



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 05:12 PM UTC

PDB ID : 8KIB / pdb_00008kib
Title : NADP⁺-dependent cytosolic isocitrate dehydrogenase complexed with oxaloacetate
Authors : Kang, B.S.; Cho, H.Y.
Deposited on : 2023-08-23
Resolution : 1.70 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

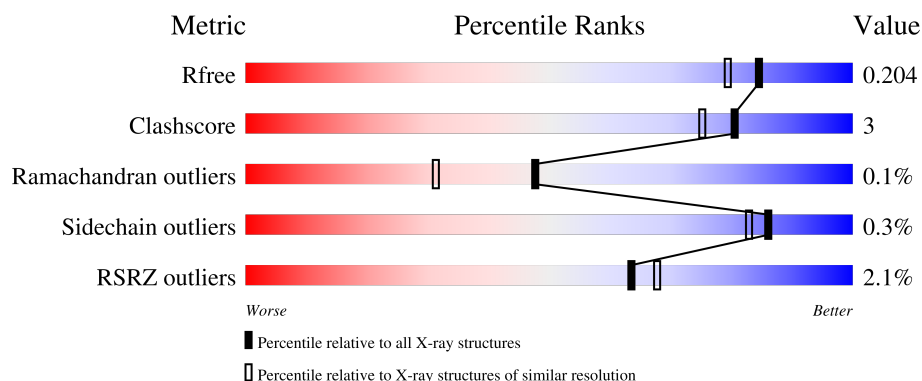
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	414	93% 6%
1	B	414	3% 95% 5%
1	C	414	92% 7%
1	D	414	3% 93% 6%

2 Entry composition ⓘ

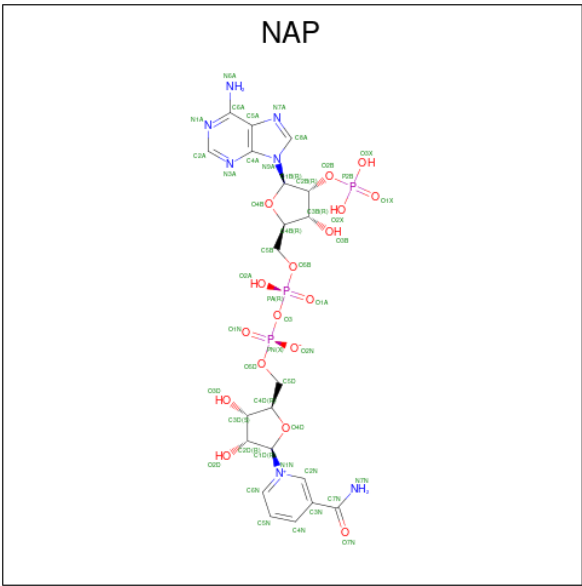
There are 5 unique types of molecules in this entry. The entry contains 14994 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Isocitrate dehydrogenase [NADP] cytoplasmic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	412	Total	C	N	O	S	5	2	0
			3263	2070	551	621	21			
1	B	411	Total	C	N	O	S	5	1	0
			3254	2066	550	617	21			
1	C	411	Total	C	N	O	S	5	0	0
			3248	2062	549	616	21			
1	D	411	Total	C	N	O	S	6	0	0
			3248	2062	549	616	21			

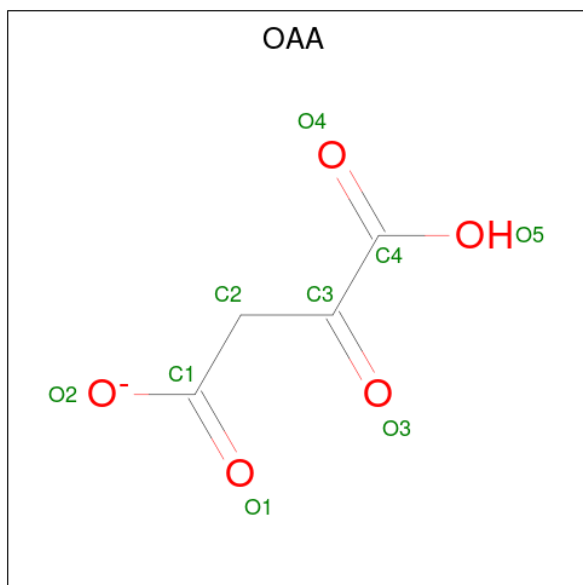
- Molecule 2 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (CCD ID: NAP) (formula: C₂₁H₂₈N₇O₁₇P₃) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 3 is OXALOACETATE ION (CCD ID: OAA) (formula: $C_4H_3O_5$) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 4 is ISOPROPYL ALCOHOL (CCD ID: IPA) (formula: C_3H_8O).



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

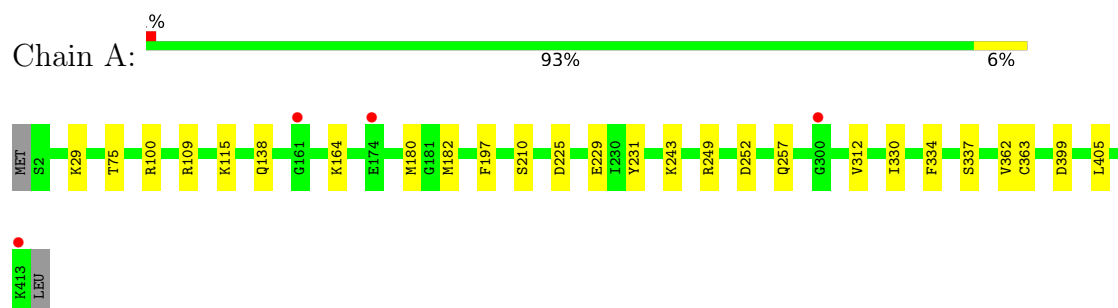
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	499	Total O 499 499	0	0
5	B	399	Total O 399 399	0	0
5	C	413	Total O 413 413	0	0
5	D	431	Total O 431 431	0	0

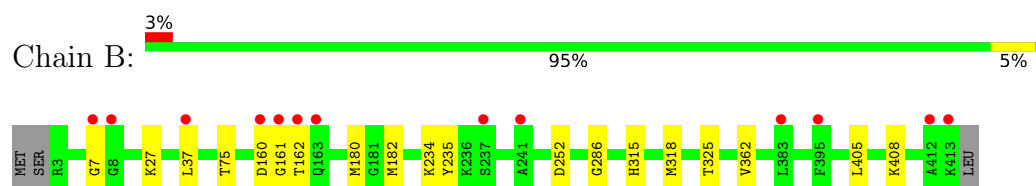
3 Residue-property plots [i](#)

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.

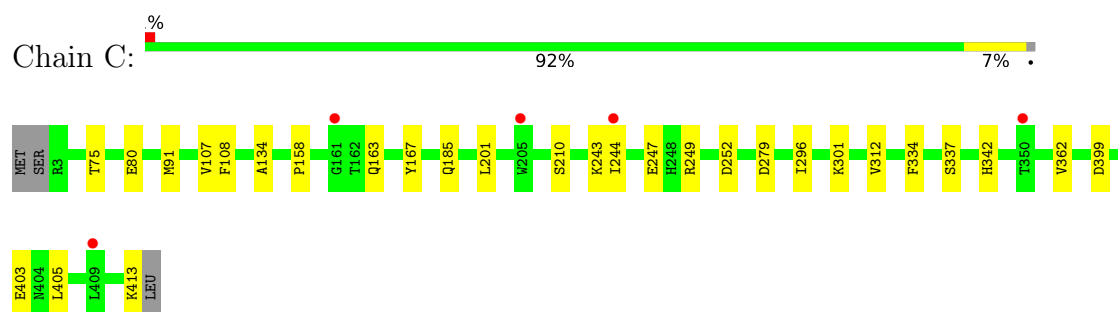
- Molecule 1: Isocitrate dehydrogenase [NADP] cytoplasmic



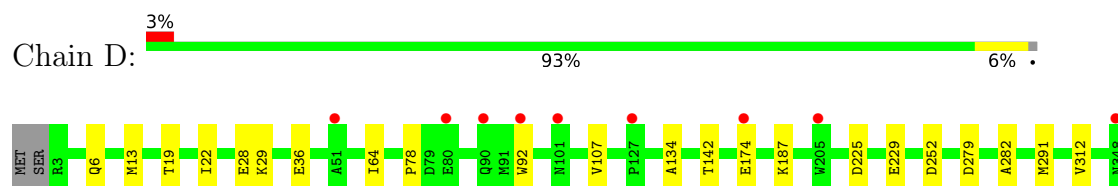
- Molecule 1: Isocitrate dehydrogenase [NADP] cytoplasmic

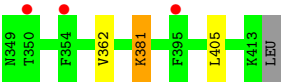


- Molecule 1: Isocitrate dehydrogenase [NADP] cytoplasmic



- Molecule 1: Isocitrate dehydrogenase [NADP] cytoplasmic





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	98.51Å 93.42Å 111.11Å 90.00° 113.85° 90.00°	Depositor
Resolution (Å)	29.55 – 1.70 29.55 – 1.70	Depositor EDS
% Data completeness (in resolution range)	93.9 (29.55-1.70) 94.0 (29.55-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.70 (at 1.70Å)	Xtriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.175 , 0.203 0.175 , 0.204	Depositor DCC
R_{free} test set	1886 reflections (0.93%)	wwPDB-VP
Wilson B-factor (Å ²)	18.4	Xtriage
Anisotropy	0.239	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 48.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.016 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14994	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 34.41 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 6.8510e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: IPA, OAA, 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	0.26	0/3331	0.47	0/4488
1	B	0.25	0/3322	0.47	0/4476
1	C	0.23	0/3313	0.45	0/4464
1	D	0.24	0/3313	0.45	0/4464
All	All	0.25	0/13279	0.46	0/17892

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	3263	0	3237	20	0
1	B	3254	0	3231	14	0
1	C	3248	0	3223	19	0
1	D	3248	0	3223	17	0
2	A	48	0	25	1	0
2	B	48	0	25	1	0
2	C	48	0	25	1	0
3	A	18	0	4	2	0
3	B	18	0	4	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	18	0	4	0	0
3	D	9	0	2	0	0
4	A	8	0	16	1	0
4	B	8	0	16	0	0
4	C	8	0	16	0	0
4	D	8	0	16	0	0
5	A	499	0	0	4	0
5	B	399	0	0	1	0
5	C	413	0	0	1	0
5	D	431	0	0	4	0
All	All	14994	0	13067	67	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 3.

