



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:04 PM UTC

PDB ID : 2RHI / pdb_00002rhi
Title : Crystal structure of the 3-MBT domain from human L3MBTL1 in complex with H1.5K27me2 at 1.66 angstrom
Authors : Li, H.; Patel, D.J.
Deposited on : 2007-10-09
Resolution : 1.66 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

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)	:	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

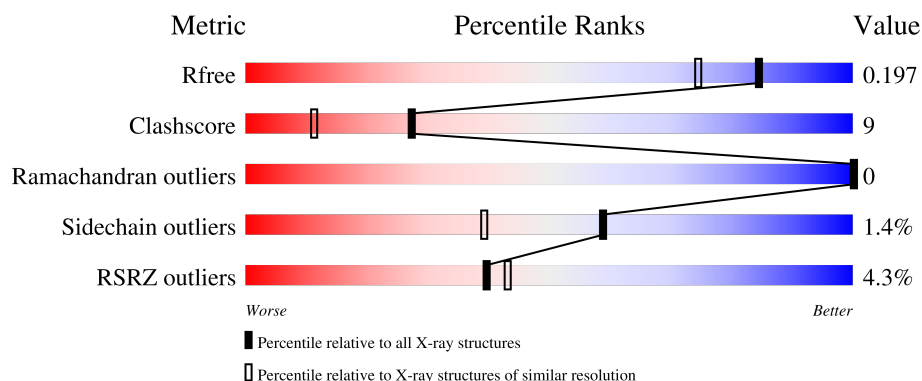
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

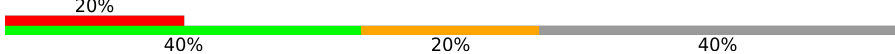
The reported resolution of this entry is 1.66 Å.

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	2563 (1.66-1.66)
Clashscore	190562	2662 (1.66-1.66)
Ramachandran outliers	187476	2621 (1.66-1.66)
Sidechain outliers	187428	2621 (1.66-1.66)
RSRZ outliers	180081	2564 (1.66-1.66)

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 $\leq 5\%$. 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	345	
2	B	5	

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3233 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 Lethal(3)malignant brain tumor-like protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	324	Total	C	N	O	S	0	0	0
			2621	1682	446	480	13			

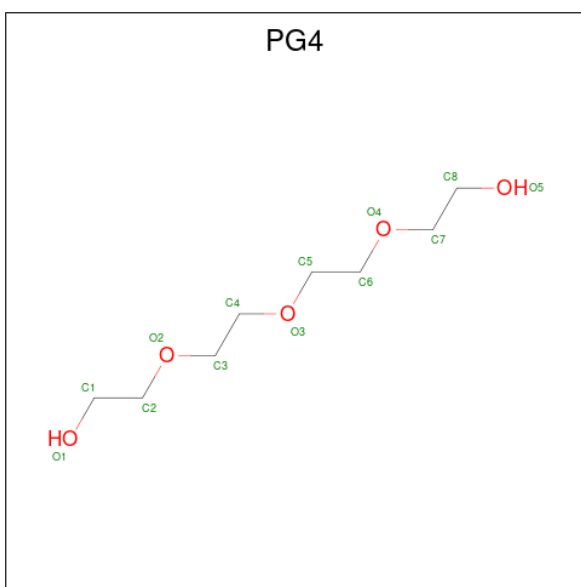
There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	192	GLY	-	expression tag	UNP Q9Y468
A	193	SER	-	expression tag	UNP Q9Y468
A	194	PRO	-	expression tag	UNP Q9Y468
A	195	ASN	-	expression tag	UNP Q9Y468
A	196	SER	-	expression tag	UNP Q9Y468
A	527	VAL	-	expression tag	UNP Q9Y468
A	528	ASP	-	expression tag	UNP Q9Y468
A	529	SER	-	expression tag	UNP Q9Y468
A	530	SER	-	expression tag	UNP Q9Y468
A	531	GLY	-	expression tag	UNP Q9Y468
A	532	ARG	-	expression tag	UNP Q9Y468
A	533	ILE	-	expression tag	UNP Q9Y468
A	534	VAL	-	expression tag	UNP Q9Y468
A	535	THR	-	expression tag	UNP Q9Y468
A	536	ASP	-	expression tag	UNP Q9Y468

- Molecule 2 is a protein called Histone H1.5.

