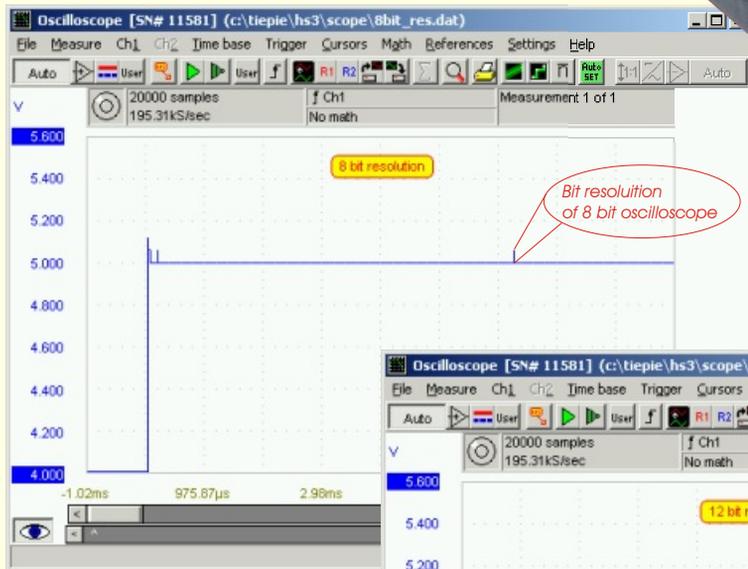


Benefits of 12 and 16 bit high resolution oscilloscope

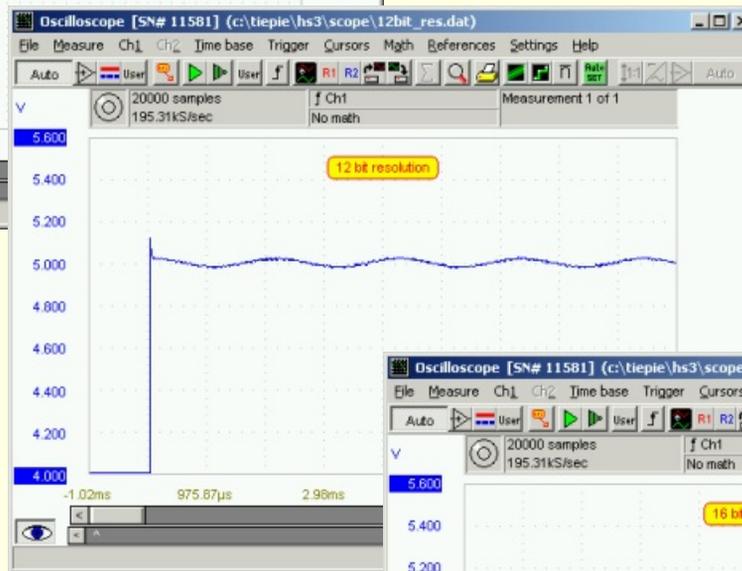
Application Note

The Handyscope 3 (50 MS/s) is a measuring instrument with a maximum hardware resolution of 16 bit. By using this high resolution, signals can be analysed very well. With an 8 bit



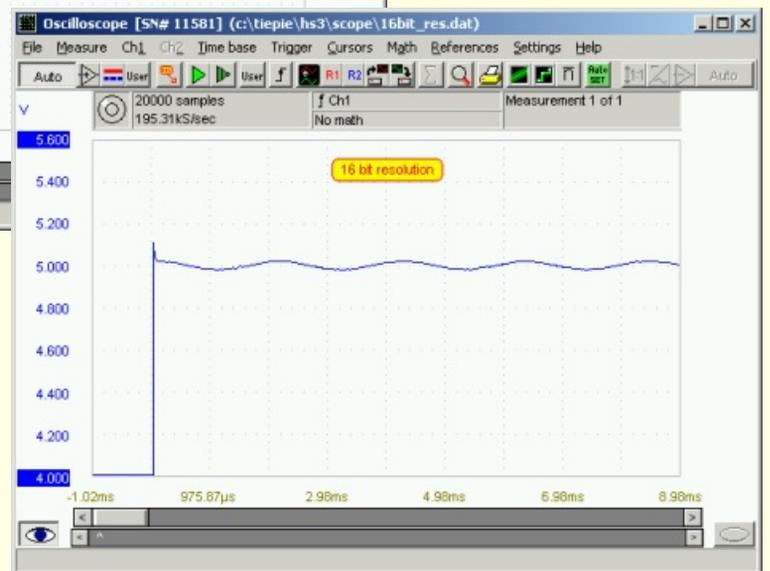
resolution, the sinus is well visible and the quantization noise has almost disappeared. When signals need to be well analysed, it is recommendable to use a resolution of at least 12 bit and possibly 16 bit for detailed signal analysis.

