Full wwPDB X-ray Structure Validation Report (i)

Jun 11, 2024 – 11:26 PM EDT

PDB ID	:	1AMK
Title	:	LEISHMANIA MEXICANA TRIOSE PHOSPHATE ISOMERASE
Authors	:	Williams, J.C.; Wierenga, R.
Deposited on	:	1997-06-17
Resolution	:	1.83 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 (i) 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 (i)) were used in the production of this report:

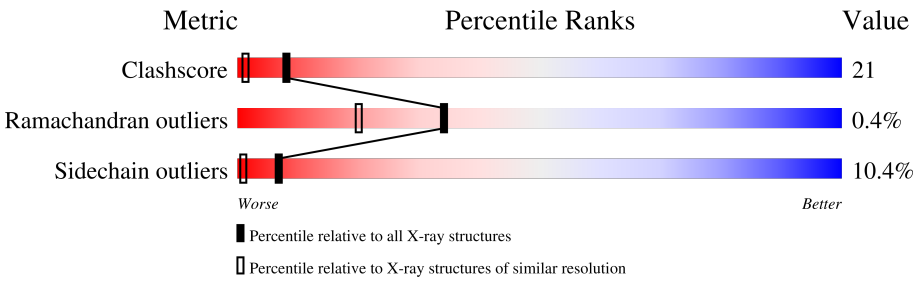
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.36.2
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36.2

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.83 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	4233 (1.86-1.82)
Ramachandran outliers	138981	4185 (1.86-1.82)
Sidechain outliers	138945	4186 (1.86-1.82)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	251	57% 31% 12%

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 criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	PGA	A	600	-	X	-	-

2 Entry composition (i)

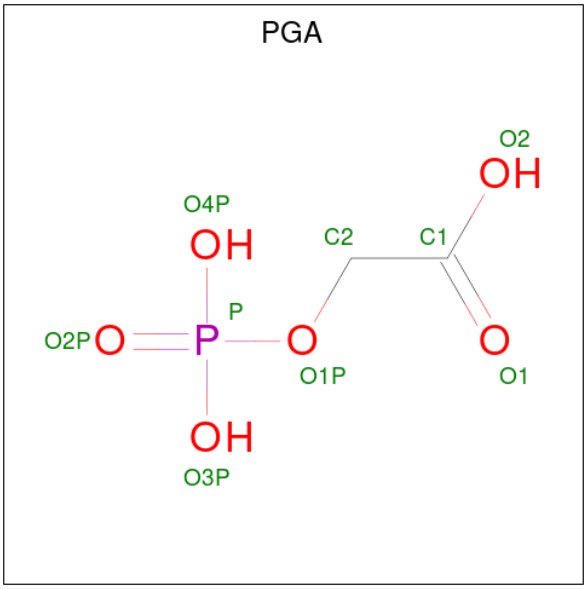
There are 3 unique types of molecules in this entry. The entry contains 2027 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 TRIOSE PHOSPHATE ISOMERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	250	1906	1212	332	356	6	0	0	0

- Molecule 2 is 2-PHOSPHOGLYCOLIC ACID (three-letter code: PGA) (formula: $C_2H_5O_6P$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	O	P		
2	A	1	9	2	6	1	0	0

- Molecule 3 is water.

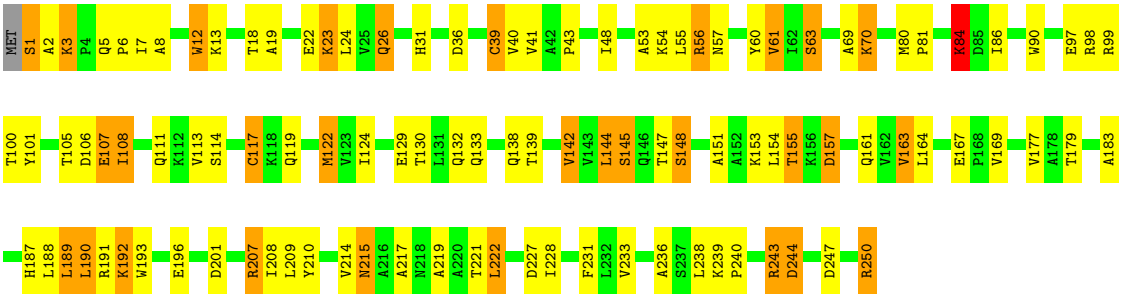
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
3	A	112	112	112	0	0

