Nav 08 & ILA 37*The Navigation Conference & Exhibition*

Far East Radio-navigation Service (FERNS) Update

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Far
East
Radio
Navigation
Service

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- The latest issues and annual activities for Loran/Chayka in t he Far East
  - 16th FRENS council meeting
  - 1st, 2nd TWG meetings
  - Next meetings (17th Council meeting, 3rd TWG)
- Verifying the needs for improving FERNS chains, the Accur acy and Functioning of the FERNS Korea chain was analyze d
- Brief outline of the system requirements in order to meet eL oran

2. Latest Meetings

Technical Working Group

- Improvement program for FERNS Co-operating Chains (Task 1)
- Mutual interference between DGNSS stations (Task 2)
- Information exchange on future plan of DGNSS in FERNS members (Task 3)
- Information of the type of Loran-C/Chayka and other integrated user equipment (Task 4)
- Practical use of AIS in the AtoN field (Task 5)
- Program, policy and technical issues developed by the USCG (Task 6)♪
- Technical matters on eLoran and e-Navigation (Task7)

16th Council Meeting

- Tokyo, Japan on 29th October – 2 November 2007

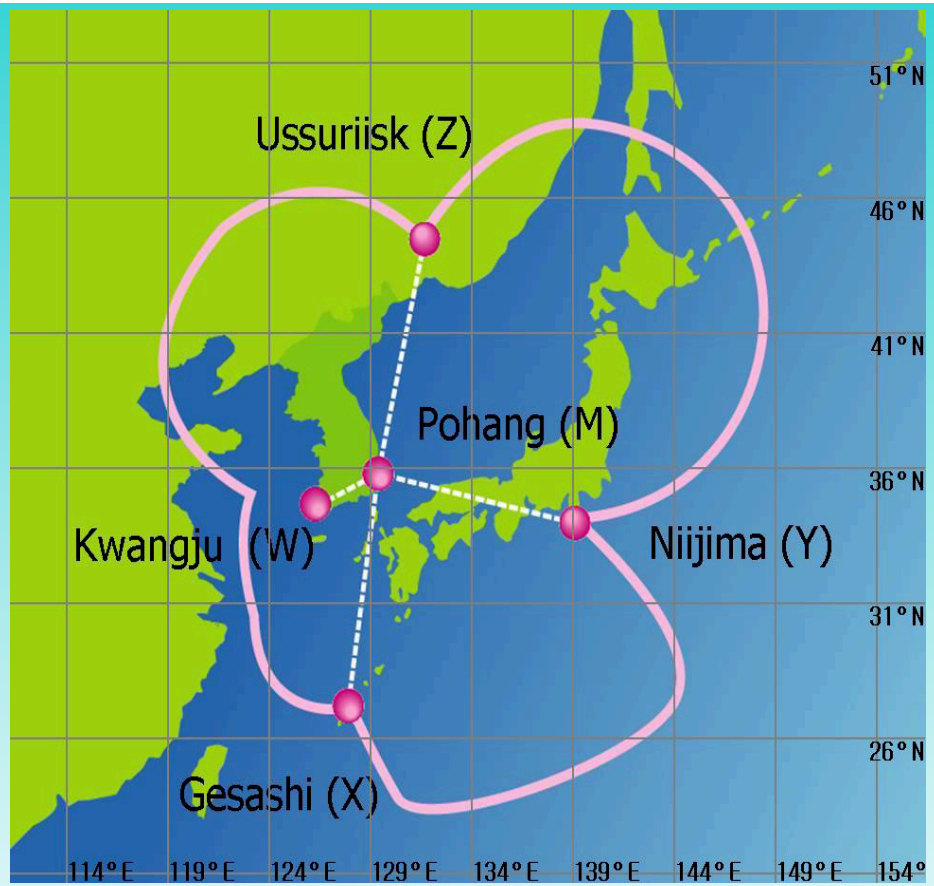
1. Presentation of a Report by Each Country on the Loran-C/Chayka Programme
   - Development of Chayka/Loran-C/Chayka-SNS/Eurofix/DGNSS Integrated Receivers (Russia)
   - Report of Ad-Hoc meeting on Loran/Chyaka (Norway)
2. Report of FERNS Technical Working Group (FERNS TWG)
4. Operational matters for FERNS cooperating chains
   - Timing functions (China)
4. Technical matters for FERNS cooperating chains
   - Proposal for common research for eLoran (Korea)
   - Timing and TOA ASF measurement (China)
5. Coordination of other radionavigation services in the Far East
   - AIS and VTS
6. Symposium on e-Navigation : 30th October 2007

