



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 09:42 AM EDT

PDB ID : 6AKY / pdb_00006aky
Title : The Crystal structure of Human Chemokine Receptor CCR5 in complex with compound 34
Authors : Zhu, Y.; Zhao, Q.; Wu, B.
Deposited on : 2018-09-04
Resolution : 2.80 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

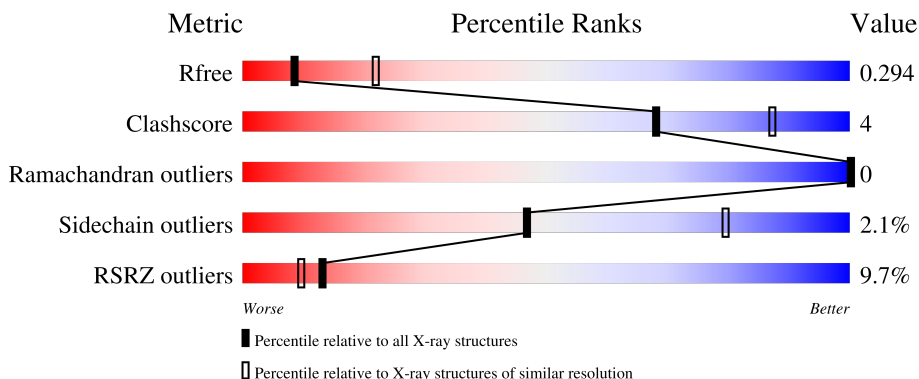
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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	381	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 2706 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 C-C chemokine receptor type 5,Rubredoxin,C-C chemokine receptor type 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	340	Total	C	N	O	S	0	0	0
			2657	1763	416	459	19			

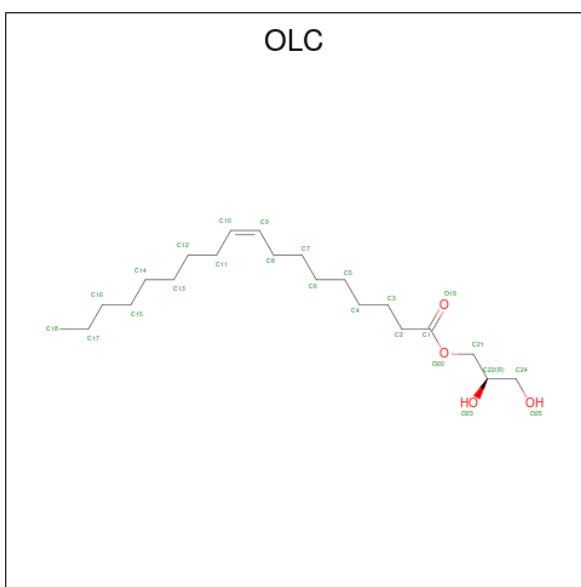
There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP P51681
A	0	ALA	-	expression tag	UNP P51681
A	1	PRO	-	expression tag	UNP P51681
A	58	TYR	CYS	engineered mutation	UNP P51681
A	163	ASN	GLY	engineered mutation	UNP P51681
A	233	ASP	ALA	engineered mutation	UNP P51681
A	303	GLU	LYS	engineered mutation	UNP P51681
A	320	GLY	-	expression tag	UNP P51681
A	321	ARG	-	expression tag	UNP P51681
A	322	PRO	-	expression tag	UNP P51681
A	323	LEU	-	expression tag	UNP P51681
A	324	GLU	-	expression tag	UNP P51681
A	325	VAL	-	expression tag	UNP P51681
A	326	LEU	-	expression tag	UNP P51681
A	327	PHE	-	expression tag	UNP P51681
A	328	GLN	-	expression tag	UNP P51681

- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

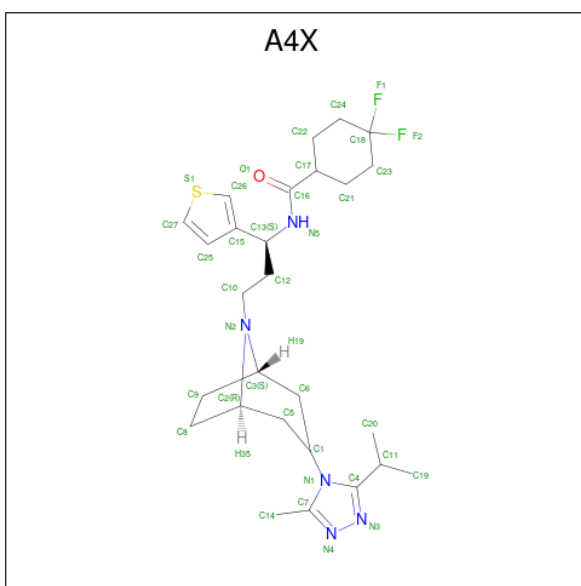
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Zn	0	0
			1	1		

- Molecule 3 is (2R)-2,3-dihydroxypropyl (9Z)-octadec-9-enoate (CCD ID: OLC) (formula: C₂₁H₄₀O₄).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			12	8	4		

- Molecule 4 is 4,4-difluoro-N-[(1S)-3-{(3-exo)-3-[3-methyl-5-(propan-2-yl)-4H-1,2,4-triazol-4-yl]-8-azabicyclo[3.2.1]octan-8-yl}-1-(thiophen-3-yl)propyl]cyclohexane-1-carboxamide (CCD ID: A4X) (formula: C₂₇H₃₉F₂N₅OS).

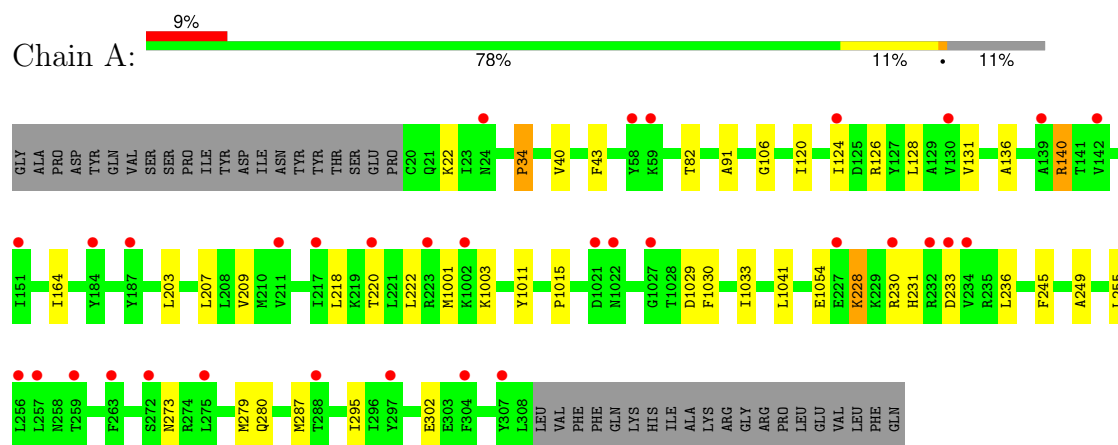


Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
4	A	1	Total	C	F	N	O	S	0	0
			36	27	2	5	1	1		

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: C-C chemokine receptor type 5,Rubredoxin,C-C chemokine receptor type 5



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 21 21	Depositor
Cell constants a, b, c, α , β , γ	35.59Å 101.48Å 136.57Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	31.56 – 2.80 31.56 – 2.80	Depositor EDS
% Data completeness (in resolution range)	96.5 (31.56-2.80) 96.5 (31.56-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.18 (at 2.81Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.275 , 0.283 0.280 , 0.294	Depositor DCC
R_{free} test set	639 reflections (5.15%)	wwPDB-VP
Wilson B-factor (Å ²)	76.0	Xtriage
Anisotropy	0.131	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 42.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	2706	wwPDB-VP
Average B, all atoms (Å ²)	82.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.92% 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: OLC, ZN, A4X

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	0.84	0/2728	1.41	14/3727 (0.4%)

