

# World Leading High-Accurate Permeability Measurement System for Magnetic Property, 100kHz - 20GHz

System No. PER01

Keysight Technologies and KEYCOM Corp.

**Measurement of magnetic property characteristics by using vector network analyzer. Without shaping specimens into toroidal form, accurate measurement is available.**

When you design or study high performance microwave magnetic devices, it is very important to know magnetic property characteristics of their materials. For this purpose, simple and easy operation way to measure magnetic properties is essential. The most important parameters of high frequency magnetic materials to be measured are as follows :

- Complex permeability
- Relaxation coefficient  $\alpha$
- FMR linewidth  $\Delta H$
- Ferromagnetic resonance (FMR)
- g-factor

This compact and easy-to-use measurement system offered by Keycom can measure all these parameters. To measure with this system, it is necessary to connect a shielded and shorted microstrip line jig to a vector network analyzer. Keysight technologies' PNA and ENA series are available for this measurement.

## Standardization

IEC 60556 Ad2·2(2016)

## Publications

- S. Takeda and H. Suzuki, "Wideband Measurement System of  $\Delta H \omega$  using All Shielded Shorted Microstrip Line", J. Magn. Soc. Jpn., 33, 171-174, (2009)
- S. Takeda, S. Motomura, T. Hotchi, and H. Suzuki, "Permeability Measurement System up to 10GHz using All Shielded Shorted Microstrip Line", Journal of the Japan Society of Powder and Powder Metallurgy, vol.61, (2014), No. S1, ppS303-S307
- S.Takeda, T.Hotchi, S.Motomura, and H.Suzuki. "Theoretical Consideration on Short-& Open-circuited Transmission Lines for Permeability & Permittivity Measurement" Journal of the Magnetics Society of Japan Vol.39, No.3 2015
- S.Takeda, T.Hotchi, S.Motomura, and H.Suzuki, "Permeability Measurements of Magnetic Thin Films using Shielded Short-Circuited Microstrip Lines" J.Magn.Soc. Jpn., 39, 227-231(2015)
- S. Takeda and M. Naoe, "Size optimization for complex permeability measurement of magnetic thin films using a short-circuited microstrip line up to 30 GHz", J.Magn. Soc. Mater. 449 (2018) 530-537

### Specifications

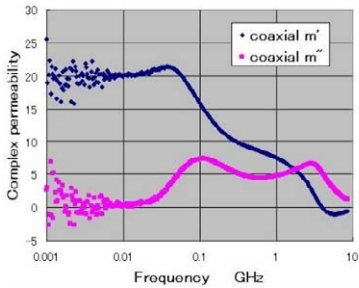
- Frequency  
Permeability : 100kHz ~ 20GHz  
FMR line width  $\Delta H$ , relaxation coefficient  $\alpha$  : 100MHz ~ 10GHz
- $\mu' - j\mu''$  : accuracy  $\pm 5\%$   
(when measured sample with optimum thickness and also depending on VNA)
- Shape of specimens : toroidal, rectangle, thin film
- Measurement temperature : standard fixture – room temperature

### Features

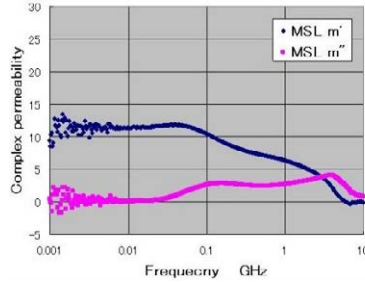
- Evaluation of magnetic property characteristics of magnetic substances.
- Beginning with complex permeability, FMR, measurement of important parameters of high frequency magnetic materials
- Simple and easy operation with vector network analyzer
- Measurement from low to high frequency by vector network analyzer



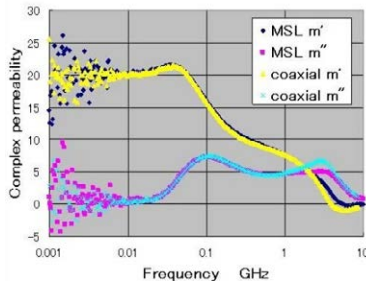
# World Leading High-Accurate Permeability Measurement System for Magnetic Property, 100kHz - 20GHz



