These release notes are describing changes in LIMES 2000 since version 18.0119.961 which has been an intermediate release dealing with extended visual aiming of automotive headlamps and has therefore not been officially distributed. Users interested in that topic may look up the release notes at http://www.lmt.de/latest/Limes 2000/Revision history/.

The new release 18.1117.1038 integrates a number of features from different application areas and constitutes a major Limes 2000 release.

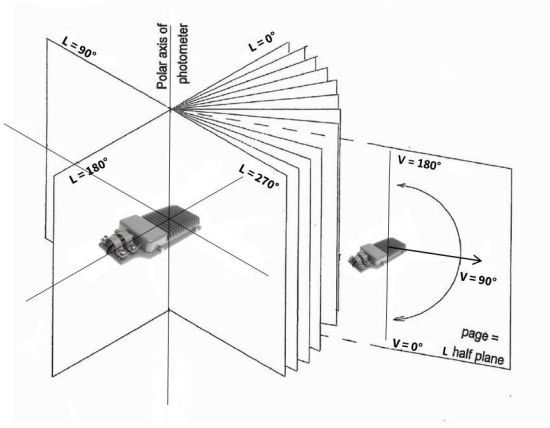
- US goniometer coordinate conventions and corresponding US light distribution representation including evaluation to IES TM 15-11 has been integrated into the main software branch.
- Degradation of automotive LED lighting and light signalling is now calculated from the stabilisation record and transferred into a new data column representing “cold” photometry values.
- Besides, a number of various new features, for instance for measurement of navigation lights, were introduced and bugs discovered since the introduction of the last version have been fixed.

Installation

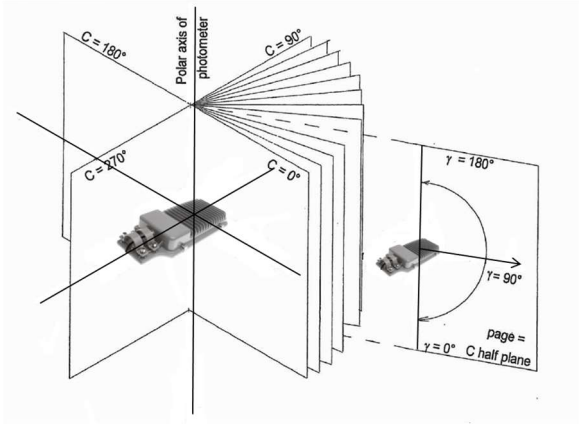
LMTAO version 1.2.88 or higher is required for LIMES 2000 rev. 18.1116.1038. If the LMTAO library is not installed or shows a wrong version, Limes and LimesControl will not start. LMTAO is available for download on the LMT homepage.

US light distribution representation

The difference between the North American (IESNA) standards and the European (EN) standards (see sketches below) leads to different lighting evaluations which can be toggled in Limes 2000 on demand. If US light distribution representation is activated, metric units will be switched to English units throughout all diagrams and reports.



Luminaire orientation according to US convention (L-V goniophotometry)

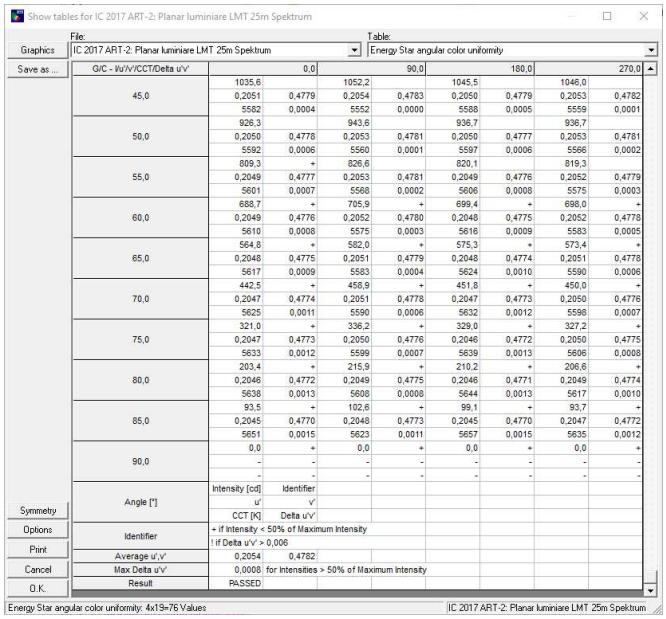


Luminaire orientation according to European and CIE convention (C-γ goniophotometry)

A detailed description of this new feature can be looked up in a detailed application note which part of this distribution, but is as well available on the LMT home page at http://www.lmt.de/-latest/Limes%202000/Doc/. Please contact LMT in case this feature is required and shall be unlocked.

