



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 11:41 AM UTC

PDB ID : 2PI2 / pdb_00002pi2
Title : Full-length Replication protein A subunits RPA14 and RPA32
Authors : Deng, X.; Borgstahl, G.E.
Deposited on : 2007-04-12
Resolution : 2.00 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

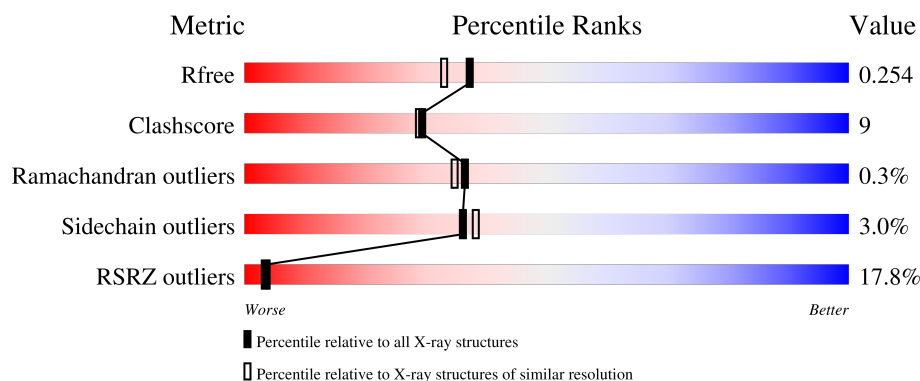
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	10052 (2.00-2.00)
Clashscore	190562	11152 (2.00-2.00)
Ramachandran outliers	187476	11031 (2.00-2.00)
Sidechain outliers	187428	11029 (2.00-2.00)
RSRZ outliers	180081	10067 (2.00-2.00)

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	270	9% 40% 6% 52%
1	B	270	6% 37% 8% 54%
1	C	270	16% 36% 9% 54%
1	D	270	15% 37% 7% 54%
2	E	142	8% 76% 6% 18%

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Mol	Chain	Length	Quality of chain
2	F	142	9% 66% 14% • • 16%
2	G	142	8% 73% 8% • 17%
2	H	142	10% 73% 8% •• 18%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7880 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 Replication protein A 32 kDa subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	129	Total	C	N	O	S	0	0	0
			1010	643	175	186	6			
1	B	124	Total	C	N	O	S	0	0	0
			973	622	168	177	6			
1	C	125	Total	C	N	O	S	0	0	0
			979	625	167	181	6			
1	D	123	Total	C	N	O	S	0	0	0
			962	616	164	176	6			

- Molecule 2 is a protein called Replication protein A 14 kDa subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	117	Total	C	N	O	S	0	0	0
			915	590	148	170	7			
2	F	119	Total	C	N	O	S	0	0	0
			934	601	153	173	7			
2	G	118	Total	C	N	O	S	0	0	0
			924	595	150	172	7			
2	H	117	Total	C	N	O	S	0	0	0
			915	590	148	170	7			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
E	-20	MET	-	expression tag	UNP P35244
E	-19	GLY	-	expression tag	UNP P35244
E	-18	HIS	-	expression tag	UNP P35244
E	-17	HIS	-	expression tag	UNP P35244
E	-16	HIS	-	expression tag	UNP P35244
E	-15	HIS	-	expression tag	UNP P35244
E	-14	HIS	-	expression tag	UNP P35244
E	-13	HIS	-	expression tag	UNP P35244

