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Performance evaluation protocol for digital fitting systems —

Part 3:
Digital fitting performance

Protocole d'évaluation de la performance des systèmes d'essayage virtuel —

Partie 3: Performance de l'essayage virtuel

ICS: 61.020

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 133, *Clothing sizing systems - size designation, size measurement methods and digital fittings*.

A list of all parts in the ISO 20947 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Digital fitting systems are used more frequently for evaluating the fit of garments without making actual physical patterns or physical garments. In a digital fitting system, a virtual garment is made using virtual patterns, and the fit of physical garment on a physical human body is assessed by draping a virtual garment on a virtual body or a virtual fit mannequin (fit form) model. Such system is useful for designers, manufacturers, educationalists because the system helps to improve the fit of garments and productivity.

The use of the digital fitting system, employed to evaluate the suitability of a real garments on real human body with the use of virtual garments on a virtual human body in virtual space, is growing in popularity. The system eliminates the need for physical garment production with fabric in product evaluation. Using a computer-generated the virtual garment pattern, virtual garment is created and tested on either a virtual human body or a virtual fit mannequin (fit form) model. The technology is expected to improve garment fit and increase productivity. It benefits not only those engaged in garment design but also consumers at the time of garment purchase, with better fit and wider choice of sizes in mass-produced products.

Digital fitting technology is still developing, and there is a wide range of differences in the specification and performance between digital fitting systems. This makes it difficult for users (designers, manufacturers, educationalists and retailers of garments) to select an appropriate system for their purposes.

Notwithstanding, the digital fitting system is still developing, with wide differences among systems regarding functions and performance description. This makes the choice of the right system extremely difficult for the system user (garment design and retail).

This international standard is ISO20947 series part 3, and stipulate evaluation protocol for digital fitting performance of digital fitting system. This international standard will help and provide judging criteria for selection of digital fitting system when garment designer or pattern engineer create virtual garment patterns and evaluate fitting performance to virtual fitting body.

Performance evaluation protocol for digital fitting systems —

Part 3:
Digital fitting performance

1 Scope

This part of ISO 20947 specifies the protocol employed in evaluating the gap between the virtual garment and the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model in the evaluation of the fitting performance of the virtual garment and the virtual human body.

In this standard, gap means space between garment and human body which is indispensable for garment design and is an important factor for wearing comfort.

For the purpose of evaluating this gap, the standard requires the reporting of whether the perimeter calculation function for the virtual garment and the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model, the function for calculating the gap in measurements and area between the virtual garment and the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model and the visualization function for gap, garment pressure, and grain are available or not.

Also, evaluation of the perimeter of the virtual garment, the perimeter of the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model and the gap in area between the virtual garment and the virtual clone, the virtual twin or the virtual fit mannequin in accordance with the method specified herein and reporting of the results are recommended.

The users covered by this standard are those users planning to install or update digital fitting systems. Users (developers, designers, manufacturers, educationalists, retailers etc.) of digital fitting systems shall produce evaluation reports according to this standard and make such reports available to the users.

This evaluation process is not limited to materials (e.g. woven). These figures are wearing woven fabric clothing. Soft fabrics, such as knitted materials, have different results.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8559-1, *Size designation of clothes — Part 1: Anthropometric definitions for body measurement*

ISO 18825-2, *Clothing — Digital fittings — Part 2: Vocabulary and terminology used for attributes of the virtual human body*

ISO 20947-1, *Performance evaluation protocol for digital fitting systems — Part 1: Accuracy of virtual human body representation*

ISO 20947-2, *Performance evaluation protocol for digital fitting systems — Part 2: Virtual garment*

ISO 20685, *3-D scanning methodologies for internationally compatible anthropometric databases – Part 1: Evaluation protocol for body dimensions extracted from 3-D body scans*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Digital fitting system
Digital fitting system provides qualitative and/or quantitative evaluation of overall and/or specific simulation garment fit through analysis of the distribution of surface grain, gap between body and garment, heat map, cross section, surface wrinkles, seam drop, garment balance, etc.

[SOURCE: ISO 20947-2:2020, 3.1]

3.2
Virtual garment
Three-dimensional clothing in digital form that exists in virtual space.

[SOURCE: ISO 20947-2:2020, 3.1.3]

3.3
Virtual human body
Virtual human model for digital fitting in the apparel industry, including information such as size, shape, cross section, body texture and skeletal structure.