The HS3 offers the user the possibility to analyse the signal with a 12, 14 or 16 bit resolution. A measurement with 16 bit resolution is giving 256 times more enlargement options than an 8 bit oscilloscope.



oscilloscope, many details, which may be present in the signal, can not be made visible well. When the signal is measured with 12 to 16 bit resolution, the details are much more visible. A 16 bit resolution displays details with a factor of 256 better, than when using an oscilloscope with 8 bit resolution.

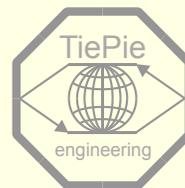
The test signal in this application note is a square-wave with a sinewave signal. When measuring with 8 bit resolution, the sinewave is not visible. The measured signal with 8 bit resolution is strongly enlarged and through this the resolution steps on bit level are well visible. At all three measurements the enlargement is of the same size, to give a clearly view between the different resolutions.



When the measurement is performed with 12 bit resolution, the sinus is well visible, though the quantization noise of the oscilloscope is still visible. When the measurement is carried out with 16 bit

The resolution advantages of 12 and 16 bit do come up the same way in the transient recorder. Furthermore the software has an option to averaging. Because of this there can be obtained an extra resolution increasement.

Application Note



The 12-16 bit spectrum analyser from TiePie engineering offers a dynamic range of 90 dB. With a record length of 32760 frequency components the Handyscope model HS3 offers unmatched performance.

