BRÜEL & KJÆR® Data Analysis Software

BK Connect FFT Analysis Applets

BK Connect® applets are for customers looking for a point solution that works like they work, providing just what you need in a user-friendly solution. The applets provide the same reliability and thought-through design of an advanced sound and vibration analysis software platform, in a small, self-contained package.

The BK Connect FFT Analysis applets are specifically for standard stationary and non-stationary FFT analysis including mobility measurements, vibration diagnostics and narrow-band analysis of acoustic signals.

There are two applets that provide full FFT analysis testing solutions to help you complete the job at hand:
- *Type 8490-A – Go from data acquisition and monitoring to measurement, recording, analysis and reporting*
- *Type 8490-F – All-in-one solution for post-processing of time data, data management and reporting*
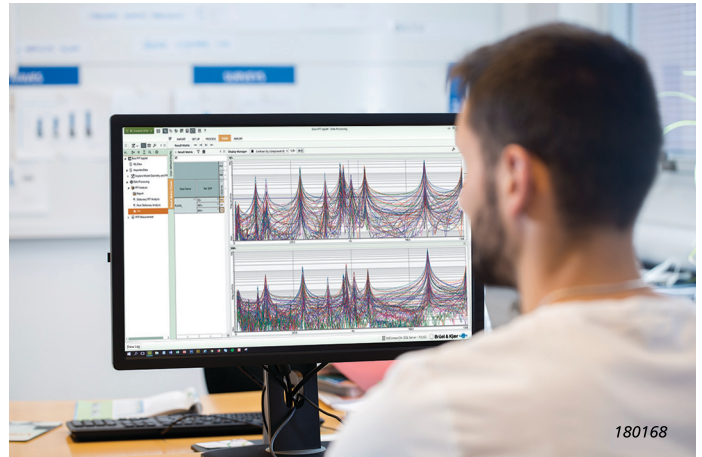
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Uses and Features

Uses

Type 8490-A – Applet for acquisition, recording, batch post-processing, data management and reporting
- General sound and vibration data acquisition, analysis and reporting
- Time data recording
- Batch processing of multiple sets of time recordings
- Stationary and non-stationary FFT analysis
- Analysis with different filter settings and FFT bandwidths

Type 8490-F – Applet for batch post-processing, data management and reporting
- General sound and vibration analysis and reporting
- Batch processing of multiple sets of time recordings
- Stationary and non-stationary FFT analysis
- Analysis with different filter settings and FFT bandwidths

Features
- User interface, task completion and data organization optimized to fit the job at hand – with tools and components that make FFT analysis quick and easy
- Visualization, editing and audio playback of time data after recording and in preparation for analysis
- Simple and efficient reporting of results with user-definable layouts and metadata
- Embedded reporting using Microsoft® Office products to integrate report creation directly in the test process
- Easy to learn and use, reducing training and test time

With Type 8490-A, you can record and perform FFT analysis in one seamless workflow. A complete set of real-time monitors is preconfigured and a targeted process (analysis) chain is predefined – ready for you to start analysis. If needed, you can adjust monitor parameters and analysis properties to suit your test specifications. When ready, record data using the simple recorder located in the monitors.

If you need to perform real-time measurements, there is also a fourth setup providing a measurement interface and FFT system output.

Using the same predetermined processing and analysis tools as Type 8490-A, post-processing applet Type 8490-F allows you to target on the post-processing of time data for on-the-spot troubleshooting and fault diagnostics.

Both applets provide three different predefined analysis setups:
- Stationary setup – multi-analysis that includes FFT, frequency extraction and CPB synthesis
- Non-stationary setup – multi-analysis that includes FFT vs time and frequency extraction
- FRF setup – FRF system analysis

