



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 02:55 PM UTC

PDB ID : 1DEA / pdb_00001dea
Title : STRUCTURE AND CATALYTIC MECHANISM OF GLUCOSAMINE
6-PHOSPHATE DEAMINASE FROM ESCHERICHIA COLI AT 2.1
ANGSTROMS RESOLUTION
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Deposited on : 1995-09-13
Resolution : 2.10 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)	:	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

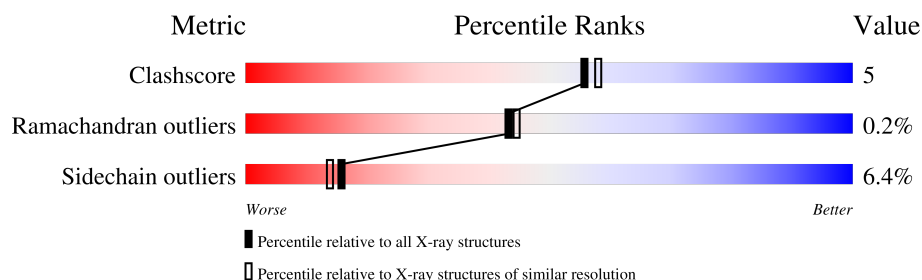
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)

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	266	 77% 18% . .
1	B	266	 80% 17% . .

2 Entry composition [i](#)

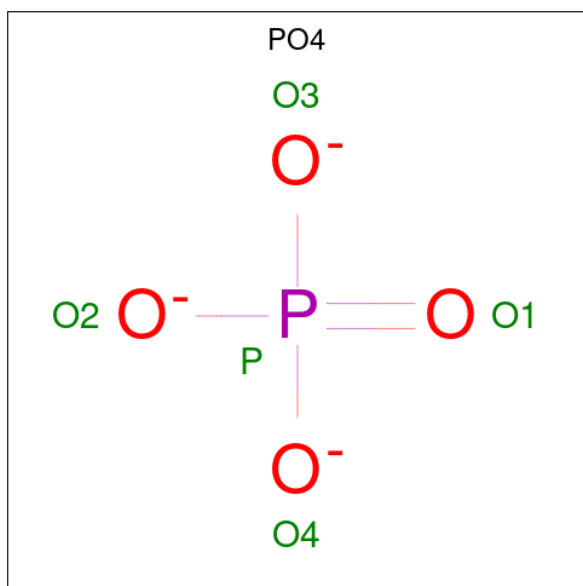
There are 3 unique types of molecules in this entry. The entry contains 4552 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 GLUCOSAMINE 6-PHOSPHATE DEAMINASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	266	Total	C	N	O	S	0	0	0
			2092	1328	364	386	14			
1	B	266	Total	C	N	O	S	0	0	0
			2092	1328	364	386	14			

- Molecule 2 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



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

- Molecule 3 is water.

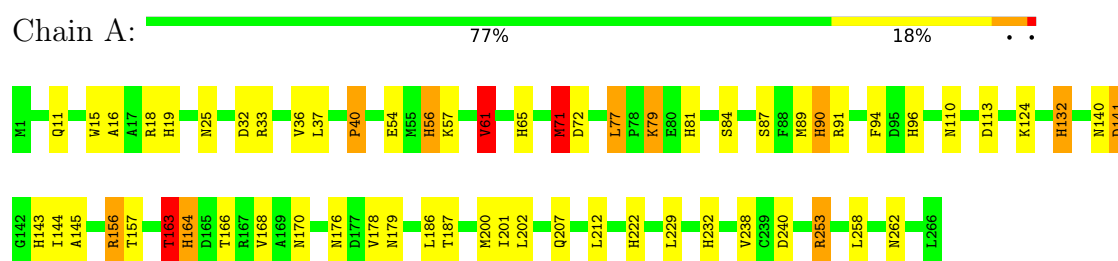
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	169	Total 169	O 169	0	0
3	B	179	Total 179	O 179	0	0

3 Residue-property plots

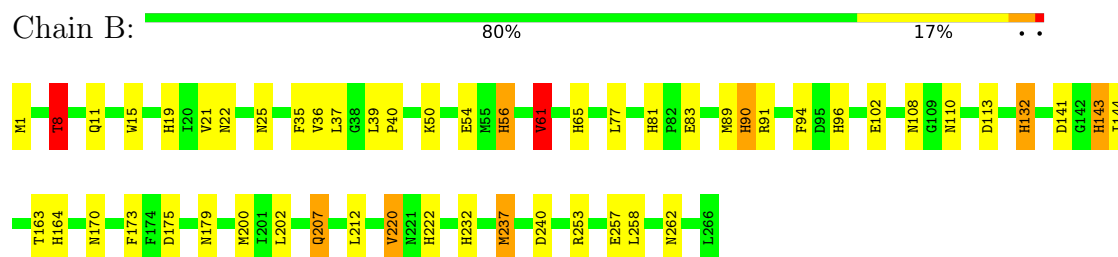
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: GLUCOSAMINE 6-PHOSPHATE DEAMINASE



