



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:25 AM UTC

PDB ID : 3IA6 / pdb_00003ia6
Title : X-ray Crystal structure of the nuclear hormone receptor PPAR-gamma in a complex with a PPAR gamma/alpha dual agonist
Authors : Ohren, J.F.
Deposited on : 2009-07-13
Resolution : 2.31 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

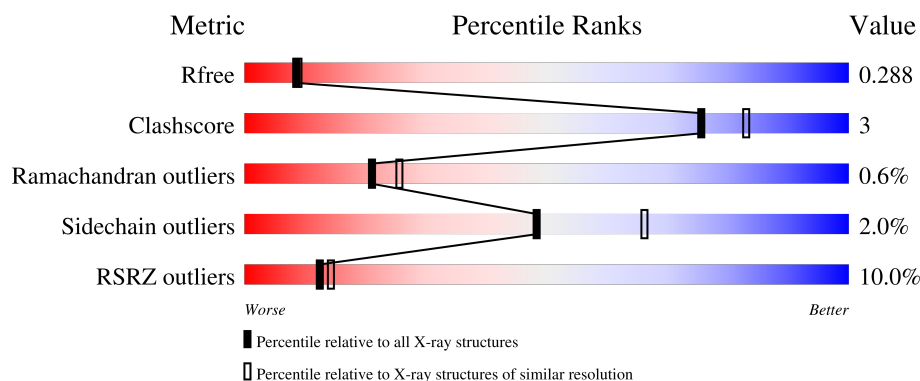
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.31 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	7754 (2.34-2.30)
Clashscore	190562	8383 (2.34-2.30)
Ramachandran outliers	187476	8303 (2.34-2.30)
Sidechain outliers	187428	8303 (2.34-2.30)
RSRZ outliers	180081	7760 (2.34-2.30)

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	271	6% 85% 9% 6%
1	B	271	13% 83% 11% 6%

2 Entry composition [i](#)

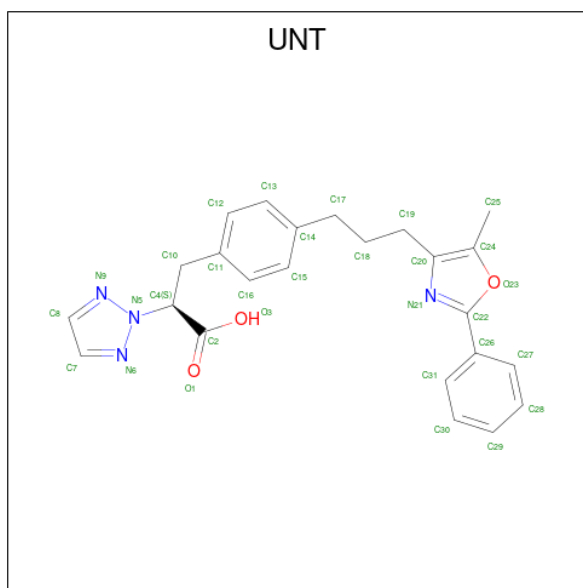
There are 3 unique types of molecules in this entry. The entry contains 4259 atoms, of which 0 are hydrogens and 0 are deuteriums.

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	A	254	Total	C	N	O	S	0	4	0
			2048	1321	332	385	10			
1	B	255	Total	C	N	O	S	0	0	0
			2036	1318	331	378	9			

- Molecule 2 is (2S)-3-{4-[3-(5-methyl-2-phenyl-1,3-oxazol-4-yl)propyl]phenyl}-2-(2H-1,2,3-triazol-2-yl)propanoic acid (CCD ID: UNT) (formula: C₂₄H₂₄N₄O₃).

