



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 19, 2025 – 09:29 AM EDT

PDB ID : 1ZGQ  
Title : Crystal Structure of the Discosoma Red Fluorescent Protein (DsRed) Variant Q66M  
Authors : Tubbs, J.L.; Tainer, J.A.; Getzoff, E.D.  
Deposited on : 2005-04-21  
Resolution : 1.90 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

<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:

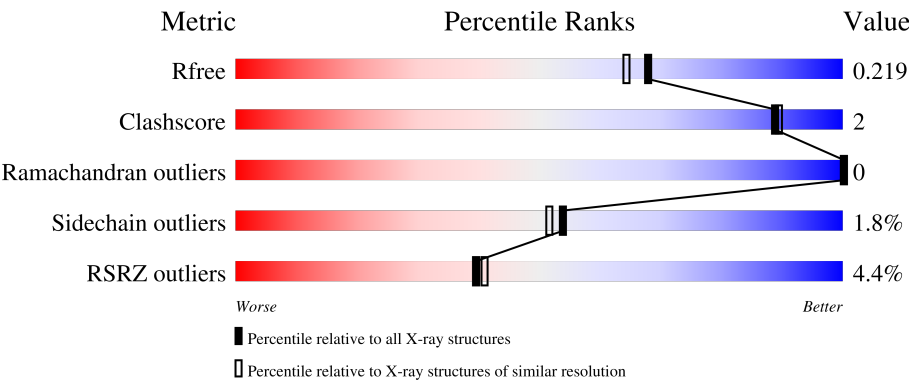
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.4

# 1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:  
*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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))
$R_{free}$	164625	7293 (1.90-1.90)
Clashscore	180529	8090 (1.90-1.90)
Ramachandran outliers	177936	8022 (1.90-1.90)
Sidechain outliers	177891	8022 (1.90-1.90)
RSRZ outliers	164620	7292 (1.90-1.90)

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	223	<div><div>%</div><div><div></div><div>91%</div><div>6%</div><div>.</div></div></div>
1	B	223	<div><div>3%</div><div><div></div><div>92%</div><div>5%</div><div>..</div></div></div>
1	C	223	<div><div>4%</div><div><div></div><div>92%</div><div>.</div><div>..</div></div></div>
1	D	223	<div><div>%</div><div><div></div><div>93%</div><div>.</div><div>..</div></div></div>
1	E	223	<div><div>4%</div><div><div></div><div>93%</div><div>.</div><div>..</div></div></div>

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Mol	Chain	Length	Quality of chain
1	F	223	
1	G	223	
1	H	223	

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	PEG	C	1603	-	X	-	-
2	PEG	D	1604	-	X	-	-
2	PEG	F	1606	-	X	-	-

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 15950 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 Red fluorescent protein drFP583.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total	C	N	O	S	0	1	0
			1792	1159	297	328	8			
1	B	218	Total	C	N	O	S	0	0	0
			1790	1158	297	327	8			
1	C	218	Total	C	N	O	S	0	1	0
			1792	1159	297	328	8			
1	D	218	Total	C	N	O	S	0	1	0
			1792	1159	297	328	8			
1	E	218	Total	C	N	O	S	0	0	0
			1790	1158	297	327	8			
1	F	218	Total	C	N	O	S	0	1	0
			1792	1159	297	328	8			
1	G	218	Total	C	N	O	S	0	0	0
			1790	1158	297	327	8			
1	H	218	Total	C	N	O	S	0	1	0
			1792	1159	297	328	8			

There are 24 discrepancies between the modelled and reference sequences:

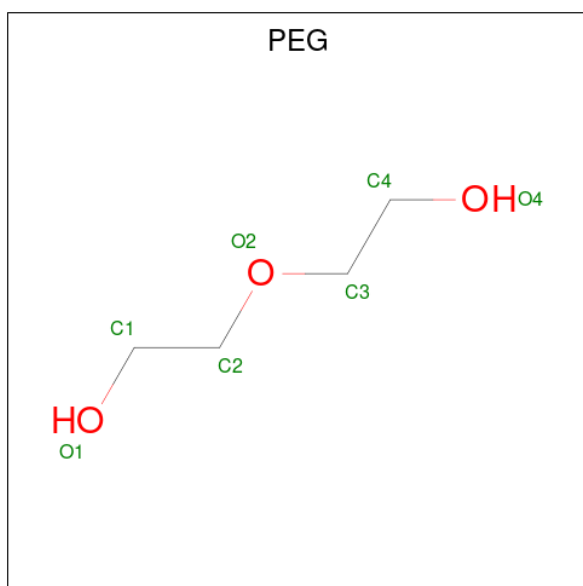
Chain	Residue	Modelled	Actual	Comment	Reference
A	66	NRQ	GLN	chromophore	UNP Q9U6Y8
A	66	NRQ	TYR	chromophore	UNP Q9U6Y8
A	66	NRQ	GLY	chromophore	UNP Q9U6Y8
B	66	NRQ	GLN	chromophore	UNP Q9U6Y8
B	66	NRQ	TYR	chromophore	UNP Q9U6Y8
B	66	NRQ	GLY	chromophore	UNP Q9U6Y8
C	66	NRQ	GLN	chromophore	UNP Q9U6Y8
C	66	NRQ	TYR	chromophore	UNP Q9U6Y8
C	66	NRQ	GLY	chromophore	UNP Q9U6Y8
D	66	NRQ	GLN	chromophore	UNP Q9U6Y8
D	66	NRQ	TYR	chromophore	UNP Q9U6Y8
D	66	NRQ	GLY	chromophore	UNP Q9U6Y8
E	66	NRQ	GLN	chromophore	UNP Q9U6Y8

