



 **NOVAC™ 7**

The first mobile electron  
linear accelerator for IORT



## The IORT Technique (IntraOperative Radiation Therapy)

IORT (*IntraOperative Radiation Therapy*) is a treatment method that involves the administration of a single dose of radiation during surgery, immediately after the resection, directly on the anatomical area that contained the neoplasia, a possible location of sub-clinical disease or macroscopic residue.

Radiation with electrons by means of a mobile accelerator (ELIOT) has enabled the limits of accelerators used for conventional radiotherapy to be overcome. This in fact involved the movement of the patient during the operation from the operating theatre to the radiotherapy department, thereby necessitating extended anaesthesia times and above all exposing the patient to high risks during the transfer. Last but not least, there was also the problem of interruption activities in both departments for a prolonged period of time.



## NRT technology

NOVAC™ 7 is the new generation accelerator produced by New Radiant Technology - NRT, which introduces an actual and innovative collaboration between surgery and radiotherapy departments. With the creation of NOVAC™ 7, ELIOT treatments have now been made possible in the conventional operating theatre without having to modify the theatre at all.

Technological research and a focus on operators' needs, as well as clinically efficient results, have enabled the design and development of an indispensable treatment system.

NOVAC™ 7 was designed to adjust to the actual operating and structural needs of oncological surgery. The IORT treatment cycle takes place in 15 minutes maximum, whilst the radiotherapist and surgeon determine the field of radiation, relative dose and prepare the theatre for the radiation.

NOVAC™ 7 does not interfere with the devices present in the operating theatre.

## Mobility

NOVAC™ 7 is a mobile device. It consists of a radiating unit and a control console, both of which are powered by the normal electrical mains.

Positioning it in various operating theatres can be considered as a routine use, not constrained by specific exposure tests. It is made mobile by a motorised traction system, operated by a portable keypad. The extensive mobility of the radiating head with its six degrees of



freedom makes **NOVACT™ 7** exceptional in terms of position precision and consequent treatment efficiency. Exposure studies on the relationship between the direction of the electron beam and energy in the radiated tissue document how important it is to reach the tumour bed perpendicularly to the direction of the beam. The weight of the radiating unit does not cause any problems to the stability of the normal floors.

### Properties of the beam

Only a couple of minutes are needed to prepare the device for radiation and less than 20 seconds to emit a dose of 10Gy on a field of 6 cm. The radiating structure is self-focusing. Neither dispersion filters nor magnetic lens are required for use. **NOVACT™ 7** technology uses the passage of air contained inside the applicator to achieve the necessary uniformity of the beam and field with all energy and applicators. The accelerating structure is therefore particularly light and small in size with a significant reduction in the interactions between the electron beam and the structure itself and the consequent reduction in X radiation diffused in negligible values.



**NOVACT™ 7** has proven itself to be a device with a very high stability of the beam over both the short and long term. The energy range of **NOVACT™ 7**, from 4 to 10 MeV, ensures that neutrons are not produced, which, even at low intensity, would become hard to screen in the operating theatre.

**NOVACT™ 7** is effective on the tumour bed even when macroscopic surgical residues are evident. At maximum energy the 80% isodose reaches the depth of 30 mm.

The environmental radiation to be screened is Bremsstrahlung, generated by the patient's body which produces X rays in as much as 0.2% of the incident radiation.

This radiation, which is mostly emitted along the direction of the axis of the beam, can be easily intercepted by a lead, horizontal screen utilising a newly designed electronic alignment system. The secondary X radiation produced by the patient's body in other directions is very negligible. An operator standing 4 metres away from the patient is exposed to a dose of 1  $\mu$ Sv per 10 Gy dispersed to the patient.

### Software

**NOVACT™ 7** is equipped with management software that memorises all the parameters of each individual treatment: patient details and clinical diagnoses, radiation data, isodose curves corresponding to the different radiation parameter selections.

