

Products: R&S® Network Analyzer ZVA, ZVB, ZVT

# Transfer of Trace Data From R&S® Network Analyzer ZVx To Microsoft™ Excel™

## Application Note

This application note describes how to directly transfer S-Parameter Trace Data from R&S® Network Analyzers to Microsoft™ Excel™ using a direct connection like GPIB or LAN



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## 1. Overview

This application note describes how to directly transfer S-Parameter Trace Data from R&S® Network Analyzers to Microsoft™ Excel™ using a direct connection like GPIB or LAN.

Prerequisites are a PC running Microsoft Excel™, a R&S® Network analyzer like ZVA, ZVB or ZVT as well as a working remote control connection between PC and instrument like GPIB or LAN/Ethernet. .

## 2. Preparation

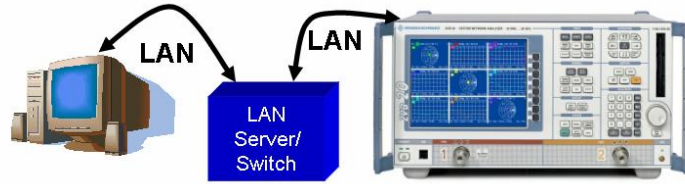
In order to use this application note, you need a remote control connection between the PC operating MS Excel™ and the R&S® Network Analyzer. There are following possibilities for this connection:

1. GPIB



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### 2. LAN/Ethernet using Intranet or Internet



### 3. LAN/Ethernet using direct Crosslink connection between PC and Network Analyzer



## 2.1. GPIB for Control PC

In order to use the GPIB interface, your PC must be equipped with a GPIB interface hardware.

In addition, the remote control library "VISA" needs to be installed on the PC. The VISA library is available e.g. at [www.nationalinstruments.com](http://www.nationalinstruments.com)

## 2.2. Preparations for LAN: RSIB32.dll

This Application Note shows how to use remote control of Rohde & Schwarz Network Analyzers over a local area network. Rohde & Schwarz VXIppn instrument drivers are based on VISA. Instrument Drivers as well as this Trace-To-Excel application can control the instrument via LAN if the RSIB interface and passport are installed.

The RSIB interface is a R&S® defined protocol that uses the TCP/IP protocol for communication with the instrument. It consists of a set of I/O functions very similar to the National Instruments NI-488.2 interface for GPIB.

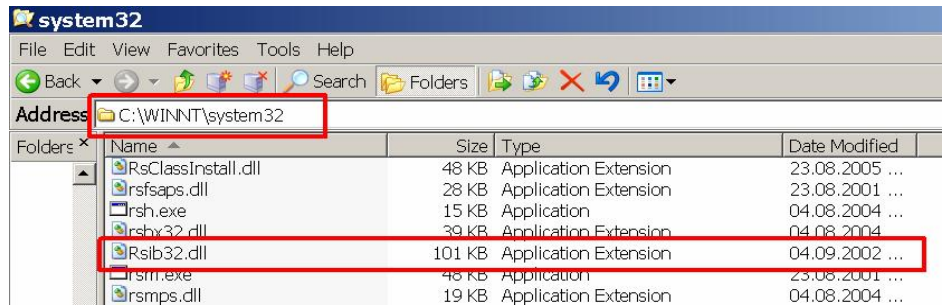
The following table shows some corresponding functions:

NI-488.2 functions	RSIB functions
ibfind	RSDLLibfind
ibwrt	RSDLLibwrt
ibrd	RSDLLibrd

A more detailed explanation of RSIB can be found in the Rohde&Schwarz application note *1EF47, "Remote Control of R&S® Spectrum and Network Analyzers via LAN"*. This application note is available at [www.rohde-schwarz.com](http://www.rohde-schwarz.com). The application note comes together with the RSIB Passport as well as the necessary RSIB.dll library.

Please install the RSIB32.dll library into the Windows System folder of your remote control PC.

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### 2.3. LAN/Ethernet

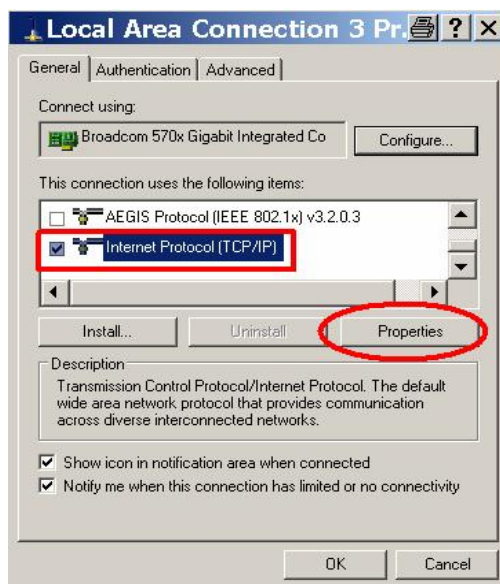
Both, PC and Instrument must be connected to the Local Area Network LAN and have a valid IP address inside the LAN. You can check the IP address of your PC from the Windows Control Panel inside the Network Connections.

