

Study of vehicle BCI test for UN R10

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Japan Automobile Manufacturers Association, Inc.

1. Outline



Vehicle immunity method of UN-R10-05 is defined ALSE method as reference test method.

And vehicle BCI test method is defined as alternating method limited only large vehicle.

However, if test vehicle has a little objective items(components) for the test, BCI test will be very efficient test method.

JAMA proposes that vehicle BCI test can be applied not only large vehicle but also whole vehicles with demonstration by comparison between ALSE and BCI test method.

2. Proposal



ANNEX 6

1.3. Alternative test methods

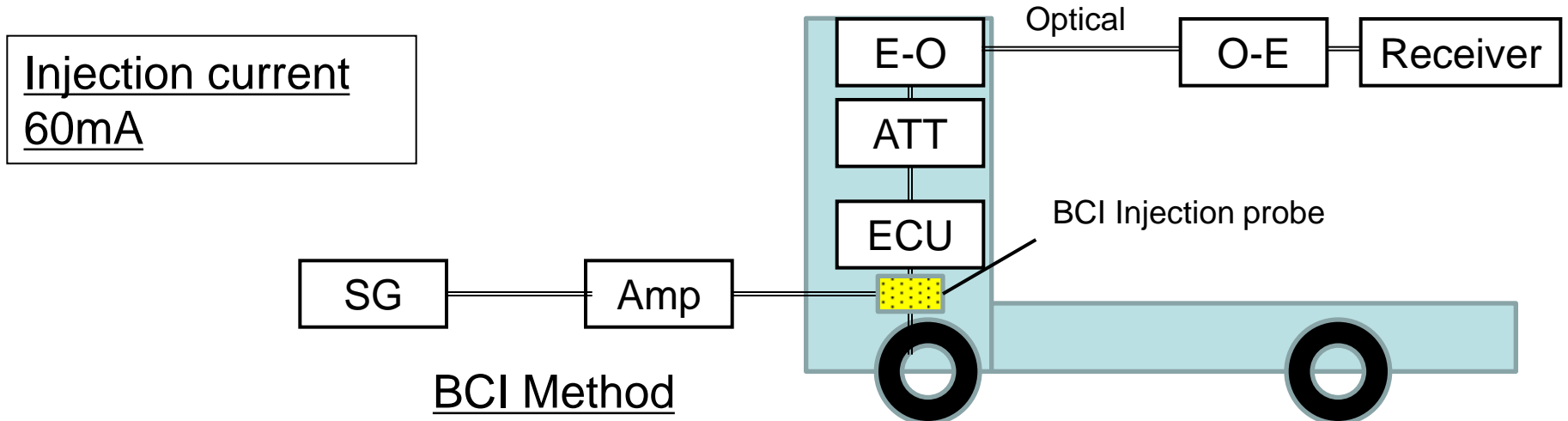
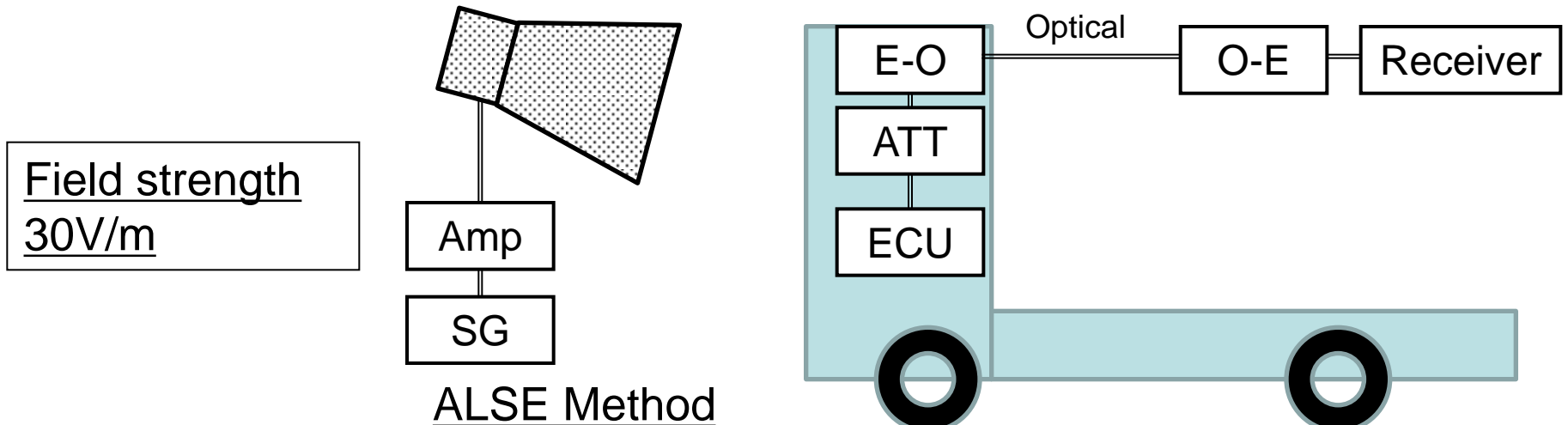
The test may be alternatively performed in an outdoor test site for all vehicles. The test facility shall comply with (national) legal requirements regarding the emission of electromagnetic fields.

~~If a vehicle is longer than 12 m and/or wider than 2.60 m and/or higher than 4.00 m,~~ BCI (bulk current injection) method according to ISO 11451-4 shall **can** be used in the frequency range 20 to 2,000 MHz with levels defined in paragraph 6.8.2.1. of this Regulation.

