



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2024 – 08:44 AM EDT

PDB ID : 4QJW
Title : Crystal structure of catalytic domain of human carbonic anhydrase isozyme XII with inhibitor
Authors : Smirnov, A.; Manakova, E.; Grazulis, S.
Deposited on : 2014-06-05
Resolution : 1.55 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	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

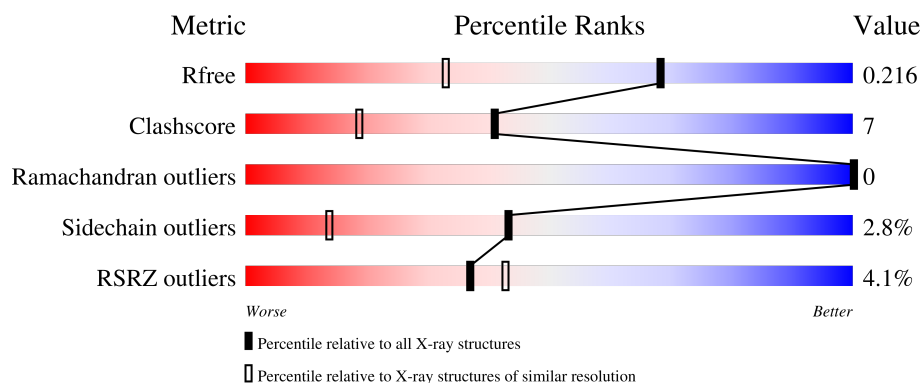
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.55 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1483 (1.56-1.56)
Clashscore	141614	1529 (1.56-1.56)
Ramachandran outliers	138981	1498 (1.56-1.56)
Sidechain outliers	138945	1495 (1.56-1.56)
RSRZ outliers	127900	1465 (1.56-1.56)

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	263	<div> <div>5%</div> <div> <div></div> <div>85%</div> <div>13%</div> <div>..</div> </div> </div>
1	B	263	<div> <div>4%</div> <div> <div></div> <div>89%</div> <div>9%</div> <div>..</div> </div> </div>
1	C	263	<div> <div>4%</div> <div> <div></div> <div>86%</div> <div>13%</div> <div>..</div> </div> </div>
1	D	263	<div> <div>3%</div> <div> <div></div> <div>86%</div> <div>13%</div> <div>..</div> </div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	WWO	B	302	-	-	X	-
4	EDO	D	304	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 9883 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 Carbonic anhydrase 12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	261	Total	C	N	O	S	0	3	0
			2121	1347	361	405	8			
1	B	261	Total	C	N	O	S	0	5	0
			2141	1357	366	410	8			
1	C	261	Total	C	N	O	S	0	4	0
			2123	1347	361	408	7			
1	D	261	Total	C	N	O	S	0	4	0
			2125	1350	361	407	7			

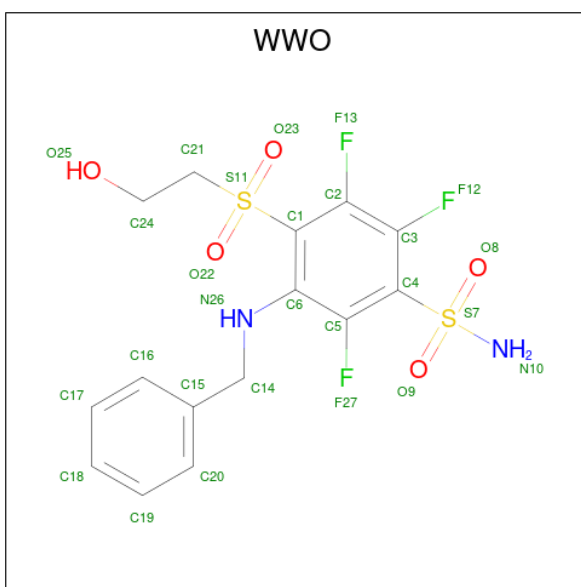
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	expression tag	UNP O43570
B	1	MET	-	expression tag	UNP O43570
C	1	MET	-	expression tag	UNP O43570
D	1	MET	-	expression tag	UNP O43570

- Molecule 2 is ZINC ION (three-letter code: ZN) (formula: Zn).

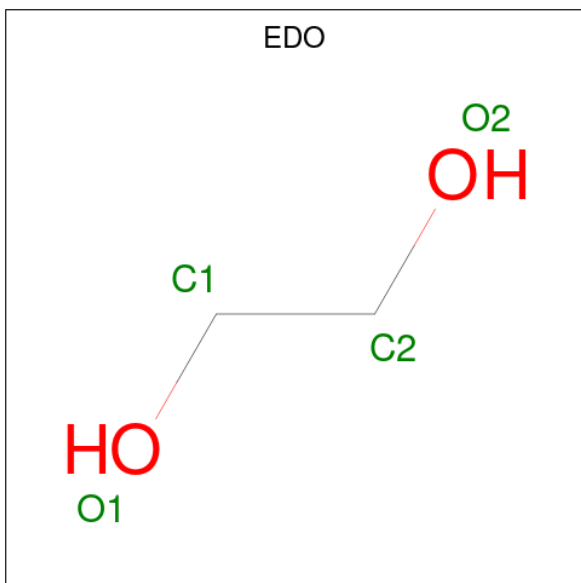
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		
2	D	1	Total	Zn	0	0
			1	1		

- Molecule 3 is 3-(benzylamino)-2,5,6-trifluoro-4-[(2-hydroxyethyl)sulfonyl]benzenesulfonamide (three-letter code: WWO) (formula: C₁₅H₁₅F₃N₂O₅S₂).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total 54	C 30	F 6	N 4	O 10	S 4	0	1
3	B	1	Total 27	C 15	F 3	N 2	O 5	S 2	0	0
3	C	1	Total 27	C 15	F 3	N 2	O 5	S 2	0	0
3	D	1	Total 27	C 15	F 3	N 2	O 5	S 2	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



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

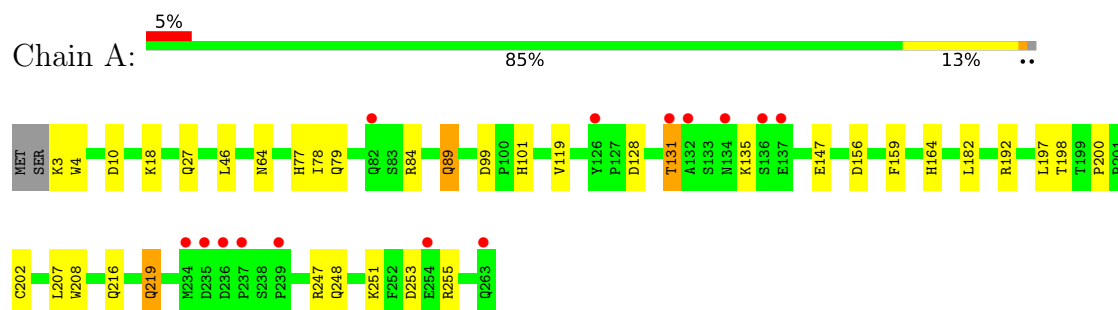
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	276	Total O 276 276	0	0
5	B	329	Total O 329 329	0	0
5	C	277	Total O 277 277	0	0
5	D	324	Total O 324 324	0	0

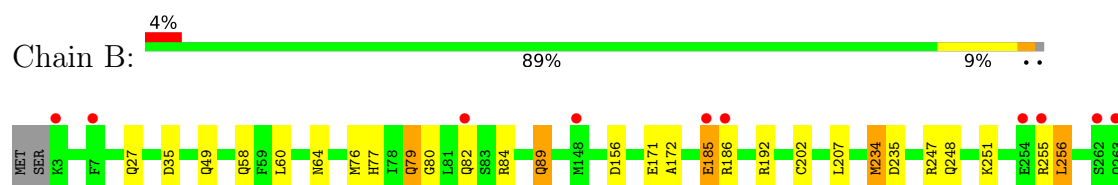
3 Residue-property plots [i](#)

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.

