Jordan Research and Training Reactor

Jordan Atomic Energy Commission

Vision & Mission

The Jordan Research and Training Reactor (JRTR) will support the development of Jordan's nuclear energy program and will serve as a regional center of excellence in nuclear science, technology, research and education.

It is a multipurpose research reactor which will be utilized for training, research, and radioisotope production. More importantly, it will be the corner stone of the nuclear infrastructure of Jordan's future nuclear power reactor.

Objectives

JRTR is a national facility built to achieve the following goals:

- Establish the infrastructure required to turn Jordan into a nuclear country.
- Support the industrial, educational, environmental, health and agricultural sectors of Jordan.
- Produce radio-isotopes for radio-pharmaceuticals and nuclear medicine applications.
- Provide neutron activation and neutron beam services for scientific and industrial use.

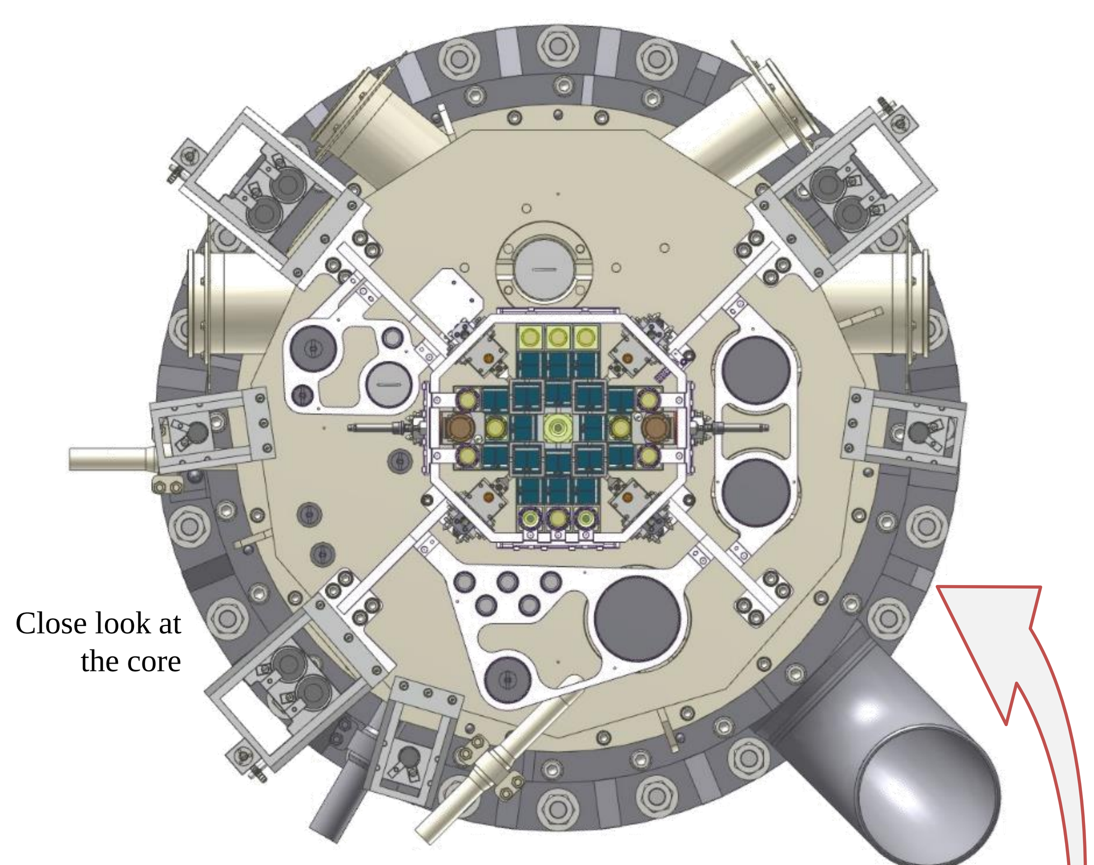
Design Philosophy

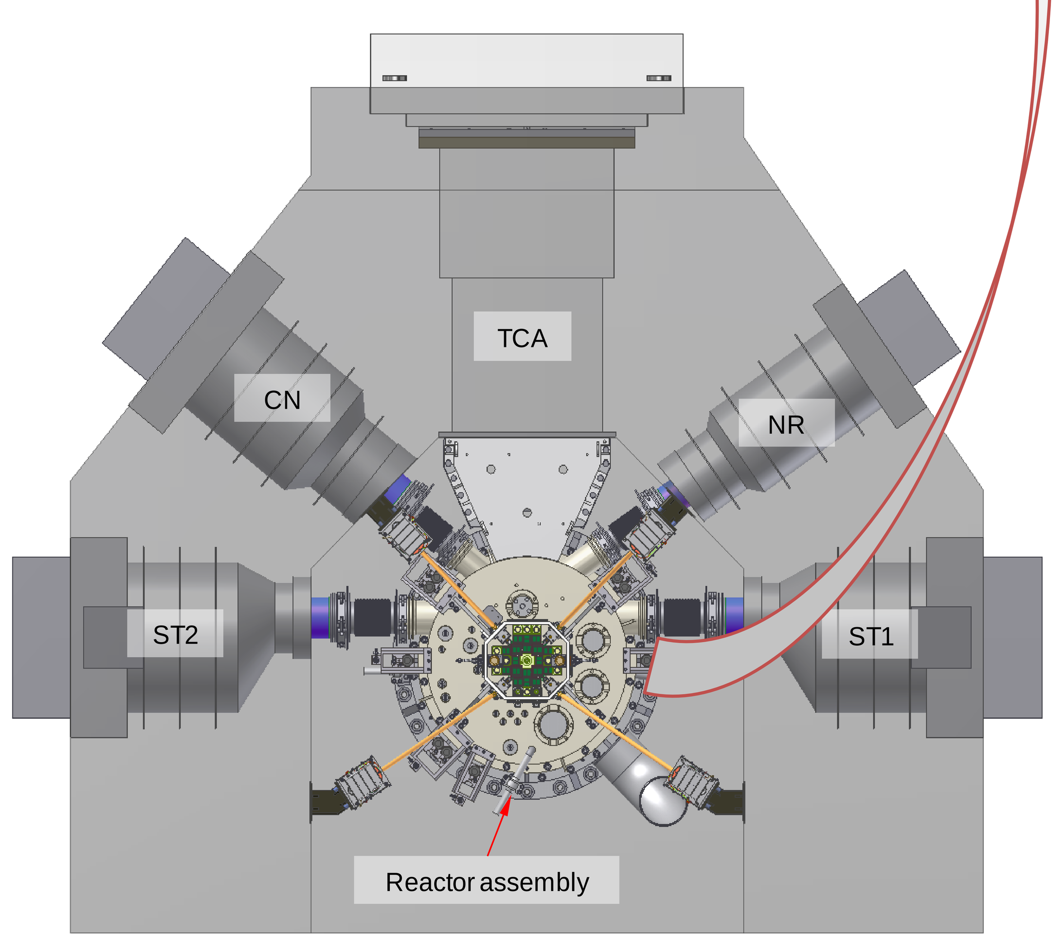
High Performance
JRTR provides the appropriate neutron flux to achieve the goals that it is designed for.

Reliability
JRTR nuclear systems have been designed based on the technology and experience of HANARO.

Design Features
JRTR has been designed in accordance with high international standards.

Flexibility of JRTR
It is a multipurpose reactor that is designed to provide a variety of experiments and applications..





Top view of the core & beam ports

General Information

* Owner: Jordan Atomic Energy Commission (JAEC).
* Contractor: Korean Atomic Energy Research Institute (KAERI) and DAEWOO E&C Consortium (KDC).
* Construction Period: 2010 to 2016.
* Site: Jordan University of Science and Technology Campus, Ramtha.

