

Update on topical evaluation of $Z=9-14$, $N=16-24$ nuclides: Island of Inversion

A collaboration of:

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Web Dissemination: Boris Pritychenko: *BNL*

Experiment and Theory: Vandana Tripathi, Sam Tabor: *FSU*

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USNDP meeting, BNL

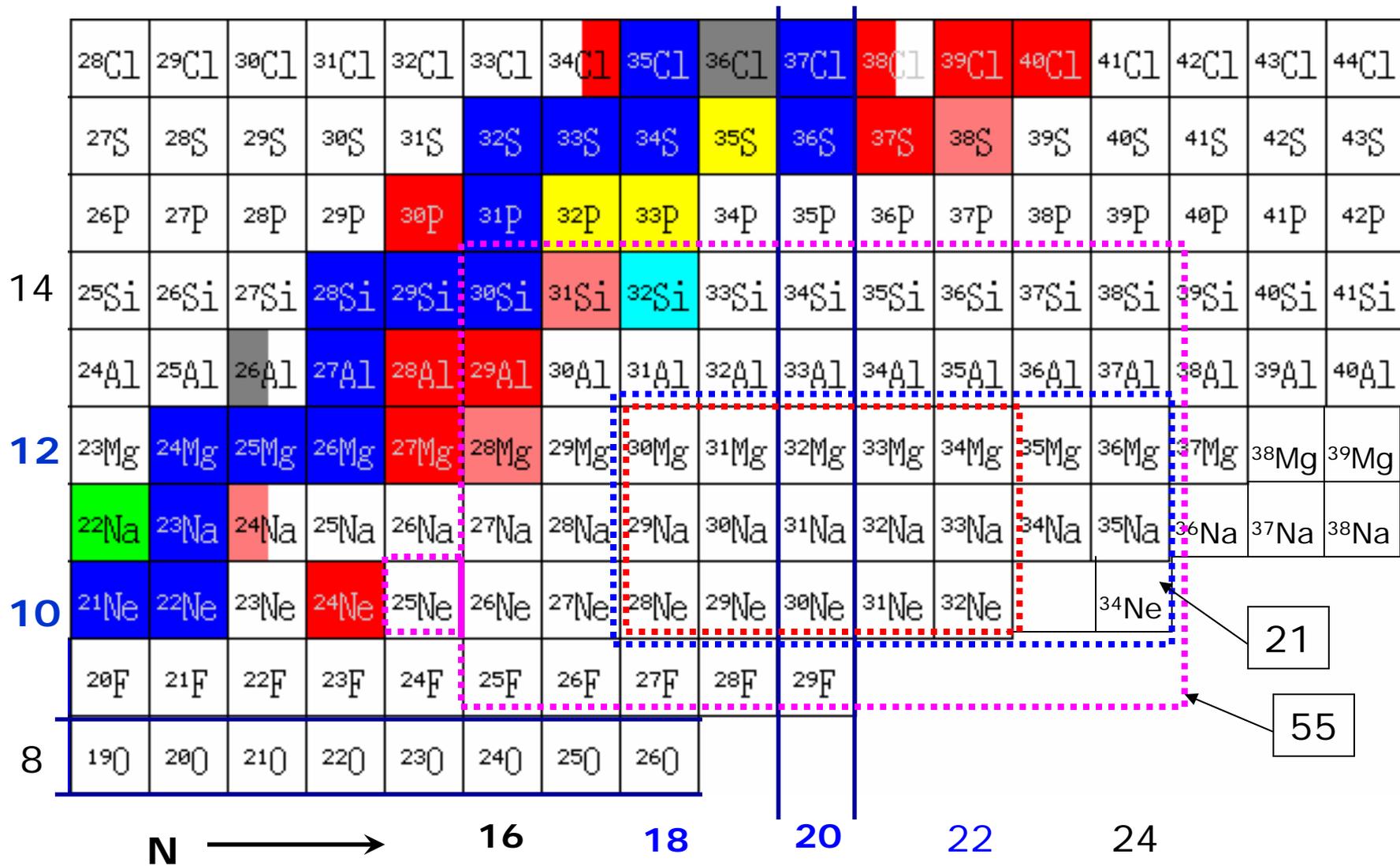
November 5-7, 2008

Background

- The $N \sim 20$ and $Z = 10-12$ region of nuclear chart, belonging to the so called “island of inversion” is of current experimental focus for structure studies. In early 2007 Rod Clark (LBNL) suggested to consider this region for a topical ENSDF evaluation.
- As a follow-up of this proposal, at USNDP-2007 meeting, it was decided that LBNL and McMaster data groups will evaluate about 14 nuclides in this mass region. These evaluations were completed in 2007-2008.
- Subsequently experimentalists and theorists at other labs have been supportive of this topical evaluation and have expressed interest in writing a review article to accompany the evaluation effort.