All (67) 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:180:MET:HE2	1:A:182:MET:HE2	1.61	0.80
1:B:180:MET:HE2	1:B:182:MET:HE2	1.64	0.78
1:A:164:LYS:NZ	5:A:606:HOH:O	2.27	0.67
1:A:109:ARG:NH1	5:A:607:HOH:O	2.28	0.67
1:C:399:ASP:O	1:C:403:GLU:HG3	1.98	0.64
1:D:6:GLN:OE1	5:D:601:HOH:O	2.15	0.64
1:D:225:ASP:O	1:D:229:GLU:HG3	2.00	0.62
1:A:225:ASP:O	1:A:229:GLU:HG3	1.99	0.62
1:A:29:LYS:NZ	1:A:399:ASP:OD1	2.22	0.61
1:B:315:HIS:HA	1:B:318:MET:HE2	1.80	0.61
1:B:160:ASP:O	1:B:162:THR:N	2.33	0.61
1:A:138:GLN:HG3	1:A:182:MET:HE1	1.84	0.60
1:C:247:GLU:OE1	1:C:249:ARG:NH1	2.26	0.59
1:B:362:VAL:HG23	1:B:408:LYS:HD2	1.85	0.58
1:A:399:ASP:OD2	5:A:601:HOH:O	2.17	0.57
1:A:182:MET:HE3	1:B:182:MET:HE3	1.89	0.55
1:B:7:GLY:HA3	1:B:37:LEU:HD23	1.92	0.52
1:B:252:ASP:N	1:B:252:ASP:OD1	2.43	0.51
3:A:502:OAA:O4	5:A:602:HOH:O	2.18	0.50
1:C:80:GLU:HG3	1:C:91:MET:HE1	1.94	0.50
1:A:252:ASP:OD1	1:A:252:ASP:N	2.45	0.49
1:D:282:ALA:HB2	1:D:291:MET:SD	2.52	0.49
1:D:28:GLU:HG3	1:D:29:LYS:HG3	1.94	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:234:LYS:HG2	1:B:235:TYR:CE2	2.48	0.48
1:A:75:THR:O	2:A:501:NAP:H2N	2.14	0.48
1:D:19:THR:HA	1:D:22:ILE:HG12	1.97	0.47
1:D:36:GLU:HG2	5:D:601:HOH:O	2.15	0.45
1:D:187:LYS:HA	1:D:187:LYS:HD2	1.72	0.45
1:B:318:MET:HE3	1:B:325:THR:HG22	1.99	0.45
1:A:180:MET:CE	1:A:182:MET:HE2	2.39	0.45
1:C:201:LEU:HD23	1:C:244:ILE:HD11	1.98	0.44
1:D:362:VAL:HG21	1:D:405:LEU:HA	1.99	0.44
1:C:210:SER:HA	1:C:249:ARG:O	2.17	0.44
1:A:330:ILE:HD12	1:A:363:CYS:HB3	1.99	0.44
1:B:75:THR:O	2:B:501:NAP:H2N	2.17	0.44
1:A:362:VAL:HG21	1:A:405:LEU:HA	1.98	0.44
1:C:279:ASP:OD2	1:D:252:ASP:HB2	2.18	0.43
1:D:107:VAL:HG23	1:D:134:ALA:HB2	2.01	0.43
1:C:185:GLN:NE2	5:C:608:HOH:O	2.38	0.43
1:B:27:LYS:NZ	5:B:614:HOH:O	2.40	0.43
1:C:413:LYS:HA	1:C:413:LYS:HD2	1.66	0.43
1:B:234:LYS:HG2	1:B:235:TYR:CZ	2.54	0.43
1:C:362:VAL:HG21	1:C:405:LEU:HA	2.01	0.43
1:B:362:VAL:HG21	1:B:405:LEU:HA	2.01	0.43
1:C:158:PRO:HD2	1:C:163:GLN:O	2.19	0.42
1:A:243:LYS:HA	1:A:243:LYS:HE3	2.00	0.42
1:C:252:ASP:HB2	1:D:279:ASP:OD2	2.19	0.42
1:C:252:ASP:OD1	1:C:252:ASP:N	2.51	0.42
1:C:108:PHE:CD2	1:C:296:ILE:HD12	2.54	0.42
1:D:13:MET:HE1	1:D:64:ILE:HD11	2.01	0.42
1:C:75:THR:O	2:C:501:NAP:H2N	2.20	0.42
1:C:334:PHE:HA	1:C:337:SER:HG	1.83	0.42
1:A:334:PHE:HA	1:A:337:SER:OG	2.20	0.41
1:D:174:GLU:O	5:D:603:HOH:O	2.22	0.41
1:A:115:LYS:HE2	1:A:115:LYS:HB3	1.80	0.41
1:C:167:TYR:HB3	1:D:142:THR:HG21	2.01	0.41
1:A:100:ARG:HH12	3:A:502:OAA:C1	2.33	0.41
1:B:234:LYS:O	1:B:234:LYS:HG3	2.19	0.41
1:C:301:LYS:O	1:C:342:HIS:NE2	2.32	0.41
1:C:243:LYS:HA	1:C:243:LYS:HD2	1.64	0.41
1:D:381:LYS:HB3	1:D:381:LYS:HE2	1.68	0.41
1:A:210:SER:HA	1:A:249:ARG:O	2.21	0.41
1:A:197:PHE:CZ	1:A:231:TYR:HB2	2.56	0.41
1:A:257:GLN:HB3	4:A:504:IPA:H13	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:107:VAL:HG23	1:C:134:ALA:HB2	2.04	0.40
1:D:78:PRO:HD2	1:D:92:TRP:O	2.22	0.40
1:D:187:LYS:NZ	5:D:602:HOH:O	2.19	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	412/414 (100%)	399 (97%)	13 (3%)	0	100	100
1	B	410/414 (99%)	396 (97%)	12 (3%)	2 (0%)	24	12
1	C	409/414 (99%)	400 (98%)	9 (2%)	0	100	100
1	D	409/414 (99%)	400 (98%)	9 (2%)	0	100	100
All	All	1640/1656 (99%)	1595 (97%)	43 (3%)	2 (0%)	48	31

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	161	GLY
1	B	286	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	349/350 (100%)	348 (100%)	1 (0%)	86	83
1	B	347/350 (99%)	347 (100%)	0	100	100
1	C	346/350 (99%)	345 (100%)	1 (0%)	86	83
1	D	346/350 (99%)	344 (99%)	2 (1%)	78	72
All	All	1388/1400 (99%)	1384 (100%)	4 (0%)	86	83

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	312	VAL
1	C	312	VAL
1	D	312	VAL
1	D	381	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	185	GLN
1	A	213	ASN
1	A	228	GLN
1	A	277	GLN
1	A	385	ASN
1	B	213	ASN
1	B	277	GLN
1	B	385	ASN
1	C	68	ASN
1	C	163	GLN
1	C	228	GLN
1	C	277	GLN
1	D	163	GLN
1	D	198	GLN
1	D	213	ASN
1	D	277	GLN

5.3.3 RNA ⓘ

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

18 ligands are 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	$\# Z > 2$
4	IPA	C	505	-	3,3,3	0.49	0	3,3,3	0.39	0
3	OAA	B	503	-	8,8,8	2.27	3 (37%)	8,10,10	1.21	0
4	IPA	B	504	-	3,3,3	0.50	0	3,3,3	0.55	0
2	NAP	B	501	-	50,52,52	1.15	6 (12%)	71,80,80	1.54	10 (14%)
4	IPA	C	504	-	3,3,3	0.48	0	3,3,3	0.47	0
3	OAA	A	502	-	8,8,8	2.29	3 (37%)	8,10,10	1.12	0
4	IPA	B	505	-	3,3,3	0.57	0	3,3,3	0.30	0
2	NAP	C	501	-	50,52,52	1.11	5 (10%)	71,80,80	1.47	9 (12%)
3	OAA	C	502	-	8,8,8	2.24	4 (50%)	8,10,10	0.90	0
4	IPA	A	505	-	3,3,3	0.53	0	3,3,3	0.37	0
4	IPA	D	502	-	3,3,3	0.60	0	3,3,3	0.21	0
3	OAA	C	503	-	8,8,8	2.31	3 (37%)	8,10,10	1.72	2 (25%)
2	NAP	A	501	-	50,52,52	1.18	6 (12%)	71,80,80	1.43	11 (15%)
4	IPA	D	503	-	3,3,3	0.49	0	3,3,3	0.39	0
4	IPA	A	504	-	3,3,3	0.52	0	3,3,3	0.34	0
3	OAA	A	503	-	8,8,8	2.26	3 (37%)	8,10,10	1.70	2 (25%)
3	OAA	B	502	-	8,8,8	2.01	3 (37%)	8,10,10	1.95	2 (25%)
3	OAA	D	501	-	8,8,8	2.19	3 (37%)	8,10,10	1.62	2 (25%)

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	OAA	B	503	-	-	1/8/8/8	-
2	NAP	B	501	-	-	6/35/67/67	0/5/5/5
3	OAA	A	502	-	-	5/8/8/8	-
2	NAP	C	501	-	-	7/35/67/67	0/5/5/5
3	OAA	C	502	-	-	5/8/8/8	-
3	OAA	C	503	-	-	4/8/8/8	-
2	NAP	A	501	-	-	5/35/67/67	0/5/5/5
3	OAA	A	503	-	-	4/8/8/8	-
3	OAA	B	502	-	-	4/8/8/8	-
3	OAA	D	501	-	-	1/8/8/8	-

All (39) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	NAP	C5A-C4A	4.32	1.46	1.39
3	B	503	OAA	O3-C3	4.29	1.31	1.23
3	C	502	OAA	O3-C3	4.20	1.31	1.23
3	D	501	OAA	O3-C3	4.19	1.31	1.23
2	C	501	NAP	C5A-C4A	4.18	1.46	1.39
3	C	503	OAA	O3-C3	4.10	1.31	1.23
3	A	502	OAA	O4-C4	4.05	1.32	1.22
3	A	503	OAA	O3-C3	4.03	1.31	1.23
2	A	501	NAP	C5A-C4A	3.91	1.46	1.39
3	A	502	OAA	O3-C3	3.84	1.30	1.23
3	B	502	OAA	O3-C3	3.76	1.30	1.23
3	C	503	OAA	O4-C4	3.63	1.31	1.22
2	A	501	NAP	PA-O3	3.57	1.63	1.59
3	A	503	OAA	O4-C4	3.55	1.31	1.22
3	B	503	OAA	O4-C4	3.50	1.31	1.22
3	D	501	OAA	O4-C4	3.31	1.30	1.22
3	C	502	OAA	O4-C4	3.26	1.30	1.22
3	C	503	OAA	O1-C1	3.18	1.32	1.22
3	B	502	OAA	O4-C4	3.09	1.30	1.22
3	A	503	OAA	O1-C1	3.07	1.32	1.22
3	A	502	OAA	O1-C1	2.94	1.31	1.22
3	B	503	OAA	O1-C1	2.85	1.31	1.22
3	D	501	OAA	O1-C1	2.83	1.31	1.22
3	C	502	OAA	O1-C1	2.78	1.31	1.22

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	501	NAP	C8A-N7A	2.66	1.36	1.31
2	A	501	NAP	PN-O3	2.56	1.62	1.59
2	B	501	NAP	C8A-N7A	2.52	1.36	1.31
3	B	502	OAA	O1-C1	2.52	1.30	1.22
2	C	501	NAP	C4A-N9A	-2.51	1.32	1.37
2	B	501	NAP	C5A-C6A	2.49	1.47	1.41
2	C	501	NAP	C5A-N7A	-2.43	1.34	1.39
2	B	501	NAP	O4D-C1D	2.42	1.44	1.40
2	A	501	NAP	C5A-C6A	2.38	1.47	1.41
2	A	501	NAP	C8A-N7A	2.34	1.36	1.31
2	B	501	NAP	C5A-N7A	-2.26	1.35	1.39
2	C	501	NAP	C5A-C6A	2.23	1.47	1.41
2	B	501	NAP	C4A-N9A	-2.23	1.33	1.37
2	A	501	NAP	C5A-N7A	-2.16	1.35	1.39
3	C	502	OAA	C3-C4	-2.02	1.50	1.53

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	501	NAP	C5A-C4A-N3A	-5.24	119.50	126.72
2	B	501	NAP	C5A-C4A-N3A	-5.18	119.58	126.72
2	A	501	NAP	C5A-C4A-N3A	-4.97	119.88	126.72
2	B	501	NAP	N3A-C4A-N9A	4.43	134.71	127.17
2	C	501	NAP	N3A-C4A-N9A	4.33	134.53	127.17
2	A	501	NAP	N3A-C4A-N9A	4.27	134.44	127.17
2	B	501	NAP	N3A-C2A-N1A	-3.78	122.86	128.58
3	B	502	OAA	O4-C4-C3	-3.73	117.17	121.81
2	B	501	NAP	C4A-N9A-C8A	3.69	109.61	105.74
2	B	501	NAP	C2A-N3A-C4A	3.59	120.61	111.83
3	A	503	OAA	O4-C4-C3	-3.40	117.58	121.81
2	A	501	NAP	N3A-C2A-N1A	-3.38	123.47	128.58
2	C	501	NAP	C2A-N3A-C4A	3.32	119.94	111.83
2	C	501	NAP	C4A-N9A-C8A	3.26	109.16	105.74
2	A	501	NAP	C2A-N3A-C4A	3.26	119.79	111.83
2	C	501	NAP	N3A-C2A-N1A	-3.20	123.73	128.58
2	A	501	NAP	C4A-N9A-C8A	3.10	108.99	105.74
3	C	503	OAA	O4-C4-C3	-2.99	118.09	121.81
2	B	501	NAP	N9A-C8A-N7A	-2.85	109.89	113.94
2	B	501	NAP	C4A-C5A-N7A	-2.82	107.36	110.58
3	B	502	OAA	O5-C4-C3	2.74	121.19	113.59
3	D	501	OAA	O4-C4-C3	-2.64	118.52	121.81
2	C	501	NAP	N9A-C8A-N7A	-2.60	110.25	113.94

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	NAP	C5A-N7A-C8A	2.53	107.43	103.45
2	C	501	NAP	C4A-C5A-N7A	-2.45	107.78	110.58
3	C	503	OAA	O3-C3-C4	2.29	122.94	119.67
2	A	501	NAP	C4A-C5A-N7A	-2.28	107.98	110.58
2	A	501	NAP	O2N-PN-O3	2.27	113.42	107.27
2	A	501	NAP	N9A-C8A-N7A	-2.27	110.72	113.94
3	D	501	OAA	O5-C4-C3	2.26	119.87	113.59
3	A	503	OAA	O5-C4-C3	2.24	119.80	113.59
2	B	501	NAP	C2A-N1A-C6A	2.19	122.33	118.73
2	A	501	NAP	N6A-C6A-N1A	2.18	123.24	118.38
2	C	501	NAP	C5A-N7A-C8A	2.15	106.82	103.45
2	A	501	NAP	C2A-N1A-C6A	2.08	122.14	118.73
2	C	501	NAP	O3X-P2B-O2X	2.03	115.43	107.80
2	A	501	NAP	C5A-N7A-C8A	2.02	106.63	103.45
2	B	501	NAP	C6A-C5A-N7A	2.02	135.99	132.09

There are no chirality outliers.