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	1029	ASP	CA-CB-CG	5.65	118.25	112.60
1	A	280	GLN	CA-C-N	5.46	127.44	120.56
1	A	280	GLN	C-N-CA	5.46	127.44	120.56
1	A	1015	PRO	CA-C-N	5.45	128.13	120.28
1	A	1015	PRO	C-N-CA	5.45	128.13	120.28
1	A	34	PRO	N-CA-C	5.44	117.33	110.70
1	A	233	ASP	CA-C-N	5.23	127.85	120.42
1	A	233	ASP	C-N-CA	5.23	127.85	120.42
1	A	124	ILE	CA-C-N	5.16	127.15	120.44
1	A	124	ILE	C-N-CA	5.16	127.15	120.44
1	A	82	THR	CA-C-N	5.16	125.38	120.43
1	A	82	THR	C-N-CA	5.16	125.38	120.43
1	A	302	GLU	CA-C-N	5.03	127.02	120.28
1	A	302	GLU	C-N-CA	5.03	127.02	120.28

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	2657	0	2608	19	0
2	A	1	0	0	0	0
3	A	12	0	13	0	0
4	A	36	0	0	0	0
All	All	2706	0	2621	19	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 4.

All (19) 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:218:LEU:O	1:A:222:LEU:HG	1.59	1.00
1:A:228:LYS:HG3	1:A:231:HIS:HD2	1.47	0.76
1:A:228:LYS:HG3	1:A:231:HIS:CD2	2.27	0.68
1:A:1030:PHE:HA	1:A:1033:ILE:HD12	1.76	0.67
1:A:1011:TYR:HB2	1:A:1041:LEU:HD12	1.80	0.62
1:A:1054:GLU:HA	1:A:1054:GLU:OE2	2.09	0.52
1:A:128:LEU:O	1:A:136:ALA:HB2	2.13	0.48
1:A:203:LEU:O	1:A:207:LEU:HB2	2.14	0.48
1:A:120:ILE:HG23	1:A:209:VAL:HG11	1.97	0.46
1:A:126:ARG:NH2	1:A:140:ARG:HH22	2.14	0.46
1:A:255:LEU:HD12	1:A:279:MET:HE2	1.97	0.46
1:A:40:VAL:HG11	1:A:287:MET:HE3	1.99	0.45
1:A:22:LYS:HA	1:A:273:ASN:HD21	1.81	0.45
1:A:34:PRO:HG3	1:A:91:ALA:HB2	1.98	0.44
1:A:106:GLY:HA2	1:A:164:ILE:HG12	1.99	0.44
1:A:126:ARG:HH21	1:A:140:ARG:HH22	1.65	0.43
1:A:220:THR:O	1:A:1001:MET:HG3	2.19	0.43
1:A:43:PHE:CE2	1:A:295:ILE:HD11	2.53	0.42
1:A:245:PHE:O	1:A:249:ALA:HB3	2.20	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	338/381 (89%)	323 (96%)	15 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	283/342 (83%)	277 (98%)	6 (2%)	47	79

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	131	VAL
1	A	140	ARG
1	A	1003	LYS
1	A	228	LYS
1	A	230	ARG
1	A	236	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	48	ASN
1	A	170	GLN

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Mol	Chain	Res	Type
1	A	231	HIS

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](#)

Of 3 ligands modelled in this entry, 1 is monoatomic - leaving 2 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	A4X	A	2003	-	39,40,40	2.35	9 (23%)	43,59,59	1.82	9 (20%)
3	OLC	A	2002	-	11,11,24	0.65	0	12,12,25	0.78	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	A4X	A	2003	-	-	2/24/58/58	0/6/5/5
3	OLC	A	2002	-	-	5/11/11/24	-

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	2003	A4X	N4-N3	-11.09	1.16	1.39
4	A	2003	A4X	C7-N1	-4.04	1.33	1.38
4	A	2003	A4X	C25-C15	-3.13	1.34	1.42
4	A	2003	A4X	C14-C7	3.03	1.54	1.49
4	A	2003	A4X	C6-C1	3.01	1.58	1.53
4	A	2003	A4X	C26-S1	-2.65	1.62	1.70
4	A	2003	A4X	C6-C3	2.60	1.58	1.53
4	A	2003	A4X	C24-C18	2.55	1.55	1.50
4	A	2003	A4X	C23-C18	2.15	1.54	1.50