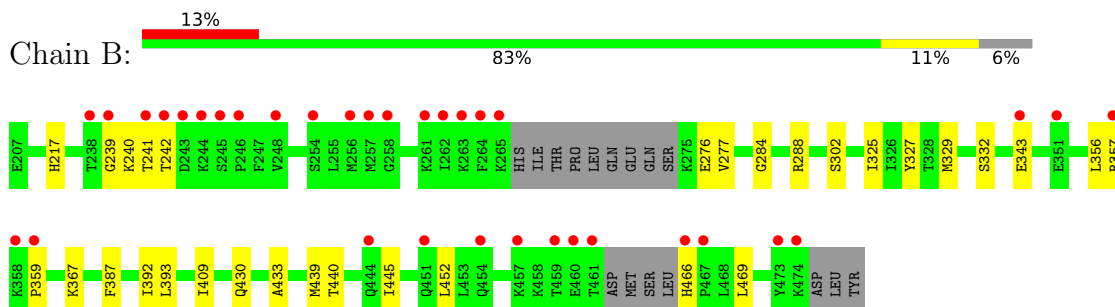


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			31	24	4	3		
2	B	1	Total	C	N	O	0	0
			31	24	4	3		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	65	Total 65	O 65	0	0
3	B	48	Total 48	O 48	0	0

- 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	93.04Å 62.19Å 118.55Å 90.00° 102.66° 90.00°	Depositor
Resolution (Å)	33.00 – 2.31 33.00 – 2.31	Depositor EDS
% Data completeness (in resolution range)	97.8 (33.00-2.31) 97.8 (33.00-2.31)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.03	Depositor
$\langle I/\sigma(I) \rangle$ ¹	10.83 (at 2.31Å)	Xtriage
Refinement program	REFMAC 5.5.0088	Depositor
R, R_{free}	0.238 , 0.297 0.233 , 0.288	Depositor DCC
R_{free} test set	1453 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	42.3	Xtriage
Anisotropy	0.110	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 36.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	4259	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.19% 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: UNT

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	0.53	0/2102	0.87	1/2831 (0.0%)
1	B	0.53	0/2069	0.85	1/2785 (0.0%)
All	All	0.53	0/4171	0.86	2/5616 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	356	LEU	N-CA-C	5.02	116.44	111.07
1	A	358	LYS	N-CA-C	5.01	120.88	109.81

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	A	2048	0	2100	13	0
1	B	2036	0	2094	13	0
2	A	31	0	23	1	0
2	B	31	0	23	0	0
3	A	65	0	0	0	0
3	B	48	0	0	0	0
All	All	4259	0	4240	25	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 (25) 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:473:TYR:O	1:A:474:LYS:HG3	1.81	0.80
1:B:343:GLU:O	1:B:343:GLU:HG3	1.91	0.69
1:B:387:PHE:HE1	1:B:439:MET:HE3	1.61	0.65
1:B:325:ILE:HD11	1:B:392:ILE:HG13	1.79	0.64
1:B:284:GLY:O	1:B:288:ARG:HG2	2.03	0.59
1:A:440:THR:OG1	1:B:440:THR:HG22	2.07	0.54
1:B:217:HIS:HE1	1:B:302:SER:O	1.92	0.53
1:A:357:ARG:HG2	1:A:359:PRO:HD2	1.92	0.52
1:A:473:TYR:O	1:A:474:LYS:CG	2.57	0.52
1:A:465:LEU:HB3	1:A:470:GLN:HG3	1.92	0.50
1:B:387:PHE:CE1	1:B:439:MET:HE3	2.43	0.49
1:A:226:PHE:CG	1:A:329:MET:HE1	2.47	0.49
1:B:239:GLY:C	1:B:241:THR:H	2.23	0.47
1:A:289:SER:HB2	2:A:1:UNT:H4	1.96	0.47
1:A:277:VAL:HG12	1:A:280:ARG:NH2	2.32	0.45
1:B:327:TYR:CZ	1:B:367:LYS:HE3	2.52	0.43
1:B:329:MET:O	1:B:332:SER:HB2	2.20	0.42
1:B:466:HIS:HA	1:B:469:LEU:HB2	2.01	0.42
1:A:370:PHE:HB2	1:A:445:ILE:HD11	2.03	0.41
1:B:393:LEU:HD22	1:B:409:ILE:HB	2.03	0.41
1:A:222:TYR:HD1	1:A:223:ILE:HD13	1.85	0.41
1:A:350:ARG:HG3	1:A:368:PHE:CD2	2.56	0.41
1:B:430:GLN:HG3	1:B:433:ALA:HB3	2.01	0.41
1:A:226:PHE:CD1	1:A:329:MET:HE1	2.55	0.41
1:A:342:SER:O	1:A:343:GLU:HG2	2.21	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	254/271 (94%)	250 (98%)	4 (2%)	0	100	100
1	B	249/271 (92%)	239 (96%)	7 (3%)	3 (1%)	10	11
All	All	503/542 (93%)	489 (97%)	11 (2%)	3 (1%)	21	25

