



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 10:02 AM UTC

PDB ID : 4TLZ / pdb_00004tlz
Title : Kutzneria sp. 744 ornithine N-hydroxylase, KtzI-FADox-NADP⁺-L-orn
Authors : Setser, J.W.; Drennan, C.L.
Deposited on : 2014-05-30
Resolution : 2.41 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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

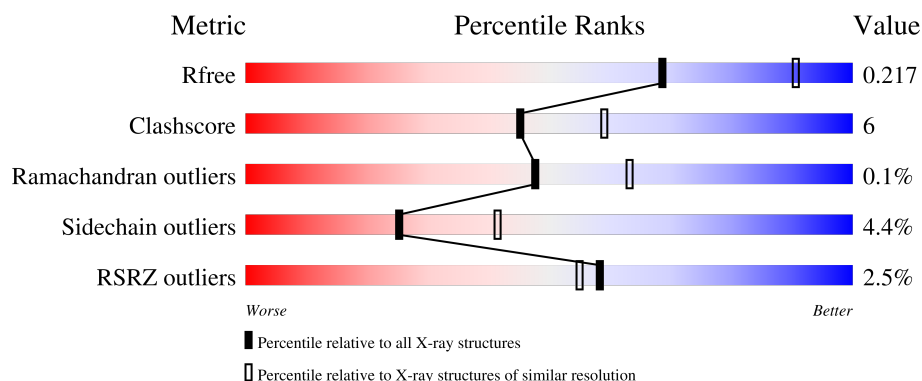
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.41 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}	180053	6062 (2.44-2.40)
Clashscore	190562	6562 (2.44-2.40)
Ramachandran outliers	187476	6481 (2.44-2.40)
Sidechain outliers	187428	6482 (2.44-2.40)
RSRZ outliers	180081	6066 (2.44-2.40)

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 ≥ 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	443	2% 81% 12% 6%
1	B	443	2% 78% 14% 6%
1	C	443	4% 79% 12% 6%
1	D	443	0% 78% 14% 6%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 13905 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 KtzI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	415	Total	C	N	O	S	0	0	0
			3216	2019	573	614	10			
1	B	415	Total	C	N	O	S	0	0	0
			3234	2029	586	609	10			
1	C	415	Total	C	N	O	S	0	0	0
			3199	2011	570	608	10			
1	D	415	Total	C	N	O	S	0	0	0
			3222	2022	576	614	10			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-18	MET	-	initiating methionine	UNP A8CF85
A	-17	GLY	-	expression tag	UNP A8CF85
A	-16	SER	-	expression tag	UNP A8CF85
A	-15	SER	-	expression tag	UNP A8CF85
A	-14	HIS	-	expression tag	UNP A8CF85
A	-13	HIS	-	expression tag	UNP A8CF85
A	-12	HIS	-	expression tag	UNP A8CF85
A	-11	HIS	-	expression tag	UNP A8CF85
A	-10	HIS	-	expression tag	UNP A8CF85
A	-9	HIS	-	expression tag	UNP A8CF85
A	-8	SER	-	expression tag	UNP A8CF85
A	-7	SER	-	expression tag	UNP A8CF85
A	-6	GLY	-	expression tag	UNP A8CF85
A	-5	LEU	-	expression tag	UNP A8CF85
A	-4	VAL	-	expression tag	UNP A8CF85
A	-3	PRO	-	expression tag	UNP A8CF85
A	-2	ARG	-	expression tag	UNP A8CF85
A	-1	GLY	-	expression tag	UNP A8CF85
A	0	SER	-	expression tag	UNP A8CF85
A	1	HIS	-	expression tag	UNP A8CF85
A	2	MET	-	expression tag	UNP A8CF85

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-18	MET	-	initiating methionine	UNP A8CF85
B	-17	GLY	-	expression tag	UNP A8CF85
B	-16	SER	-	expression tag	UNP A8CF85
B	-15	SER	-	expression tag	UNP A8CF85
B	-14	HIS	-	expression tag	UNP A8CF85
B	-13	HIS	-	expression tag	UNP A8CF85
B	-12	HIS	-	expression tag	UNP A8CF85
B	-11	HIS	-	expression tag	UNP A8CF85
B	-10	HIS	-	expression tag	UNP A8CF85
B	-9	HIS	-	expression tag	UNP A8CF85
B	-8	SER	-	expression tag	UNP A8CF85
B	-7	SER	-	expression tag	UNP A8CF85
B	-6	GLY	-	expression tag	UNP A8CF85
B	-5	LEU	-	expression tag	UNP A8CF85
B	-4	VAL	-	expression tag	UNP A8CF85
B	-3	PRO	-	expression tag	UNP A8CF85
B	-2	ARG	-	expression tag	UNP A8CF85
B	-1	GLY	-	expression tag	UNP A8CF85
B	0	SER	-	expression tag	UNP A8CF85
B	1	HIS	-	expression tag	UNP A8CF85
B	2	MET	-	expression tag	UNP A8CF85
C	-18	MET	-	initiating methionine	UNP A8CF85
C	-17	GLY	-	expression tag	UNP A8CF85
C	-16	SER	-	expression tag	UNP A8CF85
C	-15	SER	-	expression tag	UNP A8CF85
C	-14	HIS	-	expression tag	UNP A8CF85
C	-13	HIS	-	expression tag	UNP A8CF85
C	-12	HIS	-	expression tag	UNP A8CF85
C	-11	HIS	-	expression tag	UNP A8CF85
C	-10	HIS	-	expression tag	UNP A8CF85
C	-9	HIS	-	expression tag	UNP A8CF85
C	-8	SER	-	expression tag	UNP A8CF85
C	-7	SER	-	expression tag	UNP A8CF85
C	-6	GLY	-	expression tag	UNP A8CF85
C	-5	LEU	-	expression tag	UNP A8CF85
C	-4	VAL	-	expression tag	UNP A8CF85
C	-3	PRO	-	expression tag	UNP A8CF85
C	-2	ARG	-	expression tag	UNP A8CF85
C	-1	GLY	-	expression tag	UNP A8CF85
C	0	SER	-	expression tag	UNP A8CF85
C	1	HIS	-	expression tag	UNP A8CF85
C	2	MET	-	expression tag	UNP A8CF85

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-18	MET	-	initiating methionine	UNP A8CF85
D	-17	GLY	-	expression tag	UNP A8CF85
D	-16	SER	-	expression tag	UNP A8CF85
D	-15	SER	-	expression tag	UNP A8CF85
D	-14	HIS	-	expression tag	UNP A8CF85
D	-13	HIS	-	expression tag	UNP A8CF85
D	-12	HIS	-	expression tag	UNP A8CF85
D	-11	HIS	-	expression tag	UNP A8CF85
D	-10	HIS	-	expression tag	UNP A8CF85
D	-9	HIS	-	expression tag	UNP A8CF85
D	-8	SER	-	expression tag	UNP A8CF85
D	-7	SER	-	expression tag	UNP A8CF85
D	-6	GLY	-	expression tag	UNP A8CF85
D	-5	LEU	-	expression tag	UNP A8CF85
D	-4	VAL	-	expression tag	UNP A8CF85
D	-3	PRO	-	expression tag	UNP A8CF85
D	-2	ARG	-	expression tag	UNP A8CF85
D	-1	GLY	-	expression tag	UNP A8CF85
D	0	SER	-	expression tag	UNP A8CF85
D	1	HIS	-	expression tag	UNP A8CF85
D	2	MET	-	expression tag	UNP A8CF85

- # FAD

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	
2	A	1	Total 53	C 27	N 9	O 15	P 2	0	0

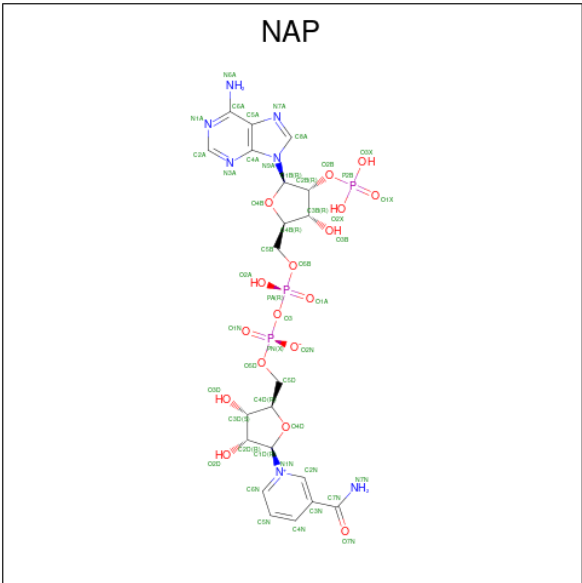


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PROTEIN DATA BANK

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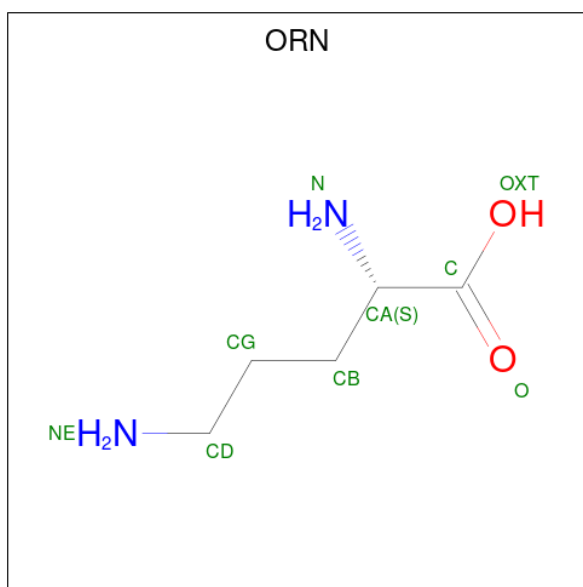
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	C	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	D	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	C	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
3	D	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 4 is L-ornithine (CCD ID: ORN) (formula: C₅H₁₂N₂O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			9	5	2	2		
4	B	1	Total	C	N	O	0	0
			9	5	2	2		
4	C	1	Total	C	N	O	0	0
			9	5	2	2		
4	D	1	Total	C	N	O	0	0
			9	5	2	2		

- Molecule 5 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	3	Total	K	0	0
			3	3		
5	B	2	Total	K	0	0
			2	2		
5	C	2	Total	K	0	0
			2	2		
5	D	1	Total	K	0	0
			1	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	162	Total	O	0	0
			162	162		

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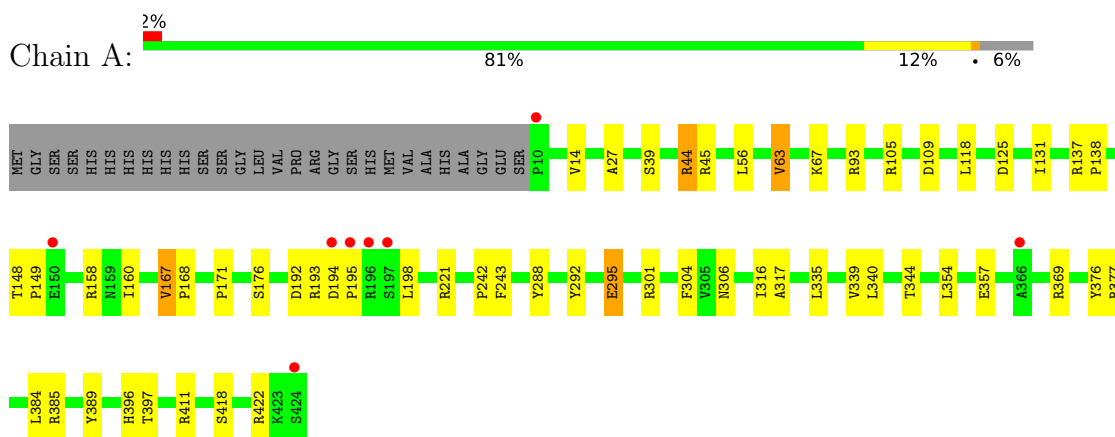
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	154	Total 154	O 154	0	0
6	C	127	Total 127	O 127	0	0
6	D	143	Total 143	O 143	0	0

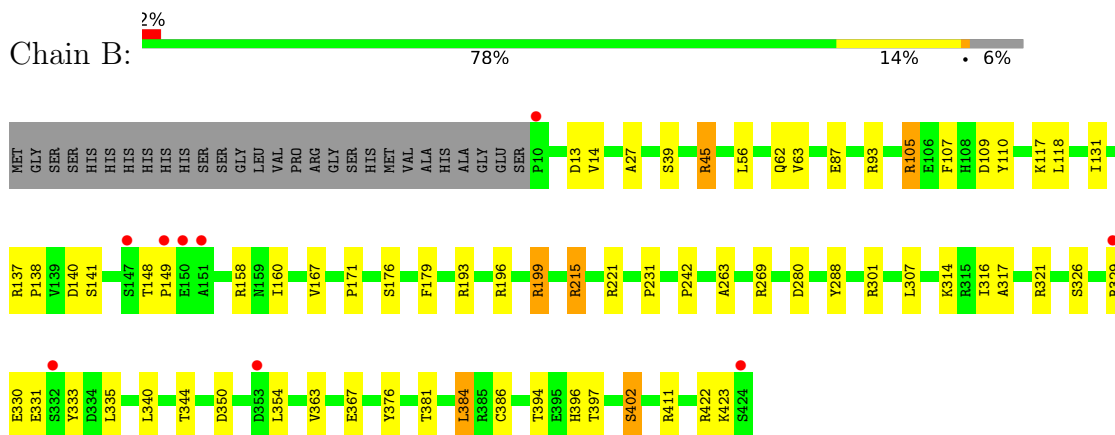
3 Residue-property plots [i](#)

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.

