W O R L D W I D E
wwPDB
PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Jan 17, 2023 – 04:05 AM EST

PDB ID	:	2Q78
Title	:	Crystal structure of a thioesterase-like protein (tm0581) from thermotoga maritima msb8 at 2.20 A resolution
Authors	:	Joint Center for Structural Genomics (JCSG)
Deposited on	:	2007-06-06
Resolution	:	2.20 Å(reported)

The following versions of software and data (see references (i)) were used in the production of this report:

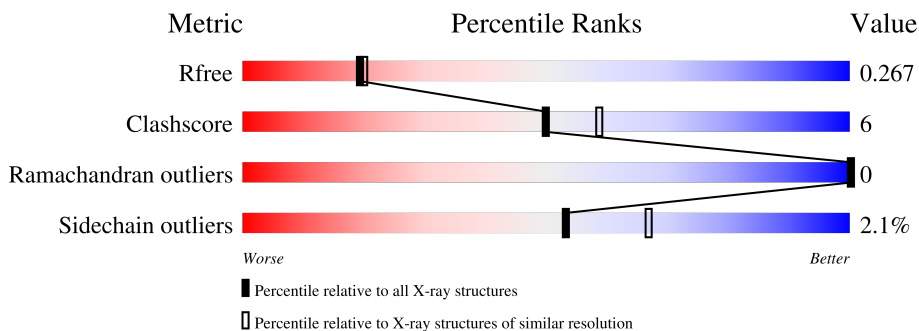|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.31.2
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

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 2.20 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	Percentile Ranks	Value
Rfree		0.267
Clashscore		6
Ramachandran outliers		0
Sidechain outliers		2.1%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	130704	4898 (2.20-2.20)
Clashscore	141614	5594 (2.20-2.20)
Ramachandran outliers	138981	5503 (2.20-2.20)
Sidechain outliers	138945	5504 (2.20-2.20)

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%

Mol	Chain	Length	Quality of chain
1	A	153	80% 8% 12%
1	B	153	79% 7% 14%
1	C	153	76% 9% 14%
1	D	153	77% 7% • 15%
1	E	153	72% 13% • 14%
1	F	153	78% 9% • 11%
1	G	153	69% 16% • 14%

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Mol	Chain	Length	Quality of chain
1	H	153	

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	MLC	A	200	X	-	-	-
2	MLC	B	200	X	-	-	-
2	MLC	C	200	X	-	-	-
2	MLC	D	200	X	-	-	-
2	MLC	E	200	X	-	-	-
2	MLC	F	200	X	-	-	-
2	MLC	G	200	X	-	-	-
2	MLC	H	200	X	-	-	-

2 Entry composition ⓘ

There are 4 unique types of molecules in this entry. The entry contains 9110 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 Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	135	Total	C	N	O	Se	0	0	0
			1064	679	190	190	5			
1	B	131	Total	C	N	O	Se	0	6	0
			1061	684	185	186	6			
1	C	131	Total	C	N	O	Se	0	5	0
			1052	674	189	184	5			
1	D	130	Total	C	N	O	Se	0	7	0
			1055	676	186	188	5			
1	E	131	Total	C	N	O	Se	0	2	0
			1027	656	184	182	5			
1	F	136	Total	C	N	O	Se	0	1	0
			1052	674	188	185	5			
1	G	131	Total	C	N	O	Se	0	7	0
			1069	683	195	186	5			
1	H	131	Total	C	N	O	Se	0	0	0
			1014	649	179	181	5			

There are 136 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	MSE	-	expression tag	UNP Q9WZ50
A	-10	GLY	-	expression tag	UNP Q9WZ50
A	-9	SER	-	expression tag	UNP Q9WZ50
A	-8	ASP	-	expression tag	UNP Q9WZ50
A	-7	LYS	-	expression tag	UNP Q9WZ50
A	-6	ILE	-	expression tag	UNP Q9WZ50
A	-5	HIS	-	expression tag	UNP Q9WZ50
A	-4	HIS	-	expression tag	UNP Q9WZ50
A	-3	HIS	-	expression tag	UNP Q9WZ50
A	-2	HIS	-	expression tag	UNP Q9WZ50
A	-1	HIS	-	expression tag	UNP Q9WZ50
A	0	HIS	-	expression tag	UNP Q9WZ50
A	1	MSE	MET	modified residue	UNP Q9WZ50

