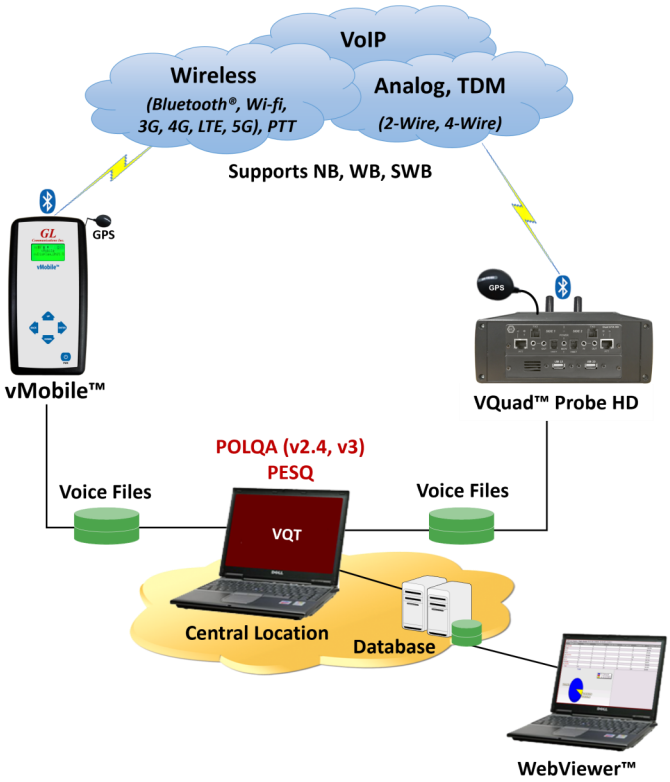
Voice Quality Testing (VQT)

(PESQ, POLQA v2.4, POLQA v3.0)



Overview

GL's **Voice Quality Testing (VQT)** software supports the next-generation voice quality testing standard for fixed, mobile and IP-based networks using POLQA v2.4 and v3 (ITU-T P.863), PESQ (ITU-T P.862), PESQ LQ / LQO (P.862.1), and PESQ WB (P.862.2).

The VQT fully supports analysis using POLQA ITU version 2.4 algorithm for Narrowband (NB 8000 sampling), Wideband (WB 16000 sampling), and Super Wideband (SWB 48000 sampling) in both manual and automated testing. It also supports analysis using latest PESQ ITU release including ITU-T P.862, 862.1 and 862.2 (supports PESQ, PESQ LQ, PESQ LQO, PESQ WB).

The optional POLQA v3 (latest version of the POLQA algorithm) supports Full Band Audio analysis which provides improved scoring for mobile based VoLTE, 5G and OTT applications using EVS and OPUS codecs. This latest POLQA v3 includes analysis which is more sensitive to distortions across the entire audio spectrum. In addition, POLQA v3 supports less harsh analysis of micropauses within the speech, reacts with less sensitivity to linear frequency distortions, and includes a significantly improved and streamlined perceptual model.

The VQT software can work either independently, or with vMobile™, VQuad™ - Dual UTA HD, Voice Analysis Tool (VAT™), and VQuad™ Probe HD. VQT performs PESQ LQ/LQO/WB, and POLQA (NB, WB, SWB) simultaneously, using two voice files (Reference File and Degraded File) and provides the algorithm results in both a graphical and tabular format. Additional analytical results are displayed as part of the assessment such as MOS, E-Model, Signal Level, SNR, jitter, clipping, noise level, and delay (end to end as well as per speech utterance).

All results can also be sent to a Central Database where GL's web-based dashboard, known as WebViewer™, is deployed. These results are saved to database for post-processing viewing, featuring sophisticated searching through WebViewer™ for both remote and local access

For more details, refer to Voice Quality Testing (VQT) Software webpage.

GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Automated Voice Quality Testing Software with POLQA v2.4

GL has improved its voice quality test with AutoVQT™, an advanced automatic application that utilizes the POLQA algorithm (following the ITU-T P.863 version 2.4 standard). This enhancement allows for the analysis of thousands of voice files within minutes, effectively evaluating the quality of voice communication across various applications, including VoIP, Mobile, and PSTN networks.

For more details, refer to AutoVQT™ - Automated Voice Quality Testing Software with POLQA v2.4 webpage.

Key Features

- Voice quality testing using POLQA version 2.4 (ITU-T P.863), with an optional upgrade to POLQA version 3 (ITU-T P.863), and PESQ (ITU-T P.862)
- Updates associated with POLQA v3 include redesign perceptual model for Full Band Audio analysis which is validated for VoLTE, 5G and OTT apps (supporting EVS and OPUS codecs)
- Provides Active Speech and Noise Levels, Latency, Jitter, Clipping, and Power measurements
- Manual or Auto modes of operations with centralized data access
- Testing the voice quality over all types of telecom networks - Wireless, VoIP, TDM, and PSTN
- Automatic mode allows the GL's VQT to execute on a network system
- VQT Command Line Interface (CLI) or API is enhanced to support both Windows® and Linux® for remote operations
- Support for Central DB Primary and Secondary IP addresses configuration for backup and redundancy
- Remote monitoring with result query and real-time statistics using web based WebViewer™
- Real-time mapping of results with GPS option used in conjunction with VQuad™
- Full support for IPv6 as well as IPv4 (includes VQT, GL Listener, and VQTCLI)
- Enhanced to support Python scripting for automation and remote access of voice quality testing
- Playback and display of audio from within VQT software using Goldwave software
- The WebViewer™ directly plots results or events from Drive or Walk tests on Google Maps when GPS is available
- When GPS is unavailable, the VQuad™ and vMobile™ Indoor Tracking option actively plots results on user-provided JPG floor plans or location diagrams associated with the testing environment