17th Council Meeting

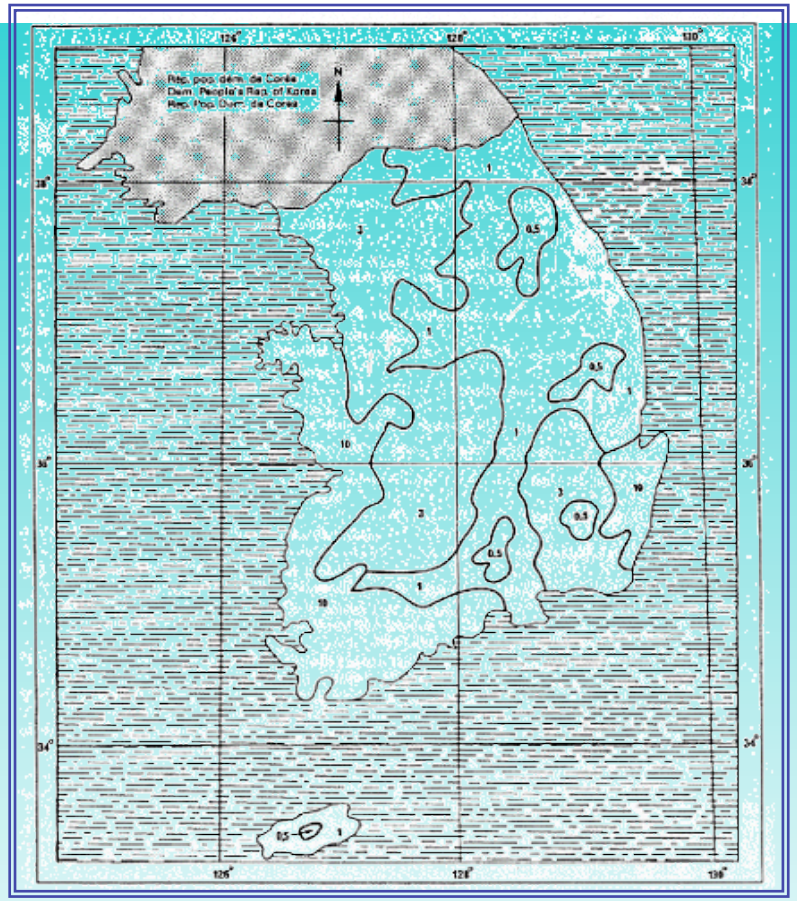
- Moscow, Russia on 10th – 14th November 2008

1. Opening of the session.
2. Adoption of the agenda.
3. Presentation of reports by each country on the Loran-C/ Chayka programme.
4. Operational matters for FERNS co-operating chains.
5. Technical matters for FERNS co-operating chains.
6. Co-ordination of other radionavigation services in the Far East.
7. Any other business.
8. Date and venue of the next session.
9. Closing of the session.