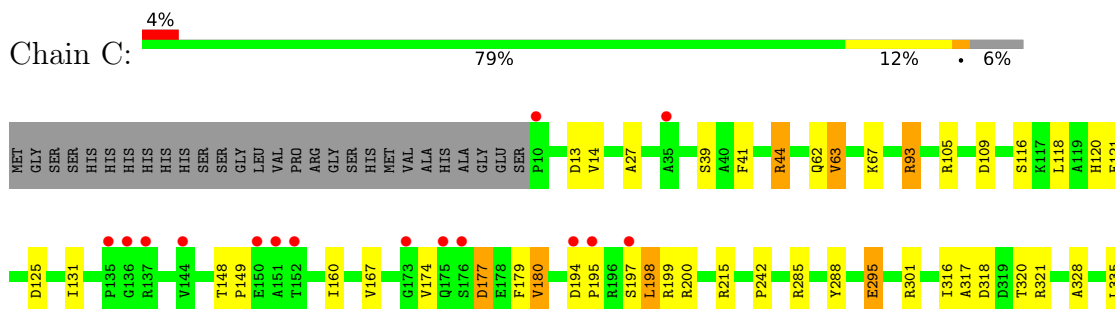
• Molecule 1: KtzI

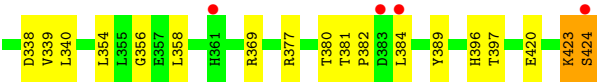


• Molecule 1: KtzI

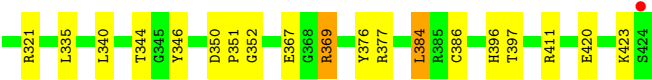
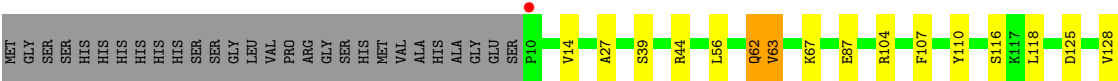
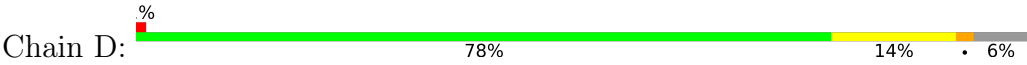


• Molecule 1: KtzI





● Molecule 1: Ktzi



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	84.62Å 157.66Å 165.29Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.30 – 2.41 47.30 – 2.41	Depositor EDS
% Data completeness (in resolution range)	94.7 (47.30-2.41) 94.7 (47.30-2.41)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.19 (at 2.42Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.178 , 0.215 0.184 , 0.217	Depositor DCC
R_{free} test set	4110 reflections (4.78%)	wwPDB-VP
Wilson B-factor (Å ²)	29.1	Xtriage
Anisotropy	0.125	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 29.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.009 for -h,l,k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	13905	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.85% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: K, NAP, ORN, FAD

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	0.67	4/3296 (0.1%)	0.80	3/4492 (0.1%)
1	B	0.71	5/3313 (0.2%)	0.80	5/4509 (0.1%)
1	C	0.79	9/3279 (0.3%)	0.82	4/4471 (0.1%)
1	D	0.70	11/3302 (0.3%)	0.82	10/4499 (0.2%)
All	All	0.72	29/13190 (0.2%)	0.81	22/17971 (0.1%)

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	174	VAL	C-O	-8.16	1.15	1.24
1	B	109	ASP	C-O	-7.60	1.15	1.24
1	A	384	LEU	C-O	-7.14	1.15	1.24
1	A	109	ASP	C-O	-6.79	1.16	1.24
1	C	174	VAL	C-O	-6.79	1.17	1.24
1	C	41	PHE	C-O	-6.73	1.16	1.24
1	D	350	ASP	C-N	6.61	1.40	1.33
1	B	381	THR	C-N	6.57	1.40	1.34
1	B	384	LEU	C-O	-6.54	1.16	1.24
1	C	320	THR	C-O	-6.47	1.16	1.24
1	B	350	ASP	C-O	-6.47	1.17	1.25
1	D	128	VAL	C-O	-6.46	1.16	1.23
1	A	109	ASP	N-CA	-6.14	1.39	1.46
1	D	160	ILE	C-O	-6.14	1.17	1.24
1	C	180	VAL	C-O	-6.02	1.17	1.24
1	C	177	ASP	C-O	-5.96	1.17	1.24
1	C	109	ASP	C-O	-5.86	1.17	1.24
1	D	420	GLU	C-O	-5.83	1.17	1.24
1	D	194	ASP	C-N	5.82	1.41	1.33
1	A	158	ARG	C-O	-5.66	1.16	1.24
1	C	285	ARG	C-O	-5.50	1.17	1.24
1	D	87	GLU	C-O	-5.48	1.17	1.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	193	ARG	CA-C	-5.44	1.46	1.52
1	C	195	PRO	N-CD	5.37	1.55	1.47
1	D	195	PRO	N-CD	5.36	1.55	1.47
1	B	363	VAL	C-O	-5.35	1.17	1.24
1	D	350	ASP	C-O	-5.32	1.18	1.25
1	D	351	PRO	N-CD	5.13	1.54	1.47
1	C	179	PHE	C-O	-5.01	1.17	1.24

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	194	ASP	CA-C-N	-6.84	112.60	119.92
1	D	194	ASP	C-N-CA	-6.84	112.60	119.92
1	D	352	GLY	N-CA-C	6.71	120.78	112.73
1	B	363	VAL	N-CA-C	6.08	117.33	108.58
1	D	350	ASP	CA-C-N	-5.95	113.84	120.45
1	D	350	ASP	C-N-CA	-5.95	113.84	120.45
1	B	381	THR	CA-C-N	-5.76	113.73	120.12
1	B	381	THR	C-N-CA	-5.76	113.73	120.12
1	D	172	ALA	N-CA-C	5.61	117.87	111.02
1	A	193	ARG	N-CA-C	-5.51	101.38	109.81
1	C	194	ASP	CA-C-N	-5.49	113.06	119.32
1	C	194	ASP	C-N-CA	-5.49	113.06	119.32
1	A	56	LEU	CA-C-N	5.45	126.65	119.84
1	A	56	LEU	C-N-CA	5.45	126.65	119.84
1	D	194	ASP	N-CA-C	-5.33	103.06	109.72
1	C	423	LYS	N-CA-C	-5.28	105.11	112.45
1	D	56	LEU	CA-C-N	5.14	126.27	119.84
1	D	56	LEU	C-N-CA	5.14	126.27	119.84
1	B	56	LEU	CA-C-N	5.13	126.26	119.84
1	B	56	LEU	C-N-CA	5.13	126.26	119.84
1	C	317	ALA	CB-CA-C	-5.10	110.29	117.23
1	D	317	ALA	CB-CA-C	-5.02	110.40	117.23

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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	3216	0	3037	32	0
1	B	3234	0	3086	47	0
1	C	3199	0	3016	43	0
1	D	3222	0	3048	37	0
2	A	53	0	28	5	0
2	B	53	0	30	1	0
2	C	53	0	30	1	0
2	D	53	0	30	5	0
3	A	48	0	25	3	0
3	B	48	0	25	0	0
3	C	48	0	25	1	0
3	D	48	0	25	2	0
4	A	9	0	11	0	0
4	B	9	0	11	0	0
4	C	9	0	11	0	0
4	D	9	0	11	1	0
5	A	3	0	0	0	0
5	B	2	0	0	0	0
5	C	2	0	0	0	0
5	D	1	0	0	0	0
6	A	162	0	0	2	0
6	B	154	0	0	9	0
6	C	127	0	0	2	0
6	D	143	0	0	0	0
All	All	13905	0	12449	153	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 6.

All (153) 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:A:138:PRO:HG2	1:A:385:ARG:NH1	1.68	1.08
1:C:197:SER:O	1:C:198:LEU:HD23	1.52	1.06
1:B:140:ASP:C	1:B:386:CYS:SG	2.46	0.98
1:B:141:SER:N	1:B:386:CYS:SG	2.45	0.90
1:B:329:ARG:NH2	1:B:333:TYR:CD1	2.44	0.86
1:D:27:ALA:HB1	1:D:118:LEU:HD21	1.63	0.80
1:A:138:PRO:HG2	1:A:385:ARG:HH12	1.47	0.76