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Chain	Residue	Modelled	Actual	Comment	Reference
A	2	MSE	MET	modified residue	UNP Q9WZ50
A	22	MSE	MET	modified residue	UNP Q9WZ50
A	30	MSE	MET	modified residue	UNP Q9WZ50
A	103	MSE	MET	modified residue	UNP Q9WZ50
B	-11	MSE	-	expression tag	UNP Q9WZ50
B	-10	GLY	-	expression tag	UNP Q9WZ50
B	-9	SER	-	expression tag	UNP Q9WZ50
B	-8	ASP	-	expression tag	UNP Q9WZ50
B	-7	LYS	-	expression tag	UNP Q9WZ50
B	-6	ILE	-	expression tag	UNP Q9WZ50
B	-5	HIS	-	expression tag	UNP Q9WZ50
B	-4	HIS	-	expression tag	UNP Q9WZ50
B	-3	HIS	-	expression tag	UNP Q9WZ50
B	-2	HIS	-	expression tag	UNP Q9WZ50
B	-1	HIS	-	expression tag	UNP Q9WZ50
B	0	HIS	-	expression tag	UNP Q9WZ50
B	1	MSE	MET	modified residue	UNP Q9WZ50
B	2	MSE	MET	modified residue	UNP Q9WZ50
B	22	MSE	MET	modified residue	UNP Q9WZ50
B	30	MSE	MET	modified residue	UNP Q9WZ50
B	103	MSE	MET	modified residue	UNP Q9WZ50
C	-11	MSE	-	expression tag	UNP Q9WZ50
C	-10	GLY	-	expression tag	UNP Q9WZ50
C	-9	SER	-	expression tag	UNP Q9WZ50
C	-8	ASP	-	expression tag	UNP Q9WZ50
C	-7	LYS	-	expression tag	UNP Q9WZ50
C	-6	ILE	-	expression tag	UNP Q9WZ50
C	-5	HIS	-	expression tag	UNP Q9WZ50
C	-4	HIS	-	expression tag	UNP Q9WZ50
C	-3	HIS	-	expression tag	UNP Q9WZ50
C	-2	HIS	-	expression tag	UNP Q9WZ50
C	-1	HIS	-	expression tag	UNP Q9WZ50
C	0	HIS	-	expression tag	UNP Q9WZ50
C	1	MSE	MET	modified residue	UNP Q9WZ50
C	2	MSE	MET	modified residue	UNP Q9WZ50
C	22	MSE	MET	modified residue	UNP Q9WZ50
C	30	MSE	MET	modified residue	UNP Q9WZ50
C	103	MSE	MET	modified residue	UNP Q9WZ50
D	-11	MSE	-	expression tag	UNP Q9WZ50
D	-10	GLY	-	expression tag	UNP Q9WZ50
D	-9	SER	-	expression tag	UNP Q9WZ50
D	-8	ASP	-	expression tag	UNP Q9WZ50

