



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2018 – 09:02 pm GMT

PDB ID : 1B8D
Title : CRYSTAL STRUCTURE OF A PHYCOUROBILIN-CONTAINING PHY-COERYTHRIN
Authors : Ritter, S.; Hiller, R.G.; Wrench, P.M.; Welte, W.; Diederichs, K.
Deposited on : 1999-01-29
Resolution : 1.90 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

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)
Xtriage (Phenix) : 1.13
EDS : trunk30967
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) : trunk30967

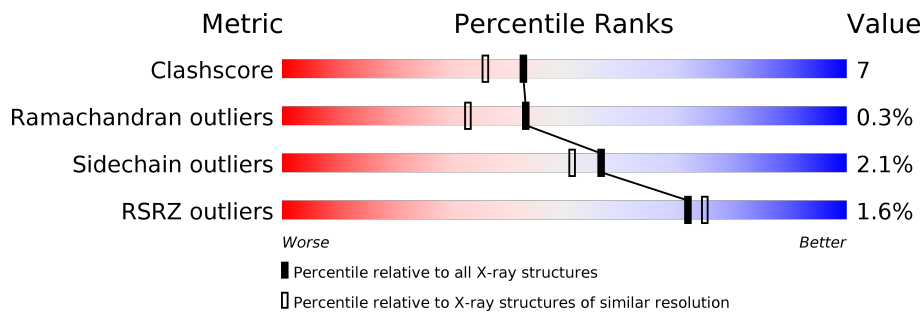
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	122126	6115 (1.90-1.90)
Ramachandran outliers	120053	6048 (1.90-1.90)
Sidechain outliers	120020	6048 (1.90-1.90)
RSRZ outliers	108989	5379 (1.90-1.90)

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	164	
1	K	164	
2	B	177	
2	L	177	
3	G	6	

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7734 atoms, of which 1879 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 PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (ALPHA CHAIN)).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	164	Total	C	H	N	O	S	290	0	0
			1530	771	290	217	245	7			
1	K	164	Total	C	H	N	O	S	290	0	0
			1530	771	290	217	245	7			

- Molecule 2 is a protein called PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (BETA CHAIN)).

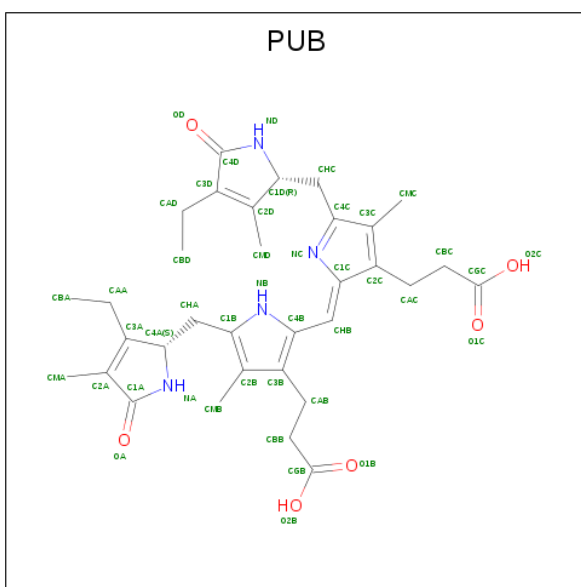
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	177	Total	C	H	N	O	S	299	0	0
			1590	797	299	223	261	10			
2	L	177	Total	C	H	N	O	S	299	0	0
			1590	797	299	223	261	10			

- Molecule 3 is a protein called PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (GAMMA CHAIN)).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	5	Total	C	H	N	O	5	0	2
			35	20	5	5	5			

- Molecule 4 is PHYCOERYTHROBILIN (three-letter code: PEB) (formula: C₃₃H₄₀N₄O₆).





Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total 46	C 33	H 3	N 4	O 6	3	0
5	L	1	Total 46	C 33	H 3	N 4	O 6	3	0

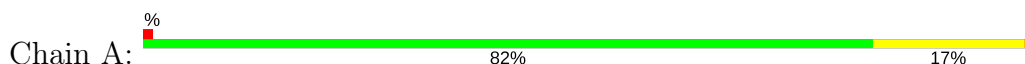
- Molecule 6 is water.

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	80	Total 240	H 160	O 80	160	0
6	B	74	Total 222	H 148	O 74	148	0
6	K	80	Total 240	H 160	O 80	160	0
6	L	99	Total 297	H 198	O 99	198	0

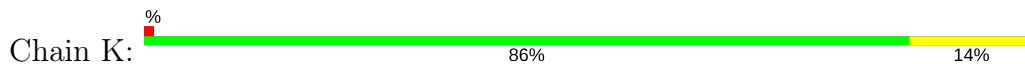
3 Residue-property plots [i](#)

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.

