PRECISION ACOUSTICS

AptFlex F21

AptFlex F21, from Acoustic Polymers Ltd is a two-component, flexible, high performance encapsulation material, exhibiting toughness, excellent hydrolytic stability and an acoustic wave speed and acoustic impedance similar to that of seawater.

AptFlex F21, has excellent electrical insulation properties and can tolerate temperatures from -50 °C to +100 °C. It is particularly useful where small, delicate components are being potted since the material exhibits low shrinkage and hence stress during the cure phase.

Precision Acoustics Ltd Hampton Farm Business Park, Higher Bockhampton, Dorchester, Dorset DT2 8QH, UK

t. +44 (0) 1305 264669 **e.** office@acoustics.co.uk **w.** acoustics.co.uk

THIS COMBINATION OF PROPERTIES PRODUCES A MATERIAL THAT CAN BE USED IN AREAS SUCH AS:

- Hydrophone potting
- Marine encapsulation
- Acoustic windows
- Cable gland strain relief

AptFlex F21 is part of a range of encapsulants and provides a good compromise between toughness, flexibility and minimisation of acoustic absorption.

TYPICAL PROPERTIES

Appearance	Black or Natural (Straw coloured)
Mix ratio (by mass)	3.35: 1 (A:B)
Shore A hardness	83 ± 3
Density	980 ± 20 kg / m^3
Density Part A	910 ± 20 kg / m^3
Density Part B	1220 ± 20 kg / m^3
Viscosity (Initial @ 25 °C)	50 Poise
Average wave speed (1 MHz to 10 MHz)	1600 ± 20 m / s
Acoustic impedance	1.57 MRayls
Elongation at break	300%
Tensile strength	12.0 MPa
Dielectric constant (Tan delta)	3.4 (0.02) @ 50 Hz 3.2 (0.03) @ 1000 Hz
Dielectric strength	25 kV/mm @ 23 °C
Flammability classification	Not UL94 rated although expected to achieve UL94-HB
Coefficient of thermal expansion	100 x 10^{-6}/°C
Thermal conductivity	< 0.3 W m^{-1} K^{-1}
Volumetric shrinkage on cure	< 2%
Volume resistivity	6 x 10^{15} ohm-cm @ 23°C (dry) 3 x 10^{15} ohm-cm @ 23°C (7 days water immersion)
Surface resistivity	1 x 10^{17} ohms @ 23°C
Water absorption (% by weight)	<0.05% 24 hours @ 23°C <0.05% 30 minutes @ 100°C <5% 2 years @ 15°C (sea water)

CURING TIMES

Pot life	20-30 minutes	
Gel time	50 minutes	
Cure time	@ 30 °C	24 hours
	@ 50 °C	6 hours
	@ 80 °C	4 hours

INSERTION LOSS

Insertion loss (IL) is defined as

$$IL = -20 \log_{10}\left(\frac{P_t}{P_i}\right)$$

where P_t is the amplitude of the acoustic pressure transmitted through a sample and P_i is the amplitude of the acoustic pressure incident upon it.

This has been experimentally determined for two samples of AptFlex F21, and this is shown in Figure 1 and Figure 2 for frequencies below 1 MHz.

The dynamic range of the IL measurement procedure is approximately 40 dB and insertion loss values higher than this value cannot be guaranteed.

