



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 09:27 PM UTC

PDB ID : 3PO2 / pdb_00003po2
Title : Arrested RNA Polymerase II elongation complex
Authors : Cheung, A.C.M.; Cramer, P.
Deposited on : 2010-11-21
Resolution : 3.30 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

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

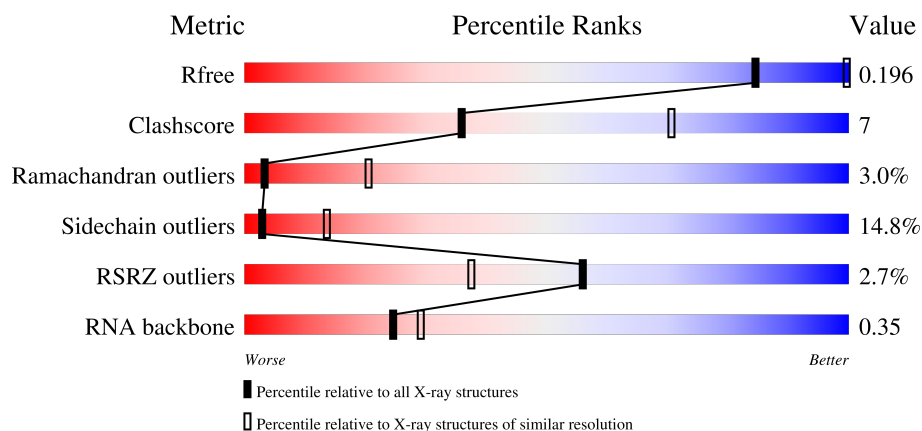
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.30 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	1169 (3.32-3.28)
Clashscore	190562	1209 (3.32-3.28)
Ramachandran outliers	187476	1188 (3.32-3.28)
Sidechain outliers	187428	1187 (3.32-3.28)
RSRZ outliers	180081	1169 (3.32-3.28)
RNA backbone	3983	1048 (3.60-3.00)

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	1733	55% 20% 5% • 18%
2	B	1224	4% 63% 23% • • 8%
3	C	318	53% 25% 5% • 16%
4	D	221	5% 58% 20% • 19%

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Mol	Chain	Length	Quality of chain
5	E	215	 % 80% 17% •
6	F	155	 % 39% 12% 5% • 44%
7	G	171	 % 67% 25% 6% •
8	H	146	 3% 56% 29% 5% 9%
9	I	122	 7% 66% 24% 8% •
10	J	70	 % 61% 21% 7% • 7%
11	K	120	 % 67% 23% 6% •
12	L	70	 10% 34% 19% 11% • 34%
13	N	14	 7% 93% 7%
14	P	15	 13% 47% 20% 27% 7%
15	T	27	 4% 52% 19% 30%

2 Entry composition [i](#)

There are 20 unique types of molecules in this entry. The entry contains 32287 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 DNA-directed RNA polymerase II subunit RPB1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	1421	Total	C	N	O	S	0	0	0
			11190	7052	1957	2119	62			

- Molecule 2 is a protein called DNA-directed RNA polymerase II subunit RPB2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	1121	Total	C	N	O	S	0	0	0
			8899	5632	1563	1649	55			

- Molecule 3 is a protein called DNA-directed RNA polymerase II subunit RPB3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	266	Total	C	N	O	S	0	0	0
			2095	1317	348	417	13			

- Molecule 4 is a protein called DNA-directed RNA polymerase II subunit RPB4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	180	Total	C	N	O	S	0	0	0
			1440	890	256	291	3			

- Molecule 5 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	214	Total	C	N	O	S	0	0	0
			1752	1111	309	321	11			

- Molecule 6 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	F	87	Total	C	N	O	S	0	0	0
			705	451	119	132	3			

- Molecule 7 is a protein called DNA-directed RNA polymerase II subunit RPB7.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
7	G	171	Total	C	N	O	S	0	0	0
			1340	861	222	249	8			

- Molecule 8 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	H	133	Total	C	N	O	S	0	0	0
			1068	673	180	211	4			

- Molecule 9 is a protein called DNA-directed RNA polymerase II subunit RPB9.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
9	I	119	Total	C	N	O	S	0	0	0
			971	596	179	186	10			

- Molecule 10 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	J	65	Total	C	N	O	S	0	0	0
			532	339	93	94	6			

- Molecule 11 is a protein called DNA-directed RNA polymerase II subunit RPB11.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
11	K	115	Total	C	N	O	S	0	0	1
			920	590	157	171	2			

- Molecule 12 is a protein called DNA-directed RNA polymerases I, II, and III subunit RPABC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	46	Total	C	N	O	S	0	0	0
			363	224	72	63	4			

