



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 14, 2018 – 01:31 pm GMT

PDB ID : 5UIU
Title : Crystal structure of IRAK4 in complex with compound 30
Authors : Han, S.; Chang, J.S.
Deposited on : 2017-01-14
Resolution : 2.02 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.7.3 (157068), CSD as539be (2018)
Xtrriage (Phenix) : 1.13
EDS : trunk31020
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)
Refmac : 5.8.0158
CCP4 : 7.0 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk31020

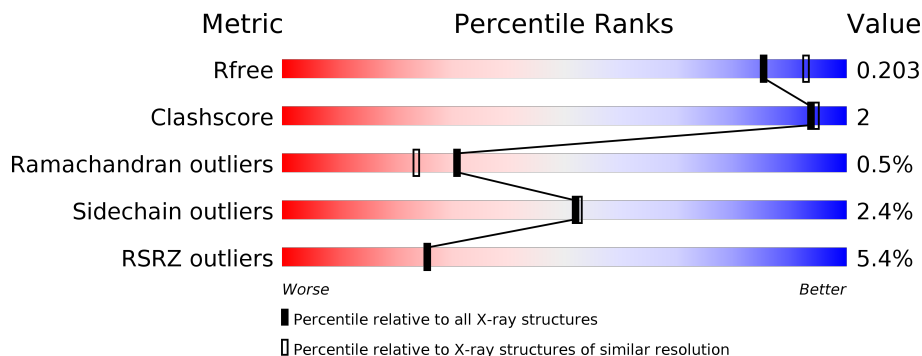
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.02 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}	111664	9172 (2.04-2.00)
Clashscore	122126	10355 (2.04-2.00)
Ramachandran outliers	120053	10237 (2.04-2.00)
Sidechain outliers	120020	10236 (2.04-2.00)
RSRZ outliers	108989	8961 (2.04-2.00)

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	A	323	 4% 86% 11%
1	B	323	 5% 83% 6% 10%

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 5060 atoms, of which 40 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 Interleukin-1 receptor-associated kinase 4.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	289	Total	C	N	O	P	S	0	1	0
			2280	1430	379	452	3	16			
1	B	290	Total	C	N	O	P	S	0	1	0
			2295	1440	383	454	3	15			

There are 32 discrepancies between the modelled and reference sequences:

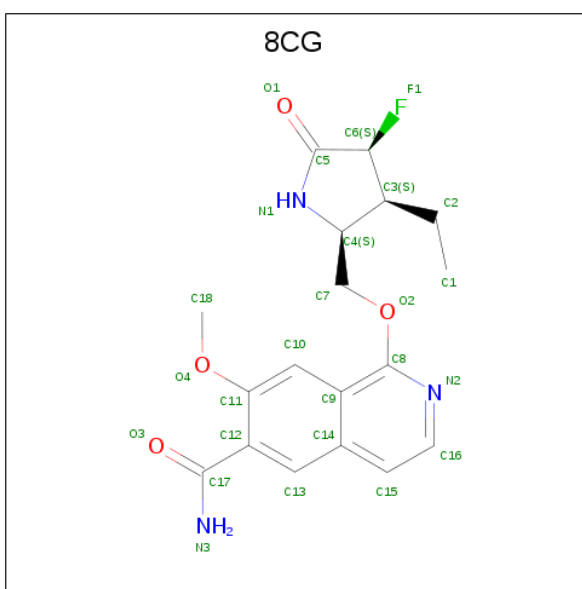
Chain	Residue	Modelled	Actual	Comment	Reference
A	138	MET	-	initiating methionine	UNP Q9NWZ3
A	139	HIS	-	expression tag	UNP Q9NWZ3
A	140	HIS	-	expression tag	UNP Q9NWZ3
A	141	HIS	-	expression tag	UNP Q9NWZ3
A	142	HIS	-	expression tag	UNP Q9NWZ3
A	143	HIS	-	expression tag	UNP Q9NWZ3
A	144	HIS	-	expression tag	UNP Q9NWZ3
A	145	GLY	-	expression tag	UNP Q9NWZ3
A	146	GLY	-	expression tag	UNP Q9NWZ3
A	147	GLU	-	expression tag	UNP Q9NWZ3
A	148	ASN	-	expression tag	UNP Q9NWZ3
A	149	LEU	-	expression tag	UNP Q9NWZ3
A	150	TYR	-	expression tag	UNP Q9NWZ3
A	151	PHE	-	expression tag	UNP Q9NWZ3
A	152	GLN	-	expression tag	UNP Q9NWZ3
A	153	GLY	-	expression tag	UNP Q9NWZ3
B	138	MET	-	initiating methionine	UNP Q9NWZ3
B	139	HIS	-	expression tag	UNP Q9NWZ3
B	140	HIS	-	expression tag	UNP Q9NWZ3
B	141	HIS	-	expression tag	UNP Q9NWZ3
B	142	HIS	-	expression tag	UNP Q9NWZ3
B	143	HIS	-	expression tag	UNP Q9NWZ3
B	144	HIS	-	expression tag	UNP Q9NWZ3
B	145	GLY	-	expression tag	UNP Q9NWZ3
B	146	GLY	-	expression tag	UNP Q9NWZ3