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:120:HIS:CD2	1:C:121:GLU:N	2.56	0.73
1:B:316:ILE:HD12	1:B:321:ARG:HD2	1.71	0.72
1:C:63:VAL:HG22	1:C:67:LYS:HD2	1.73	0.71
1:B:215:ARG:NH2	6:B:664:HOH:O	2.24	0.70
1:D:187:LEU:HD13	1:D:191:ARG:HH21	1.58	0.69
1:B:422:ARG:HD2	6:B:657:HOH:O	1.94	0.68
1:B:105:ARG:HH22	1:D:297:ALA:HA	1.59	0.67
1:B:196:ARG:O	1:B:199:ARG:HD2	1.99	0.63
1:B:314:LYS:NZ	6:B:601:HOH:O	2.31	0.63
1:B:179:PHE:CD1	1:B:193:ARG:NH2	2.68	0.61
1:D:148:THR:HB	1:D:149:PRO:CD	2.30	0.61
1:A:148:THR:HB	1:A:149:PRO:CD	2.30	0.61
1:C:198:LEU:HD21	1:C:339:VAL:HG21	1.82	0.61
1:C:177:ASP:HB3	1:C:180:VAL:H	1.66	0.60
1:C:148:THR:HB	1:C:149:PRO:CD	2.31	0.59
1:A:44:ARG:HG2	2:A:501:FAD:C4A	2.31	0.59
1:C:380:THR:HG21	1:C:384:LEU:HD22	1.85	0.59
1:C:13:ASP:OD1	1:C:423:LYS:HE3	2.01	0.59
1:B:148:THR:HB	1:B:149:PRO:CD	2.33	0.59
1:C:120:HIS:HD2	1:C:121:GLU:C	2.11	0.57
1:C:381:THR:HB	1:C:382:PRO:HD2	1.86	0.57
1:C:377:ARG:HD2	1:C:389:TYR:CZ	2.40	0.57
1:A:377:ARG:HD2	1:A:389:TYR:CZ	2.41	0.56
1:C:198:LEU:CD2	1:C:339:VAL:CG2	2.84	0.56
1:D:187:LEU:HD13	1:D:191:ARG:NH2	2.19	0.56
1:C:420:GLU:O	1:C:424:SER:HB2	2.05	0.55
1:A:138:PRO:CG	1:A:385:ARG:NH1	2.57	0.55
1:B:179:PHE:HD1	1:B:193:ARG:HH22	1.52	0.55
1:C:381:THR:HB	1:C:382:PRO:CD	2.37	0.55
1:C:198:LEU:HD21	1:C:339:VAL:CG2	2.37	0.54
1:C:120:HIS:HD2	1:C:121:GLU:N	2.03	0.53
1:B:221:ARG:O	1:B:301:ARG:NH2	2.41	0.53
1:B:331:GLU:HB2	6:B:603:HOH:O	2.08	0.53
1:C:198:LEU:CD2	1:C:339:VAL:HG23	2.38	0.53
1:A:63:VAL:HG22	1:A:67:LYS:HD3	1.91	0.53
1:A:93:ARG:HH12	1:C:295:GLU:HG3	1.74	0.52
1:B:105:ARG:NH2	1:D:297:ALA:HA	2.25	0.52
1:B:326:SER:OG	1:B:329:ARG:HG3	2.09	0.52
1:B:117:LYS:HD2	6:B:729:HOH:O	2.10	0.51
1:D:221:ARG:O	1:D:301:ARG:NH2	2.43	0.51
1:B:131:ILE:HD13	1:B:160:ILE:HD13	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:141:SER:CA	1:B:386:CYS:SG	2.97	0.51
1:C:120:HIS:CD2	1:C:121:GLU:C	2.88	0.51
1:D:148:THR:HB	1:D:149:PRO:HD2	1.93	0.51
1:A:93:ARG:NH1	1:C:295:GLU:HG3	2.26	0.50
1:B:179:PHE:CE1	1:B:193:ARG:NH2	2.79	0.50
1:C:358:LEU:HD22	1:C:384:LEU:HD11	1.94	0.50
1:B:242:PRO:HB2	1:C:288:TYR:CD1	2.47	0.50
1:B:329:ARG:NH1	1:B:331:GLU:OE2	2.45	0.50
1:D:44:ARG:HG2	2:D:501:FAD:N3A	2.26	0.49
2:A:501:FAD:O2A	6:A:762:HOH:O	2.20	0.49
1:B:269:ARG:NH2	6:B:740:HOH:O	2.42	0.49
1:D:104:ARG:HD3	3:D:502:NAP:O7N	2.13	0.49
2:A:501:FAD:C4	3:A:502:NAP:H4D	2.43	0.49
1:A:418:SER:O	1:A:422:ARG:HG3	2.13	0.49
1:A:148:THR:HB	1:A:149:PRO:HD2	1.92	0.48
1:B:148:THR:HB	1:B:149:PRO:HD2	1.95	0.48
1:C:148:THR:HB	1:C:149:PRO:HD2	1.94	0.48
1:A:376:TYR:CE1	1:A:411:ARG:HG3	2.48	0.48
1:D:44:ARG:O	1:D:125:ASP:HA	2.13	0.48
1:B:367:GLU:H	1:B:367:GLU:CD	2.21	0.48
1:C:27:ALA:HB1	1:C:118:LEU:HD21	1.94	0.48
2:D:501:FAD:O2A	2:D:501:FAD:O4'	2.27	0.48
1:C:120:HIS:CD2	1:C:120:HIS:C	2.91	0.48
2:C:501:FAD:C4	3:C:502:NAP:H4D	2.43	0.47
1:D:137:ARG:HA	1:D:138:PRO:C	2.39	0.47
1:A:194:ASP:OD2	1:A:195:PRO:HD2	2.14	0.47
1:B:93:ARG:NH1	1:D:295:GLU:OE2	2.47	0.47
1:D:384:LEU:HD22	1:D:386:CYS:SG	2.55	0.47
1:B:367:GLU:CD	1:B:367:GLU:N	2.73	0.47
1:B:45:ARG:HG3	6:B:648:HOH:O	2.15	0.46
1:C:198:LEU:CD2	1:C:339:VAL:HG21	2.46	0.46
1:A:14:VAL:O	1:A:39:SER:HA	2.16	0.46
1:B:221:ARG:HB2	6:B:665:HOH:O	2.16	0.46
1:D:316:ILE:HD12	1:D:321:ARG:NH1	2.31	0.46
1:A:396:HIS:CD2	1:A:397:THR:HG23	2.50	0.46
1:A:27:ALA:HB1	1:A:118:LEU:HD21	1.98	0.45
1:A:131:ILE:HD13	1:A:160:ILE:HD13	1.97	0.45
1:C:131:ILE:HD13	1:C:160:ILE:HD13	1.98	0.45
1:D:14:VAL:O	1:D:39:SER:HA	2.16	0.45
2:A:501:FAD:C4X	3:A:502:NAP:H4D	2.47	0.45
1:D:179:PHE:CD1	1:D:193:ARG:NH2	2.84	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:14:VAL:O	1:C:39:SER:HA	2.17	0.44
1:C:120:HIS:CD2	1:C:121:GLU:O	2.70	0.44
2:B:501:FAD:O1A	2:B:501:FAD:O4'	2.25	0.44
1:B:62:GLN:NE2	1:B:280:ASP:OD1	2.51	0.44
1:D:139:VAL:HB	1:D:384:LEU:HD23	1.98	0.44
1:D:396:HIS:CD2	1:D:397:THR:HG23	2.53	0.44
1:A:137:ARG:HA	1:A:138:PRO:C	2.43	0.44
1:B:394:THR:OG1	1:B:402:SER:HB2	2.16	0.44
1:C:200:ARG:NH1	1:C:338:ASP:OD1	2.50	0.44
1:D:285:ARG:CG	1:D:285:ARG:HH11	2.31	0.44
1:A:221:ARG:O	1:A:301:ARG:NH2	2.51	0.44
1:B:376:TYR:CE1	1:B:411:ARG:HG3	2.53	0.44
1:C:396:HIS:CD2	1:C:397:THR:HG23	2.53	0.44
1:B:14:VAL:O	1:B:39:SER:HA	2.17	0.43
1:A:242:PRO:HB2	1:D:288:TYR:CD1	2.54	0.43
1:C:44:ARG:O	1:C:125:ASP:HA	2.18	0.43
1:B:158:ARG:O	1:B:386:CYS:HB3	2.19	0.43
1:C:316:ILE:HD12	1:C:321:ARG:HD2	1.99	0.43
1:D:179:PHE:HD1	1:D:193:ARG:HH22	1.65	0.43
1:A:295:GLU:OE2	6:A:731:HOH:O	2.21	0.43
1:D:367:GLU:HG2	1:D:369:ARG:HH21	1.84	0.43
1:C:62:GLN:NE2	6:C:650:HOH:O	2.52	0.43
1:B:288:TYR:CD1	1:C:242:PRO:HB2	2.54	0.43
1:D:44:ARG:HG2	2:D:501:FAD:C4A	2.48	0.43
1:A:292:TYR:HD2	1:C:93:ARG:HD2	1.84	0.43
1:B:316:ILE:O	1:B:317:ALA:HB3	2.19	0.43
1:D:171:PRO:HG3	1:D:344:THR:HG21	2.00	0.42
1:C:382:PRO:C	1:C:384:LEU:H	2.26	0.42
1:A:167:VAL:HA	1:A:168:PRO:HD3	1.92	0.42
1:A:171:PRO:HG3	1:A:344:THR:HG21	2.00	0.42
1:C:198:LEU:HD22	1:C:339:VAL:HG23	2.00	0.42
1:D:166:LEU:HB3	1:D:346:TYR:HB3	2.01	0.42
1:D:304:PHE:HB3	1:D:306:ASN:HD21	1.85	0.42
1:B:137:ARG:HA	1:B:138:PRO:C	2.45	0.42
1:D:63:VAL:HG22	1:D:67:LYS:HD2	2.00	0.42
1:A:44:ARG:O	1:A:125:ASP:HA	2.20	0.42
1:B:242:PRO:HB2	1:C:288:TYR:CG	2.54	0.42
1:A:243:PHE:HD2	1:D:284:ILE:HG23	1.84	0.42
1:B:27:ALA:HB1	1:B:118:LEU:HD21	2.01	0.42
2:D:501:FAD:C4	3:D:502:NAP:H4D	2.50	0.42
1:C:301:ARG:NH1	6:C:682:HOH:O	2.40	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:288:TYR:CD1	1:D:242:PRO:HB2	2.55	0.41
1:A:44:ARG:HG2	2:A:501:FAD:N3A	2.35	0.41
1:A:194:ASP:HA	1:A:195:PRO:HD3	1.94	0.41
1:A:198:LEU:HD22	1:A:339:VAL:CG2	2.50	0.41
1:C:198:LEU:HD22	1:C:339:VAL:CG2	2.49	0.41
3:A:502:NAP:O2X	1:D:270:TYR:OH	2.36	0.41
1:B:13:ASP:OD1	1:B:423:LYS:HE3	2.20	0.41
1:B:396:HIS:CD2	1:B:397:THR:HG23	2.55	0.41
1:D:44:ARG:HD3	2:D:501:FAD:C5A	2.50	0.41
1:D:142:VAL:HG13	1:D:386:CYS:SG	2.61	0.41
1:D:376:TYR:CE1	1:D:411:ARG:HG3	2.55	0.41
1:C:197:SER:O	1:C:198:LEU:CD2	2.44	0.41
1:A:304:PHE:HB3	1:A:306:ASN:HD21	1.86	0.41
1:B:231:PRO:O	1:B:307:LEU:HA	2.20	0.41
1:B:329:ARG:NH2	1:B:333:TYR:CE1	2.86	0.41
1:A:316:ILE:O	1:A:317:ALA:HB3	2.21	0.41
1:D:167:VAL:HA	1:D:168:PRO:HD3	1.91	0.41
1:B:263:ALA:HB2	1:C:328:ALA:HA	2.02	0.40
1:D:62:GLN:HB2	4:D:503:ORN:HD3	2.03	0.40
1:D:107:PHE:O	1:D:110:TYR:HB3	2.22	0.40
1:B:93:ARG:HB2	6:B:619:HOH:O	2.21	0.40
1:B:171:PRO:HG3	1:B:344:THR:HG21	2.03	0.40
1:B:107:PHE:O	1:B:110:TYR:HB3	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	413/443 (93%)	397 (96%)	16 (4%)	0	100	100
1	B	413/443 (93%)	399 (97%)	14 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	413/443 (93%)	392 (95%)	20 (5%)	1 (0%)	43	57
1	D	413/443 (93%)	399 (97%)	14 (3%)	0	100	100
All	All	1652/1772 (93%)	1587 (96%)	64 (4%)	1 (0%)	48	63

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	C	356	GLY

5.3.2 Protein sidechains ⓘ

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	338/372 (91%)	325 (96%)	13 (4%)	29	47
1	B	340/372 (91%)	326 (96%)	14 (4%)	27	44
1	C	334/372 (90%)	318 (95%)	16 (5%)	23	38
1	D	339/372 (91%)	323 (95%)	16 (5%)	23	39
All	All	1351/1488 (91%)	1292 (96%)	59 (4%)	25	41

All (59) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	ARG
1	A	45	ARG
1	A	63	VAL
1	A	105	ARG
1	A	167	VAL
1	A	176	SER
1	A	192	ASP
1	A	295	GLU
1	A	335	LEU
1	A	340	LEU
1	A	354	LEU

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Mol	Chain	Res	Type
1	A	357	GLU
1	A	369	ARG
1	B	45	ARG
1	B	63	VAL
1	B	87	GLU
1	B	105	ARG
1	B	167	VAL
1	B	176	SER
1	B	199	ARG
1	B	215	ARG
1	B	330	GLU
1	B	335	LEU
1	B	340	LEU
1	B	354	LEU
1	B	384	LEU
1	B	402	SER
1	C	44	ARG
1	C	63	VAL
1	C	93	ARG
1	C	105	ARG
1	C	116	SER
1	C	167	VAL
1	C	198	LEU
1	C	199	ARG
1	C	215	ARG
1	C	295	GLU
1	C	318	ASP
1	C	335	LEU
1	C	340	LEU
1	C	354	LEU
1	C	369	ARG
1	C	424	SER
1	D	62	GLN
1	D	63	VAL
1	D	116	SER
1	D	167	VAL
1	D	175	GLN
1	D	176	SER
1	D	194	ASP
1	D	215	ARG
1	D	285	ARG
1	D	295	GLU

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Mol	Chain	Res	Type
1	D	335	LEU
1	D	340	LEU
1	D	369	ARG
1	D	377	ARG
1	D	384	LEU
1	D	423	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	12	HIS
1	A	52	GLN
1	A	189	HIS
1	A	220	ASN
1	A	262	GLN
1	A	306	ASN
1	A	309	HIS
1	B	12	HIS
1	B	52	GLN
1	B	189	HIS
1	B	262	GLN
1	B	306	ASN
1	B	309	HIS
1	C	12	HIS
1	C	52	GLN
1	C	62	GLN
1	C	120	HIS
1	C	175	GLN
1	C	189	HIS
1	C	227	HIS
1	C	306	ASN
1	C	309	HIS
1	D	52	GLN
1	D	175	GLN
1	D	220	ASN
1	D	262	GLN
1	D	306	ASN
1	D	309	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 20 ligands modelled in this entry, 8 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	$\# Z > 2$
2	FAD	B	501	-	58,58,58	2.68	15 (25%)	85,89,89	1.95	19 (22%)
2	FAD	A	501	-	58,58,58	2.48	17 (29%)	85,89,89	2.94	29 (34%)
4	ORN	B	503	-	7,8,8	0.96	0	6,9,9	1.00	0
4	ORN	C	503	-	7,8,8	0.95	0	6,9,9	0.96	0
4	ORN	A	503	-	7,8,8	1.01	0	6,9,9	1.14	1 (16%)
3	NAP	D	502	-	50,52,52	1.61	6 (12%)	71,80,80	1.59	10 (14%)
3	NAP	C	502	-	50,52,52	1.65	6 (12%)	71,80,80	1.61	10 (14%)
4	ORN	D	503	-	7,8,8	0.89	0	6,9,9	1.00	1 (16%)
2	FAD	D	501	-	58,58,58	2.50	15 (25%)	85,89,89	2.12	26 (30%)
3	NAP	B	502	-	50,52,52	1.55	7 (14%)	71,80,80	1.57	11 (15%)
3	NAP	A	502	-	50,52,52	1.67	6 (12%)	71,80,80	2.06	17 (23%)
2	FAD	C	501	-	58,58,58	2.96	15 (25%)	85,89,89	1.90	21 (24%)

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
2	FAD	B	501	-	-	8/34/50/50	0/6/6/6
2	FAD	A	501	-	-	9/34/50/50	0/6/6/6
4	ORN	B	503	-	-	0/8/8/8	-
4	ORN	C	503	-	-	0/8/8/8	-
4	ORN	A	503	-	-	0/8/8/8	-
3	NAP	D	502	-	-	6/35/67/67	0/5/5/5
3	NAP	C	502	-	-	6/35/67/67	0/5/5/5
4	ORN	D	503	-	-	0/8/8/8	-
2	FAD	D	501	-	-	9/34/50/50	0/6/6/6
3	NAP	B	502	-	-	2/35/67/67	0/5/5/5
3	NAP	A	502	-	-	5/35/67/67	0/5/5/5
2	FAD	C	501	-	-	5/34/50/50	0/6/6/6

