



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2022 – 12:47 pm GMT

PDB ID : 6SCH  
Title : NADH-dependent variant of CBADH  
Authors : Selles Vidal, L.; Murray, J.W.; Heap, J.T.  
Deposited on : 2019-07-24  
Resolution : 2.20 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

---

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.4, CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.27  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0267  
CCP4 : 7.1.010 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.27

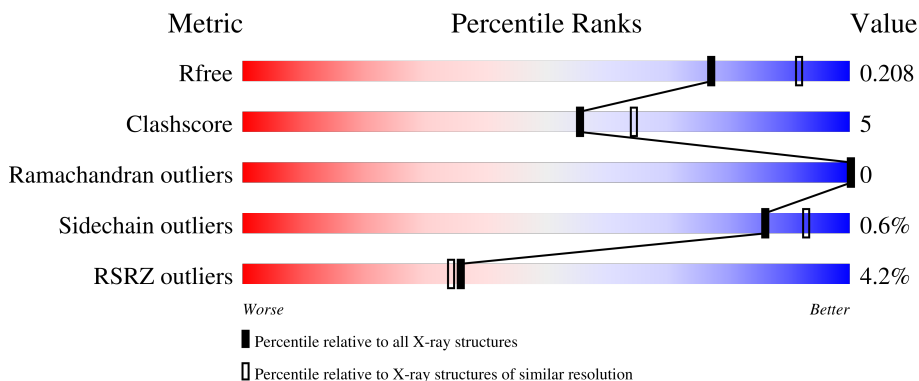
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)
RSRZ outliers	127900	4800 (2.20-2.20)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	355	 4% 88% 10%
1	B	355	 4% 88% 11%
1	C	355	 6% 91% 9%
1	D	355	 2% 90% 10%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	NAD	B	401	-	-	-	X

## 2 Entry composition i

There are 6 unique types of molecules in this entry. The entry contains 11354 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called NADP-dependent isopropanol dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	352	2654	1685	463	483	23	0	0	0
1	B	352	2654	1685	463	483	23	0	0	0
1	C	355	2684	1703	472	486	23	0	0	0
1	D	354	2674	1697	469	485	23	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

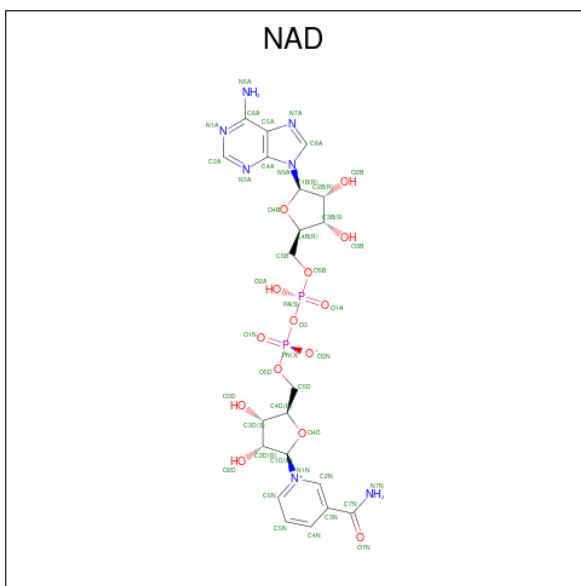
Chain	Residue	Modelled	Actual	Comment	Reference
A	198	ASP	GLY	conflict	UNP P25984
A	199	TYR	SER	conflict	UNP P25984
A	218	PRO	TYR	conflict	UNP P25984
A	352	HIS	-	expression tag	UNP P25984
A	353	HIS	-	expression tag	UNP P25984
A	354	HIS	-	expression tag	UNP P25984
A	355	HIS	-	expression tag	UNP P25984
B	198	ASP	GLY	conflict	UNP P25984
B	199	TYR	SER	conflict	UNP P25984
B	218	PRO	TYR	conflict	UNP P25984
B	352	HIS	-	expression tag	UNP P25984
B	353	HIS	-	expression tag	UNP P25984
B	354	HIS	-	expression tag	UNP P25984
B	355	HIS	-	expression tag	UNP P25984
C	198	ASP	GLY	conflict	UNP P25984
C	199	TYR	SER	conflict	UNP P25984
C	218	PRO	TYR	conflict	UNP P25984
C	352	HIS	-	expression tag	UNP P25984
C	353	HIS	-	expression tag	UNP P25984
C	354	HIS	-	expression tag	UNP P25984
C	355	HIS	-	expression tag	UNP P25984

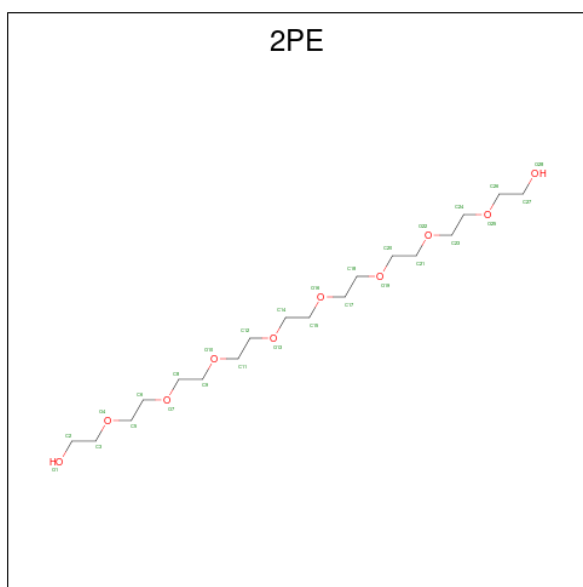
*Continued on next page...*

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
D	198	ASP	GLY	conflict	UNP P25984
D	199	TYR	SER	conflict	UNP P25984
D	218	PRO	TYR	conflict	UNP P25984
D	352	HIS	-	expression tag	UNP P25984
D	353	HIS	-	expression tag	UNP P25984
D	354	HIS	-	expression tag	UNP P25984
D	355	HIS	-	expression tag	UNP P25984

- Molecule 2 is NICOTINAMIDE-ADENINE-DINUCLEOTIDE (three-letter code: NAD) (formula: C<sub>21</sub>H<sub>27</sub>N<sub>7</sub>O<sub>14</sub>P<sub>2</sub>) (labeled as "Ligand of Interest" by depositor).





Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			22	14	8		
3	A	1	Total	C	O	0	0
			17	11	6		
3	A	1	Total	C	O	0	0
			22	14	8		
3	B	1	Total	C	O	0	0
			17	11	6		
3	B	1	Total	C	O	0	0
			22	14	8		
3	C	1	Total	C	O	0	0
			17	11	6		
3	D	1	Total	C	O	0	0
			17	11	6		
3	D	1	Total	C	O	0	0
			16	10	6		

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		
4	B	1	Total	Zn	0	0
			1	1		
4	C	1	Total	Zn	0	0
			1	1		
4	D	1	Total	Zn	0	0
			1	1		

- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total 2	Mg 2	0	0

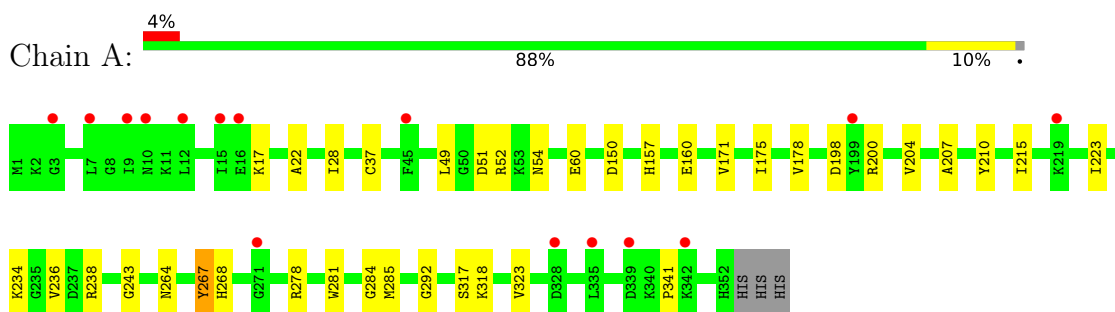
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	99	Total 99	O 99	0	0
6	B	81	Total 81	O 81	0	0
6	C	95	Total 95	O 95	0	0
6	D	81	Total 81	O 81	0	0

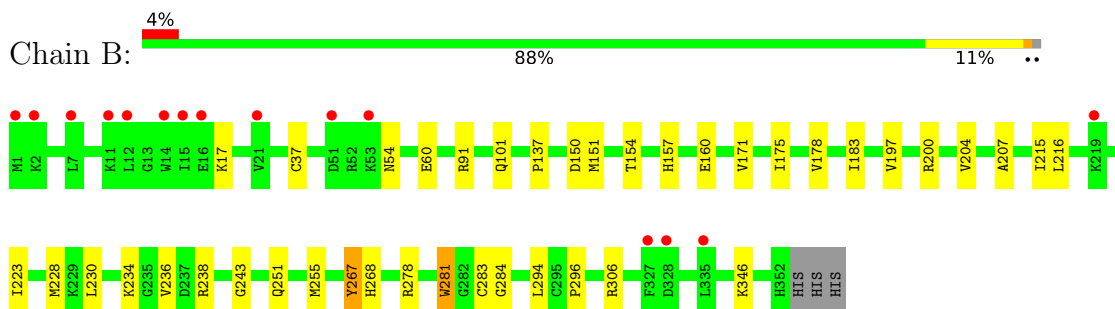
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ( $RSRZ > 2$ ). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

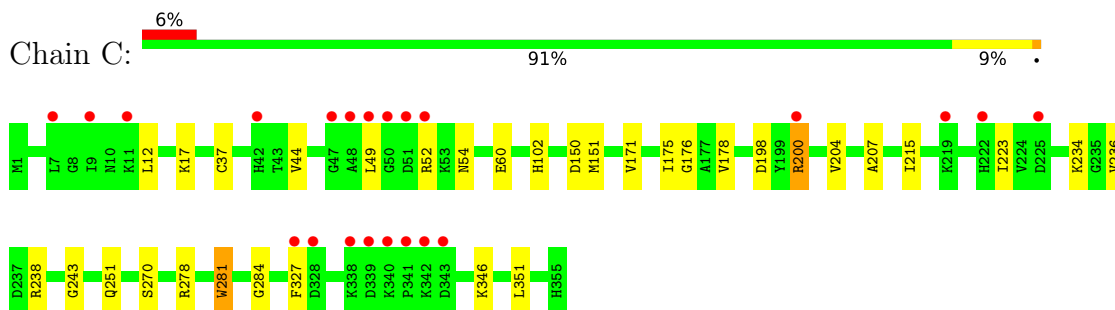
- Molecule 1: NADP-dependent isopropanol dehydrogenase



