



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 26, 2026 – 02:58 PM EDT

PDB ID : 8IHG / pdb_00008ihg
Title : Crystal structure of aminophenol dioxygenase from Pseudomonas species AP-3
Authors : Shi, Q.L.; Su, D.
Deposited on : 2023-02-22
Resolution : 2.86 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

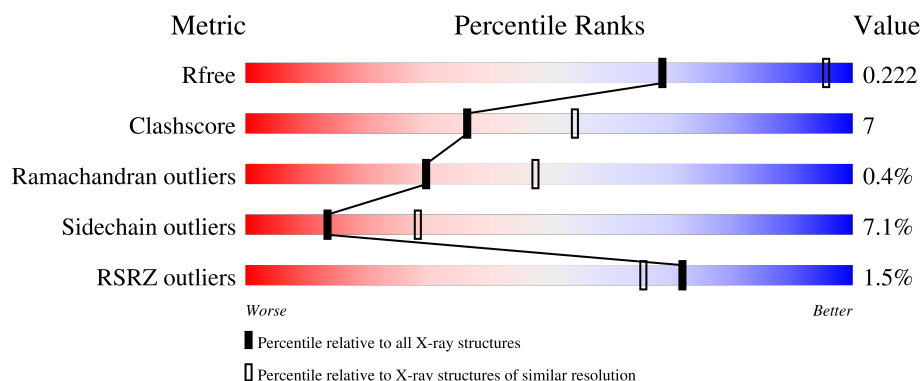
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.86 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	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

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	305	% 79% 17% ..
1	C	305	3% 79% 17% ..
2	B	272	% 77% 19% ..
2	D	272	% 86% 12% ..

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 9034 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 2-aminophenol 1,6-dioxygenase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	300	Total	C	N	O	S	0	0	0
			2395	1530	416	435	14			
1	C	299	Total	C	N	O	S	0	0	0
			2386	1525	415	432	14			

- Molecule 2 is a protein called 2-aminophenol 1,6-dioxygenase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	270	Total	C	N	O	S	0	0	0
			2055	1303	350	394	8			
2	D	270	Total	C	N	O	S	0	0	0
			2055	1303	350	394	8			

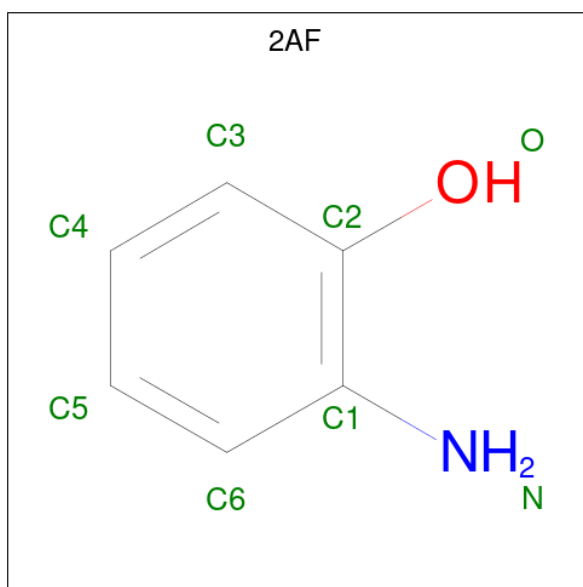
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	272	ALA	-	expression tag	UNP O33478
B	273	ALA	-	expression tag	UNP O33478
D	272	ALA	-	expression tag	UNP O33478
D	273	ALA	-	expression tag	UNP O33478

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn) (labeled as "Ligand of Interest" by depositor).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Zn	0	0
			1	1		
3	C	1	Total	Zn	0	0
			1	1		

- Molecule 4 is 2-AMINOPHENOL (CCD ID: 2AF) (formula: C₆H₇NO) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			8	6	1	1		
4	C	1	Total	C	N	O	0	0
			8	6	1	1		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	C	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	C	1	Total	C	O	0	0
			6	3	3		

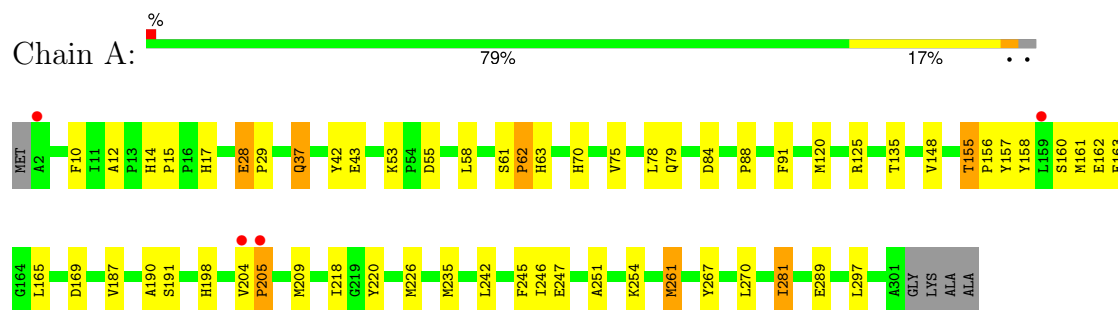
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	32	Total	O	0	0
			32	32		
6	B	23	Total	O	0	0
			23	23		
6	C	33	Total	O	0	0
			33	33		
6	D	25	Total	O	0	0
			25	25		

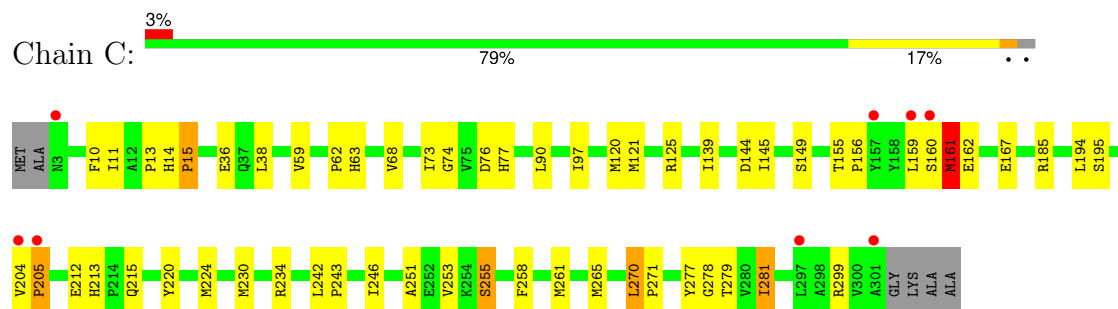
3 Residue-property plots [i](#)

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.

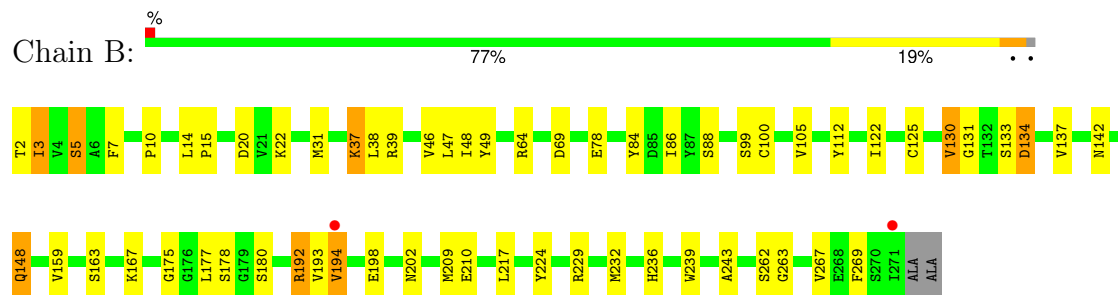
- Molecule 1: 2-aminophenol 1,6-dioxygenase beta subunit



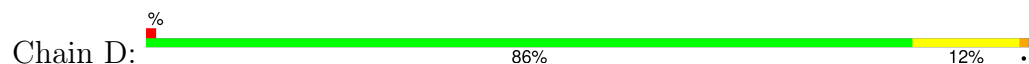
- Molecule 1: 2-aminophenol 1,6-dioxygenase beta subunit