For the R&S Network Analyzer instrument, please check first if the automatic assignment of an IP address (DHCP) is activated.

- Press the "Windows" button on the ZVx frontpanel in order to display the Windows Taskbar

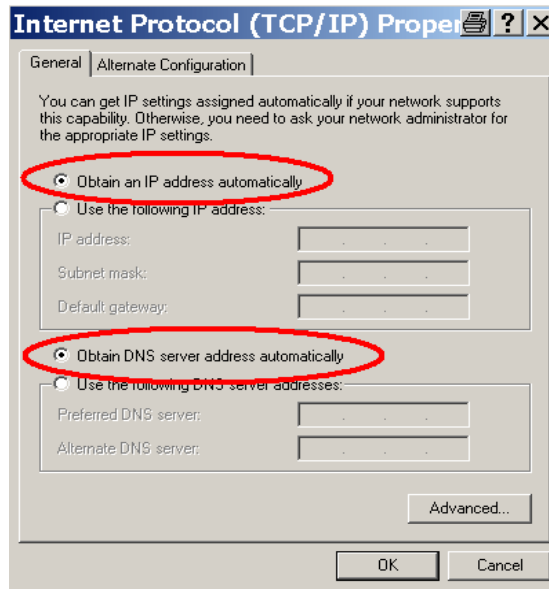


- Open Start->Settings->Network Connections->Local Area Network Connection
- In the dialog, select "Internet Protocol (TCP/IP)" and go to "Properties"



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- Make sure that the settings are “Obtain IP address automatically” and “Obtain DNS address automatically”

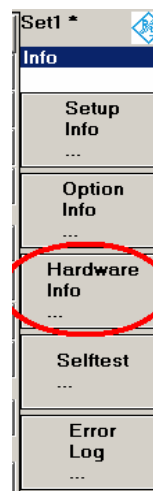


After confirmation of the automatic network settings, please check the obtained Network Analyzer IP address. You can do this in the following way:

- Press Info Button



- Press the softkey “Hardware Info”



- Now you can find the IP address of the analyzer below the “IP addresses” section

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### Hardware Configuration

Instrument Type: ZVA24 with 4 Ports  
Part Number: 1145.1110k26  
Serial Number: 100171  
Product Index: 01.00  
IEC Bus Address: 20  
IP Addresses  
IP Address: 0.0.0.0 Subnet Mask: 0.0.0.0  
IP Address: 10.7.11.54 Subnet Mask: 255.255.0.0  
IP Address: 127.0.0.1 (Localhost) Subnet Mask: 255.0.0.0  
SyMapping: ZVA\_P4  
LO Divider: is not active  
Firmware Version: 2.01  
Image:  
Version 02.10

Please note that the ZVx instrument has two LAN ports. Depending on the port you are using, please use the first or second IP address in the Hardware info field.

- Final preparation step: Make sure that you have the LAN remote control library RSIB32.dll installed on your PC remote computer (see section 2.2).

### 2.4. LAN/Ethernet using direct Crossover connection between PC and Network Analyzer

You can also directly connect your remote PC to the ZVx Network Analyzer instrument by means of a normal LAN cable or by a crossover LAN cable.

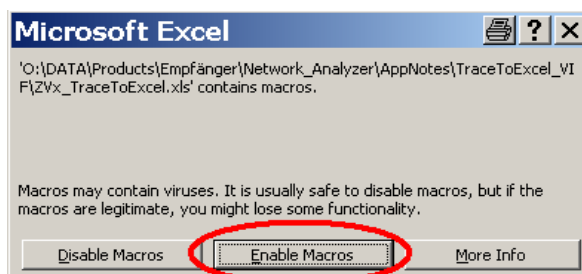
A crossover LAN cable has same connector types as a normal LAN cable, however the wires inside the crossover cable are crossed.

## 3. Operation of the Trace-to-Excel Tool

This application note comes with an Excel™ file tool which enables you to directly transfer S-parameter trace data from Instrument to Excel™.

The supplied Excel-file ZVx\_TraceToExcel.xls consists of a spreadsheet and a software macro function written in Visual Basic for Applications VBA.