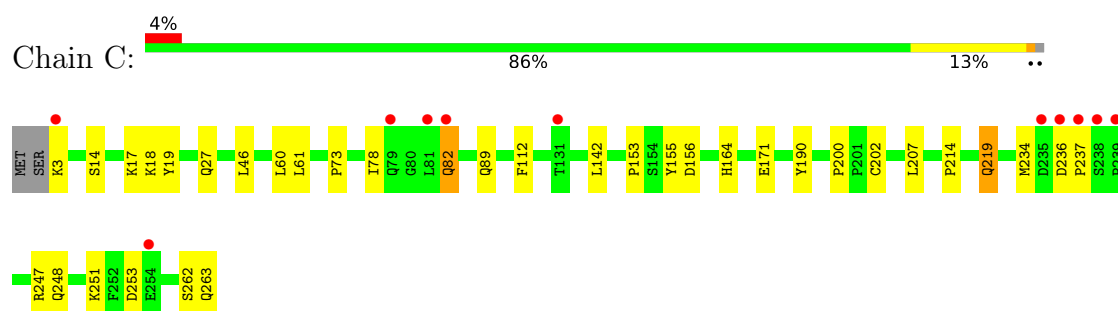
• Molecule 1: Carbonic anhydrase 12



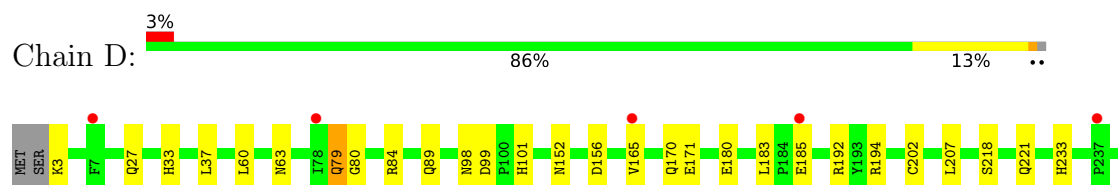
• Molecule 1: Carbonic anhydrase 12



• Molecule 1: Carbonic anhydrase 12



• Molecule 1: Carbonic anhydrase 12





4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	46.50Å 66.76Å 80.47Å 81.57° 84.21° 86.66°	Depositor
Resolution (Å)	39.82 – 1.55 38.67 – 1.55	Depositor EDS
% Data completeness (in resolution range)	96.8 (39.82-1.55) 96.7 (38.67-1.55)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 1.55Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.185 , 0.222 0.179 , 0.216	Depositor DCC
R_{free} test set	13154 reflections (9.85%)	wwPDB-VP
Wilson B-factor (Å ²)	14.4	Xtriage
Anisotropy	0.118	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.42 , 50.5	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	0.96	EDS
Total number of atoms	9883	wwPDB-VP
Average B, all atoms (Å ²)	15.0	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 40.53 % 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 2.6995e-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: WWO, ZN, EDO

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	1.09	1/2184 (0.0%)	1.11	5/2971 (0.2%)
1	B	1.10	0/2204	1.11	2/2998 (0.1%)
1	C	1.11	1/2187 (0.0%)	1.11	2/2977 (0.1%)
1	D	1.11	0/2188	1.10	2/2979 (0.1%)
All	All	1.10	2/8763 (0.0%)	1.10	11/11925 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	C	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	208	TRP	CD2-CE2	5.74	1.48	1.41
1	C	155	TYR	CG-CD1	5.52	1.46	1.39

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	256	LEU	CB-CG-CD1	5.97	121.16	111.00
1	A	255	ARG	NE-CZ-NH2	-5.39	117.60	120.30
1	A	219	GLN	CB-CG-CD	5.35	125.51	111.60
1	B	35	ASP	CB-CG-OD1	-5.31	113.52	118.30
1	D	84	ARG	NE-CZ-NH2	-5.30	117.65	120.30
1	D	256	LEU	CA-CB-CG	5.16	127.16	115.30
1	A	159	PHE	CB-CG-CD2	-5.13	117.21	120.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	190	TYR	CB-CG-CD2	-5.10	117.94	121.00
1	C	142	LEU	CB-CG-CD1	-5.09	102.35	111.00
1	A	255	ARG	NE-CZ-NH1	-5.07	117.77	120.30
1	A	182	LEU	CB-CG-CD1	-5.00	102.50	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	262	SER	Mainchain

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	2121	0	2011	27	0
1	B	2141	0	2023	27	0
1	C	2123	0	2005	26	0
1	D	2125	0	2013	35	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
3	A	54	0	29	12	0
3	B	27	0	15	11	0
3	C	27	0	15	2	0
3	D	27	0	15	1	0
4	A	4	0	6	0	0
4	B	8	0	12	0	0
4	C	4	0	6	0	0
4	D	12	0	18	7	0
5	A	276	0	0	4	0
5	B	329	0	0	6	0
5	C	277	0	0	8	0
5	D	324	0	0	5	0
All	All	9883	0	8168	119	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 7.

