



Full wwPDB X-ray Structure Validation Report ⓘ

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PDB ID : 5LMG
Title : Yeast protein peptide complex
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Deposited on : unknown
Resolution : 1.89 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

<http://wwpdb.org/validation/2016/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 : 1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20030345
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)
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) : rb-20030345

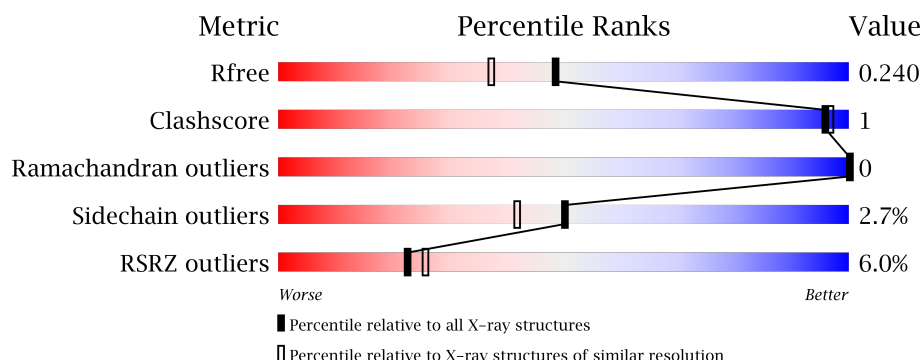
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.89 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}	100719	5047 (1.90-1.90)
Clashscore	112137	5731 (1.90-1.90)
Ramachandran outliers	110173	5669 (1.90-1.90)
Sidechain outliers	110143	5670 (1.90-1.90)
RSRZ outliers	101464	5100 (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	369	<div> <div>2%</div> <div>80%</div> <div>5%</div> <div>14%</div> </div>
1	B	369	<div> <div>7%</div> <div>82%</div> <div>5%</div> <div>13%</div> </div>
2	C	14	<div> <div>21%</div> <div>93%</div> <div>7%</div> </div>
2	D	14	<div> <div>7%</div> <div>86%</div> <div>7%</div> <div>7%</div> </div>

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit crite-

ria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	EDO	A	805	-	-	-	X
3	EDO	A	808	-	-	-	X
3	EDO	A	809	-	-	-	X
3	EDO	B	802	-	-	-	X
3	EDO	B	803	-	-	-	X
3	EDO	B	804	-	-	-	X
5	TRS	A	811	-	-	-	X

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 5655 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 DNA topoisomerase 2-associated protein PAT1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	316	Total	C	N	O	S	0	0	0
			2583	1671	422	482	8			
1	B	321	Total	C	N	O	S	0	0	0
			2615	1686	429	492	8			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	428	MET	-	initiating methionine	UNP P25644
A	429	HIS	-	expression tag	UNP P25644
A	430	HIS	-	expression tag	UNP P25644
A	431	HIS	-	expression tag	UNP P25644
A	432	HIS	-	expression tag	UNP P25644
A	433	HIS	-	expression tag	UNP P25644
A	434	HIS	-	expression tag	UNP P25644
A	706	ALA	GLN	engineered mutation	UNP P25644
A	713	ALA	LEU	engineered mutation	UNP P25644
B	428	MET	-	initiating methionine	UNP P25644
B	429	HIS	-	expression tag	UNP P25644
B	430	HIS	-	expression tag	UNP P25644
B	431	HIS	-	expression tag	UNP P25644
B	432	HIS	-	expression tag	UNP P25644
B	433	HIS	-	expression tag	UNP P25644
B	434	HIS	-	expression tag	UNP P25644
B	706	ALA	GLN	engineered mutation	UNP P25644
B	713	ALA	LEU	engineered mutation	UNP P25644

- Molecule 2 is a protein called mRNA decapping protein 2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	13	Total	C	N	O	0	0	0
			99	60	19	20			

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	D	13	Total	C	N	O	0	0	0
			101	62	20	19			

- Molecule 3 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		

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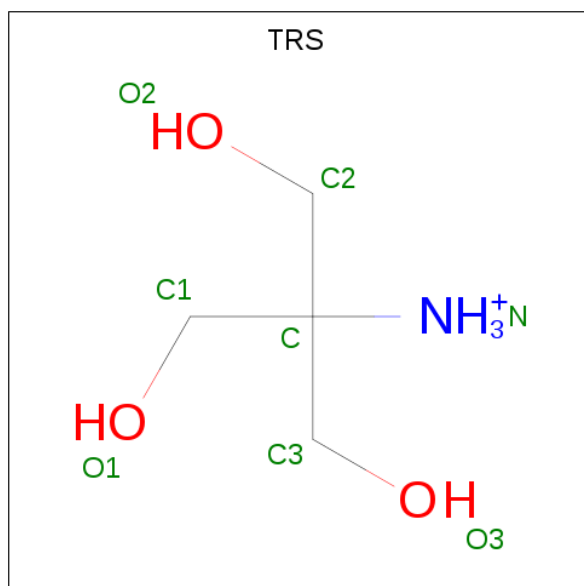
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		
3	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: $C_4H_{12}NO_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			8	4	1	3		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	112	Total	O	0	0
			112	112		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	84	Total	O	0	0
			84	84		