Reports and diagrams

The table for colour angular uniformity according to Energy Star requirements has been added to Limes 2000 (see figure on the right).



The lower part in the table shows an explanatory legend and the summary of results, e.g. the average u'v' and the maximum Δu'v' for intensities >50% of the peak intensity.

In cases in which luminaire throw and spread cannot be calculated, the corresponding data will not be available in the luminaire report table.

In the cone diagram the angle shown in the textbox was not correct. The angle was given as G instead of C and its value was permutated by 180°. If someone moves the mouse within the diagram frame, now in both cone and polar diagram the correct angle (C, G or L, V if representation is US.) will be displayed in the textboxes.

γ=0 can be displayed as well. For accessing the maximum value, the user can choose "Max" in the configuration window of the gamma angles.

A number of new entries have been added to the evaluation list:

- A table for roadway classification is available. The evaluation will show several street light specific values like the BUG rating, however, the IES classification is given in that table, too. The table can be printed or saved in csv file format.
  BUG ratings in above mentioned table will be given for the specific luminaire type. Type I, II, III and IV are asymmetrical luminaires, type V and VS represent a quadrilateral luminaire for which the G rating is different.
- A new diagram called "Roadway Isoline Diagram" was implemented. This diagram is useful to identify the roadway classification. The scale for both x- and y-axis in this diagram will be in units of mounting height (=MH). Intensity values will be calculated depending on which representation is chosen (metric/ lx or English/fc).

- A new entry “H0V0” has been added to the evaluation tables list. This table is needed for evaluation of flood lights. The corresponding data can be saved in csv file format or they can be printed within the report.

Above listed features are part of the US light distribution representation and availability is similarly controlled via the user database settings.

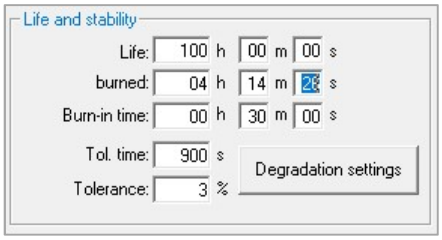
General Lighting

Miscellaneous features have been added in the frame of up/down measurements using GO-DS goniophotometers.

- If LOR is available from different light distribution measurements (photometer, radiospectrometer, …), the photometer value will be the default choice.
- All recorded electrical and temperature values are now added to the corresponding tables.
- In measurements with “arm down” before “arm up” a wrong message was displayed, e.g. in the second part of the measurements the user was requested to move the arm up and then a message requested the arm to be down. The bug was fixed.
- Stabilisation data were only saved from the first part of the measurement. Now the data of both parts are saved. After the measurement the user can display either the first or second set of stabilisation data.
- The orientation in which stabilisation is performed has been changed. If no explicit orientation is chosen, stabilisation with “arm down” will be at C=0° and γ=0° while for “arm up” it will be C=0° and γ=180°. If the user defines explicitly a specific angle, then this angle will be chosen for both “arm up” and “arm down”.
- If readjustment of power supplies is configured, the adjustment will be done after the measurement of a cone then the data will be saved as electrical data. As the readjustment can lead to other electrical data the data with which the cone was measured are not correct. Now the readjustment will be done before the cone is measured. After that the electrical values will be taken after cone measurement without readjustment.

