



Full wwPDB X-ray Structure Validation Report ⓘ

Oct 12, 2026 – 10:22 am BST

PDB ID : 30FA / pdb_000030fa
Title : Crystal structure of carbonic anhydrase XII with methyl 4-benzylsulfanyl-3-sulfamoyl-benzoate
Authors : Paketuryte-Latve, V.; Smirnov, A.; Manakova, E.N.; Grazulis, S.
Deposited on : 2026-04-22
Resolution : 1.13 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 Phenix2.2
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.2
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	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

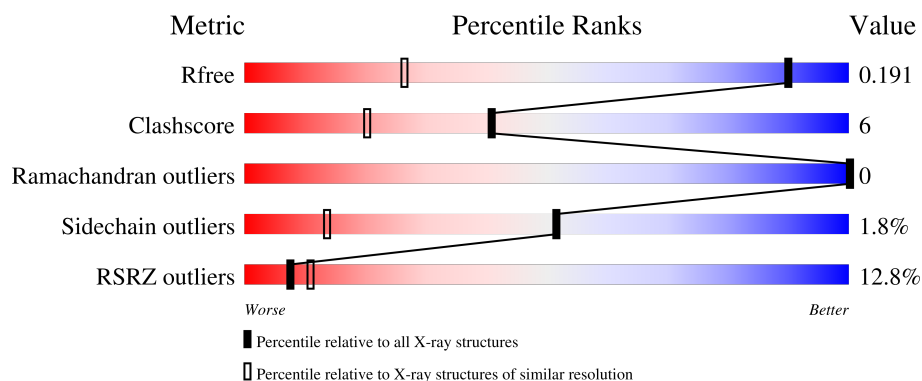
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.13 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	1985 (1.14-1.10)
Clashscore	190562	2021 (1.14-1.10)
Ramachandran outliers	187476	1978 (1.14-1.10)
Sidechain outliers	187428	1974 (1.14-1.10)
RSRZ outliers	180081	1984 (1.14-1.10)

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	9% 88% 11% .
1	B	263	8% 90% 9% ..
1	C	263	29% 87% 10% ..
1	D	263	5% 93% 6% .

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
4	PEG	A	303	-	-	X	-
4	PEG	B	303	-	-	X	-
5	EDO	A	304	-	-	X	-
5	EDO	D	304	-	X	-	-

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 9816 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	8	0
			2153	1368	366	412	7			
1	B	261	Total	C	N	O	S	0	12	0
			2193	1391	372	422	8			
1	C	261	Total	C	N	O	S	0	4	0
			2104	1341	355	400	8			
1	D	260	Total	C	N	O	S	0	5	0
			2133	1353	363	410	7			

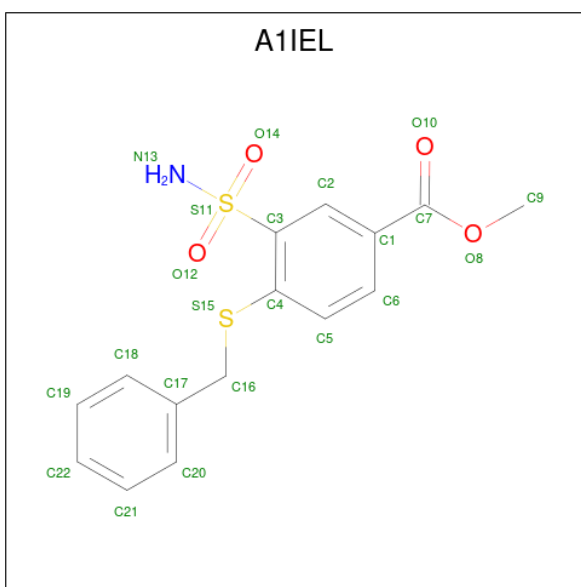
There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	initiating methionine	UNP O43570
B	1	MET	-	initiating methionine	UNP O43570
C	1	MET	-	initiating methionine	UNP O43570
D	1	MET	-	initiating methionine	UNP O43570

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

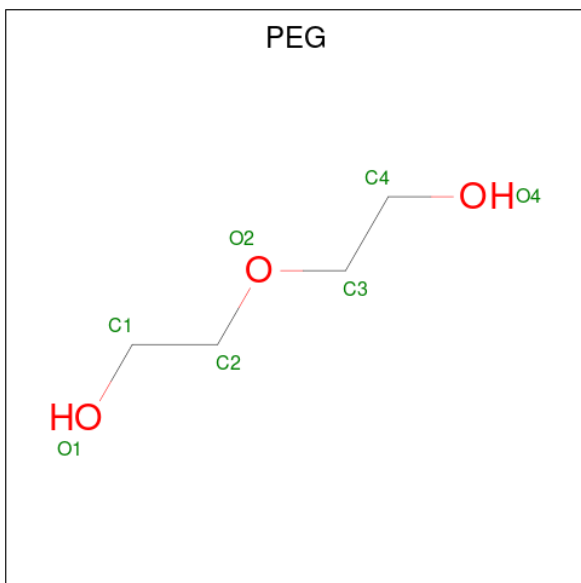
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		
2	D	1	Total	Zn	0	0
			1	1		

- Molecule 3 is methyl 4-(phenylmethylsulfanyl)-3-sulfamoyl-benzoate (CCD ID: A1IEL) (formula: C₁₅H₁₅NO₄S₂) (labeled as "Ligand of Interest" by depositor).



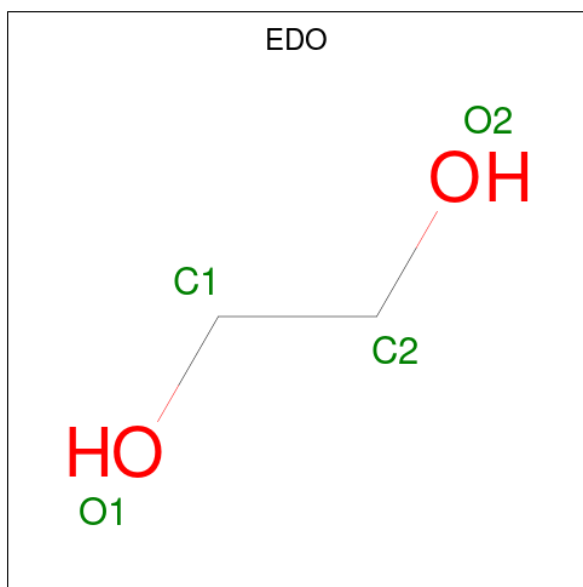
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			22	15	1	4	2		
3	B	1	Total	C	N	O	S	0	0
			22	15	1	4	2		
3	C	1	Total	C	N	O	S	0	0
			22	15	1	4	2		
3	D	1	Total	C	N	O	S	0	0
			22	15	1	4	2		

- Molecule 4 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			7	4	3		
4	B	1	Total	C	O	0	0
			7	4	3		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	281	Total	O	0	0
			281	281		