- Molecule 1: NADP-dependent isopropanol dehydrogenase



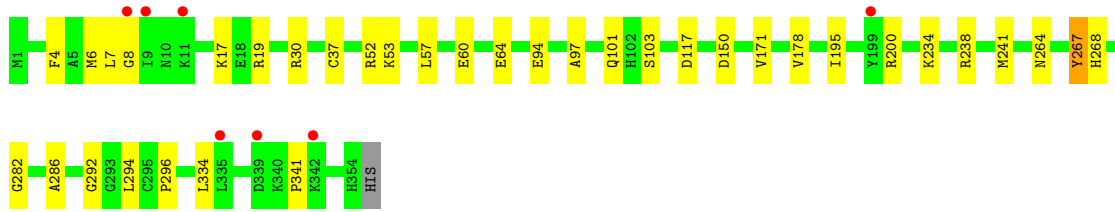
- Molecule 1: NADP-dependent isopropanol dehydrogenase



- Molecule 1: NADP-dependent isopropanol dehydrogenase







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	75.81Å 99.57Å 114.09Å 90.00° 102.77° 90.00°	Depositor
Resolution (Å)	69.01 – 2.20 69.01 – 2.20	Depositor EDS
% Data completeness (in resolution range)	98.4 (69.01-2.20) 98.4 (69.01-2.20)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.51 (at 2.20Å)	Xtrriage
Refinement program	PHENIX 1.16_3549, PHENIX 1.16_3549	Depositor
R, $R_{free}$	0.164 , 0.208 0.164 , 0.208	Depositor DCC
$R_{free}$ test set	4038 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	34.9	Xtrriage
Anisotropy	0.110	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	(Not available) , (Not available)	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.97	EDS
Total number of atoms	11354	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	45.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.26% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, NAD, 2PE, ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	0.39	0/2705	0.59	0/3651
1	B	0.38	0/2705	0.59	0/3651
1	C	0.39	0/2738	0.62	1/3696 (0.0%)
1	D	0.39	0/2727	0.60	0/3681
All	All	0.39	0/10875	0.60	1/14679 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	200	ARG	NE-CZ-NH2	-6.21	117.19	120.30

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2654	0	2691	31	0
1	B	2654	0	2691	33	0
1	C	2684	0	2712	25	0
1	D	2674	0	2705	25	0
2	A	44	0	26	6	0
2	B	44	0	26	12	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	44	0	26	3	0
2	D	44	0	26	4	0
3	A	61	0	79	6	0
3	B	39	0	50	3	0
3	C	17	0	21	4	0
3	D	33	0	42	5	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	2	0	0	0	0
6	A	99	0	0	1	0
6	B	81	0	0	1	0
6	C	95	0	0	1	0
6	D	81	0	0	1	0
All	All	11354	0	11095	112	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 5.

All (112) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:176:GLY:HA2	1:C:200:ARG:HH22	1.45	0.81
1:A:238:ARG:HH12	3:A:403:2PE:H151	1.47	0.80
1:C:234:LYS:HD3	3:C:402:2PE:H51	1.65	0.79
6:A:585:HOH:O	1:B:283:CYS:SG	2.43	0.77
1:A:234:LYS:HD3	3:A:403:2PE:H51	1.68	0.75
1:C:17:LYS:NZ	1:C:54:ASN:O	2.19	0.75
1:D:178:VAL:HG21	2:D:401:NAD:H6N	1.69	0.73
1:D:200:ARG:NH2	1:D:341:PRO:O	2.20	0.73
1:B:178:VAL:HG21	2:B:401:NAD:H6N	1.71	0.72
1:C:176:GLY:CA	1:C:200:ARG:HH22	2.04	0.71
1:B:151:MET:HG3	1:B:346:LYS:HD2	1.74	0.69
1:B:234:LYS:HD3	3:B:402:2PE:H51	1.75	0.68
1:B:243:GLY:HA3	2:B:401:NAD:H51A	1.76	0.67
1:A:150:ASP:OD1	2:A:401:NAD:H4N	1.93	0.67
1:A:200:ARG:NH2	1:A:341:PRO:O	2.28	0.67
1:A:178:VAL:HG21	2:A:401:NAD:H6N	1.75	0.66
1:D:234:LYS:HD3	3:D:402:2PE:H51	1.77	0.65
1:D:30:ARG:NH2	1:D:64:GLU:OE2	2.30	0.64

Continued on next page...

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:49:LEU:O	1:A:52:ARG:NH1	2.31	0.61
1:C:238:ARG:HH12	3:C:402:2PE:H151	1.66	0.60
1:D:101:GLN:HB3	1:D:294:LEU:HD23	1.83	0.60
1:B:175:ILE:HG21	1:B:207:ALA:HB2	1.84	0.59
1:C:150:ASP:OD1	2:C:401:NAD:H4N	2.03	0.59
1:D:150:ASP:OD1	2:D:401:NAD:H4N	2.04	0.58
1:C:175:ILE:HG12	1:C:198:ASP:HB2	1.85	0.57
1:B:197:VAL:HG12	2:B:401:NAD:H2A	1.85	0.57
1:B:17:LYS:NZ	1:B:54:ASN:O	2.37	0.56
1:D:19:ARG:HE	3:D:403:2PE:H91	1.69	0.56
1:D:37:CYS:HB2	1:D:60:GLU:OE2	2.05	0.55
1:B:200:ARG:NH2	2:B:401:NAD:H4B	2.21	0.54
1:B:151:MET:CG	1:B:346:LYS:HD2	2.38	0.53
1:A:51:ASP:O	1:A:52:ARG:HD2	2.10	0.52
1:C:175:ILE:HG12	1:C:198:ASP:CB	2.40	0.51
1:C:278:ARG:HD2	1:D:268:HIS:O	2.10	0.51
1:C:327:PHE:HD1	1:C:351:LEU:HD22	1.74	0.51
1:B:281:TRP:CE3	1:B:284:GLY:HA2	2.45	0.51
1:A:238:ARG:NH1	3:A:403:2PE:H151	2.21	0.50
1:A:175:ILE:HG12	1:A:198:ASP:HB2	1.94	0.50
1:B:150:ASP:OD1	2:B:401:NAD:H4N	2.12	0.50
1:C:223:ILE:HD11	1:C:251:GLN:OE1	2.12	0.50
1:B:204:VAL:HG22	1:B:215:ILE:HG21	1.94	0.50
1:C:37:CYS:HB2	1:C:60:GLU:OE2	2.12	0.50
1:C:178:VAL:HG21	2:C:401:NAD:H6N	1.95	0.49
1:A:285:MET:HE3	2:B:401:NAD:H71N	1.77	0.49
1:C:171:VAL:HG23	1:C:236:VAL:HG11	1.94	0.49
1:B:216:LEU:HD21	1:B:230:LEU:HD11	1.95	0.49
1:A:17:LYS:NZ	1:A:54:ASN:O	2.41	0.48
1:B:267:TYR:HB3	2:B:401:NAD:H1D	1.94	0.48
1:C:12:LEU:HD21	1:C:44:VAL:HG21	1.95	0.48
1:B:91:ARG:CD	3:B:403:2PE:H121	2.44	0.48
1:A:37:CYS:HB2	1:A:60:GLU:OE2	2.14	0.48
1:A:267:TYR:HB3	2:A:401:NAD:H1D	1.95	0.48
1:C:49:LEU:HB2	1:C:52:ARG:HH12	1.79	0.47
1:D:19:ARG:HH21	3:D:403:2PE:H112	1.79	0.47
1:A:281:TRP:CE3	1:A:284:GLY:HA2	2.50	0.47
1:C:49:LEU:C	1:C:52:ARG:HH12	2.18	0.47
1:A:204:VAL:HG22	1:A:215:ILE:HG21	1.96	0.46
1:B:101:GLN:HB3	1:B:294:LEU:HD23	1.97	0.46
1:C:49:LEU:CB	1:C:52:ARG:HH12	2.29	0.46

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:243:GLY:HA3	2:C:401:NAD:H51A	1.98	0.46
1:D:171:VAL:HG22	1:D:195:ILE:HB	1.98	0.46
1:A:175:ILE:HG21	1:A:207:ALA:HB2	1.98	0.46
1:D:4:PHE:HE2	1:D:334:LEU:HD23	1.80	0.46
1:B:37:CYS:HB2	1:B:60:GLU:OE2	2.16	0.46
1:A:210:TYR:OH	1:A:318:LYS:HB2	2.16	0.45
1:C:238:ARG:HH12	3:C:402:2PE:C15	2.27	0.45
1:C:281:TRP:CE3	1:C:284:GLY:HA2	2.51	0.45
1:C:175:ILE:HD12	1:C:207:ALA:HB2	1.99	0.45
1:A:171:VAL:HG23	1:A:236:VAL:HG11	1.99	0.45
1:A:278:ARG:HD2	1:B:268:HIS:O	2.17	0.44
1:A:285:MET:CE	2:B:401:NAD:H71N	2.30	0.44
1:A:323:VAL:HG21	3:A:402:2PE:H202	1.99	0.44
1:C:151:MET:HG3	1:C:346:LYS:HD2	1.99	0.44
1:D:282:GLY:HA3	1:D:286:ALA:HB2	1.99	0.44
1:D:7:LEU:O	1:D:53:LYS:HA	2.19	0.43
1:B:137:PRO:HG3	1:B:306:ARG:HD2	2.00	0.43
1:A:268:HIS:O	1:B:278:ARG:HD2	2.18	0.43
1:B:238:ARG:HH12	3:B:402:2PE:C15	2.32	0.43
1:B:228:MET:CE	1:B:255:MET:HA	2.48	0.43
1:B:178:VAL:HG21	2:B:401:NAD:C6N	2.45	0.43
1:D:241:MET:HB3	1:D:241:MET:HE2	1.89	0.43
1:A:223:ILE:HD12	1:A:223:ILE:HA	1.89	0.43
1:D:6:MET:HB2	1:D:57:LEU:HD21	2.01	0.43
1:D:17:LYS:HZ3	1:D:117:ASP:CG	2.22	0.43
3:C:402:2PE:H111	1:D:97:ALA:CB	2.48	0.42
1:D:238:ARG:HH12	3:D:402:2PE:H141	1.84	0.42
1:D:264:ASN:O	1:D:292:GLY:HA2	2.19	0.42
1:C:204:VAL:HG22	1:C:215:ILE:HG21	2.01	0.42
1:A:267:TYR:CB	2:A:401:NAD:H1D	2.50	0.42
1:B:154:THR:HG21	2:B:401:NAD:C5N	2.49	0.42
1:D:8:GLY:HA2	1:D:52:ARG:O	2.20	0.42
1:D:267:TYR:HB3	2:D:401:NAD:H1D	2.01	0.42
1:A:317:SER:HB2	3:A:402:2PE:H152	2.01	0.42
1:B:223:ILE:HD11	1:B:251:GLN:OE1	2.19	0.42
1:B:171:VAL:HG23	1:B:236:VAL:HG11	2.02	0.42
3:A:404:2PE:H181	6:C:570:HOH:O	2.19	0.42
1:B:267:TYR:HB3	2:B:401:NAD:O2D	2.20	0.42
1:D:267:TYR:HB3	2:D:401:NAD:O2D	2.19	0.41
1:A:22:ALA:HB2	1:A:28:ILE:HG12	2.01	0.41
1:A:243:GLY:HA3	2:A:401:NAD:H51A	2.01	0.41

