



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 10:31 PM GMT

PDB ID : 1U0C
Title : Y33C Mutant of Homing endonuclease I-CreI
Authors : Sussman, D.; Chadsey, M.; Fauce, S.; Engel, A.; Bruett, A.; Monnat, R.;
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Deposited on : 2004-07-13
Resolution : 2.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

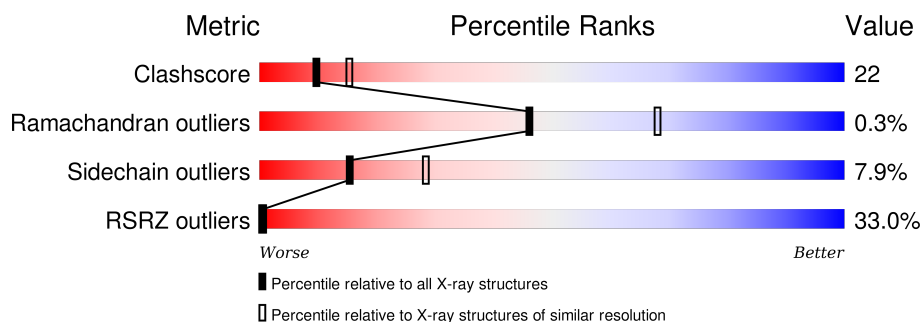
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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))
Clashscore	102246	4242 (2.50-2.50)
Ramachandran outliers	100387	4156 (2.50-2.50)
Sidechain outliers	100360	4158 (2.50-2.50)
RSRZ outliers	91569	3562 (2.50-2.50)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	1-C	24	
1	2-C	24	
2	1-D	24	
2	2-D	24	
3	1-A	163	
3	1-B	163	
3	2-A	163	

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Mol	Chain	Length	Quality of chain
3	2-B	163	 A horizontal bar chart showing the quality of chain 2-B. The bar is divided into five segments: red (20%), green (53%), yellow (35%), orange (6%), and grey (7%). The percentages are labeled above each segment.

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 7062 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 DNA chain called 5'-D(*GP*CP*TP*AP*AP*AP*CP*GP*TP*CP*GP*T
P*GP*AP*GP*AP*CP*AP*GP*TP*TP*AP*CP*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	1-C	24	Total	C	N	O	P	0	0	0
			493	235	95	140	23			
1	2-C	24	Total	C	N	O	P	0	0	0
			493	235	95	140	23			

- Molecule 2 is a DNA chain called 5'-D(*CP*GP*TP*AP*AP*CP*TP*GP*TP*CP*TP*CP
*AP*CP*GP*AP*CP*GP*TP*TP*TP*AP*GP*C)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	1-D	24	Total	C	N	O	P	0	0	0
			485	233	85	144	23			
2	2-D	24	Total	C	N	O	P	0	0	0
			485	233	85	144	23			

- Molecule 3 is a protein called DNA endonuclease I-CreI.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	1-A	152	Total	C	N	O	S	0	0	0
			1230	790	209	229	2			
3	2-A	152	Total	C	N	O	S	0	0	0
			1230	790	209	229	2			
3	1-B	152	Total	C	N	O	S	0	0	0
			1230	790	209	229	2			
3	2-B	152	Total	C	N	O	S	0	0	0
			1230	790	209	229	2			

There are 10 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	33	CYS	TYR	ENGINEERED MUTATION	UNP P05725
A	42	THR	ALA	ENGINEERED MUTATION	UNP P05725

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Chain	Residue	Modelled	Actual	Comment	Reference
A	47	GLU	GLN	ENGINEERED MUTATION	UNP P05725
A	110	GLU	TRP	ENGINEERED MUTATION	UNP P05725
A	111	GLN	ARG	ENGINEERED MUTATION	UNP P05725
B	333	CYS	TYR	ENGINEERED MUTATION	UNP P05725
B	342	THR	ALA	ENGINEERED MUTATION	UNP P05725
B	347	GLU	GLN	ENGINEERED MUTATION	UNP P05725
B	410	GLU	TRP	ENGINEERED MUTATION	UNP P05725
B	411	GLN	ARG	ENGINEERED MUTATION	UNP P05725

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	1-B	1	Total Mg 1 1	0	0
4	1-C	1	Total Mg 1 1	0	0
4	2-C	1	Total Mg 1 1	0	0
4	1-A	1	Total Mg 1 1	0	0
4	2-B	1	Total Mg 1 1	0	0
4	2-A	1	Total Mg 1 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	1-A	34	Total O 34 34	0	0
5	2-A	32	Total O 32 32	0	0
5	1-B	28	Total O 28 28	0	0
5	2-B	28	Total O 28 28	0	0
5	1-C	11	Total O 11 11	0	0
5	2-C	12	Total O 12 12	0	0
5	1-D	17	Total O 17 17	0	0

