



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:38 PM UTC

PDB ID : 5GWJ / pdb_00005gwj
Title : Structure of a Human topoisomerase IIbeta fragment in complex with DNA and E7873S
Authors : Wang, Y.R.; Chen, S.F.; Wu, C.C.; Chan, N.L.
Deposited on : 2016-09-12
Resolution : 2.57 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

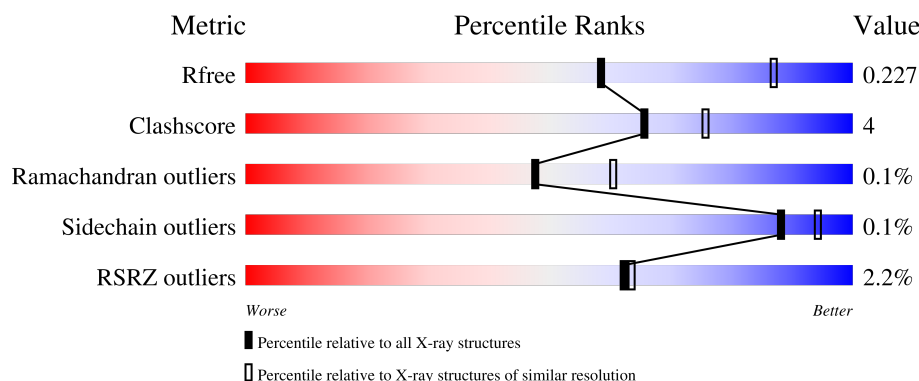
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.57 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	1853 (2.58-2.54)
Clashscore	190562	1897 (2.58-2.54)
Ramachandran outliers	187476	1875 (2.58-2.54)
Sidechain outliers	187428	1875 (2.58-2.54)
RSRZ outliers	180081	1853 (2.58-2.54)

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	803	2% 75% 9% 16%
1	B	803	2% 74% 10% 16%
2	C	8	100%
2	E	8	100%
3	D	12	92% 8%

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Mol	Chain	Length	Quality of chain
3	F	12	 100%

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 12264 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 DNA topoisomerase 2-beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	677	Total	C	N	O	S	0	9	0
			5508	3504	954	1026	24			
1	B	676	Total	C	N	O	S	0	5	0
			5462	3477	947	1014	24			

There are 92 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	419	MET	-	expression tag	UNP Q02880
A	420	ALA	-	expression tag	UNP Q02880
A	421	SER	-	expression tag	UNP Q02880
A	422	TRP	-	expression tag	UNP Q02880
A	423	SER	-	expression tag	UNP Q02880
A	424	HIS	-	expression tag	UNP Q02880
A	425	PRO	-	expression tag	UNP Q02880
A	426	GLN	-	expression tag	UNP Q02880
A	427	PHE	-	expression tag	UNP Q02880
A	428	GLU	-	expression tag	UNP Q02880
A	429	LYS	-	expression tag	UNP Q02880
A	430	GLY	-	expression tag	UNP Q02880
A	431	ALA	-	expression tag	UNP Q02880
A	432	ASP	-	expression tag	UNP Q02880
A	433	ASP	-	expression tag	UNP Q02880
A	434	ASP	-	expression tag	UNP Q02880
A	435	ASP	-	expression tag	UNP Q02880
A	436	LYS	-	expression tag	UNP Q02880
A	437	VAL	-	expression tag	UNP Q02880
A	438	PRO	-	expression tag	UNP Q02880
A	439	ASP	-	expression tag	UNP Q02880
A	440	PRO	-	expression tag	UNP Q02880
A	441	THR	-	expression tag	UNP Q02880
A	442	SER	-	expression tag	UNP Q02880
A	443	VAL	-	expression tag	UNP Q02880

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Chain	Residue	Modelled	Actual	Comment	Reference
A	444	ASP	-	expression tag	UNP Q02880
A	1202	GLY	-	expression tag	UNP Q02880
A	1203	ALA	-	expression tag	UNP Q02880
A	1204	PRO	-	expression tag	UNP Q02880
A	1205	GLY	-	expression tag	UNP Q02880
A	1206	PHE	-	expression tag	UNP Q02880
A	1207	SER	-	expression tag	UNP Q02880
A	1208	SER	-	expression tag	UNP Q02880
A	1209	ILE	-	expression tag	UNP Q02880
A	1210	SER	-	expression tag	UNP Q02880
A	1211	ALA	-	expression tag	UNP Q02880
A	1212	HIS	-	expression tag	UNP Q02880
A	1213	HIS	-	expression tag	UNP Q02880
A	1214	HIS	-	expression tag	UNP Q02880
A	1215	HIS	-	expression tag	UNP Q02880
A	1216	HIS	-	expression tag	UNP Q02880
A	1217	HIS	-	expression tag	UNP Q02880
A	1218	HIS	-	expression tag	UNP Q02880
A	1219	HIS	-	expression tag	UNP Q02880
A	1220	HIS	-	expression tag	UNP Q02880
A	1221	HIS	-	expression tag	UNP Q02880
B	419	MET	-	expression tag	UNP Q02880
B	420	ALA	-	expression tag	UNP Q02880
B	421	SER	-	expression tag	UNP Q02880
B	422	TRP	-	expression tag	UNP Q02880
B	423	SER	-	expression tag	UNP Q02880
B	424	HIS	-	expression tag	UNP Q02880
B	425	PRO	-	expression tag	UNP Q02880
B	426	GLN	-	expression tag	UNP Q02880
B	427	PHE	-	expression tag	UNP Q02880
B	428	GLU	-	expression tag	UNP Q02880
B	429	LYS	-	expression tag	UNP Q02880
B	430	GLY	-	expression tag	UNP Q02880
B	431	ALA	-	expression tag	UNP Q02880
B	432	ASP	-	expression tag	UNP Q02880
B	433	ASP	-	expression tag	UNP Q02880
B	434	ASP	-	expression tag	UNP Q02880
B	435	ASP	-	expression tag	UNP Q02880
B	436	LYS	-	expression tag	UNP Q02880
B	437	VAL	-	expression tag	UNP Q02880
B	438	PRO	-	expression tag	UNP Q02880
B	439	ASP	-	expression tag	UNP Q02880

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Chain	Residue	Modelled	Actual	Comment	Reference
B	440	PRO	-	expression tag	UNP Q02880
B	441	THR	-	expression tag	UNP Q02880
B	442	SER	-	expression tag	UNP Q02880
B	443	VAL	-	expression tag	UNP Q02880
B	444	ASP	-	expression tag	UNP Q02880
B	1202	GLY	-	expression tag	UNP Q02880
B	1203	ALA	-	expression tag	UNP Q02880
B	1204	PRO	-	expression tag	UNP Q02880
B	1205	GLY	-	expression tag	UNP Q02880
B	1206	PHE	-	expression tag	UNP Q02880
B	1207	SER	-	expression tag	UNP Q02880
B	1208	SER	-	expression tag	UNP Q02880
B	1209	ILE	-	expression tag	UNP Q02880
B	1210	SER	-	expression tag	UNP Q02880
B	1211	ALA	-	expression tag	UNP Q02880
B	1212	HIS	-	expression tag	UNP Q02880
B	1213	HIS	-	expression tag	UNP Q02880
B	1214	HIS	-	expression tag	UNP Q02880
B	1215	HIS	-	expression tag	UNP Q02880
B	1216	HIS	-	expression tag	UNP Q02880
B	1217	HIS	-	expression tag	UNP Q02880
B	1218	HIS	-	expression tag	UNP Q02880
B	1219	HIS	-	expression tag	UNP Q02880
B	1220	HIS	-	expression tag	UNP Q02880
B	1221	HIS	-	expression tag	UNP Q02880

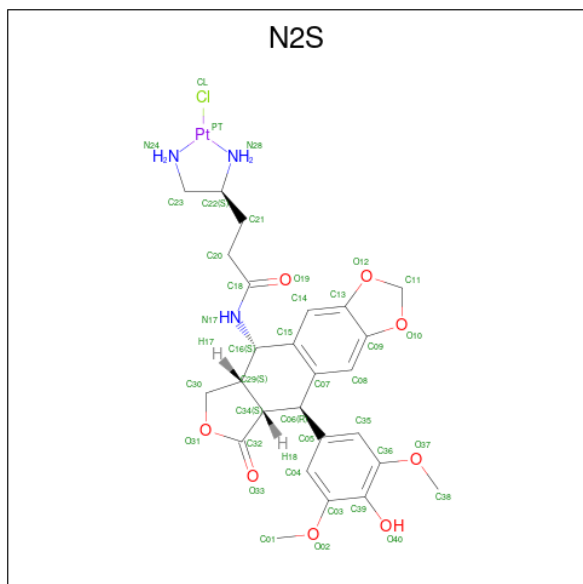
- Molecule 2 is a DNA chain called DNA (5'-D(P*AP*GP*CP*CP*GP*AP*GP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	C	8	Total 165	C 77	N 34	O 46	P 8	0	0	0
2	E	8	Total 165	C 77	N 34	O 46	P 8	0	0	0

- Molecule 3 is a DNA chain called DNA (5'-D(P*TP*GP*CP*AP*GP*CP*TP*CP*GP*GP*CP*T)-3').

