



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 25, 2024 – 04:52 AM EDT

PDB ID : 6HR8  
Title : HMG-CoA reductase from *Methanothermococcus thermolithotrophicus* in complex with NADPH at 2.9 Å resolution  
Authors : Wagner, T.; Voegeli, B.; Erb, T.J.; Shima, S.  
Deposited on : 2018-09-26  
Resolution : 2.90 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 types of validation reports are described at

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

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

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtriage (Phenix) : 1.13  
EDS : 2.37.1  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

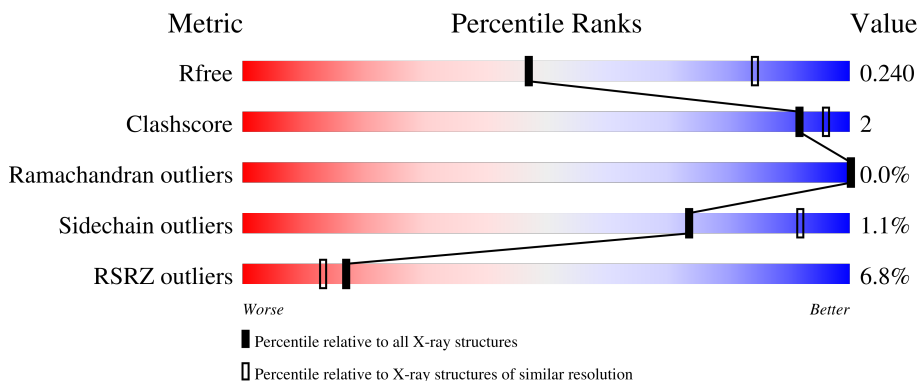
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

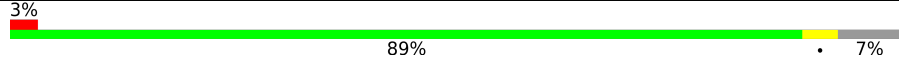
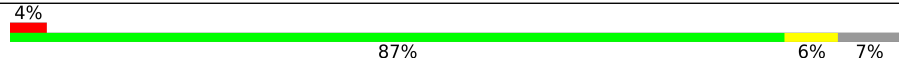
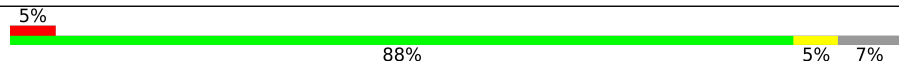
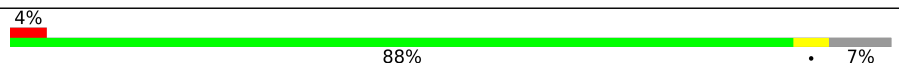
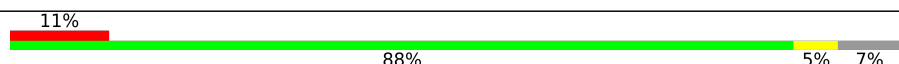
The reported resolution of this entry is 2.90 Å.

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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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	427	
2	B	427	
2	C	427	
2	D	427	
2	E	427	

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Mol	Chain	Length	Quality of chain
2	F	427	

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
5	PEG	C	505	-	-	-	X

## 2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 18073 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.

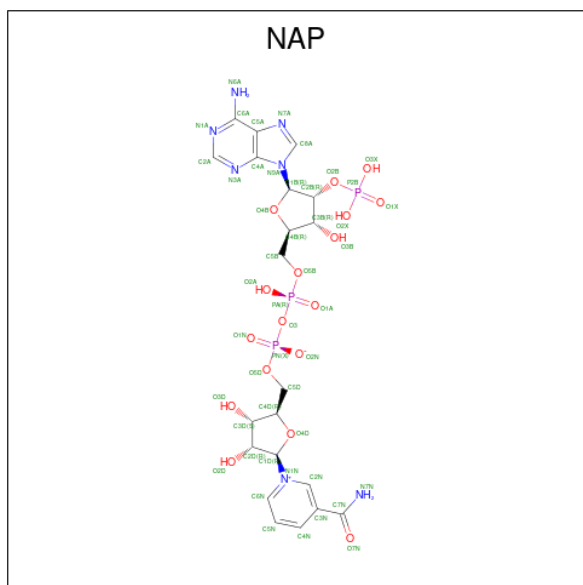
- Molecule 1 is a protein called HMG-CoA reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	397	3035	1927	515	578	15	0	0	0

- Molecule 2 is a protein called HMG-CoA reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	396	3025	1923	513	574	15	0	0	0
2	C	396	3003	1910	511	567	15	0	0	0
2	D	396	3030	1926	514	575	15	0	0	0
2	E	396	2845	1799	488	544	14	0	0	0
2	F	396	2856	1806	484	551	15	0	0	0

- Molecule 3 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula:  $C_{21}H_{28}N_7O_{17}P_3$ ).



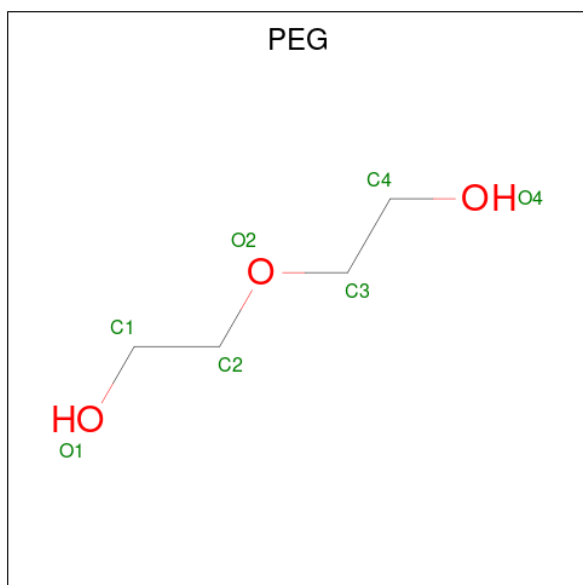
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	Total 35	C 13	N 5	O 14	P 3	0	0
3	B	1	Total 32	C 11	N 5	O 13	P 3	0	0
3	C	1	Total 35	C 13	N 5	O 14	P 3	0	0
3	D	1	Total 35	C 13	N 5	O 14	P 3	0	0
3	E	1	Total 35	C 13	N 5	O 14	P 3	0	0
3	F	1	Total 32	C 11	N 5	O 13	P 3	0	0

- Molecule 4 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			7	4	3		
5	A	1	Total	C	O	0	0
			4	2	2		
5	A	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			4	2	2		
5	B	1	Total	C	O	0	0
			7	4	3		
5	B	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			7	4	3		
5	C	1	Total	C	O	0	0
			4	2	2		
5	C	1	Total	C	O	0	0
			5	3	2		
5	D	1	Total	C	O	0	0
			7	4	3		

- Molecule 6 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	2	Total	Na	0	0
			2	2		

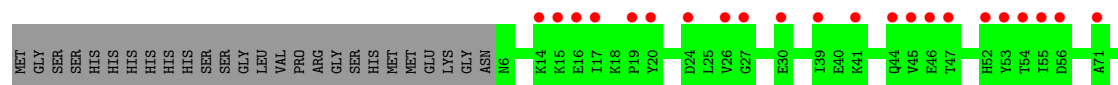






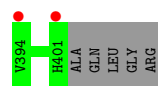
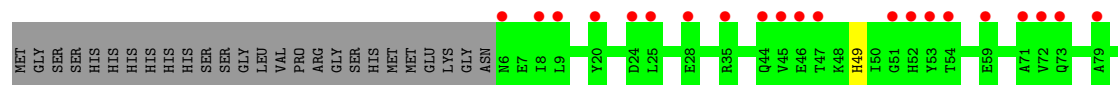
- Molecule 2: HMG-CoA reductase

Chain E: 11% 88% 5% 7%



- Molecule 2: HMG-CoA reductase

Chain F: 10% 89% 7%



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 4 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	231.79Å 231.79Å 98.71Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.99 – 2.90 24.99 – 2.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (24.99-2.90) 100.0 (24.99-2.90)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.50 (at 2.89Å)	Xtrriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, $R_{free}$	0.211 , 0.243 0.212 , 0.240	Depositor DCC
$R_{free}$ test set	2998 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	92.7	Xtrriage
Anisotropy	0.081	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 77.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.43$ , $\langle L^2 \rangle = 0.25$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	18073	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	113.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.38% 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: PEG, NA, SO4, CSO, NAP

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	0.27	0/3069	0.46	0/4137
2	B	0.28	0/3066	0.47	0/4133
2	C	0.28	0/3045	0.46	0/4110
2	D	0.28	0/3072	0.47	0/4141
2	E	0.26	0/2886	0.45	0/3927
2	F	0.25	0/2897	0.45	0/3942
All	All	0.27	0/18035	0.46	0/24390

There are no bond length outliers.

There are no bond angle outliers.

