



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 13, 2017 – 05:14 am GMT

PDB ID : 1JN5  
Title : Structural basis for the recognition of a nucleoporin FG-repeat by the NTF2-like domain of TAP-p15 mRNA export factor  
Authors : Fribourg, S.; Braun, I.C.; Izaurralde, E.; Conti, E.  
Deposited on : 2001-07-23  
Resolution : 2.80 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

<http://wwpdb.org/validation/2016/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)	:	1.9-1692
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

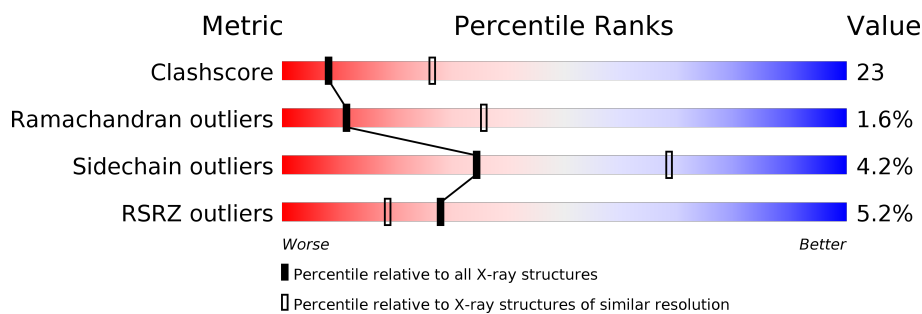
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.80 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))
Clashscore	112137	3033 (2.80-2.80)
Ramachandran outliers	110173	2983 (2.80-2.80)
Sidechain outliers	110143	2985 (2.80-2.80)
RSRZ outliers	101464	2610 (2.80-2.80)

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  $\geq 3$ , 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	140	<div> <div>6%</div> <div>62%</div> <div>29%</div> <div>6%</div> <div>.</div> </div>
2	B	250	<div> <div>2%</div> <div>43%</div> <div>28%</div> <div>.</div> <div>27%</div> </div>
3	C	12	<div> <div>25%</div> <div>33%</div> <div>17%</div> <div>50%</div> </div>

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 2555 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 p15.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	136	Total	C	N	O	S	0	0	0
			1087	687	183	210	7			

- Molecule 2 is a protein called TAP.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	182	Total	C	N	O	S	0	0	0
			1429	909	248	266	6			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	370	ALA	-	CLONING ARTIFACT	UNP Q9UBU9

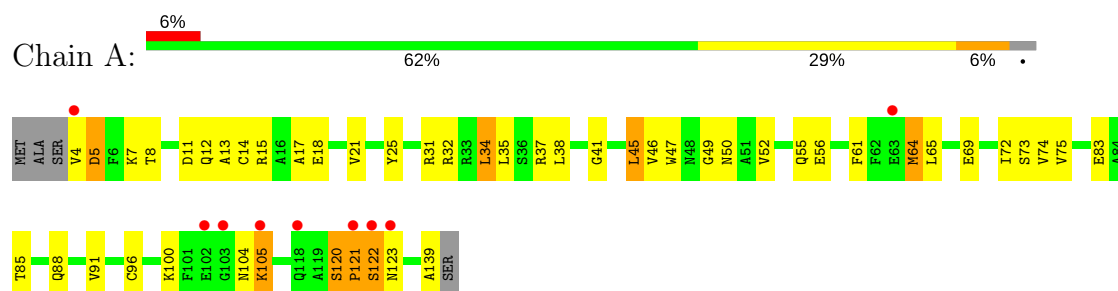
- Molecule 3 is a protein called FG-repeat.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	6	Total	C	N	O	0	0	0
			39	25	7	7			

