



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 08:08 am GMT

PDB ID : 3R4P
Title : Optimization of potent, selective, and orally bioavailable pyrrolidinopyrimidine-containing inhibitors of heat shock protein 90. identification of development candidate 2-amino-4-{4-chloro-2-[2-(4-fluoro-1H-pyrazol-1-yl)ethoxy]-6-methylphenyl}-N-(2,2-difluoropropyl)-5,7-dihydro-6H-pyrrolo[3,4-d]pyrimidine-6-carboxamide
Authors : Gajiwala, K.S.
Deposited on : 2011-03-17
Resolution : 1.70 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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

MolProbity	:	4.02b-467
Mogul	:	1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	recalc28949

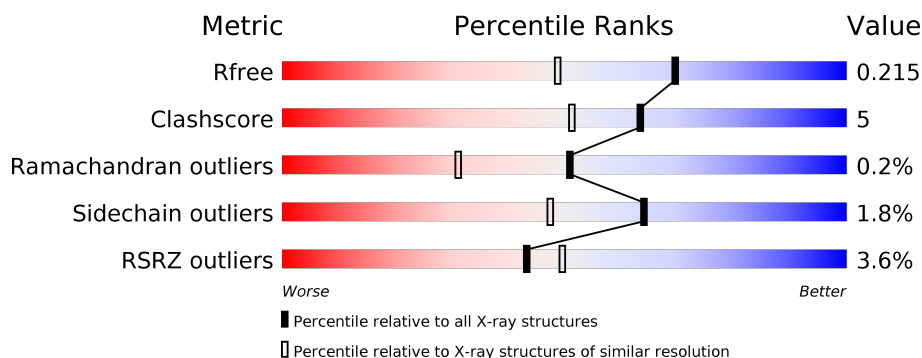
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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}	100719	3453 (1.70-1.70)
Clashscore	112137	3876 (1.70-1.70)
Ramachandran outliers	110173	3815 (1.70-1.70)
Sidechain outliers	110143	3815 (1.70-1.70)
RSRZ outliers	101464	3491 (1.70-1.70)

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 $\leq 5\%$. 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	226	<div> <div>4%</div> <div> <div></div> <div>86%</div> <div>11%</div> <div>••</div> </div> </div>
1	B	226	<div> <div>4%</div> <div> <div></div> <div>88%</div> <div>9%</div> <div>••</div> </div> </div>

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
3	PO4	A	904	-	-	-	X

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 3967 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.

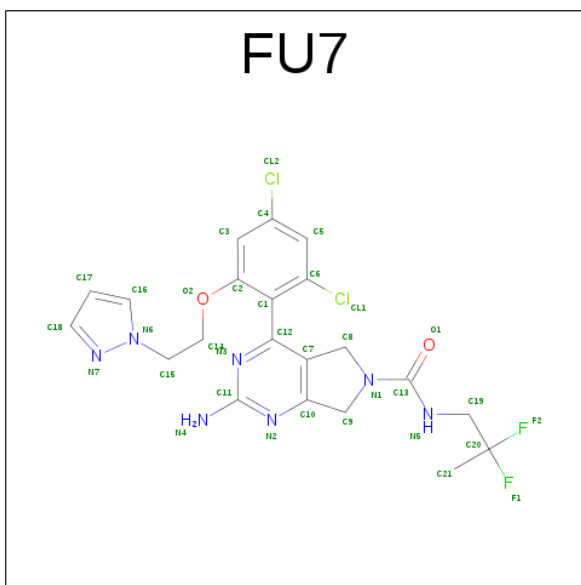
- Molecule 1 is a protein called Heat shock protein HSP 90-alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	222	Total	C	N	O	S	0	0	0
			1759	1112	291	350	6			
1	B	222	Total	C	N	O	S	0	1	0
			1763	1114	290	352	7			

There are 18 discrepancies between the modelled and reference sequences:

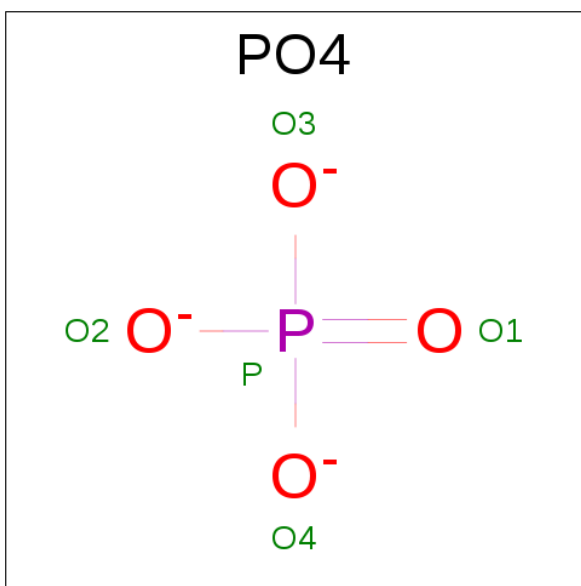
Chain	Residue	Modelled	Actual	Comment	Reference
A	8	MET	-	INITIATING METHIONINE	UNP P07900
A	226	LEU	-	EXPRESSION TAG	UNP P07900
A	227	GLU	-	EXPRESSION TAG	UNP P07900
A	228	HIS	-	EXPRESSION TAG	UNP P07900
A	229	HIS	-	EXPRESSION TAG	UNP P07900
A	230	HIS	-	EXPRESSION TAG	UNP P07900
A	231	HIS	-	EXPRESSION TAG	UNP P07900
A	232	HIS	-	EXPRESSION TAG	UNP P07900
A	233	HIS	-	EXPRESSION TAG	UNP P07900
B	8	MET	-	INITIATING METHIONINE	UNP P07900
B	226	LEU	-	EXPRESSION TAG	UNP P07900
B	227	GLU	-	EXPRESSION TAG	UNP P07900
B	228	HIS	-	EXPRESSION TAG	UNP P07900
B	229	HIS	-	EXPRESSION TAG	UNP P07900
B	230	HIS	-	EXPRESSION TAG	UNP P07900
B	231	HIS	-	EXPRESSION TAG	UNP P07900
B	232	HIS	-	EXPRESSION TAG	UNP P07900
B	233	HIS	-	EXPRESSION TAG	UNP P07900

- Molecule 2 is 2-AMINO-4-{2,4-DICHLORO-6-[2-(1H-PYRAZOL-1-YL)ETHOXY]PHENYL}-N-(2,2-DIFLUOROPROPYL)-5,7-DIHYDRO-6H-PYRROLO[3,4-D]PYRIMIDINE-6-CARBOXAMIDE (three-letter code: FU7) (formula: C₂₁H₂₁Cl₂F₂N₇O₂).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 34	C 21	Cl 2	F 2	N 7	O 2	0	0
2	B	1	Total 34	C 21	Cl 2	F 2	N 7	O 2	0	0

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O_4P).



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

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


- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	193	Total	O	0	0
			193	193		
4	B	169	Total	O	0	0
			169	169		

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: Heat shock protein HSP 90-alpha

Chain A: 



- Molecule 1: Heat shock protein HSP 90-alpha

Chain B: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	46.24Å 79.59Å 118.65Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.99 – 1.70 66.10 – 1.28	Depositor EDS
% Data completeness (in resolution range)	95.8 (19.99-1.70) 95.9 (66.10-1.28)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.00 (at 1.28Å)	Xtriage
Refinement program	CNX 2005	Depositor
R, R_{free}	0.187 , 0.212 0.189 , 0.215	Depositor DCC
R_{free} test set	2258 reflections (5.05%)	DCC
Wilson B-factor (Å ²)	13.8	Xtriage
Anisotropy	0.161	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 50.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3967	wwPDB-VP
Average B, all atoms (Å ²)	18.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 21.62 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 6.7514e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FU7, PO4

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	0.25	0/1789	0.46	0/2412
1	B	0.25	0/1792	0.47	0/2415
All	All	0.25	0/3581	0.47	0/4827

There are no bond length outliers.

