Sun Nuclear Corporation

3DVH™ Release 1.1

DICOM Conformance Statement

November 11, 2010

Document Version	Date of Issue	Description of Change
1.0	April 9, 2010	Initial release
1.1	November 11, 2010	Corrections and updates for release 1.1

Table of Contents

List of Tables

1 Conformance Statement Overview

3DVH is a radiation therapy (RT) quality assurance (QA) software application that allows the user to estimate patient dose/dose volume histogram (DVH) impact based on conventional intensity-modulated radiation therapy (IMRT) QA phantom measurements. To do this, 3DVH uses a "Planned Dose Perturbation" (patent pending) algorithm. In addition to plan dose QA, 3DVH can also be used for quantitative 3D dose and DVH comparisons between any two sets of DICOM RT data.

3DVH does not support any of the DICOM networking services (transfer, query/retrieve, workflow management, print management). Instead, browser functionality is provided to read DICOM format files from any networked location. Table 1-1 identifies the supported standard SOP classes.

Table 1-1   Supported Standard SOP Classes

SOP Class Name	SOP Class UID	PS 3.3 Reference
CT Image Storage	1.2.840.10008.5.1.4.1.1.2	A.3
RT Dose Storage	1.2.840.10008.5.1.4.1.1.481.2	A.18
RT Structure Set Storage	1.2.840.10008.5.1.4.1.1.481.3	A.19
RT Plan Storage	1.2.840.10008.5.1.4.1.1.481.5	A.20
RT Ion Plan Storage	1.2.840.10008.5.1.4.1.1.481.8	A.49

2 Introduction

2.1 Audience

This document is written for people that need to understand how 3DVH will integrate into their healthcare facility. This includes both those responsible for overall network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

2.2 Remarks

The scope of this DICOM Conformance Statement is to facilitate integration between 3DVH and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

* The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

* Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

2.3 Terms and Definitions

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Attribute	A unit of information in an object definition; a data element identified by a tag. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).
Information Entity (IE)	That portion of information defined by a Composite IOD which is related to one specific class of Real-World Object. There is a one-to-one correspondence between Information Entities and entities in the DICOM Application Model.
Information Object Definition (IOD)	The specified set of Attributes that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The Attributes may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.
Module	A set of Attributes within an Information Object Definition that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.
Service/Object Pair (SOP) Class	The specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.
Service/Object Pair (SOP) Instance	An information object; a specific occurrence of information exchanged in a SOP Class. Example: a specific x-ray image.
Tag	A 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]
Transfer Syntax	The encoding used for exchange of DICOM information objects and messages. Examples: JPEG compressed (images), little endian explicit value representation.
Unique Identifier (UID)	A globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.
Value Representation (VR)	The format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

2.4 Basics of DICOM Communication

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in italics below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Since 3DVH does not support any DICOM networking services, these services need to be provided by other applications. 3DVH does provide browser functionality to read DICOM format files created by these other applications.

DICOM specifies a variety of methods for encoding data, denoted Transfer Syntaxes. The Transfer Syntax specifies endianness and whether the Value Representation for each Attribute is explicitly provided or whether it must be determined based on the Tag using a DICOM Dictionary. Each unit of data is formatted in accordance with the appropriate Information Object Definition, using the Transfer Syntax.

2.5 Abbreviations & Acronyms

C	Conditional (Module Usage)
DICOM	Digital Imaging and Communications in Medicine
IE	Information Entity
IOD	Information Object Definition
ISO	International Organization for Standards
M	Mandatory (Module Usage)
NEMA	National Electrical Manufacturers Association
OSI	Open Systems Interconnection
PS 3.3	DICOM Standard Part 3: Information Object Definitions
PS 3.15	DICOM Standard Part 15: Security and System Management Profiles
QA	Quality Assurance
RT	Radiotherapy
SOP	Service-Object Pair
U	User Option (Module Usage)
UID	Unique Identifier
VR	Value Representation

2.6 References

NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

3 Networking

3DVH does not provide any networking services.

4 Media Interchange

3DVH does not provide any media interchange services.

5 Support of Character Sets

3DVH does not support extended character sets.