All (119) 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:64:ASN:HD21	3:B:302:WWO:H6	1.24	0.98
1:B:64:ASN:ND2	3:B:302:WWO:H6	1.83	0.94
1:B:64:ASN:HD21	3:B:302:WWO:C24	1.84	0.90
1:B:185:GLU:HG2	1:B:186:ARG:HH11	1.36	0.88
1:A:64:ASN:HD21	3:A:302[B]:WWO:H3	1.38	0.88
1:C:234:MET:CE	5:C:660:HOH:O	2.21	0.88
1:A:64:ASN:ND2	3:A:302[B]:WWO:H3	1.89	0.87
1:C:251:LYS:HZ2	1:D:248:GLN:HE21	1.22	0.84
1:D:192:ARG:HH21	4:D:304:EDO:C1	1.91	0.83
1:B:185:GLU:HG2	1:B:186:ARG:NH1	1.96	0.81
1:D:63:ASN:HB2	1:D:165[B]:VAL:HG12	1.64	0.79
1:D:218:SER:H	1:D:221:GLN:HE21	1.33	0.76
1:C:27:GLN:HE22	1:C:202:CYS:HB3	1.51	0.75
1:A:27:GLN:HE22	1:A:202:CYS:HB3	1.50	0.75
1:D:27:GLN:HE22	1:D:202:CYS:HB3	1.53	0.74
1:B:79:GLN:HG3	1:B:80:GLY:N	2.02	0.73
1:B:27:GLN:NE2	1:B:247:ARG:HH12	1.87	0.72
1:D:194:ARG:HD2	1:D:207:LEU:HD13	1.71	0.72
1:D:192:ARG:HH21	4:D:304:EDO:H12	1.57	0.69
1:A:18[B]:LYS:O	1:A:18[B]:LYS:HG3	1.93	0.69
1:B:64:ASN:HD22	3:B:302:WWO:H3	1.58	0.69
1:B:27:GLN:HE22	1:B:202:CYS:HB3	1.57	0.68
1:B:64:ASN:ND2	3:B:302:WWO:H3	2.09	0.68
1:D:63:ASN:CB	1:D:165[B]:VAL:HG12	2.24	0.68
1:D:152:ASN:H	1:D:221:GLN:HE22	1.42	0.67
1:A:27:GLN:NE2	1:A:247:ARG:HH12	1.92	0.66
1:C:234:MET:HE1	5:C:660:HOH:O	1.88	0.66
1:C:14[B]:SER:HB2	1:C:17:LYS:HE3	1.78	0.65
1:B:64:ASN:ND2	3:B:302:WWO:C24	2.51	0.65
1:A:89:GLN:HE22	3:A:302[B]:WWO:C24	2.09	0.64
1:C:27:GLN:NE2	1:C:247:ARG:HH12	1.96	0.64
1:A:99:ASP:OD1	1:A:101:HIS:HD2	1.82	0.62
1:A:251:LYS:HZ2	1:B:248:GLN:HE21	1.46	0.62
1:B:27:GLN:HE21	1:B:247:ARG:HH12	1.46	0.61
1:A:198:THR:OG1	3:A:302[A]:WWO:N10	2.34	0.61
1:C:46:LEU:HD22	1:C:78:ILE:CG2	2.31	0.61
1:A:251:LYS:NZ	1:B:248:GLN:HE21	1.98	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:27:GLN:NE2	1:D:247:ARG:HH12	1.99	0.61
1:C:219:GLN:NE2	5:C:653:HOH:O	2.34	0.60
1:D:165[B]:VAL:HG13	1:D:170:GLN:O	2.02	0.60
1:C:248:GLN:HE21	1:D:251:LYS:HZ2	1.49	0.59
3:A:302[B]:WWO:C14	3:A:302[B]:WWO:F27	2.40	0.59
1:B:58:GLN:NE2	5:B:700:HOH:O	2.34	0.59
1:A:89:GLN:HE22	3:A:302[B]:WWO:H6	1.68	0.59
1:C:18:LYS:HD3	5:C:609:HOH:O	2.02	0.58
3:C:302:WWO:C14	3:C:302:WWO:F27	2.40	0.57
1:D:152:ASN:H	1:D:221:GLN:NE2	2.02	0.57
1:A:164:HIS:HD2	5:A:612:HOH:O	1.88	0.57
1:D:192:ARG:HG2	4:D:304:EDO:H12	1.86	0.57
1:A:27:GLN:HE21	1:A:247:ARG:HH12	1.52	0.57
1:B:64:ASN:ND2	3:B:302:WWO:C21	2.67	0.56
1:A:3:LYS:NZ	5:A:664:HOH:O	2.25	0.56
1:C:112:PHE:CE2	1:C:214[B]:PRO:HG2	2.40	0.56
1:B:185:GLU:HB2	5:B:651:HOH:O	2.06	0.55
1:C:60:LEU:HD11	1:C:171:GLU:HB3	1.88	0.54
1:C:164:HIS:HD2	5:C:560:HOH:O	1.89	0.54
1:D:3:LYS:N	5:D:724:HOH:O	2.40	0.53
1:C:27:GLN:HE21	1:C:247:ARG:HH12	1.55	0.52
1:C:234:MET:HE3	5:C:660:HOH:O	1.98	0.52
1:B:89:GLN:NE2	3:B:302:WWO:H4	2.24	0.52
1:D:255:ARG:NH2	5:D:442:HOH:O	2.29	0.52
3:A:302[B]:WWO:F27	3:A:302[B]:WWO:H9	1.99	0.51
1:A:79:GLN:NE2	1:A:84:ARG:HE	2.07	0.51
1:C:14[B]:SER:CB	1:C:17:LYS:HE3	2.40	0.51
1:B:84:ARG:HD2	5:B:575:HOH:O	2.11	0.51
1:D:79:GLN:HG3	1:D:80:GLY:N	2.25	0.51
1:D:180:GLU:HG3	1:D:183:LEU:HD12	1.93	0.50
1:A:198:THR:OG1	3:A:302[B]:WWO:N10	2.45	0.50
1:D:60:LEU:HD11	1:D:171:GLU:HB3	1.93	0.50
1:A:192:ARG:HD2	1:A:207:LEU:HD11	1.95	0.49
1:B:60:LEU:HD11	1:B:171:GLU:HB3	1.95	0.49
1:D:165[B]:VAL:HG12	1:D:165[B]:VAL:O	2.13	0.49
1:D:27:GLN:HE21	1:D:247:ARG:HH12	1.63	0.47
1:D:63:ASN:N	1:D:165[B]:VAL:HG11	2.29	0.47
1:C:253:ASP:OD1	5:C:552:HOH:O	2.20	0.47
1:C:27:GLN:HE21	1:C:247:ARG:HH22	1.63	0.47
1:A:77:HIS:ND1	5:A:574:HOH:O	2.34	0.47
1:B:192:ARG:HD2	1:B:207:LEU:HD11	1.97	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:D:302:WWO:F12	3:D:302:WWO:N10	2.34	0.46
1:D:98:ASN:CG	5:D:574:HOH:O	2.53	0.46
1:C:251:LYS:NZ	1:D:248:GLN:HE21	2.02	0.46
1:A:248:GLN:HE21	1:B:251:LYS:NZ	2.14	0.46
3:B:302:WWO:H3	5:B:604:HOH:O	2.16	0.46
1:D:192:ARG:HD2	4:D:304:EDO:H11	1.97	0.46
1:A:3:LYS:NZ	1:A:10:ASP:OD2	2.48	0.46
1:A:253:ASP:OD2	5:A:507:HOH:O	2.21	0.45
1:A:147:GLU:HG3	1:A:216:GLN:HG2	1.97	0.45
1:B:185:GLU:O	1:B:186:ARG:C	2.52	0.45
1:B:49:GLN:OE1	1:B:77:HIS:NE2	2.50	0.45
1:A:46:LEU:HD22	1:A:78:ILE:CG2	2.46	0.45
1:D:192:ARG:NH2	4:D:304:EDO:C1	2.71	0.44
1:B:234[A]:MET:HE3	1:B:234[A]:MET:HB3	1.65	0.44
3:A:302[A]:WWO:O22	3:A:302[A]:WWO:N26	2.49	0.44
1:D:33:HIS:HE1	5:D:495:HOH:O	2.00	0.44
1:A:197:LEU:HD22	3:A:302[A]:WWO:F27	2.08	0.43
1:D:253:ASP:O	1:D:254:GLU:HB2	2.18	0.43
1:B:172:ALA:HB1	5:B:697:HOH:O	2.19	0.43
1:D:192:ARG:NH2	4:D:304:EDO:O1	2.52	0.43
3:B:302:WWO:F27	3:B:302:WWO:C14	2.56	0.43
3:A:302[B]:WWO:N10	3:A:302[B]:WWO:F12	2.40	0.42
1:C:236:ASP:HA	1:C:237:PRO:HD3	1.84	0.42
1:C:263:GLN:NE2	5:C:669:HOH:O	2.51	0.42
3:C:302:WWO:F27	3:C:302:WWO:H10	2.07	0.42
1:C:19:TYR:CD1	1:C:200:PRO:HB3	2.55	0.42
3:B:302:WWO:F13	3:B:302:WWO:H5	2.10	0.41
1:C:61:LEU:O	1:C:171:GLU:HA	2.20	0.41
1:D:37:LEU:HD23	1:D:257:VAL:HB	2.00	0.41
1:B:255[A]:ARG:NH1	5:B:434:HOH:O	2.52	0.41
1:C:82:GLN:HE21	1:C:82:GLN:HB2	1.73	0.41
1:D:27:GLN:HE21	1:D:247:ARG:HH22	1.68	0.41
1:D:194:ARG:HD2	1:D:207:LEU:CD1	2.46	0.41
1:A:4:TRP:CG	1:A:200:PRO:HG2	2.56	0.41
1:A:128:ASP:OD1	1:A:131:THR:HG23	2.21	0.41
1:C:207:LEU:HD12	1:C:207:LEU:HA	1.90	0.41
1:A:119:VAL:HG11	3:A:302[A]:WWO:H10	2.02	0.40
1:D:192:ARG:HD2	4:D:304:EDO:C1	2.51	0.40
1:D:233:HIS:HE1	5:D:627:HOH:O	2.03	0.40
1:C:46:LEU:HD22	1:C:78:ILE:HG21	2.02	0.40
1:D:99:ASP:OD1	1:D:101:HIS:HD2	2.05	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	262/263 (100%)	254 (97%)	8 (3%)	0	100	100
1	B	264/263 (100%)	260 (98%)	4 (2%)	0	100	100
1	C	263/263 (100%)	259 (98%)	4 (2%)	0	100	100
1	D	263/263 (100%)	256 (97%)	7 (3%)	0	100	100
All	All	1052/1052 (100%)	1029 (98%)	23 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	236/235 (100%)	231 (98%)	5 (2%)	53	24
1	B	238/235 (101%)	227 (95%)	11 (5%)	27	4
1	C	237/235 (101%)	230 (97%)	7 (3%)	41	12
1	D	237/235 (101%)	232 (98%)	5 (2%)	53	24
All	All	948/940 (101%)	920 (97%)	28 (3%)	43	12

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	89	GLN
1	A	131	THR
1	A	135	LYS
1	A	156	ASP
1	A	219	GLN
1	B	76	MET
1	B	79	GLN
1	B	82[A]	GLN
1	B	82[B]	GLN
1	B	89	GLN
1	B	156	ASP
1	B	185	GLU
1	B	234[A]	MET
1	B	234[B]	MET
1	B	235	ASP
1	B	256	LEU
1	C	3	LYS
1	C	73	PRO
1	C	82	GLN
1	C	89	GLN
1	C	153	PRO
1	C	156	ASP
1	C	219	GLN
1	D	79	GLN
1	D	89	GLN
1	D	156	ASP
1	D	185	GLU
1	D	256	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (24) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	27	GLN
1	A	49	GLN
1	A	79	GLN
1	A	101	HIS
1	A	111	HIS
1	A	164	HIS
1	A	248	GLN
1	B	27	GLN
1	B	56	ASN
1	B	58	GLN
1	B	111	HIS

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Mol	Chain	Res	Type
1	B	203	ASN
1	B	248	GLN
1	C	27	GLN
1	C	164	HIS
1	C	219	GLN
1	C	248	GLN
1	C	263	GLN
1	D	27	GLN
1	D	82	GLN
1	D	221	GLN
1	D	233	HIS
1	D	248	GLN
1	D	263	GLN

