



wwPDB X-ray Structure Validation Summary Report ⓘ

Oct 23, 2021 – 12:41 PM EDT

PDB ID : 1GLJ
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 : 1998-09-03
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

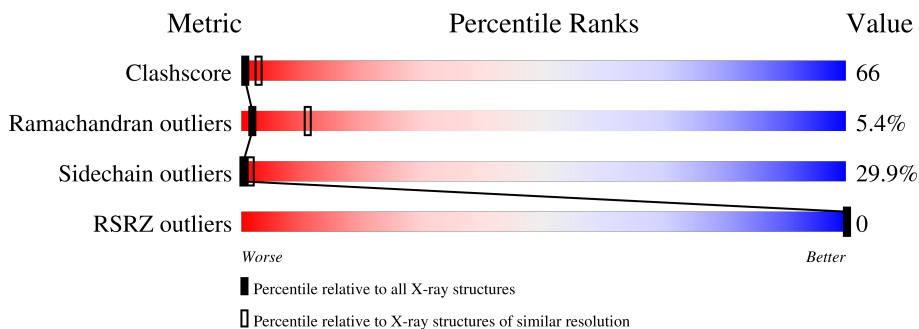
1 Overall quality at a glance

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	 19% 47% 25% 7%
1	Y	501	 20% 47% 25% 7%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7895 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

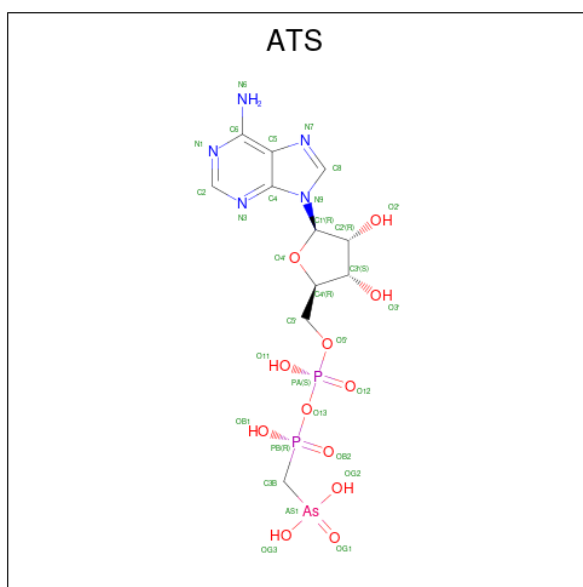
There are 2 discrepancies between the modelled and reference sequences:

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		

- Molecule 3 is GAMMA-ARSONO-BETA, GAMMA-METHYLENEADENOSINE-5'-DIPHOSPHATE (three-letter code: ATS) (formula: C₁₁H₁₈AsN₅O₁₂P₂).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	As	C	N	O	P		
3	Y	1	31	1	11	5	12	2	0	0
3	O	1	31	1	11	5	12	2	0	0

