



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 19, 2024 – 01:26 AM EDT

PDB ID : 3WNF  
Title : Cyclic hexapeptide CKIDNC in complex with HIV-1 integrase  
Authors : Wielens, J.; Chalmers, D.K.; Parker, M.W.  
Deposited on : 2013-12-09  
Resolution : 1.45 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](mailto: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 : 4.02b-467  
Mogul : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.20.1  
EDS : 2.37.1  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.37.1

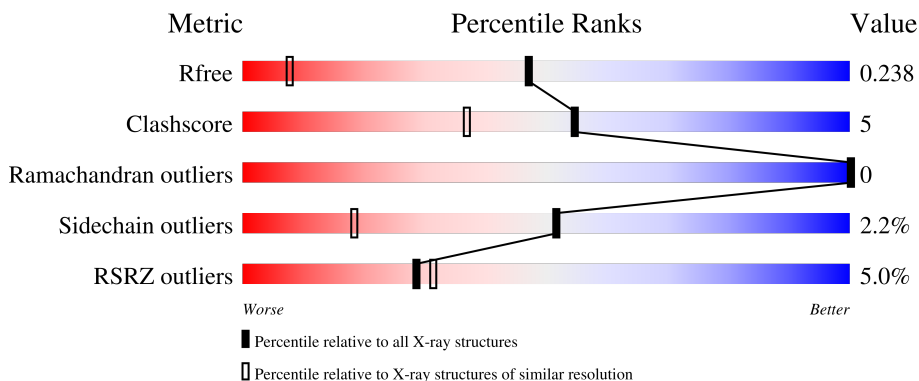
# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.45 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))
$R_{free}$	130704	1156 (1.46-1.46)
Clashscore	141614	1202 (1.46-1.46)
Ramachandran outliers	138981	1178 (1.46-1.46)
Sidechain outliers	138945	1178 (1.46-1.46)
RSRZ outliers	127900	1139 (1.46-1.46)

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  $\geq 3$ , 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	157	 3% 71% 12% 15%
1	B	157	 3% 73% 11% 15%
2	C	8	 38% 62% 38%
2	D	8	 25% 88% 12%

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 2378 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 Gag-Pol polyprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	133	1041	659	185	193	4	0	1	0
1	B	134	1055	671	188	192	4	0	3	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	56	SER	CYS	engineered mutation	UNP P12497
A	123	GLY	SER	engineered mutation	UNP P12497
A	124	ALA	THR	engineered mutation	UNP P12497
A	127	ARG	LYS	engineered mutation	UNP P12497
A	131	ASP	TRP	engineered mutation	UNP P12497
A	139	ASP	PHE	engineered mutation	UNP P12497
A	185	HIS	PHE	engineered mutation	UNP P12497
B	56	SER	CYS	engineered mutation	UNP P12497
B	123	GLY	SER	engineered mutation	UNP P12497
B	124	ALA	THR	engineered mutation	UNP P12497
B	127	ARG	LYS	engineered mutation	UNP P12497
B	131	ASP	TRP	engineered mutation	UNP P12497
B	139	ASP	PHE	engineered mutation	UNP P12497
B	185	HIS	PHE	engineered mutation	UNP P12497

- Molecule 2 is a protein called CKIDNC peptide.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	8	49	28	9	10	2	0	0	1
2	D	8	49	28	9	10	2	0	0	1

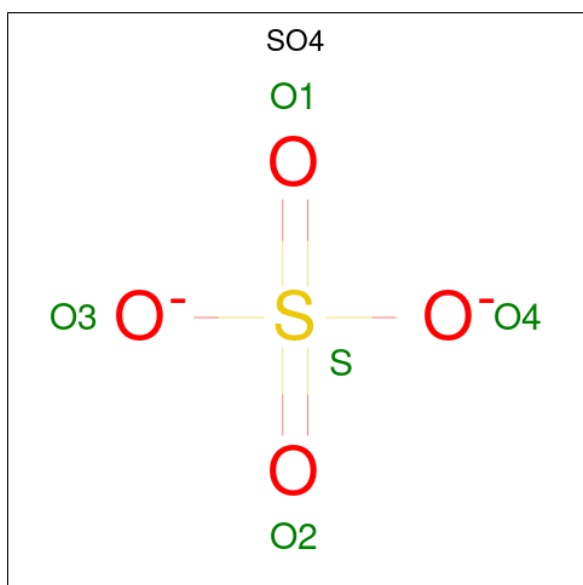
- Molecule 3 is CADMIUM ION (three-letter code: CD) (formula: Cd).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	2	Total Cd 2 2	0	0
3	B	2	Total Cd 2 2	0	0

