



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 25, 2026 – 03:50 PM UTC

PDB ID : 4KP8 / pdb_00004kp8
Title : Crystal structure of catalytic domain of human carbonic anhydrase isozyme XII with 3-[(Pyrimidin-2-ylsulfanyl)acetyl]benzenesulfonamide
Authors : Smirnov, A.; Manakova, E.; Grazulis, S.
Deposited on : 2013-05-13
Resolution : 1.80 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

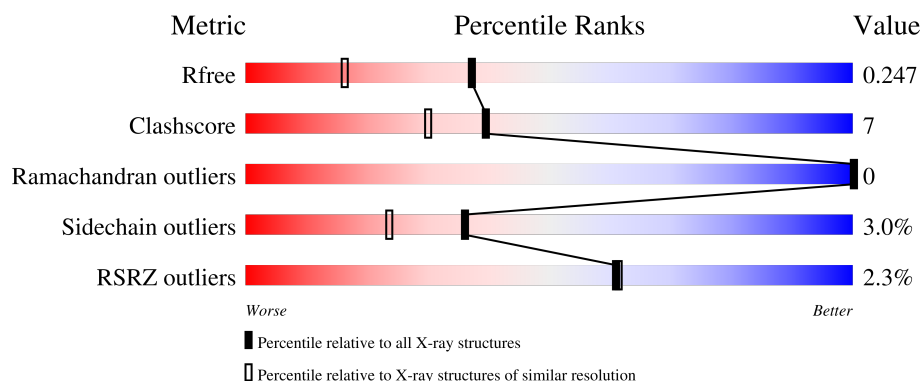
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	3% 83% 16% ..
1	B	263	2% 87% 9% ..
1	C	263	3% 84% 14% ..
1	D	263	2% 88% 10% ..

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	E1G	A	302	-	X	-	-
5	PEG	D	303	-	-	X	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 9615 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
			2168	1373	375	412	8			
1	B	259	Total	C	N	O	S	0	5	0
			2118	1346	361	404	7			
1	C	261	Total	C	N	O	S	0	4	0
			2130	1352	364	407	7			
1	D	260	Total	C	N	O	S	0	3	0
			2116	1345	361	403	7			

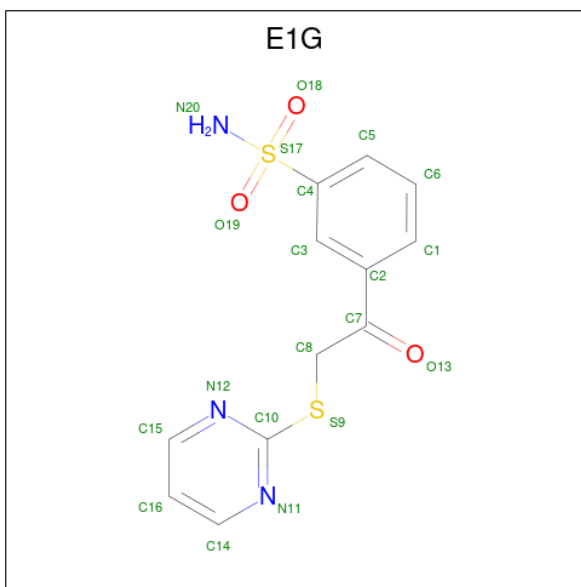
There are 4 discrepancies between the modelled and reference sequences:

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 (CCD ID: ZN) (formula: Zn).

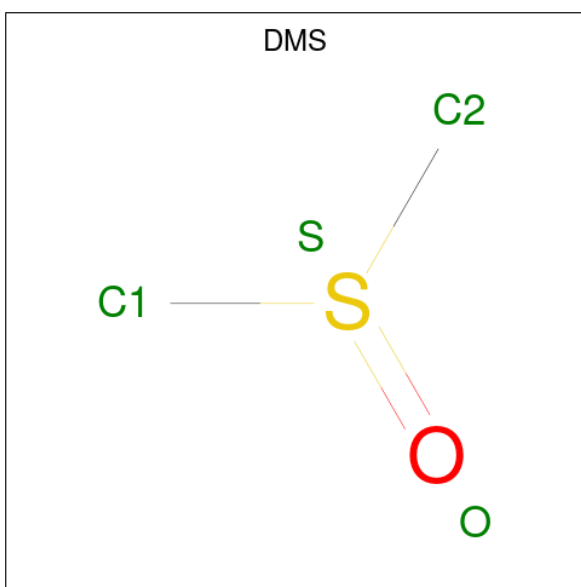
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		
2	B	1	Total	Zn	0	0
			1	1		
2	C	1	Total	Zn	0	0
			1	1		
2	D	1	Total	Zn	0	0
			1	1		

- Molecule 3 is 3-[(pyrimidin-2-ylsulfanyl)acetyl]benzenesulfonamide (CCD ID: E1G) (formula: C₁₂H₁₁N₃O₃S₂).



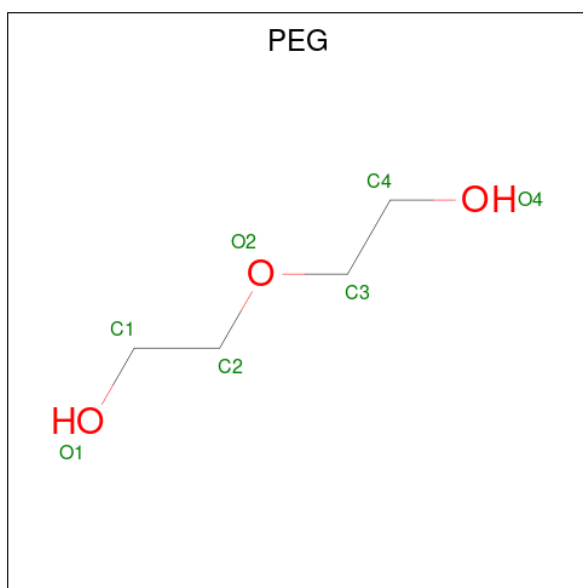
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	S	0	0
			20	12	3	3	2		
3	B	1	Total	C	N	O	S	0	0
			20	12	3	3	2		
3	D	1	Total	C	N	O	S	0	0
			20	12	3	3	2		

- Molecule 4 is DIMETHYL SULFOXIDE (CCD ID: DMS) (formula: C₂H₆OS).



