

Integrating the Healthcare Enterprise



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**IHE Eye Care
Technical Framework Supplement**

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**Key Measurements in
DICOM Encapsulated PDF**

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Revision 1.0 – Draft for Public Comment

20

Date: January 22, 2019
Author: IHE Eye Care Technical Committee
Email: eyecare@ihe.net

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Please verify you have the most recent version of this document. See [here](#) for Trial Implementation and Final Text versions and [here](#) for Public Comment versions.

Foreword

30 This is a supplement to the IHE Eye Care Technical Framework V4.0. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is published on January 22, 2019 for Public Comment. Comments are invited and can be submitted at https://www.ihe.net/Eye_Care_Public_Comments. In order to be considered in development of the Trial Implementation version of the supplement, comments 35 must be received by February 21, 2019.

This supplement describes changes to the existing technical framework documents.

“Boxed” instructions like the sample below indicate to the Volume Editor how to integrate the relevant section(s) into the relevant Technical Framework volume.

<i>Amend section X.X by the following:</i>
--

40 Where the amendment adds text, make the added text **bold underline**. Where the amendment removes text, make the removed text **~~bold strikethrough~~**. When entire new sections are added, introduce with editor’s instructions to “add new text” or similar, which for readability are not bolded or underlined.

45 General information about IHE can be found at www.ihe.net.

Information about the IHE Eye Care domain can be found at ihe.net/IHE_Domains.

Information about the organization of IHE Technical Frameworks and Supplements and the process used to create them can be found at http://ihe.net/IHE_Process and <http://ihe.net/Profiles>.

50 The current version of the IHE Eye Care Technical Framework can be found at http://ihe.net/Technical_Frameworks.

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Introduction to this Supplement

100 Eye care devices commonly generate PDF reports (i.e., OCT optic disc, OCT RNFL, Visual Field, etc.) that clinicians store in a patient’s medical record, for example within an EMR and/or PACS. The DICOM^{®1} Encapsulated Document IOD provides the specification for eye care implementers to transmit these displayable PDF reports.

105 When generating the PDF reports, eye care devices also have the ability to output a broad range of numeric measurements (i.e., key measurements). Certain of these measurements are critical for the long-term care of patients, clinical quality management and other use cases. The original release of DICOM Encapsulated Document IOD did not provide the ability to include discreet data therefore this important information was not available for import into receiving systems.

110 DICOM has enhanced the Encapsulated Document IOD with an optional feature to provide discreet structured data by leveraging the DICOM structured reporting encoding format. The IHE Key Measurements in Encapsulated PDF Option utilizes this new DICOM feature to encode structured data. It is required for a well-defined list of eye care reports.

115 The initial scope of this option targets eye care clinical workflow automatons to reduce and/or eliminate manual entry burden for long-term care of patients and for existing clinical quality measures programs. IHE Eye Care expects this list to expand based upon additional use cases. Each supplement undergoes a process of public comment and trial implementation before being incorporated into the volumes of the Technical Frameworks.

This supplement is written as changes to the documents listed below. The reader should have already read and understood these documents:

1. [IHE Eye Care Technical Framework Volume 1, Integration Profiles](#)
- 120 2. [IHE Eye Care Technical Framework Volume 2, Transactions](#)

This supplement also references other documents. The reader should have already read and understood these documents:

1. [Radiology Technical Framework Volume 1, Integration Profiles](#)
2. [Radiology Technical Framework Volume 2, Transactions](#)

125 Open Issues and Questions

1. The current choice is to leave the feature defining “measurement properties” (such as normals) as optional. Should we require this feature for some measurements, such as mean deviation, pattern standard deviation, etc., for Visual Field and central grid macular thickness for OCT, etc.? If yes, we need to specify requirement for each measurement.

¹ DICOM is the registered trademark of the National Electrical Manufacturers Association for its standards publications relating to digital communications of medical information.

- 130 2. This draft is missing an encoding example, it would be very useful to include such an example before we release for implementation

Closed Issues

TBD

History of Document Changes

- 135 This section provides a brief summary of changes and additions to this document.

Date	Document Revision	Change Summary
2019-01-22	1.0	Initial Public Comment release

General Introduction and Shared Appendices

- 140 The [IHE Technical Framework General Introduction and Shared Appendices](#) are components shared by all of the IHE domain technical frameworks. Each technical framework volume contains links to these documents where appropriate.

- 145 *Update the following appendices to the General Introduction as indicated below. Note that these are **not** appendices to Volume 1.*

Appendix A – Actor Summary Definitions

Add the following actors to the IHE Technical Frameworks General Introduction Appendix A:

Actor Name	Definition
None	NA

150

Appendix B – Transaction Summary Definitions

Add the following transactions to the IHE Technical Frameworks General Introduction Appendix B:

Transaction Name and Number	Definition
None	NA

155

Appendix D – Glossary

*Add the following **new** glossary terms to the IHE Technical Frameworks General Introduction Appendix D.*

- 160 No new Glossary terms.

Volume 1 – Profiles

Copyright Licenses

165 NA

Domain-specific additions

NA

170 Add the following updates to Section 9.2

9 Unified Eye Care Workflow (U-EYECARE)

...

175

Update Actor Options for Key Measurements Option

9.2 U-EYECARE Actor Options

180 Options that may be selected for each actor in this profile, if any, are listed in the Table 9.2-1. Dependencies between options, when applicable, are specified in notes. IHE does not place any restrictions on which options are supported for any of the Real World Models **or Refractive Measurement Models**; however, some options do not make sense. For example, in Real World Model III the DSS/Order Filler does not support DICOM; therefore, the optional transactions related to DICOM are not relevant.

Table 9.2-1: Unified Eye Care Workflow - Actors and Options

Actor	Option Name	Reference
Patient Registration Source	Patient Record Merging Option	EYECARE TF-1: 9.2.2
Appointment Scheduler	<i>No options defined</i>	--
Charge Processor	<i>No options defined</i>	--
Patient Registration Consumer	Patient Record Merging Option	EYECARE TF-1: 9.2.2
Appointment Consumer	<i>No options defined</i>	--
Department System Scheduler/Order Filler	Patient Record Merging Option	EYECARE TF-1: 9.2.2
	Imaging Procedure Instructions Option	EYECARE TF-1: 9.2.3
	Imaging Procedure Status Update (DICOM) Option	EYECARE TF-1: 9.2.4
	Imaging Procedure Status Update (HL7 ^{®3}) Option	EYECARE TF-1: 9.2.5
	Charge Posting Option	EYECARE TF-1: 9.2.7

³ HL7 is the registered trademark of Health Level Seven International.

