SKIPPER Electronics AS

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Using the ETT on SKIPPER products

This bulletin is designed to be used with the ETT 985 transducer tester as an aid to diagnostic of SKIPPER transducers and echo-sounders.

Diagnostics of acoustic/signal problems require that the user can locate which unit has the problem(s). If the problem is in transducer, then the repair is often costly and time consuming. If in the electronics, then the problem usually involves changing a card. The third, and maybe worst case, is if the problem is caused by noise. In this case the point that the noise enters the cabinet needs to be located and removed or filtered.

To find out if the problem is in the transducer or echo-sounder, we need to split the two elements and test separately, transducer and echo-sounder.

1 Transducer

Using the ETT we can analyse the impedance of the transducer in situ or on the bench (in a bucket of water). Although the results are slightly different in these cases, they are similar enough that some limits can be set.

Some general rules:

- A transducer design may have wires connected to the ceramic (ETN050, ETN200S, ETN200, ETN50200). In this care it is a large capacitor and will have a high impedance.
- A transducer may also have a matching transformer, usually made to give an approx.. 50 ohm resistive load (ETN024, ETN038). In this case, the transducer is inductive or pure resistive and DC resistance will be very low.
- A transducer will have a cable connected, the length of this will vary the impedence, usually the capacitance, however coiling up the cable will introduce inducatance, which works opposite to capacitance. The result being that the impedance will change from measurement to measurement. This means the limits have to be quite wide.
- If the transducer is mounted, measure the transducer at the closest connection to the transducer it-self. If measuring directly from the bridge, be aware that the cabling inbetween will affect the results.

To make the results as similar as possible, the cable should be wound in a figure of 8, or stretched out.

To test a SKIPPER transducer, select the transducer in the preset menu. These presets will change from time to time, as we get more statistics of how the units behave, so keep the units tables updated using the SKIPPER service software. Then run the test on the tester.

Preset test results: The results of this test will be a resonant frequency close to the expected frequency, usually within 5 % of the expected resonant frequency (ETN050 = 50 kHz, ETN200 = 200kHz etc). An impedance made up of magnitude in ohms and phase in degrees, at resonance will be presented. Also the impedance at the exact expected frequency.

How to interpret these results.

Z.050 or Z.200 etc - The echo-sounder will transmit at the expected frequency of the transducer, say 50 kHz (checked later with simulator). At this frequency it is tuned to work best at a particular range on impedances. So the transducer should be within these limits at that frequency.

Zres – The transducer will have a resonant frequency, usually not quite at the expected frequency, the impedance should be within limits (see table at the end of this paper). The phase is less accurate from the ETT but should be at a minimum at resonant (accuracy is worse at lower Z magnitudes).

If a transducer has, or is in the process of failing, the impedance at the expected frequency will usually rise, or be zero (short circuit). In this case, the resonance will have moved and possible disappeared completely (usually shows the highest scanned value).

What to do if you suspect a fault.

If you have software activation, scan the transducer and look at the form of the curve and compare it to the reference curve. If the curve shows the correct shape, but is offset in values slightly, then check wiring and grounding, but continue to check echo sounder.

Ensure you test at the closest connection to the transducer, and that the transducer is in water. Sea valve versions may have risen slightly in the valve, ice tank versions may need bleeding, as air bubbles may have worked into the tank)

If you see no resonance at all, the tester will display the maximum measured frequency, and the preset test will fail. Check you have the correct transducer defined and try again. Also, if all is correct, check you have connected it correctly to the echo-sounder on the correct channel(frequency).

SKIPPER is always happy to comment on your results, but please provide the following information.

- Transducer Part Number or Frequency
- Measured parameters
- Serial no. of Echosounder
- Picture of Screen 9,10 (GDS101) or screen 11, 12 (GDS102) under test or at sea.

How should it look

See ‘Reference measurements of standard transducers’ at end of this document for how the plots should look. These are also available in the skipper downloads folder if the SKIPPER service software is used.

2 Echo-sounder

The echo-sounder tester is made to allow you to check the output signal and the input response of the echo-sounder. Values will vary slightly from system to system, but limits can be set. Producers set these values and using this data sheet and the tester, you can check these limits. If the ETT software

is activated, you can measure directly into the software and it will perform a test based on the manufacturer limits.

What to look for.

If you suspect an error in the transceiver, then you need to check there is a good signal coming from the transmitter, and that any received signals are being processed correctly.

Transmitter.

The main parameters here are:

- **Vpp** - Transmission pulse peak to peak Voltage; This parameter is the voltage within the pulse, difficult to measure except on a tester or scope. It will change depending on the load (transducer) attached. The tester uses a 300 ohm load when it measures. The value of this is often in the range 500 (for low impedance transducers) to 2200V for higher impedance transducers.
  Remember, set the echo-sounder settings as per the table below ('How should it look?') to get the expected values.
- **Pulse length** – The length of the transmitted pulse; An Echo-sounder may change its pulse characteristics depending on the detected depth, so make sure the simulator is replying before checking this parameter. If a transmitter is failing, the pulse may fade before it is meant to, and the pulse length becomes shorter. This can be checked from the table below or from the software.

Receiver.

The simulator is made to send a known signal and the response of the receiver can be seen on the scope screen or on the echogram.

- **TVG test**. A long pulse is presented and the output is checked on the screen. This displays the Time Variable Gain (TVG) function of the system.
- **Noise test**, a very small signal is injected to the system at a depth that is outside the influence of the TVG (or with TVG turned off) and this is then compared with a known parameter on the screen, for example the depth should be detected.

To use this, set up the settings as in the table, and compare the screen to the picture in the table. Settings are also shown in the table. This table can be updated and can be viewed in the SKIPPER support software.

What can go wrong?