All (87) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	FAD	O3'-C3'	-14.93	1.06	1.43
2	B	501	FAD	C8M-C8	-10.48	1.31	1.51
2	D	501	FAD	O3'-C3'	-9.72	1.18	1.43
2	A	501	FAD	P-O3P	-9.57	1.49	1.59
2	D	501	FAD	PA-O3P	7.46	1.67	1.59
2	B	501	FAD	O3'-C3'	-6.74	1.26	1.43
2	B	501	FAD	C1'-C2'	-6.42	1.43	1.52
2	B	501	FAD	C4'-C3'	6.07	1.64	1.53
2	C	501	FAD	PA-O3P	-6.02	1.53	1.59
2	A	501	FAD	C5X-N5	5.67	1.49	1.39
2	A	501	FAD	O3'-C3'	-5.66	1.28	1.43
2	D	501	FAD	C2-N1	5.51	1.49	1.36
2	B	501	FAD	C5X-N5	5.49	1.49	1.39
2	A	501	FAD	C2-N1	5.38	1.48	1.36
2	C	501	FAD	C5X-N5	5.36	1.49	1.39
3	A	502	NAP	C6A-N6A	5.20	1.47	1.34
2	C	501	FAD	C2-N1	5.19	1.48	1.36
2	D	501	FAD	C5X-N5	5.14	1.48	1.39
3	D	502	NAP	C6A-N6A	5.11	1.47	1.34
2	B	501	FAD	C2-N1	5.09	1.48	1.36
3	B	502	NAP	C6A-N6A	5.07	1.47	1.34
3	C	502	NAP	C6A-N6A	5.01	1.47	1.34
2	D	501	FAD	P-O3P	-5.00	1.54	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	502	NAP	C7N-N7N	4.92	1.42	1.33
2	C	501	FAD	C4'-C3'	4.88	1.61	1.53
3	C	502	NAP	C7N-N7N	4.73	1.41	1.33
2	A	501	FAD	C2'-C3'	4.70	1.61	1.53
3	B	502	NAP	C7N-N7N	4.56	1.41	1.33
2	A	501	FAD	O2'-C2'	-4.47	1.34	1.43
2	B	501	FAD	C7M-C7	-4.37	1.42	1.51
2	C	501	FAD	P-O3P	-4.36	1.54	1.59
3	D	502	NAP	C7N-N7N	4.31	1.40	1.33
2	D	501	FAD	C6A-N6A	4.23	1.45	1.34
3	C	502	NAP	PN-O3	-4.15	1.55	1.59
3	A	502	NAP	C3B-C2B	-4.09	1.44	1.53
3	D	502	NAP	C2D-C3D	-4.05	1.42	1.53
2	B	501	FAD	C6A-N6A	4.02	1.44	1.34
3	D	502	NAP	PN-O3	-4.01	1.55	1.59
3	A	502	NAP	C2D-C3D	-3.96	1.42	1.53
2	A	501	FAD	C6A-N6A	3.95	1.44	1.34
3	C	502	NAP	C2D-C3D	-3.90	1.42	1.53
3	C	502	NAP	C3B-C2B	-3.90	1.44	1.53
2	B	501	FAD	PA-O2A	-3.85	1.37	1.55
3	B	502	NAP	C3B-C2B	-3.79	1.44	1.53
3	B	502	NAP	C2D-C3D	-3.70	1.43	1.53
2	C	501	FAD	C6A-N6A	3.68	1.43	1.34
3	A	502	NAP	PA-O3	3.65	1.63	1.59
2	C	501	FAD	PA-O1A	-3.64	1.38	1.50
2	C	501	FAD	PA-O2A	-3.60	1.38	1.55
3	D	502	NAP	C3B-C2B	-3.56	1.45	1.53
3	B	502	NAP	PN-O3	-3.51	1.55	1.59
2	C	501	FAD	P-O2P	-3.44	1.39	1.55
2	C	501	FAD	P-O1P	-3.35	1.39	1.50
2	D	501	FAD	PA-O5B	3.09	1.71	1.59
2	B	501	FAD	PA-O1A	-3.04	1.40	1.50
2	A	501	FAD	PA-O5B	2.89	1.70	1.59
2	D	501	FAD	C4X-N5	2.87	1.37	1.30
2	D	501	FAD	C4'-C3'	-2.81	1.48	1.53
2	A	501	FAD	O4'-C4'	-2.81	1.37	1.43
2	C	501	FAD	C4X-N5	2.79	1.36	1.30
2	A	501	FAD	C5'-C4'	2.77	1.55	1.51
2	A	501	FAD	C4X-N5	2.76	1.36	1.30
2	C	501	FAD	C5A-N7A	-2.73	1.34	1.39
2	D	501	FAD	C5A-N7A	-2.67	1.34	1.39
2	C	501	FAD	C8-C7	2.62	1.47	1.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	501	FAD	O2'-C2'	-2.55	1.38	1.43
2	A	501	FAD	C5A-N7A	-2.52	1.34	1.39
3	B	502	NAP	O4D-C4D	-2.47	1.39	1.45
2	D	501	FAD	PA-O2A	2.46	1.66	1.55
2	B	501	FAD	C5A-N7A	-2.45	1.34	1.39
2	A	501	FAD	C4'-C3'	-2.44	1.49	1.53
2	A	501	FAD	C9A-N10	2.42	1.45	1.41
2	A	501	FAD	C4X-C10	2.40	1.51	1.44
2	B	501	FAD	C1'-N10	-2.38	1.42	1.47
3	C	502	NAP	O4D-C4D	-2.37	1.39	1.45
2	A	501	FAD	PA-O1A	2.34	1.58	1.50
2	B	501	FAD	O2'-C2'	-2.33	1.38	1.43
3	D	502	NAP	O4D-C4D	-2.32	1.39	1.45
2	D	501	FAD	O4'-C4'	-2.30	1.38	1.43
2	C	501	FAD	O4B-C4B	-2.27	1.39	1.45
2	B	501	FAD	C4X-N5	2.22	1.35	1.30
2	A	501	FAD	PA-O2A	2.21	1.65	1.55
2	B	501	FAD	O4'-C4'	-2.20	1.38	1.43
2	D	501	FAD	C4X-C10	2.19	1.50	1.44
3	A	502	NAP	O4D-C4D	-2.15	1.40	1.45
2	D	501	FAD	C2'-C3'	2.08	1.57	1.53
3	B	502	NAP	C8A-N7A	2.04	1.35	1.31

All (145) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	501	FAD	O3P-PA-O1A	-12.95	71.75	110.70
3	A	502	NAP	O2A-PA-O3	-8.75	83.64	107.27
2	A	501	FAD	O2P-P-O3P	8.13	129.26	107.27
2	A	501	FAD	O5B-PA-O1A	-7.87	77.76	108.94
2	C	501	FAD	O4'-C4'-C3'	6.85	125.29	109.25
2	A	501	FAD	O3'-C3'-C4'	6.80	124.39	108.93
2	A	501	FAD	O2A-PA-O1A	-6.35	82.91	112.44
2	B	501	FAD	O4'-C4'-C3'	6.15	123.65	109.25
2	C	501	FAD	N3A-C2A-N1A	-5.94	119.58	128.58
2	D	501	FAD	N3A-C2A-N1A	-5.68	119.99	128.58
2	B	501	FAD	N3A-C2A-N1A	-5.58	120.14	128.58
2	A	501	FAD	N3A-C2A-N1A	-5.57	120.16	128.58
2	A	501	FAD	C4'-C3'-C2'	5.42	122.59	113.57
3	D	502	NAP	N3A-C2A-N1A	-5.38	120.43	128.58
2	D	501	FAD	C5'-C4'-C3'	-5.32	102.18	112.22
3	C	502	NAP	C5A-C4A-N3A	-5.26	119.47	126.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	NAP	O3-PA-O1A	-5.24	94.94	110.70
2	D	501	FAD	O4'-C4'-C3'	5.13	121.24	109.25
3	A	502	NAP	C5A-C4A-N3A	-5.08	119.73	126.72
2	D	501	FAD	O3P-PA-O1A	-5.08	95.43	110.70
3	C	502	NAP	N3A-C2A-N1A	-5.05	120.93	128.58
3	D	502	NAP	C5A-C4A-N3A	-5.00	119.83	126.72
3	B	502	NAP	N3A-C2A-N1A	-4.95	121.08	128.58
3	A	502	NAP	N3A-C2A-N1A	-4.95	121.09	128.58
3	B	502	NAP	C5A-C4A-N3A	-4.94	119.92	126.72
2	A	501	FAD	O2P-P-O5'	-4.86	85.55	107.57
2	B	501	FAD	C5A-C4A-N3A	-4.84	120.05	126.72
2	D	501	FAD	O2'-C2'-C3'	-4.75	98.13	109.25
2	B	501	FAD	C5'-C4'-C3'	-4.53	103.67	112.22
2	C	501	FAD	O3'-C3'-C2'	4.48	119.12	108.93
2	A	501	FAD	O5'-P-O1P	-4.48	91.17	108.94
2	A	501	FAD	C5A-C4A-N3A	-4.41	120.65	126.72
2	D	501	FAD	C5A-C4A-N3A	-4.39	120.67	126.72
2	B	501	FAD	C5A-N7A-C8A	4.33	110.26	103.45
2	D	501	FAD	C5A-N7A-C8A	4.31	110.22	103.45
2	A	501	FAD	O2A-PA-O3P	4.31	118.92	107.27
2	A	501	FAD	C5A-N7A-C8A	4.30	110.21	103.45
2	B	501	FAD	O3'-C3'-C2'	4.17	118.41	108.93
2	C	501	FAD	C5A-C4A-N3A	-4.05	121.14	126.72
2	D	501	FAD	O2A-PA-O3P	4.03	118.16	107.27
2	C	501	FAD	C4-C4X-N5	3.87	123.55	118.21
2	D	501	FAD	C4'-C3'-C2'	3.82	119.92	113.57
2	B	501	FAD	C2A-N3A-C4A	3.73	120.93	111.83
2	B	501	FAD	C4A-C5A-N7A	-3.72	106.33	110.58
2	C	501	FAD	C5A-N7A-C8A	3.70	109.26	103.45
2	A	501	FAD	N9A-C8A-N7A	-3.69	108.70	113.94
2	B	501	FAD	N3A-C4A-N9A	3.65	133.38	127.17
3	C	502	NAP	C2B-C1B-N9A	3.64	119.75	113.75
3	C	502	NAP	N3A-C4A-N9A	3.64	133.36	127.17
2	A	501	FAD	O4'-C4'-C3'	3.62	117.71	109.25
3	D	502	NAP	N3A-C4A-N9A	3.59	133.28	127.17
3	A	502	NAP	N3A-C4A-N9A	3.58	133.26	127.17
2	D	501	FAD	C4A-C5A-N7A	-3.54	106.53	110.58
3	B	502	NAP	N9A-C8A-N7A	-3.53	108.93	113.94
2	A	501	FAD	C4A-C5A-N7A	-3.53	106.55	110.58
2	A	501	FAD	O4'-C4'-C5'	3.53	117.77	109.99
2	D	501	FAD	N3A-C4A-N9A	3.53	133.16	127.17
2	A	501	FAD	C2A-N3A-C4A	3.52	120.44	111.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	502	NAP	C2A-N3A-C4A	3.50	120.39	111.83
3	C	502	NAP	C2A-N3A-C4A	3.48	120.32	111.83
3	B	502	NAP	C2A-N3A-C4A	3.44	120.24	111.83
2	A	501	FAD	N3A-C4A-N9A	3.43	133.00	127.17
2	C	501	FAD	C2A-N3A-C4A	3.41	120.17	111.83
2	D	501	FAD	N9A-C8A-N7A	-3.41	109.09	113.94
2	D	501	FAD	C2A-N3A-C4A	3.41	120.16	111.83
3	C	502	NAP	C3N-C7N-N7N	3.36	121.87	117.74
3	D	502	NAP	N9A-C8A-N7A	-3.36	109.17	113.94
3	A	502	NAP	C2A-N3A-C4A	3.35	120.00	111.83
2	B	501	FAD	N9A-C8A-N7A	-3.31	109.23	113.94
2	C	501	FAD	N3A-C4A-N9A	3.27	132.73	127.17
2	A	501	FAD	O5'-C5'-C4'	3.25	118.03	109.36
3	B	502	NAP	N3A-C4A-N9A	3.24	132.68	127.17
2	D	501	FAD	C9A-C5X-N5	-3.21	119.05	122.45
3	D	502	NAP	C2B-C1B-N9A	3.20	119.02	113.75
2	D	501	FAD	C4-C4X-N5	3.20	122.63	118.21
3	A	502	NAP	O2N-PN-O3	3.19	115.90	107.27
2	B	501	FAD	C4-C4X-N5	3.07	122.45	118.21
2	C	501	FAD	C4A-C5A-N7A	-3.02	107.13	110.58
3	B	502	NAP	C4A-C5A-N7A	-3.00	107.15	110.58
2	C	501	FAD	C1'-C2'-C3'	-3.00	101.53	109.66
2	C	501	FAD	C5'-C4'-C3'	-2.99	106.58	112.22
2	C	501	FAD	N9A-C8A-N7A	-2.98	109.71	113.94
2	D	501	FAD	O3'-C3'-C2'	-2.94	102.26	108.93
3	B	502	NAP	C2N-C3N-C4N	2.90	121.63	118.26
3	B	502	NAP	C5A-N7A-C8A	2.89	107.99	103.45
3	D	502	NAP	O5D-C5D-C4D	2.86	118.72	108.99
3	A	502	NAP	O4B-C1B-N9A	2.84	113.55	108.09
2	A	501	FAD	C4-N3-C2	-2.83	120.62	125.64
2	A	501	FAD	C4-C4X-N5	2.82	122.10	118.21
2	B	501	FAD	C10-C4X-N5	-2.80	119.09	124.81
3	D	502	NAP	C5A-N7A-C8A	2.78	107.83	103.45
3	A	502	NAP	O2A-PA-O5B	2.76	120.09	107.57
2	B	501	FAD	C4-N3-C2	-2.76	120.75	125.64
3	C	502	NAP	N9A-C8A-N7A	-2.73	110.07	113.94
3	A	502	NAP	O5B-PA-O1A	2.70	119.65	108.94
2	C	501	FAD	C9A-C5X-N5	-2.69	119.60	122.45
2	A	501	FAD	C4X-C4-N3	2.68	120.08	113.25
2	D	501	FAD	O3'-C3'-C4'	2.67	114.99	108.93
3	A	502	NAP	C4A-C5A-N7A	-2.66	107.53	110.58
2	C	501	FAD	C4X-C4-N3	2.66	120.03	113.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	502	NAP	N9A-C8A-N7A	-2.65	110.18	113.94
3	B	502	NAP	C4A-N9A-C8A	2.65	108.52	105.74
2	B	501	FAD	C9A-C5X-N5	-2.64	119.65	122.45
3	C	502	NAP	O2N-PN-O3	2.60	114.31	107.27
3	A	502	NAP	C2N-C3N-C4N	2.60	121.28	118.26
3	A	502	NAP	C5A-N7A-C8A	2.59	107.52	103.45
2	D	501	FAD	C4X-C4-N3	2.54	119.71	113.25
2	C	501	FAD	C10-C4X-N5	-2.52	119.66	124.81
2	A	501	FAD	O4-C4-C4X	-2.50	119.94	126.53
2	D	501	FAD	O2A-PA-O1A	-2.49	100.86	112.44
3	D	502	NAP	C4A-N9A-C8A	2.48	108.34	105.74
2	C	501	FAD	C4-N3-C2	-2.48	121.24	125.64
2	D	501	FAD	O4-C4-C4X	-2.47	120.00	126.53
3	D	502	NAP	C4A-C5A-N7A	-2.47	107.75	110.58
2	A	501	FAD	C9A-C5X-N5	-2.46	119.84	122.45
2	B	501	FAD	O4-C4-C4X	-2.45	120.05	126.53
3	C	502	NAP	C4A-C5A-N7A	-2.44	107.79	110.58
2	D	501	FAD	O5B-PA-O1A	-2.44	99.26	108.94
2	B	501	FAD	C4X-C4-N3	2.42	119.41	113.25
3	C	502	NAP	C5A-N7A-C8A	2.42	107.25	103.45
2	C	501	FAD	C8M-C8-C7	-2.41	115.83	120.76
2	D	501	FAD	C4-N3-C2	-2.41	121.36	125.64
2	D	501	FAD	C10-C4X-N5	-2.40	119.90	124.81
2	C	501	FAD	O4-C4-C4X	-2.34	120.35	126.53
2	A	501	FAD	C10-C4X-N5	-2.34	120.03	124.81
2	A	501	FAD	C4A-N9A-C8A	2.34	108.19	105.74
2	B	501	FAD	C6A-C5A-N7A	2.23	136.38	132.09
3	A	502	NAP	C2B-C1B-N9A	2.20	117.37	113.75
3	A	502	NAP	C6N-N1N-C2N	-2.18	120.02	121.88
2	B	501	FAD	C4'-C3'-C2'	2.18	117.19	113.57
3	B	502	NAP	O5D-C5D-C4D	2.15	116.33	108.99
2	C	501	FAD	O4B-C4B-C3B	2.15	109.43	105.15
4	A	503	ORN	OXT-C-O	-2.15	119.21	124.08
3	A	502	NAP	C5N-C4N-C3N	-2.15	118.26	120.36
2	D	501	FAD	C4A-N9A-C8A	2.14	107.99	105.74
2	A	501	FAD	C6A-C5A-N7A	2.13	136.20	132.09
2	A	501	FAD	C5'-C4'-C3'	-2.13	108.20	112.22
2	A	501	FAD	O2P-P-O1P	2.12	122.30	112.44
2	C	501	FAD	C2A-N1A-C6A	2.08	122.15	118.73
2	C	501	FAD	C6A-C5A-N7A	2.07	136.08	132.09
4	D	503	ORN	OXT-C-O	-2.04	119.45	124.08
2	D	501	FAD	C2A-N1A-C6A	2.03	122.06	118.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	FAD	O4B-C4B-C3B	2.03	109.18	105.15
2	D	501	FAD	O4B-C4B-C3B	2.01	109.15	105.15
3	B	502	NAP	O4B-C4B-C5B	2.00	115.74	109.33