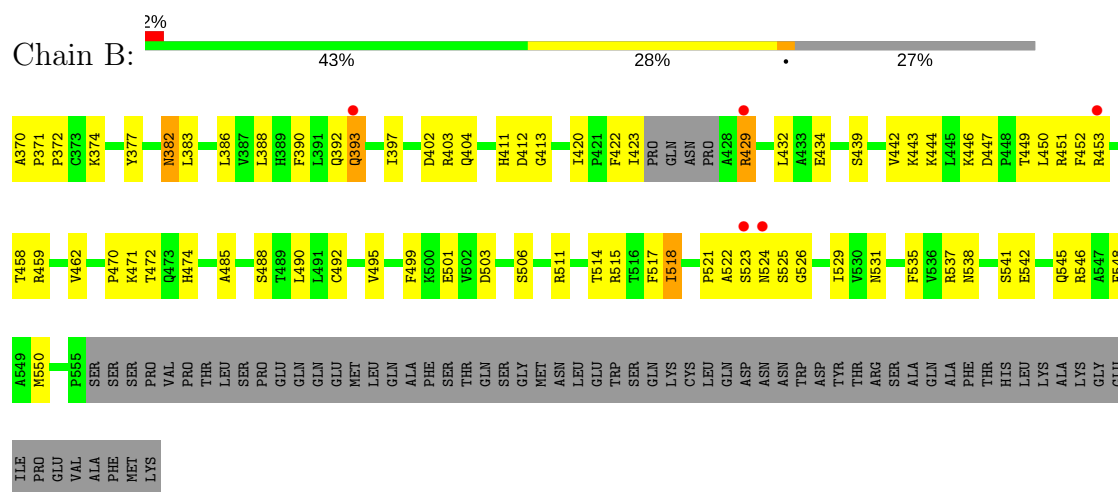
### 3 Residue-property plots [i](#)

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.

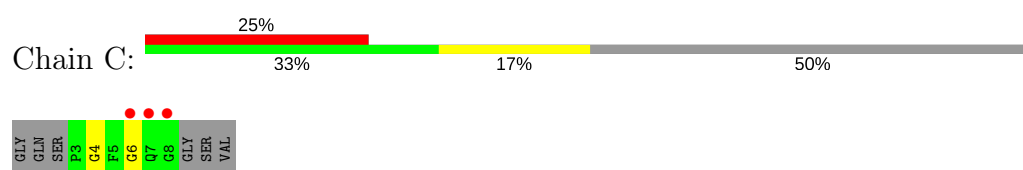
#### • Molecule 1: p15



#### • Molecule 2: TAP



#### • Molecule 3: FG-repeat



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 65 2 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	105.20Å 105.20Å 172.96Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	30.00 – 2.80 20.00 – 2.80	Depositor EDS
% Data completeness (in resolution range)	87.2 (30.00-2.80) 87.4 (20.00-2.80)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	0.05	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.44 (at 2.79Å)	Xtriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.241 , 0.267 0.238 , (Not available)	Depositor DCC
$R_{free}$ test set	No test flags present.	DCC
Wilson B-factor (Å <sup>2</sup> )	64.0	Xtriage
Anisotropy	0.022	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 25.5	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	2555	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	59.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.61% 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	0.44	0/1111	0.69	0/1508
2	B	0.40	0/1459	0.66	0/1974
3	C	0.54	0/40	1.24	0/51
All	All	0.42	0/2610	0.69	0/3533

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	B	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	377	TYR	Sidechain

### 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	1087	0	1040	55	0
2	B	1429	0	1421	77	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	39	0	33	2	0
All	All	2555	0	2494	118	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 23.