- Molecule 1: DNA topoisomerase 2-associated protein PAT1



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	97.69 Å 123.03 Å 126.56 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	21.82 – 1.89 48.84 – 1.89	Depositor EDS
% Data completeness (in resolution range)	96.6 (21.82-1.89) 97.2 (48.84-1.89)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.96 (at 1.90 Å)	Xtriage
Refinement program	BUSTER-TNT 2.10.2	Depositor
R, R_{free}	0.204 , 0.235 0.210 , 0.240	Depositor DCC
R_{free} test set	2953 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	46.1	Xtriage
Anisotropy	0.496	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 49.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	0.012 for -h,-l,-k	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	5655	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.39% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: TRS, MG, EDO

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	0/2623	0.59	0/3535
1	B	0.48	0/2655	0.58	0/3578
2	C	0.43	0/99	0.48	0/132
2	D	0.43	0/101	0.58	0/133
All	All	0.49	0/5478	0.58	0/7378

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	2583	0	2677	8	0
1	B	2615	0	2705	6	0
2	C	99	0	100	0	0
2	D	101	0	106	1	0
3	A	36	0	54	3	0
3	B	16	0	24	1	0
4	A	1	0	0	0	0
5	A	8	0	12	0	0
6	A	112	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	84	0	0	0	0
All	All	5655	0	5678	14	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 1.

All (14) 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:B:598:PHE:HA	3:B:803:EDO:H11	1.63	0.79
1:B:625:THR:HB	1:B:680:ILE:HG22	1.76	0.67
1:B:486:TYR:CE1	1:B:535:ILE:HG12	2.31	0.66
1:A:625:THR:HB	1:A:680:ILE:HG22	1.84	0.60
1:A:716:LYS:HE2	3:A:808:EDO:H11	1.85	0.59
1:B:599:LEU:HB3	1:B:640:ARG:HG2	1.91	0.51
1:A:743:LYS:HE2	1:A:747:GLU:HG3	1.93	0.50
1:B:638:ILE:HD11	1:B:669:LEU:HD21	1.97	0.47
1:A:785:LEU:HD22	2:D:964:LEU:HD13	1.97	0.46
1:A:666:TYR:CD1	3:A:808:EDO:H21	2.53	0.44
1:A:684:ARG:HB3	1:A:684:ARG:HE	1.64	0.43
1:B:581:LEU:HD21	1:B:690:ILE:HD12	2.02	0.41
1:A:681:PHE:HB3	3:A:804:EDO:H21	2.03	0.41
1:A:795:LEU:HG	1:A:796:LYS:HD2	2.03	0.40

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	312/369 (85%)	309 (99%)	3 (1%)	0	100	100
1	B	317/369 (86%)	315 (99%)	2 (1%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	C	11/14 (79%)	11 (100%)	0	0	100	100
2	D	11/14 (79%)	11 (100%)	0	0	100	100
All	All	651/766 (85%)	646 (99%)	5 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	295/338 (87%)	286 (97%)	9 (3%)	45	36
1	B	300/338 (89%)	292 (97%)	8 (3%)	50	42
2	C	12/13 (92%)	12 (100%)	0	100	100
2	D	12/13 (92%)	12 (100%)	0	100	100
All	All	619/702 (88%)	602 (97%)	17 (3%)	50	42

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	468	ASN
1	A	469	LEU
1	A	501	GLN
1	A	513	ILE
1	A	549	LEU
1	A	552	LEU
1	A	554	LYS
1	A	615	LEU
1	A	684	ARG
1	B	509	GLU
1	B	535	ILE
1	B	692	ARG
1	B	730	GLU
1	B	739	GLU

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Mol	Chain	Res	Type
1	B	759	ASP
1	B	782	VAL
1	B	791	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no carbohydrates in this entry.

5.6 Ligand geometry ⓘ

Of 15 ligands modelled in this entry, 1 is monoatomic - leaving 14 for Mogul analysis.