When opening the file ZVx\_TraceToExcel.xls, you will be asked to enable the macros. Attention: It is absolutely necessary to press “Enable Macro” here. The tool will not work without the macros.

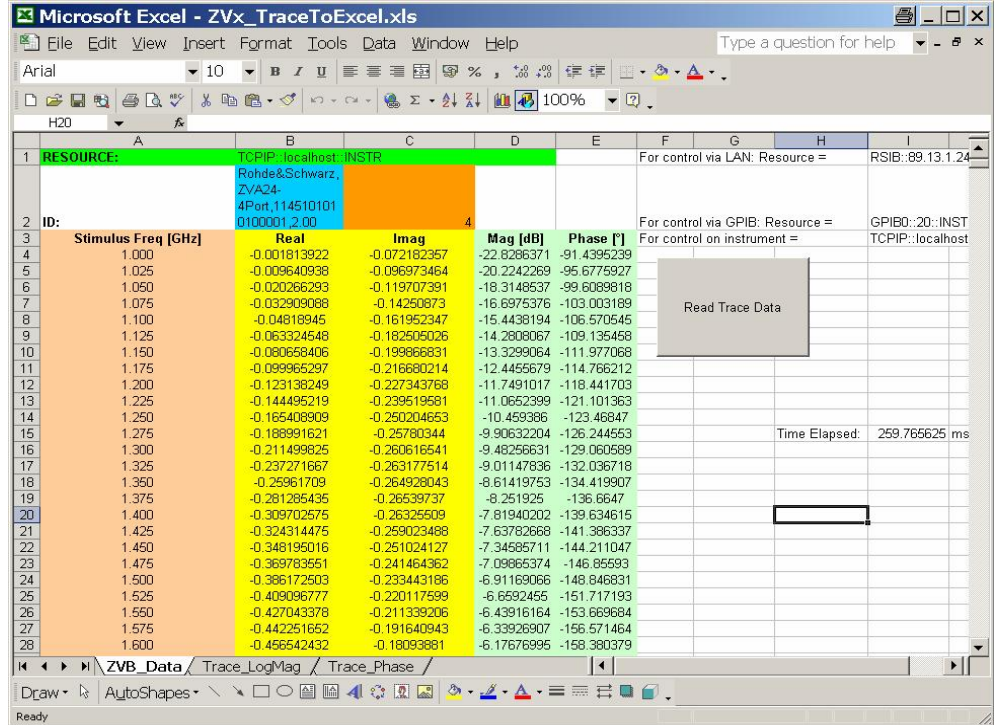




# Transfer of Trace Data from R&S ZVx to MS Excel

## 3.1. Screen of Trace-to-Excel-Tool

After opening the Excel™ tool, you will find see a spreadsheet as shown below:



The spreadsheet consists of following elements:

- Resource String
- Instrument Identification
- Execution Button for download of trace data
- Frequency List
- Real and Imaginary Part of S-Parameter Trace Data
- Magnitude and Phase of S-Parameter Trace Data

### 3.1.1. Resource String of instrument

This string is located in cell "B1" of the Excel™ spreadsheet (green color). Depending on the interface type, a different resource string is used to address the instrument.

#### GPIB Interface:

Use Resource String "**GPIB0::20::INSTR**", where "GPIB0" = Name of GPIB interface and "20" = GPIB address of Network Analyzer

#### LAN Interface:

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Use Resource String **“RSIB::89.13.1.241::INSTR”**, where “RSIB” = Name of interface, don’t change, and “89.13.1.241” = actual IP address of your network Analyzer

	A	B	C	D	E
1	<b>RESOURCE:</b>	GPIB0:20:INSTR			
		Rohde&Schwarz, ZVA24- 4Port,114510101 0100001,2.00			
2	<b>ID:</b>		4		
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>	<b>Mag [dB]</b>	<b>Phase [°]</b>
4	1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593
5	1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539
6	1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797

### 3.1.2. Instrument Identification

This string is located in cell “B2” of the Excel™ spreadsheet (light blue color). The instrument identification string shows instrument type, model, serial number as well as FW version. The string is updated after each trace download from the instrument.

	A	B	C	D	E
1	<b>RESOURCE:</b>	GPIB0:20:INSTR			
		Rohde&Schwarz, ZVA24- 4Port,114510101 0100001,2.00			
2	<b>ID:</b>		4		
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>	<b>Mag [dB]</b>	<b>Phase [°]</b>
4	1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593
5	1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539
6	1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797

In the neighboring cell “C2”, you can find the detected number of ports (orange color).