All (118) 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:41:GLY:HA2	1:A:55:GLN:HB2	1.51	0.93
1:A:120:SER:HB2	1:A:121:PRO:HD2	1.55	0.88
2:B:429:ARG:HE	2:B:429:ARG:N	1.75	0.84
1:A:5:ASP:OD1	1:A:5:ASP:N	2.12	0.83
2:B:411:HIS:HD2	2:B:413:GLY:H	1.27	0.82
2:B:429:ARG:HE	2:B:429:ARG:H	1.27	0.79
2:B:518:ILE:HG23	2:B:531:ASN:HB2	1.65	0.79
1:A:73:SER:HA	2:B:443:LYS:HE2	1.64	0.78
1:A:14:CYS:HB3	2:B:451:ARG:HH11	1.49	0.77
1:A:120:SER:HB2	1:A:121:PRO:CD	2.14	0.77
2:B:390:PHE:CZ	2:B:529:ILE:HD11	2.23	0.74
2:B:390:PHE:HZ	2:B:529:ILE:HD11	1.52	0.73
1:A:61:PHE:HE1	2:B:371:PRO:HG2	1.54	0.72
2:B:511:ARG:HH11	2:B:538:ASN:HD21	1.38	0.72
2:B:471:LYS:H	2:B:471:LYS:HD2	1.58	0.69
1:A:105:LYS:NZ	1:A:105:LYS:HA	2.08	0.69
2:B:411:HIS:CD2	2:B:413:GLY:H	2.11	0.67
1:A:8:THR:O	1:A:12:GLN:HG2	1.94	0.67
1:A:45:LEU:HD22	1:A:46:VAL:N	2.10	0.66
1:A:64:MET:CE	1:A:65:LEU:HD23	2.25	0.66
2:B:434:GLU:HG2	2:B:470:PRO:HG3	1.77	0.66
2:B:383:LEU:HD23	2:B:386:LEU:HD23	1.77	0.66
2:B:443:LYS:NZ	2:B:444:LYS:HE2	2.11	0.65
1:A:74:VAL:HB	1:A:96:CYS:HB3	1.78	0.64
1:A:15:ARG:HA	1:A:15:ARG:HE	1.63	0.63
2:B:511:ARG:NH1	2:B:538:ASN:HD21	1.96	0.63
2:B:434:GLU:HG2	2:B:470:PRO:CG	2.29	0.63
1:A:14:CYS:HB3	2:B:451:ARG:NH1	2.14	0.63
2:B:488:SER:HA	3:C:4:GLY:O	2.00	0.62
2:B:429:ARG:H	2:B:429:ARG:NE	1.96	0.62
1:A:64:MET:HE2	1:A:65:LEU:HA	1.83	0.60
2:B:511:ARG:HH11	2:B:538:ASN:ND2	1.97	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:45:LEU:CD1	1:A:47:TRP:HB2	2.32	0.59
1:A:45:LEU:HD11	1:A:47:TRP:HB2	1.84	0.59
1:A:64:MET:HE1	2:B:370:ALA:HA	1.84	0.59
1:A:64:MET:HE2	1:A:65:LEU:HD23	1.83	0.59
2:B:429:ARG:HD2	2:B:538:ASN:OD1	2.03	0.58
2:B:471:LYS:N	2:B:471:LYS:HD2	2.18	0.58
2:B:432:LEU:HD21	2:B:538:ASN:ND2	2.19	0.57
1:A:37:ARG:NH2	1:A:37:ARG:HB3	2.20	0.57
1:A:75:VAL:O	2:B:442:VAL:HG22	2.05	0.57
1:A:35:LEU:HD12	1:A:38:LEU:HD12	1.88	0.56
1:A:139:ALA:HB1	2:B:546:ARG:NH1	2.21	0.56
1:A:17:ALA:O	1:A:21:VAL:HG23	2.06	0.56
1:A:49:GLY:O	2:B:374:LYS:HE3	2.06	0.55
2:B:422:PHE:CD2	2:B:444:LYS:HE3	2.40	0.55
1:A:31:ARG:HG2	1:A:34:LEU:HD22	1.89	0.55
1:A:50:ASN:OD1	2:B:374:LYS:HE2	2.07	0.54
1:A:15:ARG:HA	1:A:15:ARG:NE	2.23	0.54
1:A:120:SER:CB	1:A:121:PRO:CD	2.81	0.54
1:A:83:GLU:OE2	2:B:411:HIS:HE1	1.91	0.54
2:B:524:ASN:O	2:B:525:SER:HB3	2.07	0.53
1:A:64:MET:HE1	1:A:65:LEU:HD23	1.90	0.53
2:B:535:PHE:HE2	2:B:537:ARG:HD3	1.73	0.53
1:A:14:CYS:O	1:A:18:GLU:HB2	2.09	0.53
1:A:11:ASP:O	1:A:15:ARG:HG2	2.09	0.52
2:B:541:SER:O	2:B:545:GLN:HG2	2.09	0.52
2:B:446:LYS:HD3	2:B:451:ARG:HH21	1.75	0.52
1:A:73:SER:CA	2:B:443:LYS:HE2	2.38	0.51
2:B:501:GLU:OE1	2:B:506:SER:HB2	2.09	0.51
1:A:41:GLY:HA2	1:A:55:GLN:CB	2.34	0.51
2:B:495:VAL:O	2:B:514:THR:HA	2.11	0.51
