gls status indicates "Select Voiceband Measurement Test" and the VF_Terminating.gls status indicates "Ready for Voiceband Measurement"

 Voiceband Measurement tests can only be started from the VF_Originating.gls

MAPS (Message Automation Protocol Simulation) VF (APS) - [Call Generation -CallGeneration -CallGeneration -CallGeneration -CallGeneration -CallGeneration - CallGeneration - Ca	enDefault]				– 🗆 X
🐇 Configurations Emulator Reports Editor Debug Tools Windows Help					_ 8 ×
Q 🗐 🖄 » 🤏 🖡 🤗 🍇 🍼 🔮 🔓 🔓 😤 4	2 0 0				
Sr No Script Name Profile Call Info Script Execution	Status	Events	Events Result	Total Iterations	Completed Iterations
1 VF_Originating.gls Port01 Port01,1,1,1 Stop	Select Voiceband Measurement Test	OutboundReleaseCall	Pass	1	0
2 VF_Terminating.gls Port02 Port02,2,2,1 Stop	Ready for Voiceband Measurement	InboundReleaseCall	Pass	1	0
	1				
Add Delete Insert Refresh Start All Stop V Stop All V	Abort All	1004 Hz 3-Tone Net Loss Slope	SCNN IMD 23-To Tes		S/NR VQT
Save Column Width — Show Latest		Find			
MAPS DL		су :: 1153 Нz			
	15:40:47.015000 Power :	: -13.0 dBm			
	15:40:48.800000 Duratic	n :: 300 ms			
3-Tone Slope :: 404Hz @ Level ::-13.0 dBm	15:40:56.328000				
3-Tone Slope :: 1004Hz @ Level ::-13.0 dBm	15:41:03.349000				
3-Tone Slope :: 2804Hz @ Level ::-13.0 dBm	15:41:10.368000				
VBM_3TONE_SLOPE					
ACK	15:41:17.296000				
Freq = 405 Hz, Power Level = -13.9 dBm	15:41:17.612000				
	15:41:22.131000				
Freq = 1005 Hz, Power Level = -13 dBm, 404Hz Gain Slope = 0.9	15:41:29.130000				
Freq = 2806 Hz, Power Level = -12.9 dBm, 2804Hz Gain Slope = -0.1	15:41:36.131000				
FIN	15:41:42.145000				
ACK	15:41:42.451000				
Message Sequence Event Config Script Flow Capture Events	1004 Hz Net Loss Report Attenuation	n Distortion Test Report λ	3-Tone Slope Test Report	Signal/C-Notch Noise	Test Report \ Interm
	Initialisation Errors	Error Events	Captured Errors	Link Status Up	=0 Down=0



Test Results

• Test results are shown in the respective tabs as shown in the screenshot

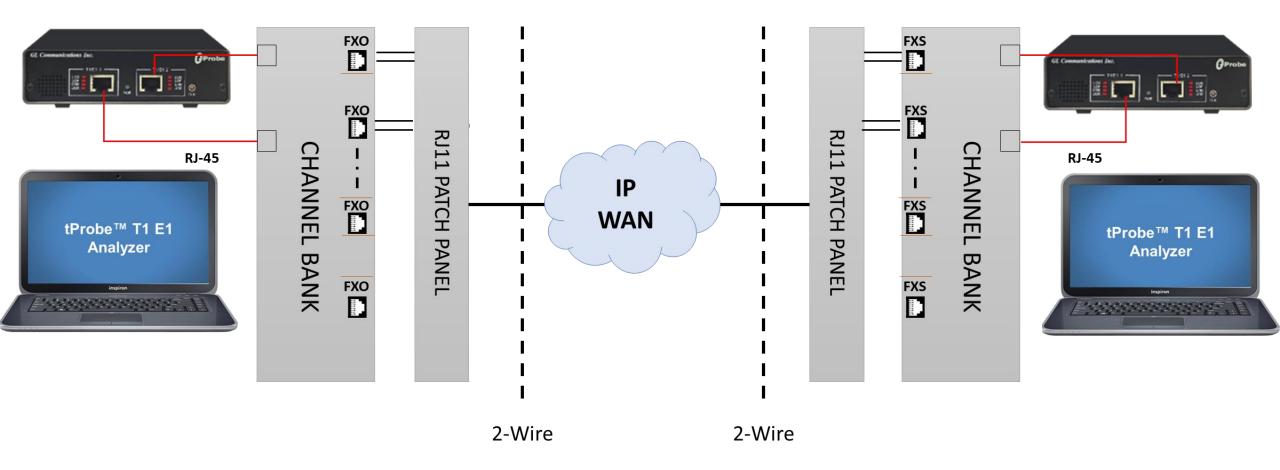
Date/Time	Circuit Selected	Freq (Hz)	Power (dBm)	404Hz Gain Slope	2804Hz Gain Slope	VG3(6) Criteria	VG3(6) Test Result
2024-3-5 15:41:22	VG3	405	-13.90			Pass Power -14 to -9 dBm	Pass
2024-3-5 15:41:29	VG3	1005	-13.00	0.90		Pass Power -14 to -9 dBm	Pass
2024-3-5 15:41:36	VG3	2806	-12.90		-0.10	Pass Power -14 to -9 dBm	Pass
Scripts Message Se	equence λ Event Config λ Scri	ot Flow λ Capture Events λ 1	1004 Hz Net Loss Report 🔪 Att	enuation Distortion Test Report	3-Tone Slope Test Report	Signal/C-Notch Noise Test Report	Intermodulation Distortion T
			h	nitialisation Errors Er	rror Events	Captured Errors Link S	itatus Up=0 Down=0



Procedure for 2-Wire FXO FXS Voiceband Measurement Test



MAPS[™] APS 2-Wire FXO FXS Setup





Invoke MAPS™ APS Emulator (Client)

- From the tProbe T1 Analyzer, select Special Applications →
 Protocol Emulation → MAPS APS
 Emulator to invoke MAPS[™] APS
 Emulator (client)
- This client passes commands to the WCS server

x Port Framing Loopback	Protocol Analysis	> ;	Cross-port Set all cards as selected	
I ESF (193E) No Loopback 2 ESF (193E) No Loopback	Protocol Emulation	>	MAPS - ISDN	
Image: Constraint of the second se	Windows Client Server (WCS) Record / Playback File Synchronous Trunk Record/Playback Dial Digits Call Capture & Analysis Physical Layer Testing Echo Test Solutions MCBERT, HDLC, TRAU Facility Data Link AudioBridge, StripChart	> > > > > > > > > > > > > > > > > > > >	MAPS - SS7 MAPS - SS7/ISUP Conformance Scripts MAPS GSM Abis Interface Emulator MAPS GSM A Interface Emulator MAPS - MAP Emulator MAPS - MAP Emulator MAPS - CAS Emulator MAPS - CAS CLI Server MAPS - CAP Emulator MAPS - FXOFXS Emulator	Card 1 - VF (Audio) - Tx (VF In)- Gain(0.0 df TS 0 ÷
T1/E1 Statistics	Voice Quality Assessment	-	MAPS - INAP Emulator MAPS - ISDN Conformance Emulator	Insert T
	Multiplex/Demultiplex		MAPS - APS Emulator	🗖 Speaker
	Recv Multiframe Streaming over UDP		MAPS - GPRSGB Interface Emulator MLPPP Emulator	- Rx (VF Out) Gain(o 0.0 dB +
Transmit Under Run			CAS Emulator ISDN Emulator SS1 Dialer	TS 0 ÷
			MFR Emulator	Drop
			IMA Emulator	🗖 Speaker
T1/E1 Alarms Loggin	g 🔺			Set 0-dB
Alarm Logging C:\Program Files\GL Communicat				VF imped./
Graph				
Online Graph Offline Graph				Drop&Insert



Protocol Selection 2-Wire FXO

- Protocol Selection window is prompted, select the following:
 - Protocol Standard APS
 - Protocol Version None
 - Node FXO
- Click **OK** to continue

Protocol Selection		\times
Protocol Standard	APS	•
Protocol Version	None	•
Node	FX0	•
Transport		-
	OK	



Configure Testbed in FXO

- By default, it will display Testbed Setup window
- Observe that default Testbed Setup is displayed.
 Verify the highlighted settings to get started with the testing
- Click on **Start** to start the Testbed setup

MAPS (Message Automation Protocol Sir	nulation) FXO (APS) - [Testbed Setup -TestBedDef	ault] — 🗆 🗙
Configurations Emulator Reports E	ditor Debug Tools Windows Help	_ 8 ×
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🗀 🔒 🛃 🔛		0
Config	Value	Enable
Configurations		
- GL Server Configuration		
– Interface	TI	
 WCS Listener Port 	17080	
Server IP Address	127.0.0.1	
Port Configuration		
L T1E1 Port Configuration	1	
L T1E1 Port Configuration 1		
 Port Number 	1	
 Start Timeslot 	0	
└── End Timeslot	23	
- Signaling Bits		
- Ringing	0000	
– Offhook	1111	
L Onhook	0101	
End User Configurations	APS_Profiles.xml	
		Start Edit
		Initialisation Errors



Procedure to Load and Configure the Global Profile

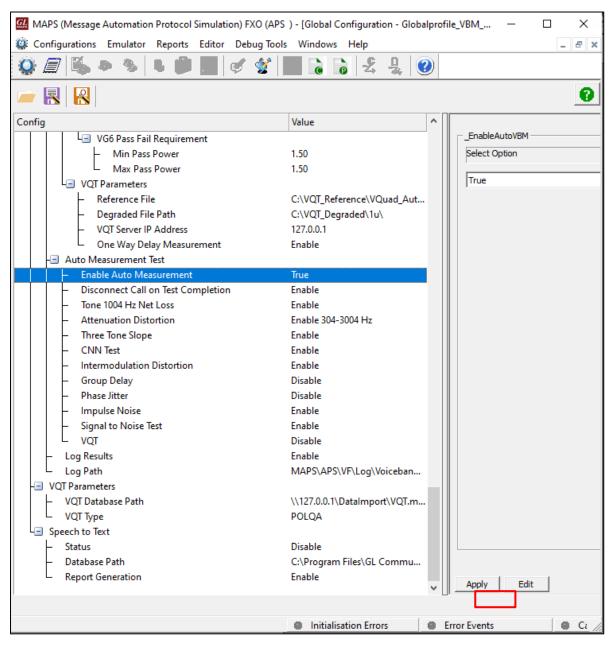
- Global Profiles is used to configure test parameters for all FXO lines
- On the MAPS Client main GUI, select Configurations →Global
 Configuration
- Click on open icon and select GlobalProfile_VBM_FENS and click on OK
- In the Global configuration window, select the required test. Test parameters can be configured for all the tests
- VG6 or VG3 circuit can be selected. The selection will be applied for all the tests
- VG6 and VG3 Pass/Fail Requirement are configured in Global profiles for all the tests. User can edit the Pass/Fail criteria

MAPS (Message Automation Protocol Simulation) FXO (APS) - [Global Configuration - Glo	balprofile_VBM — 🗆 🗙
🏟 Configurations Emulator Reports Editor Debug Tool:	s Windows Help	_ & ×
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		0
Config	Value	<u>^</u>
L Random Inter Call Duration		VG6VG3Selection
 Minimum inter call duration in ms 	3000	Select Option
Maximum inter call duration in ms	6000	
 Receive File Naming Convention 	DateTimeStamp	VG6
- Voiceband Measurement		
Traffic Options		
L Record Call	Disable	
 VG6 VG3 Circuit Selection 	VG6	
 Voiceband Measurement Parameters 		
Tone 1004 Hz Net Loss Test Parameters		
- Tone Power in dBm	-13	
 Tone Duration in ms 	10000	
 Report Frequency in ms 	1000	
- VG3 Pass Fail Requirement		
 Min Pass Power 	1.50	
Max Pass Power	1.50	
- VG6 Pass Fail Requirement		
- Min Pass Power	1.50	
Max Tone Power	1.50	
- Attenuation Distortion Parameters		
- Tone Power in dBm	-13.0	
 Tone Duration in ms 	2000	
- VG3 Pass Fail Requirement		
- Min Pass Power 304 to 3004 Hz	1.30	
- Max Pass Power 304 to 3004 Hz	5.00	
- Min Pass Power 404 to 2804 Hz	1.30	
- Max Pass Power 404 to 2804 Hz	3.00	
- Min Pass Power 504 to 2504 Hz	1.30	
Max Pass Power 504 to 2504 Hz	3.00	
- VG6 Pass Fail Requirement		Analy Cate
Min Pass Power 304 to 3004 Hz	1.30	V Apply Edit
	Initialisation Errors	Error Events Cz



Procedure to Load and Configure Global Profile (Contd.)

- Auto Measurement Test parameters allow users to automate voiceband measurement tests and select which test to run. Call disconnects automatically upon completion
- After making changes to Global Profile. Click on Apply icon
- Close the Global Profile window





Protocol Selection 2-Wire FXS

- From the tProbe T1 Analyzer, select Special Applications → Protocol Emulation → MAPS APS Emulator to invoke MAPS APS Emulator (client)
- Protocol Selection window is prompted, select the following:
 - Protocol Standard APS
 - Protocol Version None
 - Node FXS
 - Click **OK** to continue

Protocol Selection	×	:
Protocol Standard	APS 💌	
Protocol Version	None	
Node	FXS 💌	
Transport	_	
	OK	



Configure Testbed in FXS

- By default, it will display Testbed Setup window
- Observe that default Testbed Setup is displayed. Verify the highlighted settings to get started with the testing
- Click on **Start** to start the Testbed setup

🔐 MAPS (Message Automation Proto	col Simulation) FXS	(APS) - [Testbed Setup 🗕 🗆 🗙
🔝 <u>C</u> onfigurations E <u>m</u> ulator <u>R</u> epo	rts <u>E</u> ditor <u>D</u> ebug	Tools Windows Help 🗕 🗗 🗙
🎯 🔎 🍇 🗣 🦠 🗉 I	P 📰 🗹 🔮	2 🔲 🗟 🗟 초 💂 🥝
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Config	Value	
Configurations		Interface
- GL Server Configuration		Select Option
 Interface 	T1	
 WCS Listener Port 	17080	T1 -
Server IP Address	127.0.0.1	
 Port Configuration 		
L T1E1 Port Configuration	1	
L T1E1 Port Configurati		
– Port Number	2	
 Start Timeslot 	0	
End Timeslot	23	
– Interface	FXS	
 End User Configurations 	APS_Profiles.xml	
Region	North America	
		Start Edit
1		



Configuring Call Generation Window in FXS

- On MAPS[™] APS FXS, select Emulator
 → Call Generation. This will invoke Call
 Generation window
- Click on Open icon, select Default, and click OK. This will load the Default configuration
- Now, select Line025 to Line048 (These belong to T1 Port 2)
- Click on Start to start FXS lines

	lessage Automation Protocol Simulati			Default]				
i i 🏹 👝 🖂	ations Emulator Reports Editor			n				
9	🖏 🧶 🗞 🖡 📁 🌆	🥑 🔮 🔓	662	2				
		8 क						
Sr No	Script Name	Profile	Call Info	Script Execution	Status	Eve	nts	Ever
25	FXS.gls	Line025	2,0,125	Stop	Idle		Terminate	
26	FXS.gls	Line026	2,1,126	Stop	Idle		Terminate	
27	FXS.gls	Line027	2,2,127	Stop	Idle		Terminate	
28	FXS.gls	Line028	2,3,128	Stop	Idle		Terminate	
29	FXS.gls	Line029	2,4,129	Stop	Idle		Terminate	
30	FXS.gls	Line030	2,5,130	Stop	Idle		Terminate	
31	FXS.gls	Line031	2,6,131	Stop	Idle		Terminate	
32	FXS.gls	Line032	2,7,132	Stop	Idle		Terminate	
33	FXS.gls	Line033	2,8,133	Stop	Idle		Terminate	
34	FXS.gls	Line034	2,9,134	Stop	Idle		Terminate	
35	FXS.gls	Line035	2,10,135	Stop	Idle		Terminate	
36	FXS.gls	Line036	2,11,136	Stop	Idle		Terminate	
37	FXS.gls	Line037	2,12,137	Stop	Idle		Terminate	
38	FXS.gls	Line038	2,13,138	Stop	Idle		Terminate	
39	FXS.gls	Line039	2,14,139	Stop	Idle		Terminate	
40	FXS.gls	Line040	2,15,140	Stop	Idle		Terminate	
41	FXS.gls	Line041	2,16,141	Stop	Idle		Terminate	
42	FXS.gls	Line042	2,17,142	Stop	Idle		Terminate	
<								
Add			Stop 🔽 Stop All	Abort Abort All	1			
Add	Delete Insert Refresh Start	Start All	Stop 🔽 Stop All	Abort Abort All]			
Cause .	Column Width	Show Latest						
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						Find		
Scripts	Message Sequence / Event Confi	g 👌 Script Flow	/		U			
			_/					
					Initialisation Errors	Error Events		Captured Er



Procedure to Start Voiceband Measurement Tests in FXO

- On MAPS[™] APS FXO GUI, select **Emulator** → **Call Generation**. This will invoke Call Generation window
- Click on **Open** icon, select **Default**, and click **OK**. This will load the Default configuration
- Now, select Line001 and verify that it is loaded with APS_PlaceCall.gls script
- Similarly, Line013 should be loaded with APS_AnswerCall.gls script
- Click on Start button to start both PlaceCall and AnswerCall script
- Observe that both the scripts are started (indicating Green color) and the PlaceCall status is displayed as "Select Voiceband Measurement Test"
- Now, user clicks on the required test button. For example, click on '3-Tone Slope' button, to run the 3-Tone Slope test

🍝 Call Gener	ration - singlecall							- • ×
	🔒 🛃 💡	8	6					
SrNo	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result
1	APS_PlaceCall.gls	Line001	Line001,1,1,0	Stop	Select Voiceband Measurement Test	OutboundRelease		Pass
2	APS_AnswerCall.gls	Line013	Line013,13,1,12	Stop	Ready for Voiceband Measurement	InboundReleaseCall		Pass
<								>
Add	Delete Insert Refresh	Start Star	t All Stop 🔻 St	op All 🔽 Abort All	1004 Hz 3-Tone CNN IMI Net Loss Slope CNN IMI		hase Impuls Jitter Noise	



Procedure to Start Voiceband Measurement Tests in FXO (Contd.)