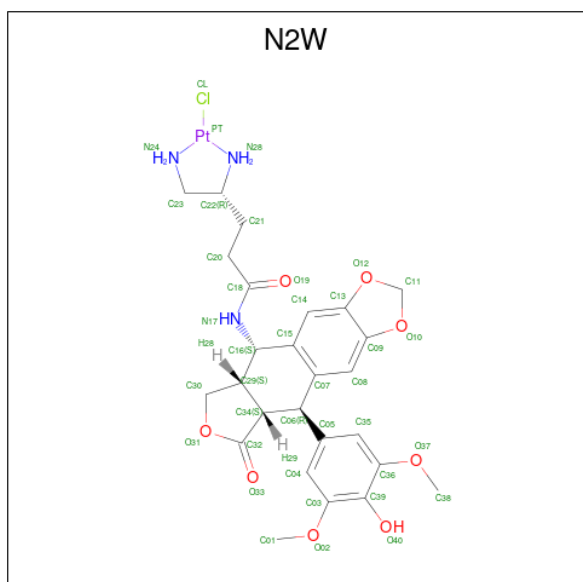
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	D	12	Total 245	C 116	N 43	O 74	P 12	0	0	0
3	F	12	Total 245	C 116	N 43	O 74	P 12	0	0	0

- Molecule 4 is chloro{4,5-di(amino-kappaN)-N-[9-(4-hydroxy-3,5-dimethoxyphenyl)-8-oxo-5,5a,6,8,8a,9-hexahydro-2H-furo[3',4':6,7]naphtho[2,3-d][1,3]dioxol-5-yl]pentanamide}platinum (CCD ID: N2S) (formula: $C_{26}H_{31}ClN_3O_8Pt$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	Cl	N	O	Pt		
4	A	1	Total 39	26	1	3	8	1	0	1
4	B	1	Total 39	26	1	3	8	1	0	1

- Molecule 5 is chloro{4,5-di(amino-kappaN)-N-[9-(4-hydroxy-3,5-dimethoxyphenyl)-8-oxo-5,5a,6,8,8a,9-hexahydro-2H-furo[3',4':6,7]naphtho[2,3-d][1,3]dioxol-5-yl]pentanamide}platinum (CCD ID: N2W) (formula: $C_{26}H_{31}ClN_3O_8Pt$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
5	A	1	Total	C	Cl	N	O	Pt	0	1
			39	26	1	3	8	1		
5	B	1	Total	C	Cl	N	O	Pt	0	1
			39	26	1	3	8	1		

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	2	Total	Mg	0	0
			2	2		
6	B	2	Total	Mg	0	0
			2	2		
6	E	1	Total	Mg	0	0
			1	1		
6	F	1	Total	Mg	0	0
			1	1		

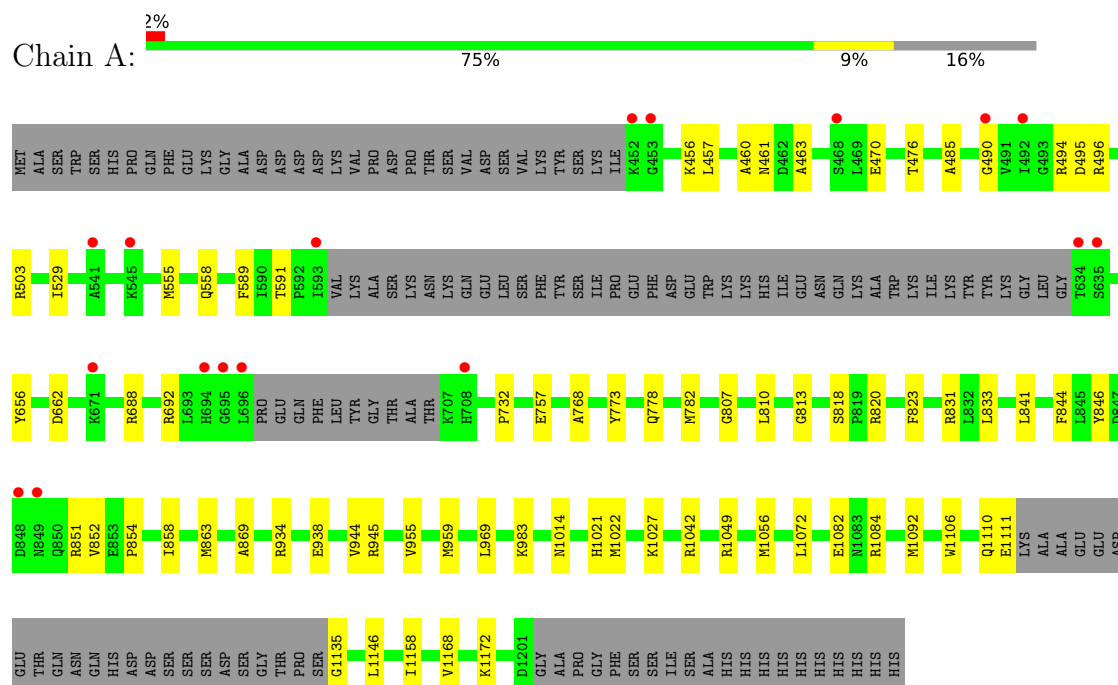
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	130	Total	O	0	0
			130	130		
7	B	144	Total	O	0	0
			144	144		
7	C	7	Total	O	0	0
			7	7		
7	D	14	Total	O	0	0
			14	14		
7	E	8	Total	O	0	0
			8	8		
7	F	9	Total	O	0	0
			9	9		

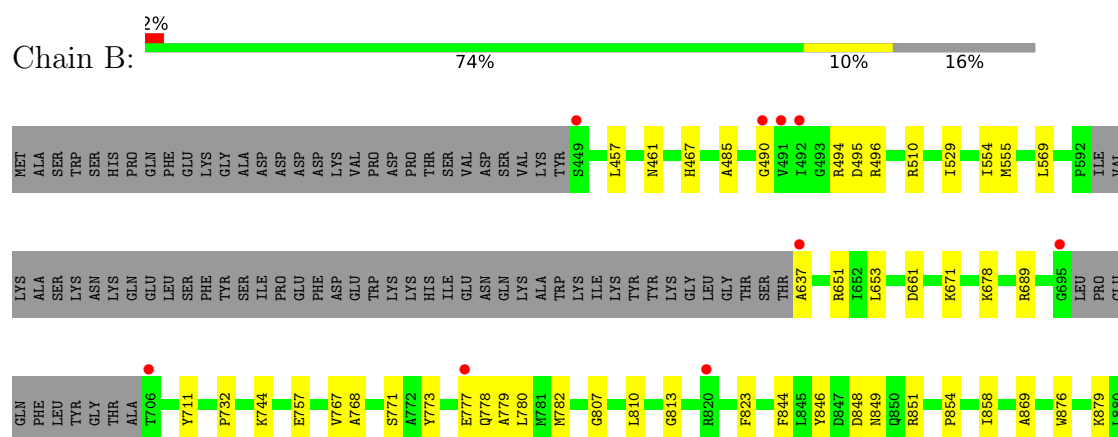
3 Residue-property plots [i](#)

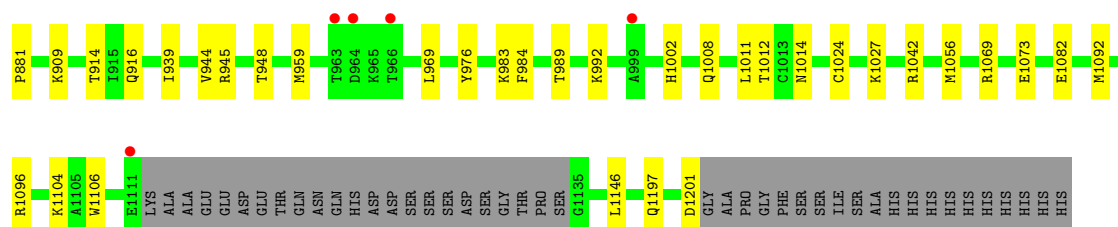
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: DNA topoisomerase 2-beta



• Molecule 1: DNA topoisomerase 2-beta





- Molecule 2: DNA (5'-D(P*AP*GP*CP*CP*GP*AP*GP*C)-3')

Chain C: 100%

There are no outlier residues recorded for this chain.