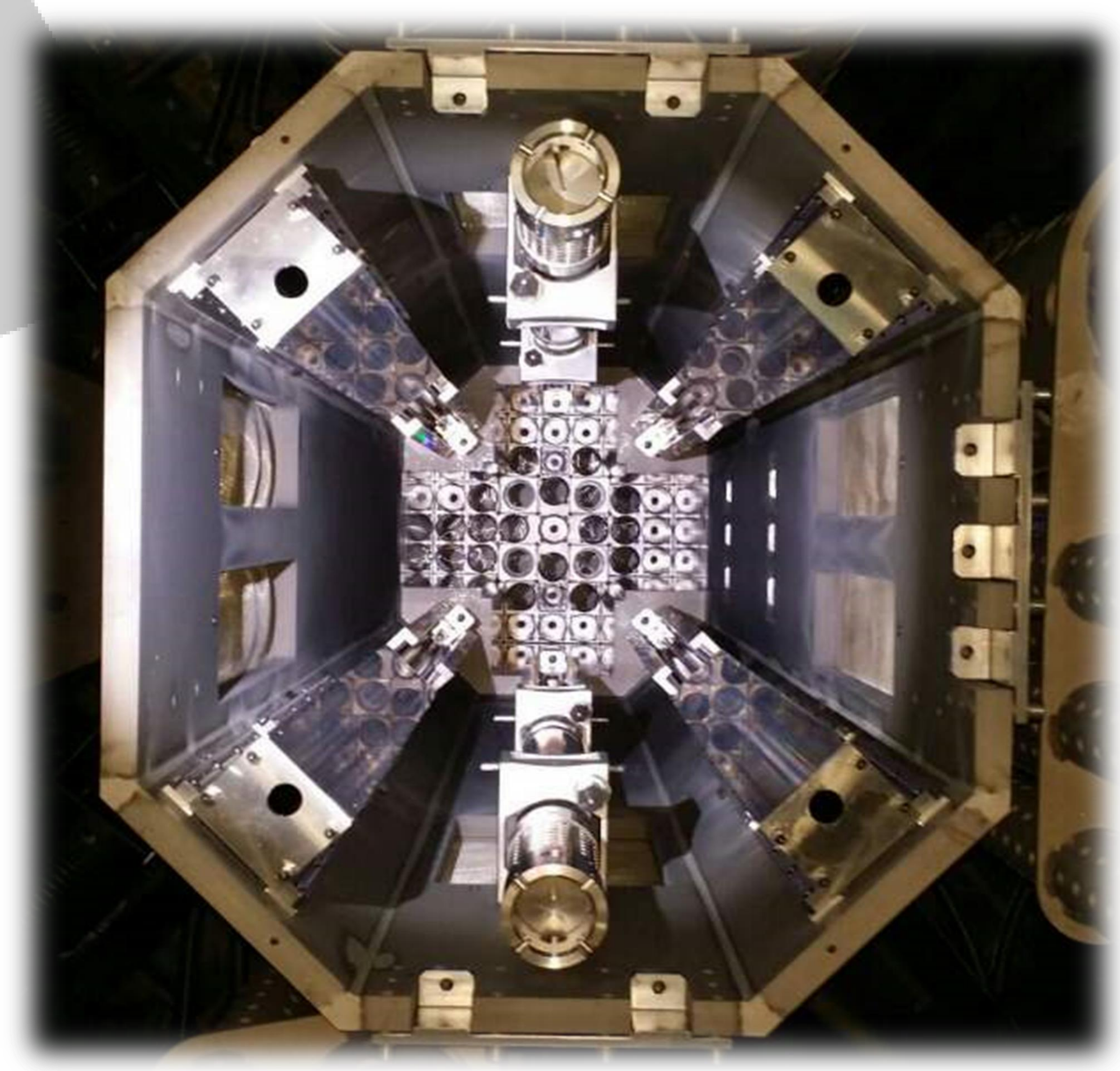
Commitments

Strong QA/QC system for all aspects of operation and utilization which conforms with ISO and GMP standards.

High security measures in full cooperation with the Jordanian Gendarmerie Forces.

The safety features of the JRTR implement the highest standards in the nuclear industry.

The radiation exposure of personnel, public, and environment is kept below the prescribed limits of international organizations and by the local regulator (to achieve the ALARA principle).



Design Features

Reactor Type	Open-tank-in-pool
Thermal Power	5 MW (upgradable to 10 MW)
Nuclear Fuel	U_3Si_2-Al matrix (dispersed) in box-type fuel assembly with flat fuel plates
Enrichment	19.75 *w/o*
Cooling & Moderator	Light water (H_2O)
In-Core Reflector **Out-Core Reflector**	Beryllium assemblies Heavy water
Absorber Materials	Hafnium (Control Absorber Rod) B4C (Secondary Shutdown Rod)
Shielding	Water, Heavy Concrete

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Utilization

JRTR is designed for various utilization areas such as radioisotope production, material testing, and neutron beam research.

Training & Education
All experimental facilities can be utilized for education and training in various reactor application areas. Moreover, the reactor itself shall be the center for the education and training of nuclear engineering and physics students.

Radioisotope Production (RIP)
The RIP Facility (RIPF) is designed to accommodate hot cells, research laboratories, ventilation systems, waste storage, radiation monitoring systems, and fire protection systems to handle RIs. The production & handling capacities of the RIPF are:

Isotope	Isotope production capacity (Ci/year)	Hot cell handling capacity (Ci/year)
^{99}Mo/^{99m}Tc	240	1000
^{131}I	960	2000
^{192}Ir	48000	100000

Neutron Activation Analysis (NAA)
Three NAA irradiation locations, a gamma-ray spectroscopy system, and three Pneumatic Transfer Systems (PTSs) are available for use.

Thermal Column (TC)
Having the thermal column occupying more than 1/6 of the periphery of the JRTR core the TC will be utilized for educational and research purposes. Experiments such as thermal neutron capture cross section measurements can be conducted.

