



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 12:22 PM UTC

PDB ID : 1T5S / pdb_00001t5s
Title : Structure of the (SR)Ca²⁺-ATPase Ca²-E1-AMPPCP form
Authors : Sorensen, T.L.-M.; Moller, J.V.; Nissen, P.
Deposited on : 2004-05-05
Resolution : 2.60 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

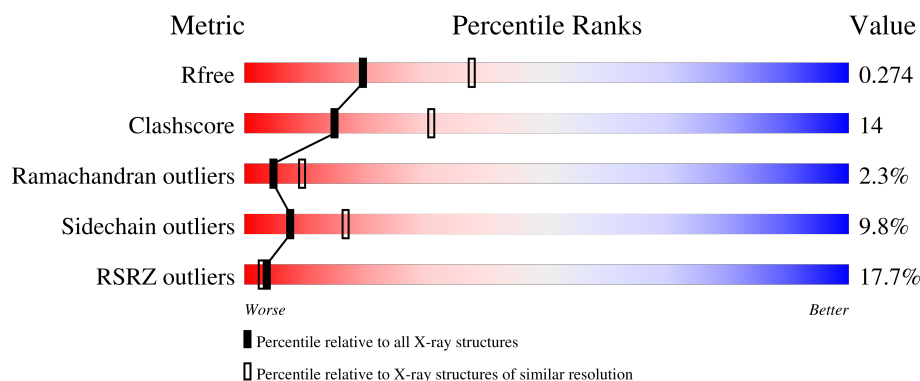
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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	4008 (2.60-2.60)
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)
RSRZ outliers	180081	4008 (2.60-2.60)

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	994	<div> <div>18%</div> <div>70%</div> <div>24%</div> <div>5%</div> </div>

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 7746 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 Sarcoplasmic/endoplasmic reticulum calcium ATPase 1 isoform SERCA1a.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	994	Total	C	N	O	S	0	0	0
			7671	4876	1287	1451	57			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	994	GLY	-	SEE REMARK 999	UNP P04191

- Molecule 2 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Ca	0	0
			2	2		

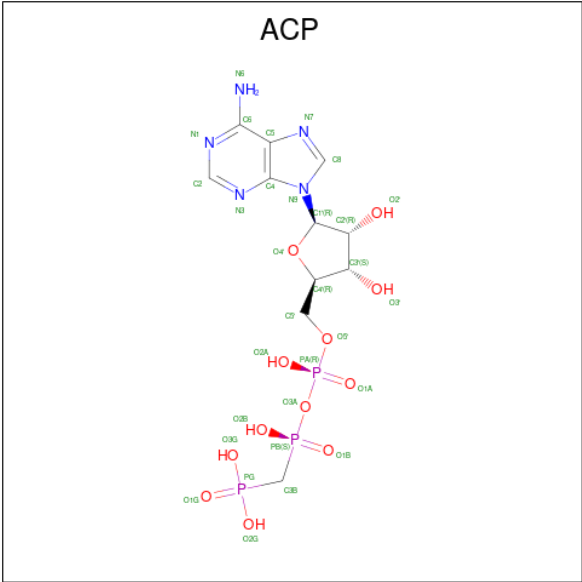
- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Mg	0	0
			1	1		

- Molecule 4 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	K	0	0
			1	1		

- Molecule 5 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (CCD ID: ACP) (formula: C₁₁H₁₈N₅O₁₂P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			31	11	5	12	3		

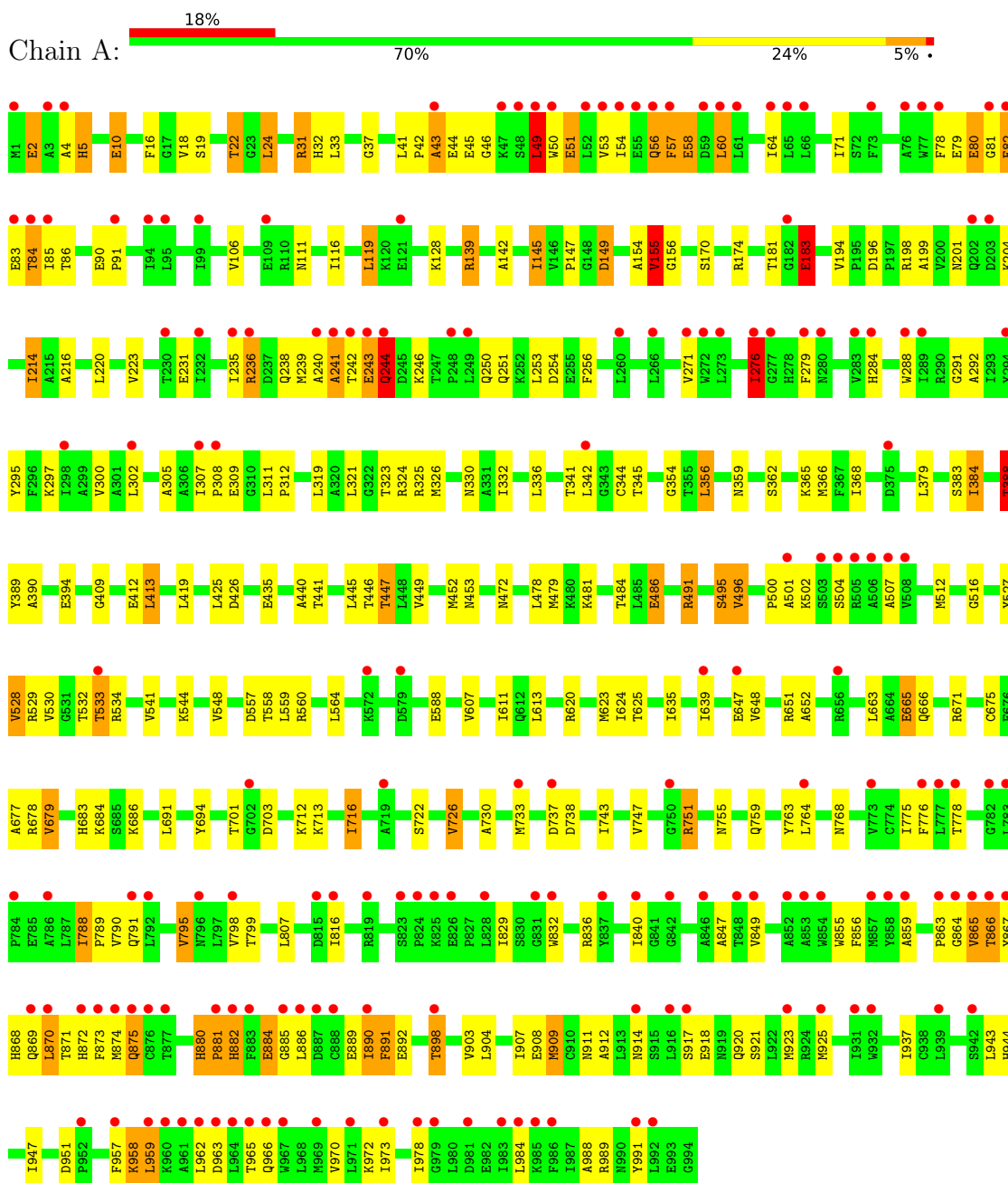
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	40	Total	O	0	0
			40	40		

