



# Full wwPDB X-ray Structure Validation Report ⓘ

May 25, 2020 – 10:46 am BST

PDB ID : 1BJW  
Title : ASPARTATE AMINOTRANSFERASE FROM THERMUS THERMOPHILUS  
Authors : Nakai, T.; Okada, K.; Kuramitsu, S.; Hirotsu, K.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 1998-06-30  
Resolution : 1.80 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](mailto: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.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

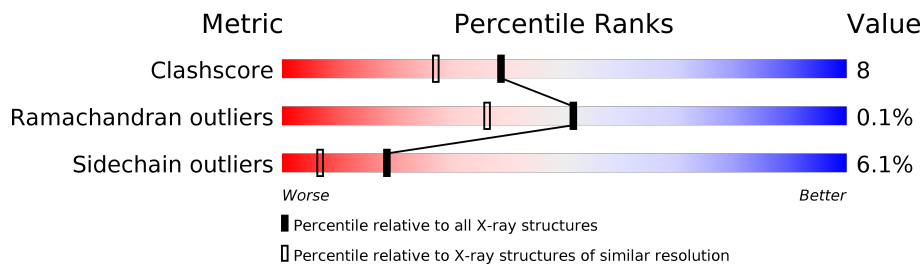
# 1 Overall quality at a glance

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	141614	6793 (1.80-1.80)
Ramachandran outliers	138981	6697 (1.80-1.80)
Sidechain outliers	138945	6696 (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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	382	
1	B	382	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 6238 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.

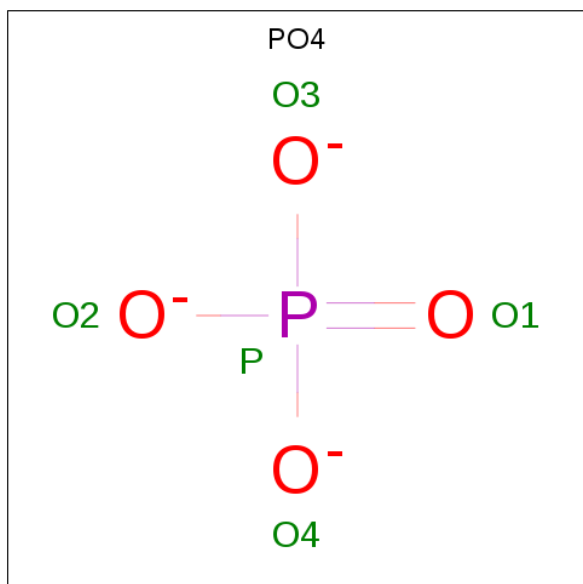
- Molecule 1 is a protein called ASPARTATE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	P	S			
1	A	382	2960	1872	522	557	1	8	0	0	0
1	B	382	2960	1872	522	557	1	8	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	234	LLP	LYS	MODIFIED RESIDUE	UNP Q56232
B	234	LLP	LYS	MODIFIED RESIDUE	UNP Q56232

- Molecule 2 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



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

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

- Molecule 3 is water.

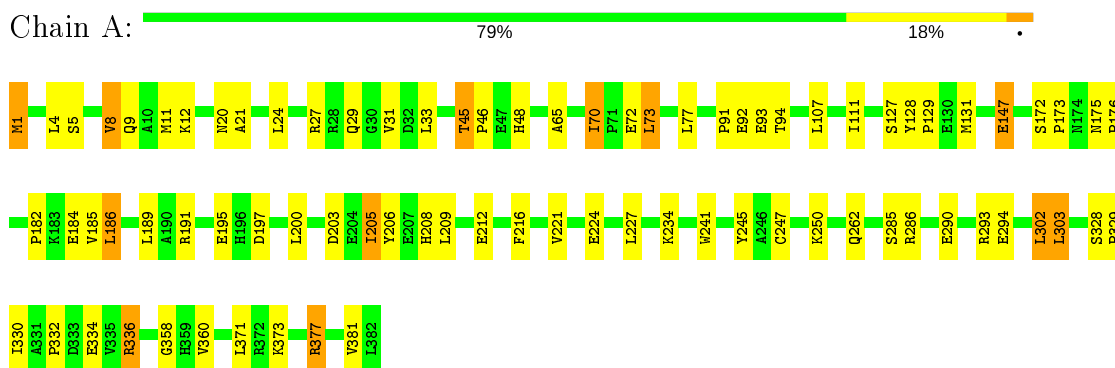
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	141	Total	O	0	0
			141	141		
3	B	167	Total	O	0	0
			167	167		

