



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 03:27 AM UTC

PDB ID : 3ZfZ / pdb_00003zfz
Title : Crystal structure of ceftaroline acyl-PBP2a from MRSA with non- covalently bound ceftaroline and muramic acid at allosteric site obtained by soaking
Authors : Otero, L.H.; Rojas-Altuve, A.; Hermoso, J.A.
Deposited on : 2012-12-13
Resolution : 2.25 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

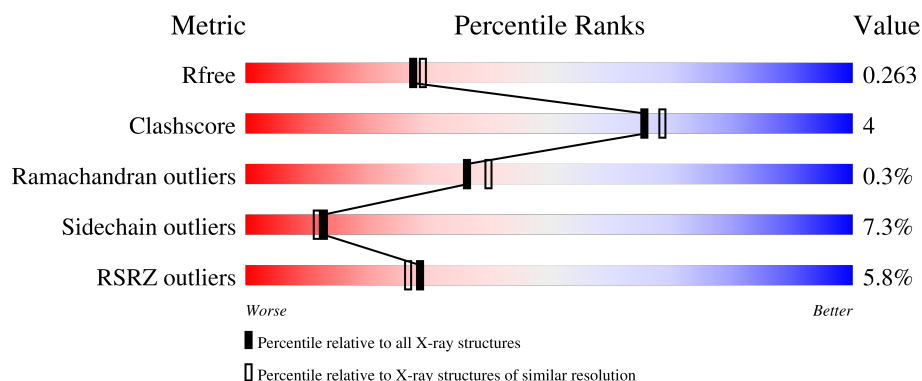
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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	642	<div> <div>5%</div> <div> <div></div> <div>80%</div> <div>17%</div> <div>..</div> </div> </div>
1	B	642	<div> <div>6%</div> <div> <div></div> <div>83%</div> <div>15%</div> <div>.</div> </div> </div>

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 11069 atoms, of which 32 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 PENICILLIN BINDING PROTEIN 2 PRIME.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	635	Total	C	N	O	S	0	0	0
			5096	3213	860	1008	15			
1	B	642	Total	C	N	O	S	0	0	0
			5151	3246	870	1019	16			

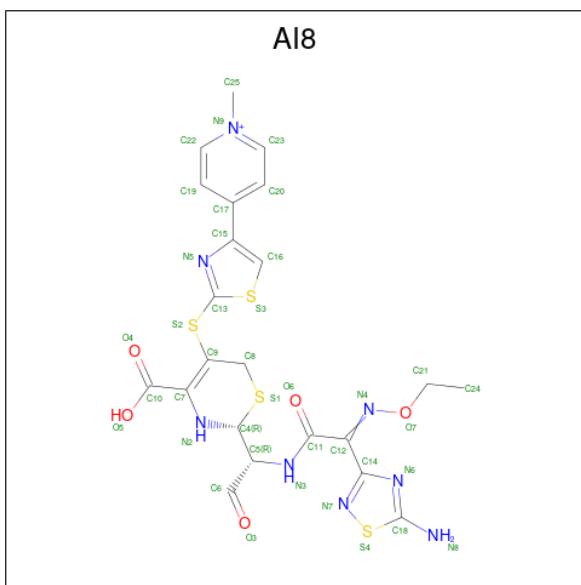
- Molecule 2 is CADMIUM ION (CCD ID: CD) (formula: Cd).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	5	Total	Cd	0	0
			5	5		
2	B	3	Total	Cd	0	0
			3	3		

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

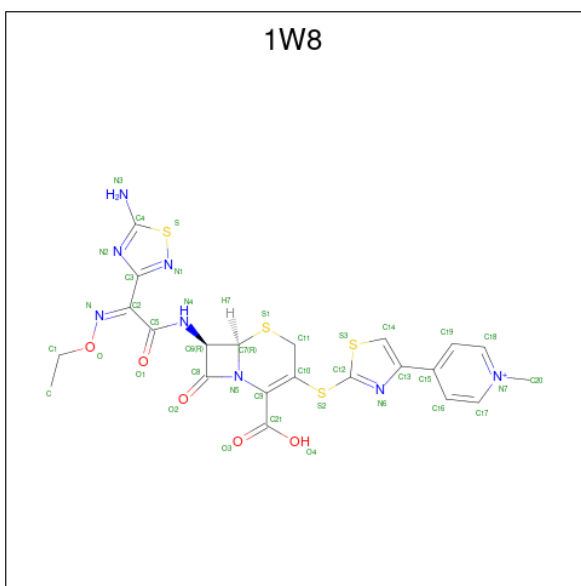
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Cl	0	0
			2	2		
3	B	2	Total	Cl	0	0
			2	2		

- Molecule 4 is Ceftaroline, bound form (CCD ID: AI8) (formula: C₂₂H₂₃N₈O₅S₄).



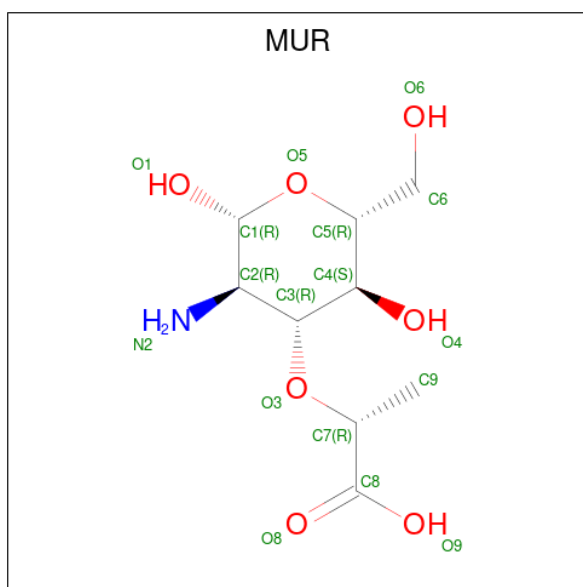
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	S	0	0
			39	22	8	5	4		

- Molecule 5 is Ceftaroline (CCD ID: 1W8) (formula: $C_{22}H_{21}N_8O_5S_4$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	S	0	0
			39	22	8	5	4		

- Molecule 6 is beta-muramic acid (CCD ID: MUR) (formula: $C_9H_{17}NO_7$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	H	N	O	0	0
			33	9	16	1	7		
6	B	1	Total	C	H	N	O	0	0
			33	9	16	1	7		

