



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:51 PM UTC

PDB ID : 2G0T / pdb_00002g0t
Title : Crystal structure of a putative nucleotide binding protein (tm0796) from *Thermotoga maritima* at 2.67 Å resolution
Authors : Joint Center for Structural Genomics (JCSG)
Deposited on : 2006-02-13
Resolution : 2.67 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

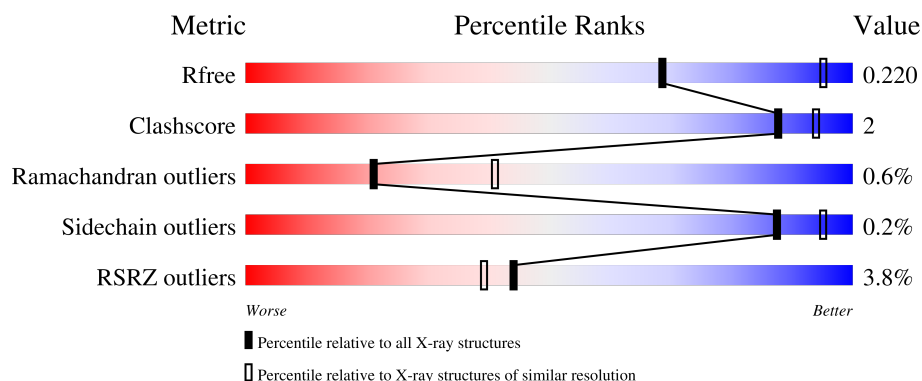
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.67 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	5070 (2.70-2.66)
Clashscore	190562	5409 (2.70-2.66)
Ramachandran outliers	187476	5324 (2.70-2.66)
Sidechain outliers	187428	5324 (2.70-2.66)
RSRZ outliers	180081	5070 (2.70-2.66)

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	350	5% 87% 8% • •
1	B	350	2% 88% 9% •

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5370 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 conserved hypothetical protein.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	337	Total	C	N	O	S	Se	0	2	0
			2595	1674	438	475	2	6			
1	B	339	Total	C	N	O	S	Se	0	1	0
			2602	1677	437	480	2	6			

There are 36 discrepancies between the modelled and reference sequences:

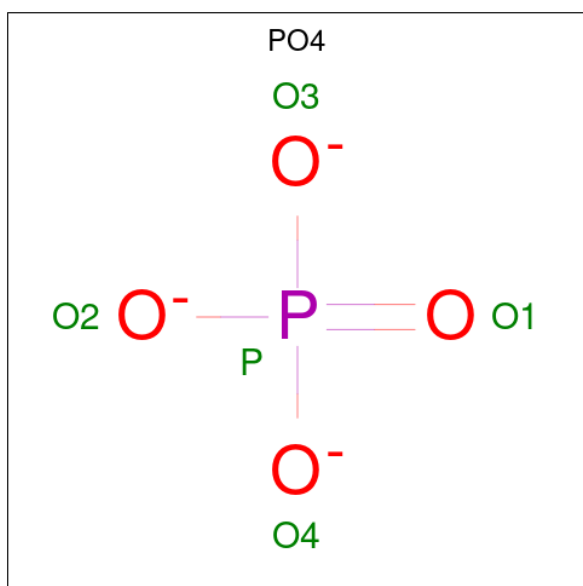
Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MSE	-	expression tag	GB 4981325
A	-10	GLY	-	expression tag	GB 4981325
A	-9	SER	-	expression tag	GB 4981325
A	-8	ASP	-	expression tag	GB 4981325
A	-7	LYS	-	expression tag	GB 4981325
A	-6	ILE	-	expression tag	GB 4981325
A	-5	HIS	-	expression tag	GB 4981325
A	-4	HIS	-	expression tag	GB 4981325
A	-3	HIS	-	expression tag	GB 4981325
A	-2	HIS	-	expression tag	GB 4981325
A	-1	HIS	-	expression tag	GB 4981325
A	0	HIS	-	expression tag	GB 4981325
A	1	MSE	MET	modified residue	GB 4981325
A	52	MSE	MET	modified residue	GB 4981325
A	76	MSE	MET	modified residue	GB 4981325
A	108	MSE	MET	modified residue	GB 4981325
A	331	MSE	MET	modified residue	GB 4981325
A	336	MSE	MET	modified residue	GB 4981325
B	-11	MSE	-	expression tag	GB 4981325
B	-10	GLY	-	expression tag	GB 4981325
B	-9	SER	-	expression tag	GB 4981325
B	-8	ASP	-	expression tag	GB 4981325
B	-7	LYS	-	expression tag	GB 4981325
B	-6	ILE	-	expression tag	GB 4981325
B	-5	HIS	-	expression tag	GB 4981325

Continued on next page...

Continued from previous page...