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	3035	0	3126	7	0
2	B	3025	0	3128	13	0
2	C	3003	0	3084	14	0
2	D	3030	0	3131	12	0
2	E	2845	0	2741	12	0
2	F	2856	0	2748	8	0
3	A	35	0	14	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	32	0	11	0	0
3	C	35	0	14	0	0
3	D	35	0	14	0	0
3	E	35	0	14	1	0
3	F	32	0	11	1	0
4	A	5	0	0	0	0
4	B	10	0	0	0	0
4	C	5	0	0	0	0
5	A	15	0	20	0	0
5	B	15	0	20	0	0
5	C	16	0	20	2	0
5	D	7	0	10	0	0
6	D	2	0	0	0	0
All	All	18073	0	18106	58	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 2.

All (58) 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)
2:E:129:LYS:O	2:E:248:GLY:N	2.27	0.68
2:C:135:VAL:HG13	2:C:226:VAL:HB	1.82	0.61
2:D:135:VAL:HG13	2:D:226:VAL:HB	1.83	0.60
2:C:256:PHE:O	5:C:504:PEG:H42	2.02	0.59
2:E:135:VAL:HG22	2:E:185:TYR:CE2	2.38	0.59
1:A:135:VAL:HG13	1:A:226:VAL:HB	1.89	0.55
2:F:166:THR:OG1	3:F:501:NAP:O3X	2.23	0.54
1:A:147:LEU:HD13	1:A:216:LEU:HD11	1.89	0.54
2:C:173:ASP:OD1	2:C:174:ILE:N	2.42	0.53
2:E:200:MET:N	3:E:501:NAP:O1A	2.41	0.53
2:C:118:CYS:O	5:C:504:PEG:H41	2.08	0.52
2:B:183:TYR:OH	2:D:326:GLU:OE1	2.28	0.52
2:C:172:ILE:HD13	2:C:191:LYS:HE2	1.91	0.51
1:A:312:GLU:HG2	2:B:306:LEU:HD11	1.93	0.51
2:D:173:ASP:OD1	2:D:174:ILE:N	2.44	0.50
1:A:132:ARG:NH1	1:A:233:CSO:SG	2.83	0.49
2:B:115:VAL:HG11	2:B:121:VAL:HG23	1.93	0.49
2:F:136:ILE:HG12	2:F:225:THR:HG22	1.95	0.49
2:C:117:LYS:HD2	2:C:265:TYR:CE1	2.48	0.48
2:D:115:VAL:HG11	2:D:121:VAL:CG2	2.43	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:173:ASP:OD1	2:F:174:ILE:N	2.46	0.48
2:B:115:VAL:HG11	2:B:121:VAL:CG2	2.44	0.48
2:D:135:VAL:CG1	2:D:226:VAL:HB	2.44	0.47
2:C:115:VAL:HG11	2:C:121:VAL:CG2	2.45	0.47
1:A:306:LEU:HD11	2:B:312:GLU:HG2	1.98	0.46
2:C:135:VAL:CG1	2:C:226:VAL:HB	2.46	0.46
2:F:115:VAL:HG11	2:F:121:VAL:CG2	2.46	0.45
2:E:178:LEU:HB2	2:E:185:TYR:HB2	1.99	0.45
2:B:28:GLU:OE1	2:B:58:LYS:HA	2.17	0.45
2:E:134:PRO:HB3	2:E:228:LEU:HA	1.99	0.45
2:E:173:ASP:OD1	2:E:174:ILE:N	2.49	0.45
2:B:23:ASP:OD1	2:B:35:ARG:NH1	2.49	0.44
2:C:306:LEU:HD11	2:D:312:GLU:HG2	1.99	0.44
2:E:353:GLU:HB3	2:F:49:HIS:CD2	2.52	0.44
1:A:173:ASP:OD1	1:A:174:ILE:N	2.51	0.44
2:C:8:ILE:H	2:C:8:ILE:HD12	1.82	0.44
2:D:147:LEU:HD13	2:D:216:LEU:HD11	2.00	0.43
2:E:115:VAL:HG11	2:E:121:VAL:CG2	2.48	0.43
1:A:35:ARG:HD2	1:A:68:MET:O	2.19	0.43
2:D:401:HIS:ND1	2:D:401:HIS:N	2.66	0.43
2:B:326:GLU:OE1	2:D:183:TYR:OH	2.36	0.43
2:B:147:LEU:HD13	2:B:216:LEU:HD11	2.01	0.43
2:E:136:ILE:HG12	2:E:225:THR:HG22	1.99	0.42
2:E:136:ILE:HG21	2:E:223:ILE:HD12	2.01	0.42
2:F:269:THR:HG23	2:F:272:ALA:H	1.85	0.42
2:E:185:TYR:CE2	2:F:284:GLY:HA2	2.54	0.42
2:E:135:VAL:HG23	2:E:230:GLY:HA3	2.00	0.42
2:B:173:ASP:OD1	2:B:174:ILE:N	2.51	0.42
2:B:358:CYS:HA	2:B:361:LEU:HD12	2.02	0.42
2:D:231:ASN:OD1	2:D:237:LYS:NZ	2.50	0.42
2:C:134:PRO:HB3	2:C:228:LEU:HA	2.02	0.41
2:D:134:PRO:HB3	2:D:228:LEU:HA	2.02	0.41
2:B:129:LYS:NZ	2:B:245:GLU:O	2.33	0.41
2:C:172:ILE:HD11	2:C:189:VAL:HG12	2.02	0.41
2:C:135:VAL:HG21	2:D:279:TYR:HB3	2.03	0.41
2:C:147:LEU:HD13	2:C:216:LEU:CD1	2.51	0.40
2:F:233:CYS:HB2	2:F:234:VAL:CA	2.52	0.40
2:B:86:GLY:O	2:B:90:ASN:ND2	2.54	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	394/427 (92%)	379 (96%)	15 (4%)	0	100	100
2	B	394/427 (92%)	380 (96%)	14 (4%)	0	100	100
2	C	394/427 (92%)	377 (96%)	16 (4%)	1 (0%)	41	71
2	D	394/427 (92%)	380 (96%)	14 (4%)	0	100	100
2	E	394/427 (92%)	380 (96%)	14 (4%)	0	100	100
2	F	394/427 (92%)	379 (96%)	15 (4%)	0	100	100
All	All	2364/2562 (92%)	2275 (96%)	88 (4%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	C	119	GLY

### 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	325/350 (93%)	321 (99%)	4 (1%)	71	91
2	B	325/351 (93%)	321 (99%)	4 (1%)	71	91
2	C	319/351 (91%)	316 (99%)	3 (1%)	78	93
2	D	326/351 (93%)	322 (99%)	4 (1%)	71	91
2	E	278/351 (79%)	275 (99%)	3 (1%)	73	92
2	F	281/351 (80%)	279 (99%)	2 (1%)	84	95

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1854/2105 (88%)	1834 (99%)	20 (1%)	73 92

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	48	LYS
1	A	289	ASN
1	A	296	HIS
1	A	351	ARG
2	B	289	ASN
2	B	296	HIS
2	B	351	ARG
2	B	399	ARG
2	C	134	PRO
2	C	296	HIS
2	C	351	ARG
2	D	134	PRO
2	D	296	HIS
2	D	351	ARG
2	D	401	HIS
2	E	296	HIS
2	E	351	ARG
2	E	401	HIS
2	F	296	HIS
2	F	351	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	168	HIS
2	C	314	HIS
2	D	168	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is modelled in this entry.

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	$\# Z  > 2$
1	CSO	A	233	1	3,6,7	0.89	0	0,6,8	-	-

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
1	CSO	A	233	1	-	0/1/5/7	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	233	CSO	1	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 22 ligands modelled in this entry, 2 are monoatomic - leaving 20 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
5	PEG	C	503	-	6,6,6	0.43	0	5,5,5	0.32	0
3	NAP	C	501	-	30,37,52	0.91	1 (3%)	35,57,80	1.23	4 (11%)
5	PEG	B	505	-	6,6,6	0.35	0	5,5,5	0.37	0
3	NAP	B	501	-	28,34,52	1.00	2 (7%)	34,53,80	1.28	5 (14%)
3	NAP	E	501	-	30,37,52	0.94	1 (3%)	35,57,80	1.22	4 (11%)
4	SO4	A	502	-	4,4,4	0.30	0	6,6,6	0.07	0
4	SO4	B	502	-	4,4,4	0.31	0	6,6,6	0.06	0
4	SO4	B	503	-	4,4,4	0.31	0	6,6,6	0.07	0
5	PEG	B	504	-	3,3,6	0.29	0	2,2,5	0.39	0
3	NAP	A	501	-	30,37,52	0.94	1 (3%)	35,57,80	1.18	4 (11%)
5	PEG	C	505	-	4,4,6	0.27	0	3,3,5	0.32	0
3	NAP	F	501	-	28,34,52	0.96	1 (3%)	34,53,80	1.22	5 (14%)
3	NAP	D	501	-	30,37,52	0.95	1 (3%)	35,57,80	1.28	4 (11%)
5	PEG	B	506	-	3,3,6	0.38	0	2,2,5	0.42	0
5	PEG	A	504	-	3,3,6	0.27	0	2,2,5	0.42	0
4	SO4	C	502	-	4,4,4	0.32	0	6,6,6	0.04	0
5	PEG	D	502	-	6,6,6	0.39	0	5,5,5	0.67	0
5	PEG	C	504	-	3,3,6	0.33	0	2,2,5	0.25	0
5	PEG	A	503	-	6,6,6	0.45	0	5,5,5	0.28	0
5	PEG	A	505	-	3,3,6	0.30	0	2,2,5	0.42	0