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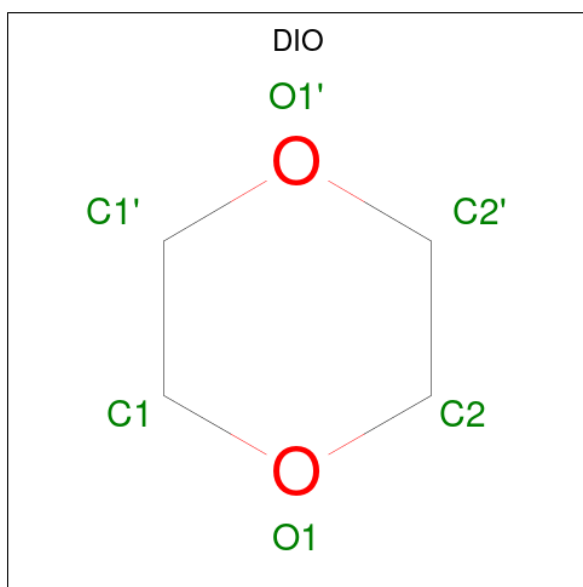
Chain	Residue	Modelled	Actual	Comment	Reference
E	-12	HIS	-	expression tag	UNP P35244
E	-11	HIS	-	expression tag	UNP P35244
E	-10	HIS	-	expression tag	UNP P35244
E	-9	HIS	-	expression tag	UNP P35244
E	-8	SER	-	expression tag	UNP P35244
E	-7	SER	-	expression tag	UNP P35244
E	-6	GLY	-	expression tag	UNP P35244
E	-5	HIS	-	expression tag	UNP P35244
E	-4	ILE	-	expression tag	UNP P35244
E	-3	GLU	-	expression tag	UNP P35244
E	-2	GLY	-	expression tag	UNP P35244
E	-1	ARG	-	expression tag	UNP P35244
E	0	HIS	-	expression tag	UNP P35244
F	-20	MET	-	expression tag	UNP P35244
F	-19	GLY	-	expression tag	UNP P35244
F	-18	HIS	-	expression tag	UNP P35244
F	-17	HIS	-	expression tag	UNP P35244
F	-16	HIS	-	expression tag	UNP P35244
F	-15	HIS	-	expression tag	UNP P35244
F	-14	HIS	-	expression tag	UNP P35244
F	-13	HIS	-	expression tag	UNP P35244
F	-12	HIS	-	expression tag	UNP P35244
F	-11	HIS	-	expression tag	UNP P35244
F	-10	HIS	-	expression tag	UNP P35244
F	-9	HIS	-	expression tag	UNP P35244
F	-8	SER	-	expression tag	UNP P35244
F	-7	SER	-	expression tag	UNP P35244
F	-6	GLY	-	expression tag	UNP P35244
F	-5	HIS	-	expression tag	UNP P35244
F	-4	ILE	-	expression tag	UNP P35244
F	-3	GLU	-	expression tag	UNP P35244
F	-2	GLY	-	expression tag	UNP P35244
F	-1	ARG	-	expression tag	UNP P35244
F	0	HIS	-	expression tag	UNP P35244
G	-20	MET	-	expression tag	UNP P35244
G	-19	GLY	-	expression tag	UNP P35244
G	-18	HIS	-	expression tag	UNP P35244
G	-17	HIS	-	expression tag	UNP P35244
G	-16	HIS	-	expression tag	UNP P35244
G	-15	HIS	-	expression tag	UNP P35244
G	-14	HIS	-	expression tag	UNP P35244
G	-13	HIS	-	expression tag	UNP P35244

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Chain	Residue	Modelled	Actual	Comment	Reference
G	-12	HIS	-	expression tag	UNP P35244
G	-11	HIS	-	expression tag	UNP P35244
G	-10	HIS	-	expression tag	UNP P35244
G	-9	HIS	-	expression tag	UNP P35244
G	-8	SER	-	expression tag	UNP P35244
G	-7	SER	-	expression tag	UNP P35244
G	-6	GLY	-	expression tag	UNP P35244
G	-5	HIS	-	expression tag	UNP P35244
G	-4	ILE	-	expression tag	UNP P35244
G	-3	GLU	-	expression tag	UNP P35244
G	-2	GLY	-	expression tag	UNP P35244
G	-1	ARG	-	expression tag	UNP P35244
G	0	HIS	-	expression tag	UNP P35244
H	-20	MET	-	expression tag	UNP P35244
H	-19	GLY	-	expression tag	UNP P35244
H	-18	HIS	-	expression tag	UNP P35244
H	-17	HIS	-	expression tag	UNP P35244
H	-16	HIS	-	expression tag	UNP P35244
H	-15	HIS	-	expression tag	UNP P35244
H	-14	HIS	-	expression tag	UNP P35244
H	-13	HIS	-	expression tag	UNP P35244
H	-12	HIS	-	expression tag	UNP P35244
H	-11	HIS	-	expression tag	UNP P35244
H	-10	HIS	-	expression tag	UNP P35244
H	-9	HIS	-	expression tag	UNP P35244
H	-8	SER	-	expression tag	UNP P35244
H	-7	SER	-	expression tag	UNP P35244
H	-6	GLY	-	expression tag	UNP P35244
H	-5	HIS	-	expression tag	UNP P35244
H	-4	ILE	-	expression tag	UNP P35244
H	-3	GLU	-	expression tag	UNP P35244
H	-2	GLY	-	expression tag	UNP P35244
H	-1	ARG	-	expression tag	UNP P35244
H	0	HIS	-	expression tag	UNP P35244

- Molecule 3 is 1,4-DIETHYLENE DIOXIDE (CCD ID: DIO) (formula: C₄H₈O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			6	4	2		
3	B	1	Total	C	O	0	0
			6	4	2		
3	C	1	Total	C	O	0	0
			6	4	2		
3	D	1	Total	C	O	0	0
			6	4	2		

