



# Radioisotope Production Facility

Tahseen Alabed, Mohammad Alqudah, Nahed Alahmad



## Overview

The Radioisotope Production Facility (RIPF) is one of the main facilities of the JRTR located in the service building. It consists of three hot-cell banks to produce  $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ ,  $^{131}\text{I}$  and  $^{192}\text{Ir}$  isotopes, using the Neutron Activation Method.

### Medical Isotope Usage

**$^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ :** used in nuclear medicine such as 3D scanning technique (SPECT), imaging ischemic myocardium, medical diagnosis, detection of breast cancer and detection of heart disease.

$^{99\text{m}}\text{Tc}$  is used in the treatment of the following diseases: brain, myocardium, thyroid, lungs, liver, gallbladder, kidney, skeleton, blood, tumors.

**$^{131}\text{I}$ :** used in thyroid diagnosis and treatment (Hyperthyroidism).

**$^{192}\text{Ir}$ :** used for brachytherapy.

## 1. Target Preparation

Target preparation is divided into two parts:

### a. Preparation of the inner irradiation capsule

After preparing the raw material, it will be placed in the inner irradiation capsule which will be closed, welded and tested.

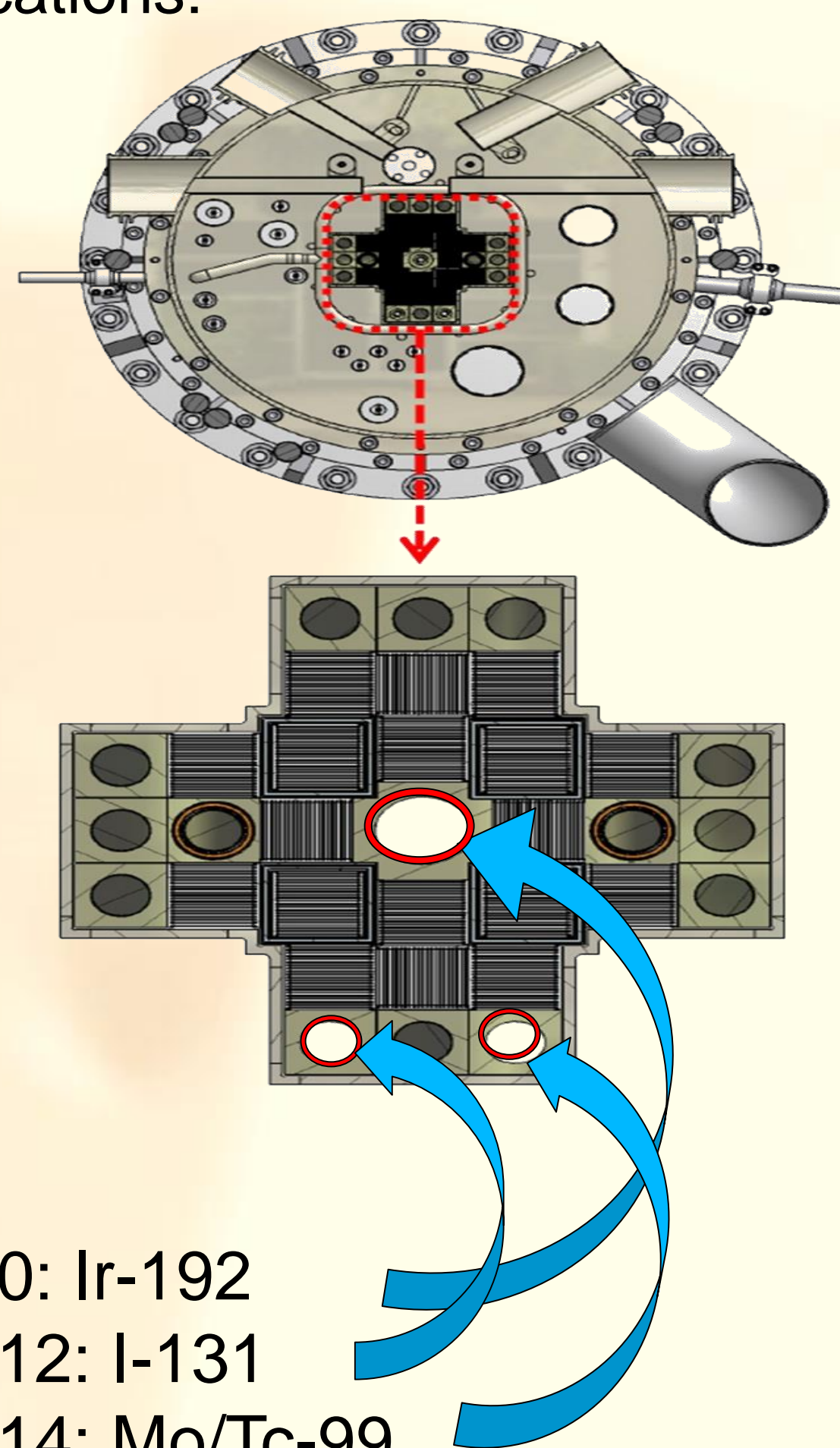
### b. Preparation of the outer irradiation capsule

The inner capsule is placed in the outer irradiation capsule, which will be welded and tested then transferred to the irradiation location in the reactor core.

## 2. Irradiation

The capsule is mounted in the specified reactor irradiation core rig for irradiation. The irradiation time depends on the thermal neutron flux and target properties (thermal neutron capture cross section and decay half-life).

The figure below shows the in- and out-core and outer irradiation locations:



Other locations in the core can be used for future RI production (with various irradiation times).

## 3. Processing

The irradiated capsule is transferred to the hot cell for preparing the RI product in final form.

This process in the hot cell consists of cutting, dissolving, distilling and dispensing.

## RIPF Capability and RI Market Demand

Isotope	Isotope production capacity (Ci/year)	Hot cell handling capacity (Ci/year)
$^{99}\text{Mo}/^{99\text{m}}\text{Tc}$	240	1000
$^{131}\text{I}$	960	2000
$^{192}\text{Ir}$	48000	100,000

Five local companies are working in import and export of medical radioisotopes.

## Imported Isotopes/year (2015)

Isotope	Activity (Ci)	Number of sources
$^{99}\text{Mo}/^{99\text{m}}\text{Tc}$	306	400
$^{131}\text{I}$	234	2267
$^{192}\text{Ir}$	500	15

## Local Stakeholders/Customers

Royal Medical Services

Ministry of Health

King Hussein Cancer Center

King Abdullah University Hospital

Jordan University Hospital

Jordanian Universities

Energy & Minerals Regulatory Commission (EMRC)

Jordan Food & Drug Administration

Jordan Standards and Metrology Department

## Product Quality

Our product complies with the GMP and the international standard requirements and specs, including:

- Radioactivity measurement
- Chemical purity
- Radionuclide purity
- pH measurement
- Sterility of product ampules
- Color transparency
- Expiry and shelf life
- Packaging and labeling
- Dose calibration

## Why Us

- competitive price
- Shorter delivery time
- Selective activity available upon customer's request



For more information, please contact us on:

Phone: (06) 5200460  
Fax: (06) 5200471  
P.O. Box: Amman 70 (11934) Jordan  
e-mail: [contact@jaec.gov.jo](mailto:contact@jaec.gov.jo)  
Website: <http://www.jaec.gov.jo>



## General RI Production Process

