



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 14, 2023 – 02:04 PM EDT

PDB ID : 1S95  
Title : Structure of serine/threonine protein phosphatase 5  
Authors : Swingle, M.R.; Honkanen, R.E.; Ciszak, E.M.  
Deposited on : 2004-02-03  
Resolution : 1.60 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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) : 1.13  
EDS : 2.35  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Refmac : 5.8.0158  
CCP4 : 7.0.044 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.35

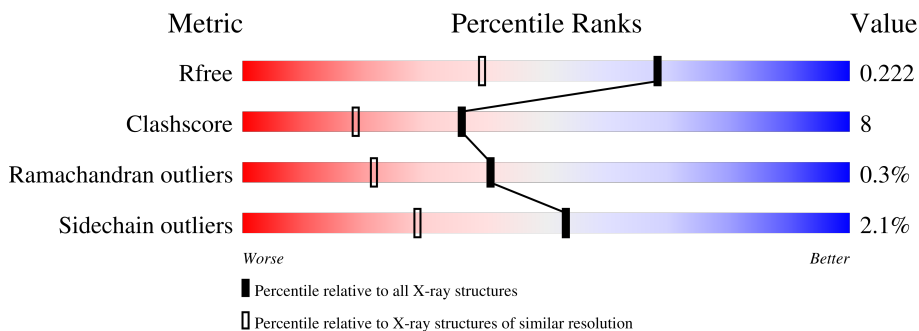
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.60 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))
$R_{free}$	130704	3398 (1.60-1.60)
Clashscore	141614	3665 (1.60-1.60)
Ramachandran outliers	138981	3564 (1.60-1.60)
Sidechain outliers	138945	3563 (1.60-1.60)

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  $\geq 3$ , 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  $\leq 5\%$ .

Mol	Chain	Length	Quality of chain
1	A	333	
1	B	333	

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 5748 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 Serine/threonine protein phosphatase 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	324	2624	1675	437	494	18	0	7	0
1	B	325	2631	1681	439	491	20	0	7	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	167	GLY	-	cloning artifact	UNP P53041
A	168	ALA	-	cloning artifact	UNP P53041
B	167	GLY	-	cloning artifact	UNP P53041
B	168	ALA	-	cloning artifact	UNP P53041

- Molecule 2 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

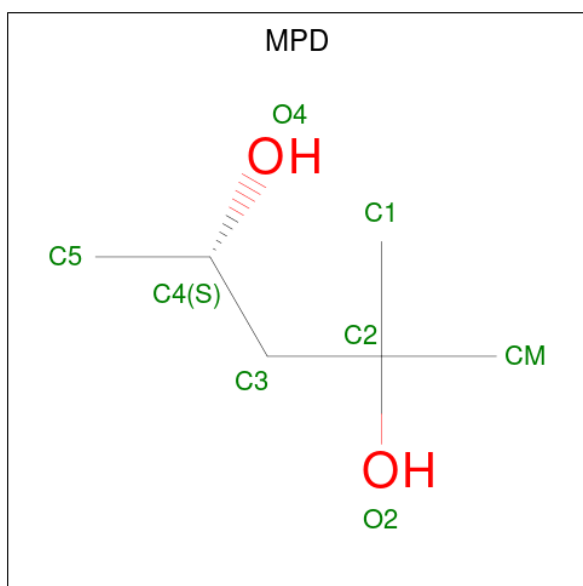
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Mn	0	0
			2	2		
2	B	2	Total	Mn	0	0
			2	2		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O<sub>4</sub>P).



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

- Molecule 4 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: C<sub>6</sub>H<sub>14</sub>O<sub>2</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			8	6	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	C	O	0	0
			8	6	2		


- Molecule 5 is water.