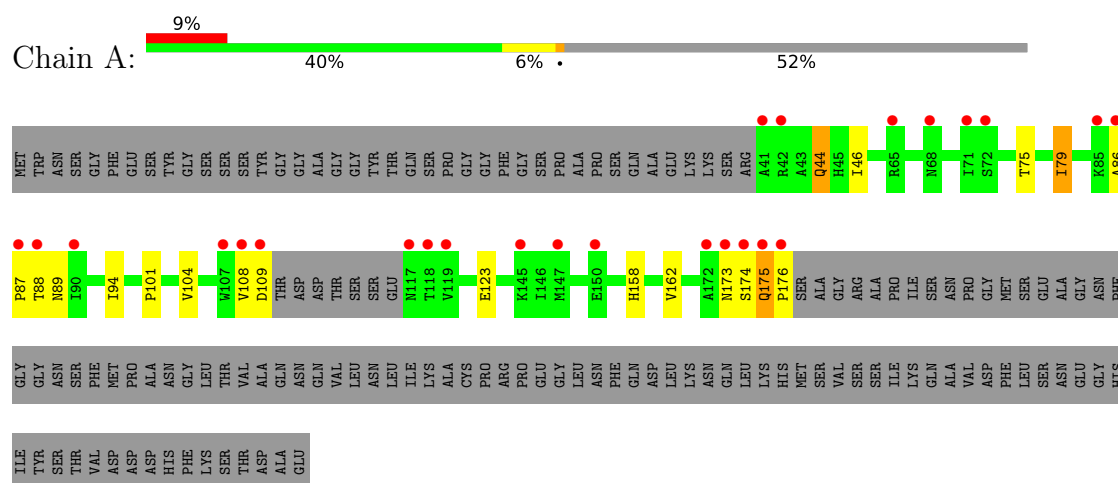
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	25	Total	O	0	0
			25	25		
4	B	26	Total	O	0	0
			26	26		
4	C	7	Total	O	0	0
			7	7		
4	D	5	Total	O	0	0
			5	5		
4	E	56	Total	O	0	0
			56	56		
4	F	41	Total	O	0	0
			41	41		
4	G	47	Total	O	0	0
			47	47		
4	H	37	Total	O	0	0
			37	37		

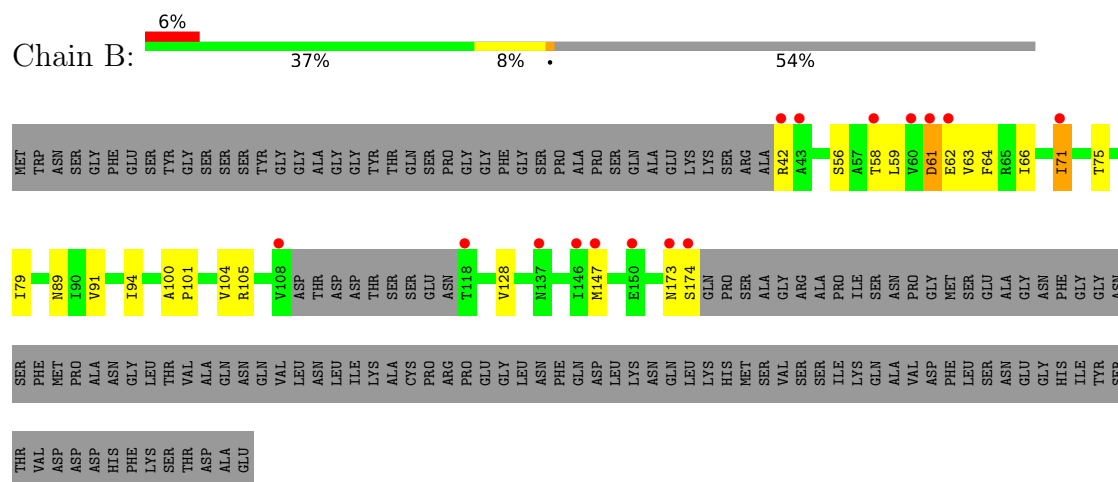
3 Residue-property plots

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.

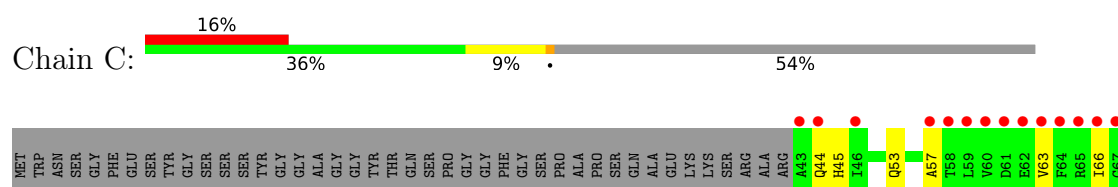
• Molecule 1: Replication protein A 32 kDa subunit



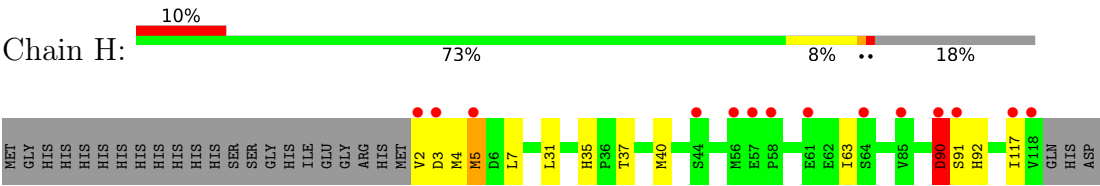
• Molecule 1: Replication protein A 32 kDa subunit