There are no chirality outliers.

All (50) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	FAD	C5B-O5B-PA-O2A
2	A	501	FAD	C5B-O5B-PA-O3P
2	A	501	FAD	N10-C1'-C2'-O2'
2	A	501	FAD	O3'-C3'-C4'-C5'
2	B	501	FAD	N10-C1'-C2'-O2'
2	B	501	FAD	C5'-O5'-P-O1P
2	D	501	FAD	C5B-O5B-PA-O1A
3	A	502	NAP	C5B-O5B-PA-O3
3	B	502	NAP	C5D-O5D-PN-O3
3	C	502	NAP	PA-O3-PN-O5D
3	A	502	NAP	O4B-C4B-C5B-O5B
2	B	501	FAD	O3'-C3'-C4'-C5'
3	A	502	NAP	C3B-C4B-C5B-O5B
2	C	501	FAD	O3'-C3'-C4'-C5'
2	A	501	FAD	O3'-C3'-C4'-O4'
2	B	501	FAD	O3'-C3'-C4'-O4'
2	A	501	FAD	P-O3P-PA-O1A
3	C	502	NAP	PN-O3-PA-O1A
2	A	501	FAD	C2'-C3'-C4'-C5'
2	D	501	FAD	O3'-C3'-C4'-O4'
2	D	501	FAD	O3'-C3'-C4'-C5'
2	D	501	FAD	C2'-C3'-C4'-C5'
2	C	501	FAD	O3'-C3'-C4'-O4'
3	D	502	NAP	PA-O3-PN-O5D
2	B	501	FAD	C2'-C3'-C4'-C5'
2	B	501	FAD	C3'-C4'-C5'-O5'
3	D	502	NAP	PN-O3-PA-O2A
2	D	501	FAD	C2'-C3'-C4'-O4'
2	C	501	FAD	N10-C1'-C2'-O2'
2	A	501	FAD	C4'-C5'-O5'-P
2	B	501	FAD	C5'-O5'-P-O3P
2	C	501	FAD	C5'-O5'-P-O1P
2	D	501	FAD	C5B-O5B-PA-O3P
2	D	501	FAD	C5'-O5'-P-O1P

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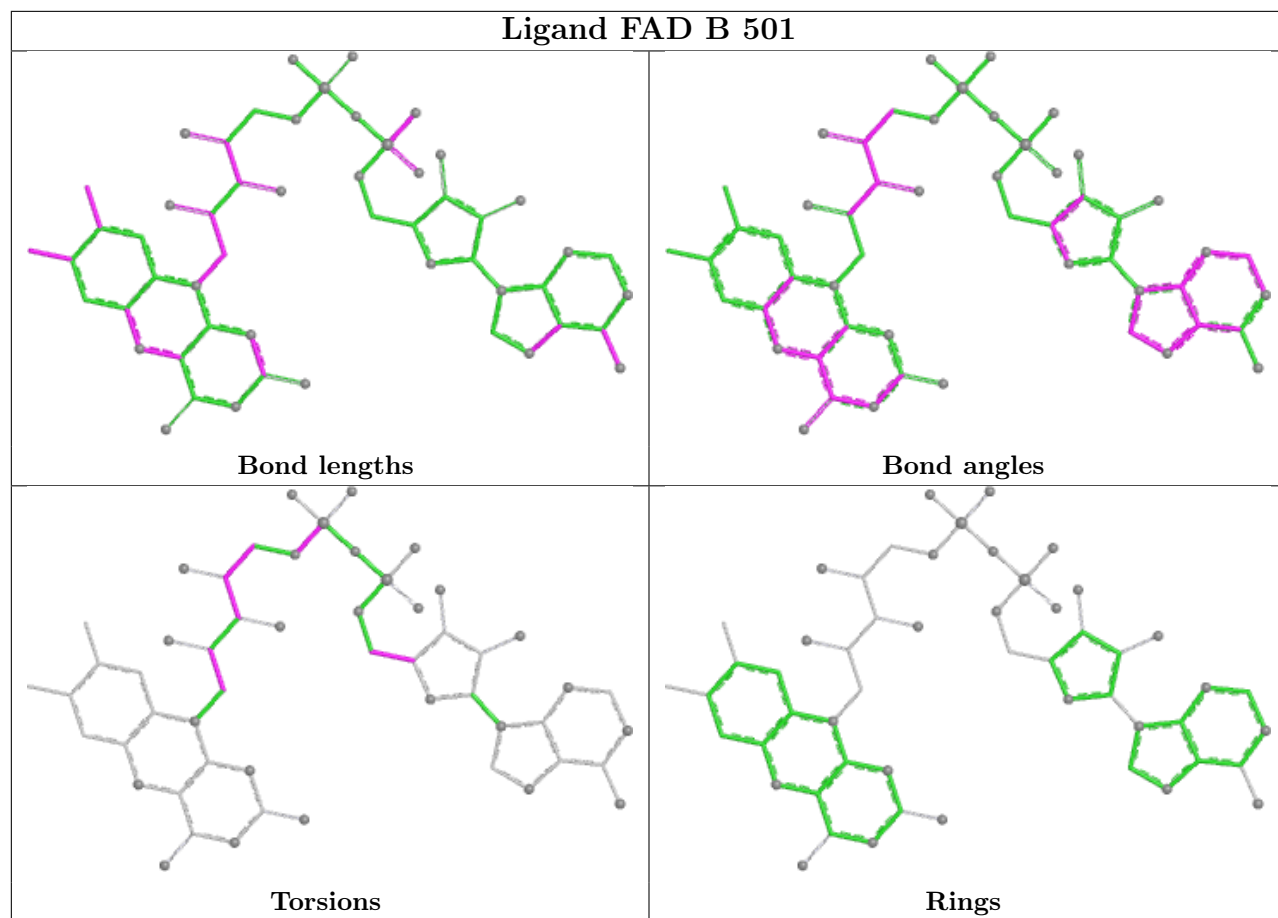
Mol	Chain	Res	Type	Atoms
3	A	502	NAP	C5B-O5B-PA-O1A
3	C	502	NAP	C5D-O5D-PN-O1N
3	D	502	NAP	C5B-O5B-PA-O1A
3	C	502	NAP	C2B-O2B-P2B-O3X
2	A	501	FAD	O2'-C2'-C3'-O3'
3	C	502	NAP	C2B-O2B-P2B-O1X
3	D	502	NAP	O4D-C4D-C5D-O5D
3	A	502	NAP	PN-O3-PA-O2A
3	C	502	NAP	PN-O3-PA-O2A
3	D	502	NAP	PN-O3-PA-O1A
2	D	501	FAD	N10-C1'-C2'-O2'
3	D	502	NAP	C3D-C4D-C5D-O5D
3	B	502	NAP	C3B-C2B-O2B-P2B
2	B	501	FAD	O4B-C4B-C5B-O5B
2	C	501	FAD	O4B-C4B-C5B-O5B
2	D	501	FAD	O4B-C4B-C5B-O5B

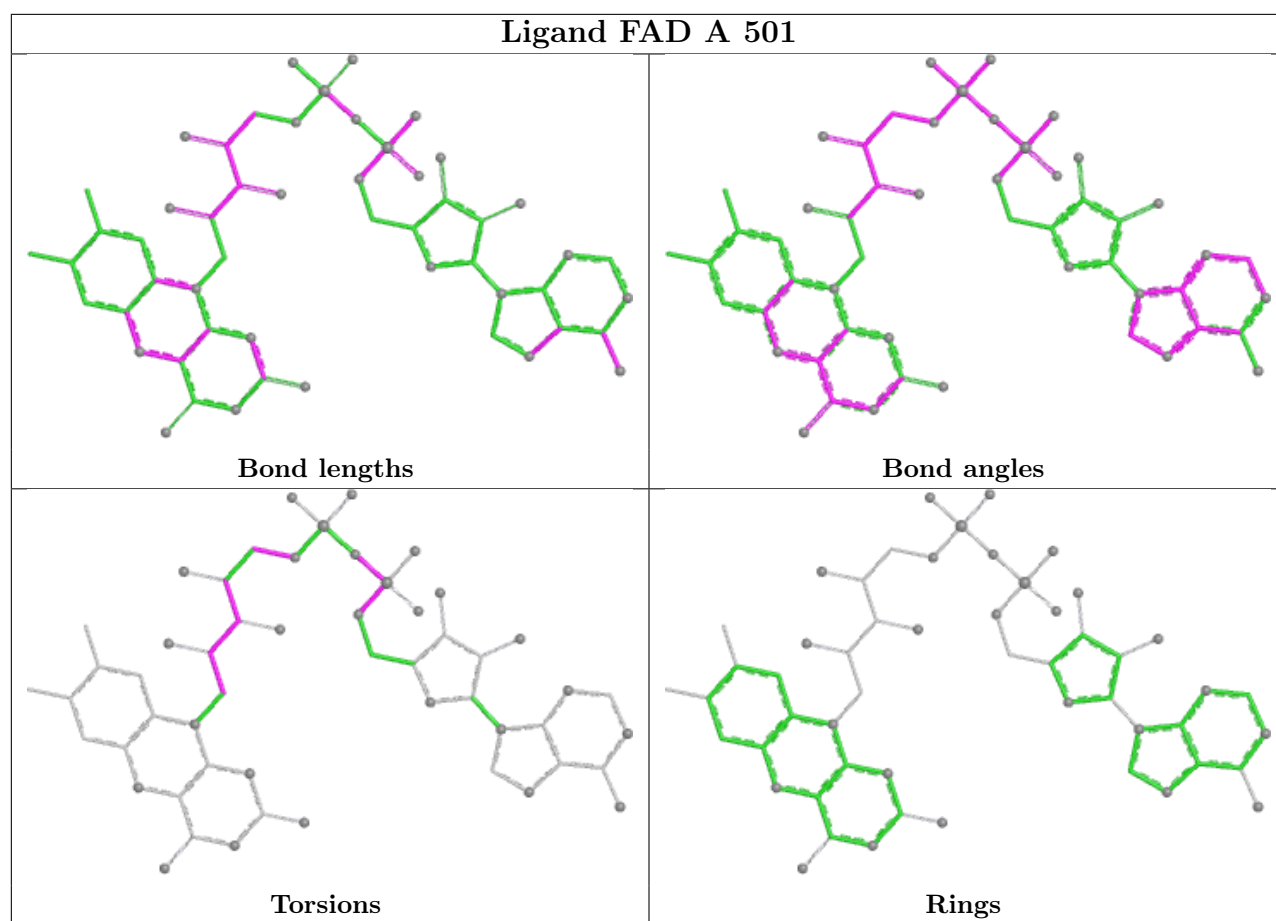
There are no ring outliers.