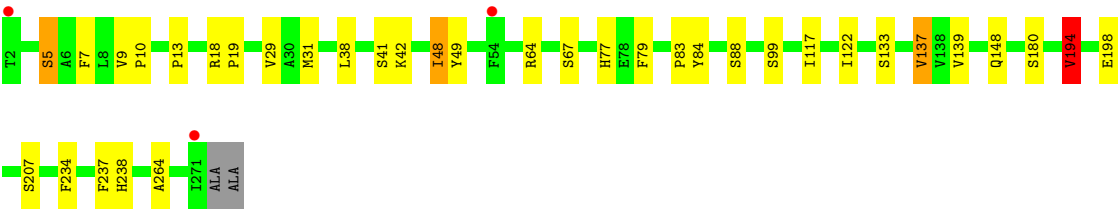


- Molecule 2: 2-aminophenol 1,6-dioxygenase alpha subunit



- Molecule 2: 2-aminophenol 1,6-dioxygenase alpha subunit





4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	153.47Å 153.47Å 312.04Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	81.91 – 2.86 81.91 – 2.86	Depositor EDS
% Data completeness (in resolution range)	99.9 (81.91-2.86) 99.9 (81.91-2.86)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.59 (at 2.86Å)	Xtriage
Refinement program	PHENIX (1.15.2_3472: ???)	Depositor
R, R_{free}	0.179 , 0.234 0.199 , 0.222	Depositor DCC
R_{free} test set	2000 reflections (3.92%)	wwPDB-VP
Wilson B-factor (Å ²)	50.7	Xtriage
Anisotropy	0.541	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 30.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9034	wwPDB-VP
Average B, all atoms (Å ²)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.76% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, 2AF, GOL

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	1.13	1/2467 (0.0%)	1.26	5/3354 (0.1%)
1	C	1.10	1/2458 (0.0%)	1.22	6/3342 (0.2%)
2	B	1.06	0/2099	1.22	0/2856
2	D	1.00	3/2099 (0.1%)	1.08	0/2856
All	All	1.08	5/9123 (0.1%)	1.20	11/12408 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	15	PRO	C-O	-5.63	1.18	1.24
1	C	15	PRO	C-O	-5.50	1.18	1.24
2	D	13	PRO	C-O	-5.45	1.17	1.24
2	D	19	PRO	C-O	-5.35	1.18	1.23
2	D	83	PRO	C-O	-5.30	1.17	1.23

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	205	PRO	N-CA-C	-12.74	95.16	110.70
1	A	205	PRO	N-CA-C	-12.59	95.34	110.70
1	A	15	PRO	N-CA-C	-6.55	102.71	110.70
1	A	62	PRO	CB-CA-C	-5.39	103.28	110.88
1	C	10	PHE	CB-CA-C	-5.37	98.16	109.38
1	A	55	ASP	N-CA-C	-5.37	106.86	113.41
1	C	253	VAL	CA-C-N	5.35	128.45	120.31
1	C	253	VAL	C-N-CA	5.35	128.45	120.31
1	C	68	VAL	CA-C-O	-5.34	117.99	122.63
1	A	63	HIS	CB-CA-C	5.22	119.39	110.56
1	C	63	HIS	CB-CA-C	5.04	119.07	110.56

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	2395	0	2322	37	1
1	C	2386	0	2313	32	1
2	B	2055	0	2004	47	0
2	D	2055	0	2004	18	0
3	A	1	0	0	0	0
3	C	1	0	0	0	0
4	A	8	0	7	0	0
4	C	8	0	7	0	0
5	C	12	0	16	0	0
6	A	32	0	0	0	0
6	B	23	0	0	1	0
6	C	33	0	0	0	0
6	D	25	0	0	0	0
All	All	9034	0	8673	127	1

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 7.

All (127) 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:204:VAL:CG1	1:A:205:PRO:HD3	1.64	1.27
1:A:204:VAL:HG13	1:A:205:PRO:CD	1.75	1.17
2:B:64:ARG:HH11	2:B:64:ARG:HG3	1.33	0.93
1:C:212:GLU:OE2	1:C:279:THR:HG22	1.73	0.89
2:B:192:ARG:HG2	2:B:192:ARG:HH11	1.40	0.85
2:B:39:ARG:HH11	2:B:39:ARG:HG3	1.43	0.82
1:C:155:THR:HG23	1:C:159:LEU:HD13	1.64	0.79
2:B:142:ASN:HD21	2:B:232:MET:HG2	1.50	0.75
1:A:204:VAL:HG13	1:A:205:PRO:HD3	0.80	0.75
1:C:73:ILE:HD12	1:C:149:SER:HB3	1.69	0.74