- Molecule 13 is a DNA chain called DNA non-template strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
13	N	14	Total	C	N	O	P	0	0	0
			288	138	57	80	13			

- Molecule 14 is a RNA chain called RNA product strand.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
14	P	15	Total	C	N	O	P	0	0	0
			300	135	45	105	15			

- Molecule 15 is a DNA chain called DNA template strand.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
15	T	19	Total	Br	C	N	O	P	0	0	0
			389	1	185	66	118	19			

- Molecule 16 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	A	2	Total	Zn	0	0
			2	2		
16	B	1	Total	Zn	0	0
			1	1		
16	C	1	Total	Zn	0	0
			1	1		
16	I	2	Total	Zn	0	0
			2	2		
16	J	1	Total	Zn	0	0
			1	1		
16	L	1	Total	Zn	0	0
			1	1		

- Molecule 17 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

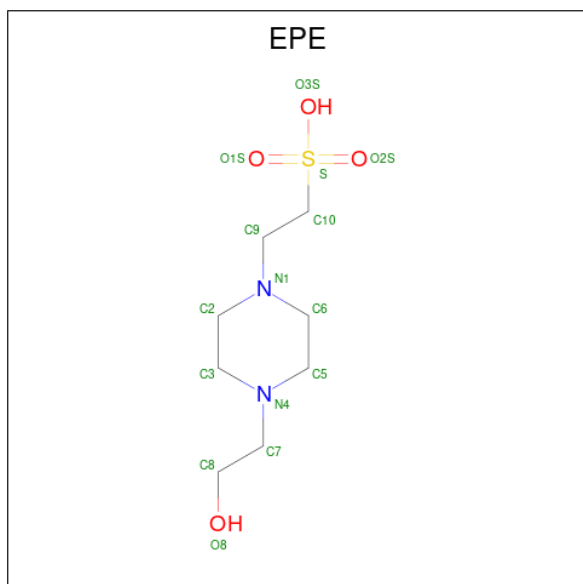
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
17	A	1	Total	Mg	0	0
			1	1		

- Molecule 18 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



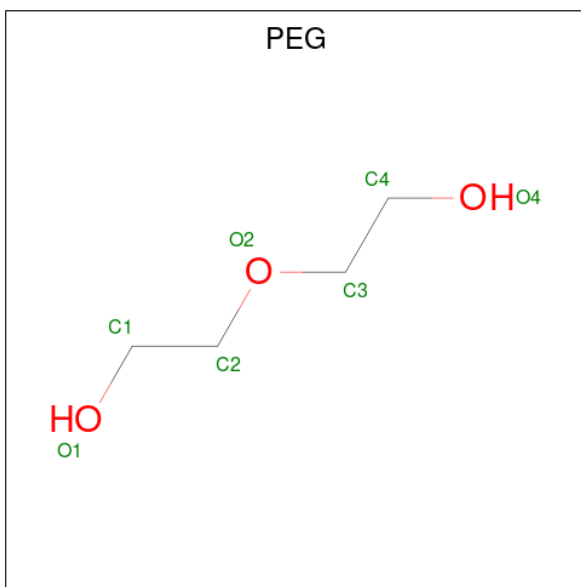
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
18	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 19 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (CCD ID: EPE) (formula: $C_8H_{18}N_2O_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
19	D	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

- Molecule 20 is DI(HYDROXYETHYL)ETHER (CCD ID: PEG) (formula: $C_4H_{10}O_3$).

