



# Full wwPDB X-ray Structure Validation Report

Feb 27, 2014 – 05:53 PM GMT

PDB ID : 3T2C  
Title : Fructose-1,6-bisphosphatealdolase/phosphatase from Thermoproteus neutrophilus, DHAP-bound form  
Authors : Du, J.; Say, R.; Lue, W.; Fuchs, G.; Einsle, O.  
Deposited on : 2011-07-22  
Resolution : 1.30 Å(reported)

This is a full wwPDB 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 <http://wwpdb.org/ValidationPDFNotes.html>

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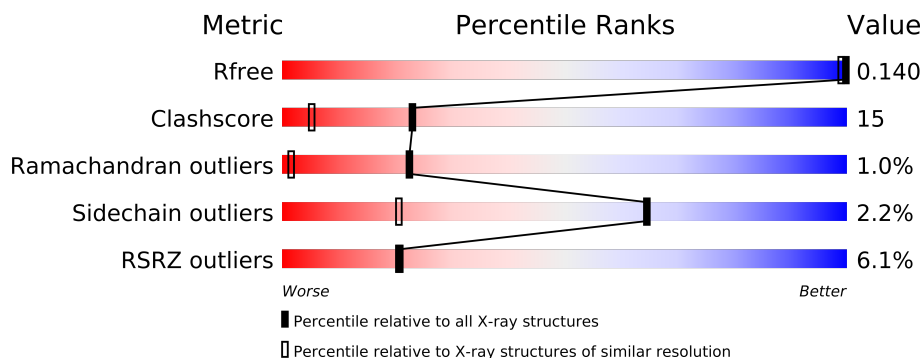
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 1.30 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))
$R_{free}$	66092	1025 (1.34-1.26)
Clashscore	79885	1140 (1.34-1.26)
Ramachandran outliers	78287	1093 (1.34-1.26)
Sidechain outliers	78261	1092 (1.34-1.26)
RSRZ outliers	66119	1025 (1.34-1.26)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	407	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
3	13P	A	412	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3856 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Fructose-1,6-bisphosphatealdolase/phosphatase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	389	Total	C	N	O	S	0	64	0
			3451	2242	577	614	18			

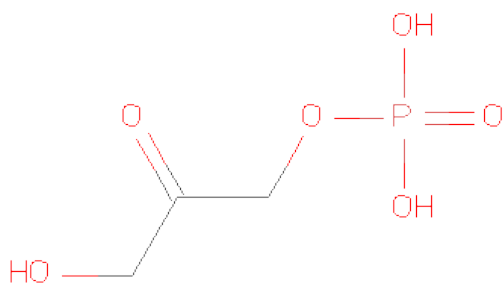
There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	400	LEU	-	EXPRESSION TAG	UNP B1YAL1
A	401	GLU	-	EXPRESSION TAG	UNP B1YAL1
A	402	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	403	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	404	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	405	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	406	HIS	-	EXPRESSION TAG	UNP B1YAL1
A	407	HIS	-	EXPRESSION TAG	UNP B1YAL1

- Molecule 2 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	3	Total	Mg	0	1
			3	3		

- Molecule 3 is 1,3-DIHYDROXYACETONEPHOSPHATE (three-letter code: 13P) (formula: C<sub>3</sub>H<sub>7</sub>O<sub>6</sub>P).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	O	P	0	1
			19	6	11	2		
3	A	1	Total	C	O	P	0	0
			10	3	6	1		

- Molecule 4 is water.

