MME-Converter and MME-Report for LS-DYNA® Users

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Abstract

This paper will focus on the main features, benefits and use of MME-Converter and MME-Report which could be highly useful to LS-DYNA users for vehicle crash test analysis. With MME-Converter users can simply convert LS-DYNA result files, such as nodout, elout, deforc and rcforc to MME-filtered files through the auto-syntax analysis and then compare these converted MME-filtered files to real vehicle crash test data. The conversion of LS-DYNA files is carried out in accordance with the international occupant protection criteria including KNCAP, USNCAP, Euro NCAP and IIHS. Furthermore, MME-Report which is one-page reporting system using MME-filtered data helps users to create concise, professional engineering reports, so that engineers in CAE teams, could share the test results with each other and even use them for formal meetings or presentations.

Introduction <MME-Converter>

MME-Converter is one of the modules of DynaX that converts LS-DYNA result files, mainly nodout, elout, deforc and rcforc, into MME-filtered files. In other words, LS-DYNA result files are used as an input file for MME-Converter and its output is an MME-filtered file which includes channel files. Prior to the conversion, users can modify the default properties of Channel and MME files, and after the property change it converts according to NCAP protection criteria in frontal, MDB side and pole impact.

Figure1. Concept of Converting Process in MME-Converter

Benefits

- Conversion from LS-DYNA result files to ISO-MME files without any data loss
- ISO-MME format, an international standard, is used (Broader Accessibility and Sharing)
- Intuitive and straightforward user interface (No hassle to learn how to use)
- Customization is available (Users could add more items for NCAP or regulations)

Main Features and Usage

MME-Converter is so easy, user-friendly software with a straightforward interface that any user can readily understand all the features in a short time. The procedure for converting does not require an in-depth tutorial, but a series of simple steps to follow. In this paper, the main features of MME-Converter are described in the same serial order as the usage, and therefore none of basic tutorials are given.

MME-Converter has an export file filter for MME format. MME is the abbreviation for Multimedia Data Exchange Format for Impact Tests and its technical specification is ISO-TS 13499 which defines a directory structure and the exchange information as ASCII files. This format presents a simple way to exchange multimedia data of impact test between different laboratories. MME-Converter consists of five different sections (Refer to Figure2): Setting Directory, Test Setting, Lond and Dummy Case, Output and Progress. First, in Setting Directory, users set the location where to bring LS-DYNA result files from and where to store the output files of MME-Converter on the computer. In Test Setting, users change the default properties of a MME file including channel files.
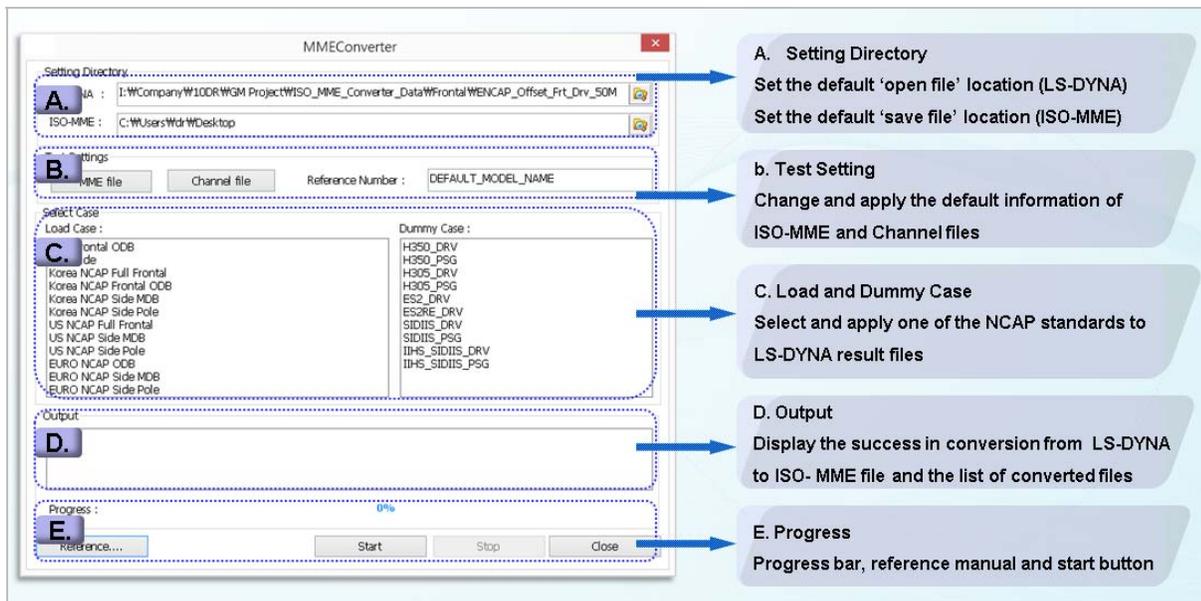

