



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 25, 2026 – 06:36 PM EDT

PDB ID : 6G13 / pdb_00006g13
Title : C-terminal domain of MERS-CoV nucleocapsid
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Coutard, B.
Deposited on : 2018-03-20
Resolution : 1.97 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	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

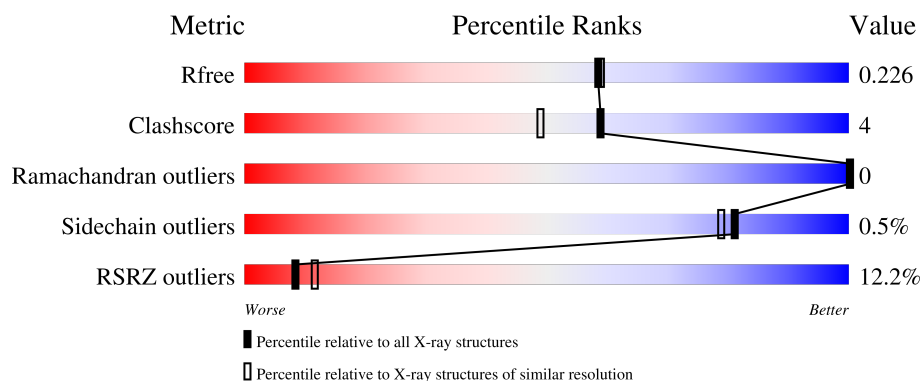
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.97 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}	180053	1506 (1.98-1.98)
Clashscore	190562	1534 (1.98-1.98)
Ramachandran outliers	187476	1518 (1.98-1.98)
Sidechain outliers	187428	1518 (1.98-1.98)
RSRZ outliers	180081	1506 (1.98-1.98)

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	126	
1	B	126	
1	C	126	
1	D	126	

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	TMO	A	401	-	X	-	-
2	TMO	A	402	-	X	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 4016 atoms, of which 46 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.

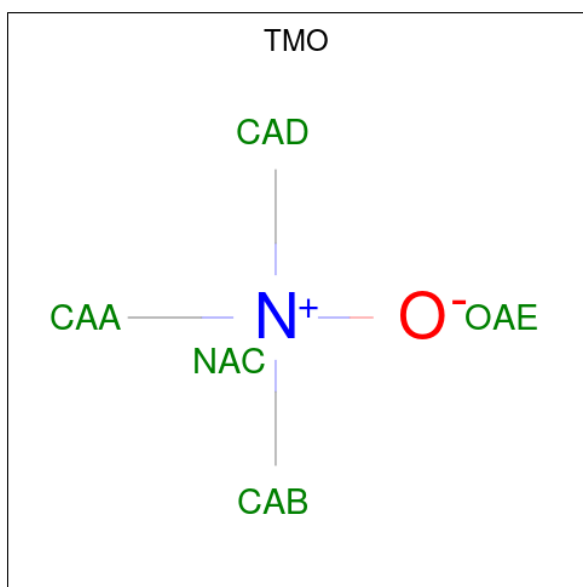
- Molecule 1 is a protein called Nucleoprotein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	112	Total	C	N	O	S	0	1	0
			909	577	161	167	4			
1	B	113	Total	C	N	O	S	0	0	0
			906	575	159	168	4			
1	C	113	Total	C	N	O	S	0	0	0
			906	575	159	168	4			
1	D	114	Total	C	N	O	S	0	0	0
			911	578	160	169	4			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	247	HIS	-	expression tag	UNP A0A0D3MU51
A	248	GLY	-	expression tag	UNP A0A0D3MU51
B	247	HIS	-	expression tag	UNP A0A0D3MU51
B	248	GLY	-	expression tag	UNP A0A0D3MU51
C	247	HIS	-	expression tag	UNP A0A0D3MU51
C	248	GLY	-	expression tag	UNP A0A0D3MU51
D	247	HIS	-	expression tag	UNP A0A0D3MU51
D	248	GLY	-	expression tag	UNP A0A0D3MU51

- Molecule 2 is trimethylamine oxide (CCD ID: TMO) (formula: C₃H₉NO).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	H	N	O	0	0
			14	3	9	1	1		
2	A	1	Total	C	H	N	O	0	0
			14	3	9	1	1		
2	B	1	Total	C	H	N	O	0	0
			14	3	9	1	1		
2	C	1	Total	C	H	N	O	0	0
			14	3	9	1	1		