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: Sarcoplasmic/endoplasmic reticulum calcium ATPase 1 isoform SERCA1a



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	162.44Å 76.26Å 151.16Å 90.00° 108.70° 90.00°	Depositor
Resolution (Å)	40.00 – 2.60 40.00 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.8 (40.00-2.60) 99.7 (40.00-2.60)	Depositor EDS
R_{merge}	0.09	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.70 (at 2.61Å)	Xtriage
Refinement program	REFMAC 5.1.9999	Depositor
R, R_{free}	0.242 , 0.285 0.236 , 0.274	Depositor DCC
R_{free} test set	1529 reflections (2.82%)	wwPDB-VP
Wilson B-factor (Å ²)	64.1	Xtriage
Anisotropy	0.213	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 73.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	7746	wwPDB-VP
Average B, all atoms (Å ²)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.28% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: K, MG, CA, ACP

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	0.66	0/7812	1.04	15/10592 (0.1%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	5

There are no bond length outliers.

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	57	PHE	N-CA-C	-9.48	97.27	110.35
1	A	84	THR	N-CA-C	8.52	121.42	111.02
1	A	155	VAL	CB-CA-C	-8.00	98.17	111.29
1	A	5	HIS	N-CA-C	-6.79	104.19	113.30
1	A	4	ALA	N-CA-C	6.12	119.45	109.59
1	A	951	ASP	N-CA-C	5.92	122.90	109.81
1	A	959	LEU	N-CA-C	5.44	122.39	110.80
1	A	501	ALA	N-CA-C	5.43	120.00	112.45
1	A	199	ALA	N-CA-C	5.26	117.66	110.24
1	A	236	ARG	N-CA-C	5.23	116.67	110.97
1	A	244	GLN	N-CA-C	5.10	116.73	109.14
1	A	516	GLY	N-CA-C	5.08	117.96	110.80
1	A	440	ALA	N-CA-C	5.03	117.42	111.33
1	A	149	ASP	N-CA-CB	5.02	118.50	110.46
1	A	388	THR	N-CA-CB	-5.02	102.81	110.49

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	238	GLN	Peptide
1	A	243	GLU	Peptide
1	A	500	PRO	Peptide
1	A	56	GLN	Peptide
1	A	880	HIS	Peptide

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	7671	0	7765	213	0
2	A	2	0	0	0	0
3	A	1	0	0	0	0
4	A	1	0	0	0	0
5	A	31	0	14	0	0
6	A	40	0	0	1	0
All	All	7746	0	7779	213	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 14.