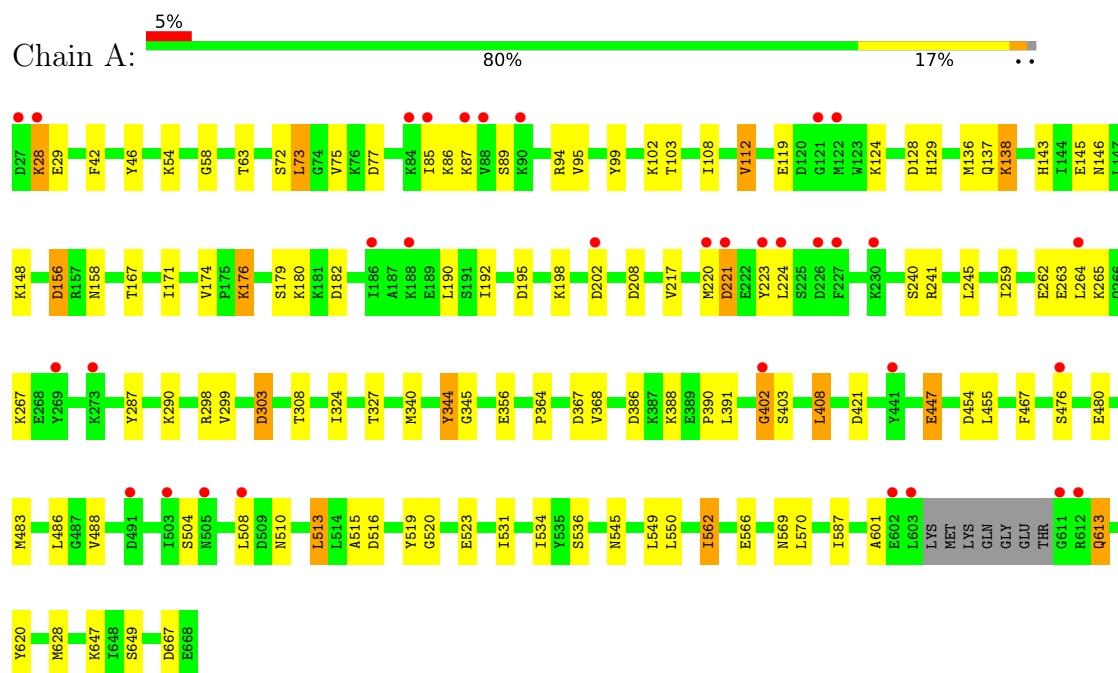
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	334	Total	O	0	0
			334	334		
7	B	332	Total	O	0	0
			332	332		

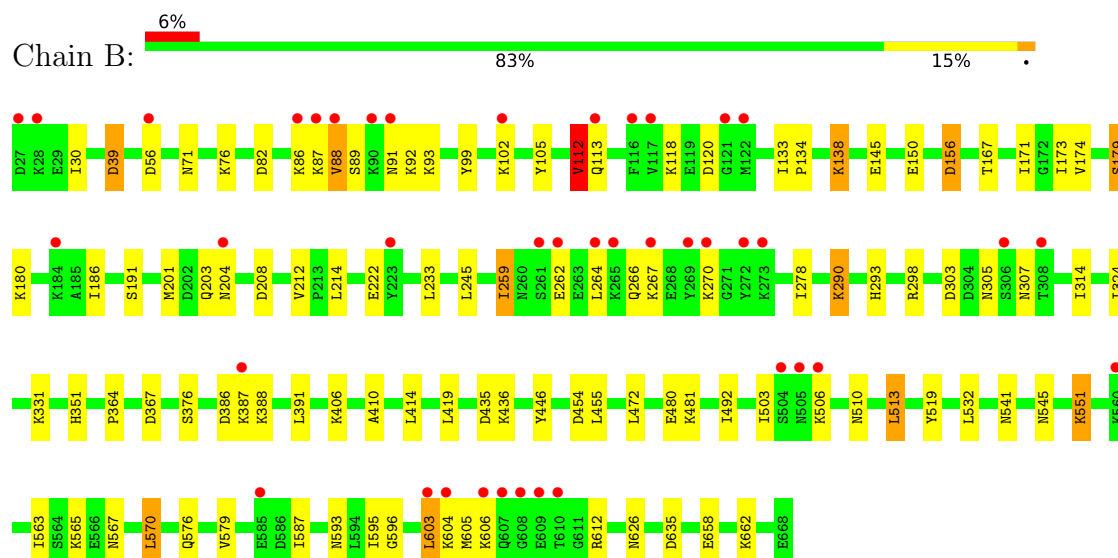
3 Residue-property plots

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: PENICILLIN BINDING PROTEIN 2 PRIME



• Molecule 1: PENICILLIN BINDING PROTEIN 2 PRIME



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	80.52Å 101.48Å 187.01Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	68.76 – 2.25 68.76 – 2.25	Depositor EDS
% Data completeness (in resolution range)	100.0 (68.76-2.25) 100.0 (68.76-2.25)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.93 (at 2.25Å)	Xtriage
Refinement program	BUSTER 2.10.0	Depositor
R, R_{free}	0.194 , 0.249 0.208 , 0.263	Depositor DCC
R_{free} test set	5315 reflections (7.24%)	wwPDB-VP
Wilson B-factor (Å ²)	33.2	Xtriage
Anisotropy	0.775	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 54.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11069	wwPDB-VP
Average B, all atoms (Å ²)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.42% 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: AI8, CL, MUR, 1W8, CD

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	0.87	2/5181 (0.0%)	1.33	36/6967 (0.5%)
1	B	0.87	2/5237 (0.0%)	1.33	31/7041 (0.4%)
All	All	0.87	4/10418 (0.0%)	1.33	67/14008 (0.5%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	403	SER	C-N	-14.61	1.14	1.34
1	A	403	SER	CA-C	-5.71	1.44	1.52
1	B	201	MET	SD-CE	-5.22	1.66	1.79
1	B	492	ILE	CA-C	5.12	1.58	1.52

All (67) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	402	GLY	CA-C-N	-10.30	105.54	122.54
1	A	402	GLY	C-N-CA	-10.30	105.54	122.54
1	A	403	SER	CB-CA-C	7.10	121.95	110.09
1	B	454	ASP	CA-CB-CG	6.98	119.58	112.60
1	A	174	VAL	N-CA-C	-6.89	100.73	107.55
1	A	28	LYS	CA-C-N	6.71	129.57	120.38
1	A	28	LYS	C-N-CA	6.71	129.57	120.38
1	A	421	ASP	CA-CB-CG	6.61	119.21	112.60
1	B	39	ASP	CA-CB-CG	6.22	118.82	112.60
1	A	137	GLN	CA-C-N	5.92	129.12	120.71
1	A	137	GLN	C-N-CA	5.92	129.12	120.71
1	A	340	MET	CA-C-N	5.87	128.42	120.38
1	A	340	MET	C-N-CA	5.87	128.42	120.38
1	A	195	ASP	CA-CB-CG	5.79	118.39	112.60
1	A	179	SER	CA-C-N	5.66	128.65	120.38