2:B:471:LYS:CD	2:B:471:LYS:H	2.23	0.51
2:B:443:LYS:CE	2:B:444:LYS:HE2	2.41	0.51
2:B:447:ASP:OD2	2:B:450:LEU:HD23	2.10	0.51
1:A:100:LYS:HD2	1:A:104:ASN:O	2.12	0.50
2:B:393:GLN:HE22	2:B:397:ILE:HD11	1.77	0.50
2:B:432:LEU:HD21	2:B:538:ASN:HD21	1.76	0.50
2:B:548:PHE:HD1	2:B:548:PHE:N	2.10	0.49
2:B:548:PHE:CD1	2:B:548:PHE:N	2.79	0.49
1:A:72:ILE:O	2:B:443:LYS:HE2	2.13	0.49
1:A:105:LYS:HA	1:A:105:LYS:HZ3	1.78	0.49
2:B:522:ALA:HB3	2:B:526:GLY:C	2.35	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:490:LEU:C	2:B:490:LEU:HD23	2.35	0.47
2:B:443:LYS:HE3	2:B:444:LYS:HE2	1.95	0.47
2:B:443:LYS:HZ2	2:B:444:LYS:HE2	1.78	0.47
1:A:37:ARG:NH2	1:A:37:ARG:CB	2.78	0.47
2:B:412:ASP:O	2:B:458:THR:HA	2.15	0.47
2:B:422:PHE:CD1	2:B:444:LYS:HG3	2.50	0.47
2:B:402:ASP:OD1	2:B:404:GLN:HB3	2.16	0.46
1:A:45:LEU:HB3	1:A:52:VAL:HG13	1.97	0.46
2:B:403:ARG:HH22	2:B:472:THR:HG23	1.81	0.46
2:B:471:LYS:HD3	2:B:503:ASP:OD2	2.16	0.46
2:B:517:PHE:CD2	2:B:529:ILE:HD13	2.51	0.45
2:B:392:GLN:HA	2:B:392:GLN:HE21	1.81	0.45
1:A:61:PHE:CE1	2:B:371:PRO:HG2	2.43	0.45
2:B:518:ILE:CG2	2:B:531:ASN:HB2	2.43	0.45
1:A:64:MET:HE2	1:A:65:LEU:CA	2.45	0.45
1:A:122:SER:OG	1:A:123:ASN:N	2.50	0.45
1:A:7:LYS:HA	2:B:452:PHE:CE1	2.52	0.45
2:B:388:LEU:O	2:B:392:GLN:HG2	2.17	0.45
1:A:4:VAL:HG13	1:A:5:ASP:OD1	2.17	0.45
2:B:392:GLN:NE2	2:B:392:GLN:HA	2.32	0.45
1:A:37:ARG:HH21	1:A:37:ARG:CB	2.30	0.44
1:A:85:THR:HB	1:A:88:GLN:HB3	1.99	0.44
1:A:45:LEU:HB3	1:A:52:VAL:CG1	2.48	0.44
2:B:393:GLN:HE22	2:B:397:ILE:CD1	2.31	0.44
1:A:4:VAL:CG1	1:A:5:ASP:OD1	2.66	0.43
2:B:459:ARG:HA	2:B:462:VAL:HB	2.00	0.43
2:B:550:MET:O	2:B:550:MET:HG3	2.18	0.43
2:B:371:PRO:HA	2:B:372:PRO:HD3	1.77	0.43
2:B:485:ALA:HB3	2:B:492:CYS:HB3	2.00	0.43
1:A:31:ARG:CG	1:A:34:LEU:HD22	2.48	0.43
2:B:474:HIS:CD2	2:B:499:PHE:HB3	2.54	0.42
2:B:422:PHE:CE2	2:B:444:LYS:HE3	2.55	0.42
2:B:515:ARG:HD3	2:B:517:PHE:CZ	2.55	0.42
1:A:5:ASP:OD2	1:A:8:THR:HG21	2.19	0.42
1:A:45:LEU:HD12	1:A:52:VAL:CG1	2.51	0.41
2:B:422:PHE:O	2:B:423:ILE:C	2.59	0.41
2:B:420:ILE:HG12	2:B:439:SER:OG	2.21	0.41
2:B:470:PRO:O	2:B:472:THR:HG23	2.21	0.41
2:B:382:ASN:C	2:B:382:ASN:HD22	2.23	0.41
2:B:447:ASP:O	2:B:451:ARG:HG3	2.21	0.41
1:A:25:TYR:CD1	1:A:72:ILE:HG13	2.56	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:521:PRO:HG2	3:C:6:GLY:HA2	2.03	0.41
1:A:13:ALA:HA	1:A:91:VAL:HG21	2.02	0.40
1:A:15:ARG:HE	1:A:15:ARG:CA	2.33	0.40
2:B:449:THR:O	2:B:453:ARG:HG3	2.20	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	134/140 (96%)	124 (92%)	6 (4%)	4 (3%)	5	17
2	B	178/250 (71%)	163 (92%)	14 (8%)	1 (1%)	28	62
3	C	4/12 (33%)	3 (75%)	1 (25%)	0	100	100
All	All	316/402 (79%)	290 (92%)	21 (7%)	5 (2%)	11	36

