



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 12, 2025 – 10:07 am BST

PDB ID : 9GFU / pdb_00009gfu
Title : Human PPAR-gamma ligand binding domain in complex with AKGO172
Authors : Oerlemans, G.J.M.; Koops, A.A.; Brunsveld, L.
Deposited on : 2024-08-12
Resolution : 2.10 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 Phenix2.0rc1
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 2.0rc1
EDS : 3.0
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4 : 9.0.006 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.45.1

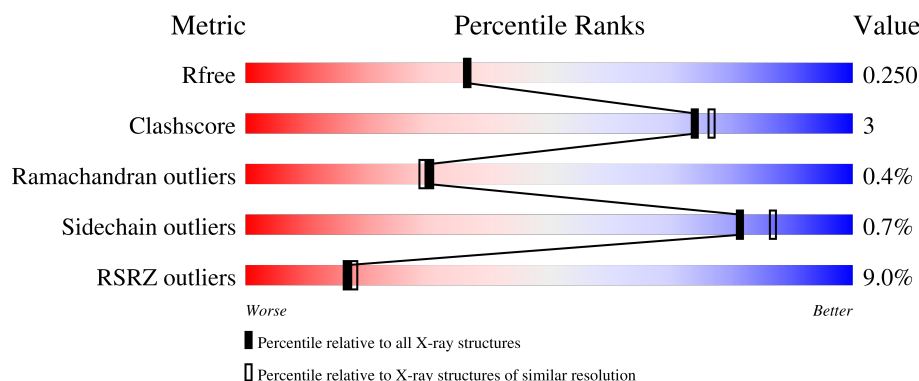
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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}	164625	6234 (2.10-2.10)
Clashscore	180529	6893 (2.10-2.10)
Ramachandran outliers	177936	6839 (2.10-2.10)
Sidechain outliers	177891	6840 (2.10-2.10)
RSRZ outliers	164620	6234 (2.10-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	275	<div> <div>9%</div> <div>87%</div> <div>8%</div> <div>5%</div> </div>
1	B	275	<div> <div>8%</div> <div>87%</div> <div>7%</div> <div>6%</div> </div>

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4202 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.

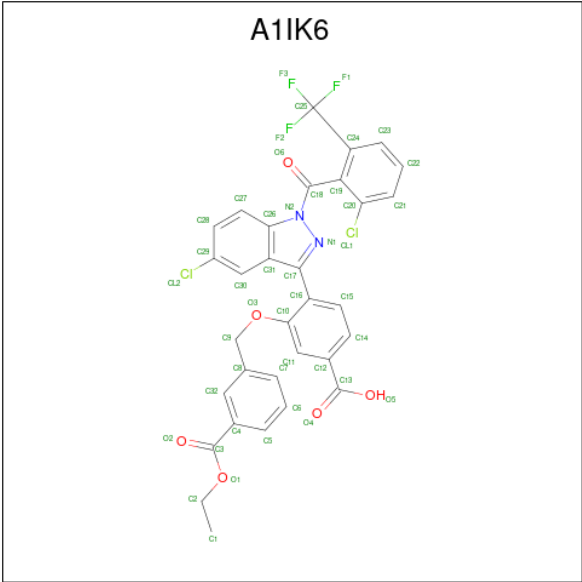
- Molecule 1 is a protein called Peroxisome proliferator-activated receptor gamma.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	B	259	Total	C	N	O	S	0	0	0
			2012	1301	328	372	11			
1	A	261	Total	C	N	O	S	0	0	0
			2022	1303	330	379	10			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	231	GLY	-	expression tag	UNP P37231
B	232	SER	-	expression tag	UNP P37231
B	233	HIS	-	expression tag	UNP P37231
B	234	MET	-	expression tag	UNP P37231
A	231	GLY	-	expression tag	UNP P37231
A	232	SER	-	expression tag	UNP P37231
A	233	HIS	-	expression tag	UNP P37231
A	234	MET	-	expression tag	UNP P37231

- Molecule 2 is 4-[5-chloranyl-1-[2-chloranyl-6-(trifluoromethyl)phenyl]carbonyl-indazol-3-yl]-3-[(3-ethoxycarbonylphenyl)methoxy]benzoic acid (CCD ID: A1IK6) (formula: C₃₂H₂₁Cl₂F₃N₂O₆) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	B	1	Total	C	Cl	F	N	O	0	0
			45	32	2	3	2	6		
2	A	1	Total	C	Cl	F	N	O	0	0
			45	32	2	3	2	6		

