



wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 15, 2016 – 10:28 AM EDT

PDB ID : 4ZCA
Title : Eg5 motor domain mutant Y231F
Authors : Luo, M.; Parke, C.; Worthylake, D.
Deposited on : 2015-04-15
Resolution : 2.30 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 ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7.1 (RC1), CSD as537be (2016)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20027790
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) : rb-20027790

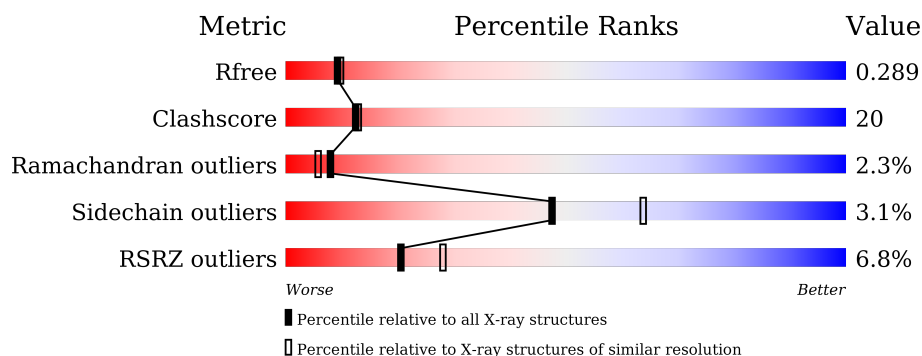
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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}	91344	3852 (2.30-2.30)
Clashscore	102246	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)
RSRZ outliers	91569	3857 (2.30-2.30)

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	369	<div> <div>8%</div> <div> <div></div> <div>59%</div> <div>29%</div> <div>•</div> <div>9%</div> </div> </div>
1	B	369	<div> <div>5%</div> <div> <div></div> <div>60%</div> <div>26%</div> <div>•</div> <div>11%</div> </div> </div>

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 5381 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.

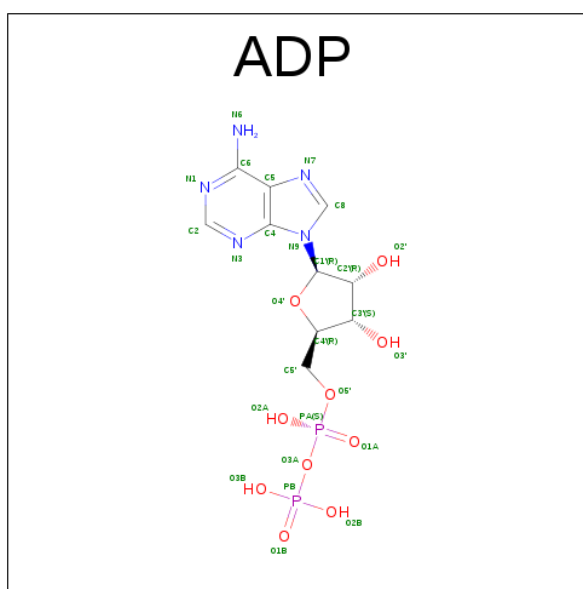
- Molecule 1 is a protein called Kinesin-like protein KIF11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	334	Total	C	N	O	S	0	0	0
			2616	1640	458	508	10			
1	B	329	Total	C	N	O	S	0	0	0
			2569	1613	446	500	10			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	231	PHE	TYR	engineered mutation	UNP P52732
B	231	PHE	TYR	engineered mutation	UNP P52732

- Molecule 2 is ADENOSINE-5'-DIPHOSPHATE (three-letter code: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	B	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	64	Total	O	0	0
			64	64		
4	B	76	Total	O	0	0
			76	76		

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 ($\text{RSRZ} > 2$). 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.