Fig. 1   Example of analysis setup: Stationary FFT analysis
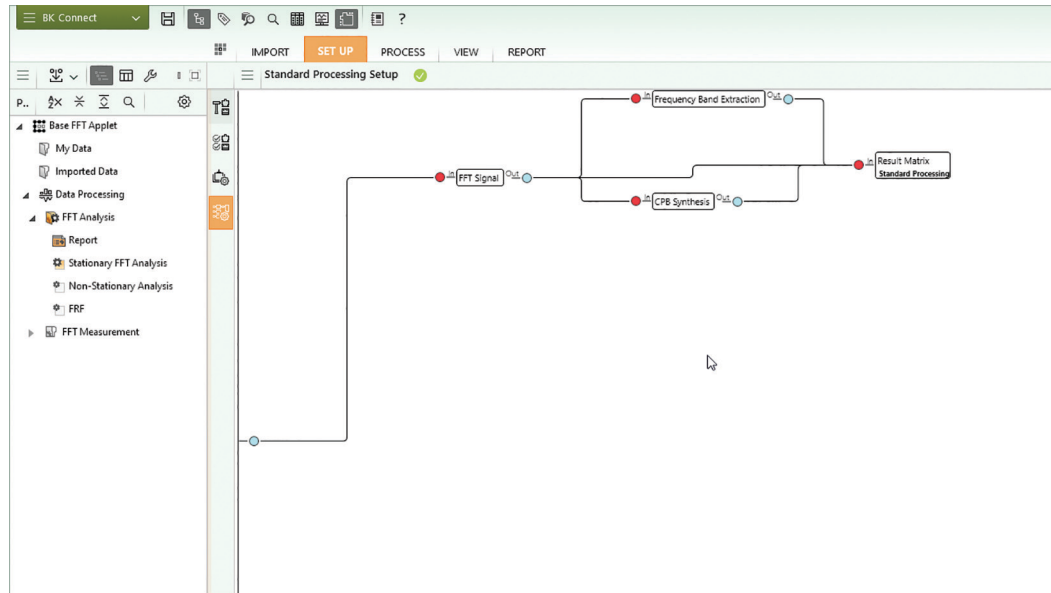
Utilizing BK Connect Application Components

To generate an efficient workflow, the FFT Analysis applets take advantage of many of the task-oriented and user-friendly features that are found in full-version BK Connect applications, including:
- In both Type 8490-A and Type 8490-F:
  - Standard Processing Setup and Standard Processing tasks for adjusting the analysis properties and executing the predefined process chains
  - Result Matrix and Display Manager processing tools to review results and set up preferred result displays
  - Standard Measurement task for basic real-time spectral measurements
  - Time Editor for review and editing of time signal, including post-processing of BK Connect recordings, Brüel & Kjær sound level meter data or HBK Tescia® data
- In Type 8490-A only:
  - Hardware Browser and Monitor components for a graphical overview and validation of your front end channels
  - Transducer Manager and Verification tasks for configuration and calibration of connected transducers
  - Generator Setup for setting up the generator output in LAN-XI modules with a signal generator

To review any data in the current project data including imported data, as well as data stored in the database, you can use the Result Matrix Viewer task.

The applets also include some basic data viewing functionality that a standard BK Connect user would have, such as: access to all the metadata attributes; Microsoft® PowerPoint®-based reporting; exporting to Microsoft® Excel®; and BK Connect Notes for on-screen notations.

Using the Applets

The practical and adaptable interface provides automated batch processing of data, immediate display and storage of analysis results and automated reporting.

With real-time spectral measurements, you can set up triggering, generator output, bandwidth, resolution, number of averages, selection of reference signals, and output function types. Results are automatically sent to the Standard Processing task for post-processing.