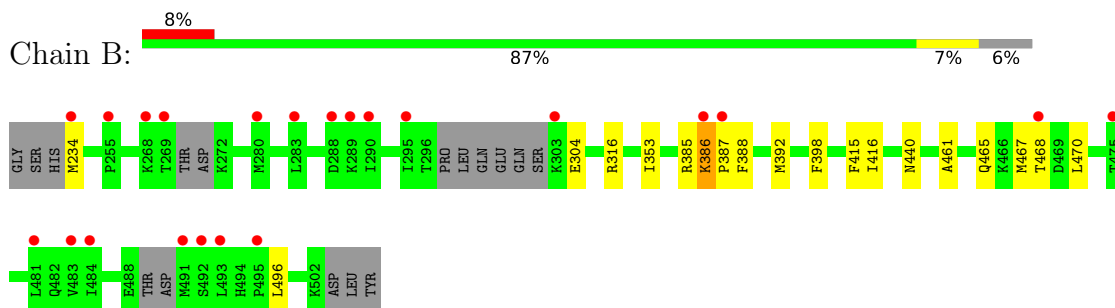
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	43	Total	O	0	0
			43	43		
3	A	35	Total	O	0	0
			35	35		

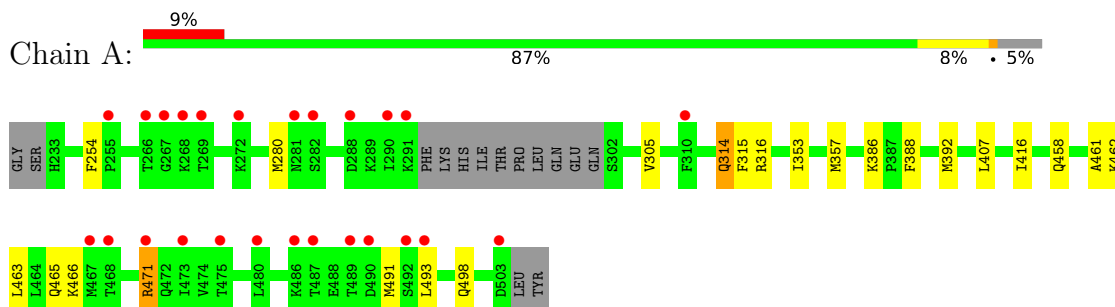
3 Residue-property plots [i](#)

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: Peroxisome proliferator-activated receptor gamma



- Molecule 1: Peroxisome proliferator-activated receptor gamma



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	94.75Å 61.79Å 119.31Å 90.00° 101.73° 90.00°	Depositor
Resolution (Å)	45.23 – 2.10 45.23 – 2.10	Depositor EDS
% Data completeness (in resolution range)	95.9 (45.23-2.10) 95.9 (45.23-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.64 (at 2.10Å)	Xtriage
Refinement program	PHENIX version 1.21.2-5419	Depositor
R, R_{free}	0.212 , 0.250 0.212 , 0.250	Depositor DCC
R_{free} test set	1918 reflections (4.84%)	wwPDB-VP
Wilson B-factor (Å ²)	43.1	Xtriage
Anisotropy	0.270	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 49.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4202	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.74% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: A1IK6

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	0.33	0/2056	0.54	0/2782
1	B	0.35	0/2045	0.56	0/2764
All	All	0.34	0/4101	0.55	0/5546

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	1
1	B	0	1
All	All	0	2

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	316	ARG	Sidechain
1	B	316	ARG	Sidechain

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	2022	0	2012	12	0
1	B	2012	0	1996	12	0
2	A	45	0	0	0	0
2	B	45	0	0	0	0
3	A	35	0	0	1	0
3	B	43	0	0	0	0
All	All	4202	0	4008	24	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 3.