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:264:ASN:O	1:A:292:GLY:HA2	2.20	0.41
1:B:175:ILE:HD12	1:B:175:ILE:HG23	1.87	0.41
1:A:157:HIS:HA	1:A:160:GLU:OE1	2.21	0.41
1:B:267:TYR:CB	2:B:401:NAD:H1D	2.50	0.41
1:A:267:TYR:HB3	2:A:401:NAD:O2D	2.20	0.41
1:C:102:HIS:CE1	1:D:286:ALA:HA	2.55	0.41
1:B:157:HIS:CG	1:B:296:PRO:HD3	2.56	0.41
1:B:175:ILE:HD12	1:B:183:ILE:HD11	2.02	0.41
1:A:285:MET:HE2	6:B:564:HOH:O	2.20	0.41
3:D:402:2PE:H112	6:D:542:HOH:O	2.20	0.41
1:D:94:GLU:HB2	1:D:103:SER:HA	2.02	0.40
1:B:157:HIS:HA	1:B:160:GLU:OE1	2.22	0.40

There are no symmetry-related clashes.

## 5.3 Torsion angles [i](#)

### 5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	350/355 (99%)	336 (96%)	14 (4%)	0	100	100
1	B	350/355 (99%)	335 (96%)	15 (4%)	0	100	100
1	C	353/355 (99%)	338 (96%)	15 (4%)	0	100	100
1	D	352/355 (99%)	338 (96%)	14 (4%)	0	100	100
All	All	1405/1420 (99%)	1347 (96%)	58 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar

resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	281/284 (99%)	280 (100%)	1 (0%)	91	96
1	B	281/284 (99%)	279 (99%)	2 (1%)	84	91
1	C	284/284 (100%)	282 (99%)	2 (1%)	84	91
1	D	283/284 (100%)	281 (99%)	2 (1%)	84	91
All	All	1129/1136 (99%)	1122 (99%)	7 (1%)	86	93

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	267	TYR
1	B	267	TYR
1	B	281	TRP
1	C	270	SER
1	C	281	TRP
1	D	267	TYR
1	D	296	PRO

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 18 ligands modelled in this entry, 6 are monoatomic - leaving 12 for Mogul analysis.



In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	2PE	A	404	-	21,21,27	0.45	0	20,20,26	0.44	0
3	2PE	D	402	-	16,16,27	0.51	0	15,15,26	0.38	0
3	2PE	A	402	5	21,21,27	0.59	0	20,20,26	0.61	0
3	2PE	C	402	-	16,16,27	0.47	0	15,15,26	0.52	0
3	2PE	D	403	-	15,15,27	0.45	0	14,14,26	0.43	0
2	NAD	D	401	-	42,48,48	0.89	1 (2%)	50,73,73	1.36	6 (12%)
3	2PE	B	403	-	21,21,27	0.40	0	20,20,26	0.76	0
3	2PE	B	402	-	16,16,27	0.45	0	15,15,26	0.45	0
3	2PE	A	403	-	16,16,27	0.47	0	15,15,26	0.48	0
2	NAD	B	401	4	42,48,48	0.91	2 (4%)	50,73,73	1.30	7 (14%)
2	NAD	A	401	5,4	42,48,48	0.84	1 (2%)	50,73,73	1.31	7 (14%)
2	NAD	C	401	-	42,48,48	0.92	3 (7%)	50,73,73	1.52	7 (14%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	2PE	A	404	-	-	6/19/19/25	-
3	2PE	D	402	-	-	7/14/14/25	-
3	2PE	A	402	5	-	8/19/19/25	-
3	2PE	C	402	-	-	8/14/14/25	-
3	2PE	D	403	-	-	8/13/13/25	-
2	NAD	D	401	-	-	6/26/62/62	0/5/5/5
3	2PE	B	403	-	-	9/19/19/25	-
3	2PE	B	402	-	-	6/14/14/25	-
3	2PE	A	403	-	-	8/14/14/25	-
2	NAD	B	401	4	-	12/26/62/62	0/5/5/5
2	NAD	A	401	5,4	-	9/26/62/62	0/5/5/5
2	NAD	C	401	-	-	9/26/62/62	0/5/5/5

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	401	NAD	C5A-C4A	2.67	1.48	1.40
2	D	401	NAD	C5A-C4A	2.61	1.47	1.40
2	A	401	NAD	C5A-C4A	2.53	1.47	1.40
2	C	401	NAD	C5A-C4A	2.29	1.47	1.40
2	C	401	NAD	C2B-C1B	-2.26	1.50	1.53
2	C	401	NAD	C2B-C3B	-2.20	1.47	1.53
2	B	401	NAD	O4D-C1D	2.08	1.44	1.41

All (27) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	401	NAD	N3A-C2A-N1A	-4.02	122.39	128.68
2	D	401	NAD	C3N-C7N-N7N	3.68	122.17	117.75
2	A	401	NAD	C3D-C2D-C1D	3.40	106.09	100.98
2	C	401	NAD	C3D-C2D-C1D	3.38	106.07	100.98
2	A	401	NAD	N3A-C2A-N1A	-3.28	123.55	128.68
2	C	401	NAD	C3B-C2B-C1B	-3.19	96.18	100.98
2	C	401	NAD	O3B-C3B-C2B	-3.08	101.86	111.82
2	B	401	NAD	C4A-C5A-N7A	-3.02	106.25	109.40
2	D	401	NAD	C4A-C5A-N7A	-3.01	106.26	109.40
2	D	401	NAD	N3A-C2A-N1A	-3.00	123.99	128.68
2	C	401	NAD	O3B-C3B-C4B	-2.97	102.46	111.05
2	B	401	NAD	C3D-C2D-C1D	2.92	105.38	100.98
2	C	401	NAD	C1B-N9A-C4A	-2.92	121.52	126.64
2	A	401	NAD	C4A-C5A-N7A	-2.87	106.41	109.40
2	B	401	NAD	N3A-C2A-N1A	-2.75	124.37	128.68
2	B	401	NAD	C3N-C7N-N7N	2.74	121.03	117.75
2	B	401	NAD	C3B-C2B-C1B	2.72	105.07	100.98
2	D	401	NAD	C3B-C2B-C1B	2.59	104.88	100.98
2	D	401	NAD	C3D-C2D-C1D	2.53	104.78	100.98
2	C	401	NAD	C2A-N1A-C6A	2.38	122.82	118.75
2	B	401	NAD	PN-O3-PA	-2.21	125.23	132.83
2	A	401	NAD	C2N-C3N-C7N	2.12	125.62	119.46
2	A	401	NAD	C1B-N9A-C4A	-2.07	123.01	126.64
2	D	401	NAD	C2N-C3N-C7N	2.07	125.46	119.46
2	A	401	NAD	C4N-C3N-C7N	-2.05	115.55	121.04
2	A	401	NAD	C2N-N1N-C1D	2.02	123.63	119.14
2	B	401	NAD	C2N-N1N-C1D	2.01	123.61	119.14

There are no chirality outliers.

All (96) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	NAD	C2N-C3N-C7N-O7N
2	A	401	NAD	C2N-C3N-C7N-N7N
2	B	401	NAD	C5D-O5D-PN-O2N
2	B	401	NAD	C2N-C3N-C7N-O7N
2	B	401	NAD	C2N-C3N-C7N-N7N
2	C	401	NAD	C5D-O5D-PN-O2N
2	B	401	NAD	C4N-C3N-C7N-N7N
2	B	401	NAD	C4N-C3N-C7N-O7N
2	A	401	NAD	C4N-C3N-C7N-O7N
2	A	401	NAD	C4N-C3N-C7N-N7N
2	B	401	NAD	O4B-C4B-C5B-O5B
2	B	401	NAD	O4D-C4D-C5D-O5D
3	D	403	2PE	O7-C8-C9-O10
3	D	402	2PE	O7-C8-C9-O10
3	D	402	2PE	O10-C11-C12-O13
3	C	402	2PE	O4-C5-C6-O7
3	A	402	2PE	O7-C8-C9-O10
3	B	402	2PE	O10-C11-C12-O13
3	A	402	2PE	O13-C14-C15-O16
3	D	402	2PE	O4-C5-C6-O7
2	C	401	NAD	O4D-C4D-C5D-O5D
2	C	401	NAD	C3D-C4D-C5D-O5D
3	B	403	2PE	O19-C20-C21-O22
3	B	403	2PE	O16-C17-C18-O19
3	A	404	2PE	O19-C20-C21-O22
3	D	403	2PE	C12-C11-O10-C9
3	D	403	2PE	O13-C14-C15-O16
3	B	403	2PE	O7-C8-C9-O10
2	C	401	NAD	O4B-C4B-C5B-O5B
3	C	402	2PE	O10-C11-C12-O13
2	A	401	NAD	O4B-C4B-C5B-O5B
2	A	401	NAD	O4D-C4D-C5D-O5D
2	D	401	NAD	O4B-C4B-C5B-O5B
3	B	402	2PE	O1-C2-C3-O4
3	D	403	2PE	O1-C2-C3-O4
2	D	401	NAD	C3B-C4B-C5B-O5B
3	A	403	2PE	O13-C14-C15-O16
2	C	401	NAD	PN-O3-PA-O1A
2	D	401	NAD	PN-O3-PA-O1A
2	A	401	NAD	C3D-C4D-C5D-O5D
2	B	401	NAD	C3B-C4B-C5B-O5B
2	B	401	NAD	C3D-C4D-C5D-O5D
2	C	401	NAD	C3B-C4B-C5B-O5B