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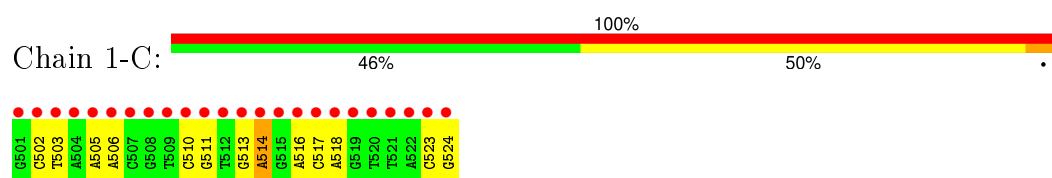
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	2-D	18	Total	O	0	0
			18	18		

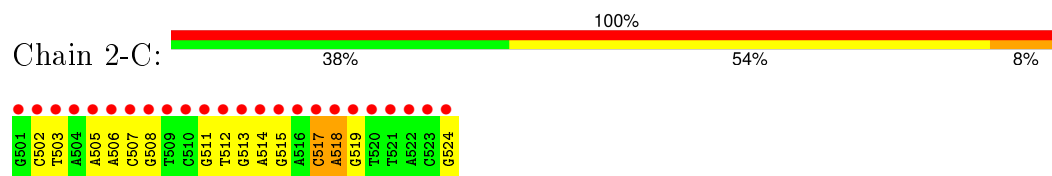
3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

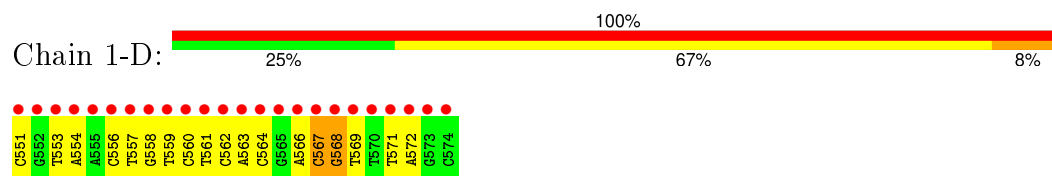
- Molecule 1: 5'-D(*GP*CP*TP*AP*AP*AP*CP*GP*TP*CP*GP*TP*GP*AP*GP*AP*CP*AP*GP*TP*TP*AP*CP*G)-3'



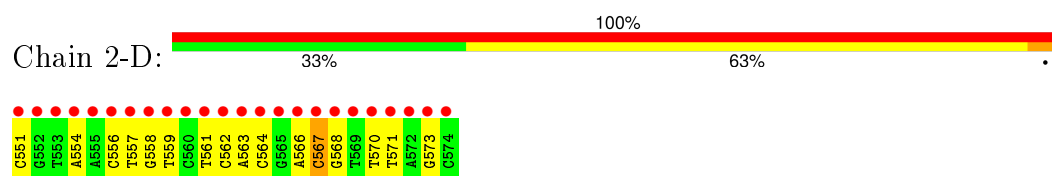
- Molecule 1: 5'-D(*GP*CP*TP*AP*AP*AP*CP*GP*TP*CP*GP*TP*GP*AP*GP*AP*CP*AP*GP*TP*TP*AP*CP*G)-3'



- Molecule 2: 5'-D(*CP*GP*TP*AP*AP*CP*TP*GP*TP*CP*TP*CP*AP*CP*GP*AP*CP*GP*TP*TP*TP*AP*GP*C)-3'

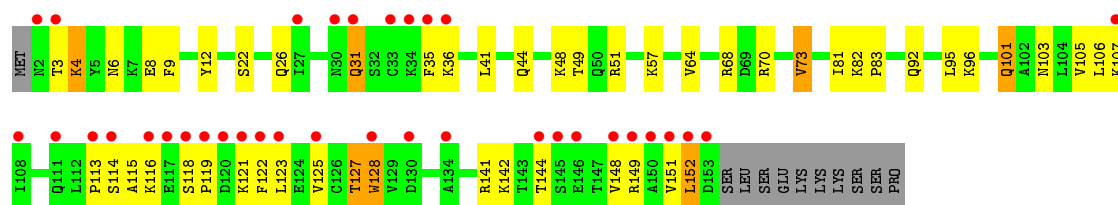


- Molecule 2: 5'-D(*CP*GP*TP*AP*AP*CP*TP*GP*TP*CP*TP*CP*AP*CP*GP*AP*CP*GP*TP*TP*TP*AP*GP*C)-3'

