COMPANY PROFILE

China Isotope & Radiation Corporation (CIRC), a subsidiary of China National Nuclear Corporation (CNNC), specializes in nuclear technology application industry and becomes the leader in the field of radioisotopes and radiation technology application in China. CIRC is the biggest manufacturer of imaging diagnostic and therapeutic Radiopharmaceuticals, Urea Breath Test Kits & Analyzers and Radioimmunoassay kits, and sealed radioactive sources for both medical and industrial purposes in China; a qualified EPC(Engineering, Procurement, Construction) supplier of irradiation facilities approved by Ministry of Ecology and Environment of China; a reputable service provider for independent medical laboratories of the Chinese hospitals and other medical institutes.

As the key member of CIRC and the pioneer of isotope industry in China, Chengdu Gaotong Isotope Co., Ltd (CNNC), commonly known as Gaotong, specializes in research & development, production and distribution of radiopharmaceuticals and sealed radioactive sources. It is the major supplier of diagnostic and therapeutic radiopharmaceuticals and sealed radioactive sources for both medical and industrial purposes in China.

Gaotong first developed Cobalt-60 teletherapy Sources, Cobalt-60 Industrial Radiation Sources and Cobalt-60 Gamma-knife Sources in China and first built 3×1 dry-process production facilities in China and Gel-type 99mTc Generator production facility in the world. Gaotong has complete radioisotope manufacturing facilities and could supply the customers with high-quality radiopharmaceuticals, sealed radioactive sources for both medical and industrial purposes, as well as Cobalt-60 Teletherapy Units, Cobalt-60 Gamma-knife Radiosurgery System, Cobalt-60 Brachytherapy equipment and Gamma-ray Flaw Detectors. Meanwhile, Gaotong has a professional nuclear technology service team and could provide the customers with transport of radioactive materials, onsite replacement of radioactive sources, recovery and disposal of spent radioactive sources, import-export trading, etc...

TENET OF HOLY MEDICAL TECHNOLOGY CO:

- The data speaks aloud
- Curative effect proves everything
- Advanced technology
- Perfect function
- Competitive price
- High safety
For human cancer ranks No. 1 among other diseases in terms of mortality caused. Currently main therapies for cancer include surgery, chemotherapy and conventional radiotherapy. However, a problem is still under discussion in the world, i.e. how to prevent damage to normal tissues when destroying lesion tissue.

Clinical application of head stereotactic radiotherapy devices, as Head Gamma Knife, leads to an effective therapy for craniocerebral lesions. With an advance in radiotherapy technologies and devices Holy Digital Control Whole Body Gamma Knife has been successfully developed for disease treatment of the whole body covering head and body, indicating a desirable solution to the above problem.


**功能四机合一·产品世界首创**
FOUR-IN-ONE FUNCTION, PIONEER IN THE WORLD

- 头部伽玛刀功能
  - Function of head gamma knife
- 体部伽玛刀功能
  - Function of body gamma knife
- 均型调强放疗功能
  - Function of conformal intensity modulated radiation therapy system
- 大野加量放疗功能
  - Function of large-field dose-boost radiation therapy system

圣爱数控全身伽玛刀
Holy Digital Control Whole Body Gamma Knife is characteristic of

- 高精度
  - High precision
- 高剂量
  - High dose
- 高疗效
  - Highly curative effect
- 微损伤
  - Slight damage
数字化多功能伽玛射线全身立体定向放射治疗系统
DIGITAL MULTI-FUNCTION GAMMA-RAY WHOLE BODY STEREOTACTIC RADIOTHERAPY SYSTEM

技术创新

"高精度、高剂量、高疗效，低损伤"是放射医学的至高目标，圣爱数字全身伽玛刀实现了“三高一低”

高精度：采用西门子数字控制加定位系统，头部定位精度≤0.5mm，体部综合定位精度≤2.5mm。

高剂量：钴60单源焦点剂量率≥30GY/min，与同类设备相比，装源速度和焦点剂量率更高。

高疗效：由于聚焦结构设计独特，使得更大的焦点比，焦点处的剂量一次性致死癌细胞。

低损伤：多源聚焦聚焦、射线分布更加均匀，单纯穿物理正常组织的单剂量剂量，正常组织只受到轻微损伤甚至不受损伤。

设计经济合理，降低投入成本

建造一座放射中心至少需要配套一台头部伽玛刀、一台体部伽玛刀、一台医用直线加速器或一台钴60治疗机及模拟定位机。与之配套的三套机房和相应的医务人员。圣爱数字全身伽玛刀，由于其强大的治疗功能和广泛的适应症范围，一台设备就可建立一套放射治疗中心，只需一套医疗用房，一台 terror 医生，5-8年后，只需要更新一套放射源，维护成本大大降低，减轻了医院的基础投入，购置成本与病员的经济负担。

