



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 7, 2024 – 12:06 am GMT

PDB ID : 2V7E  
Title : Crystal structure of coactivator-associated arginine methyltransferase 1 (CARM1), unliganded  
Authors : Yue, W.W.; Hassler, M.; Roe, S.M.; Thompson-Vale, V.; Pearl, L.H.  
Deposited on : 2007-07-30  
Resolution : 2.70 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>.

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

MolProbity : 4.02b-467  
Xtriage (Phenix) : 1.13  
EDS : 2.36  
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) : 2.36

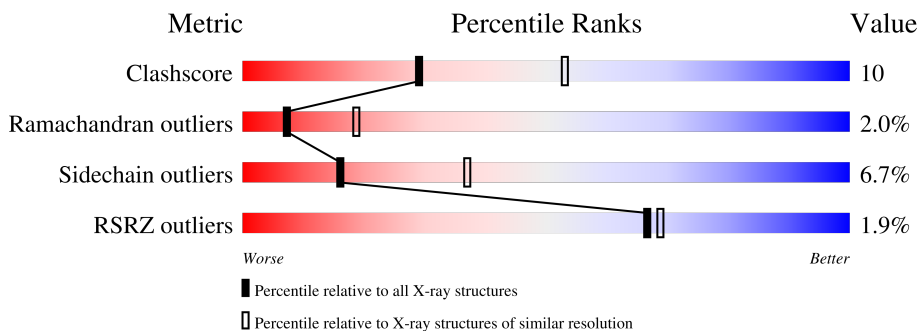
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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	141614	3122 (2.70-2.70)
Ramachandran outliers	138981	3069 (2.70-2.70)
Sidechain outliers	138945	3069 (2.70-2.70)
RSRZ outliers	127900	2737 (2.70-2.70)

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	346	 3% 72% 18% 7%
1	B	346	 % 75% 14% 7%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	HG	A	1478	-	-	X	-

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 5146 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 HISTONE-ARGININE METHYLTRANSFERASE CARM1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	322	2512	1619	415	465	13	0	0	0
1	B	322	2527	1632	418	463	14	0	0	0

- Molecule 2 is MERCURY (II) ION (three-letter code: HG) (formula: Hg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total 2	Hg 2	0	0
2	B	1	Total 1	Hg 1	0	0

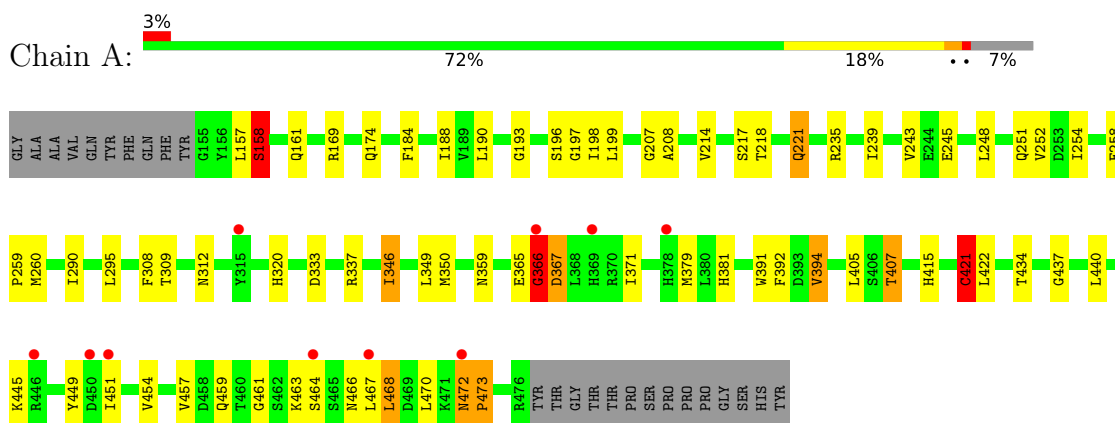
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	52	Total 52	O 52	0	0
3	B	52	Total 52	O 52	0	0