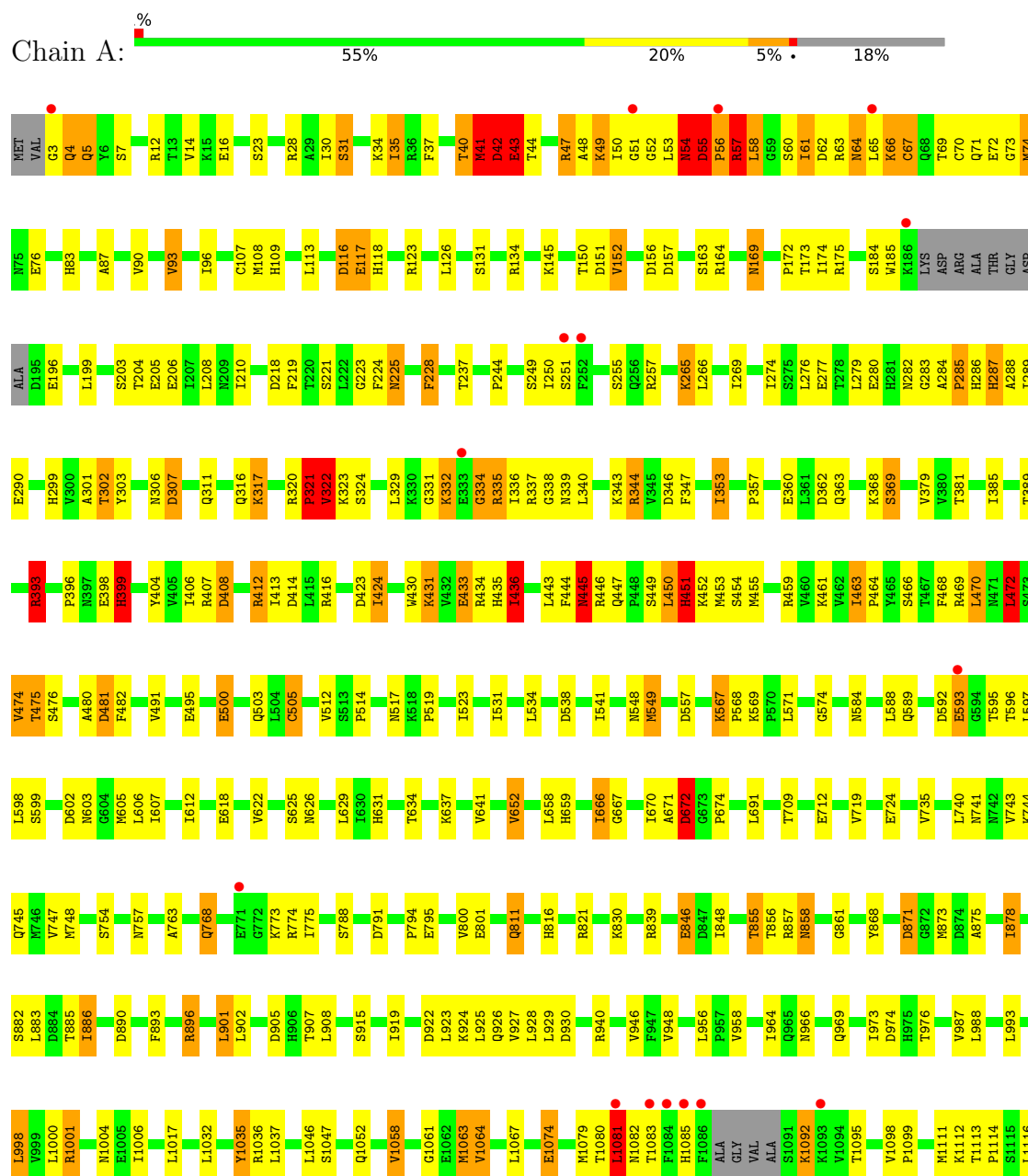


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
20	G	1	Total	C	O	0	0
			7	4	3		