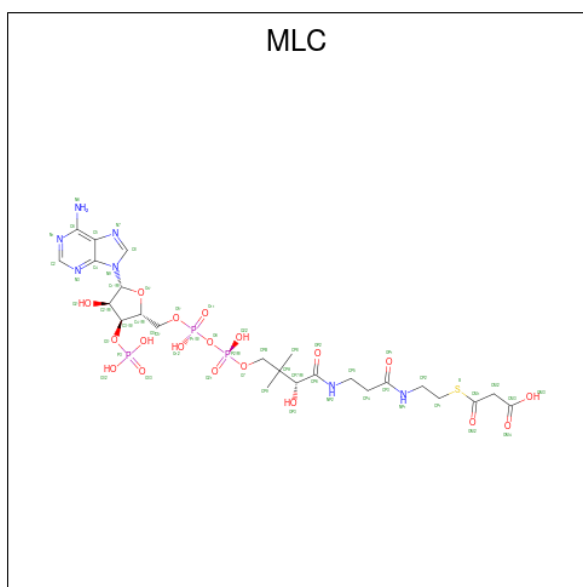*Continued on next page...*

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-7	LYS	-	expression tag	UNP Q9WZ50
D	-6	ILE	-	expression tag	UNP Q9WZ50
D	-5	HIS	-	expression tag	UNP Q9WZ50
D	-4	HIS	-	expression tag	UNP Q9WZ50
D	-3	HIS	-	expression tag	UNP Q9WZ50
D	-2	HIS	-	expression tag	UNP Q9WZ50
D	-1	HIS	-	expression tag	UNP Q9WZ50
D	0	HIS	-	expression tag	UNP Q9WZ50
D	1	MSE	MET	modified residue	UNP Q9WZ50
D	2	MSE	MET	modified residue	UNP Q9WZ50
D	22	MSE	MET	modified residue	UNP Q9WZ50
D	30	MSE	MET	modified residue	UNP Q9WZ50
D	103	MSE	MET	modified residue	UNP Q9WZ50
E	-11	MSE	-	expression tag	UNP Q9WZ50
E	-10	GLY	-	expression tag	UNP Q9WZ50
E	-9	SER	-	expression tag	UNP Q9WZ50
E	-8	ASP	-	expression tag	UNP Q9WZ50
E	-7	LYS	-	expression tag	UNP Q9WZ50
E	-6	ILE	-	expression tag	UNP Q9WZ50
E	-5	HIS	-	expression tag	UNP Q9WZ50
E	-4	HIS	-	expression tag	UNP Q9WZ50
E	-3	HIS	-	expression tag	UNP Q9WZ50
E	-2	HIS	-	expression tag	UNP Q9WZ50
E	-1	HIS	-	expression tag	UNP Q9WZ50
E	0	HIS	-	expression tag	UNP Q9WZ50
E	1	MSE	MET	modified residue	UNP Q9WZ50
E	2	MSE	MET	modified residue	UNP Q9WZ50
E	22	MSE	MET	modified residue	UNP Q9WZ50
E	30	MSE	MET	modified residue	UNP Q9WZ50
E	103	MSE	MET	modified residue	UNP Q9WZ50
F	-11	MSE	-	expression tag	UNP Q9WZ50
F	-10	GLY	-	expression tag	UNP Q9WZ50
F	-9	SER	-	expression tag	UNP Q9WZ50
F	-8	ASP	-	expression tag	UNP Q9WZ50
F	-7	LYS	-	expression tag	UNP Q9WZ50
F	-6	ILE	-	expression tag	UNP Q9WZ50
F	-5	HIS	-	expression tag	UNP Q9WZ50
F	-4	HIS	-	expression tag	UNP Q9WZ50
F	-3	HIS	-	expression tag	UNP Q9WZ50
F	-2	HIS	-	expression tag	UNP Q9WZ50
F	-1	HIS	-	expression tag	UNP Q9WZ50
F	0	HIS	-	expression tag	UNP Q9WZ50

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Chain	Residue	Modelled	Actual	Comment	Reference
F	1	MSE	MET	modified residue	UNP Q9WZ50
F	2	MSE	MET	modified residue	UNP Q9WZ50
F	22	MSE	MET	modified residue	UNP Q9WZ50
F	30	MSE	MET	modified residue	UNP Q9WZ50
F	103	MSE	MET	modified residue	UNP Q9WZ50
G	-11	MSE	-	expression tag	UNP Q9WZ50
G	-10	GLY	-	expression tag	UNP Q9WZ50
G	-9	SER	-	expression tag	UNP Q9WZ50
G	-8	ASP	-	expression tag	UNP Q9WZ50
G	-7	LYS	-	expression tag	UNP Q9WZ50
G	-6	ILE	-	expression tag	UNP Q9WZ50
G	-5	HIS	-	expression tag	UNP Q9WZ50
G	-4	HIS	-	expression tag	UNP Q9WZ50
G	-3	HIS	-	expression tag	UNP Q9WZ50
G	-2	HIS	-	expression tag	UNP Q9WZ50
G	-1	HIS	-	expression tag	UNP Q9WZ50
G	0	HIS	-	expression tag	UNP Q9WZ50
G	1	MSE	MET	modified residue	UNP Q9WZ50
G	2	MSE	MET	modified residue	UNP Q9WZ50
G	22	MSE	MET	modified residue	UNP Q9WZ50
G	30	MSE	MET	modified residue	UNP Q9WZ50
G	103	MSE	MET	modified residue	UNP Q9WZ50
H	-11	MSE	-	expression tag	UNP Q9WZ50
H	-10	GLY	-	expression tag	UNP Q9WZ50
H	-9	SER	-	expression tag	UNP Q9WZ50
H	-8	ASP	-	expression tag	UNP Q9WZ50
H	-7	LYS	-	expression tag	UNP Q9WZ50
H	-6	ILE	-	expression tag	UNP Q9WZ50
H	-5	HIS	-	expression tag	UNP Q9WZ50
H	-4	HIS	-	expression tag	UNP Q9WZ50
H	-3	HIS	-	expression tag	UNP Q9WZ50
H	-2	HIS	-	expression tag	UNP Q9WZ50
H	-1	HIS	-	expression tag	UNP Q9WZ50
H	0	HIS	-	expression tag	UNP Q9WZ50
H	1	MSE	MET	modified residue	UNP Q9WZ50
H	2	MSE	MET	modified residue	UNP Q9WZ50
H	22	MSE	MET	modified residue	UNP Q9WZ50
H	30	MSE	MET	modified residue	UNP Q9WZ50
H	103	MSE	MET	modified residue	UNP Q9WZ50

- Molecule 2 is MALONYL-COENZYME A (three-letter code: MLC) (formula: $C_{24}H_{38}N_7O_{19}P_3S$).

