



# Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 09:23 pm BST

PDB ID : 1D9Q  
Title : OXIDIZED PEA FRUCTOSE-1,6-BISPHOSPHATASE FORM 1  
Authors : Chiadmi, M.; Navaza, A.; Miginiac-Maslow, M.; Jacquot, J.-P.; Cherfils, J.  
Deposited on : 1999-10-29  
Resolution : 2.40 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  
Xtriage (Phenix) : 1.13  
EDS : 2.11  
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) : 2.11

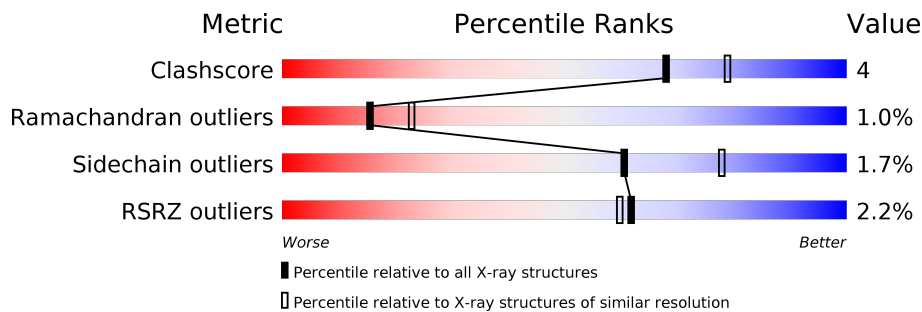
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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  $\leq 5\%$ . The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	357	 81% 9% • 10%
1	B	357	 83% 10% • 7%
1	C	357	 85% 6% • 8%
1	D	357	 79% 11% • 9%

## 2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 10184 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 FRUCTOSE-1,6-BISPHOSPHATASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	323	Total 2457	C 1564	N 404	O 479	S 10	0	0	0
1	B	333	Total 2505	C 1590	N 408	O 497	S 10	0	0	0
1	C	327	Total 2464	C 1565	N 404	O 485	S 10	0	0	0
1	D	325	Total 2424	C 1542	N 393	O 479	S 10	0	0	0

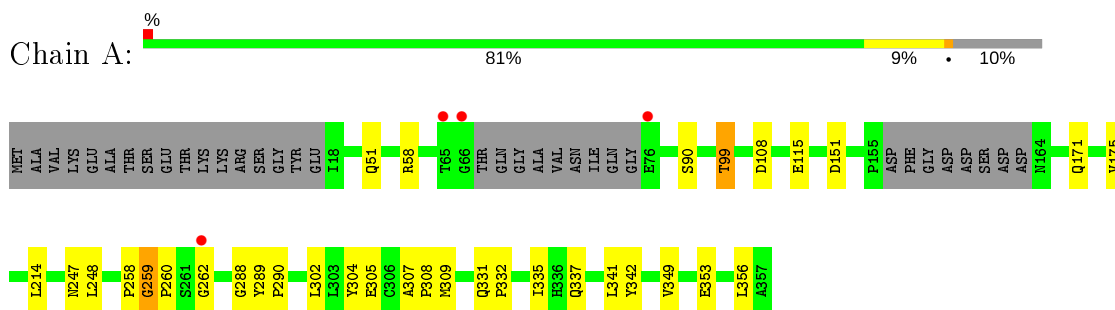
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	78	Total 78	O 78	0	0
2	B	103	Total 103	O 103	0	0
2	C	83	Total 83	O 83	0	0
2	D	70	Total 70	O 70	0	0

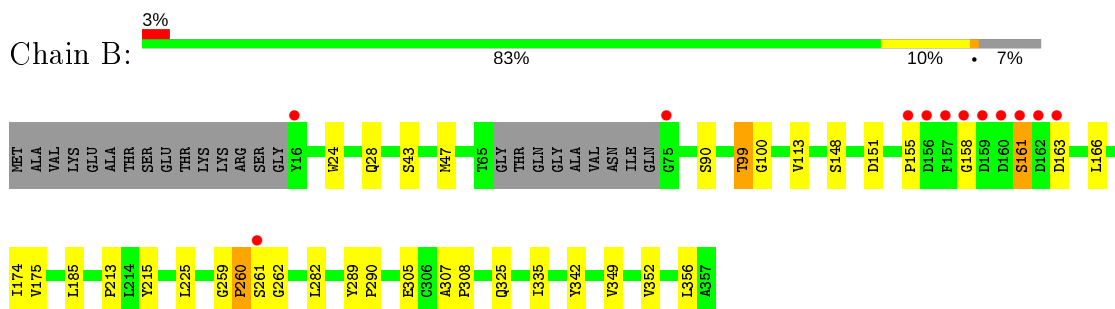
### 3 Residue-property plots [i](#)

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 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.

