

IXB-9000 Whole Body Human Phantom '**ADAM**'

Articulated Dielectric Anthropomorphic Mannequin

For body worn wireless device and antenna testing



Table of Contents

IXB-9000 Whole Body	1
Human Phantom 'ADAM'	1
Articulated Dielectric Anthropomorphic Mannequin	1
Preliminary Information	1
Introduction:	3
References:.....	3
Head;.....	3
Shell material:.....	4
Figure 1. Representation of the fully assembled body.	5
Figure 2. Body exploded view.	6
Head:.....	7
Upper Torso:	7
Legs and Arms:	7
Liquid and Gel Dielectric materials:	8
Hands (optional):	9
Ancillary Information:.....	9
Mounting Support:	9
Tissue simulant filling:	9
Filling system:.....	9
References:.....	10
Quotation	11
Delivery:	11

Introduction

The Whole Body Human Phantom IXB-9000 uses a dataset that is widely used in military ergonomic design. The figure combines a number of human study datasets to give a 95 percentile male body. To maintain commonality with current wireless standards the head in the original dataset has been substituted for a standard wireless industry SAM head phantom. The IXB-9000 has been designed to meet customer requirements for assessing body effects where electromagnetic performance is important, such as, tablet/ laptop computers, handheld wireless devices and body worn transmitters and receivers.

References

Body

DOD-HDBK-743A Anthropometry

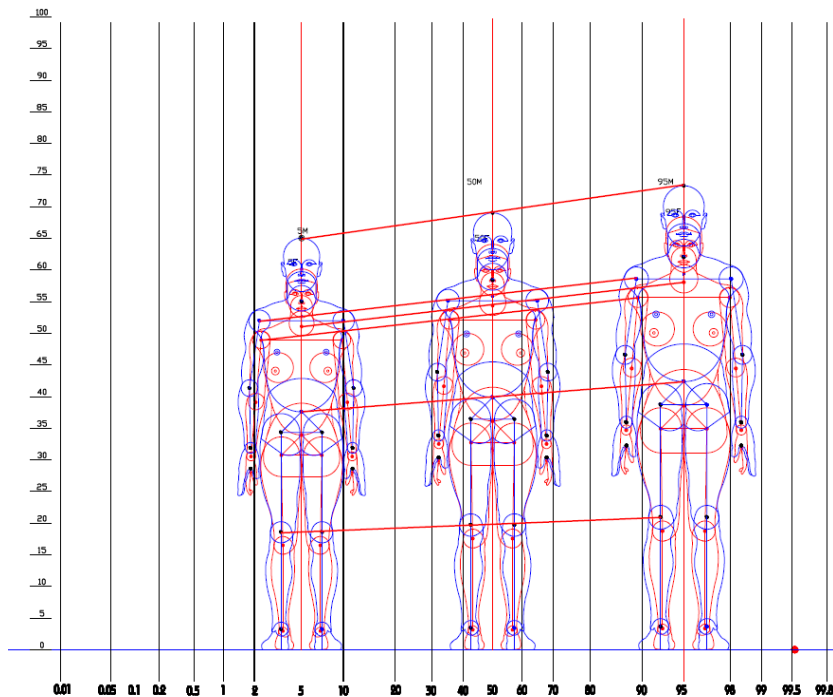
MIL-STD-1472C - MIL-STD-1472F

1997 Anthropometric Survey of the Land Forces (Canadian military)

Head;

1988 anthropometric survey of U.S. Army personnel: summary statistics interim report (NATICK/TR-89/027). As used by IEEE/IEC for SAR measurements, CTIA OTA Test Plan

5F - 95M STATURE COMPARISON



Description

The IXB-9000 phantom consists of 15 sections: a generic head, an anatomical upper torso, pelvis/buttocks, generic legs and arms (two sections each), solid carbon loaded anatomical hands (optional), feet (included in lower leg sections). With the exception of hands, each section is liquid/gel fillable with sealed plugs (2 x per section). Supports and base for mounting, lifting, filling and emptying are provided; Figure 1 illustrates an anatomic whole body phantom design.

Shell material

After the consideration of various manufacturing processes, given the limited volume and potential for customizing, 3D printing using selective laser sintering (SLS) has been selected and most cost effective way of production.

Selective Laser Sintering (SLS) is an additive manufacturing technique that uses a laser as the power source to sinter powdered material, aiming the laser automatically at points in space defined by a 3D model, binding the material together to create a solid structure.