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Chain	Residue	Modelled	Actual	Comment	Reference
E	66	NRQ	TYR	chromophore	UNP Q9U6Y8
E	66	NRQ	GLY	chromophore	UNP Q9U6Y8
F	66	NRQ	GLN	chromophore	UNP Q9U6Y8
F	66	NRQ	TYR	chromophore	UNP Q9U6Y8
F	66	NRQ	GLY	chromophore	UNP Q9U6Y8
G	66	NRQ	GLN	chromophore	UNP Q9U6Y8
G	66	NRQ	TYR	chromophore	UNP Q9U6Y8
G	66	NRQ	GLY	chromophore	UNP Q9U6Y8
H	66	NRQ	GLN	chromophore	UNP Q9U6Y8
H	66	NRQ	TYR	chromophore	UNP Q9U6Y8
H	66	NRQ	GLY	chromophore	UNP Q9U6Y8

- Molecule 2 is DI(HYDROXYETHYL)ETHER (three-letter code: PEG) (formula: C<sub>4</sub>H<sub>10</sub>O<sub>3</sub>).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			7	4	3		
2	B	1	Total	C	O	0	0
			7	4	3		
2	C	1	Total	C	O	0	0
			7	4	3		
2	C	1	Total	C	O	0	0
			7	4	3		
2	D	1	Total	C	O	0	0
			7	4	3		
2	E	1	Total	C	O	0	0
			7	4	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	F	1	Total	C	O	0	0
			7	4	3		
2	G	1	Total	C	O	0	0
			7	4	3		

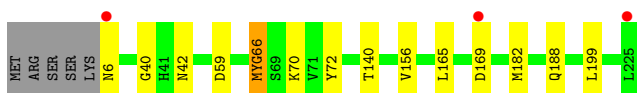
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	215	Total	O	0	0
			215	215		
3	B	224	Total	O	0	0
			224	224		
3	C	186	Total	O	0	0
			186	186		
3	D	212	Total	O	0	0
			212	212		
3	E	206	Total	O	0	0
			206	206		
3	F	144	Total	O	0	0
			144	144		
3	G	187	Total	O	0	0
			187	187		
3	H	190	Total	O	0	0
			190	190		

### 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.

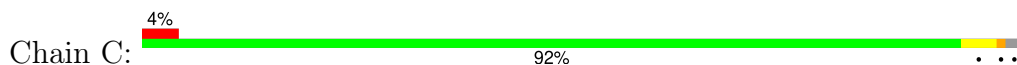
- Molecule 1: Red fluorescent protein drFP583



- Molecule 1: Red fluorescent protein drFP583



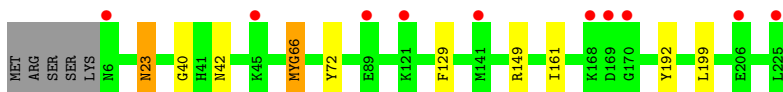
- Molecule 1: Red fluorescent protein drFP583



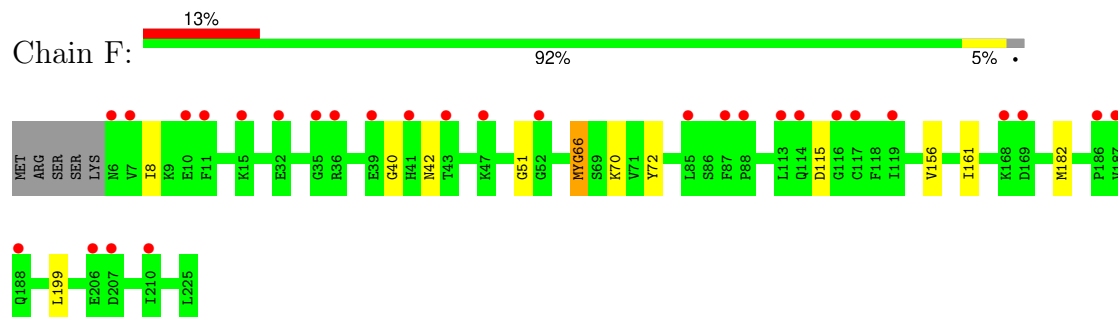
- Molecule 1: Red fluorescent protein drFP583



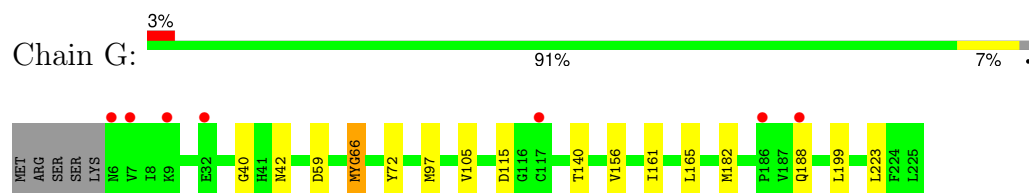
- Molecule 1: Red fluorescent protein drFP583



