



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 08:38 PM UTC

PDB ID : 8HS6 / pdb\_00008hs6  
Title : Brucella melitensis 7-alpha-Hydroxysteroid Dehydrogenase mutant:1-53 truncation  
Authors : Liu, Z.Y.; Zhang, R.Z.  
Deposited on : 2022-12-17  
Resolution : 2.35 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](mailto:validation@mail.wwpdb.org)

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<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 : 4-5-2 with Phenix2.0  
Xtrriage (Phenix) : 2.0  
EDS : 3.0  
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

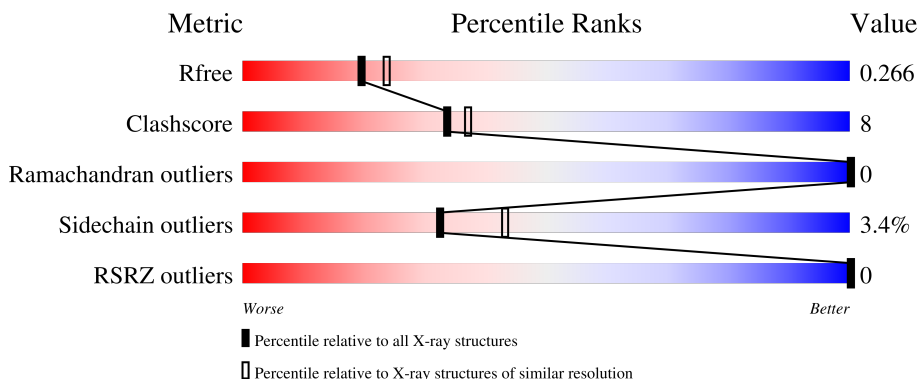
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.35 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	1596 (2.36-2.36)
Clashscore	190562	1663 (2.36-2.36)
Ramachandran outliers	187476	1646 (2.36-2.36)
Sidechain outliers	187428	1646 (2.36-2.36)
RSRZ outliers	180081	1598 (2.36-2.36)

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	249	
1	B	249	
1	C	249	
1	D	249	
1	E	249	

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Mol	Chain	Length	Quality of chain
1	F	249	 80% 10% 9%
1	G	249	 78% 13% 9%
1	H	249	 82% 17% .
1	I	249	 67% 22% . 9%
1	J	249	 69% 19% 11%
1	K	249	 70% 28% ..
1	L	249	 69% 26% . .

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 20848 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 7-alpha-hydroxysteroid dehydrogenase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	232	Total 1656	C 1041	N 297	O 310	S 8	0	0	0
1	B	245	Total 1766	C 1112	N 316	O 330	S 8	0	0	0
1	C	229	Total 1633	C 1027	N 292	O 306	S 8	0	0	0
1	D	247	Total 1773	C 1118	N 317	O 330	S 8	0	0	0
1	E	248	Total 1782	C 1123	N 319	O 332	S 8	0	0	0
1	F	227	Total 1629	C 1026	N 293	O 302	S 8	0	0	0
1	G	227	Total 1623	C 1023	N 291	O 301	S 8	0	0	0
1	H	249	Total 1791	C 1128	N 320	O 335	S 8	0	0	0
1	I	226	Total 1612	C 1013	N 290	O 301	S 8	0	0	0
1	J	221	Total 1577	C 993	N 281	O 295	S 8	0	0	0
1	K	246	Total 1766	C 1113	N 316	O 329	S 8	0	0	0
1	L	239	Total 1718	C 1083	N 309	O 318	S 8	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	258	ILE	MET	engineered mutation	UNP Q8YIN7
A	262	LYS	THR	engineered mutation	UNP Q8YIN7
B	258	ILE	MET	engineered mutation	UNP Q8YIN7
B	262	LYS	THR	engineered mutation	UNP Q8YIN7
C	258	ILE	MET	engineered mutation	UNP Q8YIN7

