

Nuclear Data Sheet Production

NDS PROGRAM IN JAVA

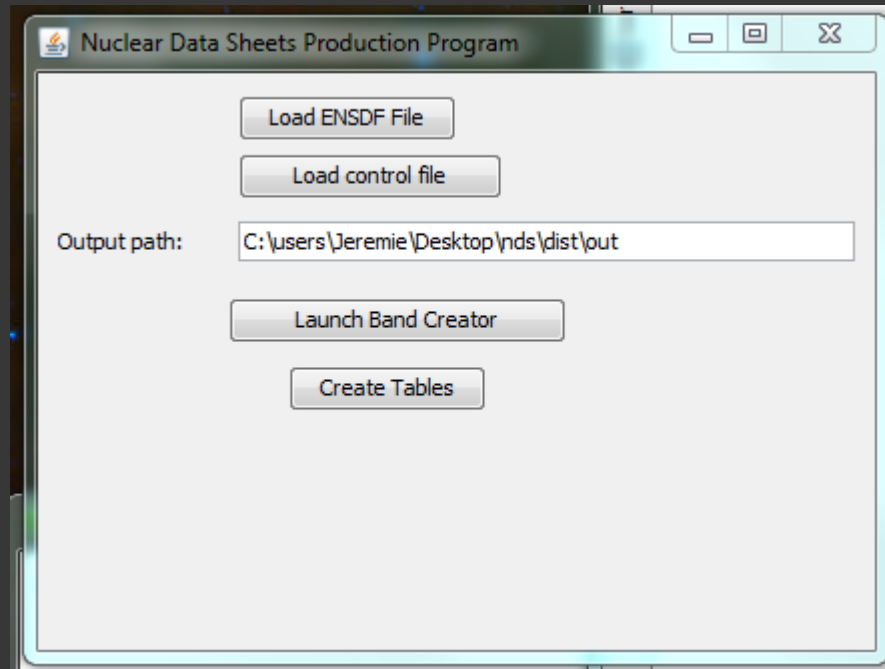
Contributions

- Presented by Jeremie Choquette (McMaster)
- Code written by Roy Zwina, Scott Geraedts, Jeremie Choquette (McMaster)
- Consultations with: Balraj Singh and Chris Ouellet (McMaster), Jagdish Tuli and Marion Blennau (NNDC) and Coral Baglin (LBNL)