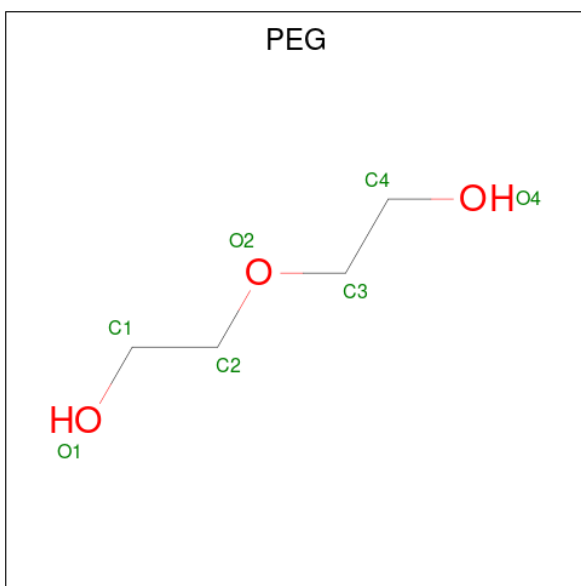
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	3	Total	C	N	O	0	0	0
			28	18	5	5			

- Molecule 3 is TETRAETHYLENE GLYCOL (CCD ID: PG4) (formula: C₈H₁₈O₅).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			13	8	5		

- Molecule 4 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			7	4	3		

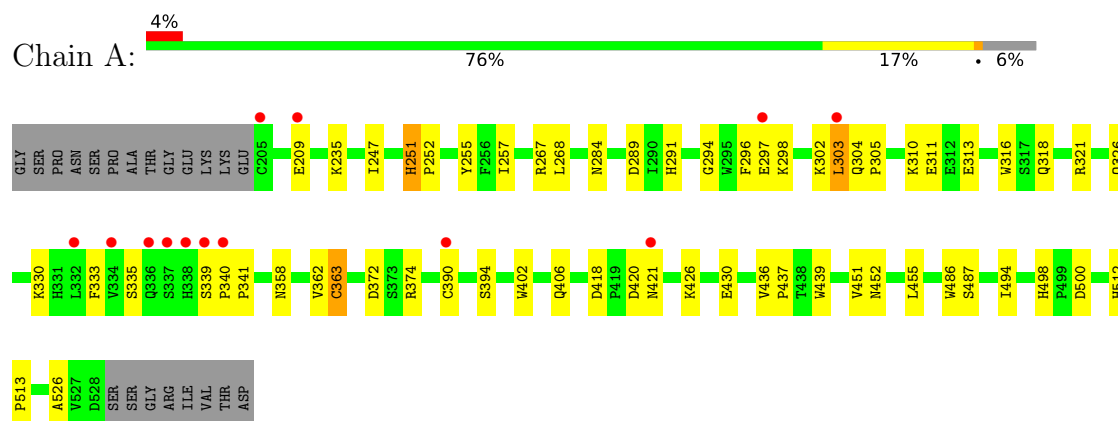
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	562	Total 562	O 562	0	0
5	B	2	Total 2	O 2	0	0

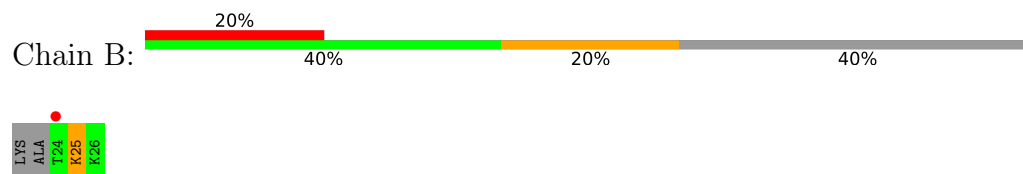
3 Residue-property plots [i](#)

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: Lethal(3)malignant brain tumor-like protein