In case of any problem with the instrument connection, there will be the message “Instrument not found” in this cell.

The string corresponds to the return value of the “\*IDN?” remote control command.

### 3.1.3. Instrument Execution Button for download of trace data

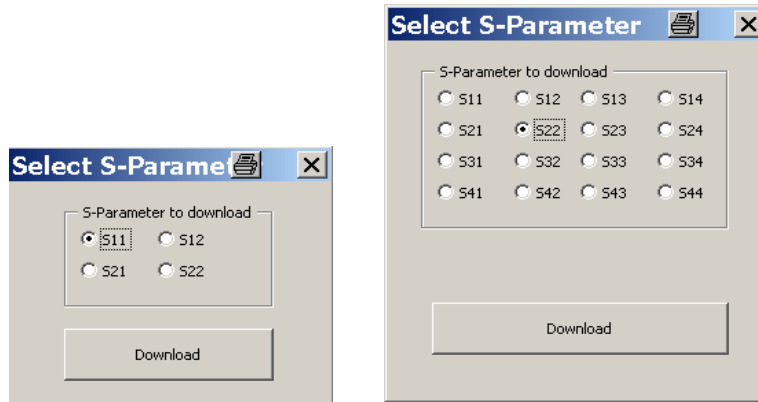
With this button you can execute the download of the trace data from the instrument.

	A	B	C	D	E	F	G	H
1	<b>RESOURCE:</b>	GPIB0:20:INSTR				For control via LAN: Resource =		
		Rohde&Schwarz, ZVA24- 4Port,114510101 0100001,2.00						
2	<b>ID:</b>		4			For control via GPIB: Resource =		
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>	<b>Mag [dB]</b>	<b>Phase [°]</b>	For control on instrument =		
4	1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593			
5	1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539			
6	1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797			
7	1.015	-0.005550795	-0.087819524	-21.1108625	-93.6166741			
8	1.020	-0.00799311	-0.092080235	-20.684069	-94.9611765			
9	1.025	-0.010037393	-0.09657333	-20.2561924	-95.9337576			
10	1.030	-0.011657862	-0.101449348	-19.8180414	-96.555284			
11	1.035	-0.013507739	-0.106411614	-19.3907976	-97.2343536			
12	1.040	-0.016502446	-0.11054045	-19.0338465	-98.4909066			

After execution of this button, you will be prompted with a dialog box where you can select one of several S-Parameters. The selection is depending on the instrument number of ports:



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Dialog for 2-port instrument

Dialog for 4-port instrument

After pressing the “Download” button, the trace data of the selected S-Parameter will be transferred to MS Excel™ .

If the current instrument setup contains several channels, the Excel™ Macro will use the currently active channel settings for the trace download.

### 3.1.4. Frequency List

After the successful download of the trace data, you will find the corresponding frequency list in column A (pink color).

	A	B	C
1	<b>RESOURCE:</b>	GPIB0:20:INSTR	
		Rohde&Schwarz, ZVA24- 4Port,114510101	
2	<b>ID:</b>	0100001.2.00	4
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>
4	1.000	-0.001847658	-0.07273946
5	1.005	-0.002462111	-0.077862829
6	1.010	-0.004455691	-0.081715219
7	1.015	-0.005550795	-0.087819524
8	1.020	-0.00799311	-0.092080235
9	1.025	-0.010037393	-0.09657333
10	1.030	-0.011657862	-0.101449348
11	1.035	-0.013507739	-0.106411614
12	1.040	-0.016502446	-0.11054045
13	1.045	-0.018718176	-0.115104377
14	1.050	-0.020021342	-0.12018279
15	1.055	-0.022612674	-0.125078574
16	1.060	-0.025476675	-0.128695175

### 3.1.5. Real and Imaginary Part of S-Parameter Trace Data

After the successful download of the trace data, you will find the trace data in complex format in the columns B and C (yellow color). Column B shows the real value, Column C the imaginary value. The values are entered in the corresponding rows next to the corresponding frequency point.

This data is the actually downloaded data.