6 Security

DICOM specifies methods for providing security at different levels of the ISO OSI Basic Reference Model through the use of mechanisms specific to a particular layer. The methods for applying these mechanisms are described in the various parts of the DICOM Standard. Some mechanisms and algorithms are specified in PS 3.15 as Security Profiles. Since 3DVH does not provide any network or media interchange services and is assumed to be operating in a secured environment, it does not support any of these security profiles.

7 Annexes

7.1 IOD Contents

7.1.1 Created SOP Instance(s)

The following section lists the attributes saved for each created object in the 3DVH implementation.

7.1.2 Usage of Attributes from Received IODs

The following sections list the attributes used in the 3DVH implementation of each information object, along with any additional attribute requirements not already specified in the DICOM Standard.

7.1.2.1 RT Plan Information Object Implementation

Table 7-1 RT Plan Required Modules

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Table 7-2
Study	General Study	C.7.2.1	See Table 7-3
Plan	RT Patient Setup	C.8.8.12	See Table 7-4
	RT Fraction Scheme	C.8.8.13	See Table 7-5
	RT Beams	C.8.8.14	See Table 7-6
	SOP Common	C.12.1	See Table 7-7

Table 7-2 Patient Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	

Table 7-3 General Study Module Attributes Used

Attribute Name	Tag	Type	Notes
Study ID	(0020,0010)	2	

Table 7-4 RT Patient Setup Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient Setup Sequence	(300A,0180)	1	
>Patient Setup Number	(300A,0182)	1	
>Patient Position	(0018,5100)	1C	

Sun Nuclear Corporation 3DVH DICOM Conformance Statement

Table 7-5   RT Fraction Scheme Module Attributes Used

Attribute Name	Tag	Type	Notes
Fraction Group Sequence	(300A,0070)	1	
>Referenced Beam Sequence	(300C,0004)	1C	
>>Referenced Beam Number	(300C,0006)	1	
>>Beam Meterset	(300A,0086)	3	

Table 7-6   RT Beams Module Attributes Used

Attribute Name	Tag	Type	Notes
Beam Sequence	(300A,00B0)	1	
>Beam Number	(300A,00C0)	1	
>Beam Name	(300A,00C2)	3	
>Beam Description	(300A,00C3)	3	
>Beam Type	(300A,00C4)	1	
>Radiation Type	(300A,00C6)	2	
>Treatment Machine Name	(300A,00B2)	2	
>Manufacturer	(0008,0070)	3	
>Source-Axis Distance	(300A,00B4)	3	Assumed to be 1000 mm if not provided.
>Beam Limiting Device Sequence	(300A,00B6)	1	
>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>Source to Beam Limiting Device Distance	(300A,00BA)	3	
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	
>>Leaf Position Boundaries	(300A,00BE)	2C	
>Referenced Patient Setup Number	(300C,006A)	3	
>Treatment Delivery Type	(300A,00CE)	3	
>Number of Wedges	(300A,00D0)	1	
>Number of Compensators	(300A,00E0)	1	
>Number of Boli	(300A,00ED)	1	
>Number of Blocks	(300A,00F0)	1	
>Applicator Sequence	(300A,0107)	3	Only one applicator is allowed
>>Applicator ID	(300A,0108)	1	
>>Accessory Code	(300A,00F9)	3	
>>Applicator Type	(300A,0109)	1	
>>Applicator Description	(300A,010A)	3	
>General Accessory Sequence	(300A,0420)	3	Used only to determine the number of general accessories.
>Final Cumulative Meterset Weight	(300A,010E)	1C	
>Control Point Sequence	(300A,0111)	1	
>>Control Point Index	(300A,0112)	1	
>>Cumulative Meterset Weight	(300A,0134)	2	
>>Nominal Beam Energy	(300A,0114)	3	
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	
>>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>>Leaf/Jaw Positions	(300A,011C)	1	
>>Gantry Angle	(300A,011E)	1C	
>>Gantry Rotation Direction	(300A,011F)	1C	
>>Gantry Pitch Angle	(300A,014A)	3	
>>Gantry Pitch Rotation Direction	(300A,014C)	3	
>>Beam Limiting Device Angle	(300A,0120)	1C	