IHE Eye Care Technical Framework Supplement – Key Measurements in DICOM Encapsulated PDF

Actor	Option Name	Reference
Refractive Measurement Consumer	Device Patient List Option	EYECARE TF-1: 9.2.9
Image Manager/ Image Archive	Patient Record Merging Option	EYECARE TF-1: 9.2.2
	Eye Care Image Option	EYECARE TF-1: 9.2.1.1
	Encapsulated PDF Option for Evidence Documents	EYECARE TF-1: 9.2.1.2
	<u>Key Measurements in Encapsulated PDF Option</u>	<u>EYECARE TF-1: 9.2.1.7</u>
	Eye Care Measurements Option	EYECARE TF-1: 9.2.1.3
	Imaging Procedure Status Update (DICOM) Option	EYECARE TF-1: 9.2.3
	Imaging Procedure Status Update (HL7) Option	EYECARE TF-1: 9.2.5
	Storage Commitment Option	EYECARE TF-1: 9.2.6
	PACS Key Images Sent Option	EYECARE TF-1: 9.2.8
	Stereo Relationship Option	EYECARE TF-1: 39.2.1.5
	Imaging Procedure Instructions Option	EYECARE TF-1: 9.2.3
Image Display	Eye Care Image Option	EYECARE TF-1: 9.2.1.1
	Encapsulated PDF Option for Evidence Documents	EYECARE TF-1: 9.2.1.2
	<u>Key Measurements in Encapsulated PDF Option</u>	<u>EYECARE TF-1: 9.2.1.7</u>
	Relative Image Position Coding Option	EYECARE TF-1: 3.2.2 EYECARE TF-2: 4.3.6
	Stereo Relationship Option	EYECARE TF-1: 9.2.1.5
Image Storage/Display <i>(an optional actor in Model I and III)</i>	Eye Care Image Option	EYECARE TF-1: 9.2.1.1
	Encapsulated PDF Option for Evidence Documents	EYECARE TF-1: 9.2.1.2
	<u>Key Measurements in Encapsulated PDF Option</u>	<u>EYECARE TF-1: 9.2.1.7</u>
	PACS Key Images Sent Option	EYECARE TF-1: 9.2.8
	Eye Care Measurements Option	EYECARE TF-1: 9.2.1.3
Evidence Creator	Storage Commitment Option	EYECARE TF-1: 9.2.6
Acquisition Modality	Patient Based Worklist Query Option (see Note 1)	EYECARE TF-2: 4.1
	Broad Worklist Query Option (see Note 1)	EYECARE TF-2: 4.1
	Eye Care Image Option (see Note 2)	EYECARE TF-1: 9.2.1.1

IHE Eye Care Technical Framework Supplement – Key Measurements in DICOM Encapsulated PDF

Actor	Option Name	Reference
	Encapsulated PDF Option for Evidence Documents (see Note 2)	EYECARE TF-1: 9.2.1.2
	<u>Key Measurements in Encapsulated PDF Option</u>	<u>EYECARE TF-1: 9.2.1.7</u>
	Eye Care Measurement Option	EYECARE TF-1: 9.2.1.3
	Imaging Procedure Status Update (DICOM) Option	EYECARE TF-1: 9.2.4
	Storage Commitment Option	EYECARE TF-1: 9.2.6
	Relative Image Position Coding Option	EYECARE TF-1: 3.2.2
	Stereo Relationship Option	EYECARE TF-1: 9.2.1.5
	Imaging Procedure Instructions Option	EYECARE TF-1: 9.2.3
Acquisition Modality Importer	Patient Based Worklist Query Option (see Note 1)	EYECARE TF-2: 4.1
	Broad Worklist Query Option (see Note 1)	EYECARE TF-2: 4.1
	Eye Care Measurement Option	EYECARE TF-1: 9.2.1.3
	Eye Care Image Option (see Note 2)	EYECARE TF-1: 9.2.1.1
	Encapsulated PDF Option for Evidence Documents (see Note 2)	EYECARE TF-1: 9.2.1.2
	<u>Key Measurements in Encapsulated PDF Option</u>	<u>EYECARE TF-1: 9.2.1.7</u>
	Imaging Procedure Status Update (DICOM) Option	EYECARE TF-1: 9.2.4
	Storage Commitment Option	EYECARE TF-1: 9.2.6
	Relative Image Position Coding Option	EYECARE TF-1: 3.2.2
	Stereo Relationship Option	EYECARE TF-1: 9.2.1.5
Imaging Procedure Instructions Option	EYECARE TF-1: 9.2.3 EYECARE TF-2: 4.1.6	
Refractive Measurement Source	Device Patient List Option	EYECARE TF-1: 9.2.9
Refractive Measurement Source Importer	Device Patient List Option	EYECARE TF-1: 9.2.9
Performed Procedure Step Manager	<i>No options defined</i>	--

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Note 1: The Radiology TF requires that the Acquisition Modality support at least one of the Worklist Query Options (i.e., Patient-Based or Broad). Eye Care requires Acquisition Modality and Acquisition Modality Importer Actors to support BOTH the Patient-Based and Broad Worklist Query Options.

Note 2: The Acquisition Modality and Acquisition Modality Importer Actors SHALL support either the Eye Care Image Option or the Encapsulated PDF Option for Evidence Documents.

190

Add new Acquisition Modalities Storage Option for Key Measurements Option

9.2.1 Acquisition Modalities Storage Options

195 The Acquisition Modality, Acquisition Modality Importer and Image Storage/Display Actors will likely support a variety of DICOM SOP Classes.

9.2.1.1

9.2.1.7 Key Measurements in Encapsulated PDF Option

200 Eye care devices commonly generate PDF reports (i.e., OCT optic disc, OCT RNFL, Visual Field, etc.) that clinicians store in a patient’s medical record, such as within an EMR and/or PACS. The DICOM Encapsulated Document IOD provides the specification for eye care implementers to transmit these displayable PDF reports.

