These release notes are describing changes in LIMES 2000 since version 20.0403.1117. The new release 21.0219.1171 integrates a number of new features and bug fixes within different application areas.

The new release is not covering the GO-R series of LMT goniophotometers and can only be applied to laboratories with GO-H, GO-DS, GO-FI and GO-V machines! Updates for GO-R goniophotometer are currently distributed on a case-by case base.

An enhanced update of LIMES 2000 including GO-R goniophotometer control originally planned for 2020 has been postponed and will be part of the next release which is scheduled later in 2021.

All new features are tested on Win-7/Win-10 operating systems only, therefore, for users running Limes 2000 still on Win-XP, LMT does not recommend to install this new version!

Installation

LMTAO version 1.2.174 or higher is required for LIMES 2000 rev. 21.0219.1171. If the LMTAO library is not installed or shows an outdated version, Limes and LimesControl will not start. LMTAO is available for download on the LMT homepage.

LMT has installed a check of the software version as well with regard to the spectrometer software. The interface between LimesControl and the spectrometer service is permanently improved and new features can only be offered, if both software packages are up-to-date.

LIMES 2000 version 21.0219.1171 requires LMT spectrometer software 1.9.2.7401 or later to be installed.

In case a goniometer laboratory contains a spectrometer and the version of the spectrometer software does not fit, LIMES 2000, respectively, LimesControl will not execute any measurement commands using the spectrometer!

Instead, LimesControl will issue a message that an outdated version of the service is installed, but will of course execute all measurement commands which do not use the spectrometer.

New features

GO-DS and GO-V installations may be extended with radiometer systems, for instance to measure spectral power in the Ultraviolet or Infrared. More details can be found within the chapter on general lighting.

Luminance cameras (LMK) from Technoteam Bildverarbeitung GmbH for indirect luminous intensity distribution (LID) measurement using a reflective screen are now as well accessible in Limes 2000. The new feature integrates stitching capability of multiple luminance images, thus overcoming restrictions in solid angle given by the individual screen image. It allows recording of intensity distributions in a fraction of the time necessary when using conventional scanning operation. More details can be found within the chapter on automotive lighting.

Flash measurement has been expanded with additional commands. These allow access to all relevant data delivered by SoLiT *Flash*.

General Lighting

S1000 photometers including radiometer for IR or UV have been added to be used in general lighting applications. A dedicated calibration factor of radiometer heads may be added within Limes 2000 to get absolute readings. Units are displayed in tables or diagrams are either mW/m² or mW/sr.

Measurement functionalities like stabilisation and program flow behave similar, independent of the type of sensor, e.g., whether a photometer or radiometer head is being used.

Since radiometer systems may be AMR devices and thus capable to measure in fast or slow mode, the general lighting branch of Limes 2000 has been extended for AMR devices. Due to the necessity of averaging 50/60 Hz mains modulation, the standard photometer in GO-DS and GO-V goniometer laboratories has always been a slow mode device, therefore they remain as they always have been and the fast/slow option is suppressed.

Automotive Lighting – Screen Photometry

The hardware portfolio of Limes 2000 has been extended for Screen Photometry, e.g., indirect intensity measurement using a luminance camera combined with a reflective screen. The hardware setup is accessible within the tab *LumCam* in *Options →Hardware*.

