PRECISION ACOUSTICS

TBW650

TBW650, from Precision Acoustics Ltd, is a two-phase acoustic composite material with high-density, rubbery inclusions embedded within a syntactic foam matrix. It has been designed specifically for use as a low frequency transducer backing to minimise backing reflections, whilst being able to withstand elevated hydrostatic pressures. The product is supplied in sheet form.

THIS COMBINATION OF PROPERTIES PRODUCES A MATERIAL THAT OFFERS:

- Excellent insertion loss and absorption
- Acoustic de-coupling and isolation
- Ability to withstand elevated hydrostatic pressures
- No toxic constituents
- Long term stability of acoustical and mechanical properties

TBW650 makes an ideal material for use as a transducer backing material in underwater acoustic transducers. Backing reflections are very effectively suppressed in only a few mm of material. For example, 10 mm of TBW650 introduces 60 dB of absorption at 300 kHz.

TYPICAL PROPERTIES

Appearance	Blue with black chips.
Dimensions of standard tile	305 mm x 240 mm x 26.5 mm
Shore D hardness **(matrix)**	70 ± 3
Shore A hardness **(filler)**	86 ± 3
Density*	2830 ± 90 kg / m^3
Average wave speed (200 kHz to 700 kHz)	1151 ± 30 m / s
Acoustic impedance	3.08 MRayls
Hydrostatic crush strength	65 MPa/ 9427 psi
Equivalent ocean failure depth	6630 meters / 21,751 feet
Operating temperature of cured material**	100 °C (long-term) 125 °C (short-term <12 hours)

*This density figure is based on a sample of 30 standard tiles from multiple batches, representing a 95% confidence interval. The density of custom form factors may vary beyond this range.

**These figures are maximum temperatures, beyond which the chemical structure of the components may begin to thermally degrade; they are not intended as guides to the mechanical or acoustic properties of the material at elevated temperatures. We recommend that thorough testing of the material, specific to your application, is carried out before integration into devices.

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. These data have been experimentally determined for two samples of TBW650, and this is shown in Figure 1. The dynamic range of the IL measurement procedure is approximately 40 dB and higher values than this cannot be guaranteed.

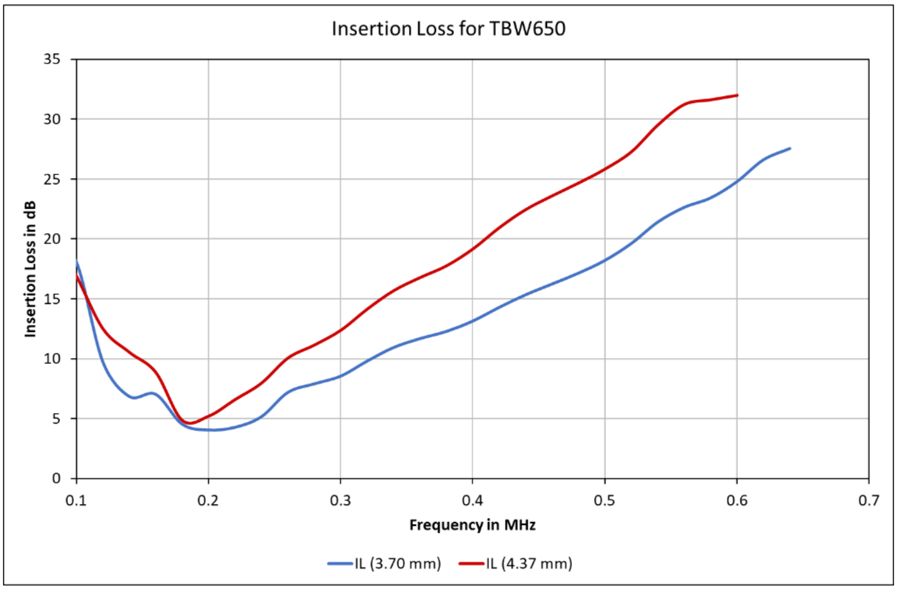

Figure 1 – Insertion loss vs Frequency for TBW650

ABSORPTION

Absorption (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 TBW650, and this is shown in Figure 2.