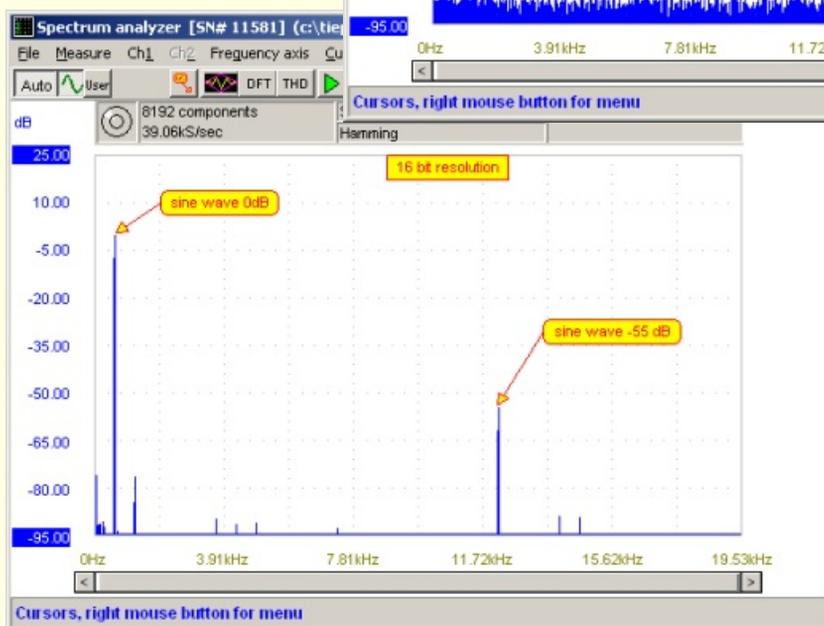
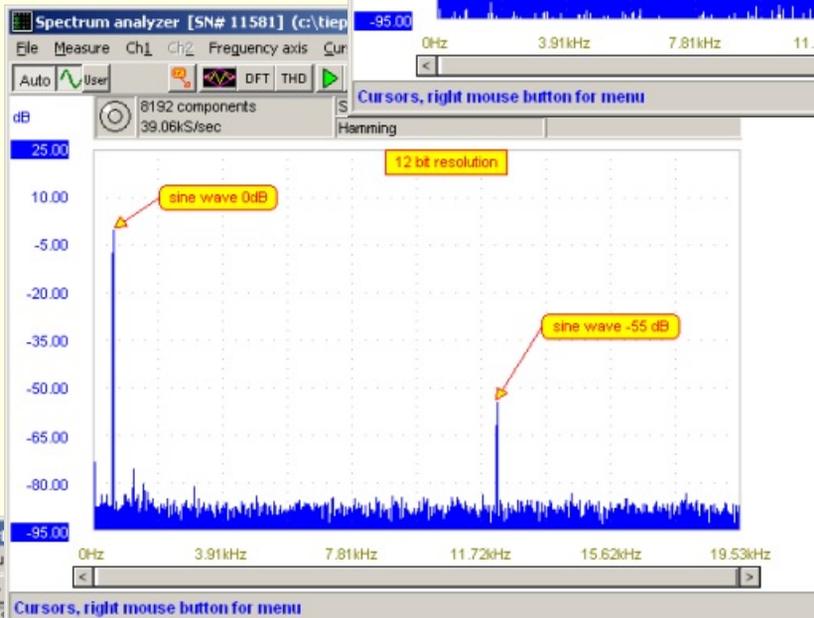
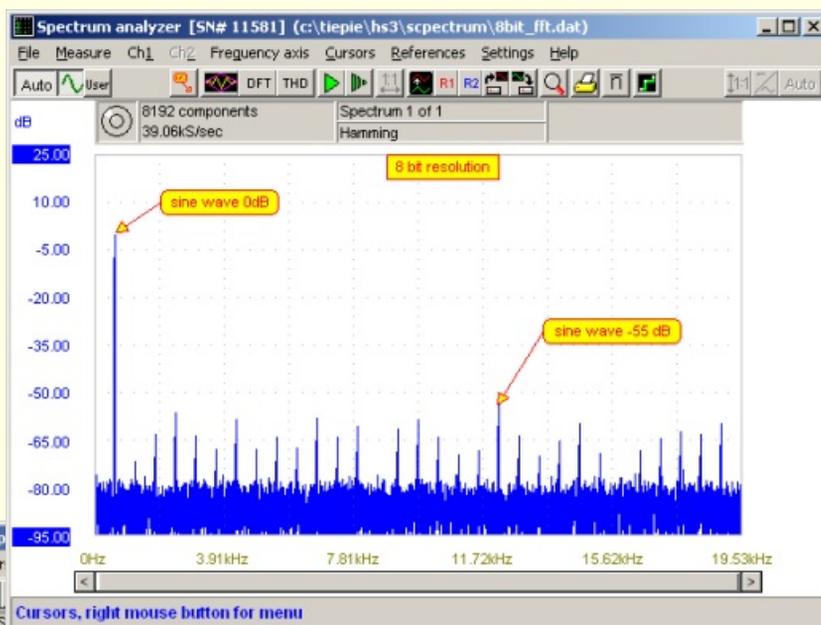
The Handyscope HS3 is designed to provide superior measurement precision and accuracy. Careful circuit layout, custom ICs and special packaging desing techniques are used to reduce overall system noise.

The low noise and low harmonic distortion are best demonstrated by the following Fourier Transform performed on an acquired signal. The three figures below show typical measurements of a 8 bit, 12 bit and 16 bit resolution.

At the spectrum analyser the difference between a measurement of 8 bit resolution and 16 bit resolution is very well visible. For the measurement a test signal of a sinewave with a 0dB amplitude and a -55dB sinewave was used. When the test signal is measured with 8 bit resolution, the -55dB sinus is lost in the noise.

When measuring with 8 bit resolution,

there are made several frequency components of which the amplitude is below -50dB. These components are created by the bit noise of the



spectrum analyser. The -55dB sinus can not be distinguished from the bit noise.

At the measurement of 12 bit resolution the -55dB sinus is well visible. The noise level of the 12 bit measurement is 24dB lower than at the 8 bit measurement.

When there is measured with 16 bit resolution, the noise level is 48dB lower than the 8 bit measurement. A measuring with 16 bit resolution is recommendable when there is required a good distortion analysis of the measured signals.

The used test signal is generated by the AWG of the HS3. The 16 bit measurement clearly shows the distortion of the AWG. The second harmonic of the 0dB sinus is -75dB. Also, the fifth, sixth and seventh harmonic are visible (-90dB). The AWG has a maximum resolution of 14 bit.

HIGH RES PORTABLE INSTRUMENTS



TiePie engineering (NL)
Koperslagersstraat 37
8601 WL SNEEK
The Netherlands
Tel: +31 515 415 416
Fax: +31 515 418 819

TiePie engineering (UK)
28, Stephenson Road, St. Ives
Cambridgeshire, PE17 3WJ, UK
Tel: +44 1480-460028
Fax: +44 1480-460340