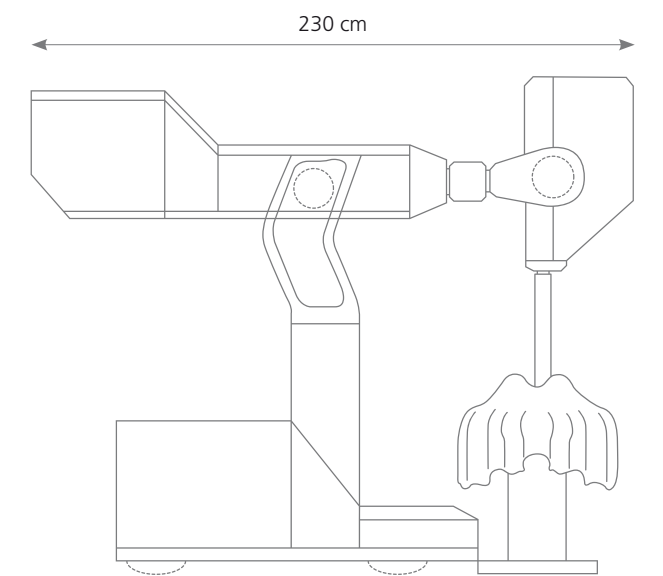
**NOVACT™ 7** software can export treatment data, sending it to an external printer software can export treatment data, sending it to an external printer.



## NOVAC™ 7 TECHNICAL DATA

Nominal energy	4, 6, 8, 10 MeV
Beam current (max)	1,5 mA
Emission frequency	9 Hz
Long-term stability	<2%
Short-term stability	<1%
Surface dose	≥ 80 ÷ 85%
Field uniformity	≤ 5% (Ref. ISTISAN guidelines)
Field symmetry	≤ 3% (Ref. ISTISAN guidelines)
Dose rate	≥ 6 and ≤ 39 Gy/min
Field of treatment	3, 4, 5, 6, 7, 8, 10 cm
X-ray contamination	≤ 0,2%
Repeatability of the exposure system	≤ 1%
Linearity of the exposure system	≤ 1%
Maximum operating temperature	25° C
Power loss	<1 kW
Power supply	230VAC 50Hz 2.5 kVA 1 phase (USA and Canada) 110VAC 60Hz 2,5 kVA 1 phase
Autonomy of beam emission with UPS	20 min
Autonomy of computer with UPS	10 min
<b>RADIATING UNIT DIMENSIONS</b>	
Length	230 cm
Width	99 cm
Height	180 cm (excluding wave guide) - 240 cm (with wave guide)
Weight	640 kg
<b>CONTROL CONSOLE</b>	
Length	80 cm
Width	60 cm
Height	110 cm
Weight	150 kg

## NOVAC™ 7 DIMENSIONS



## Company

**New Radiant Technology - NRT** is a leader in the production of accelerators for IORT. The company has continuously invested in the research and development of the technology, guaranteeing a high level of reliability to its users and the specific skills of its technical support staff.



**NRT** consists of a team of professionals (physicists and engineers) and makes use of expert consultants on an international level for the development and fine tuning of treatment protocols (medical physicists, oncology surgeons and radiotherapists).



ISO 13485:2003  
N.9124.NRT.2



ISO 9001:2008  
N.9120.NRT.1

In addition to sales, **NRT** offers a series of skilled activities including:

### Assistance services

- 24 hour hotline
- Routine maintenance with preventive and corrective interventions.

### Technological upgrade

- For hardware and software

### Legal and organisational consultancy

- assisting with quality certification
- risk management in the workplace
- radio-protective risk management
- production process management.

### Clinical support

- Regular meetings with users for the development of the method, identifying best performance and sharing treatment protocols.

### Training support

- Specialist courses for users only (radiotherapists, surgeons, medical physicists, medical radiology technicians).

### References

**NOVACT™ 7** is the only mobile electron linear accelerator produced in Europe approved by the **FDA**.

**NOVACT™ 7** has been installed in dozens of centres of excellence for tumour research and treatment in Italy and abroad and is validated by leading scientific production.

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