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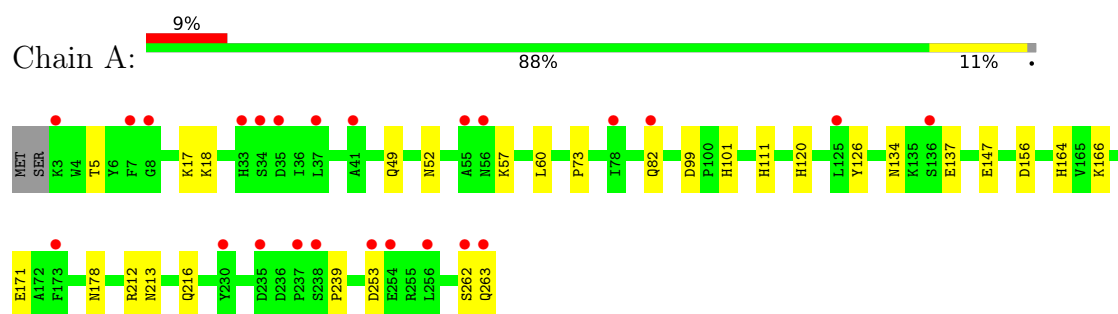
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	277	Total 277	O 277	0	0
6	C	229	Total 229	O 229	0	0
6	D	312	Total 312	O 312	0	0

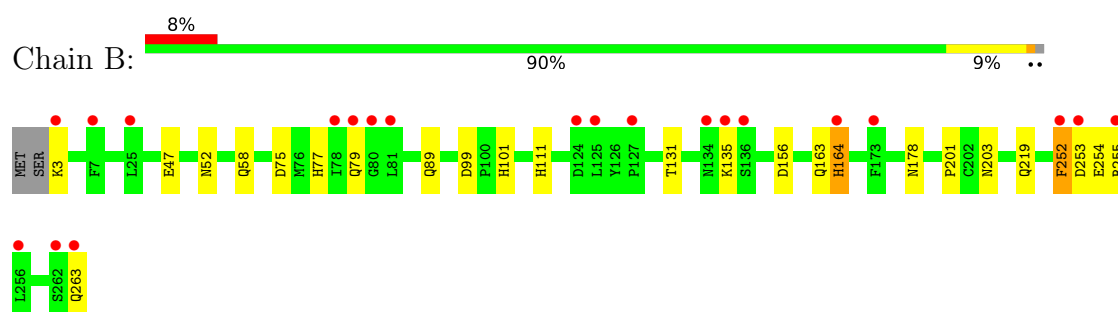
3 Residue-property plots [i](#)

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.

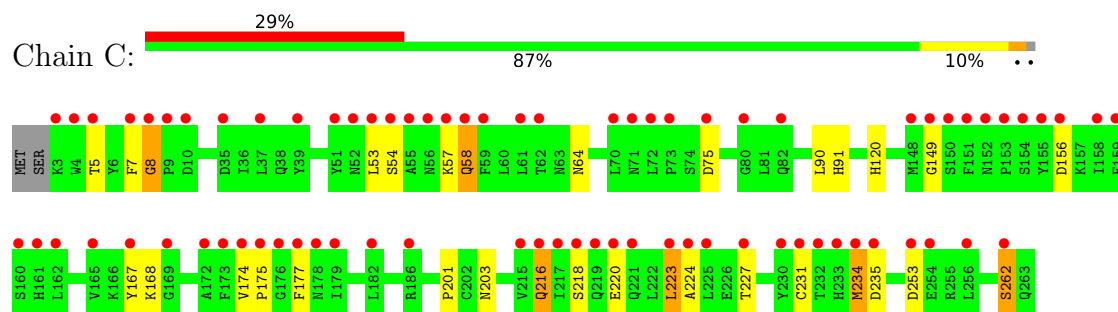
• Molecule 1: Carbonic anhydrase 12



• Molecule 1: Carbonic anhydrase 12

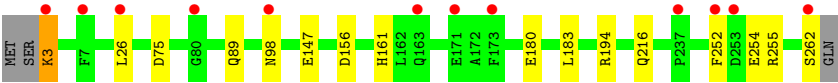


• Molecule 1: Carbonic anhydrase 12



• Molecule 1: Carbonic anhydrase 12





4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	77.22Å 74.07Å 91.65Å 90.00° 108.68° 90.00°	Depositor
Resolution (Å)	86.82 – 1.13 86.82 – 1.13	Depositor EDS
% Data completeness (in resolution range)	97.3 (86.82-1.13) 97.3 (86.82-1.13)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.50 (at 1.13Å)	Xtrriage
Refinement program	REFMAC 5.8.0232	Depositor
R, R_{free}	0.157 , 0.186 0.166 , 0.191	Depositor DCC
R_{free} test set	35287 reflections (9.68%)	wwPDB-VP
Wilson B-factor (Å ²)	11.7	Xtrriage
Anisotropy	0.108	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 47.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	9816	wwPDB-VP
Average B, all atoms (Å ²)	19.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 37.39 % 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 4.3185e-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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: ZN, PEG, EDO, A1IEL

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	0.88	0/2217	1.13	7/3019 (0.2%)
1	B	0.89	1/2258 (0.0%)	1.12	5/3074 (0.2%)
1	C	1.01	5/2168 (0.2%)	1.34	13/2954 (0.4%)
1	D	0.91	1/2197 (0.0%)	1.10	5/2992 (0.2%)
All	All	0.93	7/8840 (0.1%)	1.18	30/12039 (0.2%)

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	B	0	1
1	C	0	1
All	All	0	2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	223	LEU	C-N	11.97	1.50	1.34
1	D	161	HIS	CE1-NE2	9.48	1.42	1.32
1	B	77	HIS	CE1-NE2	5.91	1.38	1.32
1	C	227	THR	CB-OG1	5.83	1.53	1.43
1	C	262	SER	CA-CB	-5.75	1.44	1.53
1	C	224	ALA	N-CA	-5.08	1.39	1.46
1	C	8	GLY	CA-C	5.03	1.59	1.51

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	75	ASP	CA-CB-CG	11.69	124.29	112.60
1	C	220	GLU	CB-CA-C	-11.13	92.09	110.79
1	A	253	ASP	CA-CB-CG	8.63	121.23	112.60
1	D	252	PHE	CA-CB-CG	-7.50	106.30	113.80
1	C	177	PHE	CA-CB-CG	7.38	121.18	113.80
1	C	5	THR	CA-CB-OG1	-7.30	98.66	109.60
1	C	58	GLN	CB-CG-CD	7.02	124.53	112.60
1	C	91	HIS	CA-CB-CG	-6.68	107.12	113.80
1	D	75	ASP	CA-CB-CG	6.39	119.00	112.60
1	A	126	TYR	O-C-N	-6.36	116.33	121.80
1	B	263	GLN	CA-C-O	-6.02	110.56	120.80
1	A	239	PRO	CB-CA-C	6.01	118.92	111.23
1	C	120	HIS	CA-CB-CG	5.94	119.74	113.80
1	B	164	HIS	CA-CB-CG	5.74	119.54	113.80
1	C	75	ASP	CA-CB-CG	-5.65	106.95	112.60
1	B	163	GLN	CB-CG-CD	5.64	122.19	112.60
1	C	64	ASN	CA-C-N	-5.47	114.47	122.46
1	C	64	ASN	C-N-CA	-5.47	114.47	122.46
1	A	120	HIS	CA-CB-CG	5.44	119.24	113.80
1	B	219	GLN	CB-CG-CD	5.37	121.73	112.60
1	D	98	ASN	CA-C-O	5.35	125.96	119.11
1	C	58	GLN	CB-CA-C	5.24	120.53	109.79
1	A	111	HIS	CB-CA-C	-5.18	99.92	109.46
1	D	194	ARG	CA-C-N	-5.18	118.17	122.16
1	D	194	ARG	C-N-CA	-5.18	118.17	122.16
1	C	234	MET	CA-C-N	-5.15	114.48	122.67
1	C	234	MET	C-N-CA	-5.15	114.48	122.67
1	C	253	ASP	CB-CA-C	5.14	118.64	109.38
1	A	5	THR	CA-CB-OG1	-5.11	101.94	109.60
1	A	137	GLU	CB-CG-CD	5.10	121.28	112.60