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. 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: TRIOSE PHOSPHATE ISOMERASE

Chain A: 57% 31% 12%



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	99.09Å 52.94Å 58.85Å 90.00° 118.13° 90.00°	Depositor
Resolution (Å)	22.00 – 1.83 19.88 – 1.83	Depositor EDS
% Data completeness (in resolution range)	88.0 (22.00-1.83) 89.5 (19.88-1.83)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	5.33 (at 1.82Å)	Xtriage
Refinement program	TNT 5D	Depositor
R, R_{free}	0.107 , (Not available) 0.207 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å^2)	18.7	Xtriage
Anisotropy	0.367	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.26 , 64.1	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	2027	wwPDB-VP
Average B, all atoms (Å^2)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.63% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: PGA

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	2.05	2/1943 (0.1%)	1.65	35/2643 (1.3%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	250	ARG	C-OXT	80.76	2.76	1.23
1	A	12	TRP	CG-CD1	5.12	1.44	1.36

All (35) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	106	ASP	CB-CG-OD1	9.81	127.13	118.30
1	A	250	ARG	NE-CZ-NH1	-9.35	115.62	120.30
1	A	201	ASP	CB-CG-OD1	9.01	126.41	118.30
1	A	243	ARG	NE-CZ-NH2	-8.57	116.02	120.30
1	A	145	SER	CB-CA-C	-8.42	94.10	110.10
1	A	179	THR	CA-CB-CG2	-7.56	101.82	112.40
1	A	108	ILE	CG1-CB-CG2	-7.38	95.16	111.40
1	A	101	TYR	CB-CA-C	-7.22	95.97	110.40
1	A	250	ARG	NE-CZ-NH2	6.99	123.79	120.30
1	A	155	THR	CB-CA-C	-6.72	93.46	111.60
1	A	98	ARG	NE-CZ-NH2	-6.61	116.99	120.30
1	A	144	LEU	CB-CG-CD2	6.36	121.81	111.00
1	A	244	ASP	CB-CG-OD2	6.27	123.94	118.30
1	A	39	CYS	CA-CB-SG	-6.26	102.73	114.00
1	A	222	LEU	CB-CG-CD1	6.04	121.27	111.00
1	A	201	ASP	CB-CG-OD2	-6.01	112.89	118.30
1	A	132	GLN	CB-CA-C	5.96	122.31	110.40
1	A	26	GLN	CB-CA-C	-5.93	98.53	110.40
1	A	190	LEU	CB-CG-CD2	-5.93	100.92	111.00

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	99	ARG	NE-CZ-NH1	-5.92	117.34	120.30
1	A	243	ARG	NE-CZ-NH1	5.91	123.26	120.30
1	A	106	ASP	CB-CG-OD2	-5.83	113.06	118.30
1	A	163	VAL	CB-CA-C	-5.75	100.48	111.40
1	A	117	CYS	CA-CB-SG	-5.61	103.91	114.00
1	A	84	LYS	CD-CE-NZ	5.54	124.45	111.70
1	A	122	MET	N-CA-C	-5.52	96.10	111.00
1	A	124	ILE	CB-CA-C	-5.43	100.74	111.60
1	A	188	LEU	CB-CG-CD2	5.42	120.21	111.00
1	A	188	LEU	CA-CB-CG	-5.21	103.31	115.30
1	A	40	VAL	CB-CA-C	-5.18	101.56	111.40
1	A	36	ASP	CB-CG-OD1	5.14	122.93	118.30
1	A	100	THR	CA-CB-CG2	-5.08	105.30	112.40
1	A	142	VAL	CB-CA-C	-5.08	101.76	111.40
1	A	61	VAL	CB-CA-C	-5.04	101.83	111.40
1	A	189	LEU	CB-CG-CD2	-5.01	102.48	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	1906	0	1938	82	0
2	A	9	0	2	2	0
3	A	112	0	0	4	1
All	All	2027	0	1940	82	1

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 21.