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	179	SER	C-N-CA	5.66	128.65	120.38
1	A	454	ASP	CA-CB-CG	5.66	118.26	112.60
1	A	58	GLY	CA-C-N	5.66	128.13	120.38
1	A	58	GLY	C-N-CA	5.66	128.13	120.38
1	A	455	LEU	CA-C-N	5.64	127.77	120.44
1	A	455	LEU	C-N-CA	5.64	127.77	120.44
1	B	386	ASP	CA-C-N	5.62	128.27	120.29
1	B	386	ASP	C-N-CA	5.62	128.27	120.29
1	B	174	VAL	N-CA-C	-5.52	101.69	107.60
1	B	222	GLU	CA-C-N	5.51	127.61	120.44
1	B	222	GLU	C-N-CA	5.51	127.61	120.44
1	A	510	ASN	CA-C-N	5.48	127.56	120.44
1	A	510	ASN	C-N-CA	5.48	127.56	120.44
1	B	266	GLN	CA-C-N	5.41	127.53	120.28
1	B	266	GLN	C-N-CA	5.41	127.53	120.28
1	B	472	LEU	CA-C-N	5.41	127.53	120.28
1	B	472	LEU	C-N-CA	5.41	127.53	120.28
1	A	531	ILE	CA-C-N	5.36	127.72	120.38
1	A	531	ILE	C-N-CA	5.36	127.72	120.38
1	B	506	LYS	CA-C-N	5.33	127.95	120.28
1	B	506	LYS	C-N-CA	5.33	127.95	120.28
1	A	128	ASP	CA-CB-CG	5.31	117.91	112.60
1	A	467	PHE	CA-CB-CG	-5.30	108.50	113.80
1	B	565	LYS	CA-C-N	5.29	127.64	120.44
1	B	565	LYS	C-N-CA	5.29	127.64	120.44
1	B	331	LYS	CA-C-N	5.27	127.31	120.56
1	B	331	LYS	C-N-CA	5.27	127.31	120.56
1	A	515	ALA	CA-C-N	5.26	127.27	120.44
1	A	515	ALA	C-N-CA	5.26	127.27	120.44
1	B	481	LYS	CA-C-N	5.25	125.81	119.98
1	B	481	LYS	C-N-CA	5.25	125.81	119.98
1	B	596	GLY	N-CA-C	5.25	118.37	110.18
1	B	133	ILE	CA-C-O	-5.20	117.23	119.94
1	A	221	ASP	CA-CB-CG	5.18	117.78	112.60
1	B	303	ASP	CA-CB-CG	5.16	117.76	112.60
1	B	435	ASP	CA-CB-CG	5.12	117.72	112.60
1	A	345	GLY	N-CA-C	5.10	117.92	110.63
1	B	112	VAL	CA-C-N	5.09	129.95	122.77
1	B	112	VAL	C-N-CA	5.09	129.95	122.77
1	B	203	GLN	CA-C-N	5.09	127.35	120.38
1	B	203	GLN	C-N-CA	5.09	127.35	120.38
1	A	156	ASP	CA-CB-CG	5.07	117.67	112.60

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	156	ASP	CA-CB-CG	5.07	117.67	112.60
1	A	536	SER	CA-C-N	5.04	127.54	120.28
1	A	536	SER	C-N-CA	5.04	127.54	120.28
1	A	476	SER	CA-C-N	5.04	127.03	120.28
1	A	476	SER	C-N-CA	5.04	127.03	120.28
1	B	56	ASP	CA-CB-CG	5.04	117.64	112.60
1	A	198	LYS	CA-C-N	5.02	127.51	120.28
1	A	198	LYS	C-N-CA	5.02	127.51	120.28
1	B	179	SER	CA-C-N	5.01	128.70	120.63
1	B	179	SER	C-N-CA	5.01	128.70	120.63

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	5096	0	5088	46	0
1	B	5151	0	5150	35	0
2	A	5	0	0	0	0
2	B	3	0	0	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	39	0	21	1	0
5	A	39	0	20	6	0
6	A	17	16	16	3	0
6	B	17	16	16	0	0
7	A	334	0	0	1	0
7	B	332	0	0	1	0
All	All	11037	32	10311	79	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 (79) 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)
5:A:1669:1W8:H18	1:B:145:GLU:HG3	1.62	0.82
1:A:138:LYS:HD2	1:A:138:LYS:H	1.56	0.71
1:A:601:ALA:O	1:A:613:GLN:HA	1.92	0.69
1:A:259:ILE:HG13	1:A:263:GLU:HG3	1.76	0.67
1:B:91:ASN:HB3	1:B:118:LYS:HB3	1.75	0.66
5:A:1669:1W8:C17	1:B:298:ARG:HH22	2.09	0.65
1:B:138:LYS:H	1:B:138:LYS:CD	2.09	0.64
1:A:402:GLY:O	1:A:520:GLY:HA3	1.96	0.64
1:B:138:LYS:H	1:B:138:LYS:HD2	1.62	0.63
1:A:447:GLU:HG3	4:A:1403:AI8:H20	1.80	0.62
1:B:88:VAL:HG13	1:B:89:SER:H	1.66	0.60
1:A:408:LEU:HD22	1:A:534:ILE:HG21	1.84	0.60
1:A:138:LYS:H	1:A:138:LYS:CD	2.13	0.60
1:A:99:TYR:HB2	1:A:112:VAL:HG22	1.85	0.58
1:A:220:MET:HG3	1:A:221:ASP:H	1.68	0.58
1:B:414:LEU:HD13	1:B:567:ASN:HB3	1.86	0.58
1:A:259:ILE:HG12	1:A:264:LEU:HG	1.85	0.58
1:B:99:TYR:HB2	1:B:112:VAL:HG22	1.87	0.57
1:B:173:ILE:HD12	1:B:214:LEU:HD11	1.86	0.56
1:A:158:ASN:HA	1:B:551:LYS:HE2	1.86	0.56
1:B:186:ILE:HD13	1:B:233:LEU:HD21	1.89	0.55
1:A:290:LYS:HB3	1:A:324:ILE:HD11	1.87	0.55
1:B:112:VAL:HG13	1:B:134:PRO:HB3	1.89	0.53
1:B:364:PRO:HG3	1:B:388:LYS:HB3	1.91	0.53
1:A:587:ILE:HD12	1:A:649:SER:HB2	1.90	0.53
1:B:455:LEU:HD23	1:B:570:LEU:HD22	1.91	0.52
1:A:143:HIS:HB3	1:A:145:GLU:OE2	2.10	0.52
1:B:259:ILE:HG12	1:B:264:LEU:HG	1.92	0.51
1:B:99:TYR:HB2	1:B:112:VAL:CG2	2.40	0.51
1:A:73:LEU:HD21	1:A:299:VAL:HG11	1.93	0.50
1:B:191:SER:HB3	1:B:376:SER:HB3	1.93	0.50
1:B:87:LYS:HA	1:B:93:LYS:HG2	1.93	0.49
1:A:146:ASN:HB2	5:A:1669:1W8:H111	1.93	0.49
1:A:72:SER:HB3	1:B:305:ASN:HB3	1.95	0.48
1:A:217:VAL:HG21	1:A:224:LEU:HD13	1.94	0.48
1:A:486:LEU:HD23	1:A:562:ILE:HG13	1.95	0.48
1:B:89:SER:HB2	1:B:92:LYS:HB3	1.96	0.48
1:A:240:SER:HA	6:A:1670:MUR:H2	1.96	0.47
1:A:85:ILE:HG23	1:A:95:VAL:HG22	1.97	0.47
1:A:182:ASP:HA	7:A:2092:HOH:O	2.15	0.47
1:B:510:ASN:HB3	1:B:513:LEU:HB2	1.97	0.47
1:A:190:LEU:HB2	1:A:192:ILE:HG12	1.96	0.47