5.3.3 RNA [i](#)

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 16 ligands modelled in this entry, 4 are monoatomic - leaving 12 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	WWO	A	302[B]	2	26,28,28	2.15	4 (15%)	37,42,42	3.91	19 (51%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	EDO	B	303	-	3,3,3	0.74	0	2,2,2	0.36	0
3	WWO	C	302	2	26,28,28	2.66	9 (34%)	37,42,42	3.61	15 (40%)
4	EDO	D	305	-	3,3,3	0.56	0	2,2,2	0.35	0
3	WWO	B	302	2	26,28,28	2.86	6 (23%)	37,42,42	2.69	10 (27%)
4	EDO	B	304	-	3,3,3	0.60	0	2,2,2	0.32	0
4	EDO	D	303	-	3,3,3	0.42	0	2,2,2	0.07	0
4	EDO	A	303	-	3,3,3	0.47	0	2,2,2	0.67	0
3	WWO	D	302	2	26,28,28	2.79	6 (23%)	37,42,42	4.00	13 (35%)
4	EDO	D	304	-	3,3,3	0.49	0	2,2,2	0.80	0
3	WWO	A	302[A]	2	26,28,28	3.04	6 (23%)	37,42,42	3.76	8 (21%)
4	EDO	C	303	-	3,3,3	0.81	0	2,2,2	0.23	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	WWO	A	302[B]	2	-	9/21/21/21	0/2/2/2
4	EDO	B	303	-	-	0/1/1/1	-
3	WWO	C	302	2	-	6/21/21/21	0/2/2/2
4	EDO	D	305	-	-	1/1/1/1	-
3	WWO	B	302	2	-	5/21/21/21	0/2/2/2
4	EDO	B	304	-	-	1/1/1/1	-
4	EDO	D	303	-	-	1/1/1/1	-
4	EDO	A	303	-	-	1/1/1/1	-
3	WWO	D	302	2	-	7/21/21/21	0/2/2/2
4	EDO	D	304	-	-	0/1/1/1	-
3	WWO	A	302[A]	2	-	7/21/21/21	0/2/2/2
4	EDO	C	303	-	-	0/1/1/1	-

All (31) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302[A]	WWO	S7-N10	8.30	1.76	1.60
3	B	302	WWO	O22-S11	7.85	1.55	1.44
3	D	302	WWO	O22-S11	7.61	1.55	1.44
3	C	302	WWO	O23-S11	7.48	1.55	1.44
3	A	302[B]	WWO	O22-S11	7.33	1.55	1.44
3	C	302	WWO	O22-S11	7.18	1.54	1.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	302	WWO	S7-N10	7.06	1.74	1.60
3	B	302	WWO	O23-S11	6.88	1.54	1.44
3	A	302[A]	WWO	O22-S11	6.73	1.54	1.44
3	A	302[A]	WWO	O23-S11	6.73	1.54	1.44
3	D	302	WWO	O23-S11	6.54	1.53	1.44
3	A	302[A]	WWO	O9-S7	5.63	1.54	1.43
3	A	302[A]	WWO	O8-S7	5.56	1.54	1.43
3	D	302	WWO	O8-S7	5.16	1.53	1.43
3	A	302[B]	WWO	S7-N10	5.15	1.70	1.60
3	B	302	WWO	O8-S7	5.00	1.53	1.43
3	D	302	WWO	S7-N10	4.97	1.70	1.60
3	D	302	WWO	C21-S11	3.97	1.85	1.77
3	C	302	WWO	S7-N10	3.72	1.67	1.60
3	A	302[B]	WWO	O23-S11	3.69	1.49	1.44
3	C	302	WWO	C4-S7	3.55	1.84	1.79
3	C	302	WWO	O8-S7	3.18	1.49	1.43
3	A	302[B]	WWO	F27-C5	-3.08	1.30	1.35
3	C	302	WWO	F13-C2	2.83	1.39	1.35
3	B	302	WWO	C4-S7	2.54	1.83	1.79
3	C	302	WWO	O9-S7	2.53	1.48	1.43
3	D	302	WWO	O9-S7	2.51	1.48	1.43
3	B	302	WWO	O9-S7	2.47	1.48	1.43
3	A	302[A]	WWO	C21-S11	2.27	1.82	1.77
3	C	302	WWO	C21-S11	2.14	1.82	1.77
3	C	302	WWO	C14-C15	-2.10	1.46	1.51

All (65) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	302	WWO	O23-S11-O22	-20.18	94.85	118.44
3	A	302[A]	WWO	O23-S11-O22	-17.11	98.44	118.44
3	A	302[B]	WWO	O23-S11-O22	-13.81	102.30	118.44
3	C	302	WWO	O23-S11-O22	-13.60	102.54	118.44
3	B	302	WWO	O23-S11-O22	-12.08	104.32	118.44
3	C	302	WWO	O8-S7-C4	10.30	122.59	107.30
3	A	302[A]	WWO	O8-S7-O9	-10.20	101.99	118.76
3	A	302[B]	WWO	O8-S7-C4	8.92	120.54	107.30
3	A	302[B]	WWO	O8-S7-O9	-8.78	104.32	118.76
3	D	302	WWO	O25-C24-C21	6.18	122.81	110.38
3	A	302[B]	WWO	O9-S7-N10	5.39	115.35	107.36
3	C	302	WWO	O8-S7-O9	-5.18	110.25	118.76
3	B	302	WWO	C15-C14-N26	-5.13	100.42	113.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	WWO	C15-C14-N26	-4.88	101.09	113.77
3	C	302	WWO	C4-S7-N10	-4.72	99.54	108.26
3	A	302[A]	WWO	O9-S7-C4	4.67	114.23	107.30
3	A	302[A]	WWO	C4-S7-N10	4.67	116.88	108.26
3	A	302[A]	WWO	C3-C4-C5	4.51	119.83	116.67
3	A	302[B]	WWO	O8-S7-N10	-4.43	100.79	107.36
3	A	302[A]	WWO	C21-S11-C1	4.38	126.31	108.15
3	A	302[B]	WWO	C3-C2-C1	-4.34	116.23	121.74
3	A	302[B]	WWO	C3-C4-C5	4.21	119.62	116.67
3	D	302	WWO	C15-C14-N26	-4.19	102.86	113.77
3	C	302	WWO	C1-C6-N26	4.18	126.19	122.01
3	D	302	WWO	C1-C6-N26	4.07	126.08	122.01
3	A	302[B]	WWO	O25-C24-C21	-4.01	102.31	110.38
3	B	302	WWO	O8-S7-N10	3.93	113.20	107.36
3	A	302[B]	WWO	O9-S7-C4	3.91	113.11	107.30
3	D	302	WWO	C3-C4-C5	3.89	119.39	116.67
3	A	302[B]	WWO	F27-C5-C6	3.88	125.38	119.56
3	D	302	WWO	C4-S7-N10	-3.56	101.68	108.26
3	A	302[A]	WWO	O8-S7-C4	3.54	112.55	107.30
3	B	302	WWO	C4-S7-N10	-3.45	101.87	108.26
3	C	302	WWO	C2-C1-S11	-3.41	112.44	120.84
3	D	302	WWO	O8-S7-N10	3.41	112.41	107.36
3	A	302[B]	WWO	C21-S11-C1	3.36	122.09	108.15
3	D	302	WWO	C2-C1-S11	-3.35	112.61	120.84
3	D	302	WWO	O22-S11-C1	3.09	114.49	106.54
3	A	302[B]	WWO	C4-S7-N10	-3.07	102.59	108.26
3	B	302	WWO	O9-S7-C4	-3.01	102.83	107.30
3	A	302[B]	WWO	C2-C1-S11	-2.97	113.52	120.84
3	C	302	WWO	C21-S11-C1	2.97	120.45	108.15
3	A	302[A]	WWO	C1-C6-N26	-2.93	119.08	122.01
3	A	302[B]	WWO	C5-C6-C1	2.93	121.24	116.14
3	C	302	WWO	F12-C3-C2	-2.89	113.25	119.27
3	C	302	WWO	C16-C15-C20	2.58	122.22	118.17
3	D	302	WWO	C21-S11-C1	2.53	118.62	108.15
3	C	302	WWO	O23-S11-C21	-2.50	103.71	108.20
3	D	302	WWO	O8-S7-C4	2.40	110.87	107.30
3	C	302	WWO	C5-C6-N26	-2.39	114.84	122.55
3	B	302	WWO	F12-C3-C2	-2.39	114.30	119.27
3	C	302	WWO	F27-C5-C4	-2.38	116.25	120.70
3	A	302[B]	WWO	O22-S11-C1	2.36	112.61	106.54
3	C	302	WWO	O22-S11-C1	2.35	112.59	106.54
3	A	302[B]	WWO	C6-C5-C4	-2.34	117.74	121.81

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302[B]	WWO	F12-C3-C2	-2.32	114.43	119.27
3	C	302	WWO	O9-S7-N10	2.32	110.80	107.36
3	A	302[B]	WWO	O23-S11-C1	-2.30	100.63	106.54
3	D	302	WWO	C5-C6-N26	-2.28	115.19	122.55
3	B	302	WWO	C16-C15-C20	2.21	121.64	118.17
3	B	302	WWO	C21-S11-C1	2.16	117.12	108.15
3	A	302[B]	WWO	F27-C5-C4	-2.07	116.83	120.70
3	D	302	WWO	C17-C16-C15	-2.04	117.50	120.63
3	B	302	WWO	O25-C24-C21	2.04	114.48	110.38
3	B	302	WWO	C2-C1-S11	-2.03	115.84	120.84

There are no chirality outliers.