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	240	LYS
1	B	357	ARG
1	B	359	PRO

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	231/244 (95%)	227 (98%)	4 (2%)	53	70
1	B	226/244 (93%)	221 (98%)	5 (2%)	45	63
All	All	457/488 (94%)	448 (98%)	9 (2%)	48	66

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	221	SER
1	A	244	LYS
1	A	392	ILE
1	A	452	LEU
1	B	242	THR
1	B	276	GLU
1	B	277	VAL
1	B	445	ILE
1	B	452	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such

sidechains are listed below:

Mol	Chain	Res	Type
1	A	375	ASN
1	A	402	ASN
1	B	217	HIS
1	B	253	ASN
1	B	375	ASN
1	B	430	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

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	UNT	B	2	-	33,34,34	0.83	0	42,46,46	2.07	7 (16%)
2	UNT	A	1	-	33,34,34	0.84	0	42,46,46	2.13	6 (14%)

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	UNT	B	2	-	-	9/22/22/22	0/4/4/4
2	UNT	A	1	-	-	6/22/22/22	0/4/4/4

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	2	UNT	C7-N6-N5	-7.14	100.89	103.26
2	A	1	UNT	C8-N9-N5	-6.85	100.99	103.26
2	A	1	UNT	C7-N6-N5	-6.70	101.04	103.26
2	B	2	UNT	C8-N9-N5	-6.23	101.19	103.26
2	A	1	UNT	N6-N5-N9	6.10	118.74	115.44
2	B	2	UNT	N6-N5-N9	5.92	118.64	115.44
2	A	1	UNT	C10-C4-C2	-4.96	102.09	112.38
2	B	2	UNT	C10-C4-C2	-3.62	104.87	112.38
2	A	1	UNT	C10-C4-N5	3.23	112.87	109.85
2	B	2	UNT	O1-C2-C4	-2.83	113.75	122.44
2	B	2	UNT	C11-C10-C4	-2.62	107.23	113.31
2	A	1	UNT	C17-C18-C19	-2.34	106.49	113.78
2	B	2	UNT	O23-C22-C26	-2.09	115.09	118.73

There are no chirality outliers.

All (15) torsion outliers are listed below:

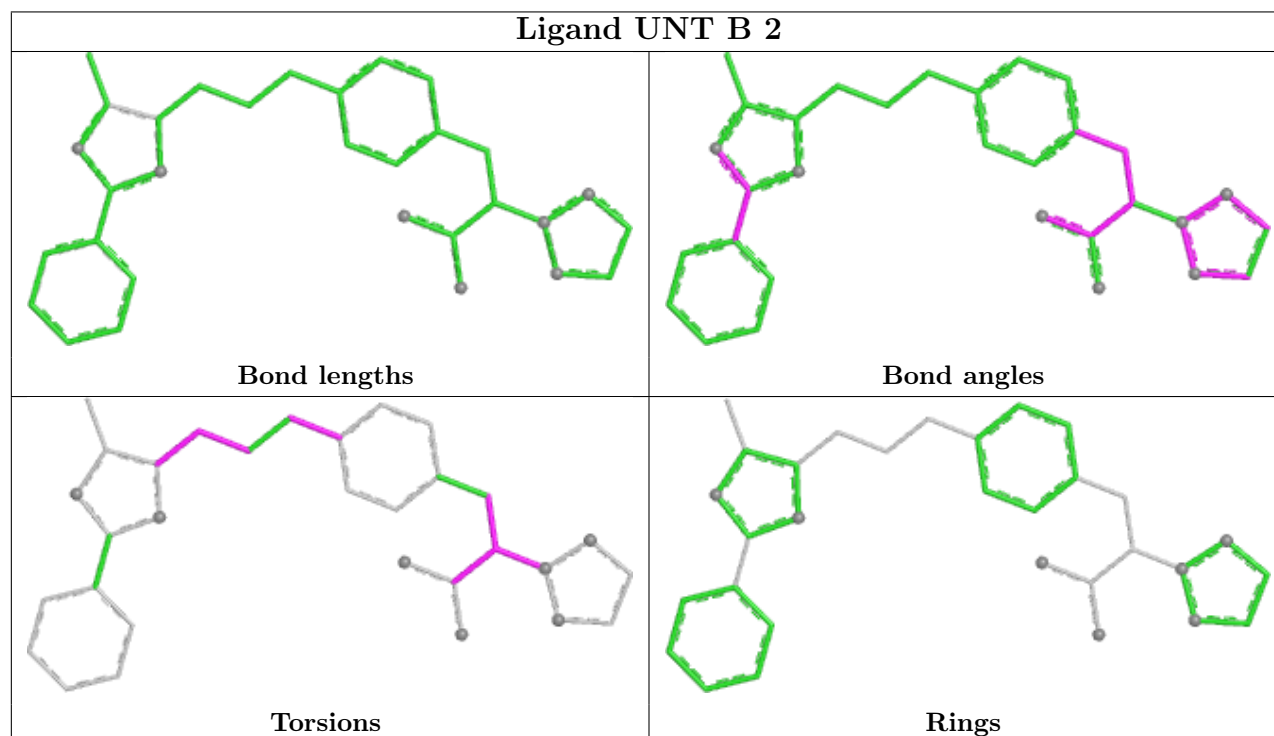
Mol	Chain	Res	Type	Atoms
2	A	1	UNT	O1-C2-C4-C10
2	A	1	UNT	C17-C18-C19-C20
2	B	2	UNT	C17-C18-C19-C20
2	B	2	UNT	O1-C2-C4-C10
2	B	2	UNT	C18-C19-C20-N21
2	B	2	UNT	C18-C19-C20-C24
2	A	1	UNT	C10-C4-N5-N6
2	B	2	UNT	C10-C4-N5-N6
2	A	1	UNT	O3-C2-C4-C10
2	B	2	UNT	O3-C2-C4-C10
2	B	2	UNT	C15-C14-C17-C18
2	B	2	UNT	C13-C14-C17-C18
2	A	1	UNT	C15-C14-C17-C18
2	A	1	UNT	C13-C14-C17-C18
2	B	2	UNT	C11-C10-C4-N5