There are no bond angle outliers.

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	1759	0	1737	22	0
1	B	1763	0	1743	17	0
2	A	34	0	21	0	0
2	B	34	0	21	0	0
3	A	15	0	0	0	0
4	A	193	0	0	0	0
4	B	169	0	0	0	0
All	All	3967	0	3522	35	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 5.

All (35) 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:40:ASN:HD22	1:A:40:ASN:H	1.29	0.78
1:A:229:HIS:HB3	1:B:218:ILE:H	1.54	0.73
1:A:10:GLN:HG3	1:A:11:PRO:HD2	1.85	0.58
1:A:92:VAL:HG13	1:A:185:LYS:HG2	1.86	0.56
1:A:85:GLN:OE1	1:A:225:GLU:HB2	2.06	0.55
1:A:40:ASN:ND2	1:A:40:ASN:H	2.04	0.53
1:B:24:ALA:O	1:B:28:GLN:HG3	2.10	0.52
1:A:23:GLN:CD	1:A:111:ALA:HB2	2.33	0.49
1:A:40:ASN:N	1:A:40:ASN:HD22	1.96	0.49
1:A:212:GLN:HA	1:A:212:GLN:HE21	1.79	0.48
1:B:13:GLU:HG2	1:B:176:THR:HG21	1.95	0.48
1:A:227:GLU:O	1:A:228:HIS:HB2	2.14	0.47
1:B:165:SER:O	1:B:166:ALA:HB3	2.14	0.46
1:A:91:ILE:N	1:A:91:ILE:HD12	2.31	0.46
1:B:120:GLU:HA	1:B:123:GLN:HG2	1.98	0.46
1:A:229:HIS:HB3	1:B:218:ILE:N	2.26	0.45
1:A:225:GLU:HB3	1:A:230:HIS:HA	1.98	0.45
1:A:155:ASN:O	1:A:156:ASP:HB2	2.16	0.45
1:A:218:ILE:H	1:B:229:HIS:HB3	1.80	0.45
1:A:224:LYS:HG2	1:B:220:LEU:HB3	1.99	0.45
1:B:120:GLU:HA	1:B:123:GLN:CG	2.47	0.45
1:B:147:LYS:HZ2	1:B:189:HIS:CD2	2.35	0.45
1:B:212:GLN:H	1:B:212:GLN:NE2	2.15	0.45
1:A:165:SER:O	1:A:166:ALA:HB3	2.18	0.43
1:A:112:LYS:HG2	1:A:114:GLY:H	1.83	0.43
1:B:178:GLU:HA	1:B:179:PRO:HD3	1.90	0.43
1:B:100:LYS:HB2	1:B:160:TYR:CZ	2.54	0.43
1:A:159:GLN:HG2	1:A:175:ASP:HB3	2.02	0.42
1:A:38:TYR:CE2	1:A:128:ILE:HG13	2.54	0.42
1:A:40:ASN:N	1:A:40:ASN:ND2	2.63	0.42
1:B:91:ILE:HD12	1:B:91:ILE:N	2.34	0.42
1:B:120:GLU:HA	1:B:123:GLN:OE1	2.20	0.42
1:B:128:ILE:O	1:B:128:ILE:HG13	2.20	0.41
1:A:38:TYR:CD2	1:A:128:ILE:HG13	2.57	0.40
1:B:123:GLN:H	1:B:123:GLN:HG2	1.77	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	220/226 (97%)	214 (97%)	5 (2%)	1 (0%)	32	15
1	B	221/226 (98%)	216 (98%)	5 (2%)	0	100	100
All	All	441/452 (98%)	430 (98%)	10 (2%)	1 (0%)	51	31

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	177	GLY

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	193/197 (98%)	190 (98%)	3 (2%)	68	53
1	B	194/197 (98%)	190 (98%)	4 (2%)	59	40
All	All	387/394 (98%)	380 (98%)	7 (2%)	64	47

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	40	ASN
1	A	212	GLN
1	A	224	LYS
1	B	8	MET
1	B	13	GLU