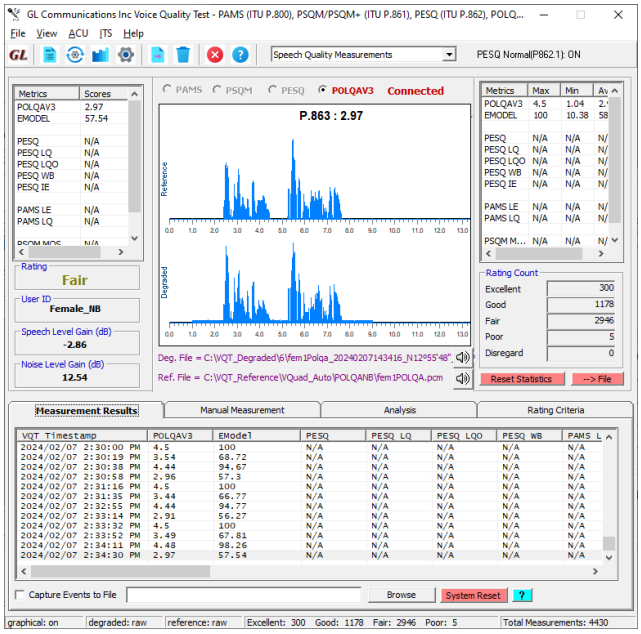
POLQA v3 Upgrade Enhancements

- POLQA v3 SWB supports 14kHz to full audio bandwidth up to 24kHz
- Full band analysis improves accuracy in assessment of codecs such as EVS, OPUS, AAC and LC3, as these codecs are used in many OTT applications
- With Full band support the discriminative power of POLQA at the upper high quality range of the MOS scale is increased
- Current OTT voice services using VoLTE/5G include highly dynamic delay jitter which leads to variations of the duration of very short pauses during speech. POLQA v3 handles these variations with increased precision
- POLQA v3 reacts with less sensitivity to linear frequency distortions than POLQA v2.4. This makes measurements less dependent on the frequency characteristics of headsets
- Perceptual model of POLQA v3 is significantly improved and streamlined

Modes of Operation

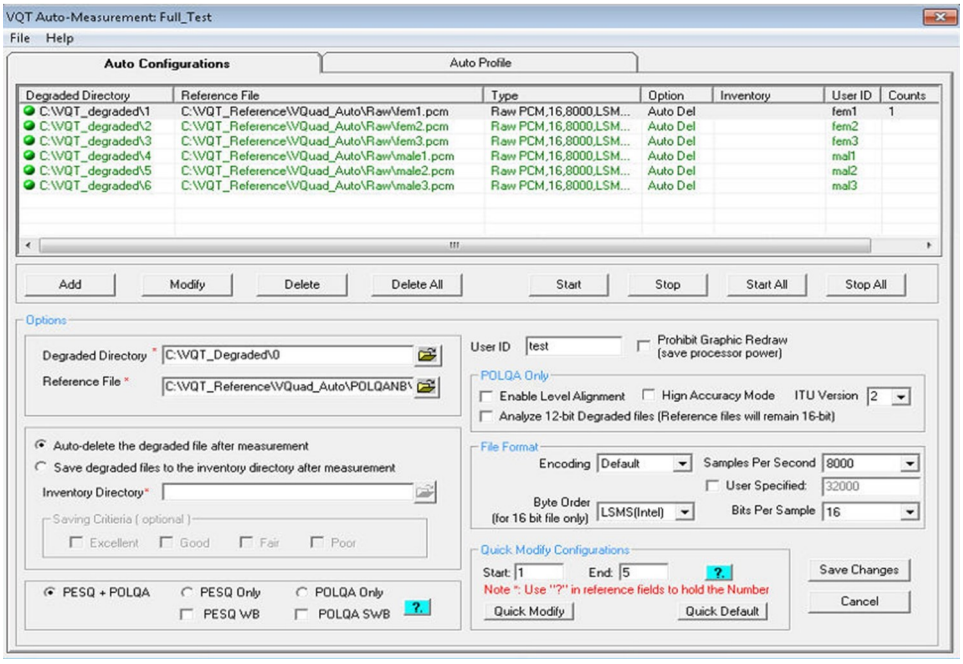
Manual Measurement

The GL VQT software provides a user-friendly interface to perform manual voice quality assessments using Reference File and Degraded File. The results of the VQT algorithms, POLQA, PESQ LQ/LQO/WB are displayed both in tabular format as well as graphically. All results may be saved to file for post processing viewing along with sophisticated searching on the results within the VQT application.



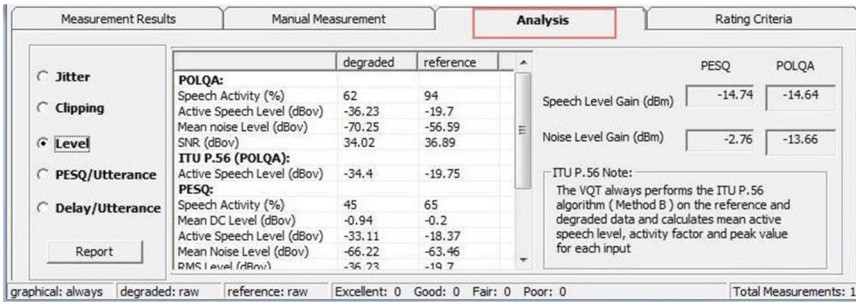
Auto Measurement

VQT can be executed in Auto Mode, which is used when VQT resides on a network computer and point to a single or multiple user-specified network drives/directories. Voice files are recorded to this network drive/directory and GL VQT automatically performs the voice quality algorithms and displays the results. Multiple GL VQT Auto-Measurement sessions may be configured, each session with a unique set of requirements and a unique reference voice file. In addition, it includes an option to analyze 12-bit degraded files in comparison with 16-bit reference files (NB, WB, SWB POLQA). Along with the standard sampling rates, POLQA also supports user-specified Sampling Rate (between 8K to 48K).

