wwPDB X-ray Structure Validation Summary Report (i)

Sep 9, 2024 – 10:11 AM EDT

PDB ID	:	8U9X
Title	:	STRUCTURAL BASIS OF TRANSCRIPTION: RNA POLYMERASE II SUBSTRATE BINDING AND METAL COORDINATION AT 3.0 A OF T834P MUTANT USING A FREE-ELECTRON LASER
Authors	:	Arjunan, P.; Calero, G.; Kaplan, C.D.
Deposited on	:	2023-09-20
Resolution	:	3.05 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 (i) 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 (i)) were used in the production of this report:

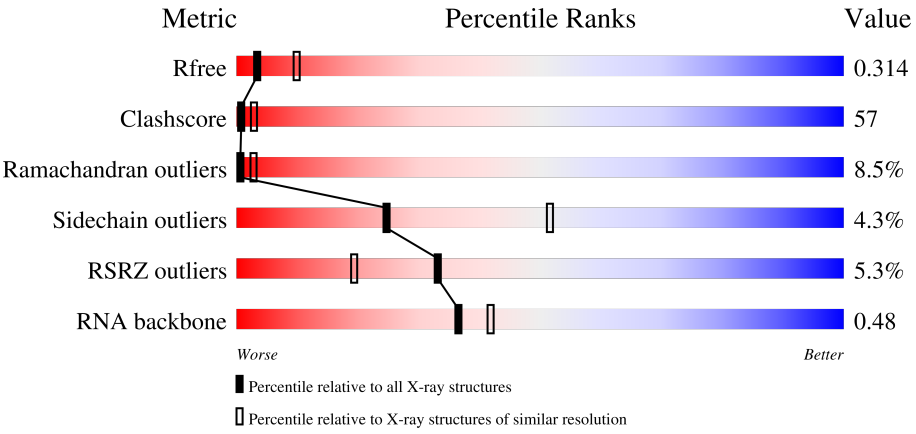
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.002 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.38.3

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 3.05 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	2258 (3.10-3.02)
Clashscore	180529	2399 (3.10-3.02)
Ramachandran outliers	177936	2269 (3.10-3.02)
Sidechain outliers	177891	2268 (3.10-3.02)
RSRZ outliers	164620	2258 (3.10-3.02)
RNA backbone	3690	1166 (3.32-2.80)

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 <=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	4% 22% 52% 7% 19%
2	B	1224	5% 21% 58% 7% 13%
3	C	318	% 30% 50% • 16%

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Mol	Chain	Length	Quality of chain
4	D	221	2% 21% 46% 6% 27%
5	E	215	7% 36% 56% 5%
6	F	155	18% 34% 46%
7	G	171	7% 35% 57% 7%
8	H	146	9% 24% 50% 6% 20%
9	I	122	14% 34% 52% 11%
10	J	70	20% 64% 7% 7%
11	K	120	33% 55% 8%
12	L	70	6% 10% 27% 24% 39%
13	R	10	40% 50% 10%
14	T	13	15% 85%

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
15	ZN	L	101	-	-	X	-

2 Entry composition (i)

There are 19 unique types of molecules in this entry. The entry contains 30893 atoms, of which 8 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	1398	Total	C	N	O	S	0	0	0
			10987	6934	1918	2073	62			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	834	PRO	THR	conflict	UNP P04050

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	1060	Total	C	N	O	S	0	0	0
			8424	5346	1475	1549	54			

- 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	162	Total	C	N	O	S	0	0	0
			1287	799	224	262	2			

- 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	208	Total	C	N	O	S	0	0	0
			1713	1089	303	312	9			

- 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	84	Total	C	N	O	S	0	0	0
			679	434	115	127	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	117	Total	C	N	O	S	0	0	0
			951	605	158	184	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 II subunit RPABC5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
10	J	65	Total	C	N	O	S	0	0	0
			526	336	90	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 II subunit RPABC4.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
12	L	43	Total	C	N	O	S	0	0	0
			343	211	69	59	4			

- Molecule 13 is a RNA chain called MOL_ID: 13.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
13	R	10	Total	C	N	O	P	0	0	0
			217	98	45	65	9			

- Molecule 14 is a DNA chain called MOL_ID: 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
14	T	13	Total	C	N	O	P	0	0	0
			260	124	44	79	13			

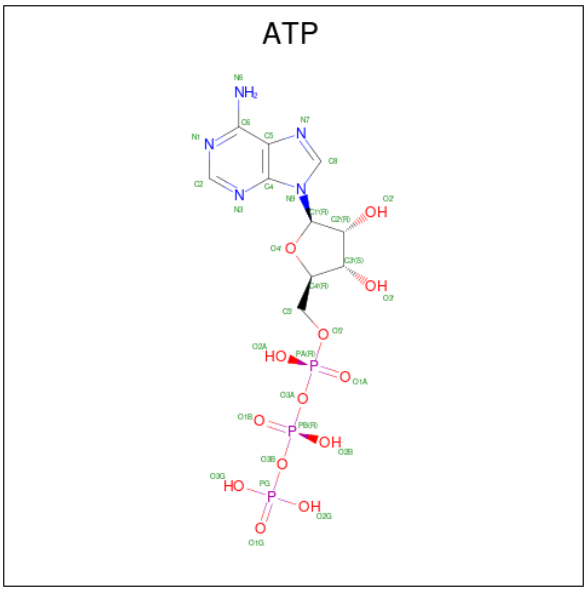
- Molecule 15 is ZINC ION (three-letter code: ZN) (formula: Zn).

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

- Molecule 16 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn) (labeled as "Ligand of Interest" by depositor).

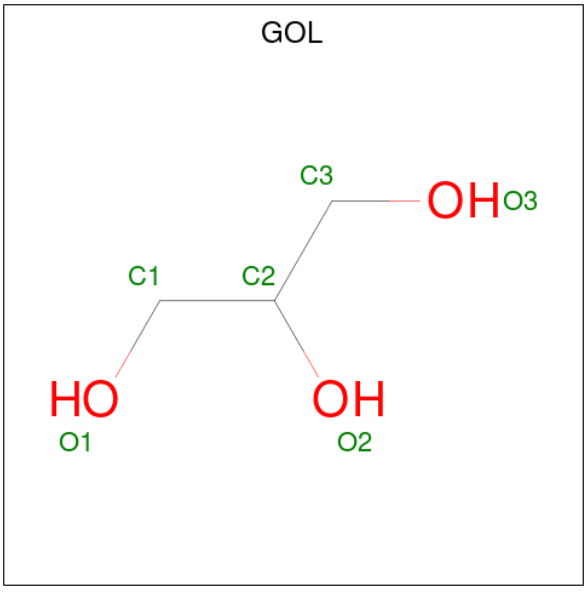
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
16	A	2	Total	Mn	0	0
			2	2		
16	B	1	Total	Mn	0	0
			1	1		

- Molecule 17 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
17	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

- Molecule 18 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
18	E	1	Total	C	H	O	0	0
			14	3	8	3		

- Molecule 19 is water.

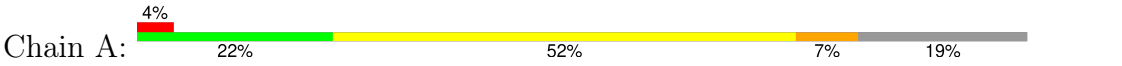
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
19	A	46	Total O 46 46	0	0
19	B	38	Total O 38 38	0	0
19	C	6	Total O 6 6	0	0
19	D	5	Total O 5 5	0	0
19	E	7	Total O 7 7	0	0
19	F	3	Total O 3 3	0	0
19	G	4	Total O 4 4	0	0
19	H	3	Total O 3 3	0	0
19	J	2	Total O 2 2	0	0
19	K	5	Total O 5 5	0	0
19	L	2	Total O 2 2	0	0
19	R	1	Total O 1 1	0	0
19	T	2	Total O 2 2	0	0