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:148:GLN:H	2:B:148:GLN:NE2	1.88	0.71
2:B:64:ARG:HG3	2:B:64:ARG:NH1	2.06	0.70
1:A:14:HIS:HD1	1:A:191:SER:HG	1.40	0.69
2:B:39:ARG:HG3	2:B:39:ARG:NH1	2.06	0.69
1:A:281:ILE:HG13	1:A:281:ILE:O	1.93	0.68
2:B:38:LEU:C	2:B:38:LEU:HD23	2.18	0.68
1:C:185:ARG:NH1	1:C:299:ARG:O	2.27	0.66
2:B:10:PRO:HG2	2:B:31:MET:HE2	1.82	0.62
2:B:192:ARG:HG2	2:B:192:ARG:NH1	2.13	0.62
1:A:88:PRO:HB2	2:B:112:TYR:CE2	2.36	0.61
2:B:2:THR:HG21	2:B:163:SER:HA	1.82	0.61
2:B:209:MET:HE2	2:B:267:VAL:HG11	1.82	0.61
1:C:194:LEU:O	1:C:251:ALA:HA	2.02	0.58
1:C:261:MET:HG2	1:C:265:MET:HE2	1.83	0.58
2:B:192:ARG:HH11	2:B:192:ARG:CG	2.15	0.57
1:C:204:VAL:HB	1:C:205:PRO:HD3	1.85	0.56
2:D:48:ILE:HG13	2:D:137:VAL:HG22	1.88	0.56
1:A:190:ALA:HB2	1:A:261:MET:HE2	1.88	0.55
2:D:180:SER:HB3	2:D:194:VAL:HG21	1.88	0.55
2:B:148:GLN:H	2:B:148:GLN:HE21	1.56	0.54
1:C:270:LEU:HD12	1:C:271:PRO:HD2	1.90	0.53
1:C:144:ASP:OD1	1:C:144:ASP:N	2.40	0.53
1:C:161:MET:HE1	1:C:246:ILE:HD12	1.90	0.53
2:B:47:LEU:HG	2:B:239:TRP:HZ2	1.72	0.53
1:A:158:TYR:O	2:B:229:ARG:NH2	2.42	0.52
2:B:131:GLY:HA2	2:B:137:VAL:HG13	1.91	0.52
1:C:38:LEU:HG	1:C:278:GLY:HA3	1.92	0.51
1:C:73:ILE:HD12	1:C:149:SER:CB	2.37	0.51
1:C:11:ILE:HD11	1:C:258:PHE:HE1	1.75	0.51
2:B:177:LEU:HB2	2:B:263:GLY:O	2.09	0.51
1:C:220:TYR:CE2	1:C:224:MET:HE3	2.45	0.51
2:D:38:LEU:C	2:D:38:LEU:HD23	2.35	0.51
2:B:134:ASP:N	2:B:134:ASP:OD1	2.44	0.51
2:B:49:TYR:C	2:B:49:TYR:CD1	2.90	0.50
2:D:137:VAL:HG13	2:D:139:VAL:HG23	1.92	0.50
1:C:121:MET:O	1:C:121:MET:HE3	2.10	0.50
2:D:194:VAL:HG23	2:D:198:GLU:OE1	2.11	0.50
2:B:142:ASN:ND2	2:B:232:MET:HG2	2.22	0.50
1:A:12:ALA:O	1:A:191:SER:HA	2.12	0.50
1:C:11:ILE:HD11	1:C:258:PHE:CE1	2.48	0.49
2:D:5:SER:HB2	2:D:7:PHE:CE1	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:HIS:N	1:A:17:HIS:ND1	2.60	0.49
2:D:9:VAL:HB	2:D:31:MET:HE3	1.94	0.49
2:B:46:VAL:HG21	2:B:130:VAL:CG2	2.43	0.49
2:D:84:TYR:HB3	2:D:122:ILE:HG23	1.94	0.48
1:A:190:ALA:CB	1:A:261:MET:HE2	2.43	0.48
1:C:14:HIS:N	1:C:15:PRO:HD3	2.29	0.48
1:A:58:LEU:HG	1:A:148:VAL:HB	1.96	0.47
1:A:235:MET:HE3	1:A:235:MET:HA	1.96	0.47
2:B:142:ASN:HD21	2:B:232:MET:CG	2.24	0.47
2:D:180:SER:CB	2:D:194:VAL:HG21	2.45	0.47
2:B:192:ARG:NH1	2:B:192:ARG:CG	2.73	0.47
1:C:13:PRO:HB2	1:C:15:PRO:HD3	1.97	0.47
1:A:155:THR:N	1:A:156:PRO:CD	2.78	0.47
1:C:281:ILE:O	1:C:281:ILE:HG13	2.15	0.46
2:B:46:VAL:HG21	2:B:130:VAL:HG22	1.96	0.46
2:B:5:SER:HB2	2:B:7:PHE:CE1	2.50	0.46
2:B:209:MET:HE3	2:B:269:PHE:CE2	2.51	0.46
2:B:159:VAL:HG21	2:B:243:ALA:HB1	1.98	0.46
1:A:37:GLN:HE21	1:C:277:TYR:H	1.64	0.46
2:B:100:CYS:HB3	2:B:105:VAL:HB	1.99	0.45
1:A:297:LEU:N	1:A:297:LEU:CD1	2.78	0.45
1:C:242:LEU:HB3	1:C:243:PRO:HD3	1.99	0.45
2:B:84:TYR:HD2	2:B:86:ILE:HG13	1.81	0.45
2:D:64:ARG:HG3	2:D:64:ARG:HH11	1.81	0.45
2:B:2:THR:HG21	2:B:163:SER:CB	2.47	0.44
2:D:38:LEU:O	2:D:41:SER:OG	2.34	0.44
1:A:281:ILE:O	1:A:281:ILE:CG1	2.61	0.44
1:A:70:HIS:CD2	1:A:70:HIS:N	2.86	0.44
1:A:160:SER:HB3	1:A:163:GLU:CD	2.43	0.44
1:A:209:MET:HG3	1:C:220:TYR:CZ	2.53	0.44
2:B:49:TYR:CD1	2:B:49:TYR:O	2.71	0.44
2:B:38:LEU:C	2:B:38:LEU:CD2	2.89	0.44
1:A:14:HIS:O	1:A:14:HIS:CD2	2.70	0.44
2:B:14:LEU:N	2:B:15:PRO:CD	2.81	0.44
1:C:121:MET:HG2	2:D:77:HIS:CE1	2.53	0.44
1:A:37:GLN:NE2	1:C:277:TYR:H	2.15	0.43
1:A:75:VAL:HG21	1:A:78:LEU:HD21	2.00	0.43
1:A:261:MET:HB3	1:A:261:MET:HE3	1.67	0.43
1:A:198:HIS:HB2	1:A:281:ILE:HG13	2.00	0.43
2:B:49:TYR:O	2:B:49:TYR:HD1	2.00	0.43
2:B:64:ARG:NH1	2:B:64:ARG:CG	2.73	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:125:CYS:HA	2:B:130:VAL:HG12	2.01	0.43
2:B:84:TYR:HB3	2:B:122:ILE:HG23	2.00	0.43
2:D:10:PRO:HB3	2:D:264:ALA:HB1	2.00	0.43
2:B:209:MET:CE	2:B:267:VAL:HG11	2.49	0.43
2:B:202:ASN:ND2	2:B:224:TYR:OH	2.52	0.43
2:D:18:ARG:HD3	2:D:79:PHE:CD1	2.54	0.43
1:A:204:VAL:CG1	1:A:205:PRO:CD	2.58	0.42
1:C:62:PRO:HB3	1:C:255:SER:OG	2.19	0.42
1:A:28:GLU:N	1:A:29:PRO:CD	2.83	0.42
1:C:230:MET:HE2	1:C:258:PHE:CZ	2.54	0.42
2:B:209:MET:HE3	2:B:269:PHE:CZ	2.55	0.42
1:A:61:SER:HA	1:A:62:PRO:HD3	1.88	0.42
1:A:157:TYR:CE2	1:A:254:LYS:HE2	2.55	0.42
2:B:37:LYS:HB3	2:B:37:LYS:HE2	1.58	0.41
2:D:38:LEU:HD23	2:D:38:LEU:O	2.20	0.41
2:B:167:LYS:NZ	6:B:301:HOH:O	2.44	0.41
1:A:297:LEU:N	1:A:297:LEU:HD12	2.35	0.41
1:C:155:THR:N	1:C:156:PRO:CD	2.84	0.41
1:C:213:HIS:C	1:C:279:THR:HG21	2.46	0.41
2:D:148:GLN:HB3	2:D:238:HIS:CE1	2.56	0.41
1:A:10:PHE:CE2	1:A:289:GLU:HG3	2.55	0.41
1:C:74:GLY:HA3	1:C:120:MET:HE3	2.02	0.41
1:A:120:MET:HE3	1:A:120:MET:HB3	1.92	0.41
1:A:169:ASP:OD1	1:A:267:TYR:OH	2.33	0.41
2:D:49:TYR:C	2:D:49:TYR:CD1	2.98	0.41
1:A:84:ASP:HB2	1:A:91:PHE:HB3	2.02	0.41
1:A:246:ILE:HA	1:A:251:ALA:HB3	2.02	0.41
2:B:198:GLU:H	2:B:198:GLU:HG3	1.66	0.41
1:C:73:ILE:HA	1:C:121:MET:HB3	2.03	0.41
1:C:215:GLN:HE21	1:C:215:GLN:HA	1.85	0.40
2:D:234:PHE:CE2	2:D:237:PHE:CD2	3.09	0.40
1:A:226:MET:HE2	1:A:245:PHE:HB2	2.04	0.40
1:A:220:TYR:OH	1:C:36:GLU:OE1	2.31	0.40
2:B:3:ILE:O	2:B:3:ILE:HG22	2.20	0.40
2:B:175:GLY:HA3	2:B:236:HIS:CD2	2.56	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:79:GLN:OE1	1:C:76:ASP:N[5_554]	2.10	0.10

5.3 Torsion angles

5.3.1 Protein backbone

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	298/305 (98%)	287 (96%)	11 (4%)	0	100	100
1	C	297/305 (97%)	286 (96%)	9 (3%)	2 (1%)	18	35
2	B	268/272 (98%)	258 (96%)	9 (3%)	1 (0%)	30	48
2	D	268/272 (98%)	257 (96%)	10 (4%)	1 (0%)	30	48
All	All	1131/1154 (98%)	1088 (96%)	39 (3%)	4 (0%)	30	48

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	194	VAL
2	D	194	VAL
1	C	161	MET
1	C	281	ILE

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	255/257 (99%)	237 (93%)	18 (7%)	13	28
1	C	254/257 (99%)	239 (94%)	15 (6%)	18	37
2	B	216/218 (99%)	194 (90%)	22 (10%)	7	15
2	D	216/218 (99%)	204 (94%)	12 (6%)	19	40
All	All	941/950 (99%)	874 (93%)	67 (7%)	13	28