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

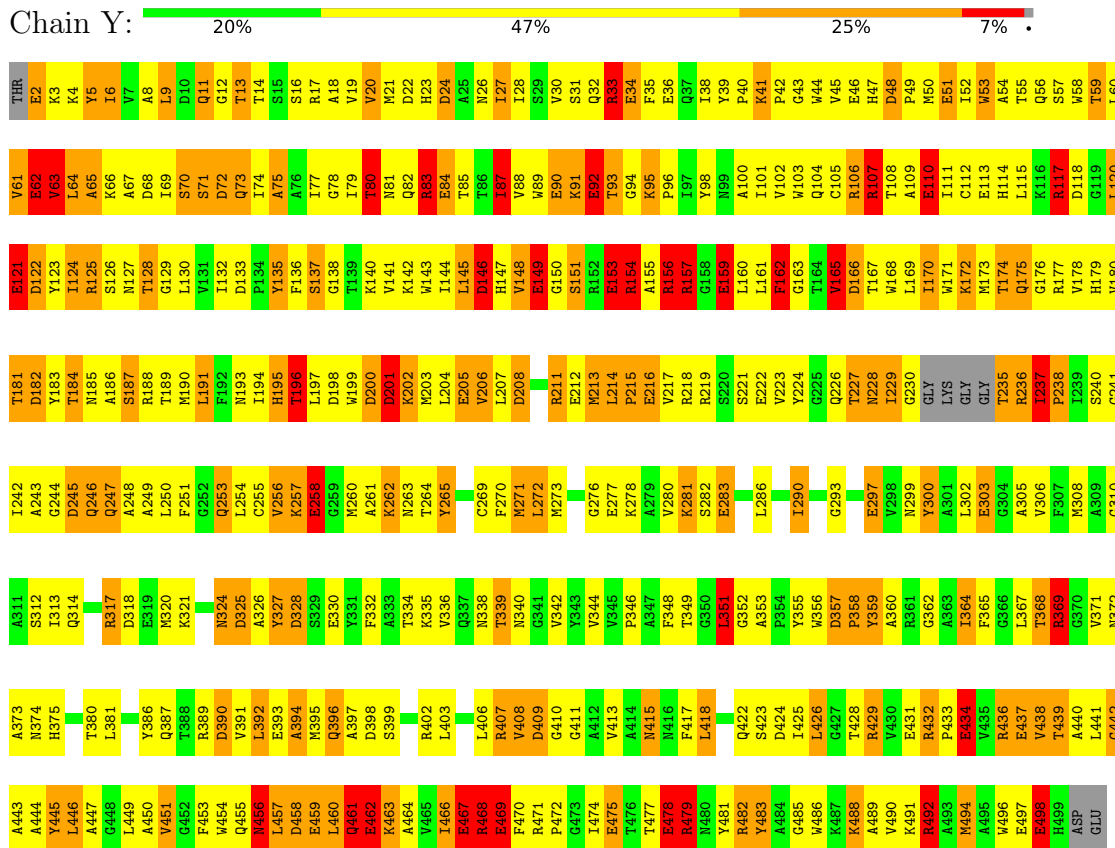


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	Y	1	6	3	3	0	0
4	O	1	6	3	3	0	0