205 When generating the PDF reports, eye care devices also have the ability to output a broad range of numeric measurements (i.e., key measurements). Certain of these measurements are critical for the long-term care of patients, clinical quality management and other use cases. The original release of DICOM Encapsulated Document IOD did not provide the ability to include discreet data therefore this important information was not available for import into receiving systems.

210 DICOM has enhanced the Encapsulated Document IOD with an optional feature to provide discreet structured data by leveraging the DICOM structured reporting encoding format. The IHE Key Measurements in Encapsulated PDF Option utilizes this new DICOM feature to encode structured data. It is required for a well-defined list of eye care reports.

The initial scope of this option targets eye care clinical workflow automatons to reduce and/or eliminate manual entry burden for long-term care of patients and for existing clinical quality measures programs. IHE Eye Care expects this list to expand based upon additional use cases.

215 Eye care reports currently defined are:

1. Visual Field Key Measurement Report
2. OCT Optic Disc Key Measurement Report
3. OCT RNFL Key Measurement Report
4. OCT Macula Thickness Key Measurement Report
- 220 5. OCT GCL Key Measurement Report
6. Corneal Topography Key Measurement Report

7. Endothelial Cell Count Key Measurement Report

225 Note: This option is titled “Key Measurements” because this is the main use case. In actuality, the design of the DICOM Option allows the capture of all types of measurements and structured data (i.e., beyond the scope of the initial targeted “key measurements”). Defining options for clinical research and other use cases is a long-term goal.

Acquisition Modality or Acquisition Modality Importer Actors that support this option SHALL be able to generate DICOM Encapsulated PDF SOP Instances as defined in EYECARE TF-2: 4.2.12 and all sub sections.

230 Image Manager/Image Archive or Image Storage/Display Actors that support this option SHALL comply with the requirements in EYECARE TF-2: 4.2.12.5.

An Image Display or Image Storage/Display Actor that supports this option SHALL be able to receive DICOM Encapsulated PDF SOP Instances and incorporate eye care key measurements as defined in EYECARE TF-2: 4.2.12.5.

235 An Image Manager/Image Archive that store the DICOM Encapsulated PDF SOP Instances SHALL support DICOM Level 2 (full fidelity) storage.

Appendices

None

Volume 2 – Transactions

Add new Section 4.2.12

240 **4.2.12 Key Measurements in Encapsulated PDF Option**

Eye care devices commonly generate PDF reports (i.e., OCT optic disc, OCT RNFL, Visual Field, etc.) that clinicians store in a patient’s medical record, such as within an EMR and/or PACS. The DICOM Encapsulated Document IOD provides the specification for eye care implementers to transmit these displayable PDF reports.

245 When generating the PDF reports, eye care devices also have the ability to output a broad range of numeric measurements (i.e., key measurements). Certain of these measurements are critical for the long-term care of patients, clinical quality management and other use cases. The original release of DICOM Encapsulated Document IOD did not provide the ability to include discreet data therefore this important information was not available for import into receiving systems.

250 DICOM has enhanced the Encapsulated Document IOD with an optional feature to provide discreet structured data by leveraging the DICOM structured reporting encoding format. The IHE Key Measurements in Encapsulated PDF Option utilizes this new DICOM feature to encode structured data. It is required for a well-defined list of eye care reports.

255 The initial scope of this option targets eye care clinical workflow automatons to reduce and/or eliminate manual entry burden for long-term care of patients and for existing clinical quality measures programs. IHE Eye Care expects this list to expand based upon additional use cases.

Eye care reports currently defined are:

1. Visual Field Key Measurement Report
2. OCT Optic Disc Key Measurement Report
- 260 3. OCT RNFL Key Measurement Report
4. OCT Macula Thickness Key Measurement Report
5. OCT GCL Key Measurement Report
6. Corneal Topography Key Measurement Report
7. Endothelial Cell Count Key Measurement Report

265 Note: This option is titled “key measurements” because this is the main use case. In actuality, the design of the DICOM Option allows the capture of all types of measurements and structured data (i.e., beyond the scope of the initial targeted “key measurements”). Defining options for clinical research and other use cases is a long-term goal.

4.2.12.1 Generic Requirements for Generating Eye Care Measurements in PDF

270 DICOM SCU systems that generate eye care measurements using the Key Measurements in Encapsulated PDF Option SHALL comply with the following list:

1. Comparing and/or tracking measurement (such as longitudinal tracking) between varying acquisition devices may not be clinically reliable and could cause patient safety issues. IHE therefore mandates the requirement for DICOM SCUs to include equipment manufacturer data for all key measurement reports.

275 Attributes Manufacturer (0008,0070), Manufacturer's Model Name (0008,1090), Device Serial Number (0018,1000) and Software Versions (0018,1020) SHALL be Type 1. This supports the features of the Enhanced Equipment Module.

280 Note: It is highly recommended that all DICOM SCP systems consider the equipment manufacturer information and use this when comparing/tracking measurements (i.e., do not compare measurements from different vendor's equipment unless clinically proven to be reliable). Determining reliability is beyond the scope of IHE and the responsibility of the implementation. Acquisition devices and their underlying algorithms may provide measurements that appear common based upon their categorical representation, but might not be physically or physiologically fungible.

- 285 2. The first occurrence of the attribute Concept Name Code Sequence (0040,A043) is encoded before the Content Sequence (0040,A730) attribute and provides a coded title of the report. The first occurrence of Concept Name Code Sequence (0040,A043) SHALL be Type 1.

Note: DICOM defines the use of Baseline CID 7020 "Document Titles" to provide this value. It is a long list of any type of medical report. IHE Eye Care has specialized this value for the Key Measurements Option.

290 Codes are specified in Table 4.2.12.1-1. Table 4.2.12.1-1 is non-extensible.

Table 4.2.12.1-1: Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
99IHEEYECARE	tobedefined	Eye Care Measurement Report

The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

295 **Table 4.2.12.1-2: Concept Name Code Sequence Definitions**

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Eye Care Measurement Report	Eye care measurement report

3. The attribute Document Class Code Sequence (0040,E008) is encoded before the Content Sequence (0040,A730) attribute and SHALL be Type 1. Codes are specified in Table 4.2.12.1-3. Table 4.2.12.1-3 is extensible.