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Chain	Residue	Modelled	Actual	Comment	Reference
C	262	LYS	THR	engineered mutation	UNP Q8YIN7
D	258	ILE	MET	engineered mutation	UNP Q8YIN7
D	262	LYS	THR	engineered mutation	UNP Q8YIN7
E	258	ILE	MET	engineered mutation	UNP Q8YIN7
E	262	LYS	THR	engineered mutation	UNP Q8YIN7
F	258	ILE	MET	engineered mutation	UNP Q8YIN7
F	262	LYS	THR	engineered mutation	UNP Q8YIN7
G	258	ILE	MET	engineered mutation	UNP Q8YIN7
G	262	LYS	THR	engineered mutation	UNP Q8YIN7
H	258	ILE	MET	engineered mutation	UNP Q8YIN7
H	262	LYS	THR	engineered mutation	UNP Q8YIN7
I	258	ILE	MET	engineered mutation	UNP Q8YIN7
I	262	LYS	THR	engineered mutation	UNP Q8YIN7
J	258	ILE	MET	engineered mutation	UNP Q8YIN7
J	262	LYS	THR	engineered mutation	UNP Q8YIN7
K	258	ILE	MET	engineered mutation	UNP Q8YIN7
K	262	LYS	THR	engineered mutation	UNP Q8YIN7
L	258	ILE	MET	engineered mutation	UNP Q8YIN7
L	262	LYS	THR	engineered mutation	UNP Q8YIN7

- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	76	Total O 76 76	0	0
2	B	59	Total O 59 59	0	0
2	C	65	Total O 65 65	0	0
2	D	53	Total O 53 53	0	0
2	E	48	Total O 48 48	0	0
2	F	49	Total O 49 49	0	0
2	G	52	Total O 52 52	0	0
2	H	63	Total O 63 63	0	0
2	I	17	Total O 17 17	0	0
2	J	16	Total O 16 16	0	0

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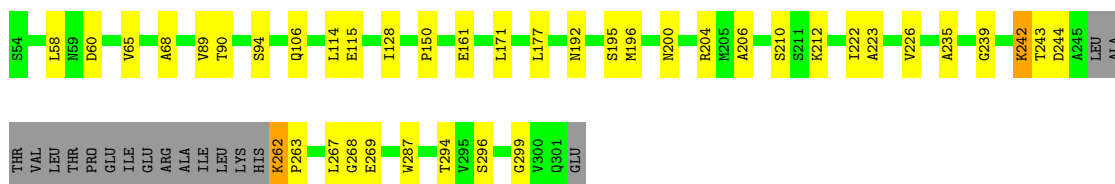
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
2	K	13	Total 13	O 13	0	0
2	L	11	Total 11	O 11	0	0

### 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.

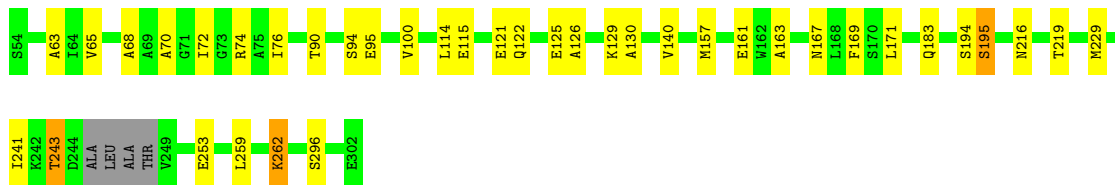
- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain A:  77% 15% 7%




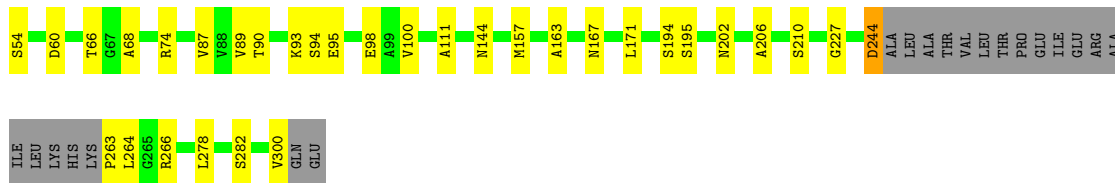
- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain B:  83% 14% ..




- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain C:  79% 12% 8%



- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain D:  90% 10%



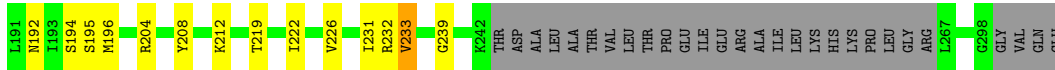
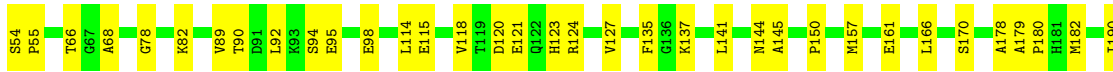
- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase





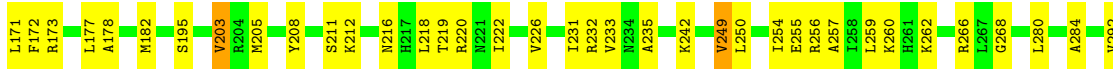
- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain J: 69% 19% 11%



- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain K: 70% 28% ..



- Molecule 1: 7-alpha-hydroxysteroid dehydrogenase

Chain L: 69% 26% ..



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	89.08Å 99.91Å 103.42Å 87.43° 78.84° 78.37°	Depositor
Resolution (Å)	23.75 – 2.35 23.75 – 2.35	Depositor EDS
% Data completeness (in resolution range)	93.4 (23.75-2.35) 93.4 (23.75-2.35)	Depositor EDS
$R_{merge}$	0.12	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.79 (at 2.36Å)	Xtrriage
Refinement program	PHENIX (1.20.1_4487: ???)	Depositor
R, $R_{free}$	0.217 , 0.266 0.219 , 0.266	Depositor DCC
$R_{free}$ test set	6448 reflections (4.52%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	20.8	Xtrriage
Anisotropy	0.216	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 17.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	0.157 for -h,-l,-k	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	20848	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.49% 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](#)

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	0.44	0/1682	0.58	0/2276
1	B	0.39	0/1794	0.56	0/2428
1	C	0.42	0/1659	0.59	0/2245
1	D	0.44	0/1802	0.56	0/2442
1	E	0.39	0/1811	0.56	0/2454
1	F	0.40	0/1655	0.54	0/2238
1	G	0.51	1/1648 (0.1%)	0.63	1/2228 (0.0%)
1	H	0.46	0/1820	0.64	3/2466 (0.1%)
1	I	0.29	0/1637	0.48	0/2214
1	J	0.30	0/1602	0.46	0/2168
1	K	0.25	0/1795	0.44	0/2432
1	L	0.34	0/1746	0.48	0/2361
All	All	0.39	1/20651 (0.0%)	0.55	4/27952 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	G	267	LEU	C-O	-6.25	1.17	1.24

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	246	LEU	N-CA-C	-7.62	104.08	113.15
1	H	247	ALA	N-CA-C	7.34	118.97	110.97
1	H	249	VAL	N-CA-C	-6.90	105.03	111.45
1	G	241	ILE	N-CA-C	6.40	117.07	108.11

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	1656	0	1671	28	0
1	B	1766	0	1789	22	0
1	C	1633	0	1646	20	0
1	D	1773	0	1804	15	0
1	E	1782	0	1812	28	0
1	F	1629	0	1645	18	0
1	G	1623	0	1643	31	0
1	H	1791	0	1818	31	0
1	I	1612	0	1624	36	0
1	J	1577	0	1588	27	0
1	K	1766	0	1795	47	0
1	L	1718	0	1745	42	0
2	A	76	0	0	3	0
2	B	59	0	0	0	0
2	C	65	0	0	1	0
2	D	53	0	0	0	0
2	E	48	0	0	1	0
2	F	49	0	0	1	0
2	G	52	0	0	0	0
2	H	63	0	0	0	0
2	I	17	0	0	0	0
2	J	16	0	0	0	0
2	K	13	0	0	1	0
2	L	11	0	0	1	0
All	All	20848	0	20580	314	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 8.