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total Cl 1 1	0	0
4	B	1	Total Cl 1 1	0	0

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total O S 5 4 1	0	0
5	A	1	Total O S 5 4 1	0	0
5	A	1	Total O S 5 4 1	0	0
5	B	1	Total O S 5 4 1	0	0
5	B	1	Total O S 5 4 1	0	0
5	B	1	Total O S 5 4 1	0	0

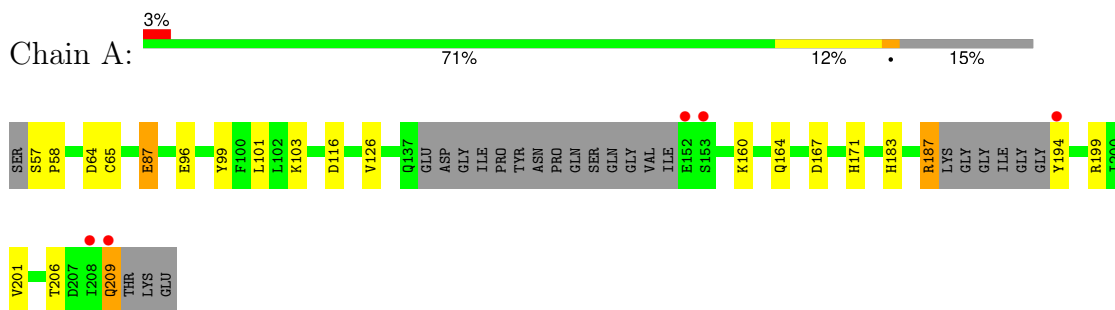
- Molecule 6 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
6	A	73	Total 73	O 73	0	0
6	B	73	Total 73	O 73	0	0
6	C	1	Total 1	O 1	0	0
6	D	1	Total 1	O 1	0	0

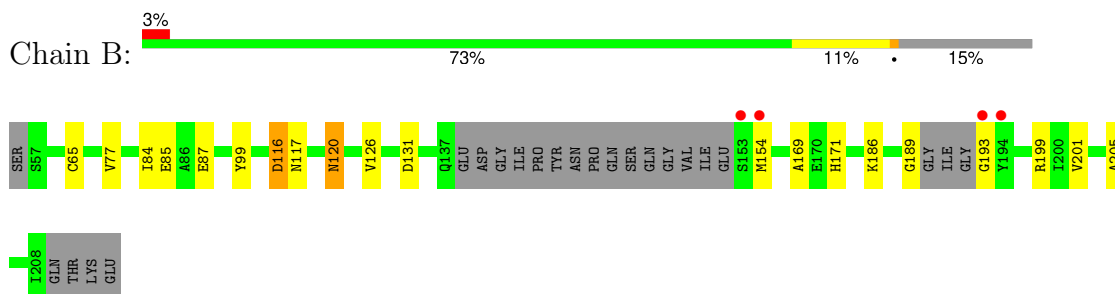
### 3 Residue-property plots [i](#)

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.

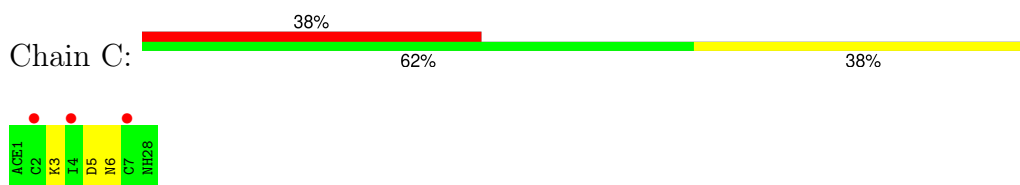
- Molecule 1: Gag-Pol polyprotein



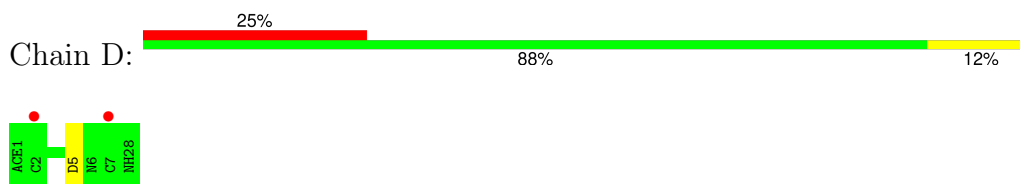
- Molecule 1: Gag-Pol polyprotein



- Molecule 2: CKIDNC peptide



- Molecule 2: CKIDNC peptide



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 32	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	50.07Å 50.07Å 102.57Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.36 – 1.45 43.36 – 1.45	Depositor EDS
% Data completeness (in resolution range)	100.0 (43.36-1.45) 98.4 (43.36-1.45)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.20 (at 1.45Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.199 , 0.232 0.207 , 0.238	Depositor DCC
$R_{free}$ test set	2511 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	16.4	Xtrriage
Anisotropy	0.027	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 26.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.035 for -h,-k,l 0.489 for h,-h-k,-l 0.034 for -k,-h,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	2378	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.74% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: CL, SO4, CD, ACE, NH2