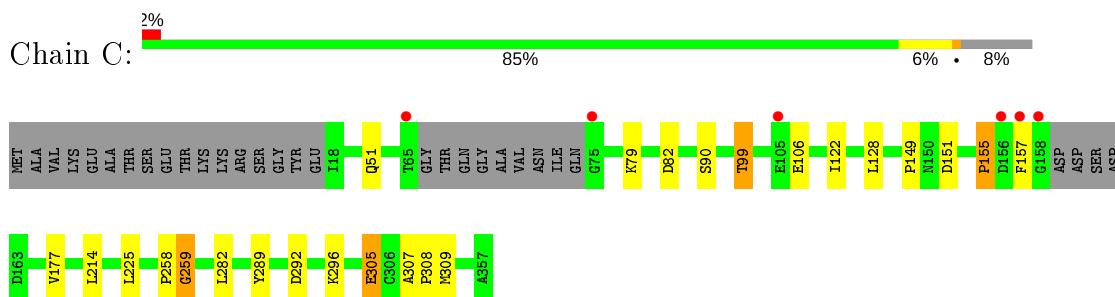
- Molecule 1: FRUCTOSE-1,6-BISPHOSPHATASE



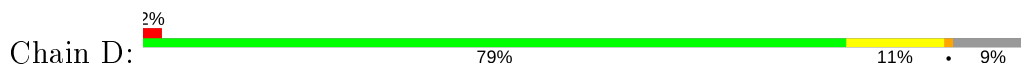
- Molecule 1: FRUCTOSE-1,6-BISPHOSPHATASE

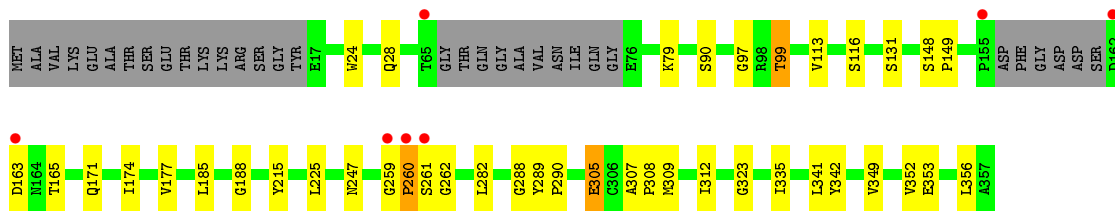


- Molecule 1: FRUCTOSE-1,6-BISPHOSPHATASE



- Molecule 1: FRUCTOSE-1,6-BISPHOSPHATASE





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	78.94Å 113.99Å 94.81Å 90.00° 114.38° 90.00°	Depositor
Resolution (Å)	10.00 – 2.40 24.31 – 2.40	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.40) 89.1 (24.31-2.40)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	5.16 (at 2.41Å)	Xtrriage
Refinement program	X-PLOR 3.851	Depositor
R, $R_{free}$	0.186 , 0.236 0.177 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.5	Xtrriage
Anisotropy	0.100	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 67.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.020 for h,-k,-h-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	10184	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.92% 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](#)

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	0.43	2/2500 (0.1%)	0.68	2/3385 (0.1%)
1	B	0.40	0/2551	0.66	0/3464
1	C	0.39	0/2507	0.64	1/3399 (0.0%)
1	D	0.38	0/2467	0.64	1/3352 (0.0%)
All	All	0.40	2/10025 (0.0%)	0.66	4/13600 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	115	GLU	CD-OE1	-5.77	1.19	1.25
1	A	115	GLU	CD-OE2	-5.45	1.19	1.25

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	115	GLU	OE1-CD-OE2	-6.88	115.04	123.30
1	A	260	PRO	N-CA-CB	6.00	110.50	103.30
1	D	260	PRO	N-CA-CB	5.70	110.14	103.30
1	C	155	PRO	N-CA-CB	5.62	110.04	103.30

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	2457	0	2403	26	0
1	B	2505	0	2412	20	0
1	C	2464	0	2388	13	0
1	D	2424	0	2306	21	0
2	A	78	0	0	0	0
2	B	103	0	0	1	0
2	C	83	0	0	0	0
2	D	70	0	0	0	0
All	All	10184	0	9509	74	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 4.