- On MAPS[™] APS FXO GUI, select **Emulator** → **Call Generation**. This will invoke Call Generation window
- Click on **Open** icon, select **Default**, and click **OK**. This will load the Default configuration
- Now, select Line001 and verify that it is loaded with APS_PlaceCall.gls script
- Similarly, Line002 should be loaded with APS_AnswerCall.gls script
- Click on Start button to start both PlaceCall and AnswerCall script
- Observe that both the scripts are started (indicating Green color) and the PlaceCall status is displayed as "Select Voiceband Measurement Test"
- Now, under Events column, user can select the required test. For example, select '3-Tone Slope' to run the 3-Tone Slope test

	1APS (N	lessage Automation Prot	ocol Simulatio	on) FXO (APS) - [C	all Generation -C	allGenDefault]					_		×
🍝 c	Configu	rations Emulator Repo	orts Editor	Debug Tools W	indows Help							-	. 8 ×
Q		🍕 🤌 🌯 🖡	🤗 🌆	🝠 🔮 🚡	662								
		🔒 🛃 💡		8 क									
Sr N	0	Script Name	Profile	Call Info	Script Execution	Status	Events	Events	Result	Total Iterations	Completed It	erations	
	1	APS_PlaceCall.gls	Line001	Line001,1,1,0	Stop	Select Voiceband Measurement Test	OutboundRelease Cell		D	4		0	
	2	APS_AnswerCall.gls	Line002	Line002,2,1,1	Stop	Ready for Voiceband Measurement	InboundRelease	Outbound	ReleaseCall			0	
								Flash					
								1004 Hz Ne	t Loss				
								Attenuation	n Distortion 304	-3004 Hz			
								Attenuation	n Distortion 404	-2804 Hz			
								Attenuation	n Distortion 504	-2504 Hz			
								3-Tone Slop	De				
								C-Notched					
- 1								IMD			-		
								Impulse No	vice				
4	Add	Delete Insert Refree	sh Start	Start All Sto	p 🔻 Stop All		04 Hz 3-Tone		//SC		S/NR	VQT	r
		1	-				t Loss Slope	S/NR					
	<u>S</u> ave	Column Width		Show Latest				VQT					
	м	APS			DUT		Find	23-Tone Tes	st				



Procedure to Start Voiceband Measurement Tests in FXO (Contd.)

- The APS_PlaceCall.gls and APS_AnswerCall.gls will set up a call between Line001 and Line02
- **APS_PlaceCall.gls** script has the options to perform various voiceband measurement tests
- Click on any of the voiceband measurement test buttons to start a test. Note that APS_PlaceCall.gls status indicates "Select Voiceband Measurement Test" and the APS_AnswerCall.gls status indicates "Ready for Voiceband Measurement"
- Voiceband Measurement tests can only be started from the APS_PlaceCall.gls

🔐 MAPS (N	lessage Automation Prot	ocol Simulatic	on) FXO (APS) - [C	all Generation -C	allGenDefault]										-		×
🍝 Configu	rations Emulator Rep	orts Editor	Debug Tools W	indows Help												- [ъ×
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	🔒 🛃 💡		8 68														
Sr No	Script Name	Profile	Call Info	Script Execution	Status			Events			Events	Result	Total Ite	rations	Completed It	erations	
1	APS_PlaceCall.gls	Line001	Line001,1,1,0	Stop	Select Voiceba				boundRelea			Pass		1		0	
2	APS_AnswerCall.gls	Line002	Line002,2,1,1	Stop	Ready for Voi	iceband Mea	asurement	Inb	oundRelea	seCall		Pass		1		0	
L																	
																	_
Add	Delete Insert Refre	sh Start	Start All Sto	p 🔻 Stop All	Abort A	Abort All		04Hz	3-Tone Slope	SCNN	IMD	23-Tone	Phase	Impulse Noise	S/NR	VQT	
		1	Show Latest					Loss	Siope			Test	Jitter	INOISE			_
<u>S</u> ave	Column Width		Show Latest							. 1							
м.	APS			DUT					Fir	nd							
		Onhook :: 0,	.1,0,1	15.1	11:40.739000		State ::	Idle									
		0// 1 1		15:1	11:40.739000		Signalin	g Bits	:: 0, 1	, 0, 1							
		Offhook :: 1,	. 1, 1, 1	15:1	11:42.748000		Transmit	ting 0	n Card :	- 1 Tin	eslot	· 0					
	T	one Detected :	:: Dial Tone	15.1	11:48.346000			oing o									
		Dialing :: 1	100	13.1	11.40.340000												
		Dialing	120	15:1	11:48.350000												
	Tone	e Detected :: R	lingback Tone		11:51.187000												
	Tope	Detected :: R	ingback Tone														
	4				11:57.181000												
		Path Verific	cation	15:1	12:04.709000												
		Path Verificati	ion Ack														
	•			15:1	12:11.214000												
$ \cdot \rangle$	Message Sequence	Event Config	Script Flow	1004 Hz Net Loss	Report	Attenuation	Distortion T	est Repor	t λ 3	-Tone Slop	pe Test Rep	oort <mark>\ S</mark> ig	nal/C-Notch	Noise Test	Report)	Intermo	odu
,						lisation Erro		G Erro	or Events			aptured Errors		6 Link	Status Up=0 [)own=0	



Test Results

• Test results are shown in the respective tabs as shown in the screenshot

Date/Time	Circuit Selected	Freq (Hz)	Power (dBm)	404Hz Gain Slope	2804Hz Gain Slope	VG3(6) Criteria	VG3(6) Test Result
2020-7-16 14:48:07	VG3	405	-12.96			Pass Power -14 to -9	Pass
2020-7-16 14:48:14	VG3	1005	-12.97	-0.00		Pass Power -14 to -9	Pass
2020-7-16 14:48:21	VG3	2806	-12.97		-0.00	Pass Power -14 to -9	Pass
▲ ► 3-Tone Slope T	est Report	I/C-Notch Noise 1	「est Report 〉 Int	ermodulation Distortion Test Re	eport 🔉 Impulse Noise 1	「est Report 入 S/NR/Net Loss	vs Level Test Report X VQT Te
			Initialisatio	n Errors 🛛 🕚 Error I	Events 🛛 🕚 🛈	Captured Errors 🛛 🕘 Li	nk Status Up=0 Down=0



Voiceband Measurements



Voiceband Measurements

Voiceband measurement includes below tests:

- Signal-to-Noise Ratio and Level
- Three Tone Slope (Gain Slope)
- 23-Tone Test
- Signal-to-C-Notched Noise Test
- Attenuation Distortion
- 1004 Hz tone
- Intermodulation Distortion (IMD)
- Impulse Noise
- VQT



Synchronization Codes

• Frequencies are used by MAPS[™] APS FXO scripts to synchronize the transmit and receive actions of each test

S/N	IR/Net Loss vs Level Synchronization Tones
S/NR Sync	Send tone @ 853Hz to indicate the start of S/N test
S/NR Ack	Send tone @ 2351Hz to indicate the S/N measurement has been started
S/NR Ack Next Tone	Send tone @ 1004Hz to send next tone level for the S/N test
	CNN Synchronization Tones
CNN	Send Tone @ 1049Hz to indicate the start of CNN test
CNN Ack	Send tone @ 2351Hz to indicate 3-Tone Slope measurements has been started
	3-Tone Synchronization Codes
3-Tone Slope	Send tone @ 1153Hz to indicate the start of 3-Tone Slope test
3-Tone Slope Ack	Send tone @ 2351Hz to indicate 3-Tone Slope measurements has been started
	Attenuation Synchronization Tones
Attenuation Distortion Test (304Hz to 3004Hz)	Send tone @ 1249Hz to indicate the start of Attenuation Distortion test
Attenuation Distortion Test (404Hz to 2804Hz)	Send tone @ 1361Hz to indicate the start of Attenuation Distortion test
Attenuation Distortion Test (504Hz to 2504Hz)	Send tone @ 1549Hz to indicate the start of Attenuation Distortion test
Attenuation Distortion Test Ack	Send tone @ 2351Hz to indicate Attenuation Distortion measurements has been started



Synchronization Codes (Contd.)

	1004Hz Net Loss Synchronization Tones						
1004Hz Net Loss	Send Tone @ 1657Hz to indicate the start of 1004Hz tone test						
1004Hz Net Loss Ack	Send tone @ 2351Hz to indicate 1004Hz tone measurements has been started						
	IMD Synchronization Tones						
IMD Sync	Send tone a2 1741Hz" to indicate start of IMD test						
IMD Sync Ack	Send tone @ 2351Hz to acknowledge start of IMD test						
	Impulse Noise Synchronization Tones						
Impulse Noise Sync	Send tone @ 1867Hz to indicate the start of Impulse Noise test						
Impulse Noise Ack	Send tone @ 2351Hz to indicate that Impulse test has been started						
	VQT Synchronization Tones						
VQT Sync	Send tone @ 751Hz to indicate the start of Voice Quality Testing						
VQT Ack	Send tone @ 2351Hz to indicate that Voice Quality Testing has been started						
	23 - Tone Synchronization Tones						
23-Tone	Send tone @ 1781Hz to indicate the start of 23-Tone Test						
23-Tone Ack	Send tone @ 2351Hz to indicate that 23-Tone has been started						



Synchronization Codes (Contd.)

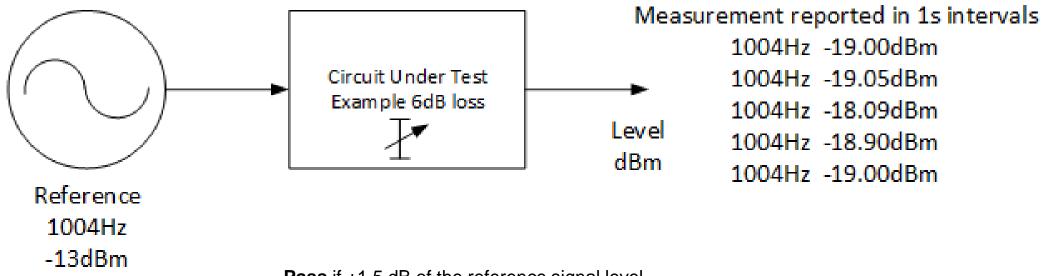
	Common Synchronization Tones to end the Voice Measurement Test							
FIN	Send tone @1949 to indicate the end of the current voice measurement test							
FIN Ack	Send tone @ 2351Hz to acknowledge the end of current voice measurement test							
	Common Synchronization Tones to complete the Voice Measurement Test							
Complete	Send tone @2251 to indicate the complete of the transmission from source to destination or destination to source							
	Common Synchronization Tones to Continue the Voice Measurement Test							
Continue	Send tone @2153 to indicate the continuation of next tone from source to destination or destination to source							



1004 Hz Tone Test



1004 Hz Tone Test

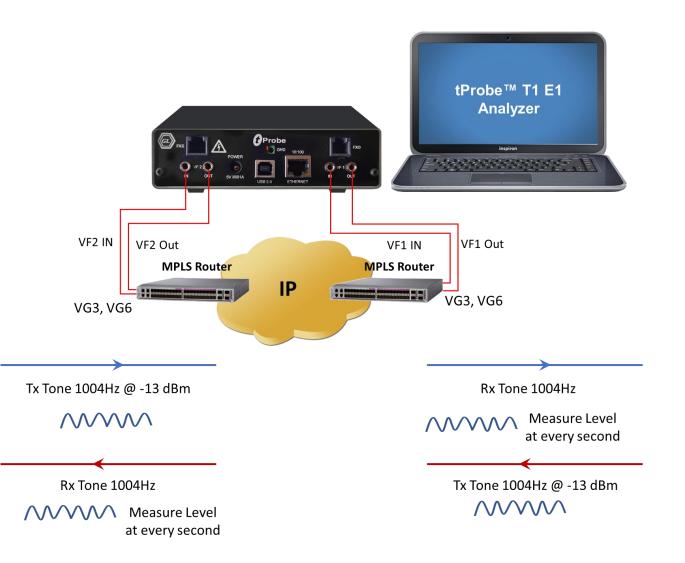


<u>**Pass**</u> if ± 1.5 dB of the reference signal level.



1004 Hz Tone Test

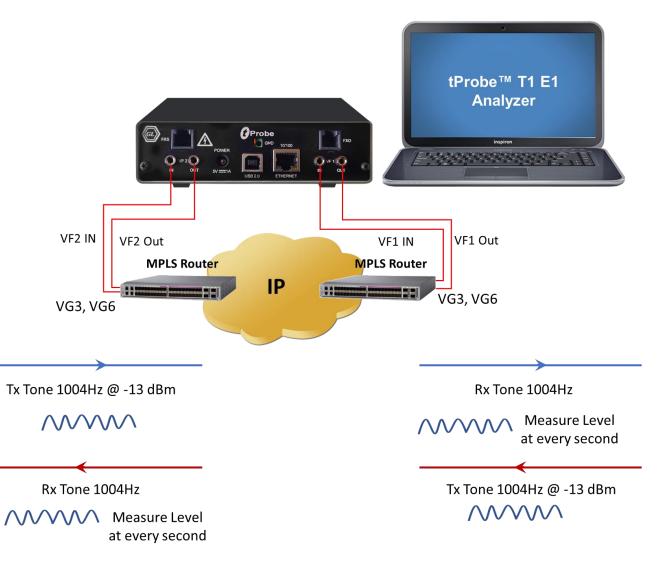
- This test is used to test 1004 Hz net loss and periodically report received tone level of a continuous 1004 Hz tone
- This is a measure of the change in net loss as the frequency of a signal on the line varies across the Voice Frequency (VF) bandwidth
- Tone (1004 Hz,-13 dBm) is sent and monitored at the receiver side. Below are the WCS commands to send and receive tones
 - monitor freq window 500 msec # 2 : 5 report 1000 msec;
 - tx tone(1004,-13.000000) #1:1 10000 msec;





WCS Commands and Tasks used for 1004 Hz Tone Test

- Tone (1004 Hz,-13 dBm) is sent and monitored at the receiver side
- Below are the WCS commands to receive and send tones
 - monitor freq window 500 msec # 2 : 5 report 1000 msec ;
 - tx tone(1004,-13.000000) #1:1 10000 msec;





1004 Hz Net Loss Test Configuration

- The following parameters can be configured in the **Global profile** for 1004 Hz Net Loss Test:
 - Tone Power in dBm
 - Tone Duration in ms
 - Report Frequency in ms
- VG3 Pass Fail Requirement
 - Min Pass Power in dBm
 - Max Pass Power in dBm
- VG6 Pass Fail Requirement
 - Min Pass Power
 - Max Pass Power e.g. Pass criteria for -13 dBm Tone Power is -14.5 to -11.5 dBm



VF_Originating.gls Ladder Diagram (Master)

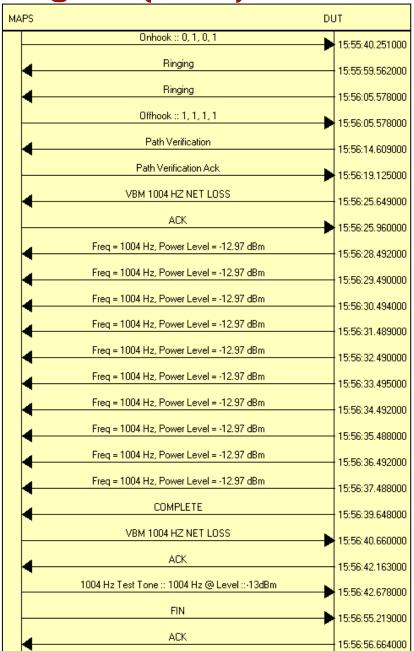
- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click on the select 1004Hz
 Tone Test then VBM 1004HZ NET LOSS request tone (Frequency:1657Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency:2351Hz, Power: -13dBm and Duration:300ms) PlaceCall side sends the 1004HZ test tone
- Finally, a FIN (Frequency:1949Hz, Power: -13dBm and Duration:300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated

	• • • • • • • • • • • • • • • • • • •	
MAPS		DUT
	Onhook :: 0, 1, 0, 1	15:55:40.244000
	Offhook :: 1, 1, 1, 1	15:55:42.257000
	Tone Detected :: Dial Tone	15:55:47.858000
	Dialing :: 126	15:55:47.870000
	Tone Detected :: Ringback Tone	15:55:55.694000
	Tone Detected :: Ringback Tone	15:56:01.697000
	Tone Detected :: Ringback Tone	15:56:06.193000
	Path Verification	15:56:13.729000
	Path Verification Ack	
	VBM 1004 HZ NET LOSS	15:56:19.226000
	ACK	15:56:24.845000
		15:56:26.760000
	1004 Hz Test Tone :: 1004 Hz @ Level ::-13dBm	15:56:27.278000
	COMPLETE	15:56:38.801000
│	VBM 1004 HZ NET LOSS	15:56:41.259000
	ACK	15:56:41.579000
│	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:44.110000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:45.106000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:46.107000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:47.111000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:48.109000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:49.111000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:50.106000
	Freg = 1004 Hz, Power Level = -12.97 dBm	
		15:56:51.117000
-	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:52.126000
	Freq = 1004 Hz, Power Level = -12.97 dBm	15:56:53.109000
	FIN	15:56:55.763000
	ACK	15:56:56.079000
		1



VF_Terminating.gls Call Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected, When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack Answercall side receives VBM 1004HZ NET LOSS request tone (Frequency: 1657Hz, Power: -13dBm and Duration: 300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms)
- Then AnswerCall side measures the 1004HZ test tone and keeps the result in the 1004Hz Tone Test Report tab
- After receiving COMPLETE (Frequency: 2251Hz, Power: -13dBm and Duration: 300ms) tone, AnswerCall side sends VBM 1004HZ NET LOSS request tone and receives the ACK
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms), and subsequently sending ACK



1004 Hz Net Loss Test Results

 1004 Hz measurement results are logged in the "1004 Hz Tone Test Report" tab for the current test. Results include the received frequency and power level

Date/Time	Circuit Selected	Freq (Hz)	Power (dBm)	VG3(6) Criteria	VG3(6) Test Result
2020-7-21 14:14:04	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:05	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:06	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:07	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:08	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:09	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:10	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:11	VG6	1004	-12.98	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:12	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:14:13	VG6	1004	-12.97	Pass Power -14.5 to -11.5 dBm	Pass