3. Method

a. Set up

- Measurement inside ECU voltage as actual influence by both immunity test method.



3. Correlation method

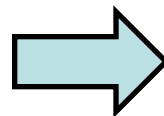
b. Test ECU and Optical link



Test ECU

- 3 measurement port (SMA) is installed.
- Port 1: Power line
- Port2 : Analog sensor
- Port3 : CAN line

Optical transmitter system



Connected to Test ECU

Optical reciever

3. Correlation method

c. About optical link

To avoid influence the metallic cable, test was used a optical RF transmitter system.

OPTICAL FEEDING RADIO OVER FIBER RECEIVER SYSTEM

Make : TAMAGAWA ELECTRICS
Optical receiver : EOS-1000
Controller : OAL-1000



Items	Specifications	Remark
Frequency range	100kHz~6GHz	
Gain	-10dB以上	@1GHz
Flatness	100kHz~6GHz: ± 6 dB 10MHz~6GHz: +6dB/-3dB	Reference of gain@1GHz
Harmonics distortion	25dBc以上	2 and 3 times of fundamental at input level -22dBm
SNR	40dB以上	Conversion by RBW=1Hz、 @Transmitter input level =-72dBm

4. Result

	Location	Around the Meter cluster	Instrument panel	Chassis mount
Circuit load				
Power line		Figure 1.	Figure 2.	Figure 3.
Analog sensor		Figure 4.	Figure 5.	Figure 6.
CAN line		Figure 7.	Figure 8.	Figure 9.



