

DICOM Correction Proposal

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Correction Number	CP-1476
Log Summary: Add settling phases information and Synch pulse for Functional MRI	
Name of Standard	PS3.3, PS3.6 2015c
<p>Rationale for Correction:</p> <p>For processing Functional MR acquisitions more information is needed than currently available in the Enhanced MR Image object.</p> <ul style="list-style-type: none"> • It is important to know if there are settling phases used during the acquisition. These phases should be skipped during the processing of the series. • Registration of the time of the first synch pulse for the current paradigm execution <p>Proposal is to only update the Enhanced MR Object definition and avoid extra complexity in the Classic object for pulse synchronization information as the Synchronization Module is not present in the MR Image IOD.</p>	
<p>Correction Wording:</p> <p><include proposed change below, following guidelines for formatting of changes in supplements></p>	

Item #1: Amend PS3.3 Table A.36-2 to add "Functional MR"

Table A.36-2. Enhanced MR Image Functional Group Macros

Functional Group Macro	Section	Usage
Pixel Measures	C.7.6.16.2.1	M
.....		
MR Arterial Spin Labeling	C.8.13.5.14	C - Required if Image Type (0008,0008) Value 3 is ASL. May be present otherwise.
Functional MR	C.8.13.5.15	U

Item #2: Amend PS3.3 Table C.7.6.16-3 to add condition to Temporal Position Index

This Functional Group Macro may only be part of the Per-frame Functional Groups Sequence (5200,9230) attribute.

Table C.7.6.16-3. Frame Content Macro Attributes

Attribute Name	Tag	Type	Attribute Description
....			
>Temporal Position Index	(0020,9128)	1C	Ordinal number (starting from 1) of the frame in the set of frames with different temporal positions. Required if the value of SOP Class UID (0008,0016) equals "1.2.840.10008.5.1.4.1.1.130" or Functional MR Sequence (0018,9621) is present . May be present otherwise. See Section C.7.6.16.2.2.6. and C.7.6.16.2.2.8.
>Stack ID	(0020,9056)	1C	Identification of a group of frames, with different positions and/or orientations that belong together, within a dimension organization. See Section C.7.6.16.2.2.4 for further explanation. Required if the value of SOP Class UID (0008,0016) equals "1.2.840.10008.5.1.4.1.1.130" or Functional MR Sequence (0018,9621) is present . May be present otherwise. See Section C.7.6.16.2.2.7 and C.7.6.16.2.2.8.
>In-Stack Position Number	(0020,9057)	1C	The ordinal number of a frame in a group of frames, with the same Stack ID Required if Stack ID (0020,9056) or Functional MR Sequence (0018,9621) is present . See Section C.7.6.16.2.2.4 and C.7.6.16.2.2.8.
...			

Item #3: Amend PS3.3 Add section C.7.6.16.2.2.8

C.7.6.16.2.2.8 Usage of Temporal Position Index, Stack ID and In-Stack Position Number in fMRI Volumes

For fMRI volumes the Temporal Position Index is used to distinguish between the multiple volumes acquired in time (phases of a volume) for the same Stack ID. Each frame in the volume has an In-Stack Position Number that is the ordinal number in space of each volume. See figure C.7.6.16-4c for an example.