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Mol	Chain	Res	Type
1	B	200	GLU
1	B	212	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	ASN
1	A	133	GLN
1	A	212	GLN
1	B	212	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](#)

5 ligands are 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	FU7	A	901	-	34,37,37	1.57	7 (20%)	37,54,54	1.25	4 (10%)
3	PO4	A	902	-	4,4,4	1.31	0	6,6,6	0.38	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	PO4	A	903	-	4,4,4	1.30	0	6,6,6	0.39	0
3	PO4	A	904	-	4,4,4	1.30	0	6,6,6	0.38	0
2	FU7	B	901	-	34,37,37	1.59	6 (17%)	37,54,54	1.21	4 (10%)

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	FU7	A	901	-	-	0/19/28/28	0/4/4/4
3	PO4	A	902	-	-	0/0/0/0	0/0/0/0
3	PO4	A	903	-	-	0/0/0/0	0/0/0/0
3	PO4	A	904	-	-	0/0/0/0	0/0/0/0
2	FU7	B	901	-	-	0/19/28/28	0/4/4/4

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	901	FU7	C5-C6	2.11	1.42	1.38
2	A	901	FU7	C5-C4	2.13	1.41	1.38
2	B	901	FU7	C5-C6	2.18	1.42	1.38
2	B	901	FU7	C11-N3	2.22	1.39	1.35
2	A	901	FU7	C11-N3	2.22	1.39	1.35
2	B	901	FU7	C3-C2	2.25	1.43	1.38
2	A	901	FU7	C11-N4	2.34	1.38	1.34
2	A	901	FU7	C3-C2	2.40	1.43	1.38
2	B	901	FU7	C11-N4	2.60	1.39	1.34
2	A	901	FU7	C1-C2	3.85	1.45	1.40
2	B	901	FU7	C1-C2	4.00	1.46	1.40
2	A	901	FU7	C1-C6	4.08	1.44	1.40
2	B	901	FU7	C1-C6	4.20	1.44	1.40

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	901	FU7	N5-C13-N1	-3.93	115.80	117.70
2	B	901	FU7	N5-C13-N1	-3.29	116.11	117.70
2	A	901	FU7	C5-C6-C1	-2.32	120.77	122.79
2	B	901	FU7	C5-C6-C1	-2.21	120.86	122.79
2	A	901	FU7	C8-C7-C12	2.16	131.51	127.91
2	B	901	FU7	C8-C7-C12	2.19	131.56	127.91

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	901	FU7	C16-N6-N7	2.57	113.77	111.57
2	A	901	FU7	C16-N6-N7	2.58	113.77	111.57

There are no chirality outliers.

There are no torsion outliers.

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](#)

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	222/226 (98%)	-0.22	8 (3%) 43 49	7, 16, 33, 43	0
1	B	222/226 (98%)	-0.23	8 (3%) 43 49	8, 15, 32, 53	0
All	All	444/452 (98%)	-0.22	16 (3%) 43 49	7, 15, 33, 53	0

All (16) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	228	HIS	5.8
1	B	213	PHE	4.9
1	B	8	MET	4.8
1	B	228	HIS	4.6
1	B	113	SER	3.6
1	A	230	HIS	3.5
1	A	176	THR	3.4
1	B	117	ALA	3.3
1	B	229	HIS	3.1
1	A	112	LYS	2.8
1	B	227	GLU	2.6
1	A	38	TYR	2.4
1	A	227	GLU	2.2
1	B	123	GLN	2.2
1	A	212	GLN	2.1
1	A	177	GLY	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](#)

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, 95th 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	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
3	PO4	A	904	5/5	0.89	0.19	10.19	34,34,36,36	0
2	FU7	B	901	34/34	0.96	0.08	0.55	7,11,17,21	0
2	FU7	A	901	34/34	0.97	0.07	-0.06	7,11,15,18	0
3	PO4	A	902	5/5	0.96	0.07	-0.31	14,15,15,16	0
3	PO4	A	903	5/5	0.92	0.15	-	25,27,28,29	0

6.5 Other polymers [i](#)

There are no such residues in this entry.