Introduction of Nakatsugawa Technical Center

Nakatsugawa Technical Center
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1 Introduction

The Nakatsugawa Technical Center was established in 1997, to welcome the coming of the 21st century, with globalization and Technical Revolution.

Being in the midst of recent drastic changes in the market, stricter electromagnetic compatibility regulations, and increased consciousness for Earth environmental protection, we would like to introduce our Technical Center. While achieving the initial goals set at our establishment 6 years ago, we are expected to continue to advance greatly in the coming years.

2 Business Office Overview

We are located in the centralized industrial park which was newly developed in Nakatsugawa city of the Gifu prefecture. We are in a convenient location only 4 km away from the Chuou Highway Nakatsugawa exit.

Location: 1683-1963 Nakagaido, Nasubigawa, Nakatsugawa city, Gifu
Established: May 1997
Main activities: Electromagnetic wave research, evaluation/testing/analysis, advanced fundamental technology development
Property area: 34,367m^2 (Flat surface area: 19,000 m^2)
Building: 3-story steel frame building (The electromagnetic wave test facility is a single story building)
Building surface area 1,873 m^2, total floor space 3,404 m^2

Our technical center is largely divided between the Electromagnetic wave research/evaluation/testing and Advanced fundamental technology development/analysis.

The advanced fundamental technology development/analysis is working to promote Earth environmental protection, miniaturize products, create new processes and to improve quality, through fundamental technology development and material evaluation analysis.

Here we would like to introduce the electromagnetic wave research / evaluation / testing as follows.

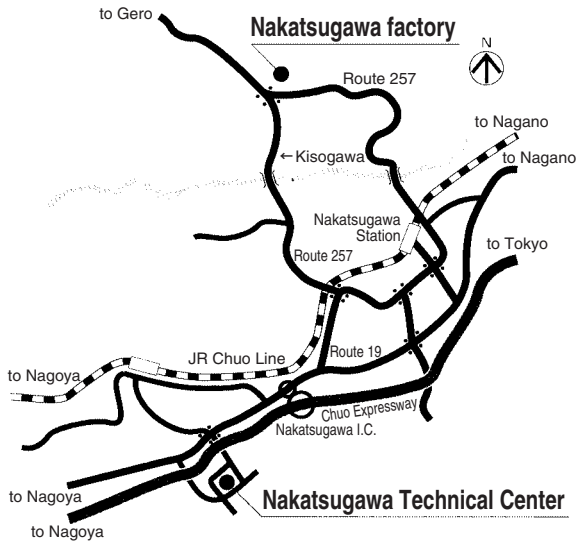

Fig.1 Access to the Nakatsugawa Technical Center

3 Activities/Facility Overview

The activities are largely divided into the operation of the EMC testing facility, electromagnetic wave noise countermeasure technology development, antenna evaluation, and outdoor test location management.

EMC is an abbreviation for Electromagnetic Compatibility, and means: "Not emitting unwanted electromagnetic waves which interfere with other systems", "Does not malfunction even when receiving electromagnetic interference from other systems", and means that it conforms/is compatible electromagnetically by satisfying the requirements above. It is referred to as the electromagnetic wave environmental compatibility.

In recent years, automobile electronics have advanced greatly, and EMC is a quality requirement that cannot be ignored. Our center performs activities which involve the evaluation and testing, and technical developments in this field.

(1) EMC Testing Facility

Our EMC testing facility provides its equipment and testing ability, which fulfill the requirements for international standards, local standards, and customer (automobile manufacturer) standards.

It was also necessary to fulfill quality parameters required for testing facilities, set in the ISO/IEC17025. By creating our own unique quality manual for our testing facility, we have become the first test facility to receive approval from (A2LA American Association for Laboratory Accreditation). We have also received approval from TÜV Rheinland (German government approved competent body).

Table 1 EMC Laboratory's qualification

Judgment body	A2LA	TÜV Rheinland
Date acquired	Dec. 2000	Dec. 1997
Applied quality system	ISO/IEC17025	ISO/IEC17025 EN45001
Other	GM, Ford approval, FCC filing	

Table 2 Indoor test facilities

Facility Name	Testing content	Structure/Dimensions
No. 1 Radio wave semi-anechoic chamber (10m method)	·Emission test ·Free field immunity test	Paneled radio wave semi-anechoic chamber 22×14×8m height
No. 2 Radio wave full-anechoic chamber	Antenna characteristics testing	Paneled radio wave full-anechoic chamber 16×16×10m height
No. 3 Radio wave semi-anechoic chamber (3m method)	·Free field immunity test ·Magnetic field immunity test	Paneled radio wave semi-anechoic chamber 11×7×7m height
No. 1 Shielded room	TEM cell immunity test	Paneled shield 10×6×3m high
No. 2 Shielded room	·BCI immunity test ·ESD test ·Conducted transient immunity test ·Conducted emission test, etc.	Paneled shield 10×6×3m high

In addition to performing EMC testing for in-house products, it is possible to perform tests requested from outside the company. Test facility certification and equipment are described in table 1 and 2.