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
5	PEG	C	503	-	-	2/4/4/4	-
5	PEG	B	504	-	-	1/1/1/4	-
3	NAP	A	501	-	-	7/23/43/67	0/3/3/5
5	PEG	B	506	-	-	1/1/1/4	-
5	PEG	C	505	-	-	2/2/2/4	-
3	NAP	F	501	-	-	3/20/40/67	0/3/3/5
3	NAP	D	501	-	-	9/23/43/67	0/3/3/5
3	NAP	C	501	-	-	1/23/43/67	0/3/3/5
5	PEG	A	504	-	-	0/1/1/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	PEG	B	505	-	-	2/4/4/4	-
3	NAP	B	501	-	-	6/20/40/67	0/3/3/5
5	PEG	D	502	-	-	3/4/4/4	-
5	PEG	C	504	-	-	0/1/1/4	-
5	PEG	A	503	-	-	1/4/4/4	-
5	PEG	A	505	-	-	0/1/1/4	-
3	NAP	E	501	-	-	7/23/43/67	0/3/3/5

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	501	NAP	C5A-C4A	2.62	1.47	1.40
3	B	501	NAP	C5A-C4A	2.56	1.47	1.40
3	D	501	NAP	C5A-C4A	2.56	1.47	1.40
3	A	501	NAP	C5A-C4A	2.55	1.47	1.40
3	F	501	NAP	C5A-C4A	2.51	1.47	1.40
3	C	501	NAP	C5A-C4A	2.43	1.47	1.40
3	B	501	NAP	O4B-C1B	2.19	1.44	1.41

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	501	NAP	PN-O3-PA	-3.94	119.31	132.83
3	E	501	NAP	PN-O3-PA	-3.62	120.41	132.83
3	D	501	NAP	N3A-C2A-N1A	-3.58	123.08	128.68
3	A	501	NAP	N3A-C2A-N1A	-3.54	123.14	128.68
3	D	501	NAP	PN-O3-PA	-3.47	120.92	132.83
3	F	501	NAP	N3A-C2A-N1A	-3.44	123.29	128.68
3	B	501	NAP	N3A-C2A-N1A	-3.40	123.36	128.68
3	C	501	NAP	N3A-C2A-N1A	-3.38	123.39	128.68
3	E	501	NAP	N3A-C2A-N1A	-3.33	123.47	128.68
3	A	501	NAP	PN-O3-PA	-3.12	122.12	132.83
3	B	501	NAP	C4A-C5A-N7A	-3.02	106.25	109.40
3	B	501	NAP	PN-O3-PA	-2.89	122.90	132.83
3	F	501	NAP	O3-PN-O5D	2.83	111.42	102.58
3	D	501	NAP	C4A-C5A-N7A	-2.82	106.46	109.40
3	C	501	NAP	C4A-C5A-N7A	-2.81	106.47	109.40
3	F	501	NAP	C4A-C5A-N7A	-2.77	106.51	109.40
3	E	501	NAP	C4A-C5A-N7A	-2.71	106.58	109.40
3	B	501	NAP	O3-PN-O5D	2.71	111.03	102.58
3	F	501	NAP	PN-O3-PA	-2.60	123.89	132.83

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	501	NAP	C2B-C3B-C4B	2.60	107.65	101.99
3	A	501	NAP	C4A-C5A-N7A	-2.54	106.75	109.40
3	A	501	NAP	C2B-C3B-C4B	2.37	107.13	101.99
3	B	501	NAP	C2B-C3B-C4B	2.21	106.80	101.99
3	F	501	NAP	C2B-C3B-C4B	2.21	106.80	101.99
3	C	501	NAP	C2B-C3B-C4B	2.12	106.60	101.99
3	E	501	NAP	C2B-C3B-C4B	2.09	106.53	101.99

There are no chirality outliers.

All (45) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	501	NAP	C5B-O5B-PA-O1A
3	A	501	NAP	C5D-O5D-PN-O3
3	A	501	NAP	C5D-O5D-PN-O1N
3	A	501	NAP	O4D-C4D-C5D-O5D
3	A	501	NAP	C3D-C4D-C5D-O5D
3	B	501	NAP	C2B-O2B-P2B-O1X
3	D	501	NAP	C5D-O5D-PN-O1N
3	D	501	NAP	C5D-O5D-PN-O2N
3	D	501	NAP	O4D-C4D-C5D-O5D
3	E	501	NAP	O4D-C4D-C5D-O5D
3	F	501	NAP	PA-O3-PN-O5D
5	C	505	PEG	O2-C3-C4-O4
5	C	503	PEG	O1-C1-C2-O2
5	B	504	PEG	O2-C3-C4-O4
5	C	503	PEG	C1-C2-O2-C3
3	D	501	NAP	C3D-C4D-C5D-O5D
3	E	501	NAP	C3D-C4D-C5D-O5D
5	B	506	PEG	O2-C3-C4-O4
3	B	501	NAP	PN-O3-PA-O5B
3	B	501	NAP	PA-O3-PN-O5D
3	D	501	NAP	PA-O3-PN-O5D
3	F	501	NAP	PN-O3-PA-O5B
3	E	501	NAP	C4D-C5D-O5D-PN
5	D	502	PEG	C4-C3-O2-C2
3	B	501	NAP	C2B-O2B-P2B-O2X
3	D	501	NAP	C5D-O5D-PN-O3
3	E	501	NAP	C5D-O5D-PN-O3
5	A	503	PEG	O2-C3-C4-O4
3	A	501	NAP	PA-O3-PN-O1N
5	D	502	PEG	C1-C2-O2-C3