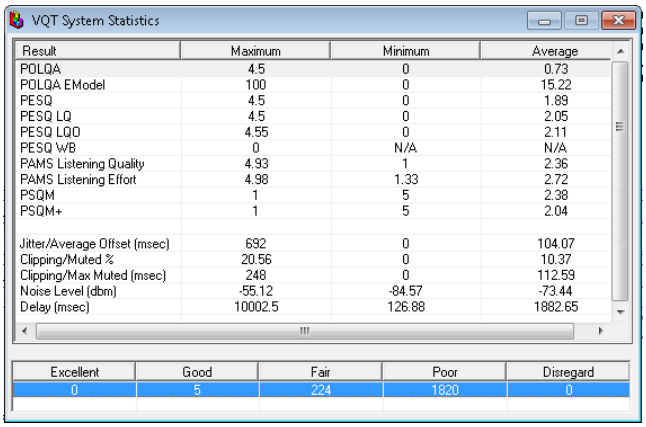


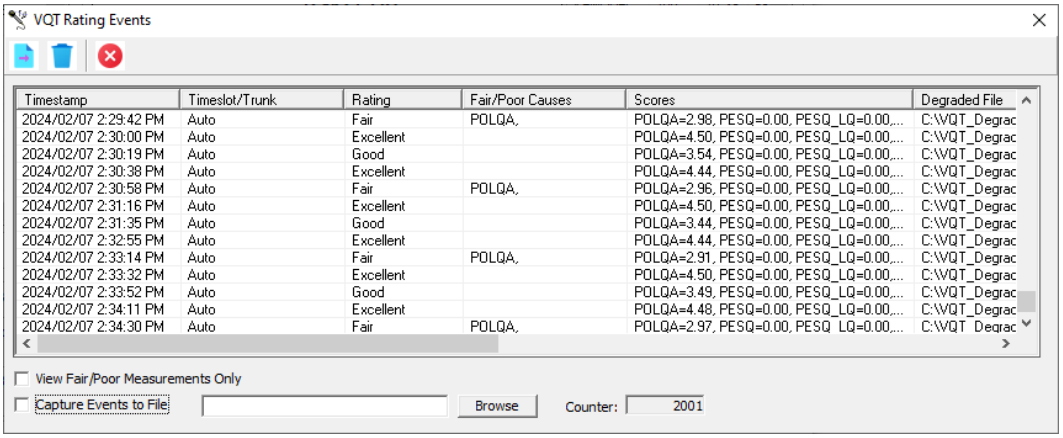
VQT Results

Analytical results are displayed as part of the assessment such as POLQA/PESQ MOS, E-Model, Signal Level, SNR, jitter, clipping, noise level, and delay (end-to-end as well as per speech utterance).

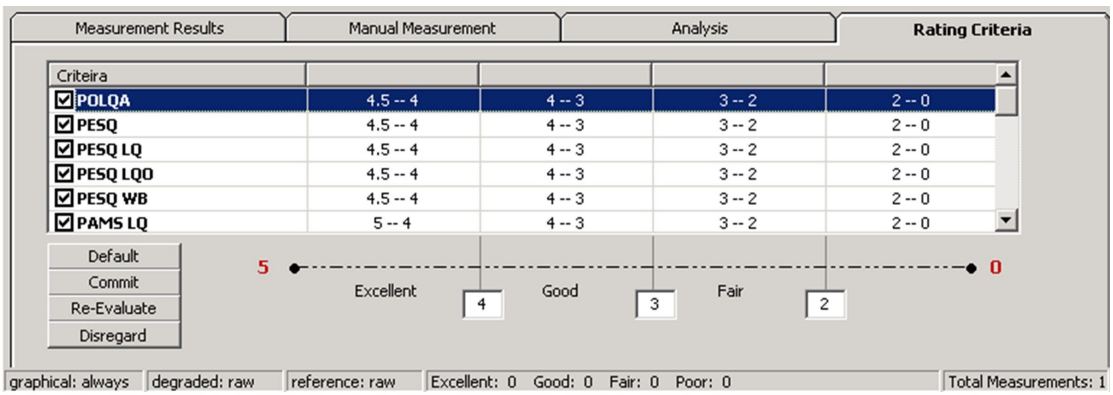


VQT System statistics provides Algorithm and Rating statistics available for all measurement results.