Chain	Residue	Modelled	Actual	Comment	Reference
B	-4	HIS	-	expression tag	GB 4981325
B	-3	HIS	-	expression tag	GB 4981325
B	-2	HIS	-	expression tag	GB 4981325
B	-1	HIS	-	expression tag	GB 4981325
B	0	HIS	-	expression tag	GB 4981325
B	1	MSE	MET	modified residue	GB 4981325
B	52	MSE	MET	modified residue	GB 4981325
B	76	MSE	MET	modified residue	GB 4981325
B	108	MSE	MET	modified residue	GB 4981325
B	331	MSE	MET	modified residue	GB 4981325
B	336	MSE	MET	modified residue	GB 4981325

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O₄P).



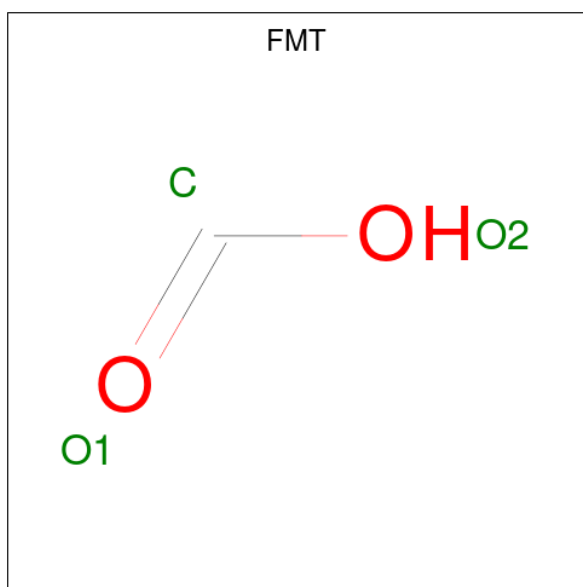
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	P	0	0
			5	4	1		
2	B	1	Total	O	P	0	0
			5	4	1		

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: 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	B	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is FORMIC ACID (CCD ID: FMT) (formula: CH_2O_2).



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

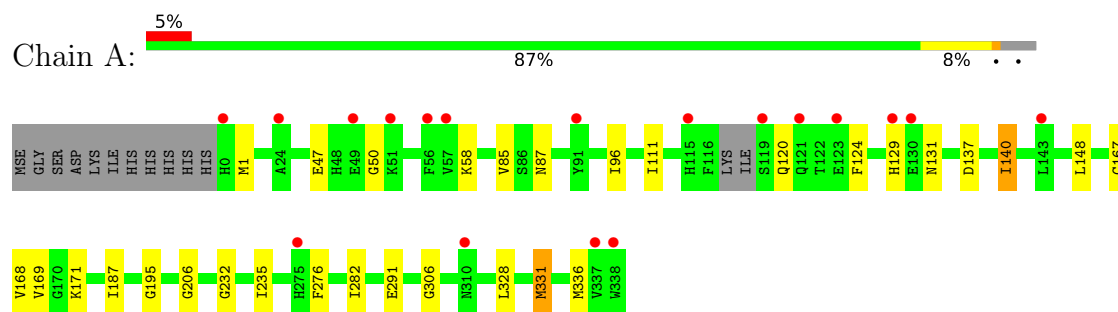
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	63	Total 63	O 63	0	0
5	B	85	Total 85	O 85	0	0

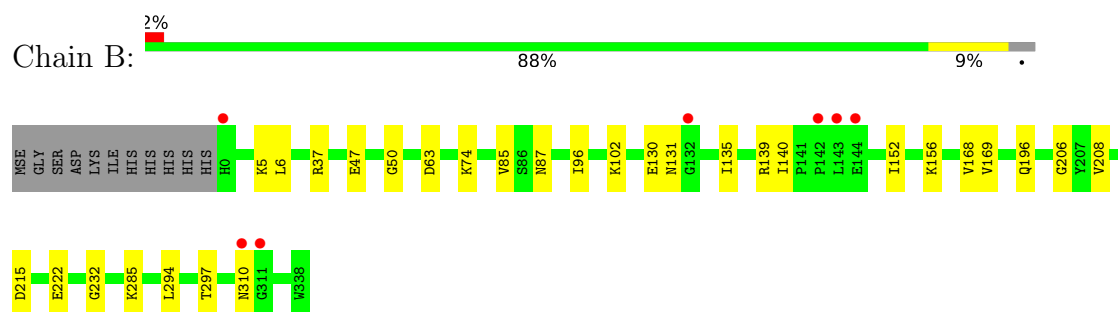
3 Residue-property plots [i](#)

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: conserved hypothetical protein