Attribute Name	Tag	Type	Notes
>>Beam Limiting Device Rotation Direction	(300A,0121)	1C	
>>Patient Support Angle	(300A,0122)	1C	
>>Patient Support Rotation Direction	(300A,0123)	1C	
>>Isocenter Position	(300A,012C)	2C	
>>Surface Entry Point	(300A,012E)	3	
>>Source to Surface Distance	(300A,0130)	3	

Table 7-7   SOP Common Module Attributes Used

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be 1.2.840.10008.5.1.4.1.1.481.8

7.1.2.2   RT Ion Plan Information Object Implementation

Table 7-8   RT ION Plan Required Modules

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Table 7-9
Study	General Study	C.7.2.1	See Table 7-10
Plan	RT Patient Setup	C.8.8.12	See Table 7-11
	RT Fraction Scheme	C.8.8.13	See Table 7-12
	RT Ion Beams	C.8.8.25	See Table 7-13
	SOP Common	C.12.1	See Table 7-14

Table 7-9   Patient Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	

Table 7-10 General Study Module Attributes Used

Attribute Name	Tag	Type	Notes
Study ID	(0020,0010)	2	

Table 7-11 RT Patient Setup Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient Setup Sequence	(300A,0180)	1	
>Patient Setup Number	(300A,0182)	1	
>Patient Position	(0018,5100)	1C	

Table 7-12 RT Fraction Scheme Module Attributes Used

Attribute Name	Tag	Type	Notes
Fraction Group Sequence	(300A,0070)	1	
>Referenced Beam Sequence	(300C,0004)	1C	
>>Referenced Beam Number	(300C,0006)	1	
>>Beam Meterset	(300A,0086)	3	

Table 7-13 RT Ion Beams Module Attributes Used

Attribute Name	Tag	Type	Notes
Ion Beam Sequence	(300A,03A2)	1	
>Beam Number	(300A,00C0)	1	
>Beam Name	(300A,00C2)	3	
>Beam Description	(300A,00C3)	3	
>Beam Type	(300A,00C4)	1	
>Radiation Type	(300A,00C6)	2	
>Treatment Machine Name	(300A,00B2)	2	
>Manufacturer	(0008,0070)	3	
>Ion Beam Limiting Device Sequence	(300A,03A4)	1	
>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>Isocenter to Beam Limiting Device Distance	(300A,00BB)	3	
>>Number of Leaf/Jaw Pairs	(300A,00BC)	1	
>>Leaf Position Boundaries	(300A,00BE)	2C	
>Referenced Patient Setup Number	(300C,006A)	3	
>Treatment Delivery Type	(300A,00CE)	3	
>Final Cumulative Meterset Weight	(300A,010E)	1C	
>Number of Wedges	(300A,00D0)	1	
>Number of Compensators	(300A,00E0)	1	
>Number of Boli	(300A,00ED)	1	
>Number of Blocks	(300A,00F0)	1	
>Snout Sequence	(300A,030C)	3	Only one snout is allowed
>>Snout ID	(300A,030F)	1	
>>Accessory Code	(300A,00F9)	3	
>Applicator Sequence	(300A,0107)	3	Only one applicator is allowed
>>Applicator ID	(300A,0108)	1	
>>Accessory Code	(300A,00F9)	3	
>>Applicator Type	(300A,0109)	1	
>>Applicator Description	(300A,010A)	3	
>General Accessory Sequence	(300A,0420)	3	Used only to determine the number of general accessories.
>Number of Range Shifters	(300A,0312)	1	
>Number of Lateral Spreading Devices	(300A,0330)	1	
>Number of Range Modulators	(300A,0340)	1	
>Ion Control Point Sequence	(300A,0111)	1	
>>Control Point Index	(300A,0112)	1	
>>Cumulative Meterset Weight	(300A,0134)	2	
>>Nominal Beam Energy	(300A,0114)	3	
>>Beam Limiting Device Position Sequence	(300A,011A)	1C	
>>>RT Beam Limiting Device Type	(300A,00B8)	1	
>>>Leaf/Jaw Positions	(300A,011C)	1	
>>Gantry Angle	(300A,011E)	1C	
>>Gantry Rotation Direction	(300A,011F)	1C	
>>Gantry Pitch Angle	(300A,014A)	3	
>>Gantry Pitch Rotation Direction	(300A,014C)	3	
>>Beam Limiting Device Angle	(300A,0120)	1C	
>>Beam Limiting Device Rotation	(300A,0121)	1C	