300 Note: An "extensible" table provides the ability for specific implementations to provide codes beyond those specified in IHE.

Table 4.2.12.1-3: Eye Care Key Measurement Document Class Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
99IHEEYECARE	tobedefined	Visual Field Key Measurement Report
99IHEEYECARE	tobedefined	OCT Optic Disc Key Measurement Report
99IHEEYECARE	tobedefined	OCT RNFL Key Measurement Report
99IHEEYECARE	tobedefined	OCT Macula Thickness Key Measurement Report
99IHEEYECARE	tobedefined	OCT GCL Key Measurement Report
99IHEEYECARE	tobedefined	Corneal Topography Key Measurement Report
99IHEEYECARE	tobedefined	Endothelial Cell Count Key Measurement Report
Additional IHE Eye Care reports to be considered in the future		

305 The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.1-4: Document Class Code Sequence Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Visual Field Key Measurement Report	Visual field key measurement report
tobedefined	OCT Optic Disc Key Measurement Report	Optical coherence tomography (OCT) optic disc key measurement report
tobedefined	OCT RNFL Key Measurement Report	Optical coherence tomography (OCT) retinal nerve fiber layer key measurement report
tobedefined	OCT Macula Thickness Key Measurement Report	Optical coherence tomography (OCT) macula thickness key measurement report
tobedefined	OCT GCL Key Measurement Report	Optical coherence tomography ganglion cell layer (GCL) key measurement report
tobedefined	Corneal Topography Key Measurement Report	Corneal topography key measurement report
tobedefined	Endothelial Cell Count Key Measurement Report	Endothelial Cell Count key measurement report

310 4. The DICOM attribute Content Sequence (0040,A730) is the mechanism to encode structured data (i.e., capture discrete measurements) within an encapsulated DICOM document (i.e., PDF). The attribute Content Sequence (0040,A730) SHALL be Type 1

Note: The Content Sequence is the main mechanism to encode structured data with a DICOM Structured Report (SR) SOP Instance. DICOM Encapsulated Document is not a DICOM SR, so DICOM SR requirements do not apply. For example, the rendering/display of the report is performed by using the encapsulated document (i.e., PDF)

- 315 not the content of Content Sequence attribute. The data encoded in the Content Sequence can be easily incorporated into a DICOM SCP's database.
5. Implementations have the ability to encode multiple PDF reports in one SOP Instance. This can be accomplished by encoding two or more titles in the attribute Document Class Code Sequence (0040,E008) and correspondingly encoding two or more measurement groups (TID 1501 Measurement Group).
- 320 The number of items in the Document Class Code Sequence (0040,E008) SHALL be the same as the number of TID 1501 Measurement Group instances. The first item within the Document Class Code Sequence (0040,E008) SHALL correspond to the first instance of TID 1501 Measurement Group. The second item SHALL correspond to the second instance and so on.
- 325 For example, if a device generates a Visual Field report and an OCT RNFL report the Document Class Code Sequence would contain two items. The first item being (tobedefined, 99IH E E Y E C A R E, "Visual Field Key Measurement Report") and the second being (tobedefined, 99IH E E Y E C A R E, "OCT RNFL Key Measurement Report").
- 330 The first instance of 1501 TID Measurement Group corresponds to the visual field report and the second instance to the OCT RNFL report.
- It also is possible to generated two reports with the same title, for example creating two OCT RNFL reports using different diameters. The Document Class Code Sequence would contain two items with the same title code (tobedefined, 99IH E E Y E C A R E, "OCT RNFL Key Measurement Report). It would also encode two TID 1501 Measurement Group instances.
- 335 The two reports can be distinguished using rows 2 and 3 in TID 1501 Measurement Group. These rows are mandatory for all key measurement reports.
- 340 Row 2 "Tracking Identifier" is defined by DICOM as: "Text label used for tracking a finding or feature, potentially across multiple reporting objects, over time. This label shall be unique within the domain in which it is used. Corresponds to Tracking ID (0062,0020)". This is a unique value referred to (and used) by humans, not just computers.
- 345 Row 3 "Tracking Unique Identifier" is defined by DICOM as: "Unique identifier used for tracking a finding or feature, potentially across multiple reporting objects, over time. Corresponds to Tracking UID (0062,0021)".
- 350 Example:
The first measurement group identifies the first OCT RNFL report.

355 TID 1501 Row 2 (112039, DCM, "Tracking Identifier") – “VendorDevice01-38” (a valid unique text value within the domain of the eye clinic(s) and device).

TID 1501 Row 3 (112040, DCM, "Tracking Unique Identifier") – 1.2.3.4.5.6.7.8 (i.e., contains a valid vendor UID)

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The second measurement group identifies the second OCT RNFL report.

TID 1501 Row 2 (112039, DCM, "Tracking Identifier") – “VendorDevice01-39”

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TID 1501 Row 3 (112040, DCM, "Tracking Unique Identifier") – 3.7.6.8.9.0.11

The reports can now be tracked as two different measurement groups.

4.2.12.2 Eye Care Key Measurement Reports in PDF

370 This section specifies the list of IHE Eye Care key measurement reports defined for this option.

4.2.12.2.1 Visual Field Key Measurement Report Content Sequence

Table 4.2.12.2-1 and the following sections define the requirements for visual field key measurement reports. Table 4.2.12.2-1 is extensible.

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Table 4.2.12.2.1-1: Visual Field Key Measurements Content Sequence

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint
1	Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module						Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "Visual Field Key Measurement Report")
Content Sequence (0040,A730) attribute within Encapsulated Document Module							
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M	\$Measurement = Table 4.2.12.2.1-1 Visual Field Concept Name Code Sequence Codes \$Units = Table 4.2.12.2-2 Visual Field Concept Name Code Sequence Codes \$Method = DICOM CID 4250 Visual Field Static Perimetry Test Patterns \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	CONTAINS	CODE	EV (111855, DCM, "Glaucoma Hemifield Test Analysis ")	1	MC	SHALL BE INCLUDED IF KNOWN DICOM CID 4254
4	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN
5	>	HAS OBS CONTEXT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN
6	>	HAS OBS CONTEXT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U	

4.2.12.2.1.1 Visual Field Document Content Macro Attributes

390 TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

Codes defined in Table 4.2.12.2.1.1-1 SHALL BE INCLUDED IF KNOWN.