Fig.2 No. 1 Radio wave semi-anechoic chamber (10m method)

(2) EMC Design Technical Development

The coming ubiquitous society is also expected of the automobile society. To perform more and more complicated information processing, the operating speeds of vehicle mounted electronic devices will become faster (>100MHz-1GHz), and EMC measures are now necessary. To develop and design these efficiently, technical developments to advance from EMC measures to "EMC Design" are being made.

As one part of the technical development, "Development of Noise Visualization System for Extraneous Electromagnetic waves" was developed, and has been actively used in the noise countermeasures for immunity. This was a method which, by injecting the magnetic field to the wire harness, forces noise into the circuit board. This was unprecedented, and the thesis regarding this technology was awarded the international award in the 2003 Society of Instrument and Control Engineers.

Also, R&D for electromagnetic field simulation is being performed, and to achieve virtual design for fur-

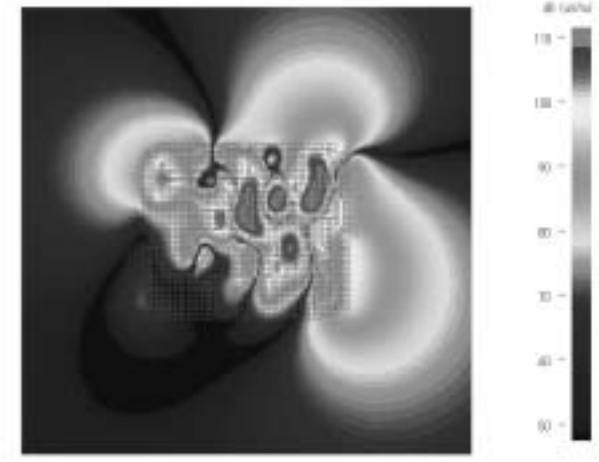

Fig.3 Electromagnetic wave simulation example

ther optimization of design, research is continuing daily. Figure 3 shows the analysis example of an electromagnetic field near a printed circuit board, using electromagnetic wave simulation.

(3) Antenna Evaluation

Antennas on a vehicle, are a factor that is important in communicating with the above ground infrastructure. To accurately evaluate these antennas, we are equipped with a full electromagnetic wave black room, which creates a completely electromagnetic wave free environment. It is possible to evaluate a wide range of frequencies from 78MHz-100GHz, and we can evaluate antennas for everything from our FM receivers to satellite digital broadcasts, and even millimeter wave radar sensor antennas.

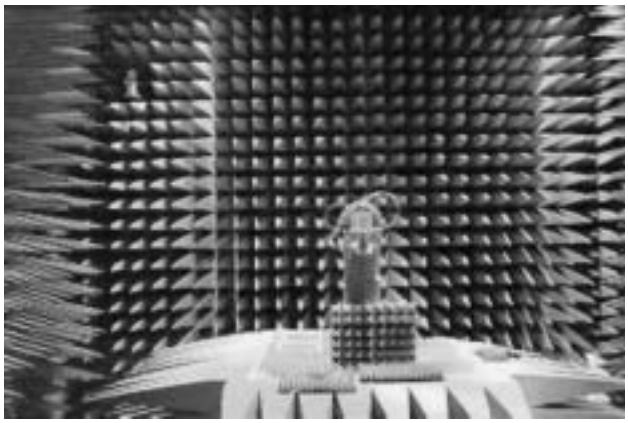

Fig.4 No. 2 Radio wave full-anechoic chamber (For antenna evaluation)

(4) Outdoor Test Grounds

There are many tests that require an outdoor evaluation, and there was a great demand for a test location equipped with the required environment for these tests.

In order to perform test data comparison, to improve test preparation efficiency, and to alleviate personnel load in performing these tests in identical environments, we have prepared the outdoor test location with a vehicle maintenance area, measurement room, and nighttime lighting facilities, in addition to the test course.

In the development of millimeter wave radar sensors, our test facility has contributed greatly. The facility is described in Table 3, and Fig. 5 shows the entire view.

Table 3 Outdoor test facilities

Facility name	Target product
Millimeter wave radar test course (200m, 4 lanes, 180m straight line)	Millimeter wave radar
VSS test course	VSS, keyless entry
Figure of 8, circle, slope test course	BS/CS antennas
Vibration test course	All audio related
Night-time lighting, vehicle maintenance area, measurement room, etc.	Test support facility

Fig.5 Outdoor test ground view

4 Conclusion

The advancement of information communication and electronics, is trying to give us an ubiquitous society. There are many technical challenges in achieving this in the automobile society, and there are many breakthroughs that must be made.

The Nakatsugawa technical center will continue to be a base for originating information faster than anyone else, for solutions to providing convenient and safe products.