



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 4, 2026 – 11:47 PM UTC

PDB ID : 9Z1L / pdb_00009z1l
Title : Structure of KIT V654A mutant with Compound 1
Authors : Kim, J.L.
Deposited on : 2025-11-04
Resolution : 1.54 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

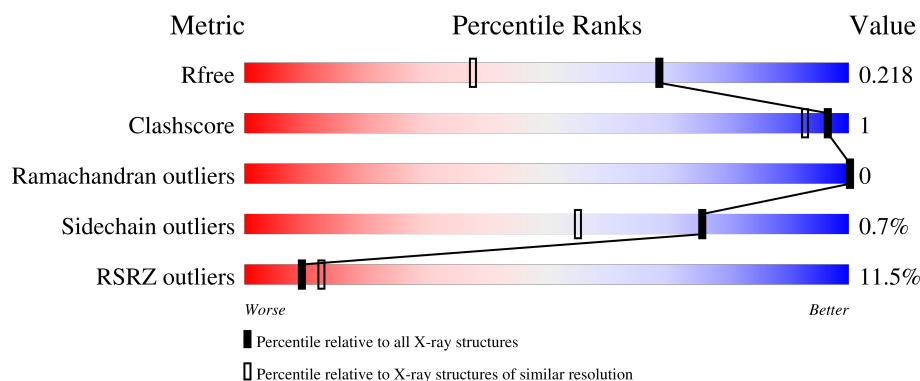
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.54 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	1003 (1.54-1.54)
Clashscore	190562	1025 (1.54-1.54)
Ramachandran outliers	187476	1007 (1.54-1.54)
Sidechain outliers	187428	1007 (1.54-1.54)
RSRZ outliers	180081	1002 (1.54-1.54)

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	359	<div> <div>10%</div> <div>85%</div> <div>13%</div> </div>

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3104 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 Mast/stem cell growth factor receptor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	312	Total	C	N	O	S	0	17	0
			2577	1676	416	463	22			

There are 85 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	519	MET	-	initiating methionine	UNP A0A0U2N547
A	520	SER	-	expression tag	UNP A0A0U2N547
A	521	TYR	-	expression tag	UNP A0A0U2N547
A	522	TYR	-	expression tag	UNP A0A0U2N547
A	523	HIS	-	expression tag	UNP A0A0U2N547
A	524	HIS	-	expression tag	UNP A0A0U2N547
A	525	HIS	-	expression tag	UNP A0A0U2N547
A	526	HIS	-	expression tag	UNP A0A0U2N547
A	527	HIS	-	expression tag	UNP A0A0U2N547
A	528	HIS	-	expression tag	UNP A0A0U2N547
A	529	ASP	-	expression tag	UNP A0A0U2N547
A	530	TYR	-	expression tag	UNP A0A0U2N547
A	531	ASP	-	expression tag	UNP A0A0U2N547
A	532	ILE	-	expression tag	UNP A0A0U2N547
A	533	PRO	-	expression tag	UNP A0A0U2N547
A	534	THR	-	expression tag	UNP A0A0U2N547
A	535	THR	-	expression tag	UNP A0A0U2N547
A	536	GLU	-	expression tag	UNP A0A0U2N547
A	537	ASN	-	expression tag	UNP A0A0U2N547
A	538	LEU	-	expression tag	UNP A0A0U2N547
A	539	TYR	-	expression tag	UNP A0A0U2N547
A	540	PHE	-	expression tag	UNP A0A0U2N547
A	541	GLN	-	expression tag	UNP A0A0U2N547
A	542	GLY	-	expression tag	UNP A0A0U2N547
A	543	PRO	-	expression tag	UNP A0A0U2N547
A	654	ALA	VAL	engineered mutation	UNP A0A0U2N547
A	?	-	GLN	deletion	UNP A0A0U2N547