A transmitter error will usually result in the wrong frequency, or a too low Vpp. If this happens, check the settings on the transceiver and software.
A receiver may have lots of noise or not enough gain. Noise test will show too much noise. In this case, try removing IO wires and locate where the noise is coming from. Remember to remove the power cable and com cable of the ETT as this creates noise in some cases too. If no connections are made and you still have noise, check the power supplies.

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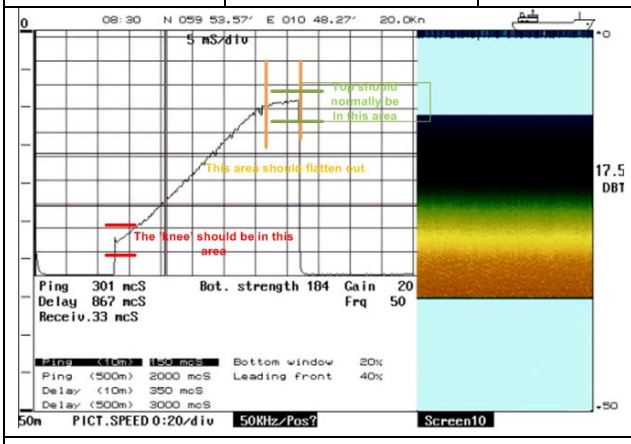
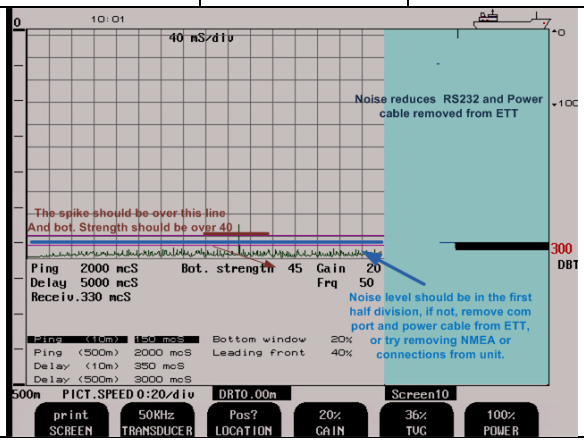
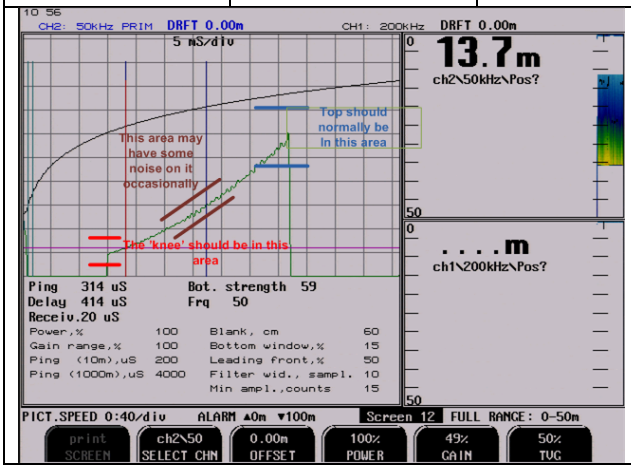
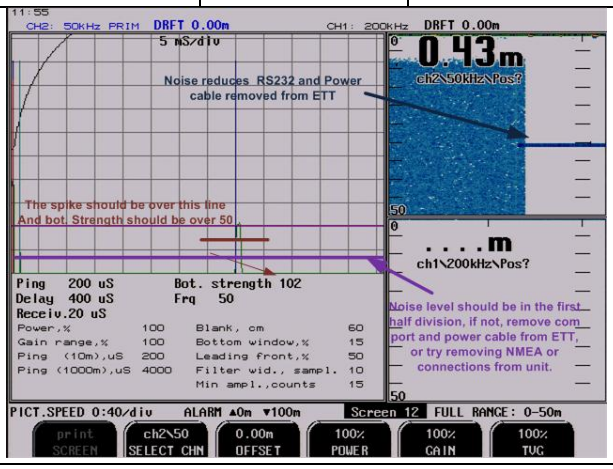
How should it look?

GDS101 TVG Curve			GDS101 Noise		
GDS101 Settings FREQ: 50kHz TVG: 36 GAIN:20 POWER:100 RANGE: 50 SCREEN 10	*Tester Settings* ECHO FREQ: 50kHz Echo Vpp: 0.5mV Bottom Width:32000 Bottom Depth:11	*Expected results* Pulse… Freq:- 46-54 Vpp: 1600-2200 Width: 300-400 Period: 315-335 And as graph	*GDS101 Settings* FREQ: 50kHz TVG: 36 GAIN:20 POWER:100 RANGE: 500m SCREEN 10	*Tester Settings* ECHO FREQ: 50kHz Echo Vpp: 0,13 Bottom Width:323 Bottom Depth:300	*Expected results* Pulse… Freq: 46-54 Vpp: 900-2200 Width: 2000-2100 Period: 600-700 And as picture
					

