IQ FILE CUTTER

Application Description

ROHDE & SCHWARZ

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Contents

1 Installation

The R&S® IQ File Cutter is bundled with an installer that will extract all program files to the installation folder specified during installation. The installer will also check for the required Matlab R2019b Runtime (9.7) and will offer to install it as part of the installation if not yet available. If automatic installation is not possible, the runtime can be manually downloaded from the official Mathworks website.

To install the application, download and start the application installer from the application note landing page. Follow the instructions on screen. After successful installation, the app can be started from the Windows start menu. The terms and conditions for the use of royalty-free products are available online and installed with the application.
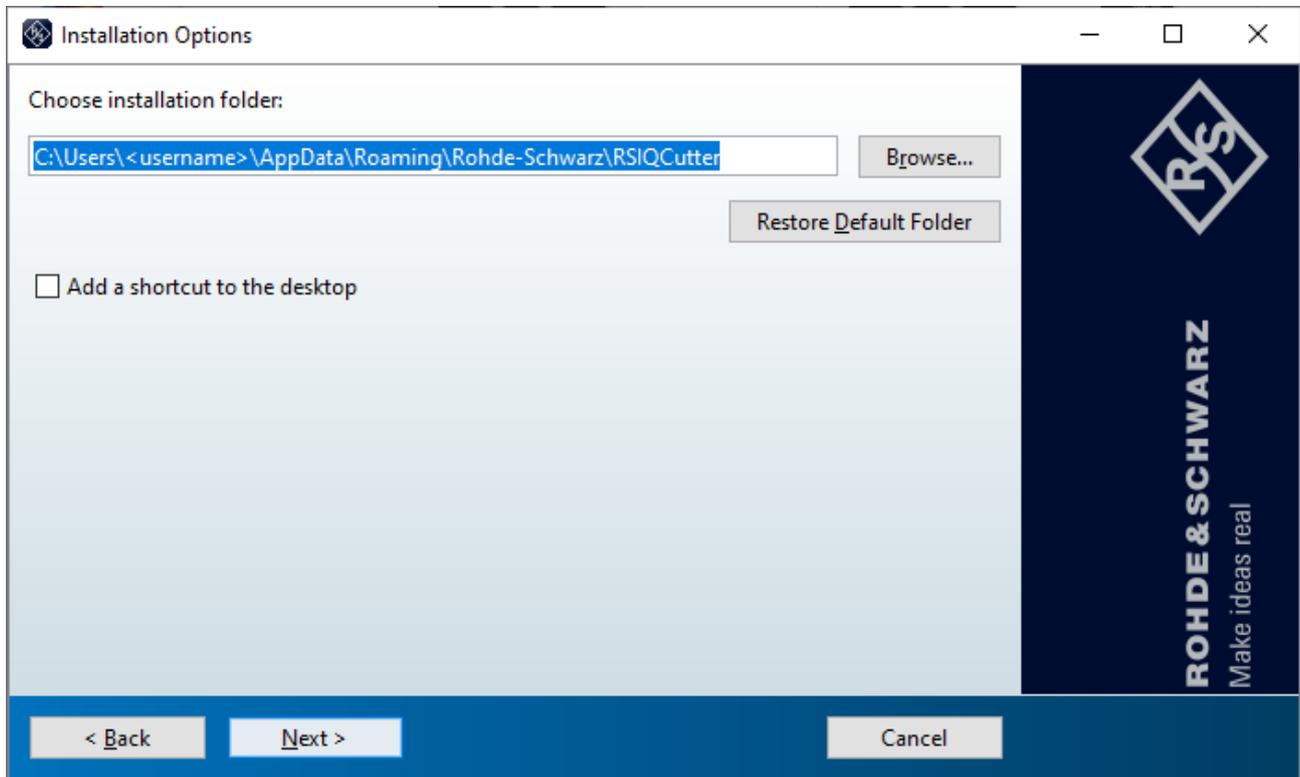
Figure 1: Installation Wizard

If installation is not desired, the application is also available as a portable executable. In this case, download and extract the folder to any location and start the executable. The Matlab runtime is still required and has to be installed manually.