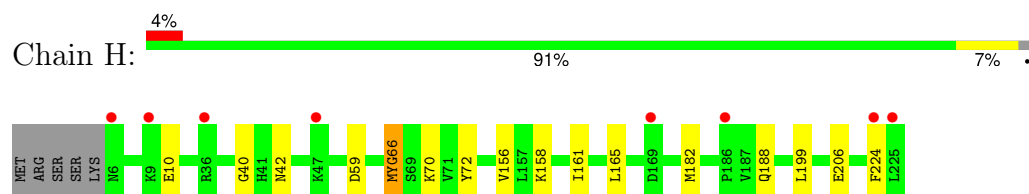
- Molecule 1: Red fluorescent protein drFP583



- Molecule 1: Red fluorescent protein drFP583



- Molecule 1: Red fluorescent protein drFP583





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	74.23Å 87.98Å 161.64Å 90.00° 96.72° 90.00°	Depositor
Resolution (Å)	37.78 – 1.90 37.78 – 1.90	Depositor EDS
% Data completeness (in resolution range)	91.3 (37.78-1.90) 91.4 (37.78-1.90)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.06	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.37 (at 1.89Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.194 , 0.220 0.193 , 0.219	Depositor DCC
$R_{free}$ test set	7494 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	17.7	Xtriage
Anisotropy	0.240	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.32 , 32.3	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	0.95	EDS
Total number of atoms	15950	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.74% 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: PEG, 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	0.68	0/1822	0.79	0/2453
1	B	0.68	0/1816	0.79	0/2445
1	C	0.68	0/1822	0.78	0/2453
1	D	0.69	0/1822	0.80	0/2453
1	E	0.68	0/1816	0.78	0/2445
1	F	0.74	3/1822 (0.2%)	0.76	0/2453
1	G	0.68	0/1816	0.77	0/2445
1	H	0.68	0/1822	0.79	1/2453 (0.0%)
All	All	0.69	3/14558 (0.0%)	0.78	1/19600 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	F	115	ASP	C-N	9.16	1.49	1.33
1	F	8	ILE	C-N	-5.86	1.20	1.34
1	F	51	GLY	C-N	-5.03	1.24	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	224	PHE	N-CA-C	5.35	125.45	111.00

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	1792	0	1747	6	0
1	B	1790	0	1745	7	0
1	C	1792	0	1747	6	0
1	D	1792	0	1747	6	0
1	E	1790	0	1745	4	0
1	F	1792	0	1747	4	0
1	G	1790	0	1745	6	0
1	H	1792	0	1747	7	0
2	A	7	0	10	0	0
2	B	7	0	10	1	0
2	C	14	0	20	5	0
2	D	7	0	10	0	0
2	E	7	0	10	0	0
2	F	7	0	10	1	0
2	G	7	0	10	2	0
3	A	215	0	0	1	0
3	B	224	0	0	1	0
3	C	186	0	0	4	0
3	D	212	0	0	1	0
3	E	206	0	0	0	0
3	F	144	0	0	2	0
3	G	187	0	0	0	0
3	H	190	0	0	1	0
All	All	15950	0	14050	50	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 2.