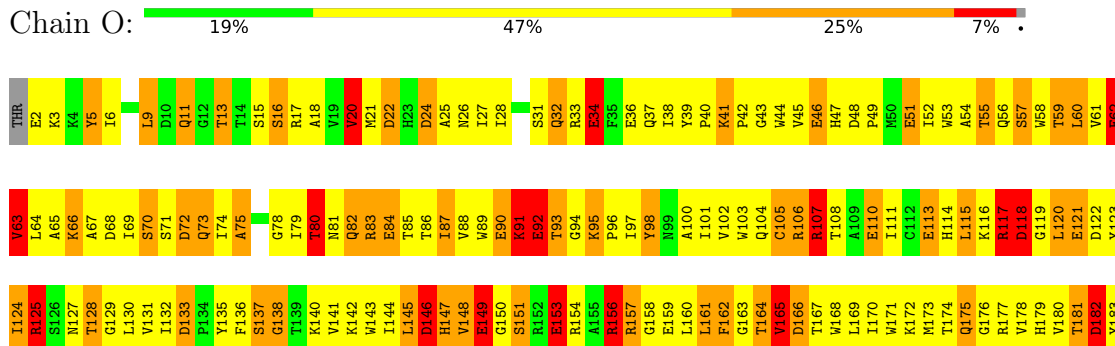
3 Residue-property plots i

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



T184	Q246	I316	L381	A484
M185	Q247	R317	E382	Y445
A186	A248	D318	S383	L446
S187	A249	E319	Y386	A447
R188	L250	K320	Q387	G448
T189	F251	K321	T388	A450
M190	G252	L322	R389	Y451
L191	Q253	I323	D390	G452
F192	L254	N324	V391	F453
N193	C255	D325	L392	W454
I194	V256	A326	E393	Q455
H195	K257	Y327	A394	W456
T196	E258	D328	M395	L457
L197	K262	S329	Q396	D458
D198	N263	Y331	A397	E459
W199	T264	F332	L460	L460
D200	Y265	A333	S399	Q461
D201	K269	T334	G400	E462
K202	F270	K335	I401	K463
L204	P271	N338	R402	A464
E205	M271	T339	L403	V465
V206	L272	N340	L406	I466
L207	M273	V341	R407	E467
D208	N274	V342	V408	E468
L209	I275	Y343	D409	E469
P210	E276	V344	G410	F470
R211	E277	V345	G411	R471
E212	K278	V346	V413	F472
M213	A279	P346	A414	G473
L214	V260	A347	M415	I474
P215	K281	F348	M416	E475
E216	S282	L351	F417	T476
V217	E283	G352	L418	T477
R218	L286	A353	M419	E478
R219	L287	P354	Q420	R479
S220	T288	Y355	F421	N480
S221	T289	W356	Q422	Y481
S222	I290	D357	S423	R482
Q226	A291	Y359	D424	Y483
T227	C292	A360	I425	A484
N228	G293	R361	L426	G485
I229	P294	G362	G427	W486
G230	T295	A363	T428	K487
GLY	G296	I364	R429	K488
LYS	E297	L367	V430	A489
GLY	V298	T368	E431	V490
GLY	N299	R369	R432	F491
T235	Y300	K369	P433	R492
R236	A301	A373	E434	A493
I237	L302	A374	V435	M494
P238	E303	N374	R436	A495
I239	G310	H375	E437	W496
S240	G241	I376	V438	E497
G241	S312	I377	T439	E498
I242	Q314	R378	A440	H499
A243	G244	A379	L441	ASP
D245	W315	T380	G442	GLU

4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	99.67Å 200.70Å 114.73Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 3.00 18.49 – 3.00	Depositor EDS
% Data completeness (in resolution range)	95.0 (20.00-3.00) 90.6 (18.49-3.00)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	246.72 (at 2.98Å)	Xtrriage
Refinement program	TNT 5F, X-PLOR	Depositor
R, R_{free}	0.166 , (Not available) 0.159 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	48.6	Xtrriage
Anisotropy	0.121	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.23 , 130.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7895	wwPDB-VP
Average B, all atoms (Å ²)	48.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.12% 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, ATS, GOL

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	1.29	39/3991 (1.0%)	1.72	80/5412 (1.5%)
1	Y	1.38	36/3991 (0.9%)	1.86	104/5412 (1.9%)
All	All	1.33	75/7982 (0.9%)	1.79	184/10824 (1.7%)

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	Y	0	1

The worst 5 of 75 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	O	258	GLU	CD-OE2	8.77	1.35	1.25
1	Y	283	GLU	CD-OE1	8.74	1.35	1.25
1	Y	462	GLU	CD-OE2	8.57	1.35	1.25
1	O	153	GLU	CD-OE1	8.19	1.34	1.25
1	Y	498	GLU	CD-OE2	8.11	1.34	1.25

The worst 5 of 184 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	Y	106	ARG	NE-CZ-NH2	-14.77	112.92	120.30
1	Y	117	ARG	NE-CZ-NH1	13.46	127.03	120.30
1	O	471	ARG	NE-CZ-NH1	13.00	126.80	120.30
1	Y	245	ASP	CB-CG-OD2	-11.70	107.77	118.30
1	Y	196	THR	N-CA-CB	-11.20	89.02	110.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	Y	196	THR	Mainchain

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	558	0
1	Y	3910	0	3841	486	0
2	Y	1	0	0	0	0
3	O	31	0	12	2	0
3	Y	31	0	12	2	0
4	O	6	0	8	2	0
4	Y	6	0	8	3	0
All	All	7895	0	7722	1036	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 66.