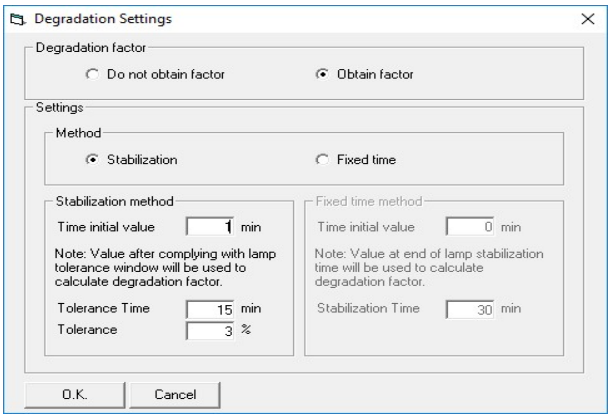
Degradation analysis of automotive LED lighting devices

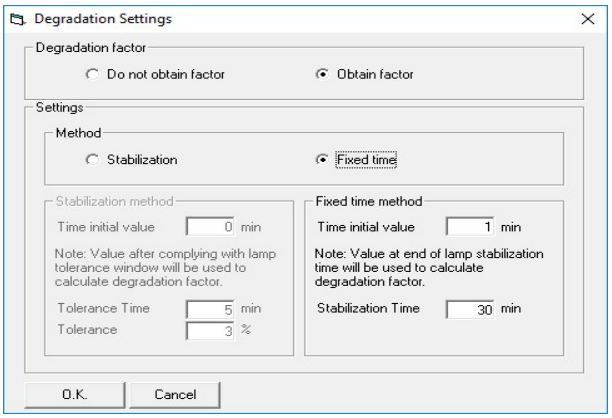
International automotive lighting regulations require taking into account the degradation of DUTs based on LED technology, either by a pre-defined tolerance interval or via a fixed time.



The tolerance interval and stabilisation time are as usual in Limes 2000 tied to the light source. Within the *life and stability* settings a new dialogue called degradation settings is available (see picture to the right).

Opening the degradation settings allows defining the type of stabilisation (fixed or variable) and the initial time, i.e. the time at which initial or “cold” photometry values shall be calculated. Degradation analysis will be only active, if the option *Obtain factor* is checked (see below).



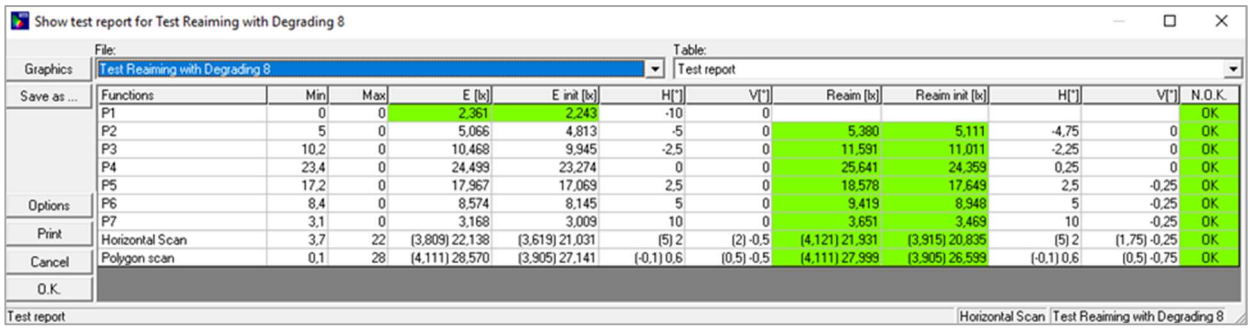


At the end of the stabilisation routine the last photometry value is used to calculate the degradation factor F_d based on the value recorded at the initial time (usually 1 minute after power on). F_d is needed to obtain the photometry status of the DUT at the initial time.

If a degradation factor has been determined, the additional column “Init Val” is available. The column *E Init* or *I init* is obtained by multiplying the stabilised data with the inverse of the degradation factor F_d.

If degradation and re-aim is activated, in addition to the re-aim column a new column called *re-aim init* will be available. This column represents the values after re-aim corrected with F_d in order to obtain values after re-aim representing photometry at the initial time.

The new columns will not be automatically visible but must be added manually to the report layout.



Independently of whether the two new columns are displayed or not, the (OK/NOK) evaluation will be obtained on the basis of both stabilised and initial value, i.e. both values need to pass the acceptance criteria. Therefore, the user should always make sure, that with degradation activated the columns for the initial values are displayed as well.

