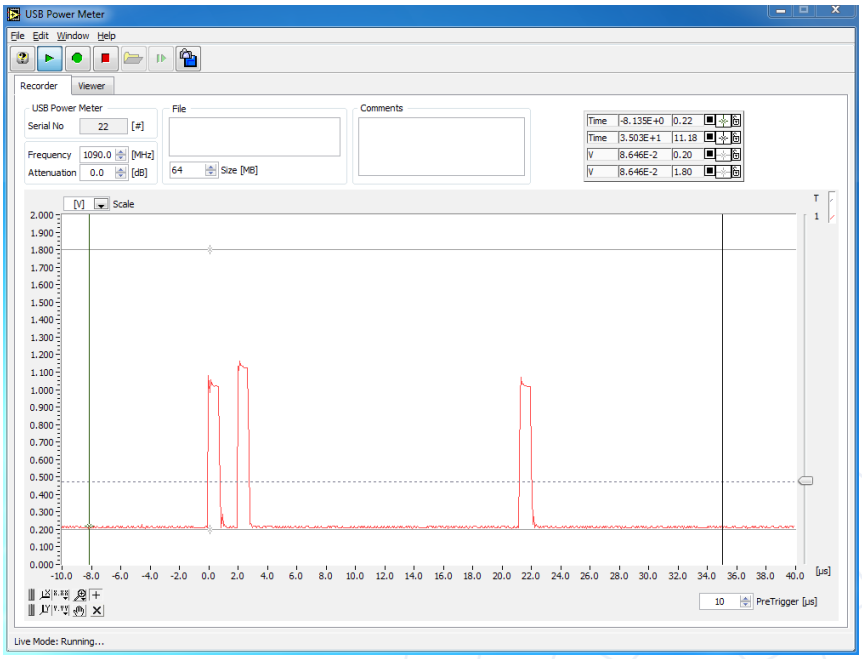
UPM772 Power Meter Manual

Use of UPM772 as a Power Meter



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002	27-Mar-14	Changes after revision	All	EV
003	25-Jun-14	Typing error	5	EV
004	20-Aug-14	Adding reference to toolbox	5	EV
005	1-Dec-15	Adding application note	12-16	EV

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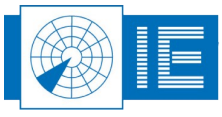


1. Introduction

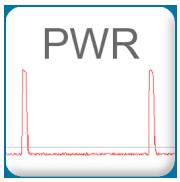
The UPM772 is a broadband log receiver (10MHz to 10GHz) and can operate on L/S/C/X band. In the field of radar the UPM772 can be used as pulse power meter to:

- Measure and record amplitude, shape and timing of radar pulses from SSR or PSR radars
- Visualise of basic Tx power and pulse parameters such as:
  - pulse width
  - rise time
  - fall time
  - timed-sidelobes

2. USB Power Meter

Check-out the UPM772 connection diagram leaflet delivered with the UPM772 for the correct connections and set-up. This connection diagram can also be loaded through the Help menu of the UPM772 Power Meter software. A Tutorial explaining how to use the UPM772 together with a DTI529 (Didactical Test Interrogator) to practice the power meter function can also be found in the Help menu.

The UPM772 Power Meter software can be started from the RASS-M Toolbox or the Windows Start menu.