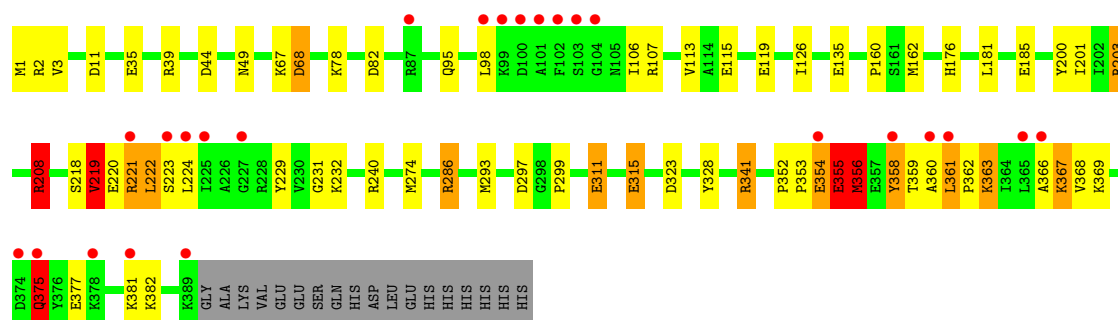
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	373	Total	O	0	5
			373	373		

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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: Fructose-1,6-bisphosphatealdolase/phosphatase

Chain A: 



## 4 Data and refinement statistics

Property	Value	Source
Space group	I 4 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	112.35Å 112.35Å 150.91Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	17.34 – 1.30 17.34 – 1.30	Depositor EDS
% Data completeness (in resolution range)	99.8 (17.34-1.30) 99.9 (17.34-1.30)	Depositor EDS
$R_{merge}$	0.07	Depositor
$R_{sym}$	0.07	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.52 (at 1.30Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, $R_{free}$	0.108 , 0.129 0.122 , 0.140	Depositor DCC
$R_{free}$ test set	5886 reflections (5.27%)	DCC
Wilson B-factor (Å <sup>2</sup> )	10.0	Xtriage
Anisotropy	0.180	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.38 , 52.1	EDS
Estimated twinning fraction	0.013 for -1/2*h+1/2*k-1/2*l, 1/2*h-1/2*k-1/2*l, -h-k 0.018 for -1/2*h-1/2*k+1/2*l, -1/2*h-1/2*k-1/2*l, h-k	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 117471 reflections	Xtriage
$F_o, F_c$ correlation	0.98	EDS
Total number of atoms	3856	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	17.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.61% of the height of the origin peak. No significant pseudotranslation is detected.*

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

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: MG, 13P

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	2.94	41/3602 (1.1%)	1.33	53/4877 (1.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	3

All (41) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	367[A]	LYS	CB-CG	99.91	4.22	1.52
1	A	367[B]	LYS	CB-CG	99.91	4.22	1.52
1	A	369[A]	LYS	CB-CG	46.36	2.77	1.52
1	A	369[B]	LYS	CB-CG	46.36	2.77	1.52
1	A	355[A]	GLU	CD-OE1	13.28	1.40	1.25
1	A	355[B]	GLU	CD-OE1	13.28	1.40	1.25
1	A	315	GLU	CB-CG	-10.72	1.31	1.52
1	A	203[A]	ARG	CZ-NH2	-9.52	1.20	1.33
1	A	203[B]	ARG	CZ-NH2	-9.52	1.20	1.33
1	A	119	GLU	CD-OE2	8.58	1.35	1.25
1	A	356[A]	MET	CG-SD	-7.75	1.60	1.81
1	A	356[B]	MET	CG-SD	-7.75	1.60	1.81
1	A	366[A]	ALA	CA-CB	7.70	1.68	1.52
1	A	366[B]	ALA	CA-CB	7.70	1.68	1.52
1	A	328	TYR	CE1-CZ	-7.69	1.28	1.38
1	A	208[A]	ARG	CG-CD	-7.55	1.33	1.51
1	A	208[B]	ARG	CG-CD	-7.55	1.33	1.51
1	A	286	ARG	CD-NE	-7.55	1.33	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	219[A]	VAL	CB-CG1	6.85	1.67	1.52
1	A	219[B]	VAL	CB-CG1	6.85	1.67	1.52
1	A	115	GLU	CG-CD	-6.32	1.42	1.51
1	A	67	LYS	CB-CG	-6.21	1.35	1.52
1	A	311[A]	GLU	CD-OE2	6.19	1.32	1.25
1	A	311[B]	GLU	CD-OE2	6.19	1.32	1.25
1	A	355[A]	GLU	CD-OE2	6.18	1.32	1.25
1	A	355[B]	GLU	CD-OE2	6.18	1.32	1.25
1	A	135	GLU	CD-OE2	-6.02	1.19	1.25
1	A	35	GLU	CD-OE1	5.93	1.32	1.25
1	A	354[A]	GLU	CG-CD	5.88	1.60	1.51
1	A	354[B]	GLU	CG-CD	5.88	1.60	1.51
1	A	377	GLU	CB-CG	-5.83	1.41	1.52
1	A	375	GLN	CG-CD	5.78	1.64	1.51
1	A	98	LEU	CG-CD2	5.64	1.72	1.51
1	A	115	GLU	CB-CG	-5.60	1.41	1.52
1	A	231[A]	GLY	C-O	5.54	1.32	1.23
1	A	293	MET	SD-CE	-5.48	1.47	1.77
1	A	126[A]	ILE	CB-CG2	-5.46	1.35	1.52
1	A	126[B]	ILE	CB-CG2	-5.46	1.35	1.52
1	A	185	GLU	CD-OE1	5.38	1.31	1.25
1	A	200	TYR	CE1-CZ	-5.17	1.31	1.38
1	A	185	GLU	CB-CG	-5.05	1.42	1.52

