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| IALA Guideline |

DraFT G1111-8

Producing Requirements for Long Range Sensors

Functions, Performance And (XXXX) specifIC AcceptANce

Working paper, output from VTS ##

Edition x.x

Date (of approval by Council)

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Revisions to this document are to be noted in the table prior to the issue of a revised document.

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| Date | Details | Approval |
|  | Edition 1.0  *Replace text as appropriate to series-specific sensor.*  ~~This document originated from Guideline G1111 which has been subdivided into 13 sub-guidelines, including this document. Document structure revised, Basic, Standard and Advanced substituted with guidance on specific areas including Inland VTS, Ports, Ports Approach and Coastal VTS. Guidance on offshore related VTS and Acceptance of VTS Radar Systems added.~~  ~~Measurements in Metric terms adopted for Inland Waterways only.~~  ~~(Note - G1111 originated from annex of Recommendation V-128 Ed 3 in May 2015)~~ |  |
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# INTRODUCTION

This Guideline presents a common source of information to assist VTS Providers in the understanding of Long Range Sensors and their contribution to the VTS traffic image (situational awareness) as well as guidance of how the VTS Provider should specify the Functional and Performance Requirements. The VTS Provider should note that it is important to determine the actual performance requirements of the Long Range Sensors and that it should be clearly defined relative to the area / vessels / targets that are to be monitored.

Copying parameters from a manufacturer’s data sheet is not recommended.

This guideline considers the application of Long Range sensors to different VTS operational areas (e.g. inland waterways, Harbours, Coastal regions and offshore).

Specific maritime security requirements, possibly identified by the International Ship and Port Security code, are not considered within this guideline.

## The IALA G1111 guideline series

This Guideline is one of the G1111 series of guideline documents. The purpose of the G1111 series is to assist the VTS Provider in preparing the definition, specification, establishment, operation, and upgrading of a VTS system. The documents in this series address the relationship between the operational requirements and VTS system performance (technical) requirements and how these reflect into the overall system design requirements.

The G1111 series of guideline documents present system design, sensors, communications, processing, and acceptance, without inferring priority. The guideline documents are numbered and titled as follows:

* G1111 Establishing Functional & Performance Requirements for VTS Systems
* G1111-1 Producing Requirements for the Core VTS System
* G1111-2 Producing Requirements for Voice Communications
* G1111-3 Producing Requirements for RADAR
* G1111-4 Producing Requirements for AIS and VDES
* G1111-5 Producing Requirements for Environment Monitoring Systems
* G1111-6 Producing Requirements for Electro Optic Sensors
* G1111-7 Producing Requirements for Radio Direction Finders
* G1111-8 Producing Requirements for Long Range Sensors
* G1111-9 Framework for Acceptance of VTS Systems

# DEFINITIONS

## General Terms

## Specific Terms

## Specific IALA Definitions

**Specific Term in bold –** details in normal text. Include items specifically related to the series topic where IALA has additional clarifying details to common definition (if common definition exists. If no common definition exists, use the IALA definition on its own.)

# References

[1] IMO - Greenhouse Gas Strategy

# Abbreviations

Please refer to IALA G.1111 Establishing Functional and Performance Requirements for VTS systems for an extensive list of abbreviations and acronyms covering the entire G1111 series. This section identifies abbreviations that are related to Long Range Sensors only.

# Operational OVERVIEW

This guideline is a part of the overall G1111 guideline and considers the operational application of Long Range sensors. The use of such sensors can assist the VTS Operator in understanding the expected time of arrival for visiting ships. It may assist in locating vessels that have not arrived on schedule or detect vessels that arrive unannounced. It allows authorities to assess potential security risks or, should the need arise, provide input data for search planning in case of a SAR incident.

Typical long range sensors include:

• LRIT (Long Range Identification and Tracking);

• Satellite AIS (SAIS);

• HF Radar;

• Satellite-based Synthetic Aperture Radar (SARSAT).

This section provides an overview of each of the above and identifies the applicability, benefits and limitations of these sensors to VTS Providers.

# LONG RANGE IDENTIFICATION AND TRACKING (LRIT)

LRIT is a mandatory carriage requirement for SOLAS vessels. It provides a ship position report at regular intervals based upon the area of operation. The normal reporting interval is every 6 hours. LRIT data is received by International Data Centres (IDC) and is available to the flag authority and to the maritime authorities of transit and destination countries.

LRIT data can provide en-route information about the progress of incoming vessels that can assist the VTS Provider in maintaining an accurate assessment of its time of arrival. When establishing the appropriate time slot for the arrival of a vessel, the LRIT data may used to determine whether the ship may arrive early or late. In such circumstances, the vessel may be contacted to advise that it should adjust its speed in order to arrive in accordance with the calculated ETA defined as its allocated arrival slot time.

In circumstances where a vessel has arrived unexpectedly or gone missing, the historical LRIT information may provide the additional information needed for a security assessment or the planning of search activities.