### 3 Residue-property plots [i](#)

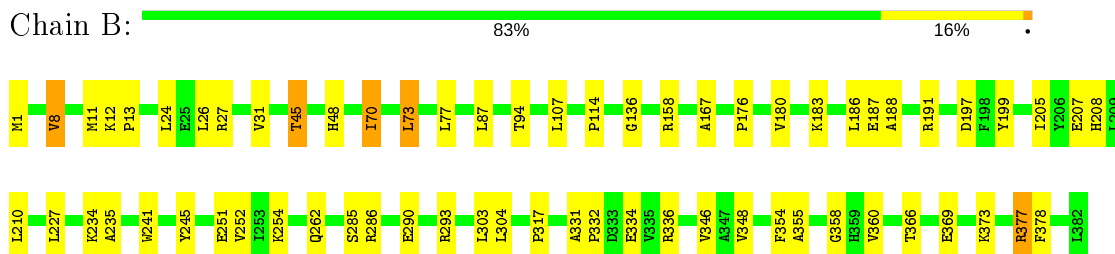
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according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



- Molecule 1: ASPARTATE AMINOTRANSFERASE



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.60Å 113.86Å 124.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 1.80	Depositor
% Data completeness (in resolution range)	89.5 (8.00-1.80)	Depositor
$R_{merge}$	0.07	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR 3.851	Depositor
R, $R_{free}$	0.215 , 0.269	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	6238	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	21.0	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: PO4, LLP

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	0.57	0/2996	0.76	2/4072 (0.0%)
1	B	0.62	0/2996	0.79	1/4072 (0.0%)
All	All	0.59	0/5992	0.77	3/8144 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	107	LEU	CA-CB-CG	7.26	132.01	115.30
1	A	302	LEU	CA-CB-CG	5.70	128.42	115.30
1	A	175	ASN	N-CA-C	-5.54	96.06	111.00

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	2960	0	2968	57	0
1	B	2960	0	2968	38	0
2	A	5	0	0	0	0
2	B	5	0	0	0	0
3	A	141	0	0	1	0
3	B	167	0	0	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
All	All	6238	0	5936	89	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 8.

