



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 29, 2023 – 09:19 AM EDT

PDB ID : 3NEZ  
Title : mRojoA  
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Deposited on : 2010-06-09  
Resolution : 1.70 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](mailto: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>.

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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  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : 1.13  
EDS : 2.35  
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

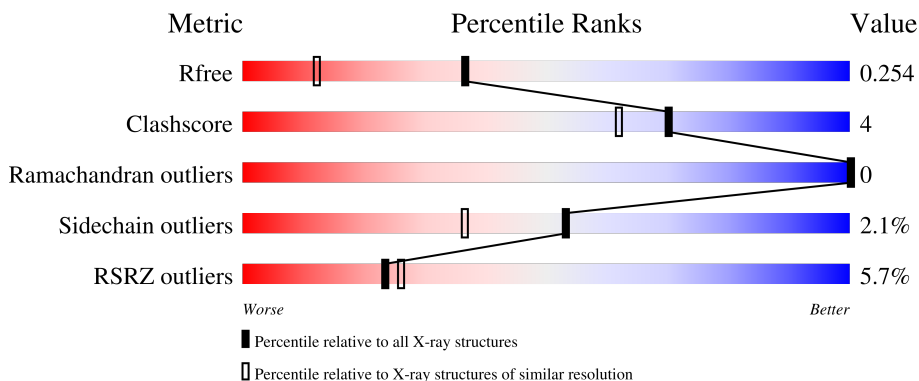
# 1 Overall quality at a glance

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))
$R_{free}$	130704	4298 (1.70-1.70)
Clashscore	141614	4695 (1.70-1.70)
Ramachandran outliers	138981	4610 (1.70-1.70)
Sidechain outliers	138945	4610 (1.70-1.70)
RSRZ outliers	127900	4222 (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 of the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	243	 6% 77% 10% • 11%
1	B	243	 7% 79% 7% • 11%
1	C	243	 4% 80% 8% • 11%
1	D	243	 3% 78% 10% • 11%

## 2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 7612 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 mRojoA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	216	1802	1154	297	339	12	35	9	0
1	B	215	1771	1139	287	335	10	62	8	0
1	C	215	1763	1128	290	335	10	72	4	0
1	D	216	1787	1141	299	337	10	52	6	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	67	NRQ	MET	chromophore	PDB 3NEZ
A	67	NRQ	MET	microheterogeneity	PDB 3NEZ
A	67	NRQ	TYR	chromophore	PDB 3NEZ
A	67	NRQ	TYR	microheterogeneity	PDB 3NEZ
A	67	NRQ	GLY	chromophore	PDB 3NEZ
A	67	NRQ	GLY	microheterogeneity	PDB 3NEZ
B	67	NRQ	MET	chromophore	PDB 3NEZ
B	67	NRQ	MET	microheterogeneity	PDB 3NEZ
B	67	NRQ	TYR	chromophore	PDB 3NEZ
B	67	NRQ	TYR	microheterogeneity	PDB 3NEZ
B	67	NRQ	GLY	chromophore	PDB 3NEZ
B	67	NRQ	GLY	microheterogeneity	PDB 3NEZ
C	67	NRQ	MET	chromophore	PDB 3NEZ
C	67	NRQ	MET	microheterogeneity	PDB 3NEZ
C	67	NRQ	TYR	chromophore	PDB 3NEZ
C	67	NRQ	TYR	microheterogeneity	PDB 3NEZ
C	67	NRQ	GLY	chromophore	PDB 3NEZ
C	67	NRQ	GLY	microheterogeneity	PDB 3NEZ
D	67	NRQ	MET	chromophore	PDB 3NEZ
D	67	NRQ	MET	microheterogeneity	PDB 3NEZ
D	67	NRQ	TYR	chromophore	PDB 3NEZ

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Chain	Residue	Modelled	Actual	Comment	Reference
D	67	NRQ	TYR	microheterogeneity	PDB 3NEZ
D	67	NRQ	GLY	chromophore	PDB 3NEZ
D	67	NRQ	GLY	microheterogeneity	PDB 3NEZ

