

**Project title:** Implications of Medical Low Dose Radiation Exposure

**Grant Agreement:** 755523

**Call identifier:** NFRP-2016-2017

**Topic:** NFRP-9

**Documentation of predefined SPARQL queries**

**Lead partner:** Inserm

**Author(s):** Bernard Gibaud

**Work Package:** WP2

**Estimated delivery:** 28 September 2020

**Actual delivery:** 28 September 2020

**Type:** Report

**Dissemination level:** Public

**Version :** V1.0

1. Introduction

This document provides a documentation of the predefined SPARQL queries that are implemented in the IRDBB system. It constitutes the main documentation of the content of the Semantic graph.

History of versions

|  |  |  |
| --- | --- | --- |
| **Version** | **Date** | **Description** |
| V1.0 | 28/09/2020 | First version corresponding to the distribution of the Semantic translator package SEMANTIC\_TRANSLATOR\_TAG = 0.0.70 containing the SEMANTICTRANSLATOR\_VERSION="0.8.10" based on ONTOLOGY\_VERSION="1.3.15" |

1. Methodology

27 predefined queries were written to enable the retrieval of data from the semantic database of the IRDBB system (the full list is provided in Table 1).

For an introduction to the IRDBB semantic database, see the presentation available at: https://eibir.teamwork.com/#/files/4620923

|  |  |  |  |
| --- | --- | --- | --- |
| **Template ID** | **Root template** |  |  |
| Request1 | Clinical research studies | Request15 | Internal radiotherapy CT images used |
| Request2 | CT Datasets and main acquisition parameters | Request16 | Internal radiotherapy NM tomo image used |
| Request3 | CT Datasets and all acquisition parameters | Request17 | Case Report Forms for WP3 T3.3 |
| Request4 | PET Datasets and main acquisition parameters | Request18 | DICOM SR Dose reports:doses of individual acquisitions |
| Request5 | PET Datasets and all acquisition parameters | Request19 | DICOM SR Dose reports: Cumulated doses |
| Request6 | NM Datasets and main acquisition parameters | Request20 | Calibration coefficients |
| Request7 | NM Datasets and all acquisition parameters | Request21 | Recovery coefficient curves |
| Request8 | Relations image datasets with Clinical research studies | Request22 | Elements of recovery coefficient curves |
| Request9 | 3D Dose Maps and provenance data | Request23 | CT number calibration curves |
| Request10 | Volumes Of Interest and organs | Request24 | Elements of CT number calibration curves |
| Request11 | Mean absorbed doses in organs | Request25 | NM phantom |
| Request12 | Non DICOM datasets and handles | Request26 | CT Calibration |
| Request13 | Internal radiotherapy radiopharmaceutical administration | Request27 | SPECT Calibration |
| Request14 | Internal radiotherapy total absorbed doses |  |  |

Table 1. List of predefined SPARQL queries

A Graphviz diagram has been produced associated to each query.

The purpose of these Graphviz diagrams is to represent the portion of the Semantic graph used in the SPARQL query, i.e.:

* the instances and the class they belong to,
* the relationships between the instances (using object properties of the ontology)
* and their attributes (i.e. names and values taken by data properties).

The conventions used in the Graphviz diagrams are the following:

* **nodes** as **ovals in blue**: denote instances of the class, whose name is denoted in the oval
* **nodes** as **ovals in green**: denote values taken by a data property
* **nodes** as **ovals in red**: denote an instance which is also a class (this mode of representation is called “punning” in the OWL language); the name of the class is shown inside the oval; for example, this is used for image formats, for units of measure, for sex
* **nodes** as **hexagons in black**: instance of a subclass of the class denoted in the oval; for example, this is used for the anatomical structures ( because it is impossible to list all possible classes, so it is more simple to mention the name of a class subsuming all the classes that may be found)
* **nodes** as **hexagons in red**: use of punning of a subclass of the class denoted in the oval); for example, this is used for the radionuclides, the radiopharmaceuticals
* **edges** in **black**: object property connecting two instances
* **edges** in **green**: data property connecting an instance to the value taken
* **edges** in **red**: object property connecting an instance to the value taken in punning mode
* **labels**: when labels of classes or properties are numbers, we show both the IRI and the label

The names of the classes and relationships make use of a prefix. They are listed in Table 2.

|  |  |
| --- | --- |
| **Prefix** | **Full IRI** |
| rdf: | <http://www.w3.org/1999/02/22-rdf-syntax-ns#> |
| owl: | <http://www.w3.org/2002/07/owl#> |
| dfs: | <http://www.w3.org/2000/01/rdf-schema#> |
| xsd: | <http://www.w3.org/2001/XMLSchema#> |
| skos: | <http://www.w3.org/2004/02/skos/core#> |
| ontomedirad: | PREFIX ontomedirad: <http://medicis.univ-rennes1.fr/ontologies/ontospm/OntoMEDIRAD.owl#> |
| purl: | <http://purl.obolibrary.org/obo/> |
| dcm: | <http://dicom.nema.org/resources/ontology/DCM/> |
| radionuclides: | <http://medicis.univ-rennes1.fr/ontologies/ontospm/Radionuclides\_for\_OntoMEDIRAD.owl#> |
| snmi: | <http://purl.bioontology.org/ontology/SNMI/> |

Table 2. List of prefixes

Note: Since the diagrams were documented manually, there may be some errors. Please report any errors to the author of this document: [bernard.gibaud@univ-rennes1.fr](mailto:bernard.gibaud@univ-rennes1.fr)

Thank you

1. Graphviz diagrams of the SPARQL queries

### Query 1 - Clinical research studies

SELECT DISTINCT ?ClinResearchStudy ?StudyId ?StudyName ?StudyDescription

WHERE { ?ClinResearchStudy rdf:type ontomedirad:clinical\_research\_study .

?ClinResearchStudy ontomedirad:has\_id ?StudyId .

?ClinResearchStudy ontomedirad:has\_name ?StudyName .

?ClinResearchStudy ontomedirad:has\_description ?StudyDescription }



### Query 2 - CT Datasets and main acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?StudyDescr ?ProtocolName ?ProtocolDescr ?ExamDate ?ExamTime ?ValueWeight ?LabelUnitWeight ?CTAcqClass ?ValueKVP ?LabelUnitKVP ?ValueTubeCur ?LabelUnitTubeCur ?LabelXRayModulationType ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?Model ?Manufacturer

WHERE {

?RolePat purl:BFO\_0000054 ?Exam .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?CTAcq purl:BFO\_0000132 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?CTAcq rdf:type ?CTAcqClass .

?CTAcqClass rdfs:subClassOf\* ontomedirad:CT\_acquisition .

?Dataset ontomedirad:is\_specified\_output\_of ?CTAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?CTAcq ontomedirad:has\_protocol ?Protocol .

?Scanner rdf:type ontomedirad:CT\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?CTAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?CTAcq ontomedirad:has\_protocol ?Protocol .

?XRayModulationType purl:BFO\_0000177 ?Protocol .

?XRayModulationType rdfs:subClassOf dcm:113842 .

?XRayModulationType skos:prefLabel ?LabelXRayModulationType . }

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?KVP .

?KVP rdf:type dcm:113733 .

?KVP purl:IAO\_0000004 ?ValueKVP .

?KVP purl:IAO\_0000039 ?UnitKVP .

?UnitKVP rdfs:label ?LabelUnitKVP.}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?TubeCur .

?TubeCur rdf:type dcm:113734 .

?TubeCur purl:IAO\_0000004 ?ValueTubeCur .

?TubeCur purl:IAO\_0000039 ?UnitTubeCur.

?UnitTubeCur rdfs:label ?LabelUnitTubeCur .}

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 3 - CT Datasets and all acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?ValueWeight ?LabelUnitWeight ?ValueHeight ?LabelUnitHeight ?StudyDescr ?LabelOrgan ?ProtocolName ?ProtocolDescr ?ExamDate ?ExamTime ?CTAcqClass ?NameRespInstitution ?ValueKVP ?LabelUnitKVP ?ValueTubeCur ?LabelUnitTubeCur ?LabelXRayModulationType ?ValueFocalSpot ?LabelUnitFocalSpot ?ValueNominalTotalCollimWidth ?LabelUnitNominalTotalCollimWidth ?XRayFilterClassLabel ?ValueExposureTime ?LabelUnitExposureTime ?ValueExposureInmAsec ?LabelUnitExposureInmAsec ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?ImageFormat ?Model ?Manufacturer

WHERE {

?RolePat purl:BFO\_0000054 ?Exam .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?CTAcq purl:BFO\_0000132 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?CTAcq rdf:type ?CTAcqClass .