UPM772 Power Meter button

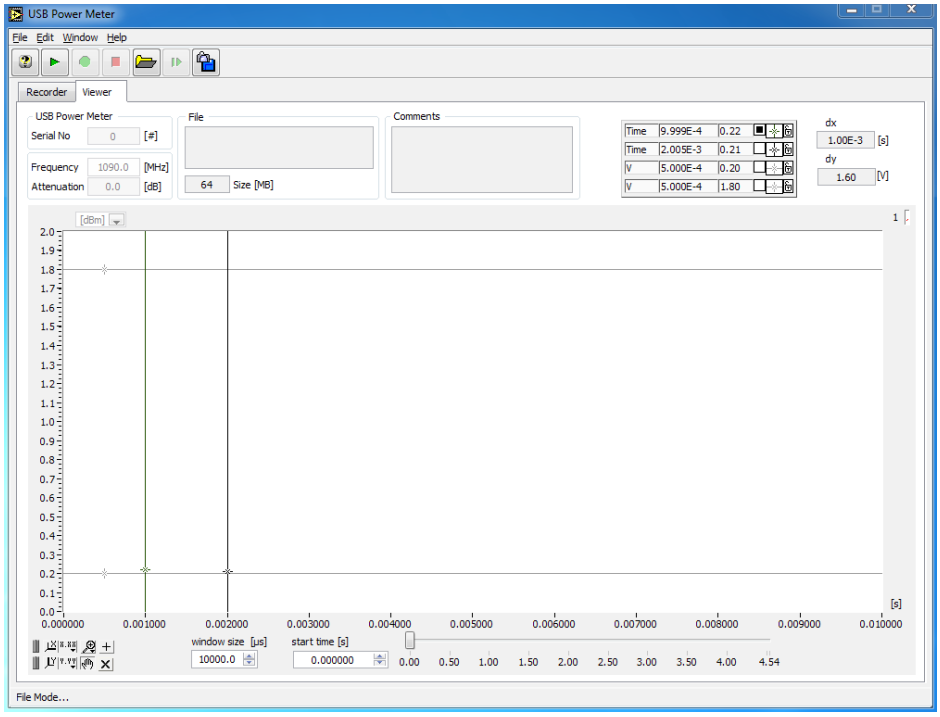


Figure 1: USB Power Meter software

2.1. Making a Recording

Step 1: Select Live mode

You can only make a recording when you are in ***Live*** mode: select the ***Recorder*** tab. The status bar at the bottom of the window will indicate that you are in Live mode.

Step 2: Check parameters

Enter the required parameters:

- Enter the ***Frequency*** of the input signal. Although the UPM772 is a broadband log receiver (10MHz...10GHz) with a relatively flat response curve, we ask you to enter the approximate frequency of the input signal for maximum accuracy.

- Enter the ***Attenuation***; this contains the attenuators, cable loss and antenna gain

  Note: Start with 30db extra attenuation. Add or remove attenuation as required. Make sure the input of the UPM772 is not saturated. A warning will appear if that is the case. After determining the correct attenuator adjust this attenuation parameter accordingly.

- Select the recording size: The sample rate is 15MHz. This results in 15MB/s data recorded to disk. The default size is 65MB. The maximum disc space depends on your free space on your local disc. By zipping the recorded files afterwards, these recordings can be compressed to 1/3th of the size.

  Caution: Check disc space before recording large files!

Step 3: Start datastream

Use the ***Start***  button to start the datastream from the UPM772 and view the incoming data. The preview window consists of a received input power in dBm or V versus time and will be refreshed when the power or voltage exceeds the trigger level. The pretrigger defines the position in the window of the triggered pulse. The trigger level and the pretrigger values will have no influence on the recorded data.

Step 4: Set Trigger level

Set the trigger level (use the slider at the right side of the vi) above noise level such that the pulses will trigger the software.