Figure2. The Main Elements of MME-Converter UI

In a Channel and MME file, there is all the necessary information for road vehicle safety test, such as test object number, channel code, unit, direction, etc. and users can edit each property and apply it to all channels and MMEs at once. 'Figure3' indicates all the properties used in the Channel and MME file.
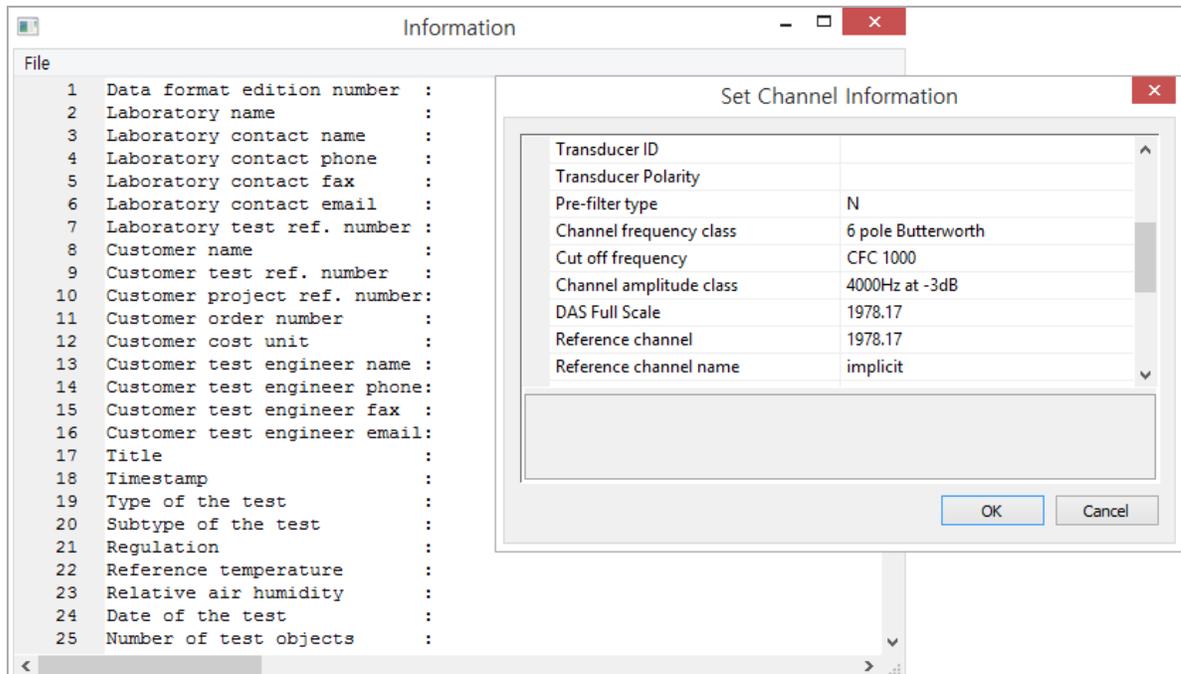