All (213) 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:A:241:ALA:C	1:A:243:GLU:H	1.74	0.95
1:A:889:GLU:O	1:A:891:PHE:N	2.06	0.89
1:A:116:ILE:HD11	1:A:323:THR:HG21	1.57	0.87
1:A:679:VAL:HG23	1:A:683:HIS:CB	2.04	0.87
1:A:957:PHE:O	1:A:958:LYS:HG2	1.77	0.84
1:A:679:VAL:HG23	1:A:683:HIS:HB2	1.61	0.82
1:A:495:SER:HB2	1:A:588:GLU:OE2	1.79	0.82
1:A:71:ILE:HD11	1:A:300:VAL:HG11	1.62	0.81
1:A:914:ASN:HD21	1:A:978:ILE:HA	1.48	0.79
1:A:354:GLY:HA2	1:A:359:ASN:HB2	1.65	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:679:VAL:CG2	1:A:683:HIS:HB2	2.14	0.77
1:A:868:HIS:O	1:A:871:THR:N	2.17	0.77
1:A:957:PHE:O	1:A:958:LYS:CG	2.32	0.76
1:A:528:VAL:HG21	1:A:541:VAL:HG11	1.70	0.73
1:A:31:ARG:HG3	1:A:31:ARG:HH11	1.52	0.73
1:A:41:LEU:HD13	1:A:236:ARG:HD2	1.71	0.73
1:A:41:LEU:CD1	1:A:236:ARG:HD2	2.21	0.71
1:A:884:GLU:O	1:A:886:LEU:N	2.23	0.71
1:A:558:THR:HG21	1:A:635:ILE:CG1	2.20	0.70
1:A:880:HIS:HB3	1:A:881:PRO:HD2	1.72	0.69
1:A:41:LEU:HD13	1:A:236:ARG:CD	2.22	0.69
1:A:679:VAL:CG2	1:A:683:HIS:CB	2.71	0.69
1:A:889:GLU:O	1:A:891:PHE:O	2.11	0.69
1:A:241:ALA:C	1:A:243:GLU:N	2.47	0.68
1:A:412:GLU:OE1	1:A:529:ARG:HD2	1.95	0.66
1:A:558:THR:HG21	1:A:635:ILE:HG13	1.79	0.65
1:A:962:LEU:HB2	1:A:966:GLN:HG2	1.79	0.65
1:A:81:GLY:HA2	1:A:297:LYS:NZ	2.12	0.64
1:A:139:ARG:HD3	1:A:435:GLU:OE1	1.97	0.64
1:A:155:VAL:HG13	1:A:216:ALA:HA	1.79	0.64
1:A:875:GLN:O	1:A:880:HIS:CG	2.51	0.63
1:A:486:GLU:O	1:A:491:ARG:NH2	2.32	0.62
1:A:10:GLU:OE1	1:A:10:GLU:O	2.18	0.62
1:A:441:THR:OG1	1:A:560:ARG:NH1	2.32	0.62
1:A:671:ARG:HD2	1:A:694:TYR:CE1	2.34	0.62
1:A:639:ILE:HG22	1:A:639:ILE:O	2.00	0.61
1:A:607:VAL:HG12	1:A:639:ILE:HG23	1.82	0.60
1:A:53:VAL:HG12	1:A:106:VAL:HG22	1.83	0.60
1:A:898:THR:HG21	1:A:958:LYS:O	2.02	0.60
1:A:155:VAL:HA	1:A:214:ILE:HG22	1.84	0.60
1:A:43:ALA:HB3	1:A:236:ARG:HH12	1.67	0.59
1:A:530:VAL:O	1:A:533:THR:HB	2.02	0.59
1:A:86:THR:HG22	1:A:790:VAL:HG21	1.84	0.59
1:A:558:THR:HG21	1:A:635:ILE:HG12	1.84	0.59
1:A:558:THR:HG22	1:A:558:THR:O	2.04	0.58
1:A:145:ILE:HD12	1:A:223:VAL:HG21	1.84	0.58
1:A:5:HIS:HD2	1:A:194:VAL:HG23	1.69	0.58
1:A:836:ARG:HG3	1:A:984:LEU:HD23	1.86	0.58
1:A:42:PRO:O	1:A:43:ALA:C	2.46	0.57
1:A:866:THR:HG22	1:A:867:TYR:H	1.69	0.57
1:A:481:LYS:HD3	1:A:484:THR:HG22	1.86	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:116:ILE:HD11	1:A:323:THR:CG2	2.34	0.57
1:A:90:GLU:HG2	1:A:790:VAL:HG22	1.86	0.56
1:A:648:VAL:HG13	1:A:651:ARG:HG3	1.86	0.56
1:A:57:PHE:O	1:A:58:GLU:CB	2.53	0.56
1:A:246:LYS:HB2	1:A:250:GLN:CD	2.31	0.56
1:A:832:TRP:CH2	1:A:988:ALA:HB2	2.40	0.56
1:A:276:ILE:HD11	1:A:291:GLY:O	2.06	0.56
1:A:170:SER:HB2	1:A:486:GLU:HG2	1.88	0.56
1:A:625:THR:O	1:A:679:VAL:HG12	2.06	0.55
1:A:558:THR:CG2	1:A:635:ILE:HG13	2.36	0.55
1:A:60:LEU:H	1:A:60:LEU:HD23	1.72	0.54
1:A:81:GLY:HA2	1:A:297:LYS:HZ1	1.72	0.54
1:A:864:GLY:O	1:A:866:THR:N	2.40	0.54
1:A:24:LEU:HD22	1:A:149:ASP:HB3	1.89	0.54
1:A:856:PHE:O	1:A:863:PRO:O	2.26	0.54
1:A:869:GLN:O	1:A:869:GLN:HG2	2.08	0.54
1:A:279:PHE:CZ	1:A:288:TRP:C	2.86	0.54
1:A:884:GLU:HA	1:A:884:GLU:OE1	2.08	0.54
1:A:847:ALA:HB1	1:A:973:ILE:HG22	1.90	0.54