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	2003	A4X	N1-C4-N3	-5.39	108.85	110.99
4	A	2003	A4X	C6-C1-C5	4.70	116.00	110.27
4	A	2003	A4X	C14-C7-N1	4.06	128.07	123.28
4	A	2003	A4X	C15-C26-S1	-3.98	105.78	112.21
4	A	2003	A4X	C25-C15-C26	3.73	116.11	111.19
4	A	2003	A4X	C24-C18-C23	-3.22	111.13	114.33
4	A	2003	A4X	C4-N3-N4	2.12	110.22	107.82
4	A	2003	A4X	C14-C7-N4	-2.11	122.66	125.96
4	A	2003	A4X	C7-N4-N3	2.02	110.01	107.95

There are no chirality outliers.

All (7) torsion outliers are listed below:

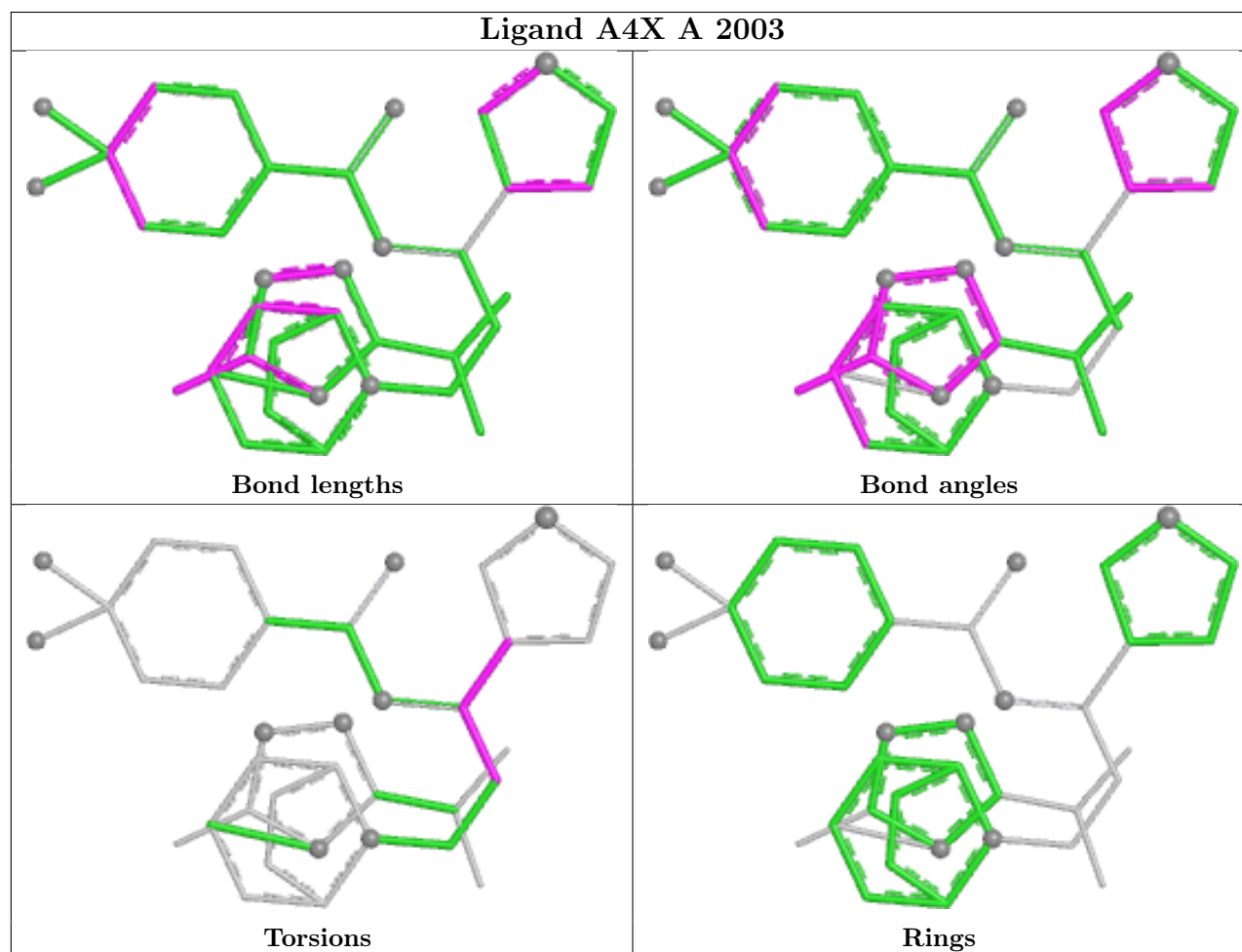
Mol	Chain	Res	Type	Atoms
3	A	2002	OLC	C2-C1-O20-C21
3	A	2002	OLC	O19-C1-O20-C21
3	A	2002	OLC	C1-C2-C3-C4
4	A	2003	A4X	C10-C12-C13-N5
4	A	2003	A4X	N5-C13-C15-C26
3	A	2002	OLC	O20-C1-C2-C3
3	A	2002	OLC	O19-C1-C2-C3