• Molecule 1: GLUCOSAMINE 6-PHOSPHATE DEAMINASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	H 3 2	Depositor
Cell constants a, b, c, α , β , γ	125.71Å 125.71Å 222.87Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	6.00 – 2.10	Depositor
% Data completeness (in resolution range)	(Not available) (6.00-2.10)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.174 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4552	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.89	11/2139 (0.5%)	1.49	28/2898 (1.0%)
1	B	0.90	12/2139 (0.6%)	1.53	33/2898 (1.1%)
All	All	0.90	23/4278 (0.5%)	1.51	61/5796 (1.1%)

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	90	HIS	CD2-NE2	-7.11	1.30	1.37
1	B	222	HIS	CD2-NE2	-7.05	1.30	1.37
1	A	56	HIS	CD2-NE2	-7.00	1.30	1.37
1	A	132	HIS	CD2-NE2	-6.78	1.30	1.37
1	A	164	HIS	CD2-NE2	-6.68	1.30	1.37
1	A	90	HIS	CD2-NE2	-6.66	1.30	1.37
1	A	81	HIS	CD2-NE2	-6.60	1.30	1.37
1	A	232	HIS	CD2-NE2	-6.55	1.30	1.37
1	A	222	HIS	CD2-NE2	-6.53	1.30	1.37
1	A	96	HIS	CD2-NE2	-6.41	1.30	1.37
1	B	65	HIS	CD2-NE2	-6.40	1.30	1.37
1	A	65	HIS	CD2-NE2	-6.37	1.30	1.37
1	B	96	HIS	CD2-NE2	-6.34	1.30	1.37
1	B	232	HIS	CD2-NE2	-6.34	1.30	1.37
1	B	143	HIS	CD2-NE2	-6.30	1.30	1.37
1	B	56	HIS	CD2-NE2	-6.29	1.30	1.37
1	B	164	HIS	CD2-NE2	-6.27	1.30	1.37
1	B	220	VAL	CA-CB	6.25	1.62	1.54
1	B	19	HIS	CD2-NE2	-6.23	1.30	1.37
1	A	19	HIS	CD2-NE2	-6.20	1.31	1.37
1	B	132	HIS	CD2-NE2	-6.02	1.31	1.37
1	B	81	HIS	CD2-NE2	-5.91	1.31	1.37
1	A	143	HIS	CD2-NE2	-5.74	1.31	1.37

