wwPDB X-ray Structure Validation Summary Report (i)

Jan 31, 2016 – 10:53 PM GMT

PDB ID	:	1VKN
Title	:	Crystal structure of N-acetyl-gamma-glutamyl-phosphate reductase (TM1782) from Thermotoga maritima at 1.80 A resolution
Authors	:	Joint Center for Structural Genomics (JCSG)
Deposited on	:	2004-06-11
Resolution	:	1.80 Å(reported)

This is a wwPDB X-ray Structure Validation Summary Report for a publicly released PDB entry.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
http://wwpdb.org/validation/2016/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The following versions of software and data (see references (1)) were used in the production of this report:

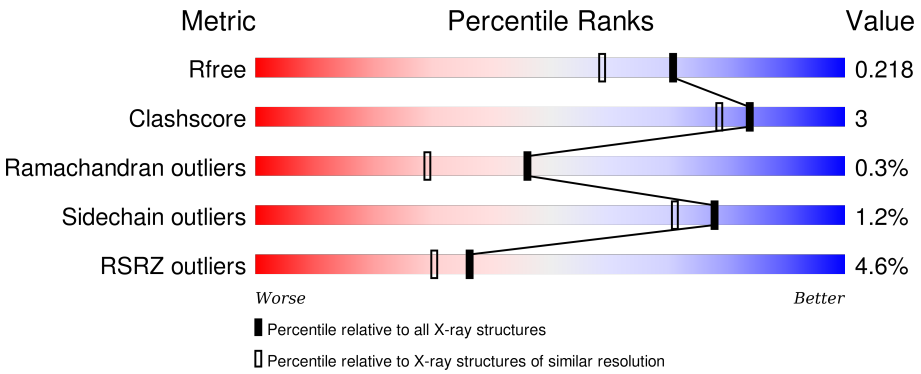
MolProbity	:	4.02b-467
Mogul	:	1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix)	:	1.9-1692
EDS	:	rb-20026688
Percentile statistics	:	20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac	:	5.8.0135
CCP4	:	6.5.0
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	trunk26865

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 1.80 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))
R_{free}	91344	4533 (1.80-1.80)
Clashscore	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)
RSRZ outliers	91569	4547 (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 >=3, 2, 1 and 0 types of geometric quality criteria. 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% 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	351	% 88% 9% •
1	B	351	2% 88% 8% • •
1	C	351	2% 86% 10% •
1	D	351	13% 87% 8% • 5%

2 Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 11278 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 N-acetyl-gamma-glutamyl-phosphate reductase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	340	2654	1707	438	498	3	8	0	0	0
1	B	340	2667	1712	440	504	3	8	0	2	0
1	C	336	2607	1676	428	492	3	8	0	0	0
1	D	335	2594	1672	426	485	3	8	0	0	0

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MET	-	LEADER SEQUENCE	UNP Q9X2A2
A	-10	GLY	-	LEADER SEQUENCE	UNP Q9X2A2
A	-9	SER	-	LEADER SEQUENCE	UNP Q9X2A2
A	-8	ASP	-	LEADER SEQUENCE	UNP Q9X2A2
A	-7	LYS	-	LEADER SEQUENCE	UNP Q9X2A2
A	-6	ILE	-	LEADER SEQUENCE	UNP Q9X2A2
A	-5	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	-4	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	-3	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	-2	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	-1	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	0	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
A	1	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	210	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	233	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	271	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	290	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	292	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	302	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	320	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
A	323	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-11	MET	-	LEADER SEQUENCE	UNP Q9X2A2
B	-10	GLY	-	LEADER SEQUENCE	UNP Q9X2A2
B	-9	SER	-	LEADER SEQUENCE	UNP Q9X2A2
B	-8	ASP	-	LEADER SEQUENCE	UNP Q9X2A2
B	-7	LYS	-	LEADER SEQUENCE	UNP Q9X2A2
B	-6	ILE	-	LEADER SEQUENCE	UNP Q9X2A2
B	-5	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	-4	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	-3	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	-2	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	-1	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	0	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
B	1	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	210	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	233	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	271	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	290	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	292	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	302	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	320	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
B	323	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	-11	MET	-	LEADER SEQUENCE	UNP Q9X2A2
C	-10	GLY	-	LEADER SEQUENCE	UNP Q9X2A2
C	-9	SER	-	LEADER SEQUENCE	UNP Q9X2A2
C	-8	ASP	-	LEADER SEQUENCE	UNP Q9X2A2
C	-7	LYS	-	LEADER SEQUENCE	UNP Q9X2A2
C	-6	ILE	-	LEADER SEQUENCE	UNP Q9X2A2
C	-5	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	-4	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	-3	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	-2	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	-1	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	0	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
C	1	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	210	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	233	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	271	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	290	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	292	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	302	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	320	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
C	323	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-11	MET	-	LEADER SEQUENCE	UNP Q9X2A2
D	-10	GLY	-	LEADER SEQUENCE	UNP Q9X2A2
D	-9	SER	-	LEADER SEQUENCE	UNP Q9X2A2
D	-8	ASP	-	LEADER SEQUENCE	UNP Q9X2A2
D	-7	LYS	-	LEADER SEQUENCE	UNP Q9X2A2
D	-6	ILE	-	LEADER SEQUENCE	UNP Q9X2A2
D	-5	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	-4	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	-3	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	-2	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	-1	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	0	HIS	-	LEADER SEQUENCE	UNP Q9X2A2
D	1	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	210	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	233	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	271	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	290	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	292	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	302	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	320	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2
D	323	MSE	MET	MODIFIED RESIDUE	UNP Q9X2A2

