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Gating Interface

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GATING INTERFACE

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Foreword

This standard provides a detailed description of the gating interface between Radiation Therapy Treatment Delivery Devices (TDD), commonly called linear accelerators (a.k.a. “linac”) or other particle therapy accelerators and Patient Position Monitoring Systems (PPMS). This standard is intended as an interface between TDD and PPMS systems requiring beam gating capability. This standard provides key technical information to developers who wish to connect a TDD to a PPMS.

This standard is intended to be used by medical device manufacturers in the design and manufacture of radiation therapy equipment.

This standard was developed by the Radiation Therapy (RT) Section of the Medical Imaging & Technology Alliance (MITA), a division of NEMA. Inquiries, comments, and proposed or recommended revisions should be submitted to the RT Section by contacting:

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Member Company List

At the time of the publication of the standard, the RT Section was composed of the following member companies:

Accuray Incorporated
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IMRIS
Landauer, Inc.
LAP of America Laser Applications, LLC
Mevion Medical Systems, Inc.
Philips Healthcare
Siemens Healthcare
The Phantom Laboratory
Varian Medical Systems, Inc.

History

This is the first edition of this standard.

Section 1
OVERVIEW

1.1 SCOPE

This standard provides the necessary information for a Radiation Therapy Treatment Delivery Device (TDD) or Patient Position Monitoring System (PPMS) developer to design and implement a compatible real-time gating interface. This standard applies to all the requirements for interaction including the electrical signal requirements between any compliant PPMS and TDD.

This standard explicitly excludes diagnostic scanners and other devices.

This standard does not describe all the requirements and testing which may be necessary to validate that a combined TDD/PPMS system is safe and effective for use. Individual device manufacturers may have additional requirements beyond compliance to the standard, including joint verification and validation of the combined system.

This standard does not include transfer of non-real-time information such as patient information. Please refer to applicable DICOM standards as appropriate.

1.2 RATIONALE

Over the last 20 years, improvements in radiation therapy delivery techniques have enabled dose distributions to better conform to the target shape, significantly reducing the volume of normal tissue that is irradiated during radiation therapy delivery. In addition, improvements in daily setup methods have increased the accuracy and precision of patient positioning, further reducing radiation dose to normal tissue. Recently, motion monitoring devices have been employed to monitor intra-fraction motion, again with the goal of improving targeting accuracy and reducing normal tissue irradiation.

Sources of intra-fraction motion include physiological processes such as digestion and respiration as well as inadvertent patient motion that are not constrained by immobilization devices. The information produced by the motion monitoring devices is intended to ensure that motion during treatment delivery coincides with the anticipated motion included in the treatment plan design. Ideally, the motion monitoring information can also be used to further improve targeting accuracy through treatment delivery interventions in the event that the target moves away from the planned position. To that end, gating interfaces have been developed that allow the motion monitoring device to signal the TDD to react to a BEAM HOLD request when motion outside a pre-defined window is detected and re-enable the beam when the target motion returns within the window. Each TDD has its own interface to PPMS. The goal of this standard is to define a single, standard interface that could be employed by all PPMS manufacturers that will connect to all TDDs.

The sections below describe the clinical scenarios in which the PPMS may detect motion outside of pre-defined windows and a BEAM HOLD/BEAM RESTART signal to the TDD should be triggered.

Respiratory motion managed with breath hold–typical treatment sites: lung, liver, pancreas, kidney, breast.

In this scenario, respiratory motion is managed through patient breath hold at a particular state in the respiratory cycle (for example, end of inspiration). In the event that the patient ceases to