All (61) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	143	HIS	CA-CB-CG	8.58	122.38	113.80
1	B	143	HIS	CA-CB-CG	8.22	122.02	113.80
1	B	8	THR	N-CA-CB	-7.60	98.08	111.08
1	A	141	ASP	CA-CB-CG	7.59	120.19	112.60
1	B	77	LEU	N-CA-C	-7.30	100.23	110.31
1	A	25	ASN	OD1-CG-ND2	-7.17	115.43	122.60
1	A	90	HIS	CA-CB-CG	-7.07	106.73	113.80
1	B	61	VAL	CB-CA-C	-7.03	98.53	111.18
1	A	71	MET	N-CA-C	6.83	118.38	111.07
1	A	240	ASP	CA-CB-CG	6.45	119.05	112.60
1	B	143	HIS	CB-CG-CD2	-6.44	122.83	131.20
1	A	232	HIS	CB-CG-CD2	-6.42	122.85	131.20
1	A	56	HIS	CB-CG-CD2	-6.37	122.92	131.20
1	B	90	HIS	CB-CG-CD2	-6.34	122.96	131.20
1	A	90	HIS	CB-CG-CD2	-6.33	122.97	131.20
1	B	143	HIS	CB-CG-ND1	6.21	132.01	122.70
1	B	144	ILE	N-CA-C	-6.20	99.48	108.17
1	B	232	HIS	CB-CG-CD2	-6.20	123.14	131.20
1	A	81	HIS	CB-CG-CD2	-6.13	123.22	131.20
1	A	176	ASN	N-CA-C	6.09	119.93	111.90
1	B	240	ASP	CA-CB-CG	6.07	118.67	112.60
1	A	132	HIS	CB-CG-CD2	-6.06	123.32	131.20
1	B	22	ASN	OD1-CG-ND2	-6.01	116.59	122.60
1	A	96	HIS	CB-CG-CD2	-5.96	123.45	131.20
1	B	102	GLU	CA-CB-CG	5.92	125.95	114.10
1	A	164	HIS	CB-CG-CD2	-5.84	123.60	131.20
1	B	96	HIS	CB-CG-CD2	-5.82	123.63	131.20
1	A	77	LEU	N-CA-C	-5.76	102.36	110.31
1	B	25	ASN	OD1-CG-ND2	-5.75	116.84	122.60
1	A	61	VAL	CB-CA-C	-5.75	100.43	110.71
1	B	110	ASN	N-CA-C	-5.73	104.03	111.71
1	A	65	HIS	CB-CG-CD2	-5.73	123.75	131.20
1	A	163	THR	N-CA-CB	-5.72	101.62	110.04
1	B	257	GLU	CA-CB-CG	5.70	125.49	114.10
1	B	164	HIS	CB-CG-CD2	-5.67	123.83	131.20
1	B	65	HIS	CB-CG-CD2	-5.61	123.91	131.20
1	A	156	ARG	NE-CZ-NH2	-5.60	114.16	119.20
1	A	179	ASN	OD1-CG-ND2	-5.52	117.08	122.60
1	B	102	GLU	CB-CA-C	-5.52	100.42	110.63
1	B	170	ASN	OD1-CG-ND2	-5.51	117.09	122.60
1	A	84	SER	N-CA-C	-5.49	102.75	110.50
1	B	108	ASN	OD1-CG-ND2	-5.48	117.12	122.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	258	LEU	CB-CA-C	-5.44	101.76	110.79
1	B	113	ASP	CA-CB-CG	5.36	117.96	112.60
1	B	132	HIS	CB-CG-CD2	-5.33	124.27	131.20
1	A	170	ASN	OD1-CG-ND2	-5.32	117.28	122.60
1	B	39	LEU	CA-C-N	5.27	126.42	119.84
1	B	39	LEU	C-N-CA	5.27	126.42	119.84
1	B	56	HIS	CB-CG-CD2	-5.24	124.39	131.20
1	A	144	ILE	N-CA-C	-5.22	100.86	108.17
1	B	179	ASN	OD1-CG-ND2	-5.21	117.39	122.60
1	B	90	HIS	CB-CG-ND1	5.21	130.51	122.70
1	A	18	ARG	CB-CG-CD	-5.18	99.38	111.30
1	A	132	HIS	CB-CG-ND1	5.18	130.47	122.70
1	B	35	PHE	N-CA-C	-5.17	101.27	109.96
1	A	11	GLN	OE1-CD-NE2	-5.13	117.47	122.60
1	B	207	GLN	OE1-CD-NE2	-5.09	117.50	122.60
1	B	108	ASN	CB-CG-ND2	5.08	124.02	116.40
1	A	140	ASN	OD1-CG-ND2	-5.04	117.56	122.60
1	A	113	ASP	CA-CB-CG	5.02	117.62	112.60
1	B	175	ASP	CA-CB-CG	5.01	117.61	112.60

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	2092	0	2081	26	0
1	B	2092	0	2081	13	0
2	A	10	0	0	0	0
2	B	10	0	0	0	0
3	A	169	0	0	6	0
3	B	179	0	0	2	0
All	All	4552	0	4162	39	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 5.