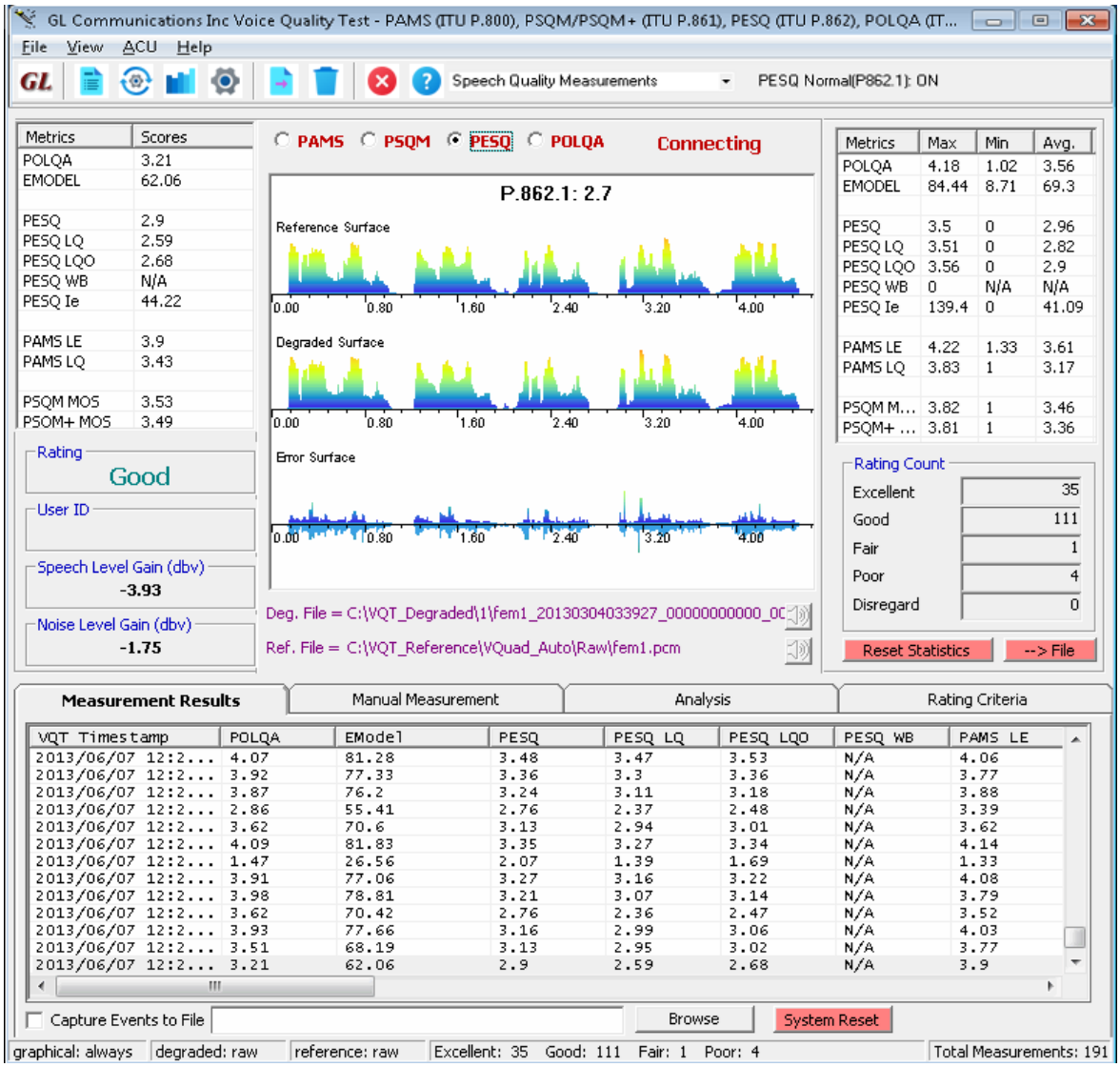


The user may configure a Rating Criteria for all VQT algorithms as well as the additional analytical results. The rating criteria may be configured for Excellent, Good, Fair, and Poor and the results of the rating criteria may be saved to file for post processing viewing.



Voice Quality Testing (PESQ)

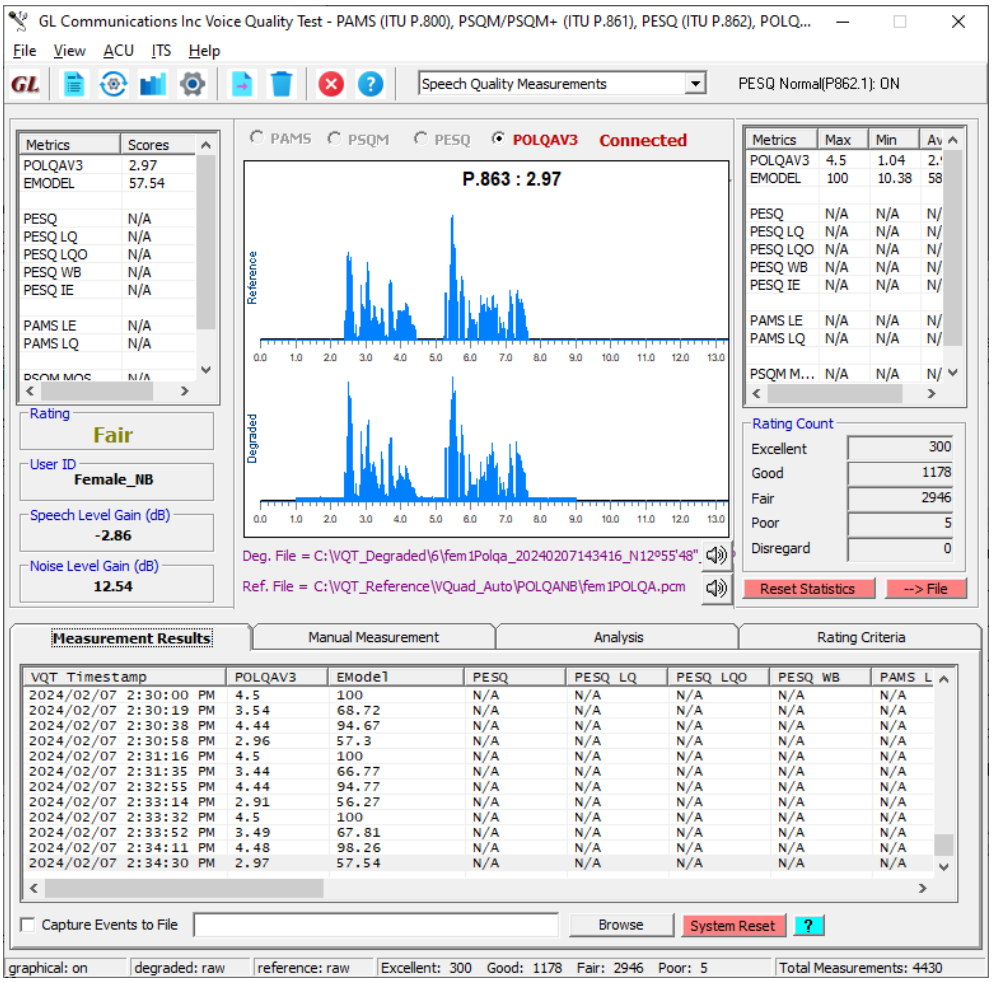
PESQ provides an objective measure that predicts the results of subjective listening tests on telephony systems. PESQ incorporates many new developments that distinguish it from earlier models for assessing codecs. These innovations allow PESQ to be used with confidence to assess end-to-end speech quality as well as the effect of such individual elements as codecs. The below screenshot shows VQT PESQ Measurement Results.



- VQT PESQ supports analysis of 16-bit uncompressed PCM and WAV files, including NB (8000 sampling) and WB (16000 sampling)
- VQT PESQ supports analysis of 8-bit compressed a-Law and mu-Law files
- PESQ analysis results include PESQ, PESQ LQ, PESQ LQO, PESQ WB, PESQ Ie, and PESQ per Utterance
- PESQ Results also include Signal Level, Noise Level, Delay, Delay per Utterance, and Jitter
- Playback and display of audio from within VQT software using Goldwave Software

Voice Quality Testing (POLQA)

Perceptual Objective Listening Quality Analysis (POLQA), the successor of PESQ (ITU-T P.862) analysis, is the next generation voice quality testing standard for fixed, mobile and IP-based networks. Based on ITU-T P.863 standard, POLQA supports the HD-quality speech coding and network transport technology, with higher accuracy for 3G, 4G/LTE and VoIP networks. Upgrading to 3rd edition of ITU-T P.863, POLQA extends its scope and applicability towards 5G telephony and OTT codecs. The below screenshot shows VQT POLQA Measurement Results.

