



ICAO

*International Civil Aviation Organization***Seventh Meeting of the Surveillance Implementation  
Coordination Group (SURICG/7)**

Video Teleconference, 24 – 27 May 2022

**Agenda Item 7:** Report on surveillance ground system and avionics performance monitoring and improvement in compliance

## **THE SHARING OF THE SOFTWARE RESOURCE FOR BENCHMARKING RADARS**

(Presented by Incheon International Airport Corporation/Republic of Korea<sup>1</sup>)

### **SUMMARY**

There is the need to access the radar performance among APAC ANSPs for the maintenance and the evaluation purpose. This paper proposed that each member states share the relevant radar analysis software for the radar benchmark. The Incheon Int'l airport could be the one of the software donor.

## **1. INTRODUCTION**

1.1 During SURICG/6 2021, the Republic of Korea proposed a new method to analyze the performance of the surveillance system. The final report of the CNS SG25/2021 notes to continue to discuss about performance specifications and benchmarking of radar. At the DAPs/5 2022 WP10, China proposes to study the radar performance parameters for the test and analysis of a Radar.

1.2 For benchmarking radars, ANSPs need the radar analysis software. This paper introduces the radar analysis software “Astecat” developed by the Incheon airport as the one of the cost-free candidate software tools that could be used for benchmarking radars.

1.3 To stimulate the benchmarking of Radars of each ANSPs, we need the communication platform to share the software and other information, for example internet forum sites and the regulatory base in condition that new software is proposed and used freely without any legal obligation.

## **2. DISCUSSION**

2.1 The radar analysis software at Incheon airport – *Astecat*

2.1.1. Incheon airport has internally developed radar analysis software named as “Astecat” for the Eurocontrol Asterix Cat032/048 interface. This software could be distributed among APAC ANSPs in the condition of no warranty and a minimum support. If the certain condition is met, the full source code written by MS Visual Studio 2022 (TM) could be opened only to the APAC member states.

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The list of the software functionality and the screen snapshot of the software are attached as the appendix.

## 2.2 The necessity of new internet forum site

2.2.1. ICAO WGs are formal and annual meetings. A message board (internet forum site) is good for a speedy online discussion and a software distribution. To use certain software tool, many Q&A or issues are normally raised from the difference of radar operation environment at each radar site. For more speedy interaction between ANSPs for the radar benchmark, an internet forum site should be opened.

## 2.3 The regulatory issues about the software resource sharing

2.3.1. The use of unfamiliar software has been sometimes not easy for the beginner. Technical background between the member states are very different. The software developer could be worried about the generation of unwanted problem or bitterly complain about the quality of his or her software, because of the mis-use. His or her software may be commercially used for a company without any notice. So the establishment of a basic regulatory framework is important to stimulate information sharing.

## 2.4 The benchmarking of the surveillance system

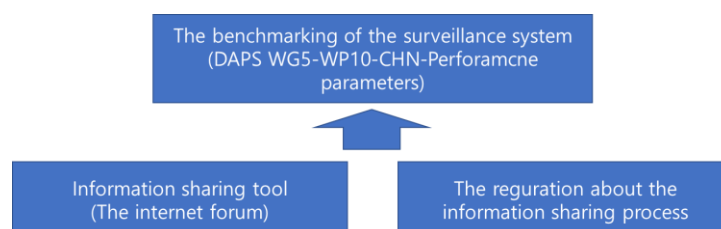
2.4.1. The performance of gaming PC could easily be checked through the open benchmark software ex) 3D MARK(TM). The clear assessment about the performance make it possible to evaluate cost-effectiveness about the investment for a gaming PC. But there is not a clear way to evaluate the surveillance system. Many ANSPs operate their surveillance system without knowing today's performance figures. Even though the implementation of 3D MARK(TM) is more complex than the radar tracking software for the surveillance system benchmark.

2.4.2. The leading aviation authorities – FAA, Eurocontrol have their own radar benchmark tool. But some software is close-used and the user manual is not enough for the beginner. APAC member states could only have very limited access about these resources.