Complex permeability of NSS toroidal core with  $\phi$  7mm x  $\phi$  3mm



Complex permeability of NSS rectangular core with 5 x 16mm



Permeability comparison between the toroidal core's result and the demagnetization corrected result of rectangular core : matches well

**KEYCOM**  
Characteristic Technologies

**KEYCOM Corp.**  
3-40-2 Minamitsuka Toshima-ku,  
Tokyo  
170-0005 Japan  
Phone: +81-3-5950-3101  
FAX: +81-3-5950-3380

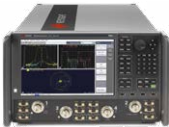
**KEYCOM USA Corp.**  
533 Airport Blvd. Suite 400  
Burlingame, CA 94010 USA  
Phone: +1-650-685-2477  
FAX: +1-650-373-2002

**www.keycom.co.jp**  
For more information on KEYCOM Corp. products, applications or services, please visit our website at [www.keycom.co.jp](http://www.keycom.co.jp) or e-mail us at E-mail: [Info@keycom.co.jp](mailto:Info@keycom.co.jp)

Keysight & Solutions Partners  
Extending our solutions to meet your needs

## Ordering Information

Keysight Technologies



Vector network analyzer  
PNA series (N52xx)  
ENA series (E50xx)



Keysight Streamline Series  
USB Vector Network Analyzers  
(P937xA, P500xA)



E-band  
network analyzer system  
N5252A

KEYCOM Corp.

System No. per01

1. Common fixing stand	BS-01A																		
2. Static magnetic field applying device	M-central value specified A Central value $\pm 15\%$ changeable, central value 500-4000 Oe																		
3. Magnetic field device for zero compensation	M-5000F 5000 Oe fixed																		
4. Measurement device	<table border="1"> <thead> <tr> <th>Frequency</th> <th>Specimen size</th> <th></th> </tr> </thead> <tbody> <tr> <td>100kHz-10GHz</td> <td>OD 7×ID 3mm</td> <td>TRO-001D</td> </tr> <tr> <td>100kHz-100MHz</td> <td>10×30mm</td> <td>ST-001A</td> </tr> <tr> <td>10MHz-1GHz</td> <td>10×30mm</td> <td>ST-002B</td> </tr> <tr> <td>1GHz-10GHz</td> <td>5×16mm</td> <td>ST-003C</td> </tr> <tr> <td>10GHz-20GHz</td> <td>2×7.5mm</td> <td>ST-004D</td> </tr> </tbody> </table>	Frequency	Specimen size		100kHz-10GHz	OD 7×ID 3mm	TRO-001D	100kHz-100MHz	10×30mm	ST-001A	10MHz-1GHz	10×30mm	ST-002B	1GHz-10GHz	5×16mm	ST-003C	10GHz-20GHz	2×7.5mm	ST-004D
Frequency	Specimen size																		
100kHz-10GHz	OD 7×ID 3mm	TRO-001D																	
100kHz-100MHz	10×30mm	ST-001A																	
10MHz-1GHz	10×30mm	ST-002B																	
1GHz-10GHz	5×16mm	ST-003C																	
10GHz-20GHz	2×7.5mm	ST-004D																	
5. Cable, 18GHz coaxial cable assembly, 1m	CM06A-AA-1000																		
6. GPIB Interface USB type	GP-01																		
7. Software	For complex permeability $\mu' - j\mu''$ . . . . . DMP-PER01-01A For ferromagnetic resonance linewidth $\Delta H$ , relaxation coefficient $\alpha$ . . . . . DMP-PER01-02A																		
8. Windows PC, Printer	Available upon request																		

Product specifications and descriptions in this document subject to change without notice.

Learn more at: [www.keysight.com](http://www.keysight.com)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