- Molecule 3 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: C₄H₁₀O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	H	O	0	0
			17	4	10	3		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

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

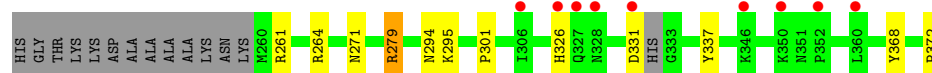
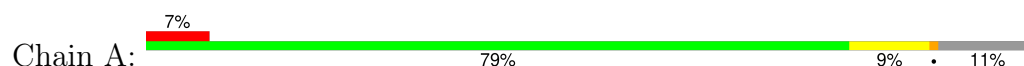
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	89	Total	O	0	0
			89	89		
5	B	86	Total	O	0	0
			86	86		
5	C	83	Total	O	0	0
			83	83		
5	D	52	Total	O	0	0
			52	52		

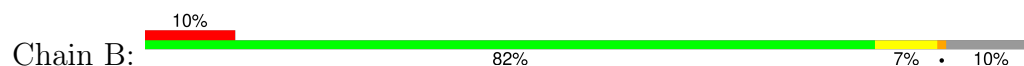
3 Residue-property plots [i](#)

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.

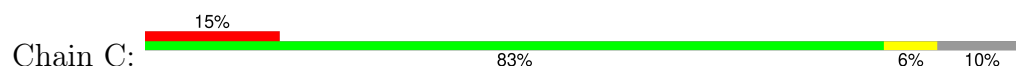
- Molecule 1: Nucleoprotein



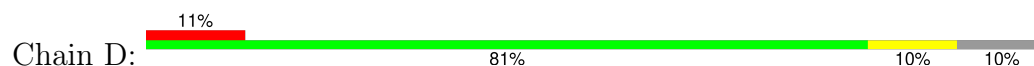
- Molecule 1: Nucleoprotein



- Molecule 1: Nucleoprotein



- Molecule 1: Nucleoprotein



4 Data and refinement statistics

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α , β , γ	120.68Å 120.68Å 92.65Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	69.33 – 1.97 69.33 – 1.97	Depositor EDS
% Data completeness (in resolution range)	100.0 (69.33-1.97) 100.0 (69.33-1.97)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.32 (at 1.97Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.190 , 0.216 0.192 , 0.226	Depositor DCC
R_{free} test set	2912 reflections (5.27%)	wwPDB-VP
Wilson B-factor (Å ²)	43.9	Xtriage
Anisotropy	0.433	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 84.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	0.027 for -h,-k,l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4016	wwPDB-VP
Average B, all atoms (Å ²)	65.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.60% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: PEG, CL, TMO

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	0.85	0/935	1.10	1/1260 (0.1%)
1	B	0.81	0/929	1.07	1/1253 (0.1%)
1	C	0.78	0/929	1.15	5/1253 (0.4%)
1	D	0.78	0/934	1.12	2/1260 (0.2%)
All	All	0.81	0/3727	1.11	9/5026 (0.2%)

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	279	ARG	CG-CD-NE	-7.04	96.50	112.00
1	C	282	GLY	CA-C-N	5.72	129.40	120.82
1	C	282	GLY	C-N-CA	5.72	129.40	120.82
1	D	258	ASN	CA-C-N	5.40	130.76	121.86
1	D	258	ASN	C-N-CA	5.40	130.76	121.86
1	C	281	PRO	CA-C-N	5.29	126.20	120.44
1	C	281	PRO	C-N-CA	5.29	126.20	120.44
1	C	271	ASN	CA-CB-CG	5.26	117.86	112.60
1	B	279	ARG	CG-CD-NE	-5.14	100.70	112.00

There are no chirality outliers.

There are no planarity outliers.

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	909	0	885	12	0
1	B	906	0	874	12	0
1	C	906	0	874	3	0
1	D	911	0	876	8	0
2	A	10	18	18	2	0
2	B	5	9	9	3	0
2	C	5	9	9	0	0
3	A	7	10	10	3	0
4	B	1	0	0	1	0
5	A	89	0	0	1	0
5	B	86	0	0	0	0
5	C	83	0	0	0	0
5	D	52	0	0	1	0
All	All	3970	46	3555	32	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 4.