[SOURCE: ISO 18825-1:2016, 2.1.1.2]

3.4
Virtual fit mannequin (fit form) model
Virtual model of a fit mannequin (fit form) in a virtual space used for digital fitting. Fit mannequin (fit form) model is used for draping and examining silhouette and fit of a garment.

Note 1 to entry: See ISO 20947-1:2021, 3.3.2.3

3.5
Virtual cross section
Closed contour extracted from the plane cutting a virtual body segment perpendicular to its main axis or the three principle axes.

[SOURCE: ISO 18825-1: 2016, 2.2.2]

3.6
Gap
An index that can quantitatively analyse the garment fit onto the body (allowance). Gap means space between Virtual garment and Virtual human body or Virtual fit mannequin (fit form model) which is shown in Virtual cross section.

Note 1 to entry: The shape changes depending on the weight of the clothes, the friction between the clothes, and the body, but "Gap" is a function that quantifies the amount of space such as the contact point with the body and the distance from the body.

Note 2 to entry: Space shall be expressed with difference amount of square measure or girth length between Virtual cross section of Virtual garment and Virtual human body (or Virtual fit mannequin (fit form) model). Or be expressed with gap amount between Virtual cross section of Virtual garment and Virtual human body (or Virtual fit mannequin (fit form) model).

3.7
Garment pressure
An index that can quantitatively analyse the part of the garment that exerts pressure on the body (tight).

Note 1 to entry: Pressure means how force is applied to the body. Pressure is affected by gravity (including the weight of the material itself), friction, and material properties.

Note 2 to entry: Pressure is determined when clothing simulation with Virtual fit mannequin model and Virtual garment is conducted. If the garment is too big, the garment will be loose and the pressure on the body will be zero. If the garment is too small, it will be tight on the body and the positive pressure on the body will be high.

3.8
Stretch
An index that can quantitatively analyse the amount of expansion and contraction of the material. This can be a function of the material properties such as bias or elastic. The amount of expansion and contraction of the material.