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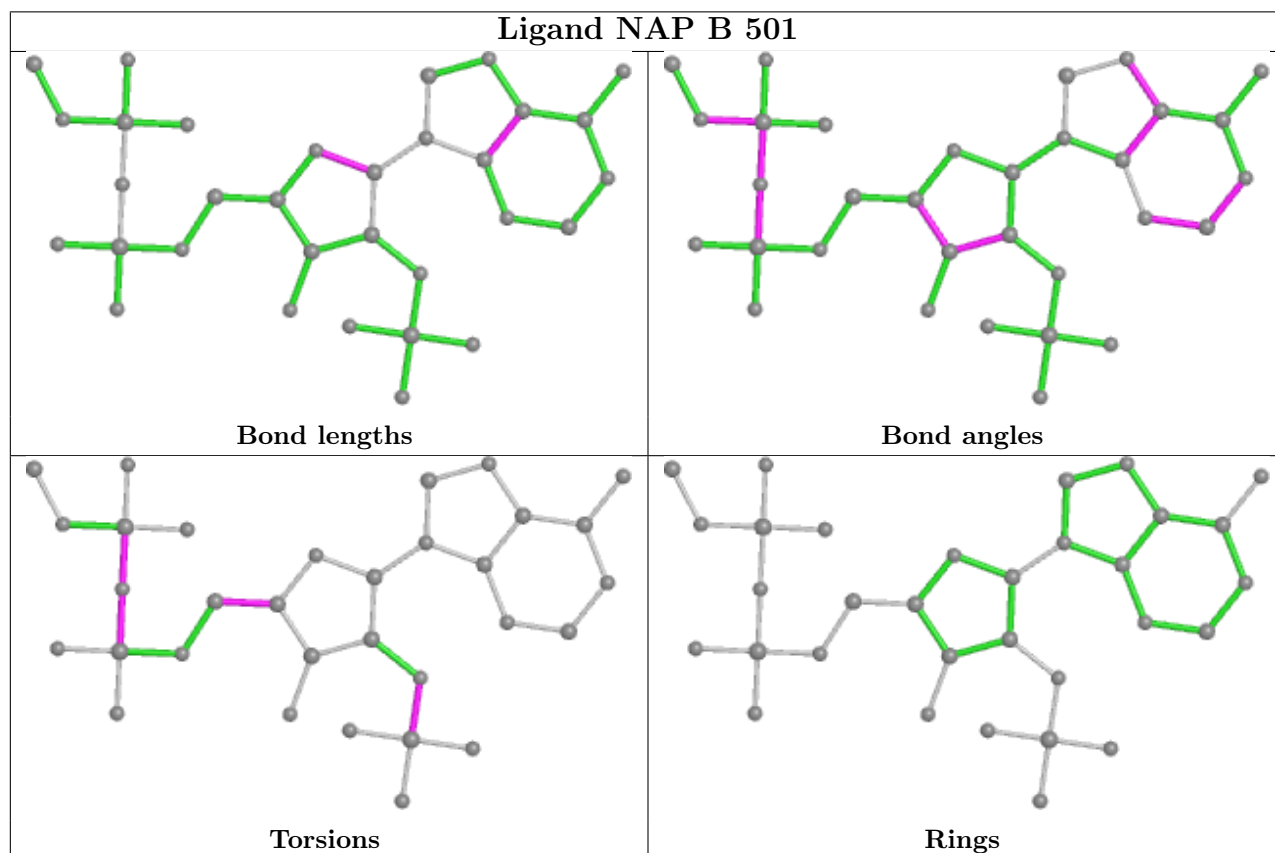
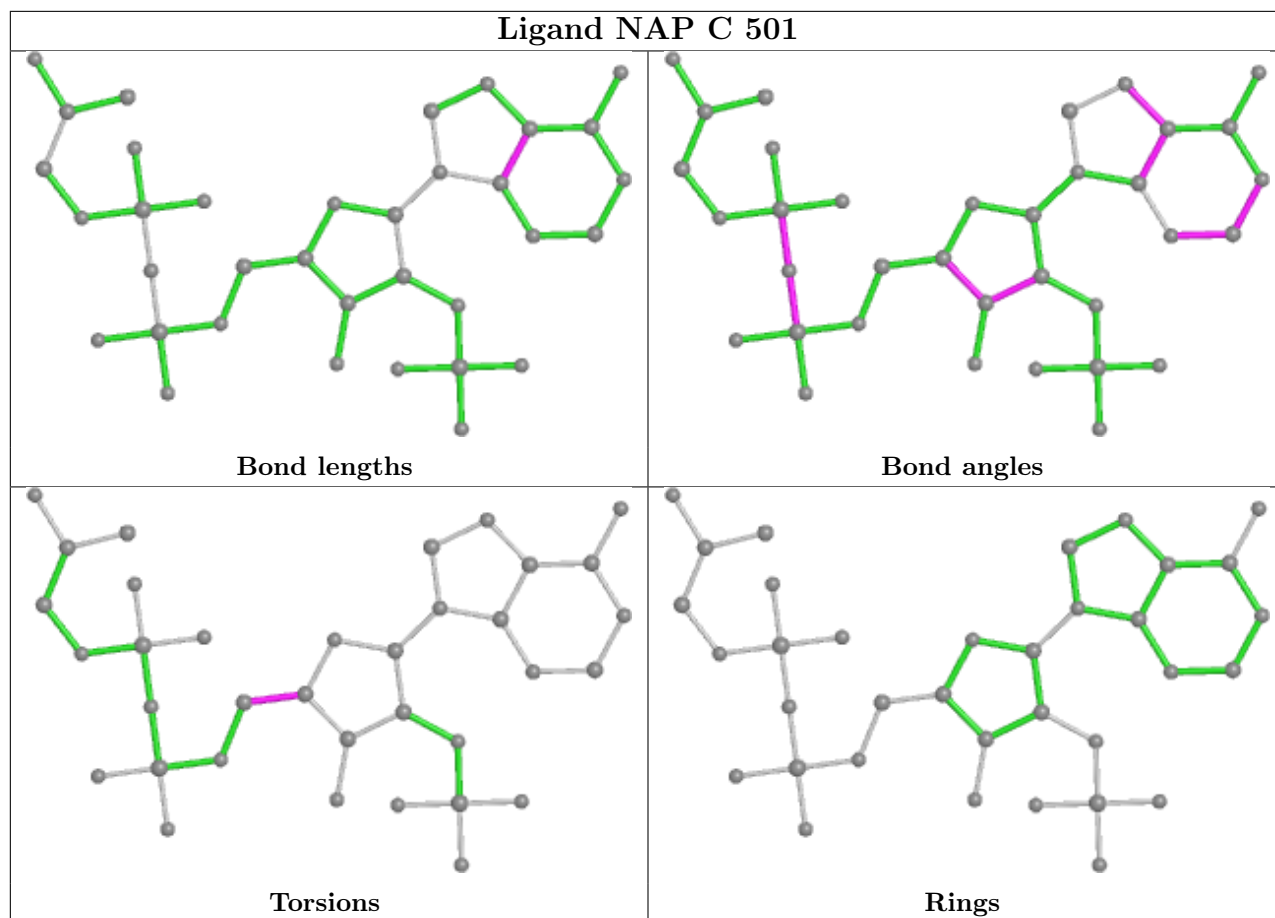
Mol	Chain	Res	Type	Atoms
5	C	505	PEG	C4-C3-O2-C2
5	D	502	PEG	O1-C1-C2-O2
3	D	501	NAP	C4D-C5D-O5D-PN
3	E	501	NAP	O4B-C4B-C5B-O5B
5	B	505	PEG	O1-C1-C2-O2
3	B	501	NAP	O4B-C4B-C5B-O5B
3	B	501	NAP	PN-O3-PA-O1A
5	B	505	PEG	C1-C2-O2-C3
3	E	501	NAP	C2B-O2B-P2B-O1X
3	D	501	NAP	C2B-O2B-P2B-O2X
3	E	501	NAP	C2B-O2B-P2B-O3X
3	A	501	NAP	O4B-C4B-C5B-O5B
3	C	501	NAP	O4B-C4B-C5B-O5B
3	D	501	NAP	O4B-C4B-C5B-O5B
3	F	501	NAP	O4B-C4B-C5B-O5B

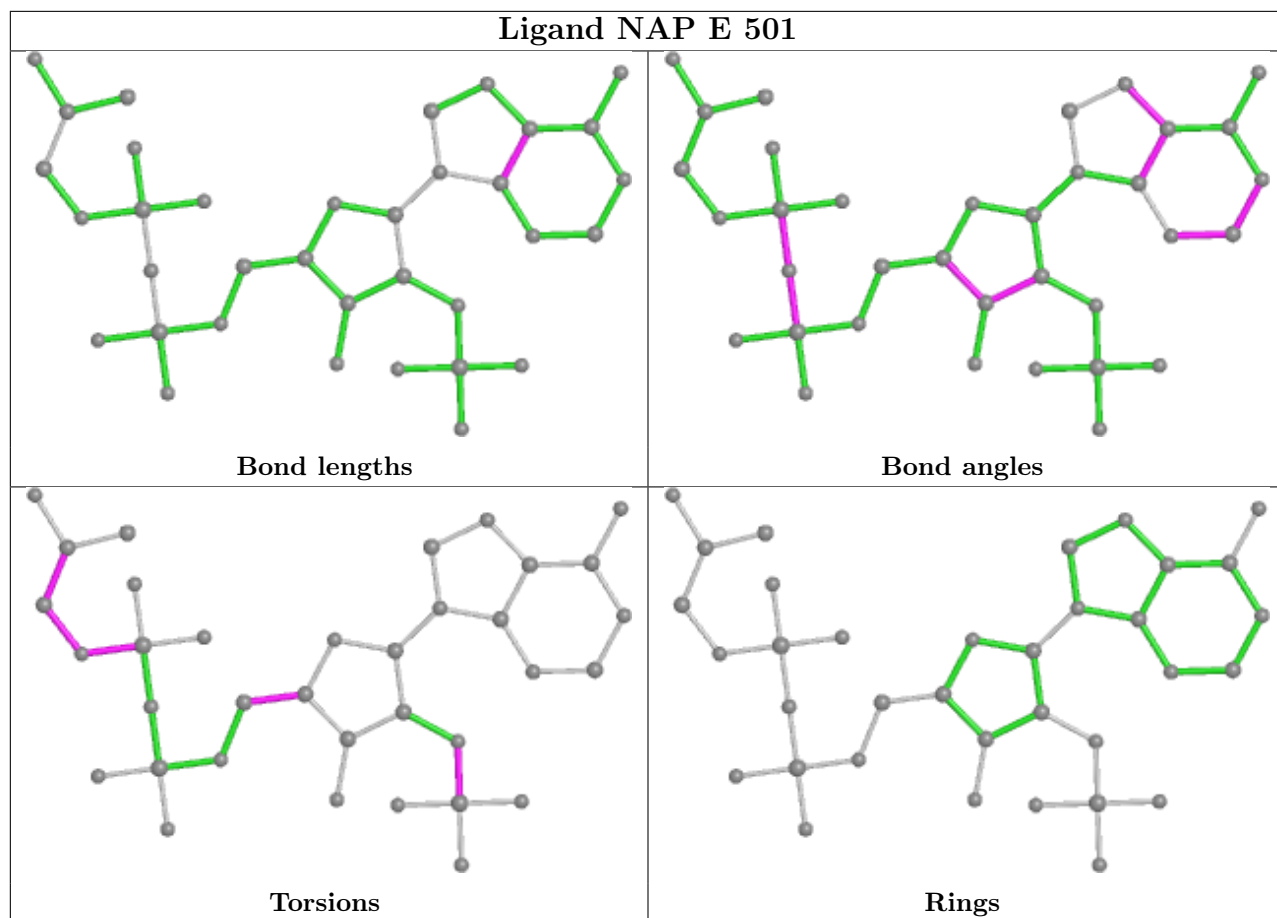
There are no ring outliers.