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:LYS:HG3	1:A:208:ASP:HB3	1.97	0.46
1:A:303:ASP:HB2	1:A:308:THR:HG23	1.98	0.46
1:A:129:HIS:HB3	1:A:136:MET:HE3	1.97	0.46
1:A:364:PRO:HG2	1:A:388:LYS:HB3	1.96	0.46
1:B:267:LYS:HA	1:B:270:LYS:HD2	1.97	0.46
1:A:158:ASN:HD21	1:A:667:ASP:HA	1.80	0.46
1:A:513:LEU:HD21	1:A:523:GLU:HG3	1.98	0.46
1:A:119:GLU:HB2	1:A:124:LYS:HE3	1.97	0.46
1:A:327:THR:OG1	1:A:549:LEU:HA	2.16	0.45
1:B:406:LYS:HE3	1:B:519:TYR:HB2	1.99	0.45
1:B:576:GLN:HE22	1:B:593:ASN:HD21	1.65	0.44
1:A:99:TYR:HB2	1:A:112:VAL:CG2	2.48	0.44
5:A:1669:1W8:H201	1:B:145:GLU:HB3	1.98	0.44
1:B:410:ALA:O	1:B:414:LEU:HG	2.18	0.44
1:A:241:ARG:H	6:A:1670:MUR:H92	1.82	0.43
1:A:480:GLU:HG3	1:A:508:LEU:HD12	2.00	0.43
1:B:105:TYR:O	1:B:314:ILE:HG21	2.19	0.43
1:B:579:VAL:HG13	1:B:587:ILE:HG23	2.00	0.43
1:B:658:GLU:HB2	1:B:662:LYS:HG2	2.00	0.43
1:A:46:TYR:O	1:A:54:LYS:HD3	2.18	0.43
1:B:290:LYS:HB3	1:B:324:ILE:HD11	2.00	0.43
1:A:287:TYR:CZ	1:A:550:LEU:HD11	2.54	0.43
1:A:344:TYR:C	1:A:344:TYR:CD1	2.97	0.43
1:B:603:LEU:HD22	1:B:612:ARG:HD3	2.00	0.43
1:A:327:THR:HB	1:A:356:GLU:HB3	2.00	0.42
1:A:386:ASP:HB3	1:A:390:PRO:HD2	2.00	0.42
5:A:1669:1W8:H18	1:B:145:GLU:CG	2.42	0.42
5:A:1669:1W8:S2	1:B:307:ASN:O	2.77	0.42
1:A:241:ARG:HB2	6:A:1670:MUR:H4	2.01	0.42
1:A:483:MET:HE3	1:A:488:VAL:HG11	2.01	0.42
1:B:293:HIS:CE1	7:B:2079:HOH:O	2.72	0.42
1:A:516:ASP:HA	1:A:519:TYR:CE1	2.55	0.42
1:A:620:TYR:HB3	1:A:628:MET:HG2	2.01	0.42
1:A:42:PHE:HB3	1:A:63:THR:HA	2.01	0.42
1:B:351:HIS:HD2	1:B:626:ASN:O	2.02	0.41
1:A:75:VAL:HG22	1:A:103:THR:HG22	2.03	0.41
1:A:504:SER:HA	1:A:523:GLU:HB2	2.03	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	631/642 (98%)	611 (97%)	19 (3%)	1 (0%)	43	50
1	B	640/642 (100%)	611 (96%)	26 (4%)	3 (0%)	24	24
All	All	1271/1284 (99%)	1222 (96%)	45 (4%)	4 (0%)	36	40

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	613	GLN
1	B	635	ASP
1	B	606	LYS
1	B	88	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	566/572 (99%)	527 (93%)	39 (7%)	14	13
1	B	572/572 (100%)	528 (92%)	44 (8%)	12	10
All	All	1138/1144 (100%)	1055 (93%)	83 (7%)	13	12

All (83) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	LYS
1	A	29	GLU

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	73	LEU
1	A	77	ASP
1	A	86	LYS
1	A	87	LYS
1	A	89	SER
1	A	94	ARG
1	A	102	LYS
1	A	108	ILE
1	A	112	VAL
1	A	138	LYS
1	A	148	LYS
1	A	156	ASP
1	A	167	THR
1	A	171	ILE
1	A	176	LYS
1	A	180	LYS
1	A	202	ASP
1	A	223	TYR
1	A	245	LEU
1	A	262	GLU
1	A	265	LYS
1	A	267	LYS
1	A	298	ARG
1	A	303	ASP
1	A	344	TYR
1	A	367	ASP
1	A	368	VAL
1	A	391	LEU
1	A	408	LEU
1	A	447	GLU
1	A	513	LEU
1	A	545	ASN
1	A	562	ILE
1	A	566	GLU
1	A	569	ASN
1	A	570	LEU
1	A	647	LYS
1	B	30	ILE
1	B	39	ASP
1	B	71	ASN
1	B	76	LYS
1	B	82	ASP

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	86	LYS
1	B	102	LYS
1	B	112	VAL
1	B	113	GLN
1	B	120	ASP
1	B	138	LYS
1	B	150	GLU
1	B	156	ASP
1	B	167	THR
1	B	171	ILE
1	B	179	SER
1	B	180	LYS
1	B	204	ASN
1	B	208	ASP
1	B	212	VAL
1	B	245	LEU
1	B	259	ILE
1	B	262	GLU
1	B	278	ILE
1	B	290	LYS
1	B	367	ASP
1	B	387	LYS
1	B	391	LEU
1	B	419	LEU
1	B	436	LYS
1	B	446	TYR
1	B	480	GLU
1	B	503	ILE
1	B	513	LEU
1	B	532	LEU
1	B	541	ASN
1	B	545	ASN
1	B	551	LYS
1	B	563	ILE
1	B	570	LEU
1	B	595	ILE
1	B	603	LEU
1	B	604	LYS
1	B	605	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (28) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	158	ASN
1	A	203	GLN
1	A	207	GLN
1	A	266	GLN
1	A	381	ASN
1	A	416	ASN
1	A	433	GLN
1	A	442	ASN
1	A	500	ASN
1	A	577	GLN
1	A	593	ASN
1	A	632	ASN
1	B	44	GLN
1	B	57	ASN
1	B	79	ASN
1	B	98	GLN
1	B	104	ASN
1	B	113	GLN
1	B	115	ASN
1	B	146	ASN
1	B	242	ASN
1	B	293	HIS
1	B	339	ASN
1	B	500	ASN
1	B	576	GLN
1	B	580	ASN
1	B	593	ASN
1	B	613	GLN

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 16 ligands modelled in this entry, 12 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$
6	MUR	B	1669	-	17,17,17	1.42	2 (11%)	21,24,24	1.89	7 (33%)
6	MUR	A	1670	-	17,17,17	1.41	2 (11%)	21,24,24	1.91	8 (38%)
5	1W8	A	1669	-	43,43,43	0.99	3 (6%)	54,62,62	1.09	3 (5%)
4	AI8	A	1403	1	39,42,42	3.66	22 (56%)	43,58,58	4.88	20 (46%)

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
6	MUR	B	1669	-	-	3/10/30/30	0/1/1/1
6	MUR	A	1670	-	-	4/10/30/30	0/1/1/1
5	1W8	A	1669	-	-	15/24/57/57	0/5/5/5
4	AI8	A	1403	1	-	9/24/47/47	0/3/4/4