All (42) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	NAP	O4D-C1D-N1N-C2N
2	A	501	NAP	O4D-C1D-N1N-C6N
2	A	501	NAP	C2D-C1D-N1N-C2N
2	B	501	NAP	C5D-O5D-PN-O3
2	B	501	NAP	C5D-O5D-PN-O2N
2	B	501	NAP	O4D-C1D-N1N-C2N
2	B	501	NAP	O4D-C1D-N1N-C6N
2	B	501	NAP	C2D-C1D-N1N-C2N
2	C	501	NAP	O4D-C1D-N1N-C2N
2	C	501	NAP	O4D-C1D-N1N-C6N
2	C	501	NAP	C2D-C1D-N1N-C2N
3	A	502	OAA	C2-C3-C4-O5
3	A	503	OAA	C2-C3-C4-O5
3	B	502	OAA	C2-C3-C4-O5
3	B	503	OAA	C2-C3-C4-O5
3	C	502	OAA	O3-C3-C4-O4
3	C	502	OAA	C2-C3-C4-O4
3	C	502	OAA	C2-C3-C4-O5
3	C	503	OAA	C2-C3-C4-O5
3	A	502	OAA	C1-C2-C3-O3
3	A	502	OAA	O3-C3-C4-O4
3	A	503	OAA	O3-C3-C4-O4

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Mol	Chain	Res	Type	Atoms
3	B	502	OAA	C1-C2-C3-O3
3	C	503	OAA	O3-C3-C4-O4
3	A	502	OAA	C2-C3-C4-O4
3	A	503	OAA	C2-C3-C4-O4
3	B	502	OAA	C2-C3-C4-O4
3	C	503	OAA	C2-C3-C4-O4
2	A	501	NAP	C5D-O5D-PN-O3
2	C	501	NAP	C5B-O5B-PA-O3
2	C	501	NAP	C5D-O5D-PN-O3
2	C	501	NAP	C5D-O5D-PN-O2N
3	A	502	OAA	O3-C3-C4-O5
3	A	503	OAA	O3-C3-C4-O5
3	C	503	OAA	O3-C3-C4-O5
3	D	501	OAA	O1-C1-C2-C3
2	A	501	NAP	C2D-C1D-N1N-C6N
2	B	501	NAP	C2D-C1D-N1N-C6N
2	C	501	NAP	C2D-C1D-N1N-C6N
3	B	502	OAA	O3-C3-C4-O4
3	C	502	OAA	C1-C2-C3-O3
3	C	502	OAA	C1-C2-C3-C4

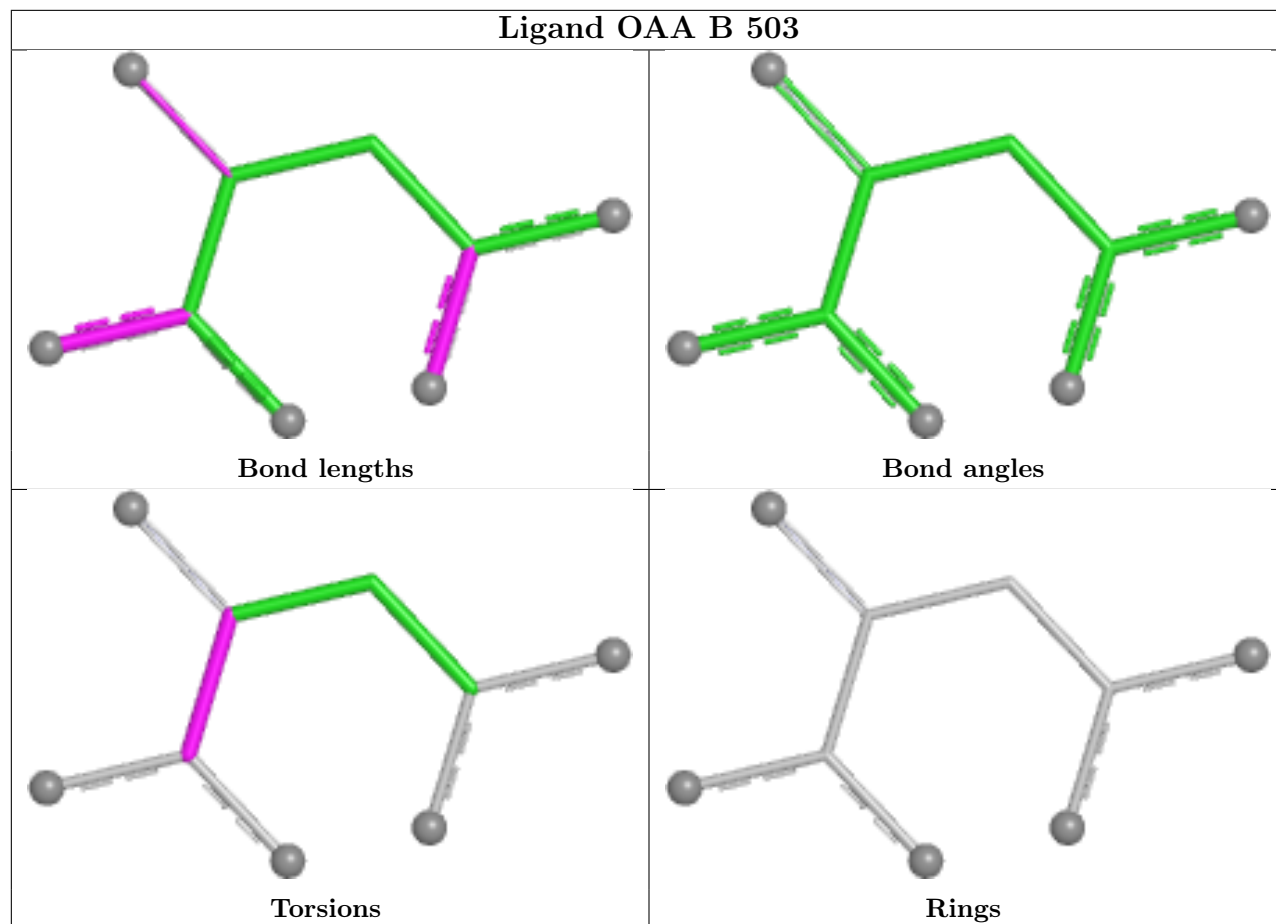
There are no ring outliers.

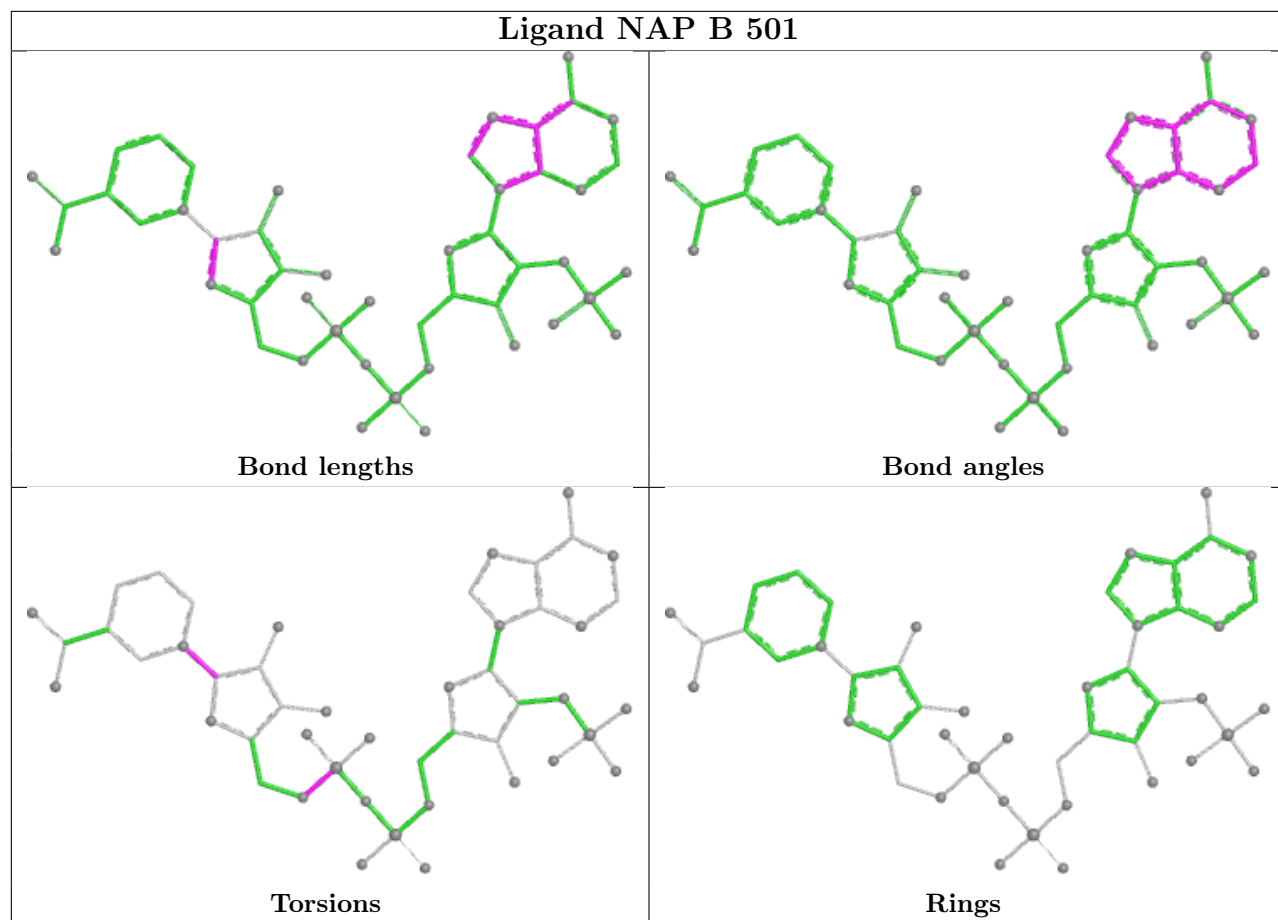
5 monomers are involved in 6 short contacts:

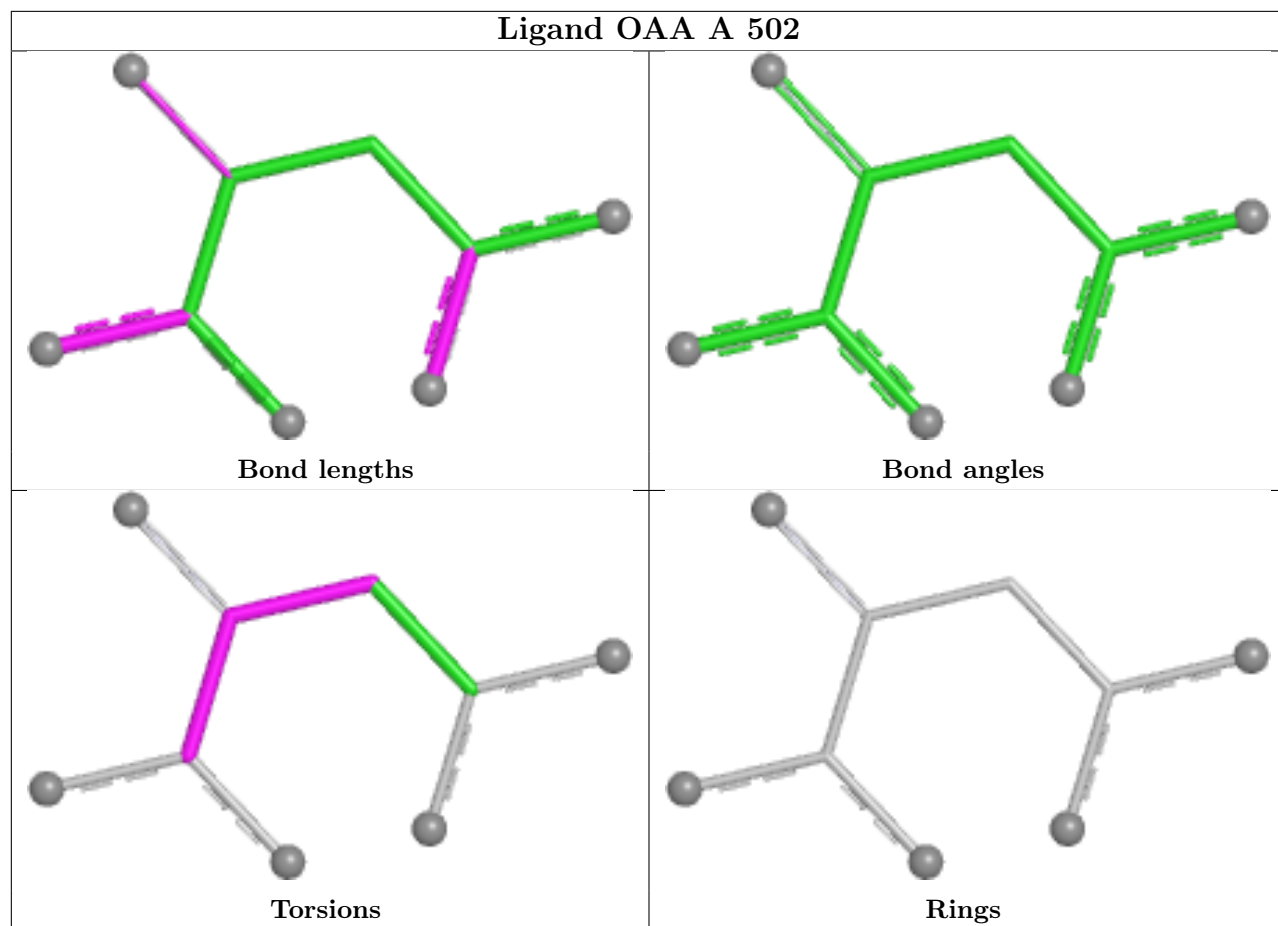
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	501	NAP	1	0
3	A	502	OAA	2	0
2	C	501	NAP	1	0
2	A	501	NAP	1	0
4	A	504	IPA	1	0

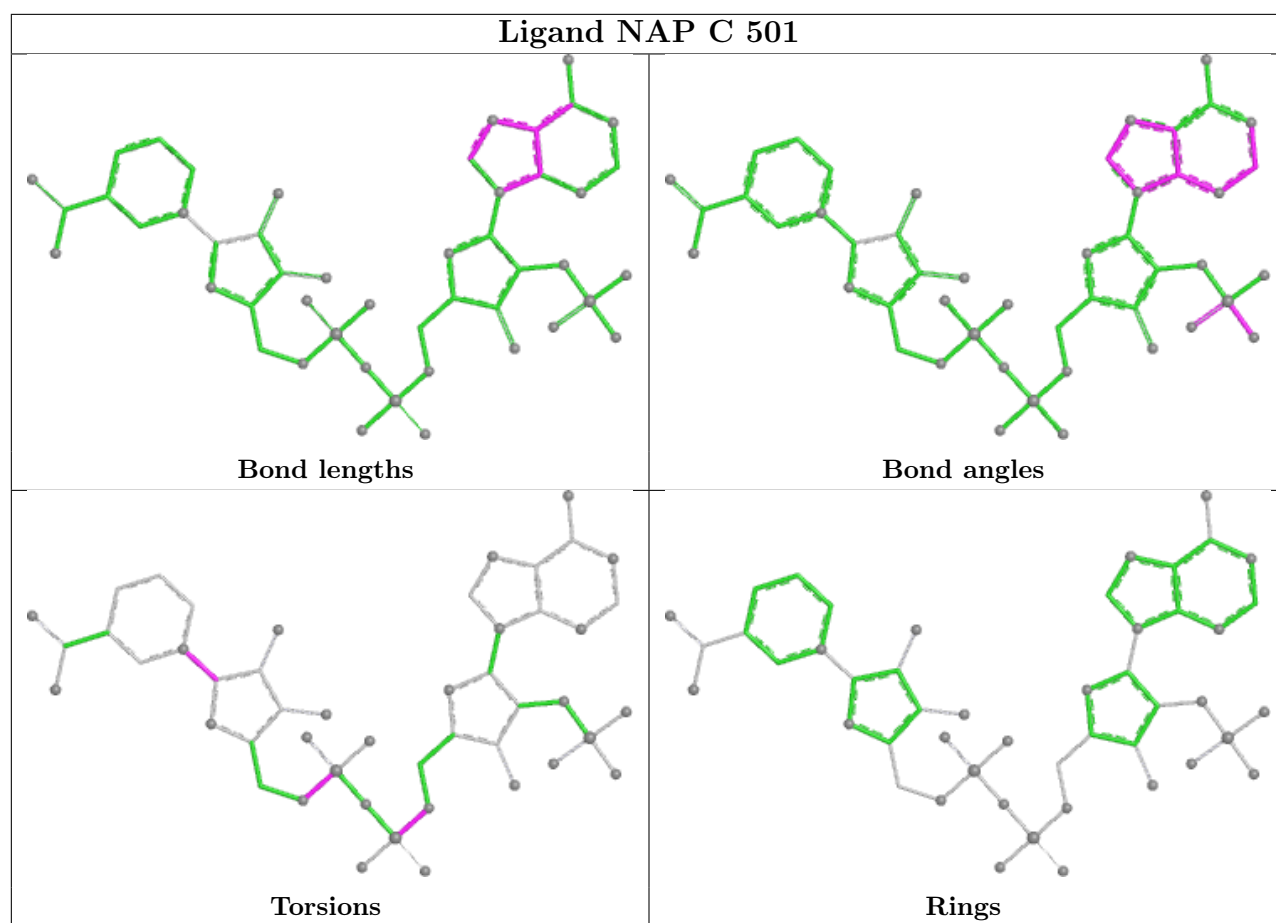
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

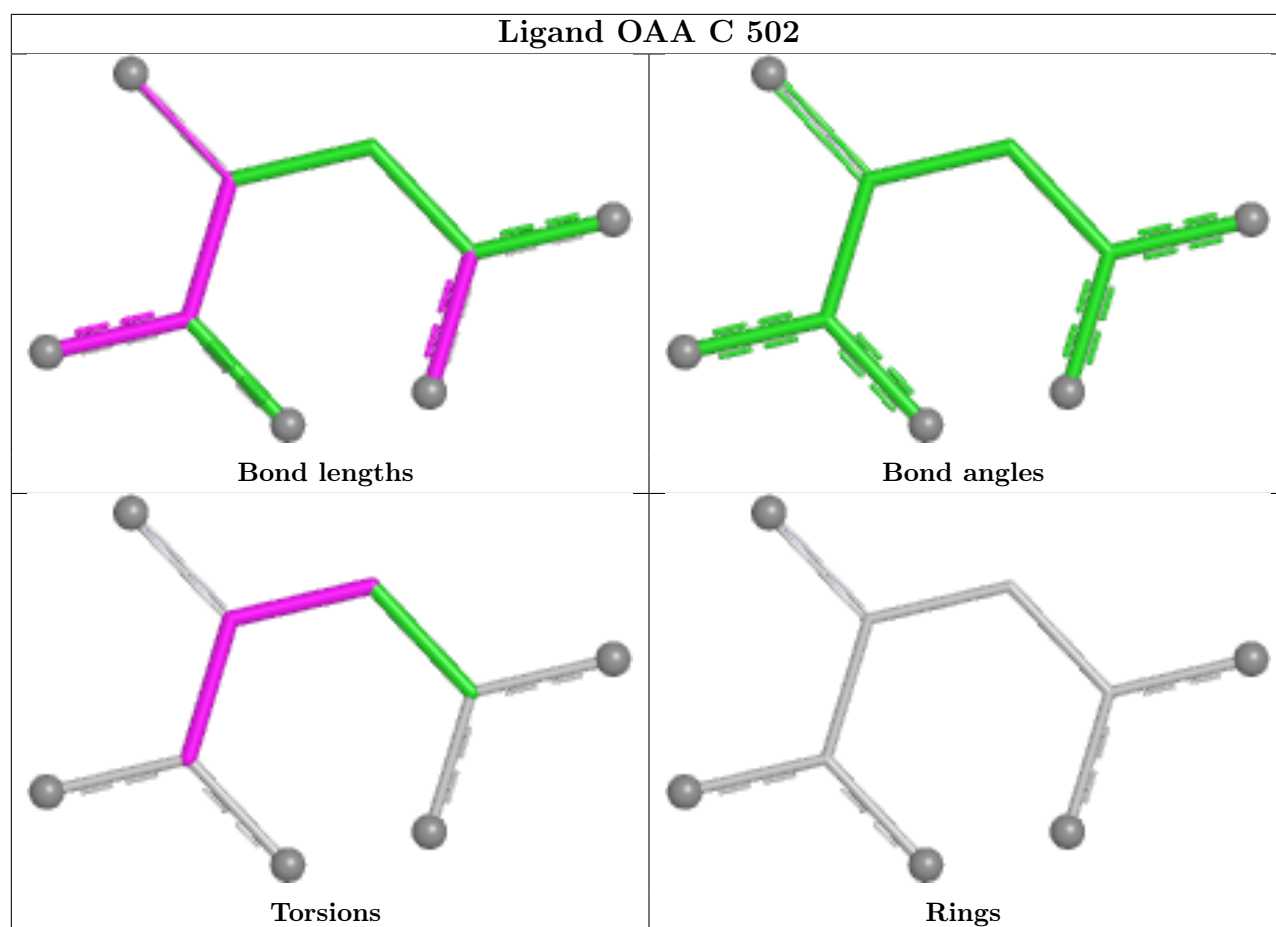
equivalents in the CSD to analyse the geometry.

