



wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 23, 2021 – 02:54 PM EDT

PDB ID : 1GLL
Title : ESCHERICHIA COLI GLYCEROL KINASE MUTANT WITH BOUND ATP ANALOG SHOWING SUBSTANTIAL DOMAIN MOTION
Authors : Bystrom, C.E.; Pettigrew, D.W.; Branchaud, B.P.; Remington, S.J.
Deposited on : 1998-09-24
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.23.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.23.2

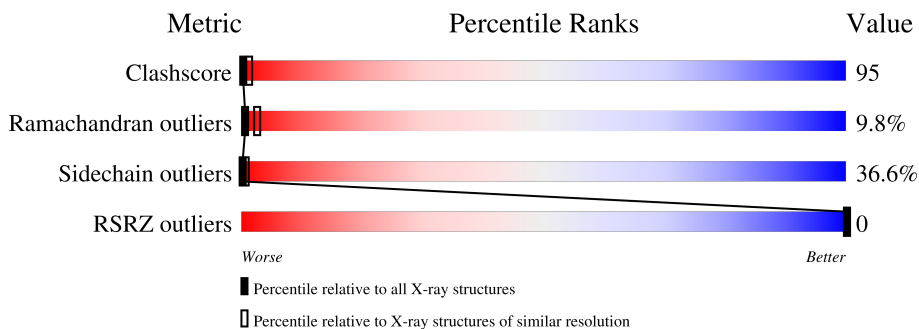
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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))
Clashscore	141614	2416 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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	O	501	
1	Y	501	

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	GOL	O	600	-	-	X	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7896 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 GLYCEROL KINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	Y	494	3910	2470	683	738	19	0	0	0
1	O	494	3910	2470	683	738	19	0	0	0

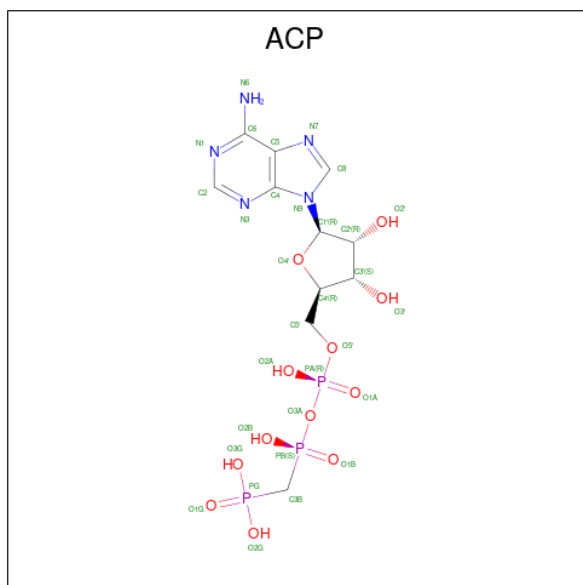
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
Y	58	TRP	SER	engineered mutation	UNP P0A6F3
O	58	TRP	SER	engineered mutation	UNP P0A6F3

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	Y	1	Total	Mg	0	0
			1	1		
2	O	1	Total	Mg	0	0
			1	1		

- Molecule 3 is PHOSPHOMETHYLPHOSPHONIC ACID ADENYLATE ESTER (three-letter code: ACP) (formula: $C_{11}H_{18}N_5O_{12}P_3$).



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

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).