All (67) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	GLU
1	A	37	GLN
1	A	42	TYR
1	A	43	GLU
1	A	53	LYS
1	A	125	ARG
1	A	135	THR
1	A	155	THR
1	A	161	MET
1	A	162	GLU
1	A	165	LEU
1	A	187	VAL
1	A	218	ILE
1	A	242	LEU
1	A	247	GLU
1	A	261	MET
1	A	270	LEU
1	A	281	ILE
2	B	3	ILE
2	B	5	SER
2	B	20	ASP
2	B	22	LYS
2	B	37	LYS
2	B	48	ILE
2	B	69	ASP
2	B	78	GLU
2	B	88	SER
2	B	99	SER
2	B	130	VAL
2	B	133	SER
2	B	134	ASP
2	B	148	GLN
2	B	178	SER
2	B	180	SER
2	B	192	ARG
2	B	193	VAL
2	B	194	VAL
2	B	210	GLU
2	B	217	LEU
2	B	262	SER
1	C	59	VAL
1	C	77	HIS

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Mol	Chain	Res	Type
1	C	90	LEU
1	C	97	ILE
1	C	125	ARG
1	C	139	ILE
1	C	145	ILE
1	C	160	SER
1	C	161	MET
1	C	162	GLU
1	C	167	GLU
1	C	195	SER
1	C	234	ARG
1	C	255	SER
1	C	270	LEU
2	D	5	SER
2	D	29	VAL
2	D	42	LYS
2	D	48	ILE
2	D	67	SER
2	D	88	SER
2	D	99	SER
2	D	117	ILE
2	D	133	SER
2	D	137	VAL
2	D	194	VAL
2	D	207	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	70	HIS
1	A	192	ASN
1	A	200	HIS
1	A	232	GLN
1	A	240	GLN
2	B	52	GLN
2	B	148	GLN
2	B	202	ASN
1	C	98	ASN
1	C	215	GLN
2	D	32	GLN
2	D	255	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 6 ligands modelled in this entry, 2 are monoatomic - leaving 4 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	$\# Z > 2$
4	2AF	A	902	3	8,8,8	1.37	2 (25%)	9,10,10	1.01	0
5	GOL	C	504	-	5,5,5	1.31	1 (20%)	5,5,5	1.09	0
5	GOL	C	502	-	5,5,5	1.05	0	5,5,5	1.21	1 (20%)
4	2AF	C	501	3	8,8,8	1.40	2 (25%)	9,10,10	1.12	1 (11%)

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
4	2AF	A	902	3	-	-	0/1/1/1
5	GOL	C	504	-	-	4/4/4/4	-
5	GOL	C	502	-	-	4/4/4/4	-
4	2AF	C	501	3	-	-	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	902	2AF	C1-N	3.01	1.47	1.38
4	C	501	2AF	C1-N	2.80	1.47	1.38
4	C	501	2AF	O-C2	2.56	1.41	1.36
5	C	504	GOL	C1-C2	2.35	1.60	1.51
4	A	902	2AF	O-C2	2.18	1.40	1.36

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	C	501	2AF	C5-C6-C1	-2.11	118.18	121.03
5	C	502	GOL	C3-C2-C1	-2.06	104.24	111.80

There are no chirality outliers.

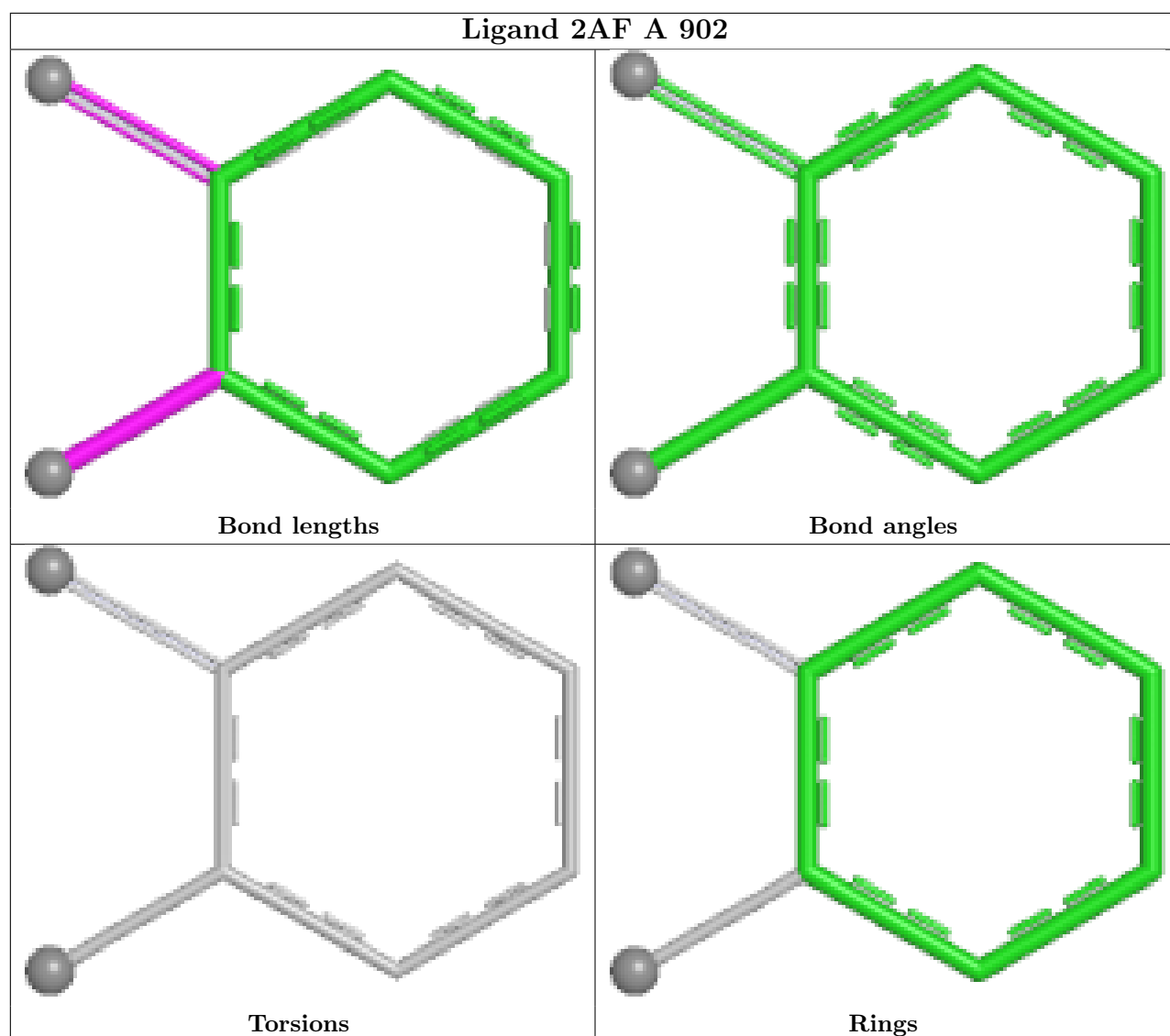
All (8) torsion outliers are listed below:

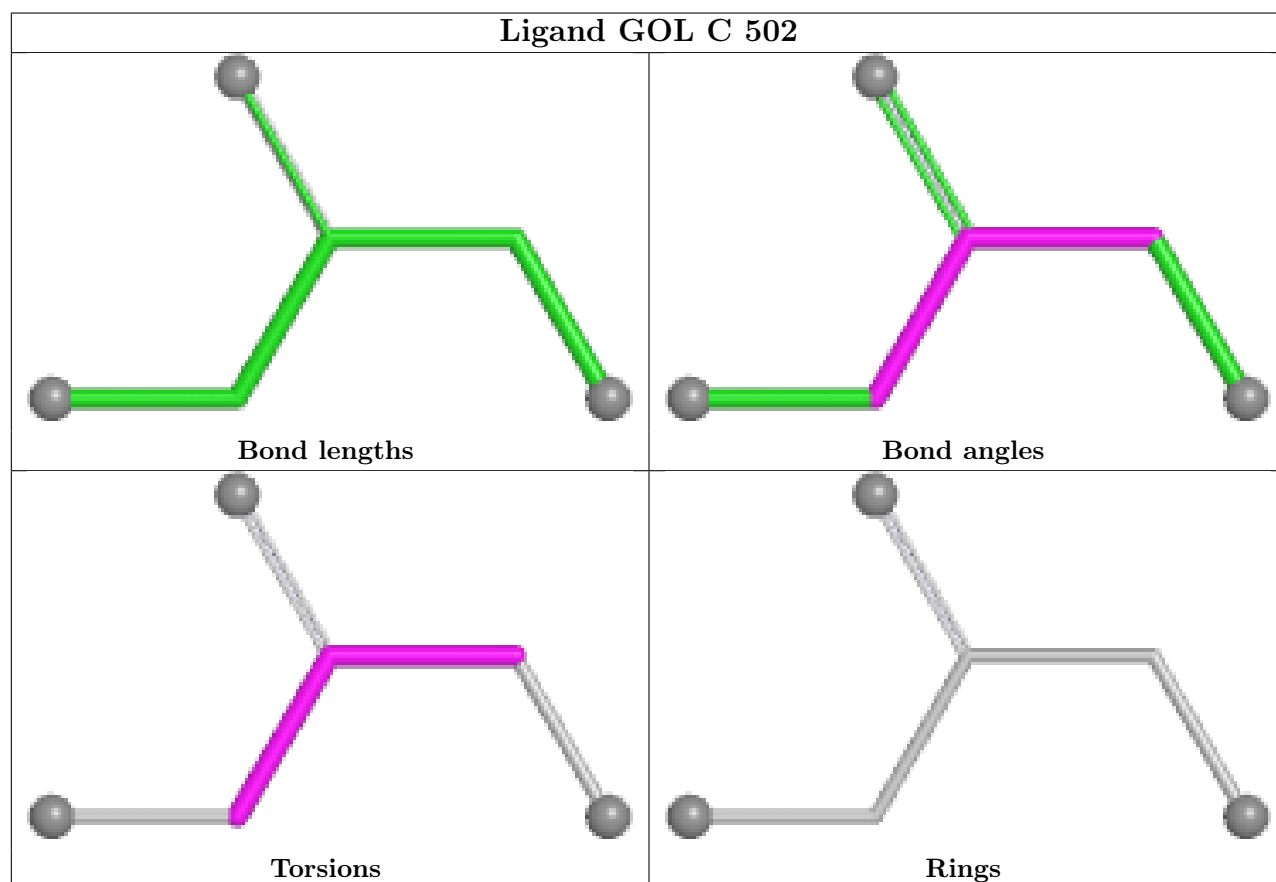
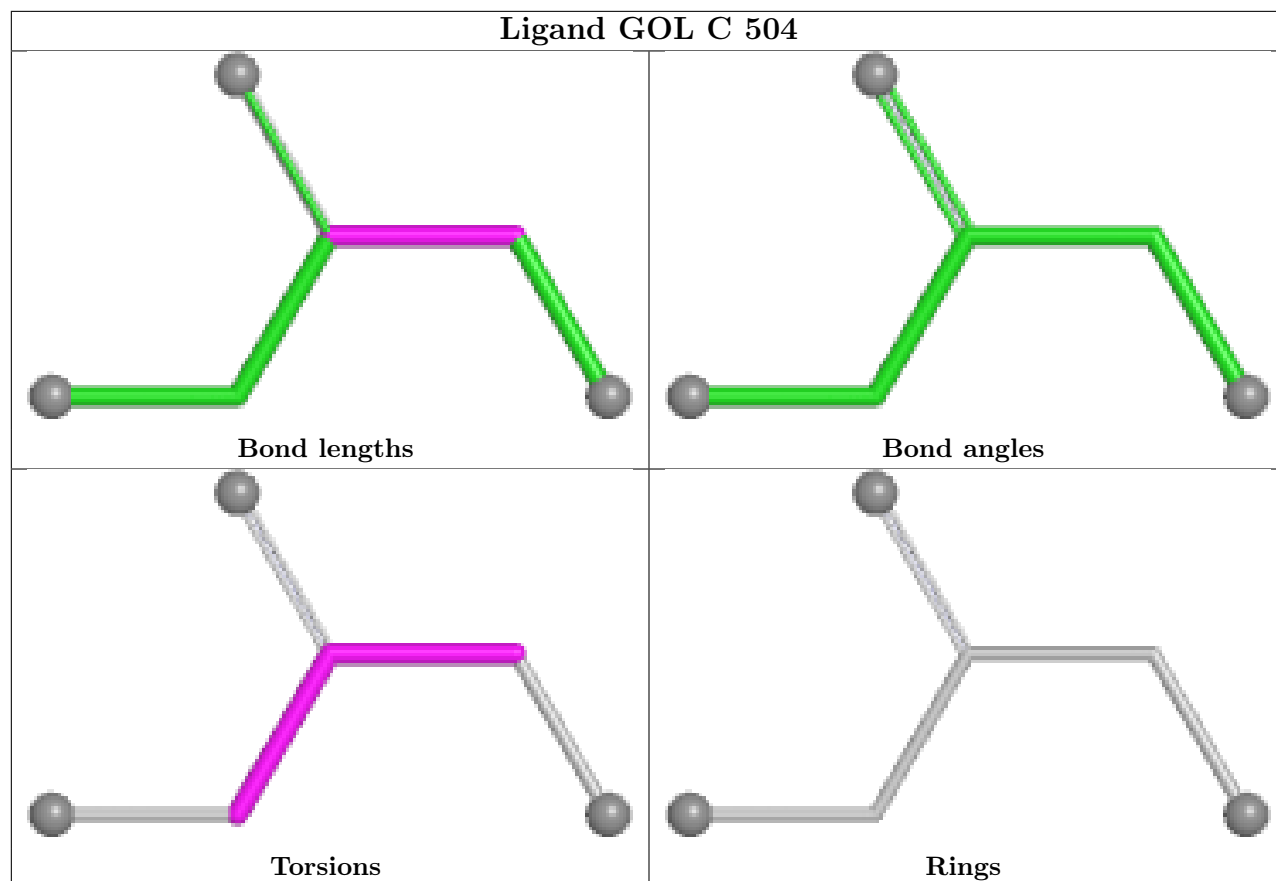
Mol	Chain	Res	Type	Atoms
5	C	502	GOL	O1-C1-C2-C3
5	C	504	GOL	O1-C1-C2-C3
5	C	504	GOL	C1-C2-C3-O3
5	C	502	GOL	C1-C2-C3-O3
5	C	504	GOL	O1-C1-C2-O2
5	C	504	GOL	O2-C2-C3-O3
5	C	502	GOL	O1-C1-C2-O2
5	C	502	GOL	O2-C2-C3-O3