Up to two different luminance cameras with offsets at 0° or 90° can be configured. The user can choose a specific camera (including the lens) via a dropdown menu. Each camera/screen combination must be assigned with the individual offset and geometric parameter. Of course, these need to be evaluated in advance during calibration. An entry for test distance is available, but this is for orientation only. The exact distance is part of the calibration data used to calculate the luminous intensity out of the luminance images.
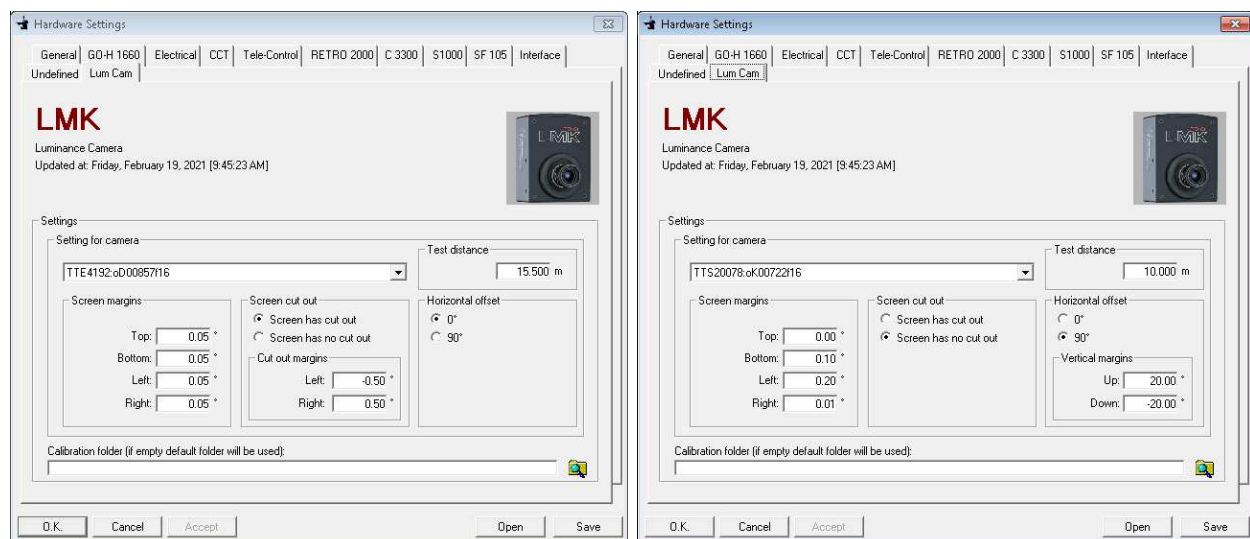

If the screen has an opening in the centre, for instance to access a photometer or retro-reflection measurement system, this part of the screen is clipped, based on the corresponding cut-out definitions (left picture above).

In case the screen is located at 90°, the vertical axis must stay of course at 0° and the accessible solid angle is limited by the screen size. Therefore, the maximum vertical range has to be entered as part of the screen parameter (right picture above).

In order to take advantage of the new hardware option, the command *CameraGrid* has been generated. *CameraGrid* requires the same input parameter as horizontal or vertical scans, but in addition, the minimum and maximum exposure times, averaging of images and source modulation, for instance a PWM frequency, may be entered.

Last but not least photometer correction may be activated. In this case, the software will perform two photometer-based point measurements to check and correct the recorded screen data (left picture below).
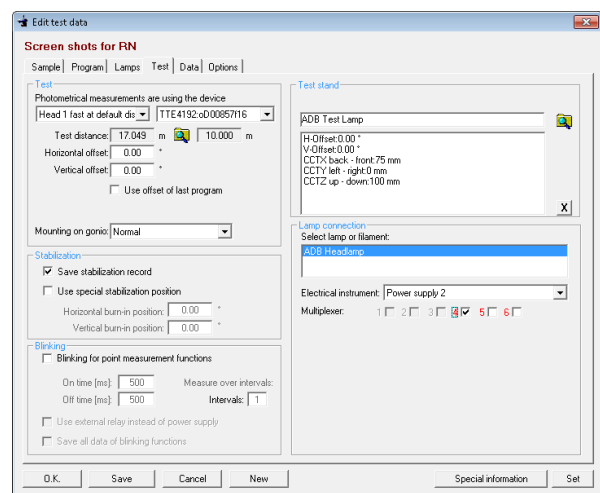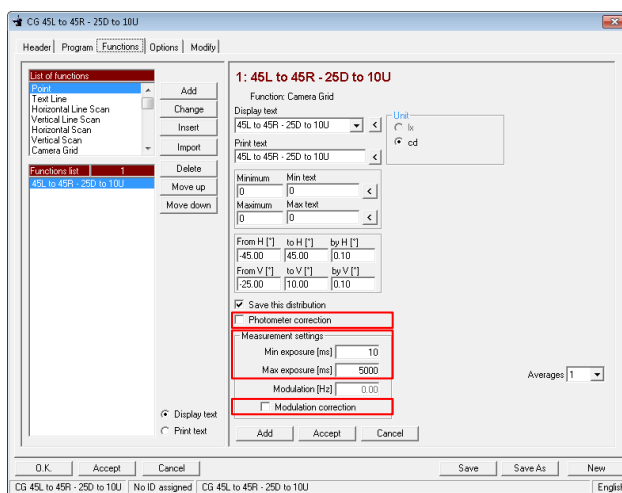
If a *CameraGrid* measurement is part of the program flow, the camera can be chosen in the tab *Test* (right picture above). In addition, a photometer choice is available to define the photometer head to be used for stabilisation, for automatic gradient determination and of course to correct the recorded *CameraGrid* with a photometer measurement.

