dBFA32

Sound and vibration acquisition and analysis software package

overview

(dBFA32) is a practical and efficient software packages, which transforms your computer into a versatile sound and vibration frequency analyser and much more...

Completely modular in concept, (dBFA32) can be configured according to specific user needs by choosing only the options required...

(dBFA32) has been developed under the **Windows®** environment, which guarantees user-friendliness, high performance and total compatibility with office software, such as word processors and spreadsheets (to generate reports including graphs and tables), as well as other tools (e.g., **MATLAB®**) for further data analysis.

The applications of (dBFA32) are:

- **Mesurements and Controls**
  - **Overall levels**
  - **Frequency analysis of the signal**
  - **Frequency analysis of systems**
  - **Structure analysis**
  - **Sound power**
  - **Commissioning test**
  - **...**
- **Sound and vibration comfort**
  - **Physiological effects of vibrations**
  - **Psychoacoustics - Sound Quality**
  - **Material tests**

...

- **Error diagnosis**
  - **Sound intensity**
  - **Sound mapping**
  - **Machine order analysis**
  - **Study of transient phenomena**
  - **Time-frequency analysis**
  - **...**

There are a lot of application fields: **Automotive, Aeronautic, Space, Railway, Mechanical, Materials, Household appliances, Electro-acoustics, Telecommunications, ...**
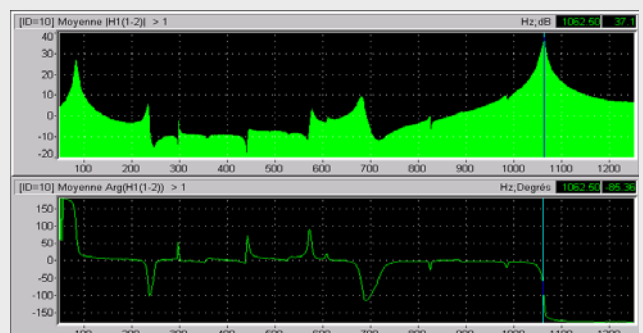
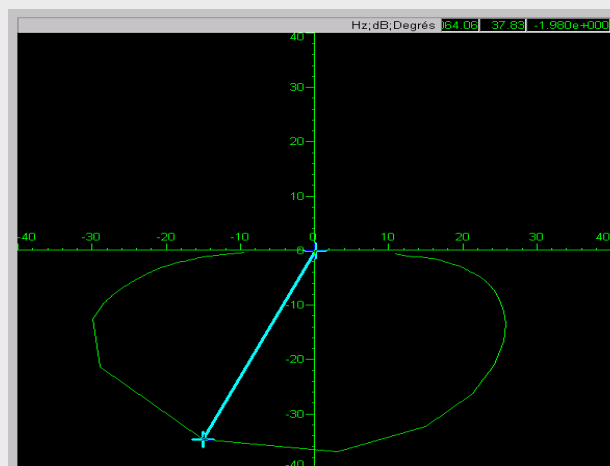## *dBFA32*
Main functions

MEASURING WITH dBFA32:

- From 1 to 16 channels depending on the hardware platform (JAZZ, SYMPHONIE, HARMONIE, MELODIE).
- Versatile: acoustics, vibrations, etc.
- Direct-to-disk digital signal recording with a frequency range varying from 40* Hz up to 80* kHz with audio playback
- Signal and FFT spectrum monitoring of one of the channels during recording
- Manual or automatic measurement gain setting
- Advanced trigger functions (channel, positive or negative delay, and/or conditions, etc.)
- Overload indicators with storage
- Real-time narrow bands FFT analysis (from 101 to 3201* lines) of autospectra, cross-spectra, transfer functions, coherence, etc., from 0 Hz to 80 kHz, with or without zoom factor (2 to 128); linear and exponential averaging, max. hold
- Broad-band analysis by digital filtering (1/1 and 1/3 octave according to Class 1 - IEC 61260). Autospectra from 1 Hz to 20 kHz
- Narrow-band (2 FFT passes - autospectra, cross-spectra, coherence) and broad-band (1/1 and 1/3 octave - autospectra) analysis of sound pressure and sound intensity (active and reactive)
- Sound power determination according to ISO 9614 parts 1 and 2
- Tachometric acquisition and calculation
- Order analysis for rotating machinery; rotation run-ups and coast-downs
- Transient analysis on impulses, shocks, etc.
- Impulse response using the MLS method (SYMPHONIE)
- Signal generator* (sine, white and pink noise, loop, MLS as an option)