Fig. 2   *Processing in the FFT Analysis Type 8490-A Applet. As a post-processing only applet, the Type 8490-F functionality does not include connection to the front end or real-time monitors*
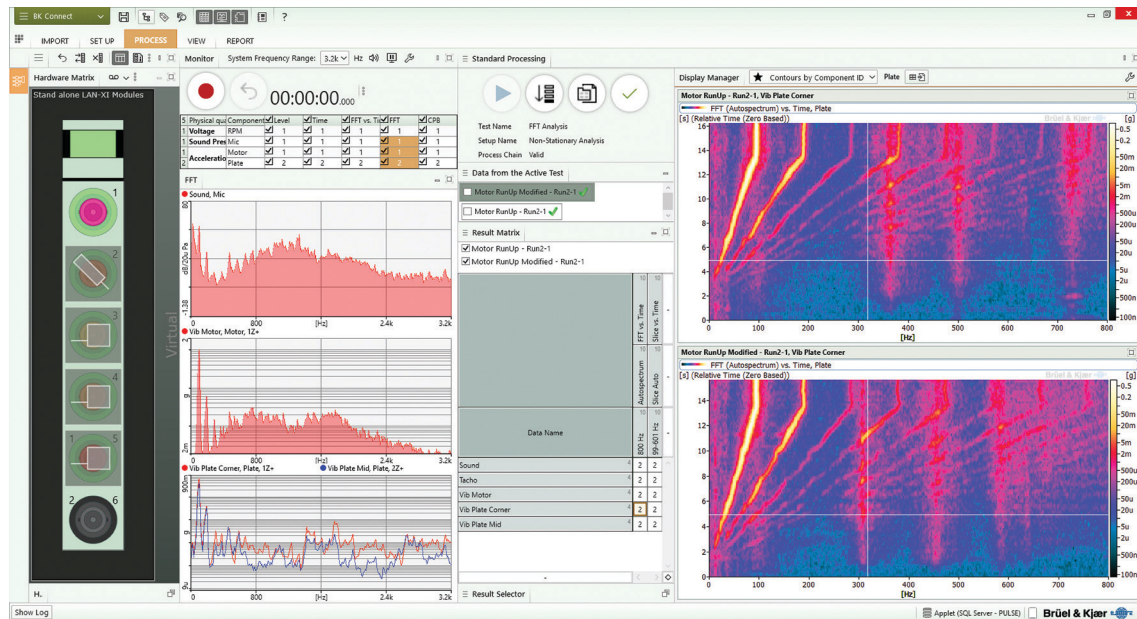
Automated Operations

The applets' many automated operations make it easy for the novice user and are perfect for repetitive testing:

- Auto-detection of hardware – The software will automatically detect connected LAN-XI data acquisition modules and TEDS-enabled transducers
- Data source management– Select a default data source for processing, the software will always draw data from that source
- Auto-analysis start – If selected, the software will automatically start analysis as soon as data is available in the Standard Processing task

- Auto-sizing of active window – If selected, the software will automatically maximize the window of the active task/component
- Result selector – Select a default combination of outputs and display layout, the software will always display and store these results
- Reporting – Set up a report, with a simple click a report will be created using the predefined template and stored with the project
- Done management – Select a default task completion operation, the software will always perform this task when you complete a task

Hardware Support

Type 8490-A can be used with any single module within the LAN-XI data acquisition hardware platform, including LAN-XI Light Types 3676 and 3677. This means that anywhere between 4 to 12 channels are supported. If additional channels are required that will require more than one module, then you need to use a full version BK Connect application.

The software is delivered via download option or USB installation media

System

PC SYSTEM REQUIREMENTS

- Windows® 10 Pro or Enterprise (x64) with either Current Branch (CB), Current Branch for Business (CBB), Semi-annual Channel (Targeted) or Semi-annual Channel servicing model
- Windows® 11 Pro or Enterprise (x64) with either Current Branch (CB), Current Branch for Business (CBB), Semi-annual Channel (Targeted) or Semi-annual Channel servicing model
- Microsoft® Office 2019 (x32 or x64) or Office 2021 (x32 or x64)
- Microsoft® SQL Server® 2019 (SQL Server 2019 Express included with software)

RECOMMENDED MINIMUM PC

- Intel® Core™ i9, 3 GHz processor or better
- 32 GB RAM
- 1 TB Solid State Drive (SSD) with 100 GB free space, or better
- 1 Gbit Ethernet network*
- Microsoft® Windows® 10 Pro or Enterprise (x64) with CB
- Microsoft® Office 2021 (x32)
- Microsoft® SQL Server® 2019
- Screen resolution of 1920 × 1080 pixels (full HD)

FRONT END

Required for real-time measurements and recording
Front-end Support: One LAN-XI-based data acquisition module