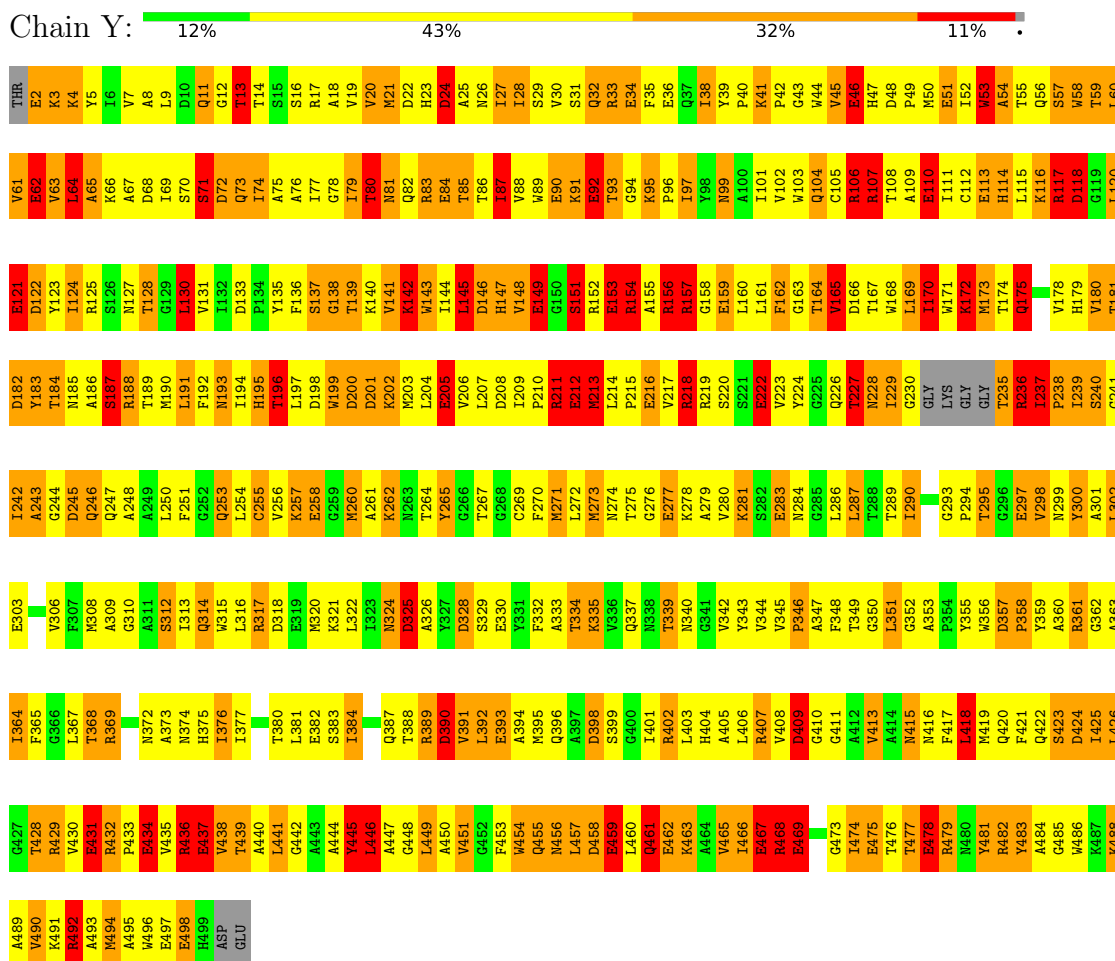


Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	C O		
4	Y	1	6	3 3	0	0
4	O	1	6	3 3	0	0