Meter cluster



Chassis mount

ALSE method



Instrument panel



4. Result

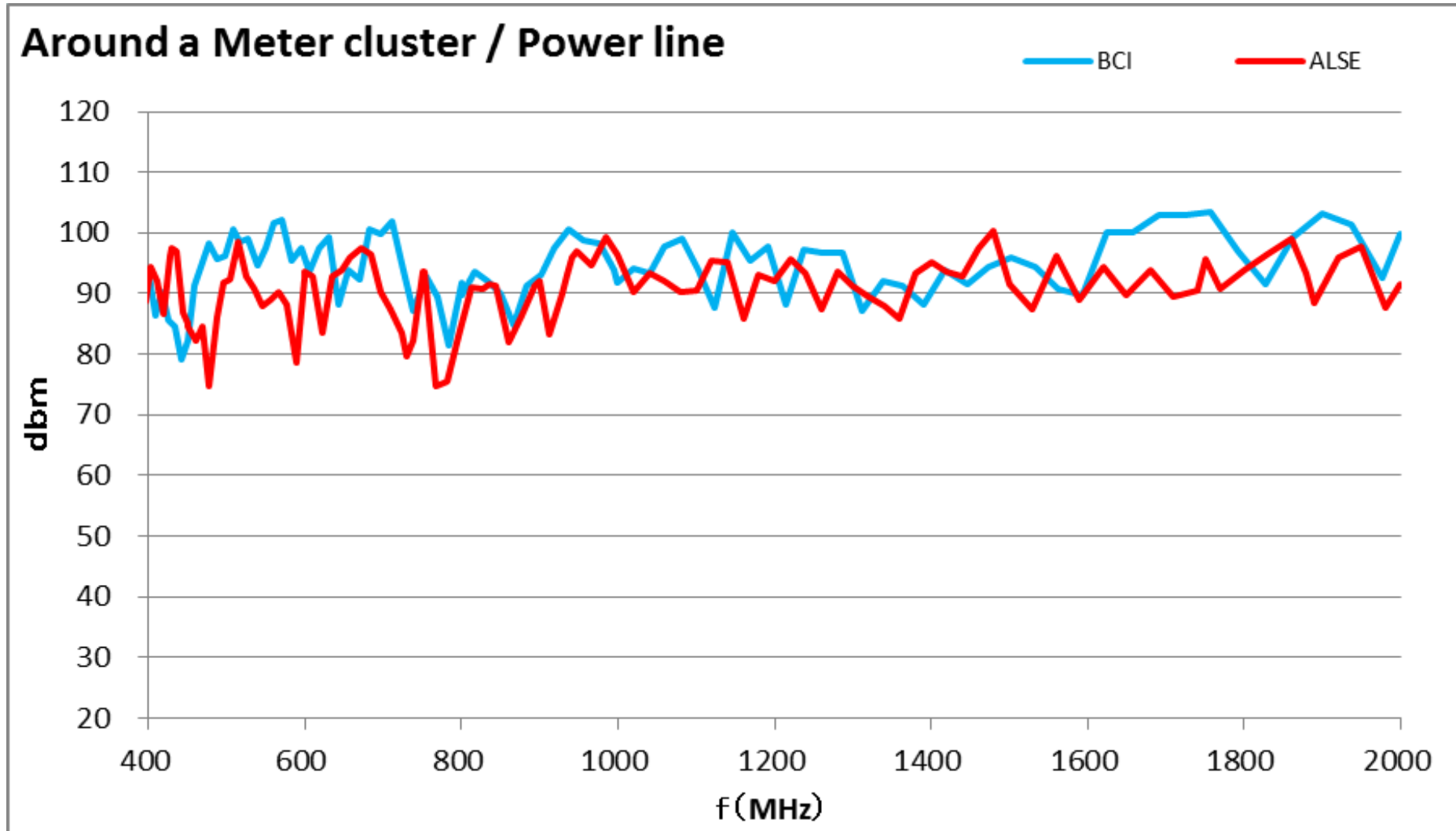


Figure 1. Around a Meter cluster / Power line

4. Result

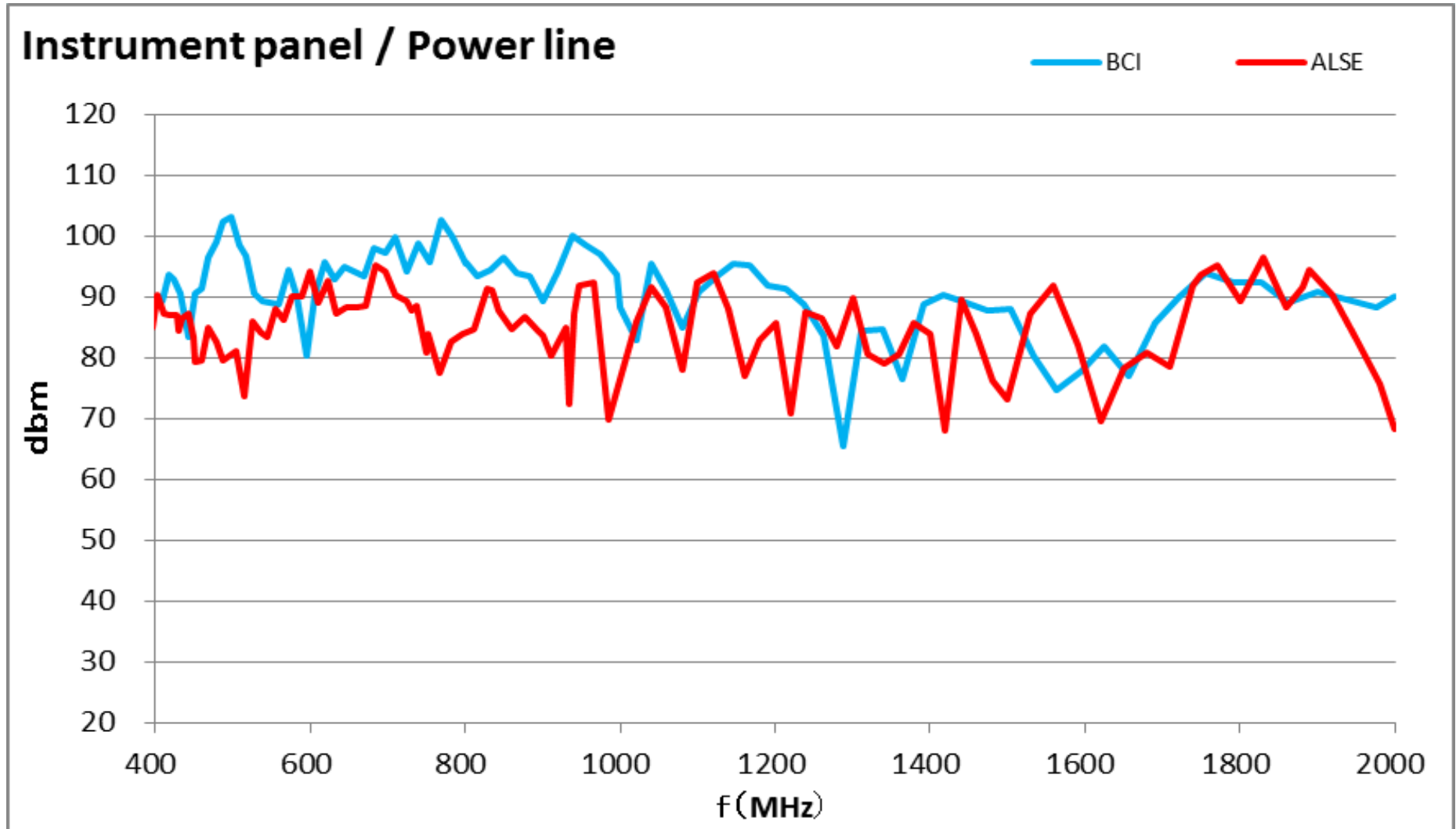