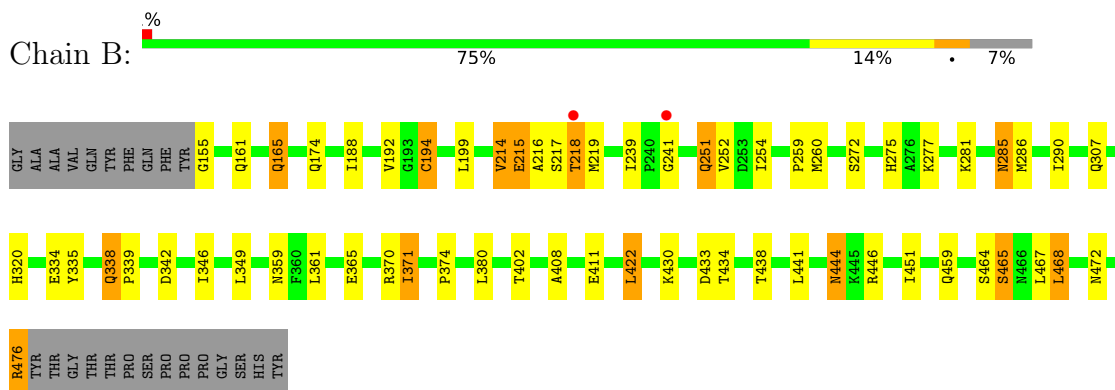
### 3 Residue-property plots [i](#)

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: HISTONE-ARGININE METHYLTRANSFERASE CARM1



- Molecule 1: HISTONE-ARGININE METHYLTRANSFERASE CARM1



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.15Å 98.02Å 206.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.69 – 2.70 51.34 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.3 (30.69-2.70) 99.3 (51.34-2.50)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.32 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.228 , 0.276 0.226 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	41.5	Xtrriage
Anisotropy	0.794	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 47.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	5146	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.06% 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: HG

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	0.39	1/2574 (0.0%)	0.62	3/3498 (0.1%)
1	B	0.37	0/2591	0.56	0/3521
All	All	0.38	1/5165 (0.0%)	0.59	3/7019 (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	A	0	2
1	B	1	0
All	All	1	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	421	CYS	CB-SG	5.18	1.91	1.82

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	365	GLU	N-CA-C	-14.30	72.40	111.00
1	A	366	GLY	N-CA-C	-6.01	98.09	113.10
1	A	365	GLU	CB-CA-C	-5.75	98.90	110.40

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	B	194	CYS	CA

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	217	SER	Peptide
1	A	445	LYS	Peptide

## 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	2512	0	2435	52	0
1	B	2527	0	2454	46	0
2	A	2	0	0	2	0
2	B	1	0	0	0	0
3	A	52	0	0	0	0
3	B	52	0	0	0	0
All	All	5146	0	4889	95	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 10.

All (95) 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:421:CYS:SG	2:A:1478:HG:HG	1.36	1.42
1:B:214:VAL:HA	1:B:215:GLU:CB	1.45	1.35
1:A:157:LEU:O	1:A:158:SER:HB3	1.47	1.15
1:B:214:VAL:CA	1:B:215:GLU:CB	2.26	1.12
1:A:366:GLY:HA3	1:A:367:ASP:HB2	1.32	1.09
1:B:215:GLU:O	1:B:241:GLY:O	1.72	1.05
1:A:421:CYS:HG	2:A:1478:HG:HG	0.92	0.96
1:A:472:ASN:HB2	1:A:473:PRO:HA	1.53	0.91
1:B:251:GLN:HB3	1:B:281:LYS:HG3	1.54	0.90
1:B:464:SER:HA	1:B:465:SER:CB	2.04	0.87
1:A:366:GLY:CA	1:A:367:ASP:HB2	2.07	0.84
1:A:472:ASN:CB	1:A:473:PRO:HA	2.06	0.84
1:B:215:GLU:CB	1:B:239:ILE:O	2.28	0.82
1:B:464:SER:HA	1:B:465:SER:HB3	1.65	0.78