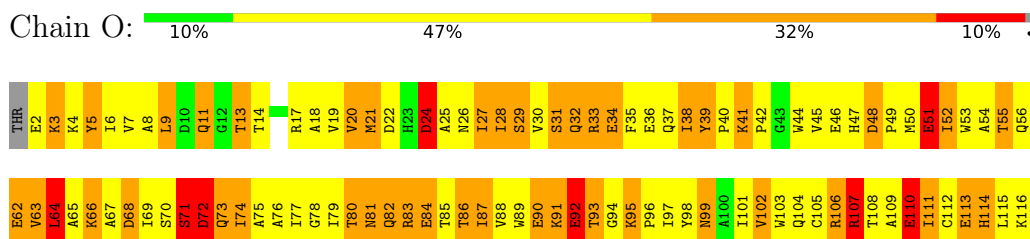
3 Residue-property plots i

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: GLYCEROL KINASE



• Molecule 1: GLYCEROL KINASE



A489	A490	A491	R492	R493	R494	A495	A496	E497	E498	E499	ASP	GLU																																																	
G497	T428	R429	V430	E431	R432	P433	E434	V435	R436	E437	V438	T439	A440	L441	G442	A443	A444	Y445	L446	A447	G448	L449	A450	V451	G452	F453	W454	Q455	R456	L457	D458	E459	L460	Q461	E462	K463	A464	V465	I466	E467	R468	E469	F470	G471	E472	E473	E474	E475	T476	T477	E478	R479	M480	Y481	R482	Q483	Y484	A485	G486	W487	K488
A363	I364	F365	T366	R367	N372	A373	N374	H375	I376	I377	R378	A379	T380	L381	E382	S383	I384	A385	Y386	Q387	T388	R389	D390	V391	L392	E393	A394	M395	G396	A397	D398	I401	R402	L403	H404	A405	L406	R407	V408	D409	G410	V413	A414	M415	M416	F417	M418	Y481	R482	Q420	F421	G422	R423	D424	I425	L426					
A369	F370	M308	A309	G310	A311	S312	I313	Q314	M315	L316	R317	D318	E319	M320	K321	L322	I323	N324	D325	A326	Y327	D328	S329	E330	F331	F332	A333	T334	K335	V336	Q337	T338	N339	M340	G341	V342	Y343	E344	V345	P346	A347	F348	T349	G350	L351	G352	A353	P354	Y355	W356	Q420	F421	G422	R423	D424	I425	L426				
I242	A243	G244	D245	Q246	Q247	A248	A249	L250	G252	Q253	L254	C255	V256	K257	E258	G259	M260	A261	K262	N263	T264	Y265	G266	T267	G268	C269	F270	M271	L272	M273	N274	K275	G276	E277	K278	A279	V280	K281	S282	E283	N284	G285	L286	L287	T288	T289	I290	A291	C292	G293	P294	T295	W296	G297	E297	V298	N299	Y300	A301		
L302	E303	V306	F307	M308	A309	G310	A311	S312	I313	Q314	M315	L316	R317	D318	E319	M320	K321	L322	I323	N324	D325	A326	Y327	D328	S329	E330	F331	F332	A333	T334	K335	V336	Q337	T338	N339	M340	G341	V342	Y343	E344	V345	P346	A347	F348	T349	G350	L351	G352	A353	P354	Y355	W356	Q420	F421	G422	R423	D424	I425	L426		
D182	Y183	T184	N185	R186	S187	T188	T189	L191	F192	I193	M193	H194	H195	T196	S197	D198	W199	K200	D201	K202	M203	L204	E205	V206	L207	D208	I209	P210	R211	S415	R212	L213	L214	P215	E216	V217	R218	R219	S220	S221	E222	Y224	V223	Y224	G225	Q226	Y227	N228	I229	G230	W171	L172	M173	L174	Q175	G176	R177	V178	H179	W180	T181

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	99.77Å 201.15Å 114.34Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 18.03 – 3.00	Depositor EDS
% Data completeness (in resolution range)	95.0 (20.00-3.00) 82.7 (18.03-3.00)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	93.19 (at 2.97Å)	Xtrriage
Refinement program	TNT 5F	Depositor
R, R_{free}	0.176 , (Not available) 0.166 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	53.7	Xtrriage
Anisotropy	0.286	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.21 , 157.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7896	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.74% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, GOL, 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	O	1.27	37/3991 (0.9%)	1.68	72/5412 (1.3%)
1	Y	1.38	35/3991 (0.9%)	1.76	90/5412 (1.7%)
All	All	1.33	72/7982 (0.9%)	1.72	162/10824 (1.5%)

The worst 5 of 72 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	O	478	GLU	CD-OE2	9.70	1.36	1.25
1	Y	153	GLU	CD-OE1	9.27	1.35	1.25
1	O	258	GLU	CD-OE2	9.23	1.35	1.25
1	Y	34	GLU	CD-OE1	9.09	1.35	1.25
1	Y	478	GLU	CD-OE2	9.08	1.35	1.25