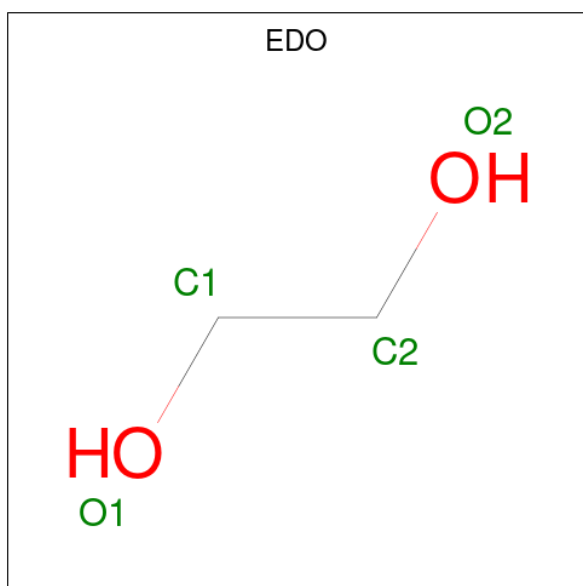
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	O	S	0	0
			4	2	1	1		

- Molecule 5 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



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

- Molecule 6 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



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

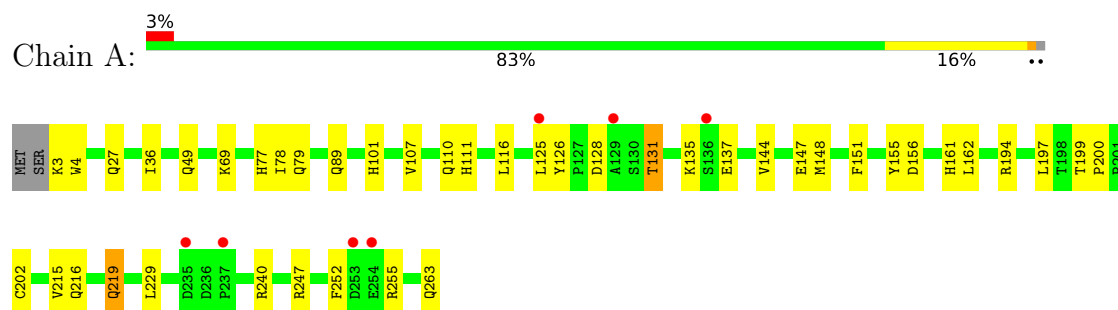
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	258	Total 258	O 258	0	0
7	B	255	Total 255	O 255	0	0
7	C	220	Total 220	O 220	0	0
7	D	264	Total 264	O 264	0	0

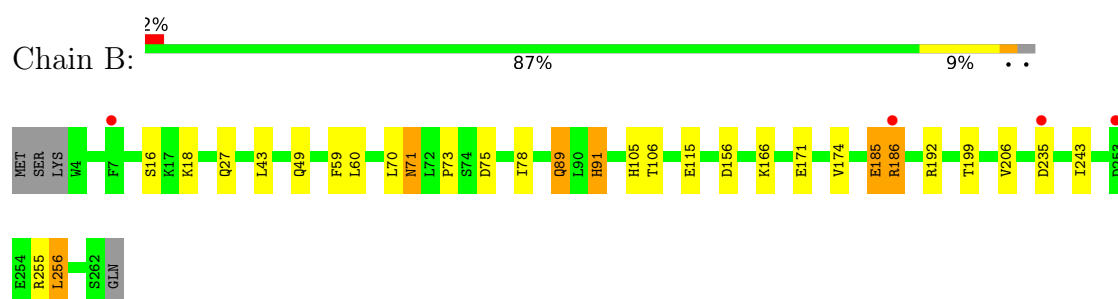
3 Residue-property plots [i](#)

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.

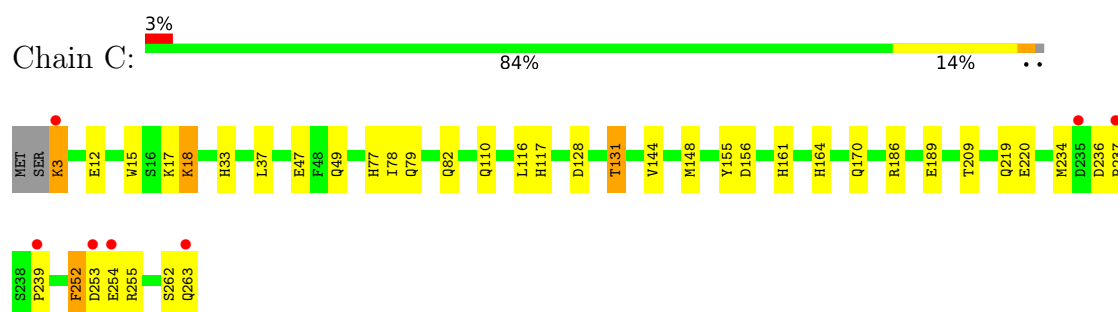
• Molecule 1: Carbonic anhydrase 12



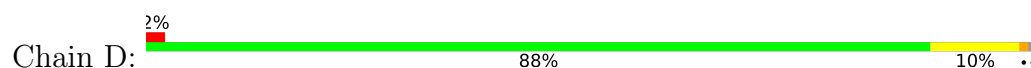
• Molecule 1: Carbonic anhydrase 12

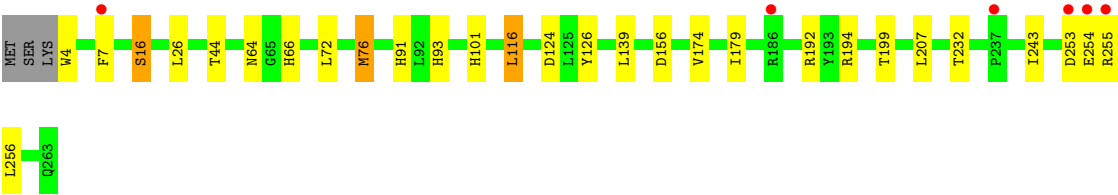


• Molecule 1: Carbonic anhydrase 12



• 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	46.82Å 67.26Å 81.19Å 81.88° 83.99° 86.51°	Depositor
Resolution (Å)	40.00 – 1.80 40.00 – 1.80	Depositor EDS
% Data completeness (in resolution range)	98.4 (40.00-1.80) 98.4 (40.00-1.80)	Depositor EDS
R_{merge}	0.18	Depositor
R_{sym}	0.18	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.00 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.198 , 0.251 0.195 , 0.247	Depositor DCC
R_{free} test set	8778 reflections (9.72%)	wwPDB-VP
Wilson B-factor (Å ²)	17.6	Xtriage
Anisotropy	0.301	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 45.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9615	wwPDB-VP
Average B, all atoms (Å ²)	16.0	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 50.04 % 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 6.8477e-05.*