?CTAcqClass rdfs:subClassOf\* ontomedirad:CT\_acquisition .

?Dataset ontomedirad:is\_specified\_output\_of ?CTAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?CTAcq ontomedirad:has\_protocol ?Protocol .

?Scanner rdf:type ontomedirad:CT\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?CTAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL { ?Exam ontomedirad:has\_target\_region ?TargetRegion .

?TargetRegion rdf:type ?OrganClass .

?OrganClass rdfs:label ?LabelOrgan . }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?XRayModulationType purl:BFO\_0000177 ?Protocol .

?XRayModulationType rdfs:subClassOf dcm:113842 .

?XRayModulationType skos:prefLabel ?LabelXRayModulationType . }

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?KVP .

?KVP rdf:type dcm:113733 .

?KVP purl:IAO\_0000004 ?ValueKVP .

?KVP purl:IAO\_0000039 ?UnitKVP .

?UnitKVP rdfs:label ?LabelUnitKVP.}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?TubeCur .

?TubeCur rdf:type dcm:113734 .

?TubeCur purl:IAO\_0000004 ?ValueTubeCur .

?TubeCur purl:IAO\_0000039 ?UnitTubeCur.

?UnitTubeCur rdfs:label ?LabelUnitTubeCur .}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?FocalSpot .

?FocalSpot rdf:type ontomedirad:focal\_spot .

?FocalSpot purl:IAO\_0000004 ?ValueFocalSpot .

?FocalSpot purl:IAO\_0000039 ?UnitFocalSpot .

?UnitFocalSpot rdfs:label ?LabelUnitFocalSpot .}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?NominalTotalCollimWidth .

?NominalTotalCollimWidth rdf:type dcm:113827 .

?NominalTotalCollimWidth purl:IAO\_0000004 ?ValueNominalTotalCollimWidth .

?NominalTotalCollimWidth purl:IAO\_0000039 ?UnitNominalTotalCollimWidth .

?UnitNominalTotalCollimWidth rdfs:label ?LabelUnitNominalTotalCollimWidth .}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?ExposureTime .

?ExposureTime rdf:type dcm:113824 .

?ExposureTime purl:IAO\_0000004 ?ValueExposureTime .

?ExposureTime purl:IAO\_0000039 ?UnitExposureTime .

?UnitExposureTime rdfs:label ?LabelUnitExposureTime .}

OPTIONAL { ?CTAcq ontomedirad:has\_setting ?ExposureInmAsec .

?ExposureInmAsec rdf:type ontomedirad:exposure .

?ExposureInmAsec purl:IAO\_0000004 ?ValueExposureInmAsec .

?ExposureInmAsec purl:IAO\_0000039 ?UnitExposureInmAsec .

?UnitExposureInmAsec rdfs:label ?LabelUnitExposureInmAsec .}

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

OPTIONAL { ?Dataset ontomedirad:has\_format ?ImageFormat .}

OPTIONAL { ?XRayFilter purl:BFO\_0000177 ?Scanner .

?XRayFilter rdf:type ?XRayFilterClass .

?XRayFilterClass rdfs:subClassOf\* dcm:113771 .

?XRayFilterClass skos:prefLabel ?XRayFilterClassLabel . }

OPTIONAL { ?RespInstitution rdf:type ontomedirad:institution .

?RespInstitution ontomedirad:has\_name ?NameRespInstitution .

?RespInstitutionrole rdf:type ontomedirad:role\_of\_responsible\_organization .

?RespInstitutionrole purl:BFO\_0000054 ?CTAcq .

?RespInstitutionrole purl:BFO\_0000052 ?RespInstitution .}

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?PatientHeight rdf:type ontomedirad:patient\_height .

?PatientHeight ontomedirad:is\_about\_procedure ?Exam .

?PatientHeight ontomedirad:is\_about ?Human .

?PatientHeight purl:IAO\_0000004 ?ValueHeight .

?PatientHeight purl:IAO\_0000039 ?UnitHeight .

?UnitHeight rdfs:label ?LabelUnitHeight . }

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 4 - PET Datasets and main acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?ValueWeight ?LabelUnitWeight ?StudyDescr ?ProtocolName ?ProtocolDescr ?ExamDate ?ExamTime ?RadioNuclLabel ?LowerLimit ?UpperLimit ?LabelUnitEnergyWindow ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?Model ?Manufacturer

WHERE {

?PETAcq rdf:type\* ontomedirad:PET\_data\_acquisition .

?PETAcq purl:BFO\_0000132 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?RolePat purl:BFO\_0000054 ?Exam .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?Dataset ontomedirad:is\_specified\_output\_of ?PETAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ontomedirad:PET\_recon\_tomo\_dataset .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?Scanner rdf:type ontomedirad:PET\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?PETAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?PETAcq ontomedirad:has\_protocol ?Protocol .

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .}

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL {?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL {?PETAcq rdfs:subClassOf\* ontomedirad:PET\_data\_acquisition}

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?PETAcq ontomedirad:has\_target\_radionuclide ?RadioNucl .

?RadioNucl rdfs:label ?RadioNuclLabel .}

OPTIONAL { ?PETAcq ontomedirad:has\_setting ?EnergyWindow .

?EnergyWindow purl:BFO\_0000177 ?AcqProtocol .

?EnergyWindow ontomedirad:has\_lower\_limit ?LowerLimit .

?EnergyWindow ontomedirad:has\_upper\_limit ?UpperLimit .

?EnergyWindow purl:IAO\_0000039 ?UnitEnergyWindow .

?UnitEnergyWindow rdfs:label ?LabelUnitEnergyWindow }

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 5 - PET Datasets and all acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?ValueWeight ?LabelUnitWeight ?ValueHeight ?LabelUnitHeight ?StudyDescr ?LabelOrgan ?ProtocolName ?ProtocolDescr ?ExamDate ?ExamTime ?NameRespInstitution ?RadioNuclLabel ?LowerLimit ?UpperLimit ?LabelUnitEnergyWindow ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?ImageFormat ?Model ?Manufacturer

WHERE {

?PETAcq rdf:type\* ontomedirad:PET\_data\_acquisition .

?PETAcq purl:BFO\_0000132 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?RolePat purl:BFO\_0000054 ?Exam .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?Dataset ontomedirad:is\_specified\_output\_of ?PETAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ontomedirad:PET\_recon\_tomo\_dataset .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?Scanner rdf:type ontomedirad:PET\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?PETAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?PETAcq ontomedirad:has\_protocol ?Protocol .

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .}

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL { ?Exam ontomedirad:has\_target\_region ?TargetRegion .

?TargetRegion rdf:type ?OrganClass .

?OrganClass rdfs:label ?LabelOrgan . }

OPTIONAL { ?PETAcq rdfs:subClassOf\* ontomedirad:PET\_data\_acquisition}

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?PETAcq ontomedirad:has\_target\_radionuclide ?RadioNucl .

?RadioNucl rdfs:label ?RadioNuclLabel .}

OPTIONAL { ?PETAcq ontomedirad:has\_setting ?EnergyWindow .

?EnergyWindow ontomedirad:has\_lower\_limit ?LowerLimit .

?EnergyWindow ontomedirad:has\_upper\_limit ?UpperLimit .

?EnergyWindow purl:IAO\_0000039 ?UnitEnergyWindow .

?UnitEnergyWindow rdfs:label ?LabelUnitEnergyWindow }

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

OPTIONAL { ?Dataset ontomedirad:has\_format ?ImageFormat .}

OPTIONAL { ?RespInstitution rdf:type ontomedirad:institution .

?RespInstitution ontomedirad:has\_name ?NameRespInstitution .

?RespInstitutionrole rdf:type ontomedirad:role\_of\_responsible\_organization .

?RespInstitutionrole purl:BFO\_0000054 ?PETAcq .