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1403	AI8	C4-S1	-13.86	1.48	1.82
4	A	1403	AI8	O7-N4	-6.34	1.30	1.42
4	A	1403	AI8	C16-C15	5.85	1.43	1.36
4	A	1403	AI8	C11-N3	5.63	1.45	1.34
4	A	1403	AI8	C18-N8	5.33	1.45	1.34
4	A	1403	AI8	C13-S2	5.06	1.82	1.75
4	A	1403	AI8	C17-C15	5.00	1.55	1.47
5	A	1669	1W8	C4-S	4.17	1.80	1.73
4	A	1403	AI8	C7-N2	3.99	1.47	1.37
4	A	1403	AI8	C18-S4	-3.97	1.66	1.73

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1403	AI8	O7-C21	-3.76	1.37	1.44
4	A	1403	AI8	O6-C11	-3.39	1.17	1.23
6	B	1669	MUR	O5-C5	-3.18	1.36	1.44
4	A	1403	AI8	C8-S1	-3.16	1.75	1.82
6	A	1670	MUR	O5-C5	-3.13	1.36	1.44
4	A	1403	AI8	C13-N5	3.12	1.37	1.30
6	B	1669	MUR	O5-C1	-2.93	1.35	1.42
5	A	1669	1W8	C12-S2	-2.88	1.72	1.75
4	A	1403	AI8	C12-C11	2.78	1.54	1.48
4	A	1403	AI8	S4-N7	-2.63	1.55	1.66
4	A	1403	AI8	C12-C14	2.62	1.49	1.46
4	A	1403	AI8	C8-C9	2.59	1.55	1.51
4	A	1403	AI8	C7-C9	2.56	1.46	1.38
4	A	1403	AI8	C7-C10	2.56	1.52	1.48
4	A	1403	AI8	C18-N6	2.50	1.35	1.31
4	A	1403	AI8	C12-N4	-2.26	1.24	1.29
5	A	1669	1W8	C10-S2	-2.25	1.73	1.77
6	A	1670	MUR	O5-C1	-2.17	1.37	1.42
4	A	1403	AI8	C19-C17	2.01	1.42	1.39

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1403	AI8	C21-O7-N4	18.46	121.09	108.30
4	A	1403	AI8	C18-S4-N7	11.00	100.47	91.81
4	A	1403	AI8	S3-C13-N5	-10.10	108.73	115.15
4	A	1403	AI8	O7-N4-C12	8.84	123.92	111.59
4	A	1403	AI8	C8-S1-C4	8.68	110.26	94.36
4	A	1403	AI8	O5-C10-O4	6.80	140.09	123.90
4	A	1403	AI8	C12-C11-N3	6.38	124.32	114.27
4	A	1403	AI8	O4-C10-C7	-5.76	110.18	120.20
4	A	1403	AI8	S4-C18-N6	-5.24	104.44	112.14
5	A	1669	1W8	O-N-C2	4.79	118.27	111.59
4	A	1403	AI8	C16-S3-C13	4.46	95.26	89.06
4	A	1403	AI8	N8-C18-N6	4.44	129.21	124.05
4	A	1403	AI8	O5-C10-C7	-4.42	109.73	116.73
5	A	1669	1W8	C10-C9-N5	-4.13	111.90	121.91
6	A	1670	MUR	C6-C5-C4	3.71	122.14	113.02
6	B	1669	MUR	C1-C2-C3	3.65	116.61	110.10
4	A	1403	AI8	C15-C16-S3	-3.56	106.85	111.16
6	B	1669	MUR	C1-O5-C5	3.51	120.44	113.65
4	A	1403	AI8	C19-C17-C15	-3.47	116.98	120.87

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	1403	AI8	O6-C11-C12	-3.45	116.05	121.60
6	B	1669	MUR	C6-C5-C4	3.21	120.89	113.02
6	A	1670	MUR	C1-C2-C3	3.01	115.47	110.10
4	A	1403	AI8	C17-C15-C16	-2.97	123.02	126.54
6	B	1669	MUR	O1-C1-C2	2.72	114.57	108.96
6	A	1670	MUR	O5-C5-C4	-2.69	104.85	109.70
6	B	1669	MUR	O9-C8-O8	-2.62	118.14	124.08
4	A	1403	AI8	O7-C21-C24	2.61	115.63	109.10
6	A	1670	MUR	O3-C3-C2	2.51	115.03	108.89
6	A	1670	MUR	O1-C1-C2	2.46	114.04	108.96
6	B	1669	MUR	O5-C5-C4	-2.46	105.27	109.70
4	A	1403	AI8	C20-C17-C15	2.36	123.51	120.87
4	A	1403	AI8	S2-C13-N5	2.33	129.68	121.39
6	A	1670	MUR	O3-C7-C9	2.30	113.93	107.54
5	A	1669	1W8	C2-C3-N2	-2.25	118.69	122.55
6	B	1669	MUR	C4-C3-C2	2.24	115.80	111.37
6	A	1670	MUR	O9-C8-O8	-2.22	119.04	124.08
6	A	1670	MUR	O9-C8-C7	2.21	122.02	113.96
4	A	1403	AI8	C18-N6-C14	2.01	112.15	106.10

There are no chirality outliers.

All (31) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	1403	AI8	C11-C12-N4-O7
4	A	1403	AI8	C14-C12-N4-O7
4	A	1403	AI8	O5-C10-C7-N2
5	A	1669	1W8	C-C1-O-N
5	A	1669	1W8	N-C2-C3-N1
5	A	1669	1W8	O1-C5-N4-C6
5	A	1669	1W8	C2-C5-N4-C6
5	A	1669	1W8	O4-C21-C9-C10
6	A	1670	MUR	O3-C7-C8-O8
6	A	1670	MUR	O3-C7-C8-O9
6	B	1669	MUR	C8-C7-O3-C3
6	B	1669	MUR	O3-C7-C8-O9
6	B	1669	MUR	O3-C7-C8-O8
6	A	1670	MUR	C2-C3-O3-C7
6	A	1670	MUR	C9-C7-O3-C3
5	A	1669	1W8	N6-C12-S2-C10
5	A	1669	1W8	C3-C2-C5-O1
5	A	1669	1W8	C3-C2-C5-N4

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms
4	A	1403	AI8	N3-C11-C12-N4
5	A	1669	1W8	N6-C13-C15-C16
5	A	1669	1W8	N6-C13-C15-C19
4	A	1403	AI8	C16-C15-C17-C19
5	A	1669	1W8	C14-C13-C15-C16
4	A	1403	AI8	O6-C11-C12-N4
5	A	1669	1W8	N-C2-C3-N2
5	A	1669	1W8	C14-C13-C15-C19
4	A	1403	AI8	N3-C11-C12-C14
4	A	1403	AI8	O6-C11-C12-C14
5	A	1669	1W8	N-C2-C5-N4
5	A	1669	1W8	N-C2-C5-O1
4	A	1403	AI8	C16-C15-C17-C20