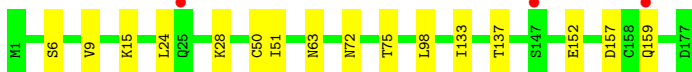
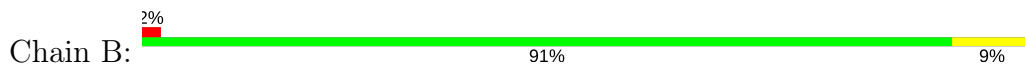
- Molecule 1: PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (ALPHA CHAIN))



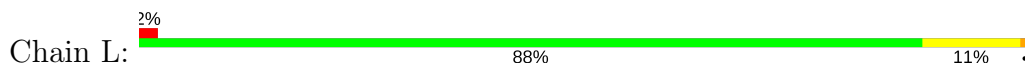
- Molecule 1: PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (ALPHA CHAIN))



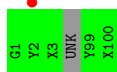
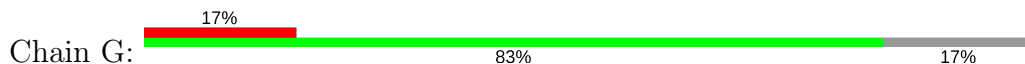
- Molecule 2: PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (BETA CHAIN))



- Molecule 2: PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (BETA CHAIN))



- Molecule 3: PROTEIN (RHODOPHYTAN PHYCOERYTHRIN (GAMMA CHAIN))



4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, α , β , γ	187.35Å 187.35Å 59.31Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	100.00 – 1.90 31.53 – 1.82	Depositor EDS
% Data completeness (in resolution range)	97.0 (100.00-1.90) 73.9 (31.53-1.82)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$	-	Xtriage
Refinement program	X-PLOR 3.843	Depositor
R, R_{free}	0.175 , 0.227 0.183 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	18.4	Xtriage
Anisotropy	0.154	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 47.8	EDS
L-test for twinning ¹	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.004 for h,-h-k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	7734	wwPDB-VP
Average B, all atoms (Å ²)	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.34% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Theoretical 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: MEN, PEB, PUB

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	0.46	0/1261	0.63	0/1704
1	K	0.46	0/1261	0.61	0/1704
2	B	0.46	0/1294	0.63	0/1748
2	L	0.46	0/1294	0.63	0/1748
3	G	0.89	0/28	0.86	0/35
All	All	0.46	0/5138	0.62	0/6939

There are no bond length outliers.

There are no bond angle outliers.

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	1240	290	1211	26	0
1	K	1240	290	1211	21	0
2	B	1291	299	1286	15	0
2	L	1291	299	1286	19	0
3	G	30	5	22	0	0
4	A	86	6	74	7	0
4	B	86	6	74	6	0
4	K	86	6	74	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	L	86	6	74	7	0
5	B	43	3	38	4	0
5	L	43	3	38	2	0
6	A	80	160	0	3	0
6	B	74	148	0	1	0
6	K	80	160	0	2	0
6	L	99	198	0	3	0
All	All	5855	1879	5388	81	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 7.

The worst 5 of 81 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:32:GLN:HG3	1:K:32:GLN:HG3	1.48	0.93
2:B:137:THR:HG21	6:B:364:HOH:O	1.82	0.79
1:A:88:HIS:CD2	1:A:91:ARG:HH21	2.04	0.75
4:B:203:PEB:HMB2	4:B:203:PEB:HNA	1.52	0.73
2:L:137:THR:HG21	6:L:401:HOH:O	1.88	0.73

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	162/164 (99%)	157 (97%)	5 (3%)	0	100	100
1	K	162/164 (99%)	159 (98%)	3 (2%)	0	100	100
2	B	174/177 (98%)	169 (97%)	4 (2%)	1 (1%)	27	15
2	L	174/177 (98%)	169 (97%)	4 (2%)	1 (1%)	27	15

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	G	1/6 (17%)	1 (100%)	0	0	100	100
All	All	673/688 (98%)	655 (97%)	16 (2%)	2 (0%)	43	33

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	L	111	ASN
2	B	75	THR

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	129/129 (100%)	126 (98%)	3 (2%)	53	47
1	K	129/129 (100%)	128 (99%)	1 (1%)	83	83
2	B	137/137 (100%)	134 (98%)	3 (2%)	55	49
2	L	137/137 (100%)	133 (97%)	4 (3%)	45	37
3	G	2/2 (100%)	2 (100%)	0	100	100
All	All	534/534 (100%)	523 (98%)	11 (2%)	56	51

5 of 11 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	63	ASN
2	B	152	GLU
2	L	63	ASN
2	B	50	CYS
2	L	50	CYS

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

Mol	Chain	Res	Type
1	K	48	HIS
1	K	88	HIS
2	L	144	ASN
2	B	63	ASN
2	L	63	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 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	$\# Z > 2$
2	MEN	B	72	2	8,8,9	1.01	1 (12%)	8,9,11	0.68	0
2	MEN	L	72	2	8,8,9	0.97	1 (12%)	8,9,11	0.66	0

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	MEN	B	72	2	-	0/6/8/10	0/0/0/0
2	MEN	L	72	2	-	0/6/8/10	0/0/0/0

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	72	MEN	CA-C	2.41	1.53	1.50
2	L	72	MEN	CA-C	2.43	1.53	1.50