Figure3. List of Properties in a Channel and MME File

MME-Converter provides a function called 'Auto-Highlighting Dummy Case.' Each load case is linked with dummy cases, so it automatically highlights a dummy case that is used for NCAP test protocal if one of the load cases is slected. However, users can manually select dummy cases for a certain road vehicle crash test. In Figure4, ES2_Driver is highlighted when KNCAP Side Pole is selected.
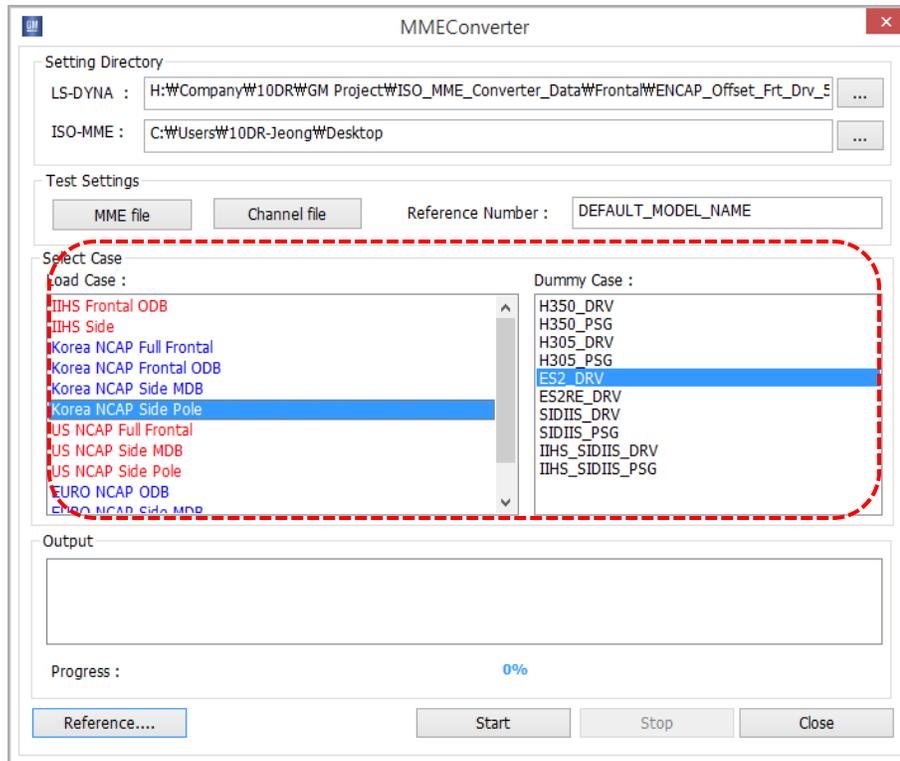
Figure4. Selection of Load Case

The conversion process is displayed in both Output and Progress sections, so that users can find out the status of the conversion, success or failure. After clicking the start button in Progress section, the parsing process starts to convert LS-DYNA result files, such as nodout, elout, deforc and rcforc, with a progress bar.
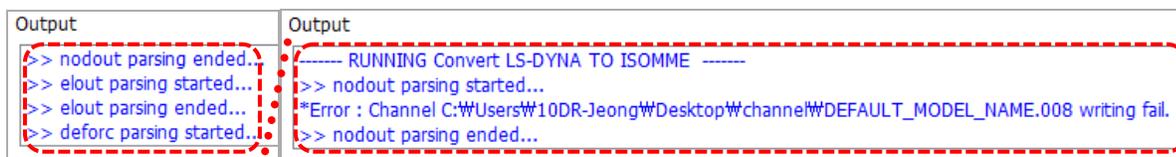

