



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 20, 2026 – 07:27 PM UTC

PDB ID : 8XB1 / pdb_00008xb1
Title : Crystal structure of FLT3 in complex with a Pyrazinamide Macrocycle derivative
Authors : Guo, M.; Chen, Y.
Deposited on : 2023-12-05
Resolution : 2.85 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

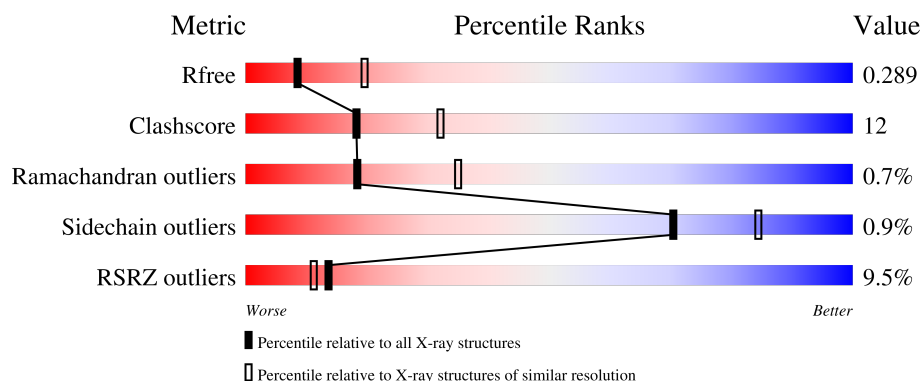
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

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	346	

2 Entry composition [i](#)

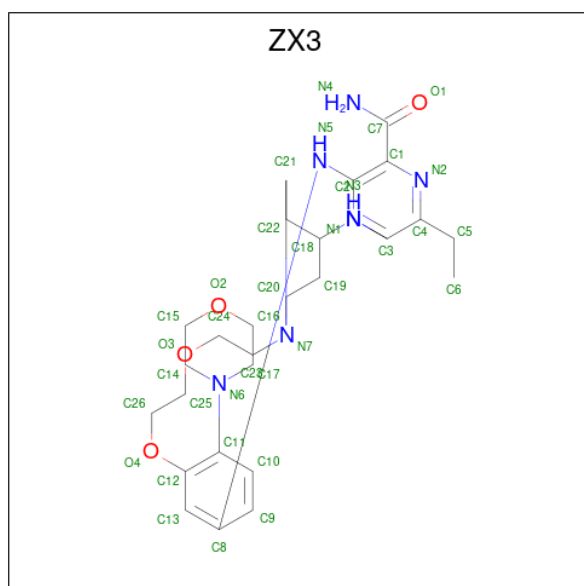
There are 2 unique types of molecules in this entry. The entry contains 2342 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Receptor-type tyrosine-protein kinase FLT3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	304	2305	1499	365	424	17	0	0	0

- Molecule 2 is 3[^]3-ethyl-5[^]4-morpholino-6,9-dioxo-2,4-diaza-3(2,6)-pyrazina-1(4,1)-peridina-5(1,3)-benzenacycloundecaphane-3[^]5-carboxamide (CCD ID: ZX3) (formula: C₂₆H₃₇N₇O₄) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	37	26	7	4	0	0

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.

- Chain A:
-
- 8% 68% 19% 12%
- GLY
ALA
HIS
LYS
TYR
LYS
GLN
PHE
ARG
TYR
E573
S574
Q575
M578
S584
E588
F594
R607
E608
N609
L610
E611
F612
G613
G614
V615
L616
G617
S618
K623
N626
A627
T628
A629
S633
S638
I639
Q640
V641
M645
L646
K647
E648
D651
S652
G653
E654
S655
K623
L662
E672
S684
G685
P686
I687
L688
L689
Y693
G697
R707
E708
K709
F710
S762
E763
ASP
GLU
ILE
GLU
TYR
GLN
ASN
GLN
LYS
ARG
LEU
GLU
GLU
ASP
LEU
N761
V782
L783
T784
F785
E786
D787
L788
L789
C790
F791
Q794
V795
A796
K797
K805
W819
T820
K823
R824
V825
D829
F830
GLY
LEU
ALA
LEU
ARG
ASP
ILE
R837
S838
L850
P851
M855
L867
K868
M879
S883
L884
G885
V886
F896
L901
Q910
T915
Y918
Y919
M922
C925
K932
R933
T940
C945
Q946
L947
A948
D949
A950
GLU
GLU
ALA
- MET
TYR
GLN
ASN
VAL