- Molecule 2: DNA (5'-D(P*AP*GP*CP*CP*GP*AP*GP*C)-3')

Chain E: 100%

There are no outlier residues recorded for this chain.

- Molecule 3: DNA (5'-D(P*TP*GP*CP*AP*GP*CP*TP*CP*GP*GP*CP*T)-3')

Chain D: 92% 8%



- Molecule 3: DNA (5'-D(P*TP*GP*CP*AP*GP*CP*TP*CP*GP*GP*CP*T)-3')

Chain F: 100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	80.18Å 176.99Å 94.41Å 90.00° 111.50° 90.00°	Depositor
Resolution (Å)	29.68 – 2.57 29.68 – 2.57	Depositor EDS
% Data completeness (in resolution range)	99.5 (29.68-2.57) 99.4 (29.68-2.57)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.48	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.85 (at 2.57Å)	Xtriage
Refinement program	PHENIX (1.10.1_2155: ???)	Depositor
R, R_{free}	0.183 , 0.226 0.185 , 0.227	Depositor DCC
R_{free} test set	2005 reflections (2.57%)	wwPDB-VP
Wilson B-factor (Å ²)	39.9	Xtriage
Anisotropy	0.186	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 40.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	12264	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.02% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

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

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: N2S, N2W, MG

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	0.23	0/5638	0.39	0/7593
1	B	0.24	0/5580	0.41	0/7516
2	C	0.30	0/185	0.45	0/283
2	E	0.34	0/185	0.49	0/283
3	D	0.33	0/273	0.60	0/419
3	F	0.32	0/273	0.56	0/419
All	All	0.24	0/12134	0.42	0/16513

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	5508	0	5561	41	0
1	B	5462	0	5496	48	0
2	C	165	0	89	0	0
2	E	165	0	89	0	0
3	D	245	0	136	1	0
3	F	245	0	136	0	0
4	A	39	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	39	0	0	0	0
5	A	39	0	0	0	0
5	B	39	0	0	0	0
6	A	2	0	0	0	0
6	B	2	0	0	0	0
6	E	1	0	0	0	0
6	F	1	0	0	0	0
7	A	130	0	0	2	0
7	B	144	0	0	4	0
7	C	7	0	0	0	0
7	D	14	0	0	0	0
7	E	8	0	0	0	0
7	F	9	0	0	1	0
All	All	12264	0	11507	88	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 4.

All (88) 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:B:732:PRO:HG2	1:B:869:ALA:HB1	1.72	0.71
1:B:467:HIS:HB3	1:B:496:ARG:HH12	1.56	0.70
1:B:909:LYS:NZ	7:B:1401:HOH:O	2.26	0.69
1:A:456:LYS:NZ	3:D:11:DC:OP1	2.26	0.68
1:B:651:ARG:NH1	7:B:1402:HOH:O	2.27	0.68
1:A:732:PRO:HG3	1:A:869:ALA:HB1	1.76	0.66
1:B:490:GLY:O	1:B:494:ARG:NH1	2.30	0.65
1:B:510:ARG:O	1:B:671:LYS:NZ	2.30	0.64
1:B:689:ARG:NH1	1:B:1024:CYS:SG	2.71	0.63
1:A:833:LEU:HD22	1:A:863:MET:HE3	1.82	0.60
1:A:846:TYR:CZ	1:A:851:ARG:HG3	2.36	0.60
1:B:846:TYR:CZ	1:B:851:ARG:HG3	2.38	0.59
1:B:637:ALA:N	7:B:1406:HOH:O	2.35	0.59
1:A:1135:GLY:N	7:A:1405:HOH:O	2.35	0.58
1:A:757:GLU:HB3	1:A:823:PHE:HB3	1.85	0.58
1:B:554:ILE:HG12	1:B:569:LEU:HD23	1.86	0.57
1:B:989:THR:HG23	1:B:992:LYS:HE3	1.87	0.57
1:B:1082:GLU:N	1:B:1082:GLU:OE2	2.35	0.56
1:A:1072:LEU:HD21	1:A:1158:ILE:HD11	1.88	0.55
1:B:1197:GLN:NE2	1:B:1201:ASP:OD2	2.39	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:461:ASN:HB2	1:B:495:ASP:HA	1.89	0.55
1:B:959:MET:HE2	1:B:969:LEU:HD23	1.88	0.54
1:B:1073:GLU:OE1	1:B:1096:ARG:NH2	2.38	0.54
1:A:490:GLY:O	1:A:494:ARG:NH1	2.40	0.54
1:A:938:GLU:OE1	1:A:983:LYS:NZ	2.40	0.54
1:B:777:GLU:HG3	7:F:209:HOH:O	2.07	0.53
1:A:1082:GLU:N	1:A:1082:GLU:OE1	2.39	0.52
1:A:1014:ASN:O	1:A:1027:LYS:NZ	2.43	0.52
1:B:689:ARG:HH22	1:B:1024:CYS:HA	1.75	0.51
1:A:1146:LEU:HD23	1:B:1146:LEU:HD23	1.92	0.51
1:B:768:ALA:HA	1:B:773:TYR:HB3	1.92	0.51
1:B:653:LEU:HD11	7:B:1402:HOH:O	2.11	0.50
1:A:457:LEU:HD22	1:A:529:ILE:HG12	1.92	0.50
1:A:485:ALA:HB2	1:A:555:MET:HE1	1.93	0.50
1:A:1056:MET:HE2	1:A:1106:TRP:CZ3	2.47	0.50
1:B:757:GLU:HB2	1:B:823:PHE:HB3	1.94	0.50
1:A:456:LYS:HE3	1:A:503[B]:ARG:HH21	1.78	0.49
1:A:858:ILE:HG13	1:A:1042:ARG:HD2	1.96	0.48
1:A:768:ALA:HA	1:A:773:TYR:HB3	1.95	0.48
1:A:1168:VAL:O	1:A:1172:LYS:HG3	2.13	0.48
1:B:879:LYS:NZ	1:B:1012:THR:O	2.47	0.48
1:A:656:TYR:OH	1:A:662:ASP:OD2	2.26	0.47
1:A:807:GLY:HA3	1:A:813:GLY:HA2	1.97	0.47
1:B:457:LEU:HD22	1:B:529:ILE:HG12	1.97	0.47
1:A:461:ASN:HB2	1:A:495:ASP:HA	1.96	0.46
1:A:778:GLN:O	1:A:782:MET:HG2	2.16	0.46
1:A:1021:HIS:NE2	1:A:1022:MET:HE2	2.31	0.46
1:A:460:ALA:HB3	1:A:463:ALA:HB2	1.97	0.46
1:A:944:VAL:HG12	1:A:945:ARG:HG3	1.98	0.46
1:B:661:ASP:HB3	1:B:711:TYR:HB2	1.97	0.46
1:B:1104:LYS:HE2	1:B:1104:LYS:HB3	1.55	0.46
1:A:555:MET:HG3	1:A:589:PHE:HB3	1.97	0.46
1:B:939:ILE:HB	1:B:984:PHE:HB2	1.97	0.46
1:A:558:GLN:HG3	1:A:591:THR:O	2.16	0.46
1:B:779:ALA:O	1:B:782:MET:HB2	2.16	0.45
1:B:844:PHE:HA	1:B:854:PRO:HA	1.98	0.45
1:A:818:SER:OG	1:A:820:ARG:HG2	2.15	0.45
1:A:959:MET:HE2	1:A:969:LEU:HD23	1.98	0.45
1:A:831:ARG:HD3	1:A:831:ARG:HA	1.56	0.45
1:A:841:LEU:HD11	1:A:1049:ARG:HB2	1.98	0.45
1:B:1069:ARG:NH2	1:B:1096:ARG:O	2.36	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:1106:TRP:O	1:A:1110:GLN:HG2	2.18	0.44
1:B:858:ILE:HG13	1:B:1042:ARG:HD2	1.98	0.44
1:A:934:ARG:HD3	1:A:934:ARG:HA	1.77	0.44
1:B:989:THR:OG1	1:B:992:LYS:HG2	2.16	0.44
1:B:881:PRO:HB3	1:B:1011:LEU:HD21	2.00	0.43
1:A:476:THR:HG22	1:A:555:MET:HE2	2.00	0.43
1:B:744:LYS:NZ	1:B:771:SER:O	2.41	0.43
1:B:678:LYS:HE3	1:B:876:TRP:CD1	2.53	0.43
1:B:807:GLY:HA3	1:B:813:GLY:HA2	2.01	0.43
1:B:976:TYR:HB2	1:B:983:LYS:HD3	2.01	0.43
1:B:1056:MET:HE2	1:B:1106:TRP:CZ3	2.53	0.43
1:B:1002:HIS:HB3	1:B:1008:GLN:HG3	2.01	0.42
1:A:844:PHE:HA	1:A:854:PRO:HA	2.01	0.42
1:B:914:THR:HG22	1:B:916:GLN:HG3	2.02	0.42
1:B:848:ASP:CG	1:B:849:ASN:H	2.25	0.42
1:A:955:VAL:O	1:A:959:MET:HG3	2.20	0.42
1:A:1111:GLU:OE2	7:A:1401:HOH:O	2.22	0.42
1:B:485:ALA:HB2	1:B:555:MET:HE1	2.02	0.42
1:B:1014:ASN:O	1:B:1027:LYS:NZ	2.52	0.41
1:B:810[A]:LEU:HD12	1:B:948:THR:HB	2.02	0.41
1:A:688:ARG:O	1:A:692:ARG:HG2	2.21	0.41
1:B:944:VAL:HG12	1:B:945:ARG:HG3	2.02	0.41
1:B:767:VAL:HB	1:B:780:LEU:HD21	2.02	0.41
1:A:1084:ARG:NH2	1:A:1092:MET:SD	2.94	0.41
1:A:470:GLU:OE1	1:A:496:ARG:NH1	2.52	0.40
1:B:778:GLN:O	1:B:782:MET:HG2	2.21	0.40
1:B:1092:MET:O	1:B:1096:ARG:HG3	2.21	0.40