2 The Application GUI

The R&S® IQ File Cutter can load IQ data from supported IQ file formats and export part of the signal to another file. This is helpful when dealing with long measurement recordings, of which only parts are of interest and should be extracted for further analysis.

The app can read and write IQ-TAR, IQW, WV, and MAT files. The IQ-TAR file format is the current format for R&S signal analyzers, IQW is the deprecated format. WV files can be played back on R&S signal generators. MAT files can be read and stored by Matlab as well as compatible third-party software. Only unencrypted WV files are supported.
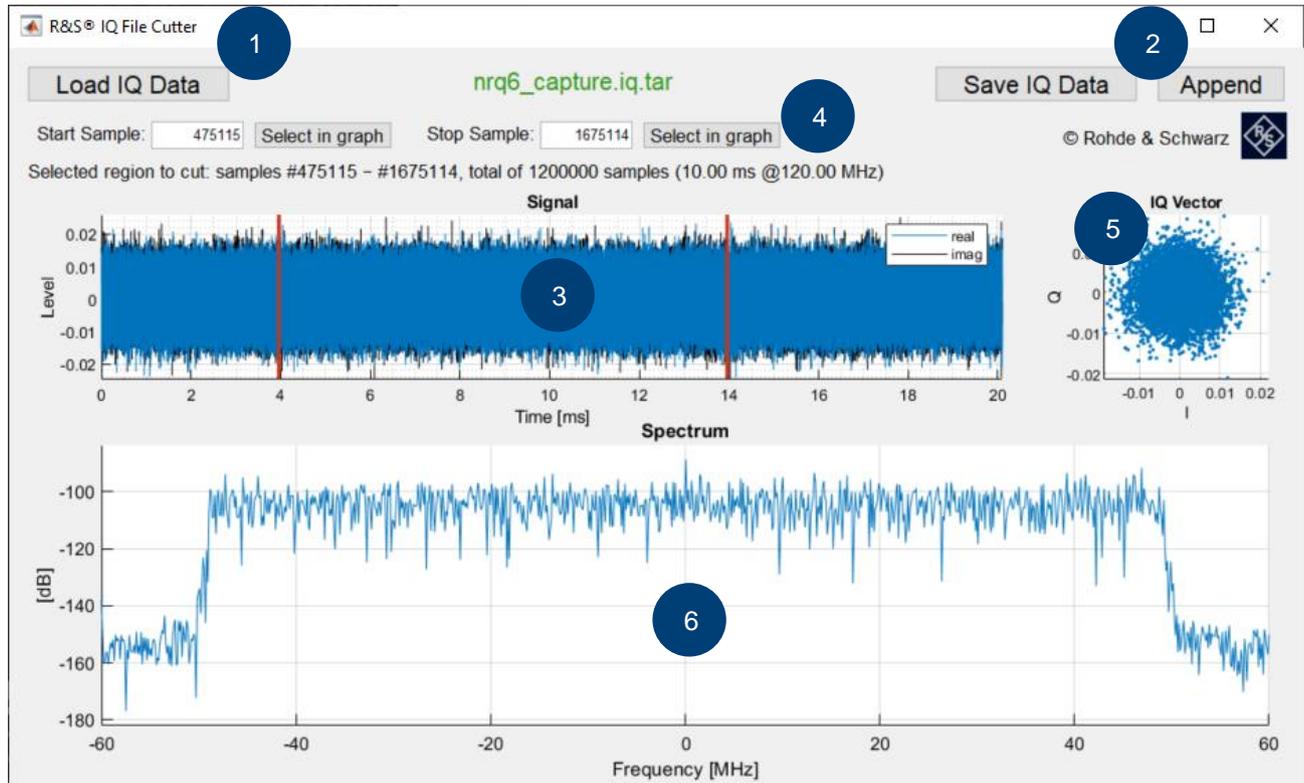
Figure 2: The main GUI

The main GUI shown in Figure 2 offers buttons to load IQ data from **(1)** and save to a file **(2)**. When a signal is loaded, the top-left graph **(3)** displays the time domain representation. Hovering the mouse over this graph reveals buttons to horizontally pan (✋), zoom (🔍), and reset (🏠) the view. Start and stop sample of the selected IQ cut region can be defined manually, or by selecting a sample from the graph **(4)**. Two vertical lines in the graph visualize the current cuts. The IQ vector **(5)** and frequency spectrum **(6)** graph always show the respective data only for the selected region, and update for every change of either cut sample.