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Chain	Residue	Modelled	Actual	Comment	Reference
B	147	GLU	-	expression tag	UNP Q9NWZ3
B	148	ASN	-	expression tag	UNP Q9NWZ3
B	149	LEU	-	expression tag	UNP Q9NWZ3
B	150	TYR	-	expression tag	UNP Q9NWZ3
B	151	PHE	-	expression tag	UNP Q9NWZ3
B	152	GLN	-	expression tag	UNP Q9NWZ3
B	153	GLY	-	expression tag	UNP Q9NWZ3

- Molecule 2 is 1-{[(2S,3S,4S)-3-ethyl-4-fluoro-5-oxopyrrolidin-2-yl]methoxy}-7-methoxyisoquinoline-6-carboxamide (three-letter code: 8CG) (formula: C₁₈H₂₀FN₃O₄).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	F	H	N			O
2	A	1	46	18	1	20	3	4	20	0
2	B	1	46	18	1	20	3	4	20	0

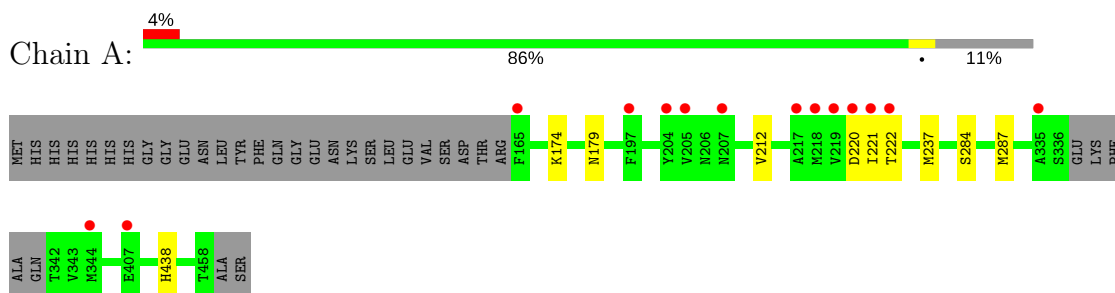
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	192	Total	O	0	0
			192	192		
3	B	201	Total	O	0	0
			201	201		

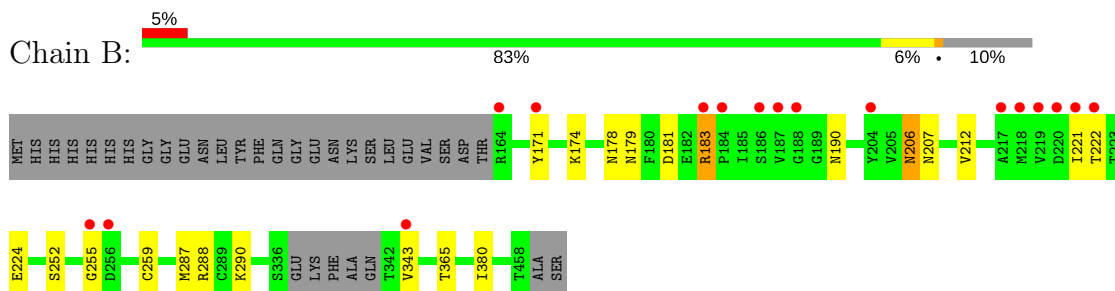
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Interleukin-1 receptor-associated kinase 4