- Chain A:
-
- 8% 59% 29% 9%
- MET ALA SER GLN PRO ASN SER SER ALA LYS LYS GLU LYS LYS G16 G17 M18 I19 Q20 V21 V22 F28 M29 L30 A31 E32 R33 K34 G55 G56 L57 A58 D59 K60 F68 D69 M70 I79 R83 V86 C87 P88 I89 E92 V93 I94 A103 Y104 G105 Q106 M115 E118 ARG SER PRO ASN SER GLU LYS T125 T126 W127 E128 E129 G134 I135 I136 P137 R138 T139 L140 H141 K146 L160 L161 E166 E167 L168 L172 S175 S176 D177 V178 S179 F180 R181 L182 Q183 M184 F185 D186 D187 R188 R189 M190 K191 R192 G193 I194 I195 K207 D208 E209 V210 V211 Q212 L213 L214 E215 R220 T223 T226 L227 W228 R234 S237 V241 T242 I243 W244 W245 R246 E247 T248 T249 T250 E253 E254 L255 V256 K257 R260 L261 N262 D265 E270 ASN ILE GLY ARG SER GLY ALA VAL ASP LYS T281 A282 R283 E284 A285 T287 T288 N289 Q290 L293 V298 P307 H308 V309 P310 Y311 R312 R313 S314 K315 R318 R319 T328 R329 S323 G326 R327 T328 R329 N342 L343 E344 I359 K362 P363 E364 V365 ASN GLN LYS LEU