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: DMS, E1G, PEG, EDO, ZN

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	1.31	2/2231 (0.1%)	1.11	4/3036 (0.1%)
1	B	1.34	9/2181 (0.4%)	1.09	4/2971 (0.1%)
1	C	1.31	4/2193 (0.2%)	1.10	3/2986 (0.1%)
1	D	1.33	6/2179 (0.3%)	1.13	5/2967 (0.2%)
All	All	1.32	21/8784 (0.2%)	1.11	16/11960 (0.1%)

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	209	THR	N-CA	6.61	1.54	1.46
1	D	174	VAL	CA-CB	6.39	1.59	1.54
1	D	76	MET	CA-C	6.30	1.60	1.52
1	B	16	SER	N-CA	6.25	1.54	1.46
1	B	206	VAL	CA-CB	6.17	1.61	1.54
1	A	200	PRO	CA-C	5.86	1.57	1.52
1	D	139	LEU	N-CA	5.82	1.53	1.45
1	C	15	TRP	N-CA	5.75	1.53	1.46
1	C	117	HIS	ND1-CE1	5.58	1.38	1.32
1	B	115	GLU	C-O	5.52	1.30	1.23
1	B	174	VAL	CA-CB	5.51	1.59	1.54
1	D	116	LEU	C-O	-5.49	1.17	1.23
1	B	91	HIS	CE1-NE2	5.48	1.38	1.32
1	B	71	ASN	N-CA	5.47	1.52	1.46
1	A	215	VAL	C-O	5.40	1.28	1.23
1	B	43	LEU	C-O	-5.37	1.17	1.24
1	D	16	SER	C-O	5.36	1.30	1.24
1	D	93	HIS	ND1-CE1	5.35	1.37	1.32
1	B	105	HIS	ND1-CE1	5.21	1.37	1.32
1	B	106	THR	N-CA	5.19	1.51	1.45
1	C	161	HIS	CE1-NE2	5.02	1.37	1.32

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	12	GLU	N-CA-C	7.41	120.23	111.71
1	A	78	ILE	CB-CA-C	-7.35	100.84	110.84
1	C	78	ILE	CB-CA-C	-6.91	101.44	110.84
1	B	185	GLU	N-CA-C	6.78	119.05	110.24
1	D	126	TYR	CA-C-N	6.49	125.93	118.85
1	D	126	TYR	C-N-CA	6.49	125.93	118.85
1	B	166	LYS	N-CA-C	6.45	119.12	111.71
1	D	44	THR	CA-C-N	-6.38	113.10	119.99
1	D	44	THR	C-N-CA	-6.38	113.10	119.99
1	A	161	HIS	N-CA-C	6.17	120.65	113.18
1	B	206	VAL	N-CA-C	6.10	116.71	108.17
1	C	252	PHE	CB-CA-C	-5.77	104.14	111.70
1	D	124	ASP	N-CA-C	-5.75	104.99	112.23
1	A	126	TYR	CA-C-N	5.26	124.44	118.97
1	A	126	TYR	C-N-CA	5.26	124.44	118.97
1	B	27	GLN	N-CA-C	5.02	117.71	110.28