4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	83.13Å 83.13Å 139.21Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	53.37 – 2.85 53.37 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.9 (53.37-2.85) 91.0 (53.37-2.85)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.83 (at 2.86Å)	Xtriage
Refinement program	PHENIX (1.15.2_3472: ???)	Depositor
R, R_{free}	0.230 , 0.287 0.236 , 0.289	Depositor DCC
R_{free} test set	1198 reflections (10.01%)	wwPDB-VP
Wilson B-factor (Å ²)	86.6	Xtriage
Anisotropy	0.099	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 98.7	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	2342	wwPDB-VP
Average B, all atoms (Å ²)	111.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.58% 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: ZX3

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	0.31	0/2359	0.49	3/3202 (0.1%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	614	LYS	CA-C-N	-5.53	112.85	120.49
1	A	614	LYS	C-N-CA	-5.53	112.85	120.49
1	A	612	PHE	N-CA-C	5.46	122.44	110.80

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	2305	0	2141	54	0
2	A	37	0	0	1	0
All	All	2342	0	2141	54	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 12.

All (54) 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:784:THR:HG23	1:A:787:ASP:H	1.51	0.76
1:A:820:THR:HG23	1:A:824:VAL:HG13	1.69	0.74
1:A:709:LYS:O	1:A:782:VAL:CG1	2.36	0.74
1:A:611:GLU:HB2	1:A:628:THR:HB	1.70	0.72
1:A:607:ARG:HE	1:A:684:SER:HB3	1.55	0.71
1:A:607:ARG:NH2	1:A:686:PRO:O	2.24	0.71
1:A:709:LYS:O	1:A:782:VAL:HG11	1.92	0.70
1:A:618:SER:HB3	1:A:623:LYS:HB3	1.74	0.70
1:A:790:CYS:HA	1:A:947:LEU:HD11	1.74	0.70
1:A:611:GLU:O	1:A:628:THR:N	2.34	0.60
1:A:614:LYS:O	1:A:616:LEU:CD1	2.50	0.60
1:A:614:LYS:O	1:A:615:VAL:C	2.43	0.60
1:A:915:THR:HG23	1:A:918:ILE:H	1.67	0.59
1:A:789:LEU:HB3	1:A:947:LEU:HG	1.87	0.57
1:A:883:SER:OG	1:A:886:VAL:HG12	2.04	0.57
1:A:607:ARG:HE	1:A:684:SER:CB	2.19	0.55
1:A:575:GLN:HB2	1:A:829:ASP:OD1	2.10	0.52
1:A:709:LYS:O	1:A:782:VAL:HG13	2.10	0.51
1:A:791:PHE:O	1:A:795:VAL:HG23	2.10	0.51
1:A:707:ARG:HA	1:A:884:LEU:HD23	1.93	0.51
1:A:614:LYS:O	1:A:616:LEU:HD12	2.10	0.50
1:A:662:LEU:HB2	1:A:689:LEU:HD21	1.93	0.50
1:A:609:ASN:O	1:A:629:ALA:HA	2.12	0.49
1:A:616:LEU:HD23	2:A:1001:ZX3:N5	2.26	0.49
1:A:790:CYS:CA	1:A:947:LEU:HD11	2.41	0.47
1:A:618:SER:HB3	1:A:623:LYS:CB	2.42	0.47
1:A:819:VAL:HA	1:A:825:VAL:HG12	1.95	0.47
1:A:898:PHE:O	1:A:901:LEU:HB2	2.14	0.47
1:A:614:LYS:O	1:A:616:LEU:HD13	2.14	0.47
1:A:641:VAL:HA	1:A:693:TYR:HB2	1.97	0.47
1:A:805:LYS:HE2	1:A:805:LYS:HB3	1.81	0.46
1:A:910:GLN:HG3	1:A:919:TYR:HB2	1.97	0.46
1:A:688:TYR:C	1:A:689:LEU:HD12	2.40	0.46
1:A:672:GLU:H	1:A:672:GLU:CD	2.24	0.45
1:A:607:ARG:HH12	1:A:686:PRO:HG2	1.83	0.44
1:A:820:THR:CG2	1:A:824:VAL:HG13	2.45	0.44
1:A:851:PRO:O	1:A:855:MET:HG3	2.18	0.43
1:A:584:SER:N	1:A:588:GLU:OE1	2.52	0.42
1:A:932:LYS:HB3	1:A:932:LYS:HE2	1.83	0.42
1:A:794:GLN:OE1	1:A:824:VAL:HA	2.19	0.42
1:A:879:TRP:HD1	1:A:922:MET:HE1	1.85	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:789:LEU:HD21	1:A:946:GLN:HB3	2.00	0.42
1:A:868:LYS:HZ1	1:A:933:ARG:C	2.28	0.41
1:A:925:CYS:HA	1:A:933:ARG:HG2	2.02	0.41
1:A:646:LEU:H	1:A:646:LEU:CD2	2.33	0.41
1:A:628:THR:CG2	1:A:638:SER:HB2	2.50	0.41
1:A:901:LEU:HA	1:A:901:LEU:HD23	1.41	0.41
1:A:578:MET:HE2	1:A:594:PHE:HZ	1.86	0.41
1:A:784:THR:HG23	1:A:787:ASP:N	2.28	0.41
1:A:787:ASP:OD1	1:A:823:LYS:HD3	2.20	0.41
1:A:613:GLY:HA3	1:A:626:ASN:HB3	2.02	0.41
1:A:645:MET:HE2	1:A:645:MET:HB3	1.95	0.41
1:A:850:LEU:HB3	1:A:855:MET:SD	2.61	0.41
1:A:784:THR:OG1	1:A:785:PHE:N	2.54	0.41