Experiments

- Spectroscopic studies include:
 - Excited state energies,
 - Ground-state spins and parities
 - Precision mass measurements (Penning-trap)
 - Cross sections for population of levels, Transition Probabilities, Log ft values, Ground State nuclear radius etc.
 - Static Magnetic and Quadrupole moments
- Production and spectroscopy involves:
 - Fragmentation of primary beam - separation and acceleration of the secondary beam
 - further fragmentation or knock-out reactions using a secondary target - gamma ray detection by large γ -ray detector array and particles by 4π particle detector
- Main experimental facilities:
 - NSCL, MSU, USA
 - ISOLDE/CERN, Switzerland
 - RIKEN, Japan
 - GANIL, France
 - GSI, Germany



A brief meeting on June 5, 2008 at NS-2008, MSU

- **Attended by:**

- Alexandra Gade (NSCL)
- Paul Fallon (LBNL)
- Sam Tabor (FSU)
- Vandana Tripathi (FSU)
- Balraj Singh (McMaster)

- **Discussed:**

- Topical ENSDF evaluation of nuclei in and around “island of inversion” by USNDP (LBNL and McMaster groups). Range of nuclides defined as: $Z=9-14$, $N\sim 16-24$ ($^{25-33}\text{F}$, $^{25-34}\text{Ne}$, $^{27-35}\text{Na}$, $^{28-36}\text{Mg}$, $^{29-37}\text{Al}$, $^{30-38}\text{Si}$)
- Writing a review article (effort to be lead by FSU)
- Dissemination via website (NNDC)

Current ENSDF Status

^{30}Si Jan,99	^{31}Si Jan,99	^{32}Si Feb,06	^{33}Si Feb,07	^{34}Si Jan,99	^{35}Si Jan,99	^{36}Si Jan,99	^{37}Si Jan,99	^{38}Si Nov,07	
^{29}Al Jan,99	^{30}Al Jan,99	^{31}Al Jan,99	^{32}Al Sep,08	^{33}Al Feb,07	^{34}Al Jan,99	^{35}Al Jan,99	^{36}Al Jan,99	^{37}Al Jan,99	
^{28}Mg Jan,99	^{29}Mg Jan,99	^{30}Mg Mar,08	^{31}Mg Oct,07	^{32}Mg Mar,04	^{33}Mg Feb,07	^{33}Mg Oct,07	^{35}Mg Feb,08	^{36}Mg Sep,07	
^{27}Na Jan,99	^{28}Na Jan,99	^{29}Na Mar,08	^{30}Na Sep,08	^{31}Na Oct,06	^{32}Na Feb,08	^{33}Na Feb,08	^{34}Na Feb,08	^{35}Na Feb,08	
^{25}Ne Jan,00	^{26}Ne Jan,00	^{27}Ne Jan,99	^{28}Ne Mar,08	^{29}Ne Mar,08	^{30}Ne Mar,08	^{31}Ne Oct,06	^{32}Ne Feb,08	^{33}Ne Nov,07	^{34}Ne Oct,06
^{25}F Jan,00	^{26}F Jan,00	^{27}F Jan,99	^{28}F Jan,99	^{29}F Jan,99	^{30}F	^{31}F Oct,06	?	?	

Web Interface

<http://www.nndc.bnl.gov/Island>

Future Site of N=20 Topical Nuclear Structure Evaluation

Beta version

This project is a collaborative effort of Lawrence Berkeley National Laboratory, McMaster University (Canada) and Brookhaven National Laboratory. The main objective is to produce a topical nuclear structure evaluation of deformed nuclei in the 'island of inversion' region ($N = 20-22$ and $Z = 10-12$). The 'island of inversion' or 'island of deformed nuclei' navigational map and list of major experimental facilities are presented below.

20											^{40}Ca		^{42}Ca	^{43}Ca	^{44}Ca	
19											^{39}K		^{41}K			
18									^{36}Ar		^{38}Ar		^{40}Ar			
17									^{35}Cl		^{37}Cl					
16							^{32}S	^{33}S	^{34}S		^{36}S					
15							^{31}P									
14					^{28}Si	^{29}Si	^{30}Si				^{34}Si					
13					^{27}Al						^{33}Al	^{34}Al	^{35}Al			
12			^{24}Mg	^{25}Mg	^{26}Mg					^{30}Mg	^{31}Mg	^{32}Mg	^{33}Mg	^{34}Mg	^{35}Mg	^{36}Mg
11			^{23}Na							^{29}Na	^{30}Na	^{31}Na	^{32}Na	^{33}Na		
10	^{20}Ne	^{21}Ne	^{22}Ne						^{27}Ne	^{28}Ne	^{29}Ne	^{30}Ne	^{31}Ne	^{32}Ne		
9	^{19}F												^{31}F			
Z/N	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	

Evaluation Process and Web Dissemination

- Procedure:
 - Evaluation, ENSDF style
 - A 3-year update cycle for relevant nuclei
- A web dissemination page on NNDC website focusing on the topical evaluation, pointers to evaluated nuclei in ENSDF, review article and detailed bibliography (experiment and theory) would be desirable and useful.

Responsibilities

- Evaluation - LBNL and McMaster
 - Current responsibility in this mass region:
 - LBNL: $A = 25-30$: total of 22 nuclides: 16 need updating: expected completion by **July, 2009** (Shamsu Basunia)
 - McMaster: $A = 31- 38$: total of 33 nuclides: 11 need updating: expected completion by **April 2009** (Balraj Singh)
- A review article – Vandana Tripathi, FSU
- Dissemination – Boris Pritychenko (BNL)
 - Development of web page: NNDC