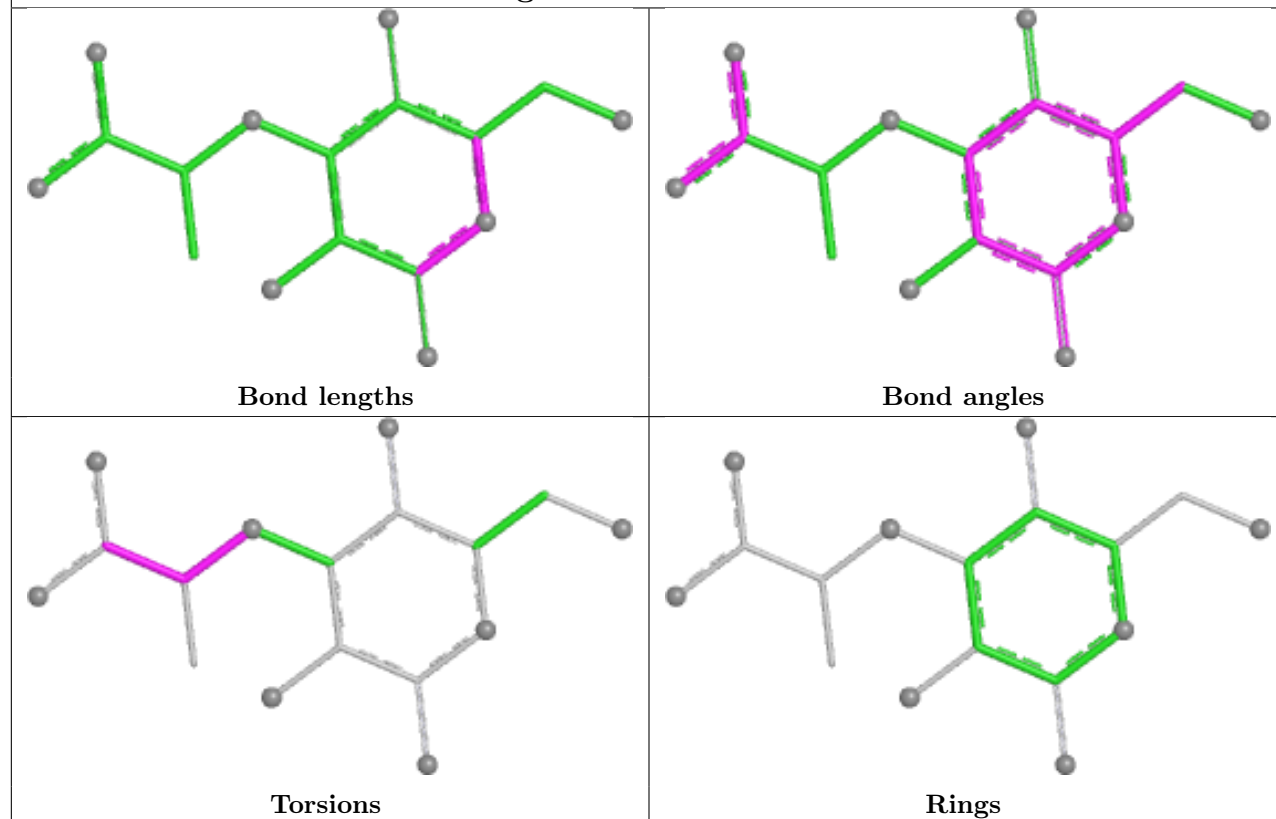
There are no ring outliers.

3 monomers are involved in 10 short contacts:

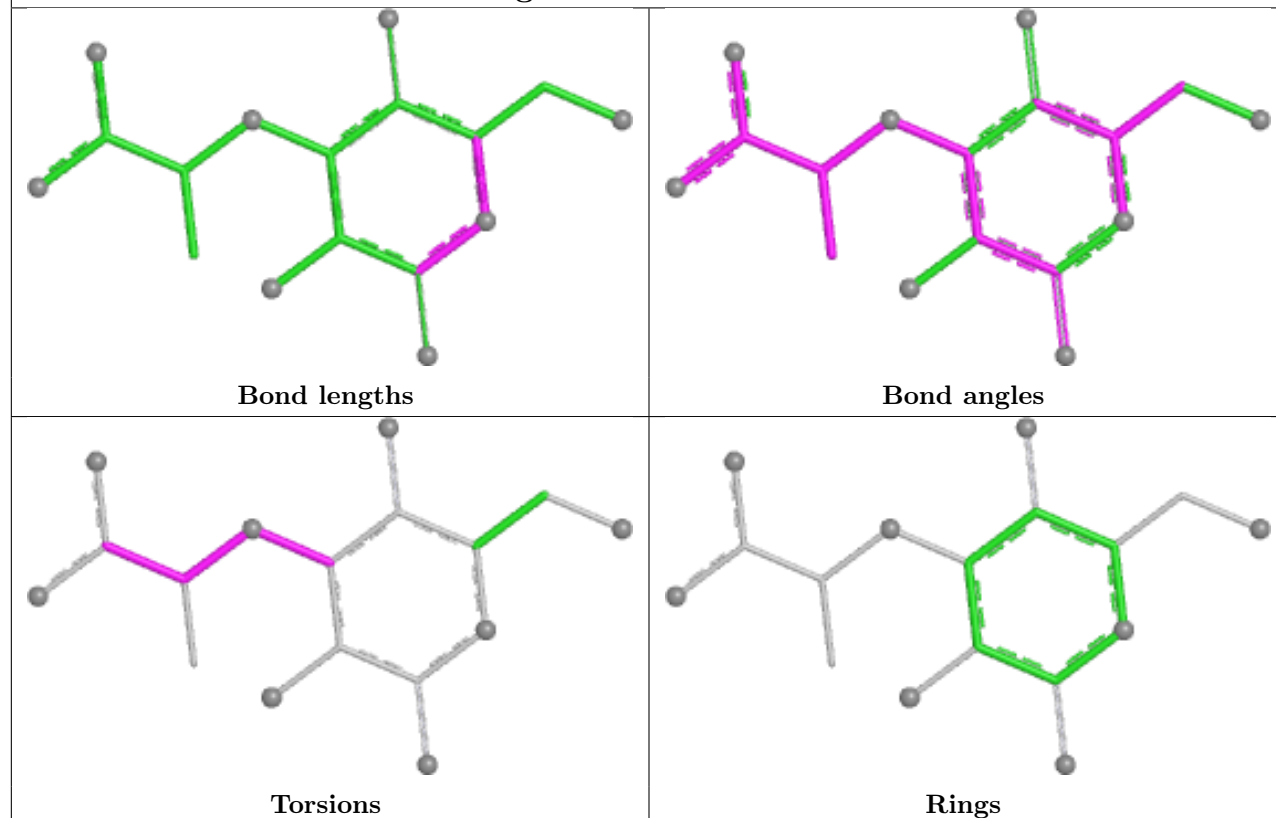
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	A	1670	MUR	3	0
5	A	1669	1W8	6	0
4	A	1403	AI8	1	0