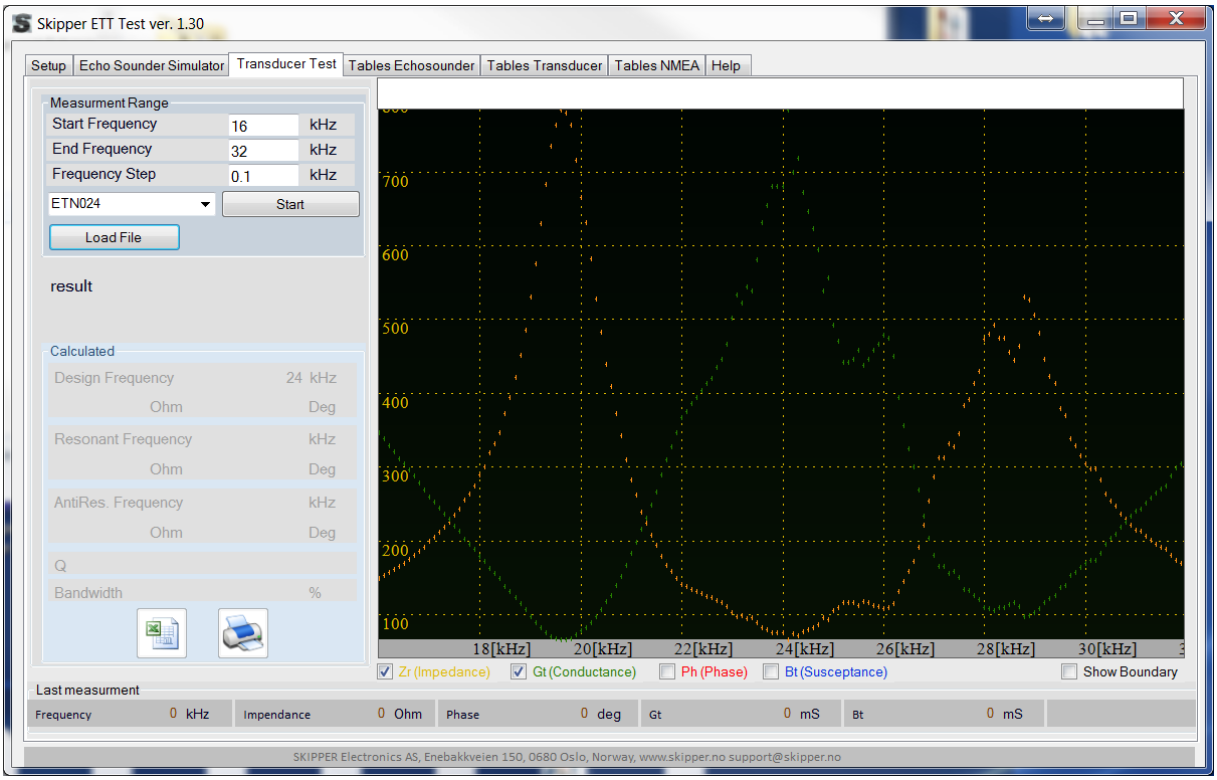
GDS102 TVG Curve			GDS102 Noise		
GDS102 Settings Channel 2: FREQ: 50kHz TVG: 49 GAIN:50 POWER:100 RANGE: 50 SCREEN 12	*Tester Settings* ECHO FREQ: 50kHz Echo Vpp: 0.6 Bottom Width:32000 Bottom Depth:11	*Expected results* Pulse… Freq:- 46-54 Vpp: 950-1200- Width: 300-400 Period: 300-430 And as picture	*GDS102 Settings* FREQ: 50kHz TVG: 100 GAIN:100 POWER:100 RANGE: 50m SCREEN 12	Tester Settings ECHO FREQ: 50kHz Echo Vpp: 0.01 Bottom Width:1000 Bottom Depth:30	*Expected results* Pulse… Freq:- Vpp: - Width: - Period: - And as picture
					

Reference measurements of standard transducers

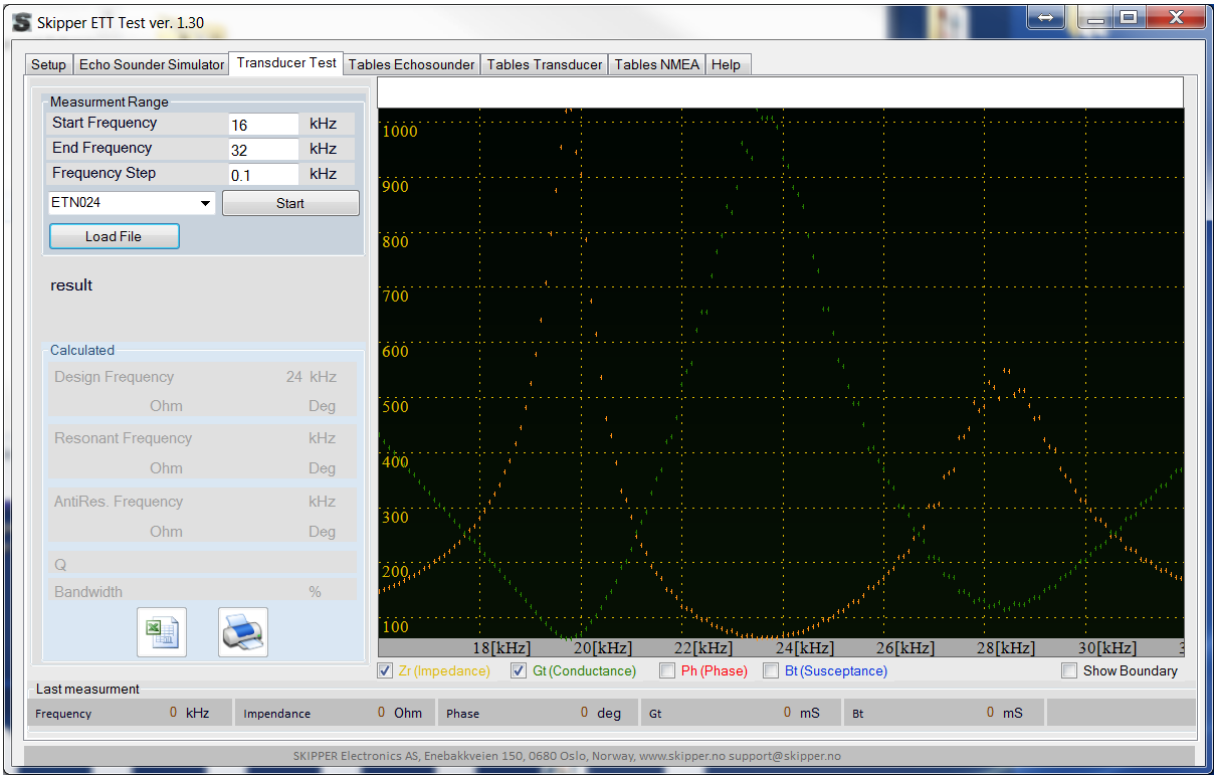
- ETN024 24 kHz large format transducer
- ETN038 38 kHz large format transducer
- ETN050 50 kHz small format transducer
- ETN200 200 kHz medium format transducer
- ETN200X 200 kHz medium format transducer 40 m cable (coiled)
- ETN200S 200 kHz small format transducer
- ETN200SX 200 kHz medium format transducer 40 m cable (coiled)