1:A:302:LEU:HD13	1:A:775:ILE:HD12	1.90	0.53
1:A:240:ALA:O	1:A:241:ALA:C	2.52	0.53
1:A:243:GLU:HA	1:A:244:GLN:HG3	1.91	0.53
1:A:276:ILE:HD13	1:A:295:TYR:HB2	1.90	0.53
1:A:865:VAL:HG13	1:A:870:LEU:HG	1.91	0.53
1:A:145:ILE:CD1	1:A:223:VAL:HG21	2.39	0.52
1:A:308:PRO:HB3	1:A:764:LEU:HD12	1.92	0.52
1:A:383:SER:O	1:A:384:ILE:HD13	2.09	0.52
1:A:527:TYR:CD1	1:A:534:ARG:HD3	2.46	0.51
1:A:388:THR:HG22	1:A:390:ALA:H	1.76	0.51
1:A:502:LYS:N	1:A:502:LYS:HD2	2.25	0.51
1:A:871:THR:O	1:A:872:HIS:CG	2.64	0.51
1:A:271:VAL:HG22	1:A:776:PHE:HE1	1.75	0.51
1:A:648:VAL:HG12	1:A:648:VAL:O	2.10	0.51
1:A:889:GLU:O	1:A:890:ILE:C	2.51	0.51
1:A:139:ARG:HG2	1:A:426:ASP:OD2	2.11	0.51
1:A:90:GLU:HB2	1:A:91:PRO:HD3	1.92	0.50
1:A:880:HIS:O	1:A:881:PRO:C	2.53	0.50
1:A:246:LYS:HG3	1:A:251:GLN:HG3	1.93	0.50
1:A:366:MET:HE2	1:A:384:ILE:HD11	1.93	0.50
1:A:947:ILE:HD11	1:A:957:PHE:CG	2.46	0.50
1:A:891:PHE:O	1:A:892:GLU:CB	2.60	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:666:GLN:HE22	1:A:686:LYS:NZ	2.10	0.50
1:A:722:SER:OG	1:A:738:ASP:OD2	2.22	0.50
1:A:909:MET:HG2	1:A:937:ILE:HG23	1.93	0.50
1:A:944:HIS:O	1:A:947:ILE:HG22	2.11	0.50
1:A:671:ARG:HD2	1:A:694:TYR:CD1	2.47	0.50
1:A:90:GLU:CG	1:A:790:VAL:HG22	2.42	0.50
1:A:679:VAL:HG23	1:A:683:HIS:CG	2.47	0.50
1:A:276:ILE:HD11	1:A:292:ALA:HA	1.93	0.49
1:A:419:LEU:O	1:A:481:LYS:NZ	2.42	0.49
1:A:43:ALA:CB	1:A:236:ARG:NH1	2.76	0.49
1:A:256:PHE:CE1	1:A:829:ILE:HD11	2.47	0.49
1:A:920:GLN:HA	1:A:989:ARG:HH21	1.78	0.49
1:A:43:ALA:HB3	1:A:236:ARG:NH1	2.28	0.48
1:A:491:ARG:NH1	1:A:588:GLU:OE2	2.46	0.48
1:A:875:GLN:O	1:A:880:HIS:CB	2.61	0.48
1:A:962:LEU:HB2	1:A:966:GLN:CG	2.43	0.48
1:A:639:ILE:O	1:A:639:ILE:CG2	2.62	0.48
1:A:962:LEU:O	1:A:963:ASP:C	2.55	0.48
1:A:41:LEU:HD13	1:A:236:ARG:HD3	1.95	0.47
1:A:909:MET:N	1:A:909:MET:HE3	2.29	0.47
1:A:33:LEU:O	1:A:37:GLY:N	2.36	0.47
1:A:875:GLN:O	1:A:880:HIS:HB2	2.14	0.47
1:A:19:SER:HB2	1:A:22:THR:HG23	1.96	0.47
1:A:142:ALA:O	1:A:145:ILE:HG23	2.14	0.47
1:A:235:ILE:HG22	1:A:235:ILE:O	2.14	0.47
1:A:111:ASN:HB3	1:A:324:ARG:CD	2.45	0.47
1:A:917:SER:HB2	1:A:925:MET:HE2	1.96	0.47
1:A:453:ASN:OD1	1:A:453:ASN:O	2.33	0.47
1:A:368:ILE:HD12	1:A:409:GLY:HA3	1.97	0.46
1:A:10:GLU:OE1	1:A:10:GLU:C	2.58	0.46
1:A:671:ARG:HG3	1:A:694:TYR:CE2	2.51	0.46
1:A:869:GLN:C	1:A:871:THR:H	2.24	0.46
1:A:884:GLU:OE1	1:A:884:GLU:CA	2.62	0.46
1:A:174:ARG:HB2	1:A:216:ALA:HB3	1.98	0.46
1:A:311:LEU:HB3	1:A:312:PRO:HD3	1.97	0.46
1:A:495:SER:CB	1:A:588:GLU:OE2	2.58	0.46
1:A:751:ARG:HB3	1:A:816:ILE:HD11	1.98	0.46
1:A:962:LEU:N	1:A:966:GLN:HG3	2.30	0.46
1:A:321:LEU:HD21	1:A:325:ARG:CZ	2.46	0.45
1:A:365:LYS:NZ	6:A:1030:HOH:O	2.50	0.45
1:A:891:PHE:O	1:A:892:GLU:HB3	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2:GLU:HG3	1:A:16:PHE:CE1	2.50	0.45
1:A:276:ILE:HG23	1:A:276:ILE:O	2.16	0.45
1:A:119:LEU:HD11	1:A:330:ASN:C	2.41	0.45
1:A:354:GLY:HA3	1:A:703:ASP:OD1	2.16	0.45
1:A:880:HIS:C	1:A:882:HIS:N	2.75	0.45
1:A:452:MET:O	1:A:453:ASN:C	2.59	0.45
1:A:903:VAL:HA	1:A:970:VAL:HG13	1.98	0.45
1:A:31:ARG:HH11	1:A:31:ARG:CG	2.27	0.45
1:A:49:LEU:O	1:A:50:TRP:C	2.60	0.45