Figure 2. Instrument panel / Power line

4. Result

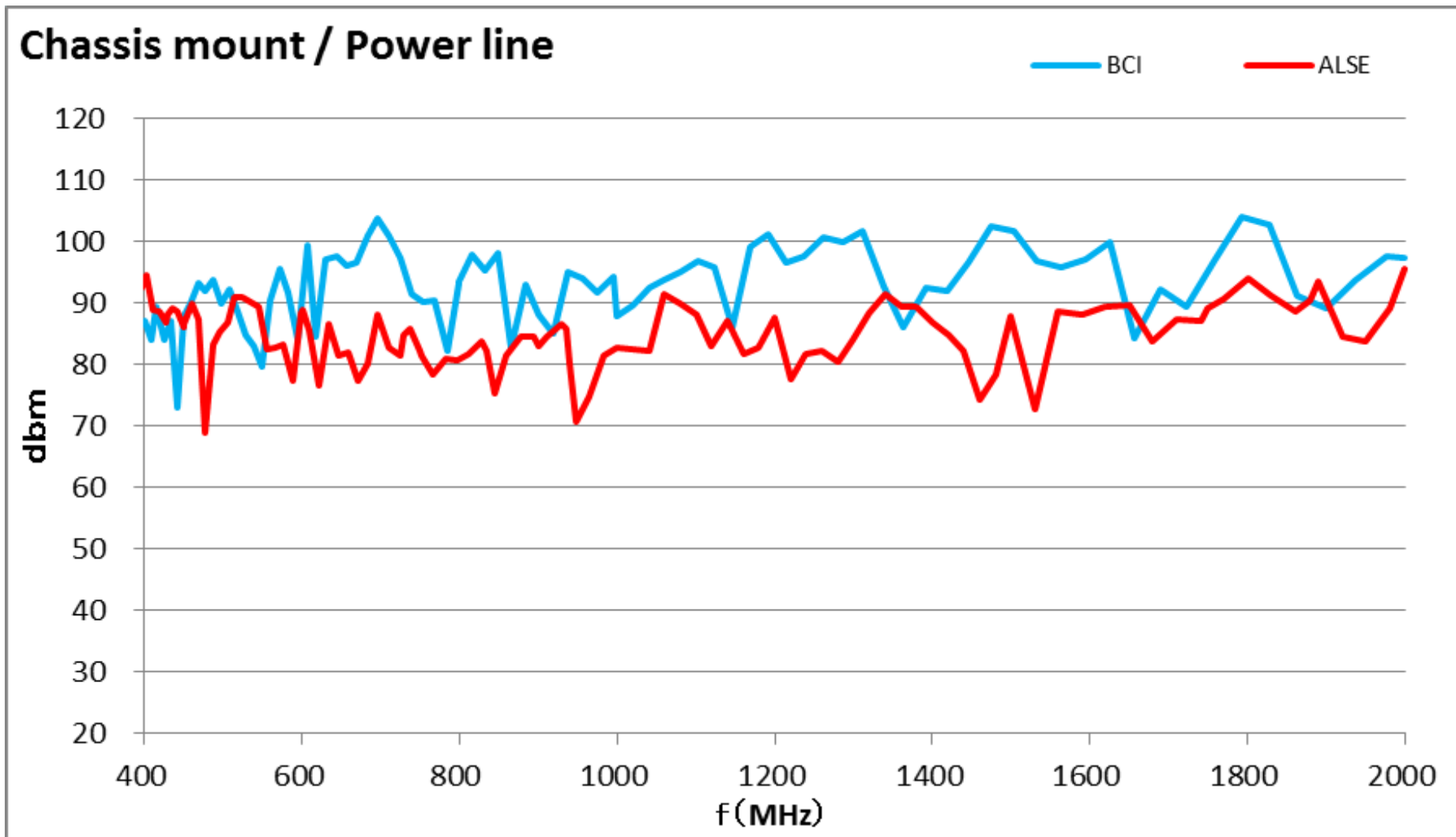


Figure 3. Chassis mount / Power line

4. Result

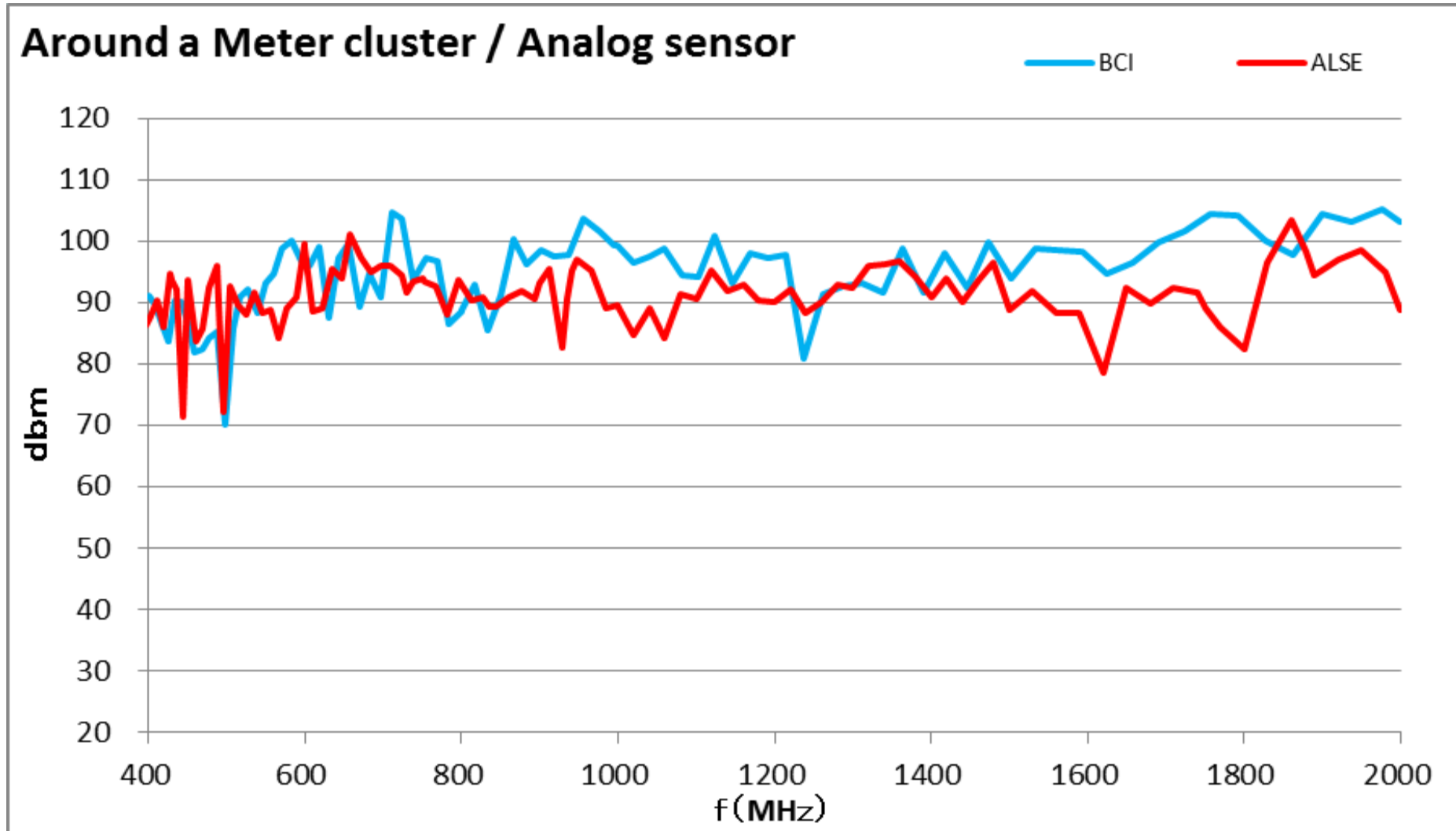


Figure 4. Around a Meter cluster / Analog sensor