Attribute Name	Tag	Type	Notes
Direction			
>>Patient Support Angle	(300A,0122)	1C	
>>Patient Support Rotation Direction	(300A,0123)	1C	
>>Isocenter Position	(300A,012C)	2C	
>>Surface Entry Point	(300A,012E)	3	

Table 7-14 SOP Common Module Attributes Used

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be 1.2.840.10008.5.1.4.1.1.481.5

7.1.2.3   RT Structure Set Information Object Implementation

Table 7-15 RT Structure Set Required Modules

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Table 7-16
Study	General Study	C.7.2.1	See Table 7-17
Structure Set	Structure Set	C.8.8.5	See Table 7-18
	ROI Contour	C.8.8.6	See Table 7-19
	RT ROI Observations	C.8.8.8	See Table 7-20
	SOP Common	C.12.1	See Table 7-21

Table 7-16 Patient Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	

Table 7-17 General Study Module Attributes Used

Attribute Name	Tag	Type	Notes
Study Date	(0008,0020)	2	
Study Time	(0008,0030)	2	
Study ID	(0020,0010)	2	
Physician(s) of Record	(0008,1048)	3	

Table 7-18 Structure Set Module Attributes Used

Attribute Name	Tag	Type	Notes
Structure Set ROI Sequence	(3006,0020)	3	
>ROI Number	(3006,0022)	1	
>ROI Name	(3006,0026)	2	

Table 7-19 ROI Contour Module Attributes Used

Attribute Name	Tag	Type	Notes
ROI Contour Sequence	(3006,0039)	1	
>Referenced ROI Number	(3006,0084)	1	
>ROI Display Color	(3006,002A)	3	
>Contour Sequence	(3006,0040)	3	
>>Contour Number	(3006,0048)	3	
>>Contour Geometric Type	(3006,0042)	1	Only POINT and CLOSED_PLANAR contours are used.
>>Contour Data	(3006,0050)	1	

Table 7-20 RT ROI Observations Module Attributes Used

Attribute Name	Tag	Type	Notes
RT ROI Observations Sequence	(3006,0080)	1	
>Referenced ROI Number	(3006,0084)	1	
>RT ROI Interpreted Type	(3006,00A4)	2	

Table 7-21 SOP Common Module Attributes Used

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be 1.2.840.10008.5.1.4.1.1.481.3

7.1.2.4 CT Image Information Object Implementation

Table 7-22 CT Image Required Modules

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Table 7-23
Study	General Study	C.7.2.1	See Table 7-24
Series	General Series	C.7.3.1	See Table 7-25
Image	Image Plane	C.7.6.2	See Table 7-26
	Image Pixel	C.7.6.3	See Table 7-27
	CT Image	C.8.2.1	See Table 7-27
	VOI LUT	C.11.2	See Table 7-29
	SOP Common	C.12.1	See Table 7-30

Table 7-23 Patient Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	

Table 7-24 General Study Module Attributes Used

Attribute Name	Tag	Type	Notes
Study ID	(0020,0010)	2	

Table 7-25 General Series Module Attributes Used

Attribute Name	Tag	Type	Notes
Modality	(0008,0060)	1	
Series Instance UID	(0020,000E)	1	
Patient Position	(0018,5100)	2C	

Table 7-26 Image Plane Module Attributes Used

Attribute Name	Tag	Type	Notes
Pixel Spacing	(0028,0030	1	Must contain one or two values. If a single value is provided, it will be used for both the row spacing and the column spacing.
Image Orientation (Patient)	(0020,0037)	1	The direction cosines must be (+/-1, 0, 0, 0, +/-1, 0) or (0, +/-1, 0, +/-1, 0, 0) with an angle tolerance of 0.001 radians, i.e., the only supported orientations are HFS, HFP, FFS, FFP, HFDR, HFDL, FFDR and FFDL.
Image Position (Patient)	(0020,0032)	1	