Figure5. Indication of Conversion Process

After the successful conversion a 'Channel folder and MME file' are created in the save directory where a user set before. Channel and MME files can be loaded in Microsoft Excel and it shows the information on road vehicle crash test. Channel Code is found in a converted channel file. It is composed of a sequence of codes with a fixed length and specific order, defining test object, position, main location, fine locations, physical dimension, direction and filter class.
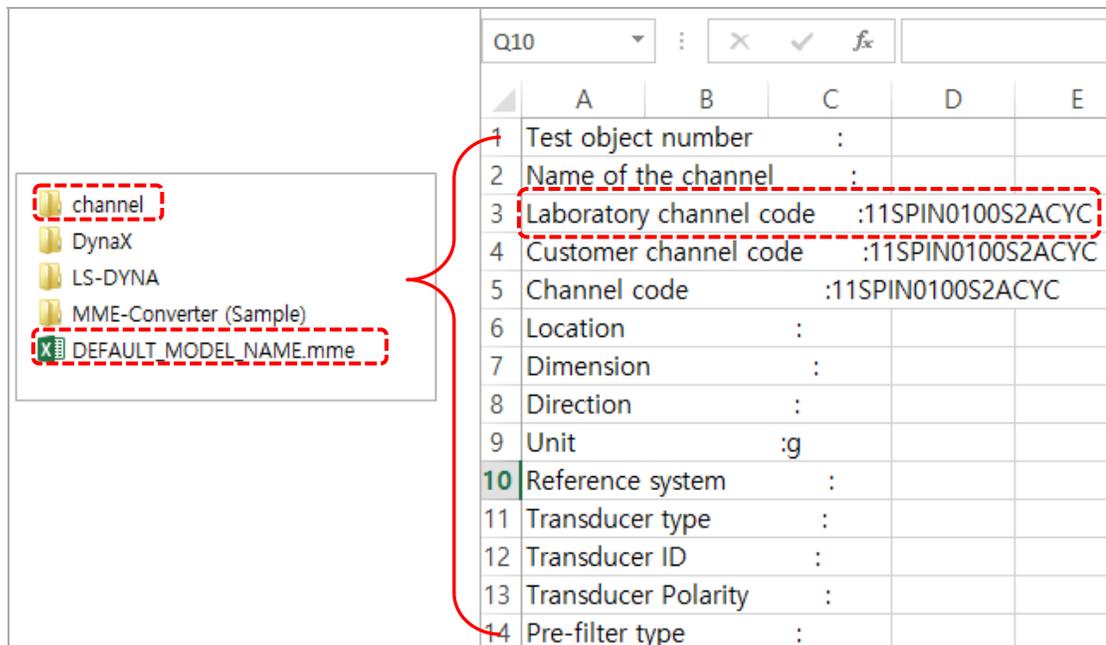
Figure6. Completion of the Conversion

Example: 1 1 HEAD LE 00 H3 AC X A				
Channel Code:	1	= Test Object	**Meaning:**	Vehicle No. 1
	1	= Position		Front Left
	HEAD	= Main Location		Dummy Head
	LE	= Fine Location 1		Center of Gravity
	00	= Fine Location 2		Undefined
	H3	= Fine Location 3		H III Dummy
	AC	= Dimension		Acceleration
	X	= Direction		X-direction
	A	= Filter Class		CFC 1000

Table 1. Interpretation of Channel Code

Introduction <MME-Report>

MME-Report is one-page reporting software using MME-filtered data as an input file. It provides users with an easy way to create concise, professional engineering reports which display the value of dummy injuries and NCAP ratings. So users can easily share the reports with others, especially when collaborating on projects. In addition, it is highly useful for formal meetings where users need to deliver effective and professional presentations.
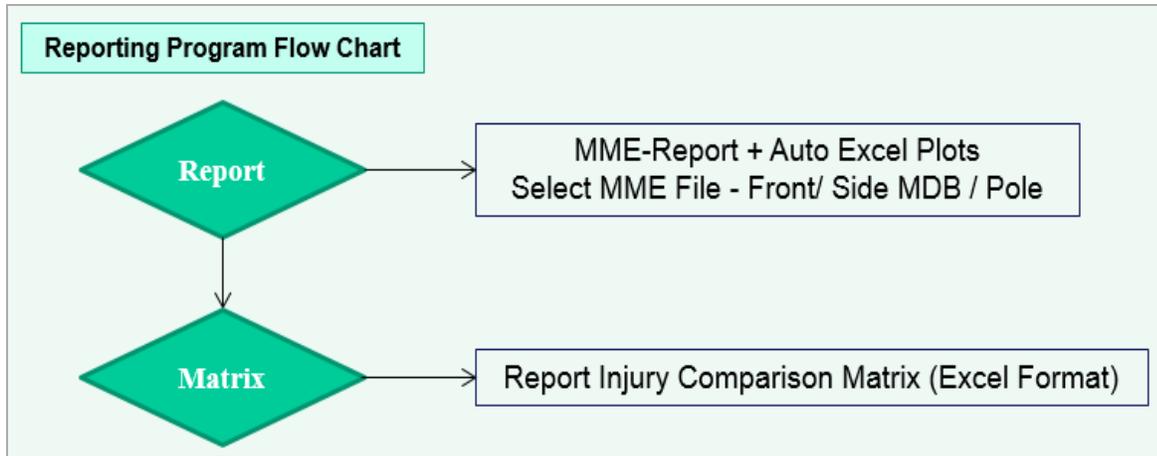

