

SMF/L – THE WORKSHOP SYSTEM FOR AIRFIELD LIGHTS ASSESSMENT

CAT II and CAT III medium-large size airports have a huge number of fixtures working in the field demanding every day for a considerable maintenance activity. In field rapid and accurate measurement of inset and elevated aerodrome lights performances must therefore be followed by a quick and affordable repair and replace service, able to maintain the overall AGLS performance conforming with ICAO recommendations.

Taking into account the large number of inset lights (at least R/W Centreline, Threshold, TDZ, T/W Centreline & Stop-Bar , Inset Approach) the maintenance routine will be mainly addressed to in field failed fixture replacement with a spare from the shelf of the workshop. Spare depot must be therefore able to provide revised fixtures ready to be installed having checked the performances of such refurbished spares. In this scenario the usage of a system dedicated to the assessment of new and refurbished fixtures may help the maintenance personnel in controlling the quality of spares stock , increasing the efficiency of operations and cancelling the costs due to uncontrolled repair activities.

ARGOS SMF/L

SMF/Lab-CHS is the photometric measurement system for AGL equipment especially designed and developed by ARGOS INGEGNERIA to operate in the workshop of the airfield lights department.

SMF/Lab-CHS belongs to the ARGOS 's photometry product family and it's typically

recommended to check the fixtures before the re-installation in the airfield after repair and refurbishment.

SMF/Lab-CHS system (Fig.1) is particularly addressed to customers already equipped with ARGOS's mobile system SMF/M , as it may share the same measurement bar used in mobile operations.

The high accuracy of SMF/Lab-CHS makes the system also suitable to certificate the performances of brand new fixtures before the installation or at the final production stage in an AGL manufacturing plant.



Fig.1 – SMF/L in a lab

Working principle

In SMF/L-CHS the measurement is performed by the combination of a steady 13 sensors array vertically installed on a suitable stand and a motorized computer controlled turntable, which rotates in the horizontal plane the beam of the fixture under test synchronizing the sampling process of the bar. In such a way a Continuous Horizontal Scan (CHS) is performed to get the photometric values of the light under test at requested vertical and horizontal angles.

The data flow coming from the high resolution horizontal scanning will be therefore processed to compute, store and display all the light parameters, including the beam average intensity in candelas, the maximum and minimum intensity, the beam elevation, the toe-in and the ISOCANDELA diagram according to ICAO Annex 14 reference grid requirements. The measuring bar is equipped with one color sensing device according to CIE 1931 recommendation.

Through the Continuous Horizontal Scan SMF/LAB-CHS covers a vertical angle of 20 arc-degrees and an horizontal angle of 40 arc-degree of the output beam.

Measurement operations are fully automated and allow 7x13 grid points measurement (ICAO grid points) or 13x13 extended grid points based on micro steps with 2 to 8 arc-minutes horizontal angle resolution.

The system is fully controlled by a user friendly application software which includes all the functions necessary to create the data base, to set up the system parameters, to save and display the results of measurements, to compute, display and print the ISOCANDELA diagrams.

The system software runs on a MS Windows 7 OS platform. All the data acquired during the measurement sessions are stored into the system data base and can be exported to other MS Office programs for any further application or customer need.

SMF/Lab-CHS Architecture

Figure 2 shows the general architecture of SMF-Lab-CHS system. The photometric sensors array integrates an high speed ADC data acquisition system (it is similar to the one used in the SMF/Mobile system). The optimized LUX sensors spacing in the bar in combination with the high resolution horizontal scan of the beam allow the SMF-Lab-CHS system to accomplish the precise and accurate measurement of all types of fixtures. Both the turntable subsystem and the sensor bar are connected to the system PC via a LAN port.

