



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 11:08 AM GMT

PDB ID : 3O62  
Title : Nucleosome core particle modified with a cisplatin 1,3-cis-{Pt(NH<sub>3</sub>)<sub>2</sub>}<sub>2</sub>+·d(GpTpG) intrastrand cross-link  
Authors : Lippard, S.J.; Todd, R.C.  
Deposited on : 2010-07-28  
Resolution : 3.22 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)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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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  
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

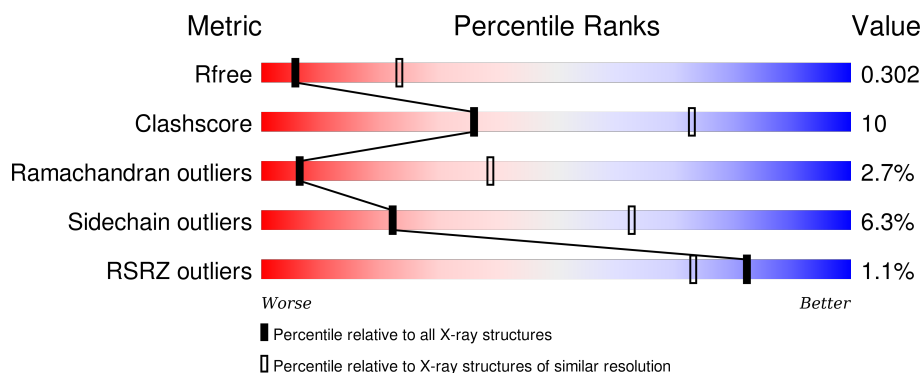
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 3.22 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))
$R_{free}$	91344	1095 (3.26-3.18)
Clashscore	102246	1046 (3.24-3.20)
Ramachandran outliers	100387	1026 (3.24-3.20)
Sidechain outliers	100360	1025 (3.24-3.20)
RSRZ outliers	91569	1100 (3.26-3.18)

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  $\geq 3$ , 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	135	
1	E	135	
2	B	102	
2	F	102	
3	C	128	

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Mol	Chain	Length	Quality of chain
3	G	128	
4	D	122	
4	H	122	
5	I	146	
6	J	146	

## 2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 12032 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 H3.2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	98	Total	C	N	O	S	0	0	0
			808	509	156	140	3			
1	E	98	Total	C	N	O	S	0	0	0
			808	509	156	140	3			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	102	ALA	GLY	CONFLICT	UNP P84233
E	102	ALA	GLY	CONFLICT	UNP P84233

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	80	Total	C	N	O	S	0	0	0
			638	401	125	111	1			
2	F	84	Total	C	N	O	S	0	0	0
			678	428	135	114	1			

- Molecule 3 is a protein called Histone H2A type 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	105	Total	C	N	O		0	0	0
			809	510	158	141				
3	G	106	Total	C	N	O		0	0	0
			818	516	160	142				

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	99	ARG	GLY	CONFLICT	UNP P06897
C	123	SER	ALA	CONFLICT	UNP P06897

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Chain	Residue	Modelled	Actual	Comment	Reference
C	?	-	ALA	DELETION	UNP P06897
G	99	ARG	GLY	CONFLICT	UNP P06897
G	123	SER	ALA	CONFLICT	UNP P06897
G	?	-	ALA	DELETION	UNP P06897

- Molecule 4 is a protein called Histone H2B 1.1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	95	Total	C	N	O	S	0	0	0
			745	469	134	140	2			
4	H	95	Total	C	N	O	S	0	0	0
			745	469	134	140	2			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	29	THR	SER	CONFLICT	UNP P02281
H	29	THR	SER	CONFLICT	UNP P02281