All (38) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302[A]	WWO	C3-C4-S7-N10
3	A	302[A]	WWO	C6-C1-S11-O23
3	A	302[A]	WWO	C24-C21-S11-C1
3	A	302[A]	WWO	C24-C21-S11-O22
3	A	302[A]	WWO	C24-C21-S11-O23
3	A	302[B]	WWO	C3-C4-S7-N10
3	A	302[B]	WWO	C2-C1-S11-O22
3	A	302[B]	WWO	C6-C1-S11-O22
3	A	302[B]	WWO	C24-C21-S11-C1
3	A	302[B]	WWO	C24-C21-S11-O22
3	A	302[B]	WWO	C24-C21-S11-O23
3	B	302	WWO	C5-C4-S7-O8
3	B	302	WWO	C3-C4-S7-N10
3	B	302	WWO	C3-C4-S7-O8
3	B	302	WWO	S11-C21-C24-O25
3	C	302	WWO	C5-C4-S7-O8
3	C	302	WWO	C3-C4-S7-N10
3	C	302	WWO	C3-C4-S7-O8
3	C	302	WWO	C24-C21-S11-C1
3	C	302	WWO	C24-C21-S11-O22
3	C	302	WWO	C24-C21-S11-O23
3	D	302	WWO	C3-C4-S7-N10
3	D	302	WWO	C3-C4-S7-O8
3	D	302	WWO	C24-C21-S11-C1
3	D	302	WWO	C24-C21-S11-O22
3	D	302	WWO	C24-C21-S11-O23
4	D	305	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
3	A	302[B]	WWO	S11-C21-C24-O25
3	A	302[A]	WWO	C2-C1-S11-O23
4	B	304	EDO	O1-C1-C2-O2
3	A	302[A]	WWO	C5-C4-S7-O9
3	A	302[B]	WWO	C5-C4-S7-O8
3	A	302[B]	WWO	C3-C4-S7-O9
3	D	302	WWO	C5-C4-S7-O8
4	A	303	EDO	O1-C1-C2-O2
4	D	303	EDO	O1-C1-C2-O2
3	B	302	WWO	C5-C4-S7-N10
3	D	302	WWO	C5-C4-S7-N10

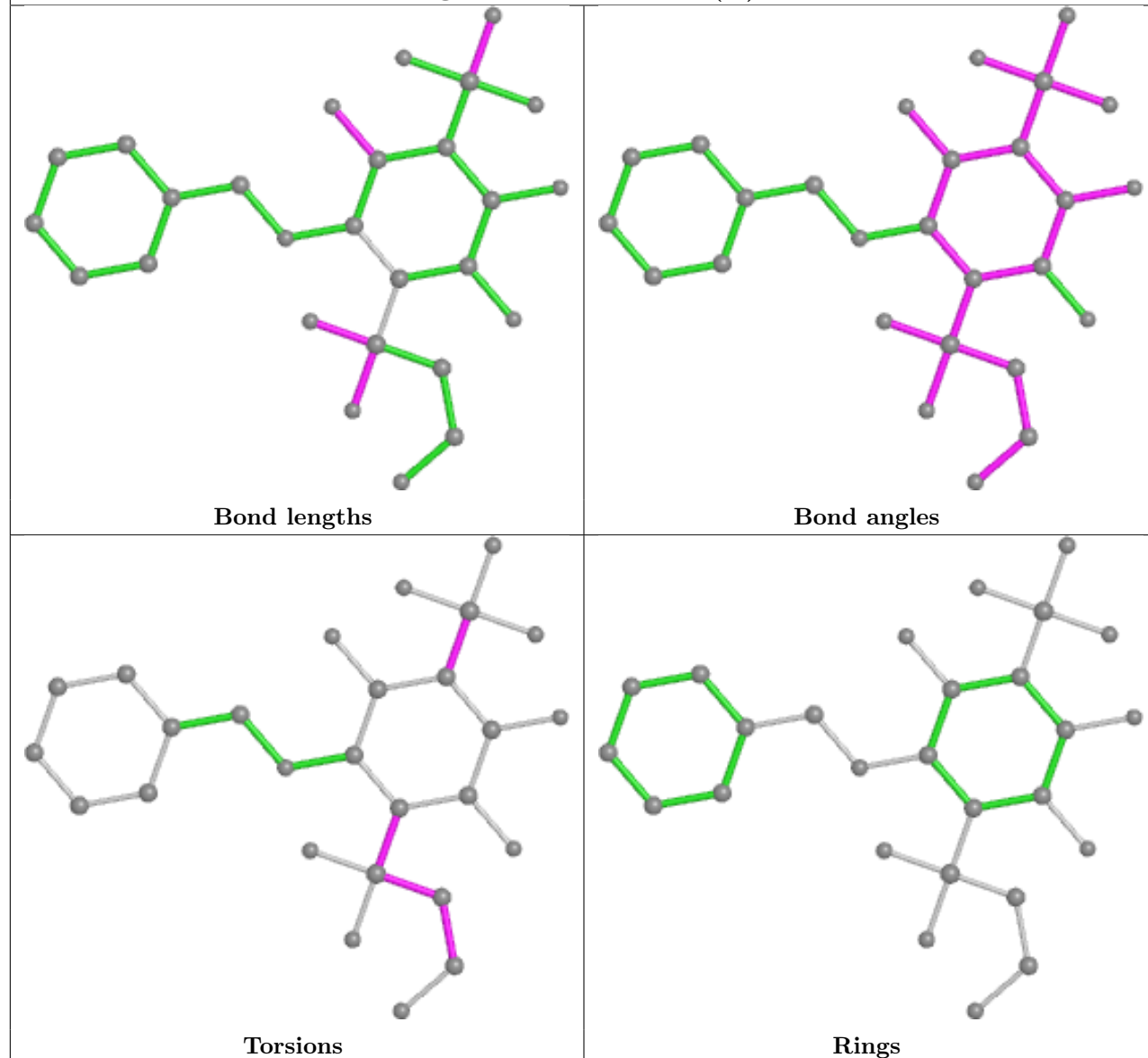
There are no ring outliers.

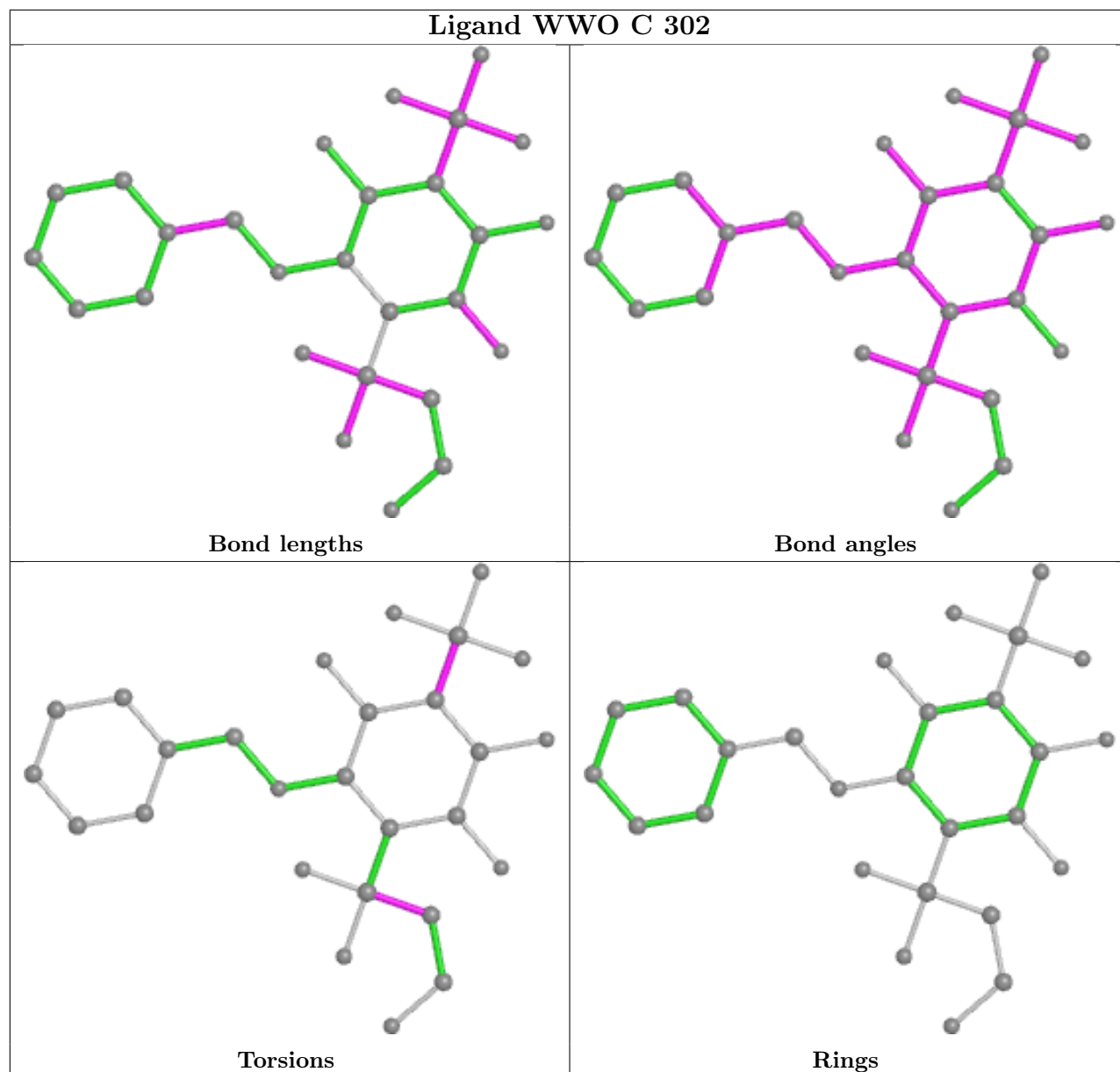
6 monomers are involved in 33 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	302[B]	WWO	8	0
3	C	302	WWO	2	0
3	B	302	WWO	11	0
3	D	302	WWO	1	0
4	D	304	EDO	7	0
3	A	302[A]	WWO	4	0