2.4.3. In the No Country Left Behind (NCLB) campaign, the resource sharing about the surveillance benchmarking is one of the easiest item to follow because it only cost the software skill and information.

## 2.5 MSSR SI operation test

2.5.1. The lack of II code availability, the use of SI code is the way we must follow. Many ANSPs have some worries about the implementing SI code operation since they do not have enough evidence about an SI code performance. At the information paper (DAPS WG/4 IP07), ROK reports the SI operation result. About this issue, the Incheon airport is ready to share all software that is used in the radar analysis freely and voluntarily in no obligation condition.



<Picture: the framework for the sharing of the software resource for benchmarking radars>

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

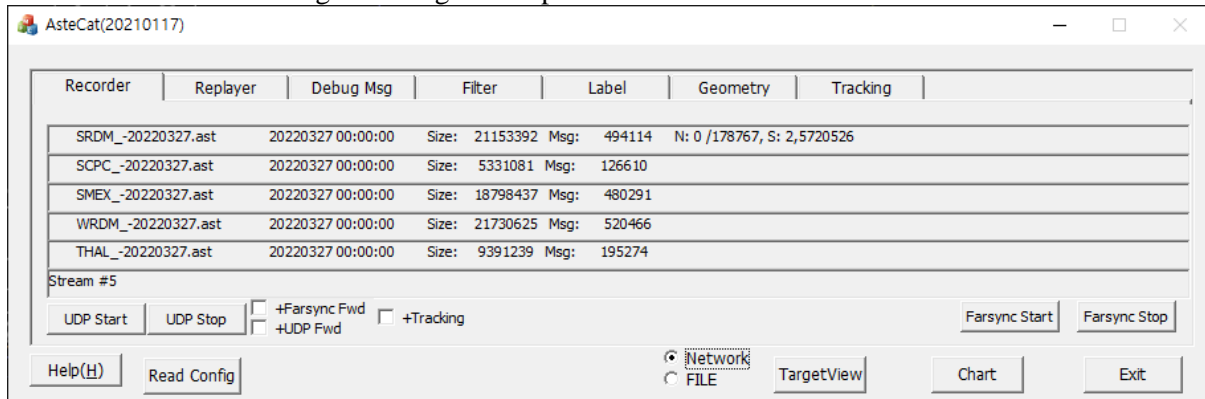
- a) note the information contained in this paper; and
- b) discuss any relevant matter as appropriate

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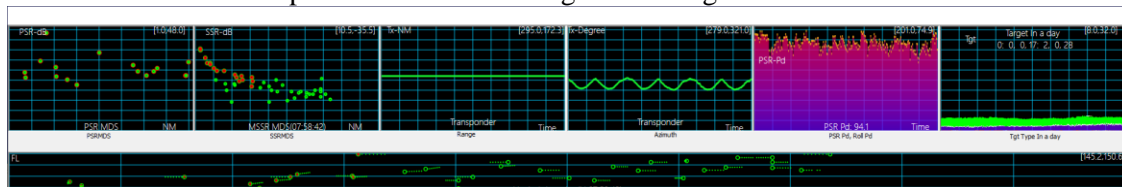
**Appendix 1. The introduction of radar analysis software (Astecat)**

*Astecat* is the radar analysis software developed by Incheon airport. For the surveillance data analysis, ANSPs need a analysis software. ROK suggests that the relevant software resource would be shared between the member states freely and voluntarily. *Astecat* could be shared freely in the condition of no warranty and a minimum support.