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms
2	D	401	NAD	O4D-C4D-C5D-O5D
3	B	402	2PE	C14-C15-O16-C17
2	B	401	NAD	C4B-C5B-O5B-PA
2	A	401	NAD	C3B-C4B-C5B-O5B
3	A	402	2PE	O19-C20-C21-O22
3	D	402	2PE	C15-C14-O13-C12
3	B	403	2PE	C6-C5-O4-C3
3	A	404	2PE	C6-C5-O4-C3
3	A	404	2PE	C15-C14-O13-C12
3	B	403	2PE	C11-C12-O13-C14
3	D	402	2PE	C11-C12-O13-C14
3	C	402	2PE	C12-C11-O10-C9
3	D	402	2PE	C5-C6-O7-C8
3	A	402	2PE	C5-C6-O7-C8
3	B	403	2PE	C9-C8-O7-C6
3	D	402	2PE	C12-C11-O10-C9
2	B	401	NAD	C5D-O5D-PN-O3
2	C	401	NAD	C5D-O5D-PN-O3
2	A	401	NAD	PN-O3-PA-O2A
2	B	401	NAD	C5D-O5D-PN-O1N
2	C	401	NAD	C5D-O5D-PN-O1N
3	D	403	2PE	C8-C9-O10-C11
2	D	401	NAD	C3D-C4D-C5D-O5D
3	A	403	2PE	O1-C2-C3-O4
3	A	403	2PE	C15-C14-O13-C12
3	D	403	2PE	C15-C14-O13-C12
3	D	403	2PE	C6-C5-O4-C3
3	A	403	2PE	O10-C11-C12-O13
3	B	402	2PE	C12-C11-O10-C9
3	B	402	2PE	O13-C14-C15-O16
3	C	402	2PE	C2-C3-O4-C5
3	C	402	2PE	C15-C14-O13-C12
2	C	401	NAD	PN-O3-PA-O2A
2	D	401	NAD	PN-O3-PA-O2A
3	B	403	2PE	O10-C11-C12-O13
3	A	403	2PE	C14-C15-O16-C17
3	A	403	2PE	C12-C11-O10-C9
3	A	403	2PE	C11-C12-O13-C14
3	B	402	2PE	C15-C14-O13-C12
3	B	403	2PE	C5-C6-O7-C8
3	A	402	2PE	C12-C11-O10-C9
3	A	402	2PE	O4-C5-C6-O7

*Continued on next page...*

*Continued from previous page...*

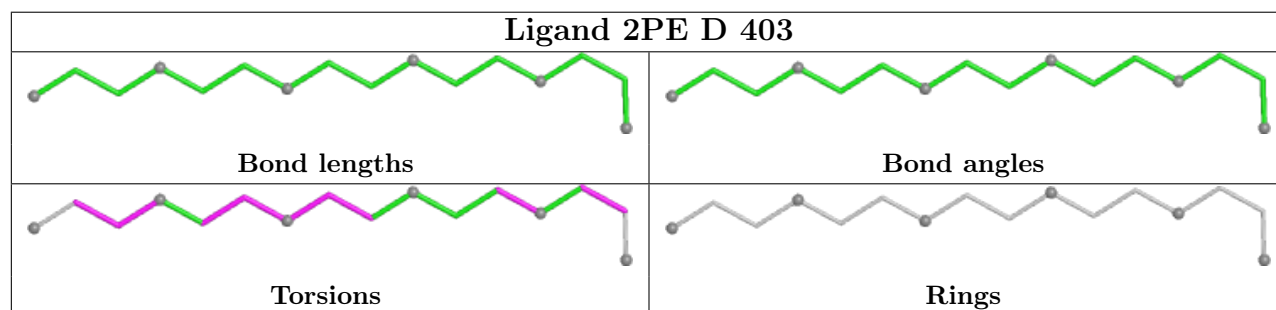
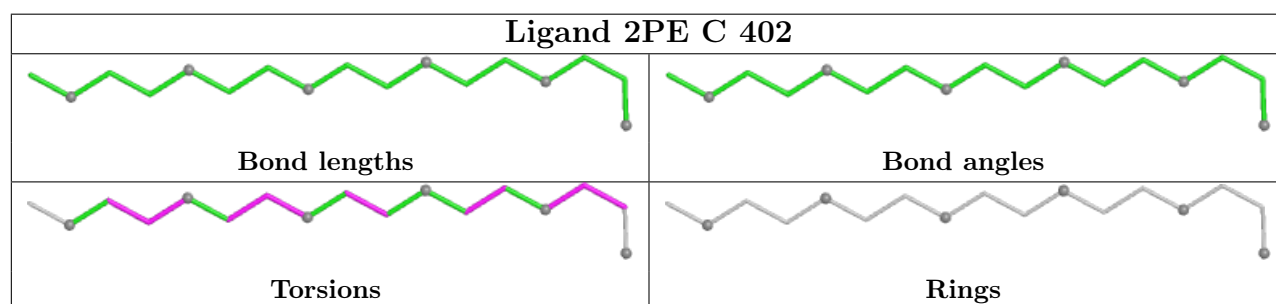
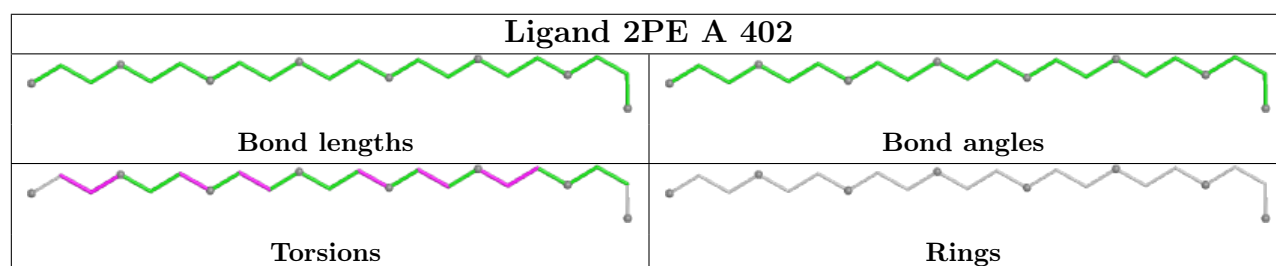
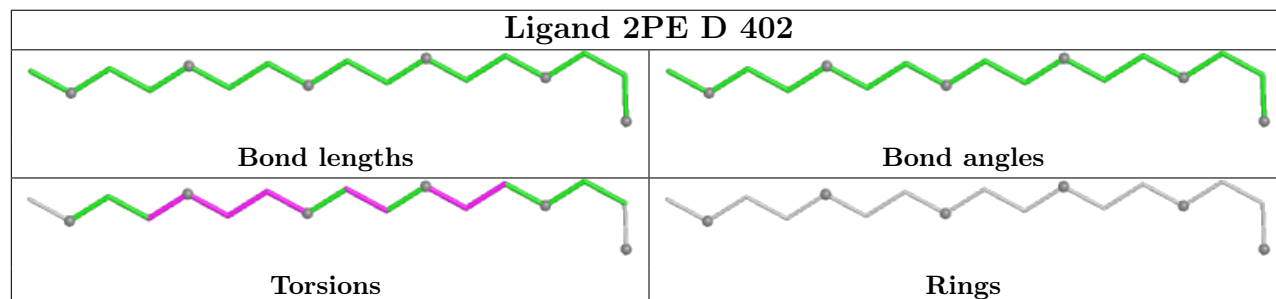
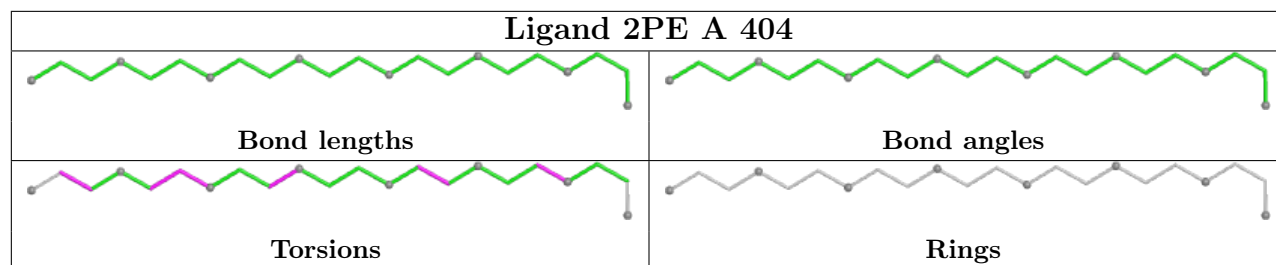
Mol	Chain	Res	Type	Atoms
3	C	402	2PE	O1-C2-C3-O4
3	A	404	2PE	C18-C17-O16-C15
3	A	402	2PE	C18-C17-O16-C15
3	A	404	2PE	O16-C17-C18-O19
3	A	403	2PE	O4-C5-C6-O7
3	A	404	2PE	O7-C8-C9-O10
3	B	403	2PE	C12-C11-O10-C9
3	D	403	2PE	O10-C11-C12-O13
3	C	402	2PE	O7-C8-C9-O10
3	C	402	2PE	O13-C14-C15-O16
3	A	402	2PE	C21-C20-O19-C18