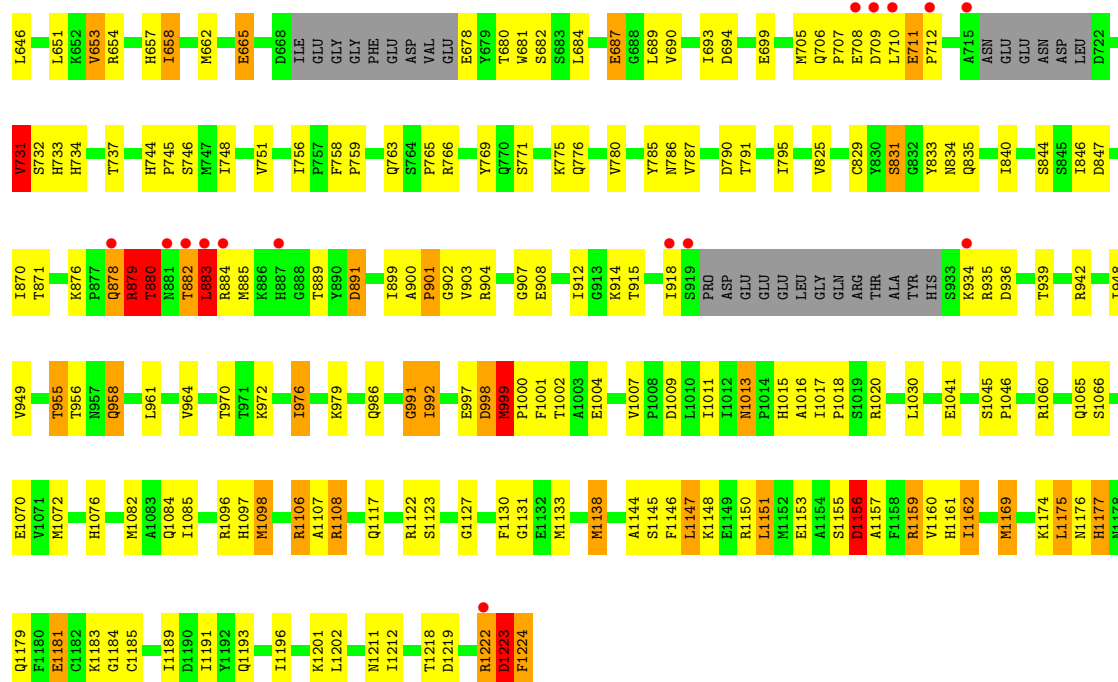
3 Residue-property plots

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: DNA-directed RNA polymerase II subunit RPB1

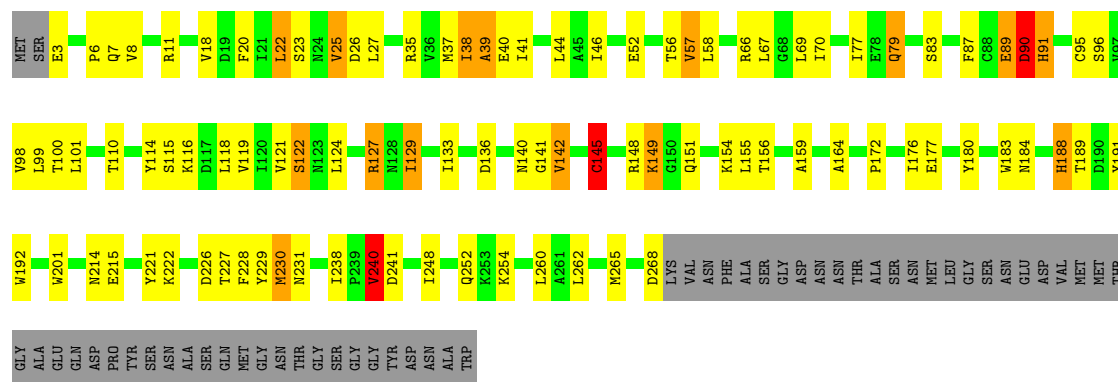






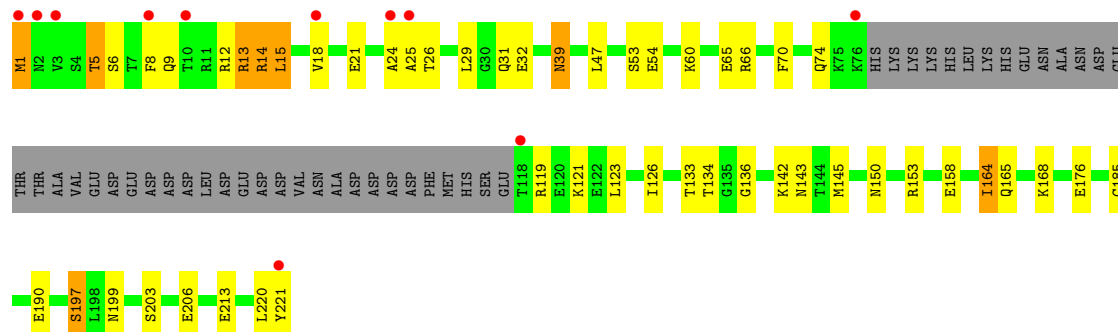
• Molecule 3: DNA-directed RNA polymerase II subunit RPB3