3. Improving the FERNS Chains



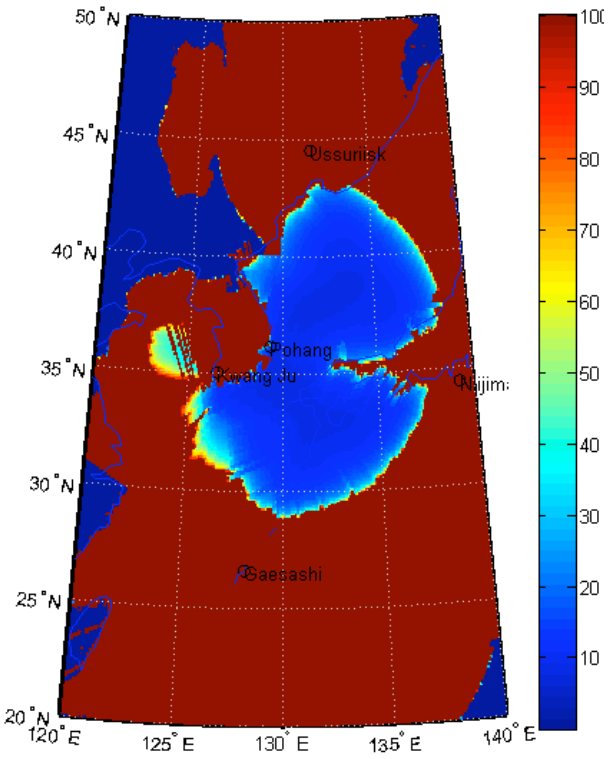
Estimate Limits of Coverage of 9930 ♪

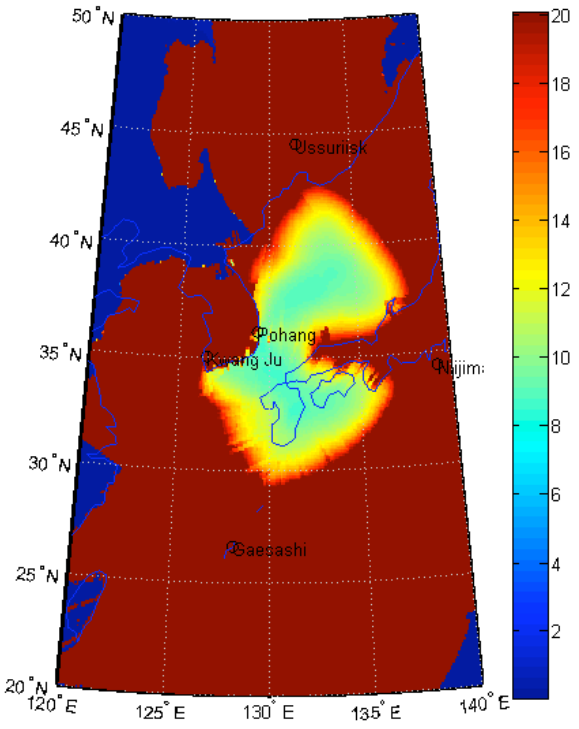


Ground Conductivity in South Korea ♪

Estimating the potential eLoran accuracy performance of the Korea chain (GRI 9930)