MLC

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	B	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	C	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	D	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	E	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	F	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	G	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0
2	H	1	Total 54	C 24	N 7	O 19	P 3	S 1	0	0

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	D	1	Total 1	Cl 1	0	0
3	F	1	Total 1	Cl 1	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	63	Total 63	O 63	0	0
4	B	38	Total 38	O 38	0	0
4	C	39	Total 39	O 39	0	0
4	D	60	Total 60	O 60	0	0
4	E	9	Total 9	O 9	0	0
4	F	29	Total 29	O 29	0	0
4	G	17	Total 17	O 17	0	0
4	H	27	Total 27	O 27	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. 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. 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: Uncharacterized protein
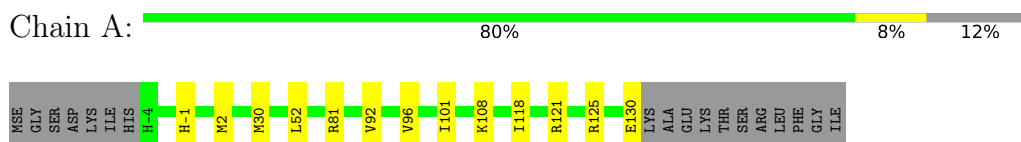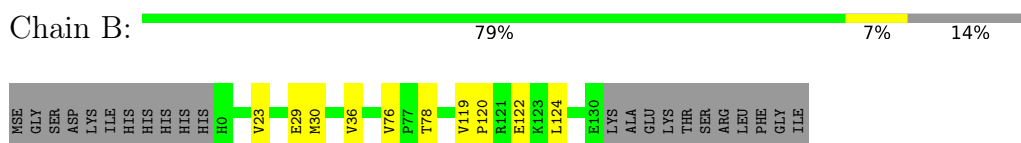
Chain A:

- Molecule 1: Uncharacterized protein

Chain B:

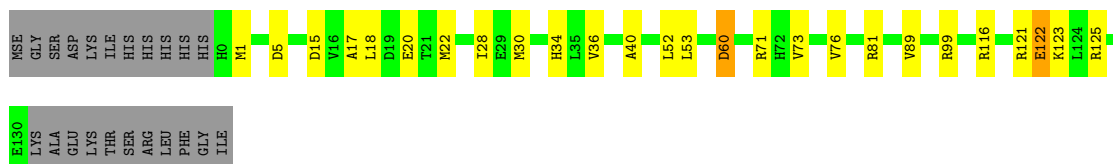- Molecule 1: Uncharacterized protein

Chain C:
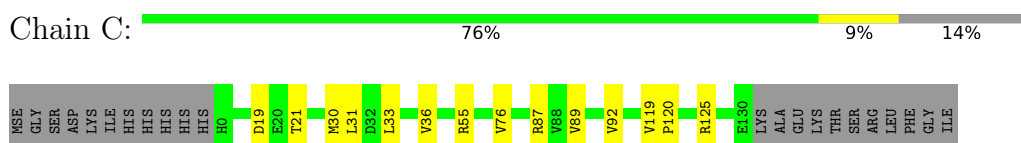
- Molecule 1: Uncharacterized protein
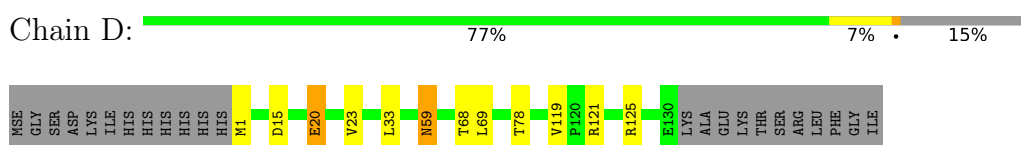
Chain D:

- Molecule 1: Uncharacterized protein
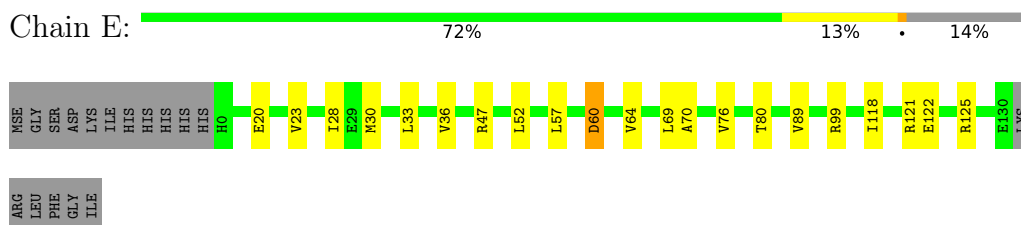
Chain E:

- Molecule 1: Uncharacterized protein

Chain F:

78%   9%   •   11%

MSE GLY SER ASP LYS ILE HIS HIS HIS H-2 K10 L18 I28 E29 M30 V36 L53 T78 R87 V88 V89 V96 I101 K108 I118 V119 P120 R121 R125 E133 LYS THR SER ARG LEU PHE GLY ILE
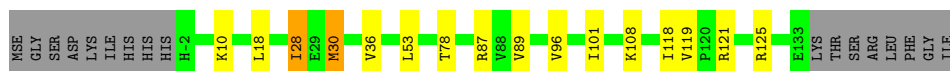
• Molecule 1: Uncharacterized protein