* depending on the acquisition front end used

DATA PROCESSING WITH dBFA32

- Numerous formats for data importation (UFF58, .Wav, Teac, Sony, etc.)
- Download of data from 01dB-Stell sound level meters and stand-alone frequency analysers
- Numerous processing functions with analysis script
- Narrow-band and broad-band spectra and multispectra (down to 1/48th octave), narrow-band cross-spectra and frequency response functions
- Low-pass, high-pass, band-pass, band-cut and notch filtering
- Under-sampling, re-sampling, sound and ISO 2631 and ISO 5349 vibration weightings and windowing on audio data
- Frequency re-composition in broad bands and in Loudness/Bark bands, time re-composition, integration/derivation
- Cross-spectra, transfer functions (H1, H2, 1/H1 and 1/H2) and coherence. Bode, Nyquist, Nichols displays.
- Single and double cursors, harmonic and sideband cursors, peak searching cursors
- Arithmetics on signals and spectra: addition, subtraction and averaging
- Stationary psychoacoustics criteria (Loudness, Loudness 10%, Fluctuation Strength, Harshness, Tonality, Roughness, Unbiased Annoyance, Sensory Pleasantness, Articulation Index), Bark band spectra, specific loudness, time history of psychoacoustic criteria (loudness, harshness)
- Histograms, Echograms
- Order extraction, cycle defaults, order filter
- Time-Frequency Analysis (Wigner-Ville, Wavelets, Capon, AR), Denoising, Convolution
- ...

CUSTOMISING dBFA32

Regardless of the selected options, dBFA32 features a large number of management functions, offering user-friendliness and ease-of-use:

- Editing of IS physical units and references for all types of measured quantities and hardware sensitivity
- Transducer, calibrator and hardware databases with storage of measurement set-ups for later use
- Storage of numerous measurement and display set-ups
- Storage of user-defined analysis scripts
- Storage and display (including data sorting functions) of measurement results in campaign files
- Follow-up of each processing operation
- Batch data processing (signals, spectra, etc.)
- Data exchange with other applications
- DDE interface, user-defined remote controls, etc.
- Extensive help functions in HTML format for each module
- Cut, Copy, Paste commands for both graphs and data to be used in a word or spreadsheet processor
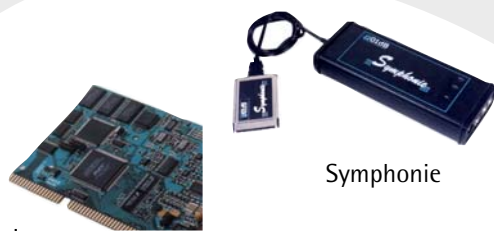
Symphonie

Jazz

Melodie

Harmonie

dBFA32
Software packages

Depending on your application, **dBFA32** can be made up of several complementary modules.

SUPER POST PROCESSING PACK (S3P)

This module allows for direct-to-disk recording on the PC hard disk and for the post processing of most of the standard sound and vibration application needs.

In **dBFA32**, digital recording of the signal can be performed on 16* channels maximum, and over a frequency range from 80* kHz down to several Hertz. Acquisition is made easier using advance triggering functions (thresholds, software or harware remote control, etc.).