Measurements are made in a 1 m high bucket of water, and 3 m depth water tank (sea)

NOTE: When measuring in a bucket you will see a noisier signal, placing some tissue paper around the transducer will damp the noise, but will also slightly reduce the size of the peaks.



ETN024 Bucket



ETN024 Sea

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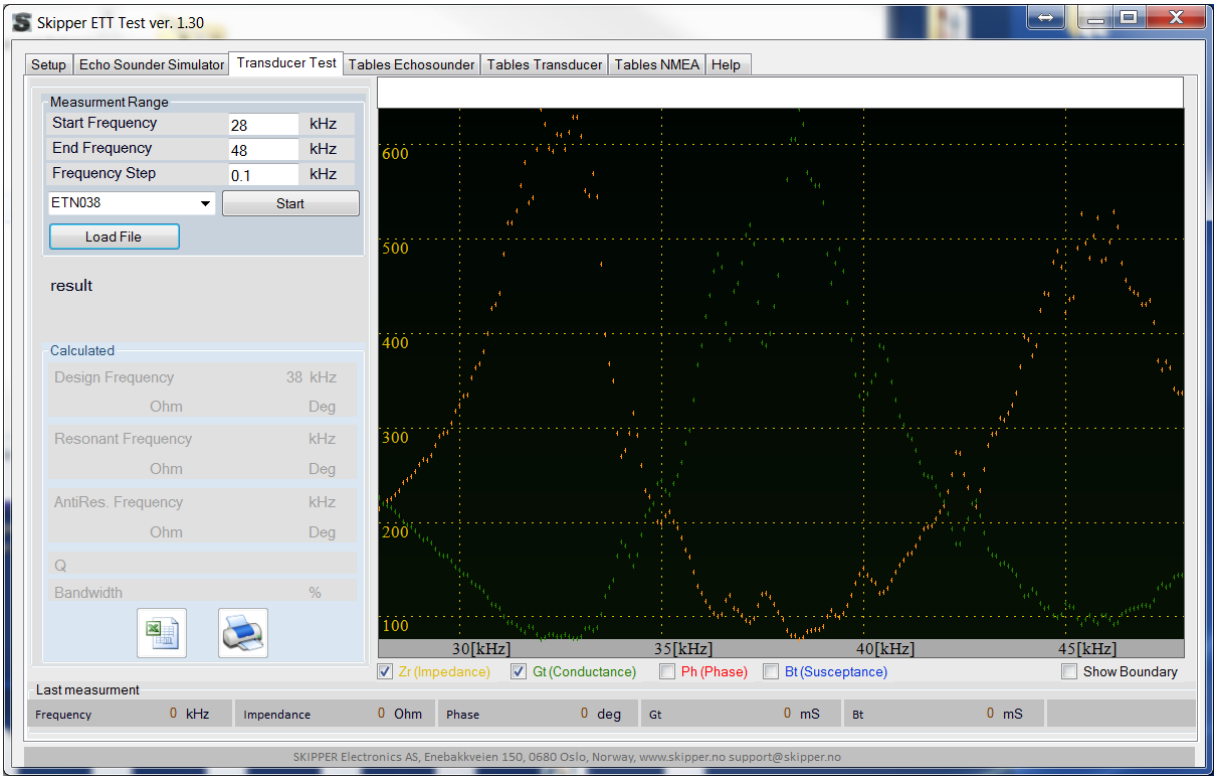
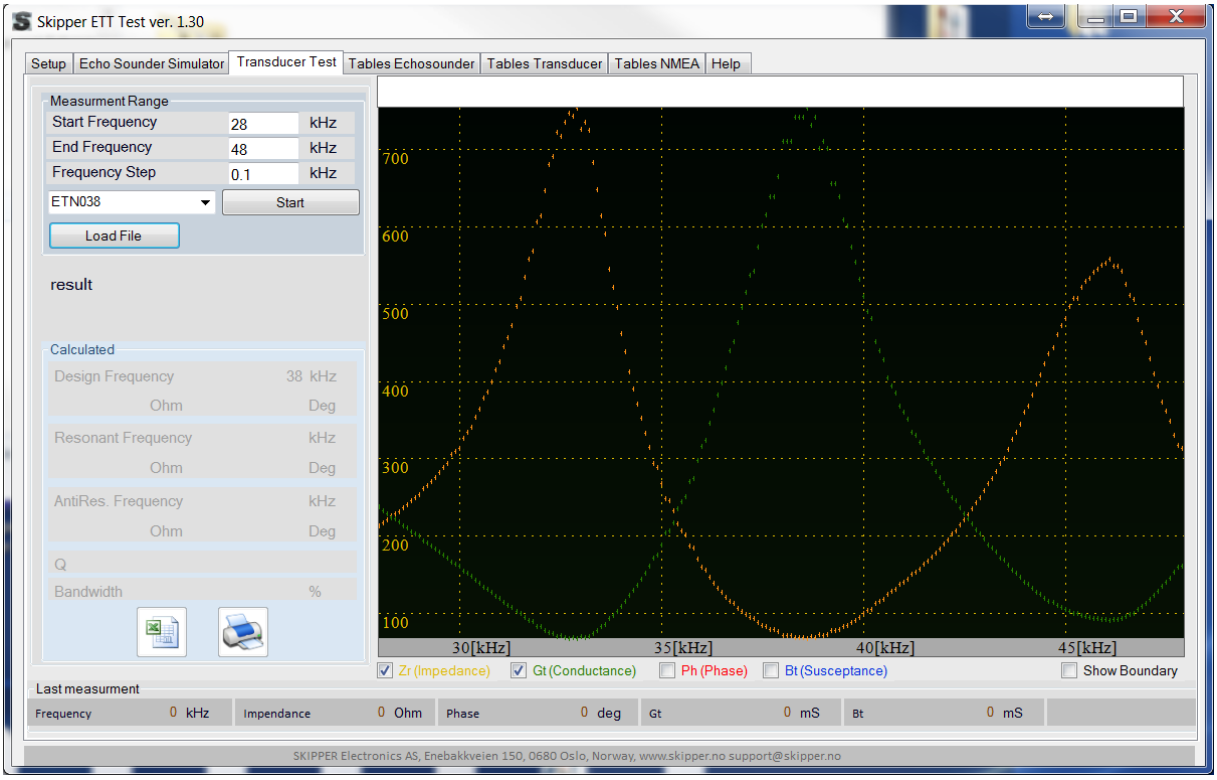