The worst 5 of 1036 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:O:22:ASP:HB3	1:O:28:ILE:HD11	1.30	1.13
1:O:47:HIS:HB3	1:O:52:ILE:HD11	1.32	1.09
1:O:5:TYR:HB2	1:O:74:ILE:HG22	1.37	1.07
1:Y:193:ASN:HB3	1:Y:196:THR:HG21	1.37	1.06
1:Y:458:ASP:HA	1:Y:461:GLN:HG3	1.34	1.06

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%)	375 (76%)	85 (17%)	30 (6%)	1	8
1	Y	490/501 (98%)	391 (80%)	76 (16%)	23 (5%)	2	14
All	All	980/1002 (98%)	766 (78%)	161 (16%)	53 (5%)	2	11

5 of 53 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	Y	61	VAL
1	Y	64	LEU
1	Y	65	ALA
1	Y	75	ALA
1	Y	151	SER

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%)	283 (69%)	125 (31%)	0	1
1	Y	408/412 (99%)	289 (71%)	119 (29%)	0	2
All	All	816/824 (99%)	572 (70%)	244 (30%)	0	1

5 of 244 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	Y	488	LYS

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Mol	Chain	Res	Type
1	O	437	GLU
1	O	107	ARG
1	O	434	GLU
1	O	478	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 40 such sidechains are listed below:

Mol	Chain	Res	Type
1	O	127	ASN
1	O	387	GLN
1	O	147	HIS
1	O	226	GLN
1	O	415	ASN

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 5 ligands modelled in this entry, 1 is 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
3	ATS	Y	601	2	25,33,33	1.08	2 (8%)	27,52,52	1.58	3 (11%)
4	GOL	O	600	-	5,5,5	0.49	0	5,5,5	0.29	0
4	GOL	Y	600	-	5,5,5	0.60	0	5,5,5	0.83	0
3	ATS	O	601	-	25,33,33	1.41	3 (12%)	27,52,52	1.20	3 (11%)

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
3	ATS	Y	601	2	-	2/9/38/38	0/3/3/3
4	GOL	O	600	-	-	4/4/4/4	-
4	GOL	Y	600	-	-	4/4/4/4	-
3	ATS	O	601	-	-	1/9/38/38	0/3/3/3

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	O	601	ATS	C4-N3	-3.36	1.31	1.35
3	O	601	ATS	PB-O13	3.34	1.62	1.58
3	O	601	ATS	C8-N7	-2.70	1.29	1.34
3	Y	601	ATS	O2'-C2'	-2.27	1.37	1.43
3	Y	601	ATS	O3'-C3'	-2.18	1.37	1.43

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	Y	601	ATS	C5-C6-N6	5.15	128.17	120.35
3	O	601	ATS	C1'-N9-C4	3.49	132.77	126.64
3	Y	601	ATS	PA-O13-PB	-3.45	121.61	132.56
3	Y	601	ATS	C3'-C2'-C1'	2.67	104.99	100.98
3	O	601	ATS	PA-O13-PB	-2.37	125.03	132.56

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	Y	600	GOL	O1-C1-C2-C3
4	Y	600	GOL	C1-C2-C3-O3