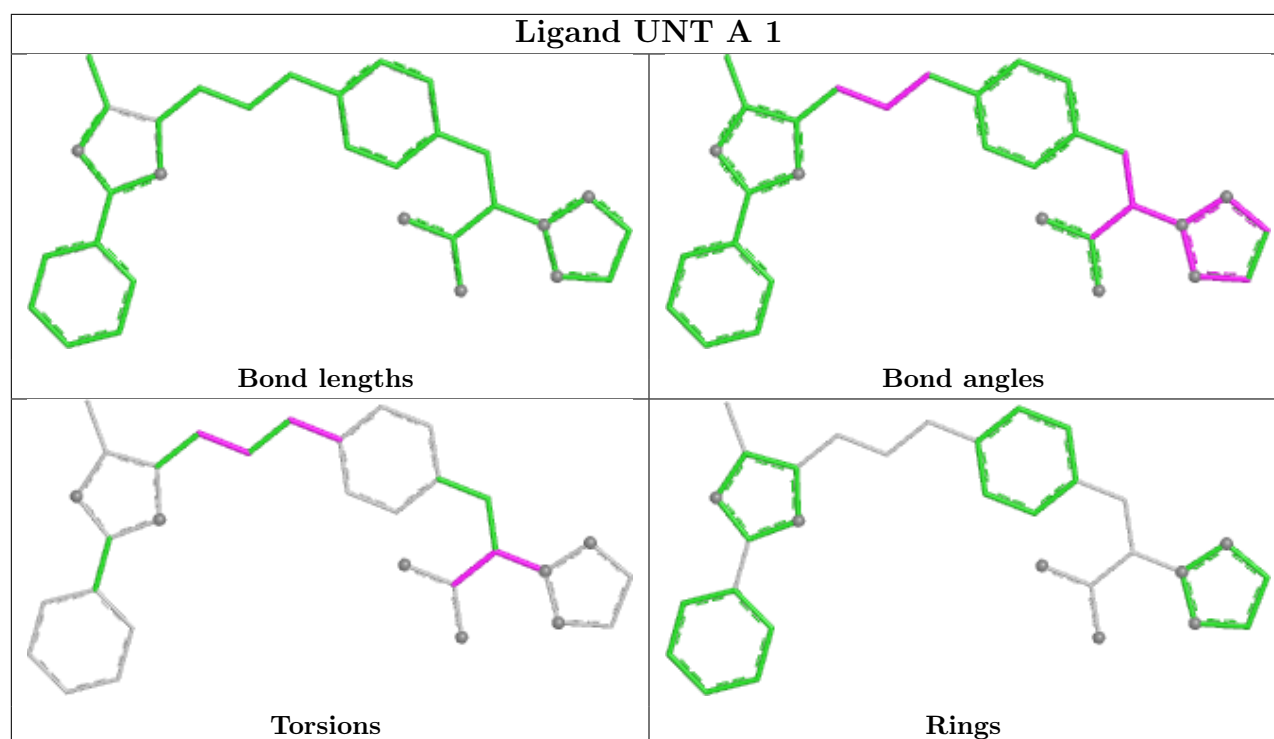
There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1	UNT	1	0

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





5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	254/271 (93%)	0.65	17 (6%) 24 26	24, 42, 60, 83	4 (1%)
1	B	255/271 (94%)	0.79	34 (13%) 7 8	28, 42, 76, 86	0
All	All	509/542 (93%)	0.72	51 (10%) 12 14	24, 42, 74, 86	4 (0%)

All (51) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	277	VAL	5.3
1	B	262	ILE	5.0
1	B	359	PRO	4.8
1	B	239	GLY	4.5
1	B	243	ASP	4.4
1	A	261	LYS	4.4
1	B	256	MET	4.2
1	B	241	THR	4.2
1	B	242	THR	3.9
1	B	264	PHE	3.8
1	A	359	PRO	3.8
1	B	459	THR	3.8
1	B	261	LYS	3.8
1	A	243	ASP	3.6
1	B	461	THR	3.4
1	B	357	ARG	3.4
1	B	466	HIS	3.3
1	A	278	ALA	3.2
1	B	451	GLN	3.2
1	B	238	THR	3.2
1	A	411	ASP	3.1
1	B	351	GLU	3.0
1	A	433	ALA	2.9
1	B	467	PRO	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	460	GLU	2.8
1	B	258	GLY	2.8
1	A	252	MET	2.8
1	A	245	SER	2.8
1	A	260	ASP	2.7
1	B	457	LYS	2.7
1	B	358	LYS	2.7
1	B	474	LYS	2.6
1	A	242	THR	2.6
1	B	265	LYS	2.6
1	A	256	MET	2.5
1	A	470	GLN	2.5
1	B	473	TYR	2.4
1	B	257	MET	2.4
1	B	263	LYS	2.4
1	B	248	VAL	2.4
1	A	254	SER	2.4
1	B	444	GLN	2.4
1	A	287[A]	PHE	2.3
1	B	245	SER	2.3
1	A	259	GLU	2.3
1	A	253	ASN	2.2
1	B	246	PRO	2.1
1	B	254	SER	2.1
1	B	343	GLU	2.0
1	B	244	LYS	2.0
1	B	454	GLN	2.0