?RespInstitutionrole purl:BFO\_0000052 ?RespInstitution .}

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?PatientHeight rdf:type ontomedirad:patient\_height .

?PatientHeight ontomedirad:is\_about\_procedure ?Exam .

?PatientHeight ontomedirad:is\_about ?Human .

?PatientHeight purl:IAO\_0000004 ?ValueHeight .

?PatientHeight purl:IAO\_0000039 ?UnitHeight .

?UnitHeight rdfs:label ?LabelUnitHeight . }

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 6 - NM Datasets and main acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?ValueWeight ?LabelUnitWeight ?StudyDescr ?ExamDate ?ExamTime ?StudyDescr ?RadioNuclLabel ?ProtocolName ?ProtocolDescr ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?Model ?Manufacturer

WHERE {

?SPECTAcq purl:BFO\_0000132 ?Exam .

?SPECTAcq rdf:type ?SPECTAcqClass .

?SPECTAcqClass rdfs:subClassOf\* ontomedirad:SPECT\_data\_acquisition .

?RolePat purl:BFO\_0000054 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?Dataset ontomedirad:is\_specified\_output\_of ?SPECTAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?Scanner rdf:type ontomedirad:SPECT\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?SPECTAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?SPECTAcq ontomedirad:has\_protocol ?Protocol .

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .}

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr .}

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?SPECTAcq ontomedirad:has\_target\_radionuclide ?RadioNucl .

?RadioNucl rdfs:label ?RadioNuclLabel .}

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 7 - NM Datasets and all acquisition parameters

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?LabelSex ?AgeInYears ?ValueWeight ?LabelUnitWeight ?ValueHeight ?LabelUnitHeight ?StudyDescr ?LabelOrgan ?ExamDate ?ExamTime ?SPECTAcqClass ?NameRespInstitution ?RadioNuclLabel ?ProtocolName ?ProtocolDescr ?CollimatorClassLabel ?Dataset ?DatasetClassLabel ?ImageTypeDescription ?DatasetHandle ?ImageFormat ?Model ?Manufacturer

WHERE {

?SPECTAcq purl:BFO\_0000132 ?Exam .

?SPECTAcq rdf:type ?SPECTAcqClass .

?SPECTAcqClass rdfs:subClassOf\* ontomedirad:SPECT\_data\_acquisition .

?RolePat purl:BFO\_0000054 ?Exam .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?Dataset ontomedirad:is\_specified\_output\_of ?SPECTAcq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?Scanner rdf:type ontomedirad:SPECT\_scanner .

?AcqRole rdf:type ontomedirad:image\_acquisition\_role .

?Scanner purl:BFO\_0000087 ?AcqRole.

?AcqRole purl:BFO\_0000054 ?SPECTAcq .

OPTIONAL { ?Scanner ontomedirad:has\_manufacturer\_name ?Manufacturer .

?Scanner ontomedirad:has\_model\_name ?Model .}

OPTIONAL { ?SPECTAcq ontomedirad:has\_protocol ?Protocol .

OPTIONAL { ?Protocol ontomedirad:has\_name ?ProtocolName .}

?Protocol ontomedirad:has\_description ?ProtocolDescr . }

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr .}

OPTIONAL { ?Exam ontomedirad:has\_target\_region ?TargetRegion .

?TargetRegion rdf:type ?OrganClass .

?OrganClass rdfs:label ?LabelOrgan . }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

OPTIONAL { ?SPECTAcq ontomedirad:has\_target\_radionuclide ?RadioNucl .

?RadioNucl rdfs:label ?RadioNuclLabel . }

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_WADO\_handle ?DatasetHandle .}

OPTIONAL { ?Dataset ontomedirad:has\_format ?ImageFormat .}

OPTIONAL { ?Collimator purl:BFO\_0000177 ?Scanner .

?Collimator rdf:type ?CollimatorClass .

?CollimatorClass rdfs:subClassOf\* ontomedirad:collimator .

?CollimatorClass skos:prefLabel ?CollimatorClassLabel .

?Collimator purl:BFO\_0000177 ?Scanner .}

OPTIONAL { ?RespInstitution rdf:type ontomedirad:institution .

?RespInstitution ontomedirad:has\_name ?NameRespInstitution .

?RespInstitutionrole rdf:type ontomedirad:role\_of\_responsible\_organization .

?RespInstitutionrole purl:BFO\_0000054 ?SPECTAcq .

?RespInstitutionrole purl:BFO\_0000052 ?RespInstitution .}

OPTIONAL { ?PatientWeight rdf:type ontomedirad:patient\_weight .

?PatientWeight ontomedirad:is\_about\_procedure ?Exam .

?PatientWeight ontomedirad:is\_about ?Human .

?PatientWeight purl:IAO\_0000004 ?ValueWeight .

?PatientWeight purl:IAO\_0000039 ?UnitWeight .

?UnitWeight rdfs:label ?LabelUnitWeight . }

OPTIONAL { ?PatientHeight rdf:type ontomedirad:patient\_height .

?PatientHeight ontomedirad:is\_about\_procedure ?Exam .

?PatientHeight ontomedirad:is\_about ?Human .

?PatientHeight purl:IAO\_0000004 ?ValueHeight .

?PatientHeight purl:IAO\_0000039 ?UnitHeight .

?UnitHeight rdfs:label ?LabelUnitHeight . }

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 8 - Relations image datasets with Clinical research studies

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?ExamDate ?ExamTime ?Dataset ?ImageTypeDescription ?DatasetClassLabel ?LabelSex ?AgeInYears

WHERE {

?Human rdf:type ontomedirad:human .

?Human purl:BFO\_0000087 ?RolePat .

?Human ontomedirad:has\_name ?PatientName .

?RolePat purl:BFO\_0000054 ?Exam .

?Acq purl:BFO\_0000132 ?Exam .

?Dataset ontomedirad:is\_specified\_output\_of ?Acq .

?Dataset ontomedirad:has\_DICOM\_image\_type\_description ?ImageTypeDescription .

?Dataset rdf:type ?Datasetclass .

?Datasetclass skos:prefLabel ?DatasetClassLabel .

?Exam ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr .}

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?PatientAge rdf:type ontomedirad:age\_of\_patient\_undergoing\_medical\_procedure .

?PatientAge ontomedirad:is\_about\_procedure ?Exam .

?PatientAge ontomedirad:is\_about ?Human .

?PatientAge ontomedirad:years ?AgeInYears . }

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 9 - 3D Dose Maps and provenance data

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?PatientId ?DoseMap ?DoseMapClassLabel ?DoseMapFormatTypeLabel ?DoseInVoxelClassLabel ?DoseUnitClassLabel ?Process ?Date ?Time ?ValueKVP ?LabelXRayModulationType ?FHIRHandle

WHERE {

?DoseMap rdf:type ?DoseMapClass .

?DoseMapClass rdfs:subClassOf\* dcm:128487 .

?DoseMapClass skos:prefLabel ?DoseMapClassLabel .

?Process ontomedirad:has\_specified\_output ?DoseMap .

?DoseMap ontomedirad:has\_patient ?Human .

?Human ontomedirad:has\_id ?PatientId .

OPTIONAL { ?Human ontomedirad:has\_name ?PatientName . }

?DoseMap purl:BFO\_0000172 ?DoseInVoxelClass .

?DoseInVoxelClass skos:prefLabel ?DoseInVoxelClassLabel .

?DoseMap purl:IAO\_0000039 ?DoseUnit .

?DoseUnit rdf:type ?DoseUnitClass .

?DoseUnitClass rdfs:label ?DoseUnitClassLabel .

?DoseMap ontomedirad:has\_format ?DoseMapFormat .

?DoseMapFormat rdf:type ?DoseMapFormatType .

?DoseMapFormatType skos:prefLabel ?DoseMapFormatTypeLabel .

OPTIONAL {?Process ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId } .

OPTIONAL {?Process ontomedirad:has\_beginning ?DateTime .

BIND (substr(?DateTime,1,8) AS ?Date) .

BIND (substr(?DateTime,10,4) AS ?Time) .}

OPTIONAL {?Process ontomedirad:has\_setting ?KVP .

?KVP rdf:type dcm:113733 .