All (32) 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:261:ARG:HH21	2:B:401:TMO:HADA	1.35	0.90
1:A:264:ARG:HH22	3:A:403:PEG:H12	1.45	0.81
1:D:279:ARG:N	1:D:279:ARG:HD2	2.02	0.74
1:B:264:ARG:HH12	2:B:401:TMO:HAAA	1.53	0.73
1:A:279:ARG:N	1:A:279:ARG:HD2	2.03	0.72
1:B:279:ARG:N	1:B:279:ARG:HD2	2.03	0.72
1:B:264:ARG:HH22	2:B:401:TMO:HADB	1.66	0.61
1:B:271:ASN:HB2	1:B:294:ASN:O	2.03	0.59
1:A:264:ARG:HH12	3:A:403:PEG:H32	1.71	0.56
1:A:261[B]:ARG:NH1	1:C:319:MET:HE3	2.21	0.55
1:D:260:MET:HE2	1:D:262:HIS:HE1	1.74	0.53
1:A:301:PRO:HB2	1:B:304:PRO:HG3	1.90	0.53
1:A:372:PRO:HB3	1:B:260:MET:HE2	1.91	0.53
2:A:402:TMO:HAA	5:A:503:HOH:O	2.10	0.51
1:C:272:MET:HB2	1:C:294:ASN:HA	1.94	0.50
1:B:290:ASP:HB2	4:B:402:CL:CL	2.50	0.47
1:C:279:ARG:HB2	1:C:368:TYR:HB3	1.95	0.47
1:A:271:ASN:HB2	1:A:294:ASN:O	2.16	0.46
1:A:372:PRO:HB3	1:B:260:MET:CE	2.45	0.45
1:D:279:ARG:HB2	1:D:368:TYR:HB3	1.99	0.44
1:D:272:MET:HB2	1:D:294:ASN:HA	2.01	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:326:HIS:HB3	1:D:337:TYR:CE1	2.54	0.43
1:A:279:ARG:N	1:A:279:ARG:CD	2.73	0.43
1:D:261:ARG:HD2	5:D:434:HOH:O	2.18	0.43
1:B:279:ARG:N	1:B:279:ARG:CD	2.73	0.42
1:B:272:MET:HB2	1:B:294:ASN:HA	2.01	0.42
1:B:348:ASP:H	1:D:260:MET:HE3	1.85	0.42
1:D:271:ASN:HB2	1:D:294:ASN:O	2.20	0.42
1:A:326:HIS:HB3	1:A:337:TYR:CD1	2.55	0.41
3:A:403:PEG:H41	3:A:403:PEG:H21	1.84	0.41
1:A:295:LYS:NZ	2:A:401:TMO:HAD	2.36	0.41
1:A:279:ARG:HB2	1:A:368:TYR:HB3	2.03	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	109/126 (86%)	106 (97%)	3 (3%)	0	100	100
1	B	109/126 (86%)	108 (99%)	1 (1%)	0	100	100
1	C	109/126 (86%)	108 (99%)	1 (1%)	0	100	100
1	D	110/126 (87%)	107 (97%)	3 (3%)	0	100	100
All	All	437/504 (87%)	429 (98%)	8 (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	97/105 (92%)	96 (99%)	1 (1%)	68	65
1	B	96/105 (91%)	96 (100%)	0	100	100
1	C	96/105 (91%)	96 (100%)	0	100	100
1	D	96/105 (91%)	95 (99%)	1 (1%)	68	65
All	All	385/420 (92%)	383 (100%)	2 (0%)	81	79

All (2) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	331	ASP
1	D	327	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	363	GLN
1	B	321	GLN
1	B	363	GLN
1	C	363	GLN
1	D	292	GLN
1	D	363	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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 6 ligands modelled in this entry, 1 is monoatomic - leaving 5 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	TMO	C	401	-	4,4,4	6.98	1 (25%)	6,6,6	0.36	0
2	TMO	A	402	-	4,4,4	8.18	4 (100%)	6,6,6	0.48	0
3	PEG	A	403	-	6,6,6	0.17	0	5,5,5	0.13	0
2	TMO	A	401	-	4,4,4	8.43	4 (100%)	6,6,6	0.43	0
2	TMO	B	401	-	4,4,4	7.90	3 (75%)	6,6,6	0.38	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
3	PEG	A	403	-	-	3/4/4/4	-