All (82) 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:54:LYS:HE3	1:A:54:LYS:HA	1.51	0.91

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:142:VAL:O	1:A:145:SER:HB2	1.85	0.77
1:A:238:LEU:HB2	3:A:334:HOH:O	1.87	0.73
1:A:63:SER:HB2	1:A:90:TRP:CB	2.20	0.72
1:A:107:GLU:O	1:A:111:GLN:HG2	1.90	0.71
1:A:54:LYS:HA	1:A:56:ARG:HH12	1.56	0.70
1:A:63:SER:HB2	1:A:90:TRP:HB2	1.75	0.69
1:A:18:THR:O	1:A:22:GLU:HG3	1.93	0.68
1:A:22:GLU:HB2	1:A:23:LYS:HE3	1.76	0.67
1:A:54:LYS:HE3	1:A:54:LYS:CA	2.22	0.67
1:A:54:LYS:HA	1:A:56:ARG:NH1	2.12	0.64
1:A:19:ALA:O	1:A:23:LYS:HD2	1.99	0.64
1:A:247:ASP:O	1:A:250:ARG:HB3	1.98	0.63
1:A:23:LYS:HE3	1:A:23:LYS:N	2.14	0.62
1:A:56:ARG:HG2	1:A:56:ARG:HH11	1.62	0.62
1:A:157:ASP:OD1	1:A:157:ASP:N	2.29	0.62
1:A:207:ARG:HD2	3:A:305:HOH:O	1.98	0.62
1:A:240:PRO:O	1:A:243:ARG:HG3	2.00	0.61
1:A:129:GLU:CG	1:A:139:THR:HG23	2.31	0.60
1:A:80:MET:HB2	1:A:81:PRO:HD3	1.84	0.60
1:A:7:ILE:HB	1:A:209:LEU:HD21	1.83	0.60
1:A:31:HIS:CE1	1:A:243:ARG:HB3	2.37	0.60
1:A:22:GLU:O	1:A:26:GLN:HG3	2.03	0.59
1:A:53:ALA:O	1:A:56:ARG:NH1	2.30	0.58
1:A:55:LEU:HD21	1:A:60:TYR:HB3	1.84	0.58
1:A:56:ARG:HH11	1:A:56:ARG:CG	2.15	0.58
1:A:63:SER:HB2	1:A:90:TRP:HB3	1.86	0.58
1:A:133:GLN:O	1:A:138:GLN:HB2	2.03	0.57
1:A:22:GLU:HB2	1:A:23:LYS:CE	2.35	0.57
1:A:215:ASN:C	1:A:215:ASN:HD22	2.07	0.57
1:A:69:ALA:O	1:A:70:LYS:HE2	2.04	0.56
1:A:191:ARG:NE	1:A:227:ASP:OD2	2.39	0.56
1:A:192:LYS:HE3	1:A:196:GLU:CD	2.25	0.56
1:A:129:GLU:HG3	1:A:139:THR:HG23	1.88	0.56
1:A:43:PRO:HG2	1:A:48:ILE:HG12	1.88	0.55
1:A:56:ARG:NH1	1:A:56:ARG:HG2	2.21	0.55
1:A:41:VAL:O	1:A:43:PRO:HD3	2.06	0.54
1:A:130:THR:HA	1:A:169:VAL:HB	1.90	0.53
1:A:22:GLU:C	1:A:23:LYS:HE3	2.29	0.53
1:A:108:ILE:O	1:A:111:GLN:HG3	2.08	0.53
1:A:13:LYS:HE2	1:A:97:GLU:OE2	2.09	0.52
1:A:148:SER:HA	1:A:193:TRP:CH2	2.44	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:2:ALA:O	1:A:3:LYS:O	2.29	0.51
1:A:129:GLU:CD	1:A:139:THR:HG23	2.31	0.51
1:A:22:GLU:HB2	1:A:23:LYS:NZ	2.27	0.50
1:A:167:GLU:OE2	2:A:600:PGA:O1	2.30	0.50
1:A:215:ASN:ND2	1:A:217:ALA:H	2.09	0.49
1:A:8:ALA:O	1:A:39:CYS:HA	2.13	0.49
1:A:54:LYS:CA	1:A:56:ARG:HH12	2.24	0.48
1:A:12:TRP:CD1	1:A:238:LEU:HD23	2.49	0.48
1:A:215:ASN:HD22	1:A:217:ALA:H	1.62	0.48
1:A:55:LEU:HD21	1:A:60:TYR:CB	2.44	0.47
1:A:187:HIS:CE1	1:A:208:ILE:HG22	2.50	0.47
1:A:122:MET:SD	1:A:161:GLN:HA	2.54	0.47
1:A:190:LEU:HA	1:A:190:LEU:HD23	1.64	0.47
1:A:114:SER:O	1:A:117:CYS:HB2	2.16	0.46
1:A:231:PHE:CD1	1:A:231:PHE:N	2.83	0.46
1:A:31:HIS:CE1	1:A:243:ARG:CB	2.99	0.46
1:A:210:TYR:CE2	1:A:214:VAL:CG2	3.00	0.45
1:A:219:ALA:O	1:A:222:LEU:HB2	2.15	0.45
1:A:144:LEU:HD22	1:A:193:TRP:CD1	2.51	0.45
1:A:12:TRP:CD1	1:A:238:LEU:CD2	3.00	0.45
1:A:31:HIS:CE1	1:A:243:ARG:HA	2.51	0.45
1:A:108:ILE:HD13	1:A:108:ILE:HG21	1.71	0.45
1:A:233:VAL:CG1	1:A:236:ALA:HB3	2.46	0.45
1:A:105:THR:HG21	3:A:363:HOH:O	2.17	0.44
1:A:151:ALA:HB1	3:A:365:HOH:O	2.16	0.44
1:A:31:HIS:CE1	1:A:243:ARG:CA	3.00	0.44
1:A:1:SER:O	1:A:2:ALA:HB3	2.17	0.44
1:A:57:ASN:HB3	1:A:60:TYR:CD1	2.53	0.44
1:A:163:VAL:HG12	1:A:164:LEU:N	2.31	0.44
1:A:147:THR:HG22	1:A:193:TRP:CZ3	2.54	0.42
1:A:144:LEU:HD22	1:A:193:TRP:CG	2.54	0.42
1:A:5:GLN:HA	1:A:6:PRO:HD3	1.86	0.42
1:A:13:LYS:NZ	2:A:600:PGA:O2	2.38	0.42
1:A:183:ALA:CB	1:A:228:ILE:HD11	2.50	0.42
1:A:12:TRP:CZ2	1:A:24:LEU:HD23	2.54	0.42
1:A:54:LYS:CA	1:A:56:ARG:NH1	2.80	0.41
1:A:53:ALA:O	1:A:54:LYS:HE3	2.21	0.40
1:A:13:LYS:HE2	1:A:97:GLU:OE1	2.22	0.40
1:A:84:LYS:HE2	1:A:119:GLN:O	2.21	0.40
1:A:113:VAL:HG12	1:A:154:LEU:HD21	2.04	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:A:274:HOH:O	3:A:274:HOH:O[2_555]	1.40	0.80