All (53) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	221[A]	ARG	NE-CZ-NH2	17.89	129.24	120.30
1	A	221[B]	ARG	NE-CZ-NH2	17.89	129.24	120.30
1	A	107	ARG	NE-CZ-NH2	-12.57	114.02	120.30
1	A	221[A]	ARG	NE-CZ-NH1	-10.57	115.02	120.30
1	A	221[B]	ARG	NE-CZ-NH1	-10.57	115.02	120.30
1	A	341	ARG	NE-CZ-NH2	-8.32	116.14	120.30
1	A	221[A]	ARG	CD-NE-CZ	7.96	134.74	123.60
1	A	221[B]	ARG	CD-NE-CZ	7.96	134.74	123.60
1	A	355[A]	GLU	CB-CG-CD	7.75	135.13	114.20
1	A	355[B]	GLU	CB-CG-CD	7.75	135.13	114.20
1	A	315	GLU	CG-CD-OE2	-7.29	103.71	118.30
1	A	341	ARG	NE-CZ-NH1	7.25	123.93	120.30
1	A	219[A]	VAL	CA-CB-CG2	7.18	121.67	110.90
1	A	219[B]	VAL	CA-CB-CG2	7.18	121.67	110.90
1	A	107	ARG	NE-CZ-NH1	7.04	123.82	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	361[A]	LEU	CB-CG-CD2	7.00	122.90	111.00
1	A	361[B]	LEU	CB-CG-CD2	7.00	122.90	111.00
1	A	315	GLU	CG-CD-OE1	6.87	132.03	118.30
1	A	367[A]	LYS	CA-CB-CG	-6.87	98.29	113.40
1	A	367[B]	LYS	CA-CB-CG	-6.87	98.29	113.40
1	A	82	ASP	CB-CG-OD1	6.86	124.48	118.30
1	A	2	ARG	NE-CZ-NH2	-6.45	117.08	120.30
1	A	297	ASP	CB-CG-OD1	6.33	124.00	118.30
1	A	39	ARG	NE-CZ-NH2	6.28	123.44	120.30
1	A	356[A]	MET	CG-SD-CE	-6.23	90.23	100.20
1	A	356[B]	MET	CG-SD-CE	-6.23	90.23	100.20
1	A	286	ARG	NE-CZ-NH1	-6.17	117.22	120.30
1	A	78	LYS	CD-CE-NZ	-6.13	97.60	111.70
1	A	203[A]	ARG	NE-CZ-NH2	-5.97	117.31	120.30
1	A	203[B]	ARG	NE-CZ-NH2	-5.97	117.31	120.30
1	A	68[A]	ASP	CB-CG-OD2	-5.89	113.00	118.30
1	A	68[B]	ASP	CB-CG-OD2	-5.89	113.00	118.30
1	A	44	ASP	CB-CG-OD2	-5.89	113.00	118.30
1	A	361[A]	LEU	CB-CG-CD1	-5.83	101.08	111.00
1	A	361[B]	LEU	CB-CG-CD1	-5.83	101.08	111.00
1	A	219[A]	VAL	CA-CB-CG1	-5.79	102.21	110.90
1	A	219[B]	VAL	CA-CB-CG1	-5.79	102.21	110.90
1	A	323	ASP	CB-CG-OD1	5.66	123.39	118.30
1	A	297	ASP	CB-CG-OD2	-5.47	113.38	118.30
1	A	11	ASP	CB-CG-OD1	5.40	123.16	118.30
1	A	181[A]	LEU	CB-CG-CD1	-5.37	101.87	111.00
1	A	181[B]	LEU	CB-CG-CD1	-5.37	101.87	111.00
1	A	323	ASP	CB-CG-OD2	-5.30	113.53	118.30
1	A	219[A]	VAL	N-CA-C	5.21	125.08	111.00
1	A	219[B]	VAL	N-CA-C	5.21	125.08	111.00
1	A	363[A]	LYS	N-CA-CB	-5.21	101.23	110.60
1	A	363[B]	LYS	N-CA-CB	-5.21	101.23	110.60
1	A	369[A]	LYS	CB-CG-CD	-5.12	98.29	111.60
1	A	369[B]	LYS	CB-CG-CD	-5.12	98.29	111.60
1	A	377	GLU	CB-CA-C	-5.07	100.27	110.40
1	A	286	ARG	NE-CZ-NH2	5.06	122.83	120.30
1	A	162[A]	MET	N-CA-C	5.01	124.54	111.00
1	A	162[B]	MET	N-CA-C	5.01	124.54	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	223[B]	SER	Peptide
1	A	240	ARG	Sidechain
1	A	358[B]	TYR	Peptide