4. Result

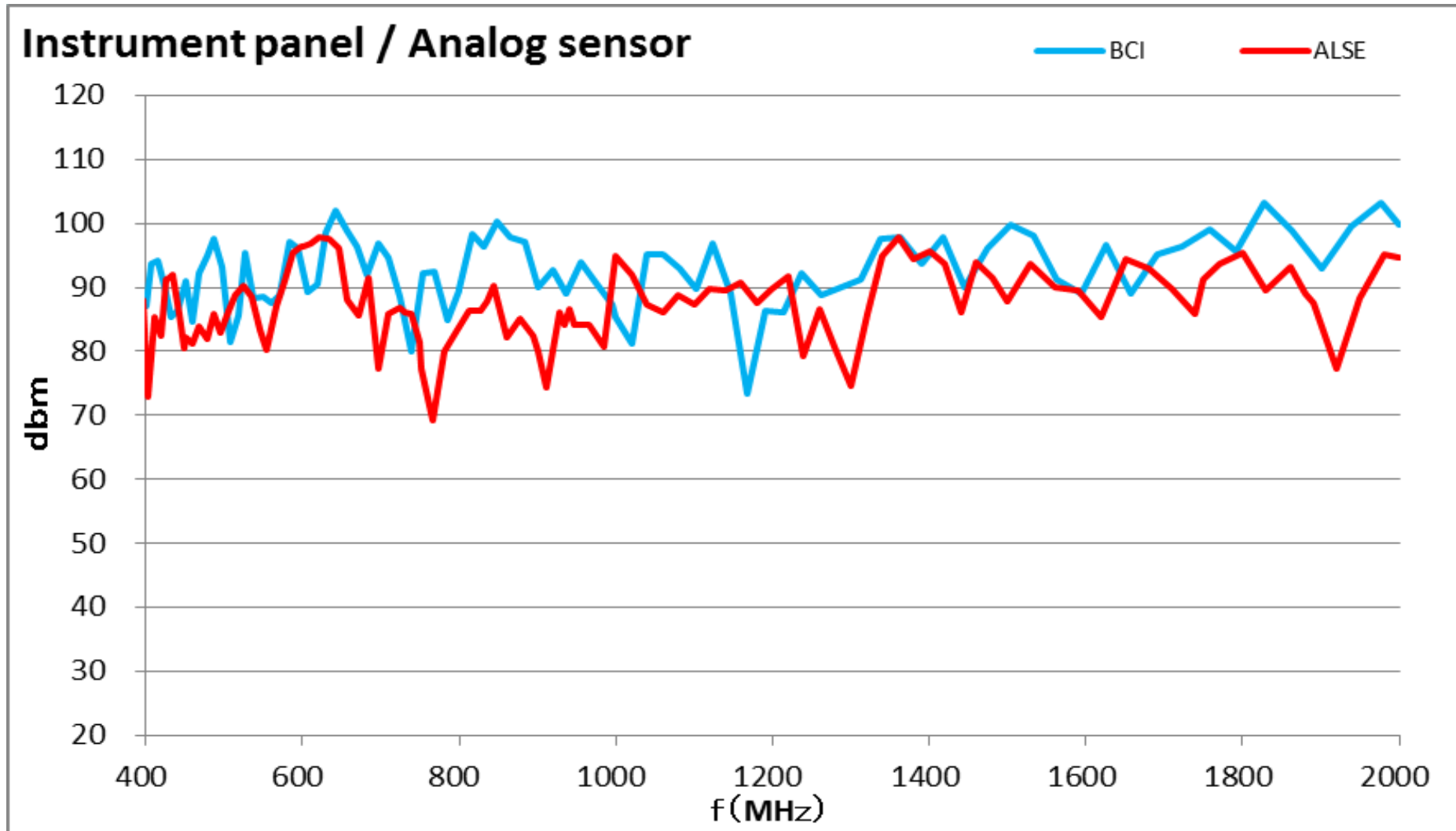


Figure 5. Instrument panel / Analog sensor

4. Result

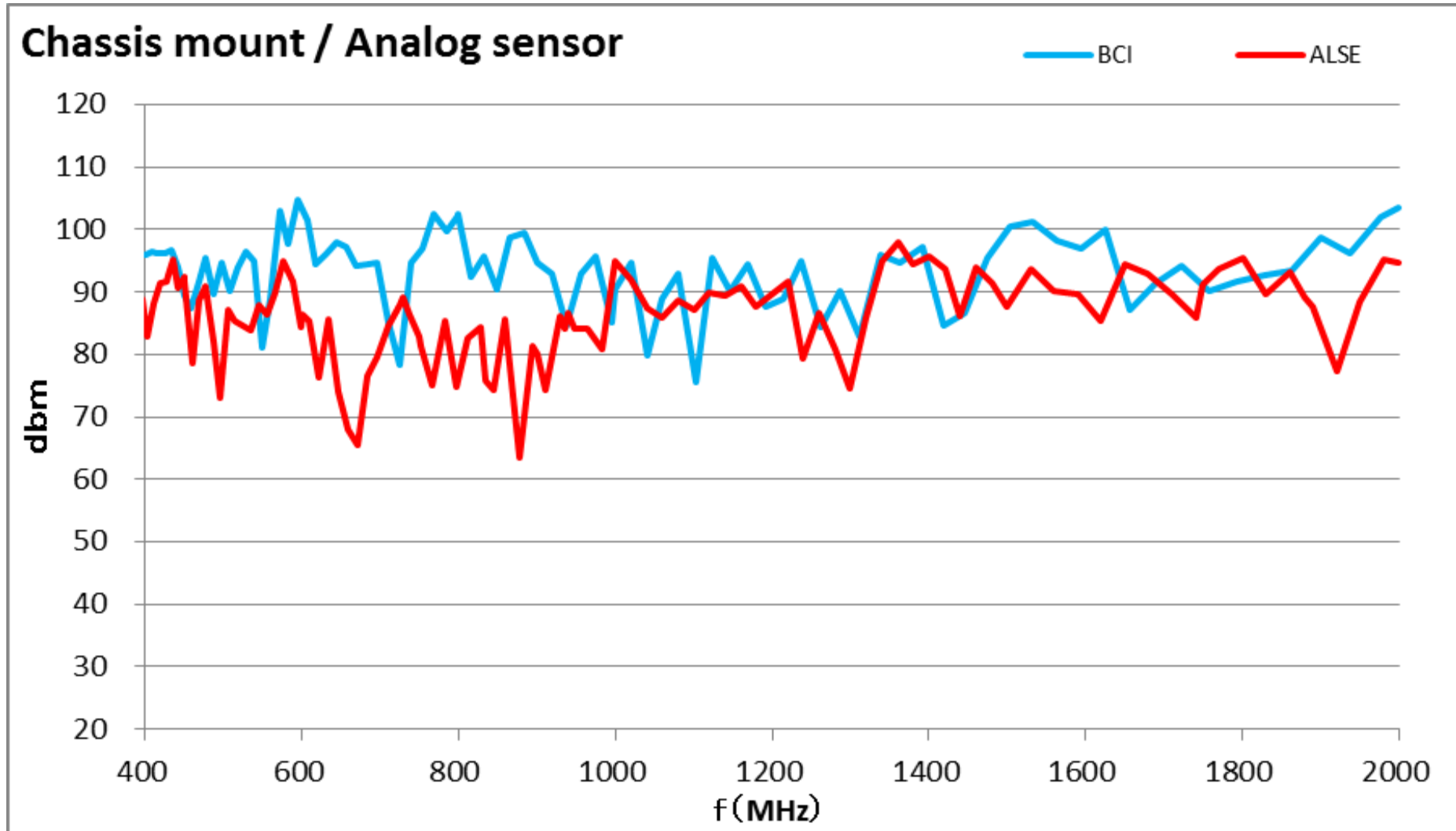


Figure 6. Chassis mount / Analog sensor