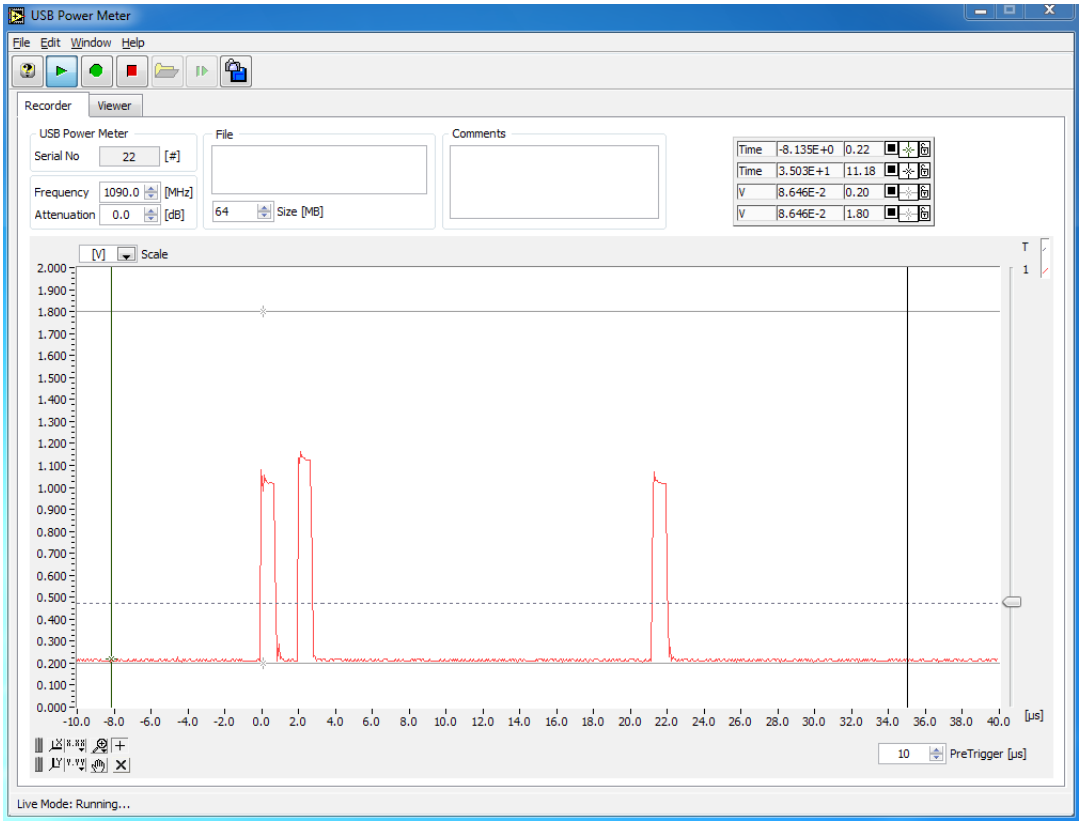


Figure 2: USB Power Meter in Live Mode

Enter some environmental and/or measurement conditions in the ***Comments*** field, such as the location towards the source, in field/on site, distance, height, polarization of the measurement antenna.

Step 5: Record data

Start the recording by clicking the ***Record***  button.
A dialog box will prompt the user to select the location. The recording on disk consists of a folder containing the measurement data. Therefore each time a recording is performed, a new folder needs to be created.

When the recording folder is selected, the recording will start. The toolbar will show a progress bar indicating the recording progress.

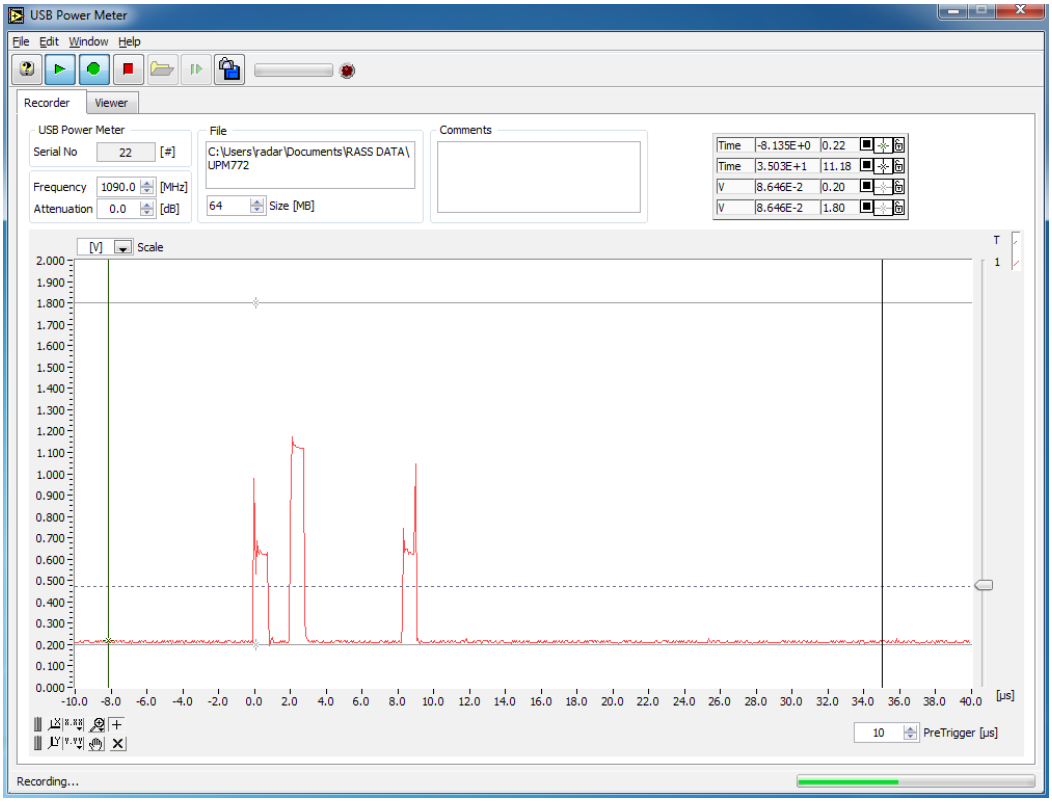


Figure 3: Recording in Progress

The buffer indicator and Error LED will indicate whether the computer is fast enough to write the data to file. During a recording the data is sampled at 15MB/s and stored to disk as a continuous, uninterrupted data stream. This means the completed waveform vs time is stored on disk for further examining. If your computer is not fast enough to write the data to file, the Error LED will turn red