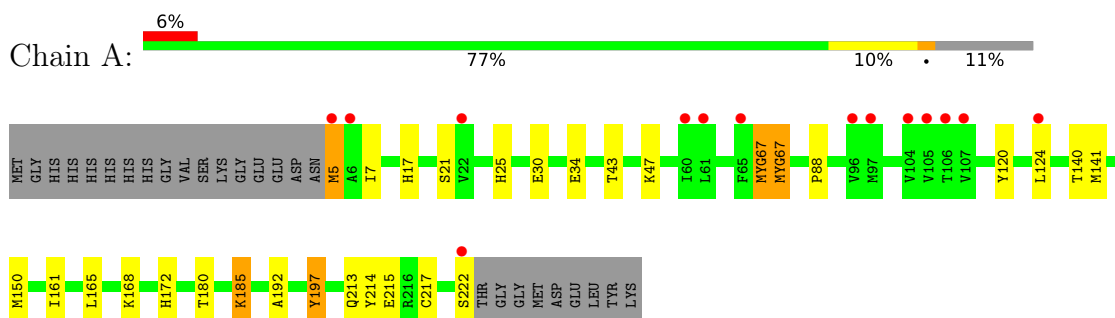
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	145	Total 145	O 145	0	0
2	B	121	Total 121	O 121	0	0
2	C	106	Total 106	O 106	0	0
2	D	117	Total 117	O 117	0	0

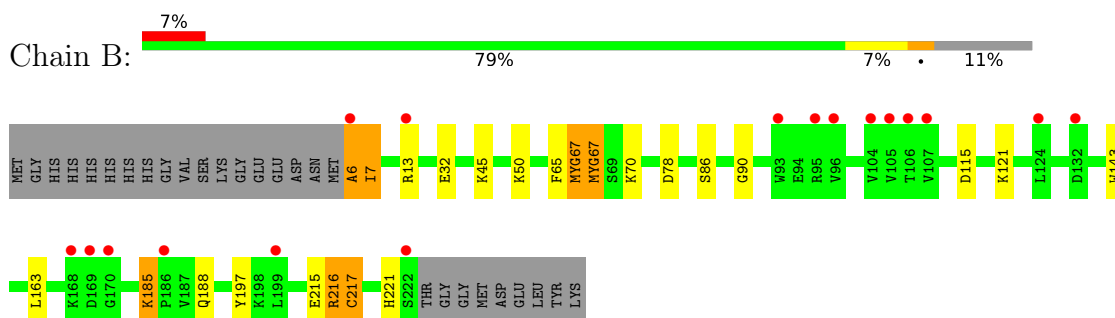
### 3 Residue-property plots [i](#)

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.