Table 7-27 Image Pixel Module Attributes Used

Attribute Name	Tag	Type	Notes
Samples per Pixel	(0028,0002)	1	Must be 1.
Photometric Interpretation	(0028,0004)	1	Must be MONOCHROME1 or MONOCHROME2.
Rows	(0028,0010)	1	
Columns	(0028,0011)	1	
Bits Allocated	(0028,0100)	1	Must be 16.
Bits Stored	(0028,0101)	1	Must be greater than or equal to 12 and less than or equal to 16.
High Bit	(0028,0102)	1	Must be one less than the Bits Allocated (0028,0100).
Pixel Representation	(0028,0103)	1	Must be either 0000H (unsigned integer) or 0001H (2's complement).
Pixel Data	(7FE0,0010)	1C	

Table 7-28 CT Image Module Attributes Used

Attribute Name	Tag	Type	Notes
Rescale Intercept	(0028,1052)	1	Rescale Intercept
Rescale Slope	(0028,1053)	1	Rescale Slope
CTDIvol	(0028,9345)	3	CTDIvol

Table 7-29 VOI LUT Module Attributes Used

Attribute Name	Tag	Type	Notes
Window Center	(0028,1050)	1	
Window Width	(0028,1051)	1	

Table 7-30 SOP Common Module Attributes Used

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be 1.2.840.10008.5.1.4.1.1.481.8
SOP Instance UID	(0008,0018)	1	

7.1.2.5 RT Dose Information Object Implementation

Table 7-31 RT Dose IOD Required Modules

IE	Module	PS 3.3 Reference	Notes
Patient	Patient	C.7.1.1	See Table 7-32
Study	General Study	C.7.2.1	See Table 7-33
Series	General Series (subsumes RT Series)	C.7.3.1	See Table 7-34
Frame of Reference	Frame of Reference	C.7.4.1	See Table 7-35
Equipment	General Equipment	C.7.5.1	See Table 7-36
Dose	Image Plane	C.7.6.2	See Table 7-37
	Image Pixel	C.7.6.3	See Table 7-38
	Multi-Frame	C.7.6.6	See Table 7-39
	RT Dose	C.8.8.3	See Table 7-40
	SOP Common	C.12.1	See Table 7-41

Table 7-32 Patient Module Attributes Used

Attribute Name	Tag	Type	Notes
Patient's Name	(0010,0010)	2	
Patient ID	(0010,0020)	2	
Patient's Birth Date	(0010,0030)	2	
Patient's Sex	(0010,0040)	2	

Table 7-33 General Study Module Attributes Used

Attribute Name	Tag	Type	Notes
Study Date	(0008,0020)	2	
Study Time	(0008,0030	2	
Study Instance UID	(0020,000D)	1	
Referring Physician's Name	(0008,0090)	2	
Study ID	(0020,0010)	2	
Accession Number	(0008,0050)	2	
Study Description	(0008,1030)	3	
Physician(s) of Record	(0008,1048	3	
Referenced Study Sequence	(0008,1110)	3	
>Referenced SOP Class UID	(0008,1150)	1	
>Referenced SOP Instance UID	(0008,1155)	1	

Table 7-34 General Series Module Attributes Used

Attribute Name	Tag	Type	Notes
Modality	(0008,0060)	1	
Series Instance UID	(0020,000E)	1	
Series Number	(0020,0011)	2	
Laterality	(0020,0060)	2C	
Protocol Name	(0018,1030)	3	
Series Description	(0008,103E)	3	
Operators' Name	(0008,1070)	3	
Patient Position	(0018,5100)	2C	

Table 7-35 Frame of Reference Module Attributes Used

Attribute Name	Tag	Type	Notes
Frame of Reference UID	(0020,0052)	1	
Position Reference Indicator	(0028,0009)	2	

Table 7-36 General Equipment Module Attributes Used

Attribute Name	Tag	Type	Notes
Manufacturer	(0008,0070)	2	
Institution Name	(0008,0080)	3	
Institution Address	(0008,0081)	3	
Station Name	(0008,1010)	3	
Institutional Department Name	(0008,1040)	3	
Manufacturer's Model Name	(0008,1090)	3	
Software Versions	(0018,1020)	3	