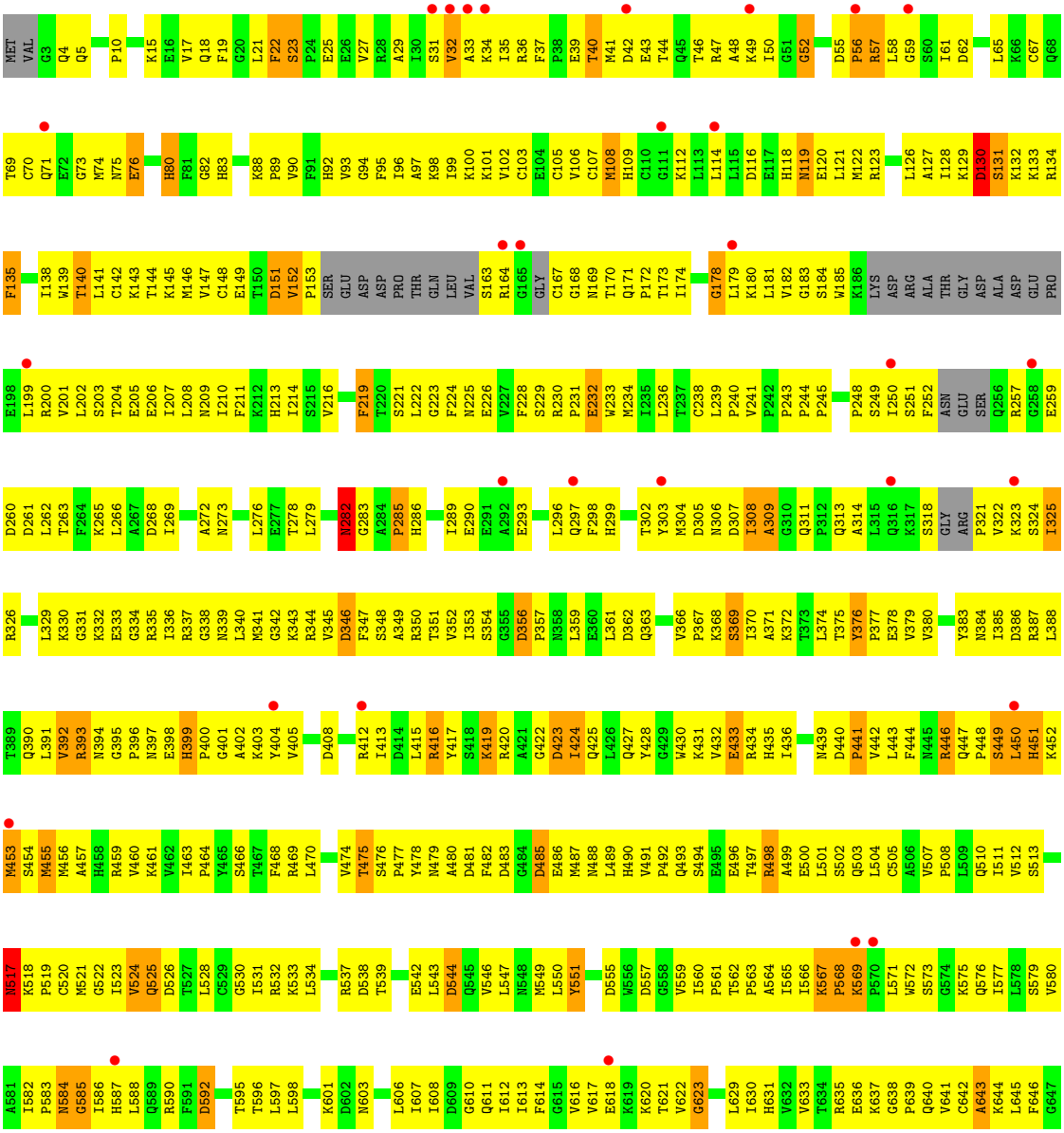
3 Residue-property plots (i)

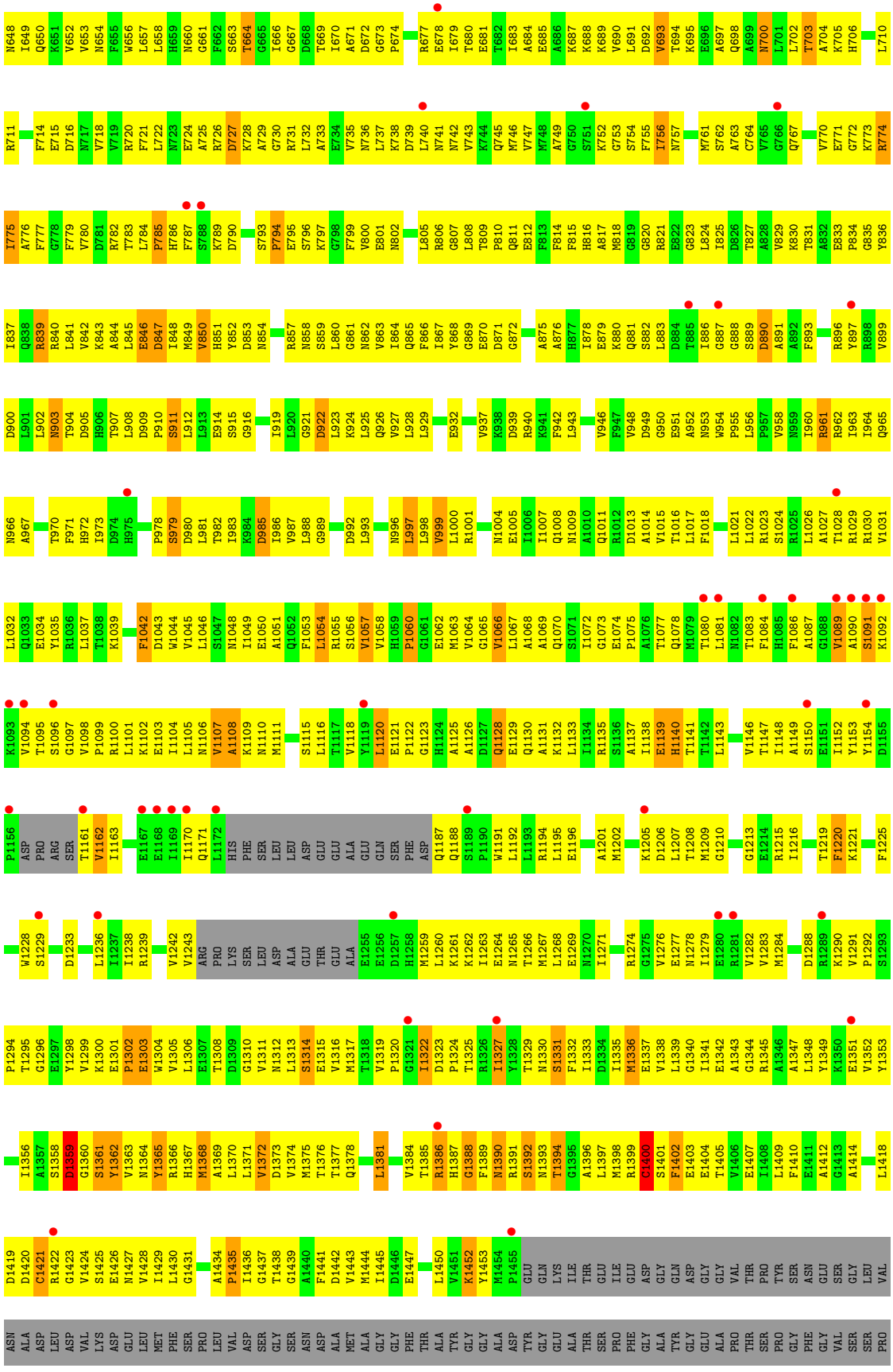
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

• Molecule 1: DNA-directed RNA polymerase II subunit RPB1

Chain A:

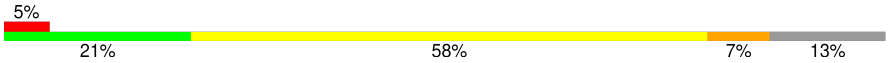


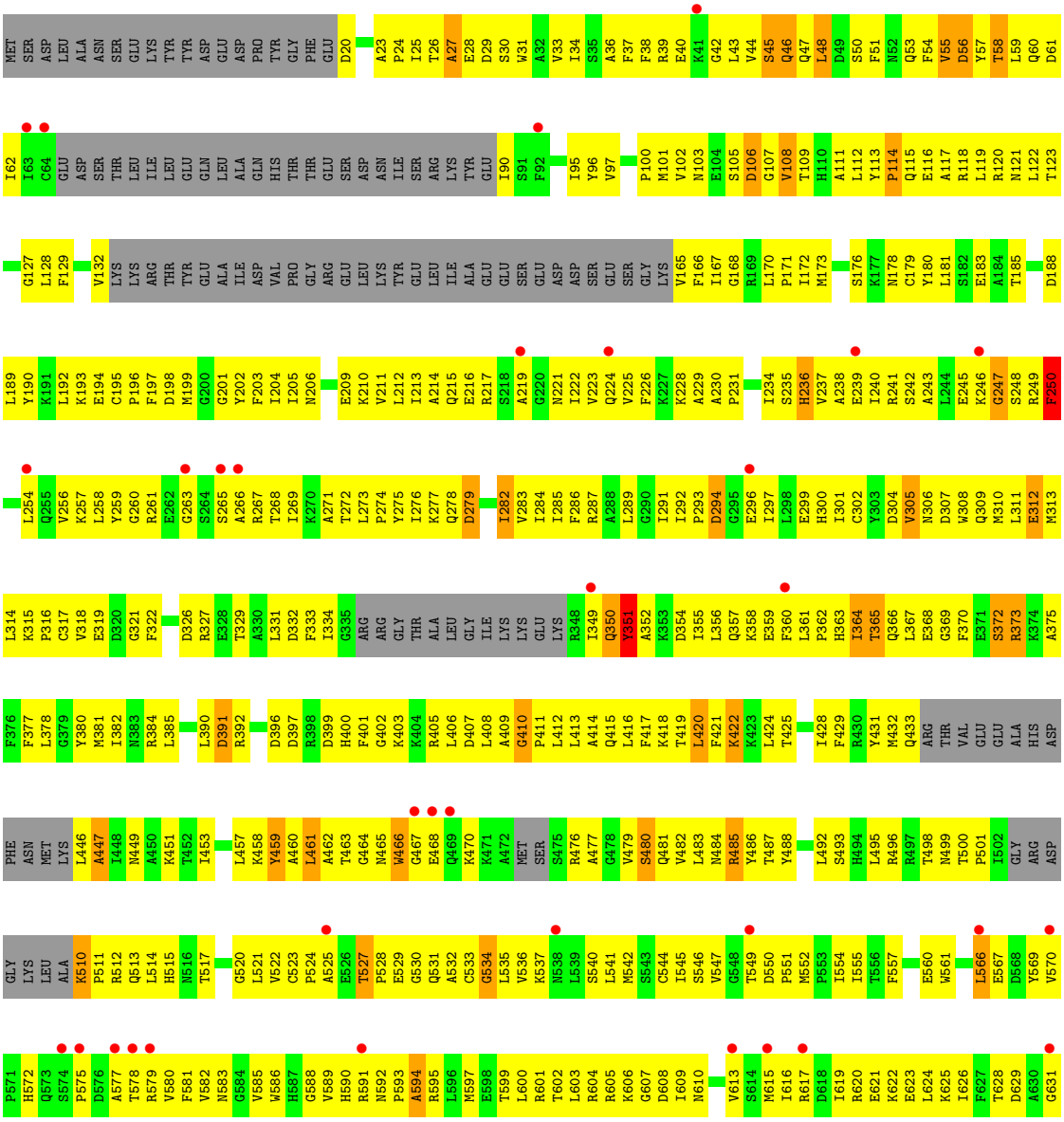


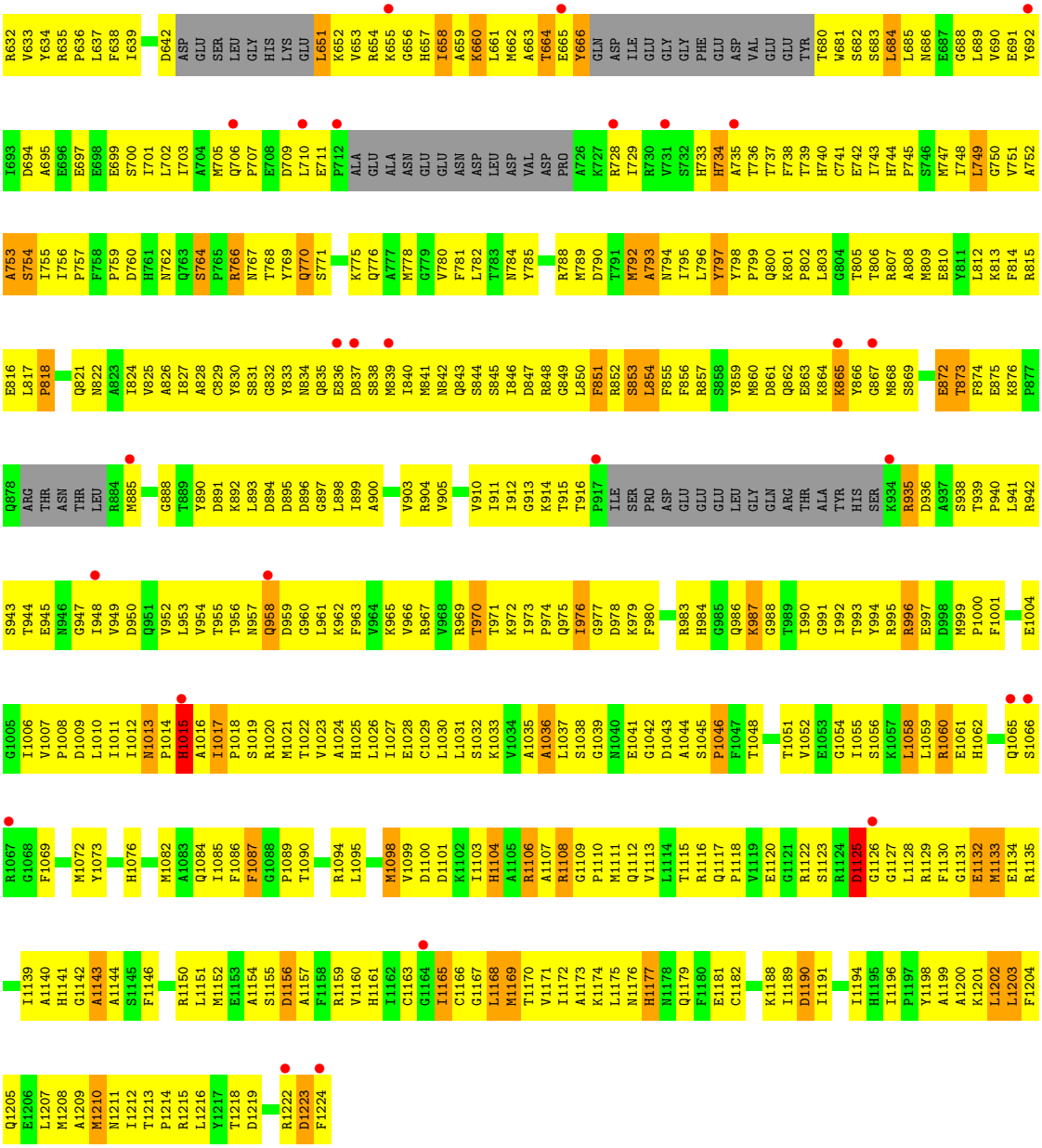


• Molecule 2: DNA-directed RNA polymerase subunit beta

Chain B:

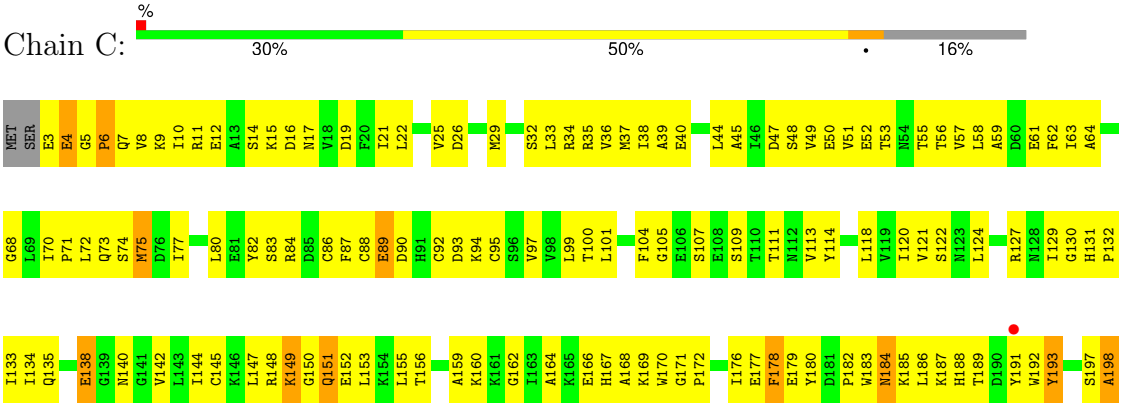


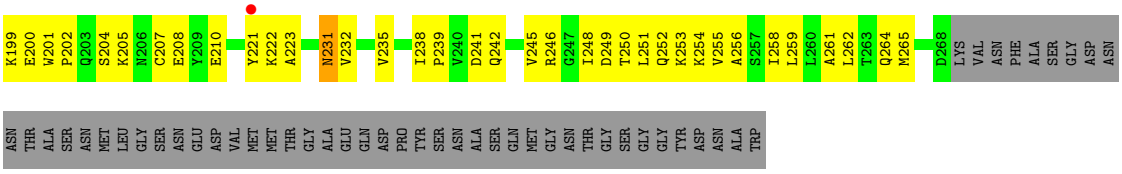


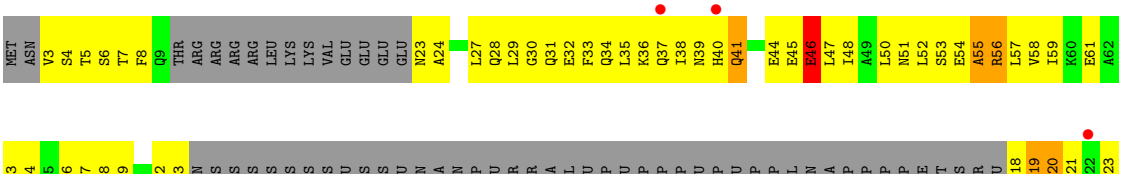


• Molecule 3: DNA-directed RNA polymerase II subunit RPB3

Chain C:





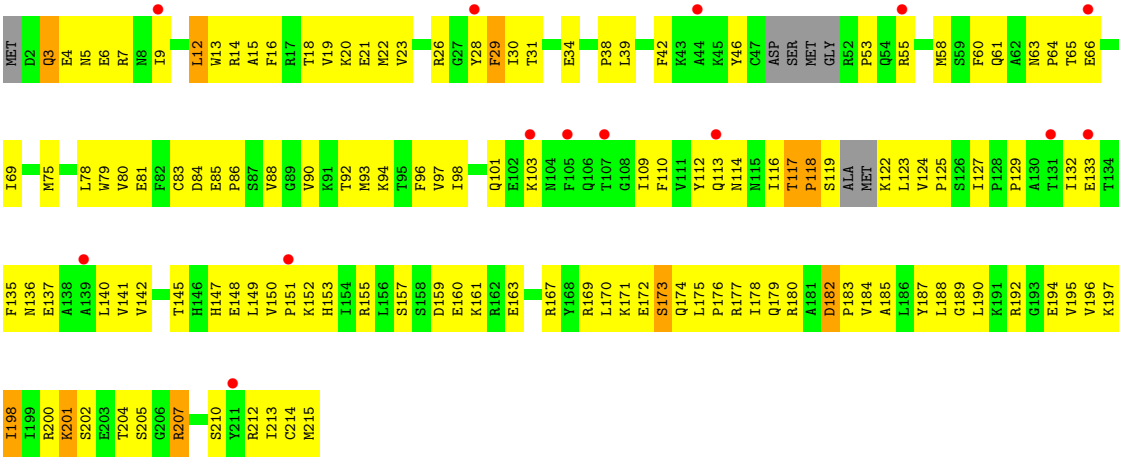


• Molecule 4: DNA-directed RNA polymerase II subunit RPB4

Chain D:

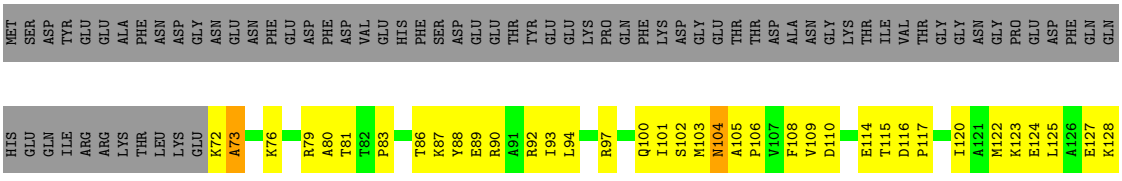
• Molecule 5: DNA-directed RNA polymerases I, II, and III subunit RPABC1

Chain E:

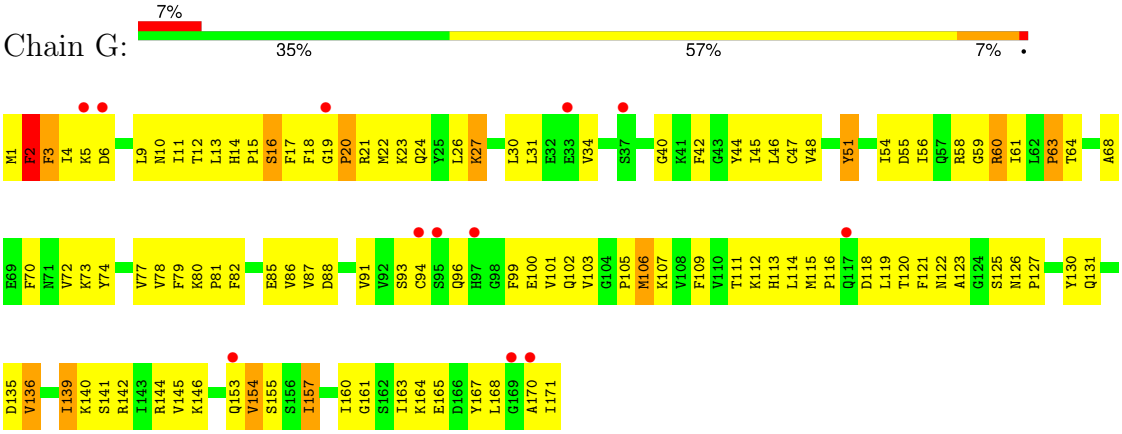


• Molecule 6: DNA-directed RNA polymerases I, II, and III subunit RPABC2

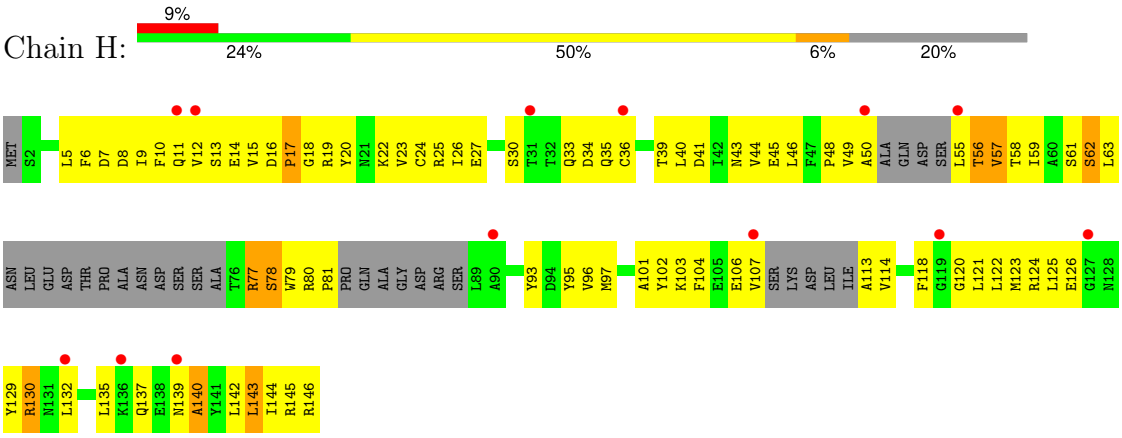
Chain F:



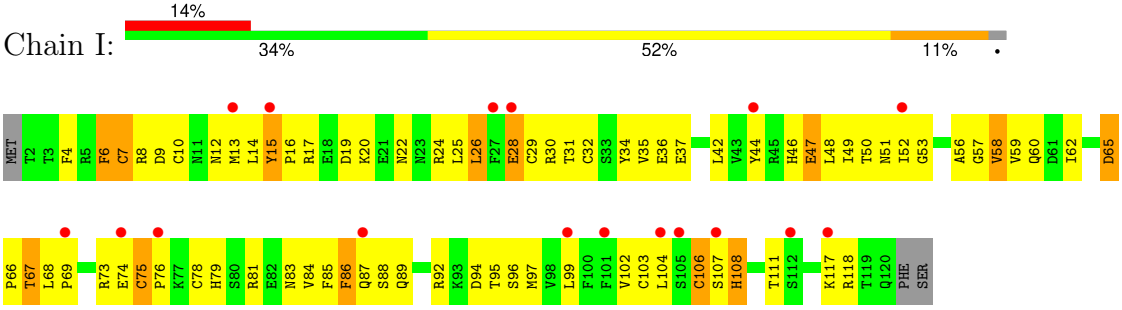
• Molecule 7: DNA-directed RNA polymerase II subunit RPB7



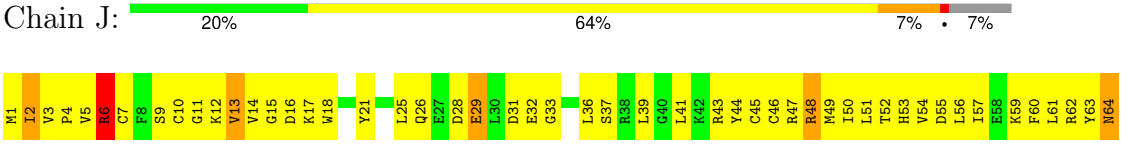
• Molecule 8: DNA-directed RNA polymerases I, II, and III subunit RPABC3



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

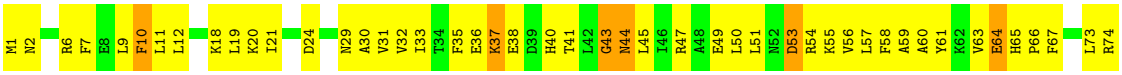


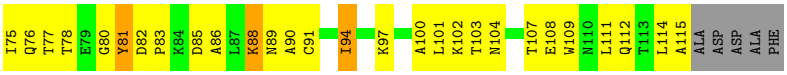
• Molecule 10: DNA-directed RNA polymerases II subunit RPABC5



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

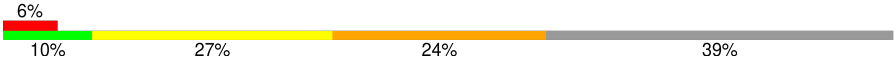
Chain K:

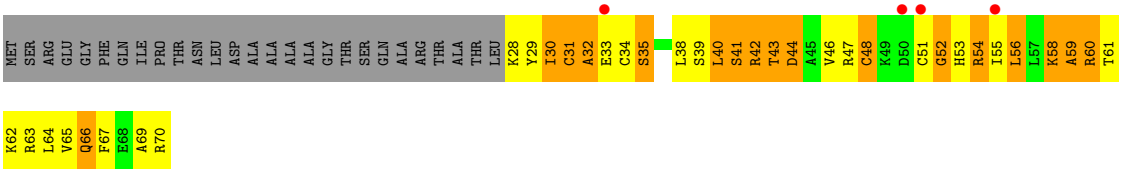




• Molecule 12: DNA-directed RNA polymerases II subunit RPABC4

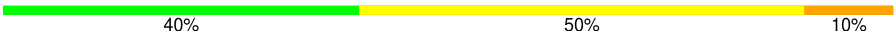
Chain L:

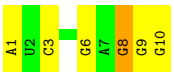




• Molecule 13: MOL_ID: 13

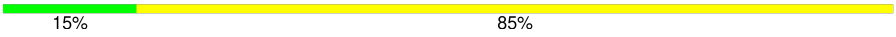
Chain R:

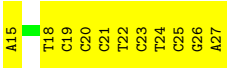




• Molecule 14: MOL_ID: 14

Chain T:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α, β, γ	220.17Å 392.60Å 280.92Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	18.00 – 3.05 18.00 – 3.05	Depositor EDS
% Data completeness (in resolution range)	98.0 (18.00-3.05) 99.2 (18.00-3.05)	Depositor EDS
R_{merge}	0.67	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.10 (at 3.00Å)	Xtriage
Refinement program	PHENIX (1.19.2_4158: ???)	Depositor
R, R_{free}	0.283 , 0.307 0.293 , 0.314	Depositor DCC
R_{free} test set	6982 reflections (3.07%)	wwPDB-VP
Wilson B-factor (Å^2)	76.8	Xtriage
Anisotropy	0.192	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.15 , 0.0	EDS
L-test for twinning[2]	$< \|L\| > = 0.33$, $< L^2 > = 0.17$	Xtriage
Estimated twinning fraction	0.073 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.078 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o,F_c correlation	0.89	EDS
Total number of atoms	30893	wwPDB-VP
Average B, all atoms (Å^2)	110.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.27% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: ZN, MN, GOL, ATP

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	0.58	0/11181	0.76	0/15114
2	B	0.54	0/8589	0.75	0/11581
3	C	0.51	0/2133	0.71	0/2891
4	D	0.47	0/1296	0.67	0/1741
5	E	0.66	0/1747	0.82	0/2349
6	F	0.70	1/691 (0.1%)	0.80	0/933
7	G	0.73	0/1368	0.85	0/1844
8	H	0.47	0/965	0.66	0/1302
9	I	0.46	0/989	0.68	0/1331
10	J	0.54	0/535	0.71	0/720
11	K	0.53	0/938	0.68	0/1267
12	L	0.61	0/345	0.77	0/457
13	R	0.55	0/244	1.11	0/380
14	T	1.06	0/289	1.05	0/442
All	All	0.57	1/31310 (0.0%)	0.76	0/42352

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

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	F	104	ASN	C-N	-5.56	1.21	1.34

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	56	PRO	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	10987	0	11060	1415	0
2	B	8424	0	8455	1094	0
3	C	2095	0	2052	230	0
4	D	1287	0	1296	157	0
5	E	1713	0	1739	186	0
6	F	679	0	701	85	0
7	G	1340	0	1357	172	0
8	H	951	0	926	132	0
9	I	971	0	930	116	0
10	J	526	0	533	85	0
11	K	920	0	929	104	0
12	L	343	0	364	70	0
13	R	217	0	109	15	0
14	T	260	0	147	20	0
15	A	2	0	0	0	0
15	B	1	0	0	0	0
15	C	1	0	0	0	0
15	I	2	0	0	0	0
15	J	1	0	0	0	0
15	L	1	0	0	2	0
16	A	2	0	0	0	0
16	B	1	0	0	0	0
17	B	31	0	12	3	0
18	E	6	8	8	2	0
19	A	46	0	0	0	0
19	B	38	0	0	0	0
19	C	6	0	0	0	0
19	D	5	0	0	0	0
19	E	7	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
19	F	3	0	0	0	0
19	G	4	0	0	0	0
19	H	3	0	0	1	0
19	J	2	0	0	0	0
19	K	5	0	0	0	0
19	L	2	0	0	0	0
19	R	1	0	0	0	0
19	T	2	0	0	0	0
All	All	30885	8	30618	3486	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 57.