- Molecule 2 is water.

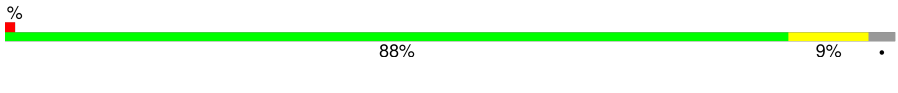
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
2	A	263	263	263	0	0
			Total	O		
2	B	213	213	213	0	0
			Total	O		
2	C	191	191	191	0	0
			Total	O		
2	D	89	89	89	0	0

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 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.

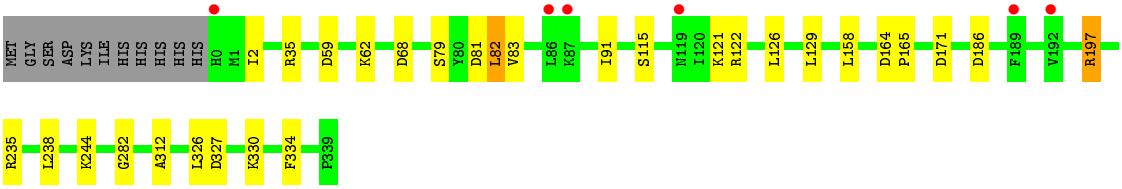
- Molecule 1: N-acetyl-gamma-glutamyl-phosphate reductase

Chain A:



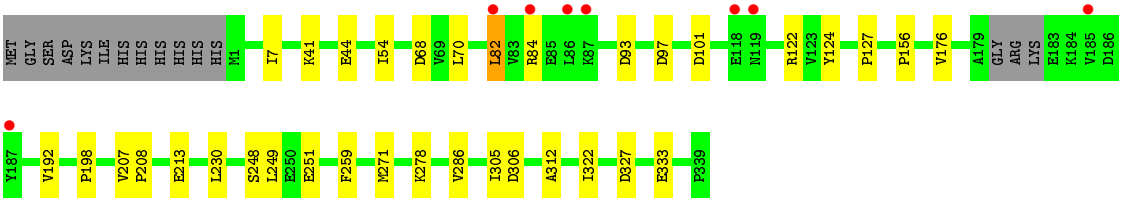
- Molecule 1: N-acetyl-gamma-glutamyl-phosphate reductase

Chain B:



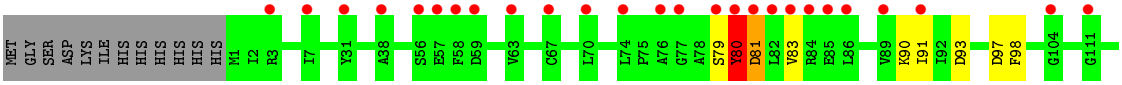
- Molecule 1: N-acetyl-gamma-glutamyl-phosphate reductase

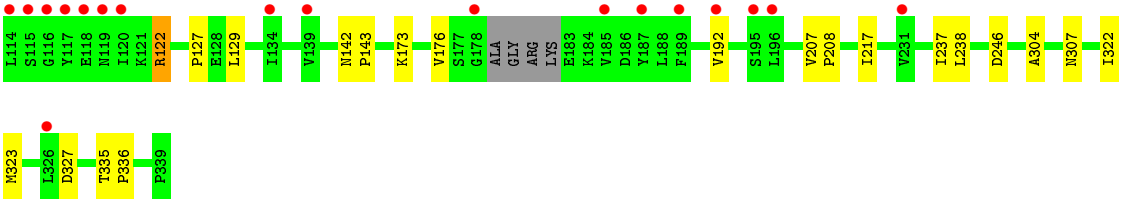
Chain C:



- Molecule 1: N-acetyl-gamma-glutamyl-phosphate reductase

Chain D:




L114
S115
G116
Y117
E118
N119
I120
K121
R122
P127
E128
L129
I134
V139
N142
P143
K173
V176
S177
G178
ALA
GLY
ARG
LYS
E183
K184
V185
D186
Y187
I188
F189
V192
S195
L196
V207
P208
I217
V231
I237
L238
D246
A304
N307
I322
M323
L326
D327
T335
P336
P339

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	85.10Å 92.10Å 100.88Å 90.00° 112.76° 90.00°	Depositor
Resolution (Å)	46.51 – 1.80 46.51 – 1.80	Depositor EDS
% Data completeness (in resolution range)	98.1 (46.51-1.80) 98.1 (46.51-1.80)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	3.20 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.2.0001	Depositor
R, R_{free}	0.178 , 0.212 0.187 , 0.218	Depositor DCC
R_{free} test set	6556 reflections (5.27%)	DCC
Wilson B-factor (Å^2)	28.1	Xtriage
Anisotropy	0.252	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 47.3	EDS
Estimated twinning fraction	0.012 for h,-k,-h-l	Xtriage
L-test for twinning[2]	$< \|L\| > = 0.51$, $< L^2 > = 0.35$	Xtriage
Outliers	0 of 131172 reflections	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	11278	wwPDB-VP
Average B, all atoms (Å^2)	39.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.66% 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, 0.375 respectively for untwinned datasets, and 0.333, 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	0.78	0/2705	0.82	1/3651 (0.0%)
1	B	0.76	0/2726	0.87	8/3681 (0.2%)
1	C	0.76	0/2658	0.82	6/3593 (0.2%)
1	D	0.60	0/2645	0.76	6/3574 (0.2%)
All	All	0.73	0/10734	0.82	21/14499 (0.1%)

There are no bond length outliers.

The worst 5 of 21 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	235	ARG	NE-CZ-NH2	-7.95	116.33	120.30
1	B	197	ARG	NE-CZ-NH2	-7.61	116.50	120.30
1	C	93	ASP	CB-CG-OD2	6.69	124.32	118.30
1	B	68	ASP	CB-CG-OD2	6.60	124.24	118.30
1	A	93	ASP	CB-CG-OD2	6.53	124.17	118.30

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	2654	0	2649	17	0
1	B	2667	0	2655	14	0
1	C	2607	0	2572	18	0
1	D	2594	0	2566	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	263	0	0	3	0
2	B	213	0	0	3	0
2	C	191	0	0	4	0
2	D	89	0	0	0	0
All	All	11278	0	10442	62	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 3.

The worst 5 of 62 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:129:LEU:HD21	1:D:217:ILE:HD11	1.69	0.74
1:A:129:LEU:HD21	1:A:217:ILE:HD11	1.72	0.71
1:C:278:LYS:HG2	2:C:431:HOH:O	1.92	0.69
1:C:286:VAL:HG22	1:C:305:ILE:HG22	1.74	0.69
1:B:79:SER:O	1:B:83:VAL:HG23	2.01	0.60

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	338/351 (96%)	332 (98%)	5 (2%)	1 (0%)	46 29
1	B	340/351 (97%)	334 (98%)	5 (2%)	1 (0%)	46 29
1	C	332/351 (95%)	326 (98%)	5 (2%)	1 (0%)	46 29
1	D	331/351 (94%)	322 (97%)	8 (2%)	1 (0%)	46 29
All	All	1341/1404 (96%)	1314 (98%)	23 (2%)	4 (0%)	46 29

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	80	TYR
1	A	312	ALA
1	B	312	ALA
1	C	312	ALA

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	287/295 (97%)	285 (99%)	2 (1%)	88	86
1	B	290/295 (98%)	285 (98%)	5 (2%)	68	57
1	C	279/295 (95%)	275 (99%)	4 (1%)	74	65
1	D	277/295 (94%)	274 (99%)	3 (1%)	80	74
All	All	1133/1180 (96%)	1119 (99%)	14 (1%)	78	71

5 of 14 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	244	LYS
1	C	54	ILE
1	D	80	TYR
1	B	122	ARG
1	C	122	ARG

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	B	262	ASN
1	D	138	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 (i)

6.1 Protein, DNA and RNA chains (i)

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, 95th 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^2)	Q<0.9
1	A	331/351 (94%)	-0.22	2 (0%)	90	88	25, 32, 50, 67	0
1	B	331/351 (94%)	-0.15	6 (1%)	71	67	25, 34, 58, 78	0
1	C	327/351 (93%)	0.03	8 (2%)	62	57	26, 35, 55, 73	0
1	D	326/351 (92%)	0.66	44 (13%)	4	3	30, 43, 66, 97	0
All	All	1315/1404 (93%)	0.08	60 (4%)	36	30	25, 36, 58, 97	0

The worst 5 of 60 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	82	LEU	6.8
1	D	84	ARG	5.8
1	B	0	HIS	5.5
1	D	58	PHE	5.4
1	D	83	VAL	5.3

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.