## 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3451	0	22	45	2
2	A	3	0	0	0	0
3	A	29	0	0	7	0
4	A	373	0	0	20	1
All	All	3856	0	22	51	3

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 15.

All (51) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:221[B]:ARG:CD	1:A:222[B]:LEU:CD2	1.97	1.43
3:A:411[A]:13P:C3	3:A:412:13P:C3	2.04	1.36
1:A:354[A]:GLU:HG3	4:A:723:HOH:O	1.40	1.17
1:A:221[B]:ARG:CG	1:A:222[B]:LEU:CD2	2.25	1.14
1:A:353[B]:PRO:O	1:A:355[B]:GLU:O	1.71	1.08
1:A:311[B]:GLU:OE1	4:A:604:HOH:O	1.74	1.04
1:A:1[B]:MET:SD	1:A:3[B]:VAL:CG1	2.48	1.02
1:A:355[A]:GLU:OE2	4:A:672:HOH:O	1.84	0.94
1:A:95[B]:GLN:NE2	4:A:416:HOH:O	2.05	0.88
1:A:356[A]:MET:CB	4:A:594:HOH:O	2.22	0.88
1:A:224[B]:LEU:O	4:A:751:HOH:O	1.91	0.88
1:A:208[A]:ARG:CD	4:A:572:HOH:O	2.21	0.87
1:A:68[A]:ASP:OD2	4:A:566:HOH:O	2.02	0.78
1:A:359[B]:THR:CG2	4:A:594:HOH:O	2.31	0.78
1:A:360[A]:ALA:O	1:A:363[A]:LYS:CB	2.37	0.73
1:A:176:HIS:CE1	1:A:221[B]:ARG:NE	2.60	0.70
1:A:221[B]:ARG:C	1:A:222[B]:LEU:CD2	2.61	0.69