• Molecule 1: Replication protein A 32 kDa subunit



● Molecule 2: Replication protein A 14 kDa subunit



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	81.48Å 139.83Å 171.84Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.00 30.00 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.0 (30.00-2.00) 99.0 (30.00-2.00)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.16 (at 1.86Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.232 , 0.255 0.234 , 0.254	Depositor DCC
R_{free} test set	8172 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	36.2	Xtriage
Anisotropy	0.204	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 34.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7880	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 3.75% 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: DIO

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	0.70	0/1028	0.85	0/1398
1	B	0.77	0/990	0.87	1/1345 (0.1%)
1	C	0.79	0/996	0.88	2/1354 (0.1%)
1	D	0.79	0/979	0.97	5/1331 (0.4%)
2	E	0.75	0/934	0.82	0/1262
2	F	0.77	0/954	0.85	1/1289 (0.1%)
2	G	0.72	0/943	0.77	0/1274
2	H	0.68	0/934	0.81	0/1262
All	All	0.75	0/7758	0.86	9/10515 (0.1%)

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	C	0	1
1	D	1	0
2	E	0	1
2	F	0	1
2	G	0	2
2	H	0	1
All	All	1	6

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	135	PHE	N-CA-C	11.92	136.19	110.80
1	C	96	ASP	CA-C-N	-7.43	110.76	122.65

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	96	ASP	C-N-CA	-7.43	110.76	122.65
1	D	135	PHE	CB-CA-C	-7.02	96.45	110.42
2	F	118	VAL	N-CA-C	6.92	118.54	111.00
1	B	61	ASP	N-CA-C	6.58	119.78	111.69
1	D	136	GLN	N-CA-C	-5.45	96.17	107.67
1	D	144	PHE	CA-C-N	5.04	129.85	122.39
1	D	144	PHE	C-N-CA	5.04	129.85	122.39

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
1	D	136	GLN	CA

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	C	107	TRP	Peptide
2	E	2	VAL	Peptide
2	F	117	ILE	Peptide
2	G	117	ILE	Peptide
2	G	118	VAL	Peptide
2	H	90	ASP	Peptide

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	1010	0	1034	22	0
1	B	973	0	1004	23	0
1	C	979	0	1003	18	0
1	D	962	0	991	16	0
2	E	915	0	921	8	0
2	F	934	0	936	21	0
2	G	924	0	929	16	0
2	H	915	0	921	18	0
3	A	6	0	8	0	0
3	B	6	0	8	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	C	6	0	8	0	0
3	D	6	0	8	1	0
4	A	25	0	0	1	0
4	B	26	0	0	1	0
4	C	7	0	0	0	0
4	D	5	0	0	0	0
4	E	56	0	0	1	0
4	F	41	0	0	0	0
4	G	47	0	0	1	0
4	H	37	0	0	0	0
All	All	7880	0	7771	132	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 9.