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	1.37	5/1058 (0.5%)	1.16	6/1429 (0.4%)
1	B	1.35	5/1073 (0.5%)	1.16	5/1449 (0.3%)
2	C	1.13	0/45	1.92	1/59 (1.7%)
2	D	1.00	0/45	1.70	1/59 (1.7%)
All	All	1.35	10/2221 (0.5%)	1.19	13/2996 (0.4%)

All (10) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	99	TYR	CG-CD2	-6.83	1.30	1.39
1	B	126	VAL	CA-CB	6.81	1.69	1.54
1	B	65	CYS	CB-SG	6.53	1.93	1.82
1	B	85	GLU	CD-OE2	6.23	1.32	1.25
1	A	87	GLU	CB-CG	-5.95	1.40	1.52
1	A	65	CYS	CB-SG	5.68	1.92	1.82
1	A	126	VAL	CB-CG1	-5.55	1.41	1.52
1	A	87	GLU	CG-CD	5.26	1.59	1.51
1	B	169	ALA	CA-CB	5.08	1.63	1.52
1	A	99	TYR	CG-CD2	-5.06	1.32	1.39

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	131	ASP	CB-CG-OD2	-8.00	111.10	118.30
2	C	5	ASP	CB-CG-OD1	-7.93	111.16	118.30
1	A	64	ASP	CB-CG-OD2	-7.14	111.87	118.30
1	A	116	ASP	CB-CG-OD1	6.85	124.47	118.30
1	A	116	ASP	CB-CG-OD2	-6.19	112.73	118.30
1	A	101	LEU	CB-CG-CD2	-5.93	100.91	111.00
1	A	96	GLU	OE1-CD-OE2	5.91	130.39	123.30

*Continued on next page...*



Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	116	ASP	CB-CG-OD2	-5.84	113.04	118.30
2	D	5	ASP	CB-CG-OD2	-5.62	113.24	118.30
1	A	199	ARG	NE-CZ-NH1	5.27	122.94	120.30
1	B	116	ASP	CB-CG-OD1	5.26	123.03	118.30
1	B	126	VAL	N-CA-CB	5.04	122.58	111.50
1	B	199	ARG	NE-CZ-NH1	5.00	122.80	120.30

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	1041	0	1040	12	0
1	B	1055	0	1067	13	0
2	C	49	0	45	2	0
2	D	49	0	45	0	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	A	15	0	0	1	0
5	B	15	0	0	2	0
6	A	73	0	0	2	0
6	B	73	0	0	2	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
All	All	2378	0	2197	23	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 5.

All (23) 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:84[A]:ILE:HD11	1:B:154:MET:SD	1.86	1.16
1:A:183:HIS:HE1	6:A:1103:HOH:O	1.41	1.02
1:B:120:ASN:HD22	1:B:120:ASN:H	1.15	0.90
1:A:103:LYS:NZ	1:B:87:GLU:OE2	2.12	0.83
1:B:84[A]:ILE:CD1	1:B:154:MET:SD	2.72	0.75
1:B:120:ASN:H	1:B:120:ASN:ND2	1.92	0.59
1:A:187:ARG:NH2	6:A:1170:HOH:O	2.41	0.52
1:B:77:VAL:HG22	1:B:84[B]:ILE:HG22	1.93	0.51
1:A:201:VAL:HG12	1:B:205:ALA:HB2	1.92	0.50
1:A:171:HIS:ND1	5:A:1004:SO4:O3	2.42	0.49
1:A:201:VAL:HG13	1:B:201:VAL:HG13	1.94	0.49
1:B:120:ASN:HD22	1:B:120:ASN:N	1.95	0.47
1:B:189:GLY:C	1:B:193:GLY:HA2	2.35	0.47
5:B:306:SO4:O4	6:B:463:HOH:O	2.20	0.46
1:A:87:GLU:HB2	6:B:415:HOH:O	2.19	0.43
1:B:171:HIS:ND1	5:B:304:SO4:O4	2.40	0.43
1:A:167:ASP:O	2:C:3:LYS:HE2	2.19	0.41
2:C:6:ASN:OD1	2:C:6:ASN:C	2.56	0.41
1:A:206:THR:O	1:A:209:GLN:HG2	2.21	0.41
1:A:103:LYS:NZ	1:B:87:GLU:CD	2.73	0.41
1:B:116:ASP:O	1:B:117:ASN:HB2	2.21	0.41
1:A:57:SER:N	1:A:58:PRO:CD	2.84	0.40
1:A:160:LYS:HG2	1:A:164:GLN:HE21	1.86	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	127/157 (81%)	126 (99%)	1 (1%)	0	100	100
1	B	131/157 (83%)	130 (99%)	1 (1%)	0	100	100
2	C	6/8 (75%)	5 (83%)	1 (17%)	0	100	100