Chain G:

69%   16%   •   14%

MSE GLY SER ASP LYS ILE HIS HIS HIS HIS H0 M1 D5 D15 V16 A17 L18 D19 E20 T21 M22 I28 E29 M30 H34 L35 V36 A40 L52 L53 D60 R71 H72 V73 V76 R81 V89 R99 R116 R121 E122 K123 L124 R125

E130 LYS ALA GLU LYS THR SER ARG LEU PHE GLY ILE

• Molecule 1: Uncharacterized protein

Chain H:

76%   10%   14%

MSE GLY SER ASP LYS ILE HIS HIS HIS HIS H0 M1 M2 M30 L33 V36 L52 L57 V64 V76 P77 V89 R99 R116 A117 I118 V119 P120 R125 E130 LYS ALA GLU LYS THR SER ARG LEU PHE GLY ILE

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	60.35Å 90.71Å 230.42Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.98 – 2.20 29.98 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.7 (29.98-2.20) 99.7 (29.98-2.20)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	0.11	Depositor
$< I/\sigma(I) >$ [1]	1.88 (at 2.20Å)	Xtriage
Refinement program	REFMAC 5.2.0019, PHENIX	Depositor
R, R_{free}	0.175 , 0.224 0.228 , 0.267	Depositor DCC
R_{free} test set	3296 reflections (5.07%)	wwPDB-VP
Wilson B-factor (Å^2)	38.0	Xtriage
Anisotropy	0.121	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 57.4	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	9110	wwPDB-VP
Average B, all atoms (Å^2)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.31% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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: CL, MLC

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	0.73	0/1077	0.82	0/1451
1	B	0.66	0/1086	0.72	0/1462
1	C	0.65	0/1075	0.75	0/1446
1	D	0.70	0/1086	0.75	0/1465
1	E	0.49	0/1042	0.65	0/1403
1	F	0.53	0/1066	0.69	0/1438
1	G	0.53	0/1100	0.70	0/1479
1	H	0.55	0/1023	0.68	1/1379 (0.1%)
All	All	0.61	0/8555	0.72	1/11523 (0.0%)

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	G	0	1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	H	116	ARG	NE-CZ-NH2	-5.60	117.50	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	G	1	MSE	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	1064	0	1082	10	0
1	B	1061	0	1118	9	0
1	C	1052	0	1108	19	0
1	D	1055	0	1107	12	0
1	E	1027	0	1059	16	0
1	F	1052	0	1076	17	0
1	G	1069	0	1120	23	0
1	H	1014	0	1040	13	0
2	A	54	0	33	0	0
2	B	54	0	33	1	0
2	C	54	0	33	0	0
2	D	54	0	33	1	0
2	E	54	0	33	1	0
2	F	54	0	33	1	0
2	G	54	0	33	1	0
2	H	54	0	33	4	0
3	D	1	0	0	0	0
3	F	1	0	0	0	0
4	A	63	0	0	0	0
4	B	38	0	0	1	0
4	C	39	0	0	0	0
4	D	60	0	0	0	0
4	E	9	0	0	0	0
4	F	29	0	0	1	0
4	G	17	0	0	0	0
4	H	27	0	0	0	0
All	All	9110	0	8974	103	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 6.

The worst 5 of 103 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:A:2:MSE:CE	1:A:2:MSE:SE	2.15	1.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:30:MSE:HE3	1:F:121:ARG:HD3	1.55	0.89
1:C:36:VAL:CG1	1:C:76:VAL:HG13	2.10	0.81
1:C:36:VAL:CG1	1:C:76:VAL:CG1	2.60	0.80
1:C:36:VAL:HG12	1:C:76:VAL:HG13	1.69	0.73

There are no symmetry-related clashes.

5.3   Torsion angles ⓘ

5.3.1   Protein backbone ⓘ

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	133/153 (87%)	129 (97%)	4 (3%)	0	100	100
1	B	135/153 (88%)	133 (98%)	2 (2%)	0	100	100
1	C	134/153 (88%)	133 (99%)	1 (1%)	0	100	100
1	D	135/153 (88%)	131 (97%)	4 (3%)	0	100	100
1	E	131/153 (86%)	127 (97%)	4 (3%)	0	100	100
1	F	135/153 (88%)	134 (99%)	1 (1%)	0	100	100
1	G	136/153 (89%)	135 (99%)	1 (1%)	0	100	100
1	H	129/153 (84%)	127 (98%)	2 (2%)	0	100	100
All	All	1068/1224 (87%)	1049 (98%)	19 (2%)	0	100	100

There are no Ramachandran outliers to report.