Table 4.2.12.2.1.1-1 is extensible.

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Table 4.2.12.2.1.1-1: Visual Field Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Mean Deviation	decibel
99IHEEYECARE	tobedefined	Pattern Standard Deviation	decibel
DCM	111852	Visual Field Index	percent
99IHEEYECARE	tobedefined	Fixation losses ratio	string
99IHEEYECARE	tobedefined	False positive percent	percent
99IHEEYECARE	tobedefined	False negative percent	percent
99IHEEYECARE	tobedefined	False positive ratio	string
99IHEEYECARE	tobedefined	False negative ratio	string

Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

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The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.1.1-2: Visual Field Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Mean Deviation	Weighted average deviation from the age corrected normal field
tobedefined	Pattern Standard Deviation	Weighted square root of loss variance
tobedefined	Fixation losses ratio	The ratio between the number of times a patient loses visual fixation while maintaining a visual gaze on a single location and the number of trials presented. Units are a string in the form of errors over number of trials such as “3/15”.
tobedefined	False positive percent	Estimated percentage of all patient responses that occurred at a time when no visual stimulus was present (false positive responses), as percent. Note: Commonly used when performing Swedish Interactive Threshold Algorithm (SITA) based measurements.
tobedefined	False negative percent	Estimated percentage of all stimuli that were not seen by the patient but were previously seen at a lower luminance earlier in the visual field test (false negative responses), as percent. Note: Commonly used when performing Swedish Interactive Threshold Algorithm (SITA) based measurements.

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	False positive ratio	<p>The ratio between the number of times patient responses that occurred at a time when no visual stimulus was present (false positive responses) and the number of trials presented. Units are a string in the form of false positive responses over the number of trials such as “3/7”.</p> <p>Note: Commonly used when NOT performing Swedish Interactive Threshold Algorithm (SITA) based measurements.</p>
tobedefined	False negative ratio	<p>The ratio between the number of times stimuli that were not seen by the patient but were previously seen at a lower luminance earlier in the visual field test (false negative responses) and the number of trials presented. Units are a string in the form of false negative responses over the number of trials such as “3/7”.</p> <p>Note: Commonly used when NOT performing Swedish Interactive Threshold Algorithm (SITA) based measurements.</p>

405 **4.2.12.2.2 OCT Optic Disc Key Measurement Report Content Sequence**

Table 4.2.12.2.2-1 and the following sections define the requirements for OCT optic disc key measurement Report. Table 4.2.12.2.2-1 is extensible.

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Table 4.2.12.2.2-1: OCT Optic Disc Key Measurements Content Sequence

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint
1	Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module						Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "OCT Optic Disc Key Measurement Report")
Content Sequence (0040,A730) attribute within Encapsulated Document Module							
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M	\$Measurement = Table 4.2.12.2.1-1 OCT Optic Disc Concept Name Code Sequence Codes \$Units = Table 4.2.12.2.1-1 OCT Optic Disc Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	CONTAINS	NUM	EV (111029, DCM, "Image Quality Rating")	1-n	MC	SHALL BE INCLUDED IF KNOWN \$Value = 0 – 100 \$Units = EV({0:100}, UCUM, "range:0:100)
4	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN
5	>	HAS OBS CONTEXT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN
6	>	HAS OBS CONTEXT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U	

4.2.12.2.2.1 OCT Optic Disc Document Content Macro Attributes

TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair

425 for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

Codes defined in Table 4.2.12.2.2.1-1 SHALL BE INCLUDED IF KNOWN.

Table 4.2.12.2.2.1-1 is extensible.

Table 4.2.12.2.2.1-1: OCT Optic Disc Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Cup to disc area ratio	no unit
99IHEEYECARE	tobedefined	Cup to disk ratio vertical	no unit
99IHEEYECARE	tobedefined	Cup to disk ratio horizontal	no unit
99IHEEYECARE	tobedefined	Optic disc rim area	millimeter squared
99IHEEYECARE	tobedefined	Optic disc cup area	millimeter squared
99IHEEYECARE	tobedefined	Optic disc area	millimeter squared
99IHEEYECARE	tobedefined	Bruch's Membrane Opening area	millimeter squared
99IHEEYECARE	tobedefined	Bruch's Membrane Opening global sector average total thickness	microns

430 Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

435 The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.2.1-2: OCT Optic Disc Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Cup to disc area ratio	Ratio of the cup area to the disc area
tobedefined	Cup to disc ratio vertical	Ratio of the vertical diameter of the physiological cup to that of the vertical diameter of the optic disc.
tobedefined	Cup to disc ratio horizontal	Ratio of the horizontal diameter of the physiological cup to that of the vertical diameter of the optic disc.
tobedefined	Optic disc rim area	Area of the “rim” portion of the optic disc
tobedefined	Optic disc cup area	Area of the “cup” portion of the optic disc
tobedefined	Optic disc area	Area of the optic disc

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Bruch's Membrane Opening area	Area of the Bruch's Membrane Opening (BMO) projected into a single linear plane Note: Some BMO points may occur above, others below the plane.
tobedefined	Bruch's Membrane Opening global sector average total thickness	Bruch's Membrane Opening (BMO) mean total thickness averaged over the global sector. The global sector combines the individual known sectors that are included in the BMO classifications. Note: Sectors are vendor specific such as include Temporal (T), Temporal-Superior (TS), Temporal-Inferior (TI), Nasal (N), Nasal-Inferior (NI), Nasal-Superior (NS).

4.2.12.2.3 OCT RNFL Key Measurement Report Content Sequence

440 Table 4.2.12.2.3-1 and the following sections define the requirements for OCT RNFL (retinal nerve fiber layer) key measurement Report. Table 4.2.12.2.3-1 is extensible.