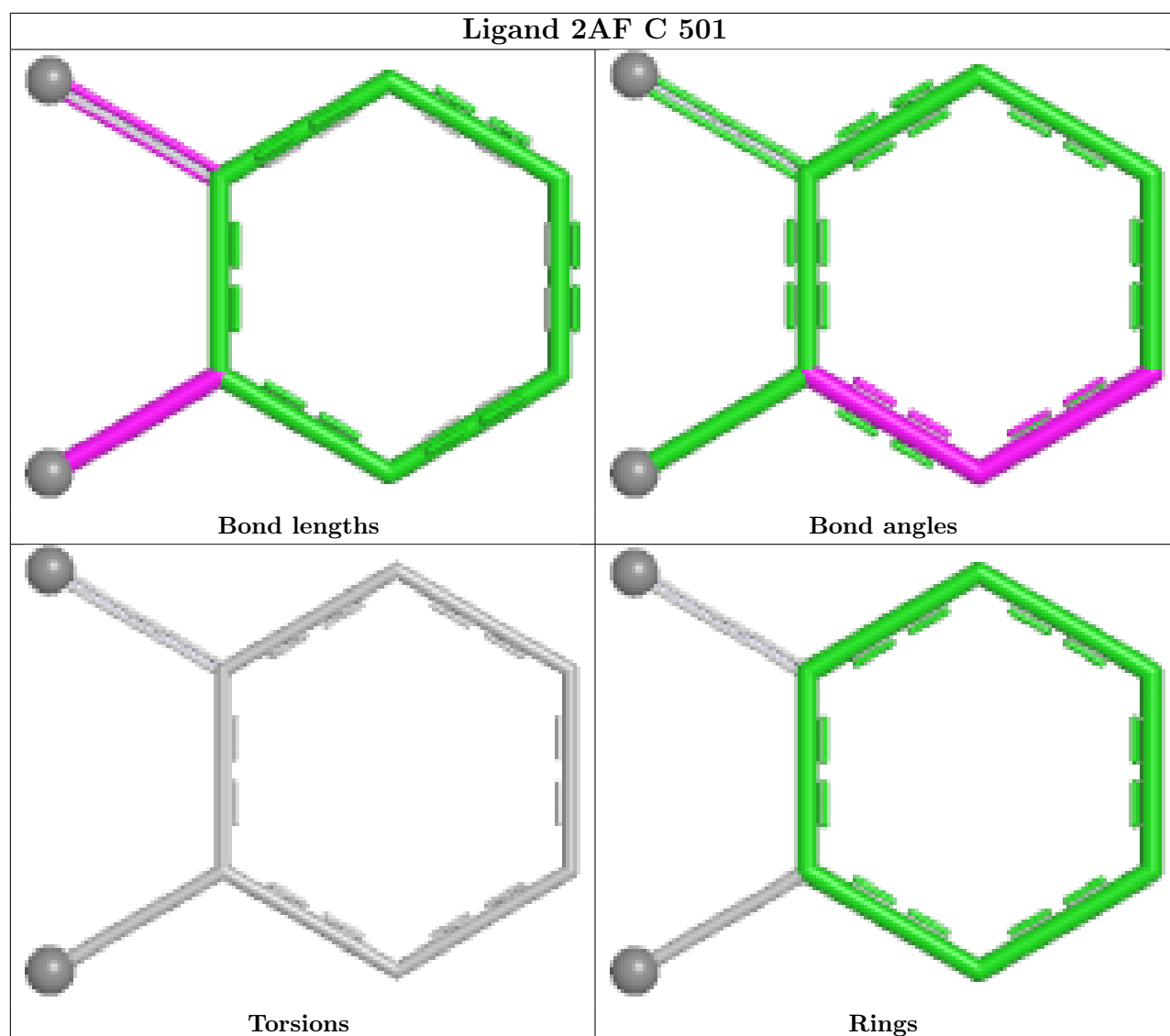
There are no ring outliers.

No monomer is involved in short contacts.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	300/305 (98%)	-0.32	4 (1%) 75 68	30, 46, 75, 100	0
1	C	299/305 (98%)	-0.38	8 (2%) 56 47	27, 41, 69, 91	0
2	B	270/272 (99%)	-0.05	2 (0%) 84 80	31, 55, 83, 102	0
2	D	270/272 (99%)	-0.41	3 (1%) 78 73	30, 43, 60, 81	0
All	All	1139/1154 (98%)	-0.29	17 (1%) 72 65	27, 45, 76, 102	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	204	VAL	6.9
1	C	204	VAL	5.0
1	A	2	ALA	4.4
2	D	271	ILE	4.4
1	C	297	LEU	3.2
1	C	160	SER	3.2
1	A	159	LEU	3.0
1	C	159	LEU	3.0
1	C	205	PRO	2.9
2	B	271	ILE	2.9
1	A	205	PRO	2.8
1	C	301	ALA	2.7
1	C	3	ASN	2.5
2	D	2	THR	2.4
1	C	157	TYR	2.1
2	B	194	VAL	2.1
2	D	54	PHE	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](#)

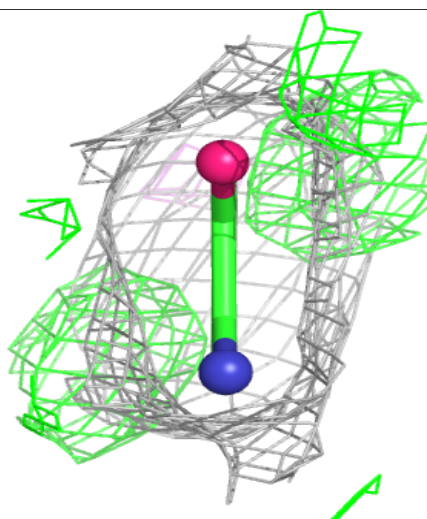
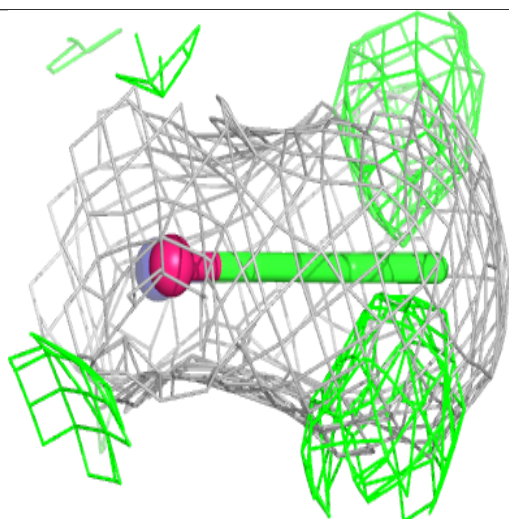
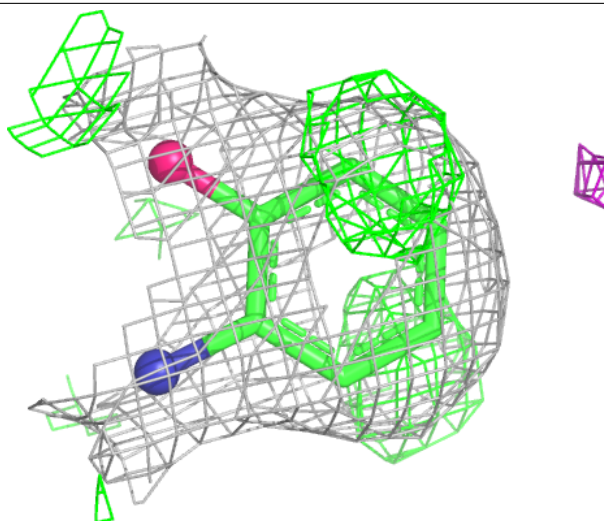
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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
4	2AF	A	902	8/8	0.87	0.13	32,39,48,51	0
5	GOL	C	504	6/6	0.90	0.18	60,68,76,76	0
5	GOL	C	502	6/6	0.94	0.10	35,52,52,53	0
4	2AF	C	501	8/8	0.94	0.10	23,33,45,50	0
3	ZN	C	503	1/1	0.96	0.04	75,75,75,75	0
3	ZN	A	901	1/1	0.98	0.05	74,74,74,74	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.

