



Full wwPDB X-ray Structure Validation Report ⓘ

Sep 26, 2023 – 10:54 PM EDT

PDB ID : 6CVD
Title : High resolution crystal structure of FtsY-NG domain of E. coli bound to fragment 1
Authors : Faoro, C.; Ataide, S.F.; Kwan, A.; Wilkinson-White, L.
Deposited on : 2018-03-27
Resolution : 1.78 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35.1
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) : 2.35.1

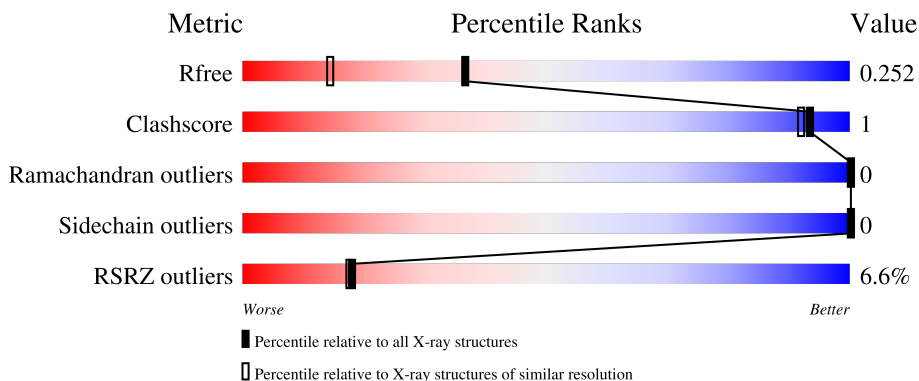
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

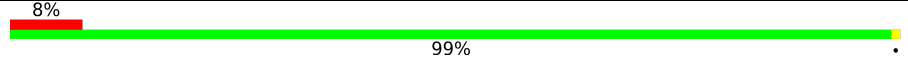
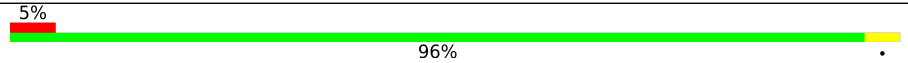
The reported resolution of this entry is 1.78 Å.

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}	130704	9185 (1.80-1.76)
Clashscore	141614	10184 (1.80-1.76)
Ramachandran outliers	138981	10051 (1.80-1.76)
Sidechain outliers	138945	10050 (1.80-1.76)
RSRZ outliers	127900	9032 (1.80-1.76)

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 $\leq 5\%$. 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	303	 8% 99%
1	B	303	 5% 96%

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	4ME	A	501	-	-	-	X
2	4ME	A	502	-	-	-	X

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 9883 atoms, of which 4811 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.

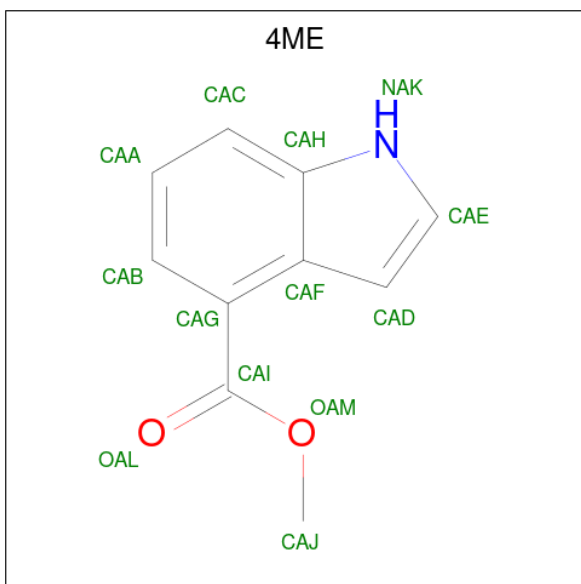
- Molecule 1 is a protein called Signal recognition particle receptor FtsY.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	302	4703	1467	2386	405	439	6	0	0	0
1	B	303	4723	1482	2381	407	446	7	0	3	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	195	GLY	-	expression tag	UNP P10121
B	195	GLY	-	expression tag	UNP P10121

- Molecule 2 is methyl 1H-indole-4-carboxylate (three-letter code: 4ME) (formula: C₁₀H₉NO₂).