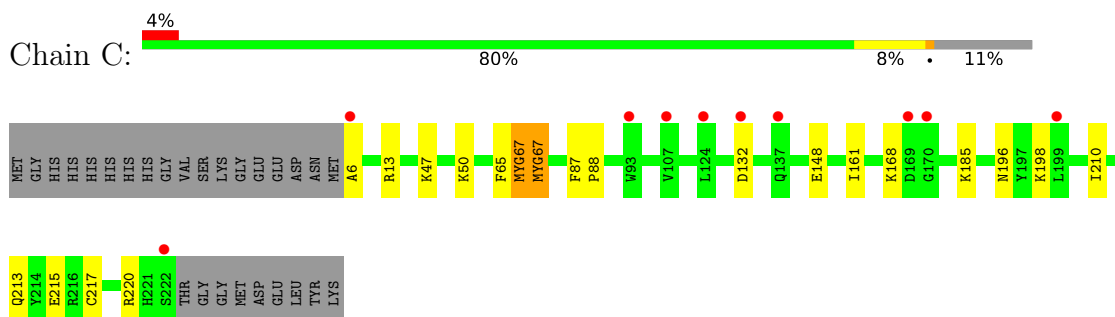
- Molecule 1: mRojoA



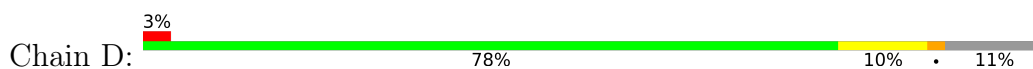
- Molecule 1: mRojoA

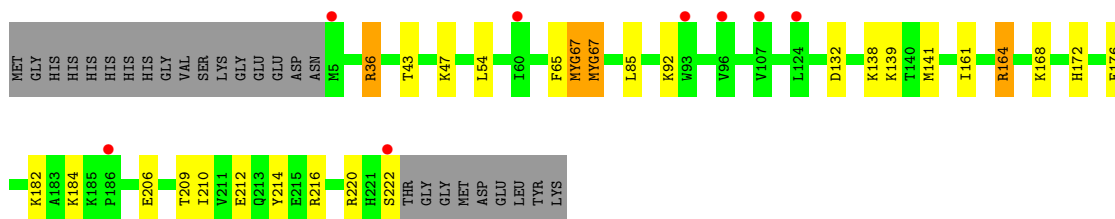


- Molecule 1: mRojoA



- Molecule 1: mRojoA





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	61.24Å 97.41Å 84.16Å 90.00° 95.54° 90.00°	Depositor
Resolution (Å)	30.48 – 1.70 30.48 – 1.70	Depositor EDS
% Data completeness (in resolution range)	95.2 (30.48-1.70) 95.2 (30.48-1.70)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.99 (at 1.70Å)	Xtrriage
Refinement program	REFMAC 5.5.0088	Depositor
R, $R_{free}$	0.182 , 0.221 0.220 , 0.254	Depositor DCC
$R_{free}$ test set	5128 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	28.3	Xtrriage
Anisotropy	0.060	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.39 , 43.8	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7612	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	32.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.69% 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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CH6, NRQ

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	1.23	5/1827 (0.3%)	1.01	3/2458 (0.1%)
1	B	1.19	8/1795 (0.4%)	1.08	11/2417 (0.5%)
1	C	1.19	5/1775 (0.3%)	1.04	9/2388 (0.4%)
1	D	1.26	9/1810 (0.5%)	1.17	13/2434 (0.5%)
All	All	1.22	27/7207 (0.4%)	1.08	36/9697 (0.4%)

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
1	B	0	1

The worst 5 of 27 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	6	ALA	CA-CB	-17.14	1.16	1.52
1	B	188	GLN	CG-CD	14.84	1.85	1.51
1	D	222	SER	CB-OG	-12.84	1.25	1.42
1	D	176	GLU	CG-CD	12.51	1.70	1.51
1	D	182	LYS	CG-CD	-10.65	1.16	1.52

The worst 5 of 36 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	132	ASP	CB-CG-OD2	-13.55	106.11	118.30
1	D	36	ARG	NE-CZ-NH2	12.81	126.70	120.30
1	B	6	ALA	CA-C-O	-10.53	98.00	120.10
1	D	220	ARG	CG-CD-NE	10.21	133.24	111.80

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	6	ALA	N-CA-CB	9.53	123.45	110.10

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	6	ALA	Mainchain

## 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	1802	0	1746	21	2
1	B	1771	0	1710	6	0
1	C	1763	0	1692	9	0
1	D	1787	0	1721	8	2
2	A	145	0	0	6	0
2	B	121	0	0	0	0
2	C	106	0	0	0	1
2	D	117	0	0	2	1
All	All	7612	0	6869	44	3

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 4.

The worst 5 of 44 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:C:47:LYS:HG2	1:C:210:ILE:HD13	1.45	0.99
1:D:36:ARG:HD2	2:D:425:HOH:O	1.72	0.89
1:A:5:MET:HA	1:A:88:PRO:HB2	1.65	0.77
1:A:5:MET:HA	1:A:88:PRO:CB	2.17	0.74
1:A:217[B]:CYS:SG	2:A:453:HOH:O	2.53	0.66

All (3) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:172[B]:HIS:NE2	1:D:172:HIS:NE2[2_444]	1.72	0.48
1:A:172[B]:HIS:CD2	1:D:172:HIS:NE2[2_444]	1.99	0.21
2:C:413:HOH:O	2:D:425:HOH:O[1_455]	2.14	0.06

### 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	218/243 (90%)	213 (98%)	5 (2%)	0	100	100
1	B	216/243 (89%)	214 (99%)	2 (1%)	0	100	100
1	C	212/243 (87%)	209 (99%)	3 (1%)	0	100	100
1	D	215/243 (88%)	212 (99%)	3 (1%)	0	100	100
All	All	861/972 (89%)	848 (98%)	13 (2%)	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	191/204 (94%)	187 (98%)	4 (2%)	53	36
1	B	185/204 (91%)	179 (97%)	6 (3%)	39	20
1	C	184/204 (90%)	182 (99%)	2 (1%)	73	63
1	D	188/204 (92%)	185 (98%)	3 (2%)	62	48
All	All	748/816 (92%)	733 (98%)	15 (2%)	53	38

5 of 15 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	115	ASP
1	D	168	LYS
1	B	185	LYS
1	D	216	ARG
1	C	213	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	172	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

