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Technical Domain / Task Number 2 Working Group 5 (PNT)

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Progress on Development of eLoran S-20X Product Specification

# SUMMARY

## Purpose of the document

IALA decided to develop S-100 based product specifications on GNSS infrastructure and S-240 DGNSS Station Almanac was drafted for the first initiative. IALA, Ministry of Oceans and Fisheries (MOF) of ROK and KRISO agreed on the development of S-201 and exchanged a letter signed for cooperation among the three parties. In order to carry out the cooperation activities in the letter, ROK undertook to develop S-200 product specification on eLoran. This paper outlines the progress of research activities and application schema of eLoran product specification

## Related documents

* IALA Guideline 1106 – Producing an IALA S-200 series product specification
* IALA S-240 DGNSS Station Almanac Product Specification
* ENAV17 13.13.1 Progress on the development of S-240 DGNSS Station Almanac
* RTCM SC 127 Minimum Performance Standards for Marine eLoran Receiving Equipment

# Discussion

## Progress of developing S-20X product specification on eLoran

The list of S-20X product specifications is like below. While the S-240 DGNSS Station Almanac was drafted for a review process, S-245, S-246 and S-247 was not started

* S-240 DGNSS Station Almanac (Draft 0.0.2 )
* S-245 eLoran ASF Data
* S-246 eLoran Station Almanac
* S-247 Differential eLoran Reference Station Almanac

IALA developed Guideline 1106, which is intended to provide an overview of the development process and be a step-by-step guideline from the data modelling to the actual production of a product specification. ROK team started to develop S-200 PS(Product Specification) on eLoran according to the IALA guideline 1106.

The major requirements of eLoran PS could be found in the Radio Technical Commission for Maritime Services (RTCM) Special Committee (SC) 127. ROK team investigated the RTCM SC 127 to develop the 245, S-246 and S-247. With the investigation results, major requirements for drafting application schema were identified and written as spread sheets. Application schema of each PS was drafted based on the major requirements. This paper describes the investigation results and application schema drafted.

## Requirements analysis for S-20X product specification on eLoran

The development of eLoran Data for Conversion to S-200 Series Format was proceed in RTCM SC 127, and corresponding data was referring to RTCM SC 127 Minimum Performance Standards for Marine eLoran Receiving Equipment (MPS).

The use of spreadsheet and XML format for information management was discussed in previously performed phase for development of S-240 (DGNSS Station Almanac), and accordingly it was decided to consider these two methods. The research team identified eLoran Data for development of S-20X based on the document of RTCM SC 127 MPS, and organized in spreadsheet format.

Table. S-245 ASF Data Spread Sheet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Item | Description | Format | Unit |
| ASF Data | Name of the coverage area |  |  |  |
| Name of issuing organization | Name of issuing organization who provide the data |  |  |
| Issue number of data |  |  |  |
| Date of issue |  | YYYY,MM,DD |  |
| Boundaries of the area | Boundaries of the area for ASF data | N/S/E/W | degree(up to four decimal places) |
| The number of cells | Number of cells in boundary | height, width |  |
| Name of dLoran Stn | Name of dLoran Station associated to ASF data |  |  |
| ID number of dLoran Stn | the ID number of the dLoran |  |  |
| Designator of ASF map | Letter designator of ASF map |  |  |
| The number of separate eLoran signal | Number of eLoran signals for which ASF data is provided |  |  |
| Name of eLoran transmitter | Name of eLoran transmitter associated to ASF map |  |  |
| GRI | GRI chain of transmitter |  |  |
| Designator of transmitter |  |  |  |
| Transmitter designation in LDC | Transmitter designation in the LDC dLoran correction message format transmitted from the dLoran reference station |  |  |
| ASF Value | ASF map value | Lexicographic format(W to E, N to S) | microseconds(three decimal places) |
| ASF measurement error values | ASF map measurements error values. Error values are given as standard-deviations | Lexicographic format(W to E, N to S) | meters(two decimal places) |

Table. S-246 eLoran Transmitter Station Almanac Spread sheet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Item | Description | Format | Unit |
| eLoran Transmitter Station Almanac | Version | Reference to Minimum Performance Specification version conformance |  |  |
| Name of issuing organization | Name of issuing organization who provide the data |  |  |
| Issue number of data |  |  |  |
| Date of issue |  | YYYY,MM,DD |  |
| Transmitter ID designator |  |  |  |
| Emission delay |  |  |  |
| Transmitter name |  |  |  |
| Signal power | Signal power of transmitter |  | kW |
| Nominal ECD | Nominal ECD of transmitter |  |  |
| Transmitter position | The latitude and longitude of the transmitter position to 1cm precision |  | degree(eight decimal places) |
| LDC Type | 0x00 = none, 0x01 = tri-state PPM,  0x02 = 9th Pulse, 0x04 = 10th Pulse |  |  |
| Pulse type | 1 = eLoran, 2 = Chyka etc. |  |  |
| Dual rate flag | 0 = single rate, 1 = dual rate |  |  |
| Blanking priority flag | 0 = priority on this rate, 1 = priority on dual rate, 2 = alternate blanking |  |  |
| UTC synchronisation mode | 0 = SAM control, 1 = TOE control |  |  |