All (74) 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:D:149:PRO:HB3	1:D:177:VAL:HG13	1.49	0.92
1:A:175:VAL:HG23	1:A:335:ILE:HG12	1.55	0.88
1:A:175:VAL:CG2	1:A:335:ILE:HG12	2.07	0.85
1:D:171:GLN:HB3	1:D:335:ILE:HG12	1.62	0.82
1:A:214:LEU:HD22	1:C:214:LEU:HD22	1.65	0.79
1:B:215:TYR:CE2	1:C:51:GLN:HG2	2.25	0.71
1:C:122:ILE:HG13	1:C:149:PRO:HG3	1.78	0.66
1:D:307:ALA:HB3	1:D:308:PRO:HD3	1.79	0.65
1:D:149:PRO:HB3	1:D:177:VAL:CG1	2.25	0.65
1:C:307:ALA:HB3	1:C:308:PRO:HD3	1.83	0.60
1:B:307:ALA:HB3	1:B:308:PRO:HD3	1.83	0.59
1:A:307:ALA:HB3	1:A:308:PRO:HD3	1.85	0.59
1:A:302:LEU:HD23	1:A:332:PRO:HG3	1.84	0.59
1:A:304:TYR:OH	1:A:335:ILE:CG2	2.51	0.58
1:B:113:VAL:HG11	1:B:174:ILE:HD13	1.85	0.58
1:B:90:SER:HA	1:B:99:THR:HG21	1.87	0.57
1:B:158:GLY:HA3	1:B:161:SER:HB2	1.87	0.56
1:D:79:LYS:HG2	1:D:131:SER:HB2	1.87	0.56
1:A:304:TYR:OH	1:A:335:ILE:HG21	2.06	0.56
1:A:171:GLN:HA	1:A:335:ILE:HD11	1.88	0.56
1:D:113:VAL:HG11	1:D:174:ILE:HD13	1.88	0.55
1:A:90:SER:HA	1:A:99:THR:HG21	1.90	0.54
1:B:43:SER:O	1:B:47:MET:HG3	2.09	0.53
1:C:149:PRO:HB3	1:C:177:VAL:CG1	2.40	0.52
1:D:163:ASP:C	1:D:165:THR:H	2.12	0.52
1:D:247:ASN:HB3	1:D:356:LEU:HD23	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:171:GLN:HB3	1:A:335:ILE:HG13	1.91	0.51
1:A:171:GLN:CA	1:A:335:ILE:HD11	2.40	0.51
1:B:290:PRO:HB3	1:B:342:TYR:OH	2.11	0.51
1:D:290:PRO:HB3	1:D:342:TYR:OH	2.11	0.51
1:D:90:SER:HA	1:D:99:THR:HG21	1.93	0.51
1:C:149:PRO:HB3	1:C:177:VAL:HG13	1.93	0.50
1:B:148:SER:HB2	1:B:185:LEU:HD11	1.94	0.49
1:A:51:GLN:HG2	1:D:215:TYR:CE2	2.47	0.49
1:A:51:GLN:HG2	1:D:215:TYR:CZ	2.47	0.49
1:A:171:GLN:O	1:A:335:ILE:HD11	2.13	0.48
1:B:215:TYR:CZ	1:C:51:GLN:HG2	2.49	0.48
1:B:260:PRO:C	1:B:262:GLY:H	2.17	0.47
1:C:79:LYS:O	1:C:82:ASP:HB2	2.14	0.47
1:A:332:PRO:HA	1:A:337:GLN:OE1	2.14	0.46
1:B:325:GLN:HB2	2:B:431:HOH:O	2.16	0.46
1:A:258:PRO:HB2	1:A:262:GLY:HA2	1.97	0.46
1:C:225:LEU:HD11	1:C:282:LEU:HD23	1.97	0.46
1:A:304:TYR:OH	1:A:335:ILE:HG22	2.16	0.46
1:A:290:PRO:HB3	1:A:342:TYR:OH	2.17	0.45
1:A:349:VAL:O	1:A:353:GLU:HG3	2.17	0.45
1:C:305:GLU:O	1:C:309:MET:HG2	2.17	0.45
1:B:175:VAL:HG21	1:B:335:ILE:HA	1.99	0.45
1:D:24:TRP:O	1:D:28:GLN:HG2	2.17	0.45
1:D:288:GLY:HA2	1:D:341:LEU:O	2.18	0.44
1:D:305:GLU:O	1:D:309:MET:HG2	2.17	0.44
1:B:260:PRO:HG2	1:B:261:SER:H	1.83	0.44
1:A:305:GLU:O	1:A:309:MET:HG2	2.18	0.44
1:B:352:VAL:O	1:B:356:LEU:HG	2.18	0.44
1:B:24:TRP:O	1:B:28:GLN:HG2	2.18	0.43
1:B:349:VAL:O	1:B:352:VAL:HG12	2.18	0.43
1:D:225:LEU:HD11	1:D:282:LEU:HD23	2.00	0.43
1:A:248:LEU:HD21	1:A:290:PRO:HG3	2.01	0.43
1:A:247:ASN:HB3	1:A:356:LEU:HD23	2.00	0.43
1:A:331:GLN:NE2	1:A:332:PRO:HD2	2.34	0.43
1:B:225:LEU:HD11	1:B:282:LEU:HD23	2.01	0.43
1:B:260:PRO:C	1:B:262:GLY:N	2.72	0.43
1:B:100:GLY:HA3	1:B:166:LEU:HD21	2.01	0.42
1:A:58:ARG:HG2	1:B:213:PRO:HD2	2.01	0.42
1:D:148:SER:HB2	1:D:185:LEU:HD11	2.02	0.42
1:D:188:GLY:HA2	1:D:312:ILE:HD11	2.01	0.42
1:C:82:ASP:OD2	1:C:128:LEU:HD12	2.19	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:97:GLY:HA3	1:D:116:SER:HA	2.02	0.41
1:A:258:PRO:O	1:A:259:GLY:O	2.38	0.41
1:D:323:GLY:O	1:D:353:GLU:HG2	2.20	0.41
1:C:90:SER:HA	1:C:99:THR:HG21	2.02	0.41
1:C:258:PRO:O	1:C:259:GLY:O	2.39	0.41
1:D:349:VAL:O	1:D:352:VAL:HG12	2.20	0.41
1:A:288:GLY:HA2	1:A:341:LEU:O	2.21	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	317/357 (89%)	304 (96%)	11 (4%)	2 (1%)	25	36
1	B	329/357 (92%)	311 (94%)	15 (5%)	3 (1%)	17	25
1	C	321/357 (90%)	302 (94%)	15 (5%)	4 (1%)	13	19
1	D	319/357 (89%)	306 (96%)	9 (3%)	4 (1%)	12	17
All	All	1286/1428 (90%)	1223 (95%)	50 (4%)	13 (1%)	15	23