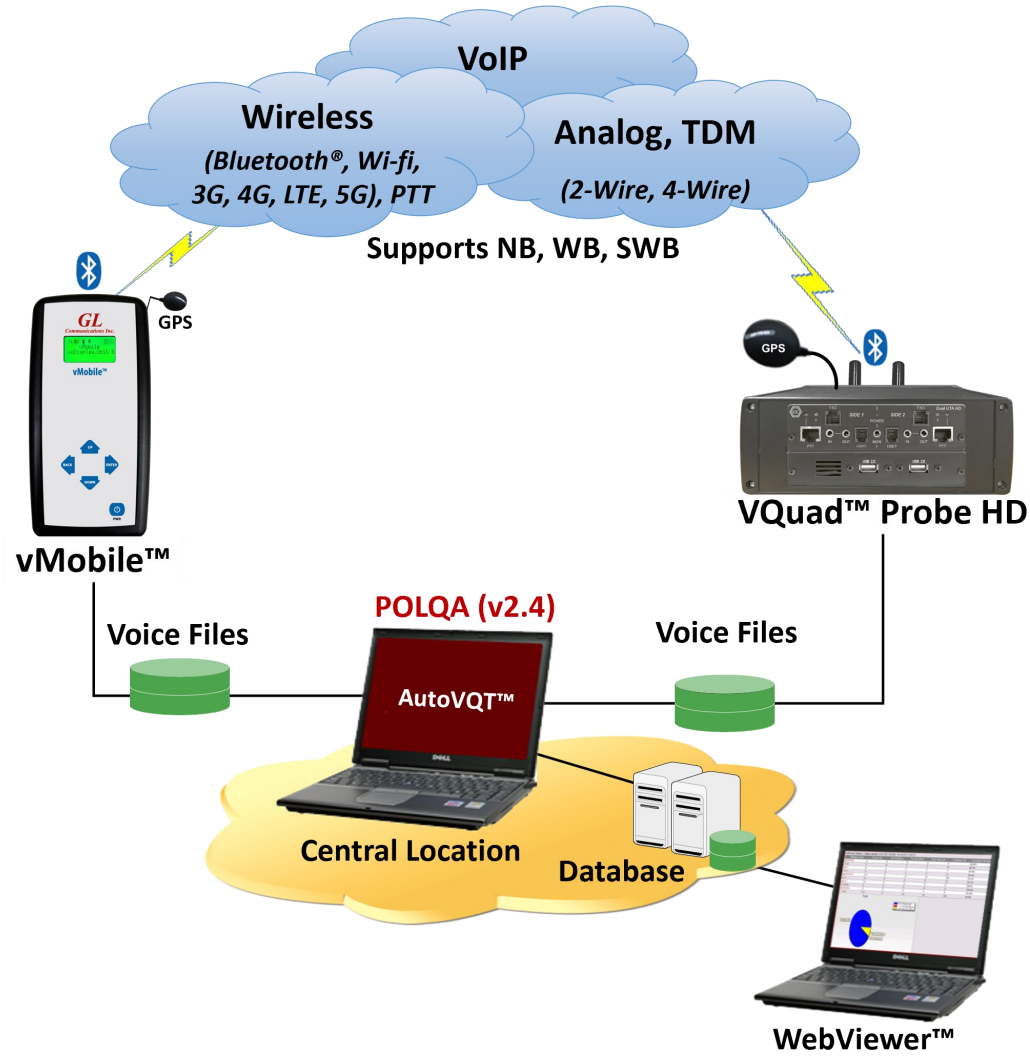


- VQT POLQA supports analysis of 16-bit uncompressed PCM and WAV files, including NB (8000 sampling), WB (16000 sampling), SWB (48000 sampling)
- POLQA supports user-specified Sampling Rate (specify any rate between 8K to 48K)
- VQT POLQA supports analysis of 8-bit compressed a-Law and mu-Law files
- VQT POLQA supports 12-bit Raw PCM Degraded voice files (NB, WB, SWB)
- POLQA analysis results include POLQA MOS, E-Model R-Factor, Signal Level, Noise Level, Delay, and Jitter
- VQT optionally supports POLQA v3 for VoLTE, 5G and OTT analysis
- Playback and display of audio from within VQT software using Goldwave software

Automated Voice Quality Testing - AutoVQT™

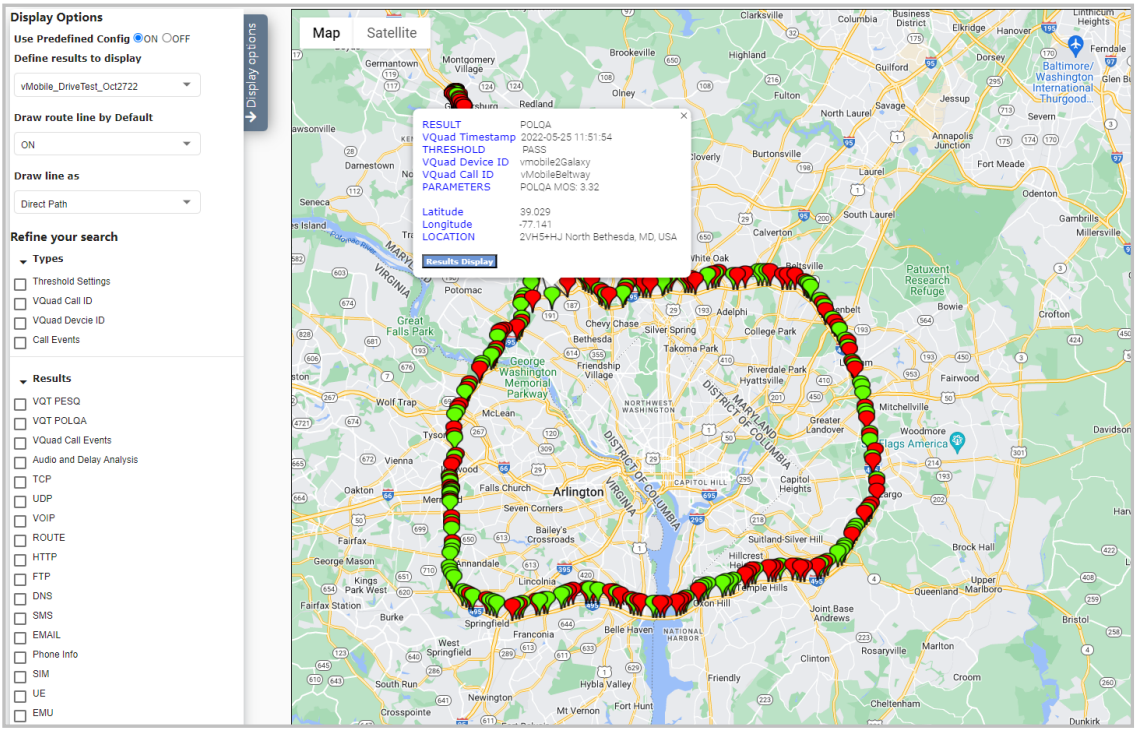
GL's Auto VQT™ is an advanced, automated solution that analyzes thousands of voice files in mere minutes, effectively evaluating the quality of voice communications across various networks, including VoIP, Mobile, and PSTN. This solution utilizes the Perceptual Objective Listening Quality Assessment (POLQA per ITU-T P.863 version 2.4) algorithm, which is widely acknowledged as the industry benchmark for assessing voice quality. The GL VQT POLQA Auto™ application works in conjunction with GL's VQuad™, vMobile™, Voice Analysis Tool (VAT™), Message Automation and Protocol Simulation (MAPS™), or T1 E1 Analysis platforms reducing analysis time and increasing efficiency.