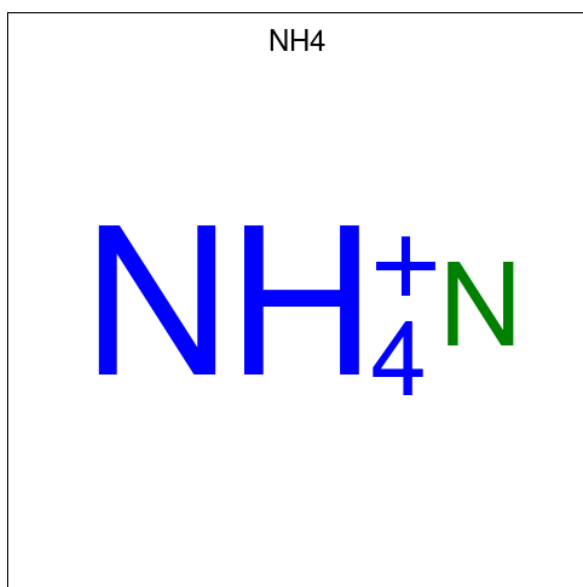
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	H	N	O		
2	A	1	22	10	9	1	2	0	0

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	0	0
			22	10	9	1	2		
2	B	1	Total	C	H	N	O	0	0
			22	10	9	1	2		
2	B	1	Total	C	H	N	O	0	0
			22	10	9	1	2		

- Molecule 3 is AMMONIUM ION (three-letter code: NH4) (formula: H₄N).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	H	N	0	0
			5	4	1		
3	A	1	Total	H	N	0	0
			5	4	1		

- Molecule 4 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Na	0	0
			1	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	180	Total	O	0	0
			180	180		

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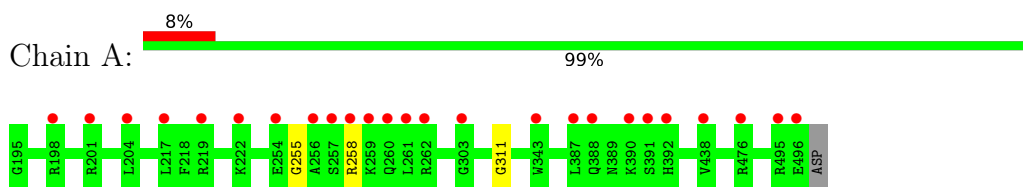
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	178	Total 178	O 178	0	0

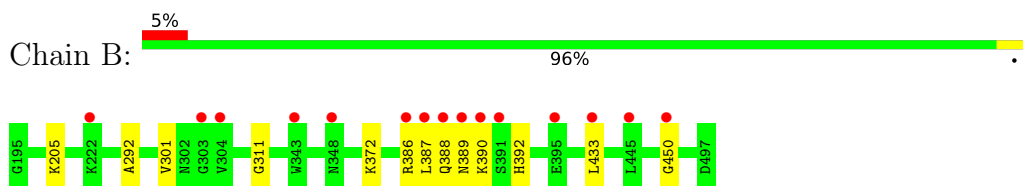
3 Residue-property plots [i](#)

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 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: Signal recognition particle receptor FtsY



- Molecule 1: Signal recognition particle receptor FtsY



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	34.34Å 76.01Å 108.03Å 90.00° 90.42° 90.00°	Depositor
Resolution (Å)	36.01 – 1.78 38.00 – 1.78	Depositor EDS
% Data completeness (in resolution range)	99.8 (36.01-1.78) 100.0 (38.00-1.78)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.10 (at 1.78Å)	Xtrriage
Refinement program	PHENIX (1.12_2829: ???)	Depositor
R, R_{free}	0.202 , 0.252 0.204 , 0.252	Depositor DCC
R_{free} test set	2593 reflections (4.86%)	wwPDB-VP
Wilson B-factor (Å ²)	19.7	Xtrriage
Anisotropy	0.507	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 42.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.055 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	9883	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 10.33% of the height of the origin peak. No significant pseudotranslation is detected.*