Import/Export

SUPPORTED DATA FORMATS	• .bkc (BK Connect native format) – both function and time data
	• .pti – PULSE LabShop and HBK Tescia time data
	• .wav – time data
	• .csv (based on a predefined format):
	  − Recording data (even abscissa time domain)
	  − 2D complex-valued frequency domain data
	  − 2D real-valued frequency domain data (FFT)

PROJECT FILE EXPORT AND IMPORT	Export a project to an external "transport" file (*.BKConnectTemplate or *.BKConnectProject), with or without imported or processed data, for archiving outside the database, sharing with other BK Connect users, capturing a snapshot of a particular state, or creating a project template

Data Management

Data management is based on a data model that interacts with a Microsoft® SQL Server® database. Connection to the last used database is automatic upon starting BK Connect. However, the user can connect to a different database at any time during a session. Only one database can be connected at a time.

Local database with each BK Connect installation; optionally accessible via a BK Connect service, one user at a time, over a company network

DATABASE HANDLING	Databases can be created, deleted, backed up and restored
DATABASE MIGRATION TOOL	Tool that allows users to start application using an SQLite database and at a later point migrate data to an SQL Server solution
DATA STORAGE	Uses a filefarm (on disk) referenced by the database to store data files, report templates, pictures. File sizes limited by disk only
DATA SHARING	Via external BK Common file enables one file to contain all results from a common source, including their metadata
METADATA AND DEVICE UNDER TEST	Defined by the user as a method to document valuable information about the test. Enables customized searching for input data and results on the BK Connect local database

* A dedicated data acquisition network (LAN or WAN) is recommended. A network that only handles data from the front end improves the stability of the data

Data Display

Displays enable viewing and comparison of measurements and results. Data is dragged-and-dropped to/from the Project Browser. The User-defined Display task is the container for displaying graphical results

GRAPH TYPES	Display of functions	
	• Waterfall • Waterfall (step) • Colour contour (3 variants) • Campbell diagram • Bar	• Line • Curve • Curve (step) • Overlay • Overlay (all) • Multi-value
SUPERIMPOSED GRAPHS	A number of functions can be superimposed on the same curve graph	
AXES	• X-axis Scale: Linear and logarithmic • Y-axis Scale: Linear, logarithmic and dB • Z-axis Scale: Linear and logarithmic	
COMPLEX DISPLAYS	• Real • Imaginary • Magnitude	• Phase • Nyquist • Bode
SPECTRAL UNITS	• Root mean square (RMS) • Power (PWR) • Power spectral density (PSD) • Energy spectral density (ESD)	• Root mean square spectral density (RMSSD) • Peak (Peak) • Peak-to-Peak (PkPk)
ACOUSTIC POST-WEIGHTING	A-, B-, C-, D-, L-weighting	
jω WEIGHTING	$1/j\omega^2$, $1/j\omega$, 1, $j\omega$, $j\omega^2$ (single and double integration and differentiation)	
CURSOR TYPES	Depending on the display type, the following are available:	
	• Main • Delta • Order	• Reference • Harmonic • Sideband
	Alignment: Cursors in different displays can be synchronized to allow the changes to one display to be reflected in other displays showing the same or different functions	
CURSOR READINGS	• Acoustic levels • Corrected frequency • Cursor indices and values • Delta • Delta/total • Max. and min. values	• Nearest harmonic • Nearest sideband • Reference • Resonance • Reverberation • Slice definition • Status • Total

Result Matrix Viewer

The Result Matrix Viewer provides a structured overview of results from a large number of tests, making selection and comparison very easy:

RESULT LAYOUT	As a matrix of signals versus analyses
SMART RESULTS GROUPING	Each individual cell in the matrix represents a group of similar results for which comparison is valid
AUTOMATIC RESULT DATA PRESENTATION	Selecting a cell presents the results, either in a table view for scalars, or graphical display for function data
AUTOMATIC REPORT GENERATION	Reports can be generated in Microsoft® PowerPoint®, either from blank documents, or from templates prepared in advance

Reporting

A separate reporting task enables templates to be created in Microsoft® PowerPoint®

Time Editor

Display, audio playback and pre-processing of time data in preparation for analysis