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	252[B]	PHE	Mainchain
1	C	223	LEU	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	2153	0	2033	25	0
1	B	2193	0	2061	45	0
1	C	2104	0	1983	16	0
1	D	2133	0	2005	9	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	22	0	0	0	0
3	B	22	0	0	0	0
3	C	22	0	0	0	0
3	D	22	0	0	0	0
4	A	7	0	10	5	0
4	B	7	0	10	12	0
5	A	16	0	23	9	0
5	B	4	0	6	0	0
5	D	8	0	12	3	0
6	A	281	0	0	10	0
6	B	277	0	0	14	0
6	C	229	0	0	2	0
6	D	312	0	0	6	0
All	All	9816	0	8143	109	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 6.

All (109) 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:D:304:EDO:C2	5:D:304:EDO:O2	1.64	1.40
5:A:307:EDO:H11	6:A:419:HOH:O	1.42	1.18
1:B:252[B]:PHE:CZ	1:B:255:ARG:HB3	1.83	1.12
1:B:252[B]:PHE:CZ	1:B:255:ARG:CB	2.48	0.97
1:B:252[A]:PHE:CZ	1:B:255:ARG:HB3	2.02	0.94
1:C:201[A]:PRO:HG2	1:C:203:ASN:OD1	1.69	0.93
5:A:307:EDO:C1	6:A:419:HOH:O	2.06	0.91
5:A:304:EDO:H12	6:A:407:HOH:O	1.73	0.88
1:B:253[B]:ASP:OD2	1:B:254[B]:GLU:HG3	1.72	0.88
1:B:252[B]:PHE:CE1	1:B:255:ARG:CB	2.57	0.87

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:134:ASN:HB2	6:A:609:HOH:O	1.75	0.86
1:D:255:ARG:CD	6:D:490:HOH:O	2.24	0.85
1:C:58:GLN:HG2	1:C:175:PRO:HA	1.58	0.84
1:A:18[B]:LYS:HG3	4:A:303:PEG:H31	1.60	0.83
1:A:82:GLN:HG3	6:A:549:HOH:O	1.80	0.82
1:B:201[A]:PRO:HG2	1:B:203[A]:ASN:OD1	1.80	0.82
1:B:255:ARG:CD	6:B:472:HOH:O	2.29	0.81
1:B:252[A]:PHE:CZ	1:B:255:ARG:CB	2.66	0.78
1:B:252[B]:PHE:CE1	1:B:255:ARG:HB2	2.18	0.77
1:A:18[A]:LYS:HD2	4:A:303:PEG:H12	1.67	0.76
1:A:212:ARG:HH11	1:A:213:ASN:HD21	1.34	0.76
4:B:303:PEG:C3	6:B:401:HOH:O	2.36	0.73
1:B:252[B]:PHE:CD1	1:B:255:ARG:NE	2.57	0.72
1:B:252[A]:PHE:O	1:B:254[A]:GLU:N	2.22	0.72
1:B:252[B]:PHE:CE1	1:B:255:ARG:HB3	2.24	0.71
1:A:18[A]:LYS:HD2	4:A:303:PEG:C1	2.22	0.69
1:A:18[B]:LYS:HG3	4:A:303:PEG:H12	1.75	0.68
1:B:111:HIS:NE2	4:B:303:PEG:H22	2.08	0.68
1:C:58:GLN:HG3	6:C:590:HOH:O	1.92	0.68
1:D:255:ARG:HG2	6:D:490:HOH:O	1.92	0.68
1:B:255:ARG:HG2	6:B:472:HOH:O	1.93	0.68
1:D:255:ARG:CG	6:D:490:HOH:O	2.42	0.68
1:A:57:LYS:NZ	5:A:304:EDO:H21	2.09	0.67
1:B:252[B]:PHE:CE1	1:B:255:ARG:CD	2.77	0.67
1:D:255:ARG:HD2	6:D:490:HOH:O	1.93	0.67
1:B:164:HIS:CD2	6:B:493:HOH:O	2.47	0.67
1:B:131:THR:O	1:B:135:LYS:NZ	2.28	0.66
1:B:252[B]:PHE:CZ	1:B:255:ARG:HB2	2.30	0.66
1:C:168:LYS:HB2	1:C:231[B]:CYS:O	1.97	0.64
1:B:252[B]:PHE:HE1	1:B:255:ARG:HD2	1.62	0.64
1:C:149:GLY:HA3	1:C:216:GLN:HG2	1.81	0.63
1:B:111:HIS:CD2	4:B:303:PEG:H42	2.33	0.62
1:B:252[B]:PHE:CE1	1:B:255:ARG:NE	2.67	0.62
1:C:7:PHE:CD2	1:C:8:GLY:N	2.68	0.62
4:B:303:PEG:C2	6:B:401:HOH:O	2.47	0.62
1:B:252[A]:PHE:CE1	1:B:255:ARG:CB	2.84	0.61
1:B:255:ARG:CG	6:B:472:HOH:O	2.49	0.60
1:B:252[A]:PHE:CE1	1:B:255:ARG:HB2	2.36	0.60
1:A:17[B]:LYS:HD2	6:A:512:HOH:O	2.01	0.60
1:B:255:ARG:HD2	6:B:472:HOH:O	2.00	0.59
1:B:252[B]:PHE:HD1	1:B:255:ARG:CZ	2.16	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:111:HIS:NE2	4:B:303:PEG:C2	2.65	0.59
1:A:73:PRO:CB	5:A:304:EDO:H22	2.34	0.58
1:B:252[A]:PHE:CE1	1:B:255:ARG:NE	2.72	0.58
1:D:3:LYS:N	6:D:401:HOH:O	2.36	0.58
1:B:252[B]:PHE:CD1	1:B:255:ARG:CZ	2.87	0.58
1:C:58:GLN:NE2	1:C:175:PRO:HB3	2.19	0.58
1:B:252[B]:PHE:CE1	1:B:255:ARG:HD2	2.38	0.57
5:D:304:EDO:C2	5:D:304:EDO:HO2	2.08	0.56
5:D:304:EDO:H11	6:D:639:HOH:O	2.06	0.55
1:A:73:PRO:CG	5:A:304:EDO:H22	2.37	0.55
1:A:164:HIS:HD2	6:A:444:HOH:O	1.88	0.55
1:A:73:PRO:HG3	5:A:304:EDO:H22	1.89	0.54
1:B:252[B]:PHE:CD1	1:B:255:ARG:HB2	2.44	0.52
1:B:252[A]:PHE:CD1	1:B:255:ARG:NE	2.78	0.52
1:B:252[A]:PHE:CD1	1:B:255:ARG:HB2	2.45	0.51
1:B:252[A]:PHE:CE2	1:B:255:ARG:CB	2.94	0.49
1:C:58:GLN:CG	1:C:175:PRO:HA	2.38	0.49
4:B:303:PEG:H12	6:B:401:HOH:O	2.13	0.49
1:A:212:ARG:NH1	1:A:213:ASN:HD21	2.07	0.48
1:B:252[A]:PHE:CZ	1:B:255:ARG:HB2	2.44	0.48
1:B:252[A]:PHE:CE2	1:B:255:ARG:C	2.91	0.48
1:D:26:LEU:HD22	1:D:255:ARG:HD3	1.95	0.48
1:A:57:LYS:NZ	5:A:304:EDO:C2	2.77	0.48
1:B:252[A]:PHE:CE1	1:B:255:ARG:CD	2.97	0.48
1:C:149:GLY:O	1:C:218:SER:HA	2.14	0.47
1:D:3:LYS:HB2	1:D:3:LYS:HE2	1.74	0.47
4:B:303:PEG:C4	6:B:401:HOH:O	2.61	0.47
4:B:303:PEG:H21	4:B:303:PEG:H41	1.49	0.47
1:D:180[A]:GLU:HG3	1:D:183:LEU:HD12	1.97	0.47
1:A:57:LYS:HZ3	5:A:304:EDO:H21	1.80	0.46
1:C:57:LYS:O	1:C:58:GLN:HG2	2.16	0.46
1:A:17[B]:LYS:CD	6:A:512:HOH:O	2.63	0.45
4:B:303:PEG:C1	6:B:401:HOH:O	2.64	0.45
4:B:303:PEG:H31	6:B:566:HOH:O	2.17	0.45
1:C:167:TYR:CD1	1:C:234:MET:HA	2.51	0.45
1:A:60:LEU:HD11	1:A:171[A]:GLU:HB3	1.98	0.45
1:A:18[A]:LYS:NZ	4:A:303:PEG:O1	2.39	0.44
1:A:147:GLU:O	1:A:216[B]:GLN:HA	2.17	0.44
1:B:58:GLN:HG3	6:B:530:HOH:O	2.17	0.44
1:B:99:ASP:OD1	1:B:101:HIS:HD2	2.01	0.44
1:D:147[A]:GLU:HG3	1:D:216:GLN:HG2	1.98	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:252[B]:PHE:CE2	1:B:255:ARG:C	2.96	0.43
1:C:53:LEU:O	1:C:54:SER:C	2.61	0.43
1:B:252[B]:PHE:HD1	1:B:255:ARG:NH2	2.17	0.43
1:A:52:ASN:HA	1:A:178:ASN:HA	2.02	0.42
1:B:52:ASN:HA	1:B:178:ASN:HA	2.02	0.42
1:A:18[A]:LYS:HG2	6:A:647:HOH:O	2.20	0.42
1:A:82:GLN:CG	6:A:549:HOH:O	2.55	0.42
1:A:99:ASP:OD1	1:A:101:HIS:HD2	2.03	0.42
1:B:111:HIS:NE2	4:B:303:PEG:H42	2.34	0.42
1:C:167:TYR:CG	1:C:234:MET:HA	2.54	0.41
1:B:47:GLU:HB2	1:B:79:GLN:HB3	2.03	0.41
1:B:252[B]:PHE:HE1	1:B:255:ARG:CD	2.23	0.41
4:B:303:PEG:O2	6:B:401:HOH:O	2.22	0.41
1:A:17[A]:LYS:HE2	6:B:465:HOH:O	2.20	0.41
1:C:90:LEU:C	1:C:90:LEU:HD12	2.45	0.41
1:C:174:VAL:HA	1:C:175:PRO:HD3	1.91	0.40
1:C:8:GLY:HA3	6:C:489:HOH:O	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	267/263 (102%)	262 (98%)	5 (2%)	0	100	100
1	B	271/263 (103%)	263 (97%)	8 (3%)	0	100	100
1	C	263/263 (100%)	255 (97%)	8 (3%)	0	100	100
1	D	263/263 (100%)	256 (97%)	7 (3%)	0	100	100
All	All	1064/1052 (101%)	1036 (97%)	28 (3%)	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	239/235 (102%)	234 (98%)	5 (2%)	47	10
1	B	244/235 (104%)	240 (98%)	4 (2%)	55	18
1	C	232/235 (99%)	228 (98%)	4 (2%)	53	16
1	D	237/235 (101%)	231 (98%)	6 (2%)	42	7
All	All	952/940 (101%)	933 (98%)	19 (2%)	51	10