- Molecule 1: conserved hypothetical protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 3 2	Depositor
Cell constants a, b, c, α , β , γ	191.63Å 191.63Å 191.63Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.57 – 2.67 29.57 – 2.67	Depositor EDS
% Data completeness (in resolution range)	99.6 (29.57-2.67) 99.4 (29.57-2.67)	Depositor EDS
R_{merge}	0.19	Depositor
R_{sym}	0.19	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.02 (at 2.68Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.207 , 0.238 (Not available) , 0.220	Depositor DCC
R_{free} test set	1734 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	35.9	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 43.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	5370	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.37% 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: FMT, EDO, PO4

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	0.52	0/2651	1.39	18/3584 (0.5%)
1	B	0.54	0/2654	1.38	20/3590 (0.6%)
All	All	0.53	0/5305	1.39	38/7174 (0.5%)

There are no bond length outliers.

All (38) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	331	MSE	CG-SE-CE	8.66	117.97	98.92
1	B	232	GLY	N-CA-C	6.73	124.92	115.43
1	B	140	ILE	N-CA-CB	6.61	117.51	110.17
1	A	140	ILE	N-CA-CB	6.42	117.30	110.17
1	A	282	ILE	N-CA-C	-6.32	100.84	107.60
1	A	276	PHE	N-CA-C	-6.22	101.07	110.28
1	A	1	MSE	CG-SE-CE	6.17	112.49	98.92
1	B	206	GLY	N-CA-C	6.04	118.57	111.63
1	A	169	VAL	CB-CA-C	-5.93	104.21	110.62
1	A	206	GLY	N-CA-C	5.85	118.36	111.63
1	A	232	GLY	N-CA-C	5.81	123.38	115.30
1	B	5	LYS	CB-CG-CD	5.79	124.61	111.30
1	B	208	VAL	N-CA-C	-5.72	98.26	106.55
1	A	291	GLU	N-CA-C	-5.65	105.04	111.14
1	A	129	HIS	CA-C-O	-5.54	115.00	120.82
1	B	131	ASN	N-CA-CB	-5.54	101.84	110.98
1	B	139	ARG	CG-CD-NE	-5.44	100.03	112.00
1	A	111	ILE	N-CA-CB	5.43	118.70	111.64
1	B	169	VAL	CB-CA-C	-5.39	104.79	110.62
1	A	50	GLY	N-CA-C	5.36	122.47	115.40
1	B	74	LYS	CA-CB-CG	5.33	124.77	114.10
1	B	63	ASP	N-CA-C	-5.31	101.32	109.76

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	120	GLN	N-CA-C	-5.31	106.67	112.72
1	B	102	LYS	CA-CB-CG	5.31	124.72	114.10
1	A	167	CYS	N-CA-C	-5.24	103.78	110.53
1	B	215	ASP	N-CA-C	5.21	118.42	111.75
1	B	215	ASP	CB-CA-C	-5.21	100.36	110.46
1	B	50	GLY	N-CA-C	5.20	122.49	115.32
1	B	130	GLU	N-CA-C	5.18	119.44	113.18
1	B	37	ARG	N-CA-CB	-5.17	103.71	110.59
1	B	135	ILE	N-CA-CB	5.14	118.15	111.67
1	A	129	HIS	N-CA-C	-5.11	105.60	111.07
1	A	131	ASN	CA-CB-CG	-5.11	107.50	112.60
1	B	285	LYS	N-CA-C	5.10	114.16	108.25
1	A	306	GLY	N-CA-C	-5.09	102.84	112.51
1	B	6	LEU	N-CA-C	5.09	119.56	112.90
1	B	156	LYS	CB-CA-C	5.01	117.11	109.34
1	A	124	PHE	N-CA-CB	5.00	117.47	110.12

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	2595	0	2614	13	0
1	B	2602	0	2629	8	0
2	A	5	0	0	1	0
2	B	5	0	0	0	0
3	A	8	0	12	1	0
3	B	4	0	6	0	0
4	B	3	0	1	0	0
5	A	63	0	0	0	0
5	B	85	0	0	0	0
All	All	5370	0	5262	21	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 2.