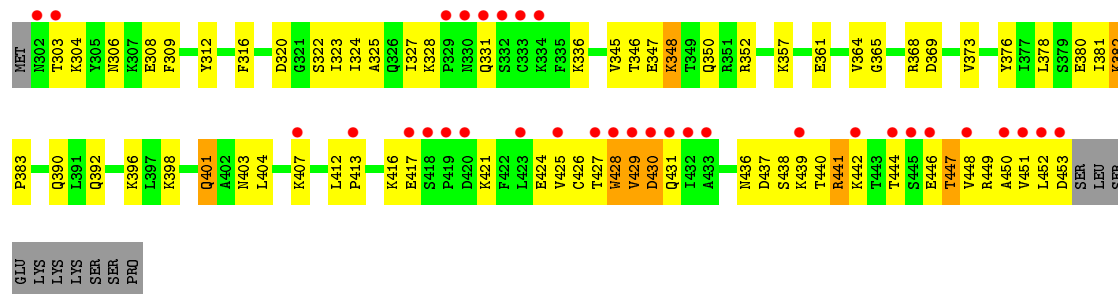


- Molecule 3: DNA endonuclease I-CreI

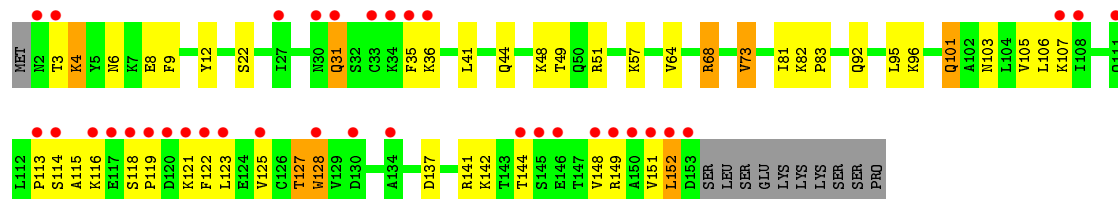




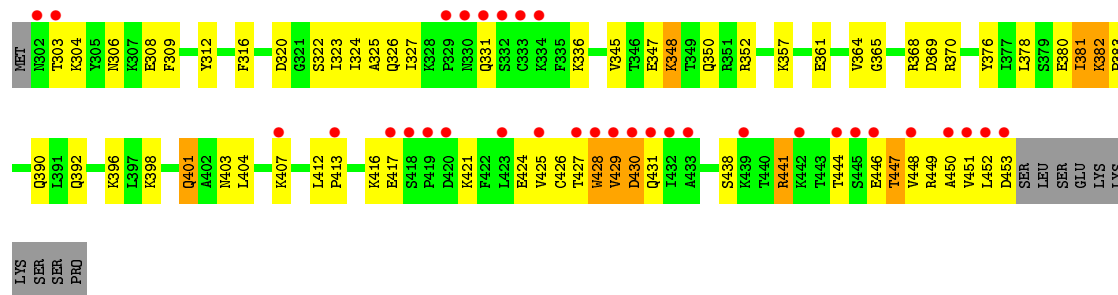
• Molecule 3: DNA endonuclease I-CreI



• Molecule 3: DNA endonuclease I-CreI



• Molecule 3: DNA endonuclease I-CreI



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	43.09Å 68.02Å 87.18Å 90.00° 92.00° 90.00°	Depositor
Resolution (Å)	50.00 – 2.50 43.56 – 2.50	Depositor EDS
% Data completeness (in resolution range)	(Not available) (50.00-2.50) 96.1 (43.56-2.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.26 (at 2.51Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.214 , 0.277 0.275 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	38.7	Xtriage
Anisotropy	0.232	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.50 , 44.6	EDS
Estimated twinning fraction	0.042 for h,-k,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 17529 reflections	Xtriage
F_o, F_c correlation	0.86	EDS
Total number of atoms	7062	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.02% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: MG

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	1-C	0.30	0/554	0.71	0/854
1	2-C	0.29	0/554	0.67	0/854
2	1-D	0.29	0/542	0.75	0/834
2	2-D	0.29	0/542	0.71	0/834
3	1-A	0.43	0/1252	0.67	0/1690
3	1-B	0.42	0/1252	0.68	1/1690 (0.1%)
3	2-A	0.43	0/1252	0.67	0/1690
3	2-B	0.42	0/1252	0.68	1/1690 (0.1%)
All	All	0.39	0/7200	0.69	2/10136 (0.0%)

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	1-C	0	1
1	2-C	0	2
2	1-D	0	2
2	2-D	0	1
All	All	0	6

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	1-B	376	TYR	N-CA-C	-5.33	96.61	111.00
3	2-B	376	TYR	N-CA-C	-5.33	96.61	111.00

There are no chirality outliers.