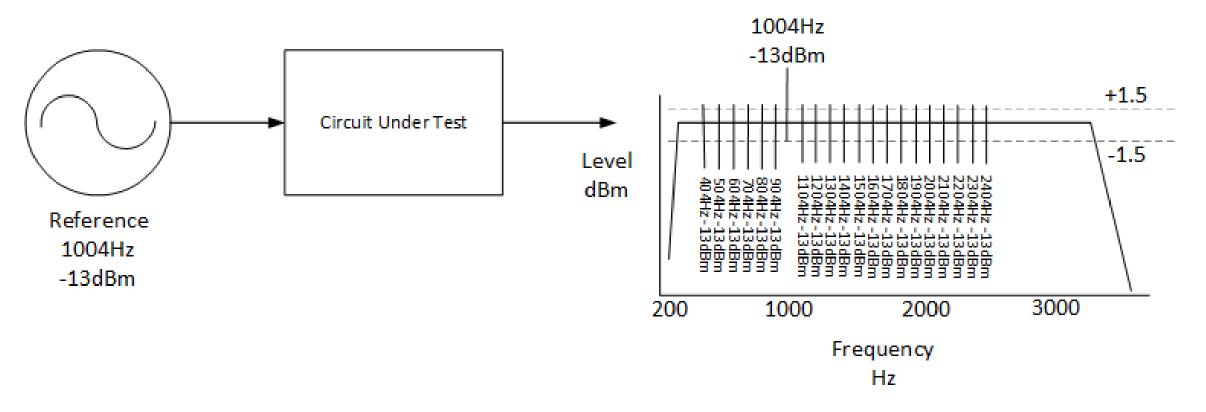


Attenuation Distortion Test



Attenuation Distortion

Reference 1004 Hz 0dB net loss ±1.5dB

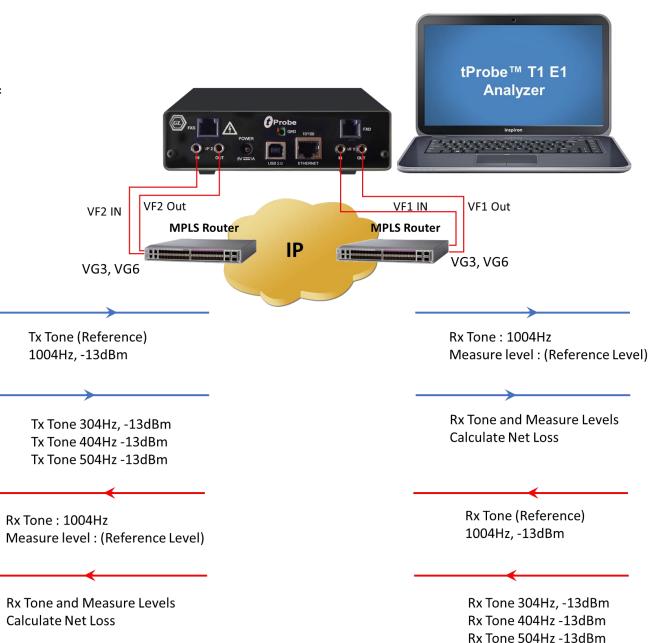


Pass if all points from 404 - 2804 Hz are between -1dB to +4dB of Reference level



Attenuation Distortion Test

- This is a measure of the change in net loss as the frequency of a signal on the line varies across the Voice Frequency (VF) bandwidth
- Reference tone is sent with (1004 Hz, -13 db) and level is monitored at receiver side. This will be the reference level to calculate net loss with the received level with the different frequencies



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WCS Commands and Tasks used for Attenuation Distortion Test

- WCS Commands to monitor and transmit reference tone
 - > monitor tones ("MAPS\APS\VF\MTD Files/AttenuationDistortion.mtd") # 2 : 5 ;
 - tx tone(1004,-13.000000) #1:1 2000 msec;
- Tone is sent with the different frequencies but with the same level and the net loss is calculated
- Commands to send tones with the difference of 100 Hz
 - tx tone(304,-13.000000) #1:1 2000 msec;
 - tx tone(404,-13.000000) #1:1 2000 msec;
 - tx tone(504,-13.000000) #1:1 2000 msec;



Attenuation Distortion Test Configuration

- The following parameters can be configured in the **Global profile** for Attenuation Distortion Test:
 - Tone Power in dBm
 - Tone Duration in ms
- VG3 Pass Fail Requirement
 - Min Pass Power
 - Max Pass Power
- VG6 Pass Fail Requirement
 - Min Pass Power
 - Max Pass Power e.g. For Frequency range 304 to 3004 Hz
 - If send level is 1004 Hz, -13 dBm and received level is -13.24 dBm (reference level)
 - For: (Min 1.3, Max 5 dBm), the pass criteria is -14.54 to -8.24 dBm

- Attenu	- Attenuation Distortion Parameters						
— то	– Tone Power in dBm -13.0						
— То	- Tone Duration in ms 2000						
- VG	33 Pass Fail Requirement						
	Min Pass Power 304 to 3004 Hz	1.30					
	Max Pass Power 304 to 3004 Hz	5.00					
	Min Pass Power 404 to 2804 Hz	1.30					
	Max Pass Power 404 to 2804 Hz	3.00					
	Min Pass Power 504 to 2504 Hz	1.30					
	Max Pass Power 504 to 2504 Hz	3.00					
L L VG	66 Pass Fail Requirement						
	Min Pass Power 304 to 3004 Hz	1.30					
	Max Pass Power 304 to 3004 Hz	5.00					
	Min Pass Power 404 to 2804 Hz	1.30					
	Max Pass Power 404 to 2804 Hz	4.00					
	Min Pass Power 504 to 2504 Hz	1.30					
L	Max Pass Power 504 to 2504 Hz	3.00					



VF_Originating.gls Ladder Diagram (Master)

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the Attenuation Distortion Test (i.e. 304 – 3004Hz, 404 – 2804Hz, or 504 – 2504Hz) then VBM ATTEN DIST 304 request tone (Frequency: 1249Hz, Power: -13dBm and Duration: 300ms) is sent
- After receiving ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms), PlaceCall sends the Attenuation Distortion test tones
- After receiving COMPLETE (Frequency: 2251Hz,Power: -13dBm and Duration: 300ms) tone, AnswerCall side will send VBM ATTEN DIST 304 request tone and receives the ACK
- After receiving the ACK, Answercall sends the Attenuation Distortion test tones
- Finally, a FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminate

IAPS		DI	TL
	Onhook :: 0, 1, 0, 1	→	16:36:16.434000
	Offhook :: 1, 1, 1, 1		16:36:18.439000
-	Tone Detected :: Dial Tone		16:36:24.039000
	Dialing :: 126		16:36:24.053000
-	Tone Detected :: Ringback Tone		16:36:31.869000
	Tone Detected :: Ringback Tone		16:36:37.868000
	Tone Detected :: Ringback Tone		16:36:42.370000
	Path Verification		16:36:49.907000
	Path Verification Ack		16:36:55.405000
	VBM ATTEN DIST 304		16:37:25.891000
	ACK		16:37:23.631000
	Attenuation Distortion :: 1004 Hz @ Level ::-13.0dBm	•	
	Attenuation Distortion :: 304 Hz @ Level ::-13.0dBm		16:37:27.939000
	Attenuation Distortion :: 404 Hz @ Level ::-13.0dBm	- [16:37:32.459000
	Attenuation Distortion :: 504 Hz @ Level ::-13.0dBm		16:37:36.978000
	Attenuation Distortion :: 604 Hz @ Level ::-13.0dBm	-	16:37:41.500000
	Attenuation Distortion :: 704 Hz @ Level ::-13.0dBm		16:37:46.020000
	Attenuation Distortion :: 804 Hz @ Level ::-13.0dBm		16:37:50.538000
		→	16:37:55.059000
	Attenuation Distortion :: 904 Hz @ Level ::-13.0dBm	->	16:37:59.599000
	Attenuation Distortion :: 1104 Hz @ Level ::-13.0dBm	→	16:38:04.119000
	Attenuation Distortion :: 1204 Hz @ Level ::-13.0dBm	->	16:38:08.638000
-	Attenuation Distortion :: 1304 Hz @ Level ::-13.0dBm	→	16:38:13.159000
	Attenuation Distortion :: 1404 Hz @ Level ::-13.0dBm		16:38:18.178000
	Attenuation Distortion :: 1504 Hz @ Level ::-13.0dBm	->	16:38:23.199000
	Attenuation Distortion :: 1604 Hz @ Level ::-13.0dBm	->	16:38:27.719000
	Attenuation Distortion :: 1704 Hz @ Level ::-13.0dBm		16:38:32.239000
	Attenuation Distortion :: 1804 Hz @ Level ::-13.0dBm		16:38:36.758000
	Attenuation Distortion :: 1904 Hz @ Level ::-13.0dBm	-	16:38:41.779000
	Attenuation Distortion :: 2004 Hz @ Level ::-13.0dBm	-	16:38:46.298000
	Attenuation Distortion :: 2104 Hz @ Level ::-13.0dBm	-	16:38:51.319000
	Attenuation Distortion :: 2204 Hz @ Level ::-13.0dBm		16:38:56.358000
	Attenuation Distortion :: 2304 Hz @ Level ::-13.0dBm	_	16:39:01.380000
	Attenuation Distortion :: 2404 Hz @ Level ::-13.0dBm		16:39:05.899000
	Attenuation Distortion :: 2504 Hz @ Level ::-13.0dBm		16:39:10.419000
	Attenuation Distortion :: 2604 Hz @ Level ::-13.0dBm	- [16:39:15.439000
			10.00.10.400000

Attenuation Distortion :: 2704 Hz @ Level ::-13.0dBm	16:39:20.459000
Attenuation Distortion :: 2804 Hz @ Level ::-13.0dBm	16:39:24.978000
Attenuation Distortion :: 2904 Hz @ Level ::-13.0dBm	16:39:29.500000
Attenuation Distortion :: 3004 Hz @ Level ::-13.0dBm	16:39:34.020000
COMPLETE	16:39:38.540000
VBM ATTEN DIST 304	16:39:40.935000
ACK	16:39:41.241000
Freq = 1005 Hz, Power Level = -12.9717 dBm	
Freq = 306 Hz, Power Level = -12.9739 dBm, 1004Hz Net Loss = 0	16:39:44.776000
Freq = 405 Hz, Power Level = -12.9693 dBm, 1004Hz Net Loss = -0.00	16:39:49.277000
Freq = 505 Hz, Power Level = -12.9736 dBm, 1004Hz Net Loss = 0.00	16:39:53.780000
Freq = 604 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = -0.00	16:39:58.776000
Freq = 704 Hz, Power Level = -12.9715 dBm, 1004Hz Net Loss = 0.00	16:40:03.271000
	16:40:07.777000
Freq = 806 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = 0.00	16:40:12.777000
Freq = 905 Hz, Power Level = -12.9708 dBm, 1004Hz Net Loss = -0.00	16:40:17.278000
Freq = 1104 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = 0.00	16:40:21.777000
Freq = 1204 Hz, Power Level = -12.9718 dBm, 1004Hz Net Loss = 0.00	16:40:26.273000
Freq = 1306 Hz, Power Level = -12.9723 dBm, 1004Hz Net Loss = -0.00	16:40:30.775000
Freq = 1405 Hz, Power Level = -12.972 dBm, 1004Hz Net Loss = -0.00	16:40:35.275000
Freq = 1505 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = -0.00	16:40:40.278000
Freq = 1604 Hz, Power Level = -12.9704 dBm, 1004Hz Net Loss = -0.00	16:40:44.776000
Freq = 1704 Hz, Power Level = -12.9732 dBm, 1004Hz Net Loss = 0.00	16:40:49.276000
Freq = 1806 Hz, Power Level = -12.9677 dBm, 1004Hz Net Loss = -0.00	16:40:54.272000
Freq = 1905 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = 0.00	16:40:58.778000
Freq = 2005 Hz, Power Level = -12.9711 dBm, 1004Hz Net Loss = -0.00	16:41:03.780000
Freq = 2104 Hz, Power Level = -12.9707 dBm, 1004Hz Net Loss = 0.00	16:41:08.277000
Freq = 2204 Hz, Power Level = -12.9714 dBm, 1004Hz Net Loss = 0.00	16:41:12.776000
Freq = 2306 Hz, Power Level = -12.972 dBm, 1004Hz Net Loss = 0.00	16:41:17.777000
Freq = 2405 Hz, Power Level = -12.9714 dBm, 1004Hz Net Loss = -0.00	16:41:22.277000
Freq = 2505 Hz, Power Level = -12.9722 dBm, 1004Hz Net Loss = 0.00	16:41:26.774000
Freq = 2604 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = -0.00	16:41:31.778000
Freq = 2704 Hz, Power Level = -12.9732 dBm, 1004Hz Net Loss = 0.00	16:41:36.277000
Freq = 2806 Hz, Power Level = -12.9711 dBm, 1004Hz Net Loss = -0.00	16:41:40.777000
Freq = 2905 Hz, Power Level = -12.9728 dBm, 1004Hz Net Loss = 0.00	16:41:45.276000
Freq = 3005 Hz, Power Level = -12.9723 dBm, 1004Hz Net Loss = -0.00	16:41:49.777000
FIN	16:41:54.931000
АСК	16:41:55.239000
	1.0.41.00.200000



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack, Answercall side receives VBM ATTEN DIST 304 request tone (Frequency:1249Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK(Frequency: 2351Hz, Power: -13dBm and Duration:300ms)
- Then AnswerCall side measures the received Attenuation Distortion tones and keep the result in the Attenuation Distortion Test Report tab
- After receiving COMPLETE (Frequency:2251Hz, Power: -13dBm and Duration:300ms) tone, AnswerCall side will send VBM ATTEN DIST 304 request tone and receives the ACK
- Now Answercall side sends the **Attenuation Distortion** test tones.
- AnswerCall side terminates the call by receiving the **FIN** (Frequency: 1949Hz, Power: -13dBm and Duration:300ms), and subsequently sending an ACK

'S	DUT
Onhook :: 0, 1, 0, 1	16:36:16.440000
Ringing	16:36:35.719000
Ringing	16:36:41.758000
Offhook :: 1, 1, 1, 1	16:36:41.758000
Path Verification	16:36:50.805000
Path Verification Ack	16:36:55.326000
VBM ATTEN DIST 304	16:37:26.342000
ACK	16:37:26.660000
Freq = 1005 Hz, Power Level = -12.9717 dBm	16:37:30.244000
Freq = 306 Hz, Power Level = -12.9739 dBm, 1004Hz Net Loss = 0	
Freq = 405 Hz, Power Level = -12.9693 dBm, 1004Hz Net Loss = -0.0	16:37:34.743000
Freq = 505 Hz, Power Level = -12.9736 dBm, 1004Hz Net Loss = 0.01	16:37:39.243000
Freq = 604 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = -0.00	n 16:37:43.745000
	16:37:48.244000
Freq = 704 Hz, Power Level = -12.9715 dBm, 1004Hz Net Loss = 0.00	16:37:52.744000
Freq = 806 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = 0.00	16:37:57.244000
Freq = 905 Hz, Power Level = -12.9708 dBm, 1004Hz Net Loss = -0.0	16:38:01.744000
Freq = 1104 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = 0.0	16:38:06.241000
Freq = 1204 Hz, Power Level = -12.9718 dBm, 1004Hz Net Loss = 0.0	16:38:10.739000
Freq = 1306 Hz, Power Level = -12.9723 dBm, 1004Hz Net Loss = -0.0	16:38:15.244000
Freq = 1405 Hz, Power Level = -12.972 dBm, 1004Hz Net Loss = -0.0	16:38:20.741000
Freq = 1505 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = -0.0	16:38:25.744000
Freq = 1604 Hz, Power Level = -12.9704 dBm, 1004Hz Net Loss = -0.	00 16:38:30.243000
Freq = 1704 Hz, Power Level = -12.9732 dBm, 1004Hz Net Loss = 0.0	16:38:34.743000
Freq = 1806 Hz, Power Level = -12.9677 dBm, 1004Hz Net Loss = -0.0	
Freq = 1905 Hz, Power Level = -12.973 dBm, 1004Hz Net Loss = 0.0	
Freq = 2005 Hz, Power Level = -12.9711 dBm, 1004Hz Net Loss = -0.0	
Freq = 2104 Hz, Power Level = -12.9707 dBm, 1004Hz Net Loss = 0.0	10
Freq = 2204 Hz, Power Level = -12.9714 dBm, 1004Hz Net Loss = 0.0	16:38:53.742000
Freq = 2306 Hz, Power Level = -12.972 dBm, 1004Hz Net Loss = 0.0	16.36.36.743000
Freq = 2405 Hz, Power Level = -12.9714 dBm, 1004Hz Net Loss = -0.0	16:39:03.744000
Freq = 2505 Hz, Power Level = -12.9722 dBm, 1004Hz Net Loss = 0.0	16:39:08.239000
	16:39:12.746000
Freq = 2604 Hz, Power Level = -12.971 dBm, 1004Hz Net Loss = -0.0	16:39:17.744000
Freq = 2704 Hz, Power Level = -12.9732 dBm, 1004Hz Net Loss = 0.0	16:39:22.743000
Freq = 2806 Hz, Power Level = -12.9711 dBm, 1004Hz Net Loss = -0.0	16:33:27.243000
Freq = 2905 Hz, Power Level = -12.9728 dBm, 1004Hz Net Loss = 0.0	16:39:31.743000
Freq = 3005 Hz, Power Level = -12.9723 dBm, 1004Hz Net Loss = -0.0	16:39:36.244000

COMPLETE	
	16:39:39.340000
VBM ATTEN DIST 304	16:39:40.360000
	16:39:41.859000
Attenuation Distortion :: 1004 Hz @ Level ::-13.0dBm	16:39:42.379000
Attenuation Distortion :: 304 Hz @ Level ::-13.0dBm	16:39:46.899000
Attenuation Distortion :: 404 Hz @ Level ::-13.0dBm	16:39:51.419000
Attenuation Distortion :: 504 Hz @ Level ::-13.0dBm	16:39:56.438000
Attenuation Distortion :: 604 Hz @ Level ::-13.0dBm	16:40:00.960000
Attenuation Distortion :: 704 Hz @ Level ::-13.0dBm	16:40:05.480000
Attenuation Distortion :: 804 Hz @ Level ::-13.0dBm	16:40:10.499000
Attenuation Distortion :: 904 Hz @ Level :: 13 0dBm	16:40:15.019000
Attenuation Distortion :: 1104 Hz @ Level ::-13.0dBm	16:40:19.539000
Attenuation Distortion :: 1204 Hz @ Level ::-13.0dBm	16:40:24.059000
Attenuation Distortion :: 1304 Hz @ Level ::-13.0dBm	16:40:28.579000
Attenuation Distortion :: 1404 Hz @ Level ::-13.0dBm	
Attenuation Distortion :: 1504 Hz @ Level ::-13.0dBm	16:40:33.099000
Attenuation Distortion :: 1604 Hz @ Level ::-13.0dBm	16:40:38.119000
Attenuation Distortion :: 1704 Hz @ Level ::-13 0dBm	16:40:42.639000
Attenuation Distortion :: 1804 Hz @ Level ::-13 0dBm	16:40:47.158000
Attenuation Distortion :: 1904 Hz @ Level :: 13.0dBm	16:40:51.698000
Attenuation Distortion :: 2004 Hz @ Level ::-13.0dBm	16:40:56.219000
Attenuation Distortion :: 2104 Hz @ Level ::-13.0dBm	16:41:01.238000
	16:41:05.759000
	16:41:10.279000
	16:41:15.298000
	16:41:19.818000
Attenuation Distortion :: 2504 Hz @ Level ::-13.0dBm	16:41:24.340000
Attenuation Distortion :: 2604 Hz @ Level ::-13.0dBm	16:41:29.358000
Attenuation Distortion :: 2704 Hz @ Level ::-13.0dBm	16:41:33.879000
Attenuation Distortion :: 2804 Hz @ Level ::-13.0dBm	16:41:38.399000
Attenuation Distortion :: 2904 Hz @ Level ::-13.0dBm	16:41:42.918000
Attenuation Distortion :: 3004 Hz @ Level ::-13.0dBm	16:41:47.460000
FIN	16:41:54.500000
ACK	16:41:55.859000

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Attenuation Distortion Results

• Attenuation Distortion measurement results are logged in the "Attenuation Distortion Test Report" tab for the current test. Results include the received frequency, power level, and 1004 Hz Net Loss