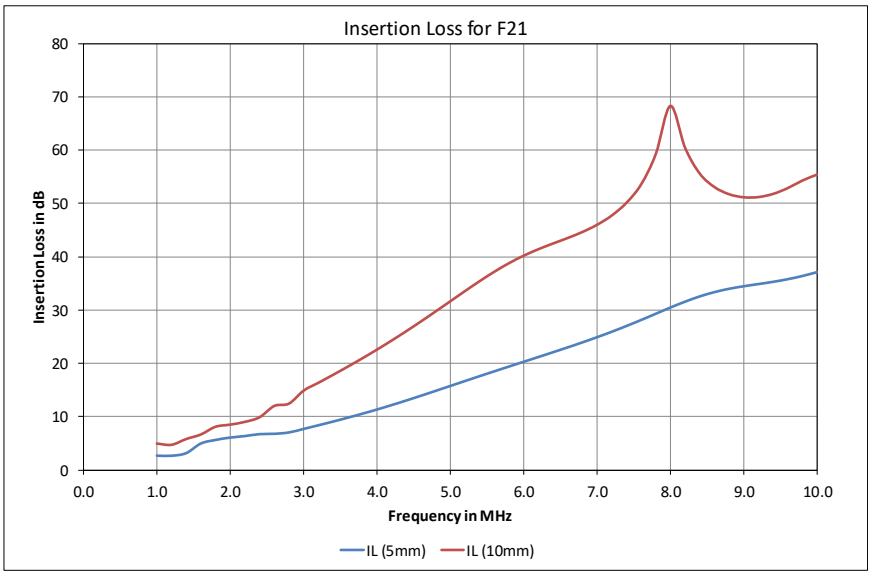

Figure 1 – Insertion loss vs Frequency for AptFlex F21

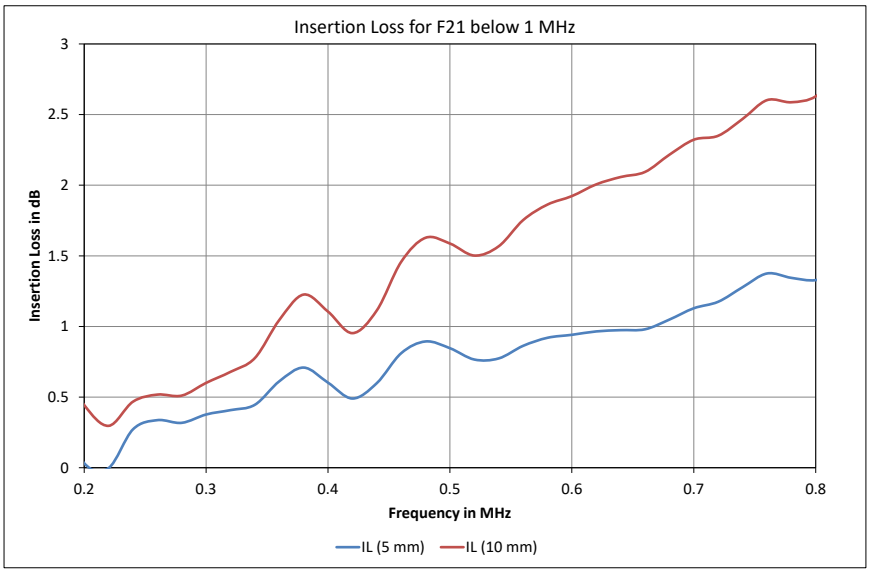

Figure 2 - Insertion loss vs Frequency for AptFlex F21

ATTENUATION

Attenuation (α) is evaluated from the measurement of Insertion Loss for 2 samples of the same material, but of different thicknesses. It is calculated as

$$\alpha = \frac{IL_1 - IL_2}{\Delta z}$$

where IL_1 is Insertion loss of sample 1, IL_2 is Insertion loss of sample 2 and Δz is the difference of between the thickness of the two samples. This has been experimentally determined for AptFlex F21, and this is shown in Figure 3 and Figure 4 for frequencies below 1 MHz. The data is fitted over the entire frequency range 0.2 MHz to 5.0 MHz and displayed on an enlarged scale below 1 MHz.