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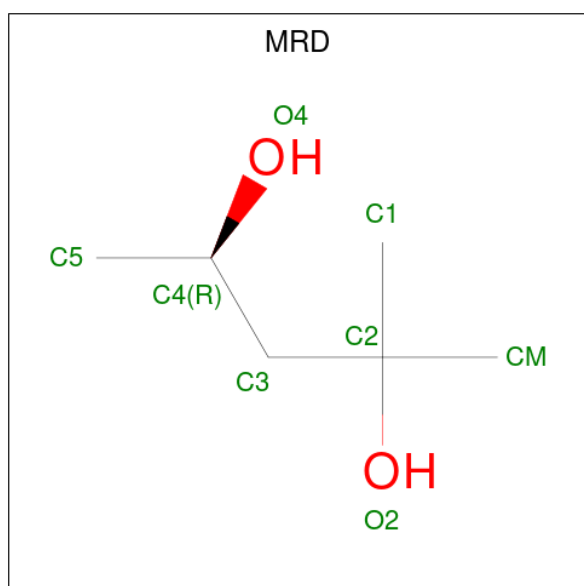
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	GLU	deletion	UNP A0A0U2N547
A	?	-	ASP	deletion	UNP A0A0U2N547
A	?	-	HIS	deletion	UNP A0A0U2N547
A	?	-	ALA	deletion	UNP A0A0U2N547
A	?	-	GLU	deletion	UNP A0A0U2N547
A	?	-	ALA	deletion	UNP A0A0U2N547
A	?	-	ALA	deletion	UNP A0A0U2N547
A	?	-	LEU	deletion	UNP A0A0U2N547
A	?	-	TYR	deletion	UNP A0A0U2N547
A	?	-	LYS	deletion	UNP A0A0U2N547
A	?	-	ASN	deletion	UNP A0A0U2N547
A	?	-	LEU	deletion	UNP A0A0U2N547
A	?	-	LEU	deletion	UNP A0A0U2N547
A	?	-	HIS	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	LYS	deletion	UNP A0A0U2N547
A	?	-	GLU	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	CYS	deletion	UNP A0A0U2N547
A	?	-	ASP	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	THR	deletion	UNP A0A0U2N547
A	?	-	ASN	deletion	UNP A0A0U2N547
A	?	-	GLU	deletion	UNP A0A0U2N547
A	?	-	TYR	deletion	UNP A0A0U2N547
A	?	-	MET	deletion	UNP A0A0U2N547
A	?	-	ASP	deletion	UNP A0A0U2N547
A	?	-	MET	deletion	UNP A0A0U2N547
A	?	-	LYS	deletion	UNP A0A0U2N547
A	?	-	PRO	deletion	UNP A0A0U2N547
A	?	-	GLY	deletion	UNP A0A0U2N547
A	?	-	VAL	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	TYR	deletion	UNP A0A0U2N547
A	?	-	VAL	deletion	UNP A0A0U2N547
A	?	-	VAL	deletion	UNP A0A0U2N547
A	?	-	PRO	deletion	UNP A0A0U2N547
A	?	-	THR	deletion	UNP A0A0U2N547
A	?	-	LYS	deletion	UNP A0A0U2N547
A	?	-	ALA	deletion	UNP A0A0U2N547
A	?	-	ASP	deletion	UNP A0A0U2N547