All (50) 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)
2:C:1602:PEG:H11	3:C:1787:HOH:O	2.03	0.59
2:F:1606:PEG:H41	3:F:1626:HOH:O	2.05	0.57
1:E:23:ASN:HD21	1:E:129:PHE:H	1.53	0.56
2:C:1602:PEG:H21	3:C:1691:HOH:O	2.08	0.53
1:E:66:NRQ:HE1	1:E:199:LEU:HB2	1.92	0.51
1:C:58:TRP:H	2:C:1602:PEG:H31	1.76	0.51
1:H:70:LYS:HD3	3:H:243:HOH:O	2.10	0.51
2:G:1607:PEG:H12	1:H:158:LYS:NZ	2.26	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:G:1607:PEG:H12	1:H:158:LYS:HZ2	1.77	0.49
1:G:40:GLY:HA2	1:G:72:TYR:O	2.14	0.48
1:A:156:VAL:HG11	1:A:182:MET:HG2	1.96	0.48
1:B:6:ASN:N	3:B:1829:HOH:O	2.47	0.47
1:B:223:LEU:HD21	1:D:223:LEU:HD11	1.96	0.47
1:F:156:VAL:HG11	1:F:182:MET:HG2	1.95	0.47
1:B:156:VAL:HG11	1:B:182:MET:HG2	1.97	0.47
1:D:70:LYS:HD3	3:D:1610:HOH:O	2.15	0.46
1:D:66:NRQ:HE1	1:D:199:LEU:HB2	1.98	0.46
1:B:40:GLY:HA2	1:B:72:TYR:O	2.15	0.46
1:H:40:GLY:HA2	1:H:72:TYR:O	2.16	0.46
1:A:70:LYS:HD3	3:A:1614:HOH:O	2.15	0.46
1:B:42:ASN:HD22	1:B:42:ASN:N	2.14	0.45
1:F:70:LYS:HD3	3:F:1646:HOH:O	2.17	0.45
1:G:140:THR:HG21	1:G:165:LEU:HD13	1.98	0.45
1:G:59:ASP:HB3	1:G:165:LEU:HD21	1.99	0.45
2:C:1603:PEG:H32	3:C:1630:HOH:O	2.16	0.45
1:B:66:NRQ:HE1	1:B:199:LEU:HB2	1.98	0.44
1:H:156:VAL:HG11	1:H:182:MET:HG2	1.99	0.44
1:B:59:ASP:HB3	1:B:165:LEU:HD21	2.00	0.44
1:C:156:VAL:HG11	1:C:182:MET:HG2	1.99	0.44
1:G:97:MET:HB2	1:G:105:VAL:HB	2.00	0.44
1:C:40:GLY:HA2	1:C:72:TYR:O	2.18	0.43
1:C:59:ASP:HB3	1:C:165:LEU:HD21	2.01	0.43
1:G:156:VAL:HG11	1:G:182:MET:HG2	2.00	0.43
2:C:1603:PEG:H31	3:C:1706:HOH:O	2.18	0.43
1:A:40:GLY:HA2	1:A:72:TYR:O	2.19	0.42
1:A:66:NRQ:HE1	1:A:199:LEU:HB2	2.02	0.42
1:A:59:ASP:HB3	1:A:165:LEU:HD21	2.02	0.42
1:C:42:ASN:HD22	1:C:42:ASN:N	2.18	0.42
1:E:40:GLY:HA2	1:E:72:TYR:O	2.20	0.42
1:G:66:NRQ:HE1	1:G:199:LEU:HB2	2.02	0.41
2:B:1605:PEG:H22	1:D:192:TYR:H	1.85	0.41
1:A:140:THR:HG21	1:A:165:LEU:HD13	2.03	0.41
1:H:59:ASP:HB3	1:H:165:LEU:HD21	2.03	0.41
1:D:140:THR:HG21	1:D:165:LEU:HD13	2.03	0.41
1:D:59:ASP:HB3	1:D:165:LEU:HD21	2.03	0.41
1:E:149:ARG:HD3	1:E:192:TYR:CZ	2.55	0.41
1:H:66:NRQ:HE1	1:H:199:LEU:HB2	2.02	0.41
1:F:66:NRQ:HE1	1:F:199:LEU:HB2	2.03	0.40
1:C:66:NRQ:HE1	1:C:199:LEU:HB2	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:40:GLY:HA2	1:F:72:TYR:O	2.22	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	213/223 (96%)	210 (99%)	3 (1%)	0	100	100
1	B	213/223 (96%)	210 (99%)	3 (1%)	0	100	100
1	C	213/223 (96%)	209 (98%)	4 (2%)	0	100	100
1	D	213/223 (96%)	212 (100%)	1 (0%)	0	100	100
1	E	213/223 (96%)	210 (99%)	3 (1%)	0	100	100
1	F	213/223 (96%)	208 (98%)	5 (2%)	0	100	100
1	G	213/223 (96%)	211 (99%)	2 (1%)	0	100	100
1	H	213/223 (96%)	211 (99%)	2 (1%)	0	100	100
All	All	1704/1784 (96%)	1681 (99%)	23 (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	192/196 (98%)	188 (98%)	4 (2%)	48	45
1	B	191/196 (97%)	188 (98%)	3 (2%)	58	56
1	C	192/196 (98%)	189 (98%)	3 (2%)	58	56
1	D	192/196 (98%)	189 (98%)	3 (2%)	58	56
1	E	191/196 (97%)	188 (98%)	3 (2%)	58	56
1	F	192/196 (98%)	190 (99%)	2 (1%)	73	74
1	G	191/196 (97%)	186 (97%)	5 (3%)	41	36
1	H	192/196 (98%)	187 (97%)	5 (3%)	41	36
All	All	1533/1568 (98%)	1505 (98%)	28 (2%)	54	52

All (28) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	6	ASN
1	A	42	ASN
1	A	169	ASP
1	A	188	GLN
1	B	42	ASN
1	B	161	ILE
1	B	187	VAL
1	C	10	GLU
1	C	42	ASN
1	C	161	ILE
1	D	42	ASN
1	D	161	ILE
1	D	167	LEU
1	E	23	ASN
1	E	42	ASN
1	E	161	ILE
1	F	42	ASN
1	F	161	ILE
1	G	42	ASN
1	G	115	ASP
1	G	161	ILE
1	G	188	GLN
1	G	223	LEU
1	H	10	GLU
1	H	42	ASN
1	H	161	ILE
1	H	188	GLN

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Mol	Chain	Res	Type
1	H	206	GLU