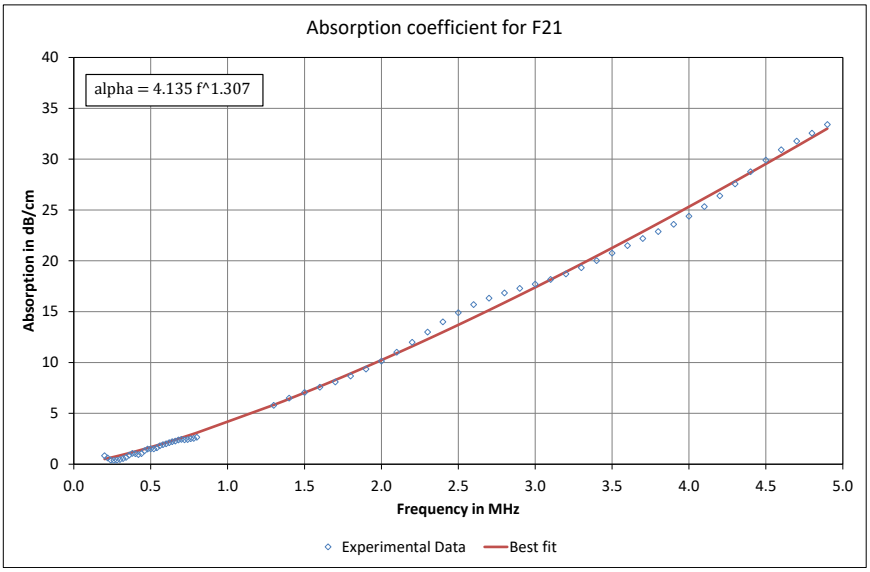

Figure 3 – Attenuation vs Frequency for AptFlex F21

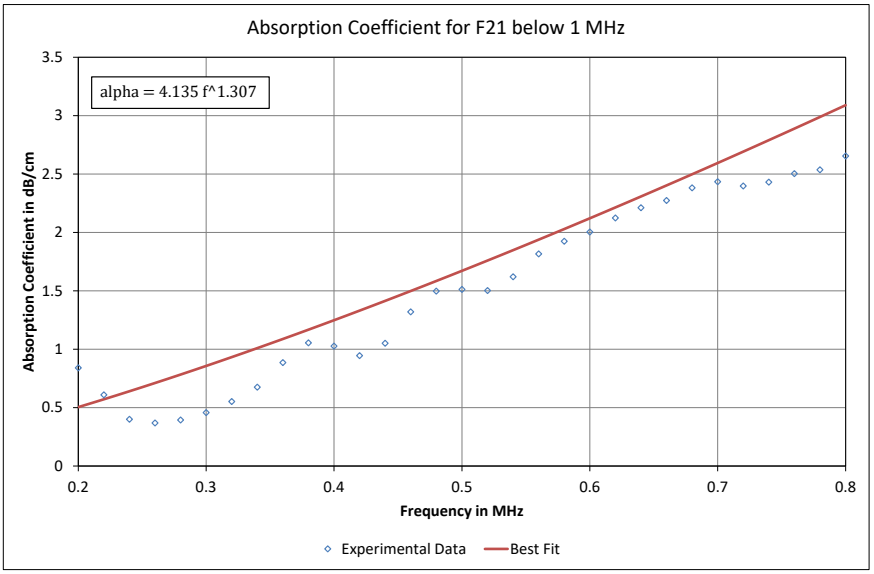

Figure 4 - Attenuation vs Frequency for AptFlex F21 below 1 MHz

ECHO REDUCTION

Echo Reduction (ER) is defined as

$$ER = -20 \log_{10}\left(\frac{P_r}{P_i}\right)$$

where P_r is the amplitude of the acoustic pressure reflected from a sample and P_i is the amplitude of the acoustic pressure incident upon it.

This has been experimentally determined for two samples of AptFlex F21, and this is shown in Figure 5.

The dynamic range of ER measurement is approximately 40 dB and values higher than this cannot be guaranteed.

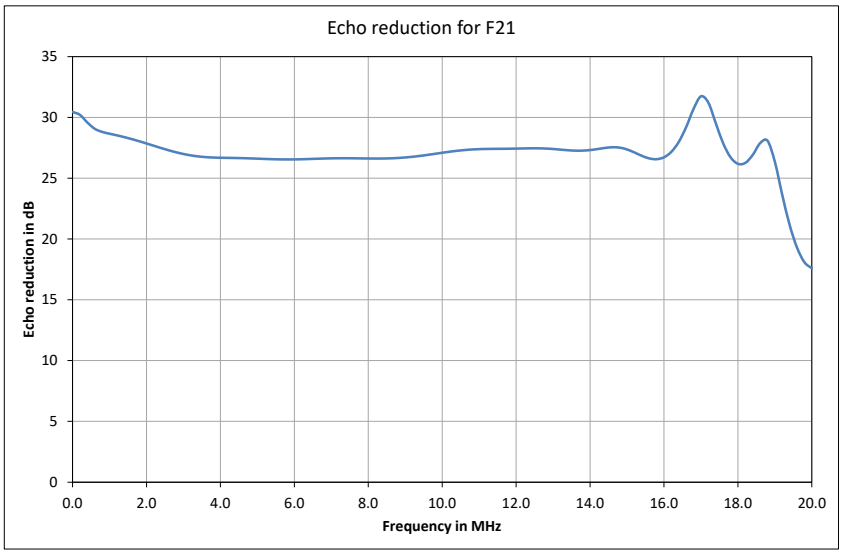

Figure 5 – Echo Reduction vs Frequency for AptFlex F21

PHASE VELOCITY

Phase velocity is evaluated from the measurement of transit time across 2 samples of the same material.

This has been experimentally determined for AptFlex F21, and this is shown in Figure 6.

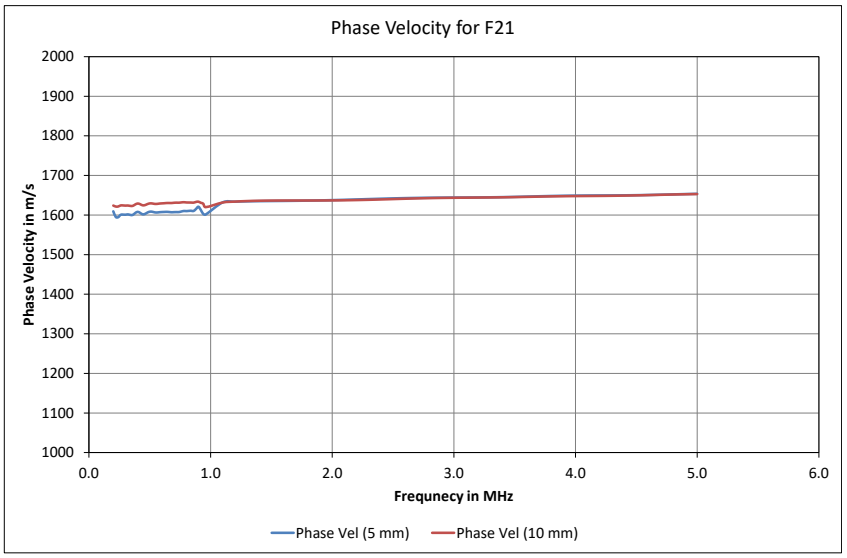

Figure 6 – Phase velocity vs Frequency for AptFlex F21

All information is based on results gained from experience and tests, and is believed to be accurate, but is given without acceptance of liability for loss or damage attributable to reliance thereon as conditions of use lie outside the control of Precision Acoustics Ltd or Acoustic Polymers Limited.