*Continued on next page...*

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	D	6/8 (75%)	5 (83%)	1 (17%)	0	100	100
All	All	270/330 (82%)	266 (98%)	4 (2%)	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	109/126 (86%)	106 (97%)	3 (3%)	43	11
1	B	110/126 (87%)	108 (98%)	2 (2%)	59	26
2	C	6/6 (100%)	6 (100%)	0	100	100
2	D	6/6 (100%)	6 (100%)	0	100	100
All	All	231/264 (88%)	226 (98%)	5 (2%)	52	18

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	187	ARG
1	A	194	TYR
1	A	209	GLN
1	B	120	ASN
1	B	186	LYS

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	164	GLN
1	A	183	HIS
1	B	120	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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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
5	SO4	A	1006	-	4,4,4	0.93	0	6,6,6	1.42	1 (16%)
5	SO4	A	1004	-	4,4,4	0.69	0	6,6,6	2.60	2 (33%)
5	SO4	B	306	-	4,4,4	1.00	0	6,6,6	1.24	0
5	SO4	B	304	-	4,4,4	0.47	0	6,6,6	1.75	2 (33%)
5	SO4	A	1005	-	4,4,4	0.80	0	6,6,6	0.89	0
5	SO4	B	305	-	4,4,4	0.42	0	6,6,6	1.02	0

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	1004	SO4	O3-S-O2	4.17	131.36	109.56
5	A	1004	SO4	O3-S-O1	-4.02	88.55	109.56
5	B	304	SO4	O4-S-O1	2.62	123.24	109.56
5	B	304	SO4	O4-S-O2	-2.47	96.63	109.56
5	A	1006	SO4	O3-S-O1	-2.04	98.90	109.56

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1004	SO4	1	0
5	B	306	SO4	1	0
5	B	304	SO4	1	0

## 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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	133/157 (84%)	0.10	5 (3%) 40 43	10, 18, 36, 57	0
1	B	134/157 (85%)	0.14	4 (2%) 50 53	11, 18, 36, 43	0
2	C	6/8 (75%)	1.39	3 (50%) 0 0	20, 29, 34, 36	0
2	D	6/8 (75%)	1.24	2 (33%) 0 0	21, 30, 32, 35	0
All	All	279/330 (84%)	0.17	14 (5%) 28 31	10, 19, 36, 57	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	7	CYS	3.9
1	A	153	SER	3.7
1	B	194	TYR	3.7
1	A	194	TYR	3.5
2	C	2	CYS	3.4
1	B	153	SER	3.1
1	B	193	GLY	3.0
1	A	208	ILE	2.9
2	C	7	CYS	2.7
2	D	2	CYS	2.6
1	A	152	GLU	2.4
1	A	209	GLN	2.4
1	B	154	MET	2.3
2	C	4	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 monosaccharides 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, 95<sup>th</sup> 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
5	SO4	A	1006	5/5	0.87	0.17	25,35,40,41	0
5	SO4	A	1004	5/5	0.88	0.14	26,32,39,42	0
5	SO4	B	304	5/5	0.89	0.15	25,33,40,43	0
5	SO4	B	306	5/5	0.91	0.21	24,33,37,37	0
5	SO4	A	1005	5/5	0.93	0.13	38,38,39,40	0
5	SO4	B	305	5/5	0.96	0.11	34,35,37,37	0
3	CD	A	1001	1/1	0.99	0.07	15,15,15,15	0
3	CD	A	1002	1/1	0.99	0.08	15,15,15,15	0
3	CD	B	301	1/1	0.99	0.08	15,15,15,15	0
3	CD	B	302	1/1	0.99	0.07	14,14,14,14	0
4	CL	A	1003	1/1	0.99	0.07	15,15,15,15	0
4	CL	B	303	1/1	0.99	0.05	15,15,15,15	0

### 6.5 Other polymers [i](#)

There are no such residues in this entry.