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	GLN
1	A	156	ASP
1	A	166	LYS
1	A	262	SER
1	A	263	GLN
1	B	3	LYS
1	B	89[A]	GLN
1	B	89[B]	GLN
1	B	156	ASP
1	C	156	ASP
1	C	216	GLN
1	C	235	ASP
1	C	262	SER
1	D	3	LYS
1	D	89[A]	GLN
1	D	89[B]	GLN
1	D	156	ASP
1	D	254	GLU
1	D	262	SER

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	13	ASN
1	A	33	HIS
1	A	49	GLN
1	A	66	HIS
1	A	110	GLN
1	A	164	HIS
1	A	213	ASN
1	B	58	GLN
1	B	96	ASN
1	B	101	HIS
1	B	110	GLN
1	B	164	HIS
1	B	244	ASN
1	B	250	GLN
1	C	13	ASN
1	C	38	GLN
1	C	56	ASN
1	C	58	GLN
1	C	79	GLN
1	C	213	ASN
1	C	250	GLN
1	D	13	ASN
1	D	58	GLN
1	D	250	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 17 ligands modelled in this entry, 4 are monoatomic - leaving 13 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	PEG	B	303	-	6,6,6	0.60	0	5,5,5	0.95	0
5	EDO	A	304	-	3,3,3	0.23	0	2,2,2	2.29	1 (50%)
3	A1IEL	D	302	2	23,23,23	2.69	13 (56%)	31,32,32	2.77	11 (35%)
3	A1IEL	A	302	2	23,23,23	1.36	4 (17%)	31,32,32	1.43	4 (12%)
5	EDO	A	307	-	3,3,3	1.80	2 (66%)	2,2,2	0.06	0
5	EDO	A	305	-	3,3,3	0.22	0	2,2,2	0.23	0
3	A1IEL	C	302	2	23,23,23	1.35	4 (17%)	31,32,32	1.54	7 (22%)
3	A1IEL	B	302	2	23,23,23	1.83	4 (17%)	31,32,32	1.98	8 (25%)
5	EDO	D	304	-	3,3,3	3.19	2 (66%)	2,2,2	1.55	0
5	EDO	D	303	-	3,3,3	0.82	0	2,2,2	0.69	0
5	EDO	B	304	-	3,3,3	0.89	0	2,2,2	0.01	0
5	EDO	A	306	-	3,3,3	0.32	0	2,2,2	0.58	0
4	PEG	A	303	-	6,6,6	0.30	0	5,5,5	0.38	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
4	PEG	B	303	-	-	4/4/4/4	-
5	EDO	A	304	-	-	0/1/1/1	-
3	A1IEL	D	302	2	-	3/17/17/17	0/2/2/2
3	A1IEL	A	302	2	-	2/17/17/17	0/2/2/2
5	EDO	A	307	-	-	0/1/1/1	-
5	EDO	A	305	-	-	1/1/1/1	-
3	A1IEL	C	302	2	-	3/17/17/17	0/2/2/2
3	A1IEL	B	302	2	-	2/17/17/17	0/2/2/2
5	EDO	D	304	-	-	1/1/1/1	-
5	EDO	D	303	-	-	0/1/1/1	-
5	EDO	B	304	-	-	1/1/1/1	-
5	EDO	A	306	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	PEG	A	303	-	-	4/4/4/4	-