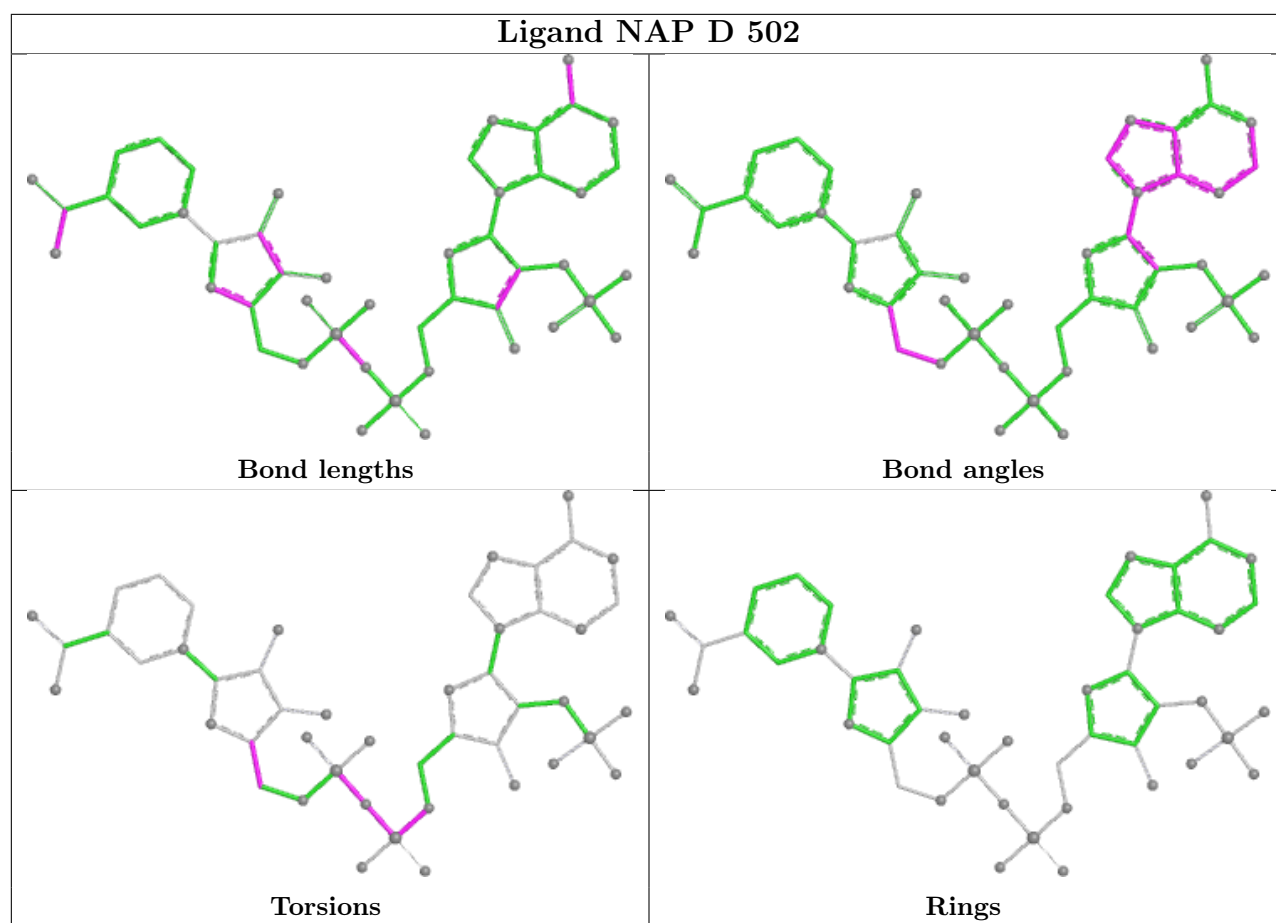
8 monomers are involved in 15 short contacts:

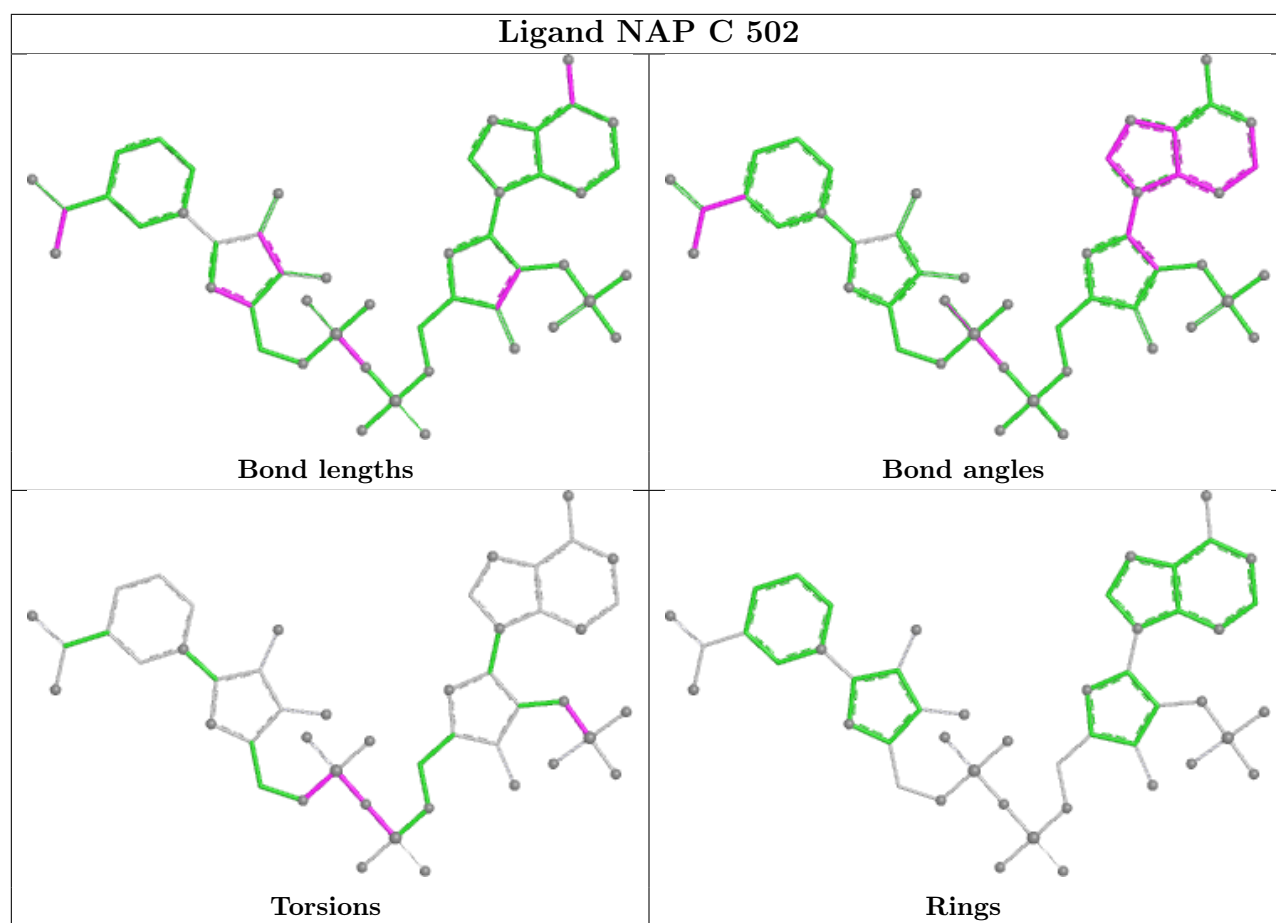
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	FAD	1	0
2	A	501	FAD	5	0
3	D	502	NAP	2	0
3	C	502	NAP	1	0
4	D	503	ORN	1	0
2	D	501	FAD	5	0
3	A	502	NAP	3	0
2	C	501	FAD	1	0

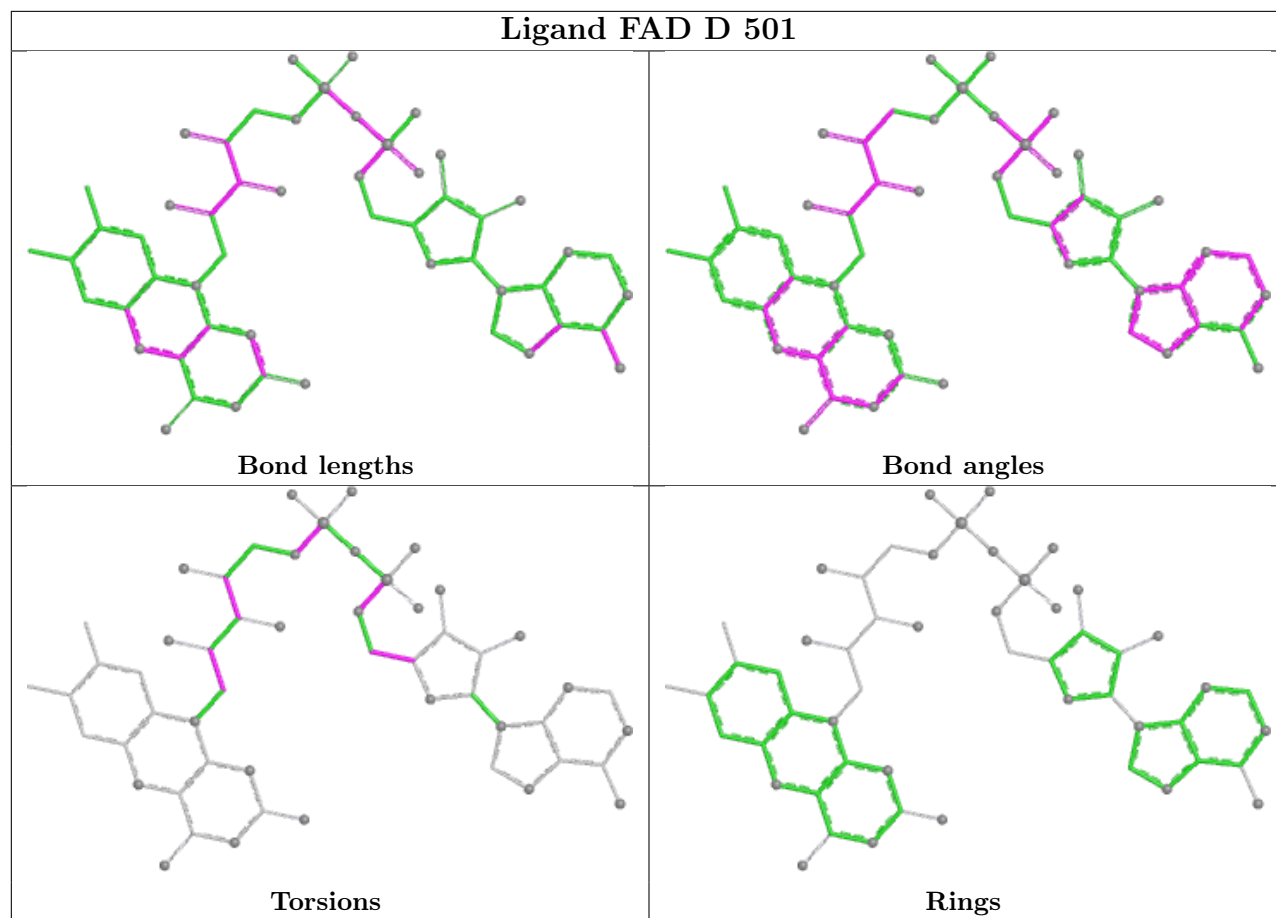
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