Chain C: 53% 25% 5% • 16%

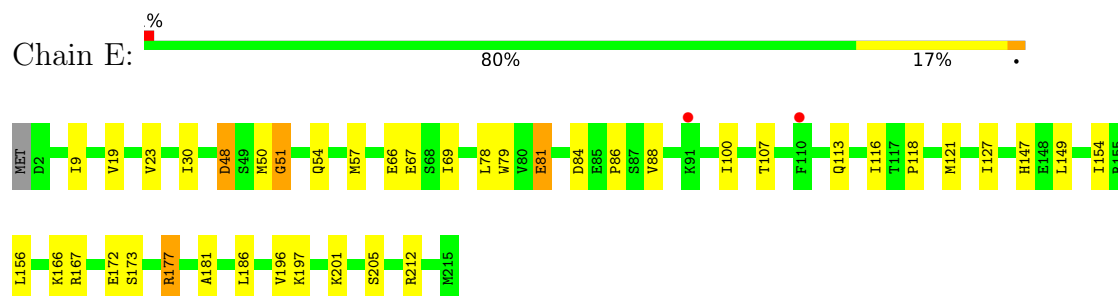


• Molecule 4: DNA-directed RNA polymerase II subunit RPB4

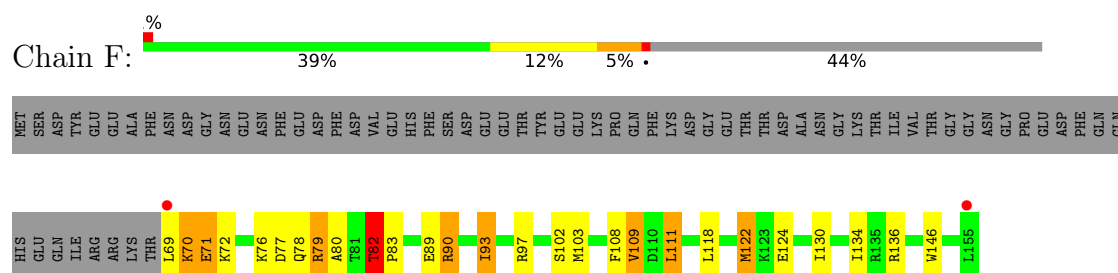
Chain D: 5% 58% 20% • 19%



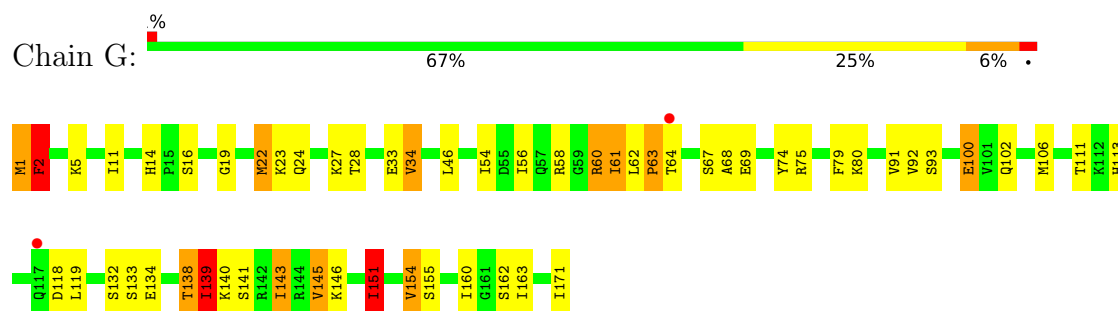
- Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC1



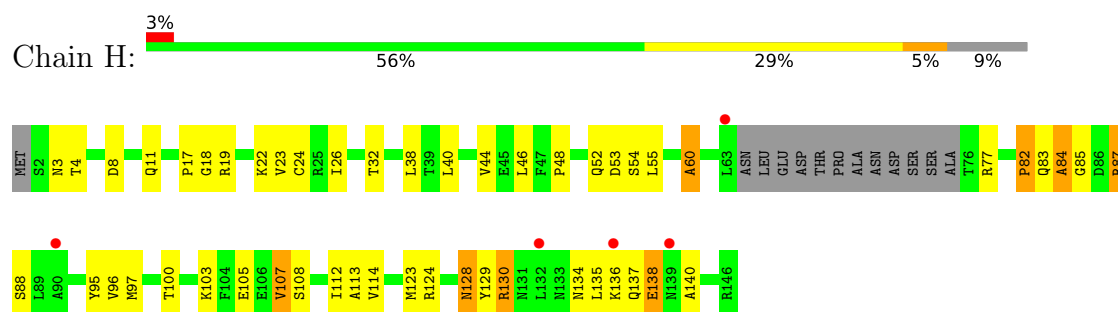
- Molecule 6: DNA-directed RNA polymerases I, II, and III subunit RPABC2



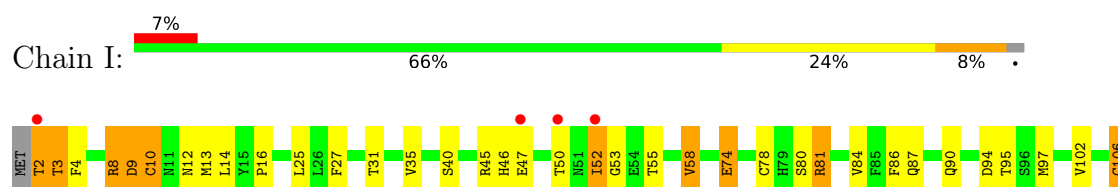
- Molecule 7: DNA-directed RNA polymerase II subunit RPB7



- Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3



- Molecule 9: DNA-directed RNA polymerase II subunit RPB9

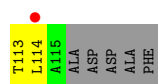




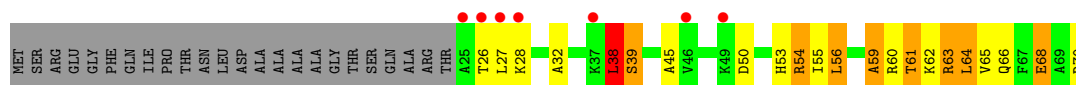
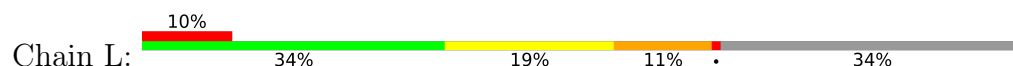
- Molecule 10: DNA-directed RNA polymerases I, II, and III subunit RPABC5



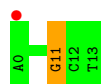
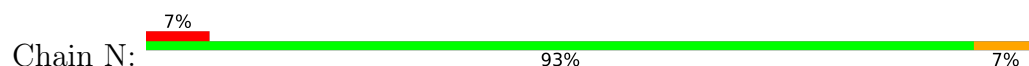
- Molecule 11: DNA-directed RNA polymerase II subunit RPB11



- Molecule 12: DNA-directed RNA polymerases I, II, and III subunit RPABC4



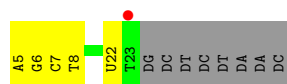
- Molecule 13: DNA non-template strand



- Molecule 14: RNA product strand



- Molecule 15: DNA template strand



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	224.57Å 394.55Å 282.14Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.98 – 3.30 48.98 – 3.30	Depositor EDS
% Data completeness (in resolution range)	(Not available) (48.98-3.30) 99.8 (48.98-3.30)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.24 (at 3.33Å)	Xtriage
Refinement program	BUSTER 2.9.2	Depositor
R, R_{free}	0.153 , 0.178 0.173 , 0.196	Depositor DCC
R_{free} test set	3690 reflections (1.98%)	wwPDB-VP
Wilson B-factor (Å ²)	109.2	Xtriage
Anisotropy	0.315	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 130.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.024 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.028 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	32287	wwPDB-VP
Average B, all atoms (Å ²)	124.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.79% 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: PEG, BRU, ZN, ACT, MG, EPE

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	0.91	11/11391 (0.1%)	1.54	142/15402 (0.9%)
2	B	0.88	4/9072 (0.0%)	1.47	93/12233 (0.8%)
3	C	0.85	0/2133	1.44	17/2891 (0.6%)
4	D	0.86	1/1450 (0.1%)	1.63	19/1945 (1.0%)
5	E	0.78	0/1788	1.39	7/2406 (0.3%)
6	F	0.96	1/717 (0.1%)	1.45	7/967 (0.7%)
7	G	0.88	2/1368 (0.1%)	1.44	13/1844 (0.7%)
8	H	0.82	0/1086	1.41	11/1470 (0.7%)
9	I	0.79	0/989	1.35	4/1331 (0.3%)
10	J	0.79	0/541	1.51	11/727 (1.5%)
11	K	0.83	0/938	1.36	4/1267 (0.3%)
12	L	1.00	0/365	1.75	11/485 (2.3%)
13	N	0.38	0/324	1.29	2/499 (0.4%)
14	P	1.15	2/329 (0.6%)	1.61	7/506 (1.4%)
15	T	0.47	0/411	1.36	3/630 (0.5%)
All	All	0.87	21/32902 (0.1%)	1.49	351/44603 (0.8%)

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	A	0	1

The worst 5 of 21 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	56	PRO	C-N	9.92	1.47	1.33
1	A	55	ASP	CA-C	-9.08	1.41	1.52
2	B	882	THR	CA-C	7.61	1.63	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	D	24	ALA	CA-C	7.31	1.62	1.52
6	F	122	MET	SD-CE	6.79	1.96	1.79

The worst 5 of 351 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	39	ALA	N-CA-C	11.89	126.31	111.69
4	D	25	ALA	CA-C-N	10.69	138.67	121.99
4	D	25	ALA	C-N-CA	10.69	138.67	121.99
1	A	288	ALA	N-CA-C	-9.69	102.54	114.75
14	P	5	C	P-O3'-C3'	9.67	134.71	120.20