During implementation of LED degradation additional changes were introduced in the context of stabilisation and re-aiming as listed below:

- If the user selects “Save stabilisation data”, the corresponding flag will be now permanently stored to the test data record, e.g. after opening the file again the setting will not be lost.
- While implementing electrical and temperature stabilisation sometimes the stabilisation window was not correctly presented. The bug was fixed.

- The re-aim algorithm has been improved for horizontal or vertical scans (not line scans). Re-aim of minimum and/or maximum (if necessary) will be executed in order to find points which are within the limit boundaries, e.g. the re-aim radius.
- Activation of re-aim did not work for S1000 PWM devices. This has been fixed.
- The group or zonal command evaluates multiple values, for instance by summing up certain point values (ECE R123) or points from a distinct zone (FMVSS signalling requirements). If a re-aim has been done for such points, the re-aim value will be used for the group evaluation.
- Changes of tolerance time in the dialog "Edit Lamp" was not directly updated, but only after saving the lamp. If further values were changed, the software did not do a consistency check. Now the user will be informed that the values do not fit and data are automatically corrected if values are smaller than zero or larger than the max time.

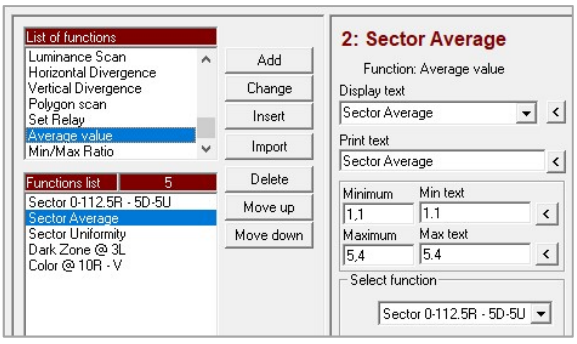
Visual aiming

Although revision 18.0119.961 was already dedicated to visual aiming (for details please check the corresponding release notes), a number of small features have been added since then:

- The method how the cut-off has been estimated is given in the result table. For example, if average is chosen, the text "Cut-off is at average" will be added to the result line.
- Data from visual aiming are now exported as well when using the ATF format. Settings from a cut-off database can be exported and imported to other database files.
- If the last element in a list of lines for vertical aiming was deleted, a runtime error occurred. The bug was fixed.
- Wrong titles in the aiming window were displayed when vertical and horizontal aiming was performed without vertical aiming before horizontal aiming. The bug was fixed.
- Both dialogues to access visual aiming (e.g. Database→Aiming and Hardware→Aiming) now work in a similar manner.
- Re-aim was not properly executed in case the special FxMin, FxMax feature was used in test functions. The bug was fixed.

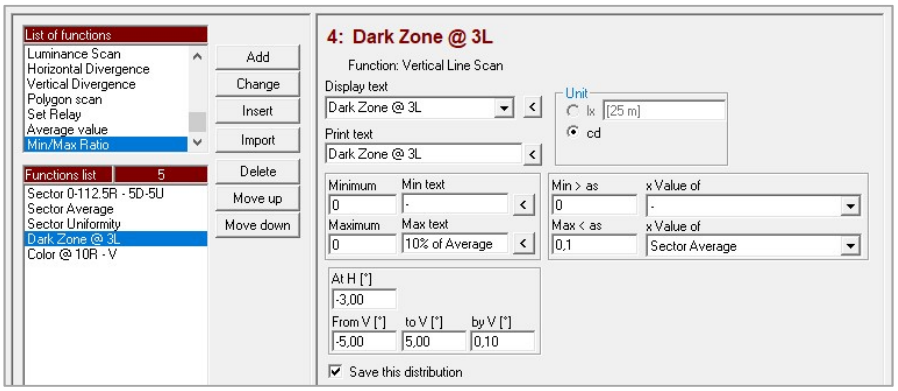
New command "Average"

A new (mathematical) command called "Average value" has been added to the list of functions available within the program flow. It calculates the average value of a preceding light distribution measurement (line scan or grid data). An example for a definition of the command is shown on the right-hand side.