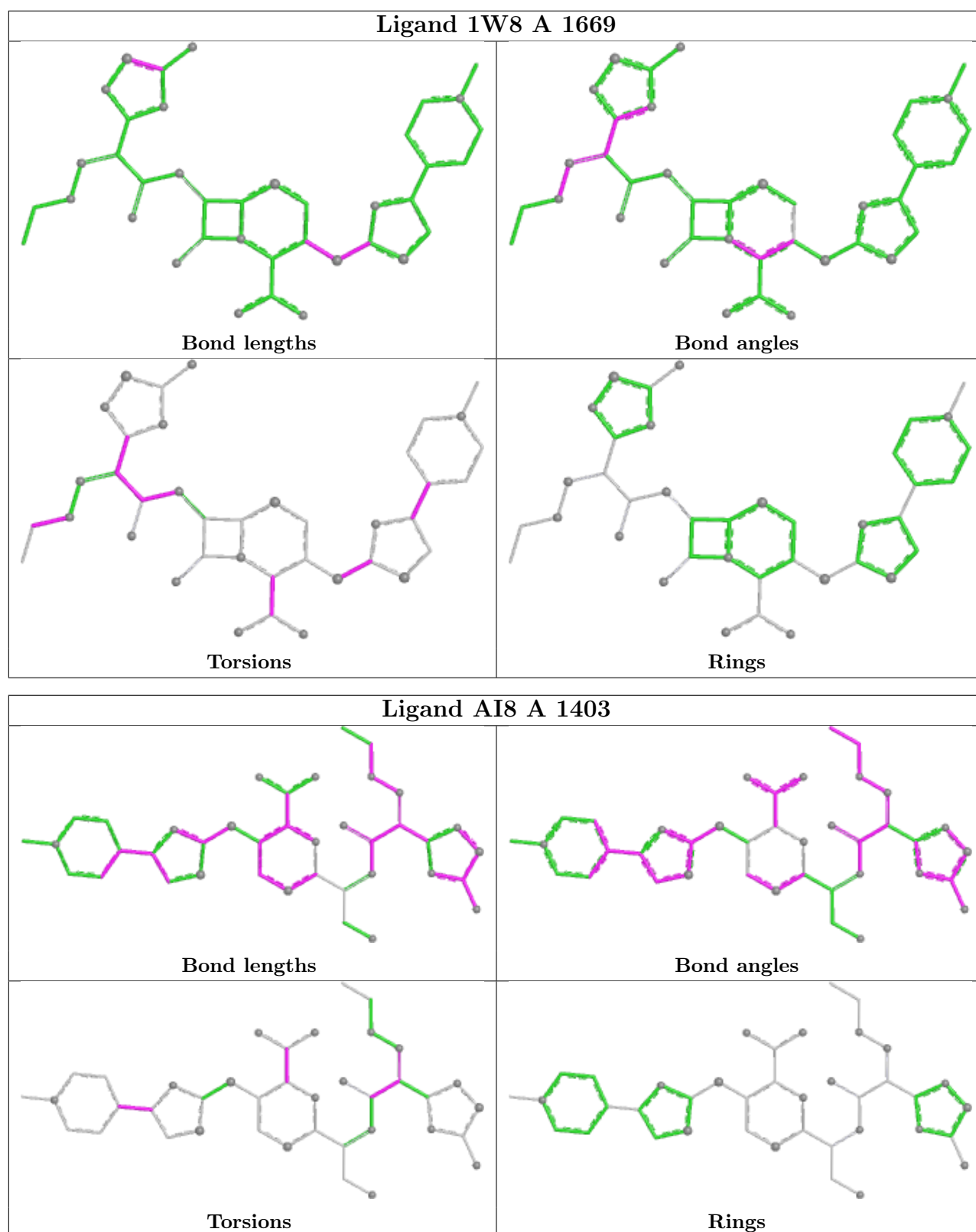
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand MUR B 1669



Ligand MUR A 1670





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	403:SER	C	404:THR	N	1.14

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	635/642 (98%)	0.52	33 (5%)	33 31	42, 62, 95, 129	0
1	B	642/642 (100%)	0.58	41 (6%)	25 24	43, 63, 104, 148	0
All	All	1277/1284 (99%)	0.55	74 (5%)	29 27	42, 63, 100, 148	0

All (74) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	611	GLY	5.0
1	A	223	TYR	5.0
1	A	603	LEU	4.2
1	A	224	LEU	3.9
1	B	603	LEU	3.6
1	B	272	TYR	3.5
1	B	610	THR	3.4
1	A	503	ILE	3.4
1	B	608	GLY	3.3
1	A	220	MET	3.3
1	B	267	LYS	3.2
1	B	506	LYS	3.1
1	A	402	GLY	3.0
1	B	184	LYS	2.9
1	A	264	LEU	2.8
1	B	269	TYR	2.8
1	B	90	LYS	2.8
1	A	28	LYS	2.7
1	B	122	MET	2.7
1	A	273	LYS	2.7
1	A	88	VAL	2.7
1	B	262	GLU	2.7
1	B	121	GLY	2.7
1	A	612	ARG	2.6

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	27	ASP	2.6
1	B	270	LYS	2.6
1	B	223	TYR	2.6
1	B	264	LEU	2.5
1	A	230	LYS	2.5
1	B	607	GLN	2.5
1	B	265	LYS	2.5
1	A	441	TYR	2.4
1	B	27	ASP	2.4
1	B	87	LYS	2.4
1	B	504	SER	2.4
1	B	117	VAL	2.4
1	A	269	TYR	2.3
1	B	261	SER	2.3
1	A	602	GLU	2.3
1	B	113	GLN	2.3
1	B	88	VAL	2.3
1	B	86	LYS	2.3
1	A	508	LEU	2.2
1	A	226	ASP	2.2
1	A	87	LYS	2.2
1	B	273	LYS	2.2
1	A	227	PHE	2.2
1	B	91	ASN	2.2
1	B	204	ASN	2.2
1	B	606	LYS	2.2
1	A	85	ILE	2.2
1	A	221	ASP	2.2
1	B	116	PHE	2.2
1	B	505	ASN	2.2
1	B	28	LYS	2.2
1	B	609	GLU	2.2
1	A	491	ASP	2.1
1	B	56	ASP	2.1
1	A	84	LYS	2.1
1	B	387	LYS	2.1
1	A	476	SER	2.1
1	B	604	LYS	2.1
1	A	505	ASN	2.1
1	A	121	GLY	2.1
1	A	202	ASP	2.1
1	B	560	LYS	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	188	LYS	2.0
1	B	306	SER	2.0
1	B	308	THR	2.0
1	B	585	GLU	2.0
1	A	90	LYS	2.0
1	B	102	LYS	2.0
1	A	122	MET	2.0
1	A	186	ILE	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(\AA^2)	Q<0.9
2	CD	A	1008	1/1	0.50	0.22	297,297,297,297	0
2	CD	B	1006	1/1	0.65	0.21	300,300,300,300	0
5	1W8	A	1669	39/39	0.65	0.22	130,134,136,136	0
6	MUR	B	1669	17/17	0.72	0.17	73,85,100,102	0
6	MUR	A	1670	17/17	0.82	0.13	37,51,68,73	0
4	AI8	A	1403	39/39	0.88	0.15	54,75,94,95	0
2	CD	A	1004	1/1	0.97	0.10	135,135,135,135	0
2	CD	B	1007	1/1	0.97	0.06	93,93,93,93	0
3	CL	B	1009	1/1	0.98	0.08	50,50,50,50	0
3	CL	A	1010	1/1	0.99	0.06	48,48,48,48	0
3	CL	A	1011	1/1	0.99	0.05	50,50,50,50	0
2	CD	B	1002	1/1	0.99	0.03	52,52,52,52	0
3	CL	B	1012	1/1	0.99	0.05	57,57,57,57	0
2	CD	A	1003	1/1	1.00	0.05	62,62,62,62	0
2	CD	A	1001	1/1	1.00	0.03	52,52,52,52	0

Continued on next page...

