Measuring method of permeability and permittivity of noise suppression sheets at the frequency from 6 GHz to 30 GHz

-IEC/TC51/WG10 activities-

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Our IEC/TC51/WG10 (convenor is Mr. Akihiko Saito) is compiling a technical report (TR) on measurement methods for the magnetic permeability and permittivity of noise suppression sheets (NSS) used worldwide as EMC components in the frequency range from 6GHz to 30GHz in order to accommodate higher frequencies such as Beyond 6G. Measurements using six measurement methods showed good agreement with all of the methods. The TR is scheduled to be published on June 30, 2027.

Keywords: noise suppression sheets, measurement method; permeability ; permittivity

1. Introduction

In recent years, noise suppression sheets (NSS) have been developed, which are made by mixing soft magnetic metal powders (flat powder, spherical powder, irregular powder, fine powder, etc.) with resins such as rubber, and are widely used as EMC components around the world. Furthermore, EMC designers have started designing using NSS from the early stages of designing electronic components through simulation. Therefore, we, IEC/TC51/WG10, published a technical report (TR63307-ED1 from 1MHz to 6GHz) [1] in 2020 on the measurement methods for permeability and permittivity of NSS. In addition, carriers have also been made into AI and Beyond5G/6G, with higher frequency (7.125GHz-8.4GHz/14.8GHz-15.35GHz/92GHz-300GHz). Therefore, we have developed a method for measuring the permeability and permittivity of NSS from 6GHz to 30GHz, which is the frequency band, and are working to issue it as IEC's TR63307-ED2. We will introduce their activities (Round-robin-test, etc.).

2. Results and discussion

This activity began by soliciting measurement methods, which were discussed within WG10. Table 1 shows the six measurement methods and measurement frequencies. Table 2 shows the person in charge of each measurement method. Four types of samples for the round-robin test were then decided. Round-robin tests were conducted on the same samples from the second half of 2022 to the second half of 2023. Editing of the technical report (TR) began in the second half of 2024 and is scheduled to be completed by the end of 2025(Table 3). Figure 2 shows the comparison results between the measured values of measurement method No. 1 and the catalog values. Figure 3 shows the comparison results between the measurement results of measurement method No. 6 and measurement method No. 1. All methods showed good agreement.

3. Publication of TR63307-ED2

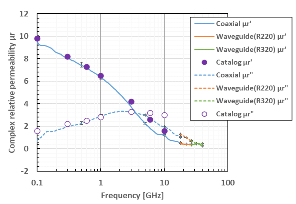
The RR (Review Report) will be published on October 18, 2024, the DTR (Draft Technical Report) on December 31, 2026, and the TR (Technical Report) on June 30, 2027.

4. Acknowledgements

I would like to thank Mr. Carlo Ragusa for inviting me to make this presentation. I would also like to thank the Japanese WG10 members.

Method Name	Main Person	Affiliation	Frequency range	In-Plane	
				μ_r	e_r
1 Nicolson Ross Weir(Coaxial)	Akihisa Tsuchiya	Kanagawa Institute of Industrial Science and Technology	500 MHz to 18 GHz	○	○
2 Nicolson Ross Weir(Waveguide)	Yu Nakama	Daido Steel Co ., Ltd.	18 GHz to 40 GHz	○	○
3 Short-Circuited Micro Strip Line	Atsushi Itagaki	Ryowa Electronics Co.,Ltd.	100 MHz to 18 GHz	○	
4 Short- Circuited Coaxial Line	Atsushi Itagaki	Ryowa Electronics Co.,Ltd.	10 MHz to 10 GHz	○	
5 Shielded Loop Coil	Yuya Inoue	KEYCOM Corporation	1 MHz to 10 GHz	○	
6 Microstrip line type probe	Shin Yabukami	TOHOKU UNIVERSITY	1 GHz to 40 GHz	○	
7 Harmonic Resonator resonance cavity perturbation	Masahiro Yamaguchi	TOHOKU UNIVERSITY	250 MHz to 35 GHz	○	

Table 1: Measurement methods and the frequencies.



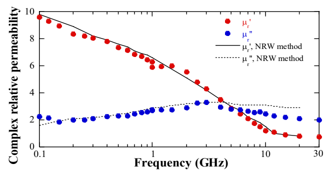


Figure2: Comparison results between the measured values of measurement method No. 1 and the catalog values (left)

Figure3: Comparison results between the measurement results of measurement method No. 6 and measurement method No. 1. (right)

References

[1] IEC TR63307-ED1(2020)