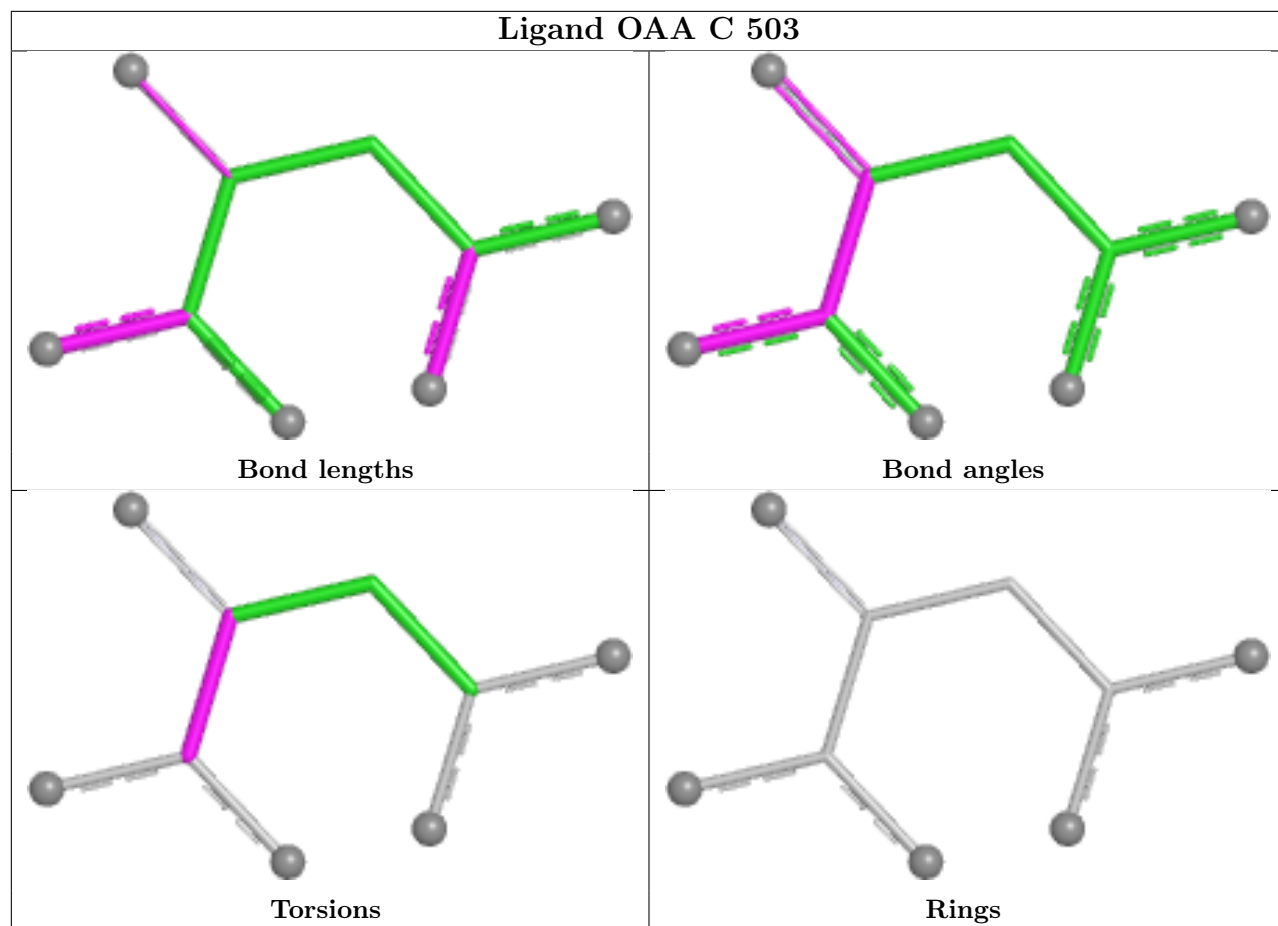


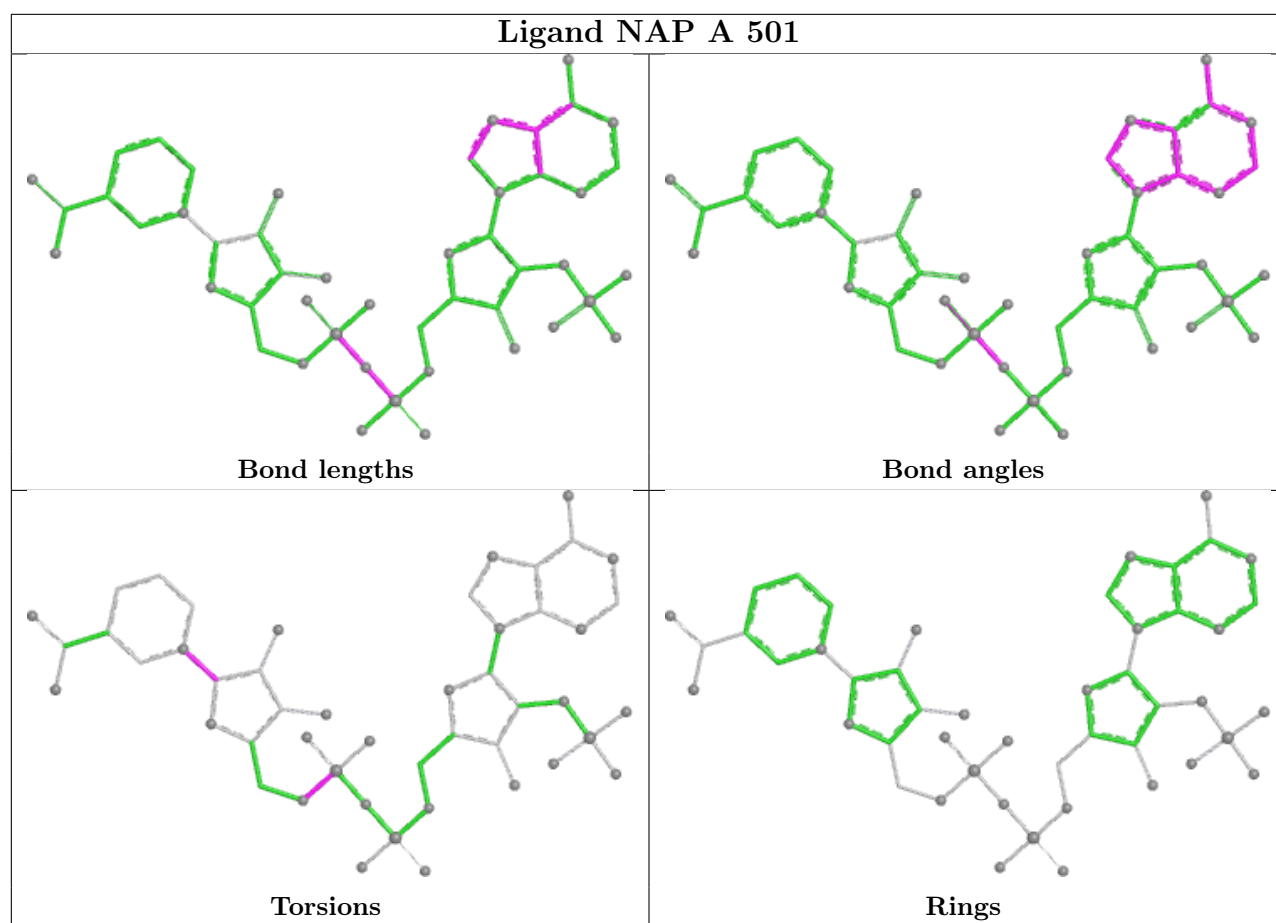


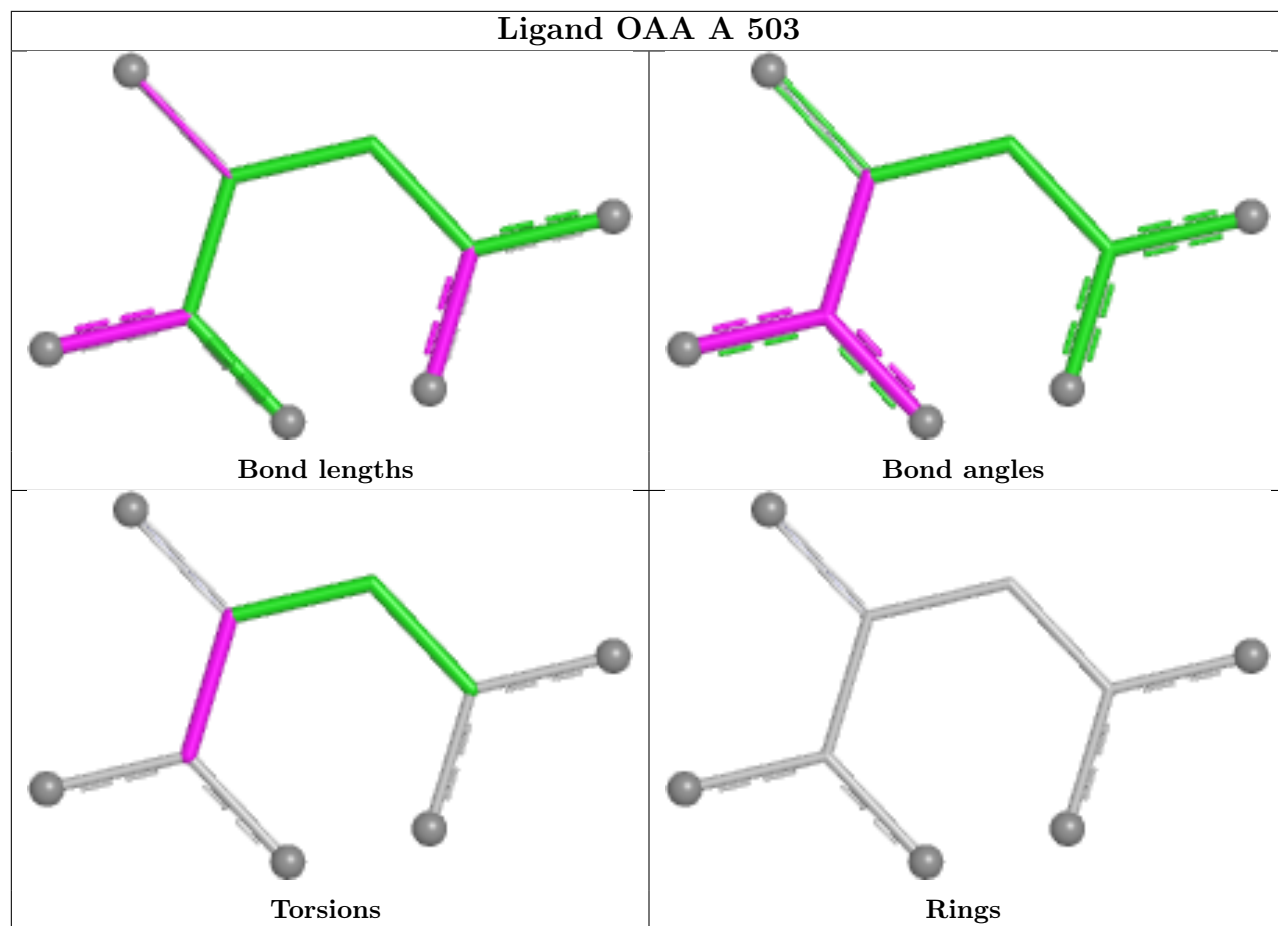


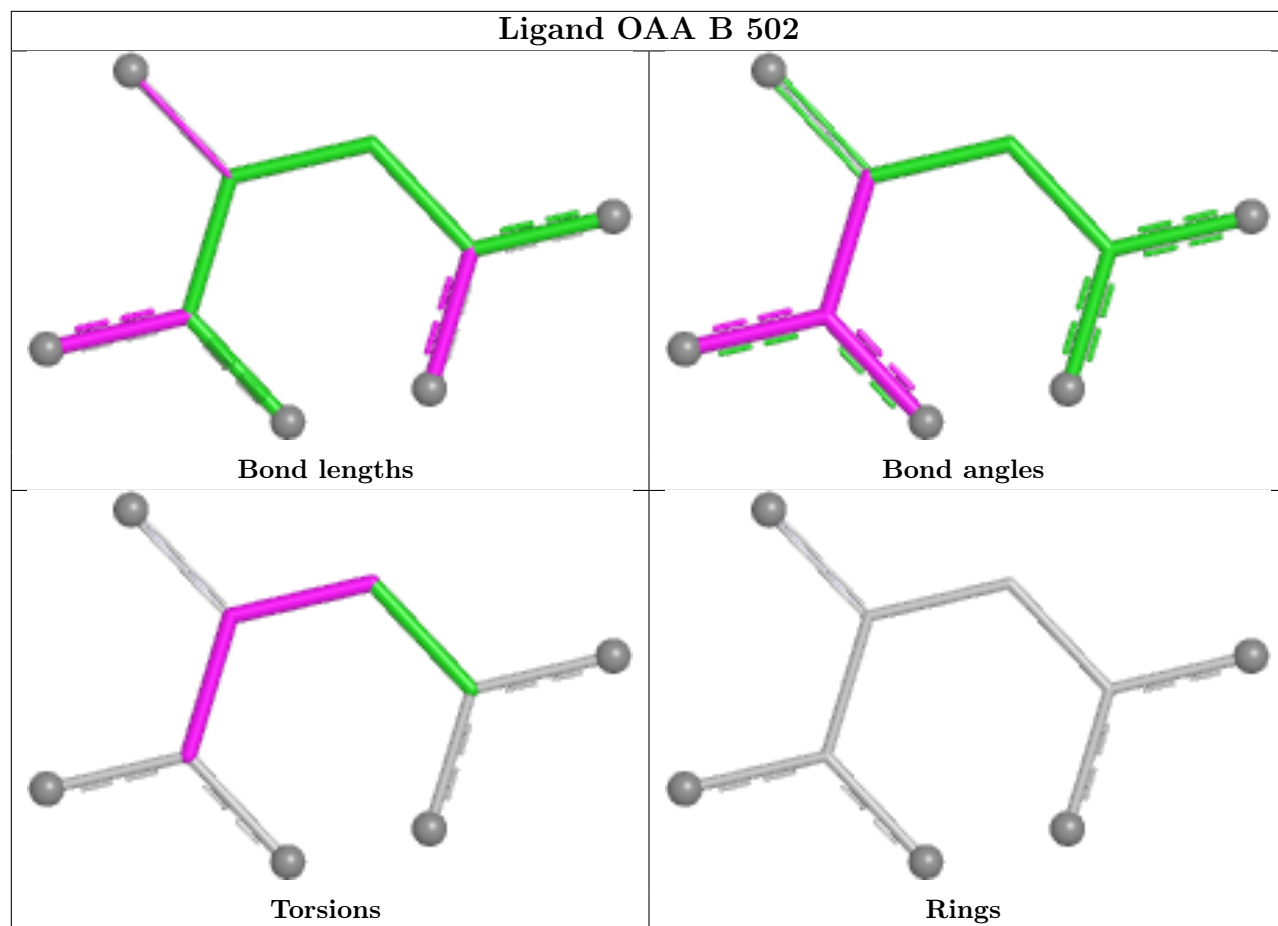


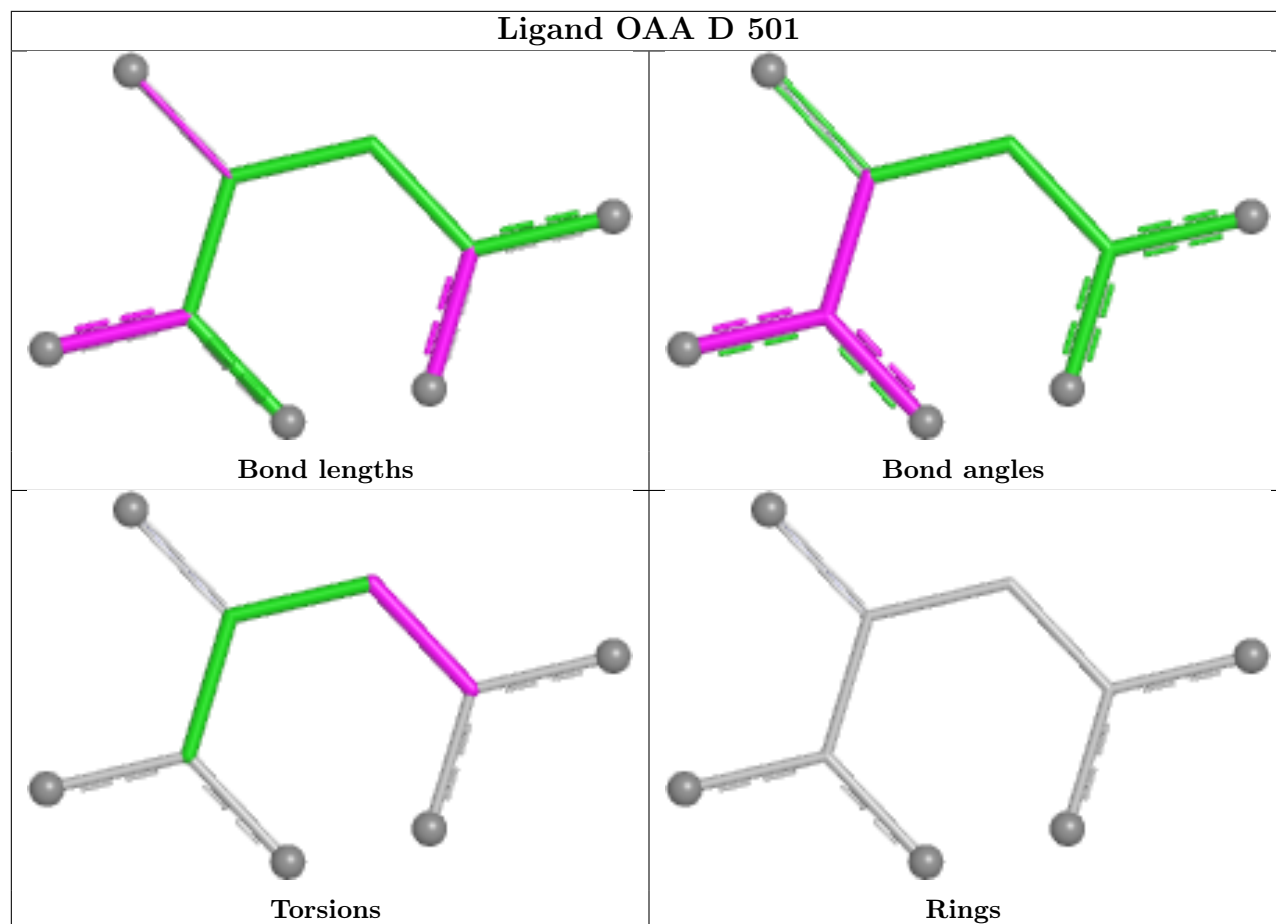












5.7 Other polymers [i](#)

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	412/414 (99%)	-0.09	4 (0%) 79 82	8, 18, 35, 53	9 (2%)
1	B	411/414 (99%)	0.16	13 (3%) 50 54	12, 21, 40, 65	7 (1%)
1	C	411/414 (99%)	0.02	5 (1%) 76 80	12, 21, 37, 66	7 (1%)
1	D	411/414 (99%)	0.19	12 (2%) 53 58	11, 23, 36, 58	6 (1%)
All	All	1645/1656 (99%)	0.07	34 (2%) 63 68	8, 21, 37, 66	29 (1%)

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	161	GLY	4.2
1	B	395	PHE	4.0
1	D	80	GLU	3.7
1	B	7	GLY	3.5
1	D	354	PHE	3.0
1	B	163	GLN	2.9
1	D	205	TRP	2.9
1	A	174	GLU	2.9
1	B	237	SER	2.9
1	B	162	THR	2.8
1	D	92	TRP	2.8
1	D	127	PRO	2.8
1	B	160	ASP	2.7
1	B	413	LYS	2.7
1	B	241	ALA	2.7