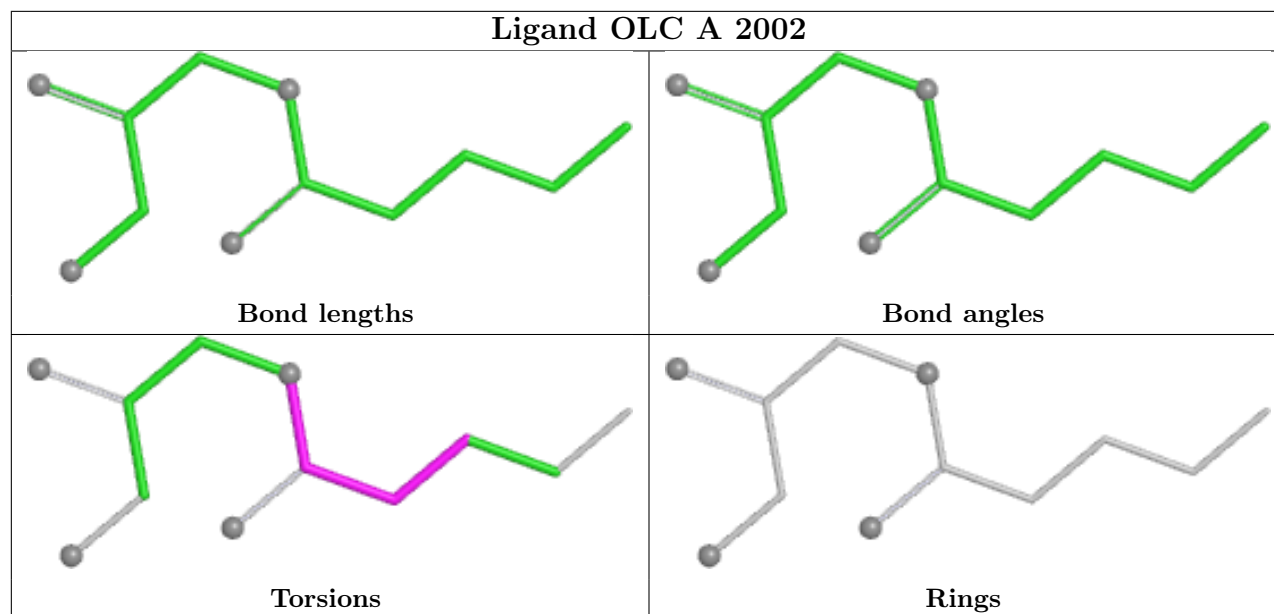
There are no ring outliers.