Figure 7. Work Flow of MME-Report

Benefits

- Create professional engineering reports with dummy injury measures and NCAP ratings
- Use the reports at formal meetings and presentations for the management or clients
- Export the reports in Excel format (Broader Accessibility and easier Sharing)
- Intuitive and straightforward user interface (No hassle to learn how to use)
- Customization is available (Users could change the rules and regulations)
- Make it easier to share results with colleagues and communicate clearly

Main Features and Usage

MME-Report is mainly designed to provide users with one-page engineering reports which are used to compare multiple MME-files and share the results of road vehicle crash tests with each other. The procedure for creating multiple reports does not require a complicated tutorial, but a series of simple steps to follow. Users could edit the formula for the properties of NCAP standards and configure graph elements. Ultimately MME-Report create an ideal environment for users to compare and analyse multiple MME files according to NCAP standards using charts and tables. As MME-Report can exports a completed report in Excel format, it allows users to sort out or filter the exported data effectively.

MME-Report consists of four sections (Refer to Figure8): Main Menu, Project Window, Load Case Table Panel, Multi-Chart Panel. First of all, in Main Menu users select one of NCAP standars, such as IIHS Side Driver, KNCAP Full Driver, ENCAP Front Offset Passenger, etc. And then the table for the selected load case appears on Load Case Table Pannel, showing the occupant protection criteria. Secondly, an MME-filtered file obtained from MME-converter is imported to compose a table with injury measures and NCAP ratings.
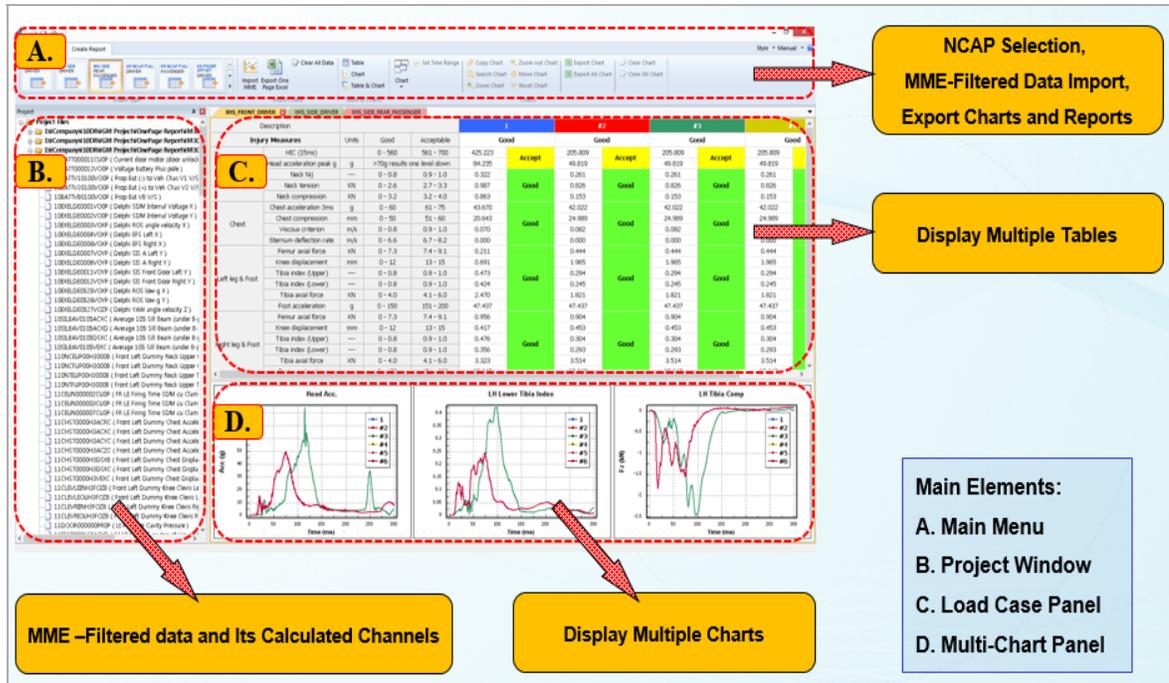