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:366:GLY:HA3	1:A:367:ASP:CB	2.12	0.77
1:A:333:ASP:O	1:A:337:ARG:HG3	1.85	0.75
1:A:366:GLY:CA	1:A:367:ASP:CB	2.63	0.75
1:B:259:PRO:HD2	1:B:260:MET:SD	2.27	0.74
1:B:194:CYS:SG	1:B:199:LEU:HB2	2.31	0.71
1:A:366:GLY:N	1:A:367:ASP:HB3	2.11	0.66
1:A:434:THR:H	1:A:459:GLN:HE22	1.44	0.66
1:B:422:LEU:HD12	1:B:422:LEU:H	1.61	0.65
1:B:338:GLN:HB3	1:B:472:ASN:O	1.97	0.65
1:A:391:TRP:HB2	1:A:407:THR:HG22	1.79	0.64
1:A:451:ILE:HB	1:A:468:LEU:HG	1.79	0.64
1:B:464:SER:HA	1:B:465:SER:HB2	1.79	0.63
1:A:472:ASN:CB	1:A:473:PRO:CA	2.76	0.63
1:B:161:GLN:O	1:B:165:GLN:HG2	1.99	0.63
1:A:337:ARG:HG2	1:A:467:LEU:O	2.00	0.61
1:B:444:ASN:C	1:B:444:ASN:HD22	2.04	0.61
1:B:434:THR:H	1:B:459:GLN:HE22	1.49	0.60
1:B:451:ILE:HB	1:B:468:LEU:HB2	1.83	0.60
1:B:165:GLN:HE21	1:B:165:GLN:HA	1.66	0.60
1:A:449:TYR:HB2	1:A:470:LEU:HD12	1.84	0.59
1:A:457:VAL:O	1:A:461:GLY:HA2	2.03	0.58
1:B:464:SER:CA	1:B:465:SER:CB	2.81	0.58
1:A:392:PHE:O	1:A:407:THR:HB	2.06	0.56
1:B:155:GLY:HA3	1:B:218:THR:HG21	1.88	0.56
1:B:216:ALA:O	1:B:218:THR:N	2.38	0.55
1:A:366:GLY:N	1:A:367:ASP:CB	2.70	0.55
1:B:285:ASN:HA	1:B:361:LEU:HD11	1.88	0.55
1:A:440:LEU:O	1:A:451:ILE:HA	2.06	0.55
1:B:194:CYS:CB	1:B:199:LEU:HB2	2.38	0.54
1:B:290:ILE:HG22	1:B:359:ASN:HA	1.89	0.54
1:A:459:GLN:NE2	1:A:459:GLN:H	2.06	0.53
1:A:320:HIS:HD2	1:B:174:GLN:NE2	2.07	0.53
1:A:259:PRO:HD2	1:A:260:MET:SD	2.49	0.52
1:A:157:LEU:O	1:A:158:SER:CB	2.33	0.52
1:B:371:ILE:HG23	1:B:441:LEU:HB2	1.92	0.52
1:A:421:CYS:HB2	1:A:468:LEU:HD22	1.91	0.51
1:A:394:VAL:HG12	1:A:405:LEU:HB3	1.93	0.50
1:A:379:MET:O	1:A:381:HIS:N	2.40	0.49
1:B:444:ASN:HD22	1:B:446:ARG:H	1.60	0.49
1:A:196:SER:C	1:A:198:ILE:H	2.15	0.49
1:A:309:THR:HA	1:A:312:ASN:HB2	1.95	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:472:ASN:HB3	1:A:473:PRO:HA	1.92	0.48
1:A:207:GLY:HA2	1:A:235:ARG:HH22	1.79	0.48
1:B:194:CYS:HB3	1:B:199:LEU:HD22	1.96	0.48
1:A:196:SER:O	1:A:198:ILE:N	2.47	0.48
1:B:370:ARG:O	1:B:441:LEU:O	2.31	0.48
1:B:192:VAL:HA	1:B:214:VAL:O	2.14	0.47
1:B:464:SER:CA	1:B:465:SER:HB3	2.40	0.47
1:A:184:PHE:O	1:A:208:ALA:HA	2.15	0.47
1:B:342:ASP:HB3	1:B:476:ARG:HA	1.97	0.47
1:B:430:LYS:O	1:B:433:ASP:HB2	2.15	0.47
1:A:218:THR:O	1:A:221:GLN:NE2	2.46	0.46
1:A:457:VAL:O	1:A:461:GLY:CA	2.62	0.46
1:A:190:LEU:HD13	1:A:248:LEU:HD21	1.96	0.46
1:A:188:ILE:HG22	1:A:252:VAL:HG12	1.97	0.45
1:A:346:ILE:H	1:A:346:ILE:HD13	1.81	0.45
1:B:374:PRO:HA	1:B:438:THR:HG22	1.99	0.45
1:A:157:LEU:O	1:B:334:GLU:OE1	2.34	0.45
1:A:199:LEU:HD11	1:A:258:GLU:HG3	1.99	0.45
1:B:188:ILE:HG22	1:B:252:VAL:HG12	1.98	0.45
1:A:214:VAL:HA	1:A:239:ILE:O	2.17	0.45
1:B:408:ALA:HB3	1:B:411:GLU:HG2	1.99	0.44
1:B:444:ASN:ND2	1:B:446:ARG:H	2.15	0.44
1:A:290:ILE:HG22	1:A:359:ASN:HA	2.00	0.44
1:A:158:SER:HA	1:A:161:GLN:HB3	2.00	0.44
1:A:350:MET:O	1:A:379:MET:O	2.36	0.43
1:A:437:GLY:HA3	1:A:454:VAL:O	2.18	0.43
1:B:194:CYS:HB3	1:B:199:LEU:HB2	1.99	0.43
1:B:307:GLN:HE21	1:B:335:TYR:HB3	1.84	0.43
1:B:194:CYS:SG	1:B:199:LEU:CB	3.02	0.42
1:B:251:GLN:HB3	1:B:281:LYS:CG	2.38	0.42
1:A:422:LEU:H	1:A:422:LEU:HD23	1.84	0.42
1:A:434:THR:H	1:A:459:GLN:NE2	2.14	0.42
1:A:169:ARG:NH2	1:A:258:GLU:OE2	2.47	0.41
1:A:472:ASN:HB3	1:A:473:PRO:CA	2.49	0.41
1:B:275:HIS:HD2	1:B:365:GLU:OE1	2.04	0.41
1:A:174:GLN:NE2	1:B:320:HIS:HD2	2.19	0.41
1:B:277:LYS:HD3	1:B:286:MET:SD	2.61	0.41
1:A:196:SER:C	1:A:198:ILE:N	2.75	0.40
1:B:338:GLN:HA	1:B:339:PRO:HD3	1.98	0.40
1:B:430:LYS:CE	1:B:430:LYS:HA	2.51	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	320/346 (92%)	289 (90%)	23 (7%)	8 (2%)	5	14
1	B	320/346 (92%)	297 (93%)	18 (6%)	5 (2%)	9	24
All	All	640/692 (92%)	586 (92%)	41 (6%)	13 (2%)	7	19