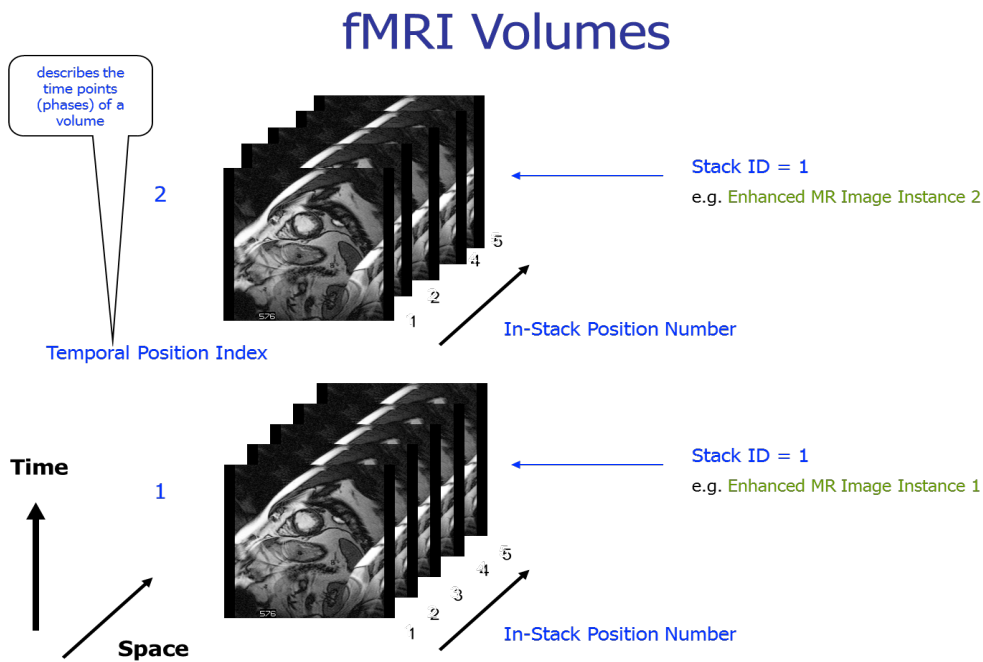


Figure C.7.6.16-4c. Example of Functional MRI volumes

Item #4: Amend PS3.3 Table C.8-84 to add "Functional MR Settling Phase Frames Present"

Table C.8-84. MR Image Description Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Complex Image Component	(0008,9208)	1C	Representation of complex data of frames in the SOP Instance. See Section C.8.13.3.1.1 for a description and Defined Terms. Required if SOP Class UID is not "1.2.840.10008.5.1.4.1.1.4.4" (Legacy Converted). May be present otherwise.
Acquisition Contrast	(0008,9209)	1C	Indication of acquisition contrast used with frames in the SOP Instance. See Section C.8.13.3.1.2 for a description and Defined Terms. Required if SOP Class UID is not "1.2.840.10008.5.1.4.1.1.4.4" (Legacy Converted). May be present otherwise.
Functional Settling Phase Frames Present	(0018,9622)	3	<u>Specifies if the acquisition used and stored settling phases.</u> <u>Enumerated Values:</u> <u>YES</u> <u>NO</u>

Item #5: Amend PS3.3 Add section C.8.13.5.15

C.8.13.5.15 Functional MR Macro

Table C.8-xx specifies the attributes of the Functional MR Group Macro.

Table C.8-xx. Functional MR Macro Attributes

Attribute Name	Tag	Type	Attribute Description
Functional MR Sequence	(0018,9621)	1	Identifies the Functional parameters of this frame. Only a single Item shall be included in this Sequence.
> Settling Phase Frame	(0018,9624)	1C	Identifies if the frame is part of a Functional MR settling phase. All frames with the same combination of Stack ID (0020,9056) and Temporal Position Index (0020,9128) shall have the same value. Enumerated Values: YES NO Required if Functional Settling Phase Frames Present (0018,9622) is YES
> Functional Sync Pulse	(0018,9623)	1	The date and time of the Functional Sync Pulse for this frame. See Section C.8.13.5.15.1

C.8.13.5.15.1 Functional Sync Pulse

Functional studies require synchronization between the Acquisition Modality and external devices to coordinate paradigm presentation by an external system with image acquisition. It is required that the Acquisition Time Synchronized (0018,1800) shall be "Y".

The Functional Sync Pulse (0018,9623) is the date-time stamp of the pulse at the start of the acquired volume(s) in the SOP Instance. All frames with the same combination of Stack ID (0020,9056) and Temporal Position Index (0020,9128) share the same time stamp.

Item #6: Amend PS3.6 Chapter 6 Registry of DICOM data elements

Tag	Name	Keyword	VR	VM	
(0018,9621)	Functional MR Sequence	FunctionalMRSequence	SQ	1	
(0018,9622)	Functional Settling Phase Frames Present	FunctionalSettlingPhaseFramesPresent	CS	1	
(0018,9623)	Functional Sync Pulse	FunctionalSyncPulse	DT	1	
(0018,9624)	Settling Phase Frame	SettlingPhaseFrame	CS	1	