VERIFICATION AND ANALYSIS TO THE SIMULATION PLATFORM FOR OPTIMUM FRAME SYNCHRONIZATION IN DEEP SPACE DATA RECEIVING MISSIONS. LI Chen[1], SU Yan[1], LI Chun-lai[1], ZHU Ben-xia[2],([1]: National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012, China, li-chen@bao.ac.cn; [2]: Credit Reference Centre, People 's Bank of China, Beijing 100162, China, 13718740040@139.com).

ABSTRACT: The realized channel coding performance is based on frame synchronization in the process of data receiving in deep space mission. Seeking the optimum frame synchronization performance is critical to improve the efficiency of data receiving. According to the frame synchronization strategy in national lunar mission, frame synchronization simulation software was completed and verified. This software simulation platform was used to find optimal parameter setting method for frame synchronization strategy in the case of high error bits rate telecommunication. Simulation method was discussed to explore optimal parameters setting for frame synchronization by use of the software simulation platform. Some standards were established to measure the frame synchronization performance, and according to the results of frame synchronization simulation, evaluate the frame synchronization performance in conditions of different parameters setting. In the end, the article summed up a set of methods for seeking optimum frame synchronization parameter setting by use of this software, and by this way the frame synchronization simulation test data was generated. The report of optimum frame synchronization was completed on how to set the frame synchronization parameters after completely data analysis. The software's correctness was tested by equipment in national lunar exploration mission, and the optimum frame synchronization report can be consulted in the data receiving system for deep space missions in the future.

FORWORD: Frame synchronization is important to the data receiving in deep space missions in which the telecommunication environment is very complex because of influence by all kinds of planets activities in universe. Especially, the faraway distance make capture of the signal and receiving of the correct data more difficult. So it's necessary to carry any research in deep space data receiving technology. According to the channel coding method applying in telecommunication, frame synchronization technology is an efficient way.

The following paragraph is to introduce a software platform worked out by the authors to simulate the frame synchronization at the condition of deep space communication environment. Paragraph 2 is to describe the theory of frame synchronization and how the simulation parameters used to evaluate the efficiency of frame synchronization are set. Paragraph 3 introduces the functions of the software platform and important input options and output results. Paragraph 4 is to design the simulating methods and describe the simulation reports. Paragraph 5 analyses the results overall, and verifies the correctness and reliability of the software platform. In the end, this article pronounces that the simulating methods are useful to find the optimum frame synchronization input parameters and the results can be consulted in the deep space data receiving missions.

Verification on simulation result consistency. Test of this kind of simulation covers all the three types frame header of 1ACFFC1D、FAF3200 and EB90. Selected simulation is base on real time data, length of the data is fixed length of data generated once a time by the software. Number of the simulation test is equal 10. It's important to select the parameter Syn_input, which is crucial in frame synchronization simulation. we should select it at different error bit rate level, and the Efficiency of Achieving Data should be different, too. Error bit rate ia set to 5E-1、7E-2 and 1E-2, and the corresponding Efficiency of Achieving Data is at the level of High、Middle and Low.

For example, when Frame Header is 1ACFFC1D, input parameter group is equal respectively 4:8:8:1:3、5:6:7:3:4 and 4:4:4:4:2, the result is listed in table 1 following.

Table 1 simulation results with Error bit rate is 1E-1

Option / NO.	Efficiency of Achieving Data		
	4:8:8:1:3	**5:6:7:3:4**	**4:4:4:4:2**
1	0.9993	0.99934	0.659525
2	0.99942	0.99925	0.66388
3	0.999415	0.998995	0.665455
4	0.99933	0.99915	0.665762
5	0.99922	0.999055	0.65572
6	0.99926	0.998755	0.666795
7	0.99935	0.998965	0.66287
8	0.999405	0.999215	0.661478
9	0.99929	0.999155	0.657737
10	0.999445	0.999225	0.666552
deviation	**7.62E-05**	**0.000171**	**0.00387**

It's obviously that maximum of the three mean square deviation is only 0.00387, which verifies the consistency of simulation result is excellent.

In a word, result of all the simulation test is identical, and the mean square deviation of Efficiency of Achieving Data is so small. All of the result verifies the correctness and consistency of the simulation software platform is excellent. All of the simulation result fol-

lowing is dependable, and can be consulted the deep space mission.

Effect analysis on synchronization from frame length. Type frame header and data length of frame decides the rate of valid data to all data. In order to analyse the effect of frame length to frame synchronization, we get the simulation results at different frame header and valid data rate. The relation among received data rate、efficiency of receiving data and frame length.

Inpit parameter group is 3:3:3:2:2，the error code rate select 1E-1 at the condition of number of error lock is 0. Simulation results of under different frame header is introduced below.

When the frame header is 1ACFFC1D, relation figure among received data rate、efficiency of receiving data and frame length is following:

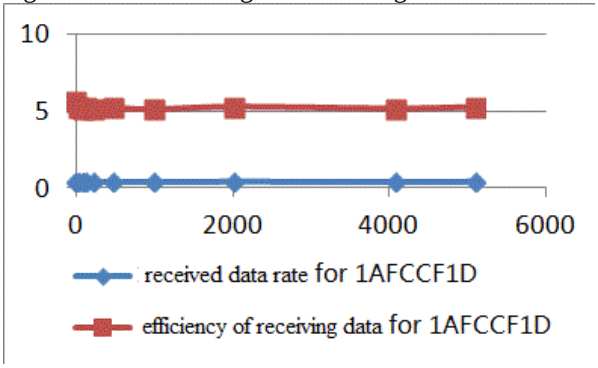

Figure 1. Relation between Simulation Results of 1ACFFC1D and Frame Length

It is knew from the figure 1 above that the received data rate is constant stable and efficiency of receiving data becomes quickly stable when the frame length rises. Range of efficiency is slight.

In a word, frame length almost has no effect on received data rate. When the valid data length in the frame is below 250bits, frame length has little effect to efficiency of receiving data, and the influence is less when the frame header is shorter.

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