Like for all other measurement or mathematical commands it is possible to define limits for the average value.

The average value will have the same unit than the underlying data set. The result may be further used within a special function call (i.e. a calculation based on the result of another command), thus defining a dynamic limit within another measurement command.



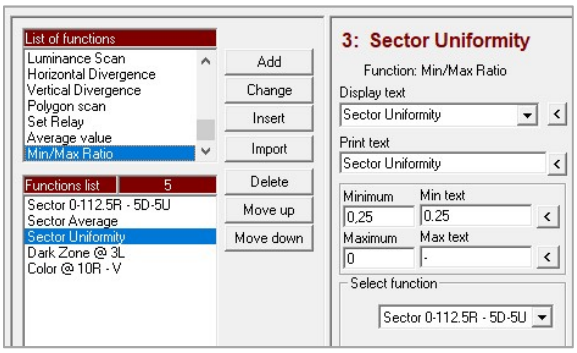
The example on the left-hand side shows, how the maximum value of a line scan is compared to the average value of a preceding sector measurement.

The average command is useful to test the practical cut-off of navigation lights according to COLREGS-1972 (International Regulations for Preventing Collisions at Sea).

During testing of the new command, it was detected that in cases where only a minimum requirement was defined via a special function call, the maximum value was shown in the result table. Although the check for the “passed” criterium was done correctly, the result value did not fit. The bug was fixed.

New command “Min/Max Ratio”

A new (mathematical) command called “Min/Max Ratio” has been added to the list of functions available with a measurement program.

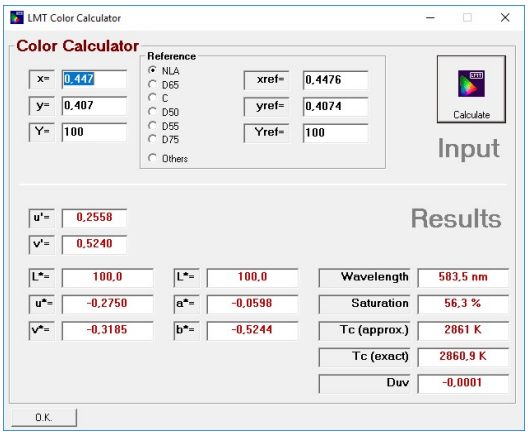


This ratio is calculated based on the values measured in a preceding scan or line scan measurement. By setting for instance a maximum value, the uniformity or homogeneity of a light distribution can be tested. The Min/Max ratio has no unit.

The figure above illustrates the definition of such a requirement while the test report below shows an example of how the new commands can be combined into a measurement program, for instance in this case for testing a starboard navigation light with a range requirement of 1 nautical mile.

No.	Function	Min	Max	H [°]	V [°]	x	y	I [cd]	Unit	N.O.K.
1	Sector 0-112.5R - 5D-5U	1.1	5.4	0,00/112,50/0,50	-5,00/5,00/0,50			(1,5) 5,3	cd	
2	Sector Average	1.1	5.4	0,00	0,00			3,5	cd	
3	Sector Uniformity	0.25	-	0,00	0,00			0,2849	cd	
4	Dark Zone @ 3L	-	10% of Average	-3,00	-5,00/5,00/0,10			0,2	cd	
5	Color @ 10R - V	-	-	10,00	0,00	0,2170	0,4858	3,9	cd	

