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**NATIONAL STANDARD OF THE  
PEOPLE'S REPUBLIC OF CHINA**

**GB/T 18987-2015**

Replacing GB/T 18987-2003

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**Radiotherapy equipment -- Coordinates, movements and scales**

放射治疗设备 坐标、运动与刻度

**(English Translation)**

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### Foreword

This standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 18987-2003 "Radiotherapy equipment coordinate system, movement and scale", and GB/T 18987-2003 phase the main changes are as follows.

- increases the order of 2.1.7 for the rotation order of more than one rotation;
- modified the 2.9 bed surface coordinate system;
- 2.10 increase in the patient coordinate system requirements;
- modified the subject of 6.7;
- increased by 6.7.4 and 6.7.5;
- Table 2 adds Ip rotation;

Figure 1a) increases the coordinate system when all angular positions are set at zero;

Figure 17a), Figure 17b), Figure 18 and Figure 19;

Added appendix F.

This standard is equivalent to IEC 61217.:2008 (including IEC 61217.:1996 A1..2000 A2..2007) "Radiotherapy equipment Coordinates, movement and scale ". The editorial differences between this and IEC 61217.:2008 are as follows.

- with decimal point "." Instead of decimal point ",";
- the standard cited in other international standards, has been translated into our standard, the standard with the corresponding standard number instead of other International standards;
- This standard removes the introduction to IEC 61217 (version 1.2, 2008-04), preface, introduction and addition 2;
- "this standard" instead of "this international standard".

### 1 Scope and purpose

This standard applies to equipment and data related to radiotherapy planning during radiotherapy, including radiotherapy planning systems, radiotherapy simulations Machine, etc. Center gamma ray treatment equipment, etc. Central medical electron accelerator and non-isocentard device related patient image data.

The purpose of this standard is to provide a set of compatible coordinate systems for use in the entire process of long-range radiotherapy for use in this process of the tick marks (provided) and the movement of the device, as well as the use of computers for computer control.

## 2 Coordinate system

For each of the main components of the equipment moving relative to the other components, as shown in Figure 1a) and listed in Table 1, there is a dedicated Coordinate System. In addition, a fixed reference coordinate system is specified. Each of the main components (such as racks, radiant heads) is relative to oneself the coordinate system is always static.

The perspective view of the central medical electron accelerator and radiotherapy simulator is shown in Figure 1a), Figure 14a) and Figure 14b). There are several figures is the isometric projection of the coordinate system. In the figure, when viewed from the origin of the coordinate system in the positive direction of an axis, Clockwise rotation of the elliptical arrow (isometric projection) indicates positive rotation.

**Note:** In the description of the individual coordinate systems below, the rotation is sometimes described in counterclockwise (CCW), where the rotation axis is not the origin of the coordinate system Point of view.

The coordinate system defined in the following terms is subject to mathematical transformation (rotation and/or translation), which can convert a point or vector coordinate in a coordinate system to another coordinate system. See Appendix A for an example of coordinate transformation.

### 2.1 Basic rules

#### 2.1.1

All coordinate systems are right hand right angle coordinate system. Coordinate system between the linear and angular motion of the positive parameters shown in Figure 2, all coordinate systems in the figure are set to zero, and all coordinate axes are vertically upward.

#### 2.1.2

The axes in the coordinate system are identified by an uppercase letter and a lowercase letter, and their lowercase letters identify the coordinate system in which the axis is located.

#### 2.1.3

The coordinate system has a hierarchical structure (mother-child relationship), which means that each coordinate system is derived from another coordinate system. Altogether the parent mat is a fixed reference coordinate system, and Figure 3 and Table 2 show the

hierarchical structure, which is divided into two sub-structures. One related to the rack, the other is related to the treatment bed.

#### 2.1.4

The position and direction of each sub-coordinate system (d) can pass through the origin  $I_d$  of its maternal (m) along one of its axes, two axes or three axes Translation, and then around its translation after a rotation of the axis derived.

**NOTE:** The mechanical movement of the components of the equipment may be carried out in a different order as long as the equipment is finally stopped at the same position and direction as if it were in the order indicated Move the same.

Figure 1b) and Figure 1c) illustrate the translation of the sub-origin  $I_d$  along the parent axis axes  $X_m$ ,  $Y_m$ , and  $Z_m$ .

Figure 1b) illustrates the translation of the origin  $I_d$  along the  $X_m$ ,  $Y_m$ ,  $Z_m$  axes and the rotation about the  $Z_d$  axis parallel to the  $Z_m$  axis.

Figure 1c) illustrates the translation of the origin  $I_d$  along the  $X_m$ ,  $Y_m$ ,  $Z_m$  axes and the rotation about the  $Y_d$  axis parallel to the  $Y_m$  axis.

Example. The beamer coordinate system is derived from the rack coordinate system, which in turn is derived from the fixed coordinate system. Therefore, the rotation of the rack coordinate system can cause the beamer coordinate system to rotate in a fixed coordinate system. The origin of the beamer coordinate system (the position of the radiation source) has a space in the fixed coordinate system Displacement.

#### 2.1.5

As shown in Figure 3 and Appendix A, the points defined in a coordinate system can be transformed with coordinates in their higher-level coordinate system (matrila) Medium and low level coordinate system (sub-system) defined. So that a series of coordinate transformations can be used to calculate the beamer coordinate system