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	302	A1IEL	C3-S11	6.89	1.86	1.77
3	B	302	A1IEL	C4-C3	5.34	1.49	1.40
3	D	302	A1IEL	C4-S15	-4.38	1.70	1.77
5	D	304	EDO	O2-C2	4.34	1.64	1.42
3	D	302	A1IEL	C1-C7	-4.25	1.40	1.50
3	D	302	A1IEL	C4-C3	4.19	1.47	1.40
3	B	302	A1IEL	C4-S15	-4.08	1.71	1.77
3	D	302	A1IEL	O10-C7	3.64	1.32	1.22
5	D	304	EDO	O1-C1	3.40	1.59	1.42
3	A	302	A1IEL	C4-S15	-2.90	1.72	1.77
3	C	302	A1IEL	C2-C3	-2.86	1.34	1.39
3	A	302	A1IEL	C1-C7	-2.75	1.43	1.50
3	D	302	A1IEL	C2-C1	2.74	1.43	1.39
3	D	302	A1IEL	C21-C20	-2.61	1.33	1.38
3	C	302	A1IEL	C4-C3	2.61	1.44	1.40
3	B	302	A1IEL	C1-C7	-2.54	1.44	1.50
3	C	302	A1IEL	C1-C7	-2.38	1.44	1.50
5	A	307	EDO	O2-C2	-2.27	1.30	1.42
3	B	302	A1IEL	C2-C3	-2.22	1.35	1.39
3	A	302	A1IEL	C20-C17	-2.21	1.34	1.38
3	A	302	A1IEL	C4-C3	2.21	1.44	1.40
3	D	302	A1IEL	O12-S11	-2.20	1.39	1.43
3	D	302	A1IEL	O8-C7	-2.15	1.28	1.33
3	D	302	A1IEL	C22-C21	2.15	1.43	1.38
3	D	302	A1IEL	O8-C9	-2.12	1.40	1.45
3	D	302	A1IEL	S11-N13	-2.10	1.56	1.60
5	A	307	EDO	O1-C1	2.10	1.52	1.42
3	D	302	A1IEL	C6-C1	2.09	1.42	1.39
3	C	302	A1IEL	O12-S11	2.03	1.47	1.43

All (31) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	302	A1IEL	O8-C7-C1	8.08	124.59	112.34
3	D	302	A1IEL	C4-C3-S11	-6.60	117.22	122.42
3	D	302	A1IEL	C9-O8-C7	6.26	127.89	115.83
3	B	302	A1IEL	C4-C3-S11	-5.62	117.99	122.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	302	A1IEL	C9-O8-C7	4.79	125.07	115.83
3	A	302	A1IEL	C9-O8-C7	3.74	123.04	115.83
3	D	302	A1IEL	O14-S11-C3	-3.68	101.89	107.29
3	D	302	A1IEL	C6-C1-C7	3.34	127.95	120.40
3	D	302	A1IEL	O8-C7-O10	-3.07	117.44	123.45
3	B	302	A1IEL	C5-C4-C3	-3.01	114.70	117.89
3	B	302	A1IEL	O8-C7-C1	2.97	116.85	112.34
3	B	302	A1IEL	C2-C3-S11	2.91	121.82	118.34
3	A	302	A1IEL	O12-S11-N13	2.90	111.66	107.36
3	D	302	A1IEL	C2-C3-S11	2.88	121.78	118.34
5	A	304	EDO	O1-C1-C2	2.85	132.38	111.91
3	B	302	A1IEL	O12-S11-N13	2.85	111.58	107.36
3	B	302	A1IEL	O14-S11-C3	-2.84	103.12	107.29
3	C	302	A1IEL	O8-C7-C1	2.73	116.48	112.34
3	D	302	A1IEL	C6-C1-C2	-2.53	116.25	119.24
3	C	302	A1IEL	C2-C3-C4	-2.50	118.44	120.61
3	C	302	A1IEL	O12-S11-N13	2.43	110.96	107.36
3	D	302	A1IEL	C2-C1-C7	-2.38	115.47	120.10
3	C	302	A1IEL	C4-C3-S11	-2.24	120.65	122.42
3	B	302	A1IEL	C19-C22-C21	2.22	124.05	119.93
3	B	302	A1IEL	C9-O8-C7	2.21	120.09	115.83
3	C	302	A1IEL	C5-C4-C3	2.17	120.18	117.89
3	C	302	A1IEL	C2-C3-S11	2.14	120.90	118.34
3	A	302	A1IEL	C5-C4-C3	-2.12	115.64	117.89
3	D	302	A1IEL	O12-S11-C3	2.10	110.36	107.29
3	D	302	A1IEL	C16-C17-C20	2.02	124.83	120.86
3	A	302	A1IEL	O8-C7-C1	2.00	115.38	112.34

There are no chirality outliers.

All (21) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	302	A1IEL	C4-C3-S11-O14
3	B	302	A1IEL	C4-C3-S11-O14
3	C	302	A1IEL	C4-C3-S11-O14
3	D	302	A1IEL	C4-C3-S11-O14
4	B	303	PEG	C4-C3-O2-C2
4	A	303	PEG	C1-C2-O2-C3
4	A	303	PEG	O2-C3-C4-O4
5	D	304	EDO	O1-C1-C2-O2
4	A	303	PEG	O1-C1-C2-O2
4	B	303	PEG	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
4	B	303	PEG	O2-C3-C4-O4
4	A	303	PEG	C4-C3-O2-C2
4	B	303	PEG	C1-C2-O2-C3
3	A	302	A1IEL	C4-C3-S11-N13
3	B	302	A1IEL	C4-C3-S11-N13
3	C	302	A1IEL	C4-C3-S11-N13
3	D	302	A1IEL	C4-C3-S11-N13
3	D	302	A1IEL	C2-C3-S11-O14
3	C	302	A1IEL	C2-C3-S11-O14
5	A	305	EDO	O1-C1-C2-O2
5	B	304	EDO	O1-C1-C2-O2