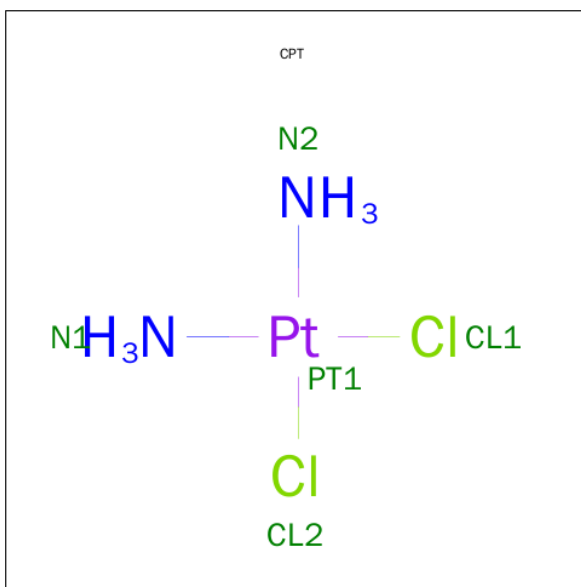
- Molecule 5 is a DNA chain called DNA (146-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	I	146	Total	C	N	O	P	0	0	0
			2968	1421	538	864	145			

- Molecule 6 is a DNA chain called DNA (146-MER).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	J	146	Total	C	N	O	P	0	0	0
			3012	1439	544	884	145			

- Molecule 7 is CISPLATIN (three-letter code: CPT) (formula: Cl<sub>2</sub>H<sub>6</sub>N<sub>2</sub>Pt).

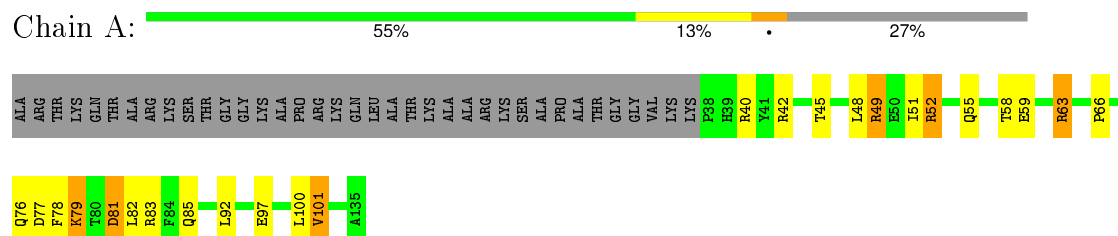


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	I	1	Total	N	Pt	0	0
			3	2	1		

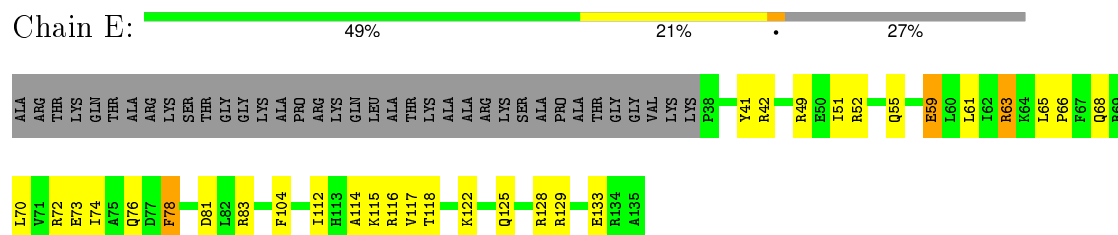
### 3 Residue-property plots

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.