1	A	161	GLY	2.6
1	B	8	GLY	2.5
1	D	101	ASN	2.5
1	D	174	GLU	2.3
1	C	350	THR	2.3
1	C	244	ILE	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	383	LEU	2.2
1	D	350	THR	2.2
1	D	348	ASN	2.2
1	B	412	ALA	2.2
1	A	300	GLY	2.2
1	C	161	GLY	2.2
1	D	395	PHE	2.2
1	D	51	ALA	2.2
1	C	205	TRP	2.2
1	A	413	LYS	2.1
1	D	90	GLN	2.0
1	B	37	LEU	2.0
1	C	409	LEU	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.

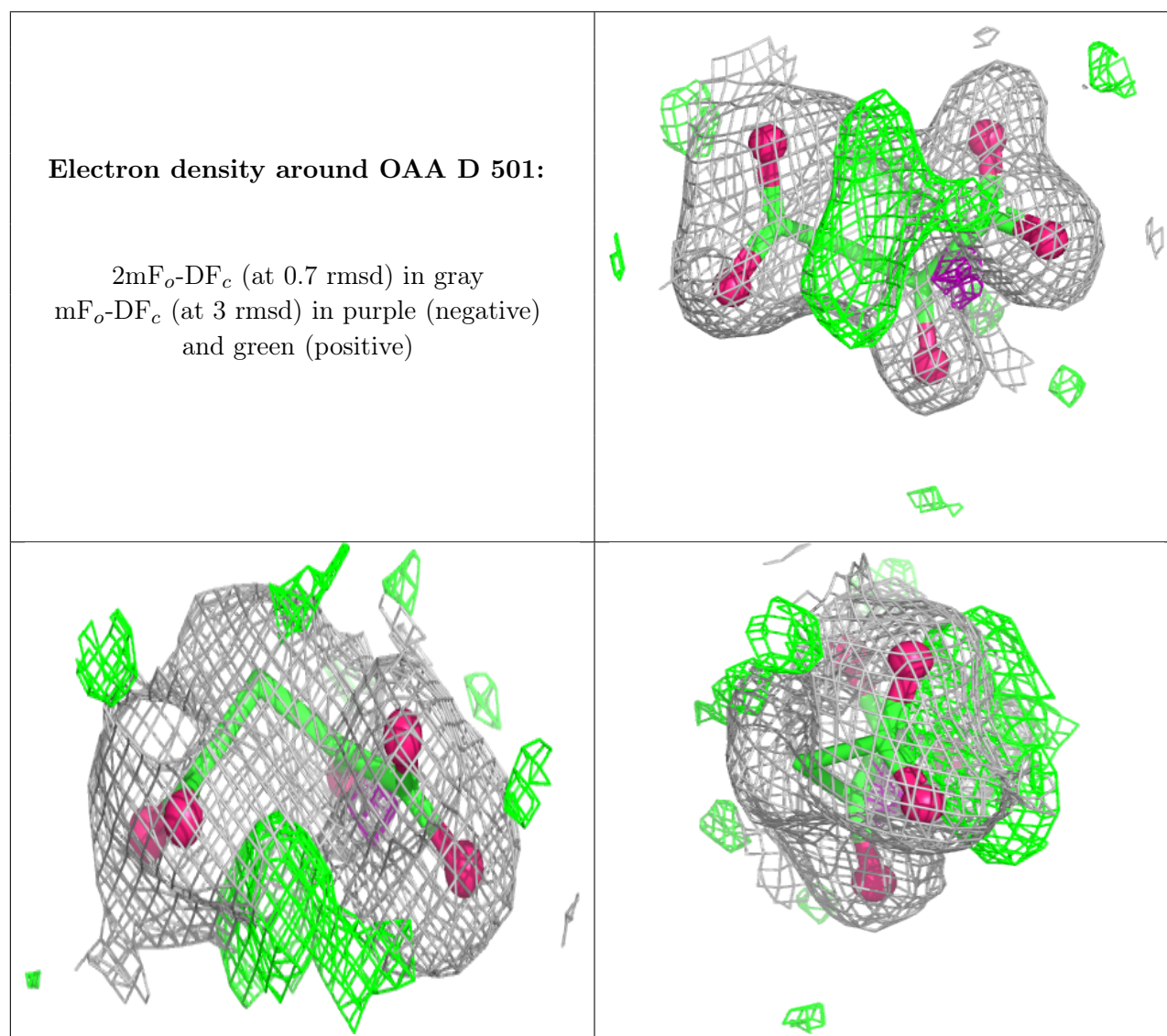
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	OAA	D	501	9/9	0.79	0.13	29,37,46,48	0
4	IPA	C	504	4/4	0.82	0.15	29,30,30,35	0
3	OAA	A	502	9/9	0.84	0.12	22,27,36,39	0
4	IPA	C	505	4/4	0.84	0.14	30,37,42,49	0
3	OAA	B	502	9/9	0.85	0.11	22,29,32,34	0
3	OAA	C	502	9/9	0.87	0.12	21,22,35,44	0
4	IPA	B	504	4/4	0.87	0.10	21,26,35,37	0
3	OAA	A	503	9/9	0.88	0.10	27,33,42,43	0
4	IPA	D	503	4/4	0.89	0.12	21,25,29,32	0
4	IPA	D	502	4/4	0.90	0.09	22,23,31,31	0