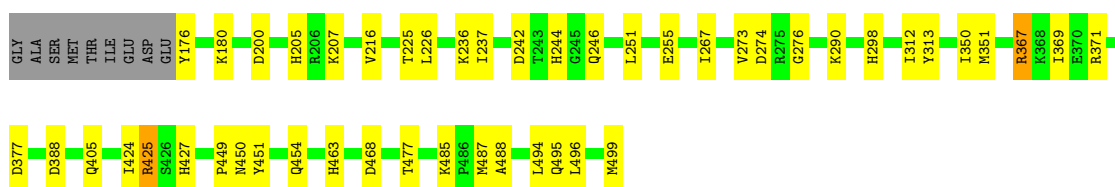
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	233	Total	O	0	0
			233	233		
5	B	230	Total	O	0	0
			230	230		

### 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. 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.

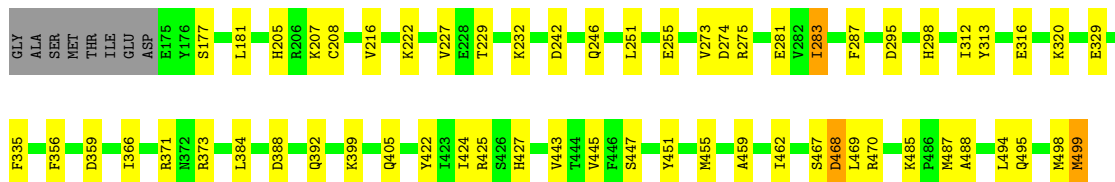
- Molecule 1: Serine/threonine protein phosphatase 5

Chain A:  83% 14% ..



- Molecule 1: Serine/threonine protein phosphatase 5

Chain B:  80% 17% ..



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	40.81Å 80.31Å 92.19Å 90.00° 94.25° 90.00°	Depositor
Resolution (Å)	40.00 – 1.60 30.65 – 1.59	Depositor EDS
% Data completeness (in resolution range)	86.5 (40.00-1.60) 86.5 (30.65-1.59)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.20 (at 1.59Å)	Xtrriage
Refinement program	REFMAC 5.1.9999	Depositor
R, $R_{free}$	0.169 , 0.209 0.182 , 0.222	Depositor DCC
$R_{free}$ test set	3431 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	21.6	Xtrriage
Anisotropy	0.170	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.34 , 45.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.47$ , $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	5748	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.87% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: MN, PO4, MPD

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	0/2716	0.91	5/3671 (0.1%)
1	B	0.95	1/2723 (0.0%)	0.95	5/3679 (0.1%)
All	All	0.92	1/5439 (0.0%)	0.93	10/7350 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	281	GLU	CD-OE1	5.61	1.31	1.25

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	295	ASP	CB-CG-OD2	7.94	125.45	118.30
1	B	373	ARG	NE-CZ-NH1	6.91	123.75	120.30
1	A	367	ARG	NE-CZ-NH2	-6.59	117.00	120.30
1	A	200	ASP	CB-CG-OD2	6.39	124.05	118.30
1	A	377	ASP	CB-CG-OD2	6.05	123.75	118.30
1	B	359	ASP	CB-CG-OD2	5.64	123.38	118.30
1	B	295	ASP	CB-CG-OD1	-5.49	113.36	118.30
1	A	468	ASP	CB-CG-OD2	5.25	123.03	118.30
1	B	371	ARG	NE-CZ-NH2	-5.21	117.69	120.30
1	A	371	ARG	NE-CZ-NH2	-5.06	117.77	120.30