All (39) 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:16:ALA:HA	1:A:200:MET:HE1	1.55	0.88
1:A:200:MET:HE3	1:A:238:VAL:HG21	1.63	0.79
1:A:71:MET:HE3	1:A:145:ALA:HA	1.62	0.79
1:A:36:VAL:H	1:A:132:HIS:HD2	1.34	0.73
1:A:200:MET:SD	3:A:406:HOH:O	2.52	0.66
1:B:36:VAL:H	1:B:132:HIS:HD2	1.40	0.66
1:A:253:ARG:HB2	1:A:253:ARG:HH11	1.64	0.63
1:A:56:HIS:HD2	1:A:61:VAL:O	1.85	0.59
1:B:8:THR:HG22	1:B:11:GLN:H	1.67	0.58
1:B:8:THR:HG21	3:B:343:HOH:O	2.02	0.58
1:A:163:THR:HG22	1:A:166:THR:H	1.69	0.58
1:B:90:HIS:HD2	3:B:289:HOH:O	1.88	0.57
1:A:201:ILE:HG13	1:A:229:LEU:HD11	1.88	0.55
1:A:200:MET:CE	1:A:238:VAL:HG21	2.35	0.54
1:A:87:SER:HB3	1:A:91:ARG:HH21	1.74	0.52
1:A:15:TRP:HZ2	1:A:262:ASN:HD21	1.58	0.52
1:A:79:LYS:NZ	1:A:110:ASN:HD22	2.09	0.51
1:B:21:VAL:HG13	1:B:61:VAL:HG13	1.93	0.51
1:A:164:HIS:HD2	3:A:375:HOH:O	1.94	0.50
1:B:56:HIS:HD2	1:B:61:VAL:O	1.96	0.48
1:B:1:MET:SD	1:B:237:MET:HE2	2.54	0.48
1:A:90:HIS:HA	1:A:94:PHE:HB2	1.96	0.48
1:A:79:LYS:HZ1	1:A:110:ASN:HD22	1.63	0.45
1:A:141:ASP:HB3	3:A:421:HOH:O	2.17	0.44
1:A:157:THR:HA	1:A:187:THR:O	2.18	0.44
1:A:89:MET:HB3	1:A:94:PHE:CE2	2.54	0.43
1:A:156:ARG:HD3	1:A:156:ARG:HA	1.83	0.43
1:B:15:TRP:HZ3	1:B:200:MET:CE	2.31	0.42
1:B:50:LYS:O	1:B:54:GLU:HG3	2.20	0.42
1:A:71:MET:HE2	3:A:278:HOH:O	2.19	0.41
1:B:15:TRP:HZ3	1:B:200:MET:HE2	1.85	0.41
1:A:168:VAL:HA	1:A:178:VAL:HG22	2.02	0.41
1:A:54:GLU:HA	1:A:57:LYS:HE2	2.01	0.41
1:B:83:GLU:HG3	1:B:173:PHE:O	2.20	0.41
1:B:141:ASP:OD1	1:B:143:HIS:HD2	2.04	0.41
1:A:71:MET:HE1	3:A:363:HOH:O	2.21	0.41
1:A:207:GLN:HB2	3:A:325:HOH:O	2.20	0.40
1:B:89:MET:HB3	1:B:94:PHE:CE2	2.57	0.40
1:A:168:VAL:HG22	1:A:178:VAL:HG21	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	264/266 (99%)	252 (96%)	11 (4%)	1 (0%)	30	28
1	B	264/266 (99%)	254 (96%)	10 (4%)	0	100	100
All	All	528/532 (99%)	506 (96%)	21 (4%)	1 (0%)	43	44

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	40	PRO

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	227/227 (100%)	211 (93%)	16 (7%)	14	11
1	B	227/227 (100%)	214 (94%)	13 (6%)	18	17
All	All	454/454 (100%)	425 (94%)	29 (6%)	16	14

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	32	ASP
1	A	33	ARG

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Mol	Chain	Res	Type
1	A	37	LEU
1	A	40	PRO
1	A	61	VAL
1	A	71	MET
1	A	72	ASP
1	A	77	LEU
1	A	79	LYS
1	A	124	LYS
1	A	163	THR
1	A	186	LEU
1	A	202	LEU
1	A	212	LEU
1	A	253	ARG
1	A	258	LEU
1	B	8	THR
1	B	37	LEU
1	B	40	PRO
1	B	61	VAL
1	B	91	ARG
1	B	163	THR
1	B	202	LEU
1	B	207	GLN
1	B	212	LEU
1	B	220	VAL
1	B	237	MET
1	B	253	ARG
1	B	262	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	22	ASN
1	A	56	HIS
1	A	110	ASN
1	A	132	HIS
1	A	140	ASN
1	A	143	HIS
1	A	207	GLN
1	A	262	ASN
1	B	22	ASN
1	B	56	HIS
1	B	110	ASN

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Mol	Chain	Res	Type
1	B	132	HIS
1	B	213	GLN

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

4 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	PO4	A	268	-	4,4,4	2.65	3 (75%)	6,6,6	0.41	0
2	PO4	B	268	-	4,4,4	2.64	3 (75%)	6,6,6	0.49	0
2	PO4	B	267	-	4,4,4	3.05	3 (75%)	6,6,6	0.51	0
2	PO4	A	267	-	4,4,4	2.93	3 (75%)	6,6,6	0.56	0

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	267	PO4	P-O3	-3.49	1.44	1.54
2	B	267	PO4	P-O2	-3.35	1.44	1.54

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	267	PO4	P-O3	-3.33	1.44	1.54
2	B	267	PO4	P-O4	-3.19	1.45	1.54
2	A	267	PO4	P-O2	-3.18	1.45	1.54
2	A	267	PO4	P-O4	-3.12	1.45	1.54
2	A	268	PO4	P-O4	-3.05	1.45	1.54
2	A	268	PO4	P-O3	-2.92	1.46	1.54
2	B	268	PO4	P-O3	-2.87	1.46	1.54
2	B	268	PO4	P-O2	-2.84	1.46	1.54
2	B	268	PO4	P-O4	-2.82	1.46	1.54
2	A	268	PO4	P-O2	-2.70	1.46	1.54

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

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.