There are no symmetry-related clashes.

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	678/803 (84%)	655 (97%)	22 (3%)	1 (0%)	48	60
1	B	673/803 (84%)	649 (96%)	24 (4%)	0	100	100
All	All	1351/1606 (84%)	1304 (96%)	46 (3%)	1 (0%)	48	60

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	852	VAL

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	603/704 (86%)	602 (100%)	1 (0%)	87	93
1	B	593/704 (84%)	593 (100%)	0	100	100
All	All	1196/1408 (85%)	1195 (100%)	1 (0%)	88	94

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	810	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	514	HIS
1	A	583	HIS
1	A	712	ASN
1	A	910	ASN
1	A	935	ASN
1	B	811	HIS
1	B	935	ASN

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 10 ligands modelled in this entry, 6 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$
5	N2W	A	1302[B]	1	40,44,44	3.83	14 (35%)	55,65,65	2.99	22 (40%)
4	N2S	B	1301[A]	1	40,44,44	3.83	14 (35%)	55,65,65	2.90	20 (36%)
4	N2S	A	1301[A]	1	40,44,44	3.82	14 (35%)	55,65,65	2.91	21 (38%)
5	N2W	B	1302[B]	1	40,44,44	3.86	13 (32%)	55,65,65	3.00	21 (38%)

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	N2W	A	1302[B]	1	-	0/17/61/61	0/6/6/6
4	N2S	B	1301[A]	1	-	3/17/61/61	0/6/6/6
4	N2S	A	1301[A]	1	-	3/17/61/61	0/6/6/6
5	N2W	B	1302[B]	1	-	2/17/61/61	0/6/6/6

All (55) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	1301[A]	N2S	C05-C06	15.23	1.70	1.52
5	B	1302[B]	N2W	C05-C06	15.15	1.70	1.52
5	A	1302[B]	N2W	C05-C06	14.83	1.70	1.52
4	A	1301[A]	N2S	C05-C06	14.79	1.70	1.52
4	A	1301[A]	N2S	O31-C32	6.80	1.49	1.35
5	A	1302[B]	N2W	O31-C32	6.80	1.49	1.35
4	B	1301[A]	N2S	O31-C32	6.63	1.49	1.35
5	B	1302[B]	N2W	O31-C32	6.59	1.49	1.35
4	B	1301[A]	N2S	C08-C09	6.55	1.50	1.38
4	A	1301[A]	N2S	C08-C07	6.49	1.50	1.39
5	B	1302[B]	N2W	C14-C15	6.48	1.50	1.39
5	B	1302[B]	N2W	C08-C09	6.48	1.49	1.38
5	A	1302[B]	N2W	C08-C07	6.46	1.50	1.39
4	A	1301[A]	N2S	C14-C13	6.44	1.49	1.38
5	A	1302[B]	N2W	C08-C09	6.44	1.49	1.38
5	A	1302[B]	N2W	C14-C15	6.44	1.49	1.39
4	B	1301[A]	N2S	C14-C15	6.43	1.49	1.39
5	A	1302[B]	N2W	C14-C13	6.43	1.49	1.38
4	A	1301[A]	N2S	C14-C15	6.42	1.49	1.39
5	B	1302[B]	N2W	C08-C07	6.39	1.49	1.39
4	B	1301[A]	N2S	C08-C07	6.39	1.49	1.39
4	A	1301[A]	N2S	C08-C09	6.38	1.49	1.38
5	B	1302[B]	N2W	C14-C13	6.36	1.49	1.38
4	B	1301[A]	N2S	C14-C13	6.29	1.49	1.38
5	A	1302[B]	N2W	C18-N17	5.56	1.45	1.34
4	A	1301[A]	N2S	C18-N17	5.26	1.45	1.34
5	B	1302[B]	N2W	C18-N17	5.24	1.45	1.34
5	B	1302[B]	N2W	C22-N28	5.24	1.61	1.50
5	A	1302[B]	N2W	C22-N28	5.15	1.60	1.50
4	B	1301[A]	N2S	C18-N17	5.12	1.44	1.34
5	B	1302[B]	N2W	C16-N17	-5.11	1.36	1.46
4	B	1301[A]	N2S	C07-C06	5.03	1.58	1.51
4	A	1301[A]	N2S	C22-N28	5.02	1.60	1.50
5	B	1302[B]	N2W	C07-C06	4.99	1.58	1.51
4	A	1301[A]	N2S	C16-N17	-4.99	1.36	1.46
4	B	1301[A]	N2S	C16-N17	-4.87	1.36	1.46
4	A	1301[A]	N2S	C07-C06	4.79	1.58	1.51
5	A	1302[B]	N2W	C07-C06	4.73	1.58	1.51
4	B	1301[A]	N2S	C22-N28	4.68	1.60	1.50
5	A	1302[B]	N2W	C16-N17	-4.65	1.37	1.46
5	A	1302[B]	N2W	C34-C06	-3.55	1.49	1.56
4	A	1301[A]	N2S	C34-C06	-3.47	1.49	1.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	1302[B]	N2W	C34-C06	-3.28	1.50	1.56
4	B	1301[A]	N2S	C34-C06	-3.20	1.50	1.56
5	B	1302[B]	N2W	O37-C36	2.56	1.41	1.37
4	B	1301[A]	N2S	O37-C36	2.52	1.41	1.37
5	A	1302[B]	N2W	O19-C18	-2.47	1.18	1.23
4	A	1301[A]	N2S	O19-C18	-2.37	1.18	1.23
4	B	1301[A]	N2S	O19-C18	-2.25	1.18	1.23
5	B	1302[B]	N2W	O19-C18	-2.23	1.18	1.23
5	A	1302[B]	N2W	O31-C30	2.19	1.50	1.45
4	A	1301[A]	N2S	O31-C30	2.18	1.50	1.45
4	A	1301[A]	N2S	O37-C36	2.17	1.40	1.37
5	A	1302[B]	N2W	O37-C36	2.16	1.40	1.37
4	B	1301[A]	N2S	O31-C30	2.12	1.50	1.45