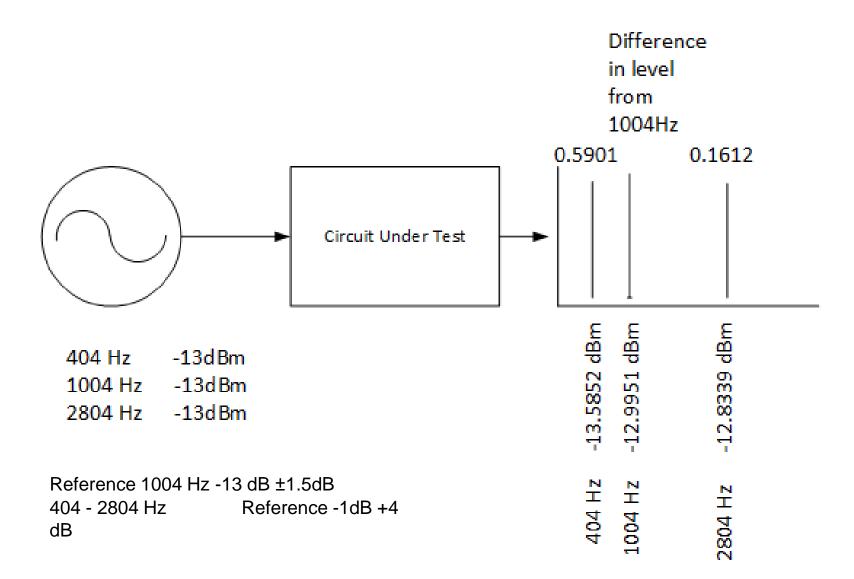
Date/Time	Circuit Selected	Freq Range	Freq (Hz)	Power (dBm)	1004Hz Net Loss	VG3(6) Criteria	VG3(6) Test Result
2020-7-21 14:16:46	VG6	304-3004	1005	-12.97	0.0237999	Pass Power -14.5 to -11.5 dBm	Pass
2020-7-21 14:16:51	VG6	304-3004	306	-13.79	-0.81	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:16:55	VG6	304-3004	405	-13.49	-0.52	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:00	VG6	304-3004	505	-13.33	-0.36	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:04	VG6	304-3004	604	-13.20	-0.22	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:09	VG6	304-3004	704	-13.12	-0.15	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:14	VG6	304-3004	806	-13.04	-0.06	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:18	VG6	304-3004	905	-12.98	-0.00	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:23	VG6	304-3004	1104	-12.94	0.02	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:27	VG6	304-3004	1204	-12.90	0.06	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:32	VG6	304-3004	1306	-12.89	0.08	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:36	VG6	304-3004	1405	-12.87	0.09	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:41	VG6	304-3004	1505	-12.87	0.10	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:46	VG6	304-3004	1604	-12.85	0.12	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:51	VG6	304-3004	1704	-12.85	0.11	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:17:55	VG6	304-3004	1806	-12.83	0.13	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:18:00	VG6	304-3004	1905	-12.82	0.15	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:18:04	VG6	304-3004	2005	-12.82	0.14	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:18:09	VG6	304-3004	2104	-12.82	0.15	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:18:14	VG6	304-3004	2204	-12.82	0.15	Pass Power -14.27 to -7.97 dBm	Pass
2020-7-21 14:18:18	VG6	304-3004	2306	-12.82	0.14	Pass Power -14.27 to -7.97 dBm	Pass
Attenuation Distortion Te	st Report 3-Tone Slope	e Test Report 👌 🤉	Signal/C-Notch Noise Tes	t Report X Intermodulation	n Distortion Test Report λ	Impulse Noise Test Report X S/NR/Net	Loss vs Level Test Report λ



Three Tone Slope (Gain Slope) Test



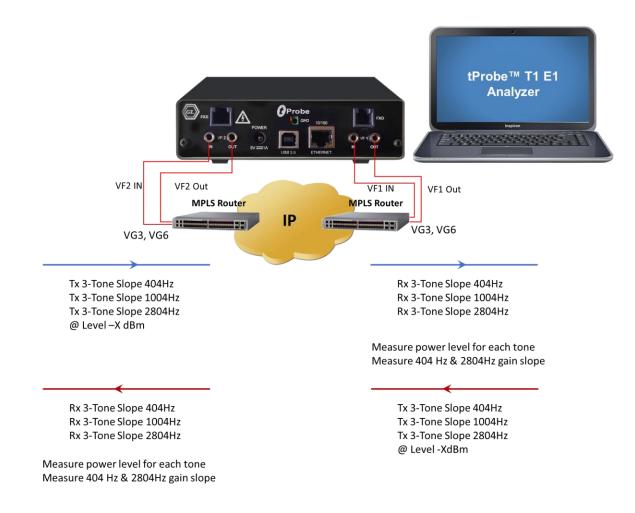
Three Tone Slope (Gain Slope) Test





Three Tone Slope (Gain Slope)

- The measurement of loss or received level vs. frequency while the transmitted level is held constant is referred to as frequency response or attenuation distortion. The specific term gain-slope refers to the measurement of received level at 404 Hz, 1004 Hz, and 2804 Hz and calculation of the difference between levels at 404 Hz and 1004 Hz for 404 Hz gain-slope and the difference between levels at 2804 Hz and 1004 Hz for 2804 Hz gain-slope. Conventionally, + means more loss and means less loss than the 1004 Hz value. The nominal 4 Hz offset prevents beating problems in level measurements on PCM systems as a result of the test frequencies being small submultiples of the 8 kHz sampling rate
- IEEE Standard Equipment Requirements and Measurement Techniques for Analog Transmission Parameters for Telecommunications, IEEE Std 743-1995
 - Level(1004) Level(404) = "404Hz" Gain Slope
 - Level(1004) Level(2804) = "2804Hz" Gain Slope





WCS Commands and Tasks used for Three Tone Slope Measurements

To send 404, 1004 and 2804 Hz tone, MAPS[™] APS uses the WCS "Tx Tone" command:

tx tone (<Freq> , <Power Level>) # <Card No> : <Timeslot> <Duration> msec ;

MAPS[™] APS sends the below commands to WCS server:

tx tone(404,-13.000000) #1:1 3000 msec;

tx tone(1004,-13.000000) #1:1 3000 msec;

tx tone(2804,-13.000000) #1:1 3000 msec;

To measure power level, MAPS[™] APS uses the WCS "Monitor Tone" commands. Responses given by WCS Server are presented to in Message Sequence and the **Three Tone Slope Report Tab** in the Call Generation window

monitor tones ("<MTD File Name>") # <Card No> : <Timeslot> ;

Measure "404 Hz" Gain Slope and "2804 Hz" Gain Slope using below formulas:

404Hz Gain Slope = Level(1004) - Level(404)

2804Hz Gain Slope = Level(1004) - Level(2804)

MAPS[™] APS sends the below command to WCS server:

monitor tones ("MAPS\APS\VF\MTD Files/3ToneSlope.mtd") # 2 : 5;



Three Tone Slope Test Configuration

- The following parameters can be configured in the Global profile for Three Tone Slope test:
 - Power of three tones in dBm
 - Tone Duration in ms
- VG3 Pass Fail Requirement
 - Max Pass Power of three tones
 - Min Pass Power of three tones e.g. the pass criteria for -13 dBm is -14 to -9 dBm
- VG6 Pass Fail Requirement
 - Min Pass Power
 - Max Pass Power e.g. the pass criteria for -13 dBm is -13.5 to -10.5 dBm

-	Three Tone Slope Parameters	
	 Power of 404Hz Tone in dBm 	-13.0
	 Power of 1004Hz Tone in dBm 	-13.0
	 Power of 2804Hz Tone in dBm 	-13.0
	 Tone Duration in ms 	3000
	- VG3 Pass Fail Requirment	
	 Min Pass Power for 1004Hz 	1.00
	 Max Pass Power for 1004Hz 	4.00
	 Min Pass Power for 404Hz Gain Slope 	1.00
	 Max Pass Power for 404Hz Gain Slope 	4.00
	 Min Pass Power for 2804Hz Gain Slope 	1.00
	Max Pass Power for 2804Hz Gain Slope	4.00
	UG6 Pass Fail Requirment	
	 Min Pass Power for 1004Hz 	0.50
	 Max Pass Power for 1004Hz 	2.50
	 Min Pass Power for 404Hz Gain Slope 	0.50
	 Max Pass Power for 404Hz Gain Slope 	2.50
	 Min Pass Power for 2804Hz Gain Slope 	0.50
	L Max Pass Power for 2804Hz Gain Slope	2.50



VF_Originating.gls Ladder Diagram (Master)

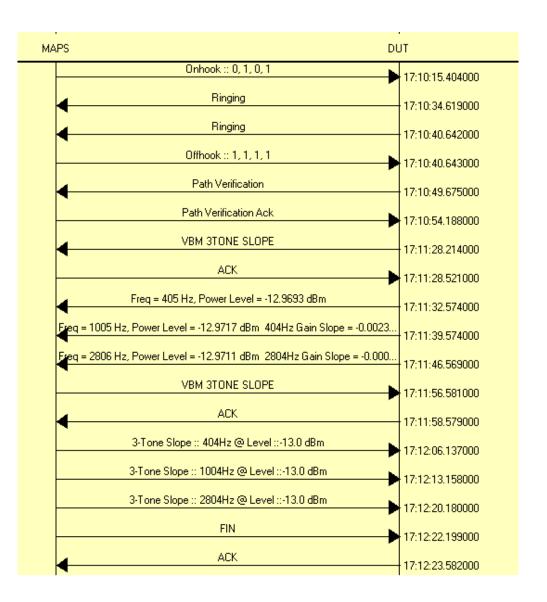
- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed, and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click on the call and select the required 3 Tone Slope Test then VBM 3TONE SLOPE request tone (Frequency:1153Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency:2351Hz ,Power: -13dBm and Duration:300ms), PlaceCall side sends 3-Tone i.e., 404Hz, 1004Hz, 2804Hz at -13dBm
- After receiving the VBM 3TONE SLOPE request, ACK will be sent to receive the frequencies i.e., 404Hz, 1004Hz, 2804Hz with Power Level and Gain Slope.
- Finally, a FIN (Frequency:1949Hz,Power: -13dBm and Duration:300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated

MAI	PS DI	UT
	Onhook :: 0, 1, 0, 1	17:10:15.397000
ŀ	Offhook :: 1, 1, 1, 1	17:10:17.419000
	Tone Detected :: Dial Tone	17:10:23.014000
	Dialing :: 126	17:10:23.023000
	Tone Detected :: Ringback Tone	17:10:30.856000
	Tone Detected :: Ringback Tone	17:10:36.855000
	Tone Detected :: Ringback Tone	17:10:41.358000
ĺ	Path Verification	
ĺ	Path Verification Ack	17:10:49.409000
ľ	VBM 3TONE SLOPE	17:10:54.405000
ł	ACK	17:11:27.340000
ŀ	•	17:11:28.931000
ł		17:11:36.458000
	3-Tone Slope :: 1004Hz @ Level ::-13.0 dBm	17:11:43.478000
	3-Tone Slope :: 2804Hz @ Level ::-13.0 dBm	17:11:50.517000
-	VBM 3TONE SLOPE	17:11:57.427000
	ACK	17:11:57.740000
	Freq = 405 Hz, Power Level = -12.9693 dBm	17:12:02.260000
	Freq = 1005 Hz, Power Level = -12.9717 dBm_404Hz Gain Slope = -0.0023	17:12:09.262000
	Freq = 2806 Hz, Power Level = -12.9711 dBm_2804Hz Gain Slope = -0.000	17:12:16.260000
	FIN	
	ACK	17:12:22.782000
		17:12:23.098000



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack, AnswerCall side receives VBM 3TONE SLOPE request tone (Frequency:1153Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration:300ms)
- After receiving **the VBM 3TONE SLOPE** request, **ACK** will be sent to receive the frequencies i.e. 404Hz, 1004Hz, 2804Hz with Power Level and Gain Slope
- After sending the VBM 3TONE SLOPE request ACK is received
- Then answercall sends 3-Tone i.e. 404Hz, 1004Hz and 2804Hz at 10dBm
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration:300ms), and subsequently sending an ACK





3-Tone Measurement Results

• 3-Tone measurement results are logged in the "**3-Tone Slope Test Report**" tab for the current test. Results include the received frequency, power level, 404Hz Gain Slope, and 2804Hz Gain Slope

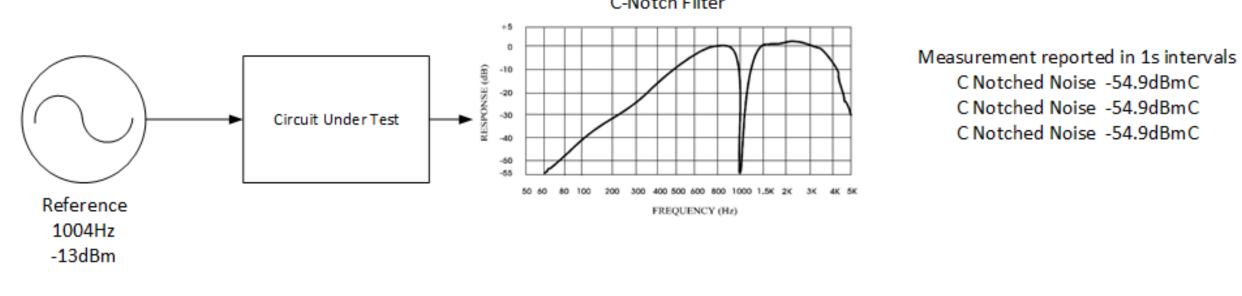
Date/Time	Circuit Selec	Freq (Hz)	Power (dBm)	404Hz Gain Slope	2804Hz Gain Slope	VG3(6) Criteria	VG3(6) Test Result	
2020-7-21 11:21:14	VG6	405	-13.37			Pass Power -13.5 to -10.5 dBm	Pass	
2020-7-21 11:21:21	VG6	1005	-13.34	0.03		Pass Power -13.5 to -10.5 dBm	Pass	
2020-7-21 11:21:28	VG6	2806	-13.32		-0.01	Pass Power -13.5 to -10.5 dBm	Pass	
▲ ▲ ▲ A-Tone Slope Test Report								
	Stone Slope Test Report Signal/C-Noter Noise Test Report A interniodulation Distortion Test Report A shrink report A shrink report A vor Test Report A							



Signal/C-Notch Noise Test



Signal/C-Notch Noise Test



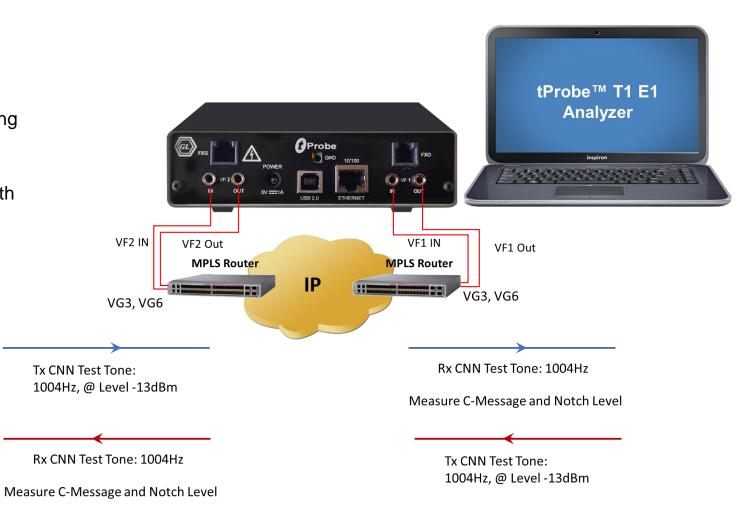
C-Notch Filter

Signal-to-C-notched-noise ratio Standard 32dB Pass \geq 30 dB



S/CNN Test

- **Signal/C-Notched Noise Level (dBrnC)** The noise power on a channel with a holding tone (signal) at the transmit end, measured through a C-Message weighting filter and a 1004 Hz notch filter in tandem
- The noise level measured in reference to the 0 TLP with C-message weighting has the units dBrnC0
- This test measures that noise level after a 1004 Hz notch filter is applied





WCS Commands and Tasks used for CNN Test

To send 1004 Hz tone at -13 dbm, MAPS APS uses WCS Tx Tone command:

tx tone (<Freq> , <Power Level>) # <Card No> : <Timeslot> <Duration> msec ;

Below are commands sent by MAPS[™] APS to WCS server

tx tone (1004, -13) #1:115000 msec;

To measure C-Message and Notch Level MAPS[™] APS uses WCS Commands. Here C-Message and Notch Filters are applied to the received data and then Power levels are measured.

dspop { NOTCH=filter(rx(#2:5), "filter files\Notch8K.IIR"),CMSG=filter(rx(#2:5), "filter files\cmessage.IIR"), NOTCHMon=power monitor(NOTCH), NOTCHMon,CMSGMon=power monitor(CMSG), CMSGMon} continuous report events;



Signal/C-Notch Noise Test Configuration

The following parameters can be configured in the **Global profile** for Signal/C-Notch Noise test :

- CNN Tone Frequency in Hz
- CNN Test Tone Duration in dBm

VG3 Pass Fail Requirement

 Pass SCNN e.g.: 30 indicates pass criteria is S/CNN >= 30

VG6 Pass Fail Requirement

 Pass SCNN e.g.: 30 indicates pass criteria is S/CNN >= 30

- C MESSAGE and Notched Noise Test Parame	ters
 CNN Tone Frequency in Hz 	1004
 CNN Test Tone Duration in ms 	15000
 CNN Test Tone Level in dBm 	-13
- VG3 Pass Fail Requirement	
L Pass SCNN	30.00
VG6 Pass Fail Requirement	
L Pass SCNN	30.00



VF_Originating.gls Ladder Diagram (Master)

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the CNN Test then VBM CNN request tone (Frequency:1049Hz, Power: -13dBm and Duration: 300ms) is sent
- After receiving the ACK (Frequency: 2351Hz , Power: -13dBm and Duration: 300ms) PlaceCall side sends CNN Test Tone 1004Hz at -13dBm
- After receiving the **VBM CNN** request, **ACK** will be sent to receive the C-Messages
- Finally, a FIN (Frequency:1949Hz, Power: -13dBm and Duration: 300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated

MAPS		DUT
	Onhook :: 0, 1, 0, 1	18:26:10.478000
	Offhook :: 1, 1, 1, 1	18:26:12.499000
	Tone Detected :: Dial Tone	18:26:18.097000
	Dialing :: 126	18:26:18.107000
	Tone Detected :: Ringback Tone	
	Tone Detected :: Ringback Tone	18:26:25.938000
	Tone Detected :: Ringback Tone	18:26:31.938000
-	Path Verification	18:26:36.438000
		18:26:44.490000
	Path Verification Ack	18:26:49.982000
	VBM CNN	18:27:39.263000
-	ACK	18:27:41.026000
	CNN Test Tone :: 1004 @ Level :: -13 dBm	18:27:41.539000
_	VBM CNN	18:28:00.026000
	ACK	18:28:00.340000
	Measurment :: C-MSG Noise = 42.9 dBmC	18:28:04.386000
	Measurment :: C-MSG = 77.1 dBmC	18:28:04.393000
	Measurment :: C-MSG Noise = 42.8 dBrnC	
	Measurment :: C-MSG = 77.1 dBmC	18:28:05.407000
	Measurment :: C-MSG Noise = 42.9 dBmC	18:28:05.414000
	Measurment :: C-MSG = 77.1 dBrnC	18:28:06.382000
-		18:28:06.384000
•	Measurment :: C-MSG Noise = 42.9 dBmC	18:28:07.388000
•	Measurment :: C-MSG = 77.1 dBrnC	18:28:07.393000
◀	Measurment :: C-MSG Noise = 42.8 dBmC	18:28:08.385000

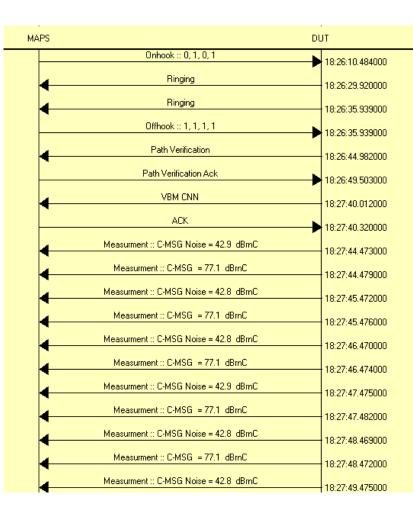
Measurment :: C-MSG = 77.1 dBmC	18:28:08.392000
Measurment :: C-MSG Noise = 42.8 dBmC	18:28:09.397000
Measurment :: C-MSG = 77.1 dBmC	18:28:09.404000
Measurment :: C-MSG Noise = 42.9 dBmC	18:28:10.385000
Measurment :: C-MSG = 77.1 dBmC	18:28:10.392000
Measurment :: C-MSG Noise = 42.9 dBmC	
Measurment :: C-MSG = 77.1 dBmC	18:28:11.392000
•	18:28:11.394000
Measurment :: C-MSG Noise = 42.9 dBmC	18:28:12.385000
Measurment :: C-MSG = 77.1 dBmC	18:28:12.392000
Measurment :: C-MSG Noise = 42.9 dBrnC	18:28:13.392000
Measurment :: C-MSG = 77.1 dBmC	18:28:13.398000
Measurment :: C-MSG Noise = 42.9 dBrnC	18:28:14.385000
Measurment :: C-MSG = 77.1 dBrnC	18:28:14.392000
Measurment :: C-MSG Noise = 42.9 dBmC	18:28:15.382000
Measurment :: C-MSG = 77.1 dBmC	
Measurment :: C-MSG Noise = 42.8 dBmC	18:28:15.384000
Measurment :: C-MSG = 77.1 dBrnC	18:28:16.382000
•	18:28:16.383000
FIN	18:28:20.382000
	18:28:21.894000



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack Answercall side receives VBM CNN request tone (Frequency:1049Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms)
- AnswerCall side measures the C Messages and keeps the result in the C-Message Test Report tab
- Then AnswerCall side sends VBM CNN Request tone and receives the ACK
- Now Answercall side sends CNN Test Tone 1004Hz at -13dBm and is being measured at PlaceCall side
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms), and subsequently sending an ACK

Communication



Measurment :: C-MSG = 77.1 dBrnC	18:27:49.481000
Measurment :: C-MSG Noise = 42.9 dBmC	18:27:50.474000
Measurment :: C-MSG = 77.1 dBmC	18:27:50.480000
Measurment :: C-MSG Noise = 42.9 dBrnC	18:27:51.474000
Measurment :: C-MSG = 77.1 dBmC	
Measurment :: C-MSG Noise = 42.9 dBmC	18:27:51.480000
Measurment :: C-MSG = 77.1 dBmC	18:27:52.472000
•	18:27:52.477000
Measurment :: C-MSG Noise = 42.9 dBmC	18:27:53.470000
Measurment :: C-MSG = 77.1 dBrnC	18:27:53.473000
Measurment :: C-MSG Noise = 42.9 dBmC	18:27:54.471000
Measurment :: C-MSG = 77.1 dBrnC	18:27:54.474000
Measurment :: C-MSG Noise = 42.9 dBrnC	18:27:55.474000
Measurment :: C-MSG = 77.1 dBrnC	18:27:55.479000
Measurment :: C-MSG Noise = 42.8 dBmC	
Measurment :: C-MSG = 77.1 dBmC	18:27:56.498000
•	18:27:56.505000
-	18:27:59.381000
	18:28:00.896000
CNN Test Tone :: 1004 @ Level :: -13 dBm	18:28:01.419000
FIN	18:28:20.895000
ACK	18:28:21.220000
	10.20.21.220000

Signal/C-Notch Noise Test Results

• C-Notch Noise measurement results are logged in the **Signal/C-Notch Noise Test Report** tab for the current test. Results include the received frequency, power level in dBrnC, Notched C-message noise levels, and signal to C-Notch Noise level

Date/Time	Circuit Selected	Freq (Hz)	C-MSG Power (dBrnC)	C-MSG Noise Power (d	S/CNN (dB)	VG3(6) Criteria	VG3(6) Test Result
2020-7-21 14:20:36	VG6	1004	77.1	43.3	33.8	S/CNN > 30 dB	Pass
2020-7-21 14:20:37	VG6	1004	77.1	43.3	33.8	S/CNN > 30 dB	Pass
2020-7-21 14:20:38	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:39	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:40	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:41	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:42	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:43	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:44	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:45	V G6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:46	V G6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:47	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
2020-7-21 14:20:48	VG6	1004	77.1	43.3	33.8	$S/CNN \ge 30 dB$	Pass
< < >				1			
▲ ▶ 🔓 3-Tone Slope Test Report Signal/C-Notch Noise Test Report / Intermodulation Distortion Test Report > Impulse Noise Test Report > S/NR/Net Loss vs Level Test Report > VQT Test Report /				/			

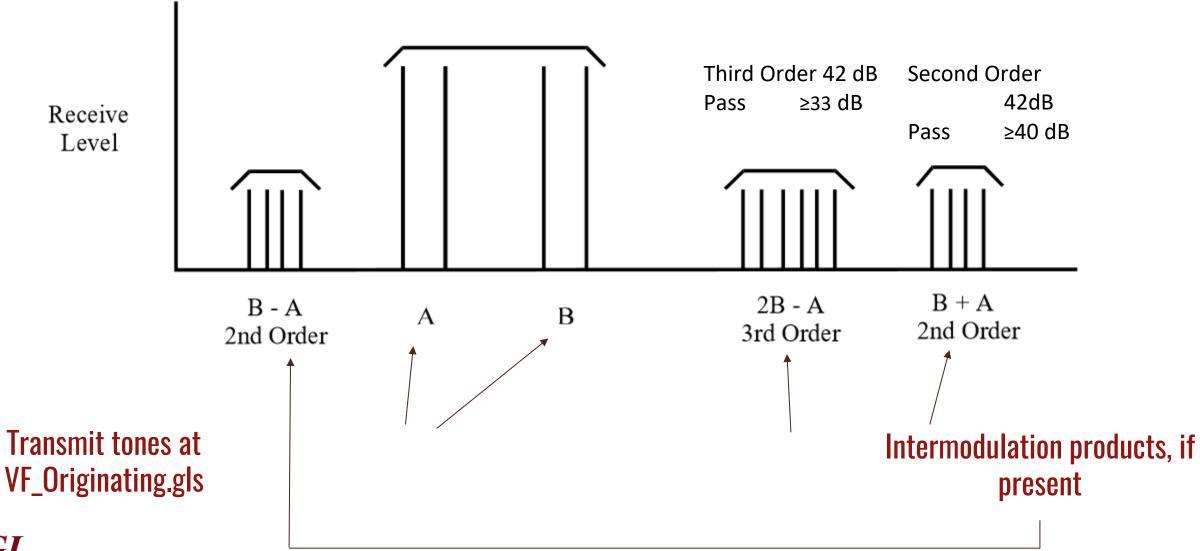
• dBrnC - dB relative noise (0dBrn=-90dBm) C-weighted



Intermodulation Distortion (IMD) Test



Intermodulation Distortion Test



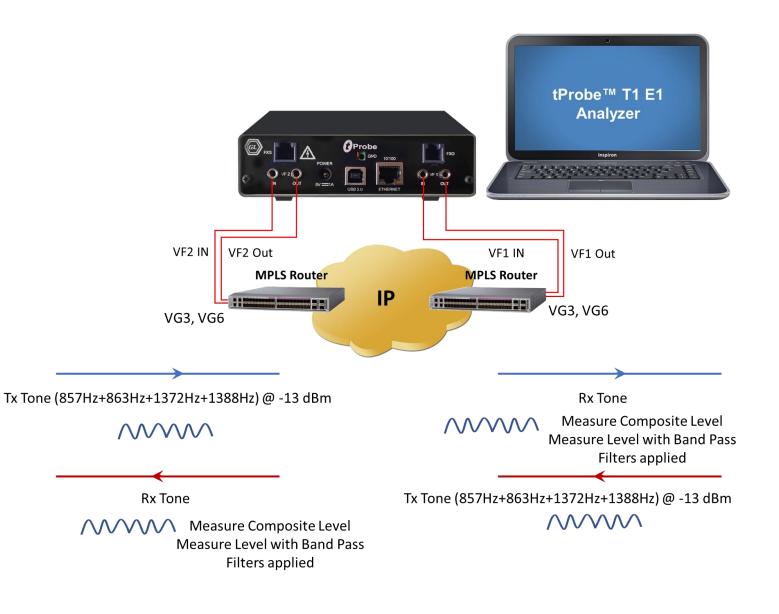
Communications

Intermodulation Distortion Test

 Side A sends 4 frequency tone continuously using the below command. User can enter the composite tone level through the profile, and we calculate the individual level in script. In this case the composite level is set to -13 dBm and each tone level is calculated to be -19.0206 dBm

tx(sum(tone(857, -19.0206), tone(863, -19.0206), tone(1372, -19.0206), tone(1388, -19.0206)), # 1:1) continuous;

 Side B runs 4 power monitors simultaneously for the following. Power values are reported on every second





Intermodulation Distortion Test

- Monitor Power without filter that looks for the power of the 4 tones (composite tone level around -13 dBm)
- IMD test uses IIR filter
- Power monitor with 505-530 bandpass filter applied. This looks for the power of the 2nd order (B-A product)
- Power monitor with 2225-2255 bandpass filter applied. This looks for the power of the 2nd order (B+A product)
- Power monitor with 1875-1925 bandpass filter applied. This looks for the power of the 3rd order product
 - dspop {IMD=rx(# 2 : 5), IMD520=filter(rx(# 2 : 5), "filter files\505-530bandpass.IIR"), IMD2240=filter(rx(# 2 : 5), "filter files\2225-2255bandpass.iir"), IMD1900=filter(rx(# 2 : 5), "filter files\1875-1925bandpass.iir"), power monitor(IMD), power monitor (IMD520), power monitor(IMD2240), power monitor(IMD1900)} report event;
 - Verify power of the 4 tones to be around -13 dBm for 4 seconds
- Then start reporting values in MAPS ladder diagram:
 - Power level of the 4 tones
 - > 2nd order signal power and S/IMD when compared to the received power of the 4 tones
 - > 3rd order signal power and S/IMD when compared to the received power of the 4 tones



Intermodulation Distortion Test Configuration

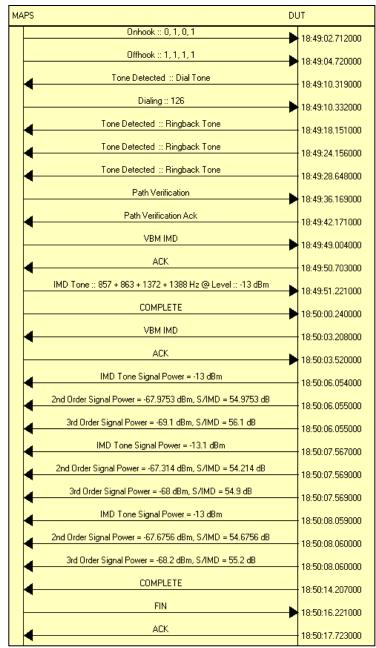
- The following parameters can be configured in the **Global profile** for IMD Test:
 - IMD Tone Tx Level
- VG3 Pass Fail Requirement
 - Second Order IMD pass dB loss
 - Third Order IMD pass dB loss e.g.: Pass criteria for -13 dBm is "Second Order S/IMD >33 AND Third Order S/IMD>40"
- VG6 Pass Fail Requirement
 - Second Order IMD pass dB loss
 - Third Order IMD pass dB loss e.g.: Pass criteria for -13 dBm indicates, "Second Order S/IMD >33 AND Third Order S/IMD>40"

Intermodulation Distortion Parameters				
 IMD Tone Tx Level 	-13.00			
- VG3 Pass Fail Requirement				
 Second Order IMD pass dB loss 	33.00			
 Third Order IMD pass dB loss 	40.00			
VG6 Pass Fail Requirement				
 Second Order IMD pass dB loss 	33.00			
 Third Order IMD pass dB loss 	40.00			



VF_Originating.gls Ladder Diagram (Master)

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed, and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the required IMD Test then VBM IMD request tone (Frequency:1741Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms), PlaceCall sends 4 tones at -13dBm power
- The Composite signal level, 2nd and 3rd order intermodulation power measurement and S/IMD ratio are measured at AnswerCall side
- Finally, PlaceCall side receives COMPLETE (Frequency: 2251Hz,Power: -13dBm and Duration: 300ms) tone, sends FIN (Frequency:1949Hz,Power: -13dBm and Duration: 300ms) and subsequently ACK is received to indicate that call will be terminated



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack AnswerCall side receives VBM IMD request tone (Frequency:1741Hz, Power: -13dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms)
- Measures level of composite tone, calculates 2nd and 3rd order Intermodulation product levels and S/IMD ratio which are displayed on the arrows in the ladder diagram and send these measurements to IMD Test Report Tab
- Then AnswerCall side sends 4 tones and COMPLETE (Frequency:2251Hz, Power: -13dBm and Duration:300ms) tone
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms), and subsequently sending an ACK

MAPS	D	UT
	Onhook :: 0, 1, 0, 1	18:49:02.719000
-	Ringing	18:49:22.080000
	Ringing	18:49:28.139000
	Offhook :: 1, 1, 1, 1	18:49:28.140000
	Path Verification	- 18:49:37.186000
	Path Verification Ack	18:49:41.705000
	VBM IMD	
-	ACK	18:49:49.725000
		18:49:50.039000
-	IMD Tone Signal Power = -13 dBm	18:49:54.141000
-	2nd Order Signal Power = -68.8014 dBm, S/IMD = 55.8014 dB	18:49:54.142000
-	3rd Order Signal Power = -68.3 dBm, S/IMD = 55.3 dB	18:49:54.142000
-	IMD Tone Signal Power = -12.9 dBm	18:49:54.629000
-	2nd Order Signal Power = -68.0622 dBm, S/IMD = 55.1622 dB	18:49:54.630000
	3rd Order Signal Power = -67.8 dBm, S/IMD = 54.9 dB	18:49:54.630000
	IMD Tone Signal Power = -13 dBm	- 18:49:55.646000
	2nd Order Signal Power = -67.6753 dBm, S/IMD = 54.6753 dB	18:49:55.647000
	3rd Order Signal Power = -68.1 dBm, S/IMD = 55.1 dB	
	COMPLETE	18:49:55.647000
-	VBM IMD	18:50:00.732000
		18:50:02.741000
-	ACK	18:50:04.245000
	IMD Tone :: 857 + 863 + 1372 + 1388 Hz @ Level :: -13 dBm	18:50:04.759000
	COMPLETE	18:50:13.779000
-	FIN	18:50:16.750000
	ACK	18:50:17.059000



IMD Test Results

 Intermodulation Distortion measurement results are logged in the "Intermodulation Distortion Test Report" tab for the current test. Results include the received power level, 2nd Order IMD Power in dB, 2nd Order S/IMD in dB, 3rd Order IMD Power in dB, and 3rd Order S/IMD in dB

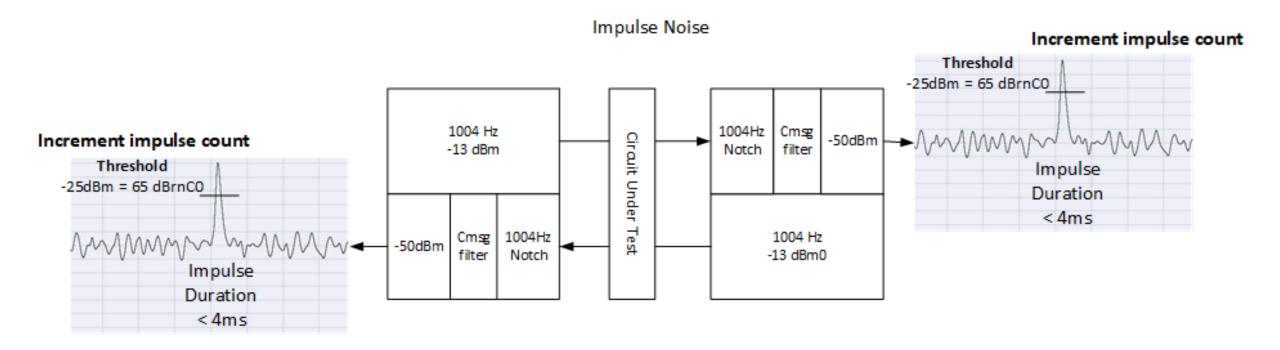
DMD Tone Power	2nd Order IMD	2nd Order S/IMD (dB)	3rd Order IMD Power (dBm)	3rd Order S/IMD (dB)	VG3(6) Criteria	VG3(6) Test Resu
-13.00	-68.89	55.89	-64.69	51.69	2nd Order S/IMD $>$ 33 dB and 3rd Order S/IMD $>$ 40 dB	Pass
-13.00	-68.44	55.44	-64.90	51.90	2nd Order S/IMD > 33 dB and 3rd Order S/IMD > 40 dB	Pass
-13.00	-69.00	56.00	-64.69	51.69	2nd Order S/IMD \geq 33 dB and 3rd Order S/IMD \geq 40 dB	Pass
<						>
- A 3-Tone Slope Test Report λ Signal/C-Notch Noise Test Report λ Intermodulation Distortion Test Report λ Impulse Noise Test Report λ S/NR/Net Loss vs Level Test Report λ VQT Test Report						



Impulse Noise Test



Impulse Noise Test

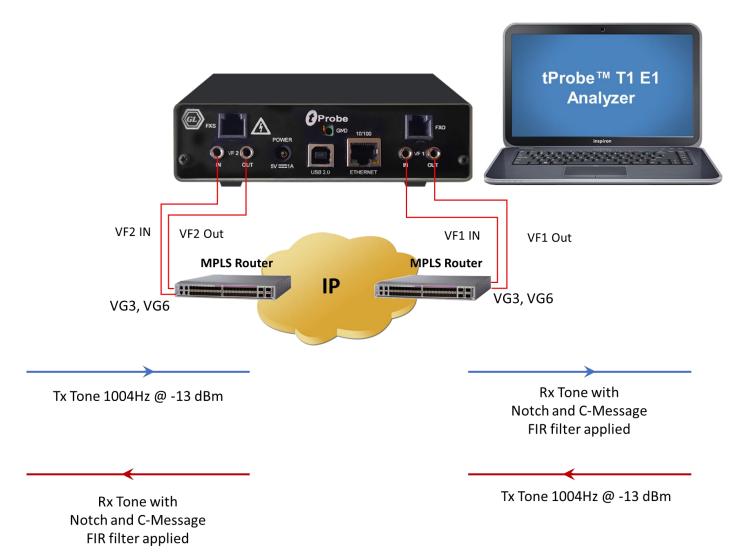


Pass criteria - No more than 15 counts in 15 minutes at -25 dBm (65 dBrnC0)



Impulse Noise Test (Contd.)