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	2168	0	2058	34	0
1	B	2118	0	2006	27	0
1	C	2130	0	2016	30	0
1	D	2116	0	2006	23	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	20	0	10	5	0
3	B	20	0	10	0	0
3	D	20	0	10	0	0
4	A	4	0	6	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	B	7	0	10	3	0
5	D	7	0	9	4	0
6	B	4	0	6	0	0
7	A	258	0	0	5	0
7	B	255	0	0	7	0
7	C	220	0	0	6	0
7	D	264	0	0	3	0
All	All	9615	0	8147	113	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 (113) 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:C:116:LEU:HB3	1:C:144[B]:VAL:CG2	1.78	1.14
1:B:186[A]:ARG:HG2	1:B:186[A]:ARG:HH21	1.03	1.13
1:D:76:MET:HE1	1:D:179[A]:ILE:HD12	1.23	1.12
1:A:116:LEU:HB3	1:A:144[A]:VAL:CG1	1.79	1.12
1:D:76:MET:CE	1:D:179[A]:ILE:HD12	1.85	1.07
1:C:116:LEU:HB3	1:C:144[B]:VAL:HG22	1.08	1.07
1:A:116:LEU:HB3	1:A:144[A]:VAL:HG12	1.05	1.04
1:B:186[A]:ARG:HH21	1:B:186[A]:ARG:CG	1.82	0.93
1:D:76:MET:HE1	1:D:179[A]:ILE:CD1	2.04	0.87
1:B:70[B]:LEU:C	1:B:70[B]:LEU:HD13	2.00	0.86
1:B:199:THR:HG21	5:B:303:PEG:H11	1.58	0.85
1:B:186[A]:ARG:HG2	1:B:186[A]:ARG:NH2	1.85	0.84
1:B:70[B]:LEU:HD13	1:B:71:ASN:N	1.95	0.81
1:D:26:LEU:HD11	1:D:194[B]:ARG:NH2	1.97	0.80
1:B:243[B]:ILE:HD12	1:B:243[B]:ILE:O	1.82	0.79
1:A:128:ASP:OD1	1:A:131:THR:HG23	1.86	0.75
1:C:116:LEU:CB	1:C:144[B]:VAL:HG22	2.04	0.74
1:B:70[B]:LEU:C	1:B:70[B]:LEU:CD1	2.61	0.74
1:D:192:ARG:HD3	1:D:207[B]:LEU:HD21	1.72	0.70
1:C:144[B]:VAL:O	1:C:144[B]:VAL:HG23	1.92	0.69
1:A:263:GLN:NE2	7:A:574:HOH:O	2.25	0.69
1:D:66:HIS:HB2	5:D:303:PEG:H32	1.75	0.68
1:C:164:HIS:HD2	7:C:522:HOH:O	1.77	0.68
1:C:49:GLN:OE1	1:C:77:HIS:NE2	2.27	0.68
1:C:17:LYS:HB2	1:C:18:LYS:HE2	1.77	0.67
1:A:27:GLN:HE22	1:A:202:CYS:HB3	1.58	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:255[A]:ARG:NH1	7:A:594:HOH:O	2.27	0.66
1:C:262:SER:O	1:C:263:GLN:HB3	1.95	0.66
1:D:76:MET:SD	1:D:179[A]:ILE:HD12	2.35	0.65
1:C:47:GLU:HB2	1:C:79:GLN:HG3	1.79	0.65
1:B:70[B]:LEU:CD1	1:B:71:ASN:O	2.45	0.64
1:A:4:TRP:CH2	1:A:199[A]:THR:HG23	2.33	0.63
1:A:240[B]:ARG:CG	1:A:240[B]:ARG:HH11	2.11	0.63
1:B:185:GLU:HA	7:B:609:HOH:O	1.97	0.63
1:A:4:TRP:CZ2	1:A:199[A]:THR:HG23	2.34	0.61
1:C:237:PRO:O	1:C:239:PRO:HD3	2.01	0.61
1:D:199:THR:HG21	5:D:303:PEG:H41	1.82	0.60
1:B:235:ASP:HB2	7:B:571:HOH:O	2.01	0.60
1:B:243[B]:ILE:HD12	1:B:243[B]:ILE:C	2.27	0.60
1:C:144[B]:VAL:CG2	1:C:144[B]:VAL:O	2.49	0.60
1:D:253:ASP:O	1:D:254:GLU:HG2	2.02	0.59
1:C:237:PRO:C	1:C:239:PRO:HD3	2.27	0.59
1:A:107:VAL:O	1:A:110[B]:GLN:HG3	2.01	0.59
1:B:73:PRO:HB2	1:B:75:ASP:OD1	2.03	0.59
1:A:116:LEU:CB	1:A:144[A]:VAL:CG1	2.70	0.57
1:B:186[A]:ARG:CG	1:B:186[A]:ARG:NH2	2.50	0.57
1:C:128:ASP:OD2	1:C:131:THR:HG23	2.05	0.56
1:D:64:ASN:HD21	5:D:303:PEG:H11	1.70	0.56
1:A:199[B]:THR:OG1	3:A:302:E1G:H4	2.04	0.56
1:D:192:ARG:CD	1:D:207[B]:LEU:HD21	2.35	0.56
1:D:7:PHE:HZ	1:D:243:ILE:HG13	1.72	0.55
1:D:255:ARG:NH1	7:D:593:HOH:O	2.39	0.55
1:B:60:LEU:HD11	1:B:171:GLU:HB3	1.88	0.54
1:A:148:MET:HE2	1:A:219:GLN:HG2	1.90	0.54
1:C:255[B]:ARG:NH1	7:C:579:HOH:O	2.40	0.54
1:A:240[B]:ARG:HH11	1:A:240[B]:ARG:HG2	1.72	0.54
1:A:144[A]:VAL:HG11	1:A:155:TYR:OH	2.07	0.54
1:C:186:ARG:NH1	1:C:189:GLU:OE1	2.38	0.54
1:A:101:HIS:HD2	7:A:646:HOH:O	1.91	0.54
1:D:72:LEU:HD22	1:D:179[A]:ILE:HD11	1.89	0.54
1:B:192:ARG:NH2	7:B:627:HOH:O	2.39	0.53
1:B:255:ARG:O	1:B:256:LEU:HD22	2.09	0.53
1:A:162:LEU:HD22	1:A:229:LEU:HD11	1.91	0.53
1:B:243[B]:ILE:C	1:B:243[B]:ILE:CD1	2.83	0.52
1:D:26:LEU:HD13	1:D:194[B]:ARG:HG2	1.92	0.52
1:B:59:PHE:HB3	1:B:70[B]:LEU:HD11	1.92	0.51
1:A:27:GLN:NE2	1:A:247:ARG:HH12	2.08	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:70[B]:LEU:HD13	1:B:71:ASN:O	2.11	0.51
1:D:101:HIS:HD2	7:D:507:HOH:O	1.94	0.50
1:D:64:ASN:HD21	5:D:303:PEG:H31	1.77	0.50
1:C:262:SER:O	1:C:263:GLN:CB	2.58	0.49
1:A:199[B]:THR:OG1	3:A:302:E1G:C6	2.60	0.49
1:A:240[B]:ARG:CG	1:A:240[B]:ARG:NH1	2.75	0.49
1:B:255:ARG:HD2	7:B:434:HOH:O	2.11	0.49
1:A:252:PHE:CE2	1:A:255[A]:ARG:HB2	2.48	0.49
1:A:255[B]:ARG:NH1	7:A:594:HOH:O	2.31	0.48
1:C:253:ASP:OD1	7:C:597:HOH:O	2.20	0.48
1:A:131:THR:O	1:A:135:LYS:HG3	2.14	0.48
1:C:144[B]:VAL:HG21	1:C:155:TYR:OH	2.16	0.46
1:D:194[B]:ARG:HG3	7:D:555:HOH:O	2.15	0.46
1:A:151:PHE:CD2	4:A:303:DMS:H12	2.51	0.46
1:A:194:ARG:CZ	7:A:489:HOH:O	2.63	0.46
1:C:253:ASP:O	1:C:255[B]:ARG:HG3	2.16	0.46
1:C:236:ASP:OD1	1:C:237:PRO:HD2	2.17	0.45
1:A:128:ASP:OD1	1:A:131:THR:CG2	2.61	0.45
1:C:252:PHE:CE1	1:C:255[A]:ARG:NH1	2.85	0.45
1:C:170:GLN:HE22	1:C:234:MET:HE3	1.82	0.44
1:C:116:LEU:CB	1:C:144[B]:VAL:CG2	2.71	0.44
1:A:4:TRP:CZ2	1:A:199[A]:THR:CG2	3.02	0.43
1:B:185:GLU:O	1:B:186[B]:ARG:C	2.61	0.43
1:A:27:GLN:HE21	1:A:247:ARG:HH12	1.66	0.43
1:A:49:GLN:OE1	1:A:77:HIS:NE2	2.47	0.43
1:A:197:LEU:HD22	3:A:302:E1G:C3	2.49	0.43
1:B:91:HIS:CE1	5:B:303:PEG:H32	2.54	0.43
1:C:148:MET:SD	1:C:219:GLN:HB2	2.59	0.42
1:C:255[B]:ARG:NH2	7:C:485:HOH:O	2.52	0.42
1:B:49:GLN:HA	7:B:574:HOH:O	2.19	0.42
1:C:17:LYS:HE2	1:D:16:SER:O	2.19	0.42
1:C:3:LYS:HA	7:C:495:HOH:O	2.19	0.42
1:D:7:PHE:CZ	1:D:243:ILE:HG13	2.53	0.42
1:C:128:ASP:OD2	1:C:131:THR:CG2	2.67	0.42
1:A:147:GLU:HG3	1:A:216:GLN:HG2	2.02	0.42
1:A:255[A]:ARG:HE	1:A:255[A]:ARG:HB3	1.69	0.42
1:A:199[B]:THR:OG1	3:A:302:E1G:C5	2.68	0.41
1:C:3:LYS:HE2	7:C:557:HOH:O	2.19	0.41
1:B:89:GLN:HE22	5:B:303:PEG:C4	2.33	0.41
1:C:33:HIS:O	1:C:37:LEU:HG	2.20	0.41
1:B:255:ARG:CD	7:B:434:HOH:O	2.68	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:4:TRP:CH2	1:D:199:THR:HB	2.56	0.41
1:B:255:ARG:NH1	7:B:567:HOH:O	2.54	0.41
1:D:91:HIS:O	1:D:116:LEU:HD12	2.22	0.40
1:D:72:LEU:HA	1:D:72:LEU:HD23	1.92	0.40
1:A:199[B]:THR:OG1	3:A:302:E1G:H3	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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%)	261 (98%)	6 (2%)	0	100	100
1	B	262/263 (100%)	253 (97%)	9 (3%)	0	100	100
1	C	263/263 (100%)	255 (97%)	8 (3%)	0	100	100
1	D	261/263 (99%)	255 (98%)	6 (2%)	0	100	100
All	All	1053/1052 (100%)	1024 (97%)	29 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains [i](#)