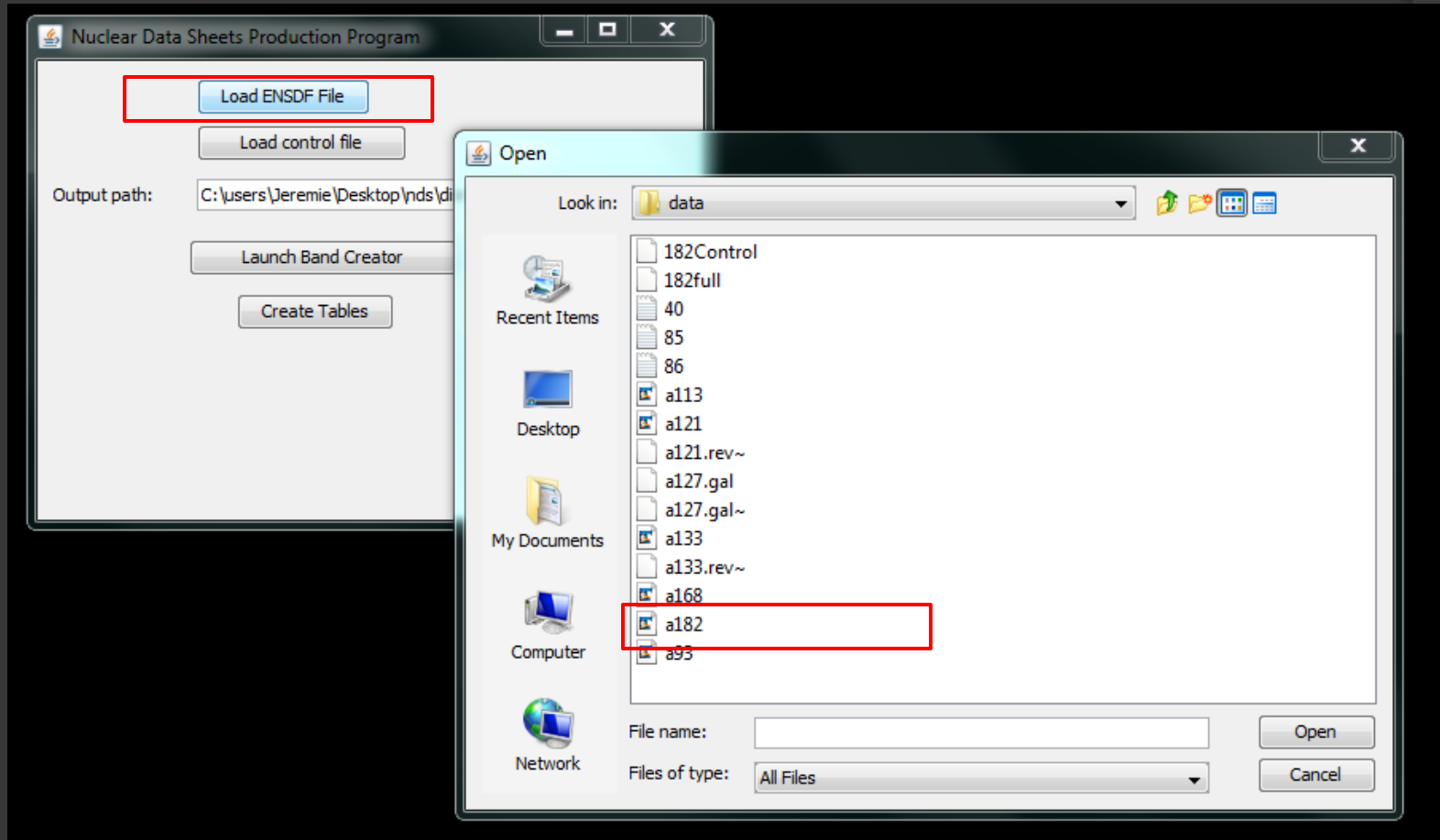
How it works

- ⦿ The program loads a complete mass chain (or a dataset) and a control file
- ⦿ The control file dictates layout and formatting, as well as which datasets, tables and drawings are to be included
- ⦿ The program generates an output file in LaTeX (drawings in metapost)
- ⦿ The LaTeX file is converted to PDF format