DATA SELECTION	· Automated generation of regions from multiple files having similar channel configurations – in preparation for batch processing · Manual grouping of regions – for batch processing · Region selection by group of channels and time range · Append regions to other regions (concatenation) · Save regions to project
DISPLAY	· Fast navigation by scrolling through channels, panning and zooming in time axis · Fast spectrogram display – synchronized with time data display & playback · Interactive order slice and frequency spectrum display synchronized with spectrogram cross-hair cursor
PRE-ANALYSIS	· Automatic calculation of rpm profile from a tachometer pulse train

Data Processing Features

· Analysis of time data including pre-processing
· Immediate display and store of analysis results
· Automated processing using the Standard Processing task
· Automated multi-page reporting
· FFT spectral measurements using the Standard Measurement task
Analyzers: FFT analyzer

Process Chains

ANALYSIS ELEMENTS	· FFT Signal · FFT Signal vs Time · FFT System
POST-ANALYSIS ELEMENTS	· CPB Synthesis (1/3-octave) · Frequency Band Extraction
GENERAL ELEMENTS	· Result Matrix: Results are presented using the same functionality as in the Data Viewer's Result Matrix Viewer where you can make predefined selections in the matrix, simplifying the process of displaying data

FFT Analysis

The following specifications apply to all FFT-based analysis

FREQUENCY RANGE	· Baseband and Zoom: 50 – 102400 lines · Frequency Span: 1 Hz – 204.8 kHz in 1, 2, 5 … or 2^n (1, 2, 4, 8 …) sequence (depending on hardware)		
SIGNAL TYPE	Random; Periodic; Transient Properties are automatically set up to a logical default; for example, when transient type is selected, Signal Trigger is selected as the triggering mode		
TRIGGER MODES	· Free run · Signal Trigger: Trigger attributes include level, hysteresis, slope, hold-off, delay and divider		
TIME WEIGHTING	· Exponential · Uniform · Transient	· Hanning · Flat-top · Kaiser-Bessel	
OVERLAP	User selectable values of 0%, 50%, 66.67%, and 75%, user editable from 0% to 95%		
OUTPUT	· FFT Signal: Autospectrum, Cross-spectrum, Phase-assigned Spectrum, Time, Weighted Time · FFT System: Autospectrum, H1 FRFs, Coherence and Phase-assigned Spectrum		

Specifications – Type 8490-A-N-SYS Only

Measurement Control

AVERAGING	Can be performed either in the frequency or time domains.
AVERAGING TYPE	Averaging types available for the measured signals are: · Linear (fixed number of blocks) · Linear All (full time range) · Exponential · Maximum hold
MEASUREMENT MODE	· Initialize analysis system · Generator start/stop · Measurement start/stop The averaging setup can be adjusted from within this mode

Hardware Setup Features

· **Hardware Support:** Support for any single LAN-XI data acquisition module or a single LAN-XI Light module
· **Transducer Manager:** For transducer setup
· **Hardware Browser:** For channel setup
· **Generator Setup:** For setting up any LAN-XI module with built-in signal generator
· **Calibration:** Transducer calibration/verification
· **Signal Monitoring:** Real-time monitor including a monitor recorder

Hardware Configuration

The software automatically detects the front-end hardware and configures the system. If IEEE 1451.4 capable transducers (with standardized TEDS) are being used, these are detected and attached automatically to the correct input channels

Hardware Browser

The Hardware Browser combines the Hardware Matrix and HW Setup Table that work together to provide a highly efficient way to work with any size system

HARDWARE MATRIX	An interactive display of the front-end hardware · Signal levels indicated using coloured rings · Channel overload status, using different symbols for different types of overload · Transducer status, using symbols to identify each transducer type · Calibration/verification status when used in the Transducer Verification task · Drop destination for transducers dragged from the Transducer Manager · Channel selector for the HW Setup Table and overall level meter · Automatic indication of TEDS transducers
LAYOUT VIEWS	· Square Grid: Completely dynamic. Signals form a best-fit grid in the available screen space using coloured rings to display signal amplitude · Bar Grid: Completely dynamic. Signals form a best-fit grid in the available screen space using bars to display signal amplitude Note that the grid displays can be sorted according to Signal Name, Maximum Level, Minimum Level and Level Range
MATRIX DISPLAY STYLES	· Physical: A visually representative display of the physical front end · Logical: Channels shown as coloured rings in the same configuration as the physical front end