All (24) 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:B:234:MET:SD	1:B:440:ASN:ND2	2.42	0.93
1:A:471:ARG:NH1	3:A:701:HOH:O	2.30	0.64
1:A:280:MET:SD	1:A:305:VAL:HG21	2.43	0.59
1:B:353:ILE:HG23	1:B:416:ILE:HD12	1.84	0.58
1:A:458:GLN:O	1:A:462:LYS:HG2	2.03	0.58
1:B:304:GLU:OE2	1:B:385:ARG:NE	2.28	0.58
1:B:385:ARG:HH11	1:B:386:LYS:CB	2.18	0.56
1:A:353:ILE:HG23	1:A:416:ILE:HD12	1.87	0.56
1:B:415:PHE:CE1	1:B:467:MET:HE2	2.40	0.56
1:A:461:ALA:O	1:A:465:GLN:HG3	2.09	0.53
1:A:388:PHE:O	1:A:392:MET:HG2	2.10	0.52
1:A:493:LEU:HB2	1:A:498:GLN:NE2	2.25	0.51
1:A:254:PHE:CG	1:A:357:MET:HE1	2.50	0.46
1:B:461:ALA:O	1:B:465:GLN:HG3	2.15	0.46
1:A:407:LEU:HD11	1:A:463:LEU:HD13	1.98	0.45
1:A:466:LYS:HA	1:A:466:LYS:HE2	1.98	0.45
1:B:386:LYS:CB	1:B:387:PRO:CD	2.95	0.44
1:A:314:GLN:HG3	1:A:315:PHE:N	2.32	0.43
1:B:398:PHE:CZ	1:B:470:LEU:HD21	2.53	0.43
1:B:415:PHE:HE1	1:B:467:MET:HE2	1.84	0.43
1:B:467:MET:HA	1:B:470:LEU:HD12	2.01	0.43
1:A:491:MET:HE3	1:A:491:MET:HB3	1.92	0.41
1:B:388:PHE:O	1:B:392:MET:HG2	2.20	0.41
1:B:496:LEU:HD23	1:B:496:LEU:HA	1.87	0.41

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	257/275 (94%)	254 (99%)	2 (1%)	1 (0%)	30	29
1	B	251/275 (91%)	247 (98%)	3 (1%)	1 (0%)	30	29
All	All	508/550 (92%)	501 (99%)	5 (1%)	2 (0%)	30	29

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	386	LYS
1	A	386	LYS

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	217/247 (88%)	215 (99%)	2 (1%)	75	82
1	B	214/247 (87%)	213 (100%)	1 (0%)	86	91
All	All	431/494 (87%)	428 (99%)	3 (1%)	81	87

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	468	THR
1	A	314	GLN
1	A	471	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	322	GLN
1	B	351	HIS
1	B	443	GLN
1	B	482	GLN
1	A	311	GLN
1	A	438	GLN
1	A	498	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 ligands are modelled in this entry.

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	$\# Z > 2$
2	A1IK6	A	601	-	45,49,49	0.69	1 (2%)	61,72,72	0.81	1 (1%)
2	A1IK6	B	601	-	45,49,49	0.74	1 (2%)	61,72,72	0.81	2 (3%)

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
2	A1IK6	A	601	-	-	2/28/34/34	0/5/5/5
2	A1IK6	B	601	-	-	1/28/34/34	0/5/5/5

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	A1IK6	C17-N1	-3.24	1.32	1.35
2	A	601	A1IK6	C17-N1	-2.81	1.33	1.35

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	A1IK6	C31-C26-N2	-2.73	105.34	109.08
2	A	601	A1IK6	C31-C26-N2	-2.69	105.39	109.08
2	B	601	A1IK6	C19-C18-N2	2.13	118.56	116.14

There are no chirality outliers.