?KVP purl:IAO\_0000004 ?ValueKVP }

OPTIONAL {?Process ontomedirad:has\_setting ?XRayModulation .

?XRayModulation rdf:type ?XRayModulationType .

?XRayModulationType rdfs:subClassOf\* dcm:113842 .

?XRayModulationType skos:prefLabel ?LabelXRayModulationType . }

OPTIONAL { ?DoseMap ontomedirad:has\_IRDBB\_FHIR\_handle ?FHIRHandle . }

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 10 - Volumes Of Interest and organs

SELECT ?ClinResearchStudyId ?PatientName ?Filename ?MaterialEntityClassLabel ?VOIClass ?Format ?ProcessClass ?MethodClassLabel ?Date ?Time ?FHIRHandle

WHERE {

?Dataset rdf:type ?VOIClass .

?Dataset ontomedirad:has\_patient ?Human .

OPTIONAL { ?Human ontomedirad:has\_name ?PatientName .}

?VOIClass rdfs:subClassOf\* ontomedirad:VOI .

?Dataset ontomedirad:represents ?MaterialEntity .

?MaterialEntity rdf:type ?MaterialEntityClass .

?MaterialEntityClass rdfs:label ?MaterialEntityClassLabel .

?Dataset ontomedirad:is\_specified\_output\_of ?Process .

?Process rdf:type ?ProcessClass .

?ProcessClass rdfs:subClassOf\* purl:BFO\_0000015 .

OPTIONAL { ?Dataset ontomedirad:has\_name ?Filename } .

OPTIONAL { ?Dataset ontomedirad:has\_format ?Format } .

OPTIONAL {?Process ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId }.

OPTIONAL {?Process ontomedirad:has\_beginning ?DateTime .

BIND (substr(?DateTime,1,8) AS ?Date) .

BIND (substr(?DateTime,10,4) AS ?Time) .}

OPTIONAL { ?Process ontomedirad:has\_protocol ?Method .

?Method rdf:type ?MethodClass .

?MethodClass skos:prefLabel ?MethodClassLabel } .

OPTIONAL { ?Dataset ontomedirad:has\_IRDBB\_FHIR\_handle ?FHIRHandle . }

} ORDER BY ?ClinResearchStudy ?PatientName ?MaterialEntity



### Query 11 - Mean absorbed doses in organs

SELECT DISTINCT ?ClinResearchStudyId ?PatientName ?PatientId ?MaterialEntityClassLabel ?DoseClassLabel ?ProcessClass ?Date ?Time ?DoseValue ?DoseUnitClassLabel ?DoseMap ?FHIRHandle ?ValueKVP ?LabelUnitKVP ?LabelXRayModulationType ?ModeledDeviceName

WHERE {

?Dose rdf:type ?DoseClass .

?DoseClass rdfs:subClassOf\* dcm:128533 .

?DoseClass skos:prefLabel ?DoseClassLabel .

?Dose purl:IAO\_0000004 ?DoseValue .

?Dose purl:IAO\_0000039 ?DoseUnit .

?DoseUnit rdf:type ?DoseUnitClass .

?DoseUnitClass rdfs:label ?DoseUnitClassLabel .

?Dose ontomedirad:is\_dose\_absorbed\_by ?MaterialEntity .

?MaterialEntity rdf:type ?MaterialEntityClass .

?MaterialEntityClass rdfs:label ?MaterialEntityClassLabel .

?Dose ontomedirad:has\_patient ?Human .

?Human ontomedirad:has\_id ?PatientId .

?Process ontomedirad:has\_specified\_output ?Dose .

?Process rdf:type ?ProcessClass .

?ProcessClass rdfs:subClassOf\* purl:BFO\_0000015 .

?Process ontomedirad:has\_specified\_input ?DoseMap .

OPTIONAL { ?DoseMap ontomedirad:has\_IRDBB\_FHIR\_handle ?FHIRHandle . }

OPTIONAL { ?ModelOfImagingDevice ontomedirad:used\_as\_instrument\_in ?ProcessCalcDoseMap .

?ModelOfImagingDevice ontomedirad:refers\_to\_device ?ImagingDevice .

?ImagingDevice ontomedirad:has\_name ?ModeledDeviceName .

?ProcessCalcDoseMap ontomedirad:has\_specified\_output ?DoseMap }

OPTIONAL { ?ProcessCalcDoseMap ontomedirad:has\_setting ?KVP .

?KVP rdf:type dcm:113733 .

?KVP purl:IAO\_0000004 ?ValueKVP .

?KVP purl:IAO\_0000039 ?UnitKVP .

?UnitKVP rdfs:label ?LabelUnitKVP }

OPTIONAL { ?ProcessCalcDoseMap ontomedirad:has\_setting ?XRayModulationType .

?XRayModulationType rdfs:subClassOf\* dcm:113842 .

?XRayModulationType skos:prefLabel ?LabelXRayModulationType . }

OPTIONAL {?Process ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId }

OPTIONAL {?Process ontomedirad:has\_beginning ?DateTime .

BIND (substr(?DateTime,1,8) AS ?Date) .

BIND (substr(?DateTime,10,4) AS ?Time) } .

OPTIONAL { ?Human ontomedirad:has\_name ?PatientName } .

OPTIONAL {?Process ontomedirad:has\_specified\_input ?DoseMap .

?DoseMap rdf:type ?DoseMapClass .

?DoseMapClass rdfs:subClassOf\* dcm:128487 .

?DoseMapClass skos:prefLabel ?DoseMapClassLabel }.

} ORDER BY ?ClinResearchStudyId ?PatientId ?MaterialEntity



### Query 12 - Non DICOM datasets and handles

SELECT DISTINCT ?PatientName ?Dataset ?DatasetClassLabel ?FHIRHandle

WHERE {

?Dataset ontomedirad:has\_IRDBB\_FHIR\_handle ?FHIRHandle .

?Dataset rdf:type ?DatasetClass .

?DatasetClass rdfs:subClassOf\* purl:IAO\_0000100 .

OPTIONAL {?DatasetClass skos:prefLabel ?DatasetClassLabel } .

OPTIONAL { ?Dataset ontomedirad:has\_patient ?Human .

?Human ontomedirad:has\_name ?PatientName }.

} ORDER BY ?Dataset



### Query 13 - Internal radiotherapy radiopharmaceutical administration

SELECT DISTINCT ?ClinResearchStudyId ?InternalRadiotherapy ?PatientName ?NameRespInstitution

?RadiopharmaceuticalClassLabel ?RadionuclideClassLabel

?PreAValuedministeredActivityValue ?PostAValuedministeredActivityValue ?AdministeredActivityUnitLabel

WHERE {

?InternalRadiotherapy rdf:type ontomedirad:internal\_radiotherapy .

?InternalRadiotherapy ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?InternalRadiotherapy ontomedirad:treats ?Human .

?Human ontomedirad:has\_name ?PatientName .

?RespInstitution rdf:type ontomedirad:institution .

?RespInstitution ontomedirad:has\_name ?NameRespInstitution .

?RespInstitutionRole purl:BFO\_0000054 ?InternalRadiotherapy .

?RespInstitution purl:BFO\_0000161 ?RespInstitutionRole .

?RadiopharmaceuticalAdmin rdf:type ontomedirad:radiopharmaceutical\_administration .

?RadiopharmaceuticalAdmin purl:BFO\_0000132 ?InternalRadiotherapy .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_date ?RadiopharmaceuticalAdminDate .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_time ?RadiopharmaceuticalAdminTime .

?RadiopharmaceuticalAdmin ontomedirad:has\_specified\_input ?Radiopharmaceutical .

?Radiopharmaceutical rdf:type ?RadiopharmaceuticalClass .

?RadiopharmaceuticalClass rdfs:subClassOf snmi:radiopharmaceutical .

?RadiopharmaceuticalClass skos:prefLabel ?RadiopharmaceuticalClassLabel .

?RadiopharmaceuticalAdmin ontomedirad:has\_specified\_input ?Radionuclide .

?Radionuclide rdf:type ?RadionuclideClass .

?RadionuclideClass rdfs:subClassOf radionuclides:radionuclide .

?RadionuclideClass skos:prefLabel ?RadionuclideClassLabel .