All (84) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1302[B]	N2W	C05-C06-C34	-9.70	96.69	113.22
5	A	1302[B]	N2W	C05-C06-C34	-9.54	96.98	113.22
4	A	1301[A]	N2S	C05-C06-C34	-9.02	97.85	113.22
4	B	1301[A]	N2S	C05-C06-C34	-8.97	97.94	113.22
5	B	1302[B]	N2W	C20-C21-C22	-7.59	106.34	114.30
5	A	1302[B]	N2W	C20-C21-C22	-7.01	106.95	114.30
5	A	1302[B]	N2W	O31-C32-O33	6.69	128.54	121.43
4	A	1301[A]	N2S	O31-C32-O33	6.67	128.51	121.43
4	B	1301[A]	N2S	O31-C32-O33	5.94	127.74	121.43
4	B	1301[A]	N2S	C20-C21-C22	-5.90	108.11	114.30
4	A	1301[A]	N2S	C20-C21-C22	-5.85	108.16	114.30
5	B	1302[B]	N2W	O31-C32-O33	5.82	127.61	121.43
5	B	1302[B]	N2W	C34-C29-C16	5.63	118.26	110.65
4	A	1301[A]	N2S	O37-C36-C39	5.61	120.40	114.53
5	A	1302[B]	N2W	C34-C29-C16	5.57	118.17	110.65
4	A	1301[A]	N2S	C07-C06-C34	5.52	115.67	106.57
5	A	1302[B]	N2W	O37-C36-C39	5.52	120.31	114.53
4	A	1301[A]	N2S	C34-C29-C16	5.52	118.11	110.65
5	B	1302[B]	N2W	C15-C16-C29	5.50	118.73	110.25
4	A	1301[A]	N2S	C15-C16-C29	5.48	118.71	110.25
5	A	1302[B]	N2W	C07-C06-C34	5.48	115.60	106.57
4	B	1301[A]	N2S	C15-C16-C29	5.48	118.70	110.25
4	B	1301[A]	N2S	C34-C29-C16	5.44	118.00	110.65
5	B	1302[B]	N2W	O02-C03-C39	5.42	120.20	114.53
4	B	1301[A]	N2S	O02-C03-C39	5.40	120.17	114.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	1302[B]	N2W	C07-C06-C34	5.40	115.45	106.57
5	B	1302[B]	N2W	O37-C36-C39	5.35	120.12	114.53
4	B	1301[A]	N2S	C07-C06-C34	5.32	115.33	106.57
4	B	1301[A]	N2S	O37-C36-C39	5.30	120.08	114.53
5	A	1302[B]	N2W	C15-C16-C29	5.28	118.40	110.25
4	B	1301[A]	N2S	C30-O31-C32	-5.02	105.32	110.31
5	A	1302[B]	N2W	C29-C34-C06	4.92	122.75	113.15
5	A	1302[B]	N2W	O02-C03-C39	4.88	119.63	114.53
4	A	1301[A]	N2S	O02-C03-C39	4.83	119.58	114.53
4	A	1301[A]	N2S	C29-C34-C06	4.83	122.56	113.15
4	B	1301[A]	N2S	C29-C34-C06	4.72	122.35	113.15
5	B	1302[B]	N2W	C29-C34-C06	4.68	122.28	113.15
4	B	1301[A]	N2S	C15-C16-N17	-4.49	101.97	111.25
5	B	1302[B]	N2W	C15-C16-N17	-4.22	102.53	111.25
5	A	1302[B]	N2W	C29-C34-C32	4.18	109.31	103.14
4	A	1301[A]	N2S	C29-C34-C32	4.17	109.30	103.14
5	B	1302[B]	N2W	C30-O31-C32	-4.15	106.19	110.31
4	A	1301[A]	N2S	C15-C16-N17	-3.83	103.34	111.25
4	A	1301[A]	N2S	C30-O31-C32	-3.64	106.69	110.31
5	B	1302[B]	N2W	C29-C34-C32	3.63	108.50	103.14
5	A	1302[B]	N2W	C15-C16-N17	-3.59	103.84	111.25
5	A	1302[B]	N2W	C30-O31-C32	-3.32	107.01	110.31
5	B	1302[B]	N2W	O12-C13-C14	3.22	132.14	127.86
4	B	1301[A]	N2S	O12-C13-C14	3.18	132.09	127.86
4	B	1301[A]	N2S	C29-C34-C32	3.16	107.80	103.14
4	B	1301[A]	N2S	C05-C06-C07	-3.11	108.16	112.95
4	A	1301[A]	N2S	O12-C13-C14	3.05	131.92	127.86
5	B	1302[B]	N2W	C05-C06-C07	-3.03	108.29	112.95
5	A	1302[B]	N2W	O12-C13-C14	3.01	131.86	127.86
5	A	1302[B]	N2W	O10-C09-C08	2.99	131.84	127.86
4	B	1301[A]	N2S	O10-C09-C08	2.97	131.81	127.86
5	A	1302[B]	N2W	O33-C32-C34	-2.92	125.67	129.38
5	B	1302[B]	N2W	O10-C09-C08	2.87	131.68	127.86
4	A	1301[A]	N2S	O10-C09-C08	2.87	131.68	127.86
4	A	1301[A]	N2S	O33-C32-C34	-2.87	125.73	129.38
5	A	1302[B]	N2W	C05-C06-C07	-2.79	108.65	112.95
4	A	1301[A]	N2S	C05-C06-C07	-2.77	108.69	112.95
5	B	1302[B]	N2W	O02-C03-C04	-2.72	119.40	124.08
4	B	1301[A]	N2S	O02-C03-C04	-2.69	119.45	124.08
4	B	1301[A]	N2S	O31-C32-C34	-2.62	105.59	109.50
4	A	1301[A]	N2S	C15-C07-C06	2.55	121.02	114.39
5	B	1302[B]	N2W	C15-C07-C06	2.55	121.02	114.39

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1302[B]	N2W	C15-C07-C06	2.54	121.00	114.39
4	A	1301[A]	N2S	O31-C32-C34	-2.52	105.75	109.50
5	A	1302[B]	N2W	O31-C32-C34	-2.49	105.78	109.50
4	B	1301[A]	N2S	C15-C07-C06	2.48	120.83	114.39
5	B	1302[B]	N2W	O31-C32-C34	-2.42	105.90	109.50
4	A	1301[A]	N2S	O37-C36-C35	-2.37	119.99	124.08
5	A	1302[B]	N2W	O37-C36-C35	-2.30	120.11	124.08
5	B	1302[B]	N2W	O33-C32-C34	-2.28	126.48	129.38
5	A	1302[B]	N2W	O02-C03-C04	-2.26	120.19	124.08
4	A	1301[A]	N2S	O02-C03-C04	-2.24	120.21	124.08
5	A	1302[B]	N2W	C30-C29-C34	2.16	105.08	101.73
4	B	1301[A]	N2S	O33-C32-C34	-2.14	126.66	129.38
5	B	1302[B]	N2W	O37-C36-C35	-2.12	120.42	124.08
4	B	1301[A]	N2S	O37-C36-C35	-2.06	120.53	124.08
4	A	1301[A]	N2S	C38-O37-C36	-2.04	114.52	117.51
5	B	1302[B]	N2W	C30-C29-C34	2.04	104.89	101.73
5	A	1302[B]	N2W	C38-O37-C36	-2.03	114.53	117.51

There are no chirality outliers.