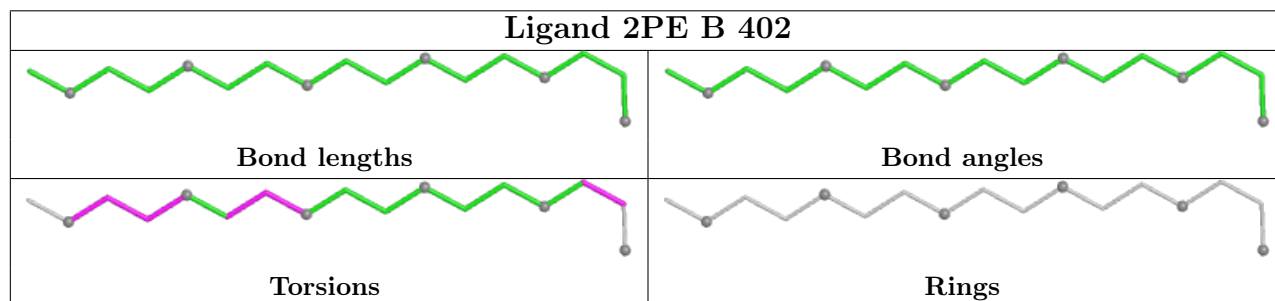
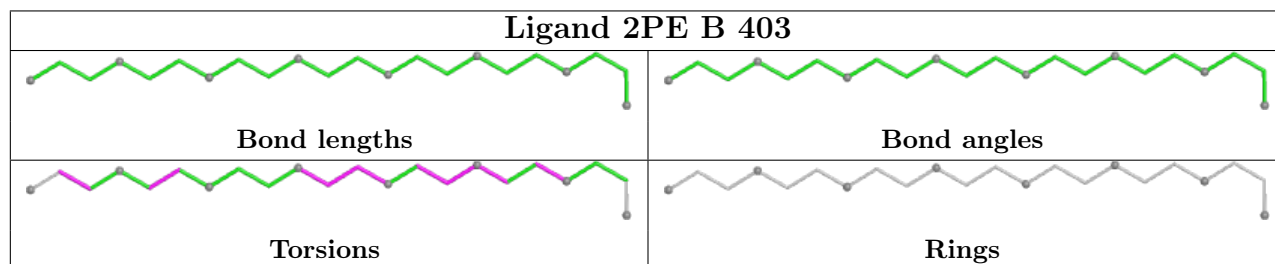
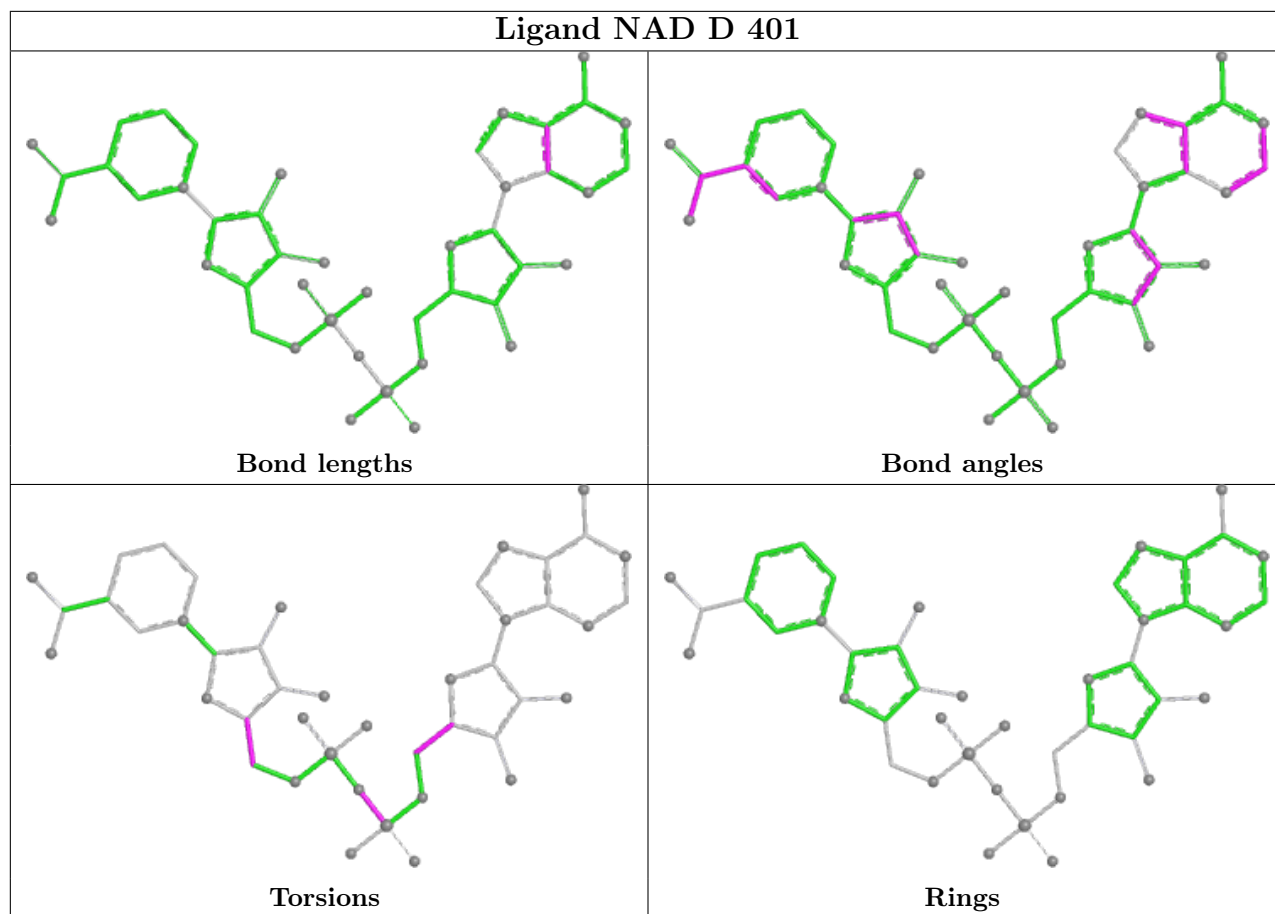
There are no ring outliers.

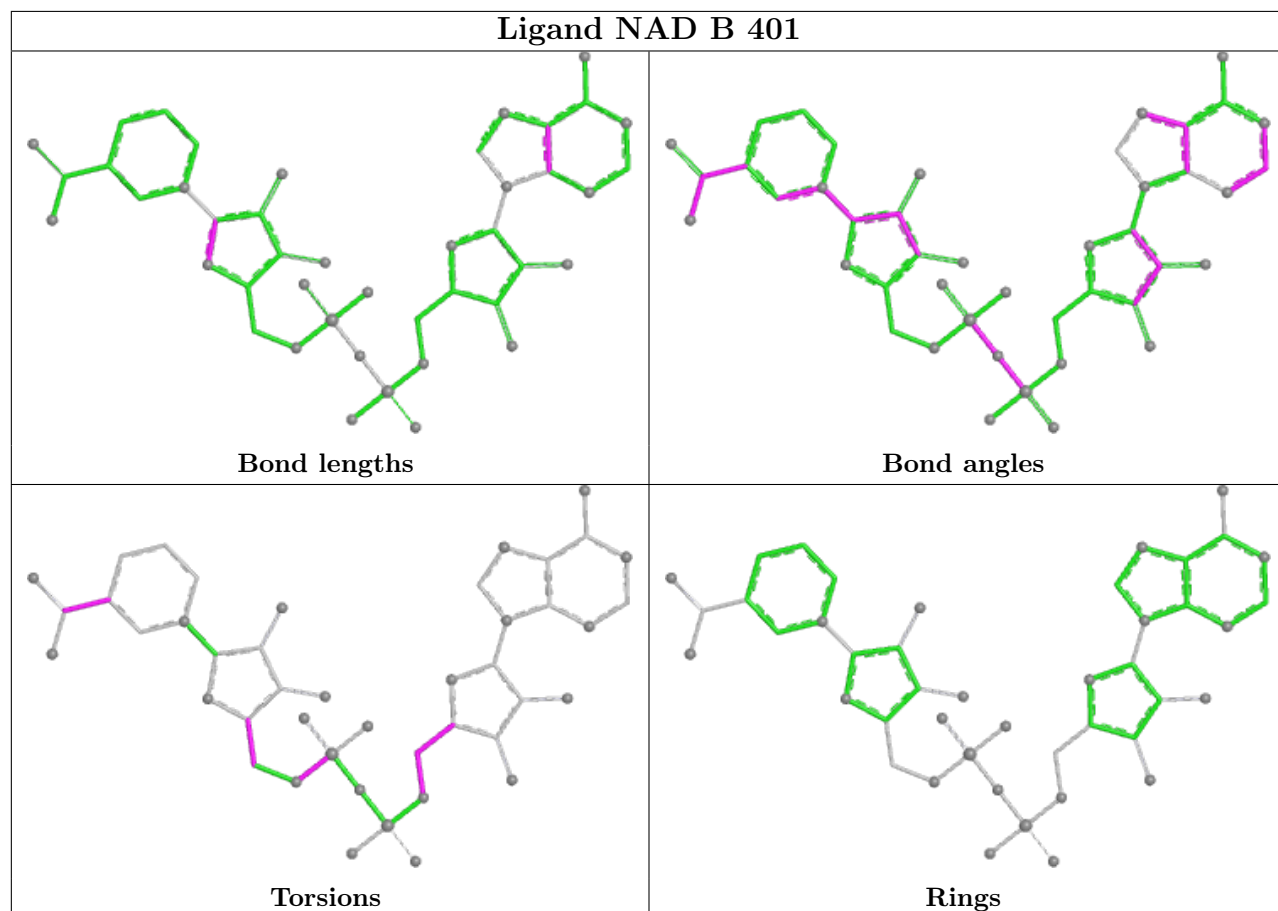
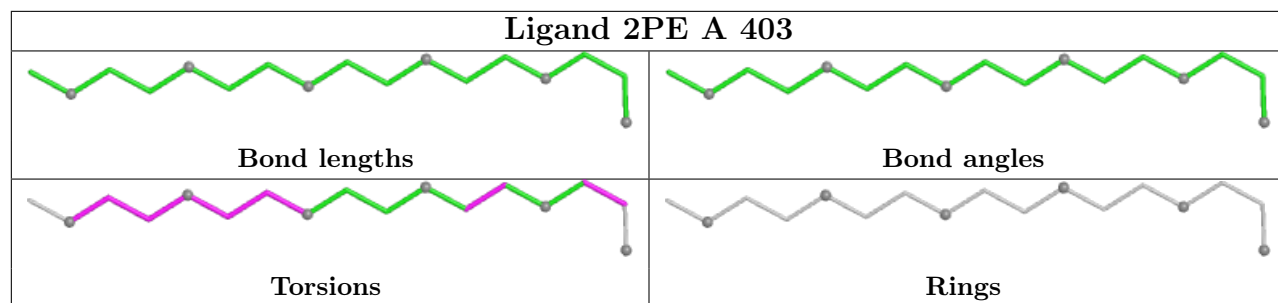
12 monomers are involved in 43 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	404	2PE	1	0
3	D	402	2PE	3	0
3	A	402	2PE	2	0
3	C	402	2PE	4	0
3	D	403	2PE	2	0
2	D	401	NAD	4	0
3	B	403	2PE	1	0
3	B	402	2PE	2	0
3	A	403	2PE	3	0
2	B	401	NAD	12	0
2	A	401	NAD	6	0
2	C	401	NAD	3	0