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	158	SER
1	A	472	ASN
1	B	215	GLU
1	B	217	SER
1	B	465	SER
1	A	367	ASP
1	A	193	GLY
1	A	371	ILE
1	B	219	MET
1	B	371	ILE
1	A	366	GLY
1	A	473	PRO
1	A	197	GLY

### 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	267/298 (90%)	249 (93%)	18 (7%)	16	37

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	B	269/298 (90%)	251 (93%)	18 (7%)	16	37
All	All	536/596 (90%)	500 (93%)	36 (7%)	16	37

All (36) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	158	SER
1	A	221	GLN
1	A	243	VAL
1	A	245	GLU
1	A	251	GLN
1	A	254	ILE
1	A	295	LEU
1	A	308	PHE
1	A	346	ILE
1	A	349	LEU
1	A	394	VAL
1	A	407	THR
1	A	415	HIS
1	A	421	CYS
1	A	463	LYS
1	A	464	SER
1	A	466	ASN
1	A	468	LEU
1	B	165	GLN
1	B	194	CYS
1	B	214	VAL
1	B	218	THR
1	B	251	GLN
1	B	254	ILE
1	B	272	SER
1	B	285	ASN
1	B	338	GLN
1	B	346	ILE
1	B	349	LEU
1	B	380	LEU
1	B	402	THR
1	B	422	LEU
1	B	444	ASN
1	B	467	LEU
1	B	468	LEU
1	B	476	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	174	GLN
1	A	221	GLN
1	A	251	GLN
1	A	294	HIS
1	A	320	HIS
1	A	369	HIS
1	A	444	ASN
1	A	459	GLN
1	A	466	ASN
1	B	159	GLN
1	B	165	GLN
1	B	174	GLN
1	B	179	GLN
1	B	275	HIS
1	B	285	ASN
1	B	294	HIS
1	B	307	GLN
1	B	320	HIS
1	B	444	ASN
1	B	447	GLN
1	B	459	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](#)

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 3 ligands modelled in this entry, 3 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, 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	322/346 (93%)	0.16	10 (3%) 49 49	31, 41, 44, 49	0
1	B	322/346 (93%)	-0.09	2 (0%) 89 91	36, 41, 45, 48	0
All	All	644/692 (93%)	0.04	12 (1%) 66 69	31, 41, 45, 49	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	451	ILE	4.0
1	A	366	GLY	3.5
1	A	467	LEU	3.2
1	B	241	GLY	3.0
1	A	315	TYR	2.8
1	A	472	ASN	2.8
1	A	378	HIS	2.4
1	A	369	HIS	2.3
1	A	450	ASP	2.2
1	A	446	ARG	2.2
1	B	218	THR	2.1
1	A	464	SER	2.1

### 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
2	HG	B	1477	1/1	0.40	0.13	82,82,82,82	1
2	HG	A	1477	1/1	0.65	0.14	112,112,112,112	1
2	HG	A	1478	1/1	0.93	0.24	111,111,111,111	1

## 6.5 Other polymers [i](#)

There are no such residues in this entry.