The worst 5 of 314 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:J:196:MET:HE2	1:J:239:GLY:HA3	1.59	0.84
1:G:196:MET:HE1	1:G:300:VAL:HA	1.59	0.84
1:I:139:THR:HG22	1:I:140:VAL:HG23	1.60	0.82

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:I:203:VAL:HG13	1:I:204:ARG:HG3	1.64	0.80
1:K:257:ALA:HA	1:K:260:LYS:HE3	1.64	0.80

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	228/249 (92%)	219 (96%)	9 (4%)	0	100	100
1	B	241/249 (97%)	235 (98%)	6 (2%)	0	100	100
1	C	225/249 (90%)	219 (97%)	6 (3%)	0	100	100
1	D	245/249 (98%)	239 (98%)	6 (2%)	0	100	100
1	E	246/249 (99%)	239 (97%)	7 (3%)	0	100	100
1	F	221/249 (89%)	212 (96%)	9 (4%)	0	100	100
1	G	221/249 (89%)	214 (97%)	7 (3%)	0	100	100
1	H	247/249 (99%)	239 (97%)	8 (3%)	0	100	100
1	I	222/249 (89%)	216 (97%)	6 (3%)	0	100	100
1	J	217/249 (87%)	209 (96%)	8 (4%)	0	100	100
1	K	244/249 (98%)	239 (98%)	5 (2%)	0	100	100
1	L	235/249 (94%)	227 (97%)	8 (3%)	0	100	100
All	All	2792/2988 (93%)	2707 (97%)	85 (3%)	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	162/177 (92%)	159 (98%)	3 (2%)	50	65
1	B	175/177 (99%)	168 (96%)	7 (4%)	28	37
1	C	160/177 (90%)	154 (96%)	6 (4%)	29	39
1	D	175/177 (99%)	173 (99%)	2 (1%)	65	79
1	E	176/177 (99%)	163 (93%)	13 (7%)	13	14
1	F	160/177 (90%)	152 (95%)	8 (5%)	22	27
1	G	159/177 (90%)	155 (98%)	4 (2%)	42	55
1	H	177/177 (100%)	171 (97%)	6 (3%)	32	43
1	I	157/177 (89%)	151 (96%)	6 (4%)	29	39
1	J	154/177 (87%)	150 (97%)	4 (3%)	40	54
1	K	174/177 (98%)	169 (97%)	5 (3%)	37	49
1	L	169/177 (96%)	166 (98%)	3 (2%)	51	66
All	All	1998/2124 (94%)	1931 (97%)	67 (3%)	32	43

5 of 67 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	J	232	ARG
1	K	89	VAL
1	L	94	SER
1	E	242	LYS
1	E	210	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	H	143	ASN
1	J	144	ASN
1	L	271	GLN
1	I	134	GLN

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Mol	Chain	Res	Type
1	J	183	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 oligosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 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	232/249 (93%)	-1.63	0 100 100	9, 18, 45, 81	0
1	B	245/249 (98%)	-1.63	0 100 100	11, 19, 51, 80	0
1	C	229/249 (91%)	-1.62	0 100 100	10, 17, 38, 93	0
1	D	247/249 (99%)	-1.64	0 100 100	11, 19, 54, 80	0
1	E	248/249 (99%)	-1.62	0 100 100	12, 20, 50, 75	0
1	F	227/249 (91%)	-1.64	0 100 100	10, 18, 41, 101	0
1	G	227/249 (91%)	-1.63	0 100 100	11, 18, 40, 83	0
1	H	249/249 (100%)	-1.64	0 100 100	10, 20, 45, 102	0
1	I	226/249 (90%)	-1.49	0 100 100	26, 39, 59, 88	0
1	J	221/249 (88%)	-1.50	0 100 100	25, 40, 56, 70	0
1	K	246/249 (98%)	-1.42	0 100 100	36, 53, 67, 82	0
1	L	239/249 (95%)	-1.38	0 100 100	36, 53, 71, 86	0
All	All	2836/2988 (94%)	-1.57	0 100 100	9, 23, 62, 102	0

There are no RSRZ outliers to report.

### 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

There are no ligands in this entry.

## 6.5 Other polymers

There are no such residues in this entry.