LRIT is an established service and, subject to approval by the national maritime authority, the VTS Provider can access the International Data Centre and integrate appropriate LRIT data.

It should be noted that LRIT data normally carries an airtime cost per position report and that the IDC may charge for the provision of the data.

As the applications for LRIT data continue to evolve, other uses and benefits may be determined and implemented.

# SATELLITE AIS

An AIS satellite listens to AIS transmissions within its footprint area and stores the data on-board until it passes over a ground station, to which the data can be downloaded. Satellite AIS has a potentially global coverage, particularly now that dedicated VHF channels are allocated to satellite AIS.

Satellite AIS data may also be used to provide en-route information about the progress of incoming vessels that can assist the VTS Provider in maintaining an accurate assessment of its time of arrival. When establishing the appropriate time slot for the arrival of a vessel, the S-AIS data may used to determine whether the ship may arrive early or late. In such circumstances, the vessel may be contacted to advise that it should adjust its speed in order to arrive in accordance with the calculated ETA defined as its allocated arrival slot time.

However, AIS satellites may be unable to receive all AIS transmissions, particularly in dense traffic areas where multiple Self Organising AIS networks may have been established causing some data to be transmitted simultaneously, resulting in data collisions. Such data collisions may make it impossible to properly decode the individual AIS messages, resulting in inaccurate or completely wrong positions, despite the use of advanced de-collision algorithms.

An AIS satellite will only be able to download data when it is in range of a ground station. This means that the data received by the VTS Authority will not be real time and may be up to 2 hours old (or possibly more).

AIS satellite systems comprise several satellites in different constellations, i.e., a polar-orbiting constellation or a mix of equatorial and polar orbiting satellites. The effect of different orbiting constellations will impact when and for how long ground stations can be accessed to download AIS data. The more frequently the satellite can download the data, the less latency between the received data and the real time position of the actual vessels.

Satellite AIS data is provided through a Service Provider to which the VTS Authority will need to subscribe and is now becoming increasingly available via commercial as well as national government-sponsored satellite AIS operators.

The main difference between the terrestrial and satellite AIS data, besides the geographic coverage, is the data latency, i.e., the age of the AIS message when it is actually received by the VTS system. This is generally not a problem, because long range data is used for strategic purposes, where accuracy is less relevant than coverage.

Satellite AIS is an established service that does not require any special design, configuration or installation on the part of the VTS Authority as these are handled by the satellite AIS Service Providers. Once the VTS Authority has subscribed to the AIS satellite service, it will be able to integrate the satellite AIS data as appropriate for its operational requirements.

As the applications for satellite AIS data continue to evolve, other uses and benefits may be determined and implemented.

# HF RADAR

One rarely used technology that can offer long range detection of vessels is HF radar. HF radar has one major advantage over other long range detection technologies in that it does not require cooperation from the vessels to be detected.

There are generally two types of HF radars, those that use the low level earth surface 'hugging' refraction duct and those that use reflection from the layer to layer boundaries in the ionosphere above the earth (sky wave). Both system types suffer from unpredictable propagation path characteristics, which can support medium and large object detection (metal ships) to hundreds of nautical miles in some conditions, but often offers very little detection performance. This makes specification of achievable performance and detection 'availability' a challenge to both radar customers and radar suppliers. The vagaries of the propagation paths can also introduce unpredictable positional measurement errors affecting both angle and range even when an object is clearly detected.

HF radar installation requires some careful selection of suitable coastal terrain, which may not suit all potential VTS locations. Similarly, suitable sites will rarely support the necessary infrastructure (power, communications, access for installation and maintenance) and these need to be factored into the installation and operational costs.

Finally, optimising the nature of HF radar may impose high workload on specialised, highly trained operators.

If the limitations are acceptable, this technology offers valuable passive detection in open waters, expensive to obtain by other means (airborne sensors and satellite). Realistically, however, HF radar systems are not used for VTS purposes.

# SYNTHETIC APERTURE RADAR (SARSAT)

Satellite-based Synthetic Aperture Radar (SARSAT) can provide vessel target information at ranges beyond that of shore-based sensors, including HF Radar. However, such services will probably only provide a single image of a specific area once per day through orbiting satellites. Images are stored on-board the satellite until they can be downloaded as the satellite passes over a ground station. The image is processed, following download from the satellite, to detect ships within the area and radar information (without identity) can be derived that can be used to recognise the type of vessel. This type of service is for analysis of vessel movement and not for any form of near real time monitoring. In addition to the latency between the required image capture and the download when passing over a ground station, there is also a further latency related to the processing of the received data.

SARSAT may, for example, be useful for detecting illegal fishing activity in remote areas of a country’s Exclusive Economic Zone and for detecting oil spills and pollution.

SARSAT is available from a variety of established service providers and does not require any special design, configuration or installation on the part of the VTS Authority. The VTS Authority will need to subscribe to a SARSAT image service and costs are involved on a per image basis. Once access to such a service has been established, the VTS Authority will be able to integrate the SARSAT target data as appropriate for his operational requirements.