4 Functions

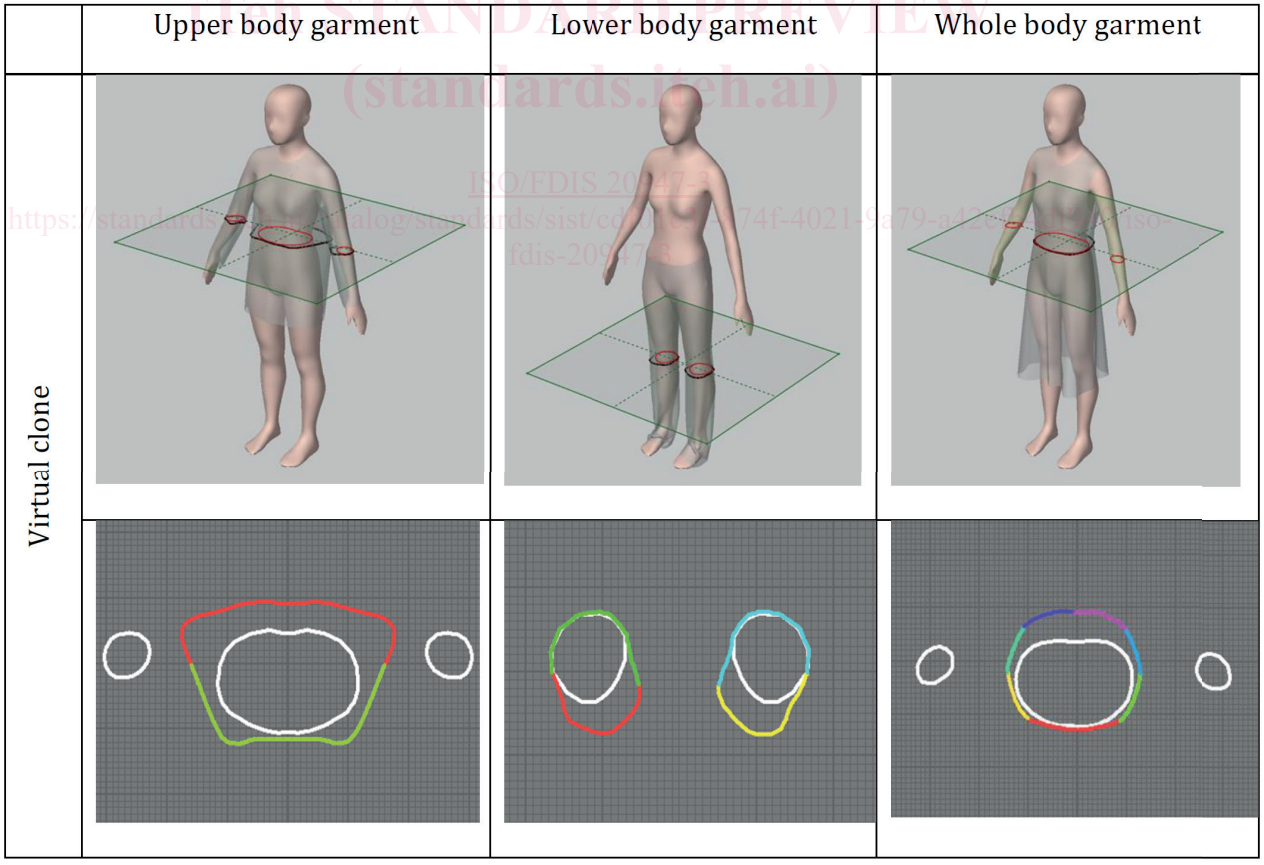
4.1 General

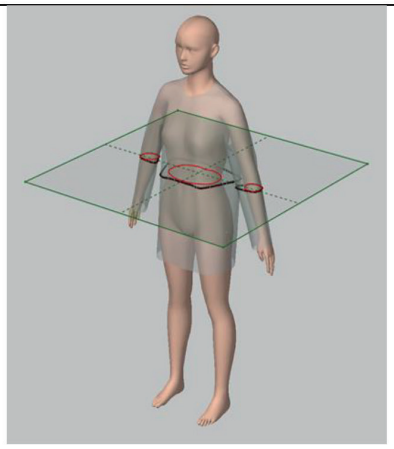
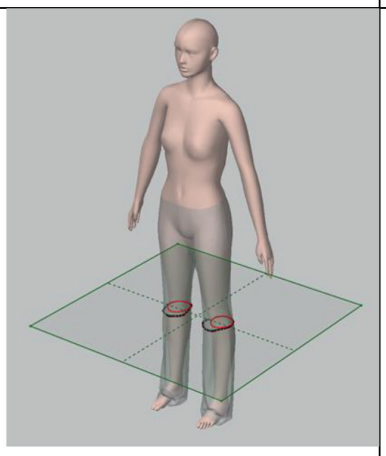
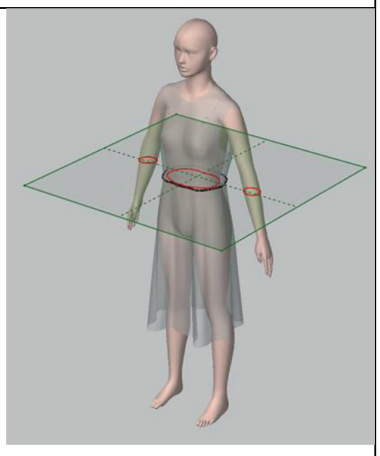
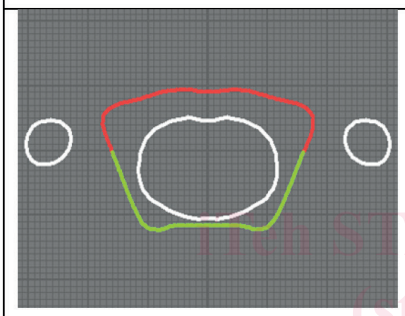
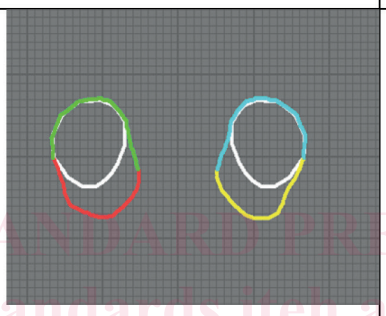
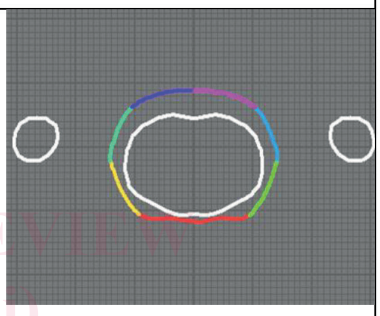
The digital fitting system has the six functions as given in clause 4.2 to 4.7.