All (8) torsion outliers are listed below:

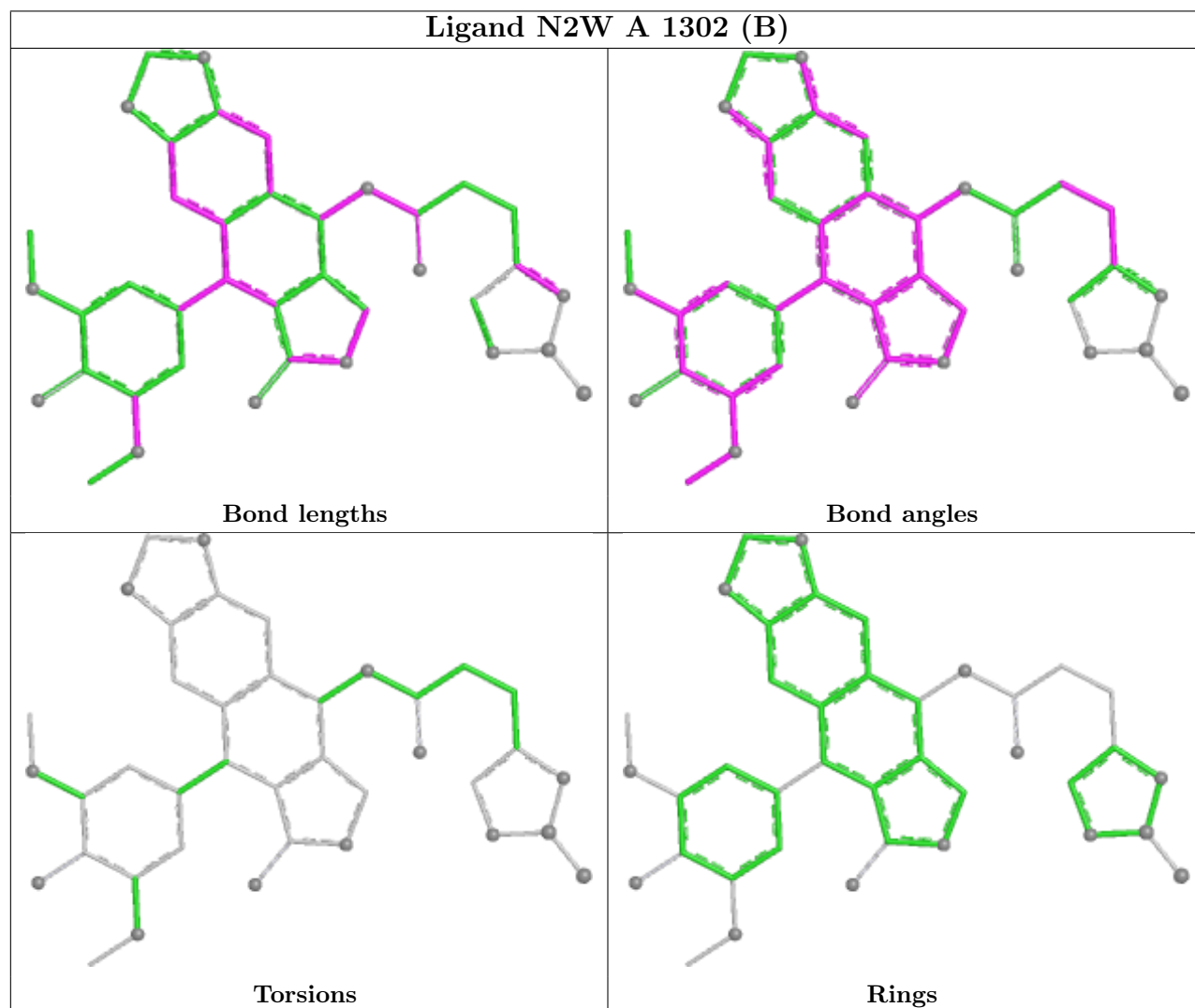
Mol	Chain	Res	Type	Atoms
4	A	1301[A]	N2S	C20-C21-C22-C23
4	A	1301[A]	N2S	C20-C21-C22-N28
4	B	1301[A]	N2S	C20-C21-C22-C23
4	B	1301[A]	N2S	C20-C21-C22-N28
5	B	1302[B]	N2W	C20-C21-C22-C23
5	B	1302[B]	N2W	C20-C21-C22-N28
4	A	1301[A]	N2S	C18-C20-C21-C22
4	B	1301[A]	N2S	C18-C20-C21-C22

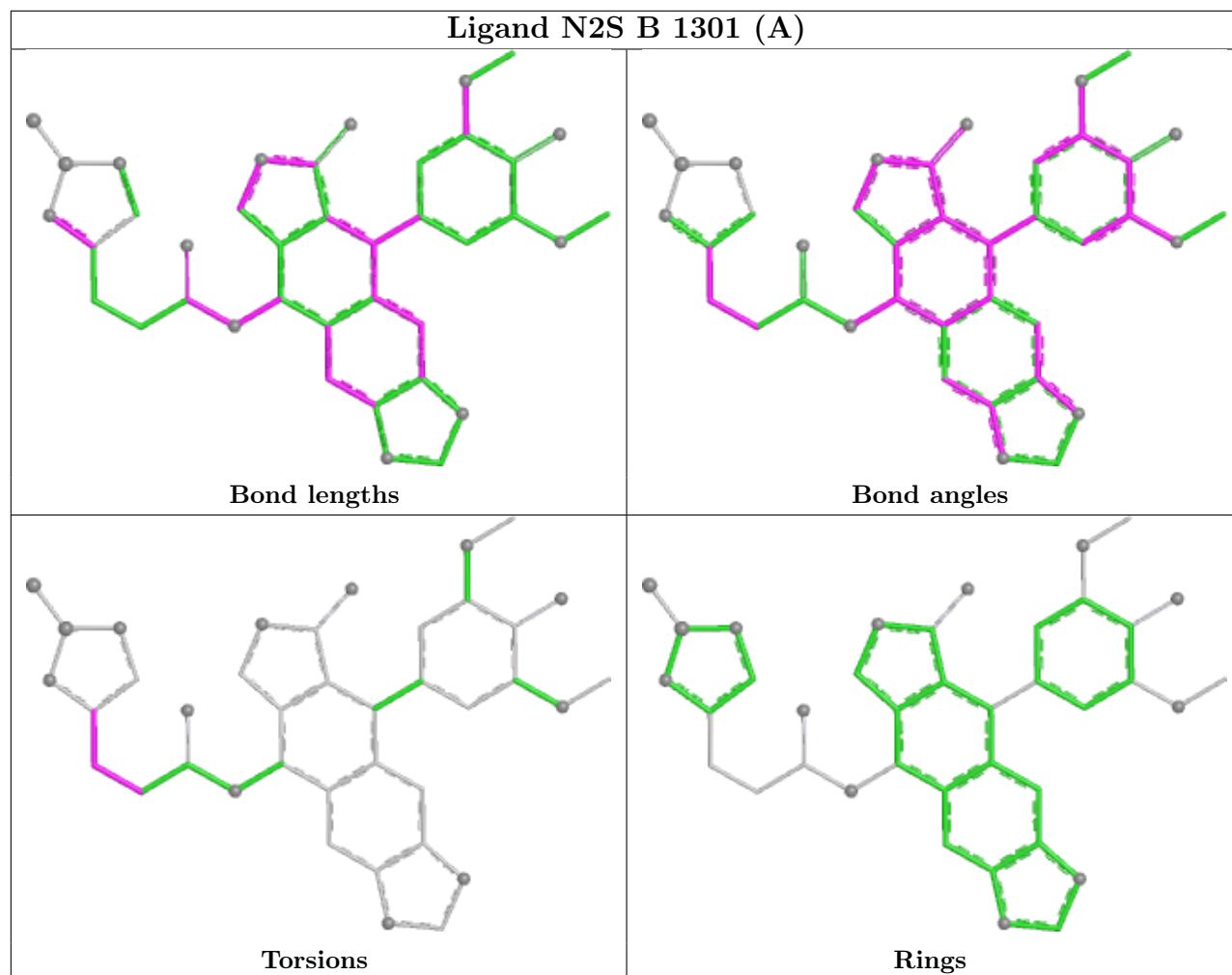
There are no ring outliers.