- Molecule 1: Interleukin-1 receptor-associated kinase 4



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	89.94Å 118.46Å 138.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	75.49 – 2.02 75.49 – 2.02	Depositor EDS
% Data completeness (in resolution range)	99.9 (75.49-2.02) 99.9 (75.49-2.02)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.09 (at 2.02Å)	Xtrriage
Refinement program	BUSTER 2.11.2	Depositor
R, R_{free}	0.185 , 0.204 0.184 , 0.203	Depositor DCC
R_{free} test set	2472 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	34.4	Xtrriage
Anisotropy	0.442	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 62.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	5060	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.62% 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: TPO, 8CG, SEP

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	0.49	0/2288	0.63	0/3084
1	B	0.48	0/2304	0.65	1/3106 (0.0%)
All	All	0.49	0/4592	0.64	1/6190 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	221	ILE	C-N-CA	6.96	139.10	121.70

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	2280	0	2244	4	0
1	B	2295	0	2257	10	0
2	A	26	20	0	0	0
2	B	26	20	0	0	0
3	A	192	0	0	1	0
3	B	201	0	0	0	0
All	All	5020	40	4501	14	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 2.

All (14) 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:B:178:ASN:HD22	1:B:190:ASN:HD21	1.37	0.72
1:B:174:LYS:HG2	1:B:179:ASN:HD22	1.63	0.62
1:A:284:SER:H	1:A:287[A]:MET:HE3	1.74	0.53
1:B:183:ARG:HB2	1:B:183:ARG:CZ	2.42	0.50
1:A:284:SER:OG	1:A:287[A]:MET:HG3	2.11	0.50
1:B:287:MET:HE1	1:B:290:LYS:HD3	1.94	0.48
1:A:174:LYS:HE2	1:A:179:ASN:HD22	1.78	0.47
1:B:252:SER:HB3	1:B:259:CYS:HB2	2.00	0.43
1:B:287:MET:HE3	1:B:290:LYS:HB3	2.01	0.42
1:B:206:ASN:HB3	1:B:207:ASN:H	1.69	0.42
1:B:287:MET:CE	1:B:290:LYS:HD3	2.50	0.42
1:B:287:MET:HE3	1:B:287:MET:HA	2.03	0.41
1:B:288:ARG:HB3	1:B:380:ILE:HG23	2.02	0.40
1:A:237:MET:HE1	3:A:4184:HOH:O	2.21	0.40

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	284/323 (88%)	276 (97%)	7 (2%)	1 (0%)	36	30
1	B	285/323 (88%)	276 (97%)	7 (2%)	2 (1%)	24	16
All	All	569/646 (88%)	552 (97%)	14 (2%)	3 (0%)	31	24

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	255	GLY
1	A	220	ASP
1	B	181	ASP

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	249/278 (90%)	245 (98%)	4 (2%)	65 68
1	B	250/278 (90%)	241 (96%)	9 (4%)	38 35
All	All	499/556 (90%)	486 (97%)	13 (3%)	52 49

All (13) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	212	VAL
1	A	221	ILE
1	A	222	THR
1	A	438	HIS
1	B	171[A]	TYR
1	B	171[B]	TYR
1	B	183	ARG
1	B	206	ASN
1	B	212	VAL
1	B	222	THR
1	B	224	GLU
1	B	343	VAL
1	B	365	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	179	ASN
1	A	190	ASN
1	A	394	GLN

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Mol	Chain	Res	Type
1	B	179	ASN
1	B	190	ASN
1	B	455	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

6 non-standard protein/DNA/RNA residues 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
1	TPO	A	342	1	9,10,11	1.45	1 (11%)	11,14,16	1.06	1 (9%)
1	TPO	A	345	1	9,10,11	1.34	2 (22%)	11,14,16	1.29	0
1	SEP	A	346	1	9,9,10	1.10	1 (11%)	9,12,14	1.49	2 (22%)
1	TPO	B	342	1	9,10,11	1.28	1 (11%)	11,14,16	1.31	1 (9%)
1	TPO	B	345	1	9,10,11	1.06	1 (11%)	11,14,16	1.20	1 (9%)
1	SEP	B	346	1	9,9,10	1.25	1 (11%)	9,12,14	1.56	2 (22%)

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
1	TPO	A	342	1	-	0/8/11/13	0/0/0/0
1	TPO	A	345	1	-	1/8/11/13	0/0/0/0
1	SEP	A	346	1	-	0/5/8/10	0/0/0/0
1	TPO	B	342	1	-	0/8/11/13	0/0/0/0
1	TPO	B	345	1	-	1/8/11/13	0/0/0/0
1	SEP	B	346	1	-	0/5/8/10	0/0/0/0