2.2. Analysis

When the recording is finished, the program switches automatically to the ***File*** mode (***Viewer*** tab of the software). The recorded data is read from the disk. This process can take up to a minute depending on the file size and computer speed.

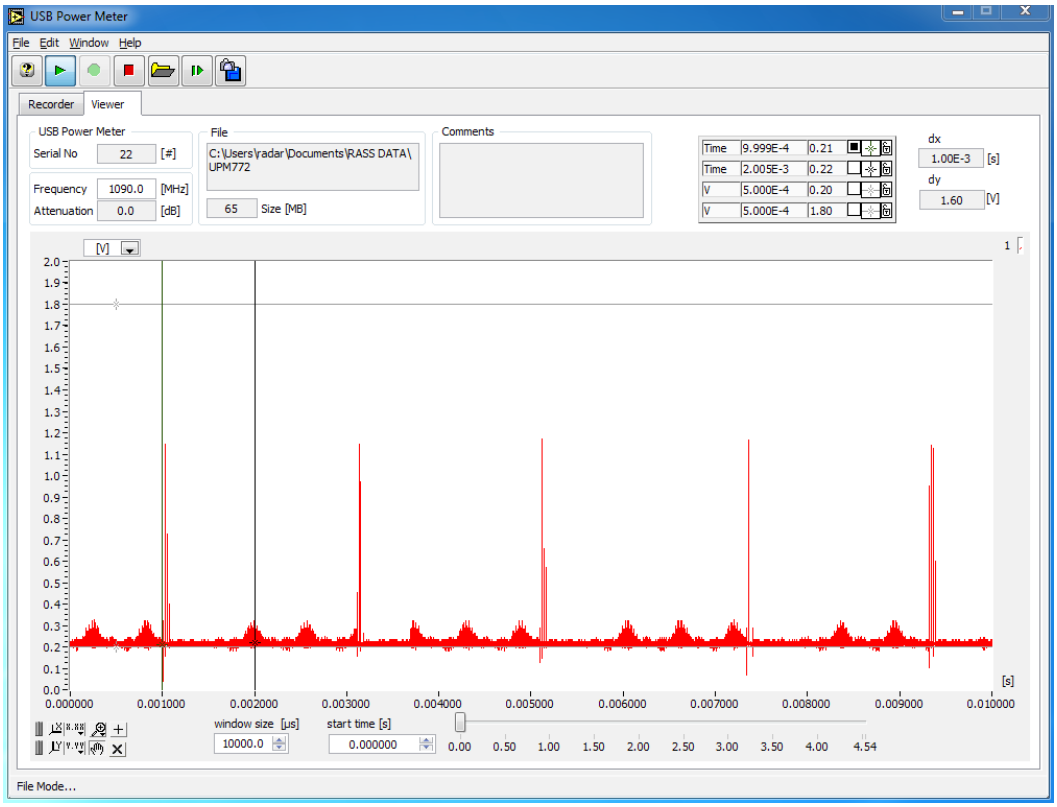


Figure 4: USB Power Meter-Viewer

- ***Window size***: length of the preview window
- ***Start time***: start of the defined window
- ***Zoom functions***: To examine the data in more detail.

Step 6: Analyse data

Use the slider at the bottom of the window to step through the data or click the ***Next***  button to jump to the next window (this action will simply add the ***Window Size*** value to the ***Start time*** value).

In case you want to view an existing recording, click the ***Select Folder***  button and a dialog will appear to select a recorded folder.

Please note that it is possible to use the program without the UPM772 connected for viewing purposes only.

2.3. Troubleshooting

The preview window doesn't show any pulses or no pulses are recorded.

- Check trigger level
- Check coupler connection
- Check video output on the oscilloscope

Record button is disabled.