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	113/126 (90%)	111 (98%)	2 (2%)	59	72
1	B	115/126 (91%)	114 (99%)	1 (1%)	78	88
1	C	112/126 (89%)	111 (99%)	1 (1%)	78	88
1	D	115/126 (91%)	111 (96%)	4 (4%)	36	46
1	E	108/126 (86%)	104 (96%)	4 (4%)	34	43
1	F	109/126 (86%)	107 (98%)	2 (2%)	59	72
1	G	115/126 (91%)	111 (96%)	4 (4%)	36	46
1	H	106/126 (84%)	105 (99%)	1 (1%)	78	88
All	All	893/1008 (89%)	874 (98%)	19 (2%)	53	67

5 of 19 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	5	ASP
1	G	122[B]	GLU
1	H	2	MSE
1	G	122[A]	GLU
1	E	47	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	-1	HIS
1	A	0	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	#$|Z| > 2$	Counts	RMSZ	#$|Z| > 2$
2	MLC	F	200	-	47,56,56	1.05	3 (6%)	60,83,83	2.09	8 (13%)
2	MLC	G	200	-	47,56,56	1.17	5 (10%)	60,83,83	2.51	9 (15%)
2	MLC	B	200	-	47,56,56	1.21	3 (6%)	60,83,83	2.50	14 (23%)
2	MLC	C	200	-	47,56,56	1.25	3 (6%)	60,83,83	2.67	9 (15%)
2	MLC	A	200	-	47,56,56	1.29	4 (8%)	60,83,83	2.88	18 (30%)
2	MLC	H	200	-	47,56,56	1.09	5 (10%)	60,83,83	1.78	9 (15%)
2	MLC	E	200	-	47,56,56	1.03	4 (8%)	60,83,83	1.59	11 (18%)
2	MLC	D	200	-	47,56,56	1.16	4 (8%)	60,83,83	2.31	11 (18%)

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	MLC	F	200	-	1/1/13/15	5/50/71/71	0/3/3/3
2	MLC	G	200	-	1/1/13/15	6/50/71/71	0/3/3/3
2	MLC	B	200	-	1/1/13/15	4/50/71/71	0/3/3/3
2	MLC	C	200	-	1/1/13/15	5/50/71/71	0/3/3/3
2	MLC	A	200	-	1/1/13/15	8/50/71/71	0/3/3/3
2	MLC	H	200	-	1/1/13/15	11/50/71/71	0/3/3/3
2	MLC	E	200	-	1/1/13/15	8/50/71/71	0/3/3/3
2	MLC	D	200	-	1/1/13/15	4/50/71/71	0/3/3/3

The worst 5 of 31 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	200	MLC	CM2-CM3	5.90	1.60	1.51

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	200	MLC	CM2-CM3	5.72	1.59	1.51
2	B	200	MLC	CM2-CM3	5.60	1.59	1.51
2	D	200	MLC	CM2-CM3	4.57	1.58	1.51
2	G	200	MLC	CM2-CM3	4.45	1.57	1.51

The worst 5 of 89 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	200	MLC	CM2-CM1-S	15.37	132.84	113.69
2	C	200	MLC	CM2-CM1-S	15.21	132.64	113.69
2	G	200	MLC	CM2-CM1-S	14.46	131.71	113.69
2	B	200	MLC	CM2-CM1-S	13.88	130.98	113.69
2	D	200	MLC	CM2-CM1-S	12.47	129.22	113.69

5 of 8 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	200	MLC	C3'
2	B	200	MLC	C3'
2	C	200	MLC	C3'
2	D	200	MLC	C3'
2	E	200	MLC	C3'

5 of 51 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	200	MLC	C2'-C3'-O3'-P3
2	A	200	MLC	C5'-O5'-P1-O11
2	C	200	MLC	C3'-O3'-P3-O32
2	C	200	MLC	C5'-O5'-P1-O11
2	D	200	MLC	C3'-O3'-P3-O32

There are no ring outliers.

6 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	F	200	MLC	1	0
2	G	200	MLC	1	0
2	B	200	MLC	1	0
2	H	200	MLC	4	0
2	E	200	MLC	1	0
2	D	200	MLC	1	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 MLC F 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC G 200

Bond lengths

Bond angles

Torsions

Rings

wwPDB X-ray Structure Validation Summary Report

Ligand MLC B 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC C 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC A 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC H 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC E 200