1:A:170:SER:CB	1:A:486:GLU:HG2	2.47	0.45
1:A:276:ILE:HD11	1:A:291:GLY:C	2.41	0.45
1:A:875:GLN:HA	1:A:880:HIS:HB2	1.99	0.45
1:A:43:ALA:C	1:A:45:GLU:H	2.25	0.45
1:A:743:ILE:O	1:A:747:VAL:HG23	2.17	0.45
1:A:788:ILE:HG22	1:A:791:GLN:HG3	1.98	0.44
1:A:903:VAL:O	1:A:907:ILE:HG22	2.17	0.44
1:A:81:GLY:HA2	1:A:297:LYS:HZ2	1.82	0.44
1:A:379:LEU:HD12	1:A:548:VAL:HG21	1.98	0.44
1:A:388:THR:CG2	1:A:390:ALA:H	2.30	0.44
1:A:201:ASN:HA	1:A:204:LYS:HG3	1.99	0.44
1:A:246:LYS:HZ1	1:A:254:ASP:CG	2.25	0.44
1:A:957:PHE:O	1:A:958:LYS:CD	2.65	0.44
1:A:78:PHE:O	1:A:80:GLU:N	2.50	0.44
1:A:119:LEU:HD11	1:A:330:ASN:HA	1.99	0.44
1:A:201:ASN:HD21	1:A:231:GLU:CG	2.30	0.44
1:A:652:ALA:HA	1:A:675:CYS:O	2.16	0.44
1:A:799:THR:HA	1:A:909:MET:HE1	1.99	0.44
1:A:855:TRP:O	1:A:859:ALA:HB3	2.18	0.44
1:A:156:GLY:HA2	1:A:726:VAL:CG1	2.47	0.44
1:A:496:VAL:O	1:A:512:MET:HA	2.17	0.44
1:A:43:ALA:O	1:A:45:GLU:N	2.51	0.44
1:A:866:THR:HG22	1:A:867:TYR:N	2.33	0.44
1:A:19:SER:CB	1:A:22:THR:HG23	2.48	0.44
1:A:51:GLU:O	1:A:54:ILE:HB	2.18	0.44
1:A:763:TYR:CE1	1:A:912:ALA:HB2	2.53	0.43
1:A:712:LYS:HG3	1:A:730:ALA:HB1	1.99	0.43
1:A:788:ILE:HG12	1:A:789:PRO:HD2	2.00	0.43
1:A:305:ALA:O	1:A:768:ASN:ND2	2.51	0.43
1:A:875:GLN:HE21	1:A:875:GLN:N	2.16	0.43
1:A:677:ALA:O	1:A:678:ARG:C	2.59	0.43
1:A:868:HIS:C	1:A:870:LEU:N	2.75	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:389:TYR:HB3	1:A:425:LEU:HD21	2.01	0.43
1:A:478:LEU:HD23	1:A:479:MET:HG2	2.01	0.43
1:A:528:VAL:O	1:A:528:VAL:HG12	2.18	0.43
1:A:909:MET:HG3	1:A:937:ILE:HG12	2.00	0.42
1:A:624:ILE:CG2	1:A:684:LYS:HG2	2.50	0.42
1:A:679:VAL:CG2	1:A:683:HIS:HB3	2.48	0.42
1:A:557:ASP:HB3	1:A:559:LEU:CD2	2.49	0.42
1:A:947:ILE:HD11	1:A:957:PHE:CD1	2.55	0.42
1:A:64:ILE:HG21	1:A:307:ILE:CD1	2.49	0.42
1:A:665:GLU:OE2	1:A:665:GLU:HA	2.19	0.42
1:A:271:VAL:HG22	1:A:776:PHE:CE1	2.53	0.42
1:A:24:LEU:HD22	1:A:149:ASP:CB	2.50	0.42
1:A:170:SER:HB2	1:A:486:GLU:CG	2.48	0.42
1:A:648:VAL:O	1:A:648:VAL:CG1	2.68	0.42
1:A:413:LEU:HD22	1:A:564:LEU:HD13	2.02	0.42
1:A:154:ALA:O	1:A:155:VAL:C	2.63	0.41
1:A:341:THR:HB	1:A:716:ILE:HD12	2.02	0.41
1:A:840:ILE:HG21	1:A:911:ASN:HD22	1.85	0.41
1:A:32:HIS:HD2	1:A:147:PRO:O	2.03	0.41
1:A:865:VAL:O	1:A:866:THR:O	2.37	0.41
1:A:904:LEU:O	1:A:908:GLU:HG3	2.21	0.41
1:A:491:ARG:HH11	1:A:588:GLU:CD	2.28	0.41
1:A:921:SER:CB	1:A:923:MET:HG2	2.51	0.41
1:A:755:ASN:O	1:A:759:GLN:NE2	2.53	0.41
1:A:119:LEU:HD13	1:A:332:ILE:HG13	2.02	0.41
1:A:156:GLY:HA2	1:A:726:VAL:HG13	2.02	0.41
1:A:425:LEU:HD11	1:A:447:THR:HG22	2.02	0.41
1:A:446:THR:HG23	1:A:472:ASN:ND2	2.36	0.41
1:A:181:THR:OG1	1:A:183:GLU:HB2	2.21	0.41
1:A:311:LEU:N	1:A:312:PRO:CD	2.83	0.41
1:A:778:THR:HG23	1:A:849:VAL:HG22	2.01	0.41
1:A:441:THR:CG2	1:A:560:ARG:NH1	2.84	0.41
1:A:560:ARG:HH11	1:A:560:ARG:HD3	1.69	0.41
1:A:795:VAL:O	1:A:799:THR:OG1	2.39	0.41
1:A:356:LEU:HD23	1:A:623:MET:HE2	2.03	0.40
1:A:453:ASN:OD1	1:A:453:ASN:C	2.63	0.40
1:A:326:MET:HA	1:A:326:MET:HE2	2.03	0.40
1:A:342:LEU:HA	1:A:345:THR:OG1	2.21	0.40
1:A:491:ARG:HD2	1:A:588:GLU:OE1	2.22	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	992/994 (100%)	909 (92%)	60 (6%)	23 (2%)	5 9