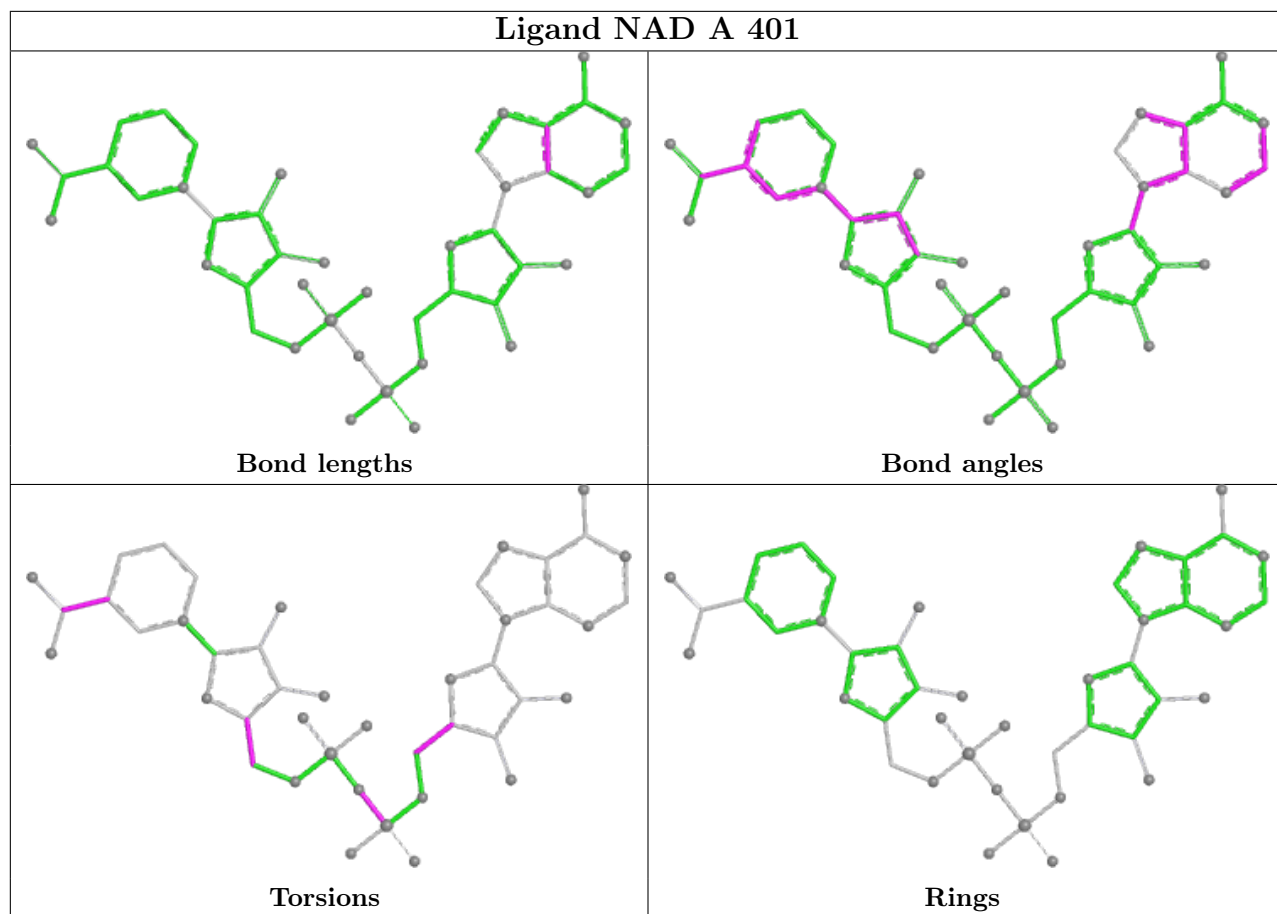
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

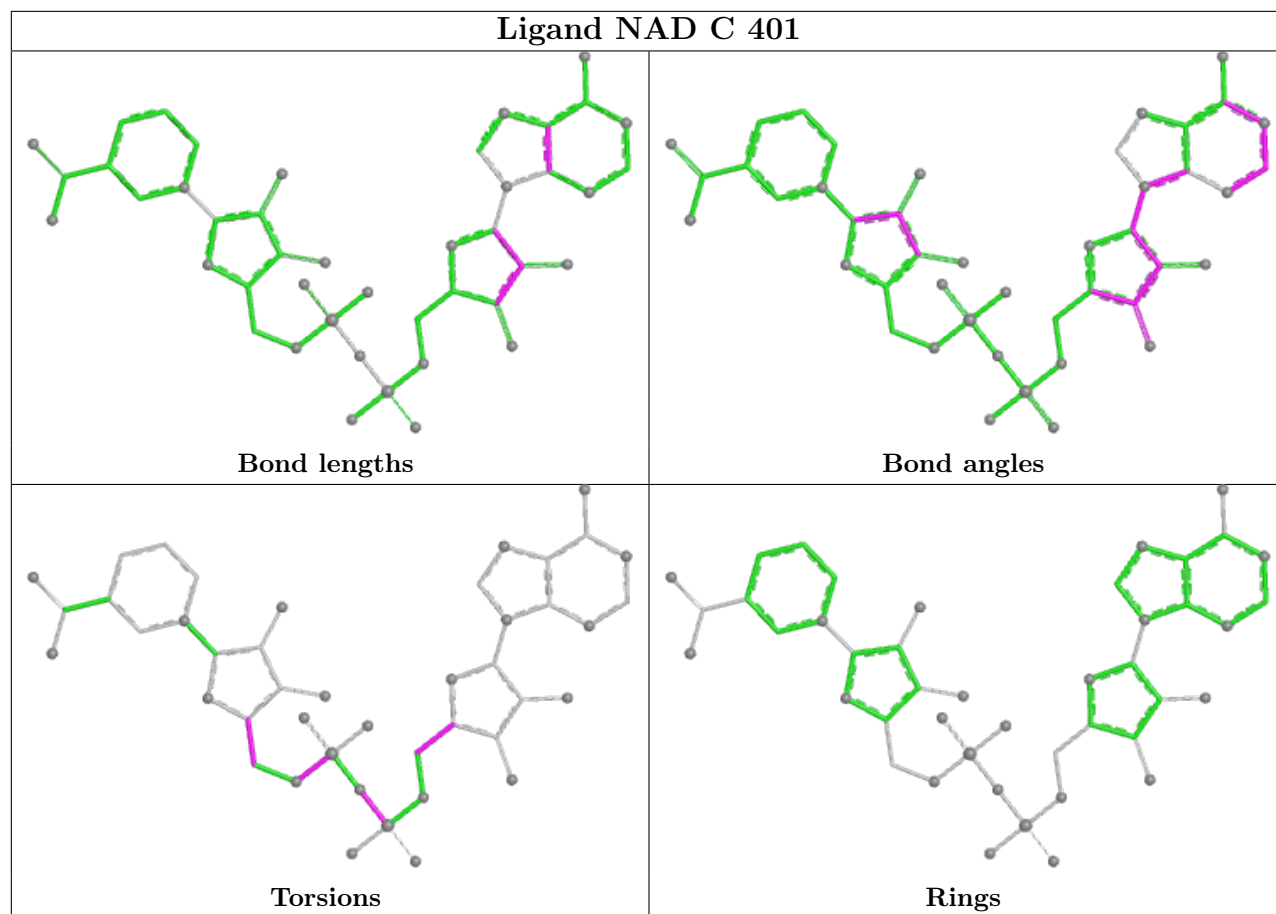












## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95<sup>th</sup> percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	A	352/355 (99%)	0.11	15 (4%) 35 33	25, 38, 74, 113	0
1	B	352/355 (99%)	0.17	15 (4%) 35 33	24, 40, 72, 104	0
1	C	355/355 (100%)	0.17	22 (6%) 20 19	23, 36, 76, 149	0
1	D	354/355 (99%)	-0.03	7 (1%) 65 63	24, 40, 72, 90	0
All	All	1413/1420 (99%)	0.11	59 (4%) 36 34	23, 39, 75, 149	0

All (59) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	48	ALA	14.5
1	C	50	GLY	11.6
1	C	9	ILE	6.3
1	C	342	LYS	4.9
1	C	51	ASP	4.2
1	D	9	ILE	3.9
1	C	52	ARG	3.9
1	C	47	GLY	3.8
1	B	21	VAL	3.7
1	A	199	TYR	3.7
1	C	219	LYS	3.7
1	B	15	ILE	3.5
1	C	327	PHE	3.4
1	C	49	LEU	3.4
1	C	328	ASP	3.3
1	B	7	LEU	3.2
1	C	343	ASP	3.1
1	D	8	GLY	3.1
1	B	16	GLU	3.1
1	B	335	LEU	3.1
1	B	1	MET	3.0

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	327	PHE	3.0
1	C	341	PRO	3.0
1	B	12	LEU	2.9
1	C	340	LYS	2.7
1	A	339	ASP	2.7
1	D	342	LYS	2.6
1	A	342	LYS	2.6
1	A	271	GLY	2.6
1	B	51	ASP	2.5
1	D	335	LEU	2.5
1	C	222	HIS	2.5
1	C	339	ASP	2.5
1	B	2	LYS	2.5
1	D	11	LYS	2.4
1	A	328	ASP	2.4
1	C	42	HIS	2.4
1	A	219	LYS	2.4
1	C	200	ARG	2.4
1	A	15	ILE	2.3
1	B	11	LYS	2.3
1	A	10	ASN	2.3
1	A	335	LEU	2.3
1	A	7	LEU	2.2
1	D	339	ASP	2.2
1	A	3	GLY	2.2
1	A	12	LEU	2.2
1	A	45	PHE	2.2
1	C	11	LYS	2.2
1	C	338	LYS	2.1
1	B	328	ASP	2.1
1	D	199	TYR	2.1
1	B	14	TRP	2.1
1	C	225	ASP	2.1
1	C	7	LEU	2.1
1	B	53	LYS	2.0
1	A	16	GLU	2.0
1	B	219	LYS	2.0
1	A	9	ILE	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