Bond lengths

Bond angles

Torsions

Rings

Ligand MLC D 200

Bond lengths

Bond angles

Torsions

Rings

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

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 MLC A 200:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative) and green (positive)
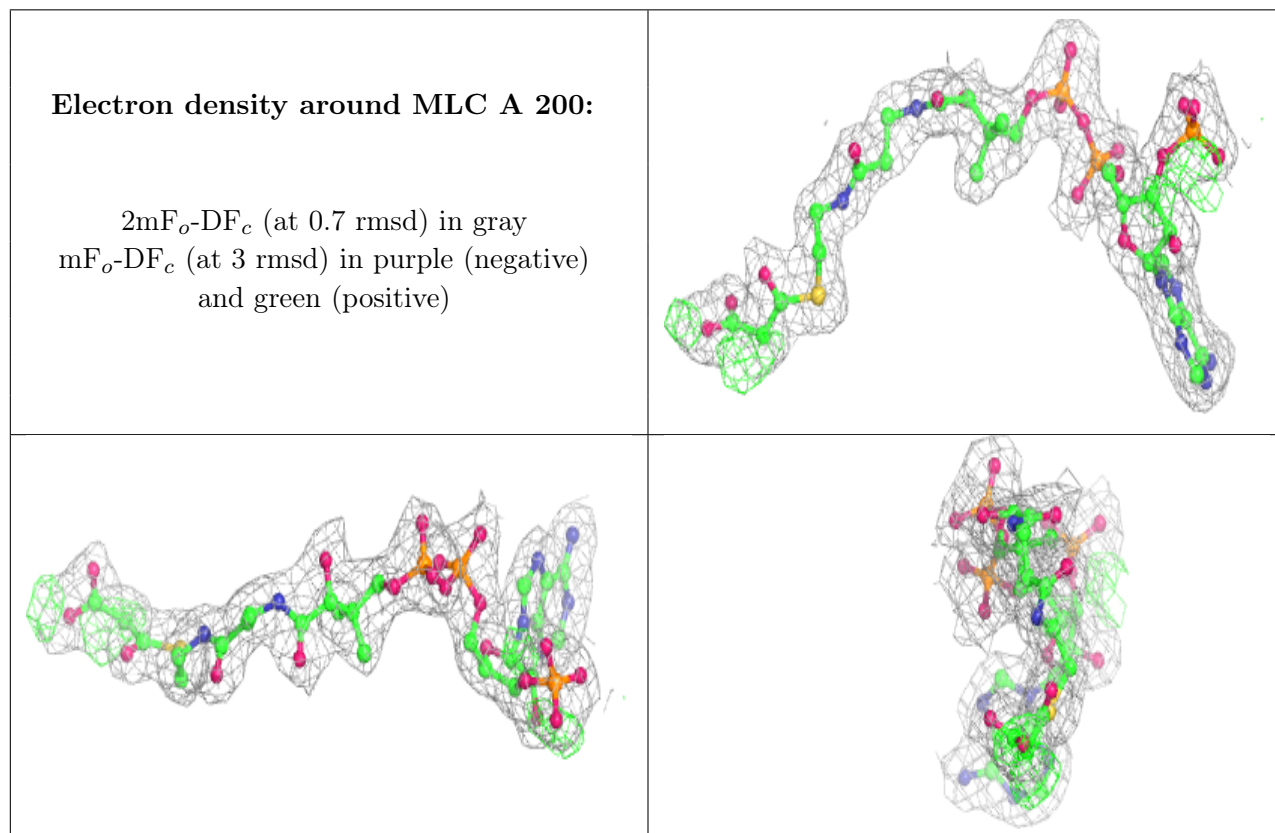
Electron density around MLC B 200:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