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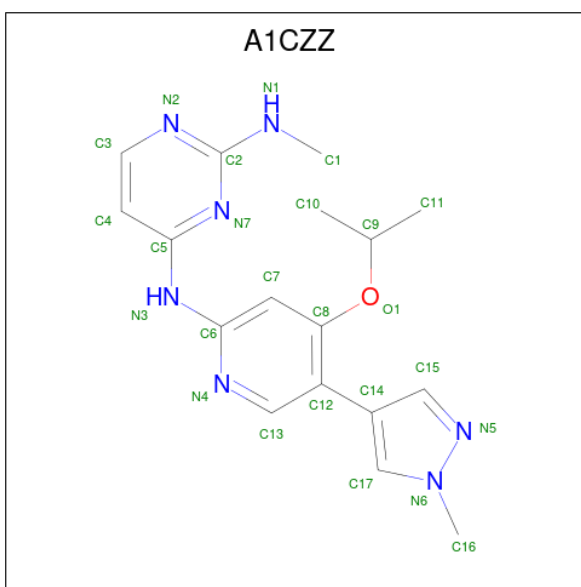
Chain	Residue	Modelled	Actual	Comment	Reference
A	?	-	LYS	deletion	UNP A0A0U2N547
A	?	-	ARG	deletion	UNP A0A0U2N547
A	?	-	ARG	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	VAL	deletion	UNP A0A0U2N547
A	?	-	ARG	deletion	UNP A0A0U2N547
A	?	-	ILE	deletion	UNP A0A0U2N547
A	?	-	GLY	deletion	UNP A0A0U2N547
A	?	-	SER	deletion	UNP A0A0U2N547
A	?	-	TYR	deletion	UNP A0A0U2N547
A	?	-	ILE	deletion	UNP A0A0U2N547
A	?	-	GLU	deletion	UNP A0A0U2N547
A	?	-	ARG	deletion	UNP A0A0U2N547
A	?	-	ASP	deletion	UNP A0A0U2N547
A	752	THR	VAL	conflict	UNP A0A0U2N547
A	753	SER	THR	conflict	UNP A0A0U2N547

- Molecule 2 is (4R)-2-METHYLPENTANE-2,4-DIOL (CCD ID: MRD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C O 8 6 2	0	0

- Molecule 3 is N 2 -methyl-N 4 -{(5P)-5-(1-methyl-1H-pyrazol-4-yl)-4-[(propan-2-yl)oxy]pyridin-2-yl}pyrimidine-2,4-diamine (CCD ID: A1CZZ) (formula: C₁₇H₂₁N₇O) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			25	17	7	1		


- Molecule 4 is water.

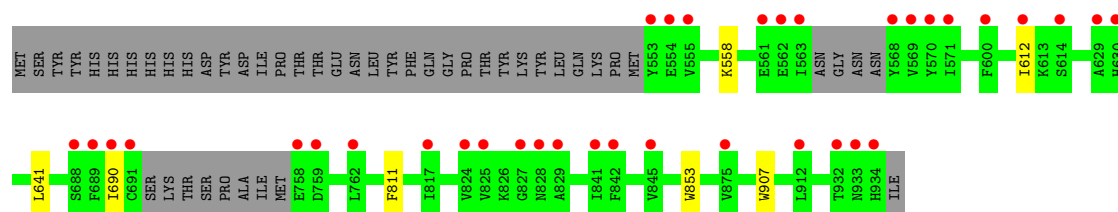
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	488	Total	O	0	13
			494	494		

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: Mast/stem cell growth factor receptor

Chain A:  10% 85% 13%



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	56.30Å 56.30Å 202.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	54.25 – 1.54 54.25 – 1.54	Depositor EDS
% Data completeness (in resolution range)	55.7 (54.25-1.54) 55.7 (54.25-1.54)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.70 (at 1.55Å)	Xtriage
Refinement program	REFMAC 5.8.0430	Depositor
R, R_{free}	0.165 , 0.206 0.179 , 0.218	Depositor DCC
R_{free} test set	1395 reflections (2.83%)	wwPDB-VP
Wilson B-factor (Å ²)	13.3	Xtriage
Anisotropy	0.150	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 51.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3104	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.95% 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: A1CZZ, MRD

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	0.45	0/2688	0.82	0/3631

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2577	0	2630	5	0
2	A	8	0	14	0	0
3	A	25	0	0	0	0
4	A	494	0	0	3	1
All	All	3104	0	2644	5	1

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 1.