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: 4ME, NA, NH4

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	0.68	0/2344	0.75	0/3154
1	B	0.76	0/2375	0.81	0/3195
All	All	0.72	0/4719	0.78	0/6349

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	2317	2386	2393	2	0
1	B	2342	2381	2416	11	0
2	A	26	18	18	1	0
2	B	26	18	18	1	0
3	A	2	8	0	0	0
4	B	1	0	0	0	0
5	A	180	0	0	0	0
5	B	178	0	0	0	0
All	All	5072	4811	4845	13	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 1.

All (13) 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:B:301:VAL:HG11	1:B:387:LEU:HD11	1.47	0.96
1:B:301:VAL:CG1	1:B:387:LEU:HD11	2.08	0.84
1:B:301:VAL:HG12	1:B:387:LEU:HD21	1.88	0.56
1:B:311:GLY:HA3	2:B:501:4ME:HAD	1.90	0.52
1:B:390:LYS:HG3	1:B:433:LEU:HD11	1.93	0.51
1:B:389:ASN:HB2	1:B:392:HIS:HB3	1.95	0.46
1:A:311:GLY:HA3	2:A:502:4ME:HAD	1.99	0.44
1:B:390:LYS:HG3	1:B:433:LEU:CD1	2.48	0.43
1:A:255:GLY:HA2	1:A:258:ARG:NH2	2.34	0.42
1:B:292:ALA:O	1:B:372:LYS:HG2	2.19	0.42
1:B:386:ARG:NH1	1:B:388:GLN:HB2	2.36	0.41
1:B:301:VAL:HG12	1:B:387:LEU:HD11	1.99	0.41
1:B:205:LYS:HD2	1:B:450:GLY:C	2.42	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	300/303 (99%)	297 (99%)	3 (1%)	0	100	100
1	B	304/303 (100%)	301 (99%)	3 (1%)	0	100	100
All	All	604/606 (100%)	598 (99%)	6 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	243/244 (100%)	243 (100%)	0	100	100
1	B	247/244 (101%)	247 (100%)	0	100	100
All	All	490/488 (100%)	490 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

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

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](#)

Of 7 ligands modelled in this entry, 2 are modelled with single atom and 1 is monoatomic - leaving 4 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$
2	4ME	B	502	-	12,14,14	2.43	4 (33%)	15,19,19	1.16	2 (13%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	4ME	A	502	-	12,14,14	2.50	5 (41%)	15,19,19	1.02	2 (13%)
2	4ME	B	501	-	12,14,14	2.49	5 (41%)	15,19,19	1.01	1 (6%)
2	4ME	A	501	-	12,14,14	2.68	5 (41%)	15,19,19	0.87	0

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	4ME	B	502	-	-	2/6/6/6	0/2/2/2
2	4ME	A	502	-	-	2/6/6/6	0/2/2/2
2	4ME	B	501	-	-	2/6/6/6	0/2/2/2
2	4ME	A	501	-	-	0/6/6/6	0/2/2/2

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	501	4ME	CAC-CAH	-5.18	1.32	1.41
2	B	502	4ME	CAC-CAH	-4.91	1.33	1.41
2	B	501	4ME	CAG-CAI	-4.64	1.40	1.50
2	A	501	4ME	CAG-CAI	-4.60	1.41	1.50
2	A	502	4ME	CAG-CAI	-4.51	1.41	1.50
2	A	501	4ME	CAG-CAF	-4.42	1.34	1.43
2	A	502	4ME	CAC-CAH	-4.32	1.34	1.41
2	B	501	4ME	CAC-CAH	-4.15	1.34	1.41
2	B	501	4ME	CAG-CAF	-4.11	1.35	1.43
2	B	502	4ME	CAG-CAI	-4.00	1.42	1.50
2	B	502	4ME	CAG-CAF	-4.00	1.35	1.43
2	A	502	4ME	CAG-CAF	-3.92	1.35	1.43
2	A	501	4ME	CAF-CAH	-3.06	1.34	1.42
2	A	502	4ME	CAF-CAH	-3.02	1.34	1.42
2	B	501	4ME	CAF-CAH	-2.89	1.34	1.42
2	B	502	4ME	CAF-CAH	-2.64	1.35	1.42
2	B	501	4ME	OAM-CAI	2.10	1.38	1.33
2	A	501	4ME	OAM-CAI	2.06	1.37	1.33
2	A	502	4ME	OAM-CAI	2.04	1.37	1.33