- Signal recording with monitoring of one of the selected channels (signal + real-time FFT spectrum) and bar-graph display for all recorded channels

Furthermore, importing/exporting signals allows to:

- Import signal files: standard and 01dB WAVE, MPEG3, SONY PCSCAN II, TEAC GX1, nSoft Dac
- Export signal files: standard and 01dB WAVE, ASCII, MPEG3, UFF58

Processing is based on the use of a calculation server allowing the operator to carry out a series of operations (script) on the same piece or set of data, such as signals, spectra, etc.

- Signal processing (low-pass, high-pass, band-pass, band-cut, notch filters, under-sampling, re-sampling, gain optimisation, windowing)
- Signal analysis (FFT 3200 lines, autospectra with or without zoom, 1/1 and 1/3 octave autospectra, echogram, overall levels, weightings, histogram, etc.)
- System analysis (FFT, cross-spectra, frequency response functions: direct, inverse and cross, coherence)
- Average spectra and multispectra
- Importation of spectra (dBFA 16bits, UFF58)
- Exportation of spectra (ASCII, Matlab, UFF58)
- Operations on spectra (frequency and time recomposition, time history of overall level)
- Arithmetics on spectra, signals and overall levels (addition, subtraction, averaging)
- Single and double cursors, harmonic and sideband cursors, cursor for peak searching. Effects of FFT weighting windows
- Synchronisation of cursors on several signal and spectrum displays
- Energy calculation between cursors and on user-defined frequency range
- Simple and double integration / derivation of spectra
- 2D display of signals, autospectra, complex spectra (Re, Im, Modulus, Phase) and multispectra
- Superposition of spectra (up to 6 on the same display)
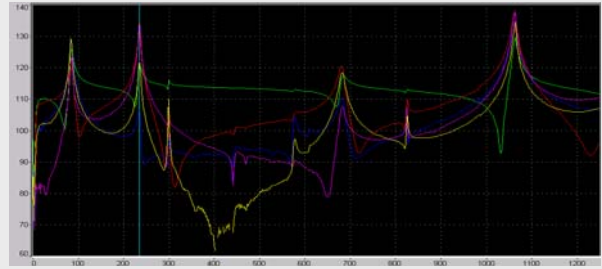
- Batch processing
- 1/N octave frequency analysis (N = 6, 12, 24, 48)
- Sonagram display for multispectra with time and frequency cross-section
- Bode, Nyquist, Nichols displays
- Lissajou calculation - Y(t)=f(X(t))
- Direct tachometric acquisition on SYMPHONIE and HARMONIE
- Conversion of tachometric signals (periodic tops) into speed profiles
- Operators for rotating machinery with variable rotation speed, designed for order extraction, order filtering and calculation of cycle defects
- Average and instantaneous cepstrum
- Dual-channel (shocks,...) transient analysis on threshold and MLS (SYMPHONIE only). Customisation of FFT time weighting windows. Calculations of autospectra, interspectra, frequency response functions and coherence. Manual and automated mode

MULTI-CHANNEL REAL TIME PACK (RTP)

This package includes the "S3P" configuration and can be used to perform real-time acquisition of narrow-band spectra using FFT analysis with various FFT windows (Rectangular, Hanning, Kaiser Bessel, Flat Top, etc.), with or without zoom factor (f1, f2). This module can also be used to perform real-time analysis of 1/1 and 1/3 octave spectra.

When performing multi-channel measurements, cross-spectra, transfer functions and coherence are also available. Data can be displayed either in polar form (modulus and phase) or complex form (real and imaginary parts).