All (5) 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:612[A]:ILE:CG1	4:A:1354[A]:HOH:O	2.49	0.59
1:A:612[A]:ILE:HG12	4:A:1354[A]:HOH:O	2.01	0.59
1:A:558:LYS:NZ	4:A:1104:HOH:O	2.49	0.46
1:A:641:LEU:C	1:A:641:LEU:HD23	2.42	0.44
1:A:853:TRP:CE3	1:A:907:TRP:HA	2.54	0.42

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:A:1262:HOH:O	4:A:1262:HOH:O[7_555]	2.15	0.05

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	A	323/359 (90%)	319 (99%)	4 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	A	288/315 (91%)	286 (99%)	2 (1%)	76	55

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	690	ILE
1	A	811	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	649	ASN
1	A	822	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 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	$\# Z > 2$
3	A1CZZ	A	1002	-	27,27,27	0.38	0	32,37,37	0.91	0
2	MRD	A	1001	-	7,7,7	0.12	0	9,10,10	0.41	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
3	A1CZZ	A	1002	-	-	2/14/14/14	0/3/3/3
2	MRD	A	1001	-	-	0/5/5/5	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

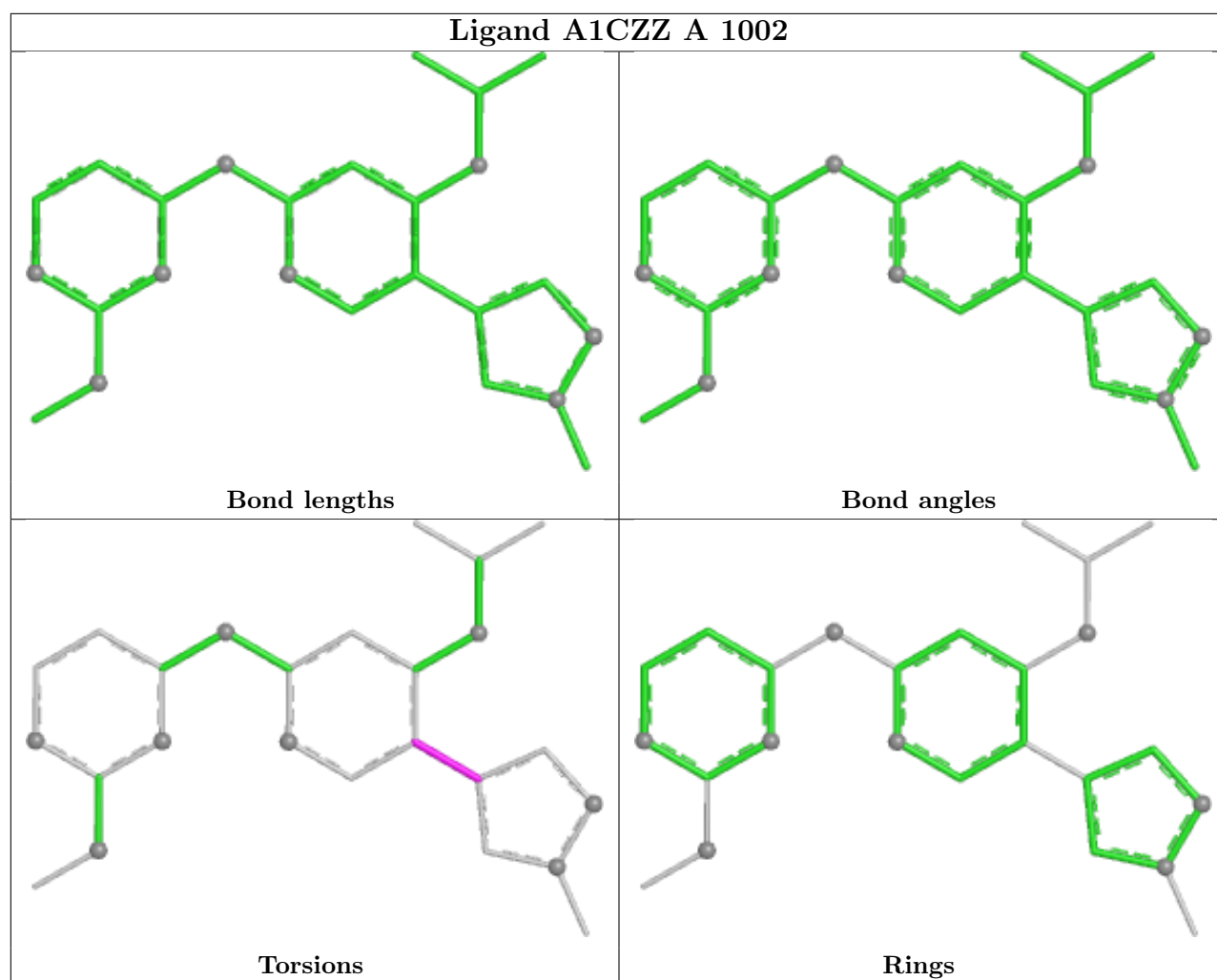
All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	1002	A1CZZ	C8-C12-C14-C17
3	A	1002	A1CZZ	C8-C12-C14-C15