ETN038 Bucket



ETN038 Sea

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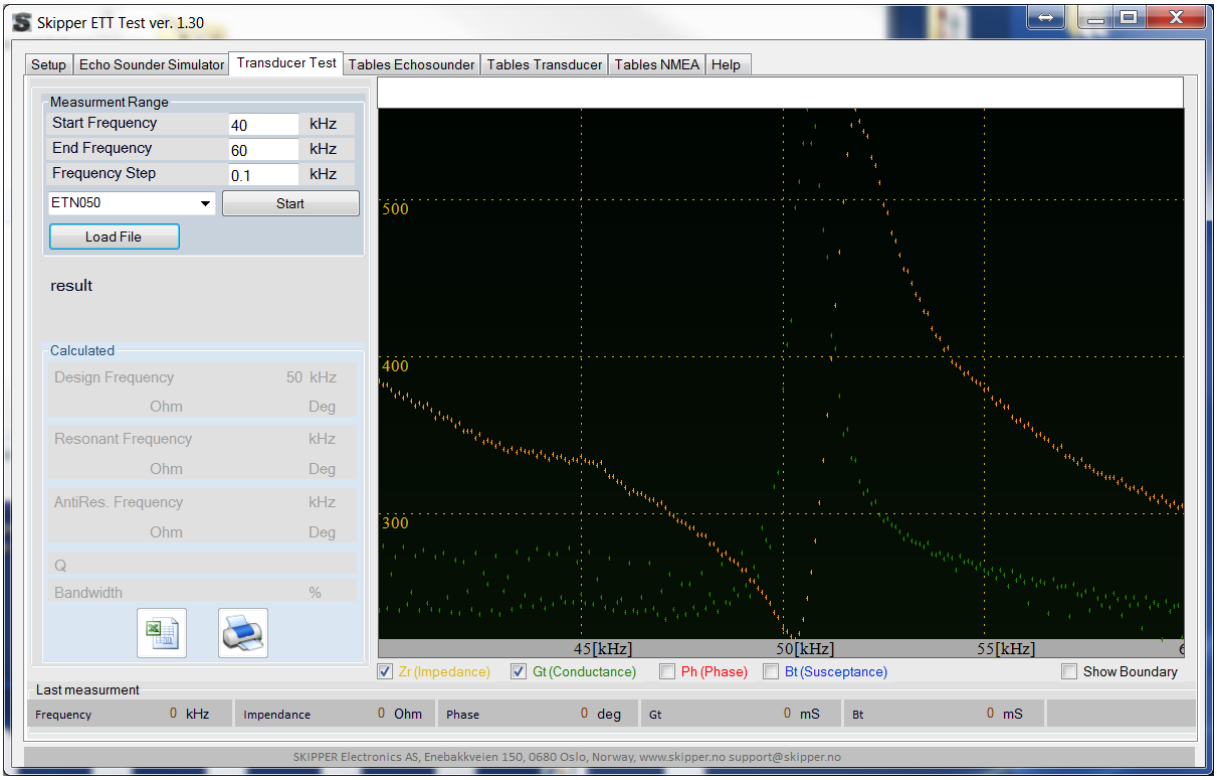
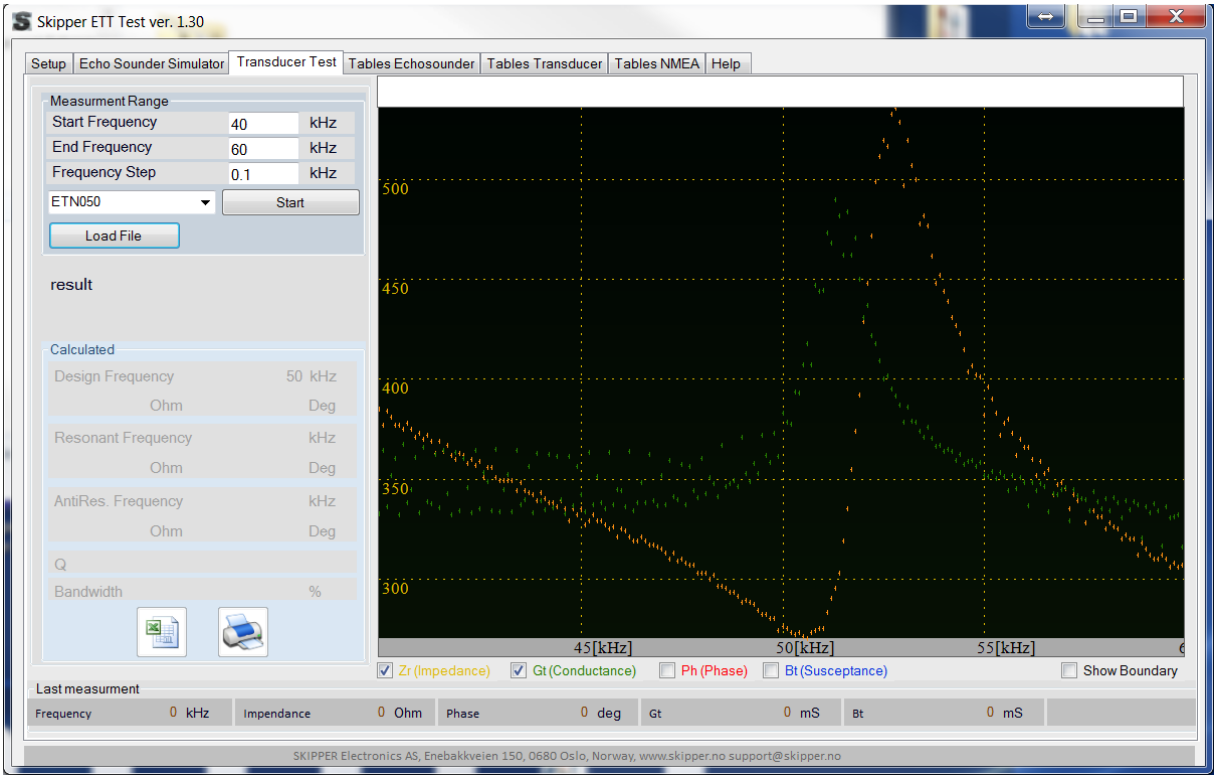