All (132) 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:D:135:PHE:O	1:D:136:GLN:HG2	1.11	1.22
1:B:66:ILE:HD12	1:B:71:ILE:HD13	1.23	1.11
1:D:135:PHE:O	1:D:136:GLN:CG	1.99	1.10
1:C:44:GLN:HB2	1:C:45:HIS:HA	1.37	1.06
2:H:90:ASP:HB2	2:H:91:SER:HB2	1.43	0.98
2:G:117:ILE:HD12	2:G:119:GLN:NE2	1.79	0.96
1:B:89:ASN:ND2	1:B:105:ARG:HH21	1.72	0.88
2:H:3:ASP:HB3	2:H:4:MET:HA	1.57	0.86
1:A:175:GLN:HB3	1:A:176:PRO:HD2	1.59	0.85
1:A:175:GLN:HB3	1:A:176:PRO:CD	2.08	0.84
1:B:94:ILE:HD12	1:B:104:VAL:HG21	1.64	0.79
1:B:173:ASN:O	1:B:174:SER:HB2	1.80	0.79
2:G:117:ILE:CD1	2:G:119:GLN:HE22	1.97	0.78
2:G:117:ILE:CD1	2:G:119:GLN:NE2	2.46	0.78
1:B:66:ILE:CD1	1:B:71:ILE:HD13	2.11	0.76
2:H:91:SER:OG	2:H:92:HIS:CD2	2.39	0.75
1:A:44:GLN:NE2	1:A:44:GLN:HA	2.01	0.75
2:H:90:ASP:HB2	2:H:91:SER:CB	2.16	0.74
2:F:11:ARG:O	2:F:107:HIS:HE1	1.71	0.74
2:G:117:ILE:HD12	2:G:119:GLN:HE22	1.52	0.74
1:C:95:ASP:OD1	1:C:96:ASP:O	2.07	0.73
1:A:94:ILE:HD12	1:A:104:VAL:HG21	1.71	0.72
1:C:44:GLN:CB	1:C:45:HIS:HA	2.19	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:57:ALA:O	1:C:139:LYS:NZ	2.22	0.70
1:B:89:ASN:ND2	1:B:105:ARG:NH2	2.40	0.69
2:H:3:ASP:HB3	2:H:4:MET:CA	2.24	0.67
1:B:61:ASP:N	1:B:62:GLU:HA	2.10	0.67
1:C:44:GLN:HB2	1:C:45:HIS:CA	2.18	0.67
1:B:61:ASP:H	1:B:63:VAL:H	1.43	0.67
2:H:91:SER:OG	2:H:92:HIS:HD2	1.78	0.66
2:H:35:HIS:CD2	2:H:37:THR:H	2.14	0.64
2:F:35:HIS:HB2	2:F:40:MET:HB3	1.80	0.64
1:C:66:ILE:HD11	1:C:71:ILE:HD13	1.81	0.62
1:D:53:GLN:HB3	1:D:66:ILE:HD13	1.82	0.62
1:A:79:ILE:HD13	2:E:85:VAL:HG21	1.82	0.61
1:C:53:GLN:HB3	1:C:66:ILE:HD13	1.83	0.60
2:G:117:ILE:HD12	2:G:119:GLN:HE21	1.65	0.59
2:E:2:VAL:HA	2:E:3:ASP:HB3	1.85	0.58
1:B:59:LEU:HD11	1:B:62:GLU:HB2	1.86	0.58
2:H:31:LEU:HD22	2:H:63:ILE:O	2.02	0.58
2:F:117:ILE:HG13	2:F:118:VAL:N	2.18	0.58
1:A:79:ILE:HD11	1:A:123:GLU:HA	1.85	0.58
1:A:94:ILE:HD12	1:A:104:VAL:CG2	2.35	0.57
1:B:66:ILE:HD12	1:B:71:ILE:CD1	2.16	0.56
2:E:49:LYS:HE2	4:E:135:HOH:O	2.05	0.55
2:F:116:GLY:HA3	2:F:118:VAL:O	2.06	0.55
2:E:35:HIS:HD2	2:E:37:THR:OG1	1.90	0.54
1:B:79:ILE:CD1	2:F:85:VAL:HG21	2.37	0.54
1:B:56:SER:HB2	4:B:323:HOH:O	2.06	0.54
1:D:135:PHE:C	1:D:135:PHE:CD1	2.85	0.54
1:A:174:SER:HA	1:A:175:GLN:HB2	1.89	0.54
1:D:60:VAL:HB	1:D:65:ARG:HH21	1.72	0.54
1:C:80:ILE:HD13	1:C:94:ILE:HG12	1.89	0.54
1:D:135:PHE:O	1:D:136:GLN:CB	2.54	0.53
1:B:94:ILE:HD13	1:B:128:VAL:HG21	1.91	0.53
2:G:35:HIS:HD2	2:G:37:THR:OG1	1.92	0.52
1:B:173:ASN:O	1:B:174:SER:CB	2.55	0.52
1:A:173:ASN:O	1:A:175:GLN:HB2	2.10	0.52
1:B:100:ALA:H	2:F:120:HIS:HB3	1.74	0.52
1:B:94:ILE:HD12	1:B:104:VAL:CG2	2.36	0.52
1:C:132:LEU:HD11	1:C:139:LYS:HG2	1.91	0.52
1:D:90:ILE:HD11	1:D:119:VAL:HG23	1.91	0.51
1:B:101:PRO:HD3	2:F:5:MET:O	2.10	0.51
2:F:119:GLN:O	2:F:120:HIS:HB2	2.09	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:35:HIS:CB	2:F:40:MET:HB3	2.39	0.51
1:D:56:SER:HA	2:H:117:ILE:HD11	1.93	0.51
2:H:3:ASP:CB	2:H:4:MET:HA	2.35	0.51
2:G:117:ILE:CG1	2:G:119:GLN:NE2	2.74	0.51
2:F:117:ILE:HG13	2:F:119:GLN:H	1.76	0.50
2:F:35:HIS:HD2	2:F:37:THR:OG1	1.94	0.49