## Transfer of Trace Data from R&S ZVx to MS Excel

	A	B	C	D	E
1	<b>RESOURCE:</b>	GPIB0::20::INSTR			
		Rohde&Schwarz, ZVA24- 4Port,114510101			
2	<b>ID:</b>	0100001,2.00			
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>	<b>Mag [dB]</b>	<b>Phase [°]</b>
4	1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593
5	1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539
6	1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797
7	1.015	-0.005550795	-0.087819524	-21.1108625	-93.6166741
8	1.020	-0.00799311	-0.092080235	-20.684069	-94.9611765
9	1.025	-0.010037393	-0.09657333	-20.2561924	-95.9337576
10	1.030	-0.011657862	-0.101449348	-19.8180414	-96.555284
11	1.035	-0.013507739	-0.106411614	-19.3907976	-97.2343536
12	1.040	-0.016502446	-0.11054045	-19.0338465	-98.4909066
13	1.045	-0.018718176	-0.115104377	-18.6648064	-99.2365371

### 3.1.6. Magnitude (dB) and Phase parameter of S-Parameter Trace Data

The Mag(dB) and phase values of the trace can be found in columns D and E, respectively (light green color). This data is actually not directly downloaded from the instrument, but it is calculated with Excel™ functions from the available real and imaginary values in the columns to the left.

	A	B	C	D	E
1	<b>RESOURCE:</b>	GPIB0::20::INSTR			
		Rohde&Schwarz, ZVA24- 4Port,114510101			
2	<b>ID:</b>	0100001,2.00			
3	<b>Stimulus Freq [GHz]</b>	<b>Real</b>	<b>Imag</b>	<b>Mag [dB]</b>	<b>Phase [°]</b>
4	1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593
5	1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539
6	1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797
7	1.015	-0.005550795	-0.087819524	-21.1108625	-93.6166741
8	1.020	-0.00799311	-0.092080235	-20.684069	-94.9611765
9	1.025	-0.010037393	-0.09657333	-20.2561924	-95.9337576
10	1.030	-0.011657862	-0.101449348	-19.8180414	-96.555284
11	1.035	-0.013507739	-0.106411614	-19.3907976	-97.2343536
12	1.040	-0.016502446	-0.11054045	-19.0338465	-98.4909066
13	1.045	-0.018718176	-0.115104377	-18.6648064	-99.2365371
14	1.050	-0.020021342	-0.12018279	-18.284269	-99.4580903

### 3.2. Graphical Result View in Excel™

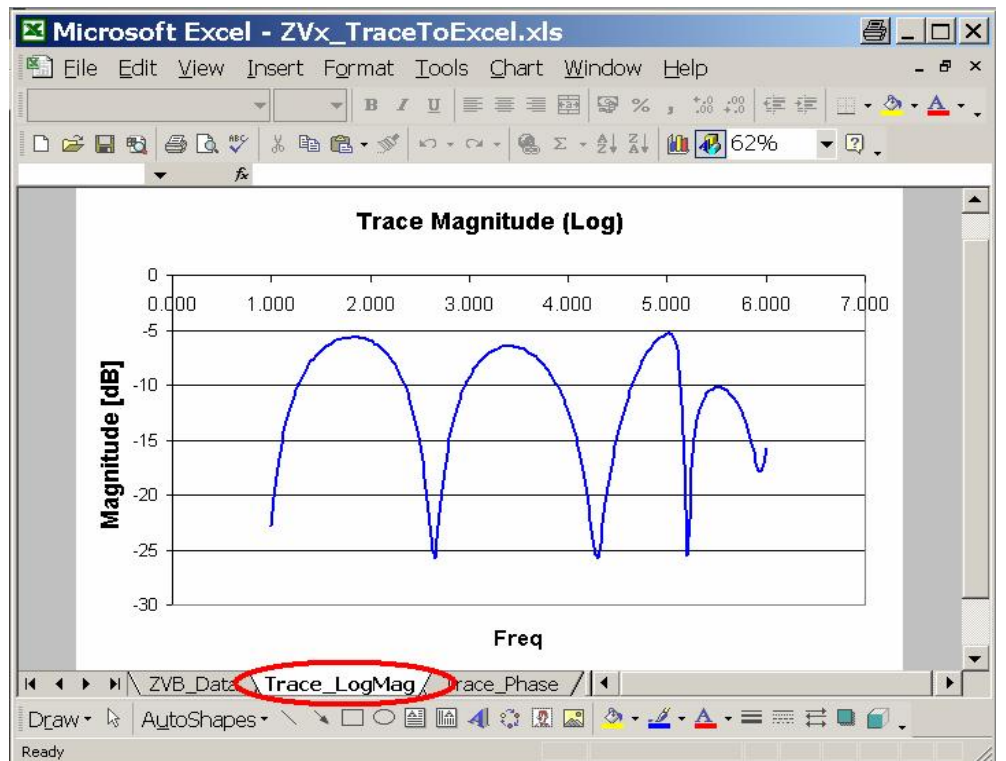
With the graphical functions inside MS Excel™, it is easily possible to display the downloaded trace data as a diagram.