Table. S-247 dLoran Reference Station Almanac Spread Sheet

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Category | Item | Description | Format | Unit |
| dLoran Reference Station Almanac | Version | Reference to Minimum Performance Specification version conformance |  |  |
| Name of eLoran region |  |  |  |
| Name of issuing organization | Name of issuing organization who provide the data |  |  |
| Issue number of data |  |  |  |
| Date of issue |  | YYYY,MM,DD |  |
| Name of dLoran Station | The name of the associated dLoran |  |  |
| Numerical ID of dLoran |  |  |  |
| Differential correction flag | relative = 0, absolute = 1 Absolute corrections are synchronized to UTC time |  |  |
| Number of ASF maps | The number of ASF maps served by the dLoran |  |  |
| ID numbers of ASF maps | The ID numbers of the ASF maps served by the dLoran |  |  |
| dLoran position | The latitude and longitude of the dLoran position to 1mm precision | latitude, longitude | degree(eight decimal places) |
| Number of transmitters | The number of transmitters served by the dLoran |  |  |
| designator of transmitter | The five character designator of the transmitter | 5 character |  |
| Nominal ASF value | The nominal ASF value of the transmitter |  | miroseconds (two decimal places) |
| Nominal ECD value | nominal ECD value from the dLoran |  | miroseconds (one decimal places) |

## Model design for S-20X product specification on eLoran

### S-245 ASF Data – Application Schema

Model design has been carried referring the analysed results of eLoran S-20X product specification requirements. The metadata of ASF file, S200 Mesh information which stores the information of mesh node, mesh based feature storing the ASF value and error value are categorized. The metadata includes ASF file’s header information and the boundary information of the map area.



Figure. S-245 ASF Data - Application Schema

Although boundaries of the ASF map area are same, map creation information (type of map, designator of transmitter) could be different. So ASF maps are grouped by series with type of map and each series has one more blocks according to the transmitters. Block can proceed the mesh based ASF value and error value. ASF data points are located at the vertex of regular mesh girds and these data values are operated by Feature Type class. One transmitter has one block and all blocks have each one mesh typed map with ASF value and error value.

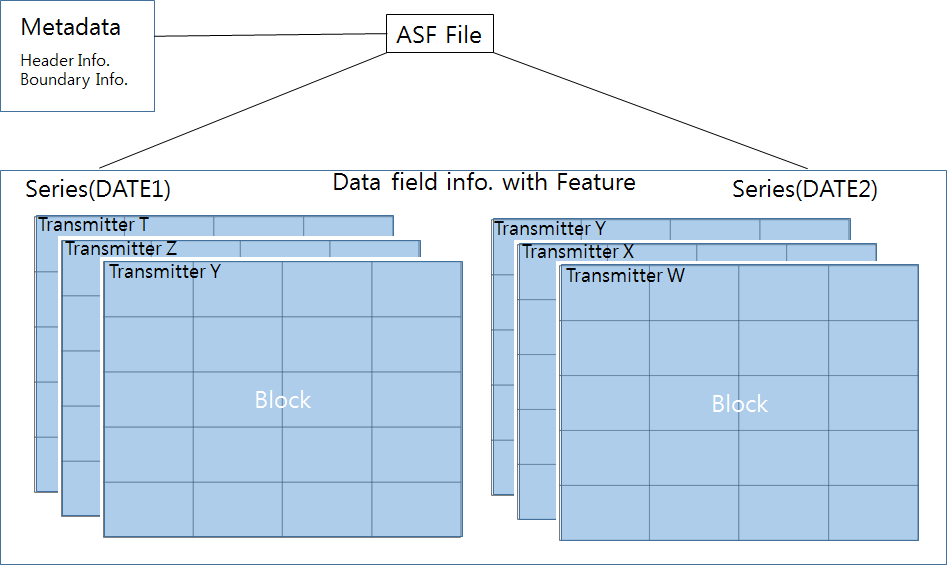


Figure. Structure for Mesh based ASF data

### S-246 eLoran Transmitter Station Almanac – Application Schema

S-246 Application schema was modelled from the investigation results on the major requirements of eLoran Transmitter Station Almanac. eLoran transmitter station was defined as Featuretype RadioStation and almanac information was defined as Informationtype ELoranStationAlmanac. In order to include additional information of eLoran station, Complex attribute graphic and information were added.



Figure. S-246 eLoran transmitter Station Almanac - Application Schema

### S-247 dLoran Reference Station Almanac – Application Schema

S-246 Application schema was modelled from the investigation results on the major requirements of dLoran Reference Station Almanac. dLoran station was defined as Featuretype RadioStation and almanac information was defined as Informationtype DLoranStationAlmanac. eLoran transmitter stations relating to dLoran station was defined Complex Attribute dLoranRelatedTransmitters to include detailed attributes.



Figure. S-246 dLoran Reference Station Almanac – Application Schema

## Future plan

The research team undertook a development of S-245, S-246 and S-247. In order to develop each PS, investigation of major requirement was done from the RTCM SC 127 and application schema for each PS was drafted. The research team is expecting next research activities like below:

* Survey of comments on each application schema on eLoran
* Improvement of application schema
* Drafting main document and annex of S-200
* Creation of test datasets on S-245, S-246, S-247

The research team will proceed above activities and present the research results to ENAV21. ROK hope to cooperate with experts concerned with eLoran.

# Action requested of the Committee

The Committee is requested to:

1. note this paper
2. review application schema on eLoran and provide comments.

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