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	55	ASP	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	11190	0	11255	219	0
2	B	8899	0	8940	126	0
3	C	2095	0	2051	46	0
4	D	1440	0	1456	11	0
5	E	1752	0	1776	14	0
6	F	705	0	731	12	0
7	G	1340	0	1357	24	0
8	H	1068	0	1040	17	0
9	I	971	0	927	21	0
10	J	532	0	542	11	0
11	K	920	0	929	21	0
12	L	363	0	386	6	0
13	N	288	0	159	1	0
14	P	300	0	166	1	0
15	T	389	0	214	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
16	A	2	0	0	0	0
16	B	1	0	0	0	0
16	C	1	0	0	0	0
16	I	2	0	0	0	0
16	J	1	0	0	0	0
16	L	1	0	0	0	0
17	A	1	0	0	0	0
18	A	4	0	3	0	0
19	D	15	0	17	0	0
20	G	7	0	10	0	0
All	All	32287	0	31959	469	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 7.

The worst 5 of 469 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)
7:G:151:ILE:CD1	7:G:151:ILE:CG1	1.75	1.58
6:F:93:ILE:HD11	6:F:134:ILE:HD11	1.40	1.02
1:A:53:LEU:HD23	1:A:54:ASN:H	1.24	1.02
1:A:1081:LEU:HB2	1:A:1082:ASN:HA	1.43	0.96
10:J:48:ARG:O	10:J:52:THR:HG22	1.67	0.94

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	1411/1733 (81%)	1279 (91%)	94 (7%)	38 (3%)	4 22
2	B	1107/1224 (90%)	997 (90%)	74 (7%)	36 (3%)	3 19

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	264/318 (83%)	235 (89%)	23 (9%)	6 (2%)	5	25
4	D	176/221 (80%)	157 (89%)	15 (8%)	4 (2%)	5	25
5	E	212/215 (99%)	201 (95%)	9 (4%)	2 (1%)	14	43
6	F	85/155 (55%)	78 (92%)	7 (8%)	0	100	100
7	G	169/171 (99%)	157 (93%)	7 (4%)	5 (3%)	3	20
8	H	129/146 (88%)	105 (81%)	10 (8%)	14 (11%)	0	2
9	I	117/122 (96%)	98 (84%)	16 (14%)	3 (3%)	4	23
10	J	63/70 (90%)	59 (94%)	2 (3%)	2 (3%)	3	19
11	K	113/120 (94%)	108 (96%)	5 (4%)	0	100	100
12	L	44/70 (63%)	27 (61%)	9 (20%)	8 (18%)	0	0
All	All	3890/4565 (85%)	3501 (90%)	271 (7%)	118 (3%)	3	20

5 of 118 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	4	GLN
1	A	42	ASP
1	A	43	GLU
1	A	54	ASN
1	A	57	ARG

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	1244/1520 (82%)	1060 (85%)	184 (15%)	3	13
2	B	969/1061 (91%)	812 (84%)	157 (16%)	2	11
3	C	234/274 (85%)	201 (86%)	33 (14%)	3	14
4	D	160/200 (80%)	132 (82%)	28 (18%)	2	9
5	E	196/197 (100%)	181 (92%)	15 (8%)	12	37
6	F	77/137 (56%)	64 (83%)	13 (17%)	2	10

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
7	G	152/152 (100%)	127 (84%)	25 (16%)	2	11
8	H	117/128 (91%)	104 (89%)	13 (11%)	6	22
9	I	113/116 (97%)	100 (88%)	13 (12%)	5	21
10	J	60/65 (92%)	51 (85%)	9 (15%)	3	13
11	K	99/102 (97%)	85 (86%)	14 (14%)	3	14
12	L	40/57 (70%)	31 (78%)	9 (22%)	1	5
All	All	3461/4009 (86%)	2948 (85%)	513 (15%)	3	13

5 of 513 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
8	H	77	ARG
9	I	81	ARG
8	H	54	SER
2	B	101	MET
2	B	58	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 99 such sidechains are listed below:

Mol	Chain	Res	Type
2	B	1040	ASN
3	C	131	HIS
2	B	1112	GLN
2	B	1179	GLN
4	D	37	GLN

5.3.3 RNA ⓘ

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
14	P	15/15 (100%)	7 (46%)	2 (13%)

5 of 7 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
14	P	6	C
14	P	7	C
14	P	8	C
14	P	16	C

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Mol	Chain	Res	Type
14	P	17	C

All (2) RNA pucker outliers are listed below:

Mol	Chain	Res	Type
14	P	5	C
14	P	16	C

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

1 non-standard protein/DNA/RNA residue is 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	$\# Z > 2$
15	BRU	T	22	15,14	18,21,22	0.77	0	25,30,33	2.22	7 (28%)

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
15	BRU	T	22	15,14	-	0/7/21/22	0/2/2/2