An example is shown in ZVx\_TraceToExcel.xls in the two diagram pages

## Transfer of Trace Data from R&S ZVx to MS Excel

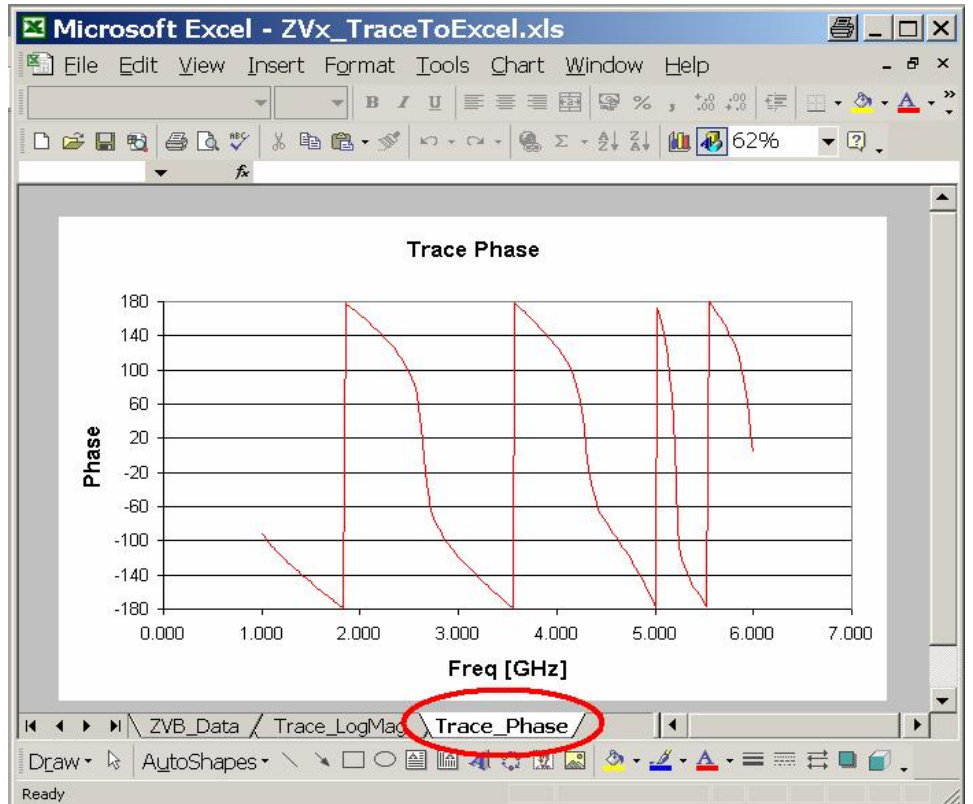
Stimulus Freq [GHz]	Real	Imag	Mag [dB]	Phase [°]
1.000	-0.001847658	-0.07273946	-22.7617974	-91.4550593
1.005	-0.002462111	-0.077862829	-22.1690561	-91.8111539
1.010	-0.004455691	-0.081715219	-21.7410478	-93.1210797
1.015	-0.005550795	-0.087819524	-21.1108625	-93.6166741
1.020	-0.00799311	-0.092080235	-20.684069	-94.9611765
1.025	-0.010037393	-0.09667333	-20.2561924	-95.9337576
1.030	-0.011657862	-0.101449348	-19.8180414	-96.555284
1.035	-0.013507739	-0.106411614	-19.3907976	-97.2343536
1.040	-0.016502446	-0.11054045	-19.0338465	-98.4909066
1.045	-0.018718176	-0.113849277	-18.6648064	-99.2365371

### 3.2.1. Magnitude View Trace\_LogMag



### 3.2.2. Magnitude View Trace\_Phase

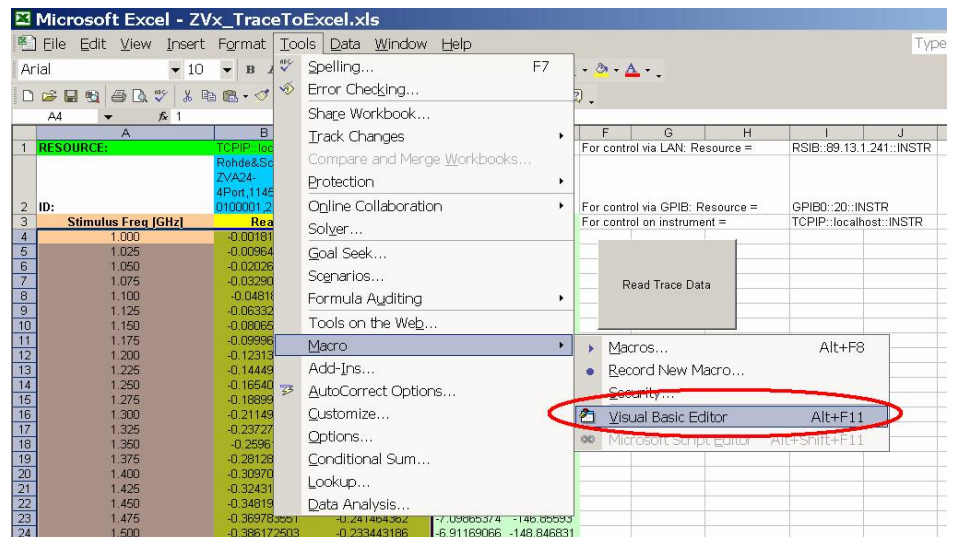
## Transfer of Trace Data from R&S ZVx to MS Excel