Table 4.2.12.2.3-1: OCT RNFL Key Measurements Content Sequence

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint	
1							Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "OCT RNFL Key Measurement Report")	
Content Sequence (0040,A730) attribute within Encapsulated Document Module								
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M		\$Measurement = Table 4.2.12.3.1-1 OCT RNFL Concept Name Code Sequence Codes \$Units = Table 4.2.12.3.1-1 OCT RNFL Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	CONTAINS	NUM	EV (111029, DCM, "Image Quality Rating")	1-n	MC	SHALL BE INCLUDED IF KNOWN	\$Value = 0 – 100 \$Units = EV([0:100], UCUM, "range:0:100)
4	>	HAS OBS	CODE	EV (111001, DCM,	1	MC	SHALL BE INCLUDED IF KNOWN	

		CONTE XT		"Algorithm Name")				
5	>	HAS OBS CONTE XT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN	
6	>	HAS OBS CONTE XT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		

4.2.12.2.3.1 OCT RNFL Document Content Macro Attributes

445 TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

Codes defined in Table 4.2.12.2.3.1-1 SHALL BE INCLUDED IF KNOWN.

450 Table 4.2.12.2.3.1-1 is extensible.

Table 4.2.12.2.3.1-1: OCT RNFL Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Retinal nerve fiber layer average thickness	microns
99IHEEYECARE	tobedefined	Retinal nerve fiber layer inferior thickness	microns
99IHEEYECARE	tobedefined	Retinal nerve fiber layer superior thickness	microns
99IHEEYECARE	tobedefined	Retinal nerve fiber layer temporal thickness	microns
99IHEEYECARE	tobedefined	Retinal nerve fiber layer nasal thickness	microns
99IHEEYECARE	tobedefined	Retinal nerve fiber layer symmetry	percent
DCM	111926	Ganglion cell complex thickness	microns

Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

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The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.3.1-2: OCT RNFL Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Retinal nerve fiber layer average thickness	Average measurement approximating the distance related to the structure between the internal limiting membrane (ILM) and the outer border of the retinal nerve fiber layer (RNFL) in all regions
tobedefined	Retinal nerve fiber layer inferior thickness	Average measurement approximating the distance related to the structure between the internal limiting membrane (ILM) and the outer border of the retinal nerve fiber layer (RNFL) in the inferior region
tobedefined	Retinal nerve fiber layer superior thickness	Average measurement approximating the distance related to the structure between the internal limiting membrane (ILM) and the outer border of the retinal nerve fiber layer (RNFL) in the superior region
tobedefined	Retinal nerve fiber layer temporal thickness	Average measurement approximating the distance related to the structure between the internal limiting membrane (ILM) and the outer border of the retinal nerve fiber layer (RNFL) in the temporal region
tobedefined	Retinal nerve fiber layer nasal thickness	Average measurement approximating the distance related to the structure between the internal limiting membrane (ILM) and the outer border of the retinal nerve fiber layer (RNFL) in the nasal region
tobedefined	Retinal nerve fiber layer symmetry	Percent symmetry of the retinal nerve fiber layer (RNFL) thickness between the two eyes

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4.2.12.2.4 OCT Macula Thickness Measurement Report Content Sequence

Table 4.2.12.4-1 and the following sections define the requirements for OCT macula thickness key measurement Report. Table 4.2.12.2.4-1 is extensible.

Table 4.2.12.2.4-1: OCT Macula Thickness Key Measurements Content Sequence

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint
1			Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module				Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "OCT Macula Thickness Key Measurement Report")
Content Sequence (0040,A730) attribute within Encapsulated Document Module							
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M	\$Measurement = Table 4.2.12.5.1-1 OCT Macula Thickness Concept Name Code Sequence Codes

								\$Units = Table 4.2.12.4.1-1 OCT Macula Thickness Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	CONTAINS	NUM	EV (111029, DCM, "Image Quality Rating)	1-n	MC	SHALL BE INCLUDED IF KNOWN	\$Value = 0 – 100 \$Units = EV([0:100], UCUM, "range:0:100)
4	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN	
5	>	HAS OBS CONTEXT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN	
6	>	HAS OBS CONTEXT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		

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4.2.12.2.4.1 OCT Macula Thickness Document Content Macro Attributes

TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

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Codes defined in Table 4.2.12.2.4.1-1 SHALL BE INCLUDED IF KNOWN.

Table 4.2.12.2.4.1-1 is extensible.

Table 4.2.12.2.4.1-1: OCT Macula Thickness Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
LN	57109-1	Macular Grid Center Subfield Thickness	microns
LN	57118-2	Macular Grid Total Volume	millimeter cubed

Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

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480 The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.4.1-2: OCT Macula Thickness Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
57109-1	Macular Grid Center Subfield Thickness	As defined by LOINC, this is based on the ETRDRS and defines a 1-millimeter diameter (.5-millimeter radius). See LOINC for the complete definition.

4.2.12.2.5 OCT GCL Measurement Report Content Sequence

485 Table 4.2.12.2.5-1 and the following sections define the requirements for OCT GCL (ganglion cell layer) key measurement Report. Table 4.2.12.2.5-1 is extensible.

Table 4.2.12.2.5-1: OCT GCL Key Measurements Content Sequence

NL	GCL	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint	
1			Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module				Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "OCT GCL Key Measurement Report")	
Content Sequence (0040,A730) attribute within Encapsulated Document Module								
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M		\$Measurement = Table 4.2.12.5.1-1 OCT GCL Concept Name Code Sequence Codes \$Units = Table 4.2.12.5.1-1 OCT GCL Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	CONTAINS	NUM	EV (111029, DCM, "Image Quality Rating?)	1-n	MC	SHALL BE INCLUDED IF KNOWN	\$Value = 0 – 100 \$Units = EV({0:100}, UCUM, "range:0:100)
4	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN	

5	>	HAS OBS CONTE XT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN	
6	>	HAS OBS CONTE XT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		

4.2.12.2.5.1 OCT GCL Document Content Macro Attributes

490 TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

Codes defined in Table 4.2.12.2.5.1-1 SHALL BE INCLUDED IF KNOWN.

495 Table 4.2.12.2.5.1-1 is extensible.

Table 4.2.12.2.5.1-1: OCT GCL Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Average GCL-IPL thickness	microns

Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

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The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.5.1-2: OCT GCL Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Average GCL-IPL thickness	Average thickness between ganglion cell layer (GCL) and inner plexiform layer (IPL)

505 4.2.12.2.6 Corneal Topography Key Measurement Report Content Sequence

Table 4.2.12.2.6-1 and the following sections define the requirements for corneal topography key measurement reports. Table 4.2.12.2.6-1 is extensible.