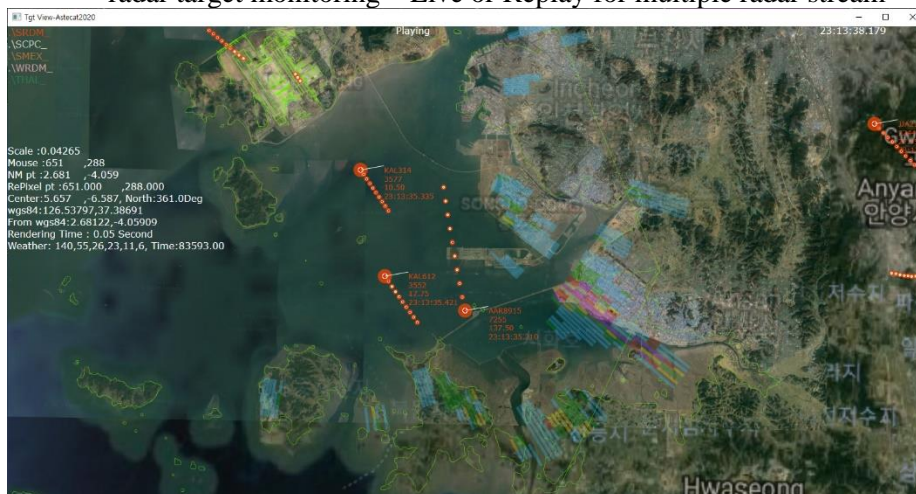
● UDP Multicasting recording – multiple stream



● Realtime radar performance monitoring – Including PSR Pd



● radar target monitoring – Live or Replay for multiple radar stream



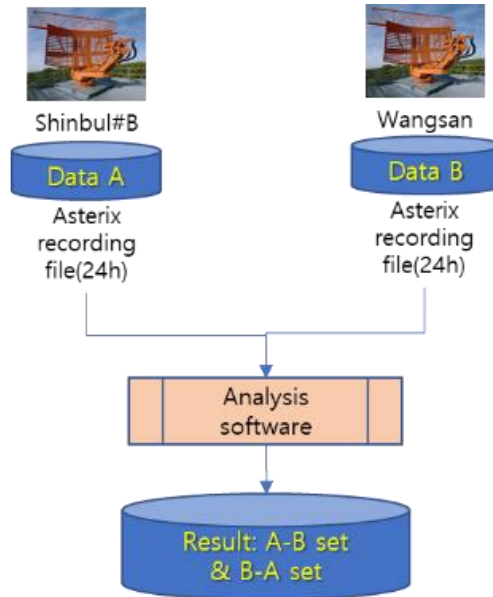
● Command version analysis – PSR Pd and False target count per scan

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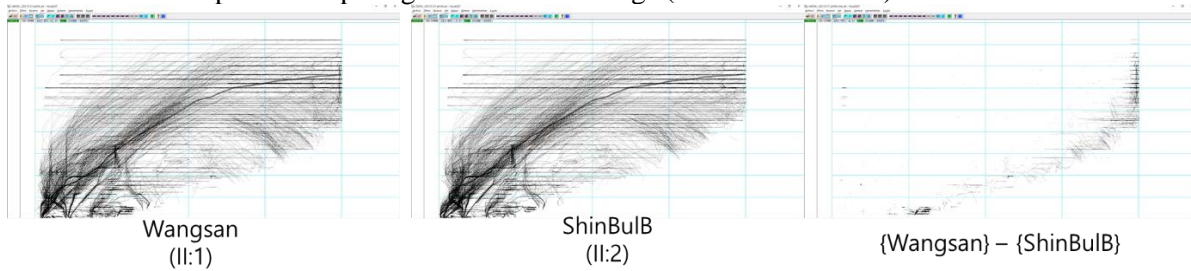
Cat11 Message 000000000000
Cat20 Message 000000000000
Cat21 Message 000000000000
Cat34 Message 000000570508
Cat48 Message 000000523004
Total Message 00000119574
North timing error occurred :0
Sector timing error occurred :0
False, Pd, 0.615, 0.908
[PSR, SSR, ASS, ALLCALL, ROLLCAL, ALLCALL_ASS, ROLLCALL_ASS]: 10714, 16160, 5709, 524, 274668, 27, 215202
    
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### Appendix 2. SI operation analysis method using Astecat