1:A:86:ALA:HB1	1:A:87:PRO:HD2	1.94	0.49
1:D:56:SER:OG	2:H:117:ILE:HD12	2.12	0.49
1:A:175:GLN:CB	1:A:176:PRO:CD	2.85	0.49
1:B:91:VAL:HG22	1:B:105:ARG:HG3	1.93	0.49
2:H:4:MET:HB2	2:H:7:LEU:HD12	1.94	0.48
2:H:90:ASP:CB	2:H:91:SER:HB2	2.29	0.48
1:D:152:MET:SD	3:D:304:DIO:H21	2.54	0.48
1:D:86:ALA:HB1	1:D:87:PRO:HD2	1.96	0.47
1:D:43:ALA:N	1:D:44:GLN:HA	2.28	0.47
1:C:44:GLN:CB	1:C:45:HIS:CA	2.84	0.47
1:D:59:LEU:HB2	1:D:64:PHE:CE2	2.50	0.47
2:H:35:HIS:HD2	2:H:37:THR:H	1.61	0.47
1:A:46:ILE:HG22	1:A:75:THR:HG23	1.98	0.46
1:A:174:SER:CA	1:A:175:GLN:HB2	2.46	0.46
1:A:101:PRO:HD3	2:E:5:MET:O	2.15	0.46
1:B:58:THR:O	1:B:64:PHE:HA	2.16	0.46
1:C:73:GLN:HE21	1:C:144:PHE:HZ	1.62	0.46
2:G:47:GLU:HG3	2:G:100:ASN:ND2	2.30	0.46
1:A:173:ASN:C	1:A:175:GLN:HB2	2.40	0.46
1:D:56:SER:HA	2:H:117:ILE:CD1	2.46	0.46
1:B:100:ALA:HB3	2:F:120:HIS:ND1	2.31	0.45
1:A:88:THR:HG23	1:A:89:ASN:OD1	2.17	0.45
2:F:5:MET:HE1	2:F:83:SER:OG	2.15	0.45
2:G:117:ILE:H	2:G:119:GLN:HB3	1.82	0.45
1:A:44:GLN:HG3	4:A:317:HOH:O	2.17	0.45
2:H:3:ASP:HB3	2:H:5:MET:H	1.81	0.45
1:A:108:VAL:HG12	1:A:109:ASP:N	2.30	0.45
2:E:31:LEU:HD13	2:E:63:ILE:HG13	1.98	0.45
1:D:82:HIS:HB3	1:D:93:LYS:HG3	1.99	0.45
1:A:44:GLN:HA	1:A:44:GLN:HE21	1.78	0.45
1:A:175:GLN:CB	1:A:176:PRO:HD2	2.40	0.45
1:C:133:ARG:HB3	1:C:135:PHE:CD2	2.52	0.44
1:C:94:ILE:HD12	1:C:104:VAL:HG21	2.00	0.44
2:F:2:VAL:HA	2:F:3:ASP:HA	1.73	0.44
2:H:2:VAL:HA	2:H:3:ASP:HA	1.67	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:89:ASN:ND2	1:C:105:ARG:HH21	2.16	0.43
1:C:107:TRP:HB3	1:C:108:VAL:C	2.43	0.43
1:B:75:THR:HA	1:B:128:VAL:O	2.18	0.43
1:B:89:ASN:HD21	1:B:105:ARG:NH2	2.12	0.43
3:B:302:DIO:H1'2	2:F:88:LYS:HB3	2.01	0.43
1:C:101:PRO:HD3	2:G:5:MET:O	2.18	0.43
2:G:117:ILE:HG13	2:G:119:GLN:NE2	2.34	0.43
2:E:35:HIS:CD2	2:E:37:THR:OG1	2.71	0.43
2:F:47:GLU:HG3	2:F:100:ASN:ND2	2.34	0.43
1:A:158:HIS:O	1:A:162:VAL:HG23	2.18	0.43
2:G:35:HIS:HB2	2:G:40:MET:HE3	2.00	0.42
2:F:56:MET:SD	2:F:81:CYS:O	2.77	0.42
1:C:135:PHE:HA	1:C:136:GLN:HA	1.56	0.42
2:F:117:ILE:HG13	2:F:119:GLN:N	2.35	0.42
2:F:117:ILE:N	2:F:118:VAL:C	2.78	0.42
1:D:141:LEU:HA	1:D:141:LEU:HD12	1.82	0.42
2:G:4:MET:HE1	2:G:72:ARG:HB2	2.02	0.42
1:A:44:GLN:NE2	1:A:44:GLN:CA	2.76	0.41
2:E:35:HIS:CD2	2:E:37:THR:H	2.38	0.41
2:F:116:GLY:HA3	2:F:119:GLN:HA	2.03	0.41
2:H:90:ASP:CB	2:H:91:SER:CB	2.94	0.41
2:F:64:SER:H	2:F:86:GLN:NE2	2.18	0.41
2:G:86:GLN:HB3	4:G:147:HOH:O	2.21	0.41
1:C:135:PHE:CD2	1:C:135:PHE:N	2.89	0.40
1:B:94:ILE:CD1	1:B:128:VAL:HG21	2.51	0.40
2:G:28:VAL:HB	2:G:99:TYR:CE2	2.56	0.40
2:G:35:HIS:CD2	2:G:37:THR:H	2.39	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	125/270 (46%)	119 (95%)	5 (4%)	1 (1%)	16	11
1	B	120/270 (44%)	116 (97%)	4 (3%)	0	100	100
1	C	121/270 (45%)	116 (96%)	4 (3%)	1 (1%)	16	11
1	D	119/270 (44%)	112 (94%)	7 (6%)	0	100	100
2	E	115/142 (81%)	115 (100%)	0	0	100	100
2	F	117/142 (82%)	115 (98%)	2 (2%)	0	100	100
2	G	116/142 (82%)	112 (97%)	4 (3%)	0	100	100
2	H	115/142 (81%)	110 (96%)	4 (4%)	1 (1%)	14	9
All	All	948/1648 (58%)	915 (96%)	30 (3%)	3 (0%)	36	35