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	6	ASN
1	B	42	ASN
1	C	42	ASN
1	D	188	GLN
1	E	23	ASN
1	G	42	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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	NRQ	C	66	1	24,24,25	3.05	9 (37%)	24,32,34	1.46	4 (16%)
1	NRQ	E	66	1	24,24,25	3.01	8 (33%)	24,32,34	1.52	4 (16%)
1	NRQ	A	66	1	24,24,25	3.04	10 (41%)	24,32,34	1.51	7 (29%)
1	NRQ	B	66	1	24,24,25	3.01	8 (33%)	24,32,34	1.50	4 (16%)
1	NRQ	H	66	1	24,24,25	3.02	10 (41%)	24,32,34	1.49	7 (29%)
1	NRQ	F	66	1	24,24,25	3.07	9 (37%)	24,32,34	1.46	6 (25%)
1	NRQ	D	66	1	24,24,25	2.92	9 (37%)	24,32,34	1.49	4 (16%)
1	NRQ	G	66	1	24,24,25	3.03	8 (33%)	24,32,34	1.44	7 (29%)

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	NRQ	C	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	E	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	A	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	B	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	H	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	F	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	D	66	1	-	1/9/31/32	0/2/2/2
1	NRQ	G	66	1	-	1/9/31/32	0/2/2/2

All (71) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	66	NRQ	CB2-CA2	7.19	1.42	1.35
1	C	66	NRQ	CB2-CA2	7.11	1.42	1.35
1	F	66	NRQ	CB2-CA2	7.08	1.42	1.35
1	G	66	NRQ	CB2-CA2	7.05	1.41	1.35
1	H	66	NRQ	CB2-CA2	6.90	1.41	1.35
1	B	66	NRQ	CB2-CA2	6.81	1.41	1.35
1	E	66	NRQ	CB2-CA2	6.37	1.41	1.35
1	D	66	NRQ	CB2-CA2	5.96	1.40	1.35
1	F	66	NRQ	CE1-CZ	5.83	1.49	1.39
1	B	66	NRQ	CE1-CZ	5.75	1.49	1.39
1	E	66	NRQ	CE1-CZ	5.69	1.49	1.39
1	C	66	NRQ	CE1-CZ	5.65	1.49	1.39
1	G	66	NRQ	CE2-CZ	5.62	1.49	1.39
1	C	66	NRQ	CE2-CZ	5.62	1.49	1.39
1	G	66	NRQ	CE1-CZ	5.59	1.49	1.39
1	H	66	NRQ	CE2-CZ	5.55	1.49	1.39
1	B	66	NRQ	CE2-CZ	5.54	1.49	1.39
1	D	66	NRQ	CE2-CZ	5.53	1.49	1.39
1	A	66	NRQ	CE2-CZ	5.53	1.49	1.39
1	H	66	NRQ	CE1-CZ	5.50	1.49	1.39
1	E	66	NRQ	CE2-CZ	5.47	1.49	1.39
1	F	66	NRQ	CE2-CZ	5.44	1.49	1.39
1	D	66	NRQ	CE1-CZ	5.44	1.49	1.39
1	G	66	NRQ	CD1-CG2	5.30	1.50	1.39
1	A	66	NRQ	CE1-CZ	5.30	1.48	1.39
1	E	66	NRQ	CD1-CG2	5.29	1.50	1.39
1	E	66	NRQ	OH-CZ	-5.22	1.25	1.37

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	66	NRQ	OH-CZ	-5.22	1.25	1.37
1	F	66	NRQ	CD1-CG2	5.19	1.50	1.39
1	A	66	NRQ	OH-CZ	-5.18	1.25	1.37
1	D	66	NRQ	OH-CZ	-5.17	1.25	1.37
1	H	66	NRQ	CD1-CG2	5.16	1.49	1.39
1	C	66	NRQ	OH-CZ	-5.16	1.25	1.37
1	C	66	NRQ	CD1-CG2	5.16	1.49	1.39
1	F	66	NRQ	OH-CZ	-5.13	1.25	1.37
1	H	66	NRQ	OH-CZ	-5.09	1.25	1.37
1	B	66	NRQ	CD1-CG2	5.05	1.49	1.39
1	D	66	NRQ	CD1-CG2	5.02	1.49	1.39
1	A	66	NRQ	CD1-CG2	4.92	1.49	1.39
1	G	66	NRQ	OH-CZ	-4.87	1.26	1.37
1	F	66	NRQ	CD2-CG2	4.52	1.48	1.39
1	C	66	NRQ	CD2-CG2	4.48	1.48	1.39
1	G	66	NRQ	CD2-CG2	4.47	1.48	1.39
1	A	66	NRQ	CD2-CG2	4.35	1.48	1.39
1	E	66	NRQ	CD2-CG2	4.32	1.48	1.39
1	B	66	NRQ	CD2-CG2	4.26	1.48	1.39
1	H	66	NRQ	CD2-CG2	4.24	1.48	1.39
1	D	66	NRQ	CD2-CG2	4.20	1.48	1.39
1	E	66	NRQ	CG2-CB2	-3.58	1.40	1.46
1	D	66	NRQ	CG2-CB2	-3.49	1.40	1.46
1	A	66	NRQ	CG2-CB2	-3.42	1.40	1.46
1	B	66	NRQ	CG2-CB2	-3.36	1.40	1.46
1	A	66	NRQ	C1-N3	3.36	1.43	1.38
1	F	66	NRQ	C1-N3	3.31	1.43	1.38
1	H	66	NRQ	CG2-CB2	-3.29	1.40	1.46
1	H	66	NRQ	C1-N3	3.22	1.43	1.38
1	D	66	NRQ	C1-N3	3.08	1.43	1.38
1	F	66	NRQ	CG2-CB2	-3.04	1.41	1.46
1	G	66	NRQ	C1-N3	3.03	1.43	1.38
1	G	66	NRQ	CG2-CB2	-3.00	1.41	1.46
1	C	66	NRQ	CG2-CB2	-2.99	1.41	1.46
1	C	66	NRQ	C1-N3	2.98	1.43	1.38
1	E	66	NRQ	C1-N3	2.96	1.43	1.38
1	B	66	NRQ	C1-N3	2.91	1.42	1.38
1	A	66	NRQ	CA3-N3	2.12	1.51	1.47
1	D	66	NRQ	CA1-N1	2.12	1.32	1.27
1	F	66	NRQ	CA3-N3	2.06	1.51	1.47
1	A	66	NRQ	CA1-N1	2.05	1.32	1.27
1	H	66	NRQ	CA1-N1	2.05	1.32	1.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	H	66	NRQ	CA3-N3	2.01	1.51	1.47
1	C	66	NRQ	CA1-N1	2.00	1.32	1.27