Figure 8. The Main Elements of MME-Report UI

In Project Window, the imported MME-file including channel files is displayed as a directory structure. Each channel file can be dragged and dropped into any chart, so that users precisely compare multiple channel files at a glance. When exporting these charts to Excel, One or multiple charts can be exported (Optional).
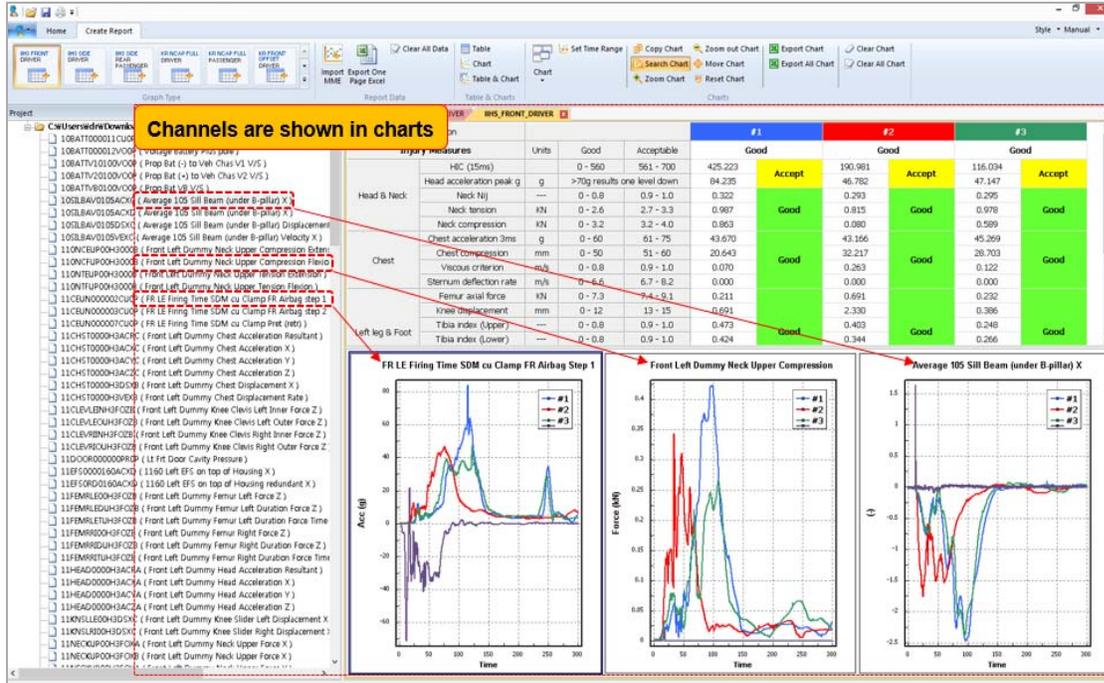

Figure 9. Drag-and-Drop the Channels to the Charts
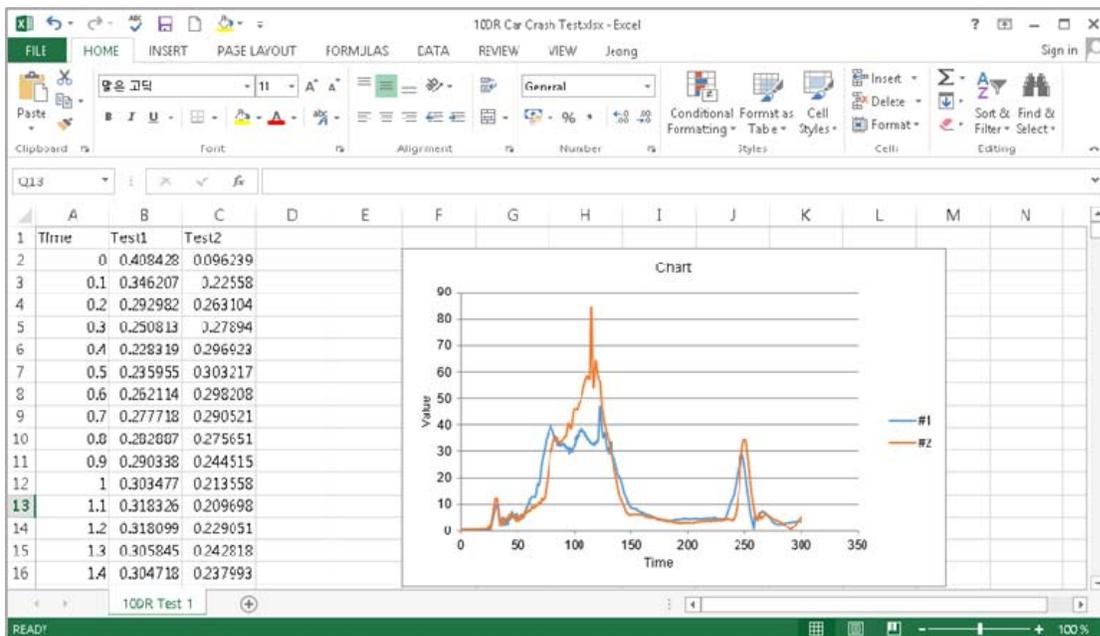

