



TEMPERATURE CONTROL SYSTEM

Microwave Dielectric Measurements in High Temperature

Measurement Demonstration

Measurements acquired with *EpsiMu*[®] PE13 from 30° to 80° at 100 MHz and 1 GHz

Ethanol ≥99.8%

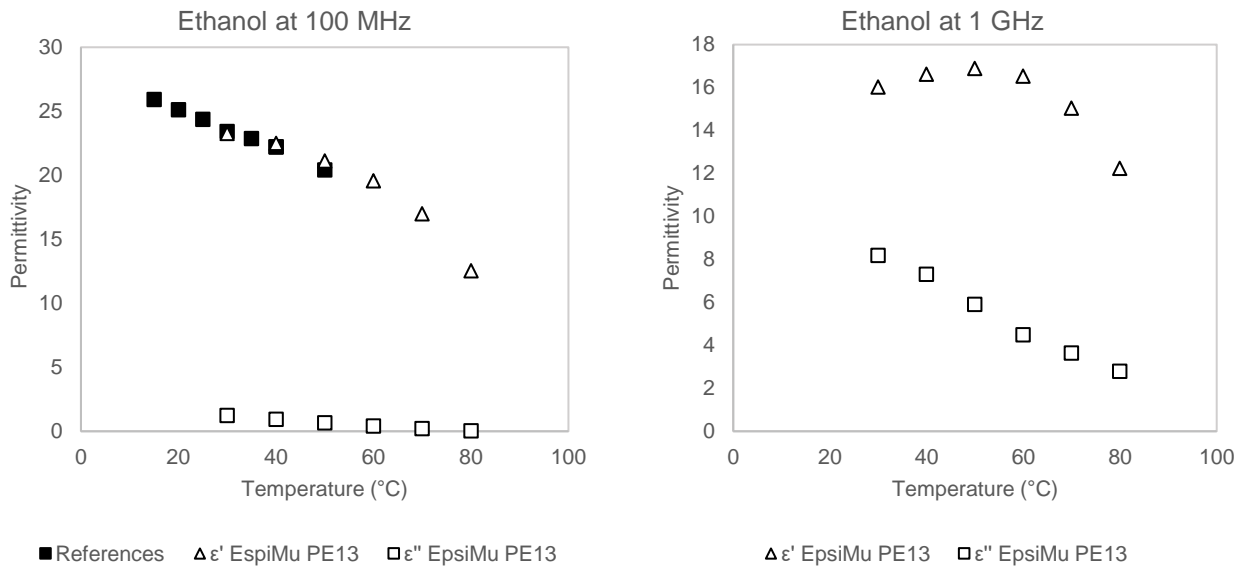


Fig. 4. (left) Real part of permittivity ϵ' (Δ) and imaginary part of permittivity ϵ'' (\square) EpsiMu measurement of ethanol as function of temperature, from 30° to 80°, at 100 MHz; comparison with references from Puranik et al, 1993, Khirade et al, 1999 and Checinska-Majak et al, 2012 (■); (right) Real part of permittivity ϵ' (Δ) and imaginary part of permittivity ϵ'' (\square) EpsiMu measurement of ethanol as function of temperature, from 30° to 80°, at 1 GHz. Measurement errors are not displayed for clarity reasons; please see [Technical Properties](#) for measurement errors.

APU10 (absorbent magnetic material)