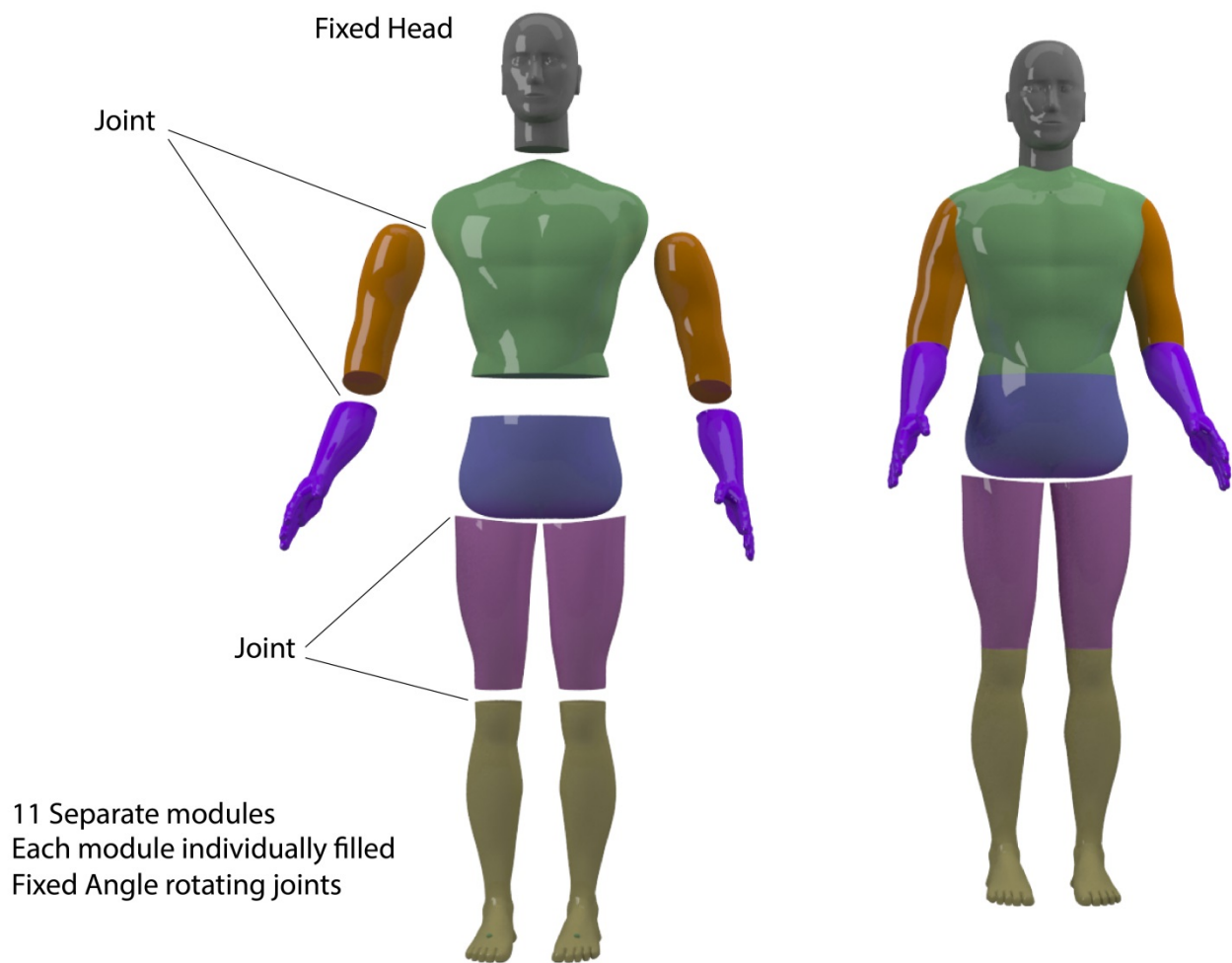
Recent advances in this technique have allowed making parts of this size/volume to become feasible.

PA2200 SLS is a fine powder on the basis of polyamide 12 nylon built in 0.12mm layers sealed internally with epoxy resin. All external surfaces to have a light bead blast and then clear lacquered to seal all internal surfaces. All parts built to generic SLS tolerances. The material's dielectric properties have tested by NPL, report number: 2014060131. The material is comparable with other materials commonly used for wireless phantoms.

Figure 1. Representation of the fully assembled body.



Figure 2. **Body exploded view.**



Head

The shape of the generic head is according to the IEEE SCC34 standard [1] and compatible with the 3GPP and CTIA standards [2], [3]. The shell of the head is also produced from PA2200 low permittivity and low loss material and has a thickness of 2.0 ± 0.2 mm in all areas (except the ear). It can be filled with gel or tissue-simulating liquid material.



Upper Torso

The upper torso is anatomically correct and also produced in SLS PA2200 nylon (thickness of 3.0 ± 1 mm) this can be filled with either tissue simulating liquids or gel materials. The dimensions of the torso are derived from the anthropomorphic data (poly model) of a 95 percentile of an adult male.