• Impulse Noise as any momentary occurrence of the noise on a line significantly exceeding the normal noise peaks. It is analyzed by counting the number of occurrences that exceed a threshold during a specified period of time





Impulse Noise Test Configuration

- The following parameters can be configured in the **Global profile** for Impulse Noise Test:
 - Monitor Duration in sec
 - Threshold level in dBrnC
 - Impulse Noise file selection for Verification
 - Impulse Noise file
 - Hold tone level in dBm
- VG3 Pass Fail Requirement
 - Pass count within 15 mins e.g.: The pass criteria is "Impulse Noise count <= 15" within duration of 15 mins</p>
- VG6 Pass Fail
 - Pass count within 15 mins e.g.: The pass criteria is "Impulse Noise count <= 15" within duration of 15 mins</p>

Impulse Noise Parameters	
 Monitor Duration in sec 	900
 Threshold level in dBrnC 	67.00
 Impulse Noise file selection for Verification 	Disable
 Impulse Noise file 	16min_16clilcks
 Hold tone level in dBm 	-13.0
VG3 Pass Requirement	
Pass count within 15 Mins	15
VG6 Pass Fail Requirement	
Pass count within 15 Mins	15



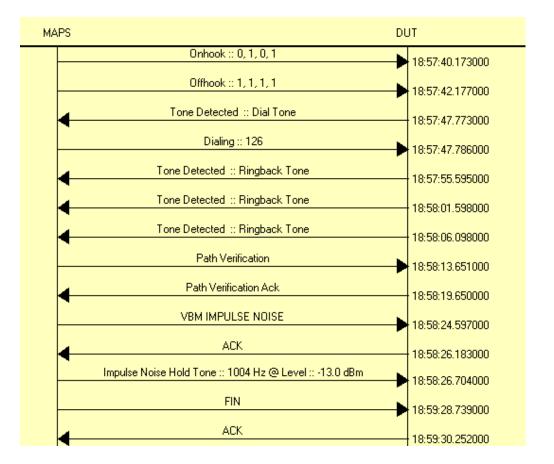
WCS Commands and Tasks for Impulse Noise Test

- Start impulse noise detector at side A and B
 - dspop {ImpulseNoise=dtmfdigitmonitor(mulaw(filter(filter(rx(# 2 : 5), "filter files\CMessage8K.XFR"), "filter files\Notch8K.FIR"), compress), "configini\1004HzWithPops.ini")} report events;
- Send 1004 Hz hold tone from both sides
- Report every burst event which meets below conditions
 - A) Exceeds the threshold level (65 dBrnC configured in Profile Editor)
 - B) Did not occur during the 125 ms blanking interval, then increase impulse noise counter
- Monitor until the Monitor Duration is satisfied, (default duration configured in Profile Editor is 900 sec)



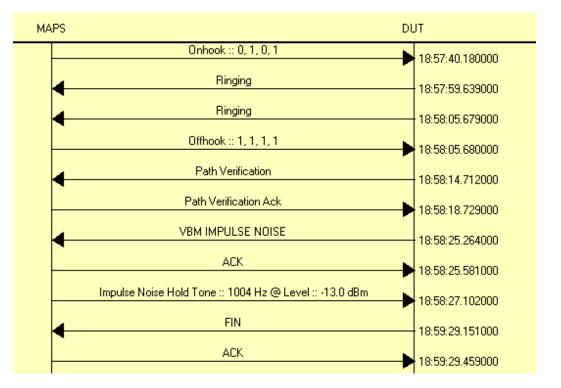
VF_Originating.gls Ladder Diagram

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the VBM Impulse Noise Test then VBM IMPULSE NOISE request tone (Frequency:1867Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency:2351Hz ,Power: -13dBm and Duration: 300ms) PlaceCall side sends Holding tone (1004Hz, -13dBm) and monitors Impulse Noise for the configured interval of time
- Finally, a FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated



VF_Terminating.gls Ladder Diagram

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack, Answercall side receives VBM IMPULSE NOISE request tone (Frequency:1867Hz, Power: -13dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration: 300ms)
- Then AnswerCall side sends **Holding tone** (**1004Hz -13.dBm**) and monitors Impulse Noise for the configured interval of time.
- AnswerCall side terminates the call by receiving the FIN (Frequency:1949Hz, Power: -13dBm and Duration:300ms), and subsequently sending an ACK





Impulse Noise Test Results

Intermodulation Distortion measurement results are logged in the "Impulse Noise Test Report" tab for the current test. Results will be empty if no
impulse hits occur. When there are counts it will report the received noise level and total counts

Date/Time	Circuit Selected	dBrnC	Count	VG3(6) Criteria	VG3(6) Test Result	
2020-7-21 14:36:46	VG6	N/A	0	Pass Count <= 15 in 15 m	Pass	
▲ ▶ A 3-Tone Slope Test Report A Signal/C-Notch Noise Test Report A Intermodulation Distortion Test Report A Impulse Noise Test Report A S/NR/Net Loss vs Level Test Report A VQT Test Report						

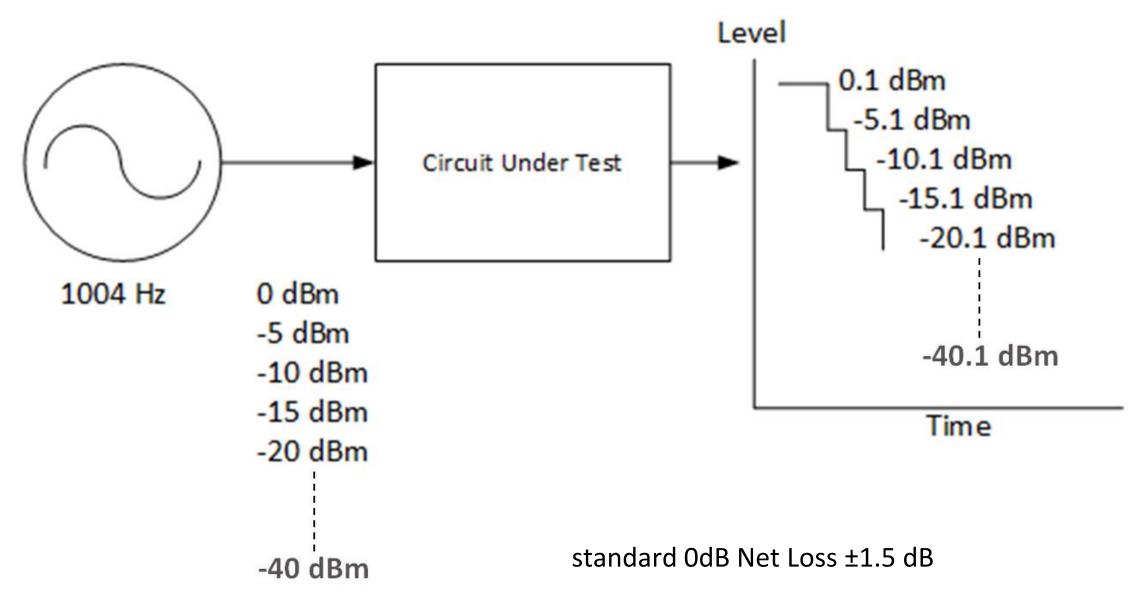
Date/Time	Circuit Selected	dBrnC	Count	VG3(6) Pass Criteria	VG3(6)_TestResult
2020-5-26 16:32:56	VG6	75	1	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:33:56	VG6	75.1	2	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:34:56	VG6	75	3	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:35:56	VG6	75	4	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:36:56	VG6	75	5	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:37:56	VG6	75.1	6	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:38:56	VG6	74.9	7	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:39:56	VG6	74.9	8	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:40:56	VG6	75	9	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:41:56	VG6	74.8	10	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:42:56	VG6	74.9	11	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:43:56	VG6	74.8	12	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:44:56	VG6	74.9	13	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:45:56	VG6	71.9	14	Pass Count =< 15 in 15 mins	Pass
2020-5-26 16:46:56	VG6	75	15	Pass Count =< 15 in 15 mins	Pass
↓ → A 3-Tone Slope Test Repo	ort) Signal/C-Notch Noise Test	Report Intermodulation D		ulse Noise Test Report S/NR/Net Loss	vs Level Test Report 🔪 VQT Test Repor



S/N Ratio and Net Loss Vs Level



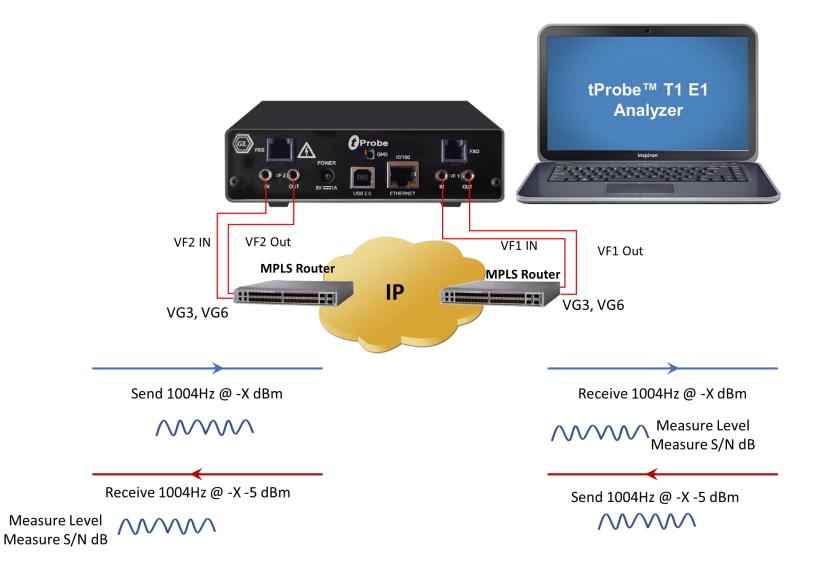
S/N Ratio and Net Loss Vs Level





S/N Ratio and Net Loss Vs Level

• Signal-to-Noise Ratio and Level - Transmission of 1004 Hz (reference tone) with incrementing level of the tone at every iteration (example, by 5 dBm). At the reception side, measure levels and S/N ratio. This can be done in both the directions in a single test





WCS Commands and Tasks used for SNR Measurements

• To send 1004 Hz tone with different levels, MAPS APS uses WCS Tx Tone command

tx tone (<Freq> , <Power Level>) # <Card No> : <Timeslot> <Duration> msec ;

• Below is the command sent by MAPS APS to WCS server

tx tone (1004, -45) #1:1 3000 msec;

 To Measure SNR Level and Signal to Noise Ratio, MAPS APS uses WCS Monitor Tone and Monitor SNR commands respectively. Responses given by WCS Server are presented to user In Ladder Diagram and SNR Report Tab in the Call Generation window monitor tones ("<MTD File Name>") # <Card No> : <Timeslot> ;

monitor s/n ratio # <Card No> : <Timeslot> ;

Below are commands sent by MAPS APS to WCS server

monitor tones ("MAPS\APS\VF\MTD Files/Voicebandsignal.mtd") # 2 : 5 ; monitor s/n ratio # 2



S/N Ratio Net Loss vs Level Test Configuration

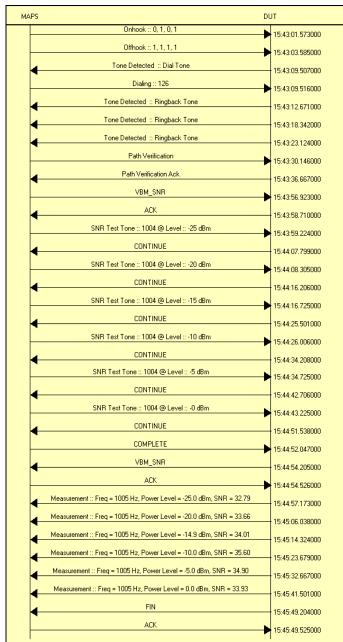
- The following parameters can be configured in the **Global profile** for SNR test:
 - SNR Tone Frequency
 - SNR Tone Duration
 - SNR Tone Minimum (starting) Level
 - SNR Tone Level step: tone levels are increased at this defined step
- VG3 Pass Fail Requirement
 - Min Pass Power in dBm
 - Max Pass Power in dBm e.g.: Pass criteria for -45 dBm is -46 to -44 dBm
- VG6 Pass Fail Requirement
 - Min Pass Power
 - Max Pass Power e.g.: Pass criteria for -45 dBm is -46.5 to -43.5 dBm

F	SNR Tone Frequency in Hz	1004
F	SNR Tone Duration in ms	3000
-	SNR Tone Minimum Level in dBm	-45.0
-3	SNR Tone Level Step Size in dBm	5
-3	VG3 Pass Fail Requirment	
1	 Min Pass Power 	1.00
	L Max Pass Power	1.00
E	VG6 Pass Fail Requirment	
	 Min Pass Power 	1.50
	Max Pass Power	1.50



VF_Originating.gls Ladder Diagram (Master)

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the SNR then VBM SNR request tone (Frequency:853Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency:2351Hz ,Power: -13dBm and Duration:300ms) PlaceCall sends SNR Test Tone of 1004Hz at -25dBm
- After receiving CONTINUE (Frequency:2153Hz, Power: -13dBm and Duration:300ms) tone, it sends 1004Hz at -20dBm Similarly, send the next tone by incrementing 5dBm till 0dBm
- After receiving COMPLETE (Frequency:2251Hz, Power: -13dBm and Duration:300ms) tone, the other end will send VBM SNR (Frequency: 853Hz, Power: -13dBm and Duration:300ms) to indicate start of SNR test in the reverse direction and start sending tone of 1004Hz from -25dBm incrementing by 5dBm at each level
- Finally, a FIN (Frequency: 1949Hz, Power: -13dBm and Duration:300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack AnswerCall side receives VBM_SNR (Frequency:853Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration:300ms) and it starts monitoring tones and Signal to Noise Ratio
- Then AnswerCall side measures SNR Test Tone of 1004Hz is received at -25dBm, Signal to Noise Ratio measurements are started and requesting for the next level of tone by sending CONTINUE (Frequency:2153Hz,Power: -13dBm and Duration:300ms) tone. Now, the tones are constantly being received incremented by 5dBm till 0dBm
- After receiving **COMPLETE** (**Frequency:2251Hz,Power: -13dBm and Duration:300ms**) tone from PlaceCall to indicate the test is completed
- Now AnswerCall side will start the test from reverse direction and SNR Test tone is sent from -25 dBm and incremented by 5dBm till 0dBm
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration: 300ms), and subsequently sending an ACK

MAPS		DUT
	Onhook :: 0, 1, 0, 1	15:43:02.470000
←	Ringing	15:43:16.086000
	Ringing	15:43:22.107000
	Offhook :: 1, 1, 1, 1	15:43:22.107000
←	Path Verification	15:43:31.638000
	Path Verification Ack	15:43:34.645000
	VBM_SNR	15:43:57.725000
	ACK	15:43:58.045000
	Measurement :: Freq = 1005 Hz, Power Level = -25.0 dBm, SNR = 32.82	15:44:01.070000
	Measurement :: Freq = 1005 Hz, Power Level = -20.0 dBm, SNR = 33.56	15:44:09.872000
	Measurement :: Freq = 1005 Hz, Power Level = -14.9 dBm, SNR = 34.02	15:44:18.239000
	Measurement :: Freq = 1005 Hz, Power Level = -10.0 dBm, SNR = 35.59	15:44:27.575000
	Measurement :: Freq = 1005 Hz, Power Level = -5.0 dBm, SNR = 34.83	15:44:36.069000
	Measurement :: Freq = 1005 Hz, Power Level = 0.0 dBm, SNR = 33.96	
	COMPLETE	15:44:44.571000
	VBM_SNR	15:44:52.722000
	ACK	15:44:53.745000
◀	SNR Test Tone :: 1004 @ Level :: -25 dBm	15:44:55.246000
	CONTINUE	15:44:55.764000
◀─		15:45:03.971000
	SNR Test Tone :: 1004 @ Level :: -20 dBm	15:45:04.486000
│	CONTINUE	15:45:12.286000
	SNR Test Tone :: 1004 @ Level :: -15 dBm	15:45:12.806000
◀	CONTINUE	15:45:21.619000
	SNR Test Tone :: 1004 @ Level :: -10 dBm	15:45:22.125000
	CONTINUE	15:45:30.991000
	SNR Test Tone :: 1004 @ Level :: -5 dBm	15:45:31.504000
	CONTINUE	15:45:39.352000
	SNR Test Tone :: 1004 @ Level :: -0 dBm	15:45:39.864000
▲	CONTINUE	15:45:47.787000
	FIN	15:45:48.304000
-	ACK	15:45:50.251000



S/N Ratio Measurement Results

• SNR measurement results are logged in the "SNR and Level Test Report" tab for the current test. Results include the received frequency, power level, and signal-to-noise ratio

Date/Time	Circuit Selected	Freq (Hz)	Power (dBm)	SNR	VG3(6) Criteria	VG3(6) Test Result	
2020-7-21 11:39:06	VG6	1005	-44.9	25.11	Pass Power -46.5 to -43.5 dBm	Pass	
2020-7-21 11:39:15	VG6	1005	-40.2	27.97	Pass Power -41.5 to -38.5 dBm	Pass	
2020-7-21 11:39:23	VG6	1005	-35.3	31.22	Pass Power -36.5 to -33.5 dBm	Pass	
2020-7-21 11:39:32	VG6	1005	-30.3	32.99	Pass Power -31.5 to -28.5 dBm	Pass	
2020-7-21 11:39:40	VG6	1005	-25.4	32.15	Pass Power -26.5 to -23.5 dBm	Pass	
2020-7-21 11:39:49	VG6	1005	-20.4	33.70	Pass Power -21.5 to -18.5 dBm	Pass	
2020-7-21 11:39:57	VG6	1005	-15.3	35.24	Pass Power -16.5 to -13.5 dBm	Pass	
2020-7-21 11:40:06	VG6	1005	-10.4	35.78	Pass Power -11.5 to -8.5 dBm	Pass	
2020-7-21 11:40:14	VG6	1005	-5.4	34.25	Pass Power -6.5 to -3.5 dBm	Pass	
2020-7-21 11:40:22	VG6	1005	-0.4	34.55	Pass Power -1.5 to 1.5 dBm	Pass	
Attenuation Distortion	Test Report 3-Tone Slope To	est Report Signal/C-Notch N	Noise Test Report 👌 Intermod	ulation Distortion Test Report	Impulse Noise Test Report S/NR/Net	t Loss vs Level Test Report 🖌	VQT Test Rep