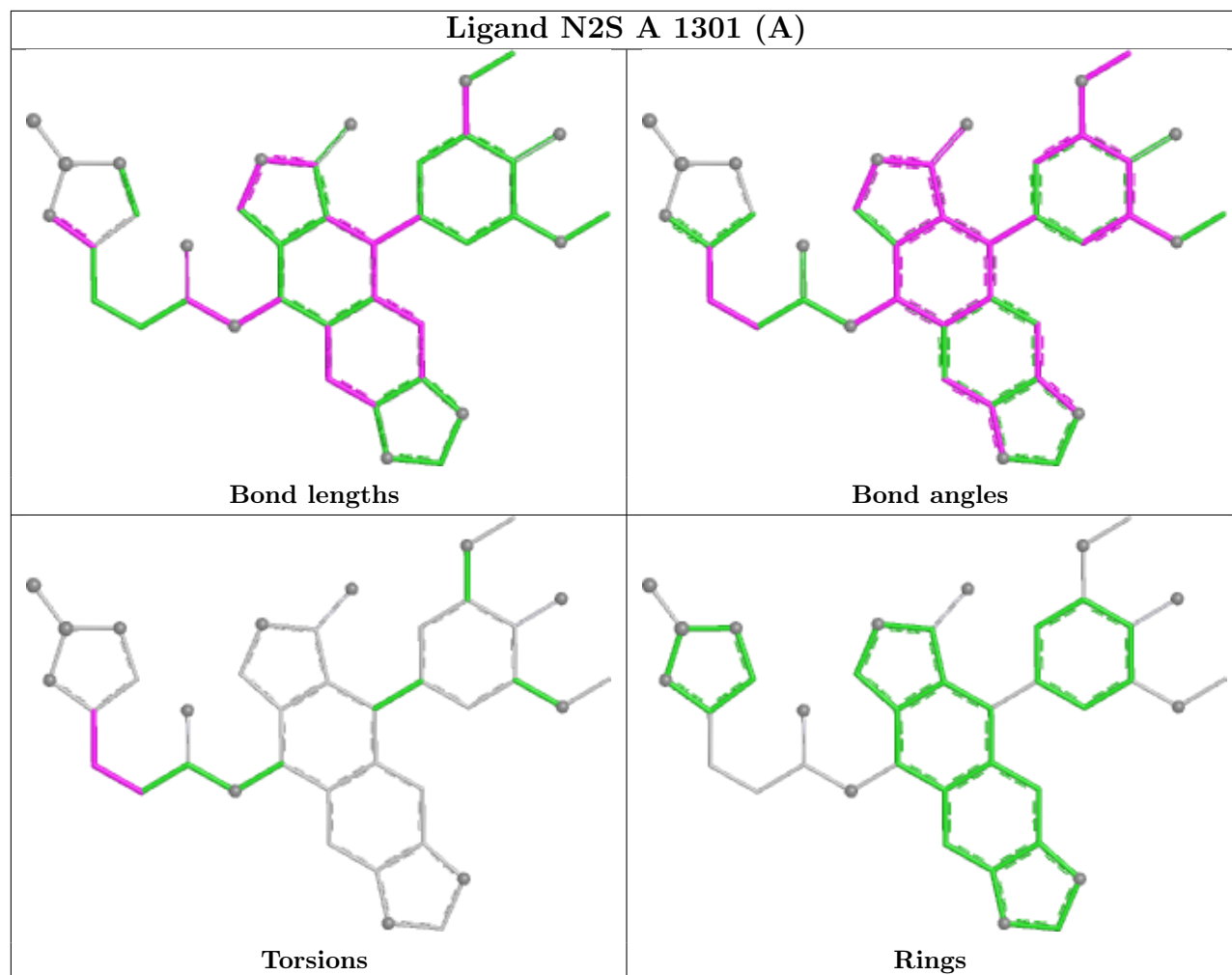
No monomer is involved in short contacts.

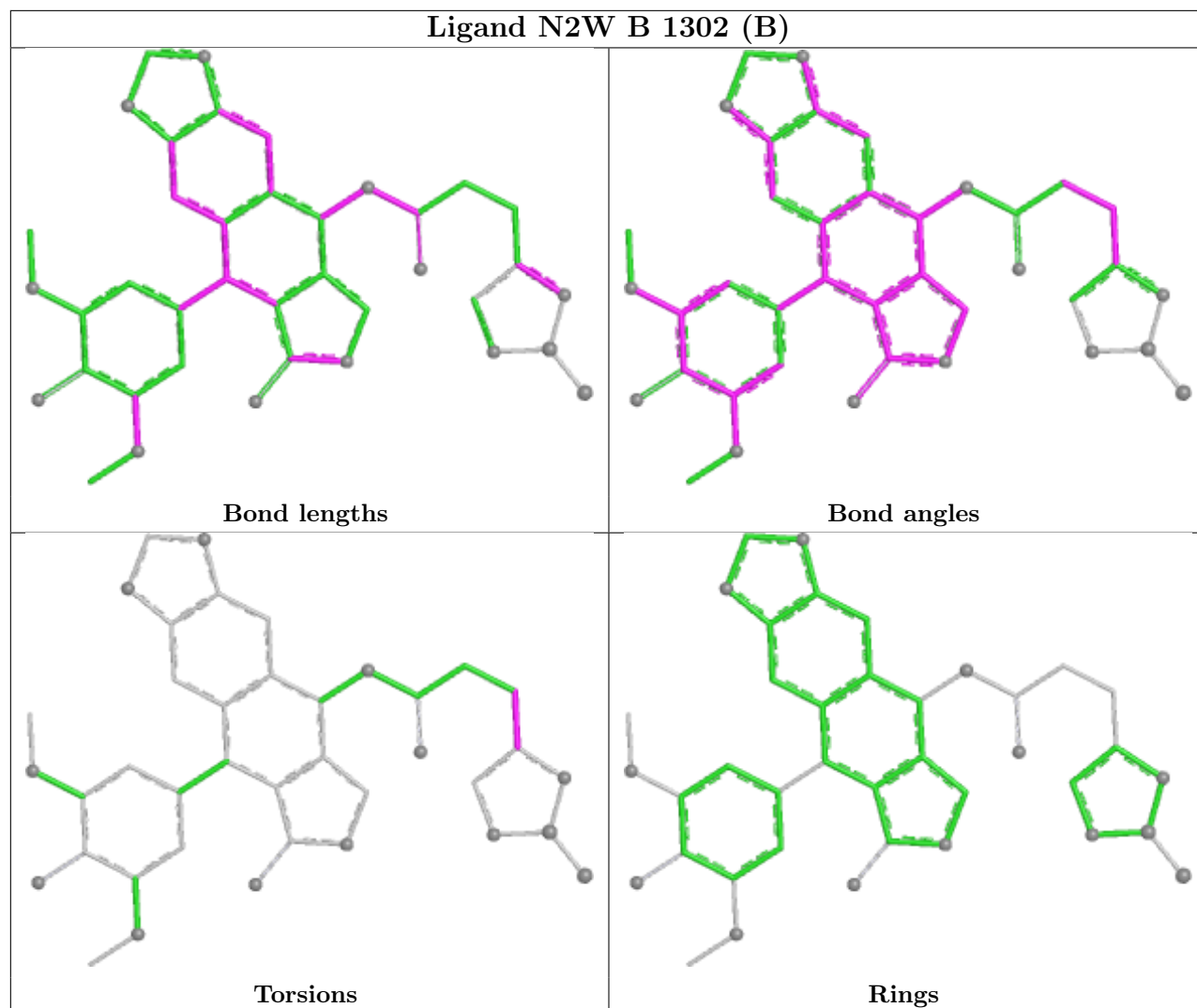
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

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	677/803 (84%)	-0.08	17 (2%) 58 59	20, 44, 82, 105	9 (1%)
1	B	676/803 (84%)	-0.19	14 (2%) 63 64	21, 41, 77, 109	5 (0%)
2	C	8/8 (100%)	-0.70	0 100 100	35, 37, 61, 89	0
2	E	8/8 (100%)	-0.71	0 100 100	31, 35, 55, 85	0
3	D	12/12 (100%)	-0.66	0 100 100	29, 40, 51, 57	0
3	F	12/12 (100%)	-0.53	0 100 100	33, 41, 62, 71	0
All	All	1393/1646 (84%)	-0.15	31 (2%) 62 63	20, 42, 79, 109	14 (1%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	695	GLY	4.9
1	B	490	GLY	4.4
1	A	634	THR	4.0
1	A	708	HIS	3.8
1	A	696	LEU	3.8
1	A	490	GLY	3.5
1	A	593	ILE	3.5
1	B	637	ALA	3.4
1	B	777	GLU	3.4
1	A	848	ASP	3.3
1	B	964	ASP	3.3
1	B	491	VAL	3.2
1	B	492	ILE	3.1
1	A	849	ASN	3.0
1	B	1111	GLU	2.7
1	A	492	ILE	2.6
1	B	966	THR	2.5
1	A	694	HIS	2.5
1	B	963	THR	2.5