All (21) 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:328:LEU:HA	1:A:331:MSE:HE3	1.62	0.80
1:A:85:VAL:HG21	1:A:96:ILE:HD13	1.75	0.68
1:A:85:VAL:HG21	1:A:96:ILE:CD1	2.30	0.61
1:B:168:VAL:HG12	1:B:168:VAL:O	2.01	0.61
1:A:195:GLY:HA3	3:A:341:EDO:H11	1.85	0.57
1:A:328:LEU:HD23	1:A:331:MSE:HE3	1.85	0.57
1:A:187:ILE:HD13	1:A:336:MSE:HE1	1.89	0.54
1:A:328:LEU:HD23	1:A:331:MSE:CE	2.41	0.49
1:A:137:ASP:CG	1:A:140:ILE:HG12	2.38	0.48
1:A:328:LEU:CA	1:A:331:MSE:HE3	2.38	0.48
1:A:235:ILE:HD13	1:A:336:MSE:HE2	1.95	0.48
1:B:294:LEU:HA	1:B:297:THR:HG22	1.96	0.47
1:A:171:LYS:HE3	2:A:339:PO4:O1	2.15	0.46
1:B:310:ASN:O	1:B:310:ASN:CG	2.59	0.46
1:B:168:VAL:O	1:B:168:VAL:CG1	2.66	0.43
1:A:168:VAL:O	1:A:168:VAL:HG12	2.19	0.43
1:B:152:ILE:HB	1:B:222:GLU:HG3	2.00	0.43
1:B:85:VAL:HG21	1:B:96:ILE:CD1	2.50	0.42
1:B:196[B]:GLN:H	1:B:196[B]:GLN:CD	2.27	0.42
1:B:85:VAL:HG21	1:B:96:ILE:HD13	2.01	0.41
1:A:148:LEU:HD23	1:A:148:LEU:C	2.46	0.41

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	335/350 (96%)	325 (97%)	8 (2%)	2 (1%)	21	41
1	B	338/350 (97%)	329 (97%)	7 (2%)	2 (1%)	21	41
All	All	673/700 (96%)	654 (97%)	15 (2%)	4 (1%)	21	41

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	47	GLU
1	B	47	GLU
1	B	87	ASN
1	A	87	ASN

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	272/283 (96%)	271 (100%)	1 (0%)	84	93
1	B	274/283 (97%)	274 (100%)	0	100	100
All	All	546/566 (96%)	545 (100%)	1 (0%)	87	95

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	58	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	121	GLN
1	A	196	GLN
1	A	300	ASN
1	B	48	HIS

5.3.3 RNA ⓘ

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

6 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	FMT	B	341	-	2,2,2	0.70	0	1,1,1	0.29	0
2	PO4	B	339	-	4,4,4	0.96	0	6,6,6	1.89	1 (16%)
3	EDO	A	340	-	3,3,3	0.47	0	2,2,2	0.25	0
3	EDO	A	341	-	3,3,3	0.46	0	2,2,2	0.86	0
2	PO4	A	339	-	4,4,4	0.82	0	6,6,6	2.23	3 (50%)
3	EDO	B	340	-	3,3,3	0.49	0	2,2,2	0.38	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	341	-	-	1/1/1/1	-
3	EDO	B	340	-	-	1/1/1/1	-
3	EDO	A	340	-	-	1/1/1/1	-

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	339	PO4	O3-P-O2	3.70	119.41	107.91
2	A	339	PO4	O4-P-O1	-3.29	99.32	110.95
2	A	339	PO4	O3-P-O2	3.00	117.25	107.91
2	A	339	PO4	O4-P-O3	2.16	114.65	107.91

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	340	EDO	O1-C1-C2-O2
3	A	341	EDO	O1-C1-C2-O2
3	B	340	EDO	O1-C1-C2-O2

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	341	EDO	1	0
2	A	339	PO4	1	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	331/350 (94%)	0.33	18 (5%) 31 27	16, 34, 45, 61	2 (0%)
1	B	333/350 (95%)	-0.06	7 (2%) 63 60	19, 34, 43, 60	1 (0%)
All	All	664/700 (94%)	0.13	25 (3%) 44 39	16, 34, 44, 61	3 (0%)

All (25) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	0	HIS	4.7
1	B	144	GLU	4.0
1	B	132	GLY	3.7
1	A	24	ALA	3.4
1	B	310	ASN	3.2
1	A	0	HIS	3.0
1	A	121	GLN	2.7
1	A	56	PHE	2.7
1	A	337	VAL	2.7
1	A	49	GLU	2.6
1	A	310	ASN	2.6
1	A	91	TYR	2.6
1	A	143	LEU	2.5
1	A	275[A]	HIS	2.5
1	B	142	PRO	2.5
1	B	143	LEU	2.5
1	A	129	HIS	2.5
1	A	130	GLU	2.4
1	A	119	SER	2.4
1	A	115	HIS	2.4
1	A	123	GLU	2.4
1	B	311	GLY	2.3
1	A	338	TRP	2.2
1	A	57	VAL	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	51	LYS	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 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(Å ²)	Q<0.9
3	EDO	B	340	4/4	0.91	0.11	40,40,40,41	0
3	EDO	A	341	4/4	0.92	0.11	39,39,39,39	0
3	EDO	A	340	4/4	0.92	0.11	41,42,42,42	0
4	FMT	B	341	3/3	0.97	0.09	43,43,43,43	0
2	PO4	A	339	5/5	0.99	0.12	19,20,22,23	0
2	PO4	B	339	5/5	0.99	0.06	21,22,22,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.