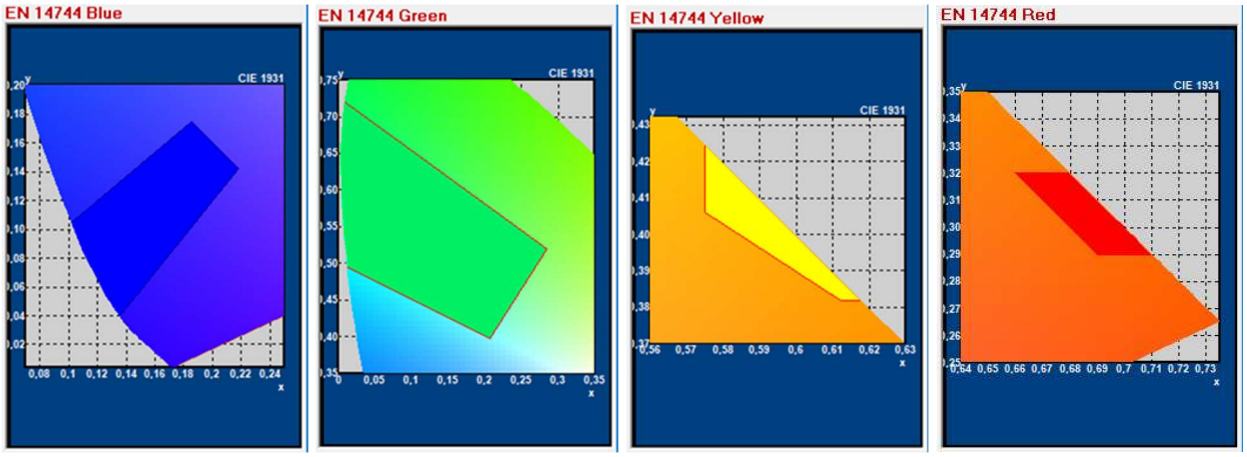
Colour analysis



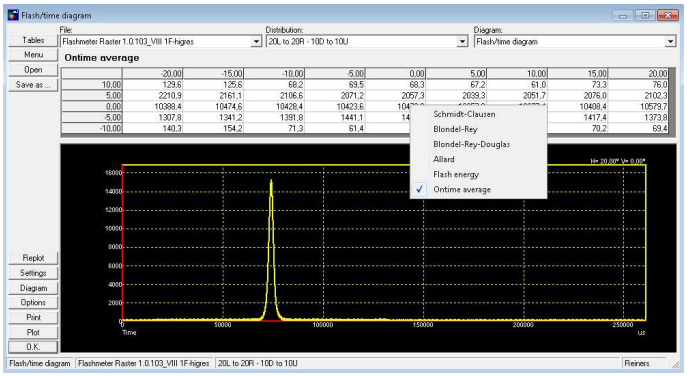
A new parameter was added to the LIMES 2000 colour calculator. In addition to the already existing colorimetric parameter list, Duv is now available as well.

Duv is the distance of a given colour point to the Planckian locus within the u'v' diagram and represents together with T_{cp} for white light sources an alternative description of the location within the CIE colour area.

New colour areas for blue, green, yellow and red according to EN 14744 have been added to the ColorArea database. A data set for white lights is included as well, although it is identical with the standard CIE white definition.



Flash measurements



In combination with the current LIMES 2000 release an improved version of SoLiT *Flash* has been published.

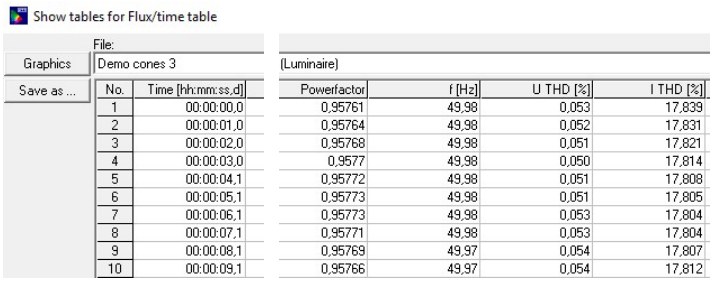
The Flash software now includes single shot capability. In addition, the report layout has been improved.

The communication protocol between SoLiT *Flash* and Limes 2000 has been expanded and transfers as well the average value during “on-time”.

Therefore, on top of the standard evaluations (Form-factor, Blondel-Rey(-Douglas), Allard and flash energy) this parameter is now as well available in Limes 2000 (see picture above).