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Mol	Chain	Res	Type	RSRZ
1	B	449	SER	2.4
1	A	468	SER	2.3
1	A	671	LYS	2.3
1	A	541	ALA	2.2
1	B	706	THR	2.2
1	B	820	ARG	2.1
1	A	635	SER	2.1
1	B	999	ALA	2.1
1	A	453	GLY	2.1
1	A	695	GLY	2.1
1	A	545	LYS	2.1
1	A	452	LYS	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](#)

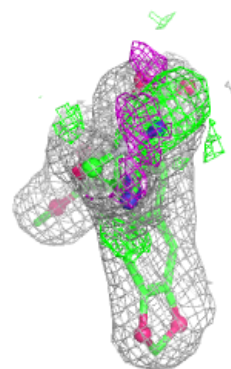
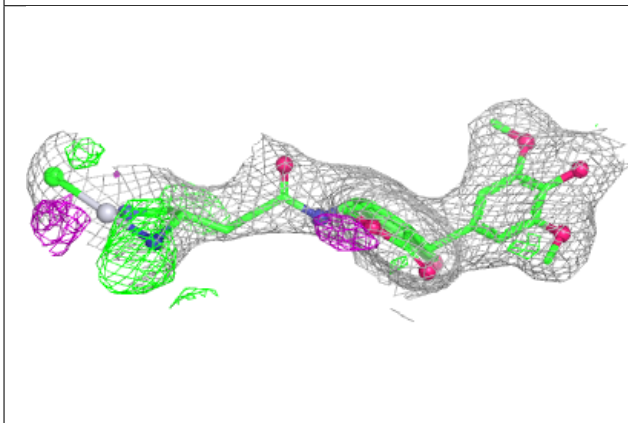
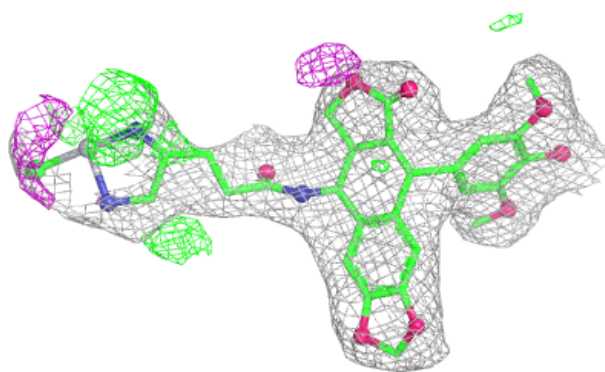
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
6	MG	B	1304	1/1	0.74	0.20	47,47,47,47	0
6	MG	B	1303	1/1	0.83	0.40	60,60,60,60	0
6	MG	A	1303	1/1	0.84	0.26	47,47,47,47	0
6	MG	E	101	1/1	0.86	0.30	57,57,57,57	0
6	MG	A	1304	1/1	0.88	0.38	59,59,59,59	0
6	MG	F	101	1/1	0.88	0.36	57,57,57,57	0
4	N2S	A	1301[A]	39/39	0.96	0.11	38,45,91,115	39
5	N2W	A	1302[B]	39/39	0.96	0.11	38,45,91,116	39
4	N2S	B	1301[A]	39/39	0.97	0.09	30,38,90,107	39
5	N2W	B	1302[B]	39/39	0.97	0.09	30,38,91,107	39

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.

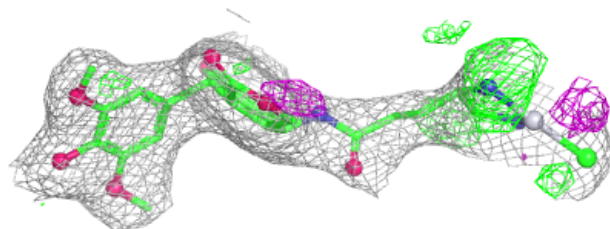
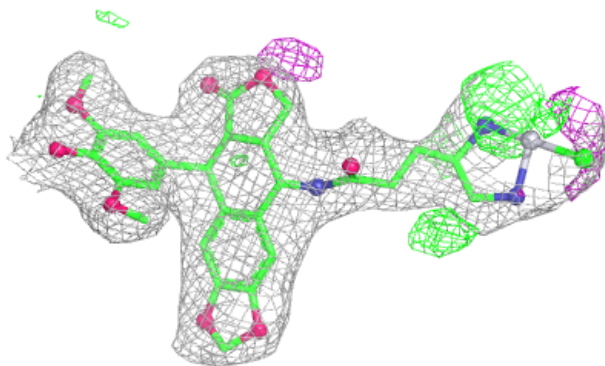
Electron density around N2S A 1301 (A):

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

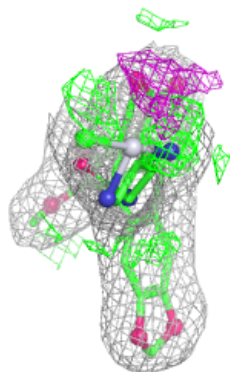
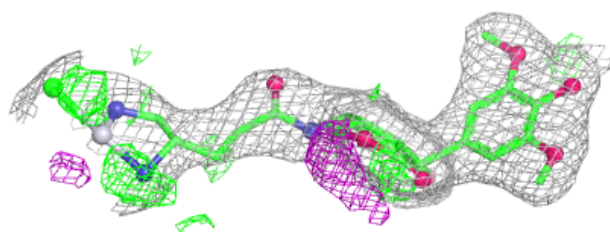
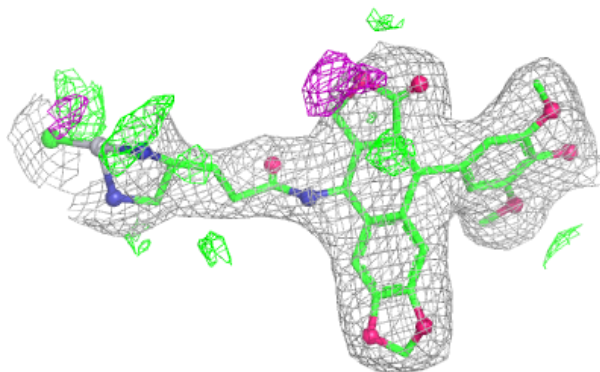


Electron density around N2W A 1302 (B):

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

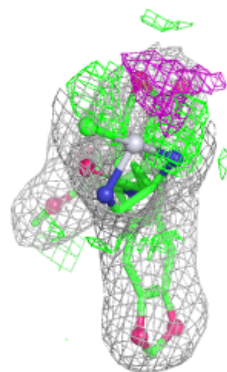
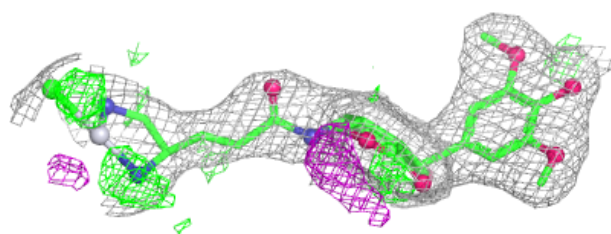
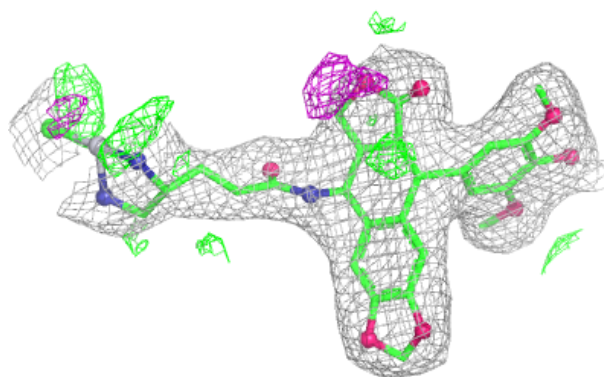
**Electron density around N2S B 1301 (A):**

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



Electron density around N2W B 1302 (B):

$2mF_o-DF_c$ (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.