- FFT analysis on 16* channels (1 to 3201* lines) up to 80* kHz
- 1/1 and 1/3 octave analysis on 16* channels from 1 Hz to 20 kHz with multispectrum rate down to 20 ms
- Real-time noise generator* (sine, pink and white noise, loop)

depending on the front-end and PC used

dBFA32
Software packages (cont'd)

PSYCHOACOUSTICS PACK (PACP)

This module can be used independently from the others and offers:
- Signal recording, wave importation/exportation
- Specific loudness
- Psychoacoustics criteria (Loudness, Loudness 10%, Fluctuation strength, Harshness, Tonality, Roughness, Unbiased annoyance, Sensory pleasantness, Articulation index)
- Time history of psychoacoustics criteria (Loudness, Harshness)
- Bark band time history of overall loudness
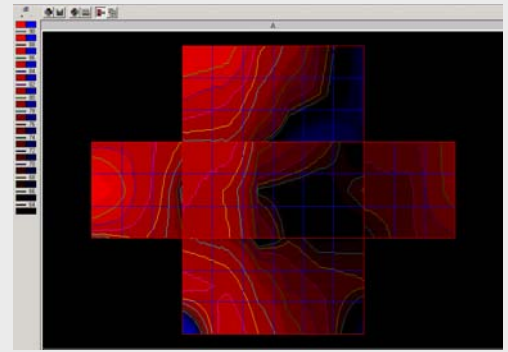
ACOUSTIC INTENSITY PACK (AIP)

This module can be used on a stand-alone basis.

The characteristics of the intensity probe (space between microphones, etc.) are user-defined for intensimetry measurements.

The probe can be calibrated (levels and phase) using the specific software package **dBSONDE32** and **calibrator G51AB** so that the system complies with IEC 1043.
- Signal recording, importation/exportation of .wav files
- Real-time analysis of sound pressure and sound intensity (2 FFT passes, 1/1 and 1/3 octave simultaneously) yielding autospectra, interspectra, coherence, active (Li), reactive (Lj) and free-field (SIL) sound intensities
- Sound power according to ISO 9614 parts 1 and 2
- Sound mapping
- Correction for phase difference and convolution
- Remote control for measuring probe
- Robot control for automated operation (option)

dBFA32
Options

MAXIMUM LENGTH SEQUENCE (MLS)

This option is used for the MLS (Maximum Length Sequence) acquisition of the single or dual-channel impulse response (1 ms rate) of a "system". It is available as a complement to the "S3P" or the "RTP" configuration.

The MLS method is an efficient measurement technique for noisy environments with no powerful sound source and yields results that are more accurate than traditional methods. A convolution operator (calculation of system responses according to the measured impulse response), as well as the module to calculate the road surface absorption coefficient according to ISO 13472-1 are available as options.

ORDER ANALYSIS (OAM)

This option may be used in real time (RTP) or in post-processing (S3P) mode and provides the user with the display of overall levels of rotation speed orders, and of 2D and sonagram spectra for sound and vibration signals. Most steps in the process have been automated: tachometric signal processing, speed profile processing, analysis of successive run-ups and coast-downs. Non-integer orders are allowed. Dating of rotation speeds is accurate.

EXTRA POST PROCESSING PACK (E3P)

Available from the S3P or RTP configuration, this option features 4 new frequency operators (Pseudo Wigner-Ville, Wavelets, Capon and auto-regressive model) that allow to perform the time-frequency calculation of very short signals (shocks, sparks, etc.) with a time base down to sample. They provide results more accurate than standard multispectrum calculations based on FFT or 1/3 octave analyses.

Furthermore, this option includes a denoising operator based on wavelets (increase of the signal-to-noise ratio for noisy signals).

Other Options

1/3 octave real time and acoustic intensity only
- DDE Interface (Dynamic Data Exchange) for external programming

Post-processing
- Linked (bi-directional) with MATLAB data
- Importation of signals from more than 16 channels (SONY, TEAC)

Minimum PC configuration

Post-processing	PC Pentium, 32 Mo RAM, all Windows operating systems
Acquisition	PC Pentium III - 600 MHz, 128 Mb RAM, operating software depending on acquisition front end (see below). For the multi-channel system MELODIE, performances depend on the PC used.