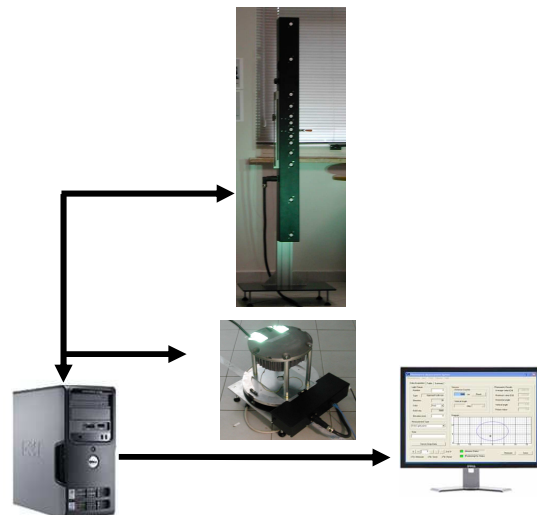


Fig.2 – System Architecture

System Components

The SMF-LAB-CHS system is made of the following three main components:

- a) a robust self-standing motorized turntable , which includes power supply and electronics to safely drive the rotation of the fixture having a constant speed. The subassembly integrates a rotating platform driven by an electric motor (Fig.3) monitored via a PWM device and controlled by an angular encoder. The run of the turntable is protected by two sensors able to switch off the electric motor should some malfunction occur on the PWM controller.
- b) a steady measurement bar, vertically installed on a proper support allowing a fine adjustment of the height. The bar contains 13 LUX sensors, 1 colorimeter CIE 1931, the electronics for high speed sensor sampling (16 bit ADC) and a local processor for data acquisition , formatting and LAN communication management.
- c) a system PC , connected via LAN to the bar and the turntable , which runs the software responsible for system data base set-up , turntable commands (Start/Stop rotation – Return), data processing and reporting.

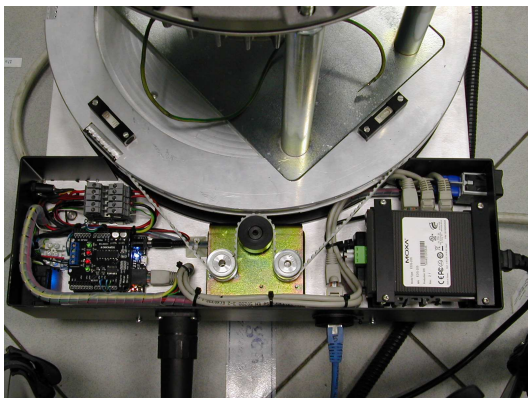


Fig.3 - Electric motor and encoder

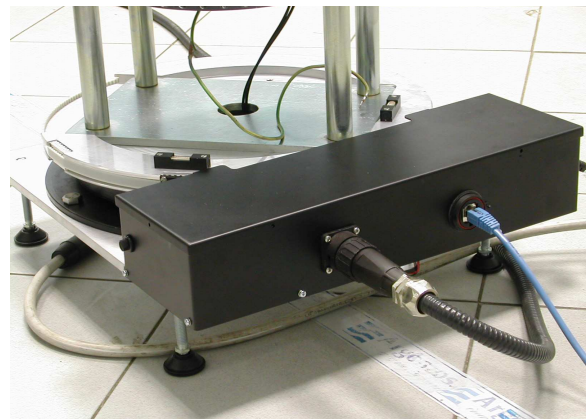


Fig.4- Master Cable and LAN connection

Turntable adapters and stands for fixtures

The turntable is able to receive all the types of fixtures through the set of stands provided with the system (Fig.5,6,7,8).

All types of fixtures (inset and elevated, with or without toe-in) will be positioned in the same way: the system will automatically compute the toe-in on the basis of the lamp type data selected in the system data-base. The computed toe-in value will be therefore indicated in the report while the centre of the light beam will appear in the middle of the intensity diagram.