?PreAdministeredActivity ontomedirad:is\_about ?RadiopharmaceuticalAdmin .

?PreAdministeredActivity rdf:type dcm:113508 .

?PreAdministeredActivity ontomedirad:has\_measurement\_date\_and\_time ?PreAdministeredActivityDateAndTime .

?PreAdministeredActivity purl:IAO\_0000004 ?PreAValuedministeredActivityValue .

?PreAdministeredActivity purl:IAO\_0000039 ?AdministeredActivityUnit .

?AdministeredActivityUnit skos:prefLabel ?AdministeredActivityUnitLabel .

?PostAdministeredActivity ontomedirad:is\_about ?RadiopharmaceuticalAdmin .

?PostAdministeredActivity rdf:type dcm:113509 .

?PostAdministeredActivity ontomedirad:has\_measurement\_date\_and\_time ?PostAdministeredActivityDateAndTime .

?PostAdministeredActivity purl:IAO\_0000004 ?PostAValuedministeredActivityValue .

?PostAdministeredActivity purl:IAO\_0000039 ?AdministeredActivityUnit .

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 14 - Internal radiotherapy total absorbed doses

SELECT DISTINCT ?ClinResearchStudyId ?InternalRadiotherapy ?PatientName ?3DDosimetryOfTRTClassLabel ?AbsorbedDoseInVOIValue ?AbsorbedDoseInVOIUnitLabel ?OrganOrTissueClassLabel

WHERE {

?InternalRadiotherapy rdf:type ontomedirad:internal\_radiotherapy .

?InternalRadiotherapy ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?InternalRadiotherapy ontomedirad:treats ?Human .

?Human ontomedirad:has\_name ?PatientName .

?AbsorbedDoseInVOI ontomedirad:has\_patient ?Human .

?AbsorbedDoseInVOI rdf:type ontomedirad:total\_absorbed\_dose\_per\_VOI .

?AbsorbedDoseInVOI ontomedirad:is\_quantity\_measured\_in ?VOI.

?VOI ontomedirad:represents ?OrganOrTissue .

?OrganOrTissue rdf:type ?OrganOrTissueClass .

?OrganOrTissueClass rdfs:label ?OrganOrTissueClassLabel .

?AbsorbedDoseCalculationInVOI ontomedirad:has\_specified\_output ?AbsorbedDoseInVOI .

?AbsorbedDoseCalculationInVOI rdf:type ontomedirad:calculation\_of\_mean\_absorbed\_doses\_in\_VOIs .

?AbsorbedDoseCalculationInVOI purl:BFO\_0000132 ?3DDosimetryOfTRT .

?3DDosimetryOfTRT rdf:type ?3DDosimetryOfTRTClass .

?3DDosimetryOfTRTClass skos:prefLabel ?3DDosimetryOfTRTClassLabel .

?3DDosimetryOfTRTClass rdfs:subClassOf\* ontomedirad:dosimetry\_of\_TRT .

?3DDosimetryOfTRT purl:BFO\_0000132 ?InternalRadiotherapy .

?AbsorbedDoseCalculationInVOI purl:BFO\_0000132 ?InternalRadiotherapy .

?AbsorbedDoseInVOI purl:IAO\_0000004 ?AbsorbedDoseInVOIValue .

?AbsorbedDoseInVOI purl:IAO\_0000039 ?AbsorbedDoseInVOIUnit .

?AbsorbedDoseInVOIUnit rdfs:label ?AbsorbedDoseInVOIUnitLabel .

} ORDER BY ?ClinResearchStudyId ?PatientName ?OrganOrTissue ?3DDosimetryOfTRTClassLabel



### Query 15- Internal radiotherapy CT images used

SELECT DISTINCT ?ClinResearchStudyId ?InternalRadiotherapy ?PatientName ?RadiopharmaceuticalAdminDate ?RadiopharmaceuticalAdminTime ?CTDataset ?TimepointClassLabel

WHERE {

?InternalRadiotherapy rdf:type ontomedirad:internal\_radiotherapy .

?InternalRadiotherapy ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?InternalRadiotherapy ontomedirad:treats ?Human .

?Human ontomedirad:has\_name ?PatientName .

?RadiopharmaceuticalAdmin rdf:type ontomedirad:radiopharmaceutical\_administration .

?RadiopharmaceuticalAdmin purl:BFO\_0000132 ?InternalRadiotherapy .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_date ?RadiopharmaceuticalAdminDate .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_time ?RadiopharmaceuticalAdminTime .

{ ?RegistrationVOISegmentationAndPropagation purl:BFO\_0000132 ?InternalRadiotherapy .

?RegistrationVOISegmentationAndPropagation ontomedirad:has\_specified\_input ?CTDataset .

?RegistrationVOISegmentationAndPropagation rdf:type ontomedirad:registration\_VOI\_segmentation\_and\_propagation .

?CTDataset rdf:type ontomedirad:CT\_image\_dataset .

?CTDataset ontomedirad:is\_about ?Timepoint .

?Timepoint rdf:type ?TimepointClass .

?TimepointClass rdfs:subClassOf\* ontomedirad:timepoint\_description .

?TimepointClass skos:prefLabel ?TimepointClassLabel .

}

UNION

{

?VOISegmentationVOIMassDetermination purl:BFO\_0000132 ?InternalRadiotherapy .

?VOISegmentationVOIMassDetermination ontomedirad:has\_specified\_input ?CTDataset.

?VOISegmentationVOIMassDetermination rdf:type ontomedirad:VOI\_segmentation\_VOI\_mass\_determination .

?CTDataset rdf:type ontomedirad:CT\_image\_dataset .

?CTDataset ontomedirad:is\_about ?Timepoint .

?Timepoint rdf:type ?TimepointClass .

?TimepointClass rdfs:subClassOf\* ontomedirad:timepoint\_description .

?TimepointClass skos:prefLabel ?TimepointClassLabel .

}

} ORDER BY ?ClinResearchStudyId ?PatientName



### Query 16- Internal radiotherapy NM tomo image used

SELECT DISTINCT ?ClinResearchStudyId ?InternalRadiotherapy ?PatientName ?RadiopharmaceuticalAdminDate ?RadiopharmaceuticalAdminTime ?DosimetryOfTRTClassLabel ?SPECTDataset ?TimepointClassLabel

WHERE {

?InternalRadiotherapy rdf:type ontomedirad:internal\_radiotherapy .

?InternalRadiotherapy ontomedirad:part\_of\_study ?ClinResearchStudy .

?ClinResearchStudy ontomedirad:has\_id ?ClinResearchStudyId .

?InternalRadiotherapy ontomedirad:treats ?Human .

?Human ontomedirad:has\_name ?PatientName .

?RadiopharmaceuticalAdmin rdf:type ontomedirad:radiopharmaceutical\_administration .

?RadiopharmaceuticalAdmin purl:BFO\_0000132 ?InternalRadiotherapy .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_date ?RadiopharmaceuticalAdminDate .

?RadiopharmaceuticalAdmin ontomedirad:has\_beginning\_time ?RadiopharmaceuticalAdminTime .

?RegistrationVOISegmentationAndPropagation purl:BFO\_0000132 ?InternalRadiotherapy .

?RegistrationVOISegmentationAndPropagation ontomedirad:has\_specified\_input ?SPECTDataset .

?SPECTDataset rdf:type ontomedirad:NM\_tomo\_dataset .

?SPECTDataset ontomedirad:is\_about ?Timepoint .

?Timepoint rdf:type ?TimepointClass .

?TimepointClass rdfs:subClassOf\* ontomedirad:timepoint\_description .

?TimepointClass skos:prefLabel ?TimepointClassLabel .

OPTIONAL {?RegistrationVOISegmentationAndPropagation purl:BFO\_0000132 ?DosimetryOfTRT .

?DosimetryOfTRT purl:BFO\_0000132 ?InternalRadiotherapy .

?DosimetryOfTRT rdf:type ?DosimetryOfTRTClass .

?DosimetryOfTRTClass skos:prefLabel ?DosimetryOfTRTClassLabel .

?DosimetryOfTRTClass rdfs:subClassOf ontomedirad:dosimetry\_of\_TRT .