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	241/235 (103%)	230 (95%)	11 (5%)	24	12

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	236/235 (100%)	229 (97%)	7 (3%)	36	24
1	C	237/235 (101%)	229 (97%)	8 (3%)	32	20
1	D	235/235 (100%)	232 (99%)	3 (1%)	61	54
All	All	949/940 (101%)	920 (97%)	29 (3%)	36	23

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	LYS
1	A	36	ILE
1	A	69	LYS
1	A	79	GLN
1	A	89	GLN
1	A	111	HIS
1	A	125	LEU
1	A	131	THR
1	A	137	GLU
1	A	156	ASP
1	A	219	GLN
1	B	18	LYS
1	B	78	ILE
1	B	89	GLN
1	B	156	ASP
1	B	186[A]	ARG
1	B	186[B]	ARG
1	B	256	LEU
1	C	3	LYS
1	C	18	LYS
1	C	82	GLN
1	C	110	GLN
1	C	131	THR
1	C	156	ASP
1	C	220	GLU
1	C	254	GLU
1	D	156	ASP
1	D	232	THR
1	D	256	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	13	ASN
1	A	27	GLN
1	A	79	GLN
1	B	56	ASN
1	B	58	GLN
1	B	89	GLN
1	B	216	GLN
1	B	250	GLN
1	C	38	GLN
1	C	152	ASN
1	C	164	HIS
1	C	170	GLN
1	C	203	ASN
1	C	233	HIS
1	C	250	GLN
1	D	13	ASN
1	D	101	HIS

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 11 ligands modelled in this entry, 4 are monoatomic - leaving 7 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	EDO	B	304	-	3,3,3	0.85	0	2,2,2	0.58	0
5	PEG	D	303	-	6,6,6	0.95	0	5,5,5	1.28	1 (20%)
3	E1G	D	302	2	21,21,21	2.68	7 (33%)	29,29,29	2.66	11 (37%)
3	E1G	B	302	2	21,21,21	2.53	6 (28%)	29,29,29	2.62	12 (41%)
4	DMS	A	303	-	3,3,3	3.12	1 (33%)	3,3,3	1.80	1 (33%)
5	PEG	B	303	-	6,6,6	0.47	0	5,5,5	1.43	0
3	E1G	A	302	2	21,21,21	2.99	8 (38%)	29,29,29	3.45	16 (55%)

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	EDO	B	304	-	-	0/1/1/1	-
5	PEG	D	303	-	-	2/4/4/4	-
3	E1G	D	302	2	-	7/15/15/15	0/2/2/2
3	E1G	B	302	2	-	5/15/15/15	0/2/2/2
5	PEG	B	303	-	-	3/4/4/4	-
3	E1G	A	302	2	-	10/15/15/15	0/2/2/2

All (22) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302	E1G	S17-N20	7.75	1.75	1.60
3	B	302	E1G	S17-N20	6.88	1.73	1.60
3	A	302	E1G	O18-S17	6.69	1.55	1.43
3	A	302	E1G	O19-S17	6.33	1.54	1.43
3	D	302	E1G	O18-S17	6.27	1.54	1.43
3	D	302	E1G	S17-N20	6.01	1.72	1.60
4	A	303	DMS	O-S	5.32	1.85	1.50
3	B	302	E1G	O19-S17	5.14	1.52	1.43
3	D	302	E1G	O19-S17	4.94	1.52	1.43
3	B	302	E1G	O18-S17	4.26	1.51	1.43
3	D	302	E1G	C10-S9	3.23	1.82	1.75
3	B	302	E1G	C10-S9	3.19	1.82	1.75
3	A	302	E1G	C10-S9	3.08	1.81	1.75
3	D	302	E1G	C10-N11	2.93	1.39	1.33
3	A	302	E1G	C3-C2	2.71	1.43	1.39
3	D	302	E1G	C10-N12	2.60	1.38	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	302	E1G	C10-N12	2.59	1.38	1.33
3	B	302	E1G	C6-C5	2.51	1.43	1.38
3	B	302	E1G	C10-N11	2.48	1.38	1.33
3	A	302	E1G	C10-N11	2.23	1.37	1.33
3	A	302	E1G	C3-C4	2.05	1.42	1.39
3	D	302	E1G	C6-C1	2.01	1.42	1.38