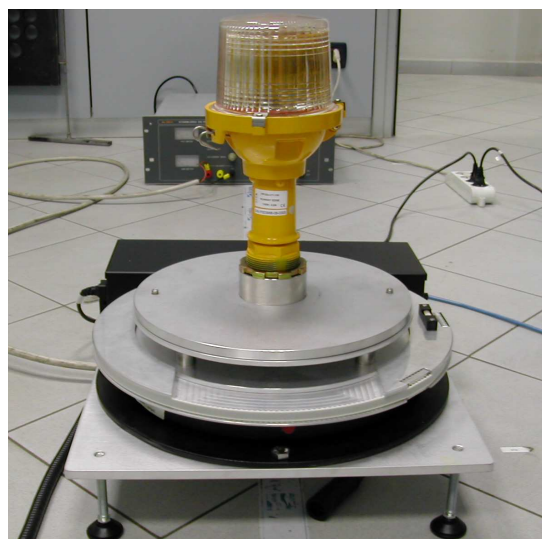


Fig.5 -Elevated light Stand – Edge light



Fig.6 - Elevated light Stand – Approach Light



Fig.7 – 8 " Inset Light Stand



Fig.8 – 12 " Inset Light Stand

SMF/Lab - CHS Reports

The system is able to display several types of diagrams and reports (Fig.9) including the intensity high resolution diagram and the ICAO ANNEX 14 ISOCANDELA diagram.

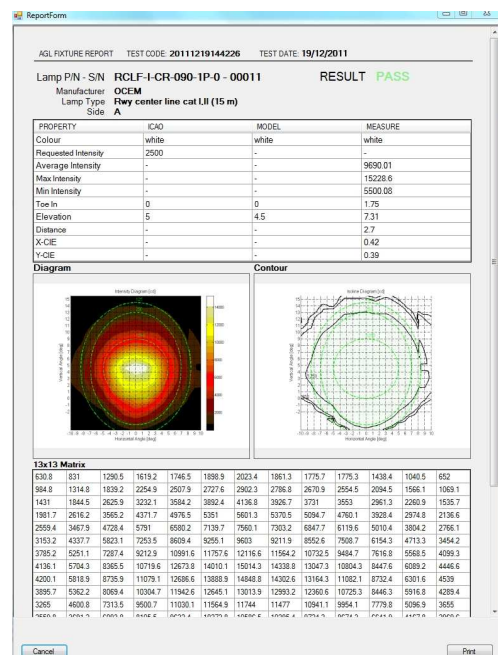
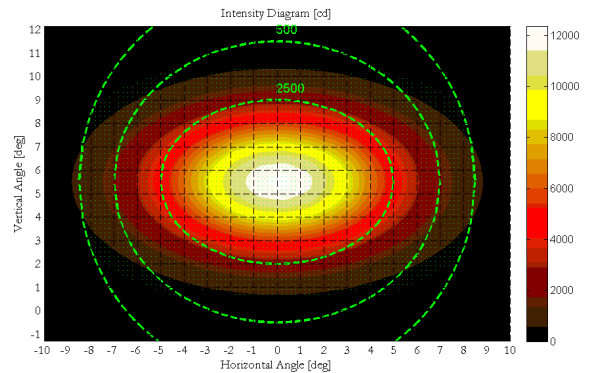
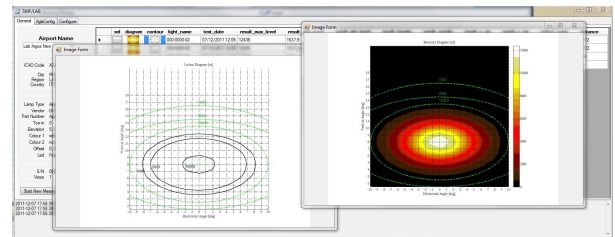


Fig.9 – Examples of reports

SMF/L – CHS - Technical features

- High precision microprocessor controlled motorized turntable subsystem
- 13 LUX sensors measuring bar with continuous acquisition method at step of 2' of arc-degree
- Illuminance sensors acquisition with 0.25 LUX resolution
- High speed electronics for sensors oversampling with 16 bits ADC
- 1 color measuring device conforming to CIE 1931 recommendation (ICAO)
- 7 x 13 (ICAO) ,13 x 13 or continuous grid points diagram
- Average , maximum and minimum values (CD) of beam intensity measurement
- Vertical and horizontal angle measurement
- SQL compatible system data base
- LAN communication
- Manual operations panel
- Power supply: 110/220 VAC, 100 W max. including system PC
- Accuracy : < 3%
- Repeatability :< 2%
- System software compatibility with SMF ARGOS products family
- SMF/L allows customers of SMF/M to use the same sensor bar of mobile system
- Integrates the SMF/M hardware and software technologies approved by Italian CAA ENAC