Power supplies and measurement

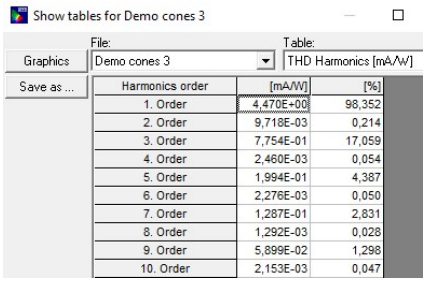
- Default settings for URI (Uniform Resource Identifier) power supplies have been altered in such a manner, that LimesControl does not freeze any more, if the power supply is switched off.
- During ramp-up of a light source using multiplexer and option “correct settings” channel 1 of the multiplexer was switched on. The bug was fixed.
- The IEEE version of the power supply TDK Lambda Genesys has been added to Limes 2000.
- The power supply Chroma 6160X was added to the list of electrical devices since the Chroma 6415 is no longer available. The description of Chroma 6160X covers a complete family, therefore, during setup of the device the correct voltage and current have to be configured for the device in use.
- The range of Chroma 61605 and Chroma 6160X power supplies will be chosen automatically depending on the individual voltage setting. For voltages greater than 150V the high range (up to 300V) will be set. Otherwise the range will be set to low range (up to 150V).
  If the device is set from remote back to local, the auto range will be set again in order to simplify subsequent manual operation.
- The power supply dialogue in LimesControl sometimes did not show the correct frequency in the measurement label for instruments capable of frequency readout. The bug was fixed.
- The Yokogawa WT3000 G6 has been added to the list of available power meters. The G6 option indicates that enhanced mathematical analysis is available, for instance to calculate total harmonic distortion (THD) of the first 40 harmonics of both voltage and current time behaviour.
  If Limes 2000 users want to implement THD evaluation, the WT3000 must be equipped with option G6 and the device settings have to be changed in Limes 2000 to Yokogawa WT3000 G6.
  Both THD values will be read from Yokogawa WT3000 G6 during stabilization and during measurement as part of the electric data which are measured for each cone or C-plane (see figures below). In Limes and LimesControl power supply control the current THD data will be shown.
  Consequently, with YOKOGAWA WT3000 G6 it is possible to get a table with harmonics up to the 40th order. For each harmonic the user will get the value in mA/W or in %. Harmonics intensity data will only be read during measurement if the table option is enabled via the udb-file. The harmonics table can be saved as csv-file or data can be printed.


Show tables for Flux/time table

Graphics | File: Demo cones 3 | (Luminaire)

Save as ...

No.	Time [hh:mm:ss,d]	Powerfactor	f [Hz]	U THD [%]	I THD [%]
1	00:00:00,0	0,95761	49,98	0,053	17,839
2	00:00:01,0	0,95764	49,98	0,052	17,831
3	00:00:02,0	0,95768	49,98	0,051	17,821
4	00:00:03,0	0,9577	49,98	0,050	17,814
5	00:00:04,1	0,95772	49,98	0,051	17,808
6	00:00:05,1	0,95773	49,98	0,051	17,805
7	00:00:06,1	0,95773	49,98	0,053	17,804
8	00:00:07,1	0,95771	49,98	0,053	17,804
9	00:00:08,1	0,95769	49,97	0,054	17,807
10	00:00:09,1	0,95766	49,97	0,054	17,812


Show tables for Demo cones 3

Graphics | File: Demo cones 3 | Table: THD Harmonics [mA/W]

Save as ...

Harmonics order	[mA/W]	[%]
1. Order	4,470E+00	98,352
2. Order	9,718E-03	0,214
3. Order	7,754E-01	17,059
4. Order	2,460E-03	0,054
5. Order	1,994E-01	4,387
6. Order	2,276E-03	0,050
7. Order	1,287E-01	2,831
8. Order	1,292E-03	0,028
9. Order	5,899E-02	1,298
10. Order	2,153E-03	0,047

Ambient Sensors

The dialogue to adjust the ambient sensor parameter has been changed. Up to 8 devices can be configured now, even if they are connected via different IP addresses. The window within the hardware test has been correspondingly adapted.

A humidity sensor is available via the same interface as the temperature sensors. It has been added in Limes 2000 as an additional ambient sensor device.