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:353[B]:PRO:C	1:A:355[B]:GLU:O	2.31	0.69
1:A:224[B]:LEU:CD1	4:A:754:HOH:O	2.42	0.67
1:A:201[A]:ILE:CD1	1:A:219[A]:VAL:CG1	2.72	0.67
3:A:411[B]:13P:C3	3:A:412:13P:C3	2.73	0.66
1:A:368[A]:VAL:O	4:A:785:HOH:O	2.15	0.65
1:A:220[B]:GLU:CG	4:A:662:HOH:O	2.45	0.64
1:A:315:GLU:OE1	4:A:643:HOH:O	2.16	0.63
1:A:219[B]:VAL:O	1:A:219[B]:VAL:CG2	2.31	0.63
1:A:274[B]:MET:SD	1:A:299:PRO:CG	2.87	0.62
1:A:224[B]:LEU:CD2	4:A:755:HOH:O	2.48	0.60
1:A:381:LYS:HG3	4:A:568:HOH:O	2.03	0.59
1:A:221[B]:ARG:O	1:A:222[B]:LEU:CD2	2.51	0.58
3:A:411[B]:13P:O3	3:A:412:13P:C3	2.54	0.56
1:A:354[A]:GLU:N	4:A:723:HOH:O	2.38	0.55
1:A:354[B]:GLU:C	1:A:355[B]:GLU:O	2.42	0.53
1:A:106:ILE:CG2	1:A:113[A]:VAL:CG2	2.86	0.53
1:A:176:HIS:ND1	1:A:221[B]:ARG:CB	2.73	0.52
1:A:219[A]:VAL:CG1	1:A:219[A]:VAL:O	2.58	0.51
1:A:224[B]:LEU:O	1:A:224[B]:LEU:CG	2.60	0.49
1:A:218[B]:SER:C	1:A:219[B]:VAL:CG2	2.85	0.45
1:A:1[B]:MET:CE	1:A:3[B]:VAL:CG1	2.94	0.45
1:A:229[A]:TYR:OH	3:A:412:13P:O3	2.35	0.44
1:A:222[B]:LEU:CG	4:A:751:HOH:O	2.65	0.44
3:A:411[B]:13P:C2	3:A:412:13P:C3	2.96	0.44
1:A:203[B]:ARG:NH1	4:A:648:HOH:O	2.52	0.43
1:A:375:GLN:CD	1:A:375:GLN:N	2.72	0.43
1:A:352:PRO:O	1:A:353[B]:PRO:C	2.57	0.43
1:A:222[B]:LEU:CD1	1:A:222[B]:LEU:N	2.69	0.42
1:A:358[B]:TYR:OH	3:A:412:13P:O2P	2.38	0.42
1:A:232[A]:LYS:N	3:A:411[A]:13P:O2P	2.54	0.41
1:A:221[B]:ARG:O	1:A:222[B]:LEU:CB	2.69	0.41
1:A:361[B]:LEU:N	1:A:362[B]:PRO:CD	2.85	0.40

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:160[A]:PRO:CD	1:A:360[A]:ALA:CB[3_565]	2.03	0.17
4:A:692:HOH:O	4:A:692:HOH:O[8_555]	2.06	0.14
1:A:160[A]:PRO:CG	1:A:360[A]:ALA:CB[3_565]	2.14	0.06

## 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	443/407 (109%)	421 (95%)	14 (3%)	8 (2%)	13 0

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	219[A]	VAL
1	A	219[B]	VAL
1	A	222[A]	LEU
1	A	222[B]	LEU
1	A	356[A]	MET
1	A	356[B]	MET
1	A	355[A]	GLU
1	A	355[B]	GLU

### 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	370/331 (112%)	361 (98%)	9 (2%)	61 17

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	49	ASN
1	A	208[A]	ARG
1	A	208[B]	ARG
1	A	286	ARG
1	A	341	ARG
1	A	367[A]	LYS