If a modulation frequency of the DUT is entered (≠ 0.00), the minimum exposure time may be altered based on the modulation frequency *f*, i.e., exposure times lower than *1/f* are not possible.

In advance of a *CameraGrid* measurement, Limes 2000 will check whether the specified luminance camera is responding. Otherwise, the default camera will be used. In case the screen is located at 90°, the vertical range will be checked as well in advance against the limits of the screen. During execution of *CameraGrid*, Limes 2000 will show a progress bar and messages are being issued about the solid angles, where images are currently recorded.

Automotive Lighting – Command Improvement

- The *Gradient* command used to determine the position, where the highest contrast in a low-beam distribution occurs, has been improved.
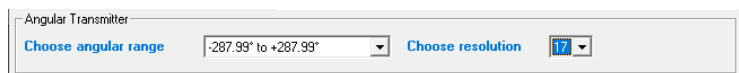
  The internal resolution of LMT angular decoders is usually smaller than 0.01°, but has not been transferred to the control software in the past because the absolute angular accuracy is limited to 0.01°.

  However, measurement and calculation of the cut-off position, especially for very soft cut-offs, benefits from higher resolution, even on a relative base. Therefore, all line scans including the gradient command can now access resolution of less than 1/100°.

  The diagram above on the right-hand side shows an example of a gradient measurement (blue) and corresponding calculation (red), which turns out to be much smoother at the cut-off location when the high-resolution feature is activated.
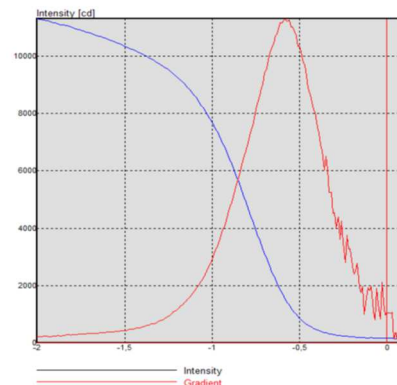
  The feature is not available for very old angular transmitters having a range from 0° to 360°, but only for new encoders displaying ±180°. The resolution setting is done in the menu *Options* → *Hardware* tab *GO-X XXXX* click on *Goniometer* → *More…* and must be set to 17 bit (see above, 18 bit is reserved for future applications).

- Function *Degradation Factor* has been added. It allows to determine a new degradation factor within a single program flow. The user can assign two (subsequently measured) points, usually with a pre-defined waiting time in between, from which the new degradation factor will be calculated. This of course assumes that the DUT has cooled off before.

  The first point will be chosen for the init (cold) value and the second point (measured at the same position) represents the stabilised value. The ratio determined by function *Degradation Factor* will be applied to all subsequent measurements to calculate the "cold" values in the init value row, however, the two points measurements used to determine a new degradation factor, will not have a cold value assigned.

  The new function is useful, if a second lighting function with a different power intake is measured within the same program flow, for instance using the two-lamp program functionality for Tail/Stop, High/Low beam, DRL/position light etc.

  Print output from test the report has been adopted for the new function *Degradation Factor* and further optimized with regard to *Average value* and *Min/Max Ratio functions*.

- AFS evaluation now offers the capability to perform re-aiming, however, only if the necessary data are available, which is usually the case if they are based on horizontal or vertical scans.

  A bug was fixed for AFS evaluations in case where more than 2 measurements from lamps or contributors were entered. The regulation requires to calculate "half of the sum of all contributors", but in the past an average calculation was performed, e.g., if 4 contributors were loaded to calculate the system performance, the denominator was 4 instead of 2.