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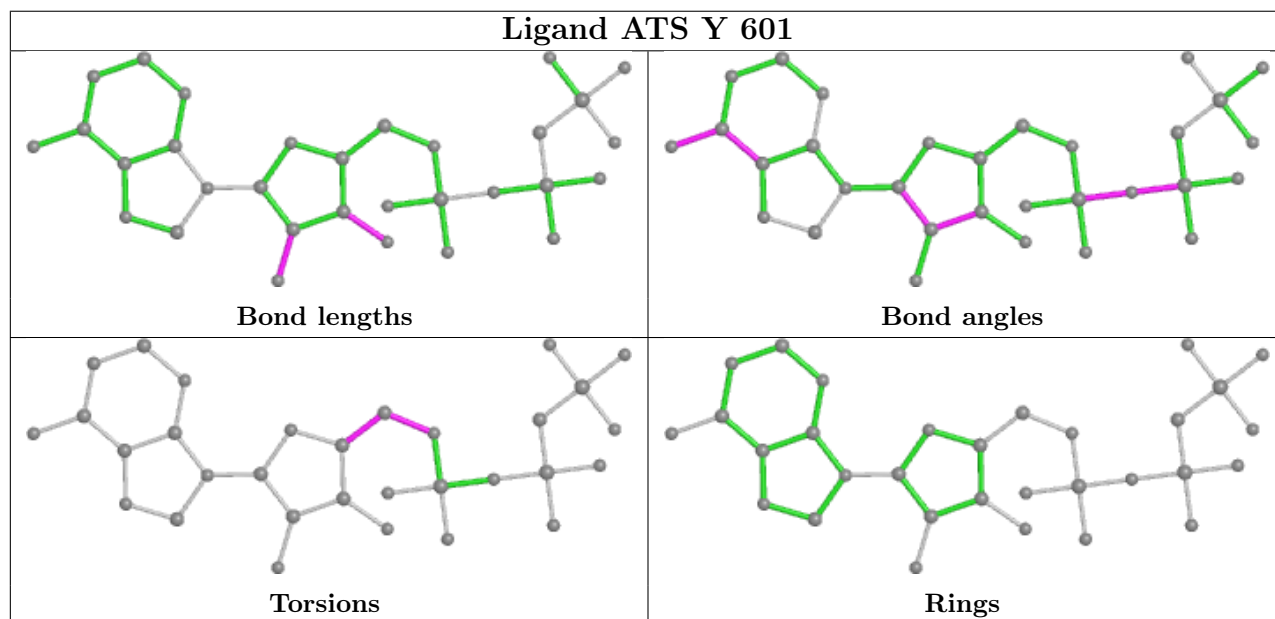
Mol	Chain	Res	Type	Atoms
4	O	600	GOL	O1-C1-C2-C3
4	O	600	GOL	C1-C2-C3-O3
4	Y	600	GOL	O1-C1-C2-O2

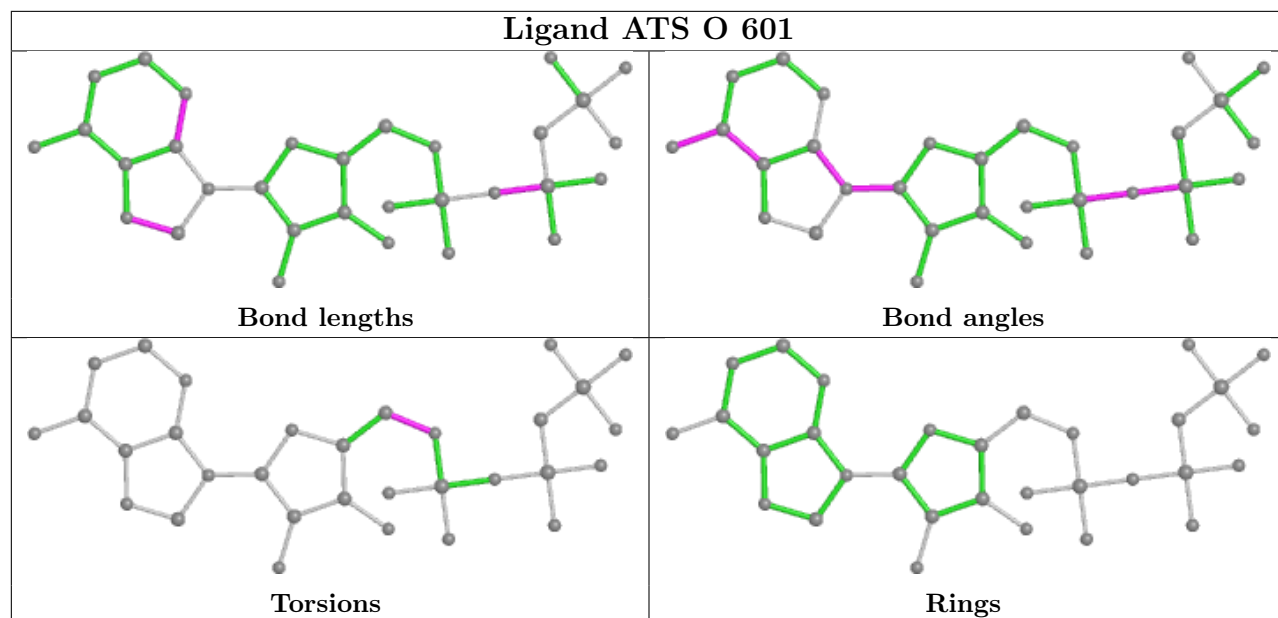
There are no ring outliers.