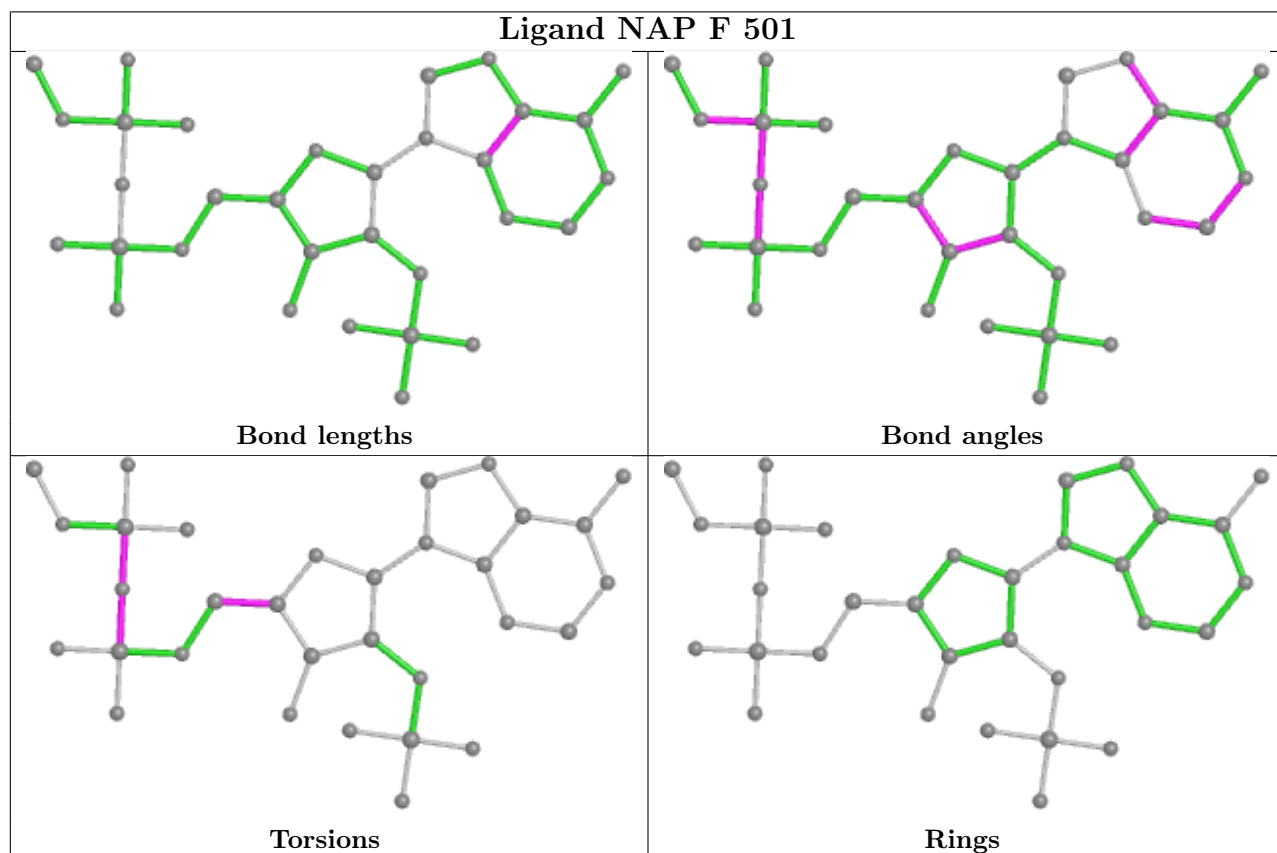
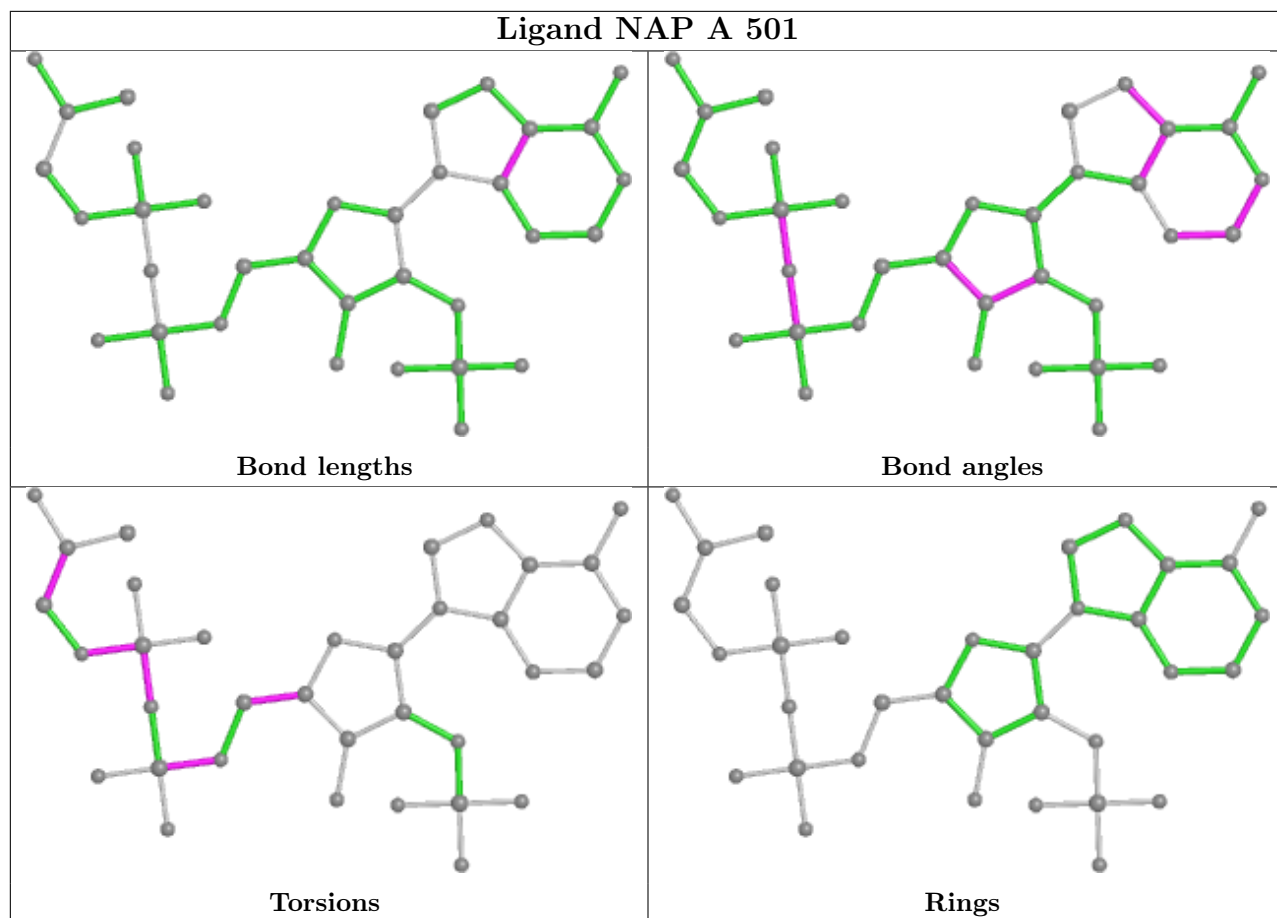
3 monomers are involved in 4 short contacts:

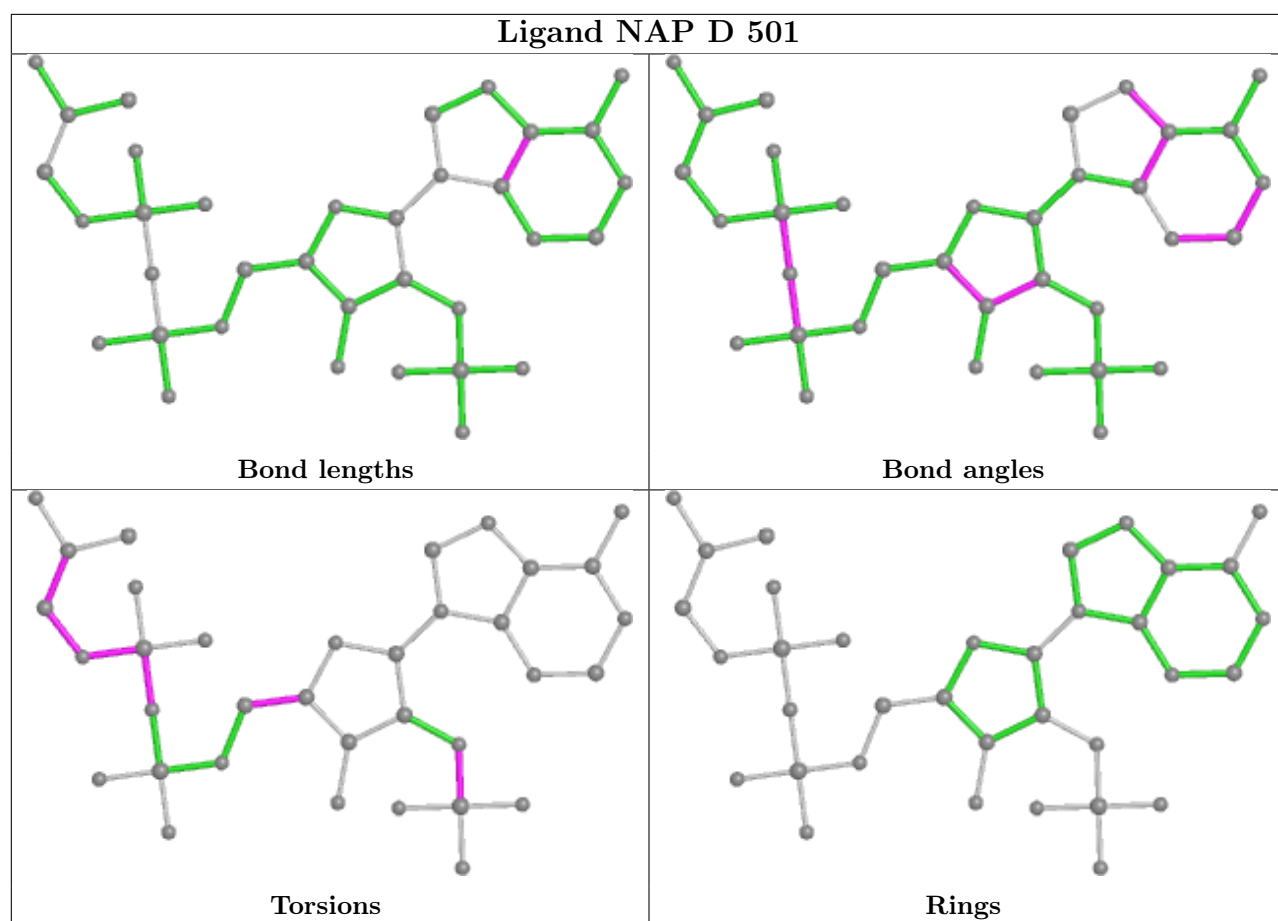
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	E	501	NAP	1	0
3	F	501	NAP	1	0
5	C	504	PEG	2	0

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	396/427 (92%)	0.05	13 (3%) 46 41	55, 89, 157, 196	0
2	B	396/427 (92%)	0.03	17 (4%) 35 31	58, 92, 142, 193	0
2	C	396/427 (92%)	0.25	22 (5%) 24 20	59, 100, 150, 194	0
2	D	396/427 (92%)	0.13	18 (4%) 33 29	54, 95, 153, 197	0
2	E	396/427 (92%)	0.59	49 (12%) 4 3	91, 138, 189, 223	0
2	F	396/427 (92%)	0.51	43 (10%) 5 4	88, 145, 190, 214	0
All	All	2376/2562 (92%)	0.26	162 (6%) 17 13	54, 108, 178, 223	0

All (162) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	17	ILE	7.1
2	C	401	HIS	6.6
1	A	401	HIS	6.5
2	B	397	LEU	5.6
2	E	79	ALA	5.4
2	D	8	ILE	5.3
2	F	266	LEU	5.2
2	F	8	ILE	5.1
2	C	25	LEU	5.1
2	E	20	TYR	5.0
2	E	307	ALA	4.9
2	E	54	THR	4.8
2	F	54	THR	4.5
2	F	401	HIS	4.4
2	F	24	ASP	4.1
2	F	52	HIS	4.1
2	E	24	ASP	3.9
2	F	394	VAL	3.9
2	F	9	LEU	3.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	F	45	VAL	3.9
2	E	358	CYS	3.8
2	E	401	HIS	3.8
2	F	221	ILE	3.8
2	E	80	GLY	3.8
2	F	71	ALA	3.7
2	E	220	ASN	3.7
2	E	167	ARG	3.7
2	F	25	LEU	3.7
2	F	72	VAL	3.7
2	E	47	THR	3.7
2	E	90	ASN	3.6
2	D	25	LEU	3.5
2	E	345	THR	3.5
2	E	17	ILE	3.5
2	C	7	GLU	3.5
2	E	221	ILE	3.5
2	E	44	GLN	3.4
2	C	46	GLU	3.4
2	E	143	ASP	3.3
2	B	5	ASN	3.3
2	F	46	GLU	3.3
2	E	71	ALA	3.3
1	A	5	ASN	3.2
2	C	20	TYR	3.2
2	B	25	LEU	3.2
2	E	41	LYS	3.2
2	B	20	TYR	3.2
1	A	47	THR	3.2
2	C	62	LYS	3.1
2	F	368	ASP	3.1
1	A	14	LYS	3.0
2	F	20	TYR	3.0
2	D	59	GLU	3.0
2	C	24	ASP	3.0
2	C	26	VAL	3.0
2	D	170	LYS	3.0
2	E	15	LYS	3.0
2	D	16	GLU	2.9
2	F	220	ASN	2.9
1	A	330	ASP	2.9
2	C	265	TYR	2.9

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	F	6	ASN	2.9
2	E	39	ILE	2.9
2	F	390	GLY	2.9
2	E	76	LEU	2.9
2	F	265	TYR	2.8
2	F	51	GLY	2.8
2	C	15	LYS	2.8
2	B	329	GLU	2.8
2	F	59	GLU	2.8
1	A	307	ALA	2.8
2	E	306	LEU	2.8
2	D	222	ASN	2.8
1	A	329	GLU	2.7
2	F	35	ARG	2.7
2	D	76	LEU	2.7
2	E	365	HIS	2.7
2	E	46	GLU	2.7
2	E	56	ASP	2.7
2	E	16	GLU	2.7
2	F	348	GLY	2.7
1	A	70	GLY	2.6
2	D	98	ALA	2.6
2	C	264	LYS	2.6
2	E	14	LYS	2.6
2	D	12	LEU	2.6
2	F	99	THR	2.6
2	B	28	GLU	2.6
2	E	330	ASP	2.6
2	C	33	GLU	2.6
2	B	23	ASP	2.6
1	A	71	ALA	2.6
2	C	52	HIS	2.6
2	E	45	VAL	2.5
2	E	324	VAL	2.5
2	E	222	ASN	2.5
2	C	13	LEU	2.5
2	B	63	LYS	2.5
2	F	28	GLU	2.5
2	F	44	GLN	2.5
2	F	53	TYR	2.5
2	F	94	TYR	2.5
2	B	44	GLN	2.5

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
2	C	398	ALA	2.5
2	F	347	GLY	2.5
2	D	14	LYS	2.5
2	E	27	GLY	2.5
2	E	87	LYS	2.4
2	F	256	PHE	2.4
2	F	47	THR	2.4
1	A	358	CYS	2.4
2	E	19	PRO	2.4
2	C	69	ILE	2.4
2	E	308	THR	2.3
2	F	93	PHE	2.3
2	C	44	GLN	2.3
1	A	13	LEU	2.3
2	F	103	ALA	2.3
2	C	59	GLU	2.3
2	E	96	PRO	2.3
2	D	7	GLU	2.3
2	C	118	CYS	2.3
2	E	329	GLU	2.3
2	C	397	LEU	2.2
2	E	266	LEU	2.2
2	E	55	ILE	2.2
2	D	167	ARG	2.2
2	E	394	VAL	2.2
2	E	384	GLY	2.2
2	F	79	ALA	2.2
2	D	24	ASP	2.2
2	D	49	HIS	2.2
1	A	368	ASP	2.2
2	F	88	TYR	2.2
2	B	168	HIS	2.2
2	B	16	GLU	2.2
2	D	346	VAL	2.2
2	B	103	ALA	2.2
2	F	329	GLU	2.2
2	F	222	ASN	2.1
2	B	92	GLU	2.1
2	B	396	HIS	2.1
2	F	344	GLY	2.1
2	C	167	ARG	2.1
2	B	24	ASP	2.1