TECHNOLOGICAL INNOVATION

Four-in-one function, Pioneer in the world

Holy Digital Control Whole Body Gamma Knife was developed by the technologies of three-dimension digital control high-precision positioning, stereotactic radiotherapy and 4~6 cylinder multi-beam ray focusing. The technology of one of the Company’s patented products, 2×4 Non-Equidistance Central Focusing Whole Body Photon Knife is introduced. It leads to a breakthrough in focusing method and structure of stereotactic radiotherapy devices, presenting multiple functions of head/body gamma knife and medical linear accelerator or Co-60 applicator. It can be applicable to treatment for a variety of tumors, no matter type, location and form, by a combination of high-precision radiotherapy, whole body conformal Intensity Modulated Radiation Therapy (IMRT) and conventional large-field added dose radiotherapy. It is characterized by non-invasion and no painfulness in treatment. Therefore, in a sense the product functions as a radiotherapy center.

Implementation of “Three high, One slight”, new achievement in radiotherapy

Holy Digital Control Whole Body Gamma Knife leads to implementation of “Three high, One slight”, a goal in the field of radiology. i.e. “High precision, high dose, highly satisfactory effect, slight damage”.

High precision: Siemens digital control machine tool locating technology is introduced, with head locating precision≤0.5mm and body locating precision≤2.5mm.

High dose: The initial total activity of Co-60 source is 1800GCi and the focus dose rate 3Gy/min, both manifesting higher values than those of similar devices.

Highly Curative effect: Innovative design for focusing structure contributes to a high ratio of the dose for focus to that for skin in unit volume. The dose in focus is high enough to destroy lesion tissue completely just in one treatment.

Clinical Cnmage: The technology of multi-source oriented focusing leads to well distribution of rays, and slight or no damage to normal tissues due to safe dose throughout the body in treatment.

Reasonable design, lower cost of devotion

Generally a radiotherapy center requires, at least, a head gamma knife, a body gamma knife, a medical linear accelerator or a Co-60 applicator, and a simulated locating device, and additionally three control rooms and related medical workers. Comparatively, however, Holy Digital Control Whole Body Gamma Knife can work only in one operation room. It presents powerful therapeutic functions and wide scope of indications, equivalent to those of a radiotherapy center. For just the same medical workers and one set of radiation source in 5-8 years is wanted. This helps greatly reduce maintenance cost, lower required investment and purchase cost in hospital's basic construction and consequently patients' expenses for medical treatment.
数控多功能伽玛射线全身立体定向放射治疗系统
DIGITAL MULTI-FUNCTION GAMMA-RAY WHOLE BODY STEREOTACTIC RADIOThERAPY SYSTEM

产品技术特点及优势

治疗空间更大，放疗功能更多
采用4/1多源圆形聚焦及治疗结构，获得更大的治疗空间和多种放疗功能。实现头部伽玛刀功能，体部伽玛刀功能，透形调强放疗功能和多源大野量放疗功能。

焦点品质更高，健康组织损伤更小
采用4/1-360度均匀布源，旋转放疗，每一分束射线通过健康正常组织时都是安全剂量，焦点处剂量一次性受控无组织损伤，获得更大的焦点比。加长长直管，使焦点品质高，周边剂量小，健康组织得到更好的防护。

准直器多种规格，治疗方法更多选择
增加了大规格的准直器，对于大体积的病灶，也能实现立体定向放疗。7种准直器规格，为放射科提供了多样化的选择和组合，得到优化的治疗效果。

更加安全的内外屏障双重防护
准直/开孔体和头盔，形成双重内屏障，降低病人的非治疗射线损伤，设置了安全可靠的外屏障体，整个治疗中心受到外屏障体的保护，减少机房防护墙的厚度，墙体间无铅灌浇，节约机房建设费用。

设置自动防护系统，增加屏障结构
在出现错误操作和意外时，能立即启动和拆除安全防护装置，以保证病人，技师和设备的安全；增加屏障结构，实施防护放疗，实现对重要器官和组织的有效保护。

先进的计算机技术和治疗计划软件
应用专利技术开发的治疗计划系统，配备头部立体定向、体部立体定向，全身透形调强放疗和全身大野量放疗的专用治疗计划系统，方便于控制和软件进行单轨的精确规划，又便于从全局综合考虑局部病变的影响和利用。

采用双计算机配置
提高治疗计划的准确性和速度，防止计算机意外故障及各种病毒的破坏。

设置源体，治疗腔端面双支撑结构
有效地防止病体和治疗腔体位，保证焦点精度和定位精度。

安全、简适、舒适的移动性，维护费用低，国际潮流的外观设计。

TECHNICAL CHARACTERS AND ADVANTAGES

1. Large space of treatment, multi-function performance in radiotherapy
   4/1 multi-source cylinder, focusing technology and treatment structure are utilized for large space of treatment and a variety of radiotherapy functions shown in head/body gamma knife, conformal intensity modulated radiation therapy system and multi-source large-field added-dose radiotherapy system.