4 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	Y	601	ATS	2	0
4	O	600	GOL	2	0
4	Y	600	GOL	3	0
3	O	601	ATS	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 [i](#)

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%)	-0.73	0 100 100	7, 52, 91, 100	0
1	Y	494/501 (98%)	-0.94	0 100 100	5, 38, 78, 100	0
All	All	988/1002 (98%)	-0.83	0 100 100	5, 45, 86, 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.

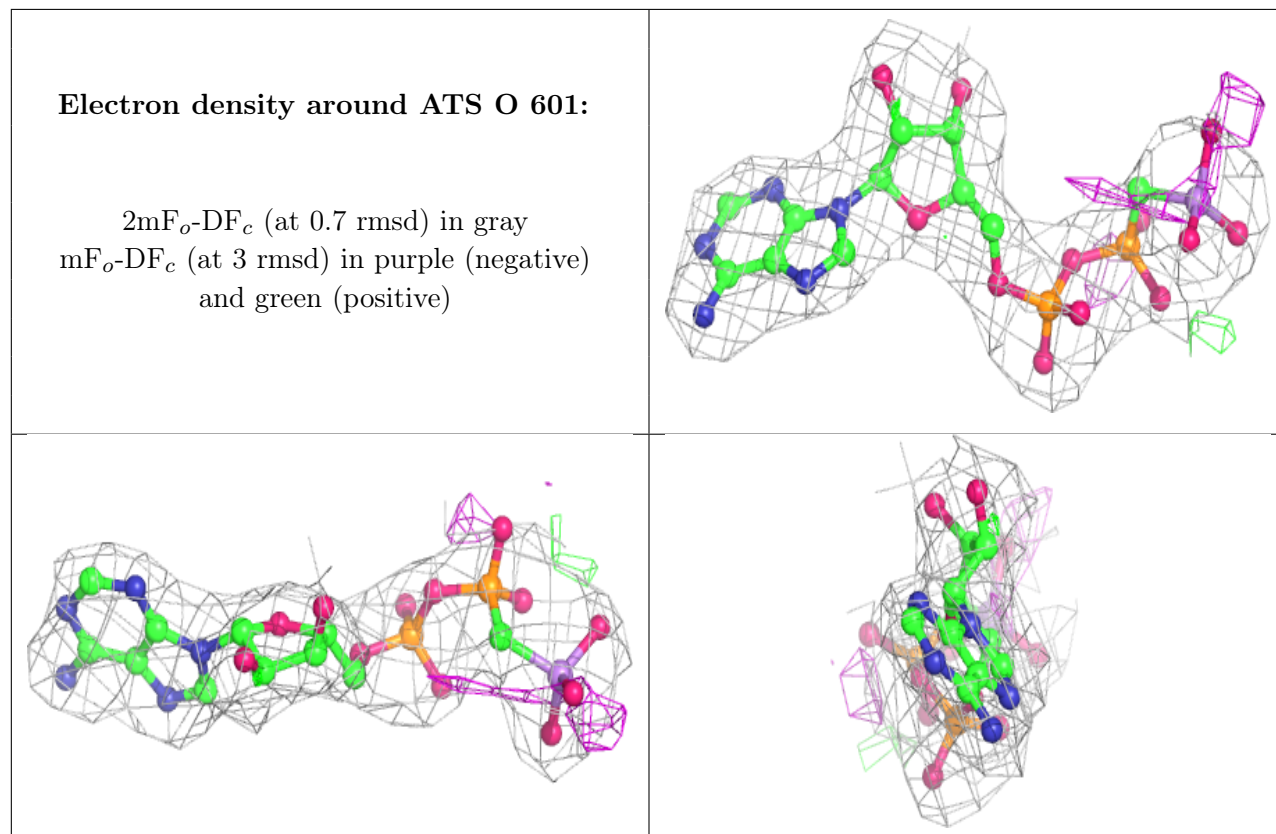
6.4 Ligands [i](#)