}

} ORDER BY ?ClinResearchStudyId ?PatientName ?DosimetryOfTRTClassLabel



### Query 17- Case Report Forms for WP3 T3.3

SELECT DISTINCT ?CRFReport ?Exam ?ExamDate ?ExamTime ?StudyDescr ?TargetRegion ?LabelOrgan ?CRFReportClassLabel ?SRTemplateName ?SRTemplateId ?PatientName ?AuthorName ?AuthorHumanId ?InstituteName ?InstituteRoleClassLabel ?ReportingDate ?ReportingTime ?SRHandle

WHERE {

?CRFReport rdf:type ?CRFReportClass .

?CRFReportClass rdfs:subClassOf\* ontomedirad:case\_report\_form .

?CRFReportClass skos:prefLabel ?CRFReportClassLabel .

?CRFReport ontomedirad:has\_patient ?Human .

OPTIONAL { ?Human ontomedirad:has\_name ?PatientName . }

?CRFReport ontomedirad:is\_specified\_output\_of ?ReportCreatingProcess .

FILTER (STRENDS(?CRFReportClassLabel,'version')) .

OPTIONAL { ?CRFReport ontomedirad:is\_about\_procedure ?Exam .

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL { ?Exam ontomedirad:has\_target\_region ?TargetRegion .

?TargetRegion rdf:type ?OrganClass .

?OrganClass rdfs:label ?LabelOrgan . } }

OPTIONAL { ?CRFReport ontomedirad:has\_IRDBB\_WADO\_handle ?SRHandle .}

OPTIONAL { ?AuthorRole rdf:type ontomedirad:author .

?AuthorRole purl:BFO\_0000052 ?Author .

?Author ontomedirad:has\_id ?AuthorHumanId .

?AuthorRole purl:BFO\_0000054 ?ReportCreatingProcess .

?AuthorRole ontomedirad:has\_name ?AuthorName .

OPTIONAL {?ReportCreatingProcess ontomedirad:has\_end\_date ?ReportingDate .

?ReportCreatingProcess ontomedirad:has\_end\_time ?ReportingTime .}

OPTIONAL {?InstituteRole purl:BFO\_0000052 ?Institute .

?InstituteRole purl:BFO\_0000054 ?ReportCreatingProcess .

?InstituteRole rdf:type ?InstituteRoleClass .

?InstituteRoleClass skos:prefLabel ?InstituteRoleClassLabel .

?Institute ontomedirad:has\_name ?InstituteName .}

OPTIONAL { ?ReportCreatingProcess ontomedirad:has\_protocol ?SRTemplate .

?SRTemplate ontomedirad:has\_name ?SRTemplateName .

?SRTemplate ontomedirad:has\_id ?SRTemplateId } } }



### Query 18 - DICOM SR Dose reports:doses of individual acquisitions

SELECT DISTINCT ?StructuredReport ?StructuredReportClassLabel ?Exam ?StudyDescr ?ExamDate ?ExamTime ?Human ?PatientName ?LabelSex ?IrradEvent ?Dose ?DoseClassLabel ?ValueDose ?UnitDoseLabel ?ValueKVP ?LabelUnitKVP ?ValueTubeCur ?LabelUnitTubeCur

WHERE {

?StructuredReport ontomedirad:has\_dose ?Dose .

?StructuredReport rdf:type ?StructuredReportClass .

?StructuredReportClass skos:prefLabel ?StructuredReportClassLabel .

?Dose ontomedirad:is\_about\_irradiation\_event ?IrradEvent .

?IrradEvent rdf:type ?IrradEventClass .

?IrradEventClass skos:prefLabel ?IrradEventClassLabel .

?IrradEvent purl:BFO\_0000132 ?Exam .

?Dose purl:IAO\_0000004 ?ValueDose .

?Dose purl:IAO\_0000039 ?UnitDose .

?UnitDose rdfs:label ?UnitDoseLabel .

?Dose rdf:type ?DoseClass .

?DoseClass skos:prefLabel ?DoseClassLabel .

?DoseClass rdfs:subClassOf\* purl:IAO\_0000109 .

?IrradEvent purl:BFO\_0000132 ?Exam .

?IrradEvent ontomedirad:has\_setting ?KVP .

?KVP rdf:type dcm:113733 .

?KVP purl:IAO\_0000004 ?ValueKVP .

?KVP purl:IAO\_0000039 ?UnitKVP .

?UnitKVP rdfs:label ?LabelUnitKVP.

?IrradEvent ontomedirad:has\_setting ?TubeCur .

?TubeCur rdf:type dcm:113734 .

?TubeCur purl:IAO\_0000004 ?ValueTubeCur .

?TubeCur purl:IAO\_0000039 ?UnitTubeCur.

?UnitTubeCur rdfs:label ?LabelUnitTubeCur .

?RolePat purl:BFO\_0000054 ?Exam .

?Human purl:BFO\_0000087 ?RolePat .

OPTIONAL { ?Exam ontomedirad:has\_beginning\_date ?ExamDate .

?Exam ontomedirad:has\_beginning\_time ?ExamTime . }

OPTIONAL { ?Exam ontomedirad:has\_description ?StudyDescr }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex . }

OPTIONAL { ?Human ontomedirad:has\_name ?PatientName }

} ORDER BY ?Human ?Exam ?IrradEvent



### Query 19 - DICOM SR Dose reports: Cumulated doses

SELECT DISTINCT ?StructuredReport ?StructuredReportClassLabel ?ScopeOfAccumul ?ScopeOfAccumul ?StudyDescr ?ExamDate ?ExamTime ?Human ?PatientName ?LabelSex ?Dose ?DoseClassLabel ?ValueDose ?UnitDoseLabel

WHERE {

?StructuredReport ontomedirad:has\_dose ?Dose .

?Dose purl:IAO\_0000004 ?ValueDose .

?Dose purl:IAO\_0000039 ?UnitDose .

?UnitDose rdfs:label ?UnitDoseLabel .

?Dose rdf:type ?DoseClass .

?DoseClass skos:prefLabel ?DoseClassLabel .

?DoseClass rdfs:subClassOf\* ontomedirad:accumulated\_dose .

?StructuredReport rdf:type ?StructuredReportClass .

?StructuredReportClass skos:prefLabel ?StructuredReportClassLabel .

?StructuredReport ontomedirad:has\_scope\_of\_accumulation ?ScopeOfAccumul .

?ScopeOfAccumul rdf:type ?ScopeOfAccumulClass .

?ScopeOfAccumulClass skos:prefLabel ?ScopeOfAccumulClassLabel .

?RolePat purl:BFO\_0000054 ?ScopeOfAccumul .

?Human purl:BFO\_0000087 ?RolePat .

OPTIONAL { ?ScopeOfAccumul ontomedirad:has\_beginning\_date ?ExamDate .

?ScopeOfAccumul ontomedirad:has\_beginning\_time ?ExamTime .

?ScopeOfAccumul ontomedirad:has\_description ?StudyDescr . }

OPTIONAL { ?Human ontomedirad:has\_sex ?PatientSex .

?PatientSex rdfs:label ?LabelSex .

?Human ontomedirad:has\_name ?PatientName .}

} ORDER BY ?Human ?Exam ?IrradEvent



### Query 20 - Calibration coefficients

SELECT DISTINCT ?CalibrationCoefficient ?RadionuclideLabel ?ReferenceCalibrationDate ?InstitutionName ?CalibrationCoefficientValue ?CalibrationCoefficientUnitLabel ?CalibrationCoefficientCalculation

WHERE {

?CalibrationCoefficient rdf:type ontomedirad:SPECT\_calibration\_coefficient .

?CalibrationCoefficient ontomedirad:is\_specified\_output\_of ?CalibrationCoefficientCalculation .

?RoleOfRespInstitution purl:BFO\_0000054 ?CalibrationCoefficientCalculation .

?Institution purl:BFO\_0000161 ?RoleOfRespInstitution .

?Institution ontomedirad:has\_name ?InstitutionName .

?CalibrationCoefficient purl:IAO\_0000004 ?CalibrationCoefficientValue .

?CalibrationCoefficient purl:IAO\_0000039 ?CalibrationCoefficientUnit .