All (23) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	43	ALA
1	A	507	ALA
1	A	865	VAL
1	A	881	PRO
1	A	882	HIS
1	A	885	GLY
1	A	890	ILE
1	A	958	LYS
1	A	959	LEU
1	A	46	GLY
1	A	79	GLU
1	A	82	GLU
1	A	155	VAL
1	A	241	ALA
1	A	870	LEU
1	A	874	MET
1	A	44	GLU
1	A	49	LEU
1	A	239	MET
1	A	242	THR
1	A	866	THR
1	A	183	GLU
1	A	276	ILE

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	840/840 (100%)	758 (90%)	82 (10%)	7 17

All (82) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	GLU
1	A	10	GLU
1	A	18	VAL
1	A	22	THR
1	A	24	LEU
1	A	31	ARG
1	A	49	LEU
1	A	51	GLU
1	A	56	GLN
1	A	58	GLU
1	A	60	LEU
1	A	80	GLU
1	A	82	GLU
1	A	83	GLU
1	A	84	THR
1	A	85	ILE
1	A	119	LEU
1	A	128	LYS
1	A	139	ARG
1	A	145	ILE
1	A	155	VAL
1	A	183	GLU
1	A	196	ASP
1	A	198	ARG
1	A	214	ILE
1	A	220	LEU
1	A	244	GLN
1	A	253	LEU
1	A	276	ILE
1	A	284	HIS

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Mol	Chain	Res	Type
1	A	309	GLU
1	A	319	LEU
1	A	336	LEU
1	A	344	CYS
1	A	356	LEU
1	A	362	SER
1	A	384	ILE
1	A	388	THR
1	A	394	GLU
1	A	413	LEU
1	A	445	LEU
1	A	447	THR
1	A	449	VAL
1	A	486	GLU
1	A	491	ARG
1	A	495	SER
1	A	496	VAL
1	A	504	SER
1	A	528	VAL
1	A	532	THR
1	A	533	THR
1	A	544	LYS
1	A	611	ILE
1	A	613	LEU
1	A	620	ARG
1	A	647	GLU
1	A	663	LEU
1	A	665	GLU
1	A	679	VAL
1	A	691	LEU
1	A	701	THR
1	A	713	LYS
1	A	716	ILE
1	A	726	VAL
1	A	733	MET
1	A	737	ASP
1	A	751	ARG
1	A	788	ILE
1	A	795	VAL
1	A	798	VAL
1	A	807	LEU
1	A	873	PHE

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Mol	Chain	Res	Type
1	A	875	GLN
1	A	884	GLU
1	A	891	PHE
1	A	898	THR
1	A	909	MET
1	A	918	GLU
1	A	943	LEU
1	A	965	THR
1	A	972	LYS
1	A	991	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	108	GLN
1	A	111	ASN
1	A	114	ASN
1	A	138	GLN
1	A	213	ASN
1	A	244	GLN
1	A	250	GLN
1	A	251	GLN
1	A	259	GLN
1	A	275	ASN
1	A	398	ASN
1	A	666	GLN
1	A	755	ASN
1	A	868	HIS
1	A	869	GLN
1	A	875	GLN
1	A	880	HIS
1	A	911	ASN
1	A	914	ASN
1	A	920	GLN

5.3.3 RNA ⓘ

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 5 ligands modelled in this entry, 4 are monoatomic - leaving 1 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
5	ACP	A	1001	3	31,33,33	1.87	9 (29%)	47,52,52	2.23	15 (31%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	ACP	A	1001	3	-	0/19/38/38	0/3/3/3

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	1001	ACP	C5-C4	4.74	1.47	1.39
5	A	1001	ACP	PB-O3A	4.31	1.63	1.58
5	A	1001	ACP	PA-O3A	3.66	1.63	1.59
5	A	1001	ACP	PB-O2B	-3.27	1.48	1.56
5	A	1001	ACP	C5-N7	-3.14	1.33	1.39
5	A	1001	ACP	C8-N9	-3.06	1.32	1.37
5	A	1001	ACP	C8-N7	2.76	1.37	1.31
5	A	1001	ACP	C5-C6	2.22	1.47	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	1001	ACP	C4-N9	-2.05	1.33	1.37

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1001	ACP	C5-C4-N3	-6.13	118.27	126.72
5	A	1001	ACP	C4-C5-N7	-4.88	105.00	110.58
5	A	1001	ACP	N3-C4-N9	4.66	135.10	127.17
5	A	1001	ACP	N3-C2-N1	-4.14	122.31	128.58
5	A	1001	ACP	C2-N3-C4	4.13	121.91	111.83
5	A	1001	ACP	C5-N7-C8	3.67	109.21	103.45
5	A	1001	ACP	C4-N9-C8	3.57	109.49	105.74
5	A	1001	ACP	O3G-PG-O2G	3.48	117.88	107.96
5	A	1001	ACP	C6-C5-N7	3.17	138.21	132.09
5	A	1001	ACP	O2B-PB-O1B	3.17	120.26	109.95
5	A	1001	ACP	O4'-C1'-N9	-3.08	102.17	108.09
5	A	1001	ACP	N9-C8-N7	-2.99	109.69	113.94
5	A	1001	ACP	PB-O3A-PA	-2.72	123.50	132.37
5	A	1001	ACP	C2-N1-C6	2.41	122.69	118.73
5	A	1001	ACP	O1G-PG-C3B	-2.13	106.73	111.37