The AutoVQT™ fully supports analysis using POLQA ITU version 2.4 algorithm for NB (8000 sampling), WB (16000 sampling), and SWB (48000 sampling) in automated testing. The tool offers a user friendly interface for automatic operation and generates comprehensive reports that provide detailed information on voice quality metrics such as Mean Opinion Score (MOS), Delay, Jitter, Packet Loss and more. These reports help user to identify issues to improve voice quality. The tool supports a wide range of codecs, including G.711, G.722, AMR, and EVS, making it suitable for testing various types of voice communication.

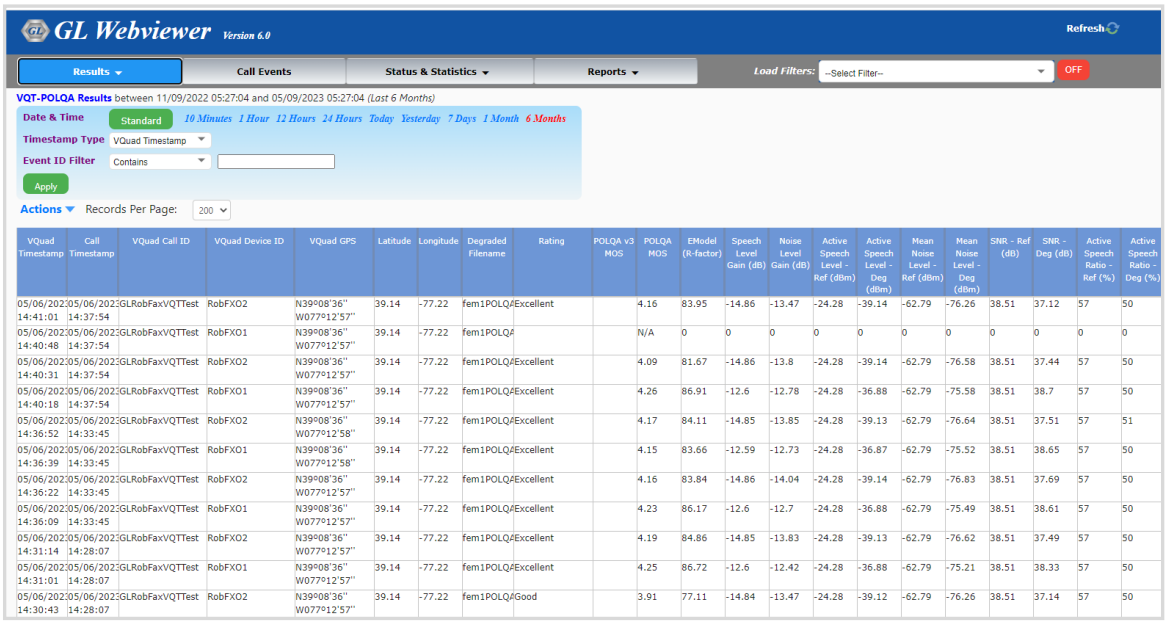


VQT WebViewer™

The results/events associated with VQT (PESQ, POLQA) analysis is sent to the central database and can be queried using the GL VQT WebViewer™ (web browser). Outputs of the query can be displayed in tabular or graphical format while also output to Excel or Text. Results can also be plotted on Google Maps (GPS connectivity is required). For details, visit [Web Based Client for Voice and Data Quality Testing] webpage.



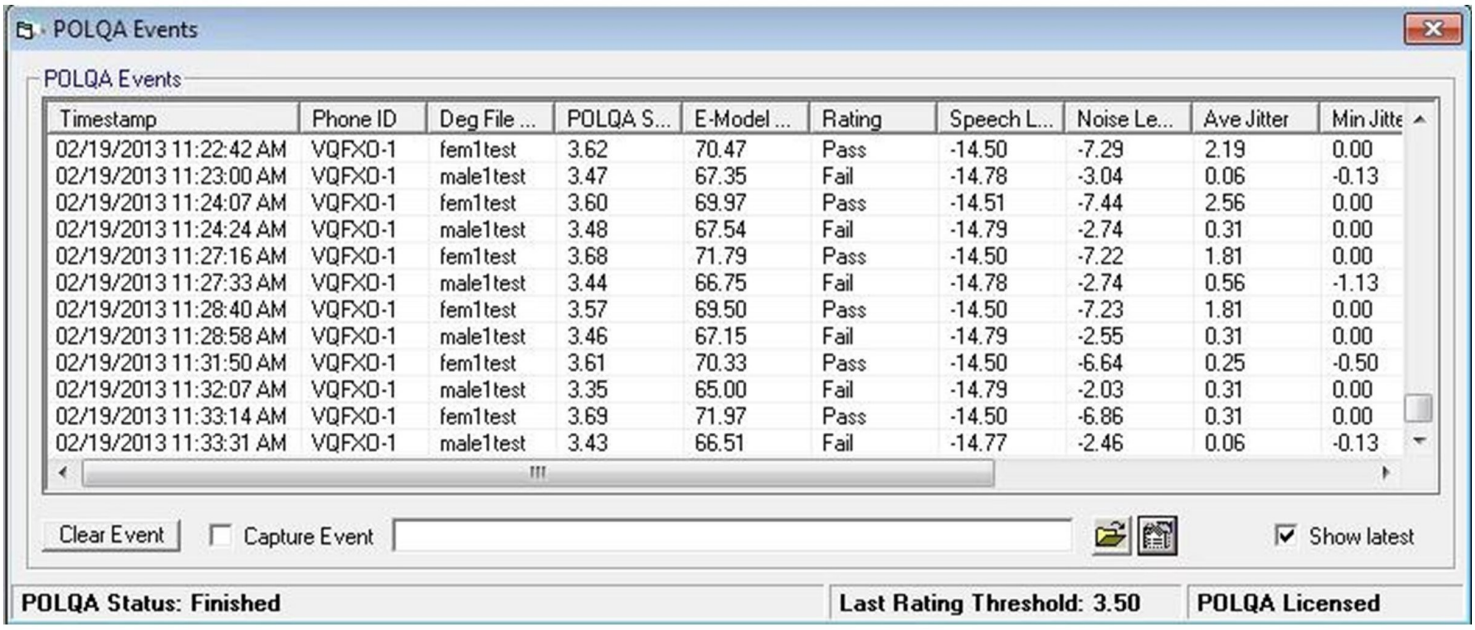
- Real-time mapping of results with GPS option used in conjunction with VQuad™
- The results can be accessed remotely from a database, queried and displayed in web browser using WebViewer™ either in tabular or graphic format