5 of 6 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	1-C	514	DA	Sidechain
2	1-D	567	DC	Sidechain
2	1-D	568	DG	Sidechain
1	2-C	517	DC	Sidechain
1	2-C	518	DA	Sidechain

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	1-C	493	0	271	26	0
1	2-C	493	0	271	26	0
2	1-D	485	0	273	24	0
2	2-D	485	0	273	17	0
3	1-A	1230	0	1264	62	0
3	1-B	1230	0	1264	64	0
3	2-A	1230	0	1264	61	0
3	2-B	1230	0	1264	55	0
4	1-A	1	0	0	0	0
4	1-B	1	0	0	0	0
4	1-C	1	0	0	0	0
4	2-A	1	0	0	0	0
4	2-B	1	0	0	0	0
4	2-C	1	0	0	0	0
5	1-A	34	0	0	2	0
5	1-B	28	0	0	2	0
5	1-C	11	0	0	2	0
5	1-D	17	0	0	0	0
5	2-A	32	0	0	2	0
5	2-B	28	0	0	2	0
5	2-C	12	0	0	0	0
5	2-D	18	0	0	1	0
All	All	7062	0	6144	291	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 22.

The worst 5 of 291 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:C:505:DA:H2"	1:C:506:DA:H5"	1.50	0.91
3:A:4:LYS:H	3:A:4:LYS:HE2	1.38	0.87
3:A:4:LYS:H	3:A:4:LYS:HE2	1.38	0.87
3:B:322:SER:OG	3:B:324:ILE:HD11	1.75	0.87
3:B:322:SER:OG	3:B:324:ILE:HD11	1.75	0.87

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	
3	1-A	150/163 (92%)	139 (93%)	11 (7%)	0	100	100
3	1-B	150/163 (92%)	138 (92%)	11 (7%)	1 (1%)	26	46
3	2-A	150/163 (92%)	139 (93%)	11 (7%)	0	100	100
3	2-B	150/163 (92%)	138 (92%)	11 (7%)	1 (1%)	26	46
All	All	600/652 (92%)	554 (92%)	44 (7%)	2 (0%)	46	68

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	1-B	450	ALA
3	2-B	450	ALA

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	
3	1-A	139/150 (93%)	131 (94%)	8 (6%)	25	45
3	1-B	139/150 (93%)	125 (90%)	14 (10%)	9	17
3	2-A	139/150 (93%)	131 (94%)	8 (6%)	25	45
3	2-B	139/150 (93%)	125 (90%)	14 (10%)	9	17
All	All	556/600 (93%)	512 (92%)	44 (8%)	15	28

5 of 44 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	1-B	430	ASP
3	2-A	68	ARG
3	2-B	429	VAL
3	1-B	441	ARG
3	2-A	4	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
3	1-B	350	GLN
3	2-A	6	ASN
3	2-A	103	ASN
3	1-B	331	GLN
3	2-A	50	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 carbohydrates in this entry.

5.6 Ligand geometry

Of 6 ligands modelled in this entry, 6 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	1-C	24/24 (100%)	4.09	24 (100%) 0 0	16, 35, 46, 49	24 (100%)
1	2-C	24/24 (100%)	4.09	24 (100%) 0 0	16, 35, 46, 49	24 (100%)
2	1-D	24/24 (100%)	4.01	24 (100%) 0 0	19, 34, 38, 43	24 (100%)
2	2-D	24/24 (100%)	4.01	24 (100%) 0 0	19, 34, 38, 43	24 (100%)
3	1-A	152/163 (93%)	1.02	35 (23%) 1 1	13, 31, 58, 70	0
3	1-B	152/163 (93%)	1.04	33 (21%) 1 1	17, 33, 61, 71	0
3	2-A	152/163 (93%)	1.02	35 (23%) 1 1	13, 31, 58, 70	0
3	2-B	152/163 (93%)	1.04	33 (21%) 1 1	17, 33, 61, 71	0
All	All	704/748 (94%)	1.44	232 (32%) 0 0	13, 32, 59, 71	96 (13%)

The worst 5 of 232 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	1-B	428	TRP	7.6
3	2-B	428	TRP	7.6
3	1-B	427	THR	6.1
3	2-B	427	THR	6.1
1	1-C	511	DG	6.0

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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
4	MG	2-B	601	1/1	0.91	0.11	-1.29	4,4,4,4	0
4	MG	1-B	601	1/1	0.91	0.11	-1.30	4,4,4,4	0
4	MG	1-A	602	1/1	0.93	0.12	-1.41	9,9,9,9	0
4	MG	2-A	602	1/1	0.93	0.12	-1.42	9,9,9,9	0
4	MG	1-C	603	1/1	0.92	0.09	-1.82	22,22,22,22	0
4	MG	2-C	603	1/1	0.92	0.09	-1.82	22,22,22,22	0

6.5 Other polymers [i](#)

There are no such residues in this entry.