- Chain B:
-
- | Item | Category |
|------|----------|
| L293 | Green |
| I299 | Green |
| L302 | Green |
| P307 | Green |
| P310 | Green |
| E313 | Green |
| I319 | Green |
| S323 | Green |
| G326 | Green |
| R327 | Green |
| T328 | Green |
| A334 | Green |
| A339 | Green |
| S340 | Green |
| L343 | Green |
| E344 | Green |
| A356 | Green |
| K357 | Green |
| N358 | Green |
| I359 | Green |
| K362 | Green |
| P363 | Green |
| E364 | Green |
| V365 | Green |
| ASN | Green |
| GLN | Green |
| LVS | Green |
| LEU | Green |
| V194 | Yellow |
| K197 | Yellow |
| K207 | Yellow |
| D208 | Yellow |
| V210 | Yellow |
| I213 | Yellow |
| A224 | Yellow |
| M228 | Yellow |
| N229 | Yellow |
| S235 | Yellow |
| H236 | Yellow |
| S237 | Yellow |
| V241 | Yellow |
| T242 | Yellow |
| I243 | Yellow |
| H244 | Yellow |
| I250 | Yellow |
| D251 | Yellow |
| T258 | Yellow |
| G259 | Yellow |
| K260 | Yellow |
| L261 | Yellow |
| N262 | Yellow |
| D265 | Yellow |
| S269 | Yellow |
| E270 | Yellow |
| N271 | Yellow |
| L272 | Yellow |
| G273 | Yellow |
| ARG | Yellow |
| ARG | Yellow |
| GLY | Yellow |
| ALA | Yellow |
| VAL | Yellow |
| ASP | Yellow |
| LVS | Yellow |
| ALA | Yellow |
| ARG | Yellow |
| GLU | Yellow |
| ALA | Yellow |
| GLY | Yellow |
| ASN | Yellow |
| ILE | Yellow |
| N289 | Yellow |
| Q290 | Yellow |
| P88 | Yellow |
| T89 | Yellow |
| ALA | Yellow |
| SER | Yellow |
| GLN | Yellow |
| PRO | Yellow |
| ASN | Yellow |
| SER | Yellow |
| ALA | Yellow |
| ALA | Yellow |
| LVS | Yellow |
| LVS | Yellow |
| GLU | Yellow |
| GLU | Yellow |
| LVS | Yellow |
| G16 | Yellow |
| K17 | Yellow |
| N18 | Yellow |
| I19 | Yellow |
| V23 | Yellow |
| F28 | Yellow |
| N29 | Yellow |
| L30 | Yellow |
| K34 | Yellow |
| A35 | Yellow |
| S36 | Yellow |
| A37 | Yellow |
| H38 | Yellow |
| S39 | Yellow |
| I40 | Yellow |
| V41 | Yellow |
| V50 | Yellow |
| S51 | Yellow |
| V52 | Yellow |
| R53 | Yellow |
| T54 | Yellow |
| G55 | Yellow |
| G56 | Yellow |
| L57 | Yellow |
| A58 | Yellow |
| D59 | Yellow |
| K60 | Yellow |
| S61 | Yellow |
| S62 | Yellow |
| R63 | Yellow |
| Y66 | Yellow |
| T67 | Yellow |
| F68 | Yellow |
| T79 | Yellow |
| R83 | Yellow |
| V86 | Yellow |
| C97 | Yellow |
| P88 | Orange |
| T89 | Orange |
| ALA | Orange |
| SER | Orange |
| GLN | Orange |
| PRO | Orange |
| ASN | Orange |
| SER | Orange |
| ALA | Orange |
| ALA | Orange |
| LVS | Orange |
| LVS | Orange |
| GLU | Orange |
| GLU | Orange |
| LVS | Orange |
| G16 | Orange |
| K17 | Orange |
| N18 | Orange |
| I19 | Orange |
| V23 | Orange |
| F28 | Orange |
| N29 | Orange |
| L30 | Orange |
| K34 | Orange |
| A35 | Orange |
| S36 | Orange |
| A37 | Orange |
| H38 | Orange |
| S39 | Orange |
| I40 | Orange |
| V41 | Orange |
| V50 | Orange |
| S51 | Orange |
| V52 | Orange |
| R53 | Orange |
| T54 | Orange |
| G55 | Orange |
| G56 | Orange |
| L57 | Orange |
| A58 | Orange |
| D59 | Orange |
| K60 | Orange |
| S61 | Orange |
| S62 | Orange |
| R63 | Orange |
| Y66 | Orange |
| T67 | Orange |
| F68 | Orange |
| T79 | Orange |
| R83 | Orange |
| V86 | Orange |
| C97 | Orange |
| P88 | Red |
| T89 | Red |
| ALA | Red |
| SER | Red |
| GLN | Red |
| PRO | Red |
| ASN | Red |
| SER | Red |
| ALA | Red |
| ALA | Red |
| LVS | Red |
| LVS | Red |
| GLU | Red |
| GLU | Red |
| LVS | Red |
| G16 | Red |
| K17 | Red |
| N18 | Red |
| I19 | Red |
| V23 | Red |
| F28 | Red |
| N29 | Red |
| L30 | Red |
| K34 | Red |
| A35 | Red |
| S36 | Red |
| A37 | Red |
| H38 | Red |
| S39 | Red |
| I40 | Red |
| V41 | Red |
| V50 | Red |
| S51 | Red |
| V52 | Red |
| R53 | Red |
| T54 | Red |
| G55 | Red |
| G56 | Red |
| L57 | Red |
| A58 | Red |
| D59 | Red |
| K60 | Red |
| S61 | Red |
| S62 | Red |
| R63 | Red |
| Y66 | Red |
| T67 | Red |
| F68 | Red |
| T79 | Red |
| R83 | Red |
| V86 | Red |
| C97 | Red |

4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	52.54Å 77.83Å 93.12Å 90.00° 93.90° 90.00°	Depositor
Resolution (Å)	25.00 – 2.30 24.99 – 2.30	Depositor EDS
% Data completeness (in resolution range)	(Not available) (25.00-2.30) 97.8 (24.99-2.30)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 2.31Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.246 , 0.289 0.246 , 0.289	Depositor DCC
R_{free} test set	1313 reflections (4.02%)	DCC
Wilson B-factor (Å ²)	26.5	Xtriage
Anisotropy	0.467	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 20.5	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	0.91	EDS
Total number of atoms	5381	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.44% 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: MG, ADP

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	0.38	0/2653	0.63	0/3583
1	B	0.43	0/2606	0.66	0/3521
All	All	0.41	0/5259	0.65	0/7104

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	2616	0	2651	121	0
1	B	2569	0	2595	92	0
2	A	27	0	12	2	0
2	B	27	0	12	1	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	64	0	0	5	0
4	B	76	0	0	3	0
All	All	5381	0	5270	205	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 20.