4. Result

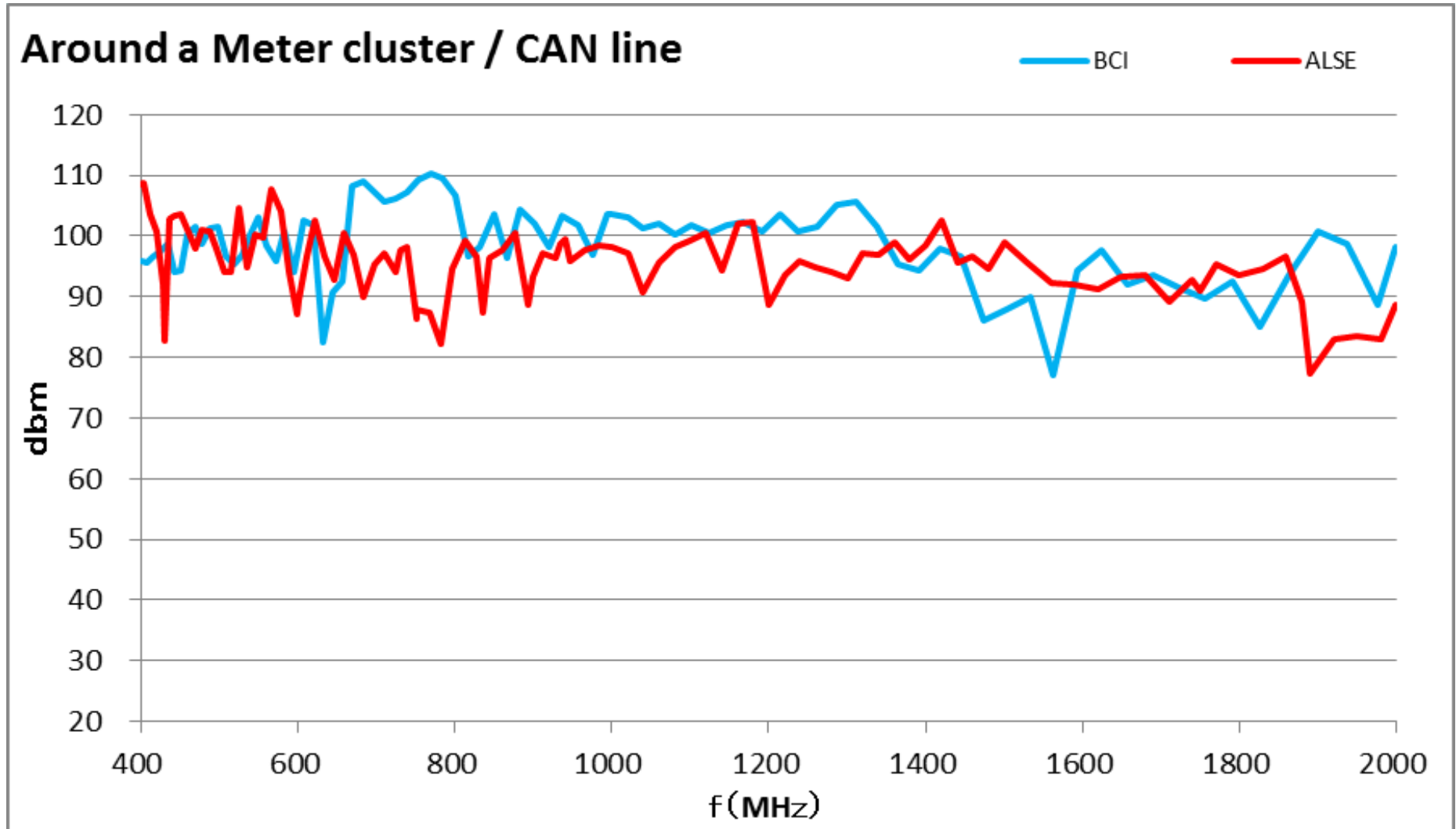


Figure 7. Around a Meter cluster / CAN line

4. Result

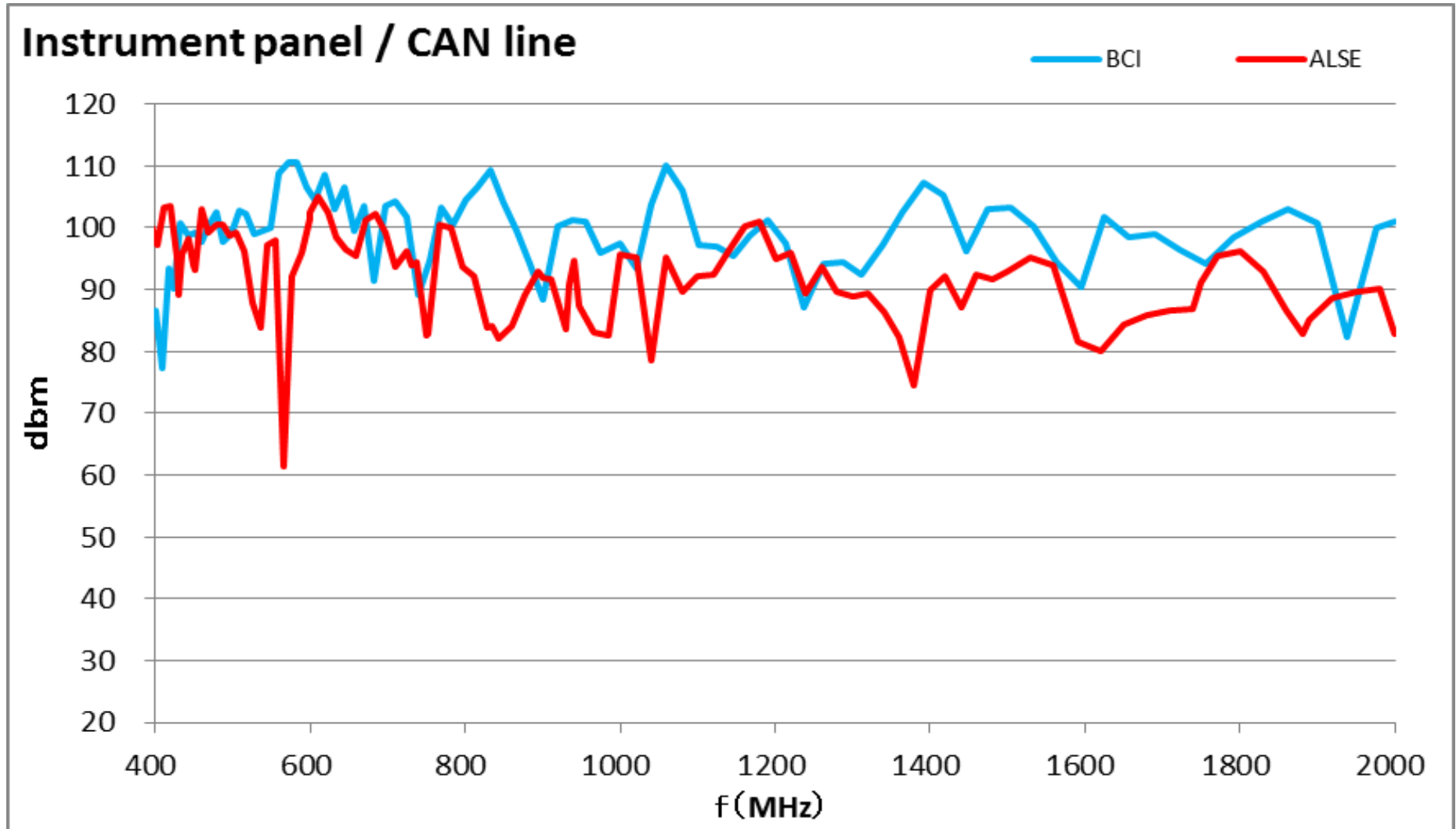


Figure 8. Instrument panel / CAN line

4. Result