### 4. Changing the Macro Source Code

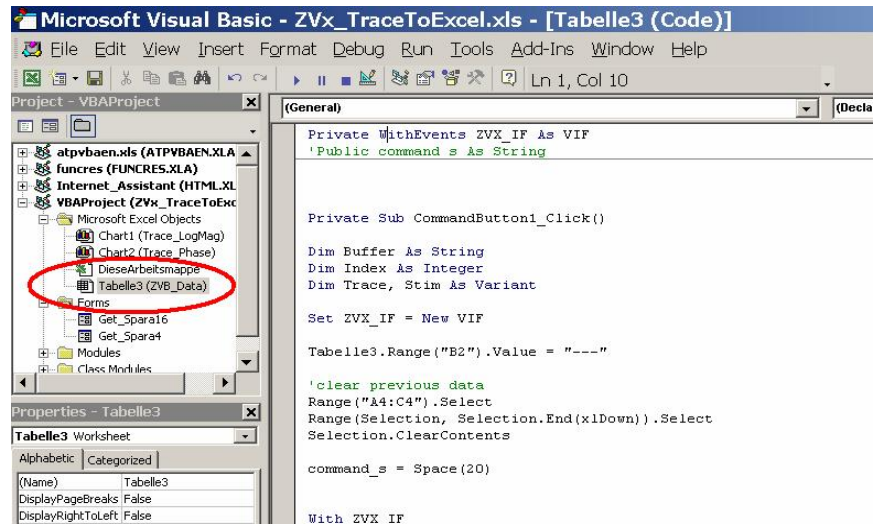
It is possible to change the actual macro program source code within Excel™. This may be required to tailor the tool to the individual needs, e.g. download of other data than trace data or special instrument setup prior to download.

In order to edit the program code, enter the Visual Basic for Application (VBA) editor in MS Excel™. The VBA Editor is located in the Tools Menu:

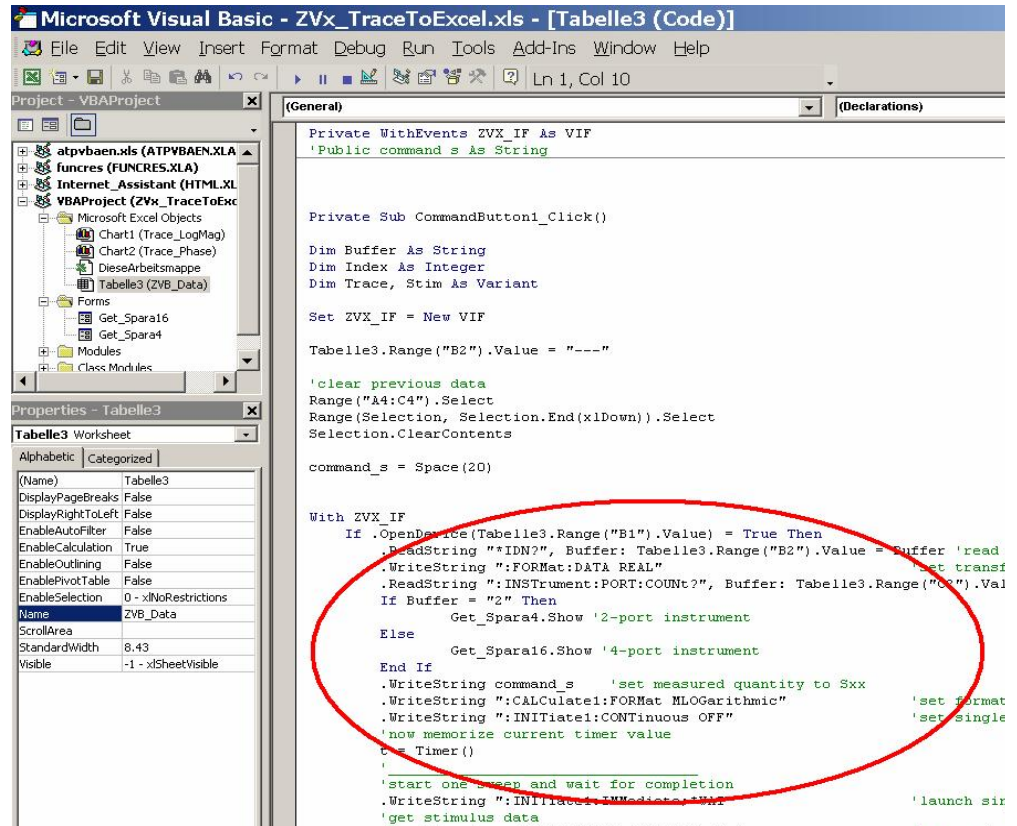


## Transfer of Trace Data from R&S ZVx to MS Excel

Inside the VBA Editor, double-click on the spreadsheet which contains the “Read Trace Data” Button. This is the spreadsheet named “ZVB\_Data” and is located inside the Project browser on the left side of the screen.



After double-clicking the spreadsheet, the macro source code appears in the main window. Here you can do the appropriate changes to the source code.



## 5. Hardware and Software Requirements

### 5.1. PC Hardware Requirements

	Minimum	Recommended
<b>CPU</b>	Pentium 133 MHz	Pentium II 450 MHz or higher
<b>RAM</b>	32 Mbyte	128 MByte
<b>Harddisc</b>	10 MByte free space	50 MByte free harddisc space
<b>Monitor</b>	VGA monitor (640x480)	SVGA color monitor, resolution 800x600 or better
<b>IEEE Bus or LAN/Ethernet</b>	required	

### 5.2. PC Software Requirements

	Minimum	Recommended
<b>OS</b>	Windows 95 / 98 / NT 4.0 / 2000 / Me / XP	Windows 98 / 2000 / Me / XP
<b>OS add-ons</b>	---	Microsoft Internet Explorer 5.0 or above Microsoft Excel™ 2002 or above
<b>IEEE Bus Driver</b>	Version 1.70 (or above)	Version 1.70 (or above)
<b>VISA</b>	VISA 4.0	VISA 4.0
<b>RSIB</b>	RSIB 1.0	RSIB 1.0

## 6. Literature

[1] R&S Application note 1EF47, "Remote Control of R&S Spectrum and Network Analyzers via LAN", available at [www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## 7. Additional Information

This application note and the associated program are updated from time to time. Please visit the website [1MAXX](http://1MAXX) in order to download new versions. Please send any comments or suggestions about this application note to [TM-Applications@rsd.rohde-schwarz.com](mailto:TM-Applications@rsd.rohde-schwarz.com).



## 8. Ordering information

### Network Analyzers

R&S® ZVA8	300 kHz to 8 GHz	1145.1110.08 (2 ports) 1145.1110.10 (4 ports)
R&S® ZVA24	10 MHz to 24 GHz	1145.1110.24 (2 ports) 1145.1110.26 (4 ports)
R&S® ZVA40	10 MHz to 40 GHz	1145.1110.40 (2 ports)
R&S® ZVB4	300 kHz to 4 GHz	1145.1010.04 (2 ports) 1145.1010.05 (3 ports) 1145.1010.06 (4 ports)
R&S® ZVB8	300 kHz to 8 GHz	1145.1010.08 (2 ports) 1145.1010.09 (3 ports) 1145.1010.10 (4 ports)
R&S® ZVB20	10 MHz to 20 GHz	1145.1010.20 (2 ports) 1145.1010.22 (4 ports)
R&S® ZVT8	300 kHz to 8 GHz	1300.0000.08 (2 ports to 8 ports)

Please note, that complete solutions for signal generation and signal analysis for various applications are available from Rohde & Schwarz.

For additional information about equipment, see the Rohde & Schwarz website [www.rohde-schwarz.com](http://www.rohde-schwarz.com).



**ROHDE & SCHWARZ**

ROHDE & SCHWARZ GmbH & Co. KG · Mühlhofstraße 15 · D-81671 München · Postfach 80 14 69 · D-81614 München · Tel (089) 4129 -0 · Fax (089) 4129 - 13777 · Internet: <http://www.rohde-schwarz.com>

*This application note and the supplied programs may only be used subject to the conditions of use set forth in the download area of the Rohde & Schwarz website.*