

v.16.16
07/15/23

Update of the Isomer database based on the Atlas of Nuclear Isomers-
Second Edition (Swati Garga, Bhoomika Maheshwarib, BalrajSinghe, Yang Sun, Alpana Goel, Ashok Kumar Jain) **and NNDC**

Project by
D.Kaloyanov and F.Krause

More than 1500 isomers
states have been added

Migration of all LISE databases to
sqlite format

Project by D.Kaloyanov

Scalability, Security,
Usability, Speed, Flexibility
(see next slides)

Problem

- in the old system we stored data in dbf-format what are essentially text files (Excel: only read).
- While this works there are many issues with this primarily Scalability, Security, and Usability.

Solutions

- Using a library like libxl to read from an excel file
- The better choice: using SQL to read from a database file
- We Initially chose to use Access .accdb files as our databases, but ran into some issues and decided to switch.
- We then began to use SQLite because it was light weight, high performance, and had cross platform support.
- SQLite files are also significantly smaller than Access files.

Post-Implementation

- There is now more versatility thanks to SQL queries
- Each query takes significantly less time to search for data than the old dbf code
- GEMINI++ reads in the data about 5x faster than before
- PACE4 reads data in about 2x quicker
- LISE++ : the start is faster, the performance is slightly better
- Overall, there were slight performance improvements, but the databases in LISE and other codes overall is now more future proof, safe, and easier to work with

- Converted the lise2016.dbf and isomer.dbf files to SQLite Databases
- LISE now uses QSQL to read and write to the Isomers and AME 2016 DBs
- Added new Data for the *Atlas of Nuclear Isomers - Second Edition*
- Added missing Cascading Isomer levels
- Converted the AME2016 Database to SQLite
- Converted the chart.tbl, mass.tbl, and mass_tf.tbl to SQLite
- GEMINI and PACE now use QSQL to read from the Databases

Original DBF data shown in excel

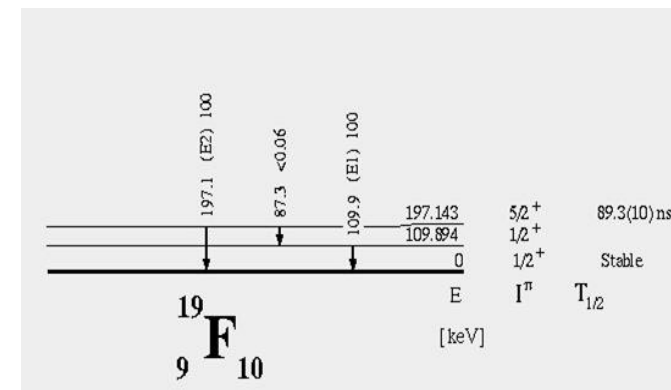
19090087	19	9	87.3	AP	10	AP	8.93E-2	1.00E-2	197.143	0.004
19090197	19	9	197.1	AP	10	AP	8.93E-2	1.00E-2	197.143	0.004



19090087	19	9	87.3		10		8.93E-02	1.00E-02	197.143	0.004
19090110	19	9	109.9		10		5.91E-04	7.00E-06	109.894	0.005
19090197	19	9	197.1		10		8.93E-02	1.00E-02	197.143	0.004

New SQLite format with the missing energy level

Fluorine 19 has 3 energy levels, but the original only showed 2.



Opening the database

```
//----- gemini_db begin

QString Gemini_DbName = "GEMINI.sqlite";
QString GeminiDbPath = QDir::currentPath() + "/lisecfg" + "/" + Gemini_DbName;

QString connectionName = "GeminiConnection";

Geminidb = QSqlDatabase::addDatabase("QSQLITE","GeminiConnection");
Geminidb.setDatabaseName(GeminiDbPath);

if (!Geminidb.open())
    QMessageBox::warning(this, "Database file didn't open", GeminiDbPath + " can't be located or an Error occured");
```

Query are used to pull data from the database

```
void CMass::FRDMFinder(QVector<QVector<QVariant>> &result)
{
    if (Geminidb.isValid() && Geminidb.isOpen())
    {
        QSqlQuery query(Geminidb);
        query.prepare("SELECT A, Z, k, l, m FROM mass");

        if (!query.exec()) { qDebug() << "Search didn't work"; return; }

        while (query.next())
        {
            QVector<QVariant> values;
            for(int k=0; k<5; k++) values.append(query.value(k));

            result.append(values);
        }
    }
    else { qDebug() << "Gemini DB connection is not valid."; }

    return;
}
```

DBF: v. 16.15.1

```

Filename:      :/LISEcute/lisecfg/lise2016.dbf
Header length: 737
Number of fields: 22
Version:      dBASE III
Updated:      09/07/22
Number of records: 3375
Record length: 211
    
```

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN	DEC
1	INDEX	N	8	0
2	A	N	7	0
3	EL	C	5	0
4	Z	N	6	0
5	MASS_EXCES	C	13	0
6	BINDING_EN	C	14	0
7	BETA-DECAY	C	10	0
8	S(2N)	C	10	0
9	S(2P)	C	10	0
10	Q(A)	C	10	0
11	S(N)	C	10	0
12	S(P)	C	10	0
13	T1_2	C	9	0
14	TIME14	C	9	0
15	D_T12	C	9	0
16	D_BE	C	10	0
17	D_BETA	C	10	0
18	D_S(2N)	C	10	0
19	D_S(2P)	C	10	0
20	D_Q(A)	C	10	0
21	D_S(N)	C	10	0
22	D_S(P)	C	10	0