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	175	GLN
2	H	90	ASP
1	C	117	ASN

5.3.2 Protein sidechains ⓘ

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	115/228 (50%)	113 (98%)	2 (2%)	53	60
1	B	111/228 (49%)	108 (97%)	3 (3%)	39	42
1	C	112/228 (49%)	107 (96%)	5 (4%)	24	23
1	D	110/228 (48%)	107 (97%)	3 (3%)	39	42
2	E	102/124 (82%)	102 (100%)	0	100	100
2	F	104/124 (84%)	97 (93%)	7 (7%)	15	11
2	G	103/124 (83%)	99 (96%)	4 (4%)	28	28
2	H	102/124 (82%)	100 (98%)	2 (2%)	48	54
All	All	859/1408 (61%)	833 (97%)	26 (3%)	36	38

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	44	GLN
1	A	79	ILE
1	B	42	ARG
1	B	71	ILE
1	B	147	MET
1	C	63	VAL
1	C	108	VAL
1	C	116	GLU
1	C	117	ASN
1	C	137	ASN
1	D	141	LEU
1	D	145	LYS
1	D	155	PHE
2	F	2	VAL
2	F	3	ASP
2	F	4	MET
2	F	19	GLN
2	F	56	MET
2	F	66	ILE
2	F	118	VAL
2	G	4	MET
2	G	90	ASP
2	G	118	VAL
2	G	119	GLN
2	H	5	MET
2	H	40	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	44	GLN
1	A	73	GLN
1	A	82	HIS
1	A	175	GLN
1	B	89	ASN
1	B	164	ASN
1	C	73	GLN
1	C	117	ASN
1	D	137	ASN
2	E	35	HIS
2	F	19	GLN

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Mol	Chain	Res	Type
2	F	35	HIS
2	F	86	GLN
2	F	92	HIS
2	F	107	HIS
2	G	35	HIS
2	G	86	GLN
2	G	119	GLN
2	H	19	GLN
2	H	92	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](#)

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 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	$\# Z > 2$
3	DIO	A	301	-	6,6,6	0.49	0	6,6,6	0.82	0
3	DIO	B	302	-	6,6,6	0.59	0	6,6,6	0.76	0
3	DIO	D	304	-	6,6,6	0.56	0	6,6,6	0.72	0
3	DIO	C	303	-	6,6,6	0.54	0	6,6,6	0.76	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	DIO	A	301	-	-	-	0/1/1/1
3	DIO	B	302	-	-	-	0/1/1/1
3	DIO	D	304	-	-	-	0/1/1/1
3	DIO	C	303	-	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	302	DIO	1	0
3	D	304	DIO	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

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, 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	129/270 (47%)	0.89	25 (19%)	3 3	22, 37, 59, 67	0
1	B	124/270 (45%)	0.55	15 (12%)	8 8	23, 35, 53, 61	0
1	C	125/270 (46%)	1.62	43 (34%)	1 1	24, 50, 69, 82	0
1	D	123/270 (45%)	1.64	40 (32%)	1 1	20, 53, 70, 77	0
2	E	117/142 (82%)	0.28	11 (9%)	14 13	23, 30, 48, 57	0
2	F	119/142 (83%)	0.67	13 (10%)	10 9	22, 32, 54, 69	0
2	G	118/142 (83%)	0.66	12 (10%)	12 11	24, 37, 54, 62	0
2	H	117/142 (82%)	0.69	14 (11%)	9 8	27, 38, 55, 60	0
All	All	972/1648 (58%)	0.88	173 (17%)	4 3	20, 38, 65, 82	0

All (173) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	F	118	VAL	12.5
2	F	120	HIS	10.7
2	G	118	VAL	9.5
2	H	2	VAL	9.3
2	G	119	GLN	8.9
2	G	2	VAL	8.4
1	C	115	SER	8.3
1	C	43	ALA	7.7
1	C	44	GLN	7.6
1	A	41	ALA	7.5
2	F	2	VAL	7.2
1	D	43	ALA	7.1
1	C	135	PHE	7.0
1	A	176	PRO	6.5
1	D	136	GLN	6.5
1	D	135	PHE	6.2

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Mol	Chain	Res	Type	RSRZ
2	E	2	VAL	5.9
1	B	61	ASP	5.5
1	D	118	THR	5.5
2	H	117	ILE	5.5
2	F	119	GLN	5.1
1	C	108	VAL	5.1
1	D	108	VAL	4.9
2	F	56	MET	4.8
1	A	175	GLN	4.7
2	F	117	ILE	4.5
2	H	3	ASP	4.4
2	H	118	VAL	4.3
1	C	86	ALA	4.3
2	G	5	MET	4.2
1	C	118	THR	4.1
2	H	57	GLU	4.1
1	A	86	ALA	4.1
1	B	60	VAL	4.1
1	D	107	TRP	4.0
2	E	5	MET	4.0
1	A	107	TRP	4.0
2	E	118	VAL	3.9
1	C	90	ILE	3.9
1	D	86	ALA	3.9
1	A	109	ASP	3.9
2	F	3	ASP	3.9
2	E	60	ASP	3.8
1	C	62	GLU	3.8
1	B	147	MET	3.8
1	D	147	MET	3.8
1	D	60	VAL	3.8
1	D	144	PHE	3.8
1	A	88	THR	3.8
1	D	119	VAL	3.8
1	D	150	GLU	3.8
2	G	56	MET	3.8
2	F	57	GLU	3.7
1	D	91	VAL	3.7
1	D	174	SER	3.7
1	C	116	GLU	3.6
1	C	87	PRO	3.6
1	D	87	PRO	3.6