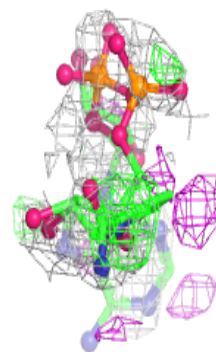
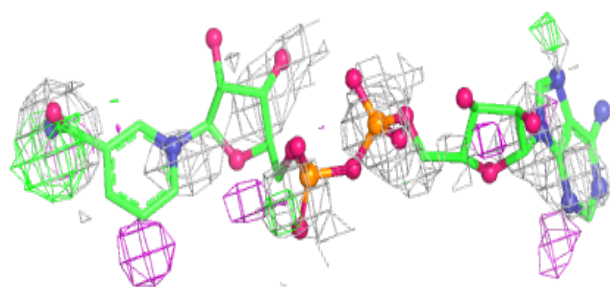
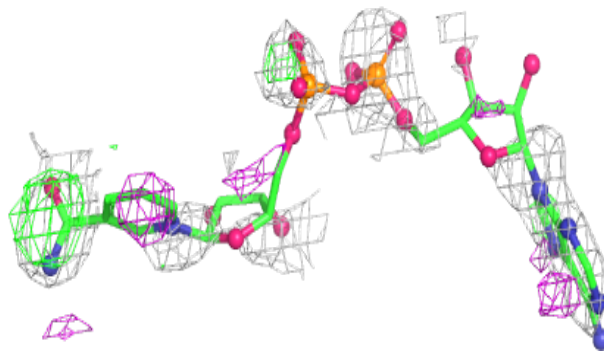
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
2	NAD	B	401	44/44	0.61	0.56	62,110,123,124	44
2	NAD	C	401	44/44	0.61	0.38	51,90,114,119	44
2	NAD	A	401	44/44	0.67	0.32	45,90,111,114	44
2	NAD	D	401	44/44	0.76	0.26	57,74,85,87	44
3	2PE	D	402	17/28	0.80	0.27	50,61,83,85	0
3	2PE	C	402	17/28	0.84	0.24	41,57,78,80	0
3	2PE	B	402	17/28	0.85	0.25	45,61,74,75	0
3	2PE	B	403	22/28	0.86	0.24	48,75,85,87	0
3	2PE	A	403	17/28	0.86	0.22	49,60,84,84	0
3	2PE	A	402	22/28	0.86	0.19	29,48,79,81	0
3	2PE	A	404	22/28	0.88	0.22	43,76,90,92	0
3	2PE	D	403	16/28	0.89	0.20	58,66,78,79	0
5	MG	A	407	1/1	0.90	0.13	76,76,76,76	0
5	MG	A	406	1/1	0.97	0.13	39,39,39,39	0
4	ZN	C	403	1/1	0.99	0.07	48,48,48,48	0
4	ZN	D	404	1/1	0.99	0.09	44,44,44,44	0
4	ZN	A	405	1/1	1.00	0.09	40,40,40,40	0
4	ZN	B	404	1/1	1.00	0.09	45,45,45,45	0

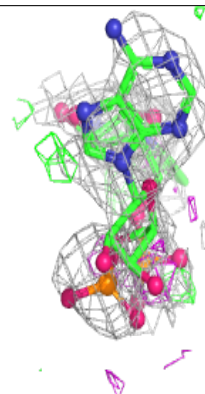
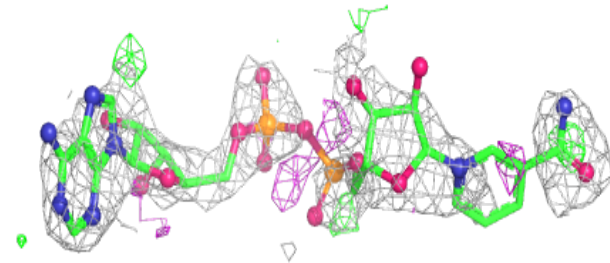
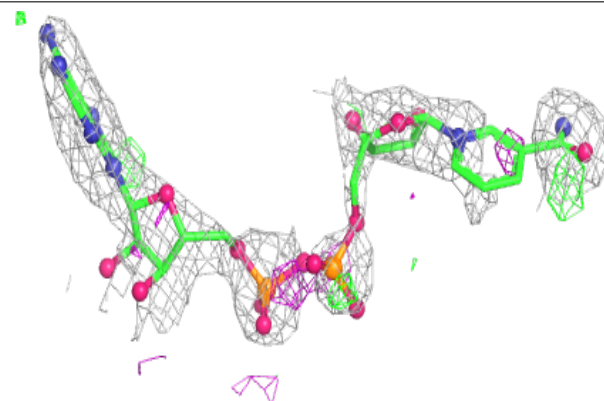
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

**Electron density around NAD B 401:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

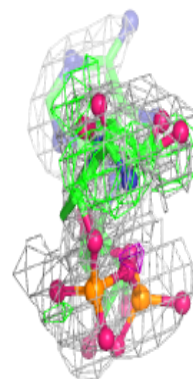
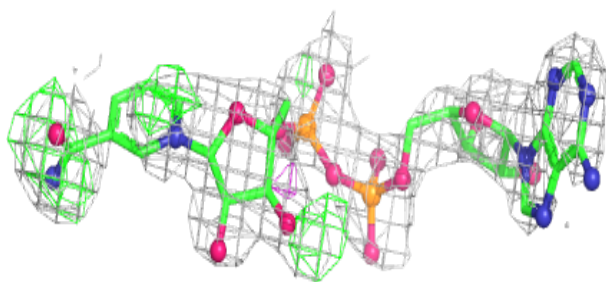
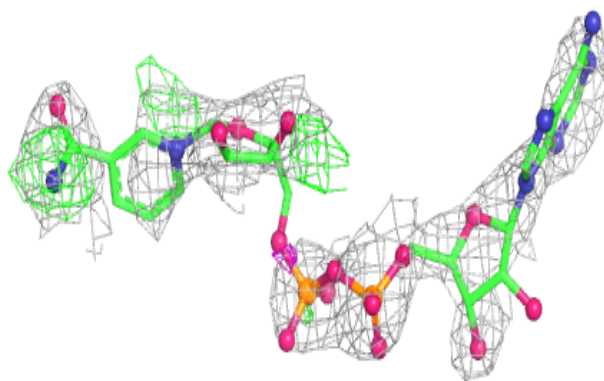
**Electron density around NAD C 401:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

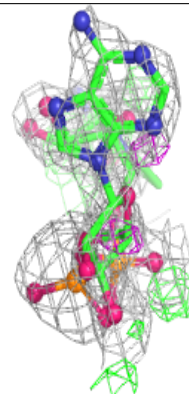
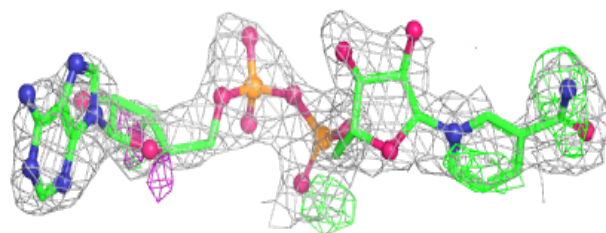
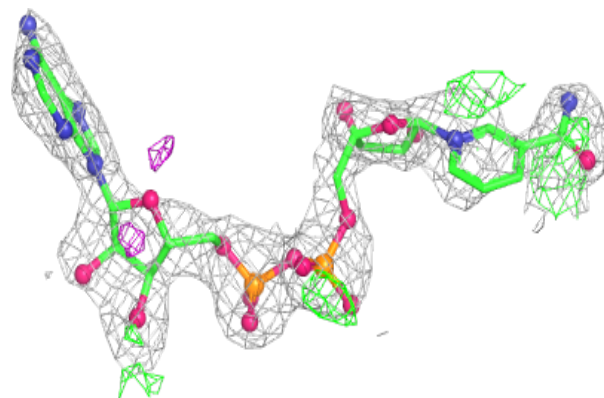


**Electron density around NAD A 401:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around NAD D 401:**

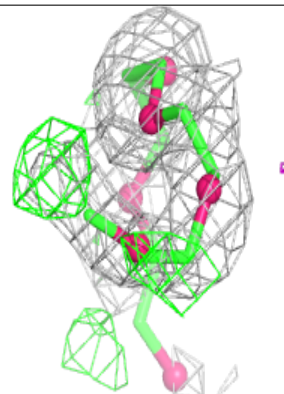
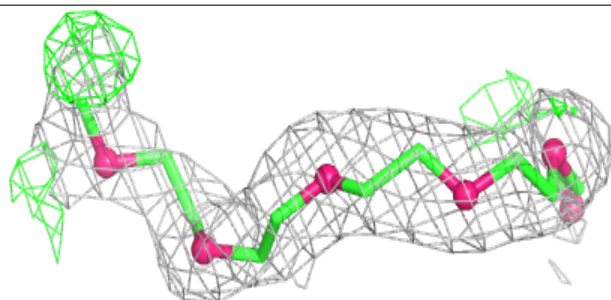
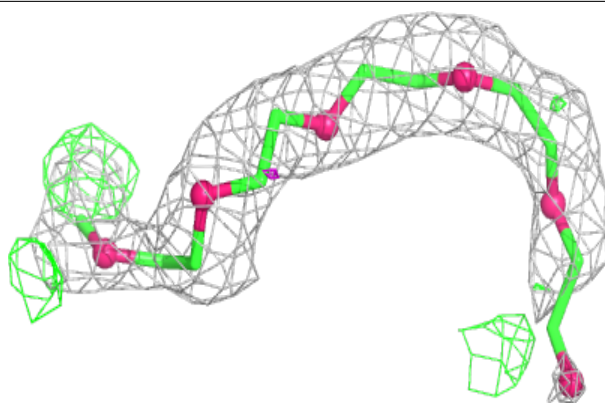
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



