Input paper: [[1]](#footnote-1) ENG5-9.17

Input paper for the following Committee(s): check as appropriate Purpose of paper:

**□** ARM **🗹** ENG **□** PAP **🗹** Input

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Technical Domain / Task Number 2 Visual

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Proposal for IALA Recommendation E-200-3 on Measurement of Marine Signal Lights

# Summary

During the review of the existing IALA Recommendation E-200-3 on the measurement of marine signal lights, it was concluded that the original plan of converting the entire document to a guideline might need to be reconsidered.

It is proposed that a Recommendation, in a much reduced form, is produced to highlight key points from the existing document, and that the techniques and other information be moved into a relevant guideline.

It was also found that the implication of measurement uncertainty and confidence requires further clarification concerning the determination of the luminous range from measurement.

## Purpose of the document

To propose a way forward on the revision of IALA Recommendation E-200-3 under the new IALA document structure.

## Related documents

* Existing IALA Recommendation E-200-3

# Background

The ENG Committee is asked to review existing documentation in light of the new documentation structure of the organisation. The original idea was to convert the entire recommendation to a new guideline, but on reviewing the document, it is felt that there is sufficient key points on measurement to warrant a recommendation on measurement.

# Discussion

The original plan for the existing IALA Recommendation E-200-3 under the new document structure of IALA is to convert the entire document to a guideline, supporting the other documents in the series on marine signal lights.

## Recommendation and Guideline Split

However, on reviewing the document, it has become evident that a number of points raised in the existing recommendation are considered too important to be in a guideline because they help define measurement results in a harmonised way across the industry.

The majority of the topics that should be considered as a part of the new recommendation largely sit in Section 11. In particular, the recommendation should define the various elements of a measurement, such as:

* Horizontal and vertical profiles (Section 11.1)
* Flash duration (Section 11.3)
* Effective intensity (Section 11.4)
* Colour representation (Section 11.7)
* Effective intensity to use for nominal range calculation (Section 11.10)
* Uncertainty and confidence (Sections 11.11 and 8.14.3)

All other topics should reside in a new guideline as it discusses the methods of measuring the attributes given above.

By splitting the document up as proposed, the reader can obtain further clarity on how lights should be measured and reported in a standard way.

## Measurement uncertainty and nominal range

One area that would require further thought and discussion at the Committee is the implication of measurement uncertainty and confidence on the reported nominal range. Whilst it is recognised that the existing recommendation covers uncertainty and confidence is sufficient detail for the reader to understand the principles, the implication of it on determining the nominal range is not sufficiently covered.

Section 8.14.3 discusses using a coverage factor that provides a confidence level of 95% in the measured value. It is not stated explicitly that the nominal range should be calculated using effective/apparent intensity values with 95% confidence.

This is particularly important when reporting the luminous range of a measured light. According to IALA Recommendation E-200-2, the luminous range of a light, to the nearest nautical mile, is determined by the effective intensity having a value within particular range. The uncertainty in the measurement allows for a distribution of probability for the actual intensity of the light, and so the value to use to determine the luminous range of the light is subject to a confidence level.

It is recommended that the luminous range be determined by an effective intensity measured to 95% confidence, i.e. an intensity of light that is 95% certain that the actual intensity value lies above. Note that for a Gaussian distribution, this equates to a coverage factor, k, of 1.64, and not 2 that is normally associated with the 95% confidence level. This is because it is necessary to include all of the upper tail of the Gaussian distribution and allow for 5% probability below the threshold level.

More information on this can be obtained from [1].

# References

1. UKAS; The Expression of Uncertainty and Confidence in Measurement; Ed. 3; November 2012; http://www.ukas.com/download/publications/publications-relating-to-laboratory-accreditation/M3003\_Ed3\_final.pdf

# Action requested of the Committee

The Committee is requested to:

1. Consider the document structure proposed for the revision of IALA Recommendation E-200-3.
2. Consider the uncertainty and confidence level of measurement on determining the luminous range of a marine signal light.

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-1)
2. Leave open if uncertain [↑](#footnote-ref-2)