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Mol	Chain	Res	Type	RSRZ
2	C	21	GLN	2.1
2	F	262	ILE	2.1
2	E	77	GLY	2.1
2	F	349	GLY	2.1
2	E	26	VAL	2.1
2	F	375	GLU	2.1
2	E	53	TYR	2.1
2	D	30	GLU	2.1
2	E	52	HIS	2.0
2	E	335	SER	2.0
2	E	368	ASP	2.0
2	B	14	LYS	2.0
1	A	43	SER	2.0
2	B	29	LYS	2.0
2	E	30	GLU	2.0
2	F	73	GLN	2.0
2	D	77	GLY	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains [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
1	CSO	A	233	7/8	0.95	0.16	74,75,78,79	0

## 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

## 6.4 Ligands [i](#)

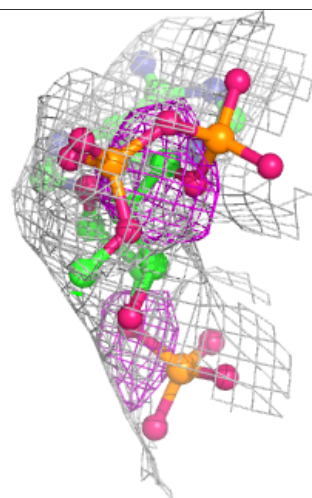
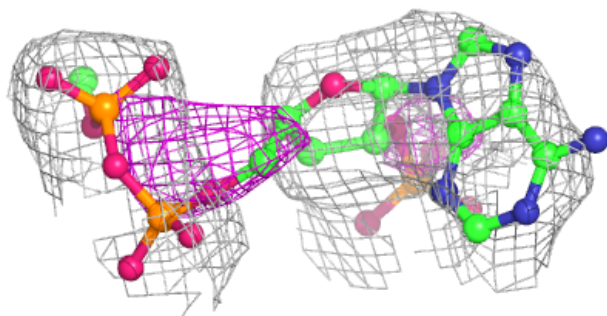
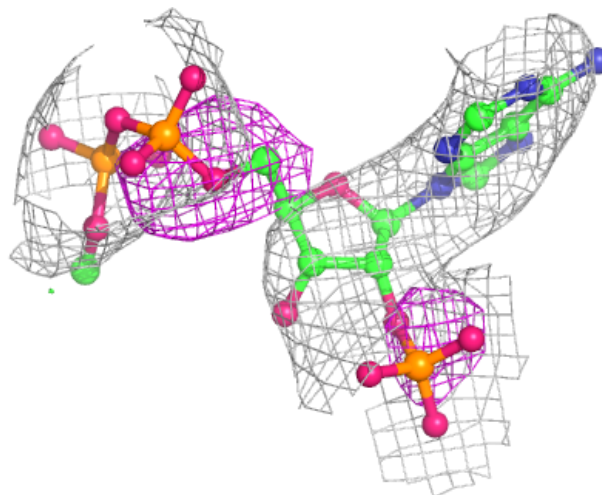
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	PEG	C	505	5/7	0.42	0.41	128,130,130,130	0
5	PEG	D	502	7/7	0.55	0.27	134,135,136,136	0
6	NA	D	503	1/1	0.67	0.13	81,81,81,81	0
5	PEG	C	504	4/7	0.74	0.21	115,115,115,116	0
5	PEG	A	504	4/7	0.75	0.27	139,140,140,140	0
5	PEG	B	506	4/7	0.77	0.19	128,129,129,130	0
5	PEG	B	504	4/7	0.78	0.19	118,119,119,119	0
3	NAP	F	501	32/48	0.79	0.23	121,136,148,153	0
3	NAP	E	501	35/48	0.79	0.36	125,152,165,168	0
5	PEG	B	505	7/7	0.80	0.18	129,129,132,133	0
4	SO4	B	502	5/5	0.80	0.28	160,160,160,160	0
4	SO4	B	503	5/5	0.80	0.36	143,144,144,144	0
4	SO4	C	502	5/5	0.83	0.38	147,148,148,148	0
3	NAP	B	501	32/48	0.84	0.22	93,108,119,122	0
3	NAP	D	501	35/48	0.86	0.23	100,117,138,140	0
5	PEG	A	503	7/7	0.86	0.20	94,95,96,96	0
3	NAP	A	501	35/48	0.87	0.29	98,110,134,138	0
4	SO4	A	502	5/5	0.87	0.48	143,144,144,144	0
5	PEG	C	503	7/7	0.88	0.28	95,95,95,96	0
3	NAP	C	501	35/48	0.89	0.22	101,113,124,128	0
6	NA	D	504	1/1	0.91	0.09	124,124,124,124	0
5	PEG	A	505	4/7	0.94	0.15	104,105,105,106	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.

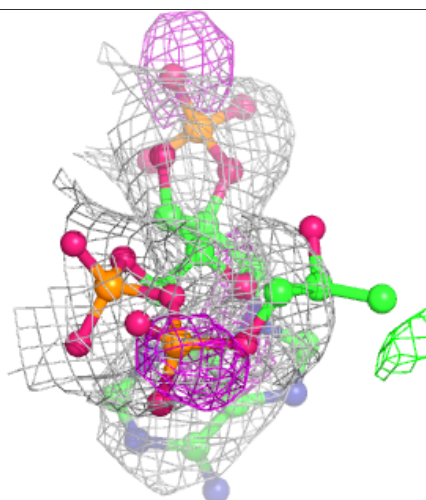
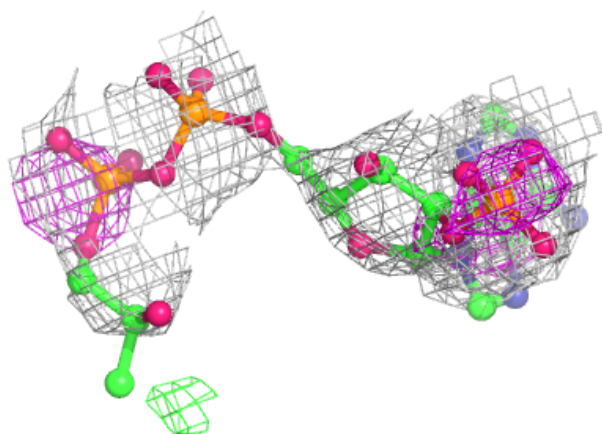
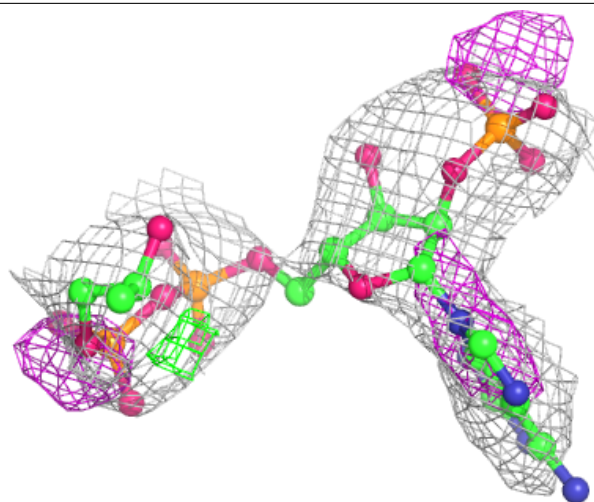
**Electron density around NAP F 501:**

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



**Electron density around NAP E 501:**

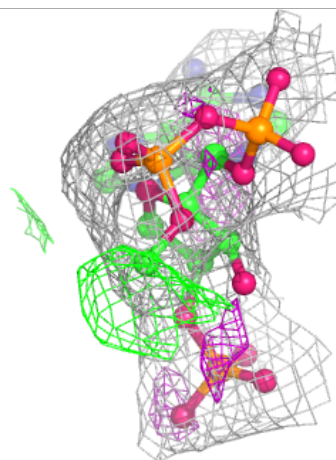
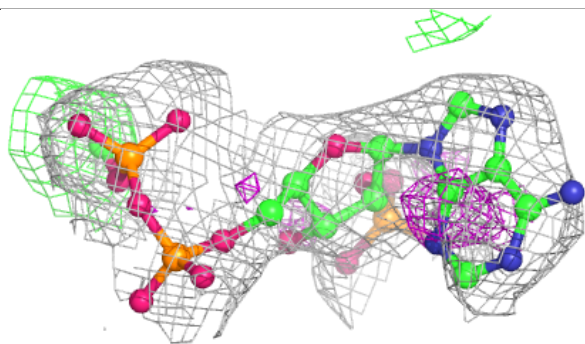
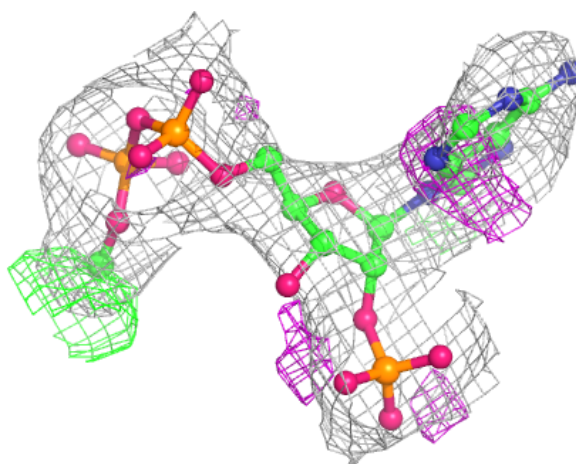
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)





