Device control software

Purpose

The device operating software is exclusively developed for the corresponding analytical technology of LLA Instruments: multi- and hyperspectral imaging cameras, multiplexed and laboratory NIR spectrometer and Echelle spectrometer. All software is developed in-house to enable a fast adaption on customer-specific requirements. The corresponding software is included in delivery for each analytical device. The device control software includes several security levels for a stable 24/7 operation in industrial environment. Important device parameters are password protected and therefore changeable exclusively by service personnel. Ready-to-use applications are available for each device control software. The application and therefore the analysis task can easily be changed by loading a different application routine into the device software. Custom-specific development of applications by LLA and an extensive application development package based on chemometrical algorithms are available.

Control software

- **KustaMPL**
  The software KustaMPL is utilised for the control of the NIR spectrometer uniSPECx.xMPL and KUSTAx.xMPL. In process mode (figure 1), status information as well as analysis statistics are available for the plant personnel. In service mode, several tabs for the adjustment of important device parameters such as integration time are accessible (figure 2). Each measurement track of the device can easily be activated and deactivated in the KustaMPL software. The device KUSTAx.xMPL is equipped with several interfaces for data transfer. Standardised data transfer protocols (TCP/IP, UDP) are implemented in device software KustaMPL. The data, i.e. the result of the active application routine is transferred in real time.

- **KustaMSI**
  The control software KustaMSI is used for the control of the multispectral and hyperspectral imaging cameras KUSTAx.xMSI and uniSPECx.xHSI. The graphic user interface is composed of the permanent main window and additional tabs. The main window shows the hardware status. In basic security level, only tabs for monitoring of camera parameters and analysis statistics are available. Tabs for parameter adjustment are password protected. For camera setup and adjustment purposes, graphical displays of the camera picture (figure 3) and plots of irradiation intensity across the sensor are implemented. Tracks as well as spectral regions of interest (ROI) can be selected easily in the software. TCP/IP and UDP are implemented for the real-time data transfer to plant control.

Software
Control software

KustaWIN
KustaWIN is the control software designed for the NIR spectrometer uniSPEC2.2USB. The permanent main window shows the current NIR spectrum as well as spectrometer status. In addition, the buttons for data acquisition and calibration are accessible. Tabs for data acquisition modes and data recording (figure 4), as well as application windows for the display of analysis results are available in the basic security level. Further tabs including important device parameters are password protected and therefore accessible exclusively by service personnel. Data transfer to plant control is also available for KustaWIN. LLA Instruments provides several ready-to-use application windows for specific qualitative and quantitative analysis tasks (figure 5). The application windows are easily selected in the device software. In addition, customised application windows for new analysis tasks are available upon request.

ESAWIN
ESAWIN (figure 6) is an online data acquisition software for the Echelle spectrometer ESA 4000. The software is included in delivery. Atom emission spectra generated by LIBS or other excitation sources are detected. Spectral display and spectral analysis are implemented in the software. In addition, the software can be operated in offline mode with deactivated acquisition options. Options are available both online and offline for recorded spectral data. A comprehensive atomic spectral lines database is integrated into the software package, facilitating atom line identification. The (optional) temperature module permits determination of the plasma temperature.

Implemented options
- Spectrometer control (online only)
- Spectra display
- Camera picture display
- ROI (Region of Interest) display
- Data conversion
- Automatic qualitative spectra analysis (all elements)
- Generation of quantitative calibrations
- Quantitative analysis (regarding calibration)
- Statistic and protocol functions for quantitative analysis
Kusta Belt
Kusta Belt (figure 7) is an off-line data evaluation software tool for 2D datasets (belt recordings) recorded by the cameras KUSTAx.xMSI and uniSPECx.xHSI or NIR spectrometer KUSTAx.xMPL / uniSPECx.xMPL. Kusta Belt enables a graphical display of analysis results for previous belt recordings of material streams. In addition, a survey of the impact of modified applications on the identification task is feasible. Especially for off-line tests of new object related identification routines, Kusta Belt is a useful addition to the chemometric software package KustaSpec.

Kusta Online Belt
Kusta Online Belt (figure 8) is visualisation software specialised on large data sets. In combination with process equipment KUSTAx.xMSI / uniSPECx.xHSI and KUSTAx.xMPL / uniSPECx.xMPL, material streams can be visualised in real-time. The distinct material types in an application are visualised by false colour representation. The graphical representation can be particularly useful for a fast assessment of information regarding material composition and material distribution on a conveyor belt.

KustaSpec
The application development software KustaSpec (figure 9) is an off-line software tool for chemometric application development. The applications developed by KustaSpec are compatible to device software KustaWIN, KustaMPL and KustaMSI. KustaSpec supports the spectral data format of the device software as well as standard ASCII data. Development and modification of analysis models require the handling and visualisation of large data sets. For this purpose, KustaSpec permits simultaneous loading, grouping and colouring of thousands of NIR-spectra. A comprehensive range of mathematical operations e.g. derivation are available for spectral processing. Statistical data evaluation as well as graphical analysis tools e.g. scores plot and vector plots are implemented for the validation of new applications by NIR test sets. The NIR test sets and learn-sets (NIR reference spectral dataset for application development) can be generated and modified by KustaSpec as well.