All Stations Available



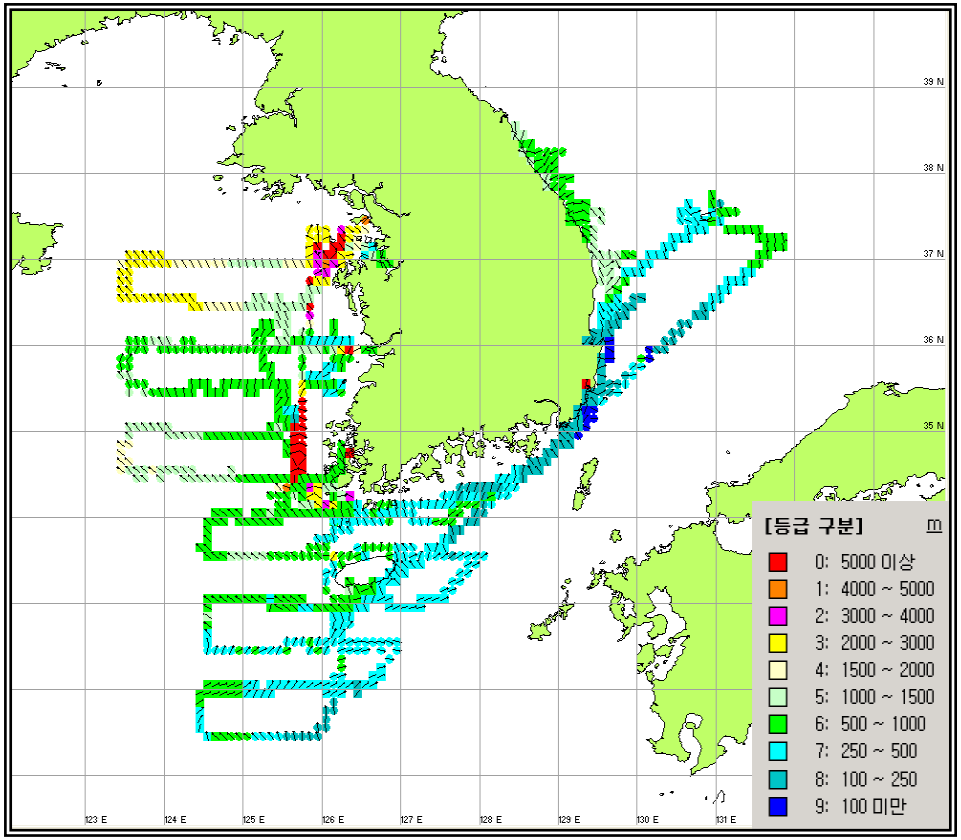


Accuracy within 100m (95%) **Accuracy within 20m (95%)**

Predicted Accuracy Performance in Korea Chain (all on-air)

- By using Pseudo range measurements at Harwich in UK
- Repeatable Accuracy

Proposal of a New Station

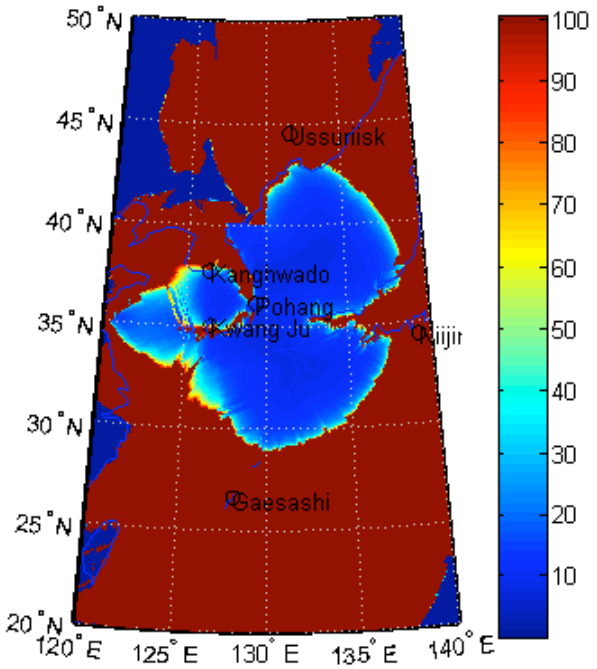


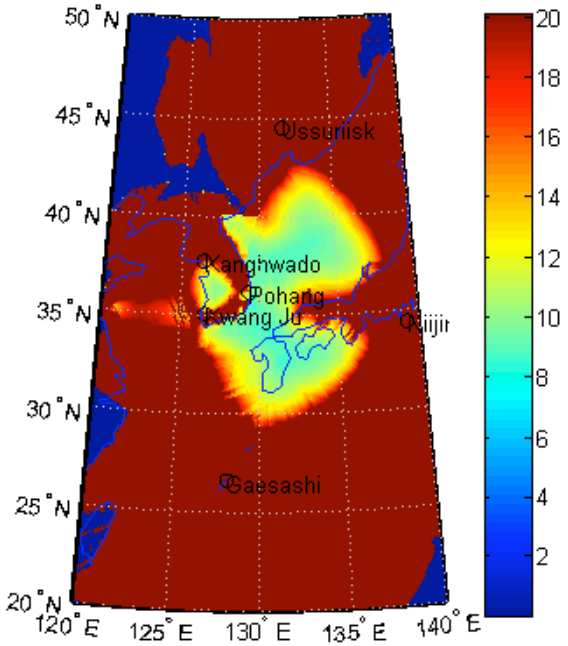
Measured Position Distributions of Korea Loran-C Chain