AACDB: v. 16.15.18

```

Filename:      I:/lisecfg/AME_DB.accdb
Table name:    lise2016
Version:      ACCDB
Record length: 345
Number of fields: 24
Number of records: 3365
    
```

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN
1	ID	integer	10
2	INDEX	double	15
3	A	double	15
4	EL	string	5
5	Z	double	15
6	MASS_EXCES	string	15
7	BE	string	15
8	BETA-DECAY	string	15
9	Q(A)	string	15
10	S(2N)	string	15
11	S(2P)	string	15
12	S(N)	string	15
13	S(P)	string	15
14	D_T1_2	string	15
15	T1_2	string	15
16	TIME14	string	20
17	D_BE	string	15
18	D_BETA-DECAY	string	15
19	D_Q(A)	string	15
20	D_S(2N)	string	15
21	D_S(2P)	string	15
22	D_S(N)	string	15
23	D_S(P)	string	15
24	Flag	integer	10

SQLITE

```

Filename:      'LISEcute/lisecfg/AME_DB.sqlite'
Table name:    AME2016
Version:      SQLITE
Record length: unknown
Number of fields: 23
Number of records: 3365
    
```

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN
1	ID	Integer	
2	INDEX	Integer	
3	A	Integer	
4	EL	Text	
5	Z	Integer	
6	MASS_EXCES	Text	
7	BE	Text	
8	BETA_DECAY	Text	
9	Q_A	Text	
10	S_2N	Text	
11	S_2P	Text	
12	S_N	Text	
13	S_P	Text	
14	D_T12	Text	
15	T12	Text	
16	TIME14	Text	
17	D_BE	Text	
18	D_BETA_DECAY	Text	
19	D_Q_A	Text	
20	D_S_2N	Text	
21	D_S_2P	Text	
22	D_S_N	Text	
23	D_S_P	Text	

DBF: v. 16.15.1

```

Filename:      /LISEcute/lisecfg/isomer.dbf
Header length: 705
Number of fields: 21
Version:      dBASE III
Updated:      02/24/15
Number of records: 1845
Record length: 193
    
```

Updated from ATLAS2
and NNDC by Foster
and Daniel

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN	DEC
1	INDEX	C	10	0
2	A	C	4	0
3	Z	C	4	0
4	E-GAMMA	C	8	0
5	D_EG	C	7	0
6	IT-RATIO	C	7	0
7	D_IT-RATIO	C	7	0
8	T12	C	10	0
9	D_T12	C	9	0
10	LEVEL	C	9	0
11	D_LEVEL	C	9	0
12	JPI	C	12	0
13	I-GAMMA	C	7	0
14	D_IG	C	6	0
15	M-GAMMA	C	9	0
16	M-RATIO	C	8	0
17	D_MRATIO	C	8	0
18	CONVCF	C	8	0
19	D_CONV	C	8	0
20	SOURCE	C	27	0
21	NAME	C	15	0

AACDB: v. 16.15.18

```

Filename:      C:/LISEcute/_install/lisecfg/Isomer_DE
Table name:    Isomers
Version:      ACCDB
Record length: 305
Number of fields: 23
Number of records: 3403
    
```

corrections

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN
1	INDEX	integer	10
2	A	integer	10
3	Z	integer	10
4	E-GAMMA	double	15
5	D_EG	string	10
6	IT-RATIO	integer	10
7	D_IT-RATIO	string	10
8	T12	double	15
9	D_T12	string	10
10	LEVEL	double	15
11	D_LEVEL	string	10
12	JPI	string	10
13	I-GAMMA	string	10
14	D_IG	string	10
15	M-GAMMA	string	10
16	M-RATIO	string	10
17	D_MRATIO	string	10
18	CONVCF	string	10
19	D_CONV	string	10
20	SOURCE	string	40
21	NAME	string	40
22	ROW	integer	10
23	FLAG	integer	10

SQLITE: v. 16.15.42

```

Filename:      'LISEcute/lisecfg/Isomer_DB.sqlite
Table name:    Isomers
Version:      SQLITE
Record length: unknown
Number of fields: 22
Number of records: 3375
    
```

FILE STRUCTURE

#	FIELD NAME	TYPE	LEN
1	INDEX_IT	Real	
2	A_IT	Integer	
3	Z_IT	Integer	
4	E_GAMMA	Real	
5	D_EG	Text	
6	IT_RATIO	Integer	
7	D_IT_RATIO	Text	
8	T12	Real	
9	D_T12	Text	
10	LEVEL	Real	
11	D_LEVEL	Text	
12	JPI	Text	
13	I_GAMMA	Text #5	
14	D_IG	Text #5	
15	M_GAMMA	Text	
16	M_RATIO	Text #5	
17	D_MRATIO	Text #5	
18	CONV	Text #5	
19	D_CONV	Text #5	
20	SOURCE	Text	
21	NAME	Text	
22	ROW	Integer	