- Check that you are in Live mode (in File mode the Record button is always disabled)
- Check USB connection

3. Application Note: RF Cable Loss Measurement

This application note explains the measurement procedure to check the cable loss of RF cables using the UPM772 USB Power Meter and a Mini-Circuits SSG-4000HP RF Generator.

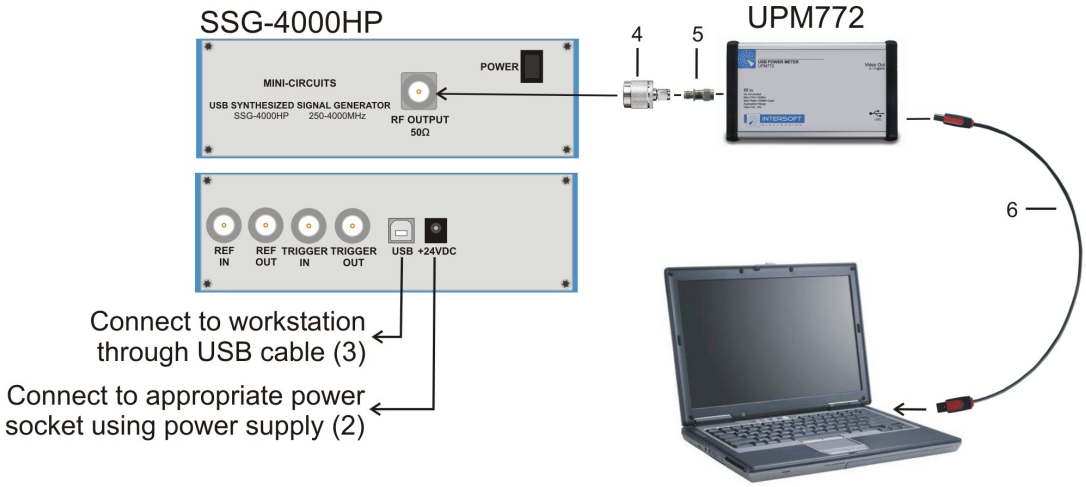
3.1. Introduction

The RF cable loss will be measured in two steps. First we measure the RF generators' output power by connecting the UPM772 directly (without the cable) to the Tx Output of the SSG-4000HP. Only a 20 dB attenuator is inserted.
Then we insert the cable in between the SSG-4000HP and the 20dB attenuator and check the power level measured with the UPM772. The difference in reading is the cable loss we are looking for.

3.2. Cable Loss Measurement

3.2.1. Measure the RF Tx Output Power without Cable

Connect the UPM772 to the Mini-circuits SSG-4000HP as shown in the setup below:



Equipment	USB Power Meter - UPM772	
	Mini-Circuits SSG-4000HP	
	Portable workstation	
Accessories	1: Mini-Circuits power cable	4: N(m) to SMA(m) adaptor
	2: Mini-Circuits power supply	5: 20dB attenuator SMA
	3: Mini-Circuits USB Cable	6: Belkin USB 2.0 A-B Cable 3.0m

Figure 5: Setup 1: Measure the signal generators' Tx power

Start the Minicircuits Signal Generator tool using the shortcut on the desktop. The launcher window will appear. Click the ***USB*** button since the SSG-4000HP is connected using USB.

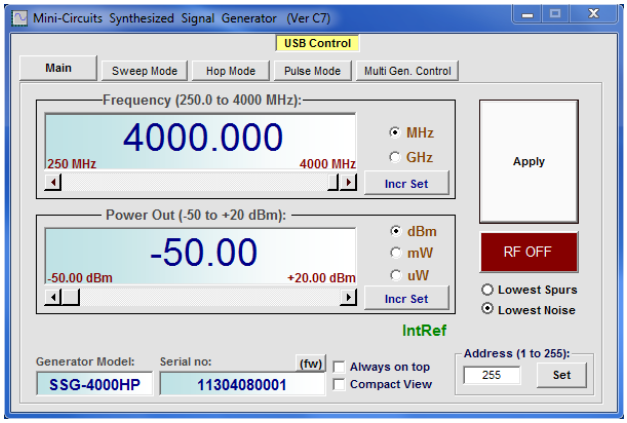


Figure 6: Minicircuits Signal Generator – Main window

Clicking the ***Pulse Mode*** button will open the ***Pulse Mode*** window to setup the signal generator. Following parameters need to be set:

- ***Frequency***: frequency you want to measure the loss at
- ***Power Level***: 0dBm
- ***Pulse Width***: 100us
- ***Pulse Period***: 1000us

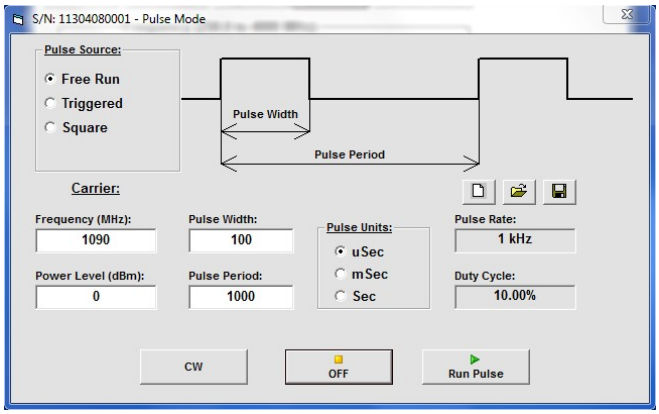


Figure 7: Mini-Circuits Signal Generator – Pulse Mode window

Start the generator using the ***Run Pulse*** button.

Now open the ***USB Power Meter*** tool from the RASS-M toolbox.
Make sure the ***Recorder*** tab is selected. Set the correct ***Frequency*** and ***Attenuation*** to make sure the power readout is correct.
Adjust the trigger so that the pulse is visible in the measurement window and place the cursors on the pulse in order to easily readout the power level in the cursor display.

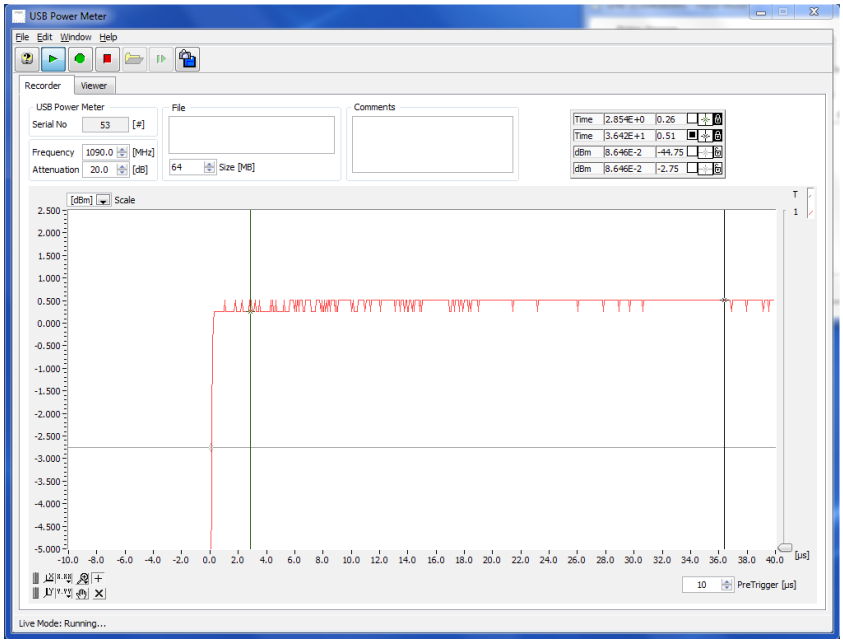
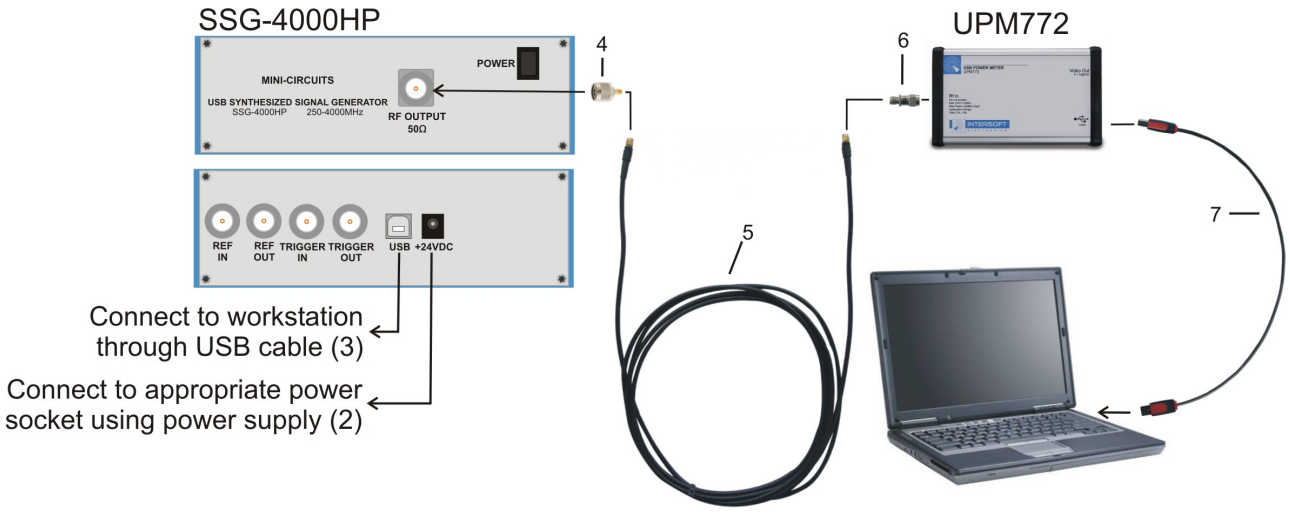


