



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 10, 2026 – 07:32 AM UTC

PDB ID : 1UKJ / pdb_00001ukj
Title : Detailed structure of L-Methionine-Lyase from Pseudomonas putida
Authors : Misaki, S.; Takimoto, A.; Takakura, T.; Yoshioka, T.; Yamashita, M.; Tamura, T.; Tanaka, H.; Inagaki, K.
Deposited on : 2003-08-24
Resolution : 1.80 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 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

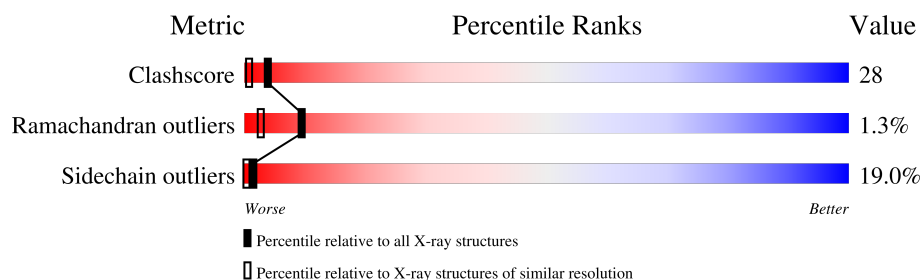
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)

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 ≥ 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 $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	398	
1	B	398	
1	C	398	
1	D	398	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 13148 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 Methionine gamma-lyase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	398	Total	C	N	O	P	S	0	0	0
			3011	1897	533	562	1	18			
1	B	398	Total	C	N	O	P	S	0	0	0
			3011	1897	533	562	1	18			
1	C	398	Total	C	N	O	P	S	0	0	0
			3011	1897	533	562	1	18			
1	D	398	Total	C	N	O	P	S	0	0	0
			3011	1897	533	562	1	18			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	211	LLP	LYS	modified residue	UNP P13254
B	711	LLP	LYS	modified residue	UNP P13254
C	1211	LLP	LYS	modified residue	UNP P13254
D	1711	LLP	LYS	modified residue	UNP P13254

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	243	Total	O	0	0
			243	243		
3	B	251	Total	O	0	0
			251	251		
3	C	297	Total	O	0	0
			297	297		
3	D	288	Total	O	0	0
			288	288		

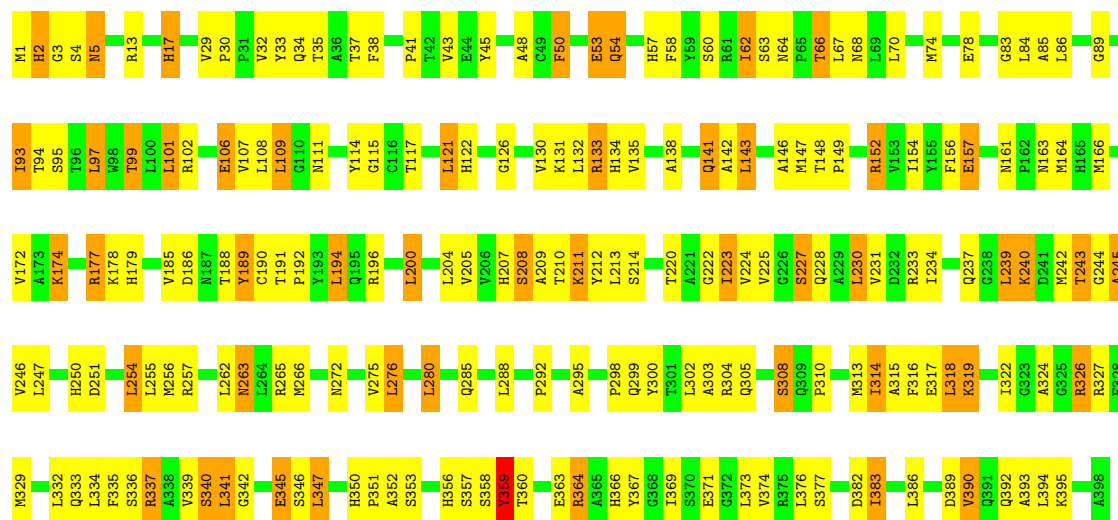
3 Residue-property plots

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. 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. 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.