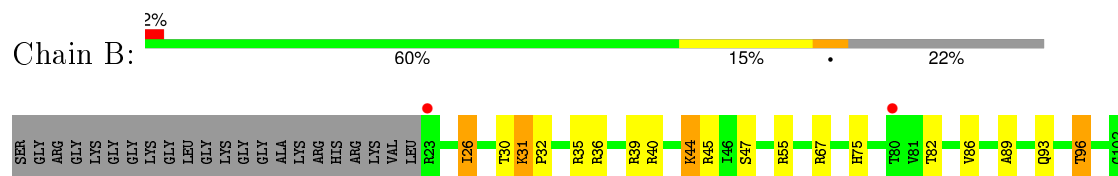
#### • Molecule 1: Histone H3.2



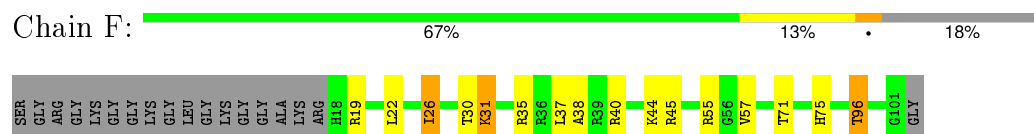
#### • Molecule 1: Histone H3.2



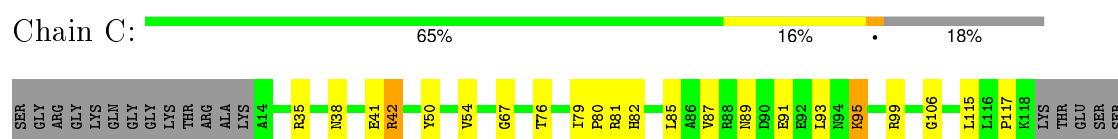
#### • Molecule 2: Histone H4



#### • Molecule 2: Histone H4

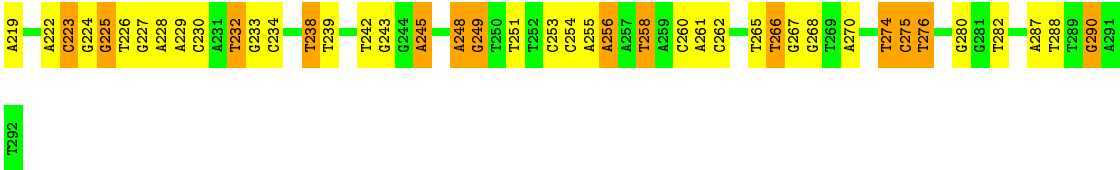


#### • Molecule 3: Histone H2A type 1



T147	A148	G149	T150	T153	A154	G155	G156	T163	C164	T165	A166	A167	G168	A169	T170	G171	G172	T173	T174	T175	T176	C179	A182	A183	A184	C185	C186	T187	T188	C192	G193	A194	T197	A198	G199	T200	T201	T202	C205	G206	A207	T208	G209	T210	T211	G212	A213	G214	G215	G216	G217	A218
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	106.09Å 109.55Å 177.18Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	42.03 – 3.22 42.03 – 3.22	Depositor EDS
% Data completeness (in resolution range)	68.8 (42.03-3.22) 68.9 (42.03-3.22)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.67 (at 3.19Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.249 , 0.306 0.246 , 0.302	Depositor DCC
$R_{free}$ test set	1209 reflections (5.41%)	DCC
Wilson B-factor (Å <sup>2</sup> )	71.6	Xtriage
Anisotropy	0.131	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.21 , 79.7	EDS
Estimated twinning fraction	0.039 for k,h,-l	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.44$ , $\langle L^2 \rangle = 0.27$	Xtriage
Outliers	1 of 23576 reflections (0.004%)	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	12032	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	158.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.48% 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, 0.375 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: CPT

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	0.50	0/820	0.73	0/1099
1	E	0.55	0/820	0.77	0/1099
2	B	0.52	0/645	0.75	0/862
2	F	0.52	0/686	0.75	0/918
3	C	0.49	0/819	0.67	0/1106
3	G	0.45	0/828	0.65	0/1117
4	D	0.56	0/756	0.72	0/1015
4	H	0.51	0/756	0.68	0/1015
5	I	1.04	1/3328 (0.0%)	1.78	80/5127 (1.6%)
6	J	1.03	0/3380	1.78	79/5223 (1.5%)
All	All	0.83	1/12838 (0.0%)	1.41	159/18581 (0.9%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	I	72	DG	N7-C5	6.38	1.43	1.39

The worst 5 of 159 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	I	26	DC	P-O3'-C3'	11.03	132.94	119.70
5	I	138	DC	P-O3'-C3'	8.39	129.77	119.70
5	I	125	DC	O4'-C1'-C2'	-8.38	99.19	105.90
6	J	147	DT	O4'-C1'-N1	8.37	113.86	108.00
6	J	172	DG	O4'-C1'-C2'	-8.27	99.28	105.90

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	808	0	846	28	0
1	E	808	0	846	29	0
2	B	638	0	676	19	0
2	F	678	0	726	16	0
3	C	809	0	864	19	0
3	G	818	0	877	23	0
4	D	745	0	773	24	0
4	H	745	0	773	19	0
5	I	2968	0	1646	49	0
6	J	3012	0	1656	51	0
7	I	3	0	0	2	0
All	All	12032	0	9683	209	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.