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	248/251 (99%)	233 (94%)	14 (6%)	1 (0%)	34 20

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3	LYS

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	201/202 (100%)	180 (90%)	21 (10%)	7 1

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	1	SER
1	A	23	LYS
1	A	56	ARG

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Mol	Chain	Res	Type
1	A	61	VAL
1	A	63	SER
1	A	70	LYS
1	A	84	LYS
1	A	86	ILE
1	A	107	GLU
1	A	148	SER
1	A	153	LYS
1	A	155	THR
1	A	157	ASP
1	A	177	VAL
1	A	189	LEU
1	A	192	LYS
1	A	207	ARG
1	A	215	ASN
1	A	221	THR
1	A	239	LYS
1	A	244	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	31	HIS
1	A	197	ASN
1	A	215	ASN

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)

1 ligand is 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	PGA	A	600	-	8,8,8	1.63	3 (37%)	10,11,11	2.93	5 (50%)

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
2	PGA	A	600	-	-	2/6/6/6	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	600	PGA	O1-C1	2.64	1.30	1.22
2	A	600	PGA	O2-C1	-2.40	1.22	1.30
2	A	600	PGA	O1P-C2	-2.04	1.41	1.43

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	600	PGA	O4P-P-O1P	-5.74	91.70	106.67
2	A	600	PGA	O3P-P-O1P	-3.79	96.79	106.67
2	A	600	PGA	O3P-P-O2P	3.13	123.05	110.83
2	A	600	PGA	O1P-C2-C1	-3.13	105.83	110.54
2	A	600	PGA	O1P-P-O2P	3.00	114.55	106.44

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	600	PGA	O2-C1-C2-O1P
2	A	600	PGA	O1-C1-C2-O1P

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	600	PGA	2	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 (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.