The worst 5 of 162 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	Y	237	ILE	C-N-CD	-15.74	85.98	120.60
1	Y	83	ARG	C-N-CA	-10.97	94.28	121.70
1	Y	200	ASP	CB-CG-OD2	-10.81	108.57	118.30
1	Y	492	ARG	NE-CZ-NH1	10.66	125.63	120.30
1	O	468	ARG	NE-CZ-NH1	9.89	125.25	120.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	O	3910	0	3841	747	0
1	Y	3910	0	3841	743	0
2	O	1	0	0	0	0
2	Y	1	0	0	0	0
3	O	31	0	14	4	0
3	Y	31	0	14	5	0
4	O	6	0	8	7	0
4	Y	6	0	8	2	0
All	All	7896	0	7726	1482	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 95.

The worst 5 of 1482 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:Y:458:ASP:HA	1:Y:461:GLN:HG3	1.25	1.13
1:O:48:ASP:HB3	1:O:51:GLU:HB3	1.16	1.13
1:O:415:ASN:ND2	1:O:418:LEU:H	1.48	1.11
1:Y:31:SER:HB2	1:Y:63:VAL:HG22	1.28	1.08
1:O:83:ARG:HB2	4:O:600:GOL:H12	1.11	1.08

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	O	490/501 (98%)	341 (70%)	102 (21%)	47 (10%)	0 3
1	Y	490/501 (98%)	354 (72%)	87 (18%)	49 (10%)	0 2

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	980/1002 (98%)	695 (71%)	189 (19%)	96 (10%)	0 2

5 of 96 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	Y	58	TRP
1	Y	59	THR
1	Y	64	LEU
1	Y	151	SER
1	Y	165	VAL

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	O	408/412 (99%)	258 (63%)	150 (37%)	0 0
1	Y	408/412 (99%)	259 (64%)	149 (36%)	0 1
All	All	816/824 (99%)	517 (63%)	299 (37%)	0 1

5 of 299 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	O	229	ILE
1	O	461	GLN
1	O	253	GLN
1	O	369	ARG
1	Y	324	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 46 such sidechains are listed below:

Mol	Chain	Res	Type
1	O	73	GLN
1	O	228	ASN
1	O	81	ASN

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Mol	Chain	Res	Type
1	O	147	HIS
1	O	253	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 6 ligands modelled in this entry, 2 are monoatomic - leaving 4 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	GOL	O	600	-	5,5,5	0.61	0	5,5,5	0.34	0
3	ACP	Y	601	2	27,33,33	2.36	5 (18%)	32,52,52	1.84	4 (12%)
3	ACP	O	601	2	27,33,33	2.90	6 (22%)	32,52,52	2.59	4 (12%)
4	GOL	Y	600	-	5,5,5	0.48	0	5,5,5	0.75	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	GOL	O	600	-	-	2/4/4/4	-
3	ACP	Y	601	2	-	4/15/38/38	0/3/3/3
3	ACP	O	601	2	-	0/15/38/38	0/3/3/3
4	GOL	Y	600	-	-	2/4/4/4	-

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	O	601	ACP	PG-O2G	9.45	1.76	1.54
3	O	601	ACP	PG-O3G	7.72	1.72	1.54
3	Y	601	ACP	PG-O3G	7.50	1.72	1.54
3	O	601	ACP	PG-O1G	6.28	1.63	1.50
3	Y	601	ACP	PG-O2G	5.53	1.67	1.54

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	O	601	ACP	C1'-N9-C4	12.90	149.31	126.64
3	Y	601	ACP	C1'-N9-C4	7.24	139.36	126.64
3	Y	601	ACP	PA-O3A-PB	-3.59	121.17	132.56
3	O	601	ACP	C5-C6-N6	3.40	125.53	120.35
3	Y	601	ACP	O1G-PG-C3B	-3.36	104.00	111.24

There are no chirality outliers.