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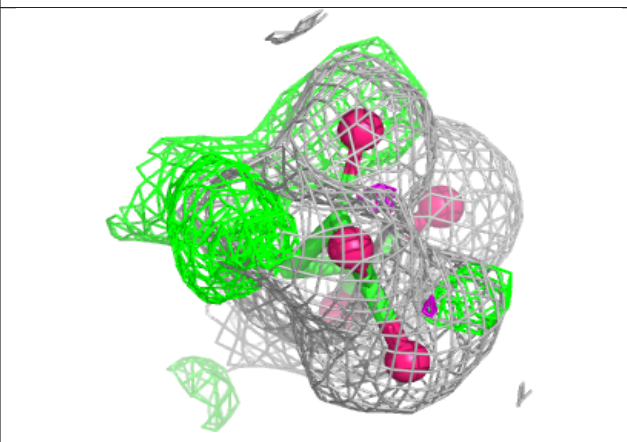
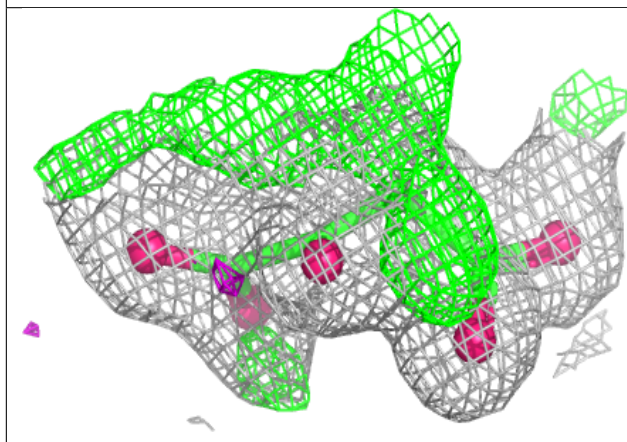
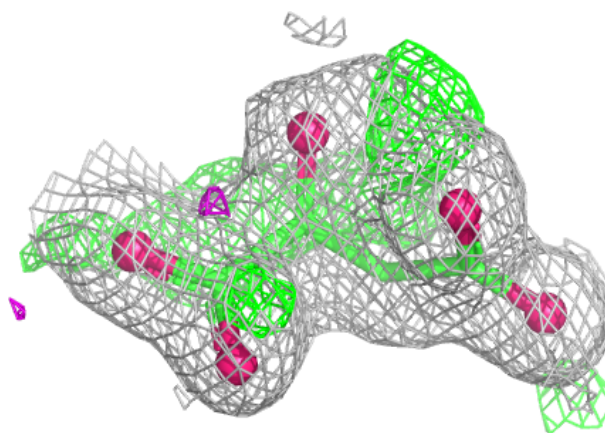
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	IPA	A	505	4/4	0.90	0.13	21,25,25,26	0
3	OAA	B	503	9/9	0.92	0.09	21,26,29,30	0
4	IPA	B	505	4/4	0.92	0.09	25,26,33,35	0
4	IPA	A	504	4/4	0.93	0.09	17,23,24,27	0
3	OAA	C	503	9/9	0.93	0.07	25,28,38,41	0
2	NAP	A	501	48/48	0.98	0.05	12,16,21,26	0
2	NAP	B	501	48/48	0.98	0.05	10,13,16,18	0
2	NAP	C	501	48/48	0.98	0.05	10,12,15,22	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.

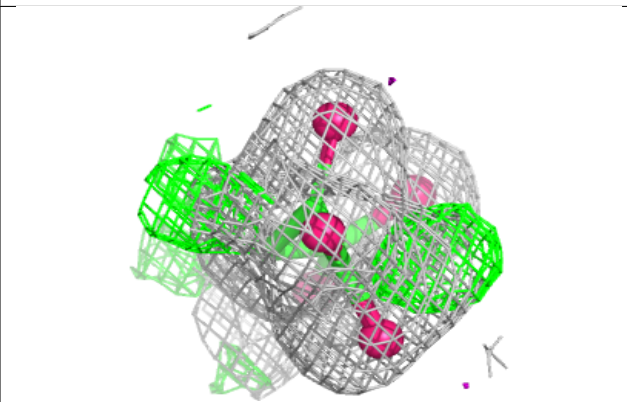
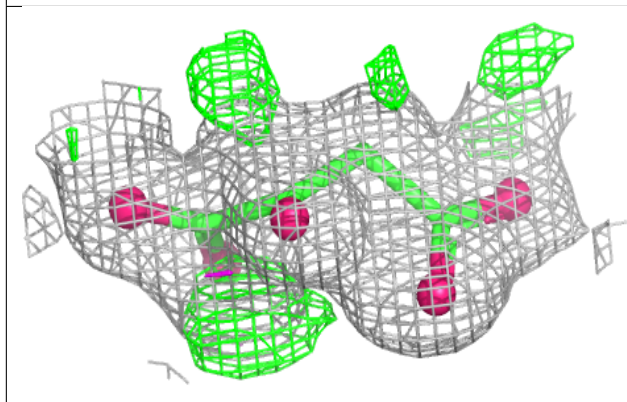
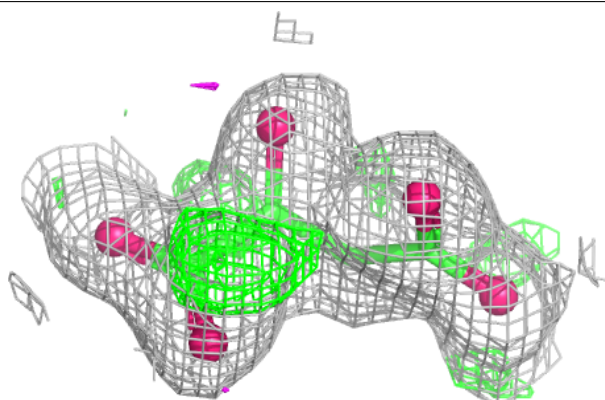


Electron density around OAA A 502:

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

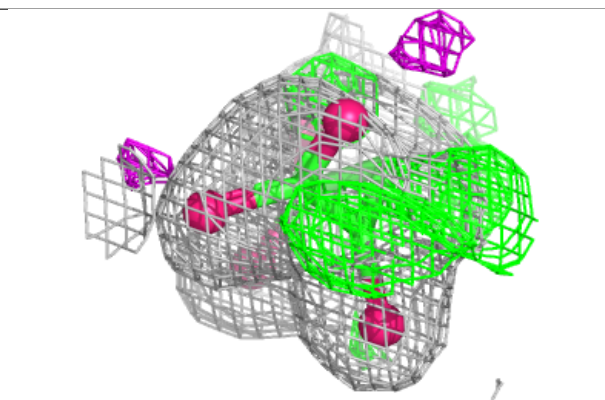
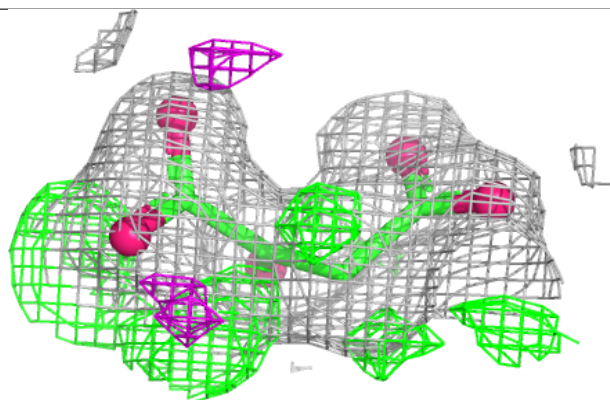
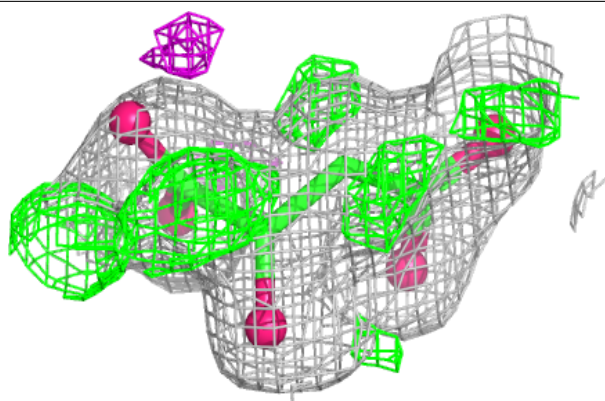
**Electron density around OAA B 502:**

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

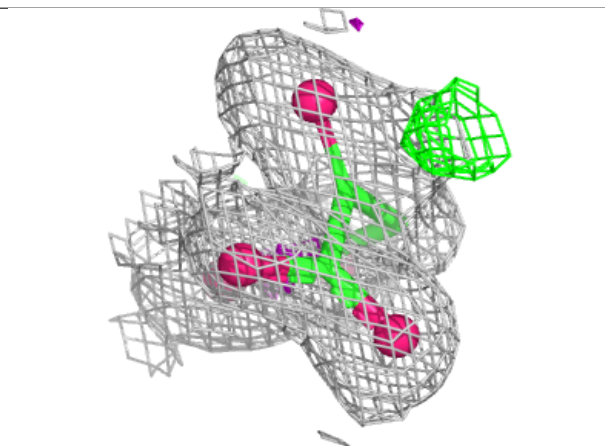
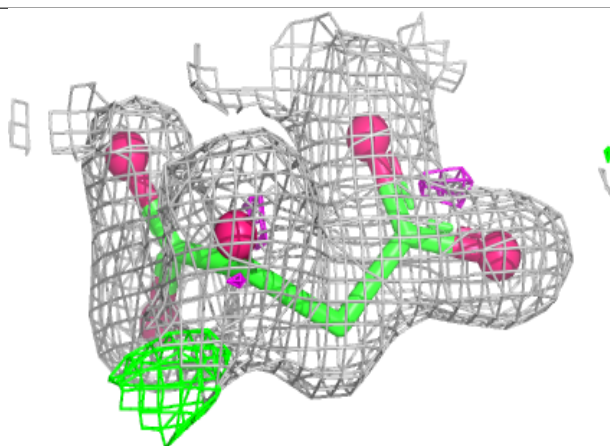
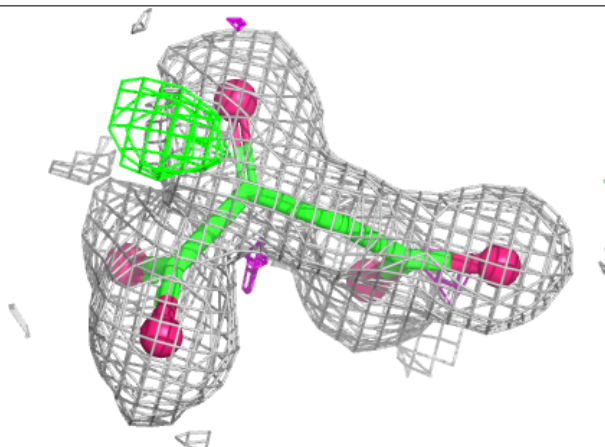


Electron density around OAA C 502:

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

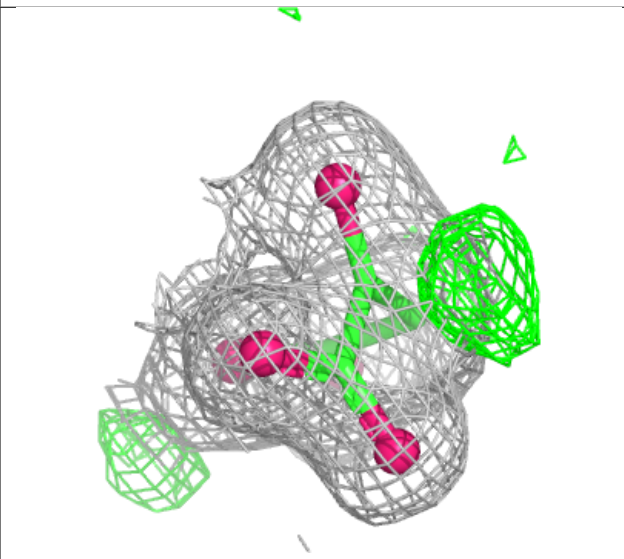
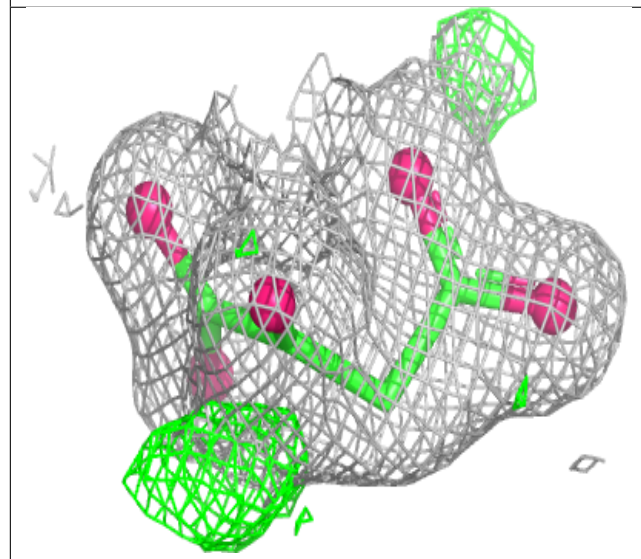
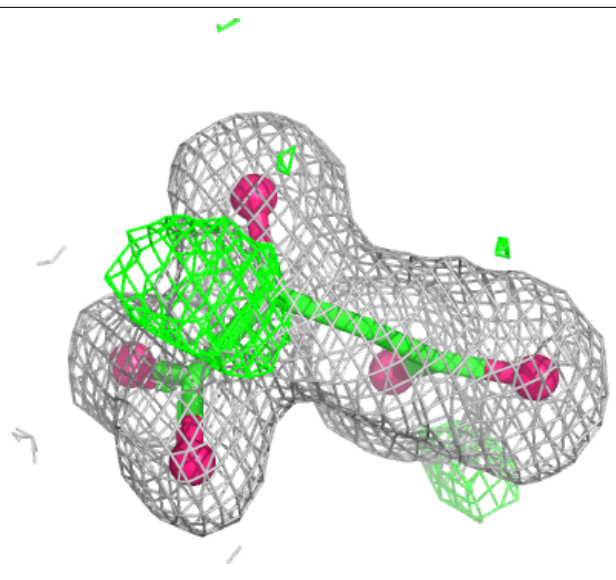
**Electron density around OAA A 503:**

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



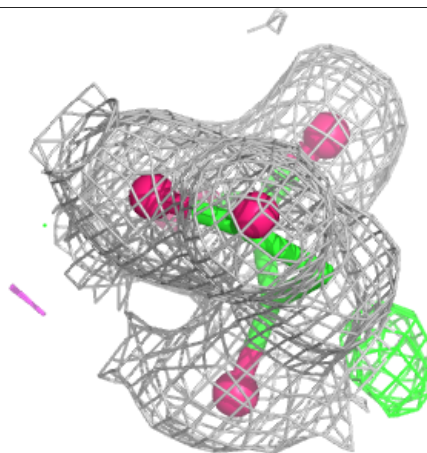
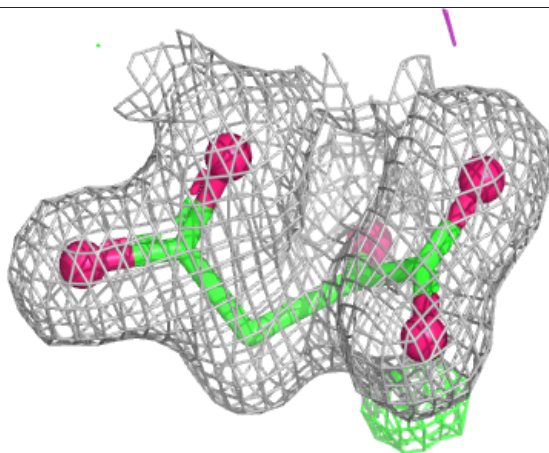
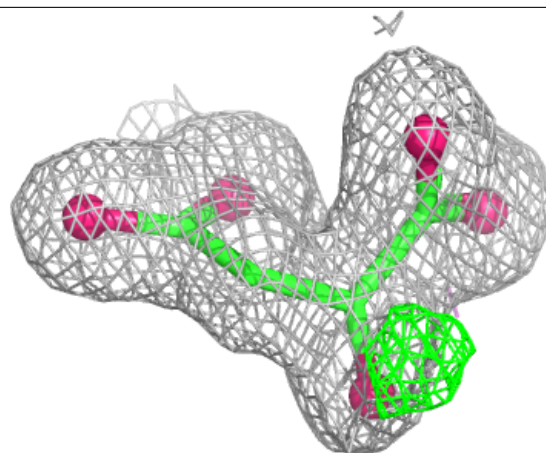
Electron density around OAA B 503:

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



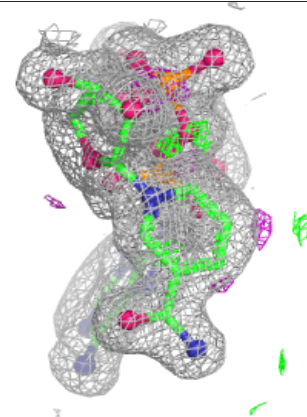
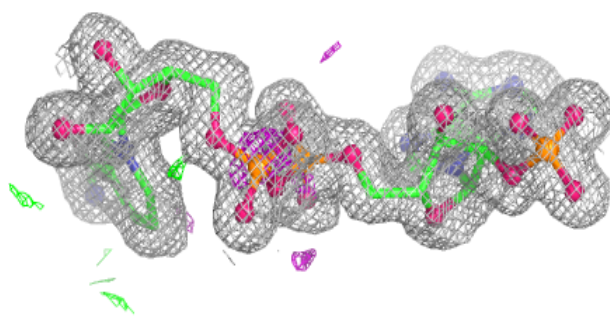
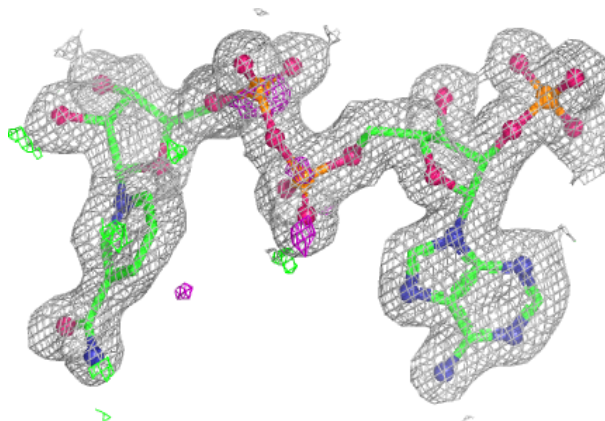
Electron density around OAA C 503:

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

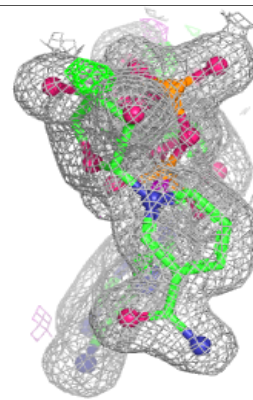
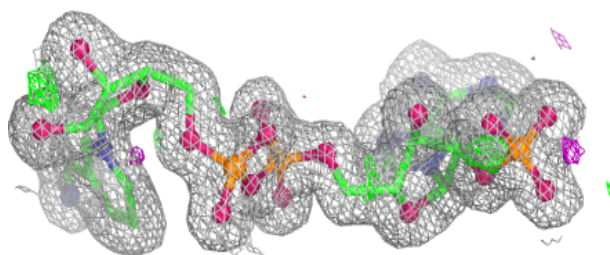
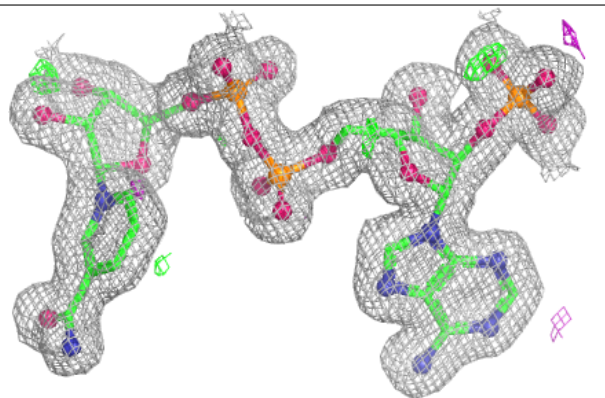


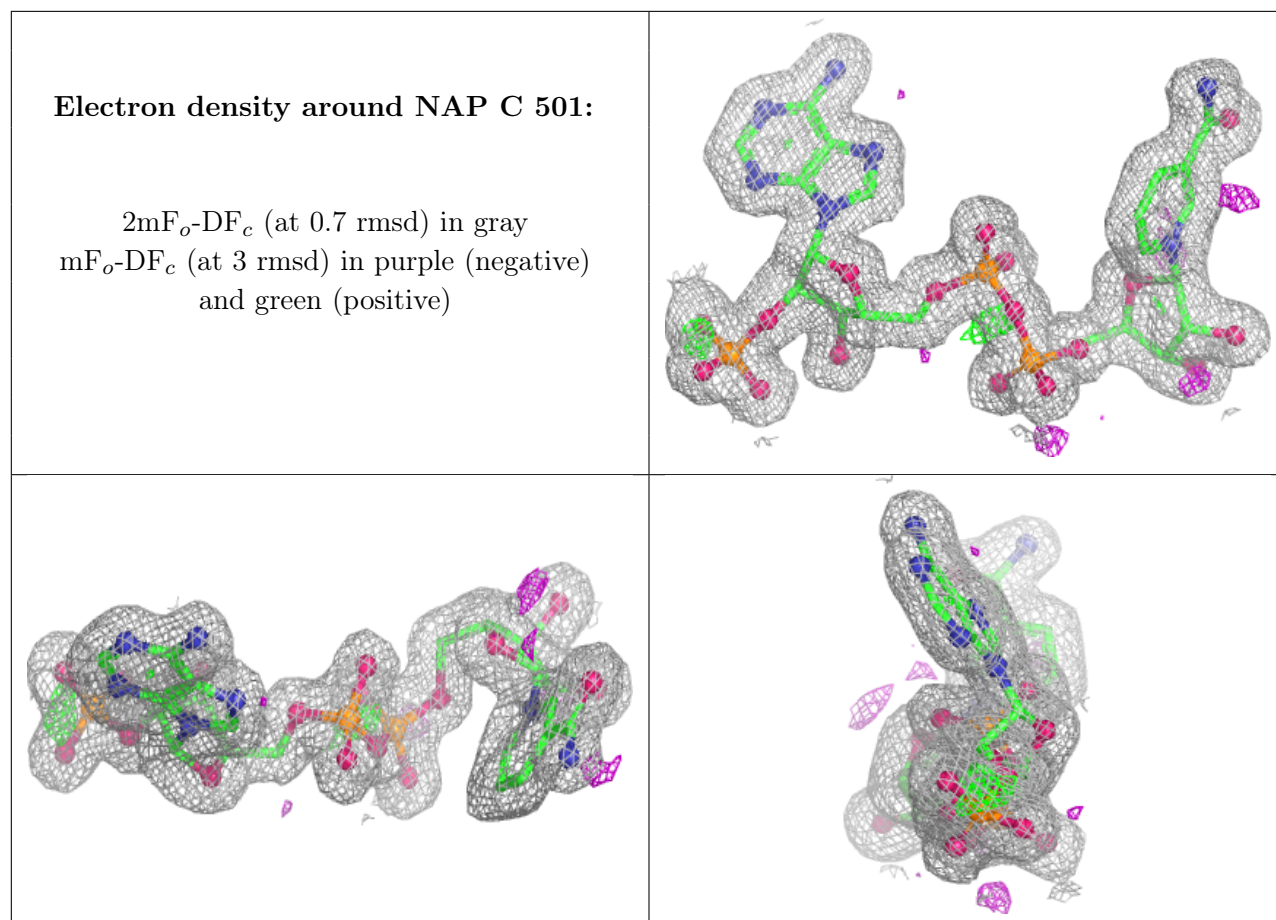
Electron density around NAP A 501:

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

**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)





6.5 Other polymers ⓘ

There are no such residues in this entry.