Figure 8: Power measurement – without cable

The measurement resolution of the UPM772 at 1090MHz is 0.25dB. When reading the power level it is best to use the cursor readout and take the average reading. The measured power is 0.385dBm.

3.2.2. Measure the Tx Power including cable

Now connect the UPM772 to the signal generator with the RF cable under test inserted in between the signal generator and the 20dB attenuator, as indicated in the setup below:



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	Portable workstation	
Accessories	1: Mini-Circuits power cable	5: SMA(m) cable 4.0m
	2: Mini-Circuits power supply	6: 20dB attenuator SMA
	3: Mini-Circuits USB Cable	7: Belkin USB 2.0 A-B Cable 3.0m
	4: N(m) to SMA(f) adaptor	

Figure 9: Set-up 2: Measure the cable loss

The N(m) to SMA(m) adapter at the SSG-4000HP needs to be replaced by a N(m) to SMA(f) adapter, in order to insert the 4m SMA(m) cable.

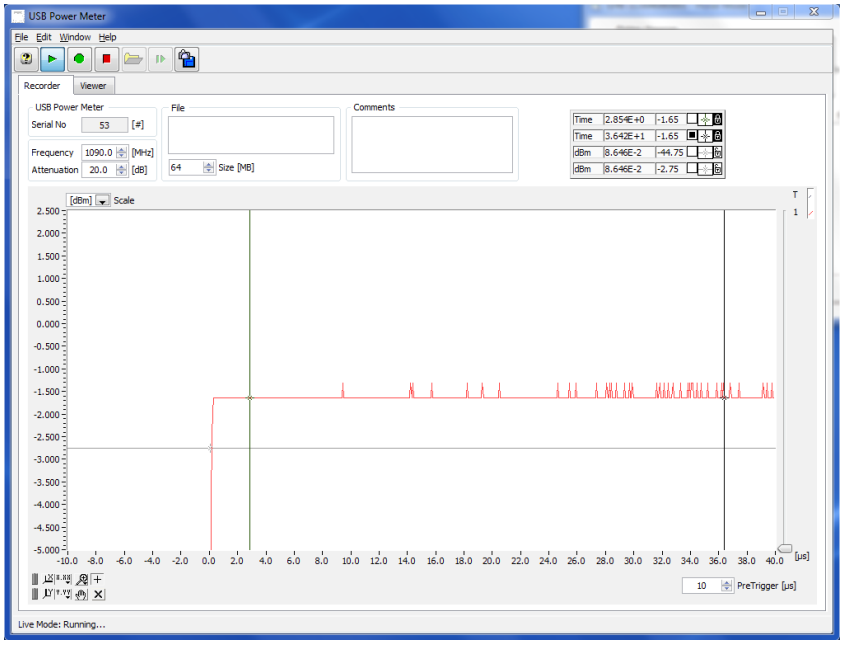

Figure 10: Power measurement – cable inserted

The measurement resolution of the UPM772 at 1090MHz is 0.25dB. When reading the power level it is best to use the cursor readout and take the average reading. The measured power is -1.525dBm.

Therefore the cable loss is 0.385 + 1.525 = 1.91 dB