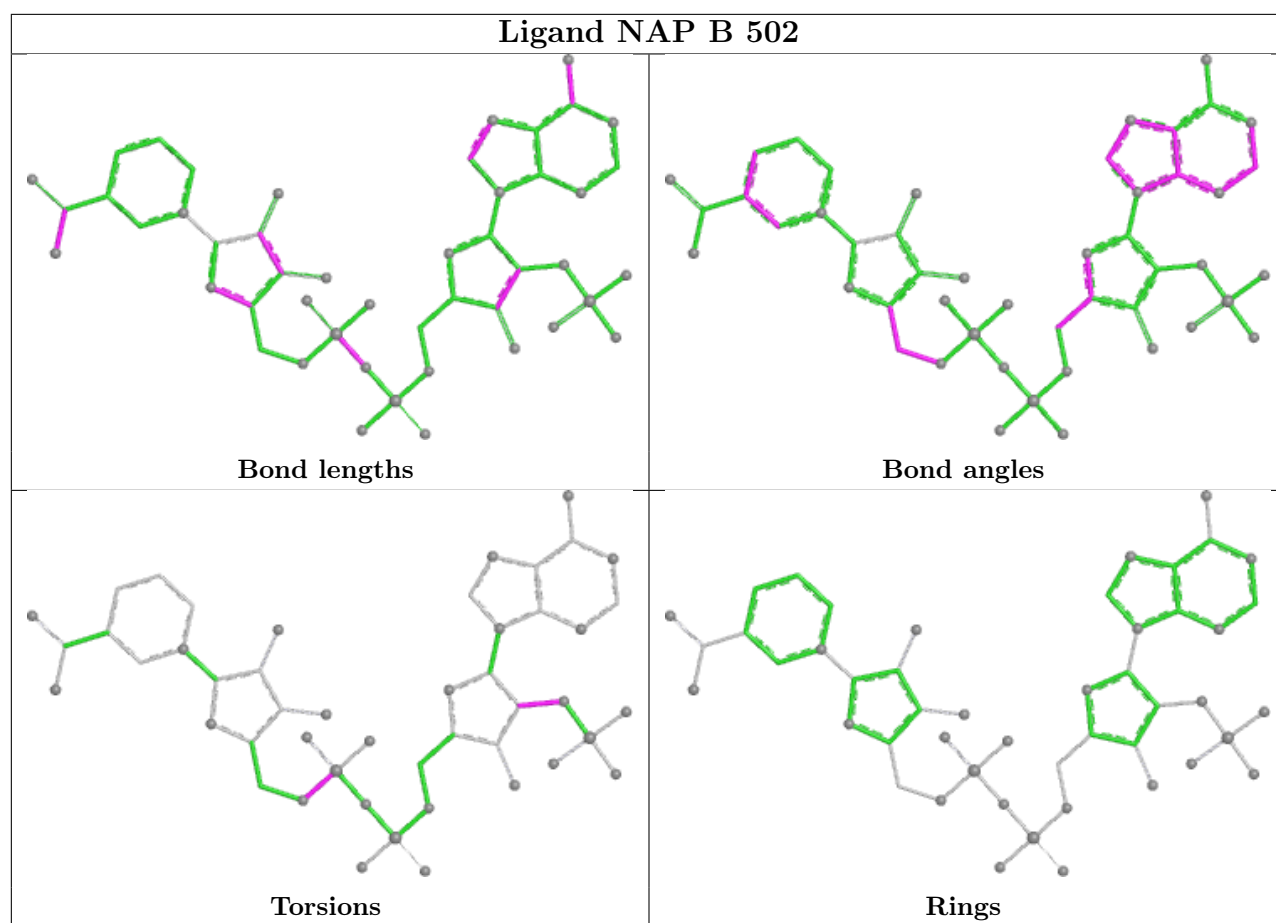


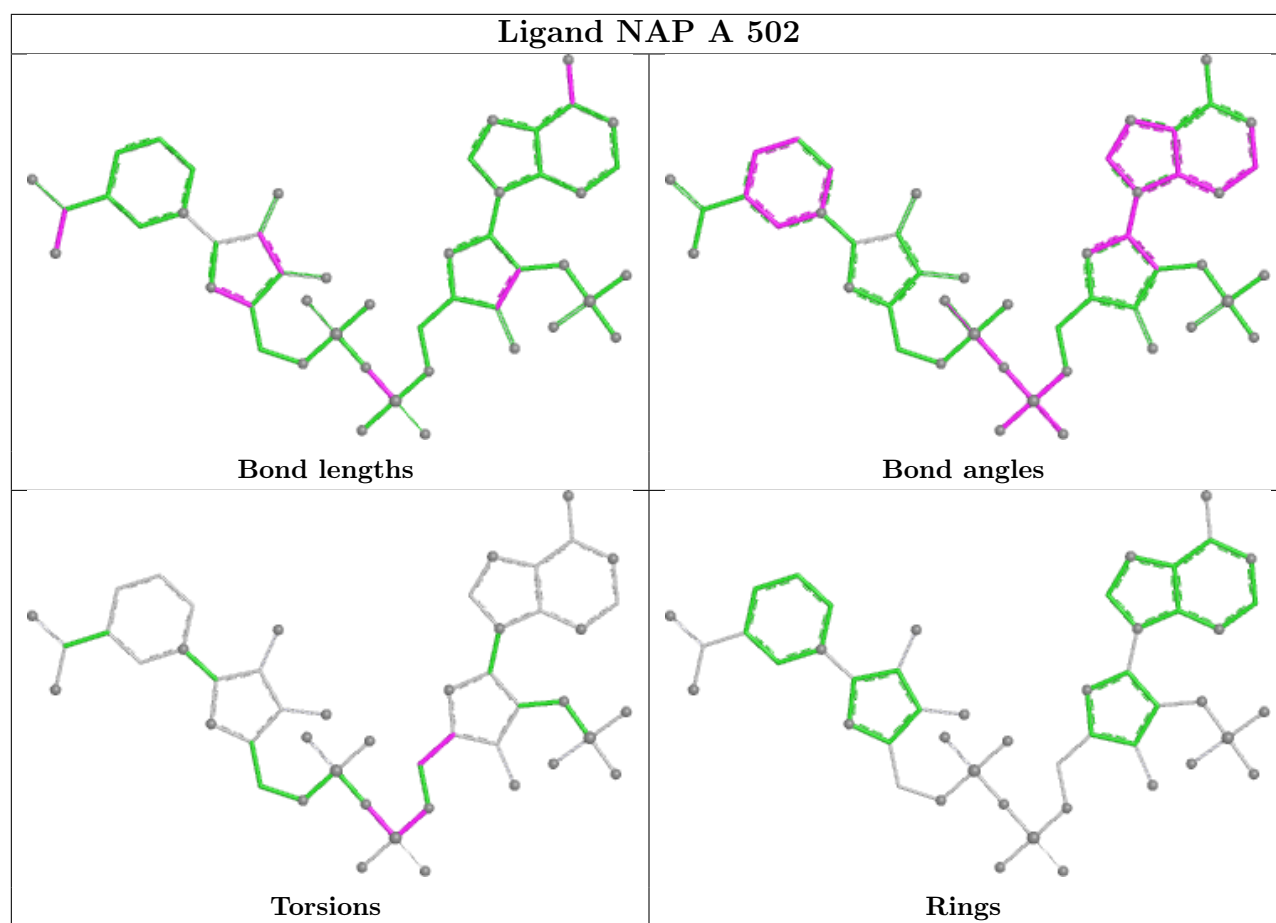


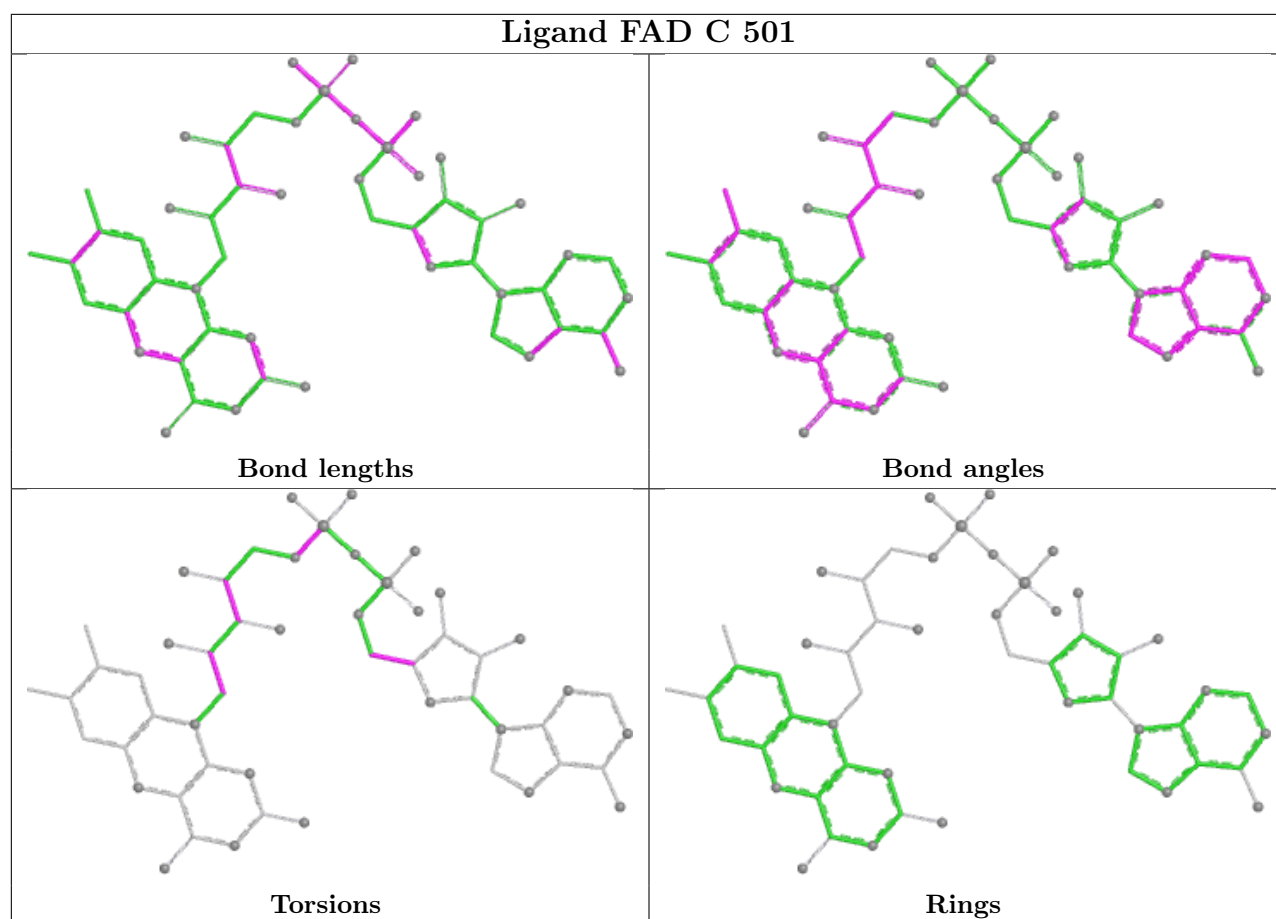












5.7 Other polymers [i](#)

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, 95th 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 ²)	Q<0.9
1	A	415/443 (93%)	-0.28	8 (1%) 66 63	18, 27, 48, 69	0
1	B	415/443 (93%)	-0.24	9 (2%) 62 59	16, 27, 50, 61	0
1	C	415/443 (93%)	0.13	19 (4%) 37 33	18, 33, 67, 81	0
1	D	415/443 (93%)	-0.14	6 (1%) 73 70	20, 31, 53, 69	0
All	All	1660/1772 (93%)	-0.13	42 (2%) 58 55	16, 29, 58, 81	0

All (42) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	424	SER	5.5
1	A	10	PRO	4.2
1	C	10	PRO	4.1
1	B	353	ASP	3.7
1	C	383	ASP	3.7
1	A	424	SER	3.5
1	D	192	ASP	3.3
1	C	194	ASP	3.3
1	D	150	GLU	3.1
1	D	220	ASN	3.1
1	B	10	PRO	3.0
1	C	384	LEU	2.9
1	C	197	SER	2.9
1	B	329	ARG	2.8
1	C	144	VAL	2.7
1	A	196	ARG	2.7
1	C	137	ARG	2.7
1	C	173	GLY	2.6
1	D	10	PRO	2.6
1	C	151	ALA	2.6
1	C	135	PRO	2.6

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Mol	Chain	Res	Type	RSRZ
1	D	195	PRO	2.5
1	C	152	THR	2.5
1	C	195	PRO	2.5
1	A	197	SER	2.5
1	B	332	SER	2.5
1	A	150	GLU	2.4
1	C	136	GLY	2.4
1	C	361	HIS	2.4
1	C	150	GLU	2.3
1	B	151	ALA	2.3
1	B	150	GLU	2.3
1	C	176	SER	2.2
1	A	194	ASP	2.2
1	B	147	SER	2.2
1	B	149	PRO	2.2
1	B	424	SER	2.2
1	C	35	ALA	2.1
1	A	195	PRO	2.1
1	A	366	ALA	2.1
1	C	175	GLN	2.0
1	C	424	SER	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 oligosaccharides 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, 95th 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($\text{\AA}^2$)	Q<0.9
5	K	C	504	1/1	0.78	0.15	64,64,64,64	0
5	K	D	504	1/1	0.89	0.11	54,54,54,54	0