All (41) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	302	E1G	O18-S17-O19	-10.34	102.89	118.80
3	A	302	E1G	C8-S9-C10	-6.09	93.83	101.65
3	D	302	E1G	C8-C7-C2	5.70	124.49	117.99
3	D	302	E1G	O18-S17-O19	-5.49	110.36	118.80
3	B	302	E1G	N11-C10-N12	-5.42	118.17	126.86
3	B	302	E1G	O18-S17-O19	-5.36	110.55	118.80
3	A	302	E1G	N11-C10-N12	-5.35	118.28	126.86
3	D	302	E1G	N11-C10-N12	-5.19	118.54	126.86
3	A	302	E1G	C5-C4-S17	-5.12	112.76	119.72
3	A	302	E1G	O19-S17-C4	4.86	112.84	107.35
3	A	302	E1G	C14-N11-C10	4.66	121.83	114.96
3	D	302	E1G	C14-N11-C10	4.59	121.74	114.96
3	D	302	E1G	C15-N12-C10	4.55	121.68	114.96
3	B	302	E1G	C14-N11-C10	4.51	121.61	114.96
3	A	302	E1G	C15-N12-C10	4.50	121.60	114.96
3	A	302	E1G	C3-C4-S17	4.39	127.26	119.34
3	B	302	E1G	C15-N12-C10	4.23	121.19	114.96
3	B	302	E1G	C2-C3-C4	4.02	122.73	119.71
3	D	302	E1G	C4-S17-N20	3.85	113.76	108.40
3	B	302	E1G	C4-S17-N20	3.64	113.48	108.40
3	B	302	E1G	C8-S9-C10	-3.49	97.17	101.65
3	D	302	E1G	O18-S17-C4	3.45	111.25	107.35
3	D	302	E1G	C8-S9-C10	-3.24	97.49	101.65
3	B	302	E1G	O13-C7-C8	-3.06	115.64	120.41
3	B	302	E1G	O19-S17-C4	-2.98	103.98	107.35
3	A	302	E1G	O18-S17-C4	2.88	110.60	107.35
4	A	303	DMS	O-S-C2	2.87	120.85	106.49
3	B	302	E1G	O19-S17-N20	2.84	111.44	107.35
3	A	302	E1G	C1-C2-C7	-2.69	114.57	120.60
5	D	303	PEG	O1-C1-C2	-2.59	96.60	111.82
3	D	302	E1G	C16-C14-N11	-2.58	119.33	123.42
3	A	302	E1G	C3-C2-C7	2.47	125.57	120.18

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	302	E1G	C8-C7-C2	2.47	120.81	117.99
3	A	302	E1G	C16-C14-N11	-2.44	119.56	123.42
3	A	302	E1G	O19-S17-N20	2.43	110.86	107.35
3	D	302	E1G	O13-C7-C8	-2.32	116.79	120.41
3	A	302	E1G	C4-S17-N20	2.27	111.56	108.40
3	A	302	E1G	C16-C15-N12	-2.25	119.85	123.42
3	A	302	E1G	C6-C5-C4	2.17	121.17	118.95
3	B	302	E1G	O13-C7-C2	2.11	123.55	120.73
3	D	302	E1G	C16-C15-N12	-2.09	120.11	123.42

There are no chirality outliers.

All (27) torsion outliers are listed below:

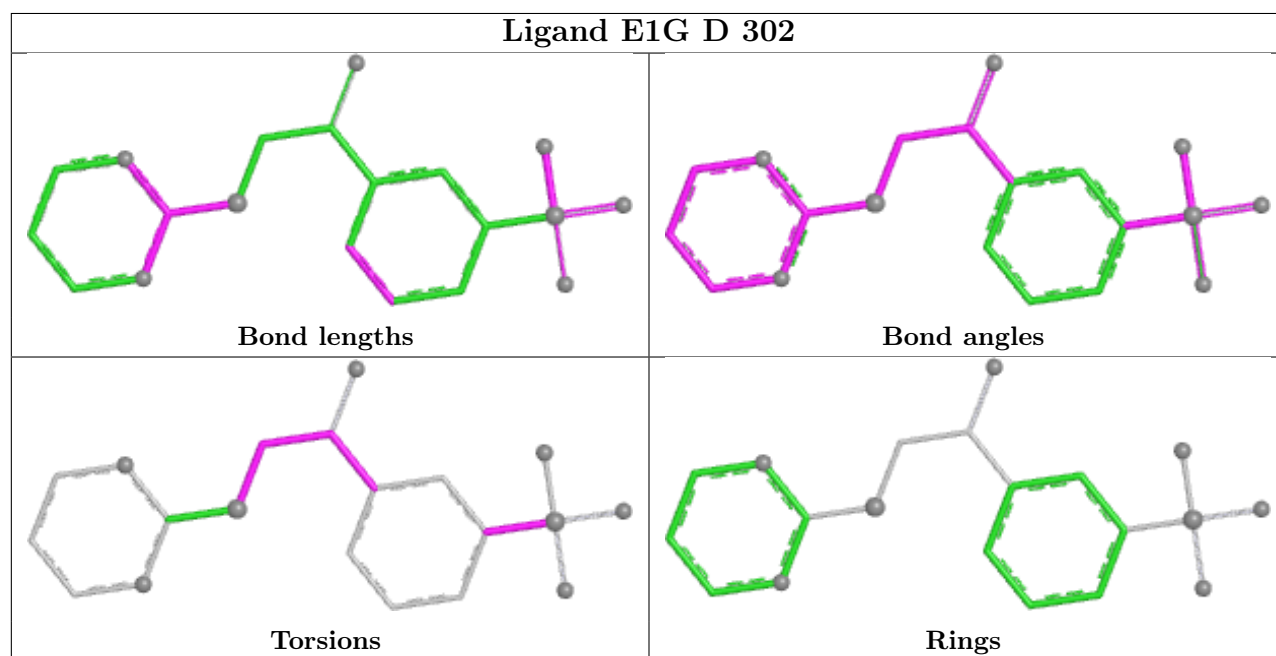
Mol	Chain	Res	Type	Atoms
3	A	302	E1G	C1-C2-C7-O13
3	A	302	E1G	C1-C2-C7-C8
3	A	302	E1G	C3-C2-C7-O13
3	A	302	E1G	C3-C2-C7-C8
3	A	302	E1G	N12-C10-S9-C8
3	A	302	E1G	N11-C10-S9-C8
3	D	302	E1G	C2-C7-C8-S9
5	B	303	PEG	O2-C3-C4-O4
5	D	303	PEG	O1-C1-C2-O2
5	B	303	PEG	O1-C1-C2-O2
3	A	302	E1G	C3-C4-S17-O19
3	A	302	E1G	C5-C4-S17-O19
3	B	302	E1G	O13-C7-C8-S9
3	D	302	E1G	O13-C7-C8-S9
3	A	302	E1G	C5-C4-S17-N20
5	D	303	PEG	C1-C2-O2-C3
3	B	302	E1G	C7-C8-S9-C10
3	D	302	E1G	C7-C8-S9-C10
3	B	302	E1G	C2-C7-C8-S9
3	A	302	E1G	C3-C4-S17-N20
3	D	302	E1G	C5-C4-S17-O19
3	B	302	E1G	C3-C4-S17-O19
3	D	302	E1G	C3-C4-S17-O19
3	D	302	E1G	C3-C2-C7-O13
3	B	302	E1G	C5-C4-S17-O19
5	B	303	PEG	C1-C2-O2-C3
3	D	302	E1G	C1-C2-C7-O13