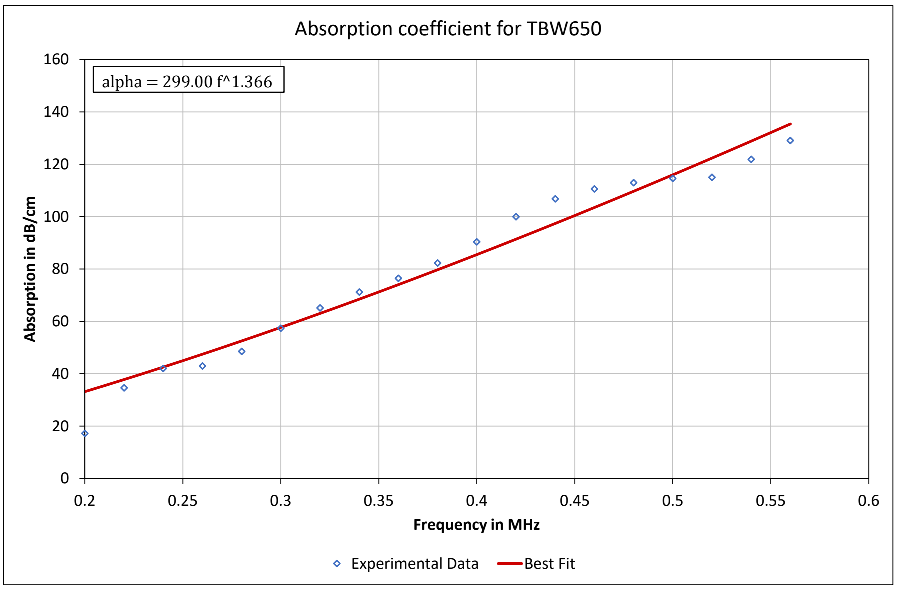

Figure 2 – Attenuation vs Frequency for TBW650

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 TBW650, and this is shown in Figure 3.

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

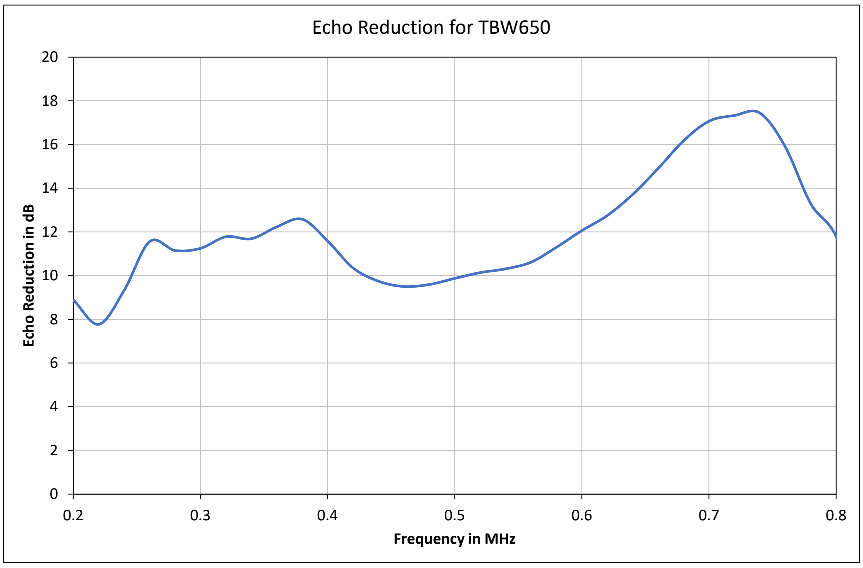

Figure 3 – Echo Reduction vs Frequency for TBW650

PHASE VELOCITY

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

This has been experimentally determined for TBW650, and this is shown in Figure 4.

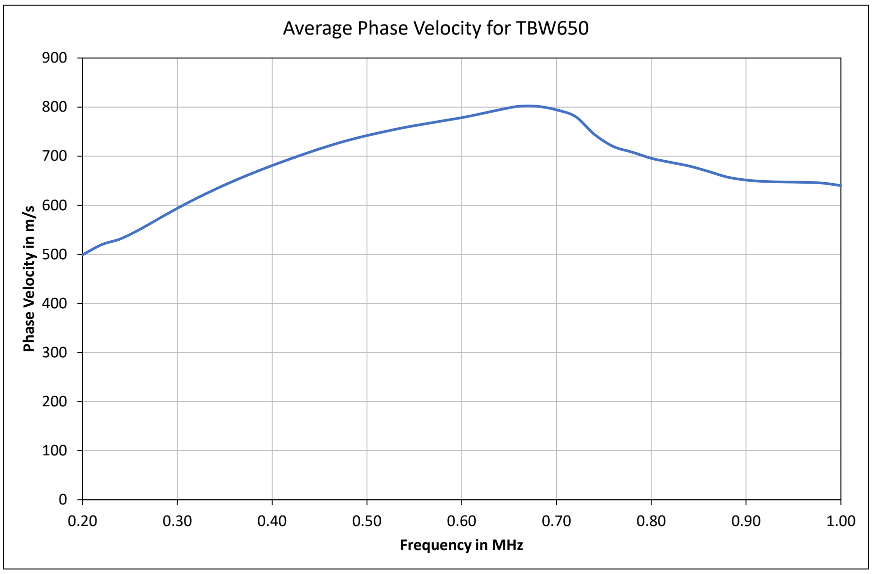

Figure 4 – Phase velocity vs Frequency for TBW650

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.