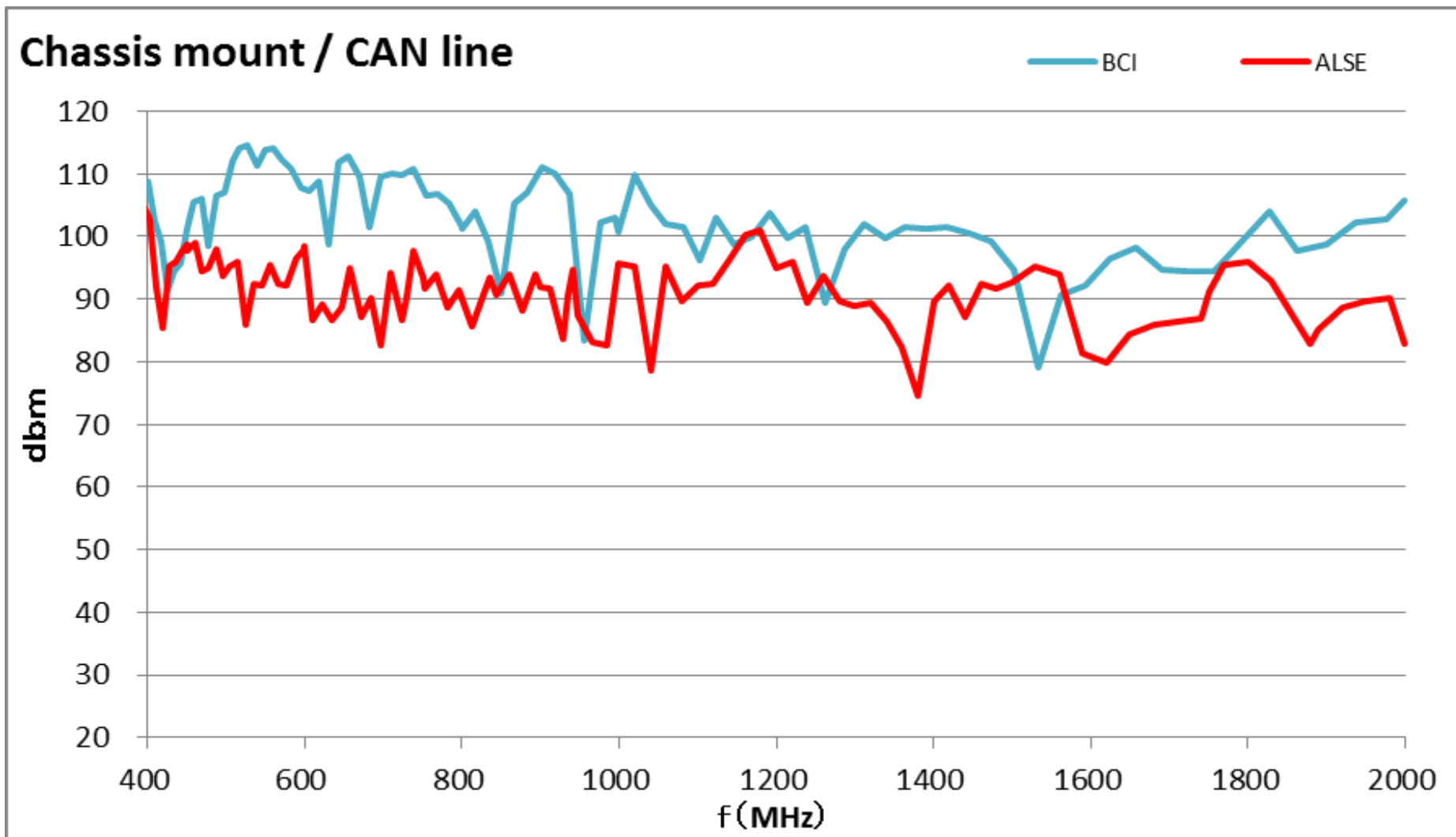


Figure 9. Chassis mount / CAN line

5. Conclusion



- BCI test is more strict than ALSE method at all ECU locations and circuit loads. That means BCI test can cover the ALSE test method.
- When number of objective components (systems) is little, vehicle BCI test method will be very efficiency test method. (Time, Cost, Location...)
- Vehicle BCI test method is suitable as alternative immunity test method.