5 of 8 torsion outliers are listed below:

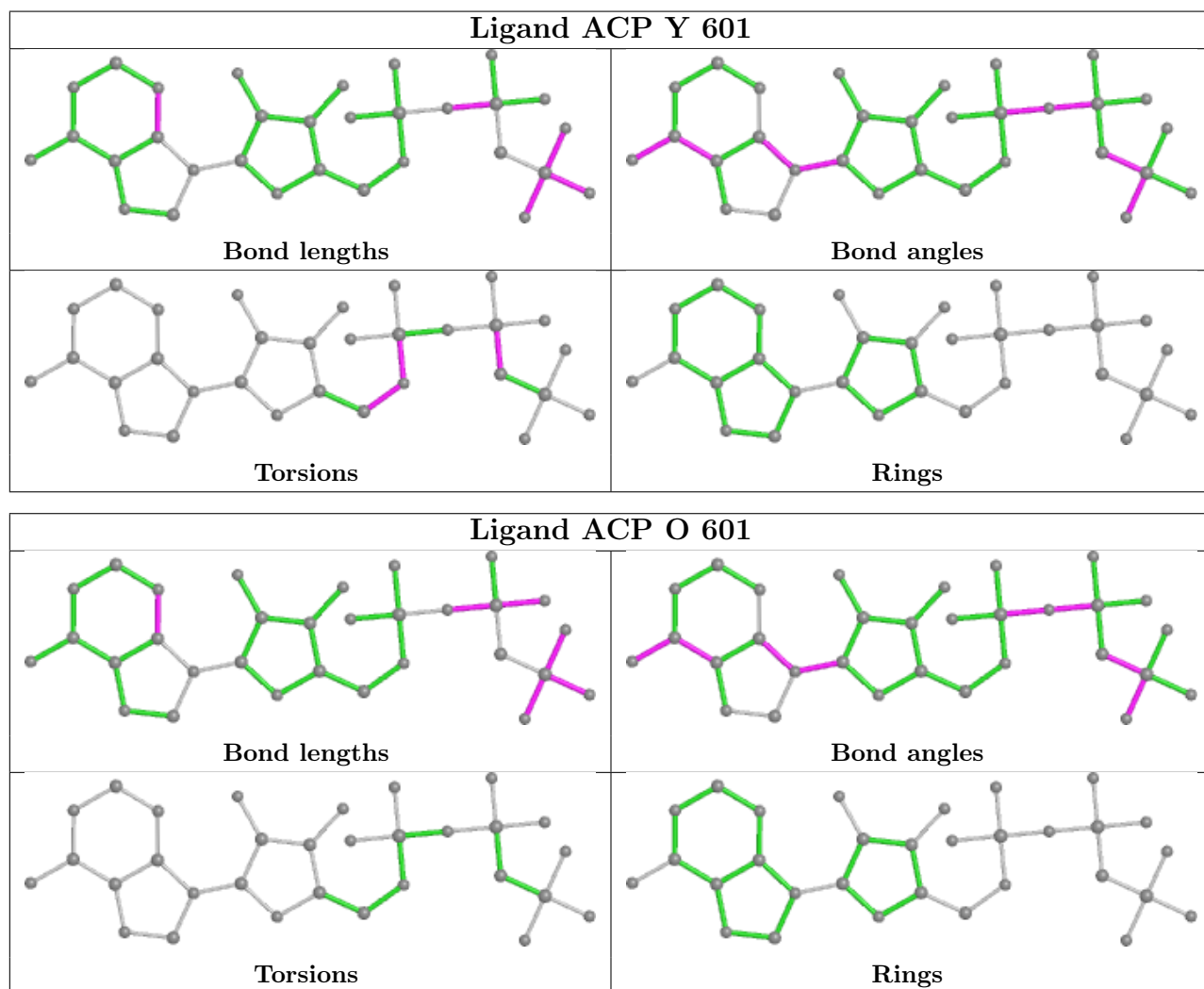
Mol	Chain	Res	Type	Atoms
3	Y	601	ACP	C5'-O5'-PA-O1A
3	Y	601	ACP	C5'-O5'-PA-O3A
4	Y	600	GOL	C1-C2-C3-O3
4	Y	600	GOL	O2-C2-C3-O3
4	O	600	GOL	C1-C2-C3-O3

There are no ring outliers.