VQuad Timestamp	Call Timestamp	VQuad Call ID	VQuad Device ID	VQuad GPS	Latitude	Longitude	Degraded Filename	Rating	POLQA v3 MOS	POLQA MOS	EModel (R-factor)	Speech Level Gain (dB)	Noise Level Gain (dB)	Active Speech Level - Ref (dBm)	Active Speech Level - Deg (dBm)	Mean Noise Level - Ref (dBm)	Mean Noise Level - Deg (dBm)	SNR - Ref (dB)	SNR - Deg (dB)	Active Speech Ratio - Ref (%)	Active Speech Ratio - Deg (%)
05/06/202 14:41:01	05/06/202 14:37:54	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.16	83.95	-14.86	-13.47	-24.28	-39.14	-62.79	-76.26	38.51	37.12	57	50
05/06/202 14:40:48	05/06/202 14:37:54	GLRobFaxVQTTest	RobFXO1	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA			N/A	0	0	0	0	0	0	0	0	0	0	0
05/06/202 14:40:31	05/06/202 14:37:54	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.09	81.67	-14.86	-13.8	-24.28	-39.14	-62.79	-76.58	38.51	37.44	57	50
05/06/202 14:40:18	05/06/202 14:37:54	GLRobFaxVQTTest	RobFXO1	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.26	86.91	-12.6	-12.78	-24.28	-36.88	-62.79	-75.58	38.51	38.7	57	50
05/06/202 14:36:52	05/06/202 14:33:45	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'58"	39.14	-77.22	fem1POLQA	Excellent		4.17	84.11	-14.85	-13.85	-24.28	-39.13	-62.79	-76.64	38.51	37.51	57	51
05/06/202 14:36:39	05/06/202 14:33:45	GLRobFaxVQTTest	RobFXO1	N39°08'36" W077°12'58"	39.14	-77.22	fem1POLQA	Excellent		4.15	83.66	-12.59	-12.73	-24.28	-36.87	-62.79	-75.52	38.51	38.65	57	50
05/06/202 14:36:22	05/06/202 14:33:45	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.16	83.84	-14.86	-14.04	-24.28	-39.14	-62.79	-76.83	38.51	37.69	57	50
05/06/202 14:36:09	05/06/202 14:33:45	GLRobFaxVQTTest	RobFXO1	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.23	86.17	-12.6	-12.7	-24.28	-36.88	-62.79	-75.49	38.51	38.61	57	50
05/06/202 14:31:14	05/06/202 14:28:07	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.19	84.86	-14.85	-13.83	-24.28	-39.13	-62.79	-76.62	38.51	37.49	57	50
05/06/202 14:31:01	05/06/202 14:28:07	GLRobFaxVQTTest	RobFXO1	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Excellent		4.25	86.72	-12.6	-12.42	-24.28	-36.88	-62.79	-75.21	38.51	38.33	57	50
05/06/202 14:30:43	05/06/202 14:28:07	GLRobFaxVQTTest	RobFXO2	N39°08'36" W077°12'57"	39.14	-77.22	fem1POLQA	Good		3.91	77.11	-14.84	-13.47	-24.28	-39.12	-62.79	-76.26	38.51	37.14	57	50

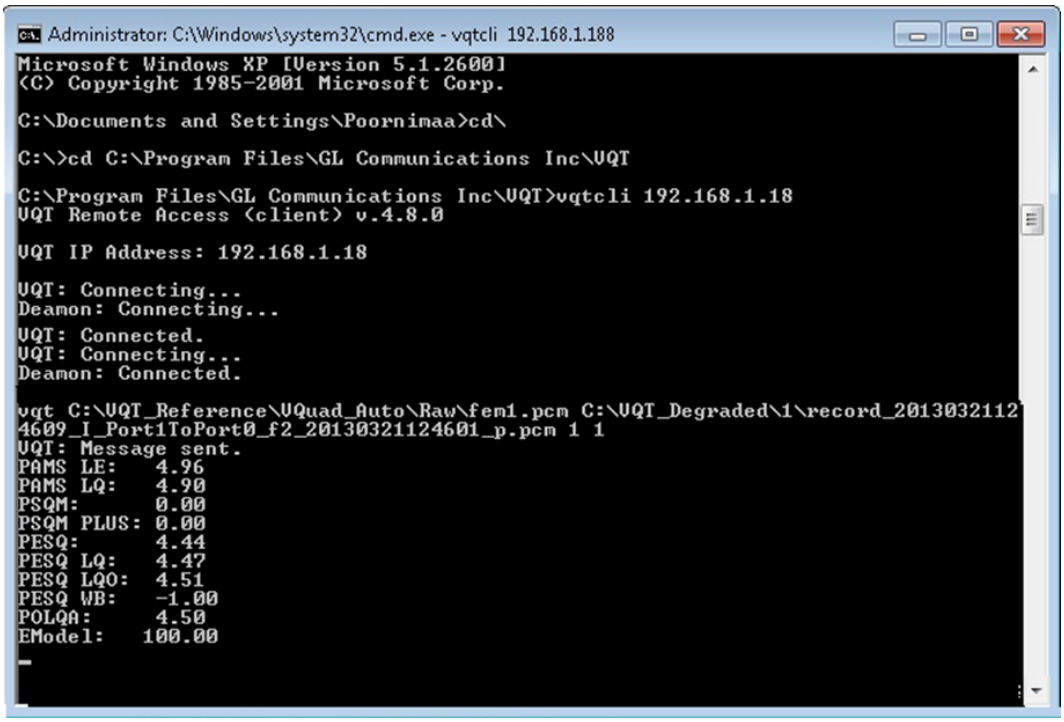
VQuad™ POLQA Events

As an option, POLQA can be added directly to VQuad™ software with support for automated testing within the VQuad™ script. In this scenario the degraded voice files remain at the VQuad™ node for analysis and display within the VQuad™ software. The below screenshot shows VQuad™ POLQA Events.