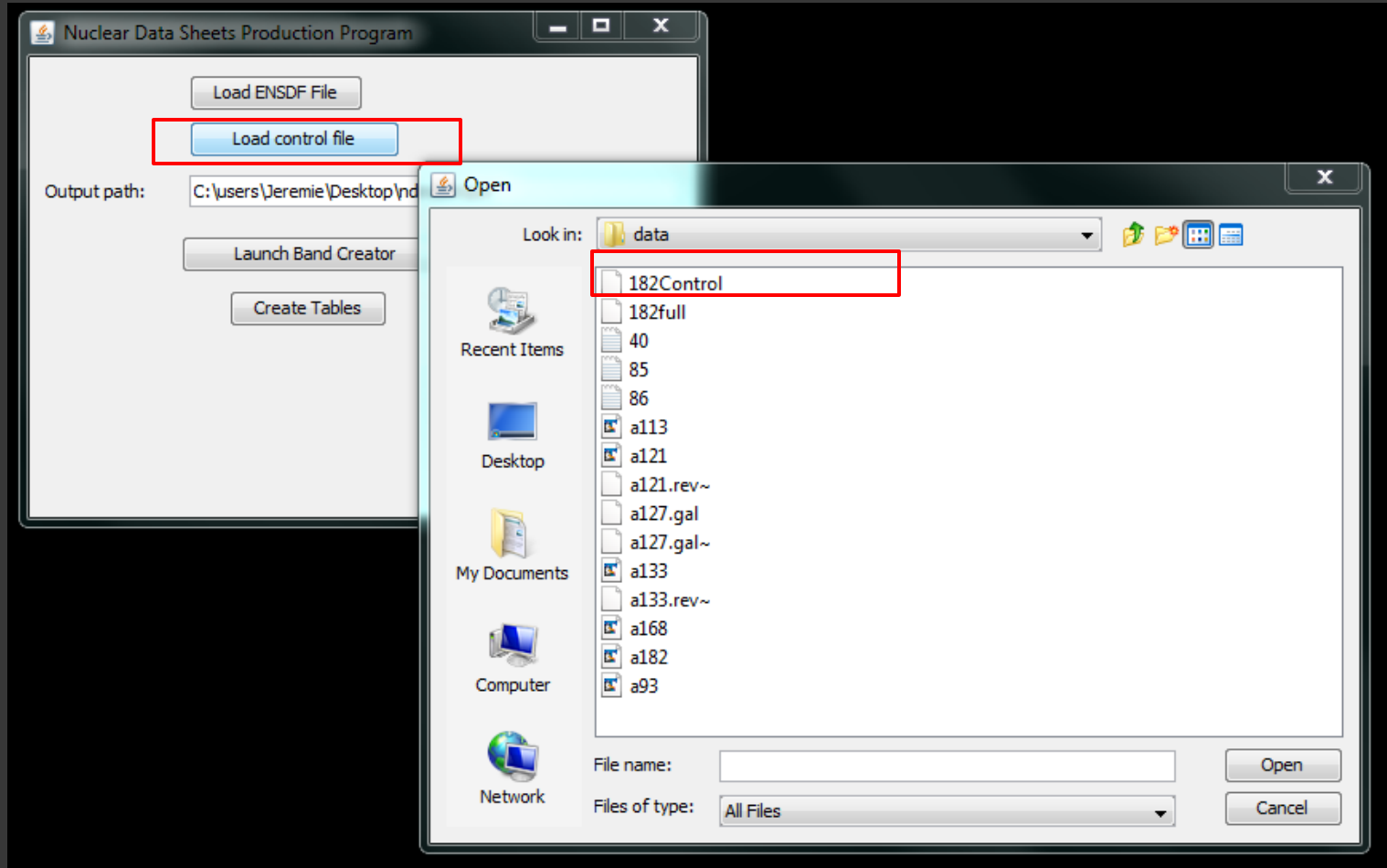
Running the Program



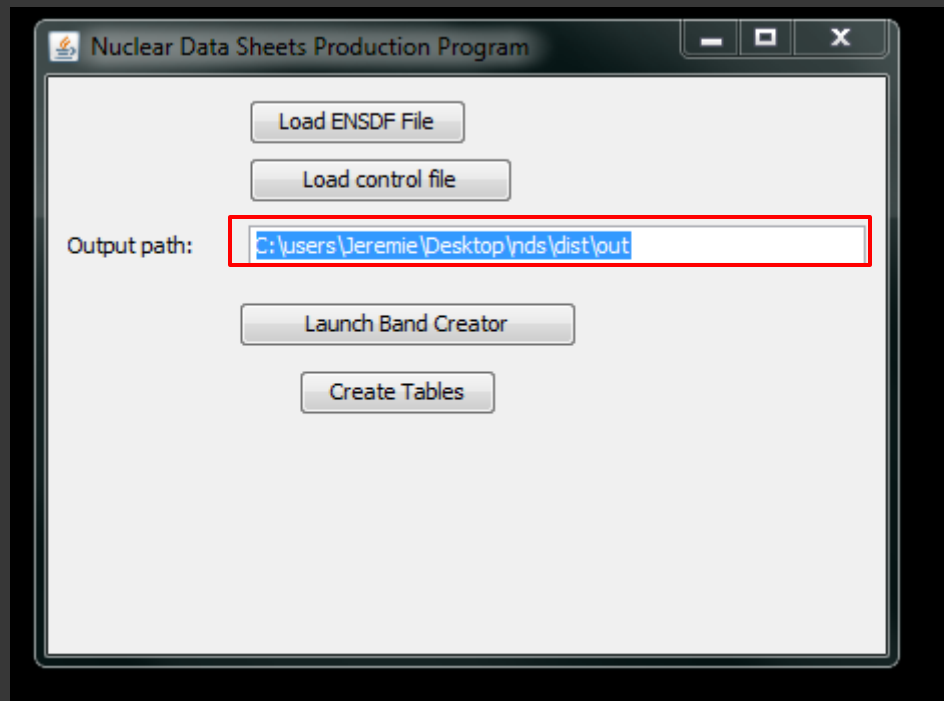
Running the Program



Running the Program



Running the Program



Running the Program

Band production interface

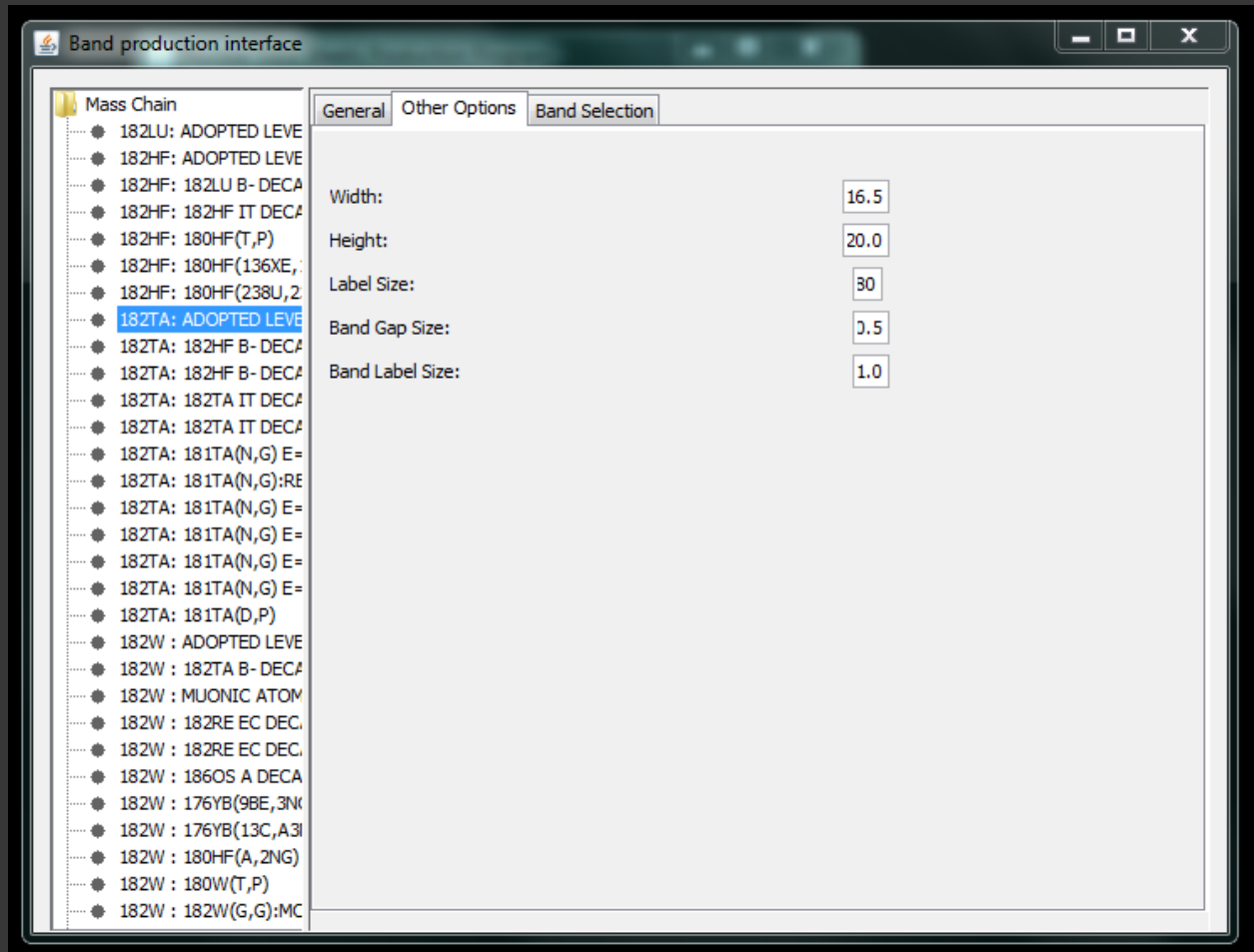
Mass Chain

- 182LU: ADOPTED LEVE
- 182HF: ADOPTED LEVE
- 182HF: 182LU B- DECA
- 182HF: 182HF IT DECA
- 182HF: 180HF(T,P)
- 182HF: 180HF(136XE,)
- 182HF: 180HF(238U, 2
- 182TA: ADOPTED LEVE**
- 182TA: 182HF B- DECA
- 182TA: 182HF B- DECA
- 182TA: 182TA IT DECA
- 182TA: 182TA IT DECA
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(N,G):RE
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(N,G) E=
- 182TA: 181TA(D,P)
- 182W : ADOPTED LEVE
- 182W : 182TA B- DECA
- 182W : MUONIC ATOM
- 182W : 182RE EC DEC.
- 182W : 182RE EC DEC.
- 182W : 186OS A DECA
- 182W : 176YB(9BE,3N)
- 182W : 176YB(13C,A3)
- 182W : 180HF(A,2NG)
- 182W : 180W(T,P)
- 182W : 182W(G,G):MC