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	345	TPO	CB-CA	2.09	1.57	1.53
1	B	345	TPO	CA-C	2.31	1.53	1.50
1	A	346	SEP	CA-C	2.46	1.53	1.50
1	A	345	TPO	CA-C	2.50	1.53	1.50
1	B	346	SEP	CA-C	2.55	1.53	1.50
1	B	342	TPO	CA-C	2.85	1.54	1.50
1	A	342	TPO	CA-C	3.26	1.54	1.50

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	346	SEP	P-OG-CB	-2.48	111.45	118.30
1	B	342	TPO	O-C-CA	-2.27	119.80	125.09
1	A	346	SEP	P-OG-CB	-2.27	112.05	118.30
1	A	342	TPO	O-C-CA	-2.16	120.05	125.09
1	B	345	TPO	O-C-CA	-2.07	120.28	125.09
1	A	346	SEP	O2P-P-OG	3.06	114.87	106.73
1	B	346	SEP	OG-P-O1P	3.11	115.20	106.47

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	345	TPO	OG1-CB-CA-N
1	B	345	TPO	OG1-CB-CA-N

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no carbohydrates 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
2	8CG	A	4000	-	27,28,28	1.22	3 (11%)	30,40,40	0.94	1 (3%)
2	8CG	B	4000	-	27,28,28	1.23	3 (11%)	30,40,40	0.96	1 (3%)

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	8CG	A	4000	-	-	0/13/29/29	0/3/3/3
2	8CG	B	4000	-	-	0/13/29/29	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	4000	8CG	F1-C6	-2.28	1.35	1.39
2	B	4000	8CG	F1-C6	-2.25	1.35	1.39
2	B	4000	8CG	C5-N1	2.22	1.38	1.34
2	A	4000	8CG	C5-N1	2.25	1.38	1.34
2	A	4000	8CG	C17-N3	2.49	1.37	1.33
2	B	4000	8CG	C17-N3	2.58	1.38	1.33

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	4000	8CG	O3-C17-N3	-2.33	119.20	122.60
2	A	4000	8CG	O3-C17-N3	-2.27	119.30	122.60

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 [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	286/323 (88%)	0.24	14 (4%) 29 29	26, 43, 79, 96	17 (5%)
1	B	287/323 (88%)	0.28	17 (5%) 22 22	24, 39, 77, 99	17 (5%)
All	All	573/646 (88%)	0.26	31 (5%) 26 26	24, 41, 80, 99	34 (5%)

All (31) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	219	VAL	6.2
1	B	220	ASP	5.4
1	A	217	ALA	4.8
1	B	183	ARG	4.2
1	B	221	ILE	4.2
1	A	222	THR	4.1
1	B	256	ASP	3.6
1	A	207	ASN	3.3
1	A	221	ILE	3.2
1	B	217	ALA	3.1
1	B	186	SER	3.1
1	B	204	TYR	3.0
1	B	218	MET	3.0
1	B	188	GLY	2.9
1	B	187	VAL	2.9
1	A	204	TYR	2.8
1	B	222	THR	2.6
1	A	197	PHE	2.6
1	A	407	GLU	2.5
1	B	171[A]	TYR	2.5
1	B	219	VAL	2.4
1	A	220	ASP	2.4
1	B	343	VAL	2.3
1	B	255	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	205	VAL	2.3
1	A	218	MET	2.3
1	B	164	ARG	2.3
1	A	165	PHE	2.2
1	A	335	ALA	2.1
1	A	344	MET	2.0
1	B	184	PRO	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	SEP	B	346	10/11	0.73	0.20	58,67,81,81	0
1	TPO	A	342	11/12	0.73	0.29	80,82,87,88	0
1	TPO	B	342	11/12	0.75	0.23	74,77,84,85	0
1	SEP	A	346	10/11	0.87	0.22	67,75,85,86	0
1	TPO	A	345	11/12	0.95	0.10	56,61,66,66	0
1	TPO	B	345	11/12	0.96	0.11	52,55,60,63	0

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. 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(Å ²)	Q<0.9
2	8CG	B	4000	26/26	0.95	0.12	27,29,34,45	20
2	8CG	A	4000	26/26	0.95	0.12	26,30,35,46	20

6.5 Other polymers [i](#)

There are no such residues in this entry.