Legs and Arms

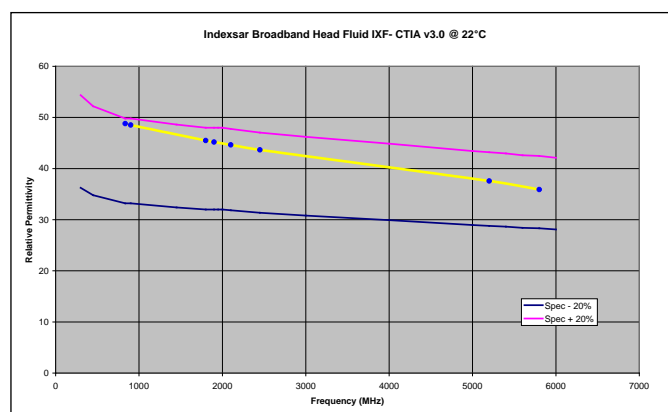
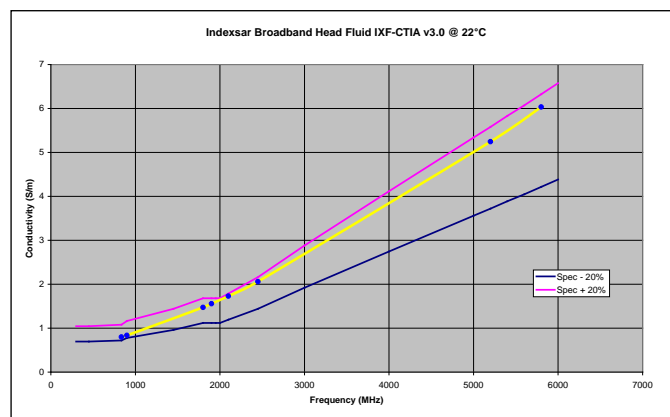
The legs and arms are anatomically correct, both in two sections, with limited adjustable joints. Using flexible joints, the whole-body phantom can be easily posed to obtain realistic scenarios (standing, sitting (optional), arms raised, etc.). The legs/arms are hollow in two independent sections adjustable at the knees and elbows. The legs and arms can be separated from torso/head, i.e., the torso including head can be used as stand-alone. The arms will have the ability to rotate and lock in fixed positions at the shoulders.

Liquid and Gel Dielectric materials

The IEEE Standards Coordinating Committee 34 has defined the dielectric properties of the head tissue-equivalent material to be used in the head phantom for SAR measurement. To provide consistency between SAR and TRP/TIS measurement, nearly identical material dielectric property values are used in Table C-1 of the CTIA test plan version 3.3.1 (July 2014).

- Meets the dielectrics targets (+/- 20%) of SAR standards IEC 62209, IEE1528
- Meets CTIA dielectric targets.
- Stable properties over time
- No Glycol, aggressive chemicals or oil
- Supplied in 9 litre containers
- Individually measured, supplied complete with test report

Typical Performance



Storage: Do not store at temperatures above 35° C

Life: Dielectric properties when kept at room temperature (22° C) should not change appreciably for at least two years.

Custom liquids can be developed to suit specific dielectric properties.

Hands (optional)



CTIA compliant or customized hands can easily be fitted to the arms. The hand material is a carbon loaded mixture to reflect the dielectric performance of hands.

Ancillary Information

Mounting Support:

A simple base stand is supplied for standing / sitting or other poses (subject to order)

Tissue simulant filling

Each section supplied with a sealed filling, draining plugs, and an air bleed screw when necessary. To avoid weight issues on installation, the torso, can be filled and drained with tissue simulating liquid in situ.

Filling system

A sealed pumping system is used for filling emptying the torso 'insitu' from an external reservoir placed outside the test chamber, all other body sections weigh less than 15kg can be filled offsite and can be hand carried for final assembly.

References

- [1] IEEE Std 1528-2003. Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices – Measurement Techniques. Institute of Electrical and Electronics Engineers, New York. 19 December 2003.
- [2] 3GPP TR25.914 “Measurements of Radio Performances for UMTS Terminals in Speech Mode” Release 11.
- [3] CTIA Test Plan for Mobile Station Over the Air Performance, Revision 3.1, January 2011.
- [4] Gordon, C.C., et. al, 1988 anthropometric survey of U.S. Army personnel: summary statistics interim report (NATICK/TR-89/027). U.S. Army Natick RD & E Center, Massachusetts.
- [5] DOD-HDBK-743A Anthropometry
- [6] MIL-STD-1472C - MIL-STD-1472F
- [7] 1997 Anthropometric Survey of the Land Forces (Canadian military)



QUOTATION

ITEM	Qty	DESCRIPTION	PRICE £ Each	PRICE £
1	1	IXB-9000 Whole Body Phantom 'ADAM'		
2		IXF-CTIA-3.3.1 Tissue simulant		
		Options		
		Upper body Torso and Head		
		Lower body		
		CTIA hands		
		IXB-050R&L		
		IXB-051R&L		
		IXB-052R&L		
		IXB-053R&L		

Delivery:

Delivery of the whole-body phantom is 12-16 weeks after receipt of written order.

Indexsar Limited
Oakfield House
Cudworth Lane
Newdigate
Surrey RH5 5BG
Tel: +44 (0) 1306 632 870
Fax: +44 (0) 1306 631 834
e-mail: sales@indexsar.com