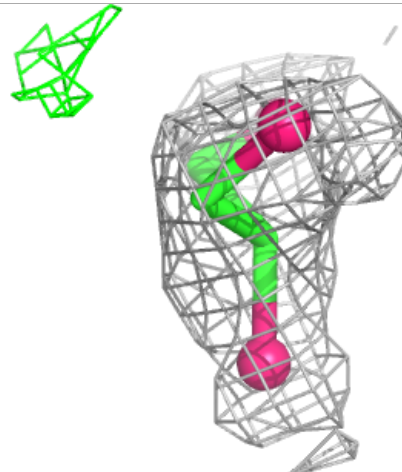
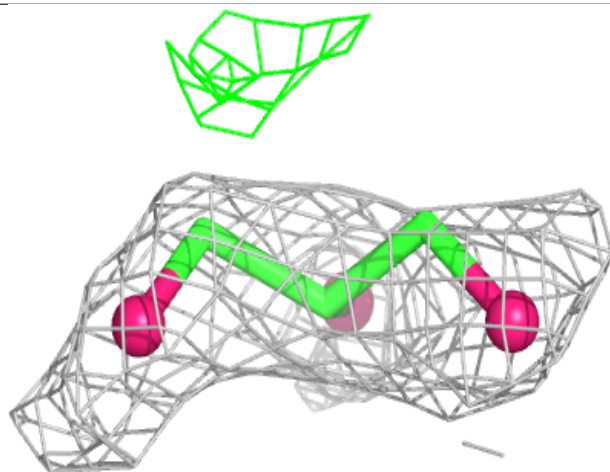
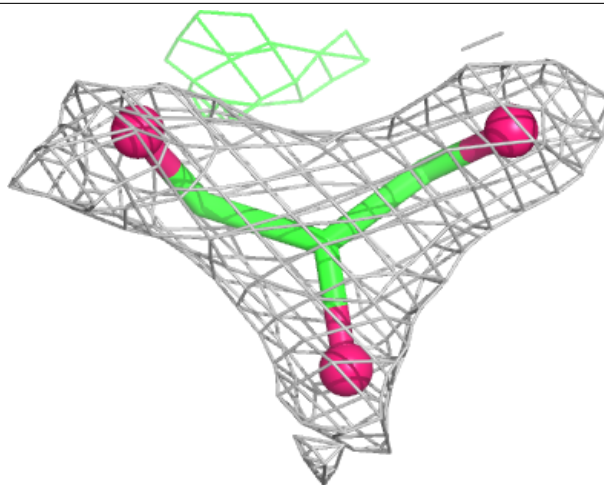
Electron density around 2AF A 902:

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



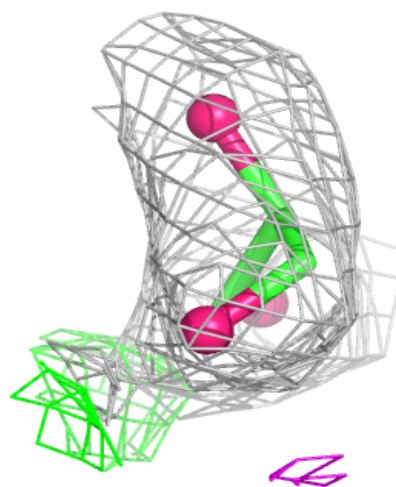
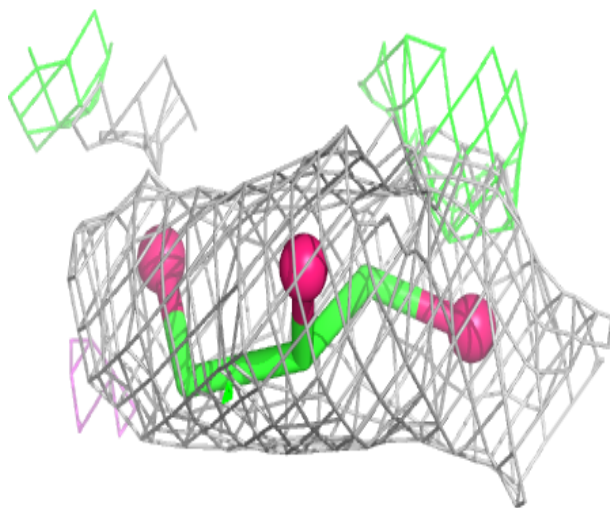
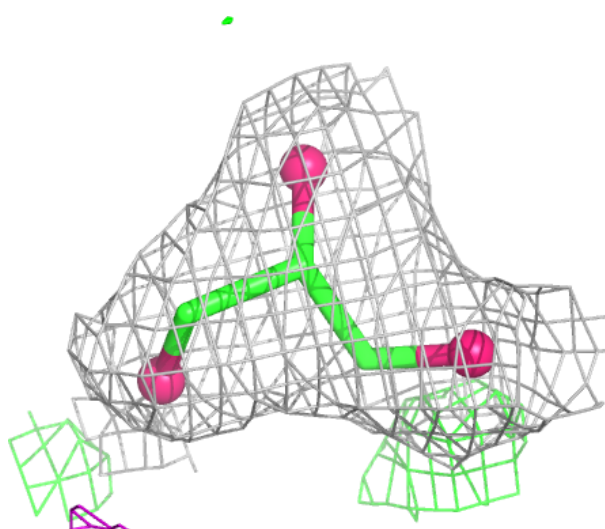
Electron density around GOL C 504:

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



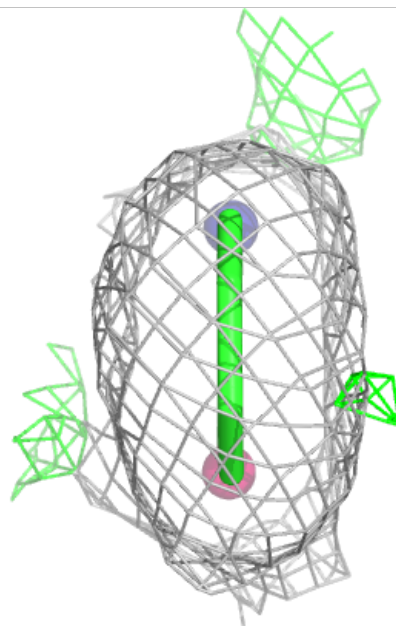
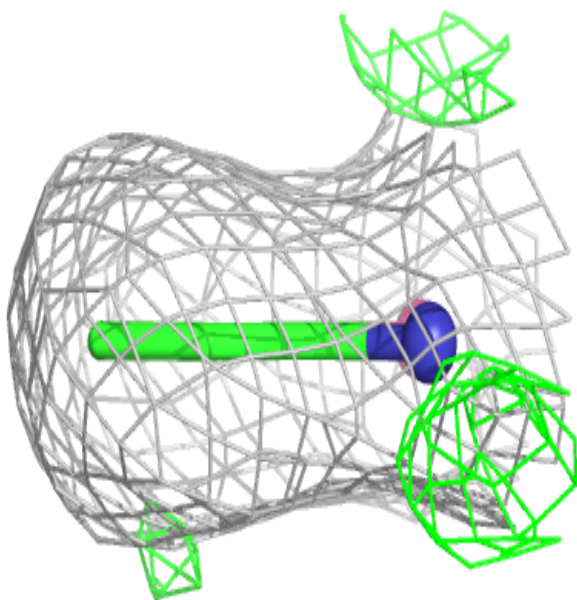
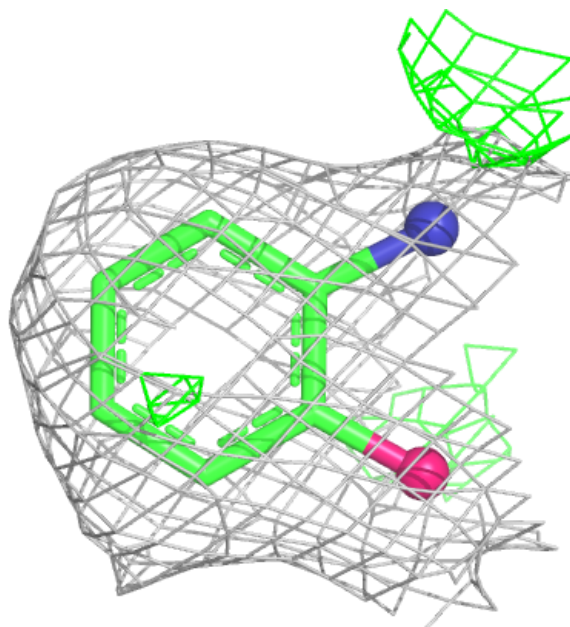
Electron density around GOL C 502:

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and green (positive)



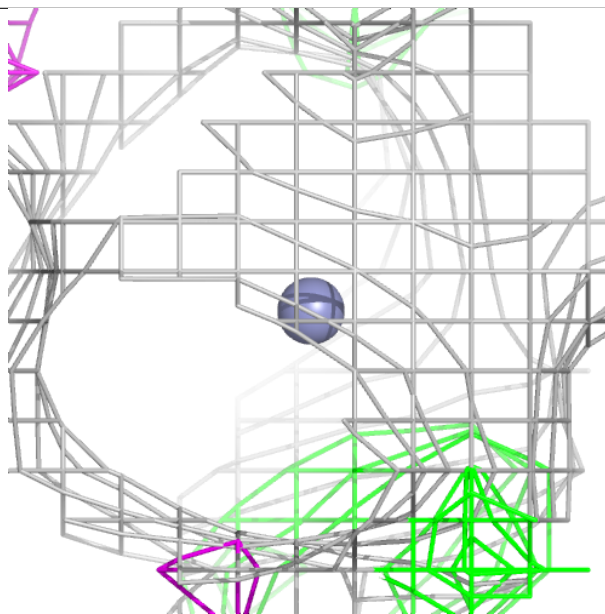
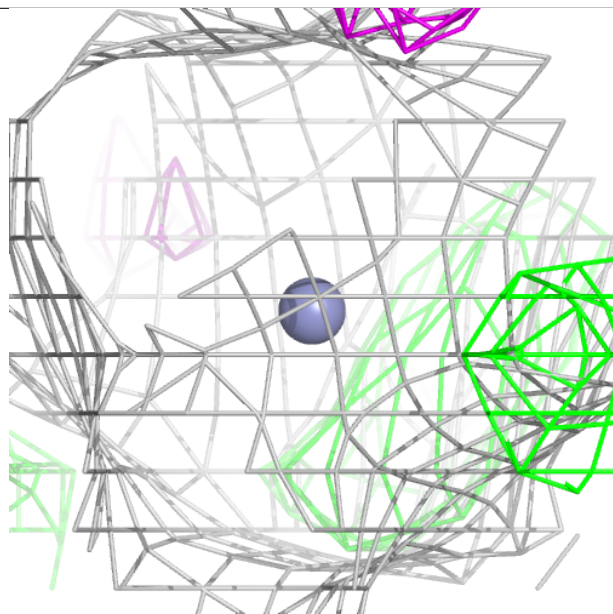
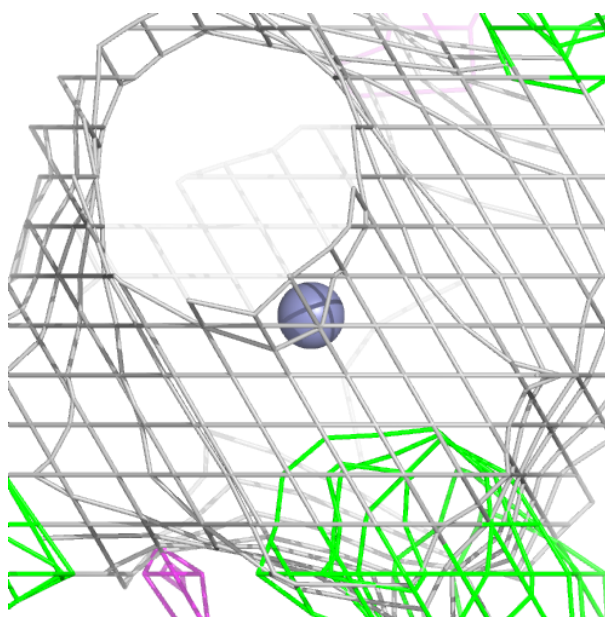
Electron density around 2AF C 501:

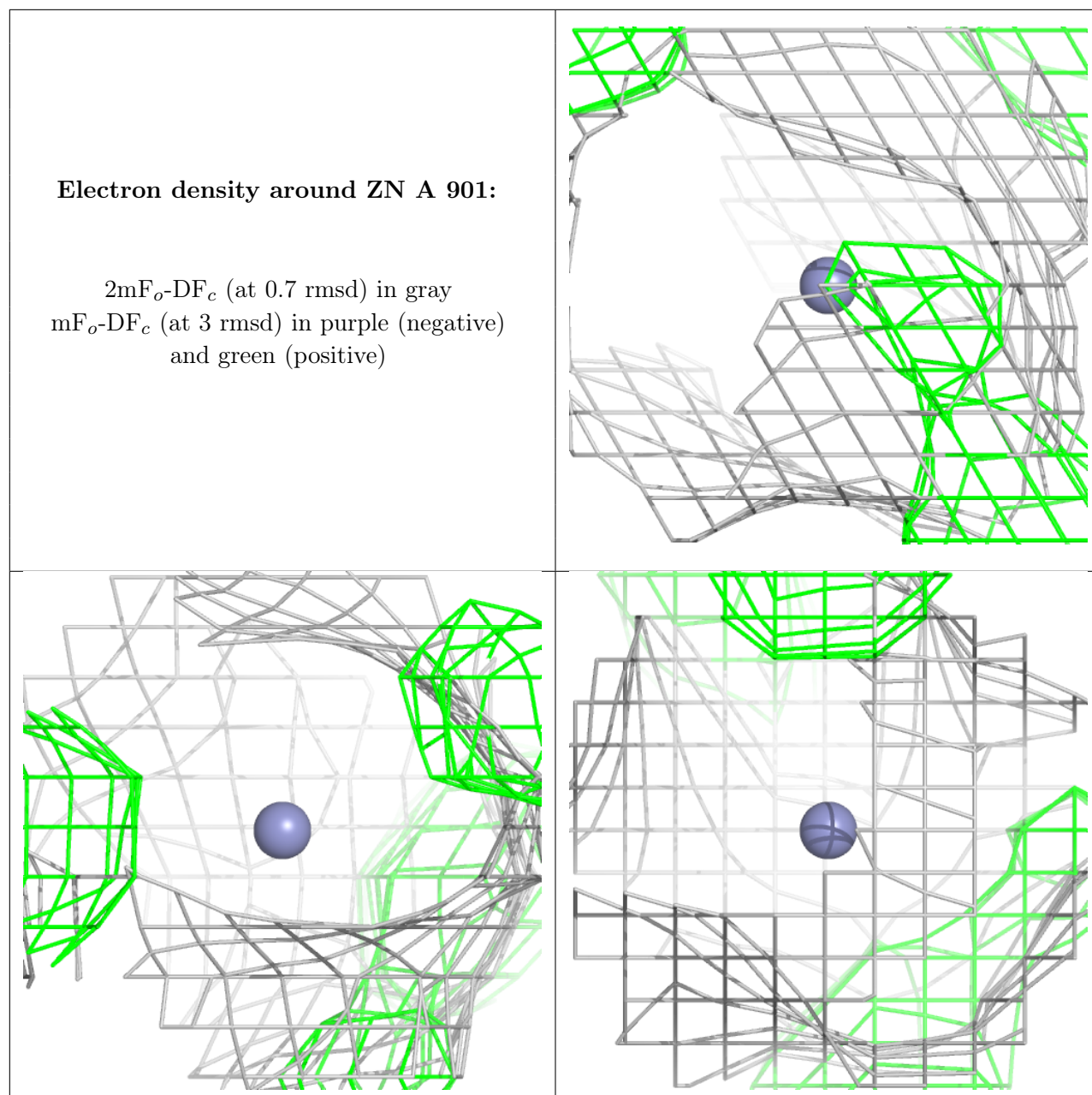
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around ZN 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)





6.5 Other polymers ⓘ

There are no such residues in this entry.