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	EDO	A	801	-	3,3,3	0.58	0	2,2,2	0.36	0
3	EDO	A	802	-	3,3,3	0.52	0	2,2,2	0.34	0
3	EDO	A	803	-	3,3,3	0.60	0	2,2,2	0.33	0
3	EDO	A	804	-	3,3,3	0.59	0	2,2,2	0.29	0
3	EDO	A	805	-	3,3,3	0.60	0	2,2,2	0.18	0
3	EDO	A	806	-	3,3,3	0.53	0	2,2,2	0.46	0
3	EDO	A	807	-	3,3,3	0.51	0	2,2,2	0.44	0
3	EDO	A	808	-	3,3,3	0.53	0	2,2,2	0.32	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	A	809	-	3,3,3	0.66	0	2,2,2	0.05	0
5	TRS	A	811	-	7,7,7	0.34	0	9,9,9	0.36	0
3	EDO	B	801	-	3,3,3	0.44	0	2,2,2	0.36	0
3	EDO	B	802	-	3,3,3	0.55	0	2,2,2	0.28	0
3	EDO	B	803	-	3,3,3	0.51	0	2,2,2	0.36	0
3	EDO	B	804	-	3,3,3	0.63	0	2,2,2	0.24	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	EDO	A	801	-	-	0/1/1/1	0/0/0/0
3	EDO	A	802	-	-	0/1/1/1	0/0/0/0
3	EDO	A	803	-	-	0/1/1/1	0/0/0/0
3	EDO	A	804	-	-	0/1/1/1	0/0/0/0
3	EDO	A	805	-	-	0/1/1/1	0/0/0/0
3	EDO	A	806	-	-	0/1/1/1	0/0/0/0
3	EDO	A	807	-	-	0/1/1/1	0/0/0/0
3	EDO	A	808	-	-	0/1/1/1	0/0/0/0
3	EDO	A	809	-	-	0/1/1/1	0/0/0/0
5	TRS	A	811	-	-	0/9/9/9	0/0/0/0
3	EDO	B	801	-	-	0/1/1/1	0/0/0/0
3	EDO	B	802	-	-	0/1/1/1	0/0/0/0
3	EDO	B	803	-	-	0/1/1/1	0/0/0/0
3	EDO	B	804	-	-	0/1/1/1	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.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	804	EDO	1	0
3	A	808	EDO	2	0
3	B	803	EDO	1	0

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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	316/369 (85%)	0.18	9 (2%) 53 57	39, 50, 79, 102	0
1	B	321/369 (86%)	0.42	27 (8%) 12 13	37, 56, 91, 142	0
2	C	13/14 (92%)	1.47	3 (23%) 1 1	50, 66, 87, 121	0
2	D	13/14 (92%)	0.44	1 (7%) 14 16	51, 58, 82, 84	0
All	All	663/766 (86%)	0.33	40 (6%) 23 26	37, 54, 85, 142	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	C	957	THR	8.4
1	B	517	SER	6.3
2	C	969	ARG	5.5
1	A	659	ILE	5.4
1	B	753	GLN	4.7
1	B	476	LYS	4.6
1	B	477	PHE	4.6
1	B	514	ASP	4.1
1	B	516	SER	4.0
1	B	515	ASP	3.7
1	A	469	LEU	3.7
1	B	481	LEU	3.7
1	B	509	GLU	3.6
1	A	472	SER	3.4
1	A	752	PRO	3.3
1	B	513	ILE	3.3
1	B	475	LYS	3.2
2	D	960	SER	3.1
1	B	521	ASN	3.0
1	B	478	ILE	3.0
1	B	474	GLY	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	561	HIS	2.9
1	A	471	LYS	2.8
1	A	519	ASP	2.8
1	B	603	SER	2.7
1	B	512	HIS	2.7
1	B	473	GLY	2.7
1	B	754	ARG	2.6
1	B	758	LEU	2.6
1	B	752	PRO	2.5
1	B	479	LEU	2.5
1	B	510	ALA	2.3
1	A	753	GLN	2.2
1	A	470	ASN	2.2
1	B	508	TRP	2.2
1	B	787	TYR	2.1
1	A	796	LYS	2.1
1	B	750	VAL	2.1
1	B	522	PRO	2.0
2	C	961	ASN	2.0

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 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, 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	LLDF	B-factors(Å ²)	Q<0.9
3	EDO	A	808	4/4	0.83	0.23	19.56	56,57,58,60	0
3	EDO	B	802	4/4	0.93	0.22	14.18	73,73,73,75	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
3	EDO	B	803	4/4	0.84	0.19	4.30	68,69,69,71	0
5	TRS	A	811	8/8	0.74	0.18	3.76	60,64,65,67	0
3	EDO	A	809	4/4	0.74	0.21	3.55	64,65,66,68	0
3	EDO	B	804	4/4	0.69	0.17	2.58	56,60,62,65	0
3	EDO	A	805	4/4	0.76	0.19	2.37	73,75,77,78	0
3	EDO	A	806	4/4	0.93	0.14	1.40	57,58,59,59	0
3	EDO	A	807	4/4	0.89	0.13	1.18	68,68,68,69	0
3	EDO	B	801	4/4	0.88	0.16	1.13	55,57,58,62	0
3	EDO	A	802	4/4	0.96	0.13	1.12	56,57,58,60	0
3	EDO	A	803	4/4	0.59	0.17	-	86,86,87,87	0
3	EDO	A	801	4/4	0.53	0.26	-	97,97,97,97	0
3	EDO	A	804	4/4	0.68	0.25	-	65,65,66,67	0
4	MG	A	810	1/1	0.99	0.03	-	51,51,51,51	1

6.5 Other polymers [i](#)

There are no such residues in this entry.