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	340/381 (89%)	0.88	33 (9%) 13 10	48, 78, 124, 139	0

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	223	ARG	4.4
1	A	263	PHE	4.1
1	A	275	LEU	3.5
1	A	58	TYR	3.4
1	A	234	VAL	3.3
1	A	142	VAL	3.0
1	A	233	ASP	2.9
1	A	272	SER	2.8
1	A	187	TYR	2.8
1	A	130	VAL	2.8
1	A	1022	ASN	2.7
1	A	1027	GLY	2.6
1	A	259	THR	2.6
1	A	1021	ASP	2.4
1	A	59	LYS	2.4
1	A	217	ILE	2.4
1	A	230	ARG	2.3
1	A	151	ILE	2.3
1	A	227	GLU	2.2
1	A	220	THR	2.2
1	A	297	TYR	2.2
1	A	139	ALA	2.2
1	A	307	TYR	2.2
1	A	304	PHE	2.2
1	A	256	LEU	2.1
1	A	257	LEU	2.1
1	A	184	TYR	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	288	THR	2.1
1	A	124	ILE	2.1
1	A	1002	LYS	2.1
1	A	24	ASN	2.1
1	A	211	VAL	2.0
1	A	232	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](#)

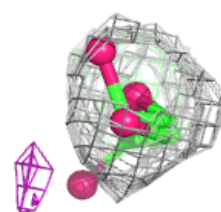
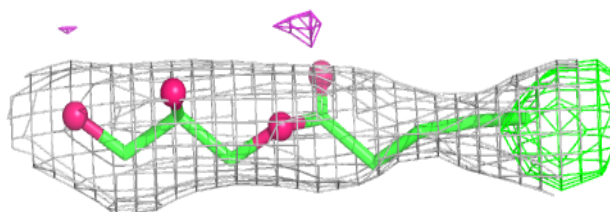
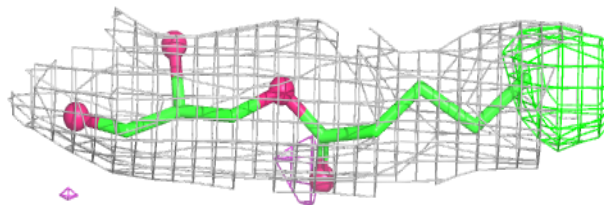
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
3	OLC	A	2002	12/25	0.62	0.28	102,105,106,107	0
4	A4X	A	2003	36/36	0.92	0.12	54,60,69,72	0
2	ZN	A	2001	1/1	0.97	0.05	88,88,88,88	0

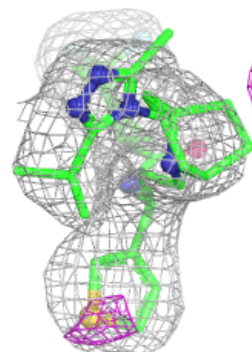
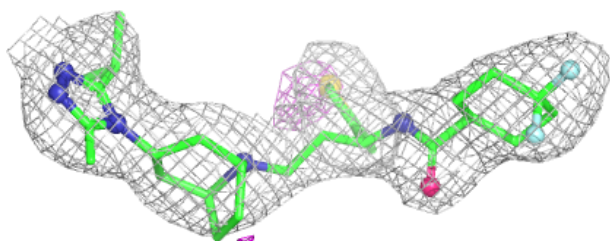
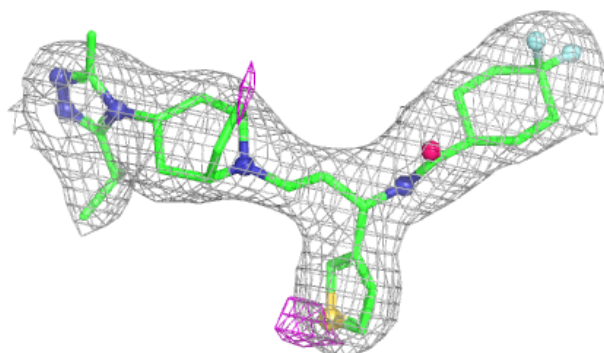
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around OLC A 2002:

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

**Electron density around A4X A 2003:**

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



6.5 Other polymers [i](#)

There are no such residues in this entry.