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

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

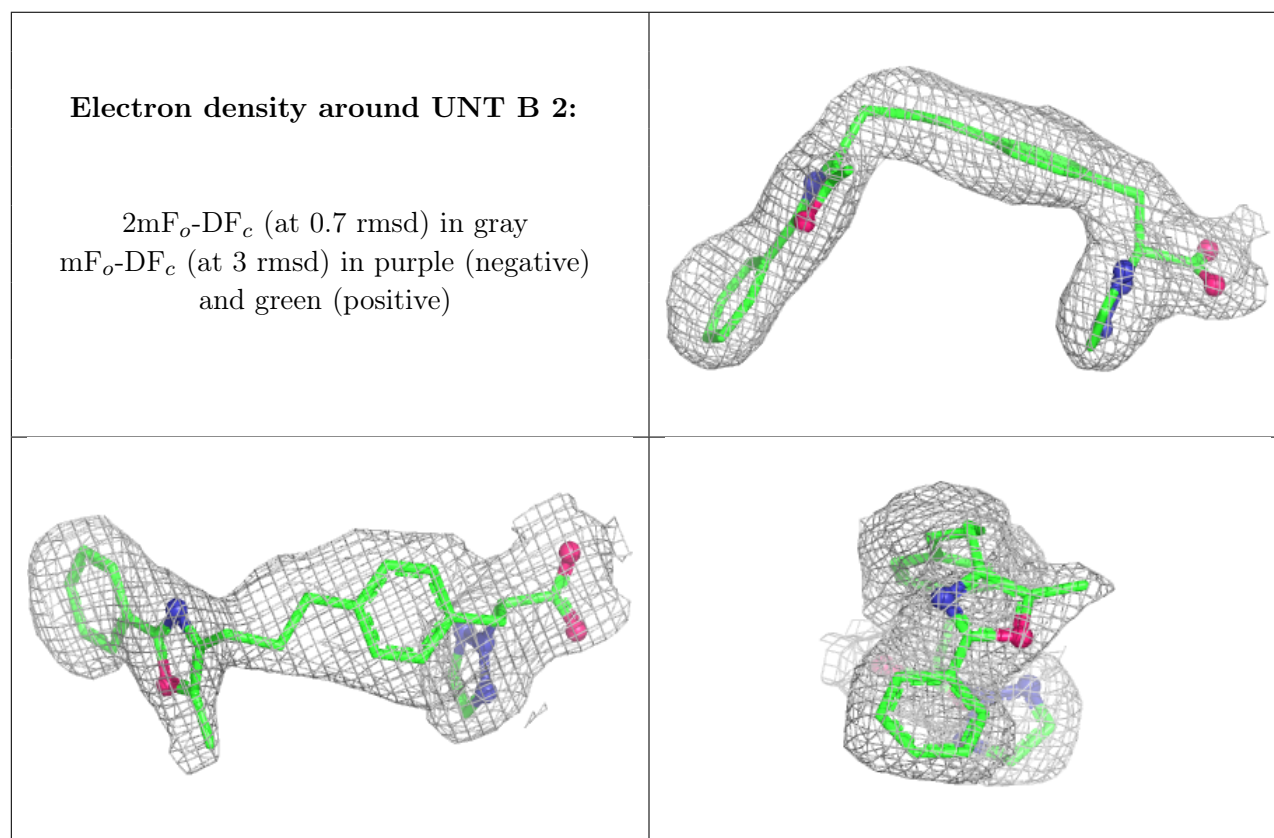
6.4 Ligands [i](#)