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Flash measurements

The new release of Limes 2000 allows to post-process measurements from SoLiT *Flash* which have been saved to disk before. This feature has been added for laboratories in which individual angles are adjusted manually, for instance using simple instruments like GO-M.
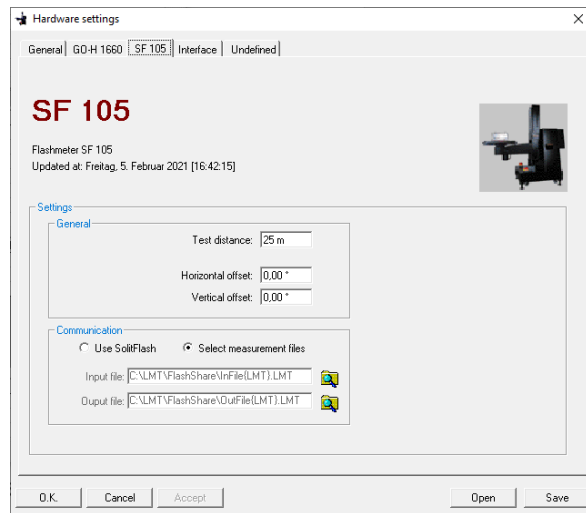
PHOTOMETRIC RESULTS
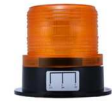
Name:	Flashmeter - 5 virtual Points		
Program:	ECE 065 Cat-T @Night Amber Demo		
Number:	42		
Report:	21-02-05 #3		
Meas.-no.:	#3	Operator:	Dr. Thomas Reiners
Voltage:	13,20 V	Date:	05.02.2021 12:52:24
Current:	4,50 A	Test distance:	25 m
Comment:			

ECE 065 Cat-T @Night Amber Demo

| No.	Function	Min	Max	H [°]	V [°]	Value	Unit	N.O.K.
1	H - 8D	70	600	0,00	-20,00	371,0	cd	
2	H - V	100	700	0,00	0,00	404,4	cd	
3	H - 8U	70	600	0,00	8,00	404,4	cd	
4	20L - V	100	700	-20,00	0,00	388,9	cd	
5	20R - V	100	700	20,00	0,00	93,5	cd	*
6	Frequency @ H - V	-	-	0,00	0,00	3,8	Hz	
7	Off-time @ H - V	-	-	0,00	0,00	0,211	s	
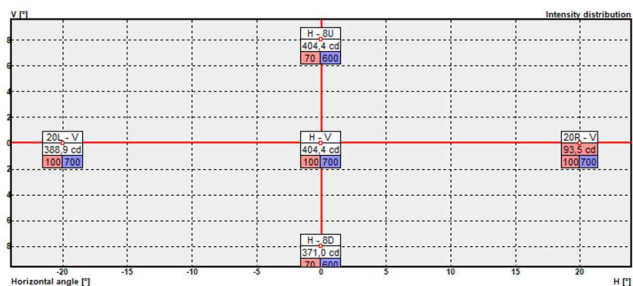
Post-processing is triggered via the well-known Limes 2000 Launch icon which starts LimesControl in simulation mode using a simple GO-H system (see foreground window on the right-hand side).

During "program flow", i.e. when processing of all commands in the execution window, at each point command or at a point measurement within a scanning operation, a file selection dialogue is opened and instead of measuring the point immediately with the SF 105 Flashmeter, a previously saved file from SoLiT *Flash* (*.daq) is imported into the measurement.

The post-processing mode is activated by editing the *SF105* tab in *Hardware → Settings* and checking the radio button *Select measurement files* (see picture above on the left-hand side).

Once all files from SoLiT *Flash* have been imported into the measurement, standard reporting according to regulatory requirements for flash lights (ECE, SAE, GB, COLREGS, ICAO etc.) with command table, interval check, program grid etc. are available.
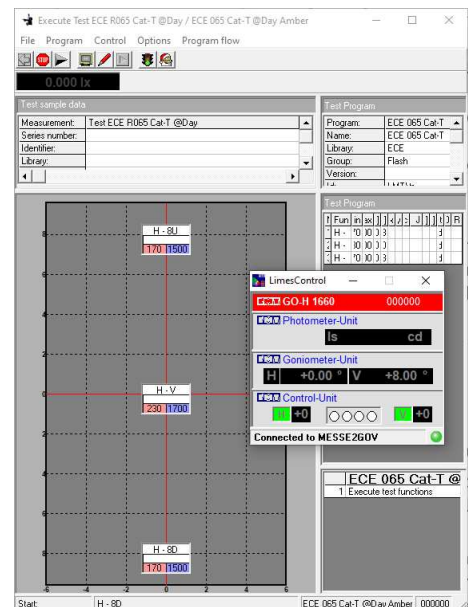
In order to use this mode, the user needs a Limes 2000 hardware key, type B, for "hardware" operation and the corresponding user database file with the hardware description.

A new function *Evaluate Flash* has been implemented allowing the user to evaluate flash specific measurement values.

The new function reads a specific value from the flash characteristics of a preceding point measurement and checks it against a tolerance requirement, e.g., a minimum and maximum value. Accessible parameter like Frequency, On- or Off-time, etc. are available via a drop-down menu. The example on the right-hand side shows for instance how to test the frequency of a flash.