?CalibrationCoefficientUnit rdfs:label ?CalibrationCoefficientUnitLabel .

?CalibrationCoefficient ontomedirad:is\_about ?Radionuclide .

?Radionuclide rdf:type ?RadionuclideClass .

?RadionuclideClass rdfs:subClassOf\* radionuclides:radionuclide .

?RadionuclideClass rdfs:label ?RadionuclideLabel .

?CalibrationCoefficient ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

} ORDER BY ?InstitutionName ?RadionuclideLabel



### Query 21 - Recovery coefficient curves

SELECT DISTINCT ?RecoveryCoefficientCurve ?RadionuclideLabel ?ReferenceCalibrationDate ?InstitutionName ?RecoveryCoefficientCurveCalculation

WHERE {

?RecoveryCoefficientCurve rdf:type ontomedirad:SPECT\_recovery\_coefficient\_curve .

?RecoveryCoefficientCurve ontomedirad:is\_specified\_output\_of ?RecoveryCoefficientCurveCalculation .

?RoleOfRespInstitution purl:BFO\_0000054 ?RecoveryCoefficientCurveCalculation .

?Institution purl:BFO\_0000161 ?RoleOfRespInstitution .

?Institution ontomedirad:has\_name ?InstitutionName .

?RecoveryCoefficientCurve ontomedirad:is\_about ?Radionuclide .

?Radionuclide rdf:type ?RadionuclideClass .

?RadionuclideClass rdfs:subClassOf\* radionuclides:radionuclide .

?RadionuclideClass rdfs:label ?RadionuclideLabel .

?RecoveryCoefficientCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

} ORDER BY ?InstitutionName ?RadionuclideLabel



### Query 22 - Elements of recovery coefficient curves

SELECT DISTINCT ?RecoveryCoefficientCurve ?RadionuclideLabel ?ReferenceCalibrationDate ?InstitutionName ?ElementOfRecoveryCoefficientCurve ?RatioMeasuredActivityToTrueActivityValue ?VolumeHotInsertValue ?VolumeHotInsertUnitLabel ?HotInsertId

WHERE {

?RecoveryCoefficientCurve rdf:type ontomedirad:SPECT\_recovery\_coefficient\_curve .

?RecoveryCoefficientCurve ontomedirad:is\_specified\_output\_of ?RecoveryCoefficientCurveCalculation .

?RoleOfRespInstitution purl:BFO\_0000054 ?RecoveryCoefficientCurveCalculation .

?Institution purl:BFO\_0000161 ?RoleOfRespInstitution .

?Institution ontomedirad:has\_name ?InstitutionName .

?RecoveryCoefficientCurve ontomedirad:is\_about ?Radionuclide .

?Radionuclide rdf:type ?RadionuclideClass .

?RadionuclideClass rdfs:subClassOf\* radionuclides:radionuclide .

?RadionuclideClass rdfs:label ?RadionuclideLabel .

?RecoveryCoefficientCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

?RecoveryCoefficientCurve purl:BFO\_0000110 ?ElementOfRecoveryCoefficientCurve .

?ElementOfRecoveryCoefficientCurve rdf:type ontomedirad:element\_of\_recovery\_coefficient\_curve .

?ElementOfRecoveryCoefficientCurve purl:BFO\_0000110 ?RatioMeasuredActivityToTrueActivity .

?RatioMeasuredActivityToTrueActivity rdf:type ontomedirad:ratio\_measured\_activity\_to\_true\_activity .

?RatioMeasuredActivityToTrueActivity purl:IAO\_0000004 ?RatioMeasuredActivityToTrueActivityValue .

?ElementOfRecoveryCoefficientCurve purl:BFO\_0000110 ?VolumeHotInsert .

?VolumeHotInsert rdf:type ontomedirad:nominal\_volume\_measurement\_datum .

?VolumeHotInsert purl:IAO\_0000004 ?VolumeHotInsertValue .

?VolumeHotInsert purl:IAO\_0000039 ?VolumeHotInsertUnit .

?VolumeHotInsertUnit rdfs:label ?VolumeHotInsertUnitLabel .

?VolumeHotInsert ontomedirad:is\_about ?HotInsert .

?HotInsert rdf:type ontomedirad:hot\_insert\_of\_NM\_phantom .

?HotInsert ontomedirad:has\_id ?HotInsertId .

} ORDER BY ?InstitutionName ?RadionuclideLabel



### Query 23 - CT number calibration curves

SELECT DISTINCT ?CTNumberCalibrationCurve ?ReferenceCalibrationDate

WHERE {

?CTNumberCalibrationCurve rdf:type ontomedirad:CT\_number\_calibration\_curve .

?CTNumberCalibrationCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

}



### Query 24 - Elements of CT number calibration curves

SELECT DISTINCT ?CTNumberCalibrationCurve ?ReferenceCalibrationDate ?ElementOfCTNumberCalibrationCurve ?HounsfieldMeasuredValue ?HounsfieldMeasuredUnitLabel ?RealDensityOfMaterialValue ?RealDensityOfMaterialUnitLabel ?MaterialId

WHERE {

?CTNumberCalibrationCurve rdf:type ontomedirad:CT\_number\_calibration\_curve .

?CTNumberCalibrationCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

?CTNumberCalibrationCurve purl:BFO\_0000110 ?ElementOfCTNumberCalibrationCurve .

?ElementOfCTNumberCalibrationCurve rdf:type ontomedirad:element\_of\_CT\_number\_calibration\_curve .

?ElementOfCTNumberCalibrationCurve purl:BFO\_0000110 ?ImageDerivedRadiodensityMeasurement .

?ImageDerivedRadiodensityMeasurement rdf:type ontomedirad:image\_derived\_radiodensity\_measurement\_datum .

?ImageDerivedRadiodensityMeasurement purl:IAO\_0000004 ?HounsfieldMeasuredValue .

?ImageDerivedRadiodensityMeasurement purl:IAO\_0000039 ?HounsfieldMeasuredUnit .

?HounsfieldMeasuredUnit rdfs:label ?HounsfieldMeasuredUnitLabel .

?ElementOfCTNumberCalibrationCurve purl:BFO\_0000110 ?NominalRadiodensityMeasurement .

?NominalRadiodensityMeasurement rdf:type ontomedirad:nominal\_radiodensity\_measurement\_datum .

?NominalRadiodensityMeasurement purl:IAO\_0000004 ?RealDensityOfMaterialValue .

?NominalRadiodensityMeasurement purl:IAO\_0000039 ?RealDensityOfMaterialUnit .

?RealDensityOfMaterialUnit rdfs:label ?RealDensityOfMaterialUnitLabel .

?ElementOfCTNumberCalibrationCurve ontomedirad:has\_id ?MaterialId .

}



### Query 25 - NM phantom

SELECT DISTINCT ?Phantom ?PhantomId ?PhantomName

?HotInsertId ?VolumeHotInsertValue ?VolumeHotInsertUnitLabel ?RadionuclideHotInsertClassLabel ?PreAdminActivityHotInsertValue ?PreAdminActivityHotInsertUnitLabel ?PreAdminActivityHotInsertTimestamp ?PostAdminActivityHotInsertValue ?PostAdminActivityHotInsertUnitLabel ?PostAdminActivityHotInsertTimestamp

?ColdInsertId ?VolumeColdInsertValue ?VolumeColdInsertUnitLabel

?TankId ?VolumeTankValue ?VolumeTankUnitLabel ?RadionuclideTankClassLabel ?PreAdminActivityTankValue ?PreAdminActivityTankUnitLabel ?PreAdminActivityTankTimestamp ?PostAdminActivityTankValue ?PostAdminActivityTankUnitLabel ?PostAdminActivityTankTimestamp

WHERE {

?Phantom rdf:type ontomedirad:NM\_phantom\_device .

?Phantom ontomedirad:has\_id ?PhantomId .

?Phantom ontomedirad:has\_name ?PhantomName .

{

?Phantom purl:BFO\_0000110 ?HotInsert .

?HotInsert rdf:type ontomedirad:hot\_insert\_of\_NM\_phantom .

?HotInsert ontomedirad:has\_id ?HotInsertId .

?VolumeHotInsert rdf:type ontomedirad:nominal\_volume\_measurement\_datum .