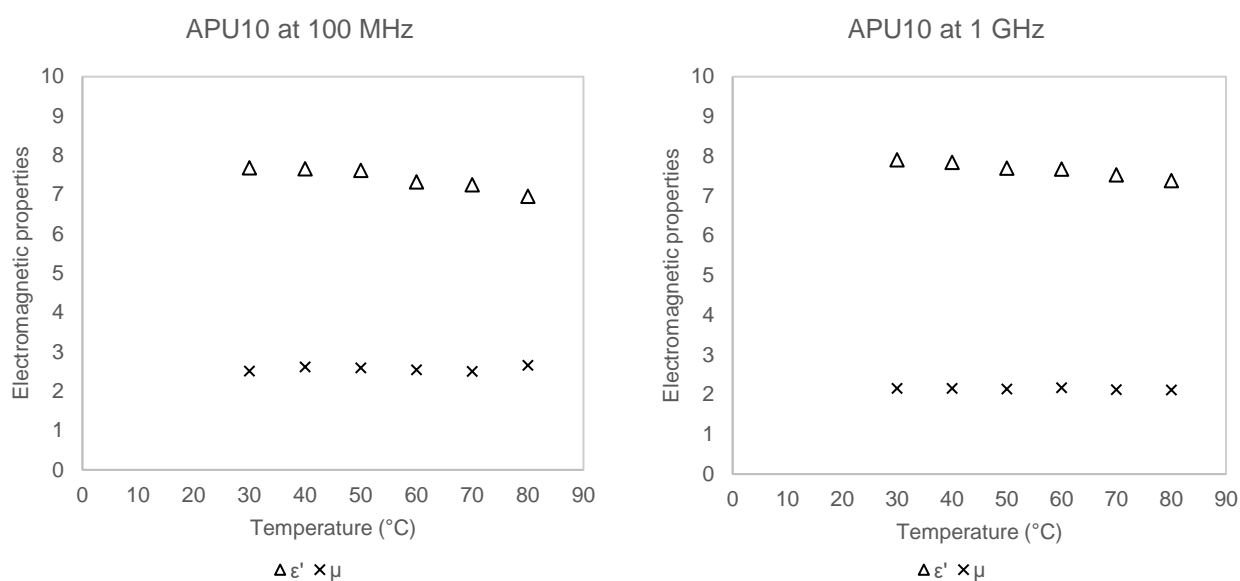


Fig. 5. (left) Real part of permittivity ϵ' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 100 MHz; (right) Real part of permittivity ϵ' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 1 GHz. Measurement errors are not displayed for clarity reasons; please see [Technical Properties](#) for measurement errors.

Measurements acquired with EpsiMu® 7mm from 30° to 80° at 530 MHz and 12 GHz

Air (constant permittivity with temperature)

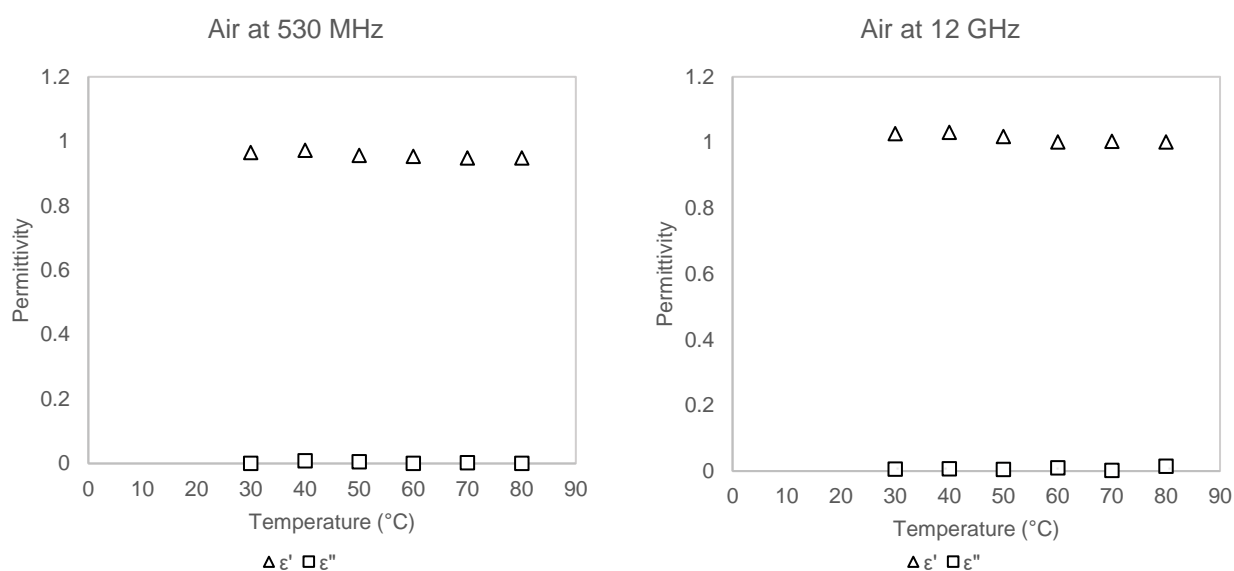


Fig. 6. (left) Real part of permittivity ϵ' (Δ) and imaginary part of permittivity ϵ'' (\square) EpsiMu measurement of air as function of temperature, from 30° to 80°, at 530 MHz; (right) Real part of permittivity ϵ' (Δ) and imaginary part of permittivity ϵ'' (\square) EpsiMu measurement of air as function of temperature, from 30° to 80°, at 12 GHz. Measurement errors are not displayed for clarity reasons; please see [Technical Properties](#) for measurement errors.