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	A	298/346 (86%)	277 (93%)	19 (6%)	2 (1%)	18	35

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	612	PHE
1	A	639	ILE

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	225/303 (74%)	223 (99%)	2 (1%)	70 84

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

Mol	Chain	Res	Type
1	A	762	SER
1	A	805	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 ⓘ

1 ligand is 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	ZX3	A	1001	-	40,41,41	3.01	12 (30%)	53,56,56	1.37	5 (9%)

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	ZX3	A	1001	-	-	14/27/45/45	0/4/5/5

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	ZX3	C3-N3	8.57	1.48	1.35
2	A	1001	ZX3	C7-N4	7.46	1.46	1.33
2	A	1001	ZX3	C23-N7	-6.47	1.32	1.47
2	A	1001	ZX3	C2-N5	6.46	1.48	1.36
2	A	1001	ZX3	C20-N7	-6.44	1.29	1.46
2	A	1001	ZX3	C21-N7	-4.62	1.34	1.46
2	A	1001	ZX3	C11-N6	4.60	1.51	1.41
2	A	1001	ZX3	C8-N5	3.75	1.49	1.40
2	A	1001	ZX3	O1-C7	-3.07	1.18	1.24
2	A	1001	ZX3	C22-C21	2.88	1.60	1.52
2	A	1001	ZX3	O4-C12	2.86	1.43	1.37
2	A	1001	ZX3	C5-C4	2.18	1.55	1.51

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	ZX3	C17-N6-C14	4.44	121.56	111.57
2	A	1001	ZX3	C10-C11-N6	-3.24	117.34	122.42
2	A	1001	ZX3	O4-C12-C11	2.97	120.46	116.07
2	A	1001	ZX3	C12-C11-N6	2.52	123.27	119.14
2	A	1001	ZX3	C1-C7-N4	2.36	120.09	116.28

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	1001	ZX3	C19-C18-N3-C3
2	A	1001	ZX3	C1-C2-N5-C8