ETN050 Bucket



ETN050 Sea

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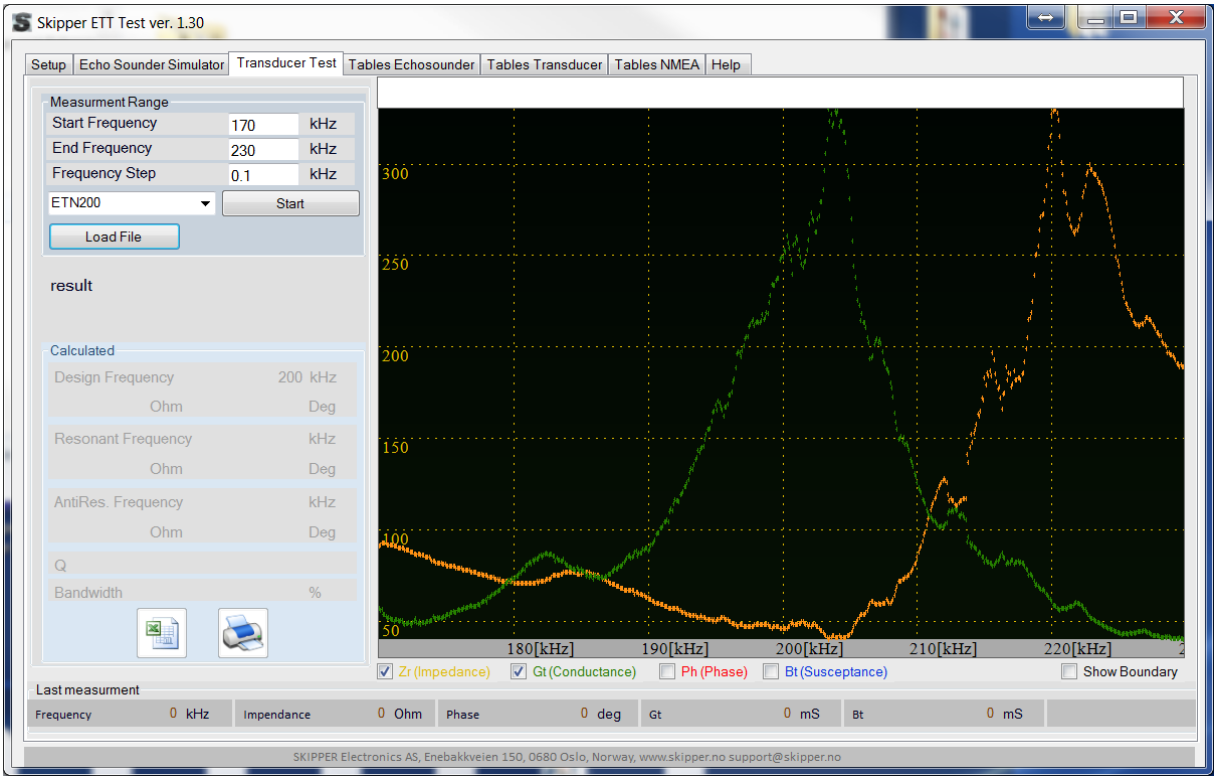