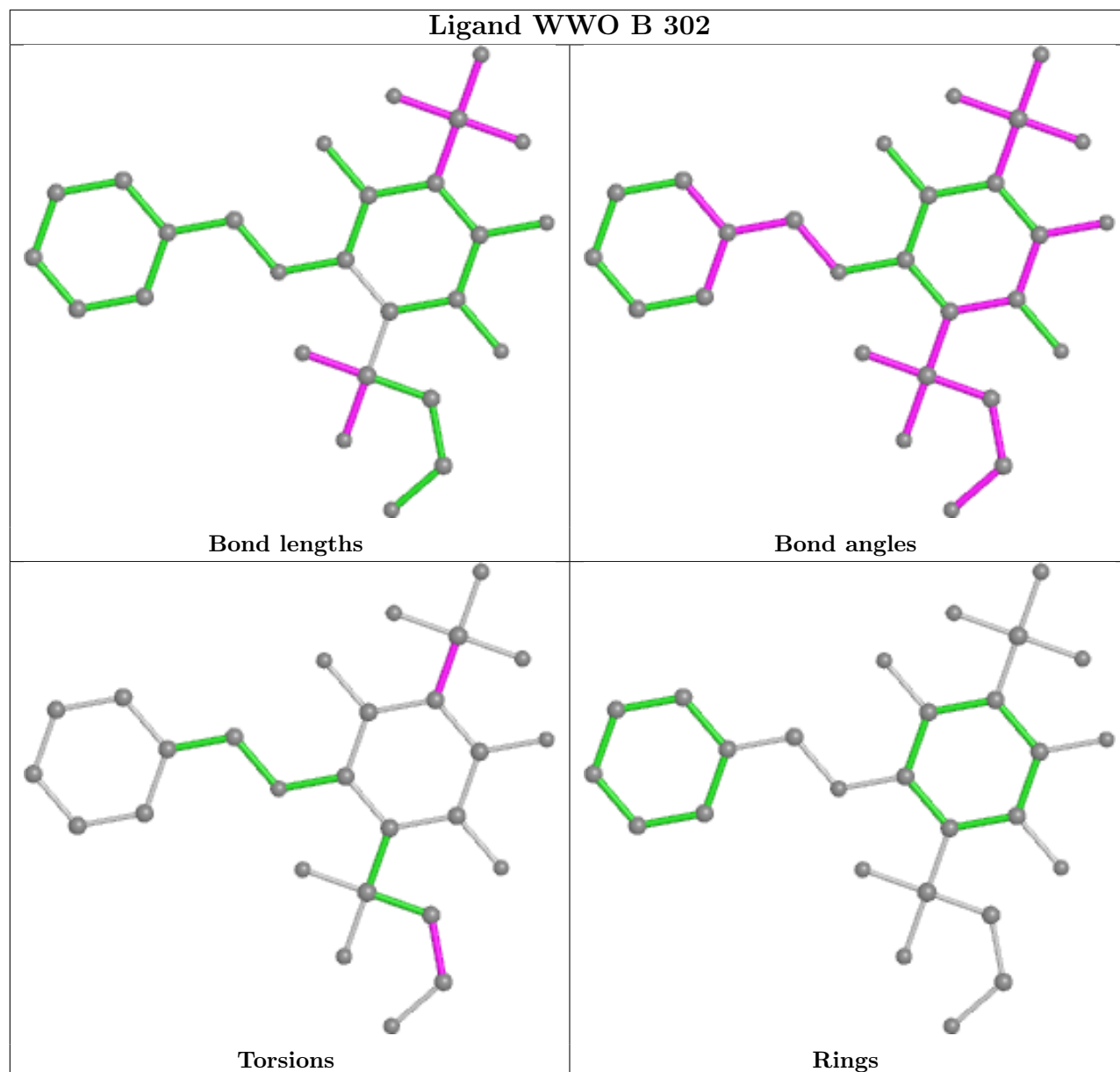
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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

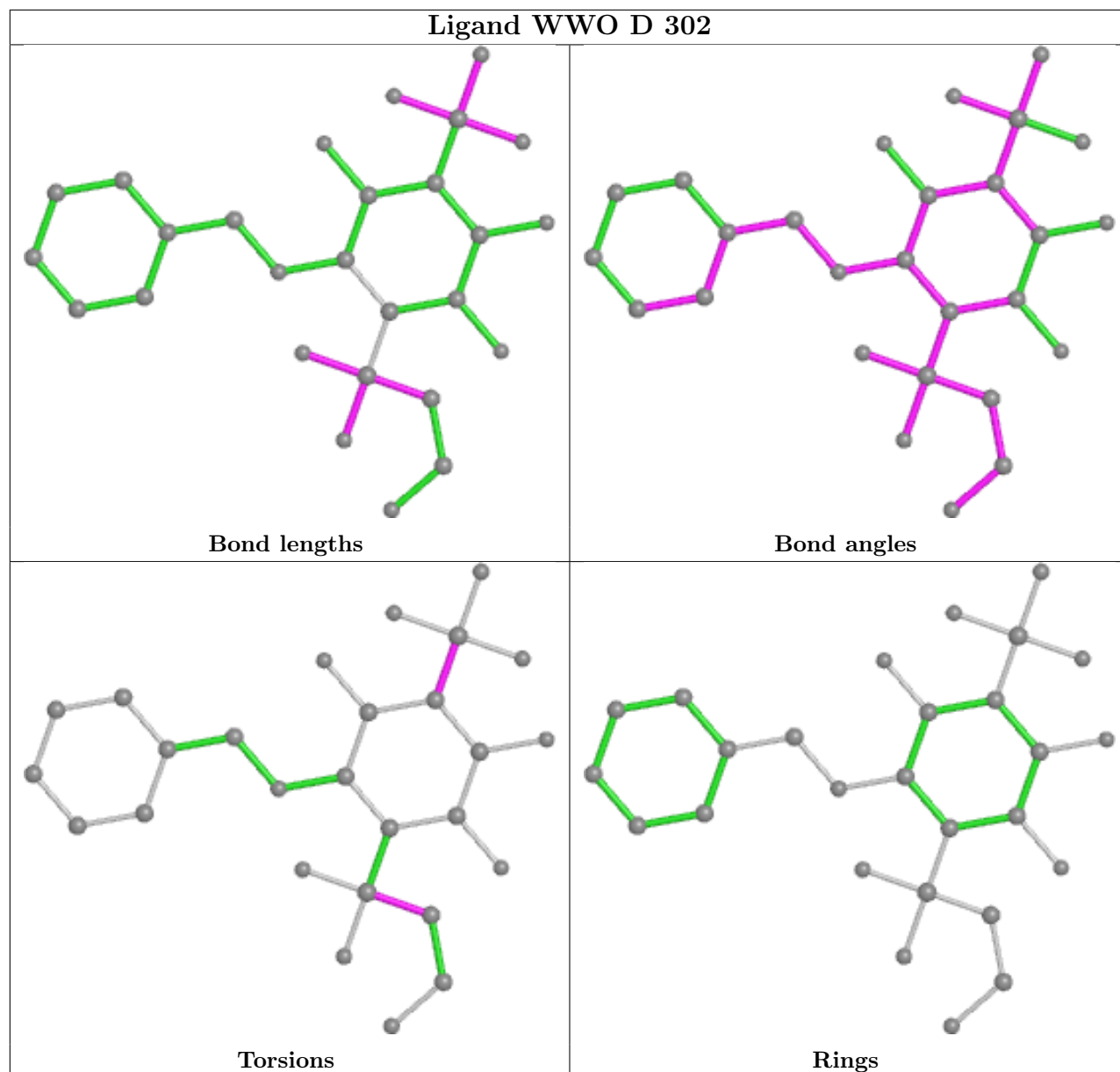
Ligand WWO A 302 (B)