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
15	T	22	BRU	C5-C4-N3	5.24	119.37	113.34
15	T	22	BRU	C4-N3-C2	-5.13	120.61	127.34
15	T	22	BRU	O4-C4-C5	-4.42	120.16	125.80
15	T	22	BRU	N3-C2-N1	4.33	120.53	114.89
15	T	22	BRU	BR-C5-C4	2.96	121.43	118.02

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 9 are monoatomic - leaving 3 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	$\# Z > 2$
20	PEG	G	172	-	6,6,6	0.50	0	5,5,5	0.31	0
18	ACT	A	1734	-	3,3,3	0.80	0	3,3,3	1.33	0
19	EPE	D	222	-	15,15,15	0.65	0	19,20,20	1.90	7 (36%)

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
20	PEG	G	172	-	-	2/4/4/4	-
19	EPE	D	222	-	-	3/9/19/19	0/1/1/1

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
19	D	222	EPE	C5-N4-C3	4.53	118.60	108.84

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
19	D	222	EPE	C7-N4-C5	2.86	118.87	111.24
19	D	222	EPE	O2S-S-C10	2.63	110.69	106.73
19	D	222	EPE	C7-N4-C3	2.50	117.89	111.24
19	D	222	EPE	C6-C5-N4	2.30	115.29	110.65

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
19	D	222	EPE	C10-C9-N1-C2
19	D	222	EPE	C10-C9-N1-C6
19	D	222	EPE	C8-C7-N4-C5
20	G	172	PEG	C4-C3-O2-C2
20	G	172	PEG	O1-C1-C2-O2

There are no ring outliers.

No monomer is involved in short contacts.

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	1421/1733 (81%)	-0.27	21 (1%) 72 53	66, 108, 173, 229	0
2	B	1121/1224 (91%)	-0.07	43 (3%) 44 30	68, 119, 185, 221	0
3	C	266/318 (83%)	-0.43	0 100 100	81, 108, 153, 188	0
4	D	180/221 (81%)	-0.01	11 (6%) 27 18	90, 120, 172, 195	0
5	E	214/215 (99%)	-0.25	2 (0%) 81 65	87, 146, 197, 206	0
6	F	87/155 (56%)	-0.44	2 (2%) 61 42	71, 90, 127, 136	0
7	G	171/171 (100%)	-0.30	2 (1%) 76 58	83, 107, 150, 175	0
8	H	133/146 (91%)	0.21	5 (3%) 44 30	111, 154, 193, 214	0
9	I	119/122 (97%)	0.15	8 (6%) 24 16	118, 148, 190, 209	0
10	J	65/70 (92%)	-0.50	1 (1%) 72 53	90, 107, 150, 161	0
11	K	115/120 (95%)	-0.55	1 (0%) 81 65	75, 108, 144, 161	0
12	L	46/70 (65%)	1.07	7 (15%) 5 5	89, 181, 199, 204	0
13	N	14/14 (100%)	0.44	1 (7%) 22 15	203, 228, 278, 279	0
14	P	15/15 (100%)	0.33	2 (13%) 7 6	151, 172, 214, 227	0
15	T	18/27 (66%)	0.43	1 (5%) 30 20	133, 199, 284, 287	0
All	All	3985/4621 (86%)	-0.18	107 (2%) 56 37	66, 115, 186, 287	0

The worst 5 of 107 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	1086	PHE	10.3
12	L	25	ALA	8.1
2	B	508	LEU	7.5
12	L	27	LEU	7.3
2	B	882	THR	6.6

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, 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
15	BRU	T	22	20/21	0.92	0.09	110,169,284,288	0

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
18	ACT	A	1734	4/4	0.93	0.20	67,89,129,132	0
20	PEG	G	172	7/7	0.96	0.15	74,118,300,300	0
19	EPE	D	222	15/15	0.97	0.07	53,72,130,170	0
16	ZN	L	1071	1/1	0.98	0.06	225,225,225,225	0
16	ZN	I	1121	1/1	1.00	0.01	124,124,124,124	0
16	ZN	I	1122	1/1	1.00	0.02	199,199,199,199	0
16	ZN	J	1066	1/1	1.00	0.02	105,105,105,105	0
16	ZN	A	2456	1/1	1.00	0.02	156,156,156,156	0
17	MG	A	2458	1/1	1.00	0.04	78,78,78,78	0
16	ZN	A	2457	1/1	1.00	0.01	94,94,94,94	0
16	ZN	B	2225	1/1	1.00	0.03	99,99,99,99	0
16	ZN	C	1269	1/1	1.00	0.01	93,93,93,93	0

6.5 Other polymers [i](#)

There are no such residues in this entry.