- Molecule 2: Histone H1.5



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	85.86Å 93.32Å 58.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.66 20.00 – 1.66	Depositor EDS
% Data completeness (in resolution range)	97.4 (20.00-1.66) 97.4 (20.00-1.66)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.88 (at 1.66Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.187 , 0.201 0.184 , 0.197	Depositor DCC
R_{free} test set	4610 reflections (8.18%)	wwPDB-VP
Wilson B-factor (Å ²)	15.9	Xtriage
Anisotropy	0.117	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 49.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	3233	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.45% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: PG4, MLY, PEG

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	0.33	0/2722	0.90	10/3721 (0.3%)
2	B	0.68	0/15	0.75	0/18
All	All	0.33	0/2737	0.90	10/3739 (0.3%)

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	251	HIS	CA-C-N	7.11	128.73	119.84
1	A	251	HIS	C-N-CA	7.11	128.73	119.84
1	A	363	CYS	N-CA-C	6.76	120.00	109.52
1	A	362	VAL	N-CA-C	-6.09	99.65	108.17
1	A	436	VAL	N-CA-C	-6.06	102.36	108.96
1	A	358	ASN	CA-C-N	5.67	126.92	119.84
1	A	358	ASN	C-N-CA	5.67	126.92	119.84
1	A	333	PHE	N-CA-C	5.31	118.27	109.46
1	A	305	PRO	N-CA-C	5.24	117.09	110.70
1	A	330	LYS	N-CA-C	5.07	116.81	111.28

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	2621	0	2449	46	0
2	B	28	0	34	1	0
3	A	13	0	18	1	0
4	A	7	0	10	3	0
5	A	562	0	0	8	0
5	B	2	0	0	0	0
All	All	3233	0	2511	47	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 9.

All (47) 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:498:HIS:HD2	1:A:500:ASP:H	1.23	0.86
1:A:390:CYS:SG	1:A:394:SER:CB	2.78	0.72
1:A:318:GLN:NE2	1:A:321:ARG:HH21	1.89	0.71
1:A:498:HIS:CD2	1:A:500:ASP:H	2.08	0.69
1:A:339:SER:HB2	1:A:340:PRO:HD2	1.73	0.69
1:A:426:LYS:O	1:A:430:GLU:HG3	1.94	0.68
1:A:302:LYS:HE3	1:A:311:GLU:OE1	1.94	0.68
1:A:310:LYS:HB2	1:A:313:GLU:HG3	1.78	0.65
1:A:235:LYS:NZ	4:A:2:PEG:H12	2.13	0.64
1:A:340:PRO:HD3	5:A:1012:HOH:O	1.99	0.63
1:A:291:HIS:HD2	1:A:335:SER:O	1.85	0.60
1:A:390:CYS:SG	1:A:394:SER:HB2	2.42	0.59
1:A:303:LEU:HG	1:A:304:GLN:N	2.19	0.55
1:A:512:HIS:HD2	1:A:513:PRO:O	1.90	0.55
1:A:257:ILE:HD12	1:A:316:TRP:CZ2	2.43	0.54
1:A:341:PRO:HA	1:A:372:ASP:O	2.08	0.53
1:A:251:HIS:N	1:A:252:PRO:HD3	2.24	0.53
1:A:374:ARG:NH2	5:A:711:HOH:O	2.42	0.52
1:A:235:LYS:HZ1	4:A:2:PEG:H12	1.74	0.52
1:A:267:ARG:HH11	1:A:512:HIS:CE1	2.29	0.51
1:A:209:GLU:HG3	5:A:975:HOH:O	2.11	0.51
1:A:247:ILE:HG22	1:A:255:TYR:CE1	2.46	0.51
1:A:498:HIS:HD2	1:A:500:ASP:N	2.02	0.49
1:A:494:ILE:HD11	1:A:498:HIS:CG	2.49	0.48
1:A:267:ARG:HD3	1:A:512:HIS:CE1	2.48	0.47
1:A:296:PHE:CE1	1:A:297:GLU:HG3	2.49	0.47
1:A:247:ILE:HG12	1:A:289:ASP:HB3	1.97	0.47
1:A:267:ARG:HG2	1:A:284:ASN:HD22	1.80	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:486:TRP:CE3	3:A:1:PG4:H72	2.51	0.45
1:A:451:VAL:O	1:A:452:ASN:HB2	2.17	0.45
1:A:390:CYS:HG	1:A:394:SER:CB	2.29	0.45
1:A:390:CYS:SG	1:A:394:SER:HB3	2.54	0.45
1:A:326:GLN:CD	5:A:1078:HOH:O	2.60	0.44
2:B:25:LYS:HA	2:B:25:LYS:HD2	1.89	0.44
1:A:402:TRP:CE2	1:A:406:GLN:HG3	2.54	0.43
1:A:267:ARG:HH11	1:A:512:HIS:HE1	1.64	0.43
1:A:235:LYS:HD3	4:A:2:PEG:C1	2.48	0.43
1:A:498:HIS:CD2	1:A:500:ASP:HB2	2.54	0.43
1:A:390:CYS:HG	1:A:394:SER:HB2	1.84	0.43
1:A:455:LEU:HD23	1:A:455:LEU:N	2.34	0.42
1:A:487:SER:HA	1:A:526:ALA:HB2	2.00	0.42
1:A:339:SER:HA	5:A:1012:HOH:O	2.19	0.42
1:A:420:ASP:HB2	5:A:881:HOH:O	2.20	0.42
1:A:298:LYS:HE2	5:A:1074:HOH:O	2.20	0.41
1:A:418:ASP:OD2	1:A:421:ASN:HB2	2.20	0.41
1:A:294:GLY:HA2	5:A:673:HOH:O	2.21	0.41
1:A:437:PRO:HB2	1:A:439:TRP:CD1	2.56	0.40