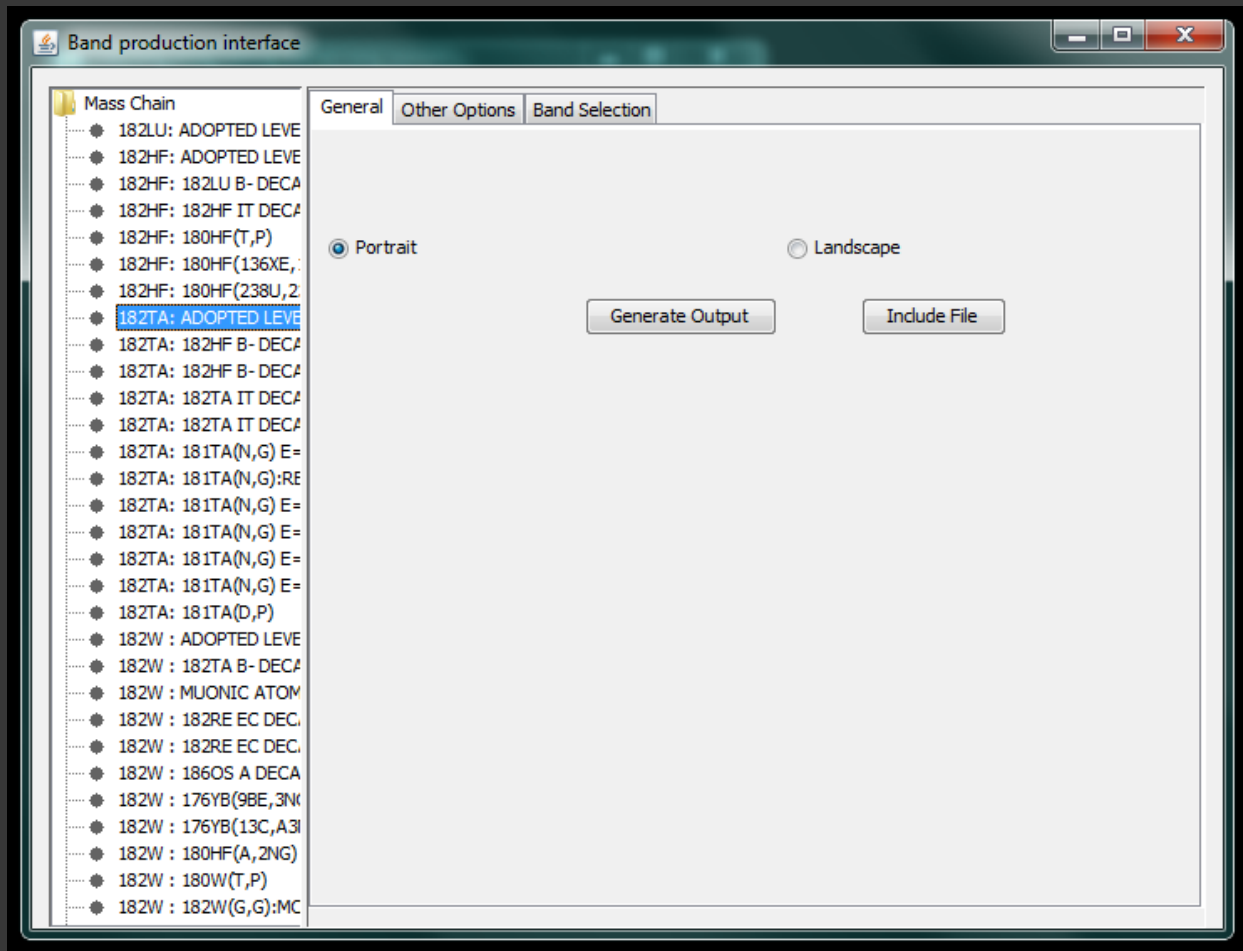
General Other Options Band Selection

Band Label	Draw Band?	Band Width
KPI=3-, p7/2[404]- n1/...	<input checked="" type="checkbox"/>	2.6
KPI=4-, p7/2[404]+ n1...	<input checked="" type="checkbox"/>	2.7
KPI=5-, p7/2[404]+ n3...	<input checked="" type="checkbox"/>	2.4
KPI=2-, p7/2[404]- n3/...	<input checked="" type="checkbox"/>	3
KPI=2+, p7/2[404]- n1...	<input checked="" type="checkbox"/>	2.5
KPI=1+, p7/2[404]- n9...	<input checked="" type="checkbox"/>	2.8
KPI=0-, p7/2[404]- n7/...	<input checked="" type="checkbox"/>	2.8
KPI=7-, p7/2[404]+ n7...	<input checked="" type="checkbox"/>	2.8
KPI=5-, p9/2[514]+ n1...	<input checked="" type="checkbox"/>	2.5
KPI=4-, p9/2[514]- n1/...	<input checked="" type="checkbox"/>	2.6
KPI=3+, p9/2[514]- n3...	<input checked="" type="checkbox"/>	2.9
KPI=3-, p5/2[402]+ n1...	<input checked="" type="checkbox"/>	3
KPI=2-, p5/2[402]- n1/...	<input checked="" type="checkbox"/>	3.1
KPI=1-, p5/2[402]- n3/...	<input checked="" type="checkbox"/>	2.6
KPI=2-, p1/2[411]+ n3...	<input checked="" type="checkbox"/>	2.7