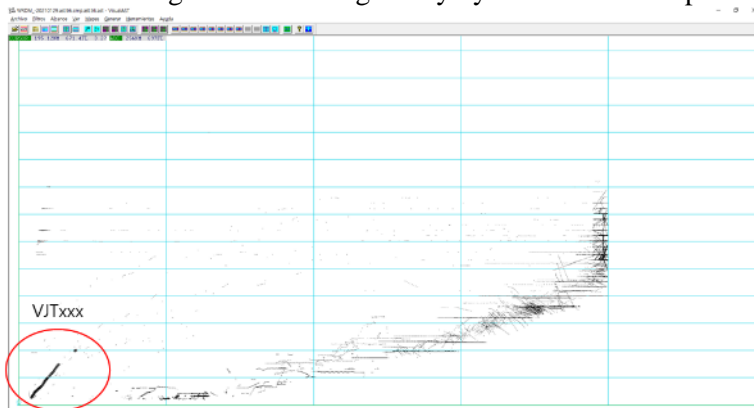
- Concept of the detection result comparison



- An example of comparing the radar recordings (Vertical detection)



- Finding undetected target only by ShinbulB at the picture of the difference set({W}-{S})



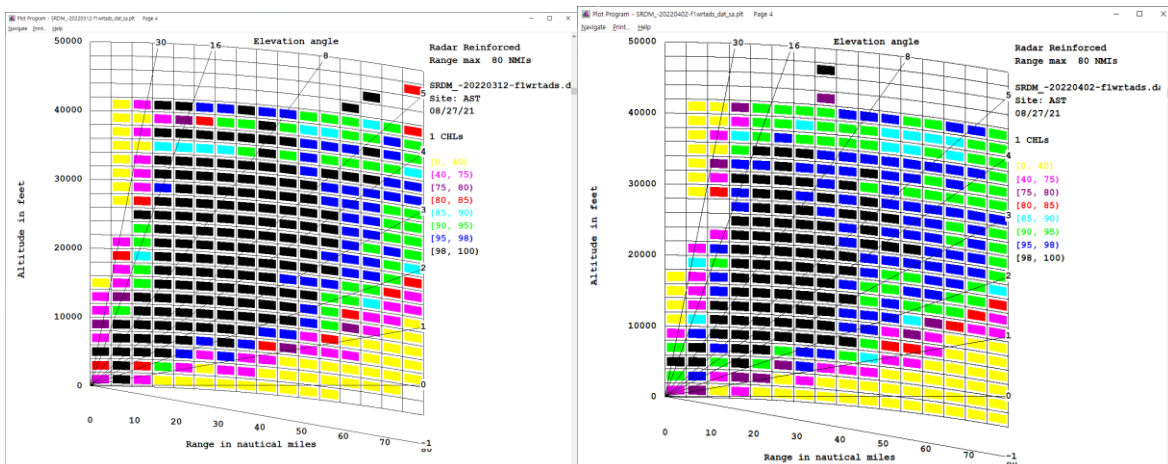
**Appendix 3. The assessment of the PSR radar optimization project**

March, 2022, the ShinbulB PSR radar is optimized by the radar manufacturer to increase the PSR Pd. Some PSR radar map is changed and target detection sensitivity is also. The following is assessment result of the radar optimization job.

Based on the result report of radar analysis software (FAA RBAT and Astecat), PSR Pd performance is a little bit worsened at the same time PSR false target count is increased. It means that the optimization project does not go as planned. By reviewing the result report of the analysis software, ANSP could evaluate the optimization job and determine future work for their radar by themselves. Incheon airport is willing to share the manual and the software for ICAO ANSPs to perform same radar analysis.

	Before the optimization(3.12)	After the optimization(4.12)	Comment
PSR Pd	93.6%	91.5%	a little bit decreased
PSR false target per scan	0.5	0.854	a little bit increased

Table : ShinbulB radar PSR performance comparison for 24 hour recording (by Astecat)



Picture : Vertical PSR Pd (X: 80NM , Y: altitude) , Black cell means best PSR Pd (By FAA RBAT) Before the optimization (2022.3.12) vs After the optimization (2022.4.12). The left picture has the more number of black cell. The more Black cell the better PSR Pd.