2.1 Loading an IQ File

Either clicking "Load IQ Data" in the GUI or pressing either L or CTRL + O on the keyboard loads a new source file. The open file requester automatically filters files by supported file types. The file type is determined by the file name extension.

When loading a file without metadata information, input prompts request the sample rate and, in the case of the deprecated IQW format, the sample order used by the file. If the target file format supports this, the sample rate is stored as metadata during export. It is also used to display the signal duration and frequency spectrum.

After successfully opening a source IQ file, the time domain, frequency domain, and IQ vector graphs are populated with the corresponding signal representation. To increase the responsiveness of the application, the number of samples drawn to the GUI is limited. Nevertheless, all samples are used for exporting, and no resampling is applied.

2.2 Selecting the Desired Sample Region

Initially, the whole signal loaded is marked for export. Red vertical lines in the time domain representation show the first and last sample included in the cut region. In addition, the number of the first and last sample in the selection are shown in the respective edit boxes **(4)**. The region can be changed by either directly typing the sample number for either start or stop sample in the respective edit box, or by selecting the respective button "Select in graph" and subsequently clicking on the sample in the time domain graph. Shortcuts to toggle selection mode for start and stop sample are the 1 and 2 key, respectively. The time domain graph supports horizontal zoom and pan to better visualize and select the correct sample. Pan and zoom can be activated by either clicking the respective button to the top right of the graph, or using the P and Z shortcuts on the keyboard. While in zoom mode, the mouse wheel zooms in and out.

The region, total number of samples to export, and resulting duration given the sampling rate, are shown above the time domain graph. The frequency domain and IQ vector graph always reflect the signal of the currently selected cut region, as also indicated by the red lines in the time domain graph.

2.3 Exporting the Selected Sample Region

The IQ data in the selected sample region can be saved to a new file by clicking "Save IQ Data" or pressing S or CTRL + S on the keyboard. The file format depends on the used file name extension. If no extension is written, the extension will be added corresponding to the currently selected "save as type". When saving to an IQW file, the desired sample order must be selected.
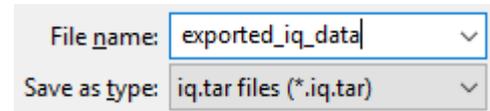
Figure 3: Export filename and type selection

In addition, the selected sample region can also be appended to an already existing IQ file by clicking "Append". The samples are added to the end of the existing file, retaining sample rate and comment of the original file. The existing file is overwritten; please keep backups to prevent data loss. When appending, no resampling is done, potentially resulting in a deviation from the expected sampling rate for the exported data.

2.4 GUI Shortcuts

For quick control, the following shortcuts can be used:
► CTRL+O or L to load IQ data
► CTRL+S or S to save IQ data
► 1 to toggle the start sample selection mode
► 2 to toggle the stop sample selection mode
► P to toggle pan mode
► Z to toggle zoom mode
► ESC to exit any currently active mode
► D or N to toggle GUI dark mode

3 Additional Tools for IQ Data Manipulation

Rohde & Schwarz offers various free tools and libraries to work with IQ data on top of the instrument and software lineup. For reading and writing various IQ file formats in C++, the daiex **da**ta **i**mport and **ex**port library is available as open-source code on GitHub. A description of the iq-tar file format used by R&S spectrum analyzers to save recorded IQ data is available on the Rohde & Schwarz website. The R&S ARB Toolbox allows importing IQ data from different file formats for use in R&S signal generators, supporting resampling, filtering, and clipping of waveforms, as well as creating multicarrier waveforms and editing markers. R&S IQ File Converter is a lightweight tool that allows straightforward conversion of typical IQ data file formats without any added overhead. The R&S IQ Wizard is able to load various IQ file formats in addition to directly retrieving IQ data from supported R&S devices.

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