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	2624	0	2554	35	0
1	B	2631	0	2573	55	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	5	0	0	0	0
3	B	5	0	0	0	0
4	A	8	0	14	0	0
4	B	8	0	14	0	0
5	A	233	0	0	5	0
5	B	230	0	0	8	0
All	All	5748	0	5155	84	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 (84) 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:424:ILE:HD13	1:B:443:VAL:HB	1.55	0.88
1:A:499:MET:HG2	1:B:399:LYS:HB3	1.67	0.76
1:B:366:ILE:HD12	1:B:384:LEU:HD11	1.65	0.76
1:B:485[B]:LYS:HG2	5:B:3079:HOH:O	1.85	0.74
1:B:312[B]:ILE:CD1	1:B:494:LEU:HD11	2.21	0.71
1:B:205:HIS:HD2	1:B:207:LYS:H	1.36	0.71
1:B:356:PHE:CZ	1:B:366:ILE:HD11	2.26	0.71
1:B:312[B]:ILE:HG13	1:B:494:LEU:HD11	1.74	0.70
1:B:283:ILE:HD11	1:B:335:PHE:HE1	1.56	0.69
1:B:356:PHE:HZ	1:B:366:ILE:HD11	1.57	0.69
1:A:477:THR:HG23	5:A:3232:HOH:O	1.94	0.67
1:B:468:ASP:O	1:B:470:ARG:N	2.28	0.66
1:B:485[B]:LYS:NZ	5:B:3157:HOH:O	2.28	0.65
5:A:3175:HOH:O	1:B:499:MET:HG3	1.97	0.64
1:B:366:ILE:CD1	1:B:384:LEU:HD11	2.27	0.64
1:A:388:ASP:O	1:A:405:GLN:HA	2.00	0.62
1:A:267:ILE:HD12	1:A:298:HIS:HB2	1.82	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:312[B]:ILE:CG1	1:B:494:LEU:HD11	2.30	0.61
1:A:454:GLN:HG3	1:B:455[B]:MET:CE	2.32	0.60
1:A:236:LYS:HZ1	1:A:463:HIS:CE1	2.20	0.59
1:B:485[B]:LYS:HG3	1:B:488:ALA:HB2	1.86	0.58
1:A:454:GLN:HG3	1:B:455[B]:MET:HE2	1.86	0.57
1:A:225:THR:HG21	1:A:369:ILE:HB	1.87	0.57
1:A:236:LYS:NZ	1:A:463:HIS:CE1	2.72	0.57
1:B:445:VAL:HG21	1:B:462:ILE:HD13	1.85	0.57
1:A:487:MET:CE	1:A:494:LEU:HB3	2.35	0.56
5:A:3190:HOH:O	1:B:499:MET:HA	2.06	0.55
1:A:487:MET:HE3	1:A:494:LEU:HB3	1.88	0.55
1:B:283:ILE:CD1	1:B:335:PHE:HE1	2.20	0.53
1:B:312[B]:ILE:HG13	1:B:494:LEU:CD1	2.37	0.53
1:A:273:VAL:O	1:A:274:ASP:HB2	2.09	0.53
1:B:275:ARG:HA	1:B:487[B]:MET:HG3	1.92	0.52
1:A:451:TYR:HE2	1:B:499:MET:CE	2.23	0.51
1:A:427:HIS:HA	5:A:3002:HOH:O	2.10	0.51
1:A:176:TYR:HA	1:A:180:LYS:HD3	1.93	0.51
1:A:205:HIS:HD2	1:A:207:LYS:H	1.59	0.51
1:A:237:ILE:HD11	1:A:267:ILE:HD11	1.93	0.51
1:A:267:ILE:CD1	1:A:298:HIS:ND1	2.75	0.50
1:B:298:HIS:HD2	5:B:3025:HOH:O	1.92	0.50
1:B:312[B]:ILE:HD12	1:B:494:LEU:HD11	1.94	0.50
1:A:451:TYR:CE2	1:B:499:MET:CE	2.95	0.50
1:B:388:ASP:O	1:B:405:GLN:HA	2.13	0.49
1:B:468:ASP:C	1:B:470:ARG:H	2.16	0.49
1:B:447:SER:HA	1:B:459:ALA:HB1	1.94	0.49
1:A:205:HIS:CD2	1:A:207:LYS:H	2.31	0.48
1:B:205:HIS:CD2	1:B:207:LYS:H	2.25	0.48
1:A:495:GLN:HG2	1:A:496:LEU:HD23	1.96	0.48
1:B:498:MET:HA	1:B:499:MET:HE2	1.96	0.48
1:A:244:HIS:O	1:A:276:GLY:HA3	2.14	0.47
1:A:451:TYR:CE2	1:B:499:MET:HE1	2.50	0.47
1:B:468:ASP:OD1	1:B:470:ARG:HG3	2.15	0.47
1:B:246:GLN:HE22	1:B:451:TYR:HA	1.79	0.47
1:A:351:MET:O	1:A:425:ARG:HA	2.15	0.46
1:A:485:LYS:O	1:A:488:ALA:HB2	2.16	0.46
1:B:316:GLU:HG2	1:B:320:LYS:HE2	1.96	0.46
1:B:462:ILE:HD12	1:B:462:ILE:N	2.29	0.46
1:A:246:GLN:HE22	1:A:451:TYR:HA	1.81	0.45
1:B:251:LEU:O	1:B:255:GLU:HG3	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:283:ILE:CD1	1:B:335:PHE:CE1	3.00	0.45
1:B:181:LEU:HG	1:B:208[B]:CYS:SG	2.55	0.45
1:A:298:HIS:HE1	5:A:3060:HOH:O	2.00	0.45
1:B:283:ILE:HD11	1:B:287:PHE:CE2	2.51	0.45
1:B:273:VAL:O	1:B:274:ASP:HB2	2.17	0.45
1:B:427:HIS:HA	5:B:3003:HOH:O	2.16	0.44
1:B:468:ASP:OD1	1:B:470:ARG:CG	2.65	0.44
1:B:298:HIS:HE1	5:B:3066:HOH:O	2.01	0.43
1:B:468:ASP:C	1:B:470:ARG:N	2.72	0.43
1:B:392:GLN:NE2	5:B:3137:HOH:O	2.51	0.43
1:A:226:LEU:HB3	1:A:367:ARG:HG2	2.01	0.43
1:A:267:ILE:HD12	1:A:298:HIS:CB	2.47	0.42
1:A:449:PRO:O	1:A:450:ASN:C	2.56	0.42
1:B:445:VAL:CG2	1:B:462:ILE:CD1	2.97	0.42
1:A:312:ILE:HG13	1:A:313:TYR:CD2	2.54	0.42
1:B:227:VAL:HG12	1:B:229:THR:HG23	2.00	0.42
1:A:350:ILE:HA	1:A:424:ILE:O	2.18	0.42
1:B:316:GLU:OE2	1:B:320:LYS:HE2	2.20	0.42
1:B:329:GLU:OE1	5:B:3103:HOH:O	2.21	0.42
1:B:422:TYR:HE2	1:B:424:ILE:HD11	1.84	0.42
1:B:312[A]:ILE:HG13	1:B:313:TYR:CD2	2.55	0.42
1:A:267:ILE:CD1	1:A:298:HIS:HB2	2.48	0.41
1:A:251:LEU:O	1:A:255:GLU:HG3	2.21	0.41
1:B:485[A]:LYS:CE	1:B:495:GLN:OE1	2.68	0.41
1:A:237:ILE:HD11	1:A:267:ILE:CD1	2.51	0.41
1:B:232:LYS:HE3	5:B:3140:HOH:O	2.21	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	329/333 (99%)	313 (95%)	16 (5%)	0	100	100
1	B	330/333 (99%)	318 (96%)	10 (3%)	2 (1%)	25	8
All	All	659/666 (99%)	631 (96%)	26 (4%)	2 (0%)	41	21