The time diagram of flashes measured in conjunction with point functions can now as well be added to the report. Formerly, this was only available within grid or line scans.

In addition, the *Program grid* diagram for flash measurements was enabled.
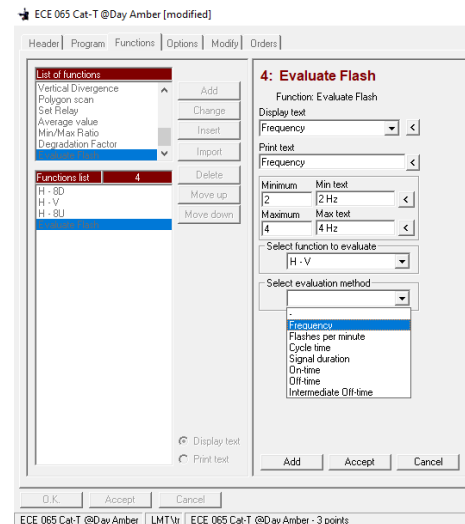
Power supplies and power measurement

- FUG power supplies and Keithley DMM6500 may now be alternatively equipped with TCP/IP interface. Both devices are internally realized with URI (Uniform Resource Identifier), therefore, URI devices have to be activated to add the FUG and Keithley DMM6500 with TCP/IP interface to Limes 2000.

- Yokogawa WT310 G5 offering harmonic evaluation has been added to the available power measurement devises.

Ambient Sensors

- With introduction of humidity sensors, the corresponding calibration method is based on multiple points and a linear best fit. Therefore, the calibration data are not introduced via two calibrated points, but instead the slope of the line and the intercept of the line as given in the calibration certificate have to be entered.

Miscellaneous

- If after start-up of Limes 2000 the connection to LimesControl was not immediately established, in the past LimesControl was not shut-down at termination of Limes 2000. Now, LimesControl will always be terminated when Limes 2000 is shut down.

- For customers using both SoLiT *Automotive* and Limes 2000 on one PC, a check was introduced which prevents both LabControl and LimesControl to access the hardware. The user will get a message that LimesControl will be started only if LabControl is closed.

- If a radiometer system has multiple integration times, for instance an AMR device, while the standard photometer has only one, this could lead to errors in the past. The issue occurred with introduction of radiometers systems for GO-DS and GO-V goniophotometer and was immediately fixed.

- Similar to all other sensors, spectrometers are now allowed to have more than one distance. The mechanism is the same as for photometer heads. However, LimesControl must be connected to Limes 2000 in order to transfer the new distance to the spectrometer service. Once the service has received the change, the Spectrometer Client will display the new set distance.

- The user-interface of GO-DS program definition was displaying an unnecessary frame (lamp mounting). This has been corrected.

- It was not possible to change programs when restriction "Edit extended program functions" was allowed. This behaviour was corrected fixed.

- In LimesControl the tab for retro-reflecting devices has been changed within the hardware test. The frame to control the epsilon axis will be only visible if such a device is available.

- If two devices are used within a measurement (for instance photometer and colorimeter) and both devices have several pre-defined distances, now the distance for both devices can be edited in the *Test* tab. In the past it was only possible to change the device distance for the first device.

- The multiplexer configuration is normally stored within the configuration file (*.ini), but was not always correctly read out at program start of Limes 2000. This has been improved and now the configuration will be always loaded from the ini-file at program start.

- Response time of Retro 2000 can be edited in the hardware section. The default time is 5000 ms and in case it is exceeded, a message will be displayed. This setting is only available for Retro 2000, for instance if the head is not moving towards the intended position.

- In case A*llow measurement while blinking* has not been enabled in *Options →Program → Diverse*, it is now as well supressed in the wait dialogue.

- Sometimes measurements with stabilization data from old versions could not be exported. This has been fixed.

- The default intermediate transfer timeout between Limes 2000 and SoLiT *Flash* or the spectrometer service is set to 5 minutes, but can be edited via *Options →Program →tab Connection →*click on *Edit* in order to change the value in the dialogue for *transfer timeouts*.

- In advance of starting a flash measurement, SoLiT *Flash* needs to be started with all parameters properly set before activating the goniometer mode. Therefore, Limes 2000 will first check if SoLiT *Flash* is responding correctly and will display a message if this is not the case.

- In program flows containing *Evaluate Flash* functions without an active Flashmeter in place, the corresponding entry in the program table will be replaced by a text line. All other functions will not be affected.