Note EDS was not executed.

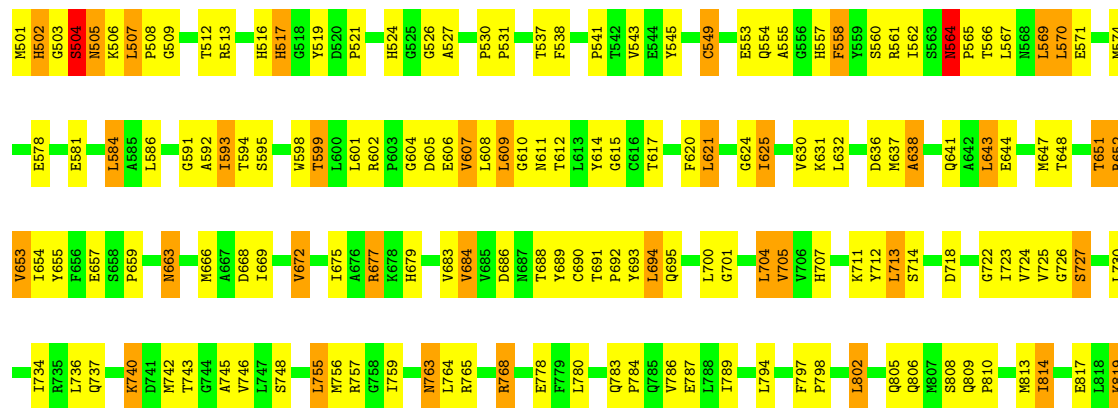
• Molecule 1: Methionine gamma-lyase

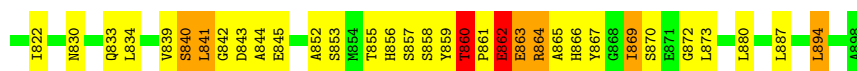
Chain A: 



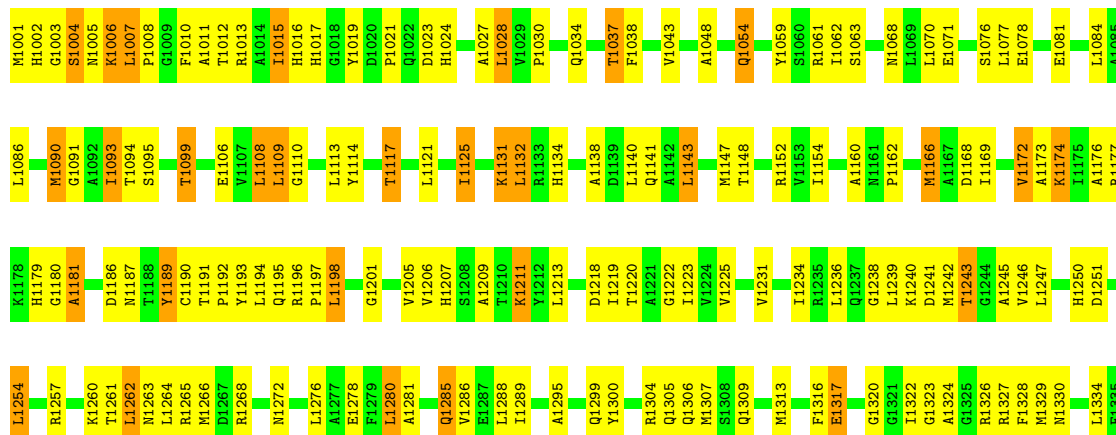
• Molecule 1: Methionine gamma-lyase

Chain B: 