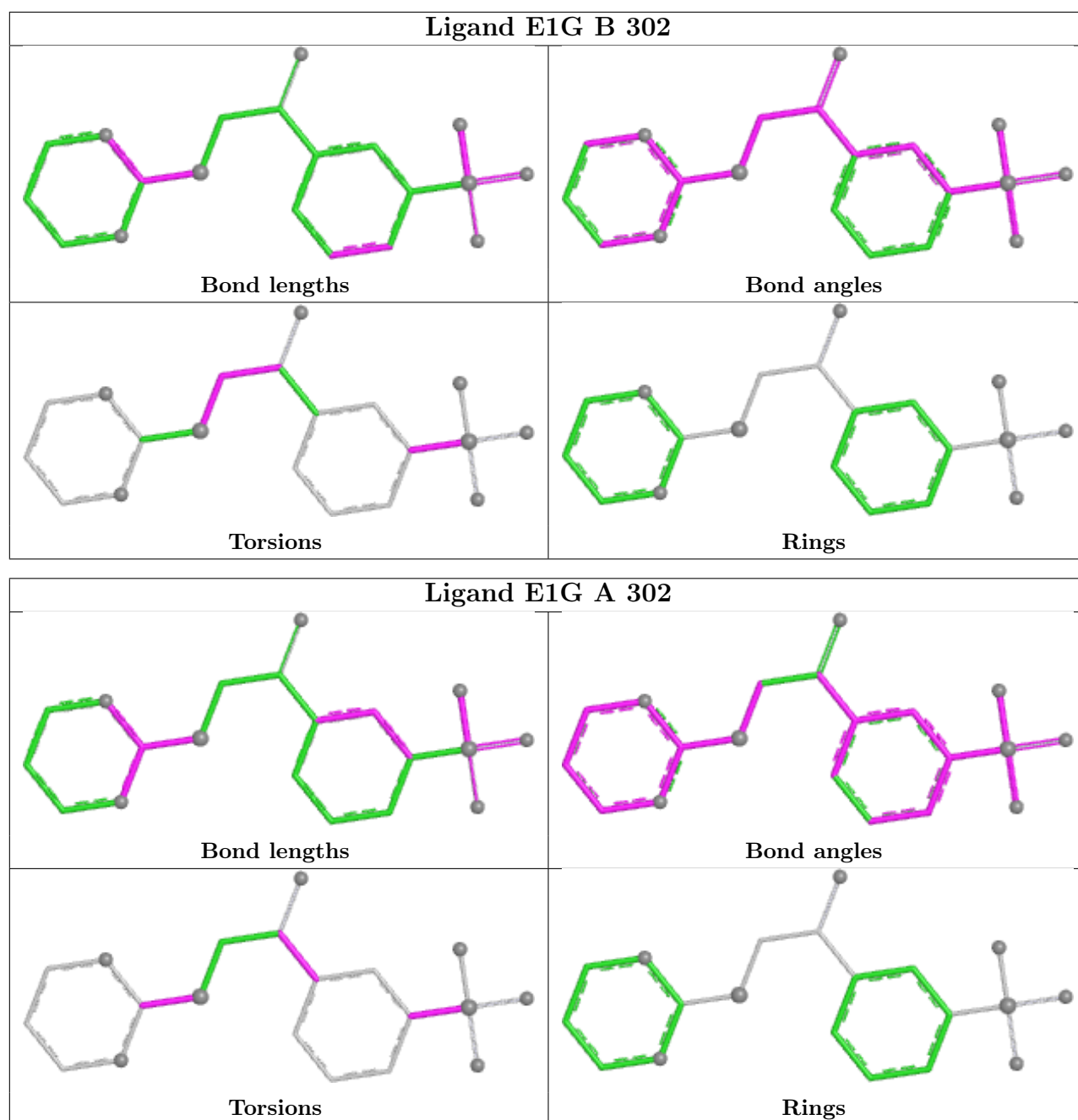
There are no ring outliers.

4 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	303	PEG	4	0
4	A	303	DMS	1	0
5	B	303	PEG	3	0
3	A	302	E1G	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.





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%)	0.07	7 (2%) 56 56	4, 14, 29, 47	8 (3%)
1	B	259/263 (98%)	0.05	4 (1%) 72 72	5, 14, 26, 47	5 (1%)
1	C	261/263 (99%)	0.08	7 (2%) 56 56	5, 14, 28, 47	5 (1%)
1	D	260/263 (98%)	-0.05	6 (2%) 61 61	4, 14, 24, 55	5 (1%)
All	All	1041/1052 (98%)	0.04	24 (2%) 61 61	4, 14, 26, 55	23 (2%)

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	186	ARG	5.6
1	C	254	GLU	4.7
1	D	7	PHE	4.3
1	C	237	PRO	3.8
1	C	253	ASP	3.3
1	A	254	GLU	3.3
1	C	3	LYS	3.3
1	A	235	ASP	3.2
1	A	237	PRO	3.2
1	A	129	ALA	3.0
1	C	239	PRO	2.8
1	B	253	ASP	2.7
1	C	235	ASP	2.6
1	A	136	SER	2.6
1	D	237	PRO	2.5
1	D	255	ARG	2.5
1	D	254	GLU	2.4
1	B	7	PHE	2.3
1	B	186[A]	ARG	2.3
1	A	253	ASP	2.2
1	D	253	ASP	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	235	ASP	2.1
1	A	125	LEU	2.0
1	C	263	GLN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