Table 4.2.12.2.6-1: Corneal Topography Content Sequence

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint	
1							Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "Corneal Topography Key Measurement Report ")	
Content Sequence (0040,A730) attribute within Encapsulated Document Module								
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M		\$Measurement = Table 4.2.12.6.1-1 Corneal Topography Concept Name Code Sequence Codes \$Units = Table 4.2.12.6.1-1 Corneal Topography Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye") \$Laterality = DICOM CID 244 "Laterality"
3	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN	
4	>	HAS OBS CONTEXT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN	
5	>	HAS OBS CONTEXT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		

510 **4.2.12.2.6.1 Corneal Topography Document Content Macro Attributes**

TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

515 Codes defined in Table 4.2.12.2.6.1-1 SHALL BE INCLUDED IF KNOWN.

Table 4.2.12.2.6.1-1 is extensible.

Table 4.2.12.2.6.1-1: Corneal Topography Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Central keratometry minimum power	diopeters
99IHEEYECARE	tobedefined	Central keratometry minimum radius of curvature	millimeter
99IHEEYECARE	tobedefined	Central keratometry minimum power axis	degrees
99IHEEYECARE	tobedefined	Central keratometry maximum power	diopeters
99IHEEYECARE	tobedefined	Central keratometry maximum radius of curvature	millimeter
99IHEEYECARE	tobedefined	Central keratometry maximum power axis	degrees
99IHEEYECARE	tobedefined	Minimum corneal thickness	microns

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Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

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Table 4.2.12.2.6.1-2: Corneal Topography Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Central keratometry minimum power	The lowest refractive power in the central zone (for example central 3mm). Note: This code is related to DICOM attribute Keratometric Power (0046,0076) within the attribute Flat Keratometric Axis Sequence (0046,0080).
tobedefined	Central keratometry minimum radius of curvature	The longest radius of curvature of the two most extreme orthogonal keratometry measurements in the central zone (for example central 3mm). Note: This code is related to DICOM attribute Radius of Curvature (0046,0075) within the attribute Flat Keratometric Axis Sequence (0046,0080).
tobedefined	Central keratometry minimum power axis	The meridian of the lowest power radius of the two most extreme orthogonal keratometry measurements in the central zone (for example central 3mm). Note: This code is related to DICOM attribute Keratometric Axis (0046,0077) within the attribute Flat Keratometric Axis Sequence (0046,0080).
tobedefined	Central keratometry maximum power	The highest refractive power in the central zone (for example central 3mm).

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
		Note: This code is related to DICOM attribute Keratometric Power (0046,0076) within the attribute Steep Keratometric Axis Sequence (0046,0074).
tobedefined	Central keratometry maximum radius of curvature	The shortest radius of curvature of the two most extreme orthogonal keratometry measurements in the central zone (for example central 3mm). Note: This code is related to DICOM attribute Radius of Curvature (0046,0075) within the attribute Steep Keratometric Axis Sequence (0046,0074).
tobedefined	Central keratometry maximum power axis	The meridian of the highest power radius of the two most extreme orthogonal keratometry measurements in the central zone (for example central 3mm). Note: This code is related to DICOM attribute Keratometric Axis (0046,0077) within the attribute Steep Keratometric Axis Sequence (0046,0074).
tobedefined	Minimum corneal thickness	The thickness of the cornea at that location representing the minimum measurable thickness.

4.2.12.2.7 Endothelial Cell Count Key Measurement Report Content Sequence

Table 4.2.12.2.7-1 and the following sections define the requirements for endothelial cell count key measurement reports. Table 4.2.12.2.7-1 is extensible.

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Table 4.2.12.2.7-1: Endothelial Cell Count Content Sequence

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Mandatory Value Set Constraint
1				Coded PDF document title plus modifiers are conveyed in Attributes Concept Name Code Sequence (0040,A043) and Document Class Code Sequence (0040,E008) residing in the Encapsulated Document Module				Concept Name Code Sequence (0040,A043) = (tobedefined, 99IHEEYECARE, "Eye Care Measurement Report ") Document Class Code Sequence (0040,E008) = (tobedefined, 99IHEEYECARE, "Endothelial Cell Count Key Measurement Report ")
Content Sequence (0040,A730) attribute within Encapsulated Document Module								
2	>	CONTAINS	INCLUDE	DTID 1501 "Measurement Group"	1-n	M		\$Measurement = Table 4.2.12.7.1-1 Endothelial Cell Count Concept Name Code Sequence Codes \$Units = Table 4.2.12.7.1-1 Endothelial Cell Count Concept Name Code Sequence Codes \$TargetSite = (T-AA000, SRT, "Eye")

								\$Laterality = DICOM CID 244 “Laterality”
3	>	HAS OBS CONTEXT	CODE	EV (111001, DCM, "Algorithm Name")	1	MC	SHALL BE INCLUDED IF KNOWN	
4	>	HAS OBS CONTEXT	TEXT	EV (111003, DCM, "Algorithm Version")	1	MC	SHALL BE INCLUDED IF KNOWN	
5	>	HAS OBS CONTEXT	TEXT	EV (111002, DCM, "Algorithm Parameters")	1-n	U		

4.2.12.2.7.1 Endothelial Cell Count Document Content Macro Attributes

535 TID 1501 Measurement Group specifies TID 300 Measurement to capture the individual key measurements. The attributes within the Document Content Marco provides the name/value pair for the key measurements. The Concept Name Code Sequence (0040,A043) used in this macro defines the name of the measurement.

Codes defined in Table 4.2.12.2.7.1-1 SHALL BE INCLUDED IF KNOWN.

Table 4.2.12.2.7.1-1 is extensible.

Table 4.2.12.2.7.1-1: Endothelial Cell Count Concept Name Code Sequence Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	Units of Measure
99IHEEYECARE	tobedefined	Endothelial cell density	Millimeter squared

540 Note: TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. Implementations may include these properties for any eye care measurement. See Section 4.2.12.9 for examples.

545 The following table defines the definitions of codes defined by IHE Eye Care. For definitions of DICOM codes (DCM), see the DICOM Standard.