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	121	PRO
1	A	32	ARG
2	B	523	SER
1	A	120	SER
1	A	122	SER

### 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	121/124 (98%)	114 (94%)	7 (6%)	23	55
2	B	159/220 (72%)	154 (97%)	5 (3%)	45	79
3	C	3/7 (43%)	3 (100%)	0	100	100
All	All	283/351 (81%)	271 (96%)	12 (4%)	34	68

All (12) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	ASP
1	A	34	LEU
1	A	45	LEU
1	A	56	GLU
1	A	64	MET
1	A	69	GLU
1	A	105	LYS
2	B	382	ASN
2	B	393	GLN
2	B	429	ARG
2	B	518	ILE
2	B	542	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	112	ASN
1	A	123	ASN
2	B	382	ASN
2	B	392	GLN
2	B	393	GLN
2	B	411	HIS
2	B	477	ASN
2	B	538	ASN
2	B	545	GLN

### 5.3.3 RNA ⓘ

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, 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	136/140 (97%)	-0.14	9 (6%) 19 11	40, 58, 86, 92	0
2	B	182/250 (72%)	-0.27	5 (2%) 55 44	41, 55, 78, 99	0
3	C	6/12 (50%)	1.64	3 (50%) 0 0	74, 84, 91, 92	0
All	All	324/402 (80%)	-0.18	17 (5%) 28 19	40, 57, 84, 99	0

All (17) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	7	GLN	3.6
1	A	122	SER	3.3
2	B	524	ASN	3.0
2	B	429	ARG	3.0
2	B	523	SER	2.7
2	B	393	GLN	2.6
3	C	8	GLY	2.6
3	C	6	GLY	2.5
1	A	121	PRO	2.5
1	A	103	GLY	2.3
2	B	453	ARG	2.3
1	A	4	VAL	2.2
1	A	118	GLN	2.2
1	A	63	GLU	2.2
1	A	123	ASN	2.1
1	A	102	GLU	2.1
1	A	105	LYS	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.