GRI	Station	Lat/Long	Power in Kw
	Kwangwhado	About 037°.7N 126°.4E	50

Proposed New Station in FERNS Korea Chain

Adding A New Station



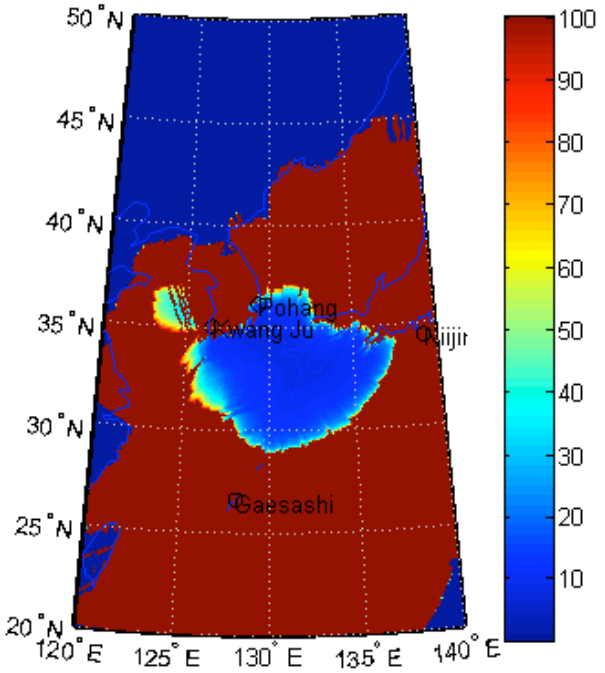


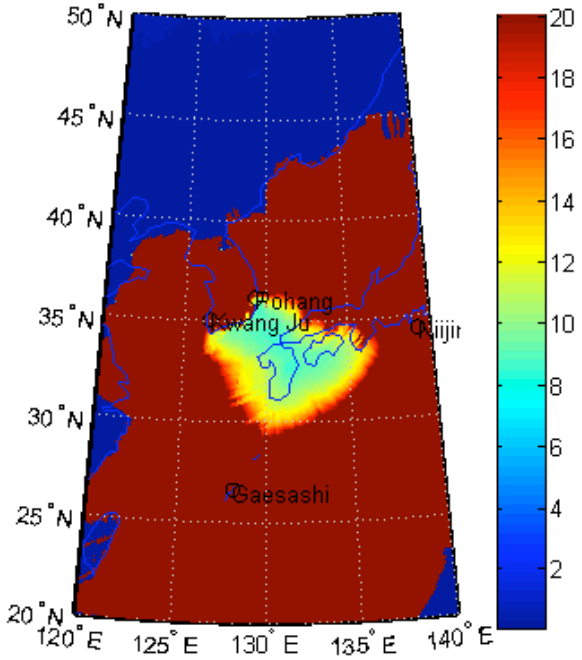
Accuracy within 100m (95%) **Accuracy within 20m (95%)**

Predicted Accuracy Performance in Korea Chain (Additional a new Station)