2. High quality focus, slight damage to normal tissues
   4/1-360° well distribution of source and rotating irradiation are applied. Therefore, single beam of ray throughout normal tissues of the body leads to safe dose. The dose in focus can rise high enough to destroy lesion tissue in one treatment. A high ratio of the dose for lesion to that for normal tissue in unit volume is obtained. The prolonged collimator contributes to high quality focus and reduced peripheral penumbras, and thus powerful protection of normal tissues in treatment.

3. Multiple collimator specifications and therapy options
   Large-diameter collimator is used in stereotactic radiotherapy for large lesion region. One collimator with types of specifications are available to radiotherapists in optional therapy, which brings optimized therapeutic effects.

4. High-safety protection by both internal and external shields
   Both internal and external shields, formed by collimator/on-off unit and headpiece, help lower harm to patients caused by non-therapeutic radiation. External shield is designed for safety protection of all patients in the center. Decreased thickness of shield wall and no lead placed inside wall together contribute to reducing construction cost of control room.

5. Application of automatic error-proof system and shield block
   Safety protection device will start immediately in case of operator’s errors and accidents, in order to ensure the safety of patients, technicians and medical devices; the utilization of shield block as well as conformal radiotherapy leads to effective protection of important organs and tissues in treatment.

6. Advanced computer-control technology and treatment plan software
   Compatible treatment plan system has been developed by the Company’s patented technology, applicable to head/body stereotactic positioning, whole body intensity modulated conformal imaging and whole body large-field added-dose radiotherapy. It helps medical technicians perform high-precision regional planning as well as estimate the influences of regional lesions.

7. Two-computer control system
   It contributes to improving accuracy and response of treatment plan and preventing computer system breakdown due to accidents or computer virus attack.

8. Double supporting structure for radiation source and treatment unit
   It helps effectively avoid the translocation of source and treatment part and thus ensure high precision of focus and positioning.

9. Safe, convenient and flexible operation, low maintenance cost, figure design towards international trend.
### Main Technical Parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focusing mode</td>
<td>Cylinder helical distribution non-equidistance focusing</td>
</tr>
<tr>
<td>Focus dose rate (initial set source)</td>
<td>≥36 Gy/min</td>
</tr>
<tr>
<td>Ratio (of the dose for focus to that for skin in unit volume)</td>
<td>1000 : 1</td>
</tr>
<tr>
<td>Specification of collimator</td>
<td>0-4-650, totally 7 groups</td>
</tr>
<tr>
<td>Space of treatment</td>
<td>X axis (landscape) 360mm</td>
</tr>
<tr>
<td></td>
<td>Y axis (vertical) 200mm</td>
</tr>
<tr>
<td></td>
<td>Z axis (portrait) 1700mm</td>
</tr>
<tr>
<td>Loaded weight of treatment bed</td>
<td>150 kg</td>
</tr>
<tr>
<td>Head locating precision</td>
<td>≤0.5 mm</td>
</tr>
<tr>
<td>Body resulting locating precision</td>
<td>≤2.5 mm</td>
</tr>
<tr>
<td>Maximum surface dose rate of gamma knife housing</td>
<td>≤100 Gy/h</td>
</tr>
<tr>
<td>Power supply</td>
<td>220V/50Hz, or 110V/60Hz</td>
</tr>
</tbody>
</table>

**Digital Multi-Function Gamma-Ray Whole Body Stereotactic Radiotherapy System**

**Main Technical Parameters:**

After positioning with CT/MRI diagnosis, high dosage radiation area can be adapted to fit the size and shape of tumor in three dimensions, making the tumor accept the deadly radioactive dosage and meanwhile reducing to the maximum the radioactive dosage to the surrounding normal tissues.

- **Dose Rate Distribution:**
  - The dosage field and dosage distribution curve formed by different rays radiating from single direction.
  - The dosage field and dosage distribution curve formed by 8M X-ray generated by linear accelerator radiating from five directions.

- **360° Rotation Radiation:**
  - The dosage field and dosage distribution curve formed by gamma knife.

- **Gamma Knife:**
  - The dosage field and dosage distribution curve formed by gamma knife linear accelerator and proton beam.