Figure 10. Export the Channel Data to Microsoft Excel

Protection point and injury rating are highlighted in different colour. <Figure 11> shows IIHS Frontal Crash Results with scores and ratings. Here green means good and yellow means acceptable injury rating.
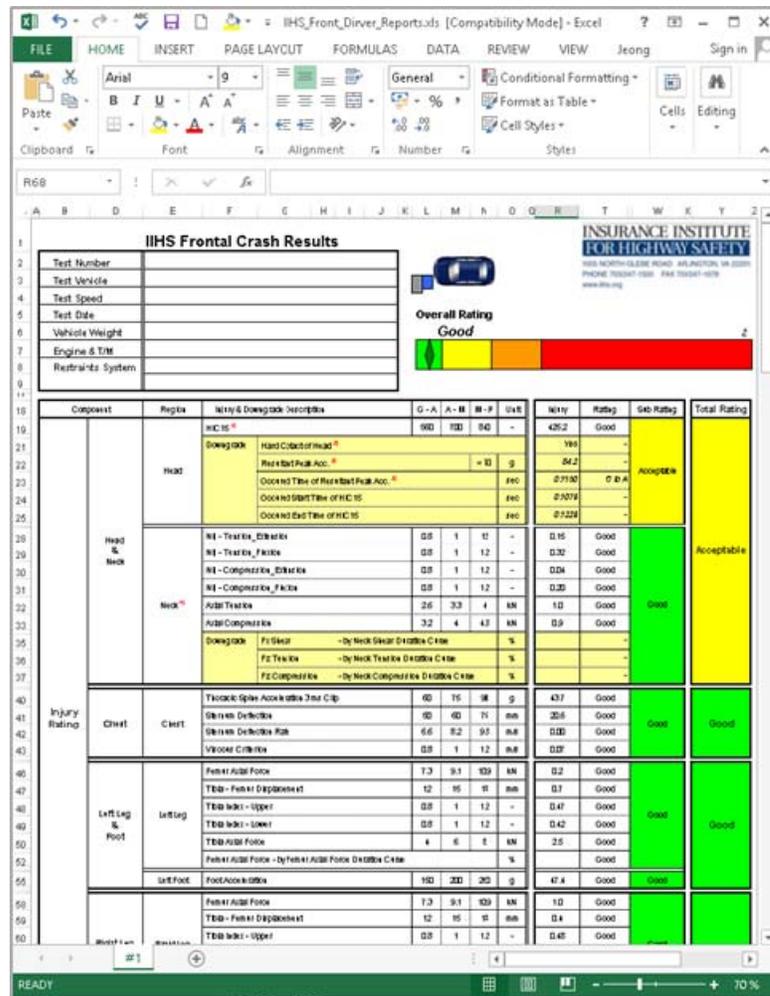

Figure 11. One-Click Export to Microsoft Excel

Conclusion

MME-Converter and MME-Report have been developed to help LS-DYNA users who usually deal with a vehicle crash test analysis. MME-Converter is used to convert LS-DYNA result files to ISO-MME files without any data loss, and MME-Report used to create professional engineering reports with dummy injury measures and NCAP ratings. Their intuitive and straightforward user interfaces make it easier to learn without any difficulty. In addition, it gives broader accessibility to be shared with others by using a common file format, for example ISO-MME and Excel files. It is strongly recommended that both software should be used together for the purpose of the compatibility and improvement in work efficiency when the vehicle crash test analysis is being carried out.

References

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