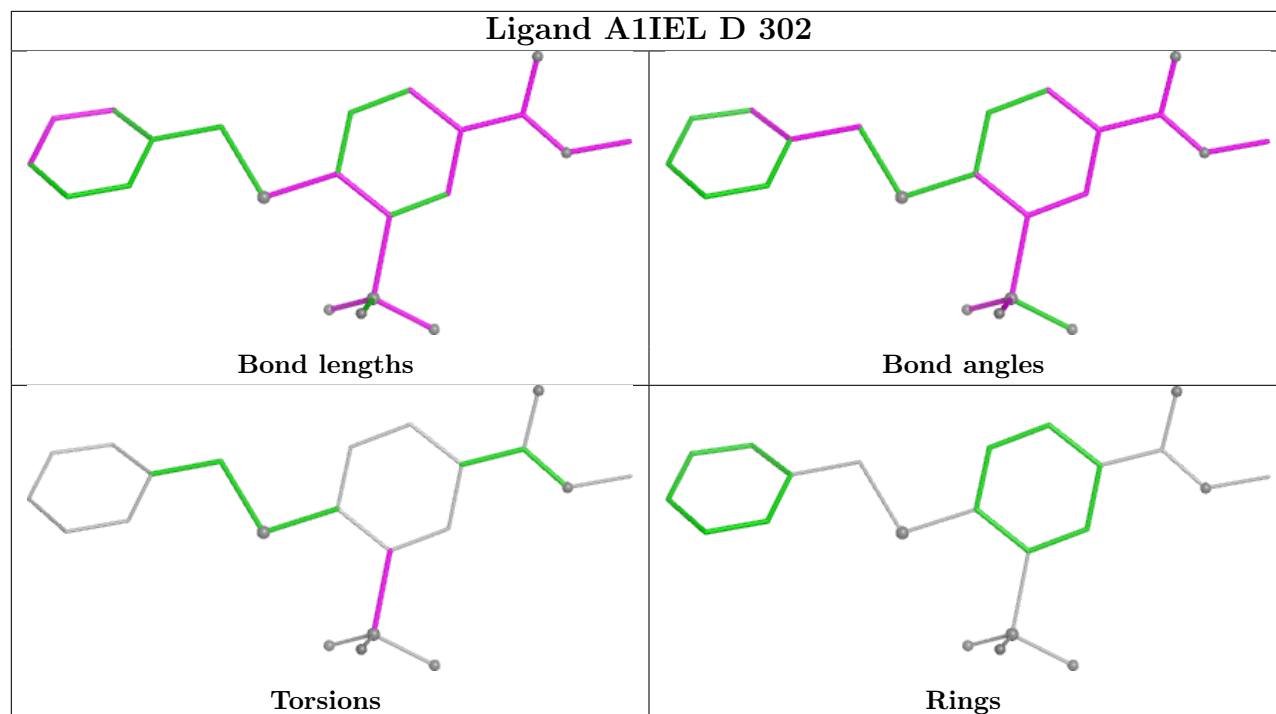
There are no ring outliers.

5 monomers are involved in 29 short contacts:

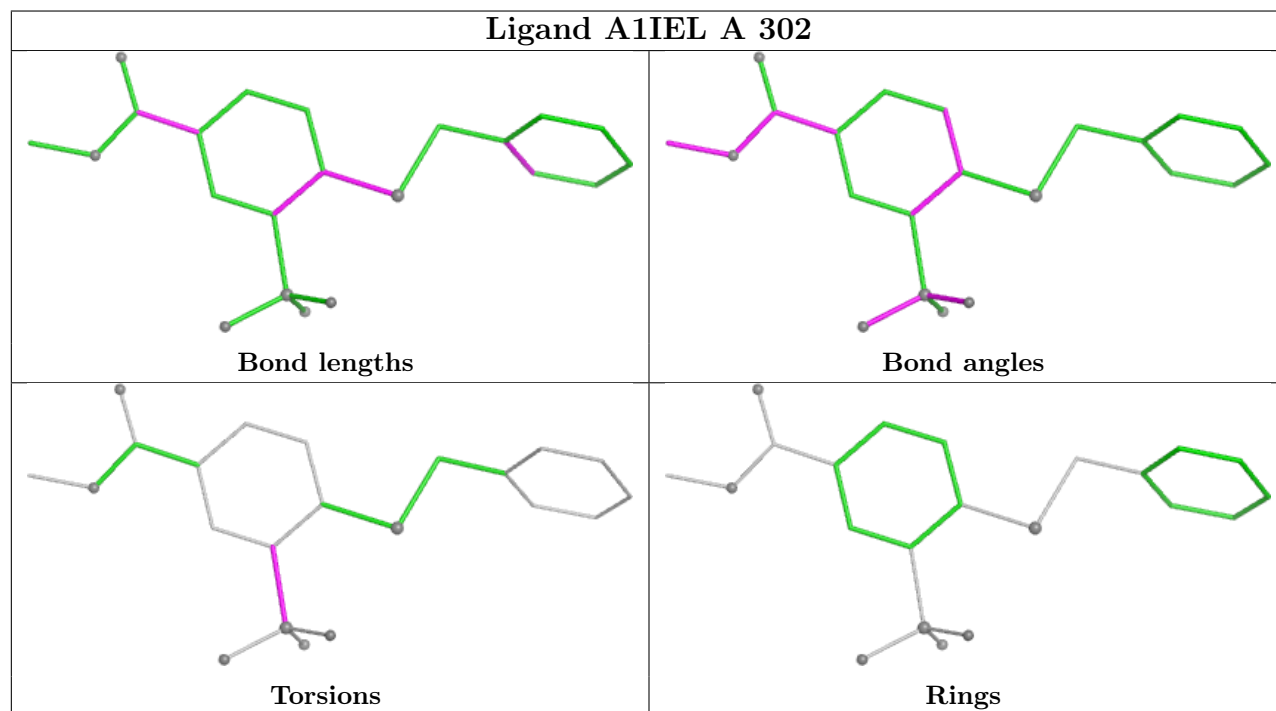
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	303	PEG	12	0
5	A	304	EDO	7	0
5	A	307	EDO	2	0
5	D	304	EDO	3	0
4	A	303	PEG	5	0

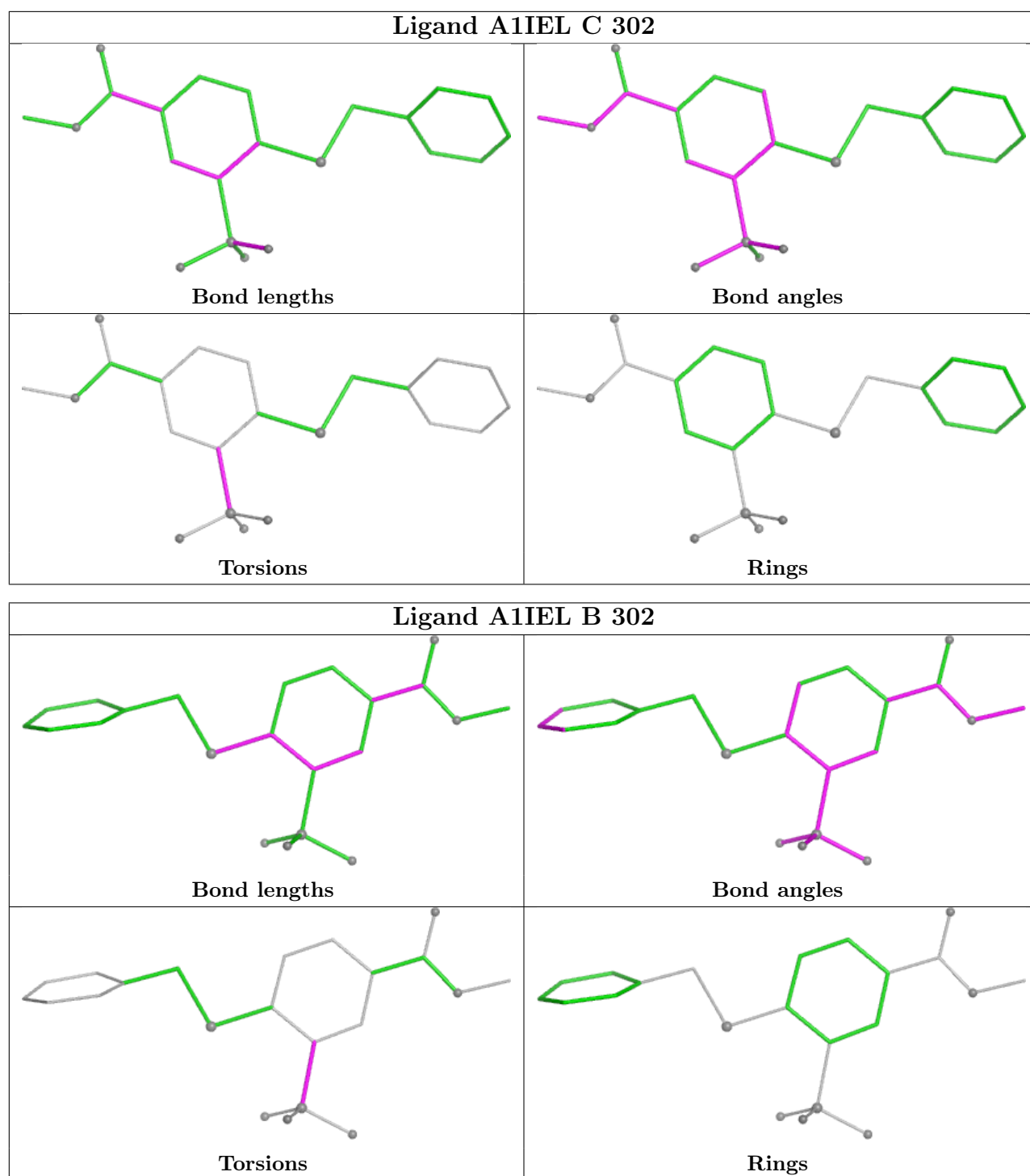
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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 A1IEL D 302