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Mol	Chain	Res	Type	RSRZ
2	E	3	ASP	3.6
1	D	146	ILE	3.5
1	C	60	VAL	3.5
2	H	91	SER	3.5
1	A	118	THR	3.5
1	B	137	ASN	3.4
1	D	137	ASN	3.4
1	A	108	VAL	3.4
1	D	66	ILE	3.4
1	C	107	TRP	3.4
1	C	173	ASN	3.3
1	A	42	ARG	3.3
1	A	174	SER	3.3
2	E	117	ILE	3.3
1	B	42	ARG	3.3
1	D	143	ALA	3.3
2	G	117	ILE	3.3
1	C	61	ASP	3.3
1	D	44	GLN	3.2
2	H	90	ASP	3.2
1	C	131	HIS	3.2
1	C	117	ASN	3.2
2	F	6	ASP	3.2
1	C	138	LYS	3.2
1	A	117	ASN	3.2
1	C	89	ASN	3.2
1	D	90	ILE	3.1
1	A	173	ASN	3.1
1	C	63	VAL	3.1
1	C	147	MET	3.0
1	C	142	VAL	3.0
2	H	56	MET	2.9
1	D	63	VAL	2.9
2	F	60	ASP	2.9
1	C	139	LYS	2.9
1	A	147	MET	2.8
2	G	3	ASP	2.8
1	D	142	VAL	2.8
1	D	61	ASP	2.8
1	D	59	LEU	2.8
1	B	108	VAL	2.8
1	C	64	PHE	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	87	PRO	2.8
1	D	120	VAL	2.7
2	G	34	ILE	2.7
1	C	172	ALA	2.7
1	D	68	ASN	2.7
1	D	132	LEU	2.7
1	D	139	LYS	2.7
1	C	67	GLY	2.7
1	C	141	LEU	2.6
1	D	89	ASN	2.6
2	E	90	ASP	2.6
1	D	65	ARG	2.6
1	C	136	GLN	2.5
1	A	85	LYS	2.5
1	A	145	LYS	2.5
1	D	58	THR	2.5
1	D	83	ALA	2.5
1	D	88	THR	2.5
2	G	57	GLU	2.5
1	D	130	GLY	2.5
2	E	56	MET	2.5
1	C	66	ILE	2.5
1	C	120	VAL	2.5
1	B	118	THR	2.5
1	D	138	LYS	2.5
1	C	137	ASN	2.5
1	C	65	ARG	2.4
2	H	5	MET	2.4
1	D	131	HIS	2.4
1	A	68	ASN	2.4
2	G	60	ASP	2.4
1	C	85	LYS	2.4
1	A	71	ILE	2.3
1	B	71	ILE	2.3
1	C	84	GLU	2.3
2	F	5	MET	2.3
1	C	58	THR	2.3
1	A	72	SER	2.3
1	C	144	PHE	2.3
1	B	58	THR	2.3
1	C	59	LEU	2.3
2	H	44	SER	2.2

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Mol	Chain	Res	Type	RSRZ
1	B	43	ALA	2.2
1	B	146	ILE	2.2
1	D	85	LYS	2.2
1	A	150	GLU	2.2
1	C	132	LEU	2.2
1	B	174	SER	2.2
1	A	119	VAL	2.2
2	H	61	GLU	2.2
1	C	83	ALA	2.2
2	G	59	LEU	2.2
1	B	173	ASN	2.2
1	B	62	GLU	2.1
2	F	62	GLU	2.1
1	D	67	GLY	2.1
2	E	92	HIS	2.1
2	F	4	MET	2.1
1	B	150	GLU	2.1
2	H	58	PRO	2.1
1	C	46	ILE	2.1
2	H	85	VAL	2.1
2	E	91	SER	2.1
2	H	64	SER	2.1
1	A	172	ALA	2.1
1	A	65	ARG	2.1
1	C	133	ARG	2.1
1	C	168	VAL	2.1
1	C	57	ALA	2.1
2	E	4	MET	2.0
2	G	35	HIS	2.0
1	A	90	ILE	2.0
1	D	172	ALA	2.0

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 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
3	DIO	D	304	6/6	0.92	0.14	53,53,54,54	0
3	DIO	C	303	6/6	0.95	0.10	43,44,45,45	0
3	DIO	A	301	6/6	0.95	0.09	42,43,44,44	0
3	DIO	B	302	6/6	0.96	0.08	31,33,34,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.