

# Symmetrical Phantom Hands

IXB-060R/IXB-060L, IXB-090R

For assessing the performance of wireless devices in real situations



- **Wide frequency range 800MHz – 3GHz**
- **Stable, elastic material with optimised stiffness**
- **Positioning spacer with graduation marks**
- **'Grasps' most standard handsets**
- **Optional fixing mounts & SAM assembly**

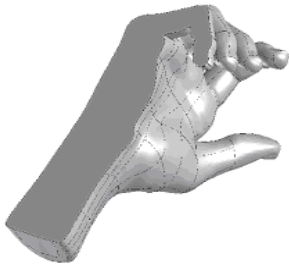
The energy absorbed from a handset by the hand is an important issue as it can alter the radiation pattern and cause considerable degradation of phone performance.

Many compromises have to be made in selecting an homogeneous material formulation for a tissue-simulating phantom hand, since real human hands are inhomogeneous exist in a wide range of sizes and can assume an almost limitless range of shapes. An average of IXB hands gives a loss difference of less than 0.7dB (IXB-060) & 0.2dB (IXB-090), from an average of real hands.

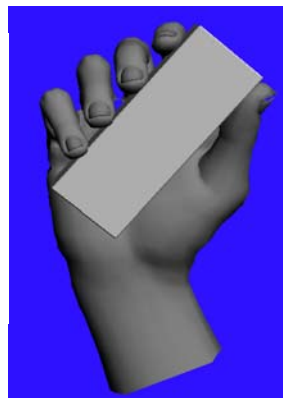
The IXB phantom hand shape has been carefully considered and has been configured into the most common setting a real hand may adopt when holding a handset. It has also been sized to allow most standard handsets to be 'grasped'. For positional repeatability it has been made reasonably 'stiff', whilst allowing some flexibility to cater for most DUT's.

The IXB-060 hands model has been constructed using mesh/polygon, spline NURBS surfaces. Left and right hands are taken from the same model and are mirror images. A solid CAD representation (IGES) is available for the comparison of computational results and measurements.

Positioning accuracy and repeatability are of key importance, and with the unique air spacer/ platform, repeatability +/- 0.1dB has been achieved in OTA tests.

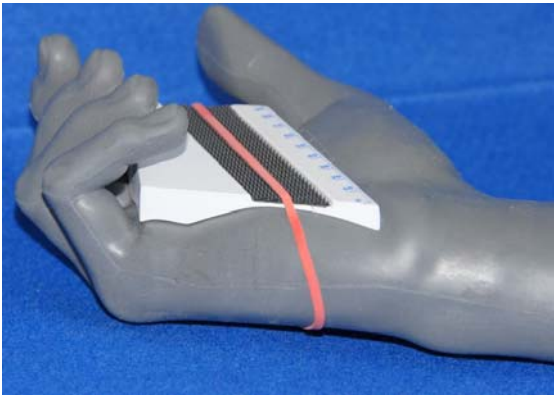


CAD Design



Left hand version (IXB-060 only)

## Air Spacer/positioning Platform



An important part of the hand development program has been the design of a detachable low loss 'air' spacer and phone positioner, IXBS, that fits, and can be fixed to the palm of hand, this allows the phone to be held in a more realistic manner and, most importantly, be able to be position the handset repeatably. The DUT is fixed to the spacer using 3M 'Dual Lock' strip for easy device holding, giving virtually no lateral movement. The spacer has number graduations to permit easy positioning. OTA tests have shown excellent repeatability, within  $\pm 0.1$ dB. An IXB-090R hand and spacer has been presented to the CTIA by Nokia.

## Fixtures

A range of positioning devices are available, from a simple universal angle hand mount, to a full assembly including a SAM phantom and CTIA recipe tissue simulant liquid.



## Custom shapes



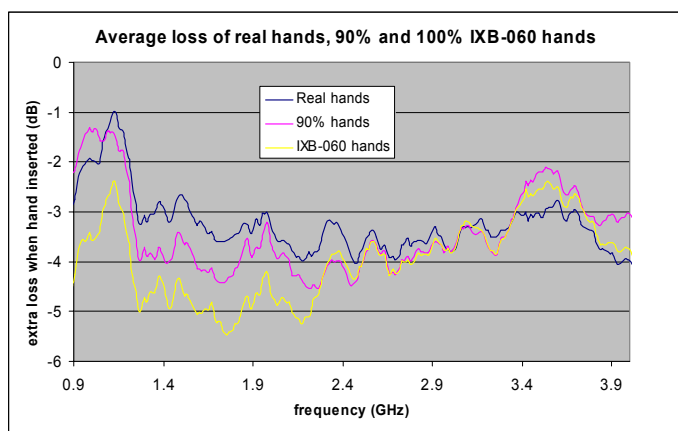
## Composition and weight

Material formulation	Weight
6% 0.5mm chopped, sized carbon fibres	IXB-060 700g
2 % carbon powder,	IXB-090 525g
92% silicone rubber	IXB-090 445g (cut-off wrist)

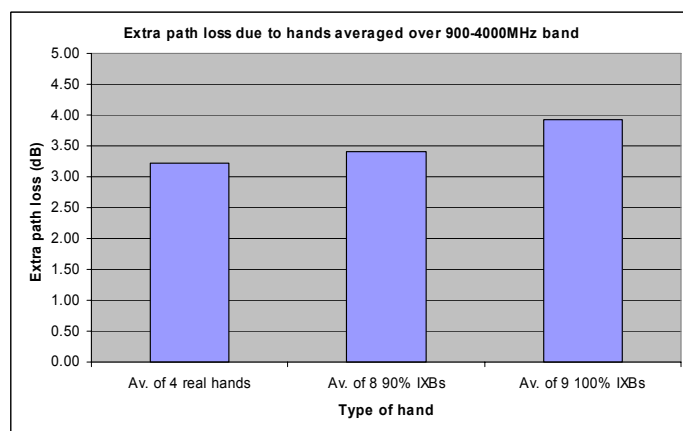
## Property measurements

Hand type	Rel. permittivity at 800 > 2000MHz	Conductivity (S/m) at 800 > 2000MHz	Measured by
IDX-060 hand	16 > 16	0.05 > 0.3	Indexsar
IDX-060 hand	21 > 20	0.07 > 0.2	Nokia
IDX-060 hand	18 > 17	0.05 > 0.2	BABT

## Performance comparison of loss between real human hands



Frequency dependence of extra path loss introduced by real hands compared to larger (IXB-060), and smaller hands (IXB-090).



Average of extra path loss introduced by real hands compared to larger and smaller hands.



Flexibility to hold a wide range of devices