Operating system (OS) according to the acquisition front end (version 4.3)

OS/Platform	Win 95	Win 98	Win NT 4.0	Win 2000
JAZZ	Available	Available	Post-processing only	Post-processing only
SYMPHONIE	Available	Available	Post-processing only	Post-processing only
HARMONIE	Available	Available	Post-processing only	Post-processing only
MELODIE	Available	Available	Available	Available

Operating mode according to the hardware (Version 4.3)

Recording, real-time and post processing modes are all available regardless of the acquisition platform (JAZZ, SYMPHONIE, HARMONIE, MELODIE), except for the real-time mode on JAZZ.

Audio recording performances according to the hardware

JAZZ / SYMPHONIE	1 to 2 channels 20 kHz (sampling 51200 Hz)
HARMONIE	1 to 4 channels 20 kHz (sampling 51200 Hz)
MELODIE	1 to 16 channels 20 kHz (sampling 51200 Hz)*

** carried out on PC (PIII 600 mini – 128 Mb)*

FFT real time performances according to the hardware

SYMPHONIE	1 to 2 channels 20 kHz–800 lines. Independent of the PC.
HARMONIE	1 to 4 channels 20 kHz–3200 lines*
MELODIE	1 to 8 channels 20 kHz; 1 to 16 channels 10 kHz–3200 lines*

* carried out on PC (PIII 600 mini – 128 Mb)

1/3 octave real time performances according to the hardware

SYMPHONIE	1 to 2 channels 20 kHz. Independent of the PC.
HARMONIE	1 to 4 channels 20 kHz*
MELODIE	1 to 10 channels 20 kHz*; 1 to 16 channels 10 kHz* (20 kHz if using a 1 GHz Pentium)

* carried out on PC (PIII 600 mini – 128 Mo)

Please refer to the specific product data sheet of JAZZ, SYMPHONIE, HARMONIE, MELODIE for detailed technical data.

01dB-Stell
MVI technologies group

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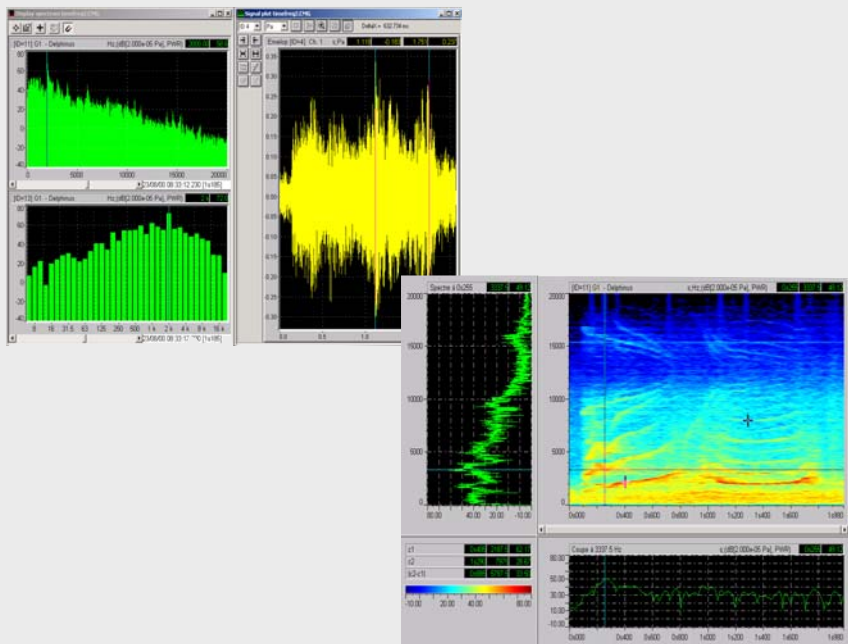
dBFA32

Benefits

- **Multi acquisition front end PC-based system**
- **Audio recording**
- **Real-time frequency analysis**
- **Order and transient analysis**
- **Time-frequency transforms**
- **Multi-tasking processing**
- **User-friendly**