Ligand A1IEL A 302





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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%)	0.60	24 (9%)	14 20	6, 16, 34, 60	8 (3%)
1	B	261/263 (99%)	0.41	21 (8%)	18 25	5, 13, 26, 66	12 (4%)
1	C	261/263 (99%)	1.53	76 (29%)	1 3	7, 21, 51, 178	4 (1%)
1	D	260/263 (98%)	0.42	12 (4%)	37 43	6, 14, 29, 53	5 (1%)
All	All	1043/1052 (99%)	0.74	133 (12%)	7 11	5, 15, 37, 178	29 (2%)

All (133) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	7	PHE	12.0
1	C	151	PHE	11.0
1	C	224	ALA	8.3
1	C	8	GLY	7.5
1	C	223	LEU	7.4
1	D	98	ASN	6.9
1	C	175	PRO	6.5
1	C	219	GLN	6.4
1	D	80	GLY	6.4
1	C	174	VAL	6.2
1	C	3	LYS	6.2
1	B	252[A]	PHE	5.7
1	C	230	TYR	5.7
1	C	59	PHE	5.3
1	C	220	GLU	5.1
1	C	186	ARG	4.9
1	A	3	LYS	4.9
1	B	164	HIS	4.8
1	C	167	TYR	4.6
1	C	218	SER	4.5
1	D	252	PHE	4.5

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Mol	Chain	Res	Type	RSRZ
1	C	53	LEU	4.4
1	C	150	SER	4.4
1	C	149	GLY	4.3
1	A	7	PHE	4.3
1	C	217	ILE	4.2
1	C	153	PRO	4.2
1	C	172	ALA	4.2
1	C	148	MET	4.2
1	C	58	GLN	4.2
1	C	165	VAL	4.1
1	C	55	ALA	4.1
1	C	173	PHE	4.1
1	C	152	ASN	4.0
1	C	56	ASN	3.9
1	C	80	GLY	3.9
1	C	160	SER	3.8
1	C	176	GLY	3.8
1	A	253	ASP	3.8
1	A	82	GLN	3.7
1	D	3	LYS	3.6
1	B	7	PHE	3.6
1	C	177	PHE	3.6
1	C	233	HIS	3.6
1	C	231[A]	CYS	3.6
1	B	125	LEU	3.5
1	C	216	GLN	3.4
1	A	34	SER	3.3
1	C	156	ASP	3.3
1	C	62	THR	3.2
1	C	61	LEU	3.2
1	A	33	HIS	3.1
1	C	52	ASN	3.1
1	C	262	SER	3.1
1	C	82	GLN	3.1
1	B	253[A]	ASP	3.1
1	C	162	LEU	3.1
1	B	136	SER	3.0
1	C	39	TYR	3.0
1	A	78[A]	ILE	3.0
1	D	262	SER	3.0
1	A	173	PHE	2.9
1	C	70	LEU	2.9

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Mol	Chain	Res	Type	RSRZ
1	C	57	LYS	2.9
1	B	127	PRO	2.9
1	C	9	PRO	2.9
1	C	159	PHE	2.9
1	B	263	GLN	2.8
1	B	134	ASN	2.8
1	C	155	TYR	2.8
1	C	169	GLY	2.8
1	B	3	LYS	2.8
1	A	35	ASP	2.8
1	C	234	MET	2.8
1	B	135	LYS	2.7
1	C	235	ASP	2.7
1	C	227	THR	2.7
1	B	78	ILE	2.7
1	C	54	SER	2.7
1	C	221	GLN	2.6
1	A	55	ALA	2.6
1	A	8	GLY	2.6
1	B	25	LEU	2.5
1	B	81	LEU	2.5
1	D	237	PRO	2.5
1	C	161	HIS	2.5
1	A	263	GLN	2.5
1	A	254	GLU	2.5
1	C	232	THR	2.4
1	B	79	GLN	2.4
1	C	254	GLU	2.4
1	D	26	LEU	2.4
1	A	237	PRO	2.4
1	A	262	SER	2.4
1	A	136	SER	2.3
1	D	173	PHE	2.3
1	A	235	ASP	2.3
1	C	71	ASN	2.3
1	C	72	LEU	2.3
1	C	253	ASP	2.3
1	C	179	ILE	2.3
1	B	262	SER	2.3
1	C	154	SER	2.3
1	A	125	LEU	2.3
1	C	5	THR	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	56	ASN	2.2
1	B	173	PHE	2.2
1	C	10	ASP	2.2
1	A	41	ALA	2.2
1	D	253	ASP	2.2
1	D	7	PHE	2.2
1	C	178	ASN	2.2
1	A	238	SER	2.2
1	B	80	GLY	2.1
1	B	124	ASP	2.1
1	B	256	LEU	2.1
1	C	37	LEU	2.1
1	C	51	TYR	2.1
1	B	255	ARG	2.1
1	C	73	PRO	2.1
1	C	75	ASP	2.1
1	D	171	GLU	2.1
1	D	163	GLN	2.1
1	C	35	ASP	2.0
1	A	256	LEU	2.0
1	C	182	LEU	2.0
1	C	158	ILE	2.0
1	C	215	VAL	2.0
1	A	230	TYR	2.0
1	C	4	TRP	2.0
1	A	37	LEU	2.0
1	C	225	LEU	2.0
1	C	256	LEU	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