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	66	NRQ	CG2-CB2-CA2	3.30	133.79	129.87
1	B	66	NRQ	CG2-CB2-CA2	3.24	133.72	129.87
1	C	66	NRQ	CG2-CB2-CA2	3.21	133.69	129.87
1	B	66	NRQ	C3-CA3-N3	3.12	119.53	112.43
1	E	66	NRQ	C3-CA3-N3	3.06	119.39	112.43
1	A	66	NRQ	C3-CA3-N3	3.04	119.35	112.43
1	A	66	NRQ	CG2-CB2-CA2	3.04	133.48	129.87
1	C	66	NRQ	C3-CA3-N3	3.02	119.31	112.43
1	D	66	NRQ	C3-CA3-N3	3.01	119.28	112.43
1	F	66	NRQ	C3-CA3-N3	2.99	119.24	112.43
1	H	66	NRQ	C3-CA3-N3	2.91	119.06	112.43
1	D	66	NRQ	CG2-CB2-CA2	2.91	133.32	129.87
1	G	66	NRQ	C3-CA3-N3	2.91	119.05	112.43
1	H	66	NRQ	CG2-CB2-CA2	2.90	133.32	129.87
1	G	66	NRQ	CG2-CB2-CA2	2.62	132.98	129.87
1	F	66	NRQ	CG2-CB2-CA2	2.59	132.95	129.87
1	F	66	NRQ	CA2-N2-C1	2.21	108.16	104.09
1	D	66	NRQ	O3-C3-CA3	-2.19	115.59	125.47
1	E	66	NRQ	O3-C3-CA3	-2.18	115.65	125.47
1	F	66	NRQ	CD2-CE2-CZ	2.16	122.16	119.88
1	B	66	NRQ	O3-C3-CA3	-2.15	115.80	125.47
1	A	66	NRQ	N3-C1-N2	-2.14	110.08	112.62
1	A	66	NRQ	CA2-N2-C1	2.14	108.03	104.09
1	E	66	NRQ	CD2-CE2-CZ	2.14	122.14	119.88
1	G	66	NRQ	O3-C3-CA3	-2.13	115.88	125.47
1	G	66	NRQ	CD2-CE2-CZ	2.13	122.13	119.88
1	H	66	NRQ	CD2-CE2-CZ	2.13	122.13	119.88
1	H	66	NRQ	CA2-N2-C1	2.13	108.00	104.09
1	C	66	NRQ	CA2-N2-C1	2.12	108.00	104.09
1	F	66	NRQ	O3-C3-CA3	-2.12	115.92	125.47
1	H	66	NRQ	O3-C3-CA3	-2.11	115.95	125.47
1	H	66	NRQ	N3-C1-N2	-2.11	110.11	112.62
1	G	66	NRQ	CE1-CZ-CE2	-2.11	116.41	119.77
1	G	66	NRQ	CA2-N2-C1	2.11	107.97	104.09
1	C	66	NRQ	O3-C3-CA3	-2.10	116.00	125.47
1	F	66	NRQ	CE1-CZ-CE2	-2.08	116.45	119.77

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	66	NRQ	N3-C1-N2	-2.08	110.15	112.62
1	A	66	NRQ	O3-C3-CA3	-2.08	116.12	125.47
1	A	66	NRQ	CE1-CZ-CE2	-2.07	116.48	119.77
1	H	66	NRQ	CE1-CZ-CE2	-2.03	116.53	119.77
1	A	66	NRQ	CD2-CE2-CZ	2.03	122.03	119.88
1	G	66	NRQ	N3-C1-N2	-2.02	110.22	112.62
1	B	66	NRQ	CE1-CZ-CE2	-2.01	116.57	119.77

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	66	NRQ	C1-CA1-CB1-CG1
1	C	66	NRQ	C1-CA1-CB1-CG1
1	D	66	NRQ	C1-CA1-CB1-CG1
1	F	66	NRQ	C1-CA1-CB1-CG1
1	G	66	NRQ	C1-CA1-CB1-CG1
1	H	66	NRQ	C1-CA1-CB1-CG1
1	B	66	NRQ	C1-CA1-CB1-CG1
1	E	66	NRQ	C1-CA1-CB1-CG1

There are no ring outliers.