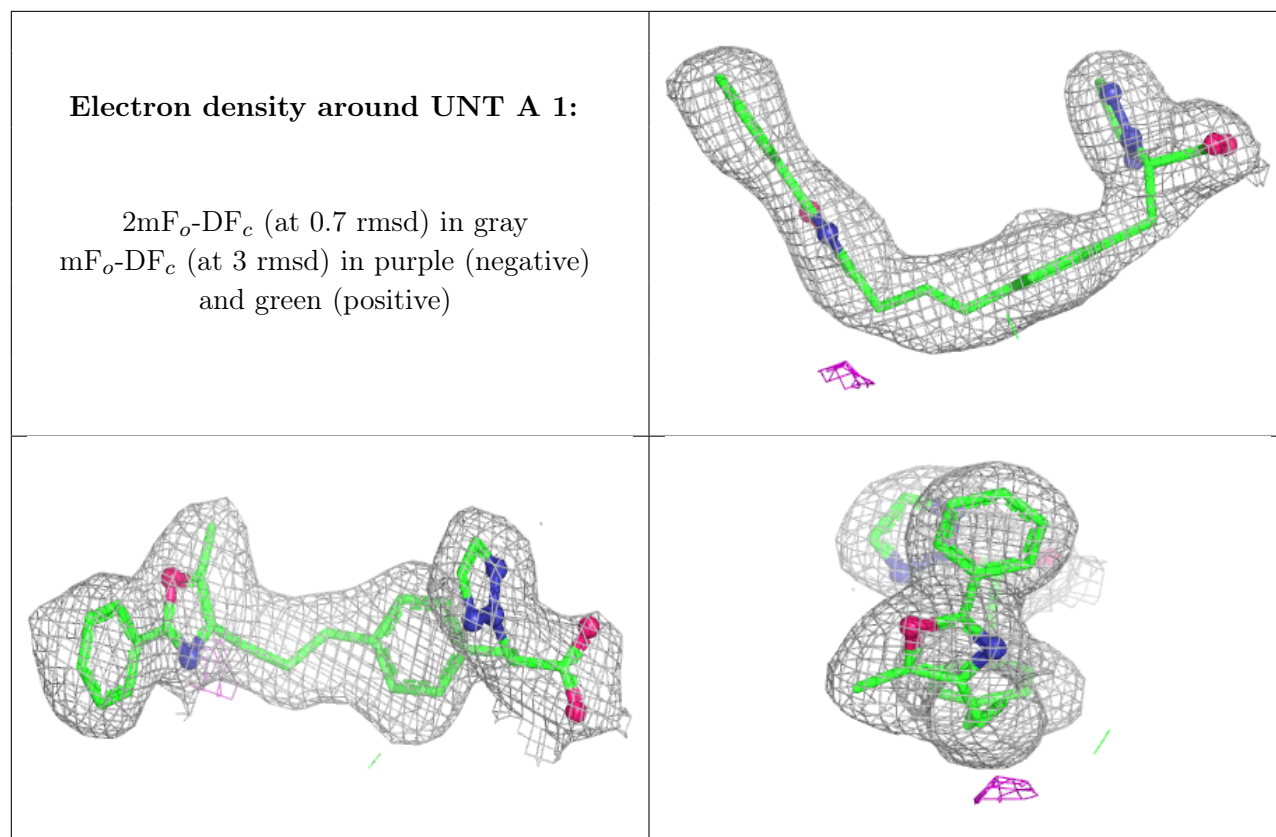
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum,

median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	UNT	B	2	31/31	0.92	0.08	48,49,51,52	0
2	UNT	A	1	31/31	0.93	0.07	44,46,48,48	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 ⓘ

There are no such residues in this entry.