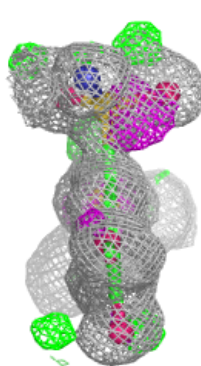
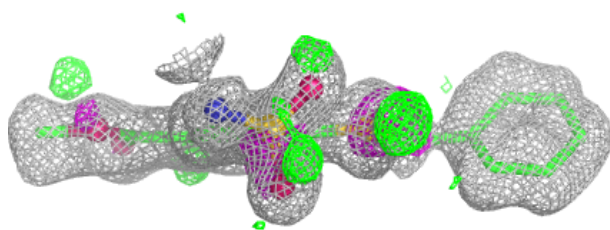
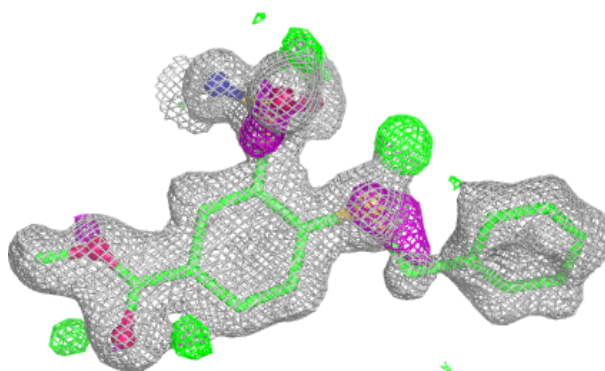
median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	PEG	B	303	7/7	0.84	0.13	20,25,35,36	0
5	EDO	A	306	4/4	0.87	0.14	21,22,24,24	0
4	PEG	A	303	7/7	0.90	0.11	22,31,33,38	0
5	EDO	D	303	4/4	0.91	0.11	19,21,22,26	0
5	EDO	B	304	4/4	0.92	0.11	19,22,26,27	0
5	EDO	D	304	4/4	0.92	0.11	17,19,19,26	0
5	EDO	A	305	4/4	0.93	0.10	22,24,24,25	0
5	EDO	A	304	4/4	0.94	0.10	24,27,29,30	0
5	EDO	A	307	4/4	0.95	0.11	13,15,19,19	0
3	A1IEL	D	302	22/22	0.98	0.08	10,16,23,25	0
3	A1IEL	B	302	22/22	0.99	0.06	9,14,25,27	0
3	A1IEL	C	302	22/22	0.99	0.06	11,17,26,28	0
3	A1IEL	A	302	22/22	0.99	0.05	10,14,26,28	0
2	ZN	B	301	1/1	1.00	0.01	7,7,7,7	0
2	ZN	C	301	1/1	1.00	0.01	11,11,11,11	0
2	ZN	D	301	1/1	1.00	0.01	8,8,8,8	0
2	ZN	A	301	1/1	1.00	0.01	8,8,8,8	0

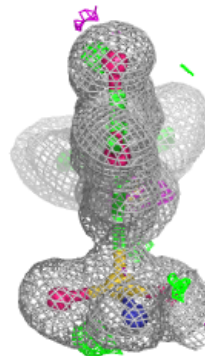
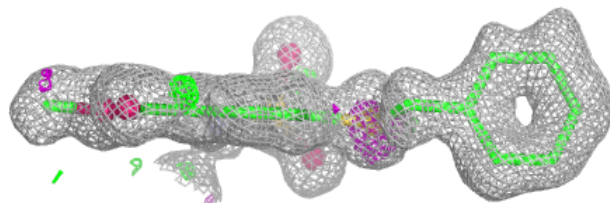
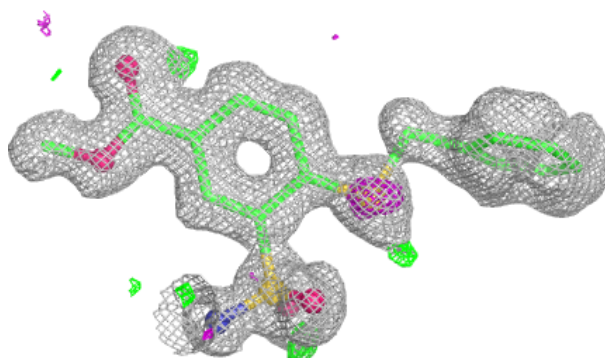
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around A1IEL 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)

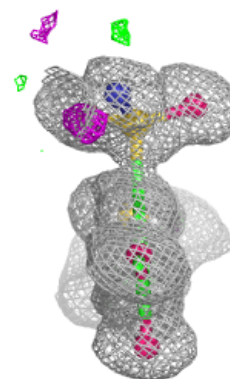
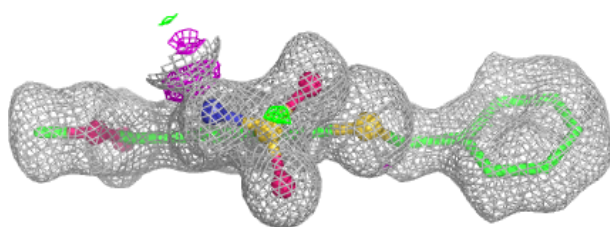
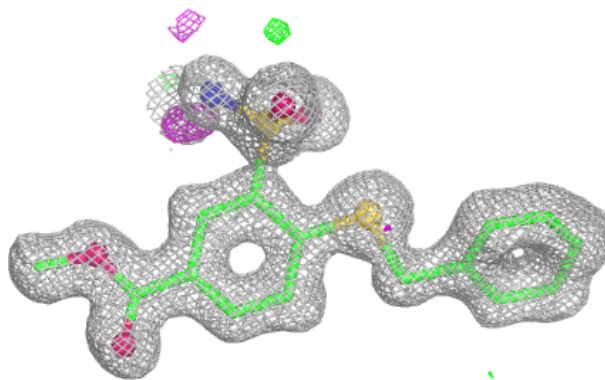
**Electron density around A1IEL B 302:**

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

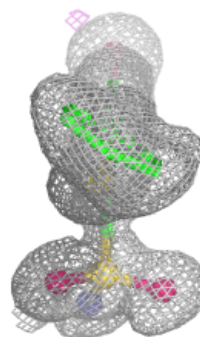
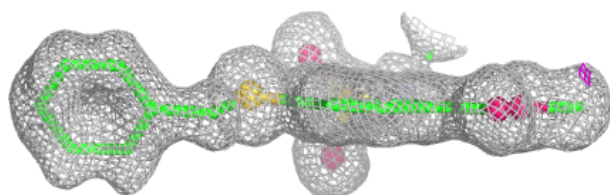
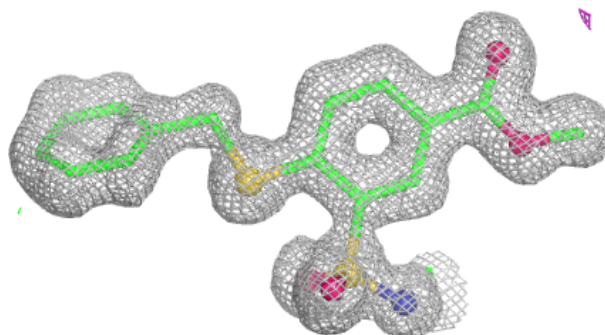


Electron density around A1IEL C 302:

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

**Electron density around A1IEL A 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.