All (89) 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:107:LEU:HD11	1:A:227:LEU:HD13	1.50	0.94
1:A:45:THR:HG21	1:A:241:TRP:HE1	1.31	0.92
1:B:45:THR:HG21	1:B:241:TRP:HE1	1.33	0.92
1:B:70:ILE:HG22	1:B:73:LEU:HB2	1.70	0.73
1:B:45:THR:HG21	1:B:241:TRP:NE1	2.05	0.72
1:B:24:LEU:HD23	1:B:27:ARG:NH1	2.06	0.71
1:A:11:MET:SD	1:B:262:GLN:OE1	2.50	0.70
1:A:286:ARG:O	1:A:290:GLU:HG2	1.92	0.69
1:A:20:ASN:O	1:A:24:LEU:HG	1.92	0.69
1:A:8:VAL:HA	1:A:11:MET:HE3	1.74	0.68
1:A:45:THR:HG21	1:A:241:TRP:NE1	2.06	0.66
1:B:348:VAL:HG21	1:B:360:VAL:HG21	1.82	0.62
1:A:373:LYS:NZ	1:A:373:LYS:HB2	2.15	0.61
1:B:8:VAL:HG23	1:B:11:MET:HE3	1.82	0.61
1:A:127:SER:O	1:A:131:MET:HG3	2.01	0.60
1:A:208:HIS:HE1	3:A:514:HOH:O	1.83	0.60
1:B:234:LLP:OP4	1:B:234:LLP:H4'1	2.02	0.60
1:A:8:VAL:HA	1:A:11:MET:CE	2.32	0.59
1:A:330:ILE:HG23	1:A:381:VAL:CG1	2.34	0.58
1:A:381:VAL:O	1:A:381:VAL:HG12	2.03	0.57
1:A:203:ASP:OD1	1:A:205:ILE:HG13	2.05	0.56
1:A:4:LEU:HD11	1:B:251:GLU:HG2	1.87	0.56
1:A:184:GLU:H	1:A:184:GLU:CD	2.09	0.56
1:B:348:VAL:CG2	1:B:360:VAL:HG21	2.37	0.55
1:A:70:ILE:HG22	1:A:73:LEU:H	1.71	0.55
1:A:332:PRO:HG3	1:A:336:ARG:NH2	2.23	0.54
1:A:182:PRO:HG2	1:A:185:VAL:CG2	2.37	0.54
1:B:188:ALA:HA	1:B:191:ARG:HH11	1.72	0.54
1:A:107:LEU:O	1:A:111:ILE:HG12	2.08	0.53
1:A:182:PRO:HG2	1:A:185:VAL:HG23	1.90	0.53
1:B:235:ALA:HB2	3:B:537:HOH:O	2.08	0.53
1:B:373:LYS:O	1:B:377:ARG:HG2	2.09	0.53
1:B:24:LEU:HD23	1:B:27:ARG:HH11	1.74	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:183:LYS:O	1:B:187:GLU:HG3	2.10	0.52
1:A:373:LYS:HB2	1:A:373:LYS:HZ3	1.73	0.52
1:A:185:VAL:O	1:A:189:LEU:HG	2.10	0.52
1:A:334:GLU:HG3	1:A:358:GLY:H	1.75	0.51
1:B:332:PRO:HG2	1:B:336:ARG:HD2	1.93	0.51
1:A:5:SER:O	1:A:9:GLN:HG3	2.11	0.51
1:B:286:ARG:O	1:B:290:GLU:HG2	2.11	0.51
1:A:330:ILE:HG23	1:A:381:VAL:HG12	1.93	0.51
1:A:203:ASP:OD2	1:A:234:LLP:N1	2.44	0.50
1:B:180:VAL:HG21	1:B:210:LEU:CD1	2.42	0.50
1:A:191:ARG:O	1:A:195:GLU:HB2	2.12	0.50
1:B:290:GLU:OE1	1:B:293:ARG:NH1	2.45	0.50
1:A:65:ALA:HB1	1:A:70:ILE:HD12	1.94	0.49
1:A:205:ILE:HG12	1:A:234:LLP:C6	2.43	0.48
1:B:114:PRO:HA	1:B:136:GLY:O	2.13	0.48
1:B:346:VAL:HG11	1:B:378:PHE:CE1	2.49	0.47
1:A:70:ILE:HG23	1:A:72:GLU:OE1	2.14	0.47
1:A:1:MET:SD	1:B:197:ASP:OD2	2.73	0.47
1:A:197:ASP:OD2	1:B:1:MET:SD	2.73	0.47
1:A:328:SER:N	1:A:329:PRO:HD2	2.29	0.47
1:B:331:ALA:HB1	1:B:332:PRO:HD2	1.97	0.46
1:A:147:GLU:H	1:A:147:GLU:CD	2.20	0.45
1:A:172:SER:HA	1:A:173:PRO:C	2.37	0.45
1:A:8:VAL:CG2	1:A:11:MET:HE3	2.47	0.45
1:A:93:GLU:O	1:A:247:CYS:HA	2.16	0.45
1:B:334:GLU:HG3	1:B:358:GLY:H	1.81	0.44
1:A:12:LYS:HE2	1:A:12:LYS:HB3	1.82	0.44
1:A:262:GLN:OE1	1:B:11:MET:SD	2.75	0.44
1:A:1:MET:HA	1:B:197:ASP:O	2.16	0.44
1:B:354:PHE:O	1:B:355:ALA:HB3	2.17	0.44
1:A:373:LYS:O	1:A:377:ARG:HG2	2.17	0.44
1:B:369:GLU:CD	1:B:369:GLU:H	2.21	0.43
1:A:206:TYR:HD1	1:A:209:LEU:HD12	1.82	0.43
1:B:251:GLU:HA	1:B:254:LYS:HE3	2.01	0.43
1:A:205:ILE:HD13	1:A:206:TYR:CE2	2.54	0.43
1:A:27:ARG:HG3	1:A:33:LEU:HD12	2.00	0.43
1:A:45:THR:HA	1:A:46:PRO:HD2	1.85	0.42
1:B:227:LEU:HD11	1:B:252:VAL:HG11	2.02	0.42
1:A:48:HIS:HE1	1:A:285:SER:OG	2.03	0.42
1:B:12:LYS:HG2	1:B:13:PRO:N	2.35	0.41
1:A:205:ILE:CD1	1:A:206:TYR:CD2	3.03	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:182:PRO:HB2	1:A:184:GLU:OE1	2.20	0.41
1:B:304:LEU:HD11	1:B:317:PRO:HD2	2.02	0.41
1:A:186:LEU:HD23	1:A:216:PHE:HB3	2.02	0.41
1:A:128:TYR:HB2	1:A:129:PRO:CD	2.50	0.41
1:A:205:ILE:HD13	1:A:206:TYR:CD2	2.56	0.41
1:A:21:ALA:HA	1:A:24:LEU:HD12	2.03	0.41
1:A:91:PRO:O	1:A:94:THR:HB	2.20	0.41
1:A:92:GLU:HB2	1:A:250:LYS:HE2	2.02	0.41
1:B:188:ALA:HA	1:B:191:ARG:NH1	2.34	0.41
1:B:26:LEU:HB3	1:B:31:VAL:HB	2.01	0.41
1:A:290:GLU:OE1	1:A:293:ARG:NH1	2.55	0.40
1:B:167:ALA:HA	1:B:199:TYR:O	2.22	0.40
1:B:48:HIS:HE1	1:B:285:SER:OG	2.04	0.40
1:A:303:LEU:HG	1:A:371:LEU:HD22	2.03	0.40
1:B:207:GLU:HG3	1:B:208:HIS:N	2.37	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	379/382 (99%)	367 (97%)	11 (3%)	1 (0%)	41	27
1	B	379/382 (99%)	370 (98%)	9 (2%)	0	100	100
All	All	758/764 (99%)	737 (97%)	20 (3%)	1 (0%)	51	36