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	TMO	OAE-NAC	-15.89	1.20	1.42
2	A	402	TMO	OAE-NAC	-15.60	1.21	1.42
2	B	401	TMO	OAE-NAC	-15.41	1.21	1.42
2	C	401	TMO	OAE-NAC	-13.71	1.23	1.42
2	A	401	TMO	CAD-NAC	-3.72	1.43	1.48
2	A	401	TMO	CAA-NAC	-3.23	1.44	1.48
2	A	402	TMO	CAB-NAC	-3.10	1.44	1.48
2	A	402	TMO	CAD-NAC	-2.79	1.44	1.48
2	A	401	TMO	CAB-NAC	-2.70	1.44	1.48
2	A	402	TMO	CAA-NAC	-2.61	1.44	1.48
2	B	401	TMO	CAB-NAC	-2.25	1.45	1.48
2	B	401	TMO	CAA-NAC	-2.13	1.45	1.48

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	403	PEG	O1-C1-C2-O2
3	A	403	PEG	C1-C2-O2-C3
3	A	403	PEG	C4-C3-O2-C2

There are no ring outliers.

4 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	402	TMO	1	0
3	A	403	PEG	3	0
2	A	401	TMO	1	0
2	B	401	TMO	3	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	112/126 (88%)	0.45	9 (8%) 18 25	29, 49, 93, 136	1 (0%)
1	B	113/126 (89%)	0.51	13 (11%) 9 13	42, 54, 87, 121	0
1	C	113/126 (89%)	0.86	19 (16%) 4 5	35, 67, 142, 210	0
1	D	114/126 (90%)	0.94	14 (12%) 8 11	39, 68, 136, 193	1 (0%)
All	All	452/504 (89%)	0.69	55 (12%) 8 11	29, 58, 105, 210	2 (0%)

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	258	ASN	15.4
1	C	335	PRO	6.9
1	D	335	PRO	5.1
1	D	372	PRO	4.7
1	B	259	LYS	4.0
1	A	326	HIS	4.0
1	C	326	HIS	3.8
1	B	333	GLY	3.6
1	A	352	PRO	3.5
1	D	333	GLY	3.4
1	C	259	LYS	3.3
1	A	328	ASN	3.3
1	C	327	GLN	3.2
1	C	333	GLY	3.2
1	C	283	ASP	3.1
1	C	284	LEU	3.1
1	B	335	PRO	3.0
1	D	272	MET	2.9
1	D	259	LYS	2.9
1	A	327	GLN	2.9
1	C	334	ASN	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	350	LYS	2.6
1	C	281	PRO	2.6
1	B	338	PHE	2.6
1	C	336	VAL	2.5
1	D	331	ASP	2.5
1	A	346	LYS	2.5
1	D	284	LEU	2.5
1	A	306	ILE	2.5
1	A	331	ASP	2.5
1	D	330	ASP	2.5
1	C	282	GLY	2.4
1	C	337	TYR	2.4
1	D	334	ASN	2.4
1	B	272	MET	2.4
1	B	284	LEU	2.3
1	C	372	PRO	2.3
1	C	269	SER	2.3
1	B	326	HIS	2.3
1	C	260	MET	2.3
1	D	305	GLN	2.2
1	B	350	LYS	2.2
1	A	360	LEU	2.2
1	B	331	ASP	2.2
1	D	350	LYS	2.2
1	B	337	TYR	2.1
1	D	354	TYR	2.1
1	C	362	GLU	2.1
1	C	270	PHE	2.1
1	D	336	VAL	2.1
1	B	260	MET	2.1
1	B	334	ASN	2.1
1	C	325	THR	2.0
1	C	352	PRO	2.0
1	B	273	VAL	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides 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($\text{\AA}^2$)	Q<0.9
2	TMO	B	401	5/5	0.73	0.16	80,80,82,83	0
2	TMO	C	401	5/5	0.76	0.17	94,97,98,98	0
3	PEG	A	403	7/7	0.85	0.14	73,81,87,88	0
2	TMO	A	402	5/5	0.91	0.11	48,60,62,63	0
4	CL	B	402	1/1	0.92	0.13	73,73,73,73	0
2	TMO	A	401	5/5	0.93	0.10	50,55,61,62	0

6.5 Other polymers [i](#)

There are no such residues in this entry.