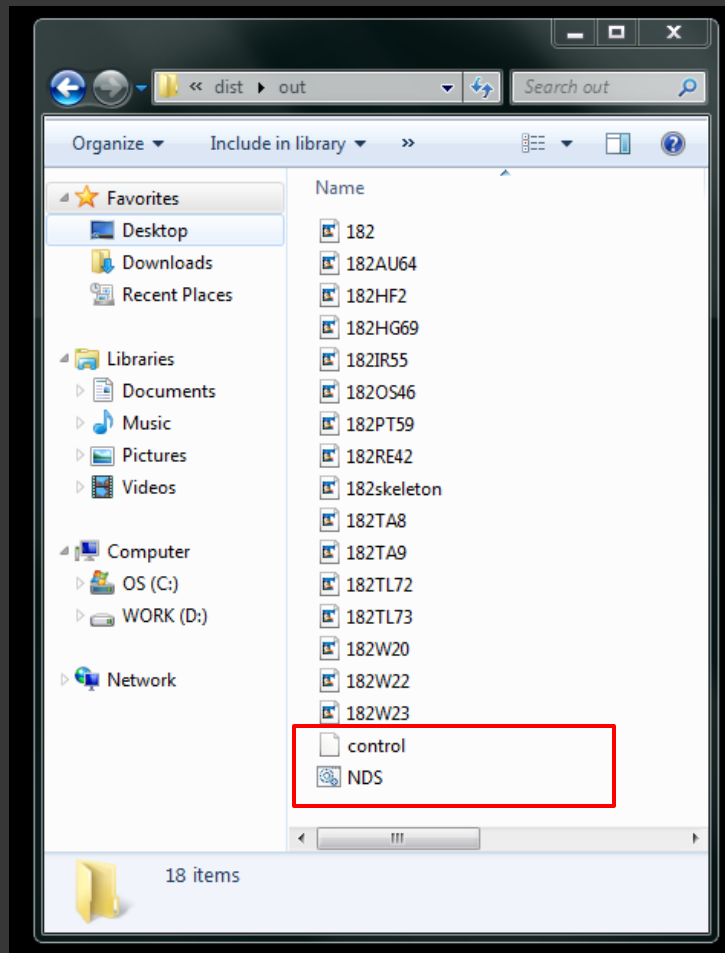
Running the Program



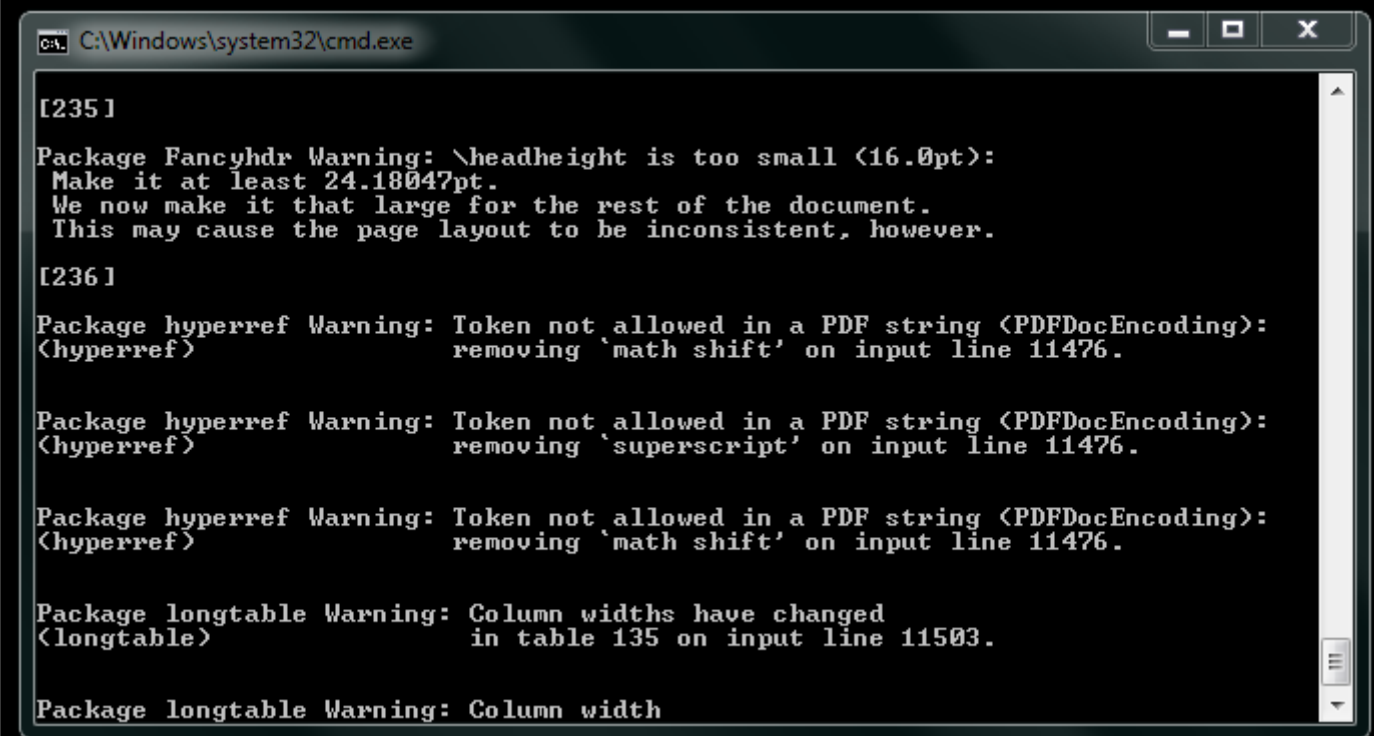
Running the Program



Running the Program



Running the Program



```
CA: C:\Windows\system32\cmd.exe

[235]
Package Fancyhdr Warning: \headheight is too small (16.0pt):
Make it at least 24.18047pt.
We now make it that large for the rest of the document.
This may cause the page layout to be inconsistent, however.

[236]
Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
(hyperref) removing 'math shift' on input line 11476.

Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
(hyperref) removing 'superscript' on input line 11476.

Package hyperref Warning: Token not allowed in a PDF string (PDFDocEncoding):
(hyperref) removing 'math shift' on input line 11476.

Package longtable Warning: Column widths have changed
(longtable) in table 135 on input line 11503.

Package longtable Warning: Column width
```

^{182}Lu β^- decay (2.0 min) 1982Ki04Parent: ^{182}Lu : E=0.0; $T_{1/2}$ =2.0 min 2; Q=4180 ST; % β^- =100

Q(g.s.): 4180.200 (syst.2003Au03).

 ^{182}Lu produced by bombardment of natural tungsten and tantalum targets with ^{136}Xe beam at 9 MeV/nucleon. ^{182}Hf Levels

E(level)	J π^{\dagger}
0.0	0+
97.77 20	2+
321.8 6	(4+)
818.4 4	(1,2+)
905.9 6	

 \dagger From Adopted Levels.