4.2 Function to measure the perimeter on the virtual cross section

4.2.1 Function to measure the perimeter on the virtual horizontal cross section

Function to measure the perimeter of the virtual garment and the virtual fit mannequin (fit form) model from any arbitrary point on the virtual horizontal cross section



	Upper body garment	Lower body garment	Whole body garment
Virtual twin			
			

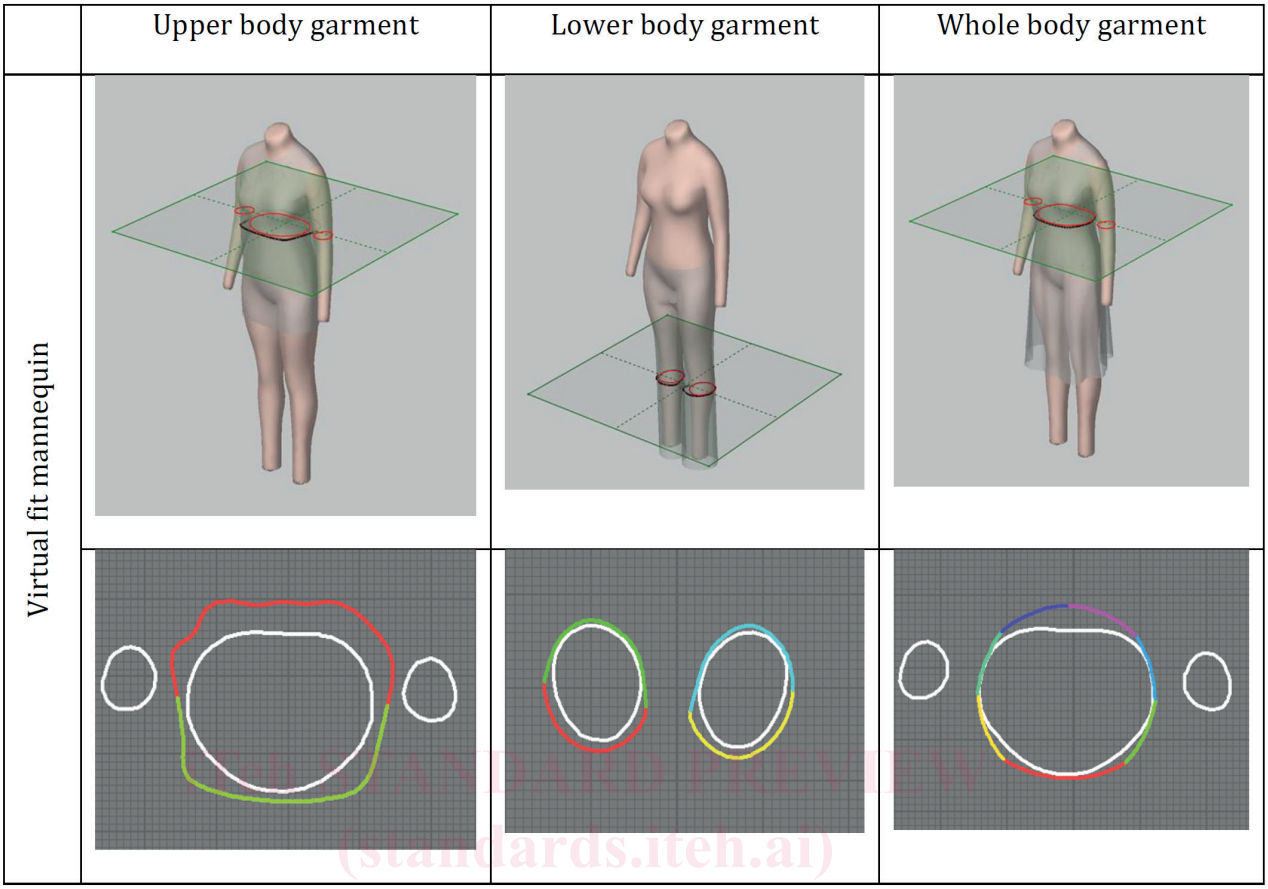
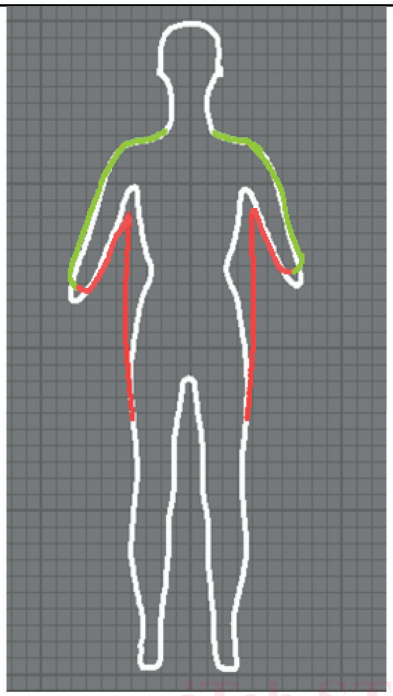
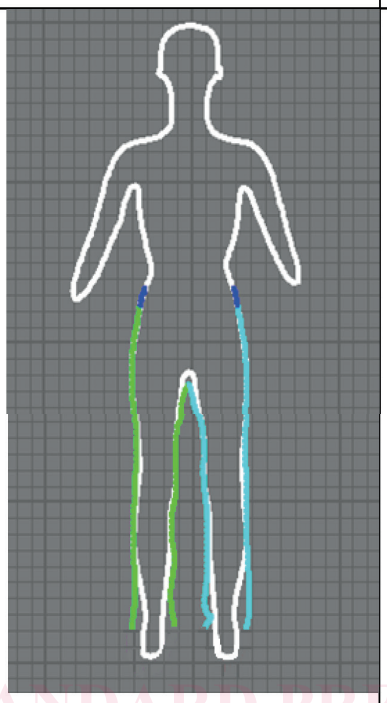
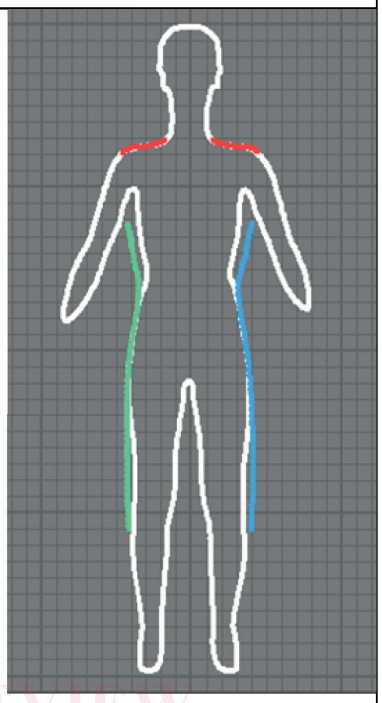
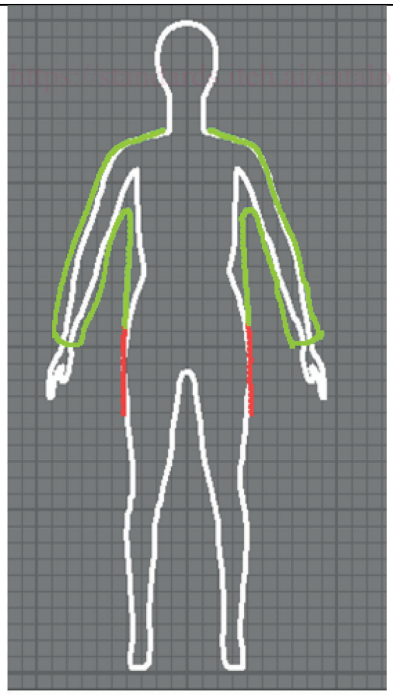
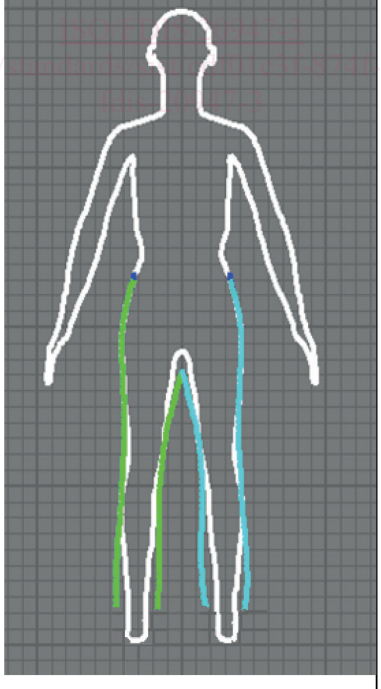
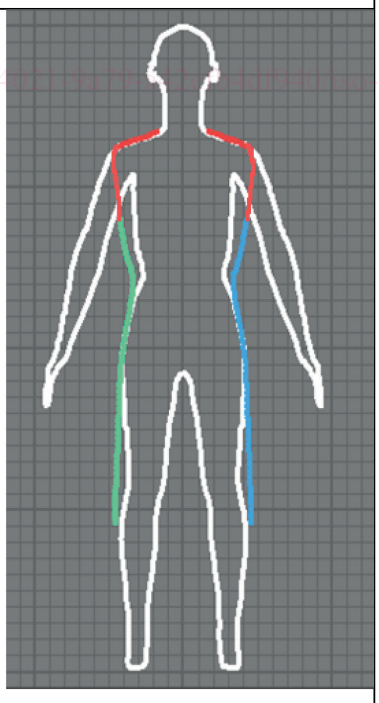