The worst 5 of 3486 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)
12:L:48:CYS:SG	12:L:51:CYS:HB2	1.92	1.09
12:L:48:CYS:SG	12:L:51:CYS:CB	2.41	1.09
2:B:1082:MET:HA	3:C:189:THR:HA	1.38	1.05
12:L:30:ILE:HG22	12:L:31:CYS:H	1.23	1.04
2:B:963:PHE:HE2	2:B:965:LYS:HE2	1.22	1.03

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	1380/1733 (80%)	959 (70%)	290 (21%)	131 (10%)	0 2
2	B	1036/1224 (85%)	726 (70%)	220 (21%)	90 (9%)	0 3
3	C	264/318 (83%)	205 (78%)	48 (18%)	11 (4%)	2 10

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
4	D	156/221 (71%)	113 (72%)	29 (19%)	14 (9%)	0 2
5	E	202/215 (94%)	164 (81%)	29 (14%)	9 (4%)	2 9
6	F	82/155 (53%)	56 (68%)	24 (29%)	2 (2%)	5 19
7	G	169/171 (99%)	132 (78%)	27 (16%)	10 (6%)	1 6
8	H	107/146 (73%)	73 (68%)	26 (24%)	8 (8%)	1 3
9	I	117/122 (96%)	82 (70%)	24 (20%)	11 (9%)	0 2
10	J	63/70 (90%)	51 (81%)	6 (10%)	6 (10%)	0 2
11	K	113/120 (94%)	77 (68%)	27 (24%)	9 (8%)	1 3
12	L	41/70 (59%)	15 (37%)	10 (24%)	16 (39%)	0 0
All	All	3730/4565 (82%)	2653 (71%)	760 (20%)	317 (8%)	0 3

5 of 317 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	40	THR
1	A	57	ARG
1	A	76	GLU
1	A	119	ASN
1	A	128	ILE

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	1218/1520 (80%)	1173 (96%)	45 (4%)	29 56
2	B	917/1061 (86%)	873 (95%)	44 (5%)	21 48
3	C	234/274 (85%)	228 (97%)	6 (3%)	41 65
4	D	144/200 (72%)	136 (94%)	8 (6%)	17 43
5	E	192/197 (98%)	185 (96%)	7 (4%)	30 57
6	F	74/137 (54%)	70 (95%)	4 (5%)	18 44
7	G	152/152 (100%)	145 (95%)	7 (5%)	23 49

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
8	H	104/128 (81%)	100 (96%)	4 (4%)	28 55
9	I	113/116 (97%)	102 (90%)	11 (10%)	6 22
10	J	59/65 (91%)	56 (95%)	3 (5%)	20 46
11	K	99/102 (97%)	98 (99%)	1 (1%)	73 85
12	L	38/57 (67%)	34 (90%)	4 (10%)	5 19
All	All	3344/4009 (83%)	3200 (96%)	144 (4%)	25 51

5 of 144 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
7	G	3	PHE
12	L	66	GLN
7	G	106	MET
9	I	74	GLU
2	B	236	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 45 such sidechains are listed below:

Mol	Chain	Res	Type
3	C	264	GLN
7	G	102	GLN
4	D	31	GLN
5	E	147	HIS
8	H	137	GLN

5.3.3 RNA (i)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
13	R	8/10 (80%)	1 (12%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
13	R	8	G

There are no RNA pucker outliers to report.

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)

Of 13 ligands modelled in this entry, 11 are monoatomic - leaving 2 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	$\#\|Z\| > 2$
18	GOL	E	301	-	5,5,5	1.38	0	5,5,5	1.02	0
17	ATP	B	2501	16	28,33,33	1.07	3 (10%)	34,52,52	1.74	5 (14%)

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
18	GOL	E	301	-	-	2/4/4/4	-
17	ATP	B	2501	16	-	2/18/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
17	B	2501	ATP	PG-O2G	-2.81	1.44	1.54
17	B	2501	ATP	C1'-N9	-2.61	1.43	1.49
17	B	2501	ATP	PB-O2B	-2.25	1.44	1.55

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
17	B	2501	ATP	O2G-PG-O3B	-5.73	85.43	104.64
17	B	2501	ATP	O2B-PB-O3B	-5.62	92.07	107.27
17	B	2501	ATP	O3G-PG-O3B	2.71	113.72	104.64
17	B	2501	ATP	C5-C6-N6	2.41	123.98	120.31
17	B	2501	ATP	O3A-PA-O1A	-2.09	104.42	110.70

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
17	B	2501	ATP	O4'-C4'-C5'-O5'
18	E	301	GOL	O1-C1-C2-C3
17	B	2501	ATP	C3'-C4'-C5'-O5'
18	E	301	GOL	O1-C1-C2-O2

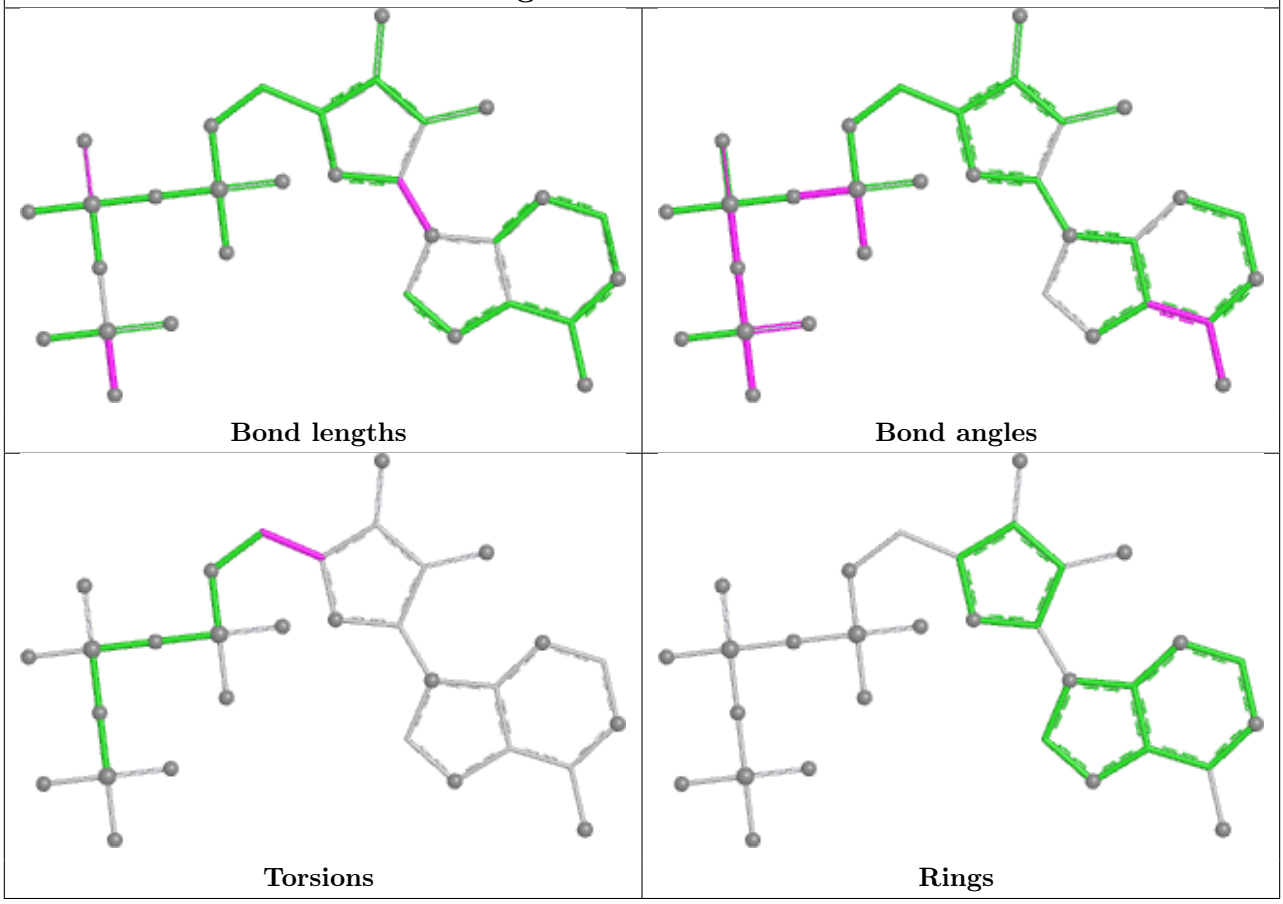
There are no ring outliers.