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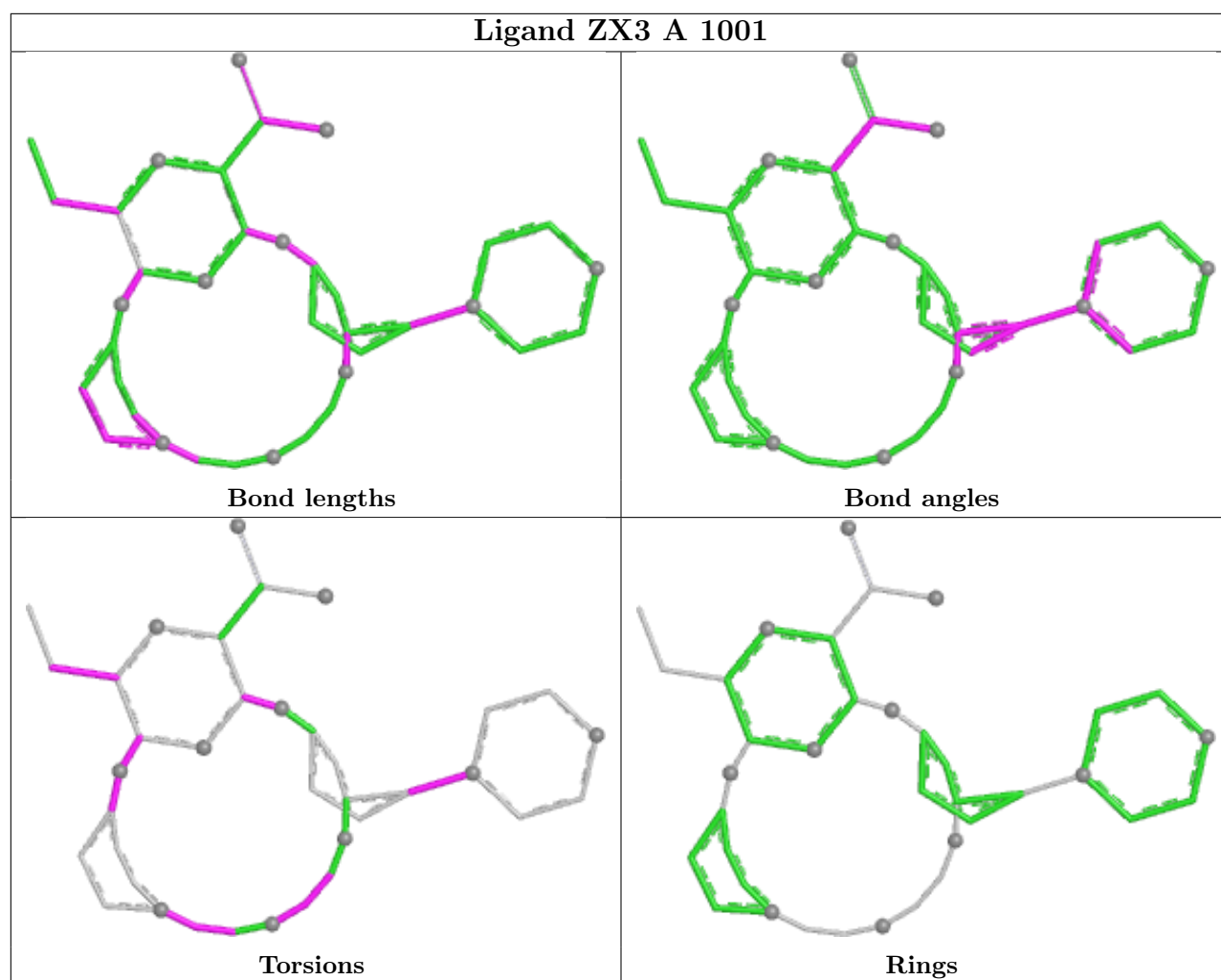
Mol	Chain	Res	Type	Atoms
2	A	1001	ZX3	C4-C3-N3-C18
2	A	1001	ZX3	N1-C3-N3-C18
2	A	1001	ZX3	C12-C11-N6-C14
2	A	1001	ZX3	C12-C11-N6-C17
2	A	1001	ZX3	N7-C23-C24-O3
2	A	1001	ZX3	N1-C2-N5-C8
2	A	1001	ZX3	C24-C23-N7-C21
2	A	1001	ZX3	C26-C25-O3-C24
2	A	1001	ZX3	C10-C11-N6-C17
2	A	1001	ZX3	C24-C23-N7-C20
2	A	1001	ZX3	O3-C25-C26-O4
2	A	1001	ZX3	C3-C4-C5-C6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1001	ZX3	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	304/346 (87%)	0.72	29 (9%) 14 11	59, 105, 188, 220	0

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	652	SER	5.1
1	A	651	ASP	5.0
1	A	830	PHE	4.9
1	A	781	ASN	4.5
1	A	654	GLU	4.0
1	A	837	MET	3.8
1	A	788	LEU	3.8
1	A	950	ALA	3.6
1	A	646	LEU	3.4
1	A	697	GLY	3.1
1	A	611	GLU	3.1
1	A	613	GLY	3.1
1	A	688	TYR	2.9
1	A	655	ARG	2.9
1	A	945	CYS	2.9
1	A	763	GLU	2.8
1	A	762	SER	2.7
1	A	867	ILE	2.7
1	A	684	SER	2.6
1	A	648	GLU	2.5
1	A	633	SER	2.5
1	A	949	ASP	2.3
1	A	612	PHE	2.2
1	A	640	GLN	2.2
1	A	940	THR	2.2
1	A	709	LYS	2.1
1	A	838	SER	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	797	LYS	2.0
1	A	594	PHE	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](#)