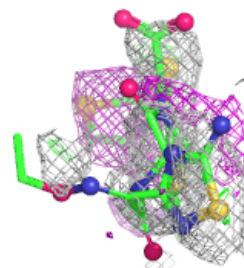
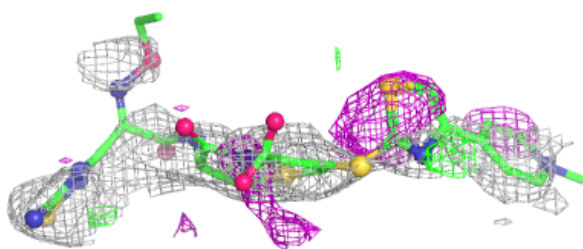
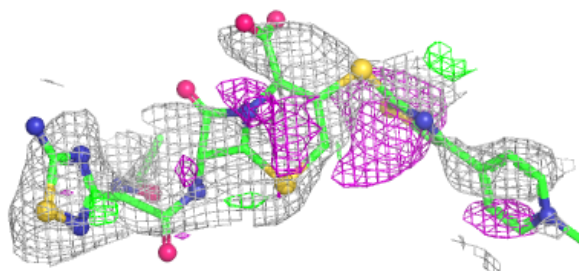
Continued from previous page...

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	CD	A	1005	1/1	1.00	0.02	57,57,57,57	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.

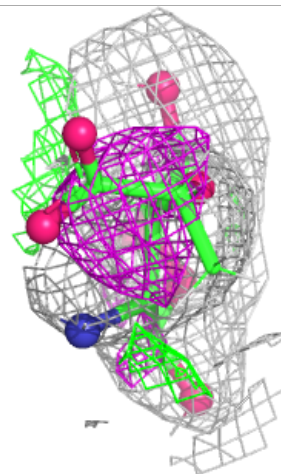
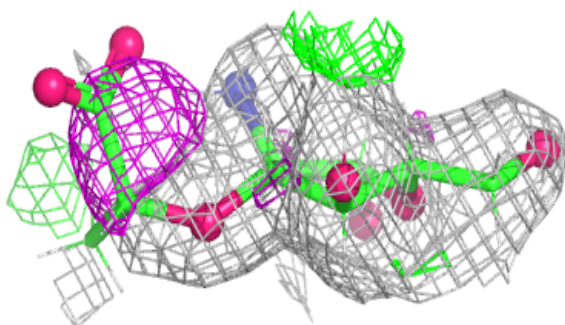
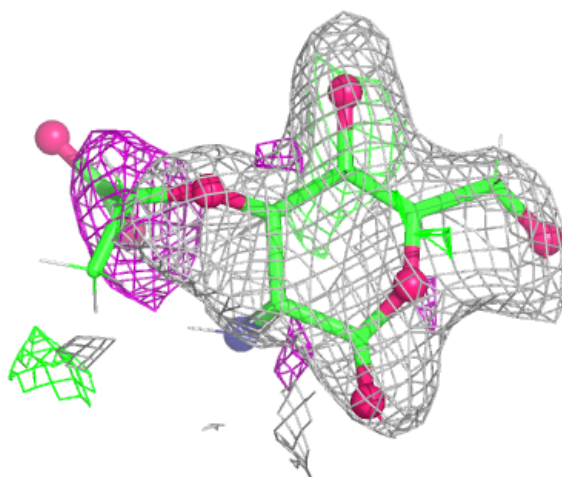
Electron density around 1W8 A 1669:

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



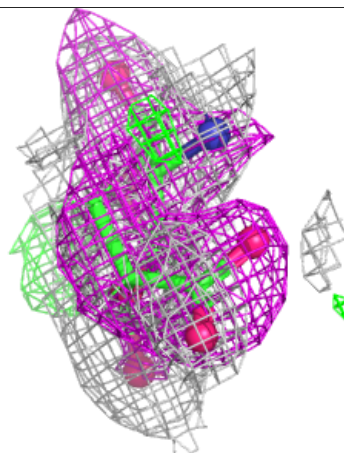
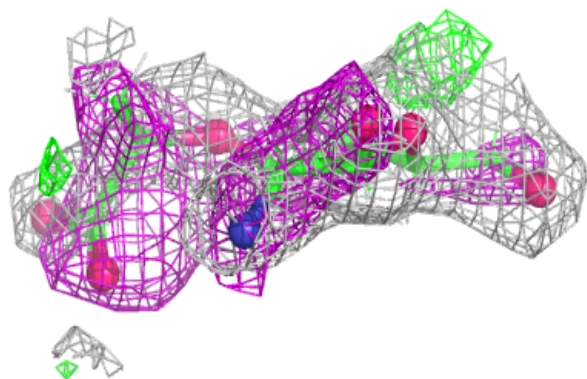
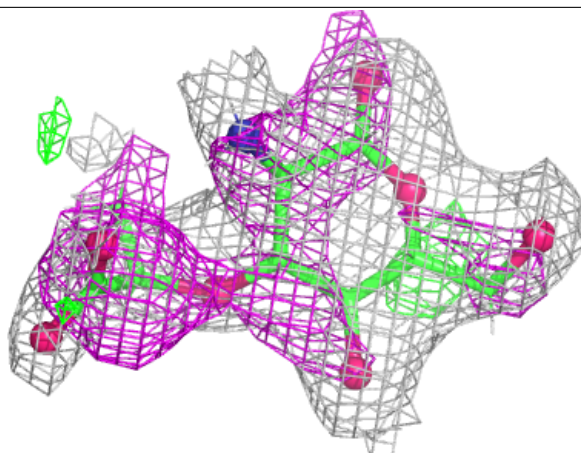
Electron density around MUR B 1669:

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

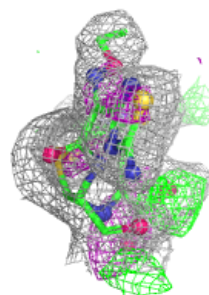
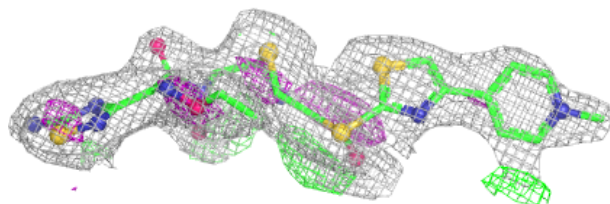
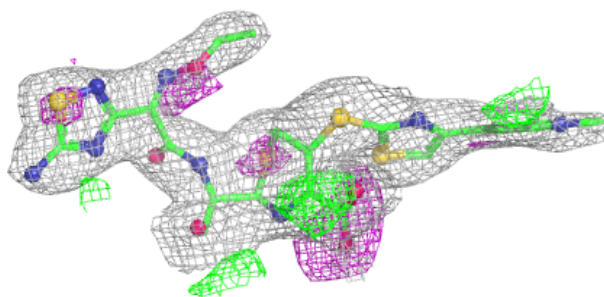


Electron density around MUR A 1670:

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

**Electron density around AI8 A 1403:**

$2mF_o-DF_c$ (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.