HW SETUP TABLE	A channel list that contains all information about the front-end hardware and any transducers connected to it. The number of rows displayed in the table depends on the channel selection made in the Hardware Matrix, the default being all channels. The size of the table updates dynamically according to which channels are selected in the Hardware Matrix, making it very easy to focus on subsets of channels when needed
TABLE EDITING	• Manual editing of channel information • Update from an external XML or UFF 1808 (Channel Table) file or from Microsoft® Excel® • Save HW Setup Table contents to an external XML or UFF 1808 (Channel Table) file for later use • Create different (favourite) views to tailor which columns should be shown
BROWSER HEADER BAR	Tools in the Hardware Browser allow for: • Resetting of channel status • Reconnecting the front end • Display of either the HW Setup Table, the LAN-XI home page, or an overall level meter for all channels

Transducer Manager

The Transducer Manager works with a Microsoft® Access® database (as used by PULSE LabShop) to manage transducer specifications and calibration information

INCLUDED TRANSDUCERS	A full set of Brüel & Kjær transducer types, with nominal sensitivities, is provided with all BK Connect installations
ADDING TRANSDUCERS	Individual devices, or groups of devices, can be dragged and dropped onto the Hardware Matrix to add transducers to the configuration and/or add calibration/sensitivity information: • Drag a transducer type to many (or all) channels. The HW Setup Table applies the nominal sensitivity for that type to the selected channel(s) • (Typical) Drag specific devices to individual channels where they are known to be physically connected
DATABASE	Each transducer type can have a number of devices of that type, each with its own unique calibration history

Transducer Verification

Transducer Verification (under Setup) can be used either to verify that transducers are functioning correctly, or to make a new calibration

A transducer calibrator is used to apply the necessary excitation for either verification or calibration. Multiple calibrators can be used simultaneously.

The software automatically detects the calibrator signal and performs the verification/calibration, with coloured status indicators in the Hardware Matrix and HW Setup Table showing In Progress, Failed or Passed. At the end of the procedure, the Transducer Manager is updated along with the HW Setup Table and calibration information is added to the device's calibration history

Generator Setup

SETUP	Graphical tools can be used for setting up excitation type, frequency parameters, output level, level ramp up/down times, and whether burst excitation is to be used	
GENERATOR SIGNAL TYPES	• Sine (fixed frequency) • Continuous and Burst Random	• Periodic and Pseudo-random • Periodic chirp

Real-time Monitor

MONITORS	Channel monitor (time or FFT), channel level meter, channel level history, elapsed time, rpm profile, tachometer. Includes generator stop/start control buttons
FFT MONITOR	Monitors 2D spectra or 3D spectrograms for all active channels or selected channels. Grouped automatically based on the physical quantity
LEVELS MONITOR	Monitors the overall levels displayed in voltage or physical quantity for all active or selected channels. The data can be monitored as instantaneous level or max. hold, using slow, fast or impulsive time weighting
TIME MONITOR	Monitors the complete raw time history for the entire length of the recording, while overlaying overload and marker locations

Ordering Information

Type 8490-A-N-SYS[*] FFT Analysis Applet
Type 8490-F-N-SYS FFT Post-analysis Applet

SOFTWARE MAINTENANCE AND SUPPORT AGREEMENTS[†]
M1-8490-A-N-SYS Agreement for Type 8490-A-N
M1-8490-F-N-SYS Agreement for Type 8490-F-N

OTHER BK CONNECT PRODUCTS
For an overview of all BK Connect applications and applets, visit the BK Connect page on the Brüel & Kjær website.

NOTE: Applets cannot be upgraded to full-version applications or added to other applets

* "N" indicates the licence is node locked to a PC or dongle. Floating licences not available

† Agreement expiration date to be agreed at time of contract

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