All (13) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	108	ASP
1	A	259	GLY
1	B	260	PRO
1	B	155	PRO
1	C	155	PRO
1	C	259	GLY
1	D	260	PRO
1	D	261	SER

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Mol	Chain	Res	Type
1	C	106	GLU
1	D	262	GLY
1	B	259	GLY
1	C	157	PHE
1	D	259	GLY

### 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	265/307 (86%)	262 (99%)	3 (1%)	73 87
1	B	269/307 (88%)	263 (98%)	6 (2%)	52 71
1	C	264/307 (86%)	258 (98%)	6 (2%)	50 70
1	D	255/307 (83%)	252 (99%)	3 (1%)	71 85
All	All	1053/1228 (86%)	1035 (98%)	18 (2%)	60 78

All (18) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	99	THR
1	A	151	ASP
1	A	289	TYR
1	B	99	THR
1	B	151	ASP
1	B	161	SER
1	B	163	ASP
1	B	289	TYR
1	B	305	GLU
1	C	99	THR
1	C	151	ASP
1	C	289	TYR
1	C	292	ASP
1	C	296	LYS
1	C	305	GLU
1	D	99	THR

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Mol	Chain	Res	Type
1	D	289	TYR
1	D	305	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	240	ASN
1	A	247	ASN
1	B	240	ASN
1	C	240	ASN
1	C	325	GLN
1	D	240	ASN
1	D	325	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 carbohydrates in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 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

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	323/357 (90%)	-0.69	4 (1%) 79 77	11, 28, 68, 100	0
1	B	333/357 (93%)	-0.73	12 (3%) 42 42	11, 24, 66, 100	0
1	C	327/357 (91%)	-0.73	6 (1%) 68 66	14, 29, 64, 100	0
1	D	325/357 (91%)	-0.63	7 (2%) 62 60	16, 34, 72, 100	0
All	All	1308/1428 (91%)	-0.70	29 (2%) 62 60	11, 29, 69, 100	0

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	160	ASP	6.5
1	B	159	ASP	5.8
1	C	157	PHE	5.6
1	D	162	ASP	4.9
1	B	157	PHE	4.9
1	A	65	THR	4.5
1	B	156	ASP	4.1
1	B	158	GLY	4.0
1	A	66	GLY	4.0
1	C	156	ASP	3.8
1	C	65	THR	3.8
1	D	260	PRO	3.7
1	D	65	THR	3.6
1	B	161	SER	3.5
1	B	162	ASP	3.4
1	B	261	SER	3.3
1	C	75	GLY	3.2
1	D	259	GLY	3.2
1	A	76	GLU	3.1
1	B	155	PRO	3.1
1	C	158	GLY	3.0

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Mol	Chain	Res	Type	RSRZ
1	D	261	SER	2.7
1	D	163	ASP	2.7
1	B	75	GLY	2.5
1	B	163	ASP	2.4
1	A	262	GLY	2.4
1	C	105	GLU	2.2
1	B	16	TYR	2.1
1	D	155	PRO	2.1

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

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

## 6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 6.4 Ligands [i](#)

There are no ligands in this entry.

## 6.5 Other polymers [i](#)

There are no such residues in this entry.