Figure 1 — Example of the perimeter measured on the virtual horizontal cross section

4.2.2 Function to measure the perimeter on the virtual vertical cross section (front center)

Function to measure the length of the virtual garment shape and the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model shape from any arbitrary point on the virtual vertical cross section (front)

	Upper body garment	Lower body garment	Whole body garment
Virtual clone			

	Upper body garment	Lower body garment	Whole body garment
Virtual twin			

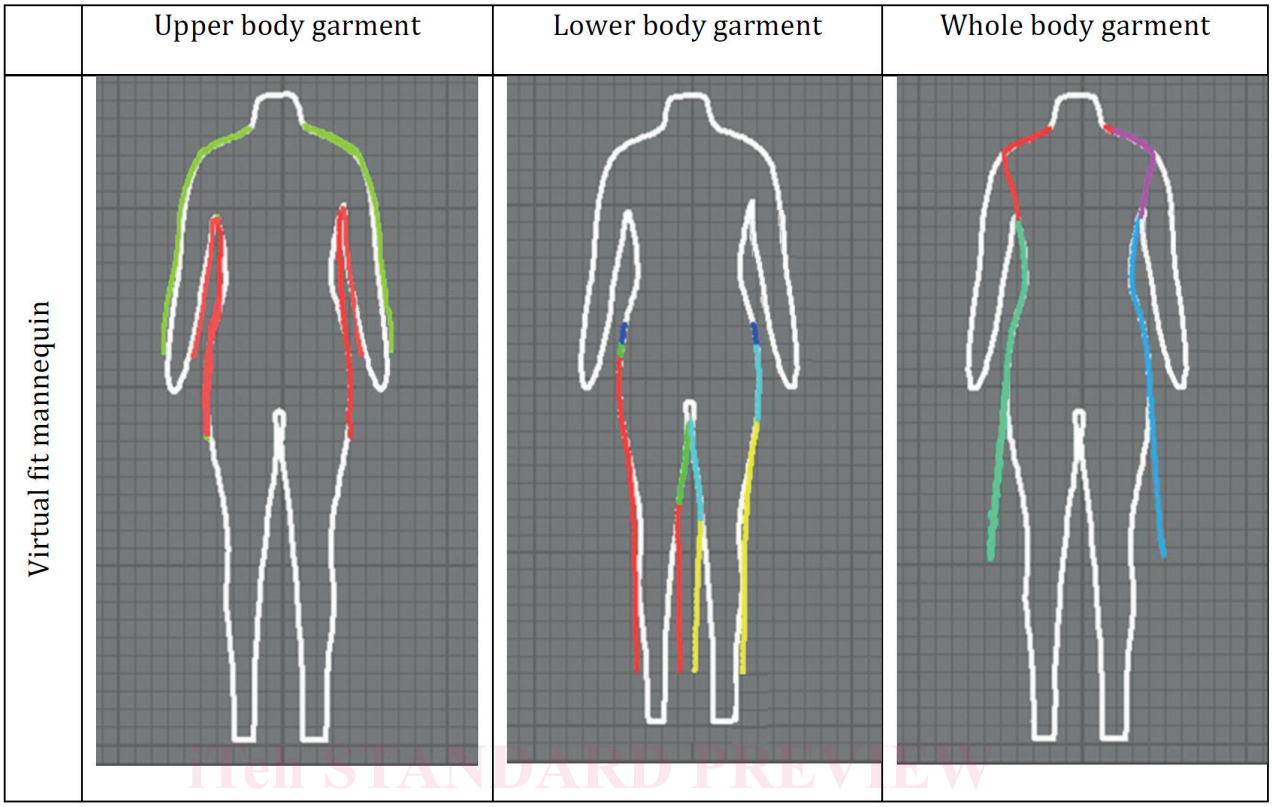


Figure 2 — Example of the length of front center shape measured on the virtual vertical cross section

4.2.3 Function to measure the perimeter on the virtual vertical cross section (side)

Function to measure the length of the virtual garment shape and the virtual clone, the virtual twin or the virtual fit mannequin (fit form) model shape from any arbitrary point on the virtual vertical cross section (front)