Reflex measurements

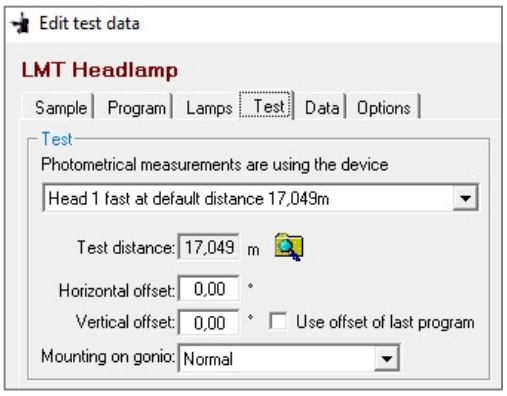
Text for tooltips have been implemented within reflex measurement definition, for instance for the dimension settings of the DUT. The parameters are used to calculate the area is if the unit is cd/(lx•m²).

If no dimension is given at all, an area of 100 cm² is used to calculate the value in cd/(lx•m²).

Miscellaneous

- During measurements performed with the spectrometer the user could not stop the measurement while LimesControl was waiting for data from the spectrometer service. This is now possible and the current status (change of range or integration time, dark measurement) and interaction will be updated as well in Limes 2000.
- The algorithm within the polygon scan sometimes neglected values on the top border of the polygon. The calculation method has been improved and works as expected.
- Editing of polygon points has been improved. The last point will be adopted even if it has not been confirmed before leaving the view.
- The smoothing option within “show grayscale” in isoline diagrams enhances the point density and interpolates gray scale in between measured points. When using the mouse cursor across the interpolated distribution, values were not properly shown. This has been corrected and the interactive display will show correct angles and intensity in smoothed plots.
- Limes 2000 was sometimes freezing during ISO-line calculation based on huge amount of grid data. Therefore, the algorithm has been improved and should be more robust now. In addition, the progress bar during calculation is now working properly.
- In case intensity or colorimetric tables (e.g. I, E, x, y, u',v', Tc, ...) are saved as csv files, the separator will be written at the start of a csv file. In this case Excel will use the correct separator, even if the language settings in Windows are different.
- The user will be informed via a label (Caps Lock ON!) during the log-in dialog if caps-lock is switched on.
- The behaviour of IR radiometer heads which are connected to a standard photometer unit was slightly changed in Limes 2000. The measuring unit of the device will be always lx because the calibration constant is given in (W/m²)/lx. Calculation of W/sr will be done during evaluation based on the measured values in W/m² and the distance. A bug was fixed which allowed to measure with unit cd.

- Automotive test programs measuring beyond ±90° should always use the sphere geometry. The calculation of photometric data to screen geometry will fail at angles ≥ 90°.
- A error occurring with screen geometry activated has been fixed. If the values were measured in cd, the calculated lx values were set to zero for |H| or |V| > 90°. The same problem occurred if lx was measured and cd was subsequently calculated.
- It is now possible via the “Head” button on the TeleControl to change between slow and fast mode of AMR photometers. The change is indicated in the head number by “f” or “s”.
- It was not feasible in the past to move to the mounting position using the TeleControl. The bug was fixed.
- CCT initialization using the actual position can be done as well with the TeleControl. There was a bug indicating the position by a factor 10 to high.
- Users of GO-H goniophotometers have now the possibility to set the type of angular transmitter for the H-axis, e.g. distinguish between old and new encoders. Angular encoders of earlier systems were ranging from 0° tor 360° or from -180° to 180° although the axis allowed a rotation of more than ±180°. After moving the H-axis manually beyond ±180° and subsequently switching back to automatic control, the software was not able determine the direction of H=0° and drove the goniometer sometimes into the end switch.
  With new goniometers having absolute encoders ranging from -288° to +288° the user can change the setting to the new decoder type and the software will be always able to move the H-axis safely back to H=0°.
- For GO-H applications the user can now decide whether the next measurement should have the same offset as the former measurement (see figure to the right). In the past there was only the possibility that all programs in a batch used the same offset or the offset was always newly defined.
  However, if in the course of a new measurement a visual aiming is performed, the offset of the former measurement will be ignored.
  This feature is helpful in case of highly automated program control where a lot of measurements with different functions and light sources within a headlamp device are executed in series.



- In GO-H applications a run-time error occurred if the user wanted to export lamps to another database. The bug has been fixed.