2 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
18	E	301	GOL	2	0
17	B	2501	ATP	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand ATP B 2501



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^{th} 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	1398/1733 (80%)	0.16	76 (5%) 32 19	38, 100, 164, 286	0
2	B	1060/1224 (86%)	0.21	60 (5%) 30 18	40, 103, 172, 273	0
3	C	266/318 (83%)	-0.08	2 (0%) 82 66	50, 102, 153, 197	0
4	D	162/221 (73%)	0.02	4 (2%) 58 39	73, 118, 163, 198	0
5	E	208/215 (96%)	0.45	14 (6%) 25 14	59, 132, 186, 293	0
6	F	84/155 (54%)	-0.03	0 100 100	44, 77, 116, 167	0
7	G	171/171 (100%)	0.35	12 (7%) 24 13	61, 103, 153, 189	0
8	H	117/146 (80%)	0.55	13 (11%) 12 7	93, 133, 189, 235	0
9	I	119/122 (97%)	0.86	17 (14%) 7 4	92, 147, 208, 248	0
10	J	65/70 (92%)	0.02	0 100 100	68, 106, 148, 186	0
11	K	115/120 (95%)	-0.24	0 100 100	54, 95, 154, 175	0
12	L	43/70 (61%)	0.61	4 (9%) 16 9	78, 120, 181, 202	0
13	R	10/10 (100%)	0.55	0 100 100	117, 161, 213, 218	0
14	T	13/13 (100%)	0.92	0 100 100	128, 140, 169, 212	0
All	All	3831/4588 (83%)	0.20	202 (5%) 33 19	38, 106, 173, 293	0

The worst 5 of 202 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
7	G	95	SER	7.9
2	B	728	ARG	6.8
7	G	153	GLN	6.3
1	A	1084	PHE	5.1
2	B	525	ALA	5.0

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 monosaccharides in this entry.

6.4 Ligands (i)

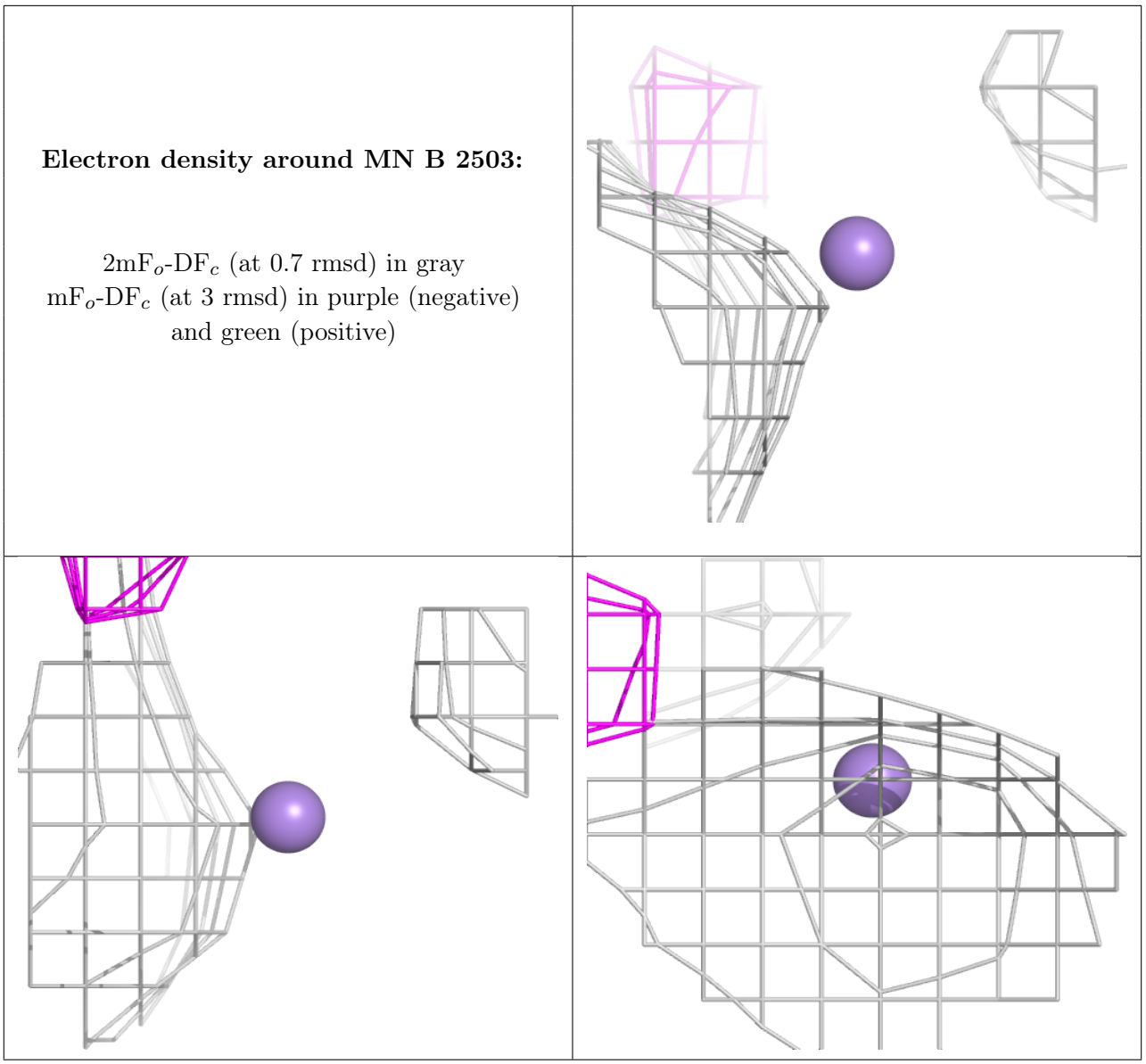
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95^{th} percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
18	GOL	E	301	6/6	0.87	0.19	113,136,158,158	0
16	MN	B	2503	1/1	0.89	0.20	138,138,138,138	1
15	ZN	L	101	1/1	0.91	0.06	153,153,153,153	0
17	ATP	B	2501	31/31	0.94	0.12	117,141,170,172	0
15	ZN	I	202	1/1	0.97	0.03	182,182,182,182	0
15	ZN	A	1801	1/1	0.98	0.05	139,139,139,139	0
15	ZN	I	201	1/1	0.98	0.12	119,119,119,119	0
16	MN	A	1804	1/1	0.98	0.04	78,78,78,78	0
15	ZN	C	401	1/1	0.99	0.04	69,69,69,69	0
15	ZN	J	101	1/1	0.99	0.04	85,85,85,85	0
15	ZN	A	1802	1/1	0.99	0.05	65,65,65,65	0
16	MN	A	1803	1/1	0.99	0.04	69,69,69,69	0
15	ZN	B	2502	1/1	1.00	0.02	77,77,77,77	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

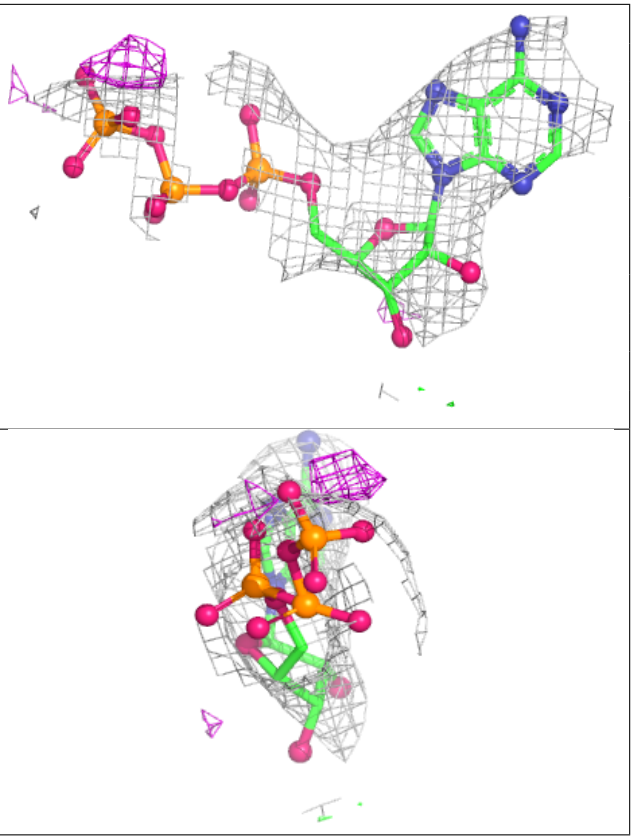
Electron density around MN B 2503:

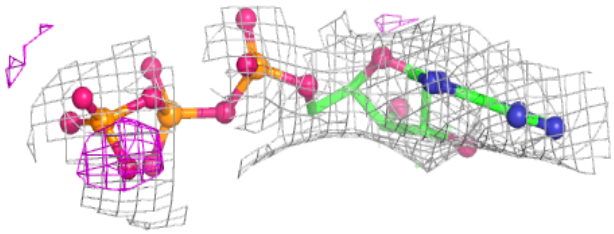
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



Electron density around ATP B 2501:

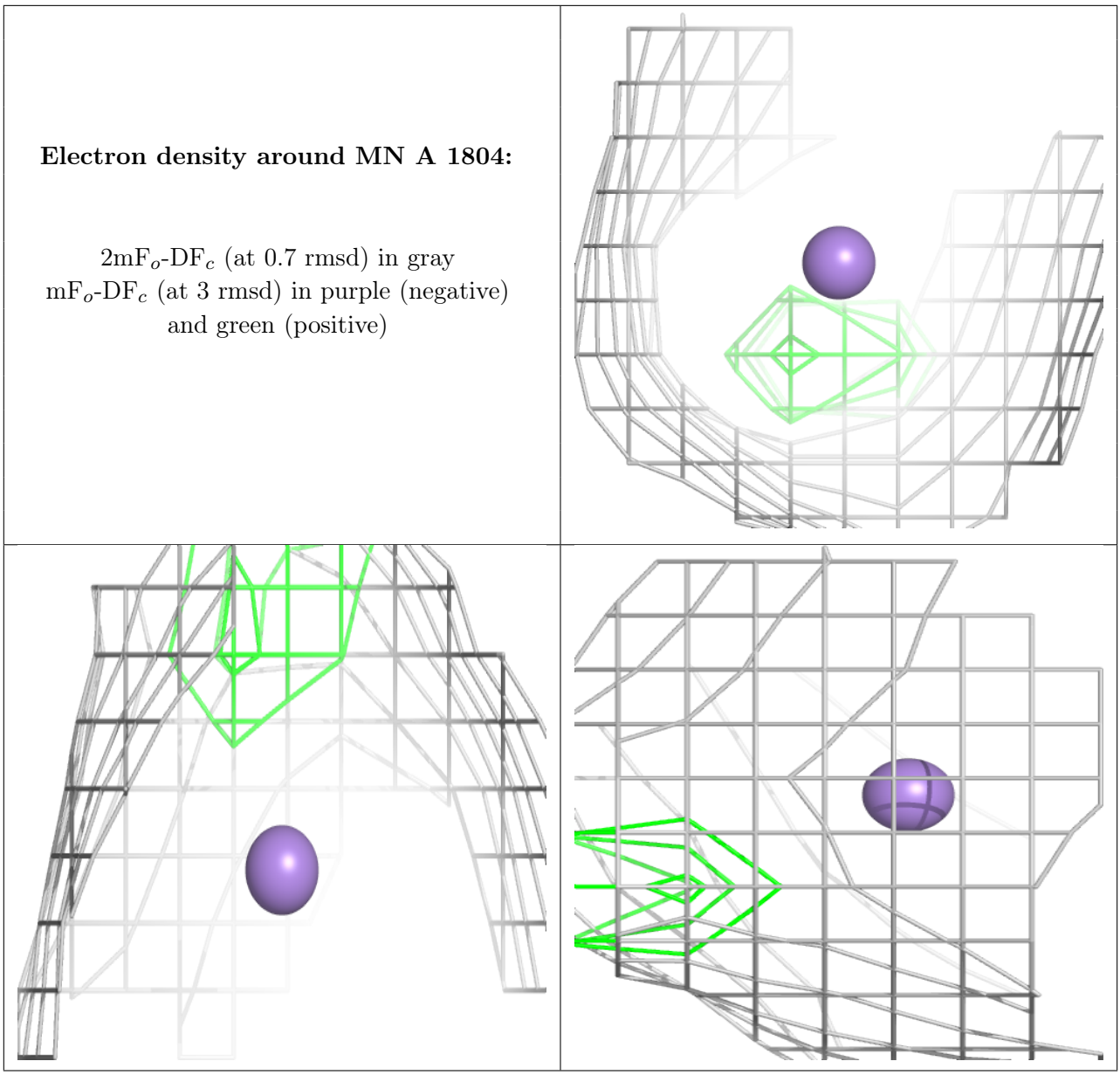
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)





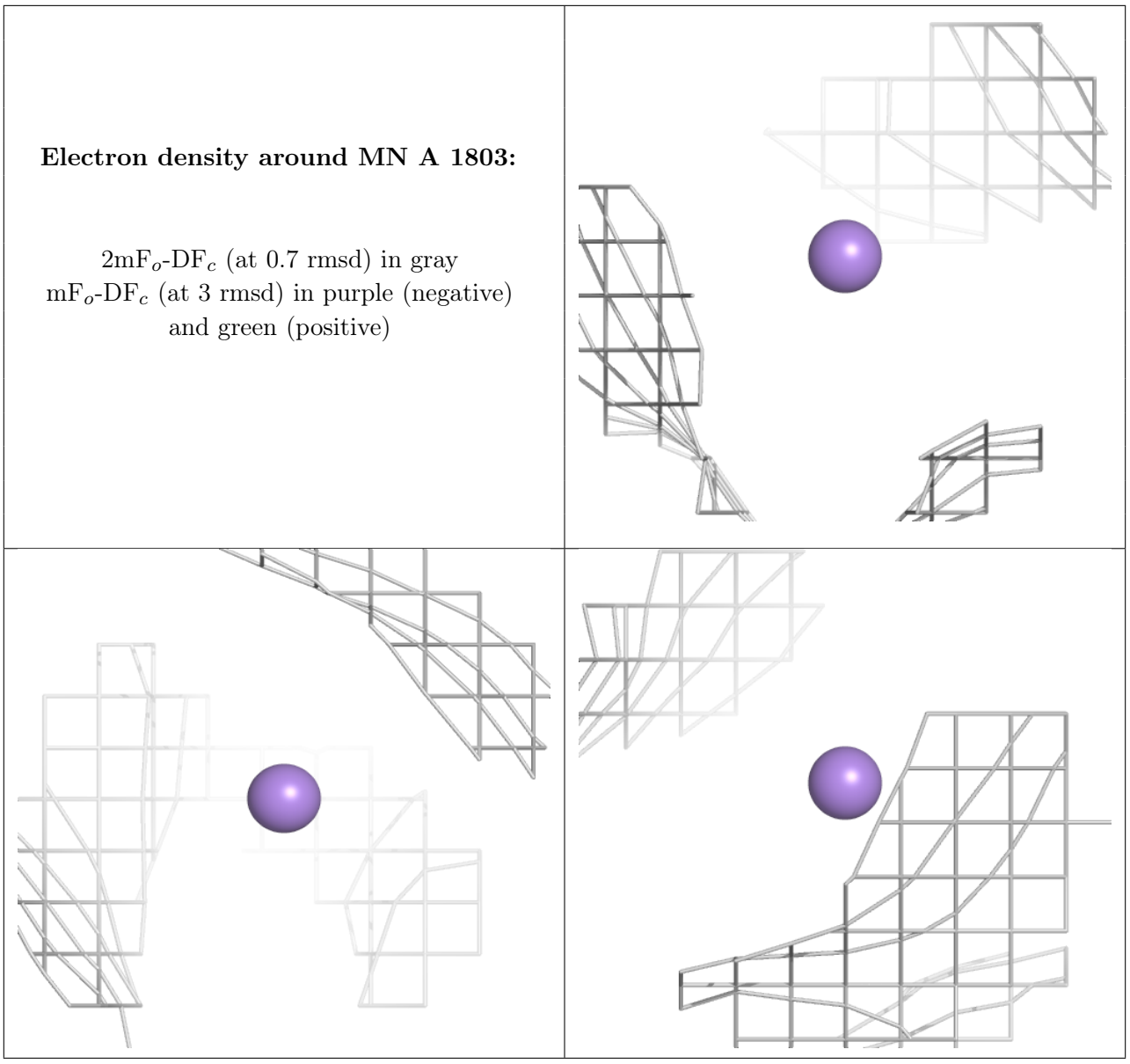
Electron density around MN A 1804:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



Electron density around MN A 1803:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)



6.5 Other polymers (i)

There are no such residues in this entry.