**Shape Adaptation & Intensification by MLC:**

**Shape Adaptation & Intensification by Gamma Knife:**

**Application:**

- **Clinical Application:**
  - After positioning with CT/MRI diagnosis, choosing and arranging different collimators. High dosage radiation area can be adapted to fit the size and shape of tumor in three dimensions. Modulating the proportion of dose to different collimators, the dose field of target can be more uniform.
**PRINCIPLE OF TREATMENT**

The technology of the patented device “2H/4/Non-Equidistance Central Focusing Whole Body Photon Knife” and a number of proprietary technologies are adopted in the product. Co-60 sources are distributed well in a complex structure of cylinder and sphere surface. Thousands of gamma rays are focused, by rotating focusing and three-grade collimation, for the purposes of head/body stereotactic radiotherapy and helical incision radiotherapy. Single beam of ray throughout the body indicates safe dose, High-dose in focus leads to destroying lesion tissue completely in one treatment. It satisfactorily realizes the goal of non-invasive radiotherapy.

**MAIN FUNCTIONS**

Cranio-cerebral stereotactic radio-neurosurgery, with the function of head gamma knife; Body stereotactic radiosurgery, with the function of body gamma knife; Conformal intensity modulated radiation therapy, for whole body treatment by helical incision radiotherapy.

The patented technology of well distribution of focus, with stereotactic technology, is introduced in conventional large-field added-dose radiotherapy, for the purpose of a ‘higher’ ratio (of the dose for focus to that for skin in unit volume) than that of Co-60 applicator or medical linear accelerator. It helps produce high dose and reduce treatment time.

**FILED OF CLINICAL APPLICATION**

**Indications for body treatment:** Liver cancer, lung cancer, esophageal carcinoma, gastric carcinoma, bladder carcinoma, bile duct carcinoma, abdominal lymphatic metastasis of cancer

**Indications for head treatment:** Pituitary tumor, acoustic nerve tumor, pineal gland region tumor, cranio-pharyngeal duct tumor, trigeminal nerve tumor, meningoma, cerebral metastasis of tumor, chordoma, vascular reticulosis carcinoma, glioma, embryona, nasopharyngeal carcinoma, retinal melanoma

Cerebrovascular diseases: Arteriovenous malformation, cavernous angioma, aneurysm

Functional diseases: Parkinson’s disease, trigeminal neuralgia, epilepsy, malignant pain

Other disease: mental illness

**COMPONENTS OF SYSTEM**

Control unit; radiation source; head/body stereotactic system; Head stereotactic therapy plan system; body stereotactic therapy plan system; conformal intensity modulated therapy plan system; automatic error-proof system.

**PROCEDURE OF TREATMENT**

Digital control radiotherapy center clinically manifests remarkable advantage - convenient and simple operation.

**Preparation:** No special preparation (including anesthesia) is required.

**Patients positioning:** Patients are immobilized in a supine position by locating device.

**CT/MRI scanning:** CT/MRI image is firstly obtained for high-precision lesion positioning.

**Establishment of treatment plan:** Doctors work out specific treatment plan, according to location, size, form and character of lesion, after input of imaging results to treatment plan system workstation.

**Radiation therapy:** It is performed by treatment operation system according to parameters of treatment plan.

**Removal of positioning:** The locating device shall be removed after treatment.

**Finding of treatment:** Patients may walk themselves out of treatment room. Given complicated state of illness or abnormal general condition medical observation in hospital for 1~2 days may be advised.

**Regular follow-up:** After completion of treatments patients shall be regularly follow-up according to illness state and doctor’s advice.
功能强大的治疗计划系统

病例资料和图像数据
- 案例资料的增加、删除、排序和检索等功能
- 符合DICOM3标准，与CT/MR等影像设备网络传输图像
- 图像定位标记的自动生成和坐标系统的自动建立
- 断层结构的自动轮廓复制和轮廓勾画
- 层间之间轮廓复制外扩或内缩
- 结构轮廓的名字、颜色、属性和密度的编辑
- 可变窗口模式便于断层图像和轮廓的直观显示
- 断层轮廓的三维显示，并可改变颜色、透明度及断层图像的开关
- 灵活有效的点、长度、面积和体积测量

视窗工具
- 六种窗口显示模式
- 三维REV显示
- 射束方向视（BEV）显示
- 轴位、冠位和矢状图像的重建和显示
- 图像的拖动、平移、翻转和旋转
- 图像叠加和重叠的灰度调节显示

计划设计工具
- 机械运动干涉范围自动检测
- 在进行图解的计划设计
- 先进的物理计算模式和三维算法
- 支持多计划设计
- 支持半程序化计算和逻辑算法

计划评估和输出
- 轴位、冠位和矢状图像的等剂量分布显示
- 三维实体或等值等剂量面显示
- 任意兴趣点实时剂量显示
- 等剂量分布显示
- 多结构的剂量体积直方图（DVH）显示
- 不同计划的DVH对比显示
- 剂量计划综合输出
- 评估图像和输出的打印输出
- 机器的配置参数