

## **About Car Seat Forward Frontal Impact Safety Performance Analysis**

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**ABSTRACT:-** several common child safety seats in the domestic market of the forward car frontal sled test In this paper, Refer to GB - 27887-2011 《motor vehicle child occupant with constraint system》 regulation of dynamic collision test method, Place the child restraint system in the regulation of standard seat, test seat 0 degrees to simulate a 40% offset impact type of collision safety test. Test by measuring the child dummy movement posture and damage index, to evaluate child restraint systems performance of occupant protection for children. In the domestic various style when testing, the child seat, it is found that a child seat is not in conformity with the national standard, including head displacement in 121 ms of the parameters of the index value of 618 mm, more than the value given in national standard 550 mm, and HTC (15) a value of 570 is greater than the national standard 570. And found that the product is lead to problems of material design in the process of product manufacturing.

**Keywords:** - child seat    frontal impact    sled test

### **I. INTRODUCTION**

In our country, private car ownership is growing rapidly, but did not increase public awareness of the children's security. Main reason is due to the study of child occupant safety protection in China started relatively late, the social propaganda is insufficient, the concept of car seat is weak, countries have to release children ride safety aspects of the industry standard. Since the 1970 s, Europe and the United States and other developed countries have started to protect children ride safety issues for the study, many countries have established a strict laws, regulations, industry rules to guide and standardize the production and use. So the research achievements of Europe and the United States and other developed countries for reference and ripe experience, and improve the level of domestic research, the study on children's occupant restraint system in China is of great significance. Traffic accident is the important cause of Chinese children casualties. 2690 children in 2010 by Chinese traffic accidents (1 ~ 15) death, 14733 children were injured, child deaths accounted for the population statistics 39.3% of child deaths in the city. The latest statistics show that children's traffic deaths in China in 2012 Several still has 2572 people, injured 2572 people, children's traffic safety problems need to be attention and concern of the society. Purpose to perfect the Chinese children safety standards of scientific rationality of the evaluation system, evaluation system analysis two aspects on the one hand, different products for different enterprises for consumers to offer reference to the child seat collision safety, on the other hand, improve the production enterprise to the attention of the child seat production safety, improve the quality of the product.

### **II. TEST METHOD**

This paper found that the quality of the defective child seat 15 kg for the seat is the five point security constraints, test method (GB - 27887-2011 "motor vehicle child occupant with constraint system" regulation of the dynamic collision test method, test speed for 49 km/h, not open force is 51.8 N experiment chooses the load buckle Q series child dummy, as the successor of P series child dummy, its biological lifelike and damage assessment has been beyond the TNO P series child dummy. Different types of child restraint systems in the evaluation test dummies corresponding with different children



Figure 1: Q series child dummy

Collision safety evaluation using dummy model for Q1.5, Q3, Q6 and Q10, of which this article before to fake the frontal crash test selected for Q3 dummies, test seat Angle of 0 degree, test process are shown in figure 2 below, slow down the car test waveform is shown in figure 3



Figure 2: the child restraint system frontal impact safety performance test

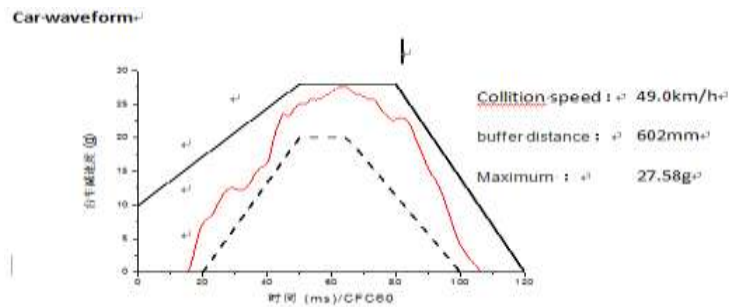


Figure 3 electric measurement data

### III. DATA

Table 1 by car experiment measured the results of the chest and head of the indicators

test number	The head displacement (mm)	HIC(15)	3msChest acceleration(g)	synthetic	Chest z axis acceleration (g)
The national standard	550	570	55		30
1	618	580	39.7		20.64



Figure 4 high-speed camera measured displacement of p3 dummy head

By the above 4 can be measured in the head in the process of positive positive impact head maximum displacement is 618 mm.

#### IV. DATA ANALYSIS ATD

Children's seat in the forward collision safety performance evaluation mainly through the child's head displacement in the process of collision, chest acceleration of synthesis and chest z axis acceleration three parameters.

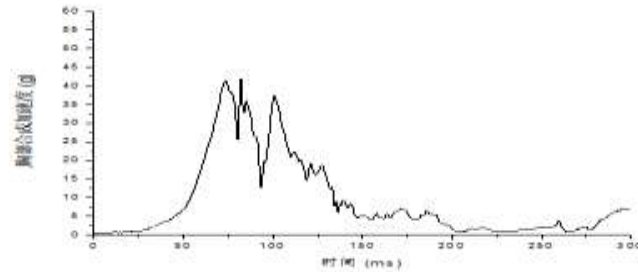


Figure 5 chest synthetic acceleration



Figure 6 Z axis acceleration in the chest

Synthesized from above 5 dummies chest can be drawn from the maximum acceleration for 42 g, 3 ms value is 39.7 g, figure 6 shows the dummy chest a maximum z-axis acceleration of 21.413 g, 3 ms value is 20.64 g, from the above test data results as compared with the standard prescribed by the state, found that this child seat is not up to the standard of obviously, children head displacement is 618 mm, the provisions of the state head displacement value more than 550 mm.

#### Child Seat

Analyze the seat after the collision as below in figure 7 and figure 8, through analysis results show that the child seat on the left side of the belt, the seat back tears, shoulder strap locking clip off, seat sliding out from the base.



Figure 7



**Figure 8**

## V. CONCLUSION

This paper mainly discusses the regulations of GB - 27887-211 based vehicle child safety seat collision process, and the result of subsequent analysis, combining with the dummy head, chest acceleration, HTC value analysis to study the motion response of the children in the process of collision and damage index, combining with the laws and regulations to verify the the performance of the child seat to protect members of the children, children's casualties in the traffic accident, another important reason is that children's seat product defects, the child seat collision safety performance can better protect the driving safety of children. Combined with the fake people in the car crash simulation, can draw child seat is mainly due to its own defects in the process of manufacturing material problem didn't pass, it's for our children's seat production put forward higher quality requirements.

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Time flies, the twinkling of an eye three years of master's career is coming to an end, summed up the past, not just on the skills, knowledge A lot of, more important is through this phase of their training up a little. Research results show at this point, but what is called Learn, more than struggle, my study to explore the road had only just begun. in the master's thesis is about to complete, my heart Is full of gratitude, to thank all my friends to help me, support encouraged me. I was confused stuck study process, have stray loss, has a long face scratching his head, was worried. is my respected teacher guide me step by step, and give it to me Teach them methods of learning, straighten out the research train of thought, it is my dear students give me help and encouragement and love of family to support me and confidence.

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