8 non-standard protein/DNA/RNA residues 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
1	CH6	C	67[B]	1	24,24,25	3.49	7 (29%)	28,32,34	4.04	11 (39%)
1	NRQ	C	67[A]	1	23,24,25	3.38	6 (26%)	23,32,34	4.26	9 (39%)
1	NRQ	B	67[A]	1	23,24,25	3.32	6 (26%)	23,32,34	3.13	8 (34%)
1	CH6	D	67[B]	1	24,24,25	3.86	6 (25%)	28,32,34	4.08	14 (50%)
1	NRQ	A	67[A]	1	23,24,25	3.26	5 (21%)	23,32,34	3.54	8 (34%)
1	CH6	B	67[B]	1	24,24,25	3.43	7 (29%)	28,32,34	3.05	10 (35%)
1	CH6	A	67[B]	1	24,24,25	3.53	7 (29%)	28,32,34	3.72	12 (42%)
1	NRQ	D	67[A]	1	23,24,25	3.65	4 (17%)	23,32,34	3.99	10 (43%)

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
1	CH6	C	67[B]	1	-	5/12/31/32	0/2/2/2
1	NRQ	C	67[A]	1	-	2/9/31/32	0/2/2/2
1	NRQ	B	67[A]	1	-	4/9/31/32	0/2/2/2
1	CH6	D	67[B]	1	-	5/12/31/32	0/2/2/2
1	NRQ	A	67[A]	1	-	5/9/31/32	0/2/2/2
1	CH6	B	67[B]	1	-	3/12/31/32	0/2/2/2
1	CH6	A	67[B]	1	-	7/12/31/32	0/2/2/2
1	NRQ	D	67[A]	1	-	3/9/31/32	0/2/2/2

The worst 5 of 48 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	67[A]	NRQ	CB2-CA2	16.23	1.48	1.35
1	D	67[B]	CH6	CB2-CA2	16.23	1.48	1.35
1	C	67[A]	NRQ	CB2-CA2	14.46	1.47	1.35
1	C	67[B]	CH6	CB2-CA2	14.46	1.47	1.35
1	B	67[A]	NRQ	CB2-CA2	14.31	1.47	1.35

The worst 5 of 82 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	67[A]	NRQ	CA2-C2-N3	13.37	109.69	103.37
1	C	67[B]	CH6	CA2-C2-N3	13.37	109.69	103.37
1	D	67[A]	NRQ	CA2-C2-N3	12.75	109.40	103.37
1	D	67[B]	CH6	CA2-C2-N3	12.75	109.40	103.37
1	C	67[A]	NRQ	O2-C2-CA2	-12.57	123.90	130.96

There are no chirality outliers.

5 of 34 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	67[A]	NRQ	C2-CA2-CB2-CG2
1	A	67[A]	NRQ	C3-CA3-N3-C2
1	A	67[B]	CH6	N1-CA1-CB1-CG1
1	A	67[B]	CH6	C1-CA1-CB1-CG1
1	A	67[B]	CH6	C2-CA2-CB2-CG2

There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	67[A]	NRQ	2	0
1	B	67[A]	NRQ	1	0
1	A	67[A]	NRQ	1	0
1	D	67[A]	NRQ	1	0

## 5.5 Carbohydrates [i](#)

There are no monosaccharides 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	215/243 (88%)	0.25	14 (6%) 18 21	19, 28, 41, 61	13 (6%)
1	B	214/243 (88%)	0.41	17 (7%) 12 14	21, 32, 47, 62	20 (9%)
1	C	214/243 (88%)	0.36	10 (4%) 31 35	21, 34, 48, 65	23 (10%)
1	D	215/243 (88%)	0.25	8 (3%) 41 46	20, 30, 46, 73	20 (9%)
All	All	858/972 (88%)	0.32	49 (5%) 23 26	19, 31, 47, 73	76 (8%)

The worst 5 of 49 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	5	MET	5.5
1	C	6	ALA	5.0
1	C	222	SER	4.1
1	B	222	SER	4.0
1	A	105	VAL	3.7

### 6.2 Non-standard residues in protein, DNA, RNA chains [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	NRQ	C	67[A]	23/24	0.89	0.14	30,39,52,62	23
1	CH6	C	67[B]	23/24	0.89	0.14	30,39,52,62	23
1	NRQ	B	67[A]	23/24	0.93	0.13	26,33,50,55	23
1	CH6	B	67[B]	23/24	0.93	0.13	26,34,50,55	23
1	CH6	A	67[B]	23/24	0.94	0.12	25,34,47,53	23
1	NRQ	D	67[A]	23/24	0.94	0.12	26,35,49,52	23
1	CH6	D	67[B]	23/24	0.94	0.12	26,34,49,52	23

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
1	NRQ	A	67[A]	23/24	0.95	0.11	25,34,47,53	23

### 6.3 Carbohydrates [i](#)

There are no monosaccharides 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.