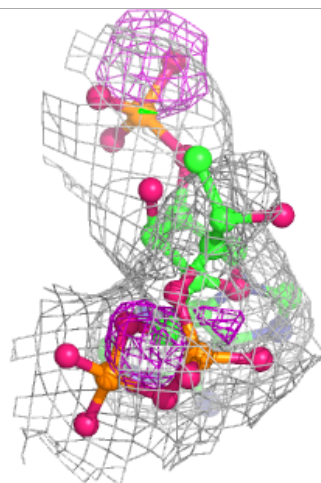
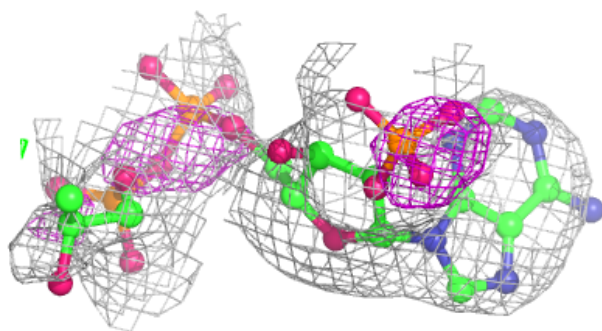
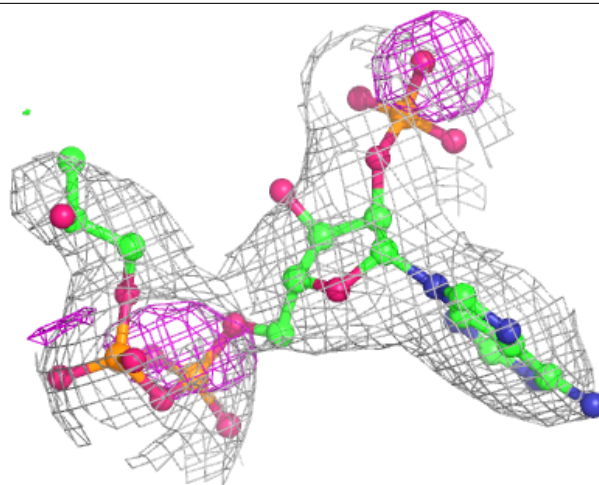
**Electron density around NAP B 501:**

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



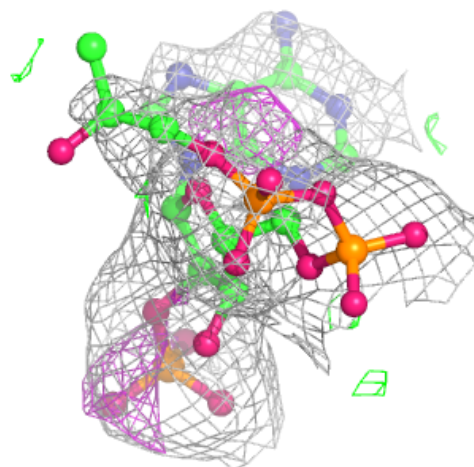
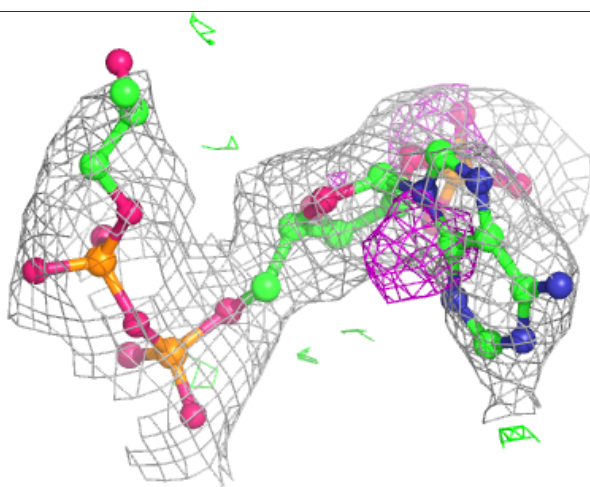
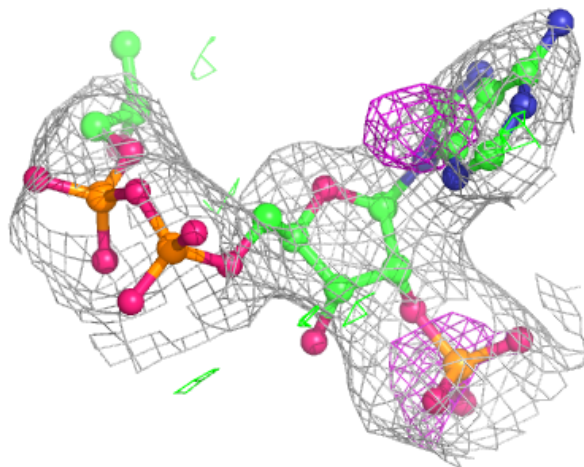
**Electron density around NAP D 501:**

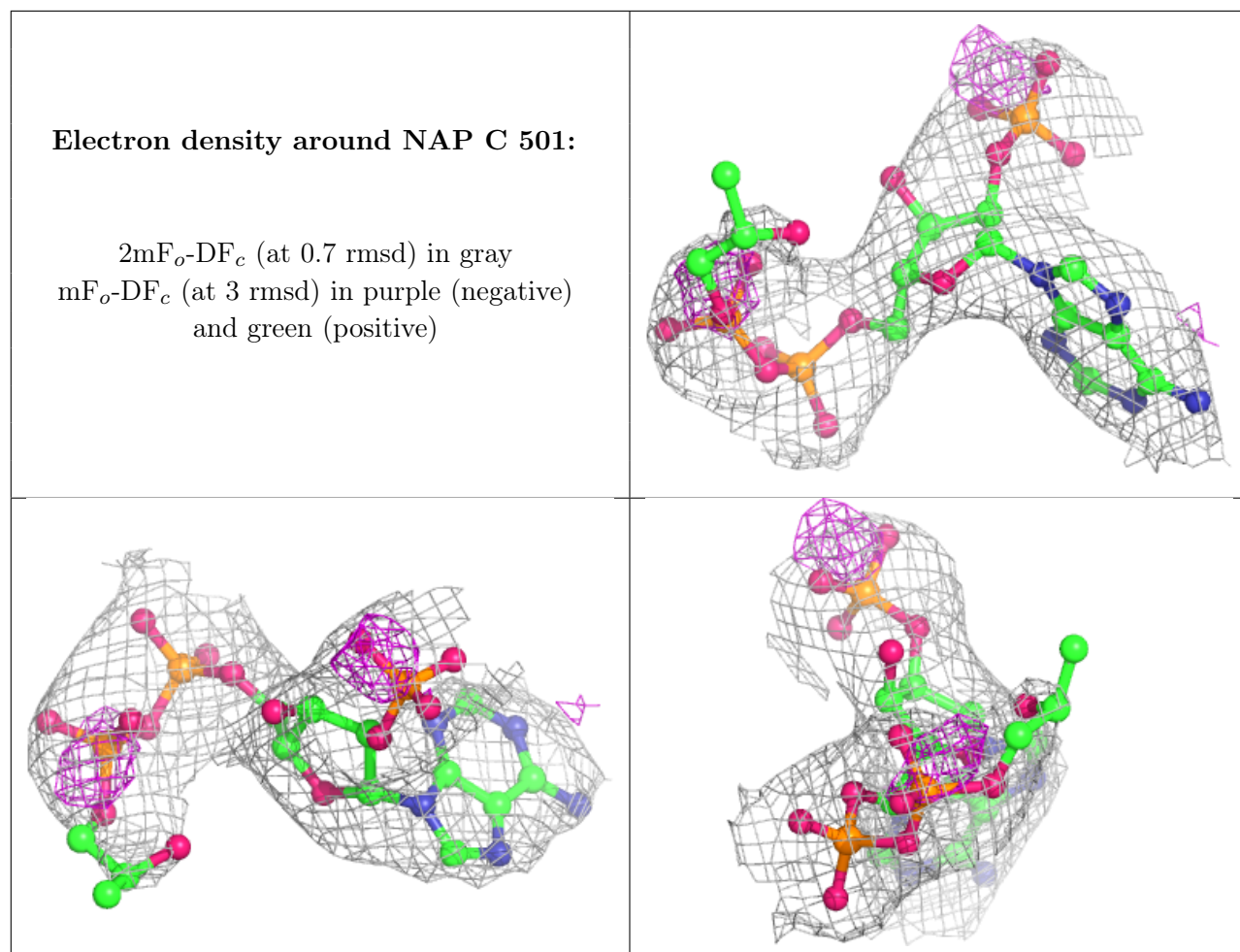
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around NAP A 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.