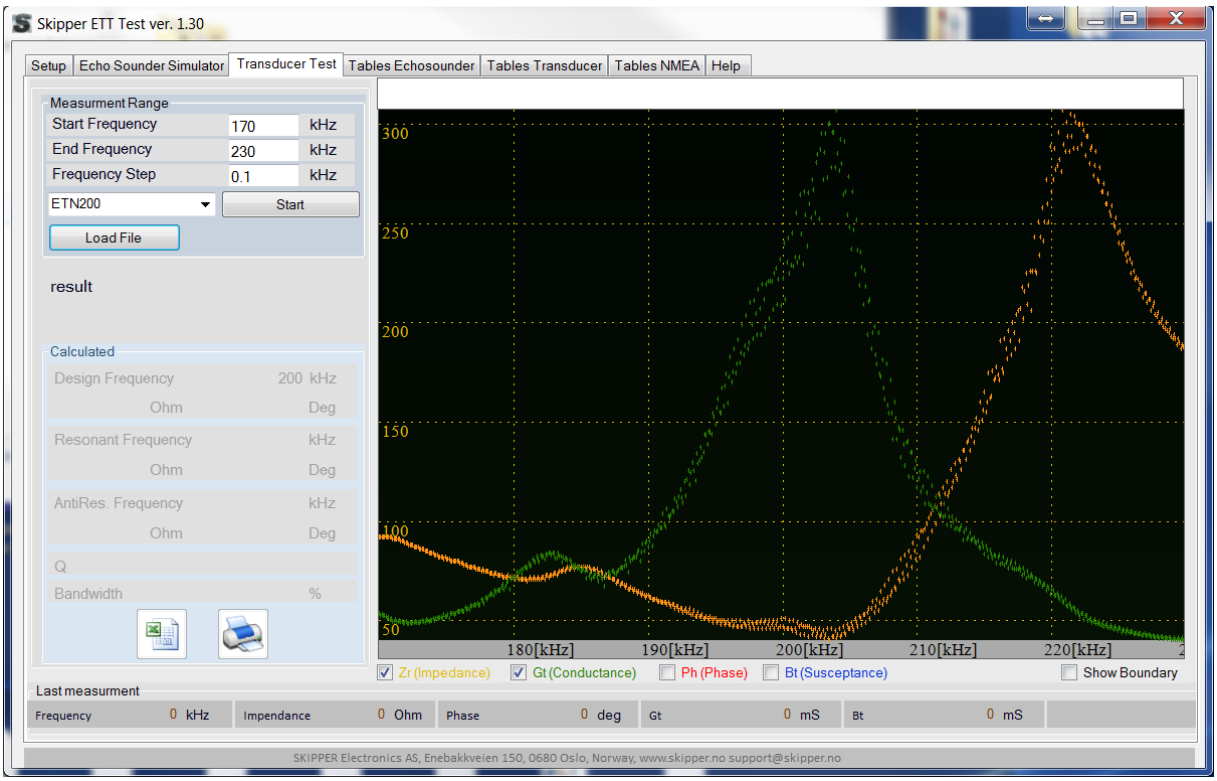
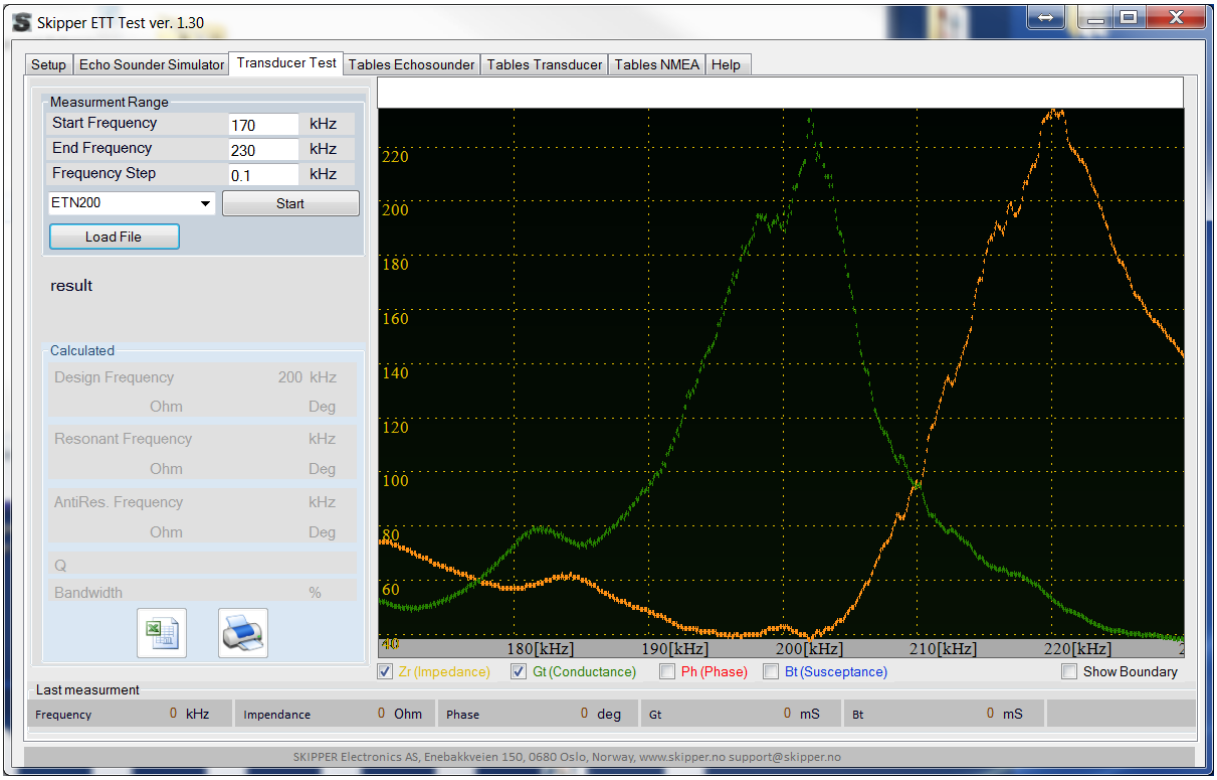