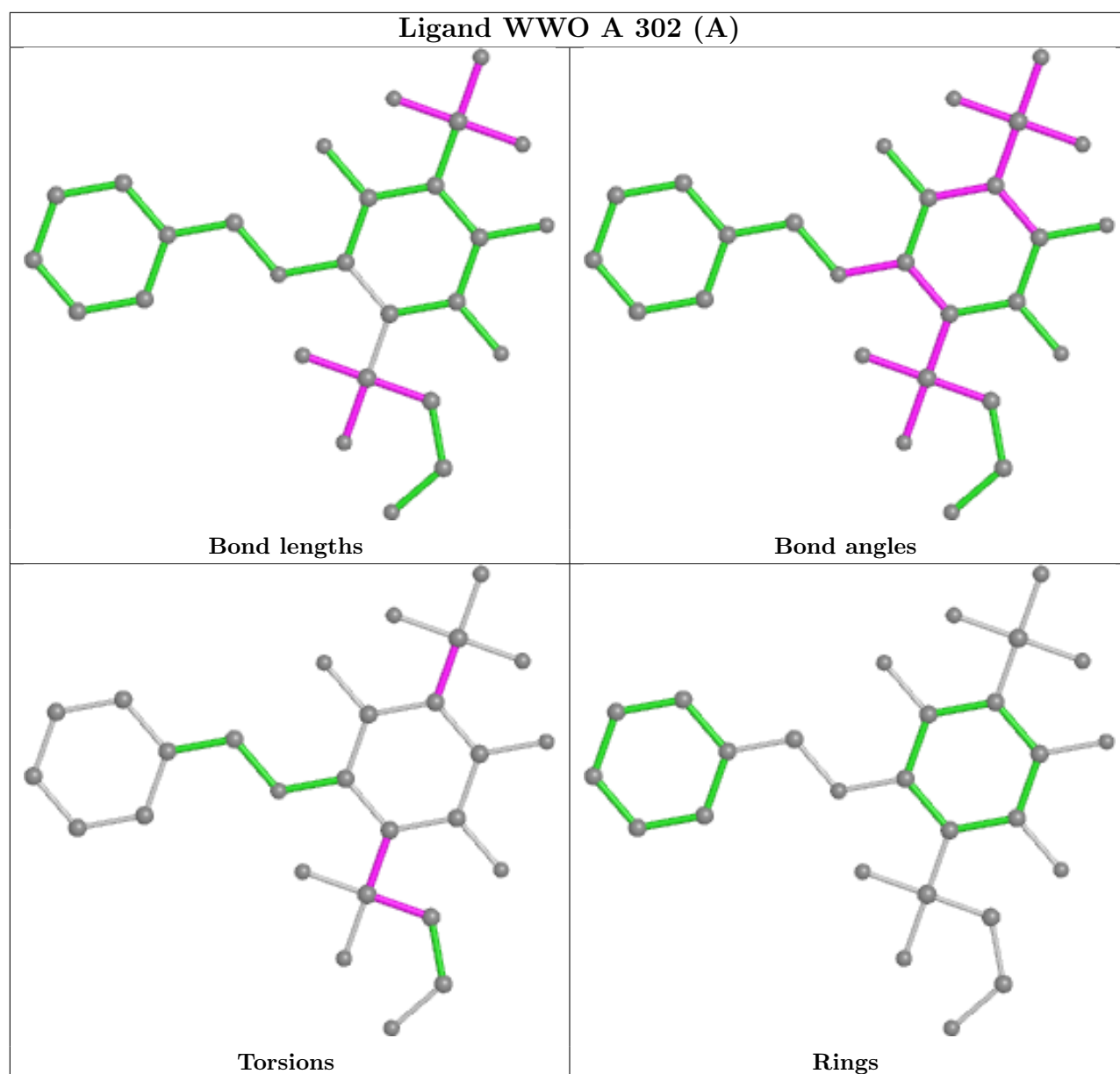




Ligand WWO B 302







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	261/263 (99%)	0.51	14 (5%)	25 30	6, 13, 29, 47	1 (0%)
1	B	261/263 (99%)	0.46	10 (3%)	40 47	6, 13, 25, 41	0
1	C	261/263 (99%)	0.43	11 (4%)	36 41	6, 12, 26, 60	1 (0%)
1	D	261/263 (99%)	0.40	8 (3%)	49 57	5, 12, 24, 50	1 (0%)
All	All	1044/1052 (99%)	0.45	43 (4%)	37 43	5, 13, 26, 60	3 (0%)

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	235	ASP	6.7
1	C	237	PRO	6.4
1	C	235	ASP	5.0
1	B	185	GLU	4.9
1	A	131	THR	4.5
1	C	238	SER	4.5
1	A	237	PRO	4.3
1	A	254	GLU	4.1
1	A	239	PRO	4.0
1	B	262	SER	3.4
1	C	82	GLN	3.4
1	A	136	SER	3.4
1	B	263	GLN	3.3
1	C	254	GLU	3.1
1	C	81	LEU	3.0
1	B	82[A]	GLN	3.0
1	D	185	GLU	2.8
1	B	148	MET	2.7
1	D	237	PRO	2.6
1	A	134	ASN	2.6
1	A	82	GLN	2.6

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Mol	Chain	Res	Type	RSRZ
1	B	186	ARG	2.5
1	D	254	GLU	2.5
1	C	236	ASP	2.5
1	C	3	LYS	2.5
1	B	3	LYS	2.4
1	D	256	LEU	2.4
1	A	236	ASP	2.4
1	C	239	PRO	2.4
1	A	132	ALA	2.3
1	C	79	GLN	2.3
1	A	234[A]	MET	2.3
1	A	126	TYR	2.2
1	B	7	PHE	2.2
1	D	78[A]	ILE	2.2
1	A	137	GLU	2.1
1	D	7	PHE	2.1
1	C	131	THR	2.1
1	D	255	ARG	2.1
1	B	254	GLU	2.1
1	A	263	GLN	2.0
1	D	165[A]	VAL	2.0
1	B	255[A]	ARG	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 monosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 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(\AA^2)	Q<0.9
4	EDO	D	305	4/4	0.64	0.23	46,51,53,62	0

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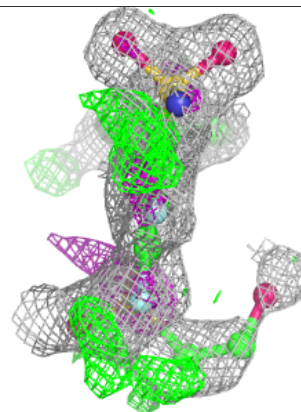
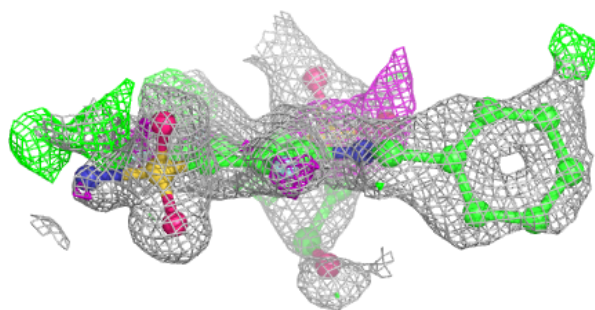
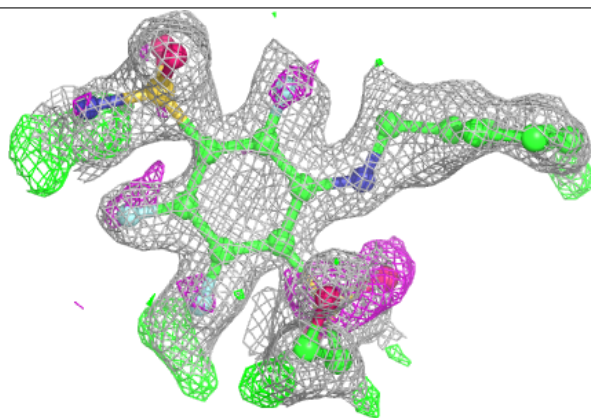
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	EDO	D	304	4/4	0.78	0.20	28,32,33,38	0
4	EDO	B	304	4/4	0.86	0.12	21,22,22,24	0
3	WWO	A	302[A]	27/27	0.86	0.24	13,25,33,34	27
3	WWO	A	302[B]	27/27	0.86	0.24	13,22,28,29	27
4	EDO	D	303	4/4	0.87	0.10	24,28,32,33	0
3	WWO	C	302	27/27	0.90	0.19	14,29,39,44	0
4	EDO	C	303	4/4	0.91	0.09	19,23,26,27	0
3	WWO	B	302	27/27	0.91	0.17	12,27,40,51	0
4	EDO	B	303	4/4	0.92	0.09	14,15,16,16	0
3	WWO	D	302	27/27	0.94	0.14	13,24,34,41	0
4	EDO	A	303	4/4	0.95	0.09	18,23,24,25	0
2	ZN	A	301	1/1	1.00	0.09	7,7,7,7	0
2	ZN	B	301	1/1	1.00	0.09	8,8,8,8	0
2	ZN	C	301	1/1	1.00	0.08	7,7,7,7	0
2	ZN	D	301	1/1	1.00	0.09	7,7,7,7	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.