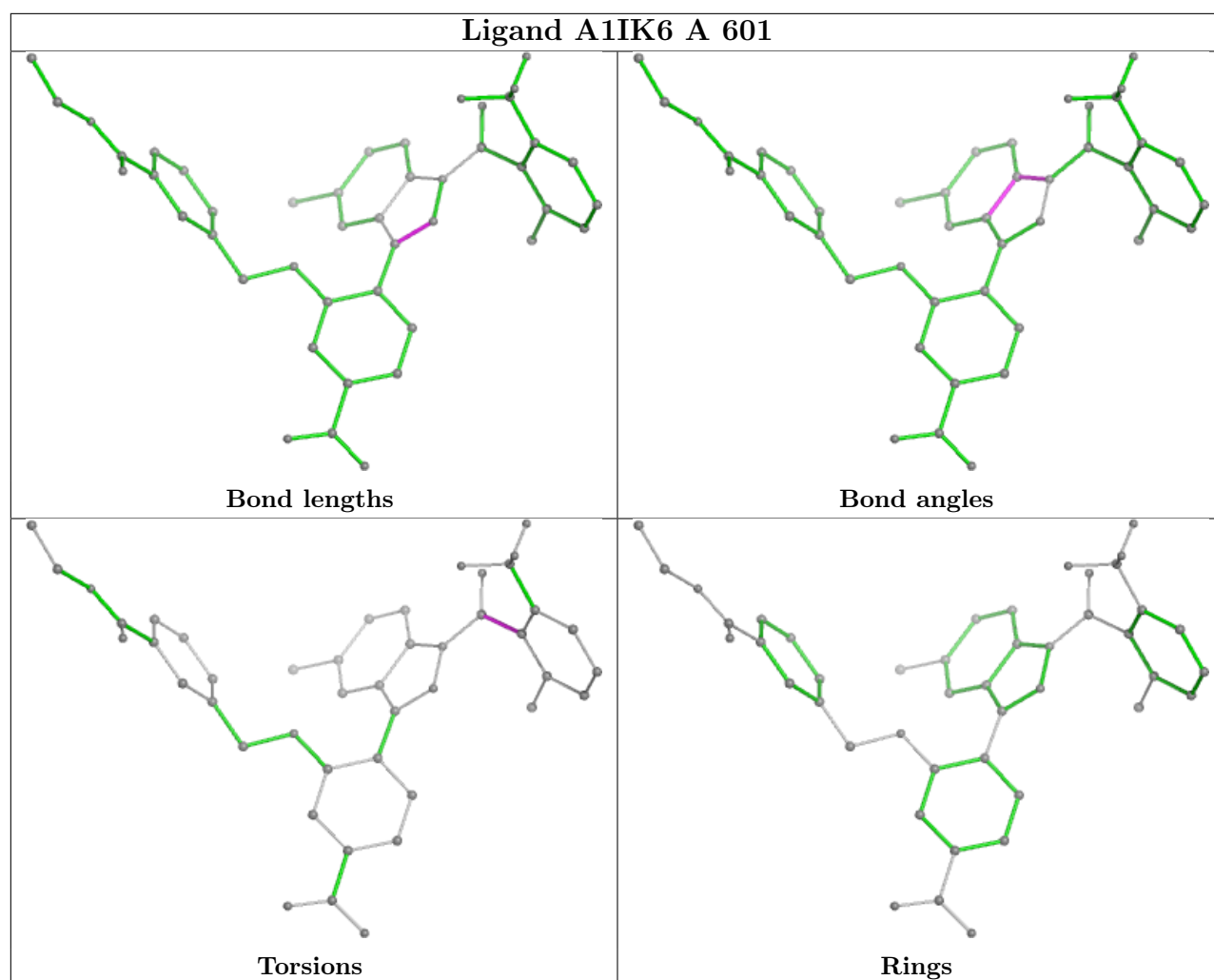
All (3) torsion outliers are listed below:

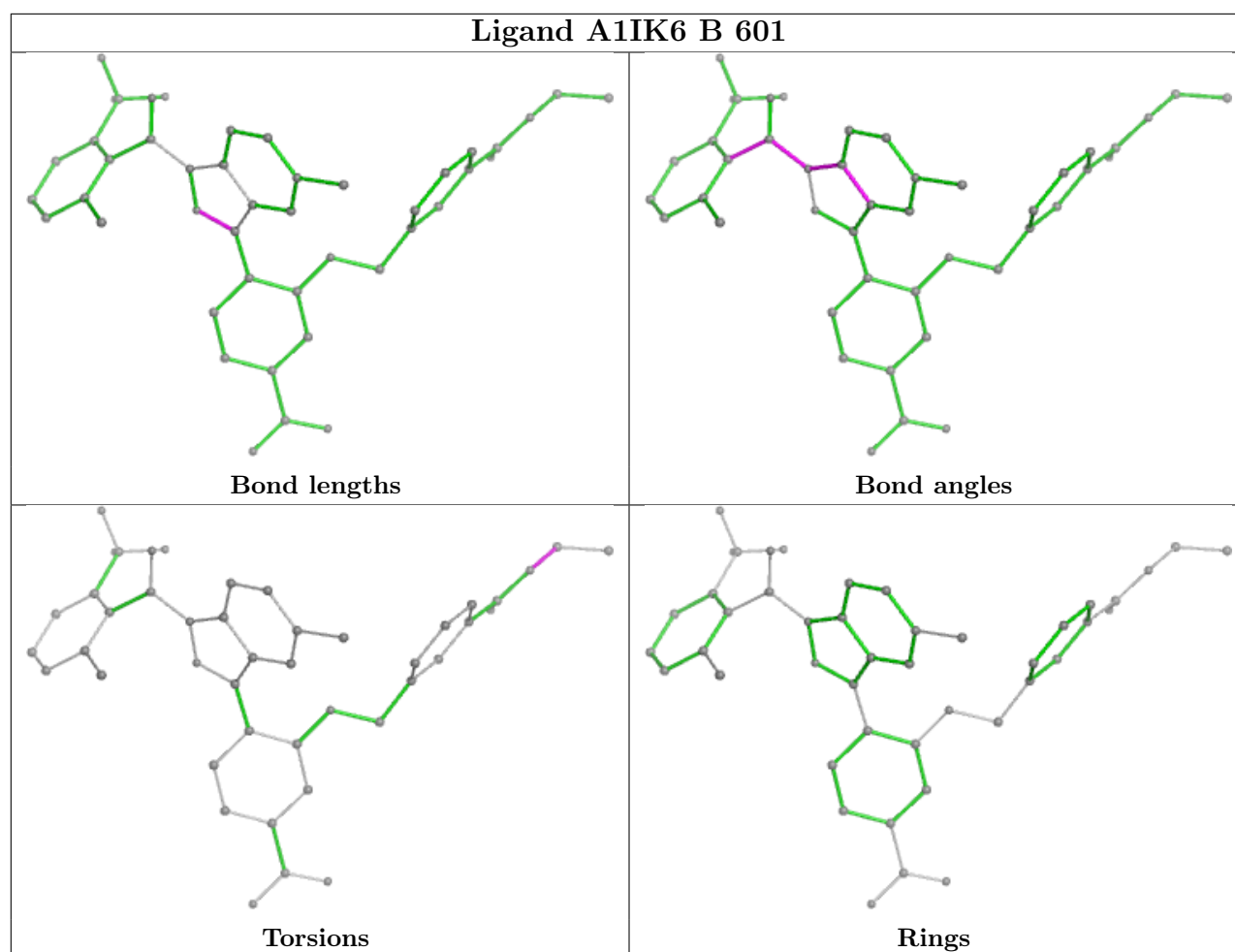
Mol	Chain	Res	Type	Atoms
2	A	601	A1IK6	O6-C18-C19-C20
2	B	601	A1IK6	C1-C2-O1-C3
2	A	601	A1IK6	O6-C18-C19-C24

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	261/275 (94%)	0.55	25 (9%) 15 16	36, 52, 86, 125	0
1	B	259/275 (94%)	0.49	22 (8%) 18 19	33, 50, 91, 137	0
All	All	520/550 (94%)	0.52	47 (9%) 17 18	33, 51, 88, 137	0

All (47) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	493	LEU	4.8
1	A	503	ASP	4.7
1	B	491	MET	4.3
1	B	484	ILE	4.0
1	A	269	THR	3.6
1	A	489	THR	3.3
1	A	492	SER	3.3
1	A	267	GLY	3.2
1	A	272	LYS	3.0
1	B	268	LYS	2.9
1	B	289	LYS	2.9
1	A	493	LEU	2.8
1	B	295	ILE	2.7
1	A	487	THR	2.7
1	B	483	VAL	2.7
1	A	268	LYS	2.7
1	B	269	THR	2.7
1	A	282	SER	2.7
1	A	486	LYS	2.7
1	B	481	LEU	2.7
1	B	288	ASP	2.7
1	A	490	ASP	2.7
1	B	255	PRO	2.5
1	B	492	SER	2.5