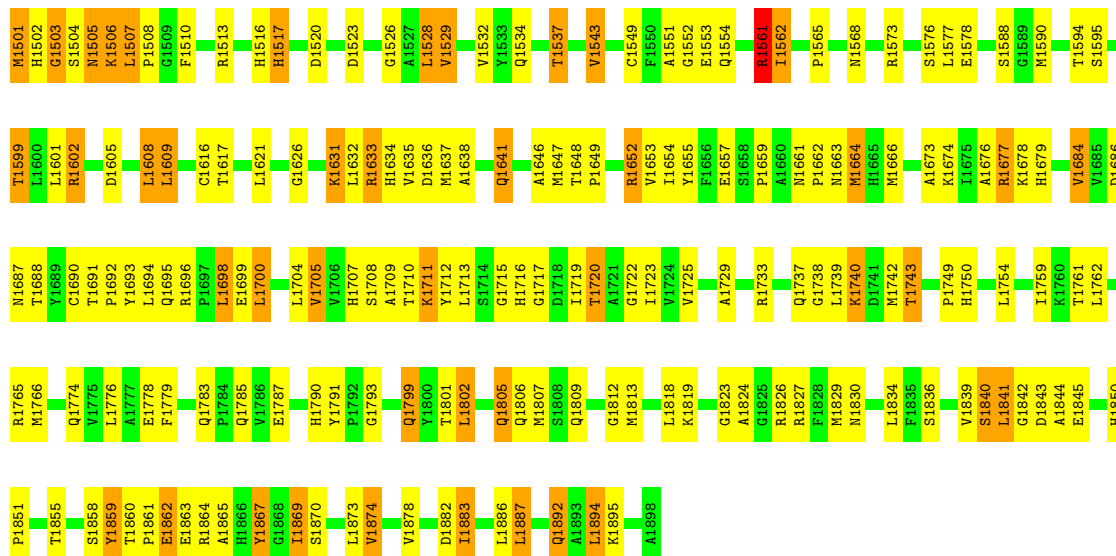




• Molecule 1: Methionine gamma-lyase



• Molecule 1: Methionine gamma-lyase



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	133.09Å 133.09Å 215.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 1.80	Depositor
% Data completeness (in resolution range)	(Not available) (10.00-1.80)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 98.0	Depositor
R, R_{free}	0.177 , 0.295	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	13148	wwPDB-VP
Average B, all atoms (Å ²)	26.0	wwPDB-VP

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: LLP, SO4

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	0/3051	0.89	11/4139 (0.3%)
1	B	0.44	0/3051	0.94	12/4139 (0.3%)
1	C	0.45	0/3051	0.92	6/4139 (0.1%)
1	D	0.45	0/3051	0.91	10/4139 (0.2%)
All	All	0.45	0/12204	0.91	39/16556 (0.2%)

There are no bond length outliers.

The worst 5 of 39 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1241	ASP	N-CA-C	7.67	122.87	112.68
1	A	60	SER	N-CA-C	7.37	120.37	111.82
1	B	860	THR	N-CA-C	-6.80	102.10	108.22
1	A	138	ALA	N-CA-C	-6.65	105.46	113.97
1	D	1740	LYS	N-CA-C	6.55	118.42	111.28

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	3011	0	2971	177	0
1	B	3011	0	2968	189	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	3011	0	2967	192	0
1	D	3011	0	2967	158	0
2	A	5	0	0	0	0
2	B	10	0	0	0	0
2	C	5	0	0	0	0
2	D	5	0	0	0	0
3	A	243	0	0	13	0
3	B	251	0	0	17	0
3	C	297	0	0	33	0
3	D	288	0	0	23	0
All	All	13148	0	11873	680	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 28.