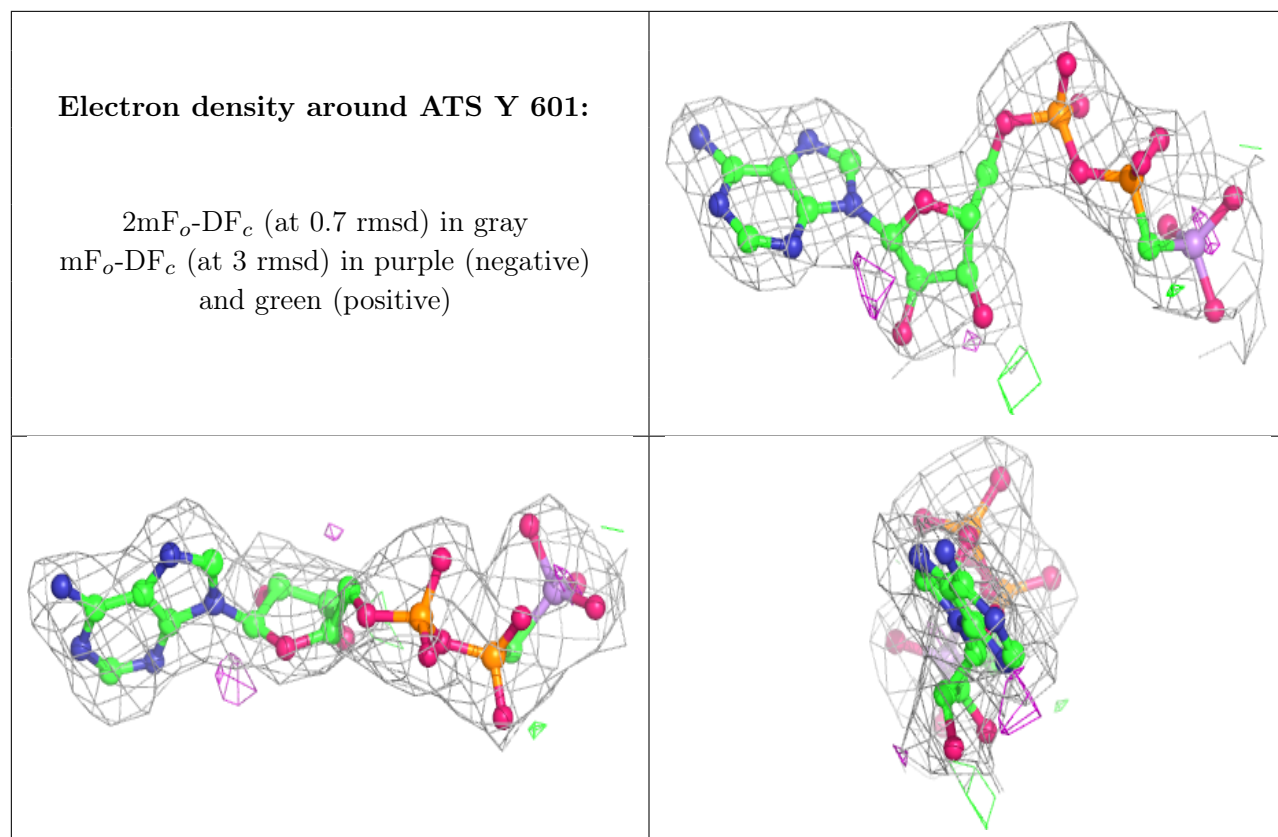
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q < 0.9' lists 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	Y	602	1/1	0.95	0.16	27,27,27,27	0
3	ATS	O	601	31/31	0.96	0.14	64,64,64,64	0
3	ATS	Y	601	31/31	0.97	0.12	50,50,50,50	0
4	GOL	Y	600	6/6	0.98	0.11	17,17,17,17	0
4	GOL	O	600	6/6	0.98	0.12	45,45,45,45	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.