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	31	VAL

### 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	304/304 (100%)	282 (93%)	22 (7%)	14 4
1	B	304/304 (100%)	289 (95%)	15 (5%)	25 11
All	All	608/608 (100%)	571 (94%)	37 (6%)	18 7

All (37) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	MET
1	A	8	VAL
1	A	29	GLN
1	A	45	THR
1	A	70	ILE
1	A	73	LEU
1	A	77	LEU
1	A	147	GLU
1	A	176	PRO
1	A	186	LEU
1	A	200	LEU
1	A	205	ILE
1	A	212	GLU
1	A	221	VAL
1	A	224	GLU
1	A	245	TYR
1	A	294	GLU
1	A	302	LEU
1	A	303	LEU
1	A	336	ARG
1	A	360	VAL
1	A	377	ARG
1	B	8	VAL
1	B	45	THR
1	B	70	ILE
1	B	73	LEU
1	B	77	LEU

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Mol	Chain	Res	Type
1	B	87	LEU
1	B	94	THR
1	B	158	ARG
1	B	176	PRO
1	B	186	LEU
1	B	205	ILE
1	B	245	TYR
1	B	303	LEU
1	B	366	THR
1	B	377	ARG

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

Mol	Chain	Res	Type
1	A	48	HIS
1	A	208	HIS
1	A	370	ASN
1	B	48	HIS
1	B	59	GLN
1	B	208	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](#)

2 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	B	234	1	23,24,25	1.57	3 (13%)	25,32,34	1.71	4 (16%)
1	LLP	A	234	1	23,24,25	1.40	2 (8%)	25,32,34	1.76	4 (16%)

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	B	234	1	-	3/16/17/19	0/1/1/1
1	LLP	A	234	1	-	7/16/17/19	0/1/1/1

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	234	LLP	C3-C2	-4.47	1.36	1.40
1	A	234	LLP	C4-C4'	3.21	1.52	1.46
1	B	234	LLP	C2-N1	3.00	1.39	1.33
1	A	234	LLP	P-OP3	-2.55	1.45	1.54
1	B	234	LLP	C4'-NZ	2.07	1.34	1.27

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	234	LLP	OP4-C5'-C5	5.73	120.27	109.35
1	B	234	LLP	OP4-C5'-C5	4.58	118.08	109.35
1	B	234	LLP	C5-C6-N1	-3.29	118.34	123.82
1	A	234	LLP	OP3-P-OP1	3.02	122.51	110.68
1	B	234	LLP	C5'-C5-C6	-2.93	114.56	119.37
1	B	234	LLP	C4-C3-C2	-2.90	118.39	120.19
1	A	234	LLP	CD-CE-NZ	-2.61	104.52	110.93
1	A	234	LLP	C5-C6-N1	-2.34	119.92	123.82

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	234	LLP	C4-C5-C5'-OP4
1	B	234	LLP	C6-C5-C5'-OP4
1	A	234	LLP	C4-C5-C5'-OP4
1	A	234	LLP	C6-C5-C5'-OP4
1	A	234	LLP	C5'-OP4-P-OP2
1	A	234	LLP	C5'-OP4-P-OP3
1	A	234	LLP	C3-C4-C4'-NZ
1	A	234	LLP	CD-CE-NZ-C4'
1	B	234	LLP	CG-CD-CE-NZ

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Mol	Chain	Res	Type	Atoms
1	A	234	LLP	C5-C4-C4'-NZ

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	B	234	LLP	1	0
1	A	234	LLP	2	0

## 5.5 Carbohydrates [i](#)

There are no carbohydrates 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	$\# Z  > 2$
2	PO4	A	414	-	4,4,4	1.09	0	6,6,6	0.60	0
2	PO4	B	414	-	4,4,4	0.89	0	6,6,6	0.94	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

### 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.