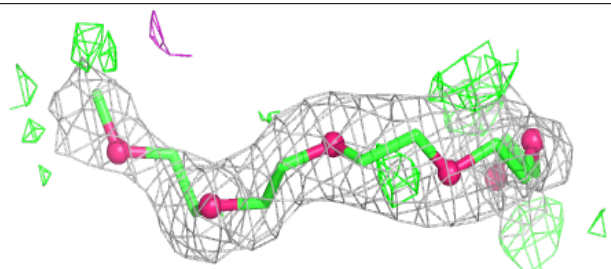
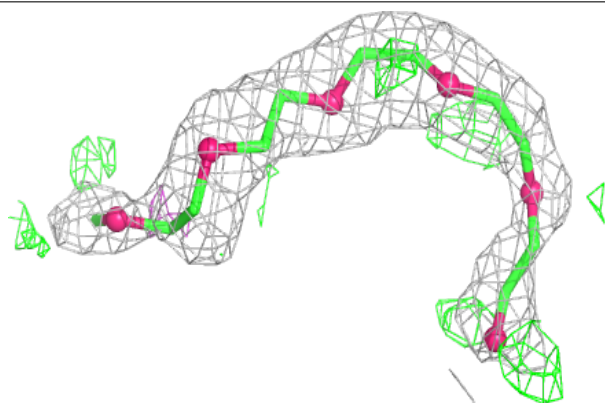


**Electron density around 2PE D 402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around 2PE C 402:**

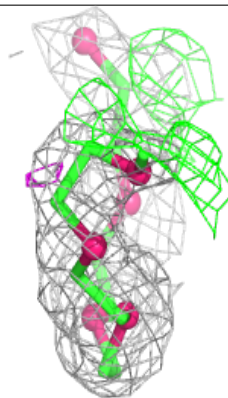
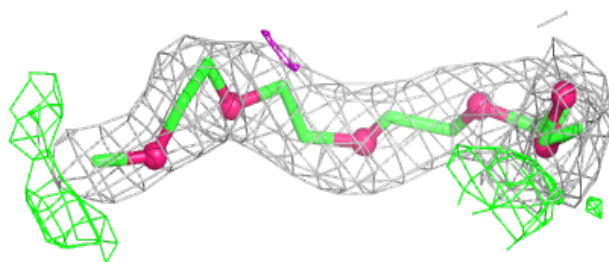
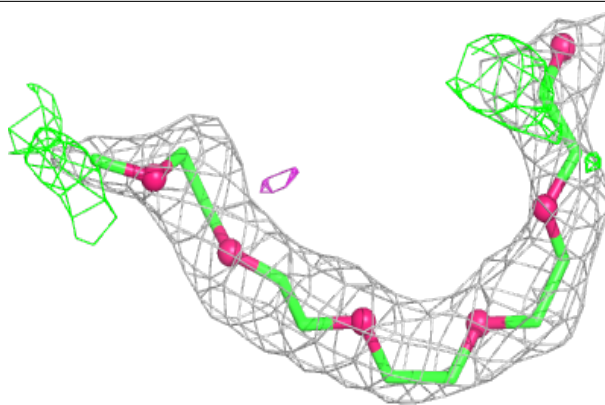
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



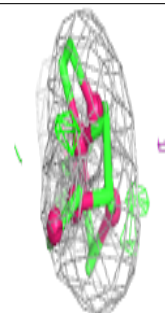
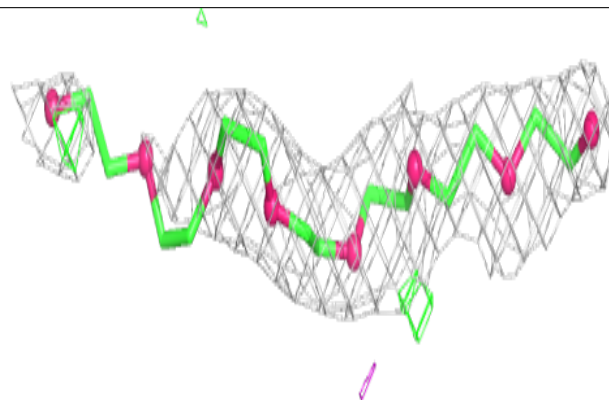
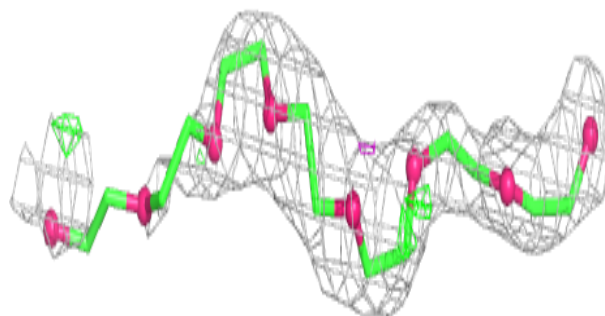


**Electron density around 2PE B 402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

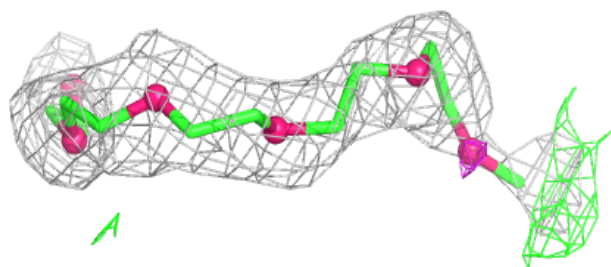
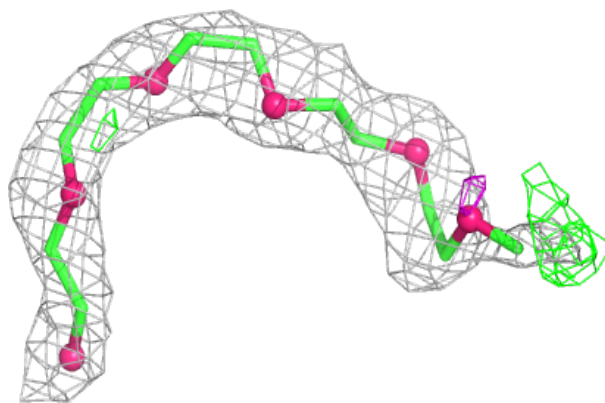
**Electron density around 2PE B 403:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

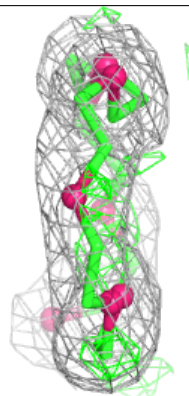
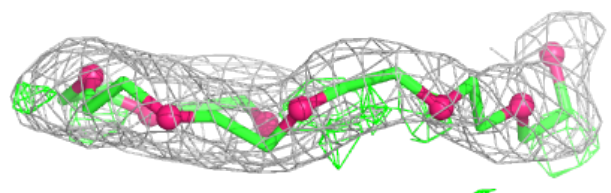


**Electron density around 2PE A 403:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

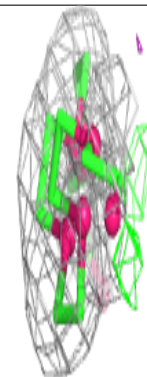
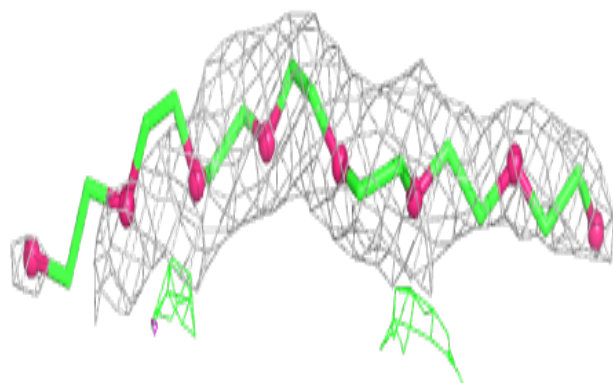
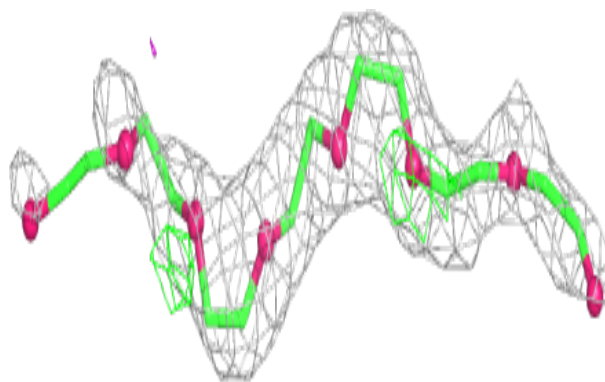
**Electron density around 2PE A 402:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

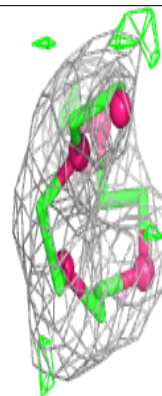
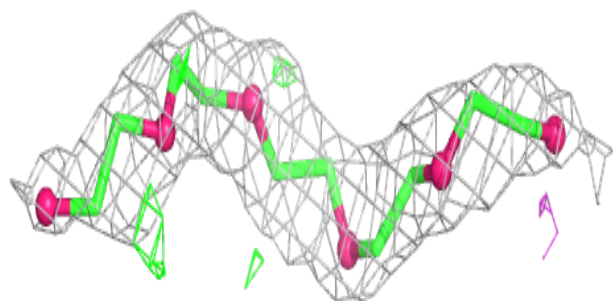
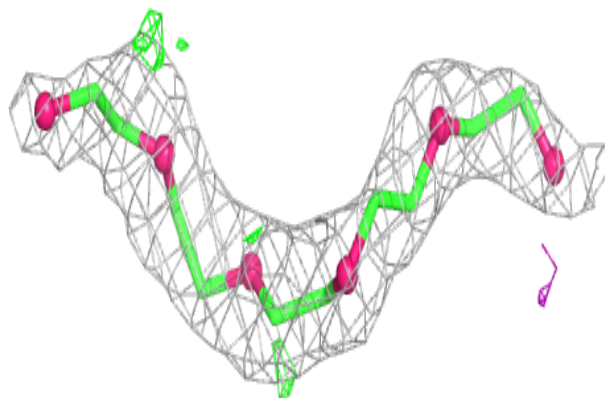


**Electron density around 2PE A 404:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)

**Electron density around 2PE D 403:**

$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



## 6.5 Other polymers [i](#)

There are no such residues in this entry.