?VolumeHotInsert purl:IAO\_0000004 ?VolumeHotInsertValue .

?VolumeHotInsert purl:IAO\_0000039 ?VolumeHotInsertUnit .

?VolumeHotInsertUnit rdfs:label ?VolumeHotInsertUnitLabel .

?VolumeHotInsert ontomedirad:is\_about ?HotInsert .

?HotInsert purl:BFO\_0000110 ?RadiopharmaceuticalHotInsert .

?RadiopharmaceuticalHotInsert rdf:type snmi:radiopharmaceutical .

?RadiopharmaceuticalHotInsert purl:BFO\_0000110 ?RadionuclideHotInsert .

?RadionuclideHotInsert rdf:type ?RadionuclideHotInsertClass .

?RadionuclideHotInsertClass rdfs:subClassOf\* radionuclides:radionuclide .

?RadionuclideHotInsertClass rdfs:label ?RadionuclideHotInsertClassLabel .

?PreAdminActivityHotInsert ontomedirad:is\_about ?RadiopharmaceuticalHotInsert .

?PreAdminActivityHotInsert rdf:type dcm:113508 .

?PreAdminActivityHotInsert purl:IAO\_0000004 ?PreAdminActivityHotInsertValue .

?PreAdminActivityHotInsert purl:IAO\_0000039 ?PreAdminActivityHotInsertUnit .

?PreAdminActivityHotInsertUnit rdfs:label ?PreAdminActivityHotInsertUnitLabel .

?PreAdminActivityHotInsert ontomedirad:has\_measurement\_date\_and\_time ?PreAdminActivityHotInsertTimestamp .

?PostAdminActivityHotInsert ontomedirad:is\_about ?RadiopharmaceuticalHotInsert .

?PostAdminActivityHotInsert rdf:type dcm:113509 .

?PostAdminActivityHotInsert purl:IAO\_0000004 ?PostAdminActivityHotInsertValue .

?PostAdminActivityHotInsert purl:IAO\_0000039 ?PostAdminActivityHotInsertUnit .

?PostAdminActivityHotInsertUnit rdfs:label ?PostAdminActivityHotInsertUnitLabel .

?PostAdminActivityHotInsert ontomedirad:has\_measurement\_date\_and\_time ?PostAdminActivityHotInsertTimestamp .

}

UNION {

?Phantom purl:BFO\_0000110 ?ColdInsert .

?ColdInsert rdf:type ontomedirad:cold\_insert\_of\_NM\_phantom .

?ColdInsert ontomedirad:has\_id ?ColdInsertId .

?VolumeColdInsert rdf:type ontomedirad:nominal\_volume\_measurement\_datum .

?VolumeColdInsert purl:IAO\_0000004 ?VolumeColdInsertValue .

?VolumeColdInsert purl:IAO\_0000039 ?VolumeColdInsertUnit .

?VolumeColdInsertUnit rdfs:label ?VolumeColdInsertUnitLabel .

?VolumeColdInsert ontomedirad:is\_about ?ColdInsert .

}

UNION {

?Phantom purl:BFO\_0000110 ?Tank .

?Tank rdf:type ontomedirad:tank\_of\_NM\_phantom .

?Tank ontomedirad:has\_id ?TankId .

?VolumeTank rdf:type ontomedirad:nominal\_volume\_measurement\_datum .

?VolumeTank purl:IAO\_0000004 ?VolumeTankValue .

?VolumeTank purl:IAO\_0000039 ?VolumeTankUnit .

?VolumeTankUnit rdfs:label ?VolumeTankUnitLabel .

?VolumeTank ontomedirad:is\_about ?Tank .

?Tank purl:BFO\_0000110 ?RadiopharmaceuticalTank .

?RadiopharmaceuticalTank rdf:type snmi:radiopharmaceutical .

?RadiopharmaceuticalTank purl:BFO\_0000110 ?RadionuclideTank .

?RadionuclideTank rdf:type ?RadionuclideTankClass .

?RadionuclideTankClass rdfs:subClassOf\* radionuclides:radionuclide .

?RadionuclideTankClass rdfs:label ?RadionuclideTankClassLabel .

?RadiopharmaceuticalTank rdf:type snmi:radiopharmaceutical .

?PreAdminActivityTank ontomedirad:is\_about ?RadiopharmaceuticalTank.

?PreAdminActivityTank rdf:type dcm:113508 .

?PreAdminActivityTank purl:IAO\_0000004 ?PreAdminActivityTankValue .

?PreAdminActivityTank purl:IAO\_0000039 ?PreAdminActivityTankUnit .

?PreAdminActivityTankUnit rdfs:label ?PreAdminActivityTankUnitLabel .

?PreAdminActivityTank ontomedirad:has\_measurement\_date\_and\_time ?PreAdminActivityTankTimestamp .

?PostAdminActivityTank ontomedirad:is\_about ?RadiopharmaceuticalTank.

?PostAdminActivityTank rdf:type dcm:113509 .

?PostAdminActivityTank purl:IAO\_0000004 ?PostAdminActivityTankValue .

?PostAdminActivityTank purl:IAO\_0000039 ?PostAdminActivityTankUnit .

?PostAdminActivityTankUnit rdfs:label ?PostAdminActivityTankUnitLabel .

?PostAdminActivityTank ontomedirad:has\_measurement\_date\_and\_time ?PostAdminActivityTankTimestamp .

}

} ORDER BY ?Phantom ?HotInsert ?ColdInsert ?Tank



### Query 26 - CT Calibration

SELECT DISTINCT ?CTCalibration ?ReferenceCalibrationDate ?CTNumberCalibrationCurve

WHERE {

?CTCalibration rdf:type ontomedirad:CT\_calibration .

?CTNumberCalibrationCurve rdf:type ontomedirad:CT\_number\_calibration\_curve .

?CTNumberCalibrationCurve ontomedirad:is\_specified\_output\_of ?CTNumberCalibrationCurveCalculation .

?CTNumberCalibrationCurveCalculation rdf:type ontomedirad:calculation\_of\_CT\_number\_calibration\_curve .

?CTNumberCalibrationCurveCalculation purl:BFO\_0000132 ?CTCalibration .

?CTNumberCalibrationCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

}



### Query 27 - SPECT Calibration

### SELECT DISTINCT ?SPECTCalibration ?ReferenceCalibrationDate ?Radionuclide ?RadionuclideLabel ?CalibrationCoefficient ?RecoveryCoefficientCurve ?IdOfSPECTCalibration

### WHERE {

### ?SPECTCalibration rdf:type ontomedirad:SPECT\_CT\_calibration .

### ?CalibrationCoefficient rdf:type ontomedirad:SPECT\_calibration\_coefficient .

### ?CalibrationCoefficient ontomedirad:is\_specified\_output\_of ?CalibrationCoefficientCalculation .

### ?CalibrationCoefficientCalculation rdf:type ontomedirad:SPECT\_calibration\_coefficient\_calculation .

### ?CalibrationCoefficientCalculation purl:BFO\_0000132 ?SPECTCalibration .

### ?CalibrationCoefficient ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

### ?CalibrationCoefficient ontomedirad:is\_about ?Radionuclide .

### ?RecoveryCoefficientCurve rdf:type ontomedirad:SPECT\_recovery\_coefficient\_curve .

### ?RecoveryCoefficientCurve ontomedirad:is\_specified\_output\_of ?RecoveryCoefficientCurveCalculation .

### ?RecoveryCoefficientCurveCalculation rdf:type ontomedirad:SPECT\_recovery\_coefficient\_curve\_calculation .

### ?RecoveryCoefficientCurveCalculation purl:BFO\_0000132 ?SPECTCalibration .

### ?RecoveryCoefficientCurve ontomedirad:has\_reference\_calibration\_date ?ReferenceCalibrationDate .

### ?RecoveryCoefficientCurve ontomedirad:is\_about ?Radionuclide .

### ?Radionuclide rdf:type ?RadionuclideClass .

### ?RadionuclideClass rdfs:subClassOf\* radionuclides:radionuclide .

### ?RadionuclideClass rdfs:label ?RadionuclideLabel .

### ?SPECTCalibration ontomedirad:has\_id ?IdOfSPECTCalibration

### }

### 