4 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	O	600	GOL	7	0
3	Y	601	ACP	5	0
3	O	601	ACP	4	0
4	Y	600	GOL	2	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

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	O	494/501 (98%)	-0.79	0 100 100	13, 61, 94, 100	0
1	Y	494/501 (98%)	-0.98	0 100 100	7, 48, 81, 98	0
All	All	988/1002 (98%)	-0.88	0 100 100	7, 54, 88, 100	0

There are no RSRZ outliers to report.

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

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

6.3 Carbohydrates [i](#)

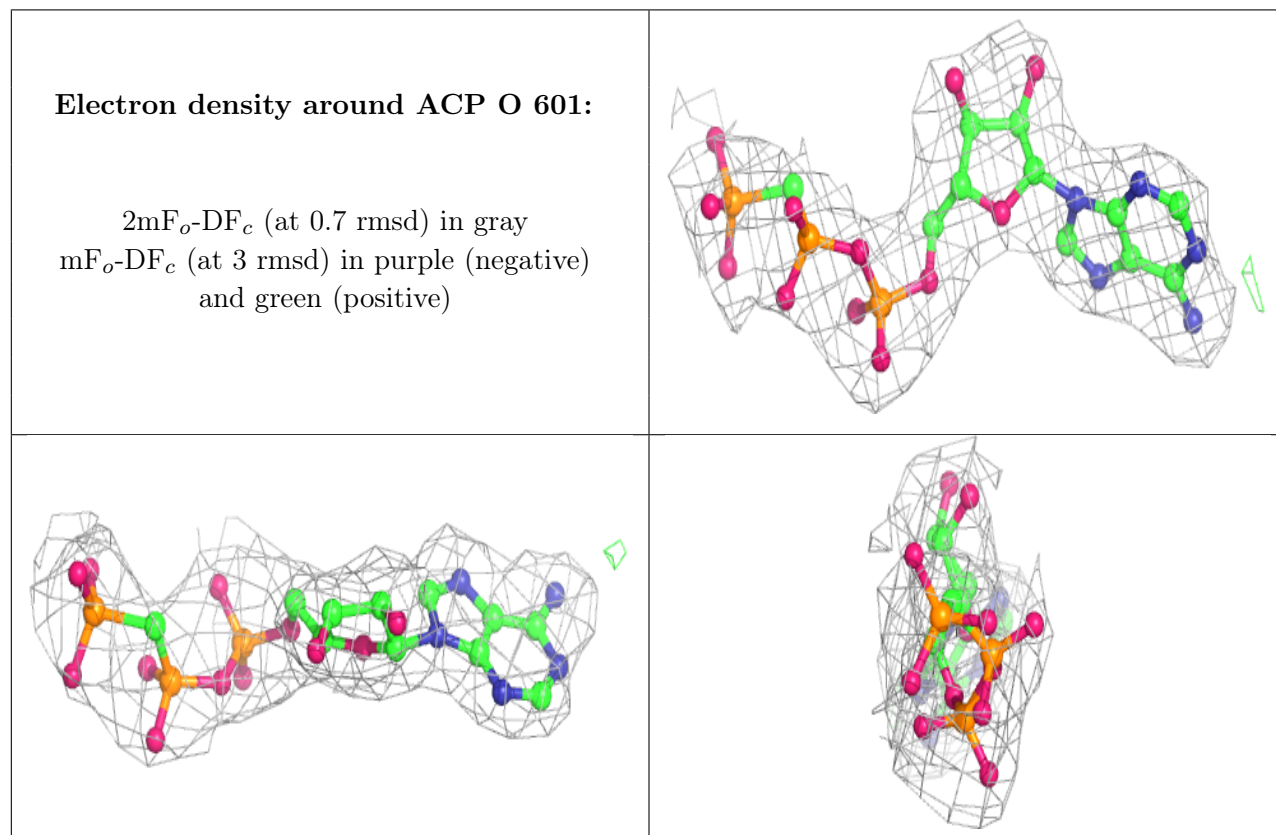
There are no monosaccharides in this entry.