The worst 5 of 680 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:174:LYS:HE2	1:A:177:ARG:HH11	1.26	1.00
1:A:303:ALA:HB1	1:A:304:ARG:HH21	1.24	1.00
1:A:152:ARG:HH22	1:A:233:ARG:HH22	1.13	0.97
1:C:1219:ILE:HD11	1:C:1254:LEU:HD23	1.45	0.96
1:C:1330:ASN:HD21	1:D:1543:VAL:H	1.09	0.95

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	395/398 (99%)	365 (92%)	24 (6%)	6 (2%)	8 2
1	B	395/398 (99%)	357 (90%)	32 (8%)	6 (2%)	8 2

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	395/398 (99%)	367 (93%)	25 (6%)	3 (1%)	16	6
1	D	395/398 (99%)	357 (90%)	33 (8%)	5 (1%)	9	3
All	All	1580/1592 (99%)	1446 (92%)	114 (7%)	20 (1%)	9	3

5 of 20 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	245	ALA
1	A	340	SER
1	B	862	GLU
1	C	1181	ALA
1	A	240	LYS

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	306/306 (100%)	243 (79%)	63 (21%)	1	0
1	B	306/306 (100%)	244 (80%)	62 (20%)	1	0
1	C	306/306 (100%)	254 (83%)	52 (17%)	2	0
1	D	306/306 (100%)	251 (82%)	55 (18%)	2	0
All	All	1224/1224 (100%)	992 (81%)	232 (19%)	1	0

5 of 232 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	855	THR
1	D	1845	GLU
1	C	1140	LEU
1	D	1836	SER
1	D	1652	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 63 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	737	GLN
1	D	1695	GLN
1	C	1034	GLN
1	D	1687	ASN
1	D	1809	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 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$
1	LLP	C	1211	1	23,24,25	2.94	7 (30%)	25,32,34	1.70	5 (20%)
1	LLP	B	711	1	23,24,25	2.99	6 (26%)	25,32,34	1.76	6 (24%)
1	LLP	A	211	1	23,24,25	2.96	7 (30%)	25,32,34	1.77	5 (20%)
1	LLP	D	1711	1	23,24,25	2.95	6 (26%)	25,32,34	1.73	5 (20%)

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
1	LLP	C	1211	1	-	6/16/17/19	0/1/1/1
1	LLP	B	711	1	-	7/16/17/19	0/1/1/1
1	LLP	A	211	1	-	6/16/17/19	0/1/1/1
1	LLP	D	1711	1	-	4/16/17/19	0/1/1/1

The worst 5 of 26 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	711	LLP	C6-C5	7.99	1.53	1.37
1	A	211	LLP	C6-C5	7.65	1.52	1.37
1	C	1211	LLP	C6-C5	7.55	1.52	1.37
1	D	1711	LLP	C6-C5	7.52	1.52	1.37
1	D	1711	LLP	C6-N1	6.13	1.46	1.34

The worst 5 of 21 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	211	LLP	C5-C6-N1	-6.13	113.85	123.83
1	B	711	LLP	C5-C6-N1	-6.01	114.05	123.83
1	D	1711	LLP	C5-C6-N1	-5.98	114.10	123.83
1	C	1211	LLP	C5-C6-N1	-5.97	114.11	123.83
1	C	1211	LLP	C4-C3-C2	3.11	121.89	120.14

There are no chirality outliers.

5 of 23 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	211	LLP	O-C-CA-CB
1	B	711	LLP	O-C-CA-CB
1	C	1211	LLP	C4-C4'-NZ-CE
1	C	1211	LLP	N-CA-CB-CG
1	C	1211	LLP	O-C-CA-CB

There are no ring outliers.

3 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	1211	LLP	3	0
1	A	211	LLP	5	0
1	D	1711	LLP	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

5 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	$\# Z > 2$
2	SO4	C	1400	-	4,4,4	0.49	0	6,6,6	0.07	0
2	SO4	B	1901	-	4,4,4	0.54	0	6,6,6	0.07	0
2	SO4	B	900	-	4,4,4	0.49	0	6,6,6	0.07	0
2	SO4	D	1900	-	4,4,4	0.47	0	6,6,6	0.07	0
2	SO4	A	400	-	4,4,4	0.51	0	6,6,6	0.06	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.

No monomer is involved in short contacts.

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](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.