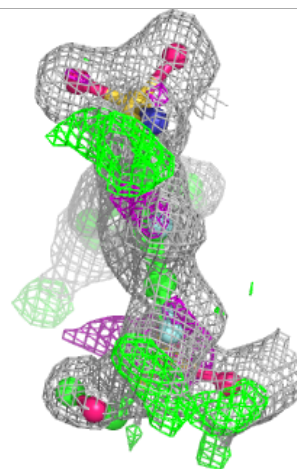
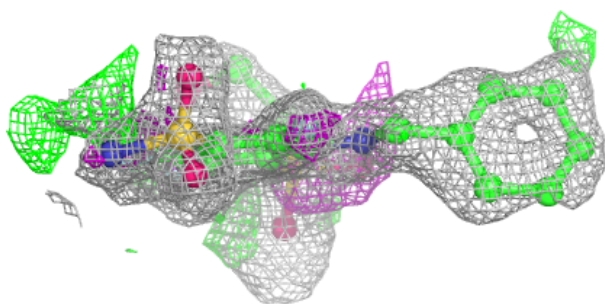
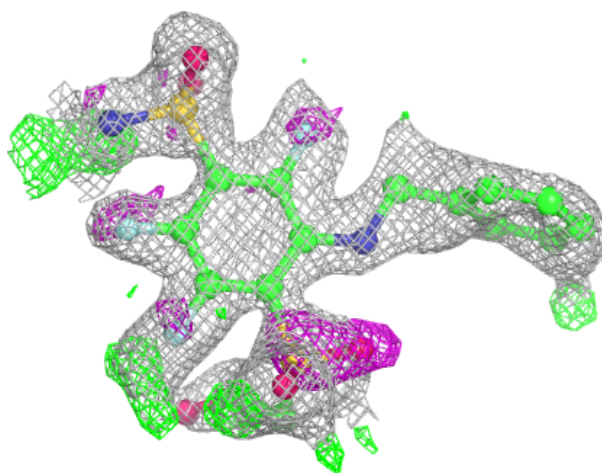
Electron density around WWO A 302 (A):

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



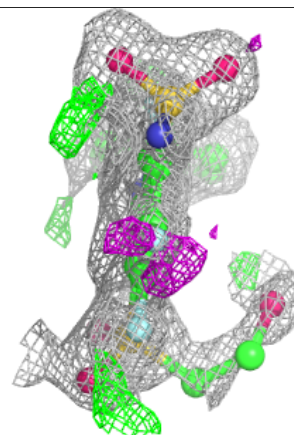
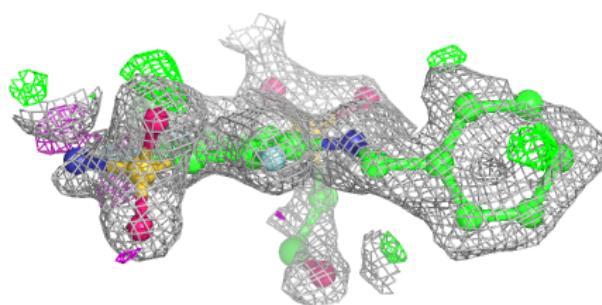
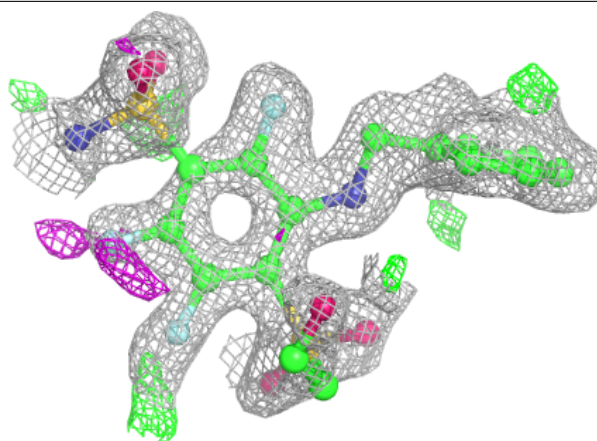
Electron density around WWO A 302 (B):

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



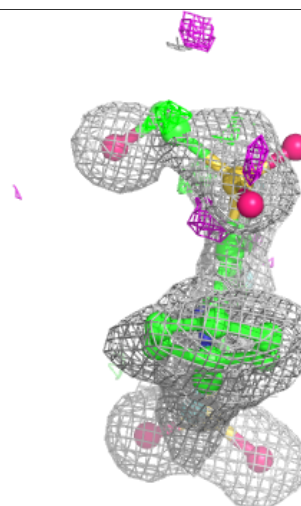
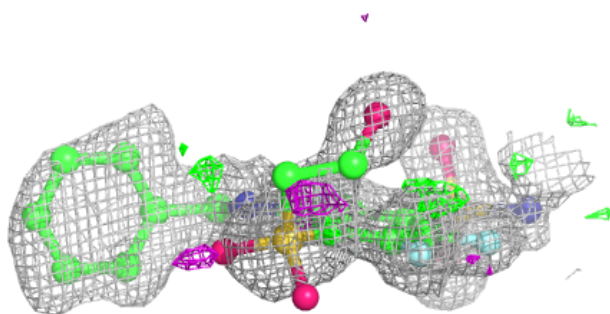
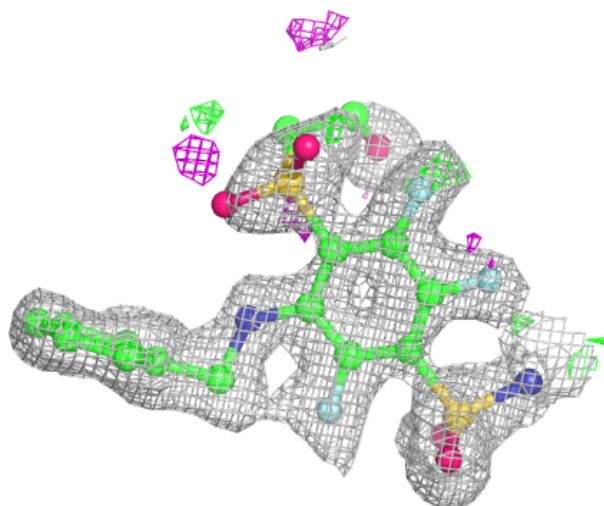
Electron density around WWO C 302:

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



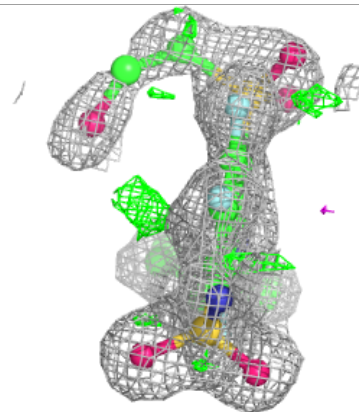
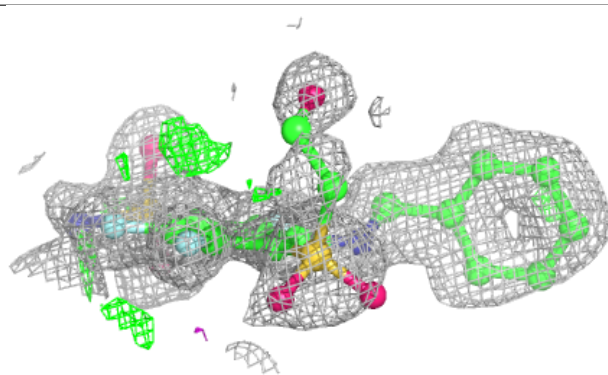
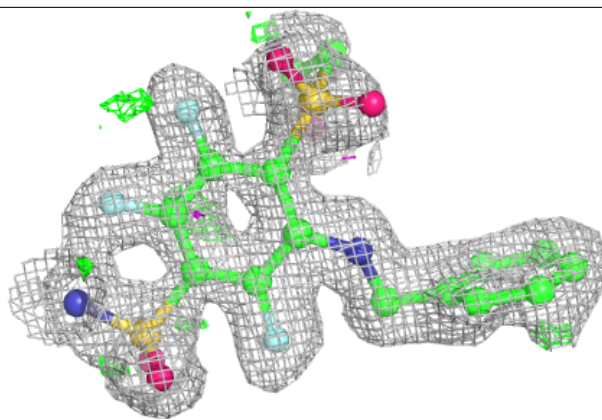
Electron density around WWO B 302:

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



Electron density around WWO D 302:

$2mF_o-DF_c$ (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.