The worst 5 of 209 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:49:ARG:HG3	1:A:49:ARG:HH11	1.26	0.98
5:I:28:DA:H2"	5:I:29:DA:H5"	1.47	0.93
6:J:255:DA:H2"	6:J:256:DA:C8	2.11	0.85
4:H:91:ILE:O	4:H:95:VAL:HG23	1.80	0.81
4:D:33:SER:HB2	4:D:60:ASN:HD21	1.51	0.76

There are no symmetry-related clashes.

## 5.3 Torsion angles ⓘ

### 5.3.1 Protein backbone ⓘ

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	96/135 (71%)	86 (90%)	7 (7%)	3 (3%)	5	34
1	E	96/135 (71%)	81 (84%)	11 (12%)	4 (4%)	3	26
2	B	78/102 (76%)	71 (91%)	6 (8%)	1 (1%)	15	58
2	F	82/102 (80%)	74 (90%)	6 (7%)	2 (2%)	7	43
3	C	103/128 (80%)	91 (88%)	11 (11%)	1 (1%)	19	64
3	G	104/128 (81%)	92 (88%)	11 (11%)	1 (1%)	19	64
4	D	93/122 (76%)	78 (84%)	12 (13%)	3 (3%)	5	33
4	H	93/122 (76%)	70 (75%)	18 (19%)	5 (5%)	2	19
All	All	745/974 (76%)	643 (86%)	82 (11%)	20 (3%)	6	39

5 of 20 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	C	117	PRO
3	G	117	PRO
1	A	81	ASP
1	A	101	VAL
4	D	51	ILE

### 5.3.2 Protein sidechains ⓘ

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	85/110 (77%)	78 (92%)	7 (8%)	14	50
1	E	85/110 (77%)	82 (96%)	3 (4%)	43	79
2	B	65/78 (83%)	61 (94%)	4 (6%)	23	64
2	F	70/78 (90%)	66 (94%)	4 (6%)	25	67
3	C	83/101 (82%)	79 (95%)	4 (5%)	31	72
3	G	84/101 (83%)	80 (95%)	4 (5%)	31	72

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
4	D	81/102 (79%)	73 (90%)	8 (10%)	10	38
4	H	81/102 (79%)	75 (93%)	6 (7%)	17	56
All	All	634/782 (81%)	594 (94%)	40 (6%)	22	63

5 of 40 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
4	D	87	THR
4	D	116	THR
4	H	87	THR
4	D	110	GLU
1	E	52	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
4	D	64	ASN
2	F	25	ASN
3	G	38	ASN
4	D	60	ASN
2	F	75	HIS

### 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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

1 ligand is 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	$\# Z  > 2$
7	CPT	I	147	5	0,2,4	0.00	-	0,1,6	0.00	-

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
7	CPT	I	147	5	-	0/0/0/0	0/0/0/0

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.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	I	147	CPT	2	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 ⓘ

### 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, 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	98/135 (72%)	-0.28	0 100 100	48, 120, 210, 276	0
1	E	98/135 (72%)	-0.48	0 100 100	31, 67, 151, 197	0
2	B	80/102 (78%)	-0.06	2 (2%) 61 49	52, 109, 167, 199	0
2	F	84/102 (82%)	-0.49	0 100 100	28, 59, 118, 199	0
3	C	105/128 (82%)	-0.56	0 100 100	27, 66, 143, 210	0
3	G	106/128 (82%)	-0.20	4 (3%) 44 30	56, 112, 192, 246	0
4	D	95/122 (77%)	-0.53	0 100 100	31, 75, 156, 181	0
4	H	95/122 (77%)	-0.45	2 (2%) 67 54	39, 103, 195, 212	0
5	I	146/146 (100%)	-0.18	3 (2%) 67 54	99, 219, 280, 358	0
6	J	146/146 (100%)	-0.15	1 (0%) 89 83	100, 221, 297, 341	0
All	All	1053/1266 (83%)	-0.32	12 (1%) 82 73	27, 113, 260, 358	0

The worst 5 of 12 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
5	I	146	DA	7.0
4	H	28	LYS	3.3
2	B	23	ARG	3.1
6	J	150	DT	3.1
5	I	71	DT	2.9

### 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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, 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
7	CPT	I	147	3/5	0.91	0.11	-	247,247,252,311	0

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

There are no such residues in this entry.