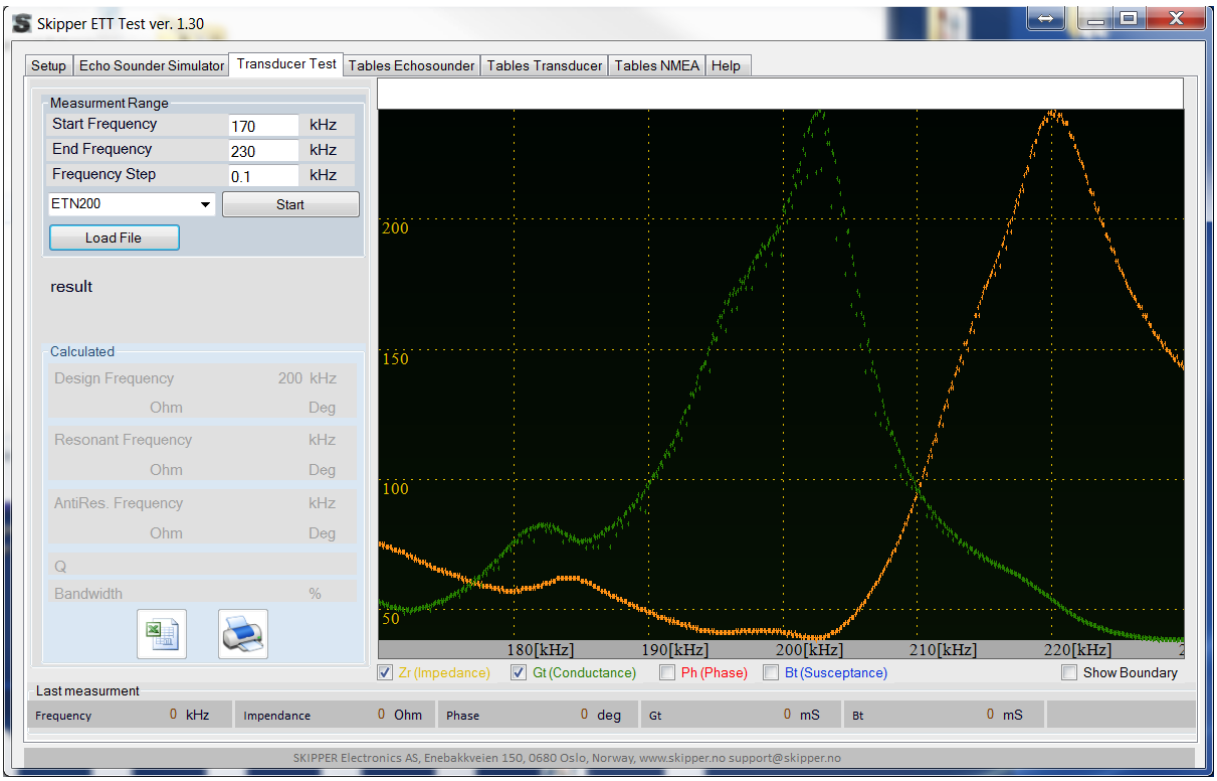
ETN200 bucket



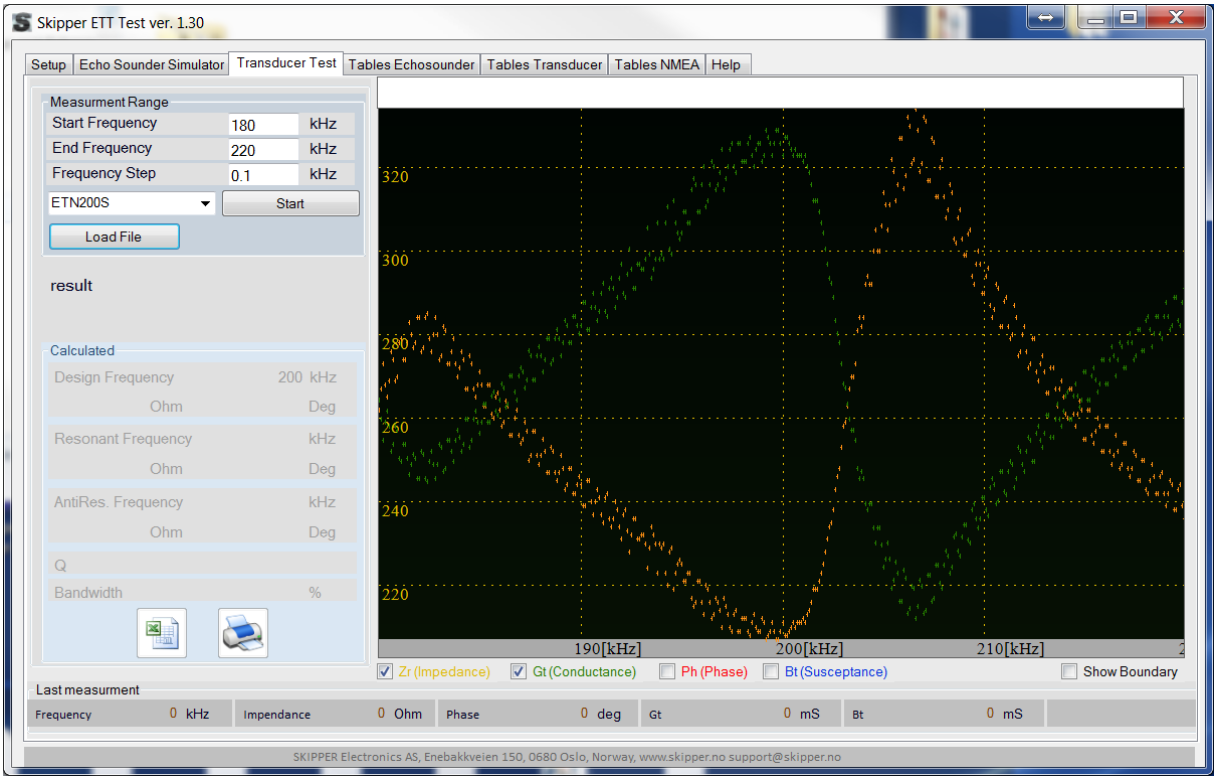
ETN200 Sea



ETN200X bucket



ETN200X Sea



ETN200S Bucket