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	4ME	CAJ-OAM-CAI	-2.74	110.55	115.83
2	B	502	4ME	CAJ-OAM-CAI	-2.50	111.01	115.83
2	A	502	4ME	OAM-CAI-CAG	2.38	116.09	111.75
2	B	502	4ME	OAM-CAI-CAG	2.29	115.92	111.75
2	A	502	4ME	CAJ-OAM-CAI	-2.08	111.83	115.83

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	502	4ME	CAG-CAI-OAM-CAJ
2	A	502	4ME	OAL-CAI-OAM-CAJ
2	B	501	4ME	CAG-CAI-OAM-CAJ
2	B	501	4ME	OAL-CAI-OAM-CAJ
2	B	502	4ME	CAB-CAG-CAI-OAM
2	B	502	4ME	CAF-CAG-CAI-OAM

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	502	4ME	1	0
2	B	501	4ME	1	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

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, 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	302/303 (99%)	0.71	25 (8%) 11 11	12, 23, 50, 80	0
1	B	303/303 (100%)	0.53	15 (4%) 28 27	12, 23, 37, 67	0
All	All	605/606 (99%)	0.62	40 (6%) 18 17	12, 23, 42, 80	0

All (40) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	387	LEU	8.3
1	A	387	LEU	5.8
1	A	388	GLN	5.5
1	B	388	GLN	5.4
1	A	256	ALA	5.4
1	A	392	HIS	5.3
1	A	438	VAL	5.3
1	A	258	ARG	4.6
1	A	262	ARG	4.5
1	A	496	GLU	4.4
1	B	389	ASN	3.8
1	A	261	LEU	3.8
1	B	386	ARG	3.7
1	B	390	LYS	3.6
1	B	391	SER	3.6
1	A	222	LYS	3.4
1	A	257	SER	3.2
1	A	390	LYS	3.1
1	A	260	GLN	3.0
1	A	201	ARG	2.9
1	B	348	ASN	2.9
1	B	222	LYS	2.8
1	B	433	LEU	2.8
1	A	495	ARG	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	445	LEU	2.6
1	B	450	GLY	2.6
1	A	259	LYS	2.6
1	A	303	GLY	2.5
1	A	219	ARG	2.5
1	B	303	GLY	2.5
1	A	343	TRP	2.3
1	A	254	GLU	2.3
1	B	395	GLU	2.3
1	A	217	LEU	2.2
1	A	476	ARG	2.2
1	A	198	ARG	2.2
1	B	343	TRP	2.2
1	B	304	VAL	2.1
1	A	391	SER	2.0
1	A	204	LEU	2.0

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 monosaccharides 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. 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	B-factors(Å ²)	Q<0.9
2	4ME	A	501	13/13	0.31	0.47	59,71,84,86	0
2	4ME	A	502	13/13	0.36	0.43	48,61,71,76	0
2	4ME	B	501	13/13	0.50	0.33	49,60,76,82	0
2	4ME	B	502	13/13	0.56	0.39	43,61,87,87	0
4	NA	B	503	1/1	0.94	0.11	30,30,30,30	0
3	NH4	A	503	1/1	0.96	0.11	18,22,22,22	0
3	NH4	A	504	1/1	0.98	0.13	16,19,19,19	0

6.5 Other polymers [i](#)

There are no such residues in this entry.