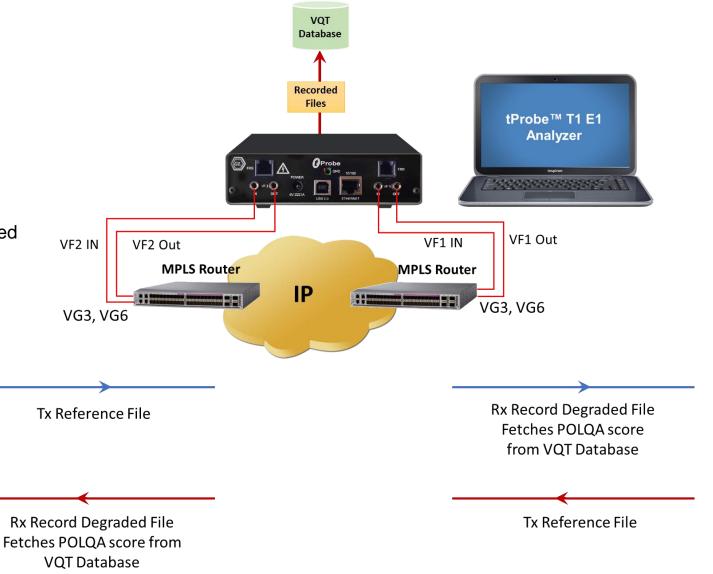


Voice Quality Testing (VQT)



VQT Test

- Voice Quality Test (VQT) This test involves transmission of reference file and recording of the degraded file in two sequential tests, one for each direction
- The VQT software calculates a POLQA score by comparing and analyzing the reference and degraded files





VQT Test Configuration

- The following parameters can be configured in the **Global profile** for VQT Test:
 - VQT parameters such as the reference file and degraded file path can be configured in the Global Configuration
 - Reference file is a ITU standard reference voice file. File path should exist on the Server system under C:\VQT_Reference
 - Degraded File Path defines where the recorded files are stored
 - VQT Database Path is the location of the VQT.mdb database file where VQT results are stored. This is typically under C:\Program Files (x86)\GL Communications Inc\DataImport\VQT.mdb

L _I vo	(T Parameters	
F	Reference File	C:\VQT_Reference\VQuad_Auto\POLQ
F	Degraded File Path	C:\VQT_Degraded\1u\
F	VQT Server IP Address	127.0.0.1
L	One Way Delay Measurement	Enable

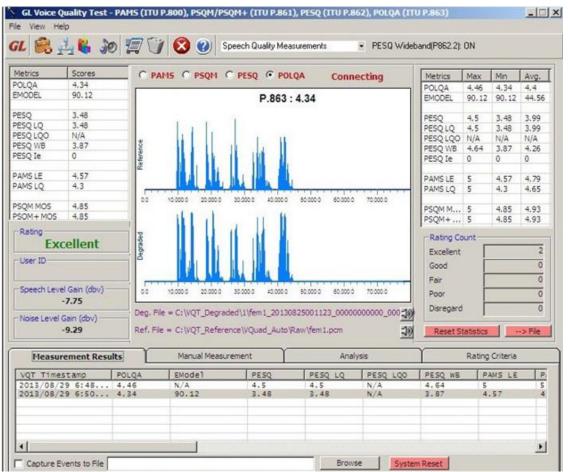
	IT Parameters	
F	VQT Database Path	\\127.0.0.1\DataImport\VQT.mdb
L	VQT Type	POLQA



VQT Test

- Double-click on the GL VQT shortcut icon created on the desktop to invoke the application
- Double click on Data Import shortcut icon created on the desktop to start the database
- MAPS[™] APS records degraded files into designated directories. VQT Auto Measurement automatically performs analysis when new degraded file is detected
- POLQA results are stored into a database via Data Import and results are read by MAPS[™] APS

🖲 Data Import			- 🗆 X
File Configuration	Help		
Time	MessageType	CallD	PhoneID
Capture Log		Browse	🗹 Show Latest
Clear			Msgs Queued 0
			Mini Form Close



- On the VQT application, click on File \rightarrow Auto-٠ Measurement to invoke VQT Auto-Measurement window
- Click on **Modify** to configure Auto-Measurement ٠ parameters

VQT Test Parameters

~	-	MS (ITU P.800), PSQM/PSQM+ (ITU P.861), PESQ (ITU P.	862), POLQ	_		×
File	View ACU Help					
	Auto-Measurement	Speech Quality Measurements - PESQ Nor	mal(P862.1): 0	IN		
	Output Properties (ASCII File) Measurement Parameters	C PESQ © POLQA Connected	Metrics	Max	Min	Avg.
	Rating Criteria	>	POLQA EMODEL	0 N/A	0 N/A	0 N/A
	Audio Alert Configuration Central DB Connection		PESQ PESQ LQ	N/A N/A	N/A N/A	N/A N/A
	Load Results from Log File		PESQ LQO PESQ WB PESO Ie	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A
	Output Measurement Result to Log File Export Data for DataImport	Communications Inc.	PAMS LE PAMS LQ	N/A N/A	N/A N/A	N/A N/A
	Exit M MOS N/A M+ MOS N/A	Lice Quality Testing	PSQM M PSQM+	N/A	N/A N/A	N/A N/A
	ting	(VQT)	, ⊢Rating Co	unt —		

٧Q	T Auto-Measurement: VBMeasur	ement			×
Fil	e Help				
Γ	Auto Configuration	ns Auto Pro	file		
	Degraded Directory	Reference File	Туре	Option	Inventory
	C:\VQT_Degraded\1u	C:\VQT_Reference\VQuad_Auto\POLQA-uLa	u-Law,8,8000,LSMS(Intel),0,0,0,0,2,	Auto Del	
	<				>
	Add Modify	Delete Delete All	Start Stop	Start All Sto	op All



VQT Test Parameters

- Degraded File Path should match the Degraded Directory defined in the MAPS[™] APS VQT parameters in profiles
- Reference File should match the Reference File specified in the MAPS™ APS VQT parameters
- After configuring, click on **Start**
- VQT Auto Measurement monitors files recorded to that directory and automatically performs POLQA analysis. VQT scores are stored in a database which is read by MAPS[™]

TAuto-Measurement: bhushan le Help							
Auto Configuration	IS	Auto	Profile				
Degraded Directory C:\VQT_Degraded\1u\	Reference File C:\VQT_Referen	ce\VQuad_Auto\POLQA-uLa.	Type u-La	Option Auto Del	Inventory	User ID C tprobe1 2	Counts 2
Add Modify Options	_	Auto\POLQA-uLa	POLQA Oni Enable I	Level Alignmer		Stop All	
Auto-delete the degraded file al Save degraded files to the inve Inventory Directory* Saving Critieria (optional) Excellent Good O PESQ + POLQA O PES	ntory directory after	r measurement	File Format- E (for 16 bit Quick Modi Start: 1	te Order file only) file configuration fy Configuration	MS(Intel) Vser Specifi MS(Intel) Sits Per Sar	cond 8000 ed: 32000	



VF_Originating.gls Ladder Diagram (Master)

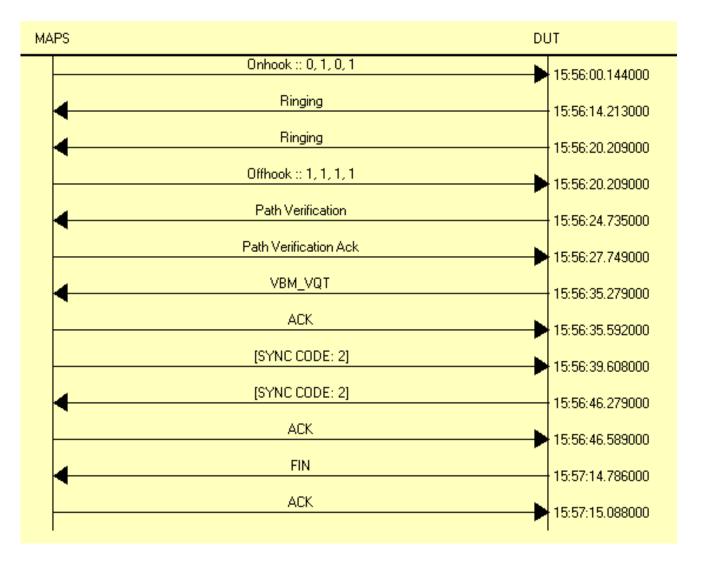
- Initially both sides are On-hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click and select the VQT Test then VBM VQT request tone (Frequency:751Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving the ACK (Frequency:2351Hz, Power: -13dBm and Duration: 300ms) PlaceCall sends a reference file
- Test the reverse direction: After receiving the VBM VQT request, ACK will be sent to receive the Degraded files and calculates the POLQA Score and Retrieve VQT results from VQT database
- Finally, a FIN (Frequency:1949Hz,Power: -13dBm and Duration:300ms) is received to end the test and subsequently an ACK is sent to indicate that call will be terminated

MAPS DI	JT
Onhook :: 0, 1, 0, 1	15:55:59.481000
Offhook :: 1, 1, 1, 1	15:56:01.490000
Tone Detected :: Dial Tone	15:56:07.082000
Dialing :: 126	15:56:07.087000
Tone Detected :: Ringback Tone	15:56:09.903000
Tone Detected :: Ringback Tone	
Path Verification	15:56:15.906000
Path Verification Ack	15:56:23.431000
•	15:56:29.443000
VBM_VQT	15:56:34.572000
	15:56:36.453000
[SYNC CODE: 2]	15:56:41.453000
[SYNC CODE: 2]	15:56:44.469000
ACK	15:56:47.452000
Sending VQT File ::: C:\VQT_Reference\VQuad_Auto\POLQA-uLaw\fem1polqaula.pcm	15:56:47.971000
Receive File Completed :: C:\VQT_Degraded\1u\2024-03-11-15-56-47-Line002.pcm	15:56:55.973000
VQT Score: 4.5 :: 2024-03-11-15-56-47-Line002.pcm	
Sending VQT File ::: C:\VQT_Reference\VQuad_Auto\POLQA-uLaw\fem1polqaula.pcm	15:57:01.194000
Receive File Completed :: C:\VQT_Degraded\1u\2024-03-11-15-57-01-Line001.pcm	15:57:01.196000
	15:57:09.184000
VQT Score: 4.5 :: 2024-03-11-15-57-01-Line001.pcm	15:57:12.274000
FIN	15:57:14.291000
ACK	15:57:15.954000



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are on-hook
- An incoming call is detected When the call is answered on the second ring, an Off-Hook is sent.
- After the Path Verification Ack AnswerCall side receives VBM VQT request tone (Frequency:751Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power:-13dBm and Duration:300ms)
- After sending the **VBM VQT** request, **ACK** is received, and then AnswerCall sends reference file
- AnswerCall side terminates the call by receiving the FIN (Frequency:1949Hz, Power:-13dBm and Duration:300ms), and subsequently sending an ACK





Test Results

• VQT measurement results are logged in the VQT Test Report tab for the current test. VQT test report contains Caller POLQA Score, Callee to Caller Delay (in msec), Callee Degraded File Name, Callee POLQA Score, and Caller to Callee Delay (in msec)

Date/Time	Caller Degraded File Name	Caller POLQA Sc	Callee to Caller Delay (msec)	Callee Degraded File Name	Callee POLQA Score	Caller to Callee Delay (msec)
2020-5-11 09:44:55	2020-May-11-Line001#6881493.pcm	4.13	70.75	2020-May-11-Line002#6881493.pcm	4.19	70.62
▲ ► SNR and Le	evel Test Report VQT Test Report 3	-Tone Slope Test Report	Attenuation Distortion Test Report	λ 1004 Hz Tone Test Report λ Interm	odulation Distortion Test Report	



Twenty-Three Tone Test



Twenty-Three Tone Test

- The Twenty-Three test signal consists of 23 equally spaced tones from 203.125Hz to 3640.625Hz with known phase relationships. Since the phases of the 23 tones are known, straightaway envelope delay distortion measurements made at 22 frequencies. At the same time, the frequency response (or attenuation distortion) at the 23 transmitted frequencies measured along with other measurements
- The following parameters can be configured in the Global profile for Twenty-Three Tone Test Parameters:
 - Twenty-Three Tone Test Duration in ms
 - Report Frequency in ms
 - Twenty-Three Test Tone Level in dBm

Twenty Three Tone Test Parameters	
 Twenty Three Test Tone Duration in ms 	10000
 Report Frequency in ms 	1000
Twenty Three Test Tone Level in dBm	-23



VF_Originating.gls Ladder Diagram (Master)

- Initially both sides are On-Hook
- When it goes Off hook, dial tone is detected, the number is dialed and ring back tone is received
- Connection is established and Path Verification is done
- Waiting for user input. Under Events column, right-click on the running call and select the required 23 Tone Test then VBM-23 Tone request tone (Frequency: 1781Hz, Power: -13dBm and Duration:300ms) is sent
- After receiving ACK (Frequency: 2351Hz, Power: -13dBm and Duration:300ms), PlaceCall sends the 23 tone test.
- After receiving COMPLETE (Frequency:2251Hz,Power: -13dBm and Duration:300ms) tone, AnswerCall side will send VBM 23 Tone request tone and receives the ACK
- After receiving the ACK, Answercall sends the 23 tone test.
- Finally, a FIN (Frequency: 1949Hz, Power: -13dBm and Duration:300ms) is received to end the test and subsequently a ACK (Frequency: 2351Hz, Power: -13 dBm and Duration:300ms) is sent to indicate that call will be terminated

e Column Width —— Show Latest		
MAPS	DUT	Find EventType :: 23ToneTest
Onhook :: 0, 1, 0, 1	12:56:22.443000	23-Tone Measurement Results :
Offhook :: 1, 1, 1, 1		Freq0 :: 203.125000 Power0 :: -36.643623 Phase0 :: 2.253228 Freq1 :: 359.375 Power1 :: -36.604668 Phase1 :: 0.346200
	12:56:24.464000	Freq2 :: 515.625 Power2 :: -36.549961 Phase2 :: -2.925522
Tone Detected :: Dial Tone	12:56:30.072000	Freq3 :: 671.875000 Power3 :: -36.619495 Phase3 :: -1.289508
Dialing :: 126	12.00.00.012000	Freq4 :: 828.125000 Power4 :: -36.549210 Phase4 :: -1.031202 Freq5 :: 984.375000 Power5 :: -36.561340 Phase5 :: 2.802425
	12:56:30.094000	Freq6 :: 1140.625000 Power6 :: -36.532280 Phase6 :: 1.159043
Tone Detected :: Ringback Tone	12:56:32.903000	Freq7 :: 1296.875000 Power7 :: -36.617615 Phase7 :: -0.482275 Freq8 :: 1453.125000 Power8 :: -36.574589 Phase8 :: 0.064398
Two Datastadio Disebuch Two	12.36.32.303000	Freq9 :: 1609.375000 Power9 :: -36.641796 Phase9 :: -0.750397
Tone Detected :: Ringback Tone	12:56:38.917000	Freq10 :: 1765.625000 Power10 :: -36.654263 Phasel0 :: 0.888888 Freq11 :: 1921.875000 Power11 :: -36.538052 Phasel1 :: -1.574086
Path Verification	12:56:46.445000	Freq12 :: 2078.125000 Power12 :: -36.539318 Phase12 :: 1.978239
	12.36.46.443000	Freq13 :: 2234.375000 Power13 :: -36.489635 Phase13 :: -0.20831
Path Veiffication Ack	12:56:52.489000	Freq14 :: 2390.625000 Power14 :: -36.612728 Phasel4 :: -2.38926 Freq15 :: 2546.875000 Power15 :: -36.593891 Phasel5 :: 1.711505
VBM_23TONE		Freq16 :: 2703.125000 Power16 :: -36.697510 Phasel6 :: 2.527787
	12:59:27.392000	Freq17 :: 2859.375000 Power17 :: -36.660049 Phasel7 :: -2.66548 Freq18 :: 3015.625000 Power18 :: -36.641846 Phasel8 :: 0.612309
ACK	12:59:29.026000	Freq19 :: 3171.875000 Power19 :: -36.649040 Phase19 :: 3.076656
23-Tone Test :: @ Level ::-23 dBm		Freq20 :: 3328.125000 Power20 :: -36.642113 Phase20 :: -1.84873. Freq21 :: 3484.375000 Power21 :: -36.641869 Phase21 :: 1.432784
	12:59:29.548000	Freq22 :: 2078.125000 Power22 :: -36.715549 Phase22 :: -2.11926
COMPLETE	12:59:40.571000	EDD_Freq0 :: 281.250000 EDD_Delay0 :: -5.343228 EDD Freq1 :: 437.500000 EDD Delay1 :: -6.582478
VBM 23TONE		EDD_Freq1 :: 437.500000 EDD_Delay1 :: -6.582478 EDD_Freq2 :: 593.750000 EDD_Delay2 :: 3.135435
	12:59:44.172000	EDD_Freq3 :: 750.000000 EDD_Delay3 :: 15.152694
ACK	12:59:44.489000	EDD_Freq4 :: 906.250000 EDD_Delay4 :: -9.248343 EDD Freq5 :: 1062.500000 EDD Delay5 :: 4.369703
23-TonePower = -22.98 dBm S/TD = 36.08 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_0ff = 0.000001 F_Shift = 0.001		EDD_Freq6 :: 1218.750000 EDD_Delay6 :: 2.267330
	12:59:47.265000	EDD_Freq7 :: 1375.000000 EDD_Delay7 :: -0.314754 EDD Freq8 :: 1531.250000 EDD Delay8 :: -4.838952
23-TonePower = -22.99 dBm S/TD = 36.05 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift = 0.001	12:59:48 847000	EDD_Freq9 :: 1687.500000 EDD_Delay9 :: -0.196220
23-TonePower = -22.98 dBm S/TD = 36.08 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T Off = 0.000001 F Shift = 0.001		EDD_Freq10 :: 1843.750000 EDD_Delay10 :: 4.412059 EDD_Freq11 :: 2000.000000 EDD_Delay11 :: -0.972396
251 OREPOWER = 122.36 dBin 571 D = 36.06 dB 57N = 36.10 IMD 2 = 100.00 IMD 5 = 40.20 I_0II = 0.000001 F_5HIR = 0.001.	12:59:49.230000	EDD_Freq12 :: 2156.250000 EDD_Delay12 :: 1.118602
23-TonePower = -22.99 dBm S/TD = 36.05 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift = 0.001	12:59:50.218000	EDD_Freql3 :: 2312.500000 EDD_Delay13 :: -4.592239 EDD_Freql4 :: 2468.750000 EDD_Delay14 :: -3.094848
23-TonePower = -22.99 dBm S/TD = 36.07 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift = 0.001		EDD_Freq15 :: 2625.000000 EDD_Delay15 :: 3.324630
	12:59:51.721000	EDD_Freq16 :: 2781.250000 EDD_Delay16 :: 2.870886
23-TonePower = -22.99 dBm S/TD = 36.05 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_0ff = 0.000001 F_Shift = 0.001	12:59:52.232000	EDD_Freq17 :: 2937.500000 EDD_Delay17 :: 0.393556 EDD Freq18 :: 3093.750000 EDD Delay18 :: -5.815550
23-TonePower = -22.98 dBm S/TD = 36.08 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_0/f = 0.000001 F_Shift = 0.001		EDD Freq19 :: 3250.000000 EDD Delay19 :: 8.266182 EDD Freq20 :: 3406.250000 EDD Delay20 :: -3.397210
	12:59:53.221000	EDD_Freq20 :: 3406.250000 EDD_Delay20 :: -3.397210 EDD_Freq21 :: 3562.500000 EDD_Delay21 :: 0.692686
23-TonePower = -22.99 dBm S/TD = 36.05 dB S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift = 0.001	12:59:54.718000	
COMPLETE	12:00:04:110000	
COMPLETE	12:59:57.262000	
FIN	12:59:59.270000	
ACK	12.00.00.270000	
ALN	13:00:01.283000	
DISCONNECT_CALL	16:17:34.579000	
Orthophy 0.1.0.1	10.17.34.373000	
Onhook :: 0, 1, 0, 1		
		×
	>	
🕽 Message Sequence 🖉 Event Config 👌 Script Flow 👌 1004 Hz Net Loss Report 👌 Attenuation Distortion Test Re	oort \lambda 3-Tone Slope T	Fest Report λ Signal/C-Notch Noise Test Report λ Intermodulation Distortion Test Re