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	72	MEN	1	0
2	L	72	MEN	2	0

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

10 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$
4	PEB	A	201	1	37,46,46	1.75	4 (10%)	40,67,67	1.74	10 (25%)
4	PEB	A	202	1	37,46,46	1.68	4 (10%)	40,67,67	1.31	4 (10%)
4	PEB	B	203	2	37,46,46	1.62	6 (16%)	40,67,67	1.73	9 (22%)
4	PEB	B	204	2	37,46,46	2.07	7 (18%)	40,67,67	1.61	7 (17%)
5	PUB	B	205	2	37,46,46	2.50	11 (29%)	31,67,67	2.85	11 (35%)
4	PEB	K	206	1	37,46,46	1.92	7 (18%)	40,67,67	1.76	10 (25%)
4	PEB	K	207	1	37,46,46	2.06	8 (21%)	40,67,67	1.88	10 (25%)
4	PEB	L	208	2	37,46,46	1.47	7 (18%)	40,67,67	1.80	9 (22%)
4	PEB	L	209	2	37,46,46	2.13	9 (24%)	40,67,67	1.56	8 (20%)
5	PUB	L	210	2	37,46,46	2.23	8 (21%)	31,67,67	2.76	8 (25%)

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
4	PEB	A	201	1	-	0/18/74/74	0/4/4/4
4	PEB	A	202	1	-	0/18/74/74	0/4/4/4
4	PEB	B	203	2	-	0/18/74/74	0/4/4/4
4	PEB	B	204	2	-	0/18/74/74	0/4/4/4
5	PUB	B	205	2	-	0/17/74/74	0/4/4/4
4	PEB	K	206	1	-	0/18/74/74	0/4/4/4
4	PEB	K	207	1	-	0/18/74/74	0/4/4/4
4	PEB	L	208	2	-	0/18/74/74	0/4/4/4
4	PEB	L	209	2	-	0/18/74/74	0/4/4/4
5	PUB	L	210	2	-	0/17/74/74	0/4/4/4

The worst 5 of 71 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	K	206	PEB	C2A-C1A	-5.05	1.47	1.52
4	A	201	PEB	C2A-C1A	-4.58	1.47	1.52
5	B	205	PUB	C1C-C2C	-4.29	1.38	1.45
4	K	207	PEB	C2A-C1A	-4.18	1.48	1.52
4	L	209	PEB	CAD-C3D	-3.59	1.37	1.47

The worst 5 of 86 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	205	PUB	CHB-C1C-NC	-11.46	112.28	128.82
5	L	210	PUB	CHB-C1C-NC	-11.38	112.39	128.82
4	L	208	PEB	C1D-ND-C4D	-4.70	107.68	113.75
5	B	205	PUB	C4A-NA-C1A	-4.51	107.93	113.75
4	A	201	PEB	C3A-C4A-NA	-4.23	104.02	108.11

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

10 monomers are involved in 29 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	201	PEB	2	0
4	A	202	PEB	5	0
4	B	203	PEB	3	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	204	PEB	3	0
5	B	205	PUB	4	0
4	K	206	PEB	1	0
4	K	207	PEB	2	0
4	L	208	PEB	4	0
4	L	209	PEB	3	0
5	L	210	PUB	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, 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	164/164 (100%)	-0.32	2 (1%) 79 81	12, 20, 34, 45	0
1	K	164/164 (100%)	-0.29	1 (0%) 89 90	12, 19, 34, 45	0
2	B	176/177 (99%)	-0.36	3 (1%) 70 73	12, 20, 39, 57	0
2	L	176/177 (99%)	-0.36	4 (2%) 60 64	11, 20, 39, 57	0
3	G	3/6 (50%)	1.33	1 (33%) 0 0	36, 36, 40, 40	0
All	All	683/688 (99%)	-0.33	11 (1%) 72 75	11, 20, 38, 57	0

The worst 5 of 11 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	25	GLN	3.7
2	L	22	SER	2.7
2	B	147	SER	2.6
1	A	140	VAL	2.5
3	G	2	TYR	2.4

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

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	MEN	L	72	9/10	0.96	0.07	0,19,23,24	1
2	MEN	B	72	9/10	0.96	0.07	0,19,23,24	1

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(\AA^2)	Q<0.9
4	PEB	A	202	43/43	0.89	0.19	0,47,59,63	3
4	PEB	B	204	43/43	0.91	0.12	0,19,44,52	3
4	PEB	L	209	43/43	0.93	0.11	0,18,43,56	3
5	PUB	B	205	43/43	0.93	0.08	0,26,38,49	3
4	PEB	L	208	43/43	0.94	0.09	0,17,29,37	3
5	PUB	L	210	43/43	0.94	0.09	0,19,32,35	3
4	PEB	K	207	43/43	0.94	0.10	0,23,38,47	3
4	PEB	B	203	43/43	0.95	0.08	0,17,28,38	3
4	PEB	A	201	43/43	0.95	0.09	0,19,27,40	3
4	PEB	K	206	43/43	0.96	0.08	0,16,27,34	3

6.5 Other polymers [i](#)

There are no such residues in this entry.