8 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	C	66	NRQ	1	0
1	E	66	NRQ	1	0
1	A	66	NRQ	1	0
1	B	66	NRQ	1	0
1	H	66	NRQ	1	0
1	F	66	NRQ	1	0
1	D	66	NRQ	1	0
1	G	66	NRQ	1	0

## 5.5 Carbohydrates

There are no oligosaccharides in this entry.

## 5.6 Ligand geometry

8 ligands 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
2	PEG	E	1608	-	6,6,6	0.62	0	5,5,5	3.04	3 (60%)
2	PEG	F	1606	-	6,6,6	0.71	0	5,5,5	3.00	3 (60%)
2	PEG	G	1607	-	6,6,6	0.58	0	5,5,5	3.05	3 (60%)
2	PEG	B	1605	-	6,6,6	0.66	0	5,5,5	3.02	3 (60%)
2	PEG	C	1603	-	6,6,6	0.59	0	5,5,5	2.93	3 (60%)
2	PEG	C	1602	-	6,6,6	0.70	0	5,5,5	2.97	3 (60%)
2	PEG	A	1601	-	6,6,6	0.76	0	5,5,5	3.08	3 (60%)
2	PEG	D	1604	-	6,6,6	0.67	0	5,5,5	3.04	3 (60%)

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	PEG	E	1608	-	-	2/4/4/4	-
2	PEG	F	1606	-	-	3/4/4/4	-
2	PEG	G	1607	-	-	2/4/4/4	-
2	PEG	B	1605	-	-	2/4/4/4	-
2	PEG	C	1603	-	-	3/4/4/4	-
2	PEG	C	1602	-	-	2/4/4/4	-
2	PEG	A	1601	-	-	1/4/4/4	-
2	PEG	D	1604	-	-	3/4/4/4	-

There are no bond length outliers.

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	1607	PEG	O2-C2-C1	5.02	132.22	110.11
2	A	1601	PEG	O2-C2-C1	4.96	131.96	110.11
2	D	1604	PEG	O2-C2-C1	4.91	131.75	110.11
2	E	1608	PEG	O2-C2-C1	4.84	131.44	110.11
2	B	1605	PEG	O2-C2-C1	4.75	131.05	110.11
2	F	1606	PEG	O2-C2-C1	4.74	130.99	110.11
2	C	1603	PEG	O2-C2-C1	4.57	130.27	110.11
2	C	1602	PEG	O2-C2-C1	4.56	130.21	110.11
2	C	1602	PEG	C3-O2-C2	3.40	128.13	113.26
2	E	1608	PEG	C3-O2-C2	3.25	127.48	113.26
2	B	1605	PEG	C3-O2-C2	3.19	127.22	113.26
2	F	1606	PEG	C3-O2-C2	3.15	127.02	113.26
2	C	1603	PEG	O2-C3-C4	3.06	123.60	110.11
2	D	1604	PEG	C3-O2-C2	3.03	126.53	113.26
2	A	1601	PEG	O2-C3-C4	3.03	123.45	110.11
2	A	1601	PEG	C3-O2-C2	3.00	126.38	113.26
2	G	1607	PEG	C3-O2-C2	2.95	126.19	113.26
2	B	1605	PEG	O2-C3-C4	2.92	122.99	110.11
2	D	1604	PEG	O2-C3-C4	2.90	122.89	110.11
2	F	1606	PEG	O2-C3-C4	2.89	122.85	110.11
2	C	1603	PEG	C3-O2-C2	2.88	125.86	113.26
2	G	1607	PEG	O2-C3-C4	2.80	122.46	110.11
2	E	1608	PEG	O2-C3-C4	2.74	122.17	110.11
2	C	1602	PEG	O2-C3-C4	2.63	121.72	110.11

There are no chirality outliers.

All (18) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	1603	PEG	C1-C2-O2-C3
2	E	1608	PEG	C1-C2-O2-C3
2	D	1604	PEG	O1-C1-C2-O2
2	D	1604	PEG	O2-C3-C4-O4
2	C	1603	PEG	O1-C1-C2-O2
2	F	1606	PEG	O1-C1-C2-O2
2	F	1606	PEG	O2-C3-C4-O4
2	A	1601	PEG	O2-C3-C4-O4
2	B	1605	PEG	O2-C3-C4-O4
2	C	1602	PEG	O1-C1-C2-O2
2	E	1608	PEG	O2-C3-C4-O4
2	C	1603	PEG	O2-C3-C4-O4
2	B	1605	PEG	O1-C1-C2-O2
2	G	1607	PEG	O2-C3-C4-O4

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Mol	Chain	Res	Type	Atoms
2	F	1606	PEG	C1-C2-O2-C3
2	C	1602	PEG	C1-C2-O2-C3
2	G	1607	PEG	O1-C1-C2-O2
2	D	1604	PEG	C1-C2-O2-C3

There are no ring outliers.