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Mol	Chain	Res	Type	RSRZ
1	A	468	THR	2.5
1	A	290	ILE	2.5
1	B	303	LYS	2.5
1	A	266	THR	2.4
1	B	468	THR	2.4
1	B	475	THR	2.4
1	A	475	THR	2.4
1	A	255	PRO	2.4
1	B	283	LEU	2.3
1	A	281	ASN	2.3
1	B	495	PRO	2.3
1	A	473	ILE	2.3
1	B	386	LYS	2.2
1	A	467	MET	2.2
1	B	290	ILE	2.1
1	A	310	PHE	2.1
1	A	480	LEU	2.1
1	B	387	PRO	2.1
1	A	291	LYS	2.1
1	B	280	MET	2.1
1	A	288	ASP	2.1
1	B	234	MET	2.1
1	A	471	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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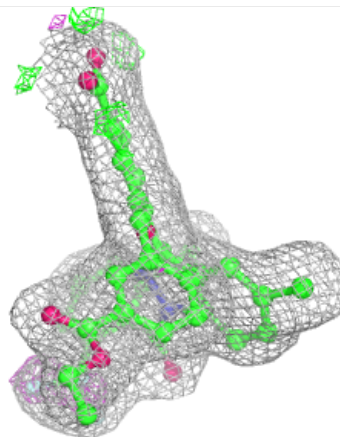
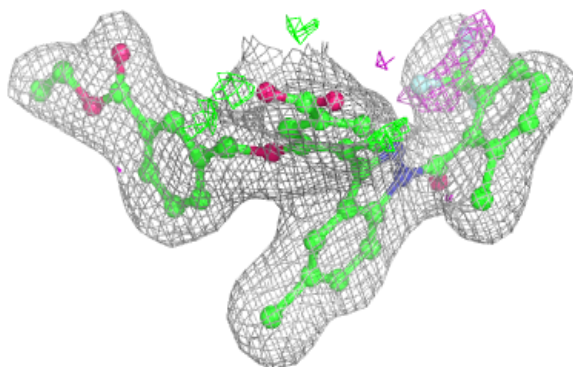
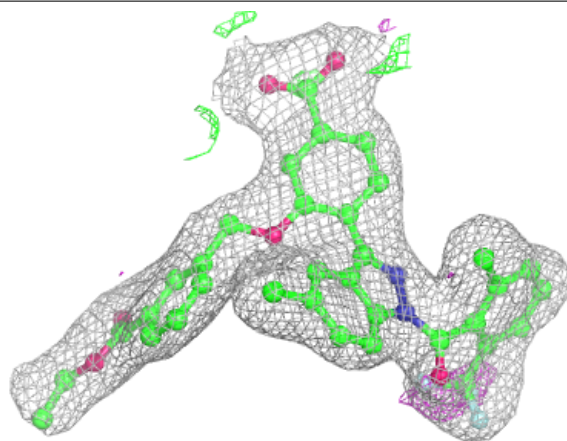
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	A1IK6	A	601	45/45	0.93	0.10	43,49,56,60	0
2	A1IK6	B	601	45/45	0.95	0.08	40,47,52,60	0

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.

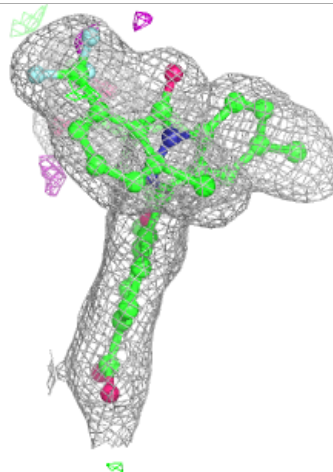
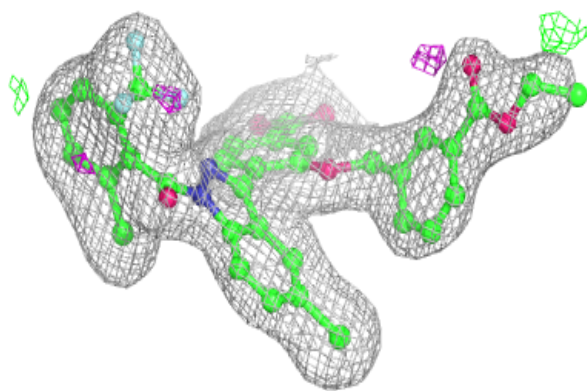
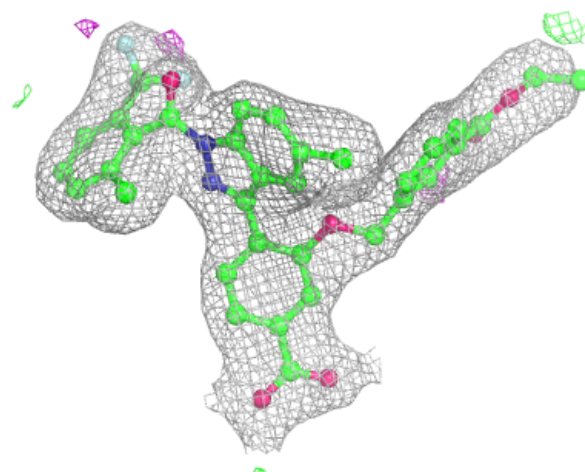
Electron density around A1IK6 A 601:

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 A1IK6 B 601:

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



6.5 Other polymers ⓘ

There are no such residues in this entry.