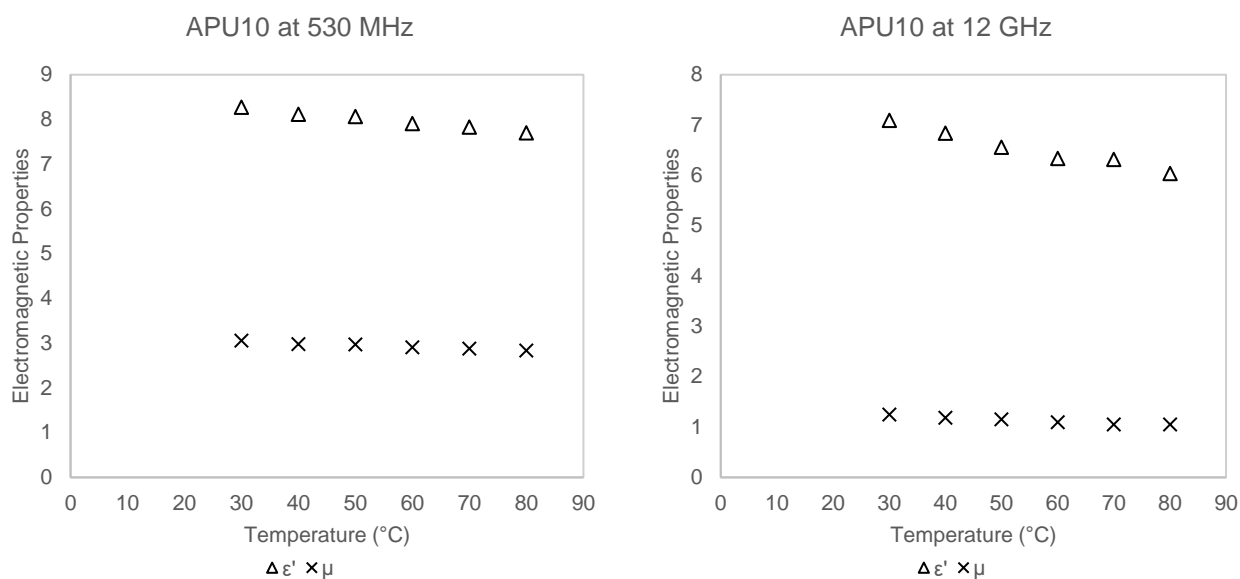
APU10 (absorbent magnetic material)

Fig. 7. (left) Real part of permittivity ϵ' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 530 MHz; (right) Real part of permittivity ϵ' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 12 GHz. Measurement errors are not displayed for clarity reasons; please see [Technical Properties](#) for measurement errors.

Technical Properties

	EpsiMu® 7mm	EpsiMu® PE13
Temperature Range	Room temperature to 85°C	
Temperature Precision	1°C	
Frequency Range	10 MHz to 8 GHz	10 MHz to 18 GHz
Heating delay time	No time restrictions (seconds)	
Number of T°C points	70 points (starting at 15°C)	
Sample type	Washer-shaped solids	Solids, powders, liquids, etc.
Sample length range (mm)	0.2 to a few mm ($< \frac{\lambda}{2}$)	1 to sample holder length
Measurement Accuracy	$\frac{\Delta\epsilon'}{\epsilon'} < 5\%$; $\frac{\Delta\epsilon''}{\epsilon''} < 10\%$	$\frac{\Delta\epsilon'}{\epsilon'} < 5\%$; $\frac{\Delta\epsilon''}{\epsilon''} < 10\%$
Length of Sample-Holder	-	24mm or higher