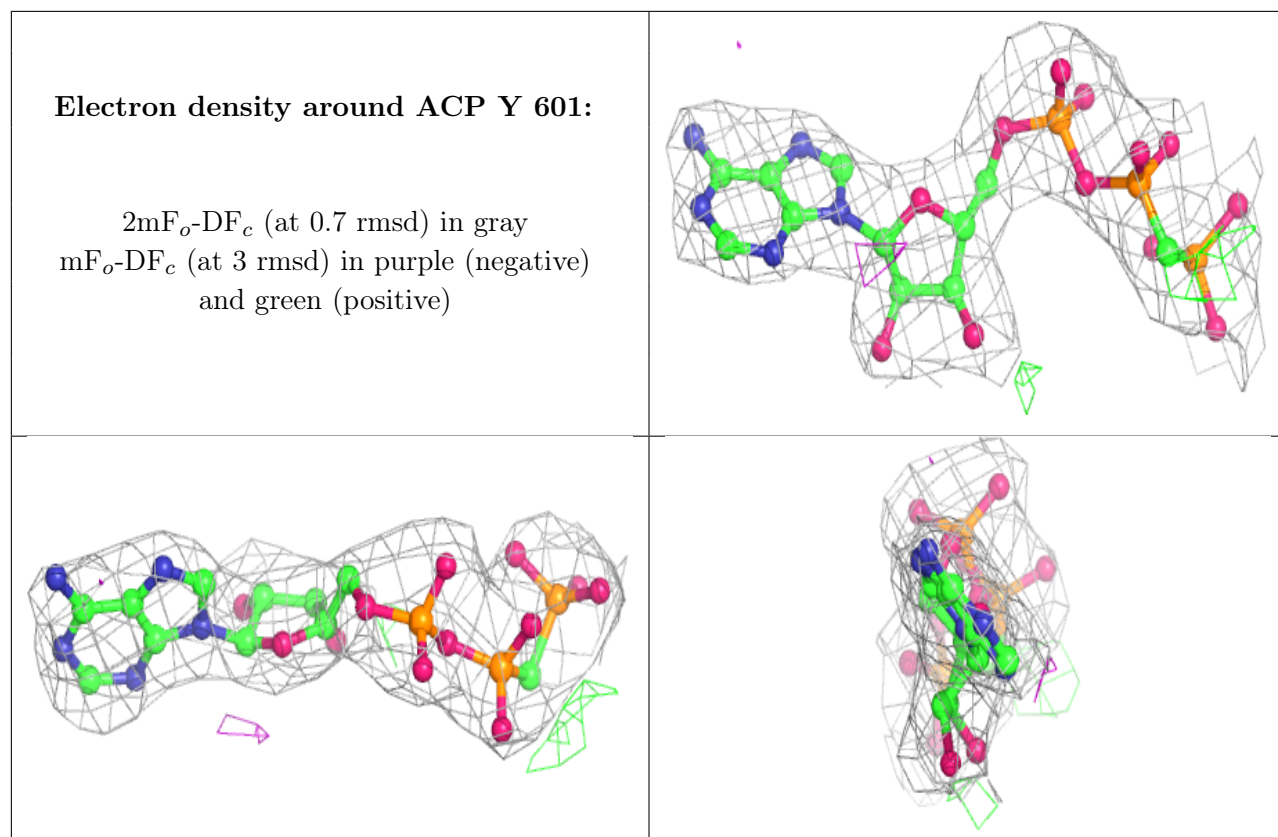
6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	MG	O	602	1/1	0.90	0.56	65,65,65,65	0
3	ACP	O	601	31/31	0.96	0.13	60,60,60,60	0
4	GOL	Y	600	6/6	0.96	0.13	32,32,32,32	0
3	ACP	Y	601	31/31	0.97	0.11	47,47,47,47	0
4	GOL	O	600	6/6	0.98	0.09	29,29,29,29	0
2	MG	Y	602	1/1	0.99	0.20	40,40,40,40	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.