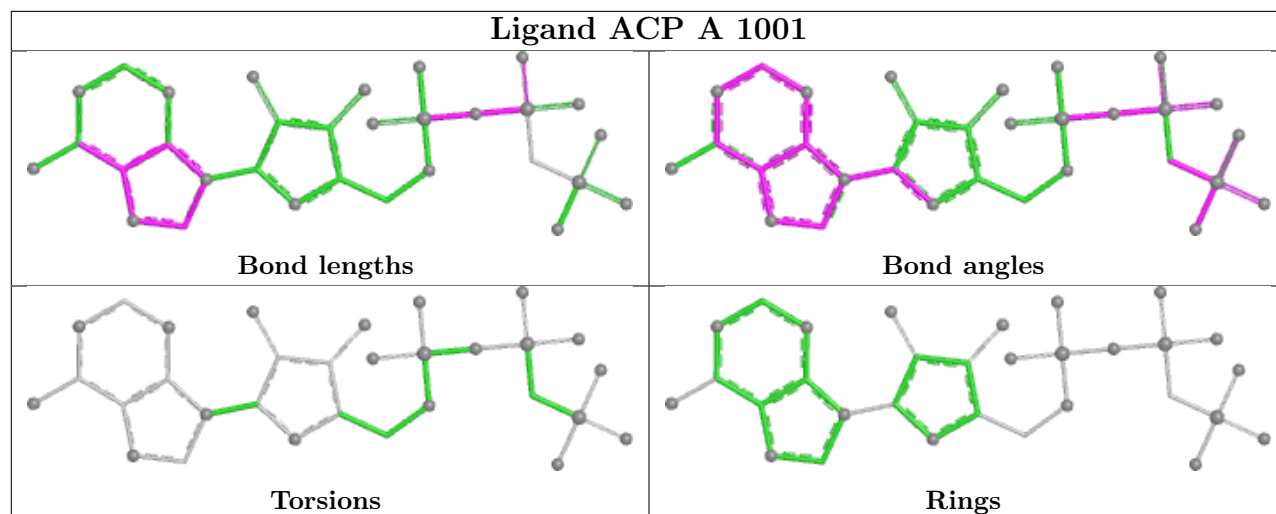
There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	994/994 (100%)	1.10	176 (17%) 4 3	40, 71, 127, 142	0

All (176) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	506	ALA	7.8
1	A	84	THR	6.5
1	A	507	ALA	6.0
1	A	276	ILE	5.9
1	A	863	PRO	5.6
1	A	873	PHE	5.5
1	A	992	LEU	5.2
1	A	508	VAL	5.2
1	A	961	ALA	5.0
1	A	1	MET	5.0
1	A	277	GLY	4.9
1	A	883	PHE	4.8
1	A	881	PRO	4.7
1	A	831	GLY	4.7
1	A	240	ALA	4.6
1	A	870	LEU	4.3
1	A	4	ALA	4.3
1	A	85	ILE	4.2
1	A	867	TYR	4.2
1	A	866	THR	4.2
1	A	288	TRP	4.2
1	A	241	ALA	4.2
1	A	782	GLY	4.2
1	A	60	LEU	4.1
1	A	342	LEU	4.0
1	A	853	ALA	3.9
1	A	83	GLU	3.9

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Mol	Chain	Res	Type	RSRZ
1	A	875	GLN	3.8
1	A	886	LEU	3.8
1	A	501	ALA	3.7
1	A	865	VAL	3.7
1	A	504	SER	3.7
1	A	877	THR	3.7
1	A	962	LEU	3.6
1	A	888	CYS	3.6
1	A	50	TRP	3.5
1	A	49	LEU	3.5
1	A	52	LEU	3.5
1	A	81	GLY	3.5
1	A	273	LEU	3.5
1	A	289	ILE	3.4
1	A	109	GLU	3.4
1	A	876	CYS	3.4
1	A	53	VAL	3.4
1	A	957	PHE	3.3
1	A	959	LEU	3.3
1	A	505	ARG	3.3
1	A	914	ASN	3.2
1	A	284	HIS	3.2
1	A	858	TYR	3.2
1	A	61	LEU	3.2
1	A	777	LEU	3.2
1	A	182	GLY	3.2
1	A	864	GLY	3.1
1	A	307	ILE	3.1
1	A	283	VAL	3.1
1	A	842	GLY	3.1
1	A	57	PHE	3.1
1	A	647	GLU	3.0
1	A	840	ILE	3.0
1	A	776	PHE	3.0
1	A	887	ASP	3.0
1	A	832	TRP	3.0
1	A	783	LEU	3.0
1	A	792	LEU	3.0
1	A	963	ASP	3.0
1	A	54	ILE	3.0
1	A	898	THR	2.9
1	A	857	MET	2.9

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Mol	Chain	Res	Type	RSRZ
1	A	846	ALA	2.9
1	A	942	SER	2.9
1	A	294	TYR	2.9
1	A	826	GLU	2.9
1	A	242	THR	2.9
1	A	969	MET	2.8
1	A	236	ARG	2.8
1	A	248	PRO	2.8
1	A	874	MET	2.8
1	A	56	GLN	2.8
1	A	639	ILE	2.8
1	A	854	TRP	2.8
1	A	121	GLU	2.8
1	A	952	PRO	2.7
1	A	985	LYS	2.7
1	A	872	HIS	2.7
1	A	43	ALA	2.7
1	A	784	PRO	2.7
1	A	939	LEU	2.7
1	A	819	ARG	2.7
1	A	960	LYS	2.7
1	A	885	GLY	2.7
1	A	824	PRO	2.7
1	A	302	LEU	2.6
1	A	243	GLU	2.6
1	A	837	TYR	2.6
1	A	272	TRP	2.6
1	A	77	TRP	2.6
1	A	503	SER	2.6
1	A	966	GLN	2.5
1	A	932	TRP	2.5
1	A	702	GLY	2.5
1	A	786	ALA	2.5
1	A	203	ASP	2.5
1	A	232	ILE	2.5
1	A	964	LEU	2.5
1	A	852	ALA	2.5
1	A	848	THR	2.5
1	A	579	ASP	2.5
1	A	967	TRP	2.5
1	A	882	HIS	2.5
1	A	890	ILE	2.4