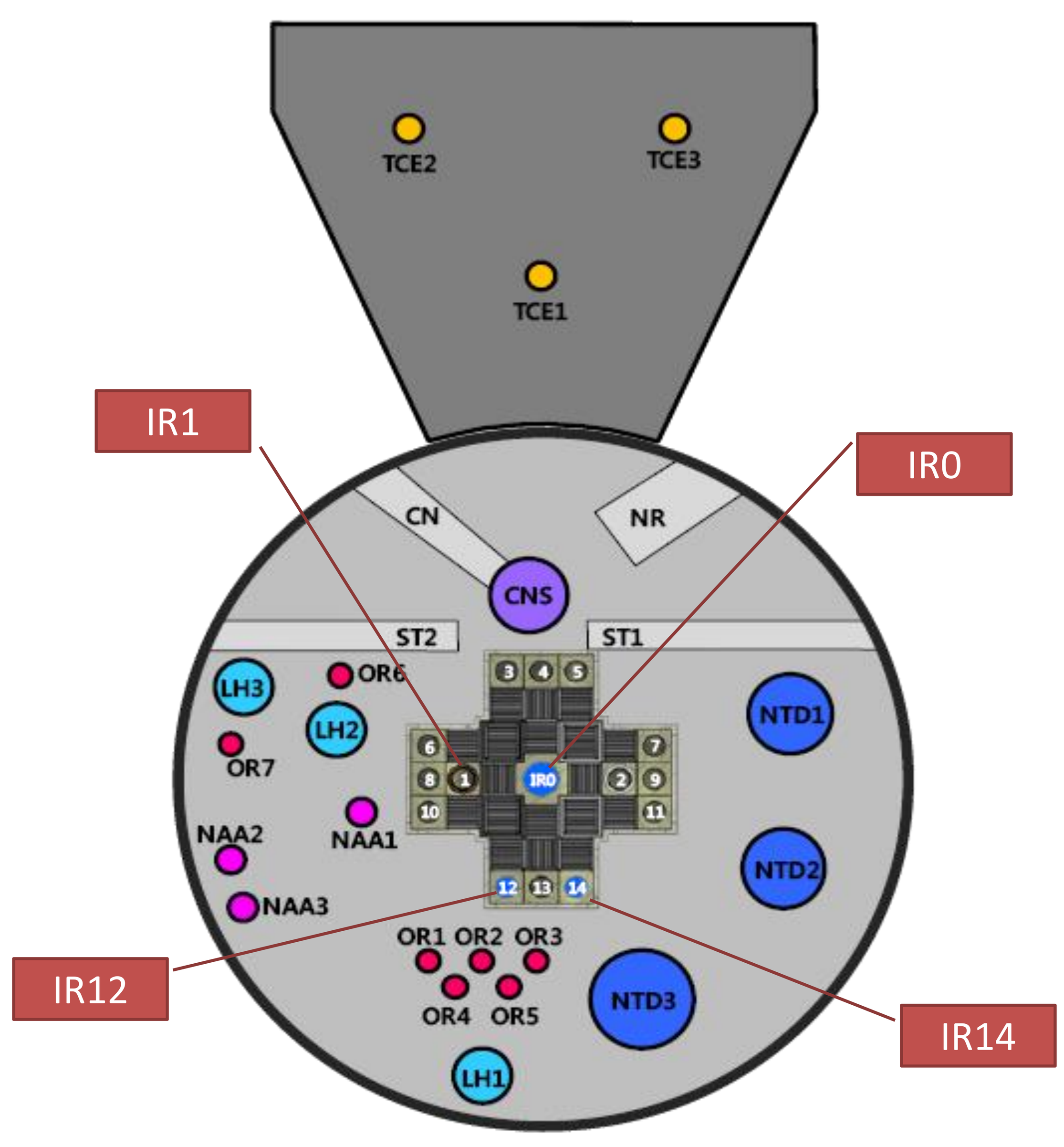
Future Applications

- Production of other Radioisotopes
- Gemstone Coloring (Topaz Production)
- Neutron Radiography
- Neutron Scattering and Diffraction
- Neutron Transmutation Doping
- Cold Neutron Source

Avg. Thermal Neutron Fluxes

Calculated at different irradiation locations in the beginning of the cycle for the initial core (n/cm^2/sec)

IR0	1.45E+14 - 5.2E+13 (depending on the plug type)	IR1	7.7E+13
		NAA1	1.9E+13
IR12	4.9E+13	NAA2	5.4E+12
IR14	5.1E+13	NAA3	5.4E+12
LH1	4.4E+12	NTD1	8.0E+12
LH2	2.1E+13	NTD2	7.3E+12
LH3	4.7E+12	NTD3	6.6E+12



Top view for the available irradiation locations and beam ports in JRTR