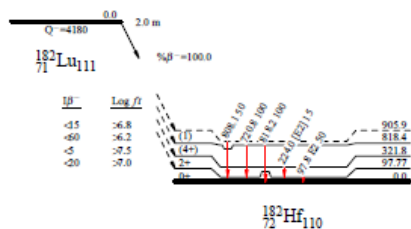
E_{γ}	E^{level}	J^{π}	$\gamma(^{182}\text{Hf})$			Mult.	α	Comments
			E_{γ}^{\dagger}	I_{γ}^{\dagger}	I_{γ}^{\dagger}			
97.8 2	97.77	2+	0.0	0+	50 10	E2	3.85 7	Mult.: from Adopted Gammas.
124.0 3	321.8	(4+)	97.77	2+	15 7	[E2]	0.198 4	
720.8 3	818.4	(1,2+)	97.77	2+	100 10			
808.1 3	905.9		97.77	2+	50 13			
818.2 3	818.4	(1,2+)	0.0	0+	100 25			

 \dagger For absolute intensity per 100 decays, multiply by 0.30 3 β^- radiations

$E\beta^-$	E^{level}	J^{π}	Log ft
(3.3E+3)	905.9	<15	>6.8
(3.4E+3)	818.4	<60	>6.2
(3.9E+3)	321.8	<5	>7.5
(4.1E+3)	97.77	<20	>7.0

 \dagger Only the upper limits can be deduced since there is no knowledge of β feeding to g.s., and there is a large energy gap of ≈ 3.3 MeV between $Q(\beta^-)$ and the highest level at 906 keV.