Table 7-37 Image Plane Module Attributes Used

Attribute Name	Tag	Type	Notes
Pixel Spacing	(0028,0030	1	Must contain one or two values. If a single value is provided, it will be used for both the row spacing and the column spacing.
Image Orientation (Patient)	(0020,0037)	1	The direction cosines must be (+/-1, 0, 0, 0, +/-1, 0) or (0, +/-1, 0, +/-1, 0, 0) with an angle tolerance of 0.001 radians, i.e., the only supported orientations are HFS, HFP, FFS, FFP, HFDR, HFDL, FFDR and FFDL.
Image Position (Patient)	(0020,0032)	1	

Table 7-38 Image Pixel Module Attributes Used

Attribute Name	Tag	Type	Notes
Samples per Pixel	(0028,0002)	1	Must be 1.
Photometric Interpretation	(0028,0004)	1	Must be MONOCHROME2.
Rows	(0028,0010)	1	
Columns	(0028,0011)	1	
Bits Allocated	(0028,0100)	1	Must be 16 or 32.
Bits Stored	(0028,0101)	1	Must have the same value as Bits Allocated (0028,0100).
High Bit	(0028,0102)	1	Must be one less than the Bits Allocated (0028,0100).
Pixel Representation	(0028,0103)	1	Must be either 0000H (unsigned integer) or 0001H (2's complement).
Pixel Data	(7FE0,0010)	1C	

Table 7-39 Multi-Frame Module Attributes Used

Attribute Name	Tag	Type	Notes
Number of Frames	(0028,0008)	1	
Frame Increment Pointer	(0028,0009)	1	

Table 7-40 RT Dose Module Attributes Used

Attribute Name	Tag	Type	Notes
Dose Units	(3004,0002)	1	Must be GY.
Dose Type	(3004,0004)	1	Must be PHYSICAL, EFFECTIVE, PHYSICAL_HETERO or PHYSICAL_HOMO.
Dose Comment	(3004,0006)	3	
Dose Summation Type	(3004,000A)	1	
Referenced RT Plan Sequence	(300C,0002)	1C	
>Referenced SOP Class UID	(0008,1150)	1	
>Referenced SOP Instance UID	(0008,1155)	1	
>Referenced Fraction Group Sequence	(300C,0020)	1C	
>>Referenced Fraction Group Number	(300C,0022)	1	
>>Referenced Beam Sequence	(300C,0004)	1C	
>>>Referenced Beam Number	(300C,0006)	1	
>>>Referenced Control Point Sequence	(300C,00F2)	1C	

Attribute Name	Tag	Type	Notes
>>>>Referenced Start Control Point Index	(300C,00F4)	1	
>>>>Referenced Stop Control Point Index	(300C,00F6)	1	
>>Referenced Brachy Application Setup Sequence	(300C,000A)	1C	
>>>Referenced Brachy Application Setup Number	(300C,000C)	1	
Grid Frame Offset Vector	(3004,000C)	1C	Dose planes must be uniformly spaced.
Dose Grid Scaling	(3004,000E)	1C	

Table 7-41 SOP Common Module Attributes Used

Attribute Name	Tag	Type	Notes
SOP Class UID	(0008,0016)	1	Must be 1.2.840.10008.5.1.4.1.1.481.2

7.1.3 Attribute Mapping

3DVH does not perform any attribute mapping.

7.1.4 Coerced/Modified Fields

3DVH does not coerce nor modify any of the input fields.

7.2 Data Dictionary of Private Attributes

3DVH does not use any private attributes.

7.3 Coded Terminology and Templates

3DVH does used not support coded terminology or templates.

7.4 Grayscale Image Consistency

3DVH does not provide support for the DICOM Grayscale Standard Display Function.

7.5 Standard Extended/Specialized/Private SOP Classes

3DVH supports extensions of the standard SOP classes specified in section 1, ignoring any private attributes. It does not support any specialized or private SOP classes.

7.6 Private Transfer Syntaxes

3DVH does not support any private transfer syntaxes.