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	322/345 (93%)	317 (98%)	5 (2%)	0	100	100
2	B	1/5 (20%)	1 (100%)	0	0	100	100
All	All	323/350 (92%)	318 (98%)	5 (2%)	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	286/303 (94%)	283 (99%)	3 (1%)	68	52
2	B	2/3 (67%)	1 (50%)	1 (50%)	0	0
All	All	288/306 (94%)	284 (99%)	4 (1%)	59	39

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	268	LEU
1	A	303	LEU
1	A	363	CYS
2	B	25	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	284	ASN
1	A	291	HIS
1	A	318	GLN
1	A	414	GLN
1	A	498	HIS
1	A	512	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](#)

1 non-standard protein/DNA/RNA residue 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	$\# Z > 2$
2	MLY	B	26	2	10,11,11	0.80	0	10,13,13	0.71	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	MLY	B	26	2	-	0/11/11/11	-

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.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 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
3	PG4	A	1	-	12,12,12	0.53	0	11,11,11	0.53	0
4	PEG	A	2	-	6,6,6	0.51	0	5,5,5	0.55	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
3	PG4	A	1	-	-	0/10/10/10	-
4	PEG	A	2	-	-	0/4/4/4	-

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.

2 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1	PG4	1	0
4	A	2	PEG	3	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 [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, 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	324/345 (93%)	0.06	13 (4%) 42 46	8, 16, 32, 43	0
2	B	2/5 (40%)	1.81	1 (50%) 0 0	35, 35, 35, 38	0
All	All	326/350 (93%)	0.07	14 (4%) 40 43	8, 16, 34, 43	0

All (14) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	337	SER	7.1
1	A	390	CYS	5.0
1	A	338	HIS	3.8
1	A	205	CYS	3.8
1	A	303	LEU	3.3
1	A	336	GLN	3.1
1	A	209	GLU	2.7
1	A	297	GLU	2.7
2	B	24	THR	2.5
1	A	332	LEU	2.4
1	A	340	PRO	2.3
1	A	334	VAL	2.2
1	A	339	SER	2.2
1	A	421	ASN	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [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($\text{\AA}^2$)	Q<0.9
2	MLY	B	26	12/12	0.92	0.08	15,21,25,27	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides 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($\text{\AA}^2$)	Q<0.9
4	PEG	A	2	7/7	0.84	0.15	41,41,42,43	0
3	PG4	A	1	13/13	0.94	0.07	17,19,24,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.