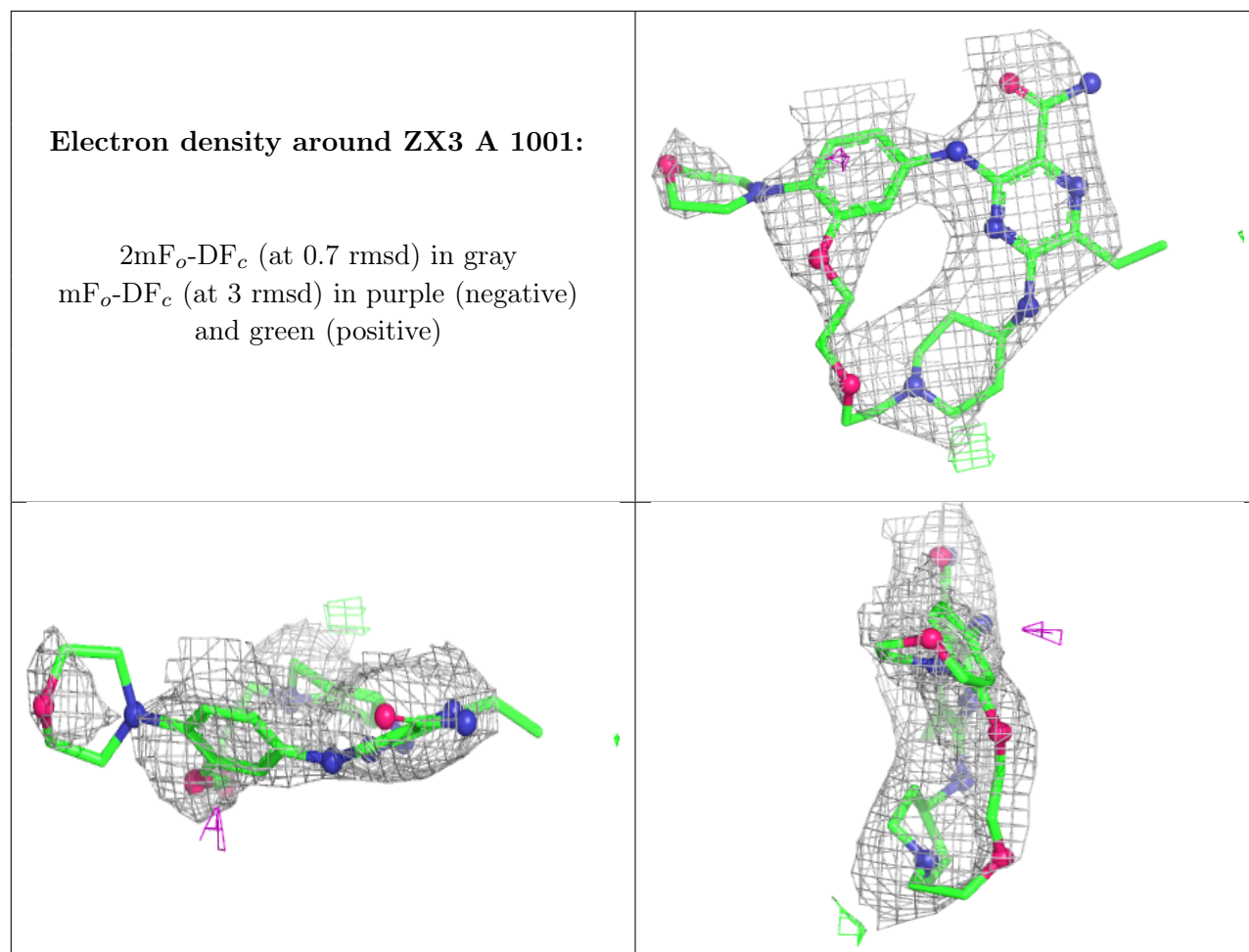
There are no oligosaccharides in this entry.

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	ZX3	A	1001	37/37	0.82	0.16	111,133,147,149	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.