Radiotherapy Patient System

RPS head SGRT/CBCT
Adjustable head support
for Radiotherapy Cancer Treatments

RPS head

3 DoF rotational error correction improves brain SRS/SRT treatments

Description and essential performance features of the adjustable head support

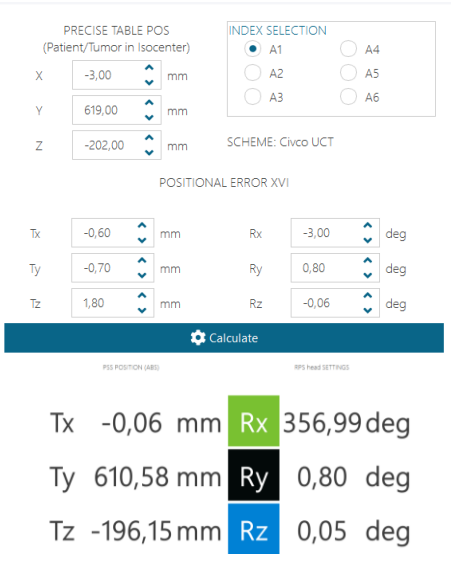
Stereotactic radiation therapy becomes more and more frequent. Recently, the simultaneous treatment of multiple brain metastases using a single isocenter is to become a standard. Accurate delivery of stereotactic treatment techniques requires – besides the translational positioning – exact rotational alignment with the planning CT. This positioning is normally supported by a 6D robotic couch. As many Linacs are equipped with couches that are restricted to translational movements only, those would benefit from a head immobilization system with adjustable rotations (X, Y and Z).

The RPS head allows sub-millimetric patient positioning accuracy in three degrees of freedom (3 DoF), improving clinical workflow and patient confidence. 3 DoF means that the system can correct rotational errors (X, Y and Z).

A rotatable head support plate is fixed by a ball joint, placed near the neck, to a base frame beneath the patient. The head support plate immobilizes the head of a patient with the aid of a thermoplastic mask (3rd party). The adjustment mechanism is placed near the patient's head. Care was taken to minimize the size of the operating housing in order not to spoil non-coplanar beams. The angles are manually adjustable via three individual star knobs.

RPS head SGRT
The simplest way of using RPS head is in combination with a surface scanner (e.g., C-RAD Catalyst). The rotational positioning error values detected by the surface scanner can be directly and easily corrected with the RPS head device. The correct patient position can be verified via live scanner data.

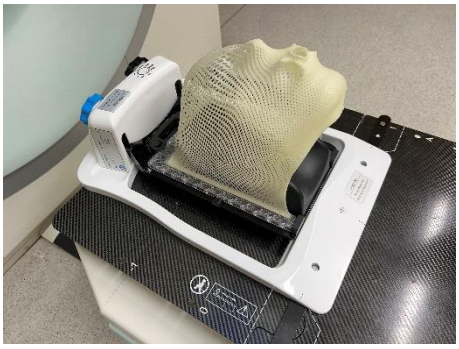
RPS head CBCT
RPS head CBCT includes a standalone software with GUI. This calculation tool takes positional 6D error values detected by a CBCT (e.g. Elekta XVI) as input and converts it. The three new rotational values are corrected by using RPS head and the three new translational error values are corrected via base table shifts.



gKteso GmbH
Technologies & Solutions

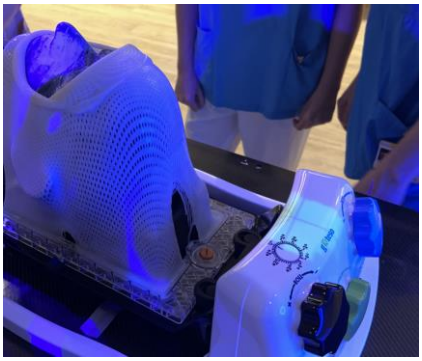
Michael-Schaeffer-Str.1
86399 Bobingen, Germany
Phone. +49 8234 / 966 38 41
info@gkteso.com
www.gkteso.com

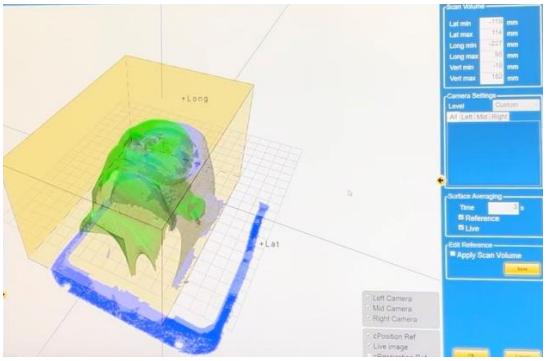
Intended use and intended user



The RPS head device is intended to support rotational positioning error corrections of a patient head prior to a radiotherapy cancer treatment. Rotational error correction is possible in all three axes individually within the range of up to +/- 4.0 degrees by adjusting related knobs manually on the device.
The device is to be used by radiation therapists. Before rotational error correction and subsequent treatment, the patient's head is immobilized by a thermoplastic mask (which is not part of the RPS head device).

Seamless SGRT (and CBCT) workflow integration





Scientific Reference: Otto A. Sauer, Sonja Wegener, Robert Schindhelm (University of Würzburg, Germany, Department of Radiation Oncology) *Design of a rotatable head fixation for cranial stereotactic treatments,* ESTRO 2021

Technical data

Pitch (X*) rotation	+/- 3°
Roll (Y*) rotation	+/- 4°
Yaw/Rot (Z*) rotation	+/- 4°
Accuracy	+/- 0.2°
Maximum load (head support plate)	15 kg
Product weight	approx. 3.5 kg
Dimensions	approx. 343mm x 140 mm x 545 mm
Standards	IEC 62366-1, IEC 61217, IEC 62304**, ISO 10993-1
Supported thermoplastic mask systems***	IT-V mask with iFrame, Klarity S-type, Orfit 3-point Push Pin, Others on demand (e.g. Q-Fix, Civco, MacroMedics, Orfit HP)
Couchtop interface	via standard indexing bar****
Operating system requirements**	Windows 10/11 (preferably installed on Microsoft Surface Tablet****)

* IEC 61217 Radiotherapy equipment – Coordinates, movements and scales
** Only relevant for RPS head CBCT configuration (RPS head SGRT does not include any software)
*** One variant of RPS head for each mask system
**** Not part of RPS head product

Michael-Schaeffer-Str.1
86399 Bobingen, Germany
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info@gkteso.com
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