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Mol	Chain	Res	Type	RSRZ
1	A	983	ILE	2.4
1	A	737	ASP	2.4
1	A	991	TYR	2.4
1	A	572	LYS	2.4
1	A	869	GLN	2.4
1	A	65	LEU	2.4
1	A	271	VAL	2.4
1	A	773	VAL	2.4
1	A	965	THR	2.4
1	A	55	GLU	2.4
1	A	73	PHE	2.4
1	A	76	ALA	2.4
1	A	235	ILE	2.4
1	A	375	ASP	2.4
1	A	719	ALA	2.4
1	A	828	LEU	2.3
1	A	925	MET	2.3
1	A	815	ASP	2.3
1	A	984	LEU	2.3
1	A	94	ILE	2.3
1	A	825	LYS	2.3
1	A	48	SER	2.3
1	A	849	VAL	2.3
1	A	823	SER	2.3
1	A	202	GLN	2.3
1	A	279	PHE	2.3
1	A	533	THR	2.3
1	A	981	ASP	2.3
1	A	99	ILE	2.2
1	A	3	ALA	2.2
1	A	47	LYS	2.2
1	A	64	ILE	2.2
1	A	82	GLU	2.2
1	A	917	SER	2.2
1	A	931	ILE	2.2
1	A	778	THR	2.2
1	A	280	ASN	2.2
1	A	978	ILE	2.2
1	A	78	PHE	2.2
1	A	859	ALA	2.1
1	A	230	THR	2.1
1	A	244	GLN	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	66	LEU	2.1
1	A	249	LEU	2.1
1	A	979	GLY	2.1
1	A	59	ASP	2.1
1	A	973	ILE	2.1
1	A	791	GLN	2.1
1	A	764	LEU	2.1
1	A	923	MET	2.1
1	A	260	LEU	2.1
1	A	750	GLY	2.1
1	A	986	PHE	2.1
1	A	308	PRO	2.1
1	A	266	LEU	2.1
1	A	796	ASN	2.1
1	A	91	PRO	2.0
1	A	971	LEU	2.0
1	A	298	ILE	2.0
1	A	816	ILE	2.0
1	A	798	VAL	2.0
1	A	733	MET	2.0
1	A	95	LEU	2.0
1	A	916	LEU	2.0
1	A	656	ARG	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

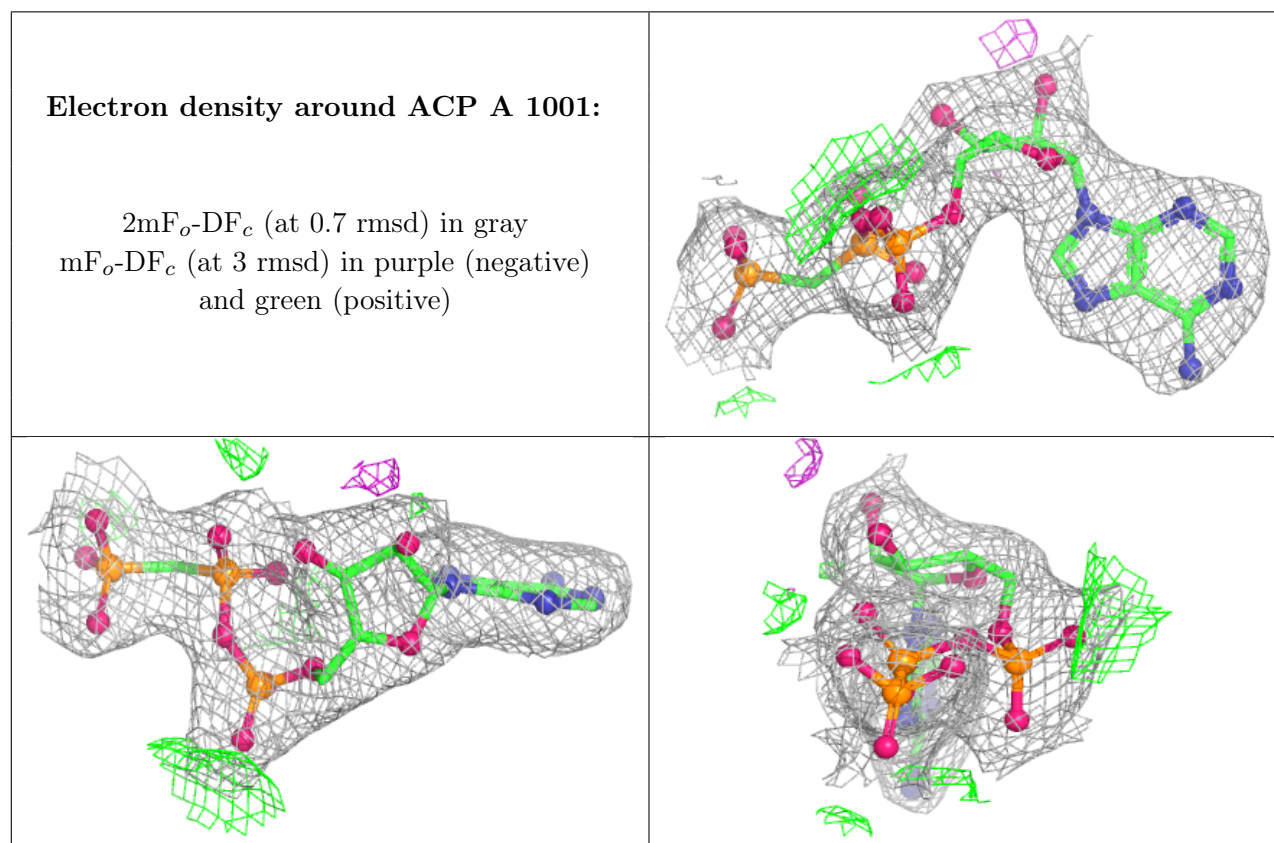
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists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

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
4	K	A	1006	1/1	0.90	0.12	69,69,69,69	0
2	CA	A	1004	1/1	0.95	0.06	83,83,83,83	0
3	MG	A	1005	1/1	0.96	0.10	32,32,32,32	0
2	CA	A	1003	1/1	0.97	0.06	85,85,85,85	0
5	ACP	A	1001	31/31	0.98	0.07	37,43,45,46	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.