*Continued on next page...*

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Mol	Chain	Res	Type
1	A	367[B]	LYS
1	A	375	GLN
1	A	382	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 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	$\# Z  > 2$
3	13P	A	411[A]	2	6,8,9	1.34	1 (16%)	7,10,12	2.22	3 (42%)
3	13P	A	411[B]	2	9,9,9	0.78	0	12,12,12	1.81	3 (25%)
3	13P	A	412	-	9,9,9	4.42	4 (44%)	12,12,12	3.59	7 (58%)

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	13P	A	411[A]	2	-	0/4/6/8	0/0/0/0
3	13P	A	411[B]	2	-	0/8/8/8	0/0/0/0
3	13P	A	412	-	-	1/8/8/8	0/0/0/0

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	412	13P	O1-C1	9.57	1.49	1.43
3	A	412	13P	O2-C2	-5.99	1.10	1.21
3	A	412	13P	P-O1	5.79	1.80	1.60
3	A	412	13P	P-O2P	-2.52	1.45	1.54
3	A	411[A]	13P	O3-C3	-2.12	1.36	1.41

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	412	13P	O1-C1-C2	-8.79	96.54	110.53
3	A	412	13P	O2P-P-O1	-6.05	89.96	106.65
3	A	411[A]	13P	O3P-P-O1	-3.70	96.43	106.65
3	A	411[A]	13P	O2P-P-O1	3.01	114.94	106.65
3	A	411[A]	13P	O3P-P-O1P	2.97	120.14	110.44
3	A	411[B]	13P	P-O1-C1	2.94	131.81	121.22
3	A	412	13P	P-O1-C1	-2.89	110.82	121.22
3	A	412	13P	C3-C2-C1	-2.88	110.80	117.24
3	A	411[B]	13P	O1-C1-C2	-2.88	105.94	110.53
3	A	412	13P	O2P-P-O1P	2.76	119.46	110.44
3	A	412	13P	O3P-P-O1	2.60	113.83	106.65
3	A	411[B]	13P	O3P-P-O2P	2.59	117.71	107.61
3	A	412	13P	O1-P-O1P	2.11	112.89	106.71

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	412	13P	O2-C2-C3-O3

There are no ring outliers.

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	389/407 (95%)	-0.22	24 (6%)	20 20	5, 12, 32, 47	9 (2%)

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	389	LYS	7.1
1	A	225[A]	ILE	6.4
1	A	100	ASP	5.6
1	A	103	SER	5.6
1	A	101	ALA	4.3
1	A	381	LYS	3.8
1	A	99	LYS	3.5
1	A	224[A]	LEU	3.5
1	A	98	LEU	3.1
1	A	365[A]	LEU	3.1
1	A	378	LYS	3.1
1	A	375	GLN	3.0
1	A	102	PHE	2.8
1	A	104	GLY	2.6
1	A	374	ASP	2.6
1	A	227[A]	GLY	2.5
1	A	221[A]	ARG	2.5
1	A	360[A]	ALA	2.4
1	A	361[A]	LEU	2.3
1	A	366[A]	ALA	2.2
1	A	87	ARG	2.2
1	A	354[A]	GLU	2.2
1	A	358[A]	TYR	2.2
1	A	223[A]	SER	2.1



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

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

## 6.4 Ligands ⓘ

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
3	13P	A	412	10/10	0.13	2.26	9,22,25,26	10
3	13P	A	411[A]	9/10	0.05	-0.07	7,8,9,9	9
3	13P	A	411[B]	10/10	0.05	-0.27	12,18,21,25	10
2	MG	A	408[A]	1/1	0.04	-0.83	7,7,7,7	1
2	MG	A	409	1/1	0.02	-1.22	7,7,7,7	0
2	MG	A	410	1/1	0.02	-1.74	8,8,8,8	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.