- By using Pseudo range measurements at Harwich in UK
- Repeatable Accuracy

Considering Ussuriisk





Accuracy within 100m (95%) **Accuracy within 20m (95%)**

Predicted Accuracy Performance in Korea Chain without Ussuriisk

- By using Pseudo range measurements at Harwich in UK
- Repeatable Accuracy

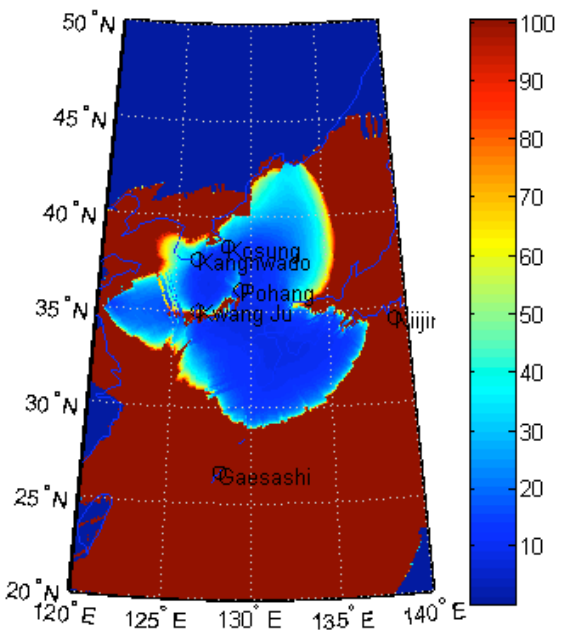
An Additional New Station

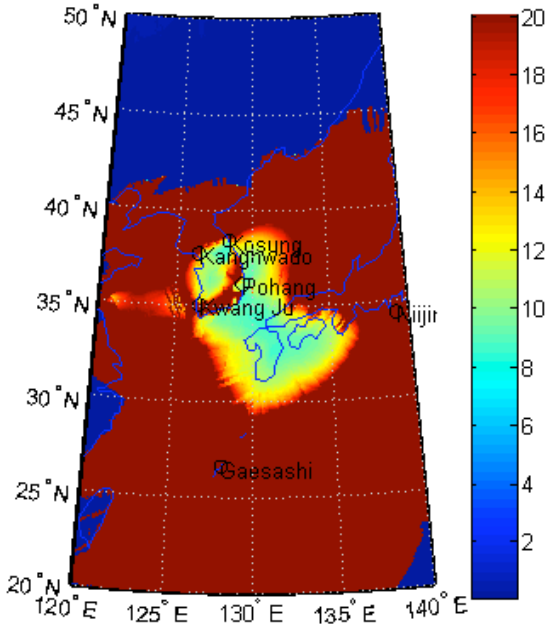
Two new stations proposed in Korea Loran-C Chain

GRI	Station	Lat/Long	Power in Kw
	Kwangwhado	About 037°.7N 126°.4E	50
	Goseong	About 038°.4N 128°.4E	50

Characteristics of the proposed new Stations in FERNS Korea Chain

An Additional New Station





Accuracy within 100m (95%) **Accuracy within 20m (95%)**

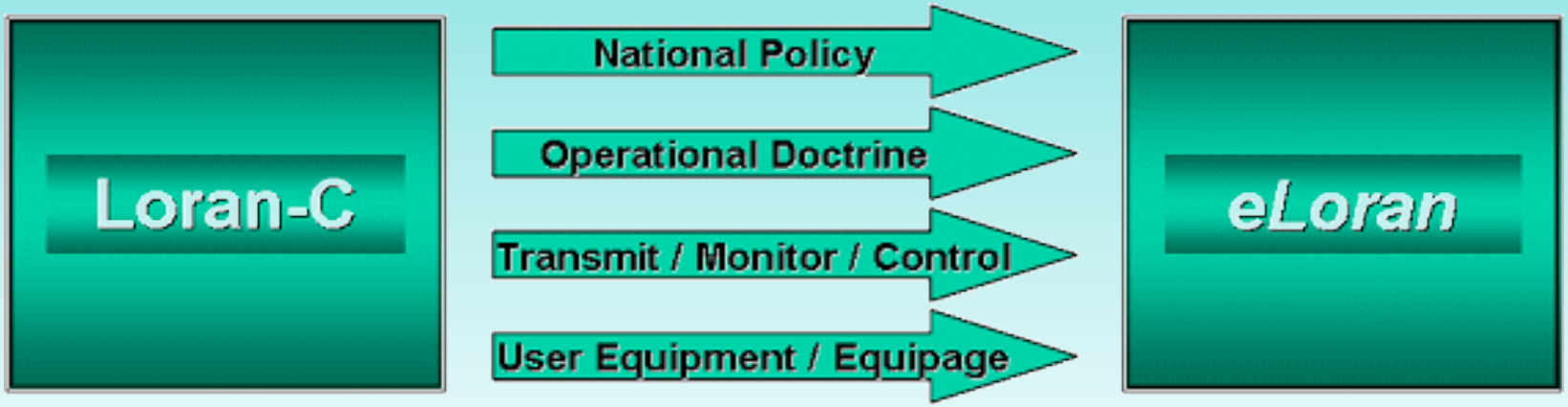
Predicted Accuracy Performance in Korea Chain
(Ussuriisk off-air + Two new stations)

- By using Pseudo range measurements at Harwich in UK
- Repeatable Accuracy

4. System Requirements to Migrate to eLoran

Goals of e-Loran

- Better Accuracy
- Improved Availability
- System Integrity
- Continuity



e-Loran Status of Korean Chain

Descriptions	Status
TOT Control	No
UPS	No
Fast Coupler Switch	Yes
UTC Sync	Yes
Cesium Steering	No
TCS (Transmitter Control System)	No
ABS (Automatic Blink System)	No
Data Channel	No

5. Conclusions

Far East Radio-navigation Service (FERNS) Update

- **A new station will be needed in the western part of the Korean peninsular to improve the performance of the chain.**
- **If Ussuriisk stays off-air, a total of at least two new stations are needed to improve the chain and to migrate to eLoran for inland use.**
- **In order to improve the chain we may need to establish an independent chain or co-operate closely with other chains.**
- **This research will serve as the basis for future studies that verify and improve the performance of all the all FERNS chains.**

Thank you for your kind attention!