The worst 5 of 205 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:92:GLU:HG3	1:A:329:ARG:HG3	1.32	1.08
1:A:207:LYS:HB2	1:A:207:LYS:HZ2	1.27	1.00
1:B:323:SER:O	1:B:328:THR:HG21	1.66	0.96
1:A:178:VAL:HG12	1:A:179:SER:H	1.34	0.89
1:A:327:ARG:HA	1:A:327:ARG:CZ	2.10	0.82

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	328/369 (89%)	302 (92%)	18 (6%)	8 (2%)	7	5
1	B	323/369 (88%)	303 (94%)	13 (4%)	7 (2%)	8	6
All	All	651/738 (88%)	605 (93%)	31 (5%)	15 (2%)	8	6

5 of 15 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	176	SER
1	A	186	ASP
1	A	191	LYS
1	A	228	MET
1	B	57	LEU

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	293/323 (91%)	284 (97%)	9 (3%)	47	64
1	B	288/323 (89%)	279 (97%)	9 (3%)	47	64
All	All	581/646 (90%)	563 (97%)	18 (3%)	47	64

5 of 18 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	327	ARG
1	B	50	VAL
1	B	191	LYS
1	A	290	GLN
1	A	293	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	321	GLN
1	A	342	ASN
1	B	289	ASN
1	A	290	GLN
1	B	290	GLN

5.3.3 RNA ⓘ

There are no RNA molecules 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 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 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	ADP	A	601	3	24,29,29	1.65	5 (20%)	23,45,45	3.18	5 (21%)
2	ADP	B	601	3	24,29,29	1.67	4 (16%)	23,45,45	3.28	6 (26%)

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	ADP	A	601	3	-	0/12/32/32	0/3/3/3
2	ADP	B	601	3	-	0/12/32/32	0/3/3/3

The worst 5 of 9 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	601	ADP	C5-C4	-3.53	1.32	1.40
2	A	601	ADP	C5-C4	-3.18	1.33	1.40
2	A	601	ADP	C6-C5	-2.10	1.31	1.42
2	A	601	ADP	O4'-C1'	2.17	1.44	1.41
2	B	601	ADP	O4'-C1'	2.23	1.44	1.41

The worst 5 of 11 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	601	ADP	N3-C2-N1	-13.94	117.92	128.87
2	A	601	ADP	N3-C2-N1	-13.78	118.05	128.87
2	B	601	ADP	C4'-O4'-C1'	-3.28	106.17	109.64
2	B	601	ADP	C2'-C3'-C4'	-3.10	96.28	102.64
2	A	601	ADP	C2'-C3'-C4'	-2.88	96.74	102.64

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	601	ADP	2	0
2	B	601	ADP	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 [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	334/369 (90%)	0.15	28 (8%)	14 19	11, 33, 104, 134	0
1	B	329/369 (89%)	0.04	17 (5%)	31 39	8, 29, 85, 134	0
All	All	663/738 (89%)	0.10	45 (6%)	20 28	8, 32, 101, 134	0

The worst 5 of 45 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	58	ALA	14.2
1	B	61	SER	11.7
1	A	365	VAL	7.9
1	A	190	ASN	7.7
1	B	59	ASP	7.2

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
2	ADP	B	601	27/27	0.93	0.18	1.05	20,26,31,37	0
2	ADP	A	601	27/27	0.97	0.11	0.26	14,20,25,31	0
3	MG	B	602	1/1	0.98	0.16	-	18,18,18,18	0
3	MG	A	602	1/1	0.98	0.13	-	18,18,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.