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	469	LEU
1	B	177	SER

### 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	294/294 (100%)	290 (99%)	4 (1%)	67	47
1	B	295/294 (100%)	287 (97%)	8 (3%)	44	20
All	All	589/588 (100%)	577 (98%)	12 (2%)	53	31

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	216	VAL
1	A	242	ASP
1	A	290	LYS
1	A	425	ARG
1	B	216	VAL
1	B	222	LYS
1	B	242	ASP
1	B	283	ILE
1	B	425	ARG
1	B	467	SER
1	B	468	ASP
1	B	499	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12)

such sidechains are listed below:

Mol	Chain	Res	Type
1	A	205	HIS
1	A	246	GLN
1	A	264	ASN
1	A	326	GLN
1	A	405	GLN
1	A	491	ASN
1	B	205	HIS
1	B	246	GLN
1	B	298	HIS
1	B	392	GLN
1	B	393	ASN
1	B	405	GLN

### 5.3.3 RNA [i](#)

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 monosaccharides in this entry.

## 5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 4 are monoatomic - leaving 4 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	$\# Z  > 2$
4	MPD	A	3001	-	7,7,7	0.37	0	9,10,10	0.76	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
3	PO4	A	1001	2	4,4,4	1.15	0	6,6,6	1.13	0
3	PO4	B	2001	2	4,4,4	1.17	0	6,6,6	1.19	1 (16%)
4	MPD	B	3002	-	7,7,7	0.37	0	9,10,10	0.56	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
4	MPD	A	3001	-	-	4/5/5/5	-
4	MPD	B	3002	-	-	0/5/5/5	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	2001	PO4	O2-P-O1	2.01	118.26	110.89

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	3001	MPD	O2-C2-C3-C4
4	A	3001	MPD	C1-C2-C3-C4
4	A	3001	MPD	CM-C2-C3-C4
4	A	3001	MPD	C2-C3-C4-O4

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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers [i](#)

Unable to reproduce the depositors R factor - this section is therefore empty.