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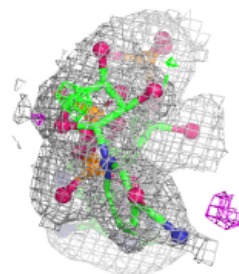
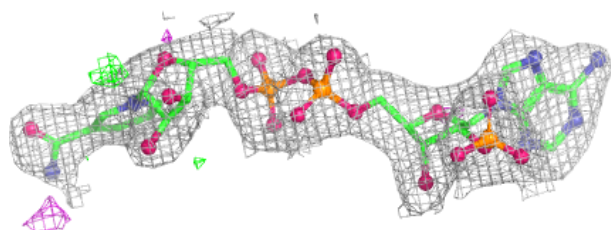
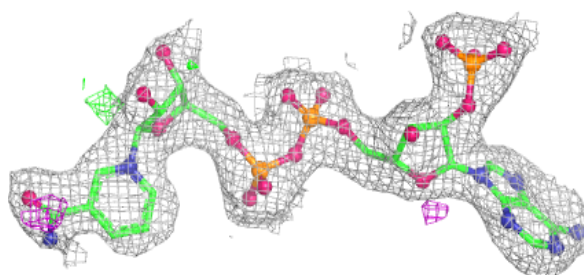
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
5	K	A	504	1/1	0.90	0.10	48,48,48,48	0
5	K	B	505	1/1	0.91	0.08	55,55,55,55	0
5	K	A	506	1/1	0.93	0.14	78,78,78,78	0
4	ORN	D	503	9/9	0.93	0.12	27,28,33,39	0
4	ORN	C	503	9/9	0.94	0.09	28,30,33,33	0
4	ORN	B	503	9/9	0.94	0.09	24,26,30,32	0
5	K	B	504	1/1	0.94	0.07	47,47,47,47	0
5	K	C	505	1/1	0.95	0.07	60,60,60,60	0
4	ORN	A	503	9/9	0.95	0.12	25,28,35,36	0
3	NAP	D	502	48/48	0.96	0.07	24,33,38,40	0
2	FAD	C	501	53/53	0.96	0.07	19,33,43,44	0
3	NAP	A	502	48/48	0.96	0.07	18,27,33,36	0
2	FAD	D	501	53/53	0.97	0.07	16,29,37,41	0
2	FAD	B	501	53/53	0.97	0.07	17,24,34,36	0
3	NAP	B	502	48/48	0.97	0.06	19,25,34,40	0
3	NAP	C	502	48/48	0.97	0.06	19,28,34,39	0
2	FAD	A	501	53/53	0.97	0.07	15,26,39,43	0
5	K	A	505	1/1	0.97	0.06	40,40,40,40	0

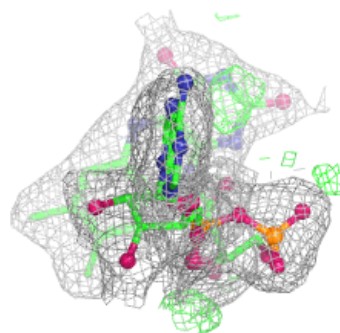
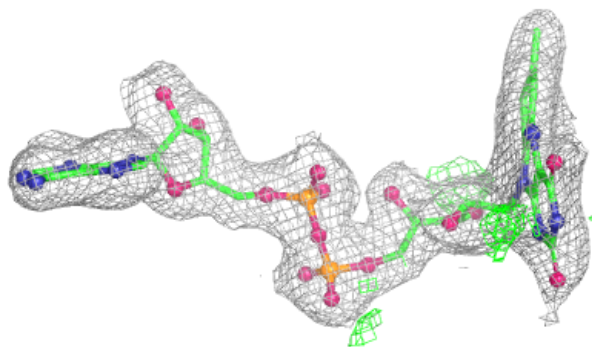
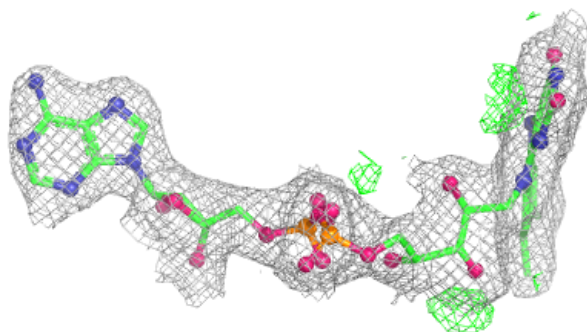
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around NAP D 502:

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

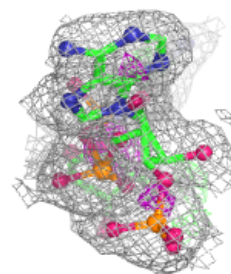
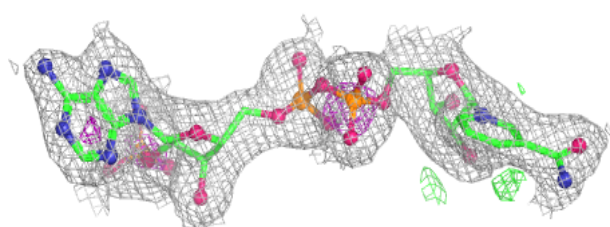
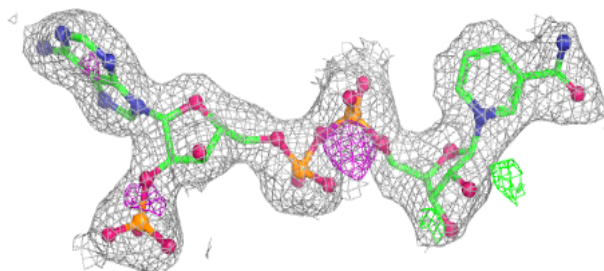
**Electron density around FAD C 501:**

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

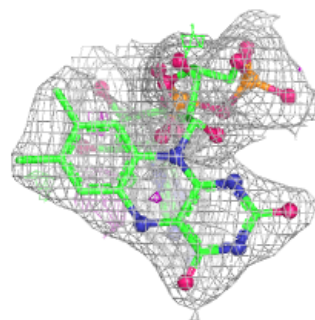
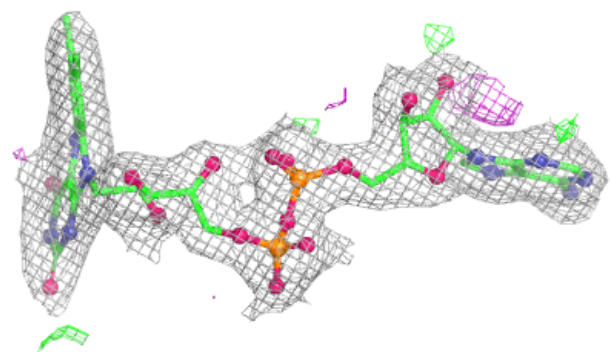
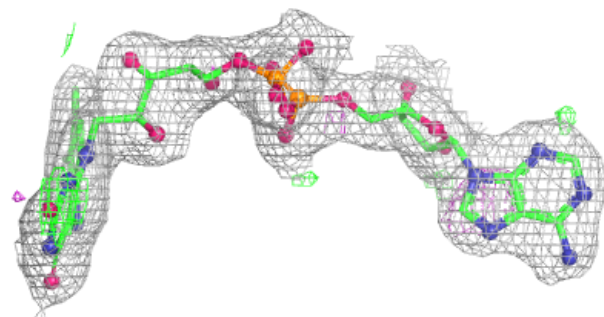


Electron density around NAP A 502:

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

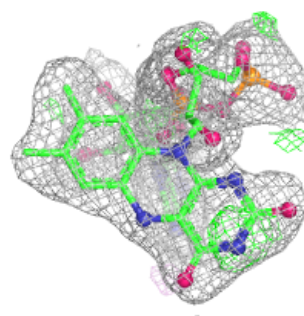
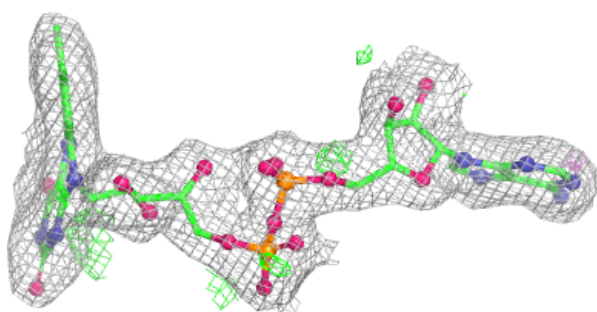
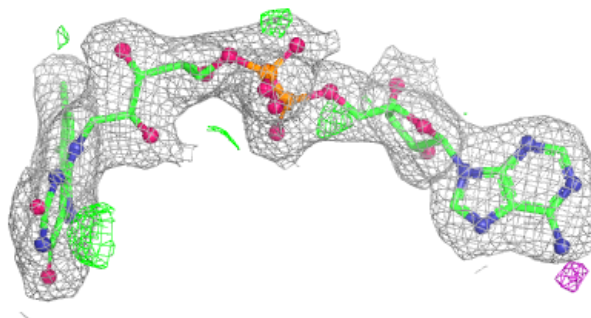
**Electron density around FAD D 501:**

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 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

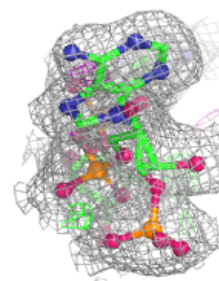
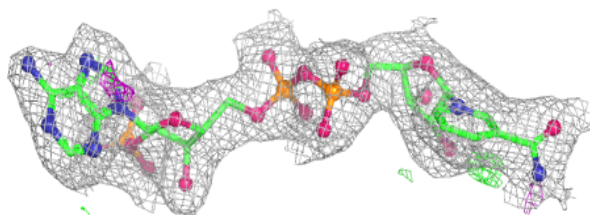
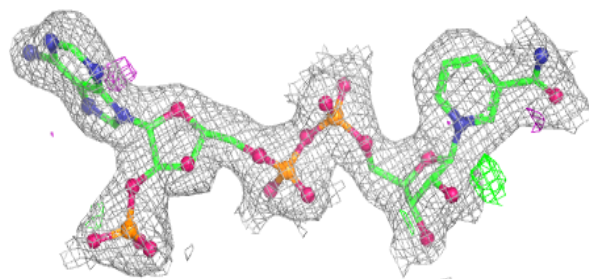


Electron density around FAD B 501:

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

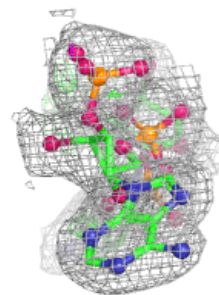
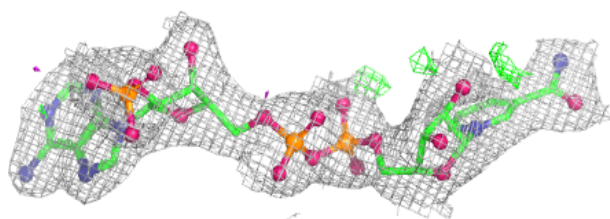
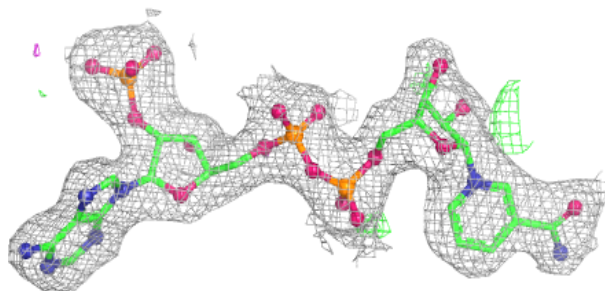
**Electron density around NAP B 502:**

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

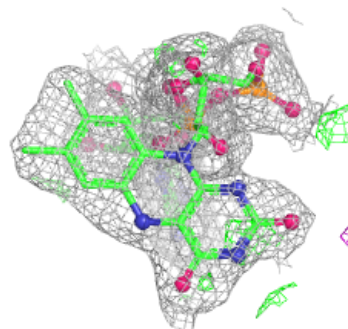
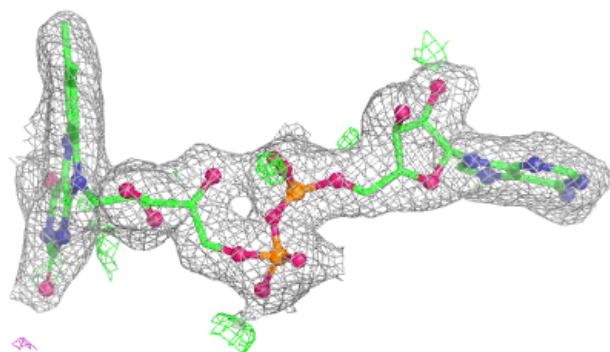
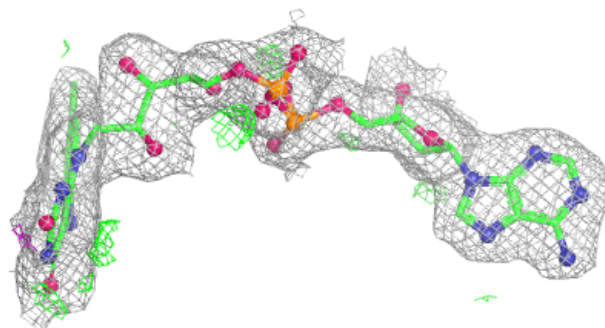


Electron density around NAP C 502:

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

**Electron density around FAD A 501:**

$2mF_o-DF_c$ (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.