5 monomers are involved in 9 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	1606	PEG	1	0
2	G	1607	PEG	2	0
2	B	1605	PEG	1	0
2	C	1603	PEG	2	0
2	C	1602	PEG	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 ⓘ

### 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, 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	217/223 (97%)	-0.14	3 (1%) 73 75	9, 17, 40, 72	1 (0%)
1	B	217/223 (97%)	-0.00	7 (3%) 50 52	10, 18, 41, 71	0
1	C	217/223 (97%)	0.09	9 (4%) 42 43	9, 19, 44, 83	1 (0%)
1	D	217/223 (97%)	-0.21	3 (1%) 73 75	9, 17, 37, 59	1 (0%)
1	E	217/223 (97%)	0.12	10 (4%) 38 39	10, 21, 45, 72	0
1	F	217/223 (97%)	0.68	29 (13%) 8 8	11, 27, 54, 80	1 (0%)
1	G	217/223 (97%)	0.04	7 (3%) 50 52	10, 20, 46, 72	0
1	H	217/223 (97%)	0.13	8 (3%) 45 47	12, 21, 45, 75	1 (0%)
All	All	1736/1784 (97%)	0.09	76 (4%) 39 41	9, 20, 45, 83	5 (0%)

All (76) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	225	LEU	6.9
1	H	225	LEU	6.1
1	F	11	PHE	5.1
1	A	225	LEU	5.0
1	C	170	GLY	4.8
1	C	7	VAL	4.7
1	E	225	LEU	4.1
1	F	6	ASN	3.6
1	F	116	GLY	3.5
1	B	7	VAL	3.4
1	A	6	ASN	3.3
1	F	187	VAL	3.3
1	C	169	ASP	3.3
1	B	186	PRO	3.2
1	F	7	VAL	3.2
1	C	6	ASN	3.2

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Mol	Chain	Res	Type	RSRZ
1	E	170	GLY	3.1
1	F	15	LYS	3.1
1	F	169	ASP	3.1
1	F	117	CYS	3.1
1	F	41	HIS	3.1
1	G	186	PRO	3.0
1	F	168	LYS	3.0
1	G	6	ASN	2.9
1	H	6	ASN	2.7
1	B	10	GLU	2.7
1	A	169	ASP	2.7
1	F	188	GLN	2.7
1	F	186	PRO	2.7
1	H	224	PHE	2.6
1	G	7	VAL	2.6
1	B	9	LYS	2.6
1	F	85	LEU	2.6
1	B	206	GLU	2.6
1	E	45	LYS	2.5
1	F	119	ILE	2.5
1	F	206	GLU	2.5
1	H	47	LYS	2.5
1	E	169	ASP	2.5
1	C	186	PRO	2.5
1	F	210	ILE	2.5
1	E	6	ASN	2.5
1	F	32	GLU	2.4
1	B	117	CYS	2.4
1	E	121	LYS	2.4
1	H	9	LYS	2.4
1	E	168	LYS	2.4
1	F	88	PRO	2.4
1	F	10	GLU	2.4
1	C	17	ARG	2.3
1	F	207	ASP	2.3
1	F	43	THR	2.3
1	F	36	ARG	2.2
1	F	35	GLY	2.2
1	H	186	PRO	2.2
1	C	206	GLU	2.2
1	F	39	GLU	2.2
1	G	32	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	F	114	GLN	2.2
1	D	115	ASP	2.2
1	H	169	ASP	2.2
1	H	36	ARG	2.2
1	E	141	MET	2.2
1	F	113	LEU	2.2
1	E	206	GLU	2.2
1	G	9	LYS	2.1
1	C	11	PHE	2.1
1	F	47	LYS	2.1
1	D	114	GLN	2.1
1	E	89	GLU	2.1
1	F	52	GLY	2.1
1	G	117	CYS	2.1
1	C	77	ALA	2.1
1	G	188	GLN	2.1
1	D	170	GLY	2.0
1	F	87	PHE	2.0

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

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	F	66	23/24	0.95	0.08	19,22,28,33	0
1	NRQ	C	66	23/24	0.96	0.06	11,16,21,22	0
1	NRQ	D	66	23/24	0.96	0.07	12,14,17,18	0
1	NRQ	E	66	23/24	0.96	0.07	14,16,20,21	0
1	NRQ	B	66	23/24	0.96	0.07	13,16,19,20	0
1	NRQ	G	66	23/24	0.96	0.07	13,17,20,22	0
1	NRQ	H	66	23/24	0.96	0.06	13,18,20,21	0
1	NRQ	A	66	23/24	0.97	0.06	13,15,18,19	0

## 6.3 Carbohydrates ⓘ

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, 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( $\text{\AA}^2$ )	Q<0.9
2	PEG	B	1605	7/7	0.62	0.31	55,57,58,59	0
2	PEG	F	1606	7/7	0.72	0.29	56,58,60,62	0
2	PEG	C	1602	7/7	0.74	0.22	42,46,52,52	0
2	PEG	A	1601	7/7	0.74	0.23	41,42,45,46	0
2	PEG	C	1603	7/7	0.75	0.23	42,47,48,50	0
2	PEG	G	1607	7/7	0.81	0.18	49,50,51,51	0
2	PEG	D	1604	7/7	0.85	0.17	25,32,40,43	0
2	PEG	E	1608	7/7	0.85	0.23	57,57,57,58	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.