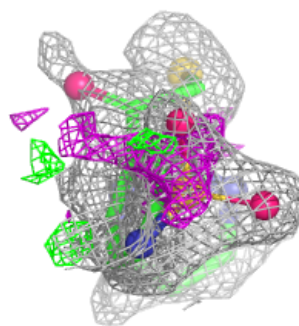
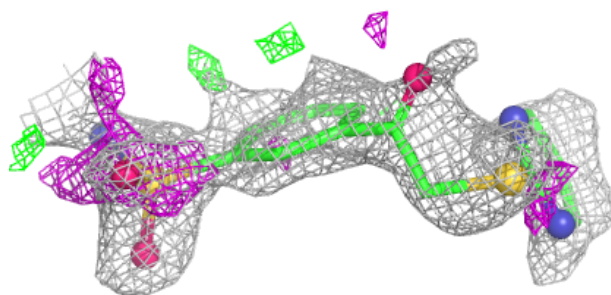
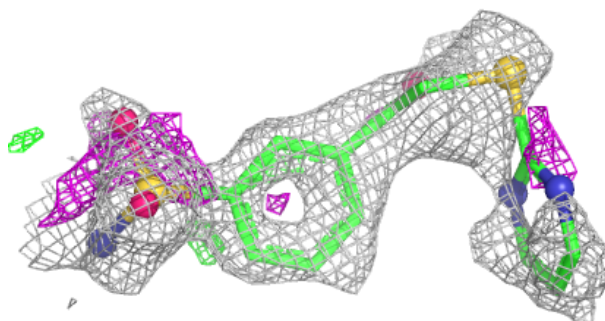
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	DMS	A	303	4/4	0.63	0.21	48,50,55,63	0
5	PEG	B	303	7/7	0.84	0.15	19,23,26,38	0
3	E1G	A	302	20/20	0.89	0.15	16,35,60,60	0
5	PEG	D	303	7/7	0.89	0.12	19,21,23,24	0
6	EDO	B	304	4/4	0.90	0.09	22,25,25,25	0
3	E1G	B	302	20/20	0.95	0.10	13,17,39,40	0
3	E1G	D	302	20/20	0.95	0.10	13,22,35,35	0
2	ZN	D	301	1/1	0.99	0.03	9,9,9,9	0
2	ZN	C	301	1/1	1.00	0.01	9,9,9,9	0
2	ZN	A	301	1/1	1.00	0.02	10,10,10,10	0
2	ZN	B	301	1/1	1.00	0.02	10,10,10,10	0

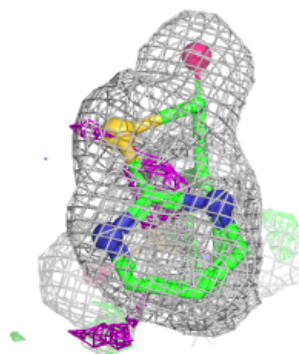
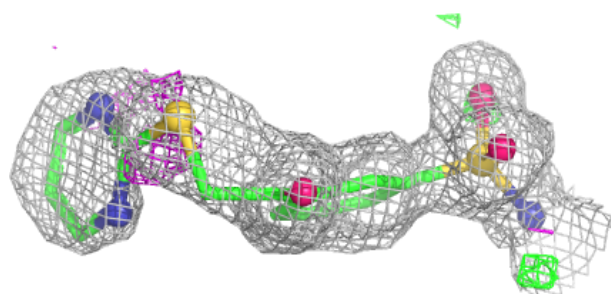
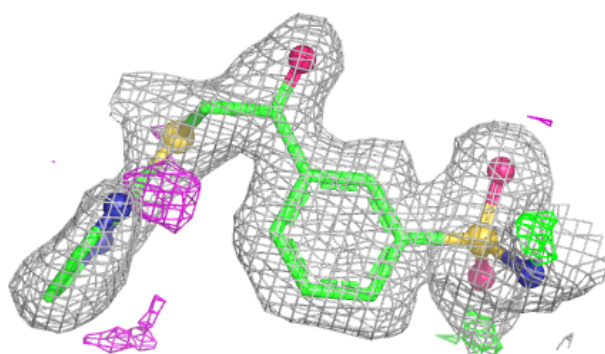
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around E1G 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)

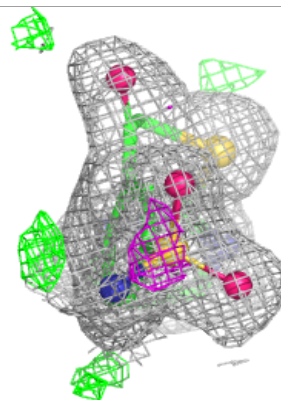
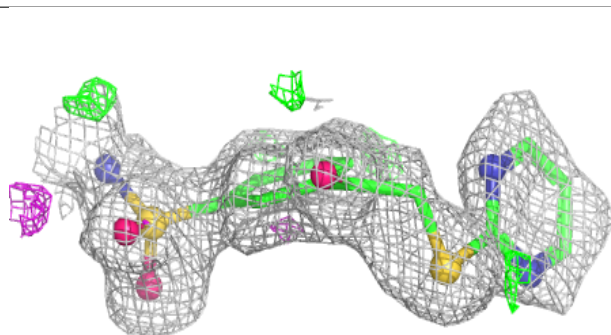
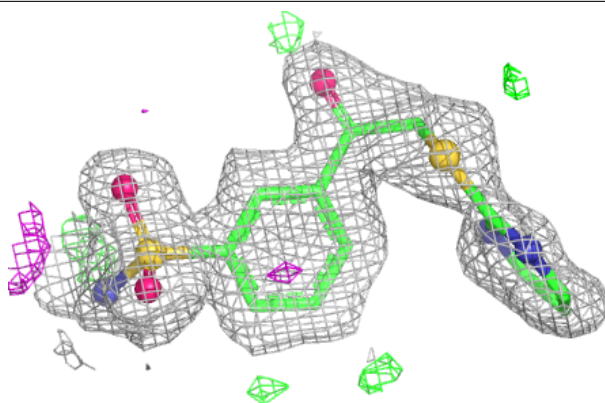
**Electron density around E1G B 302:**

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



Electron density around E1G 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.