Table 4.2.12.2.7.1-2: Endothelial Cell Count Measurement Code Definitions

Code Value (0008,0100)	Code Meaning (0008,0104)	Definition
tobedefined	Endothelial cell density	The density of endothelial cells present on the innermost surface of the cornea.

4.2.12.3 TID 310 Measurement Properties

550 TID 300 Measurement defines an optional feature to specify properties of a measurement via TID 310 Measurement Properties. TID 310 supports properties such as normality, statistical properties, normal ranges, level of significance and more. These properties may exist for any eye care measurement, such as Mean Deviation, Patterned Standard Deviation, RNFL thickness, etc. Below are examples using TIDs 300, 310 and 312.

Table 4.2.12.3-1: TID 300 Measurement

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	\$Measurement	1	M		UNITS = \$Units
2	>	HAS CONCEPT MOD	CODE	\$ModType	1-n	U		\$ModValue
3 - 7	>
8	>	HAS PROPERTIES	INCLUDE	DTID 310 "Measurement Properties"	1	U		\$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority
9 - n	>

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Table 4.2.12.3-2: TID 310 Measurement Properties

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CODE	EV (121402, DCM, "Normality")	1	U		DCID 222 "Normality Codes"
2			INCLUDE	DTID 311 "Measurement Statistical Properties"	1	U		\$RefAuthority = \$RefAuthority
3			INCLUDE	DTID 312 "Normal Range Properties"	1	U		\$RangeAuthority = \$RangeAuthority
4			CODE	EV (121403, DCM, "Level of Significance")	1	U		DCID 220 "Level of Significance"
5			NUM	DCID 225 "Measurement Uncertainty Concepts"	1-n	U		

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
6			CODE	EV (121404, DCM, "Selection Status")	1	U		DCID 224 "Selection Method"

Table 4.2.12.3-3: TID 312 Normal Range Properties

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	DCID 223 "Normal Range Values"	1-n	M		
2			TEXT	EV (121407, DCM, "Normal Range description")	1	U		
3			TEXT	EV (121408, DCM, "Normal Range Authority")	1	UC	XOR row 4	
4			CODE	EV (121408, DCM, "Normal Range Authority")	1	UC	XOR row 3	\$RangeAuthority

560 **1. Visual Field example values showing Mean Deviation with properties of Normality**

From TID 300 row 1 - (99IHEEYECARE, tobedefined, "Mean Deviation") = (-0.53, db).

From TID 300 use optional row 8 (TID 310 Measurement Properties) to convey Normality for Mean Deviation.

From TID 310 row 1 – (121402, DCM, "Normality") = (G-A460, SRT, "Normal")

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2. OCT example values showing RNFL thickness with properties of Normality and identifying implementation specific normals database

From TID 300 row 1 - (99IHEEYECARE, tobedefined, "Retinal nerve fiber average layer thickness") = (60, um)

570 From TID 300 use optional row 8 (TID 310 Measurement Properties) to convey Normality

From TID 310 row 1 – (121402, DCM, "Normality") = (R-002C5, SRT, "Abnormally Low")

From TID 310 use optional row 2 (DTID 312 "Normals Range Properties")

From TID 312 use row 1 using DCID 223 "Normal Range Values" - (R-10041, SRT, "Normal Range Lower Limit") = (75,um)

575 From TID 312 use row 1 using DCID 223 "Normal Range Values" - (R-0038B, SRT, "Normal Range Upper Limit") = (110, um)

From TID 312 row 2 - EV (121407, DCM, "Normal Range description") – "Reference population is 500 eyes from 500 subjects of ethnicity Chinese, Indian and Japanese

580 From TID 312 row 4 - EV (121408, DCM, "Normal Range Authority") – (12345, 99VENDORNAME, "Vendor Name ethnicity")

Note: The coloring of values for display is not defined by DICOM and is vendor specific. The level of detailed information is vendor specific and IHE encourages vendors to provide all significant details in "Normal Range description".

Note: Some devices offer more than one normative database (e.g. based on the ethnicity, age, etc.), varying the code for "Normal Range Authority" facilities the identification of different normative databases.

585 **4.2.12.4 Extending Normality Value Codes**

DICOM PS3.16 CID 222 Normality Codes specifies an extensible value set of normality codes. IHE extends the table as defined below.

Table 4.2.12.4-1: CID 222 Normality Codes

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)	SNOMED-CT Concept ID
SRT	G-A460	Normal	17621005
SRT	R-42037	Abnormal	263654008
SRT	R-002C4	Abnormally High	371879000
SRT	R-002C5	Abnormally Low	371880002
SRT	G-A385	Normality Undetermined	82334004
Include DICOM CID 4254. Visual Field Static Perimetry Test Analysis Results			
SNOMED-CT	394844007	Outside reference range	394844007
SNOMED-CT	281302008	Above reference range	281302008
SNOMED-CT	281300000	Below reference range	281300000
SNOMED-CT	442777001	Borderline high	442777001
SNOMED-CT	442779003	Borderline low	442779003
SNOMED-CT	371917008	One standard deviation above mean	371917008
SNOMED-CT	371919006	One standard deviation below mean	371919006
SNOMED-CT	371920000	Two standard deviations above mean	371920000
SNOMED-CT	371918003	Two standard deviations below mean	371918003

590 **4.2.12.5 DICOM SCP Expected Action**

This section defines DICOM SCP expected actions:

1. SHALL be able to display the PDF as specified for the Image Display in Section 4.2.6.2

2. SHALL be able to incorporate into its database one or more discreet data fields for each report title supported
- 595 3. SHALL support DICOM Level 2 (full fidelity) storage if the DICOM SCP supports DICOM Query/Retrieve and/or DICOM Media Storage
- 600 4. It is highly recommended that all DICOM SCP systems consider the equipment manufacturer information and use this when comparing/tracking measurements (i.e., do not compare measurements from different vendor's equipment unless clinically proven to be reliable). Determining reliability is beyond the scope of IHE and the responsibility of the implementation. Acquisition devices and their underlying algorithms may provide measurements that appear common based upon their categorical representation, but might not be physically or physiologically fungible.

605

Appendices

None

Volume 3 – Content Modules

610

Not applicable

Volume 4 – National Extensions

Add appropriate Country section

615 Not applicable