Decay Scheme

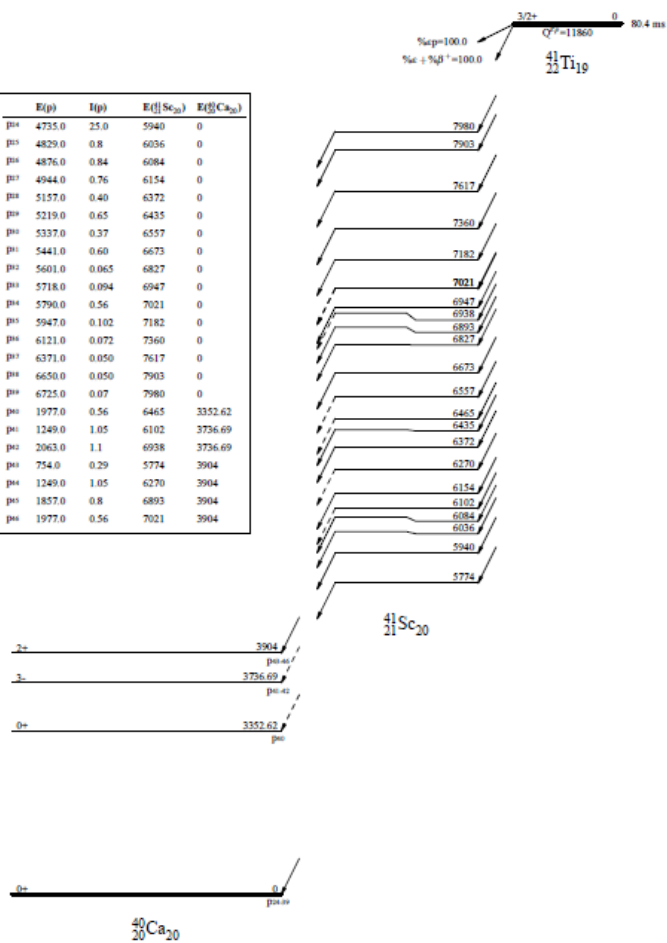
Intensities: Relative 1 γ 

$\gamma(^{182}\text{W})$ (continued)										
E_{level}	J_{π}^{\dagger}	E_{level}	J_{π}^{\dagger}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	Mult. [‡]	δ^{\ddagger}	α	$I_{(\gamma+ce)}$	Comments
		2273.87	9-	437.1 1	100 18	Q				
2730.85	(10-)	2455.74	(9-)	275.1 1	100 14	(D+Q)				
		2204.54	(8-)	526.2 10	<14					
2739.15	(10-)	2225.35	(8-)	513.8 1	100	Q				
2741.66	(11-)	2301.56	(9-)	440.1 1	100 18	Q				
		2273.87	9-	467.7 5	35 6					
2769.26	(10+)	2479.83	(9+)	289.4 1	100	D+Q				
		2212.49	(8+)	557.6 5	39 4					
2775.63	(12+)	2492.76	(11+)	282.8 1	100	D+Q				
		2230.63	(10+)	545.1 2	18 3	Q				
2823.93	(11-)	2563.94	(10-)	260.0 1	100	D+Q				
		2327.91	(9-)	496.0 5	48 5					
2884.1	1	100.10597	2+	2784 1	40 11					
		0.0	0+	2884 1	100					
2892.1	(1)	100.10597	2+	2792 1	150 90					
		0.0	0+	2892 1	100					
2941.0	(1,2+)	0.0	0+	2941 2	100					
2972.49	12-	2710.93	11-	261.6 2	20 5					
		2486.89	10-	485.6 1	100 20	Q				
2980.58	(11-)	2445.98	(9-)	534.6 1	100	Q				
2981.33	(12-)	2507.48	(10-)	473.8 1	100 19					
		2486.89	10-	494.6 2	38 6					
2996.1	1	100.10597	2+	2896 1	168 35					
		0.0	0+	2996 1	100					
3027.96	(11-)	2730.85	(10-)	297.1 1	100	(D+Q)				
		2455.74	(9-)	575.2 20	24 11					
3078.23	(13+)	2775.63	(12+)	302.5 1	100	D+Q				$I_{\gamma(586\gamma)}I_{\gamma(302)}=1.67$ in $(\alpha,2n\gamma)$.
		2492.76	(11+)	585.8 2	47 9	Q				
3080.1	1	100.10597	2+	2980 1	61 18					
		0.0	0+	3080 1	100					
3106.72	(12-)	2823.93	(11-)	282.8 1	100	(D+Q)				
		2563.94	(10-)	542.5 5	53 6					
3112.87	14+	2372.57	12+	740.3 1	100	(E2)		0.00843		$B(E2)(W.u.)=1.7 \times 10^2 5$. $\alpha(K)=0.00678 10$. $\alpha(L)=0.001277 18$. $\alpha(M)=0.000297 5$. $\alpha(N)=8.28 \times 10^{-5} 12$. $\alpha(N)=7.10 \times 10^{-5} 10$. $\alpha(O)=1.114 \times 10^{-5} 16$. $\alpha(P)=6.29 \times 10^{-7} 9$.
3163.1	1	100.10597	2+	3063 1	54 12					
		0.0	0+	3163 1	100					
3198.1	(1,2+)	100.10597	2+	3098 1	59 21					
		0.0	0+	3198 1	100					
3224.53	13-	2710.93	11-	513.6 1	100	Q				
3269.56	(13-)	2741.66	(11-)	527.9 1	100	Q				
3319.7	(12-)	2739.15	(10-)	580.6 4	100					
3343.06	(12-)	3027.96	(11-)	315.1 1	100 14	(D+Q)				
		2730.85	(10-)	612.6 10	43 29					
3365.1	1	100.10597	2+	3265 1	63 17					
		0.0	0+	3365 1	100					
3398.33	(14+)	3078.23	(13+)	320.0 1	100	D+Q				
		2775.63	(12+)	622.7 1	61 18	Q				
3410.54	(13-)	3106.72	(12-)	303.8 1	100 13					
		2823.93	(11-)	586.8 5	88 13					
3415.90	(12)	2492.76	(11+)	923.1 1	100	D+Q				
3422.1	(1,2+)	100.10597	2+	3322 1	53 15					
		0.0	0+	3422 1	100					
3518.04	(14-)	2981.33	(12-)	536.7 1	100 20					
		2972.49	12-	545.7 5	40 10					
3549.99	14-	2981.33	(12-)	568.6 10	<22					
		2972.49	12-	577.5 1	100 22	Q				

Continued on next page (footnotes at end of table)

Decay Scheme (continued)

	E(β)	I(β)	E($^{41}_{21}\text{Sc}_{20}$)	E($^{41}_{21}\text{Ca}_{20}$)
β^{14}	4735.0	25.0	5940	0
β^{13}	4829.0	0.8	6036	0
β^{12}	4876.0	0.84	6084	0
β^{11}	4944.0	0.76	6154	0
β^{10}	5157.0	0.40	6372	0
β^9	5219.0	0.65	6435	0
β^8	5337.0	0.37	6557	0
β^7	5441.0	0.60	6673	0
β^6	5601.0	0.065	6827	0
β^5	5718.0	0.094	6947	0
β^4	5790.0	0.56	7021	0
β^3	5947.0	0.102	7182	0
β^2	6121.0	0.072	7360	0
β^1	6371.0	0.050	7617	0
β^0	6650.0	0.050	7903	0
β^0	6725.0	0.07	7980	0
β^0	1977.0	0.56	6465	3352.62
β^0	1249.0	1.05	6102	3736.69
β^0	2063.0	1.1	6938	3736.69
β^0	754.0	0.29	5774	3904
β^0	1249.0	1.05	6270	3904
β^0	1857.0	0.8	6893	3904
β^0	1977.0	0.56	7021	3904



Features

- ⦿ The output can be generated with color diagrams for all datasets (including delayed particle decays)
- ⦿ Can generate delayed particle decay drawings, with all three nuclides shown and table of data for particle emission
- ⦿ Can switch between a shortened version for publishing and a full (or untruncated) version for online usage
- ⦿ A short manual has been prepared which can be expanded when a final version is ready

Style

- The style approximates that of the current Nuclear Data Sheets; however, changes can be made to incorporate new ideas and suggestions
- Diagrams color-coded by relative intensity of decay

Maintenance and Changes

- Since the program is in Java, which is a popular programming language, the code offers reasonable flexibility and ease of access when making changes
- We feel that the long-term maintenance of this program should not be time-intensive
- The program is built to be clear and easy to edit

Future Plans

- Our goal is to have the program complete by mid summer 2011
- Few changes will be made until April 2011
- During May and June 2011, I plan to work closely with NNDC on the final version of the code
- By July 2011, this code will be handed over to NNDC, at which point McMaster group will phase out its involvement