VQT CLI

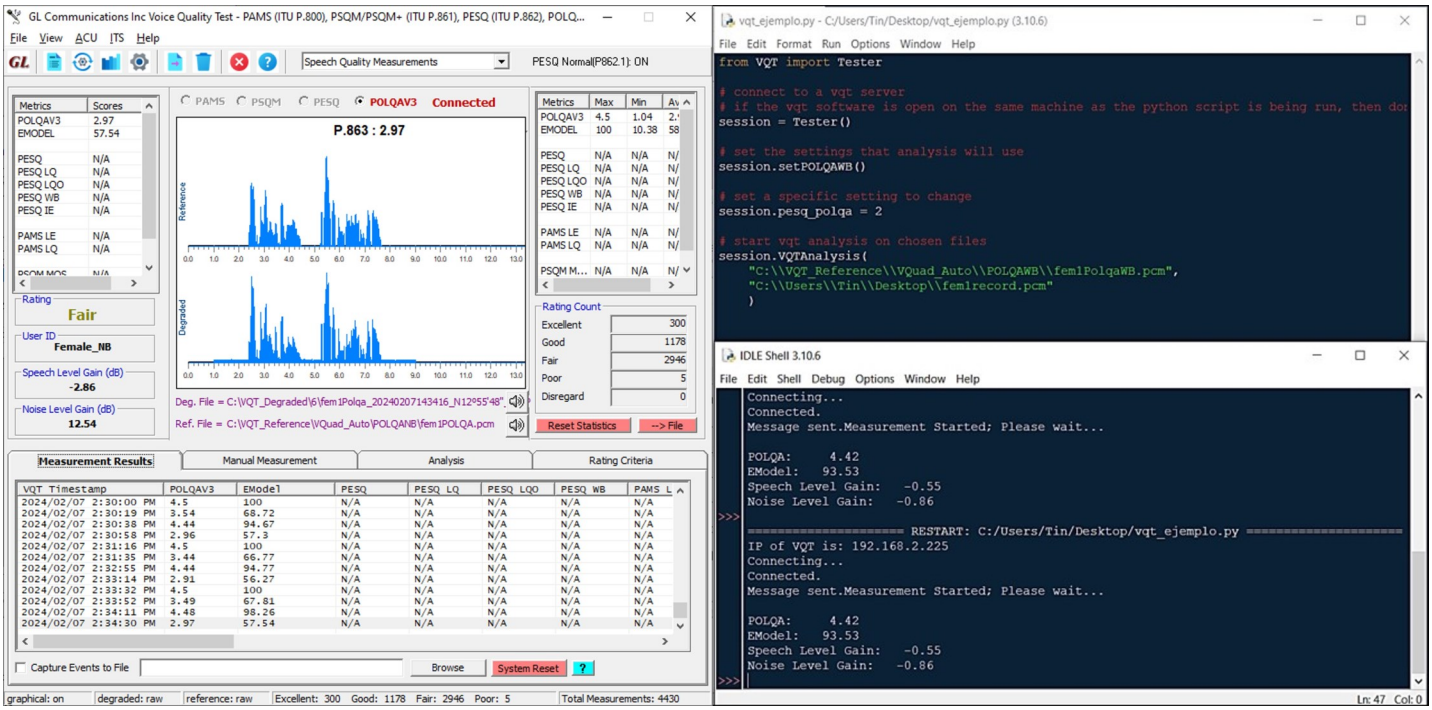
The VQT CLI is designed to remotely access various application functionalities and thus controlling VQT nodes located at various destinations. The supporting commands helps the VQT users to run the application installed on remote PC, get the connection status, run the analysis, load Auto Measurement configuration, start/stop Auto Measurement, save events captured to file, transfer the events captured to client, get any file from server or even get latest log, and other operations. The VQT CLI is supported on Windows® and Linux systems .



VQT with Python API

The VQT Python libraries provide a range of Python functions which can be used to remotely or locally control these two applications. The VQT library can be used to run automatic and manual VQT tests with custom settings.

Python for VQT works by connecting to the existing VQT CLI and using a portion of the CLI commands to run manual and automated VQT tests. Class variables are linked to the settings for each test and can be changed easily.



Main Features

- Python scripts support accessing and VQT functionalities remotely
- Controls VQT nodes located at various destinations
- Automation with enhanced Python scripting and remote operation includes traffic generation, call control, and automated scheduling of operation

For complete details, refer to Python Scripting for Automation and Remote Access of Voice Quality Testing webpage.

Buyer's Guide

Item No	Product Description
VQT002	Voice Quality Testing (PESQ only)
VQT006	Voice Quality Testing (POLQA v 2.4)
VQT007	Voice Quality Testing (POLQA v3)

Item No	Related Hardware
VQT251	Dual UTA HD Next generation Dual UTA with FXO Wideband support
VQT252	Dual UTA HD – Bluetooth Option
VQT280	VQuad™ Probe HD (with Dual UTA HD)

Item No	Related Software
VQT010	VQuad™ Software
VQT014	AutoVQT™ (POLQA v2.4)
VQT014U	Upgrade from VQT POLQA to AutoVQT™
VBA032	Near Real-time Voice-band Analyzer
EMU037	Echo Measurement Utility (EMU) Software
VQT040	VQT WebViewer™
SA048	Goldwave Software

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more details, visit Voice Quality Testing (VQT) Software webpage.

GL Communications Inc.
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com