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	312/359 (86%)	0.57	36 (11%) 9 13	10, 21, 57, 96	17 (5%)

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	690	ILE	5.5
1	A	569	VAL	5.5
1	A	563	ILE	4.9
1	A	568	TYR	4.8
1	A	555	VAL	4.6
1	A	553	TYR	4.4
1	A	571	ILE	4.3
1	A	932	THR	4.2
1	A	689	PHE	4.0
1	A	825	VAL	3.7
1	A	934	HIS	3.7
1	A	691	CYS	3.6
1	A	570	TYR	3.6
1	A	829	ALA	3.5
1	A	688	SER	3.4
1	A	828	ASN	3.0
1	A	759	ASP	3.0
1	A	845	VAL	2.9
1	A	933	ASN	2.9
1	A	842	PHE	2.8
1	A	562	GLU	2.8
1	A	561	GLU	2.7
1	A	758	GLU	2.7
1	A	827	GLY	2.6
1	A	600	PHE	2.5
1	A	554	GLU	2.5
1	A	629	ALA	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	612[A]	ILE	2.3
1	A	762[A]	LEU	2.2
1	A	630	HIS	2.2
1	A	824	VAL	2.1
1	A	841	ILE	2.1
1	A	614	SER	2.1
1	A	875	VAL	2.0
1	A	912	LEU	2.0
1	A	817	ILE	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](#)

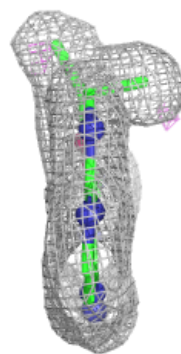
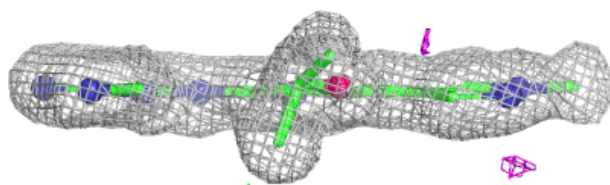
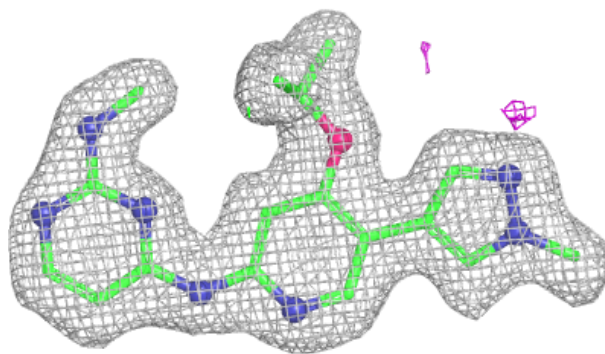
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
2	MRD	A	1001	8/8	0.89	0.14	32,38,41,42	0
3	A1CZZ	A	1002	25/25	0.97	0.06	13,15,19,20	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 A1CZZ A 1002:

$2mF_o-DF_c$ (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.