VF_Terminating.gls Ladder Diagram (Slave)

- Initially both sides are On-Hook
- An incoming call is detected. When the call is answered on the second ring, an Off-Hook is sent
- After the Path Verification Ack, Answercall side receives VBM 23 Tone request tone
 (Frequency:1781Hz, Power: -13 dBm and Duration:300ms) and acknowledged by sending ACK (Frequency: 2351Hz, Power: -13dBm and Duration:300ms)
- Then AnswerCall side detects the received **23** tone at **-23dBm** level for duration of 10sec and keep the result in the **23 Tone Test Report t**ab
- After receiving COMPLETE (Frequency:2251Hz, Power: -13dBm and Duration:300ms) tone,
 AnswerCall side will send VBM 23 Tone request tone and receives the ACK
- Now Answercall side sends the 23 tone test.
- AnswerCall side terminates the call by receiving the FIN (Frequency: 1949Hz, Power: -13dBm and Duration:300ms), and subsequently sending an ACK

PS	DUT	Find
0nhook :: 0.1.0.1		EventType :: 23ToneTest
Unnook :: 0, 1, 0, 1	16:23:16.824000	23-Tone Measurement Results :
		Freq0 :: 203.125000 Power0 :: -36.644791 Phase0 :: 2.253330
Ringing	16:23:33.385000	Freql :: 359.375 Powerl :: -36.602261 Phasel :: 0.346202
	16:23:33.365000	Freq2 :: 515.625 Power2 :: -36.550034 Phase2 :: -2.925375
A Ringing		Freq3 :: 671.875000 Power3 :: -36.620338 Phase3 :: -1.289439
t night g	16:23:39.404000	Freq4 :: 828.125000 Power4 :: -36.548473 Phase4 :: -1.031062
		Freg5 :: 984.375000 Power5 :: -36.561024 Phase5 :: 2.802212
Offhook :: 1, 1, 1, 1	16:23:39.405000	Freq6 :: 1140.625000 Power6 :: -36.533939 Phase6 :: 1.158933
		Freg7 :: 1296.875000 Power7 :: -36.618343 Phase7 :: -0.482301
Path Verification	16:23:43.926000	Freg8 :: 1453.125000 Power8 :: -36.574287 Phase8 :: 0.064563
	16:23:43.326000	Freq9 :: 1609.375000 Power9 :: -36.640671 Phase9 :: -0.750603
Path Verification Ack		
- ar - one ar - one ar	16:23:46.942000	Freq10 :: 1765.625000 Power10 :: -36.652397 Phase10 :: 0.88910
VEM 22TONE		Freq11 :: 1921.875000 Power11 :: -36.537155 Phase11 :: -1.5738
VBM_23TONE	16:24:02.973000	Freq12 :: 2078.125000 Power12 :: -36.539345 Phase12 :: 1.97849
	10.24.02.010000	Freq13 :: 2234.375000 Power13 :: -36.489883 Phase13 :: -0.2080
ACK		Freq14 :: 2390.625000 Power14 :: -36.611603 Phase14 :: -2.3890
	16:24:03.282000	Freq15 :: 2546.875000 Power15 :: -36.592426 Phase15 :: 1.71150
23-TonePower = -22.98 dBm_S/TD = 36.07 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.30 T_Off = 0.000002 F_Shift =	0.002923	Freq16 :: 2703.125000 Power16 :: -36.698051 Phase16 :: 2.52772
	16:24:05.811000	Freq17 :: 2859.375000 Power17 :: -36.658974 Phase17 :: -2.6653
	0.001100	Freq18 :: 3015.625000 Power18 :: -36.641033 Phase18 :: 0.61250
23-TonePower = -22.99 dBm_S/TD = 36.07 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	16:24:06.808000	Freg19 :: 3171.875000 Power19 :: -36.647606 Phase19 :: 3.07666
		Freg20 :: 3328.125000 Power20 :: -36.642956 Phase20 :: -1.84880
,23-TonePower = -22.99 dBm_S/TD = 36.05 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	0.001300	Freg21 :: 3484.375000 Power21 :: -36.643150 Phase21 :: 1.43280
	16:24:07.809000	Freq22 :: 3640.625000 Power22 :: -36.715084 Phase22 :: -2.1195
23-TonePower = -22.99 dBm_S/TD = 36.07 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	0.001169	EDD Freg0 :: 281.250000 EDD Delay0 :: -5.241628
	16:24:08.808000	EDD Freq1 :: 437.50000 EDD Delay1 :: -6.729643
23-TonePower = -22.99 dBm_S/TD = 36.05 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	0.001300 16:24:09.813000	EDD_Freq2 :: 593.750000 EDD_Delay2 :: 3.214824 EDD Freg3 :: 750.000000 EDD Delay3 :: 15.080507
	10.24.03.013000	
23-TonePower = -22.99 dBm_S/TD = 36.07 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	0.001169	EDD_Freq4 :: 906.250000 EDD_Delay4 :: -8.888144
	16:24:10.807000	EDD_Freq5 :: 1062.500000 EDD_Delay5 :: 4.264009
23-TonePower = -22.99 dBm_S/TD = 36.05 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	0.001300	EDD_Freq6 :: 1218.750000 EDD_Delay6 :: 2.182171
23-10161 0We1 = -22,35 dbit 37 D = 30,55 db 374 = 30,16 tmD-2 = -100,06 tmD-5 = 40,26 t0tt = 0.000001 t5ttttt	16:24:11.891000	EDD_Freq7 :: 1375.000000 EDD_Delay7 :: -0.509109
	0.001100	EDD_Freq8 :: 1531.250000 EDD_Delay8 :: -4.461238
23-TonePower = -22.99 dBm_S/TD = 36.07 dB_S/N = 38.10 IMD-2 = -100.00 IMD-3 = 40.20 T_Off = 0.000001 F_Shift =	16:24:13.310000	EDD_Freq9 :: 1687.500000 EDD_Delay9 :: -0.630061
	10.24.13.310000	EDD_Freq10 :: 1843.750000 EDD_Delay10 :: 4.399038
COMPLETE		EDD_Freq11 :: 2000.000000 EDD_Delay11 :: -0.994591
	16:24:16.471000	EDD_Freq12 :: 2156.250000 EDD_Delay12 :: 1.071713
VBM 23TONE		EDD_Freq13 :: 2312.500000 EDD_Delay13 :: -4.495502
TEM_ENTONE	16:24:18.479000	
ACK		EDD_Freq15 :: 2625.000000 EDD_Delay15 :: 3.389610
ALK	16:24:19 985000	EDD Freq16 :: 2781.250000 EDD Delay16 :: 2.616954
	10.21.10.000000	EDD Freg17 :: 2937.500000 EDD Delav17 :: 0.381900
23-Tone Test :: @ Level ::-23 dBm		
	16:24:20.503000	
COMPLETE		
	16:24:31.522000	
	r l	LDD_FIEd21 3562.500000 EDD_DETA921 0.553/51
FIN	16:24:35.063000	
	10.24.33.003000	
ACK		
	16:24:35.383000	
		U.
VBM_23TONE ACK 23-Tone Test:: @ Level::-23 dBm COMPLETE FIN ACK	16:24:18.479000 16:24:19.985000 16:24:20.503000 16:24:31.522000 16:24:35.063000 16:24:35.383000	EDD_Freq14 :: 2468.750000 EDD_Delay14 :: -2.886488 EDD_Freq15 :: 2655.0000000 EDD_Delay15 :: 3.389610 EDD_Freq16 :: 2781.250000 EDD_Delay16 :: 2.616954



Test Results

• The **23-Tone tab** results are as follows:

Date/Time	Total Signal P	Total 23-Tone Power (S/TDR	SNR	IMD 2nd Order	IMD 3rd Order	T_Off	F_Shift	Freq0	Power0	Phase0	Freq1	Power1	Phase1	Freq2	Power2	Phase2	Freq3	Power3	Phase3
2024-3-1 12:59:31	-22.988426	-22.989771	36.085354	38.160557	-100.000000	40.288956	0.000001	0.001254	203.125000	-36.643623	2.253228	359.375	-36.604668	0.346200	515.625	-36.549961	-2.925522	671.875000	-36.619495	-1.28950
2024-3-1 12:59:32	-22.988659	-22.990009	36.058861	38.134090	-100.000000	40.262421	0.000001	0.001300	203.125000	-36.644096	2.253417	359.375	-36.603668	0.346299	515.625	-36.550247	-2.925542	671.875000	-36.620953	-1.28948
2024-3-1 12:59:33	-22.988426	-22.989771	36.085354	38.160557	-100.000000	40.288956	0.000001	0.001254	203.125000	-36.643623	2.253228	359.375	-36.604668	0.346200	515.625	-36.549961	-2.925522	671.875000	-36.619495	-1.28950
2024-3-1 12:59:34	-22.988947	-22.990295	36.071377	38.149170	-100.000000	40.270748	0.000001	0.001169	203.125000	-36.642929	2.253314	359.375	-36.606075	0.346297	515.625	-36.550179	-2.925689	671.875000	-36.620110	-1.28954
2024-3-1 12:59:35	-22.988947	-22.990295	36.071377	38.149170	-100.000000	40.270748	0.000001	0.001169	203.125000	-36.642929	2.253314	359.375	-36.606075	0.346297	515.625	-36.550179	-2.925689	671.875000	-36.620110	-1.28954
2024-3-1 12:59:36	-22.988947	-22.990295	36.071377	38.149170	-100.000000	40.270748	0.000001	0.001169	203.125000	-36.642929	2.253314	359.375	-36.606075	0.346297	515.625	-36.550179	-2.925689	671.875000	-36.620110	-1.28954
2024-3-1 12:59:37	-22.988426	-22.989771	36.085354	38.160557	-100.000000	40.288956	0.000001	0.001254	203.125000	-36.643623	2.253228	359.375	-36.604668	0.346200	515.625	-36.549961	-2.925522	671.875000	-36.619495	-1.28950
2024-3-1 12:59:38	-22.988659	-22.990009	36.058861	38.134090	-100.000000	40.262421	0.000001	0.001300	203.125000	-36.644096	2.253417	359.375	-36.603668	0.346299	515.625	-36.550247	-2.925542	671.875000	-36.620953	-1.28948
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▲ ► Event Config	λ Script Flow λ 1	004 Hz Net Loss Report 🔪 Atten	nuation Distortion	Test Report	3-Tone Slope Test I	Report X Signal/C	Notch Noise	Test Report) Intermodu	ation Distortion Te	st Report	Impulse N	oise Test Report	_λ s/NR	/Net Loss vs L	evel Test Repor	н Д Мат	Test Report λ	23-Tone Test I	1eport /
											Initiali	sation Errors		Error Even	its	Captured E	rrors	Link St	atus Up=0 Dowr	.=0

(1	1	1			1				(
Phase3	Freq4	Power4	Phase4	FreqS	Power5	Phase5	Freq6	Power6	Phase6	Freq7	Power7	Phase7	Freq8	Power8	Phase8	Freq9	Power9	Phase9	Freq10	Power10
-1.289508	828.125000	-36.549210	-1.031202	984.375000	-36.561340	2.802425	1140.625000	-36.532280	1.159043	1296.875000	-36.617615	-0.482275	1453.125000	-36.574589	0.064398	1609.375000	-36.641796	-0.750397	1765.625000	-36.65426
-1.289480	828.125000	-36.549305	-1.031278	984.375000	-36.560146	2.802326	1140.625000	-36.533222	1.159161	1296.875000	-36.619900	-0.482354	1453.125000	-36.574665	0.064586	1609.375000	-36.642254	-0.750467	1765.625000	-36.65445
-1.289508	828.125000	-36.549210	-1.031202	984.375000	-36.561340	2.802425	1140.625000	-36.532280	1.159043	1296.875000	-36.617615	-0.482275	1453.125000	-36.574589	0.064398	1609.375000	-36.641796	-0.750397	1765.625000	-36.65426
-1.289549	828.125000	-36.550041	-1.031418	984.375000	-36.560459	2.802540	1140.625000	-36.531563	1.159270	1296.875000	-36.619171	-0.482328	1453.125000	-36.574970	0.064422	1609.375000	-36.643379	-0.750260	1765.625000	-36.65632
-1.289549	828.125000	-36.550041	-1.031418	984.375000	-36.560459	2.802540	1140.625000	-36.531563	1.159270	1296.875000	-36.619171	-0.482328	1453.125000	-36.574970	0.064422	1609.375000	-36.643379	-0.750260	1765.625000	-36.65632
-1.289549	828.125000	-36.550041	-1.031418	984.375000	-36.560459	2.802540	1140.625000	-36.531563	1.159270	1296.875000	-36.619171	-0.482328	1453.125000	-36.574970	0.064422	1609.375000	-36.643379	-0.750260	1765.625000	-36.65632
-1.289508	828.125000	-36.549210	-1.031202	984.375000	-36.561340	2.802425	1140.625000	-36.532280	1.159043	1296.875000	-36.617615	-0.482275	1453.125000	-36.574589	0.064398	1609.375000	-36.641796	-0.750397	1765.625000	-36.65426
-1.289480	828.125000	-36.549305	-1.031278	984.375000	-36.560146	2.802326	1140.625000	-36.533222	1.159161	1296.875000	-36.619900	-0.482354	1453.125000	-36.574665	0.064586	1609.375000	-36.642254	-0.750467	1765.625000	-36.65445
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Eve	nt Config 🔪 Scrip	t Flow 1004	Hz Net Loss Report	t Attenuation	Distortion Test Repor	t 🔪 3-Tone	e Slope Test Report	Signal/C-N	lotch Noise Test Re	port 🔪 Inter	nodulation Distorti	on Test Report	A Impulse Noi	ise Test Report	S/NR/Net	Loss vs Level Test	Report 🔪 VQ	T Test Report	23-Tone Test R	eport /

Phase10	Freg11	Power11	Phase11	Freg12	Power12	Phane 12	Freq13	Power13	Phase13	Freg14	Power14	Phase 14	Freq15	Power15	Phase 15	Freq16	Power16	Phase 16	Freg17	Power17	Phase17	Freq18
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0.888888	1921.875000	-36.538052	-1.574082	2078.125000	-36.539318	1.978239	2234.375000	-36.489635	-0.208315	2390.625000	-36.612728	-2.389263	2546.875000	-30.593891	1.711505	2703.125000	-36.697510	2.527787	2859.375000	-36.660049		3015.625000
0.888954	1921.875000	-36.538307	-1.573882	2078.125000	-36.538395	1.978411	2234.375000	-36.489132	-0.208278	2390.625000	-36.613186	-2.389193	2546.875000	-36.592304	1.711459	2703.125000	-36.699184	2.527588	2859.375000	-36.661018	-2.665371	3015.625000
0.888888	1921.875000	-36.538052	-1.574082	2078.125000	-36.539318	1.978239	2234.375000	-36.489635	-0.208315	2390.625000	-36.612728	-2.389263	2546.875000	-36.593891	1.711505	2703.125000	-36.697510	2.527787	2859.375000	-36.660049	-2.665489	3015.625000
0.888735	1921.875000	-36.539204	-1.574114	2078.125000	-36.538368	1.978157	2234.375000	-36.488888	-0.208578	2390.625000	-36.614307	-2.389398	2546.875000	-36.593769	1.711458	2703.125000	-36.698643	2.527651	2859.375000	-36.662094	-2.665557	3015.625000
0.888735	1921.875000	-36.539204	-1.574114	2078.125000	-36.538368	1.978157	2234.375000	-36.488888	-0.208578	2390.625000	-36.614307	-2.389398	2546.875000	-36.593769	1.711458	2703.125000	-36.698643	2.527651	2859.375000	-36.662094	-2.665557	3015.625000
0.888735	1921.875000	-36.539204	-1.574114	2078.125000	-36.538368	1.978157	2234.375000	-36.488888	-0.208578	2390.625000	-36.614307	-2.389398	2546.875000	-36.593769	1.711458	2703.125000	-36.698643	2.527651	2859.375000	-36.662094	-2.665557	3015.625000
0.888888	1921.875000	-36.538052	-1.574082	2078.125000	-36.539318	1.978239	2234.375000	-36.489635	-0.208315	2390.625000	-36.612728	-2.389263	2546.875000	-36.593891	1.711505	2703.125000	-36.697510	2.527787	2859.375000	-36.660049	-2.665489	3015.625000
0.888954	1921.875000	-36.538307	-1.573882	2078.125000	-36.538395	1.978411	2234.375000	-36.489132	-0.208278	2390.625000	-36.613186	-2.389193	2546.875000	-36.592304	1.711459	2703.125000	-36.699184	2.527588	2859.375000	-36.661018	-2.665371	3015.625000
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► Ev	rent Config 🔪 Scr	ipt Flow 👌 10	104 Hz Net Loss	Report Att	tenuation Distortio	n Test Report	λ 3·Tone SI	ope Test Report) Signal/C	C-Notch Noise Tes	t Report	Intermodulation	n Distortion Test R	eport 🔪 In	npulse Noise Te	est Report	S/NR/Net Loss v	vs Level Test R	eport 🔪 VQT	Test Report 23	3-Tone Test F	Report /

Thank you