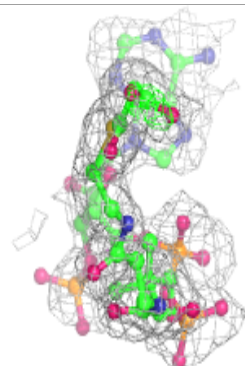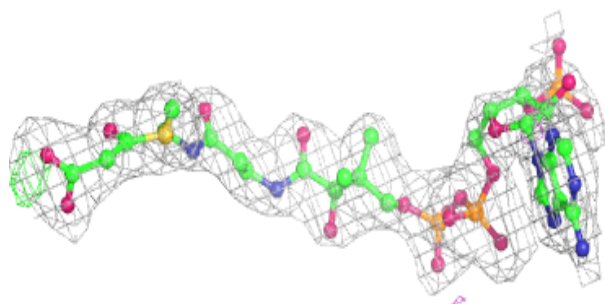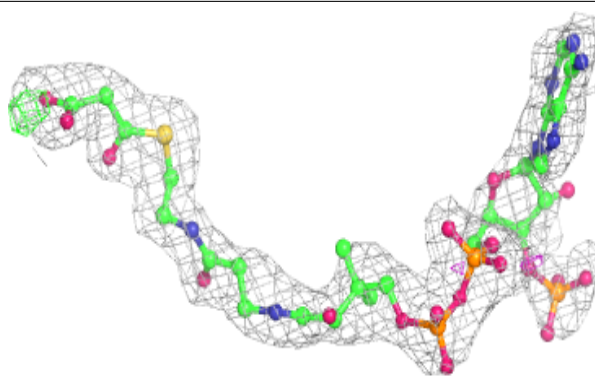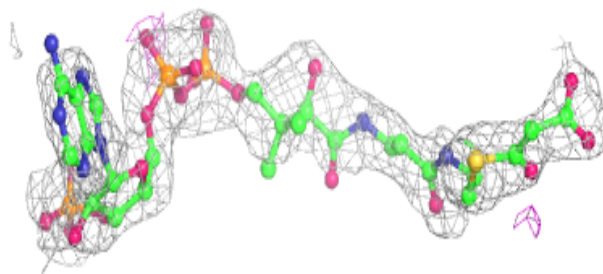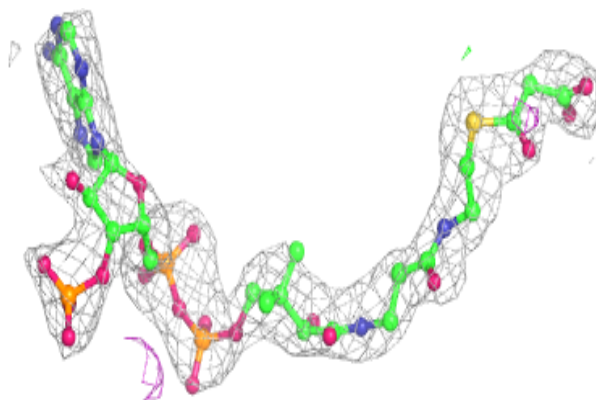and green (positive)
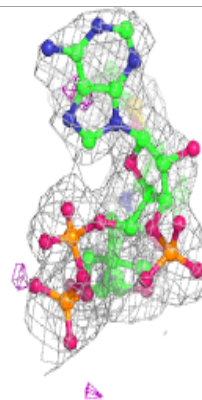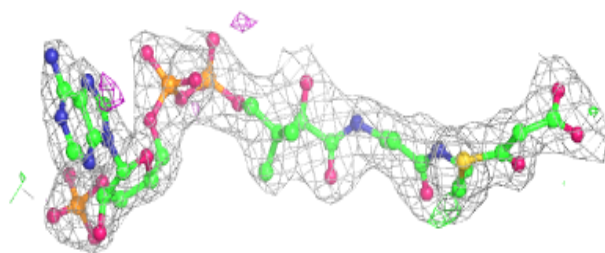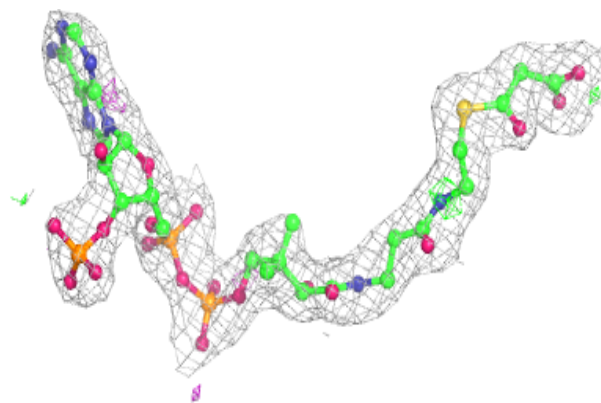
Electron density around MLC C 200:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
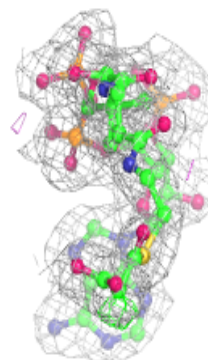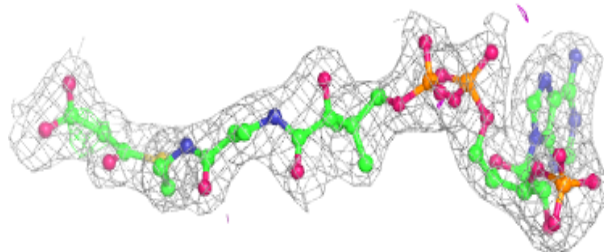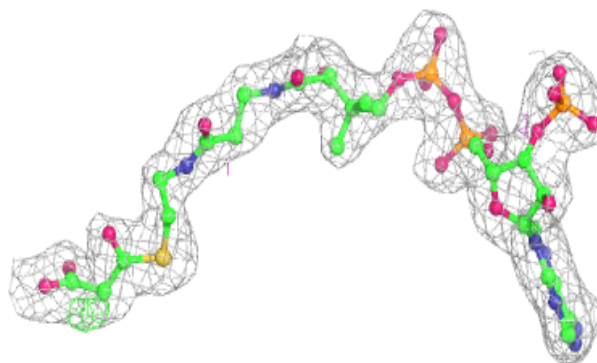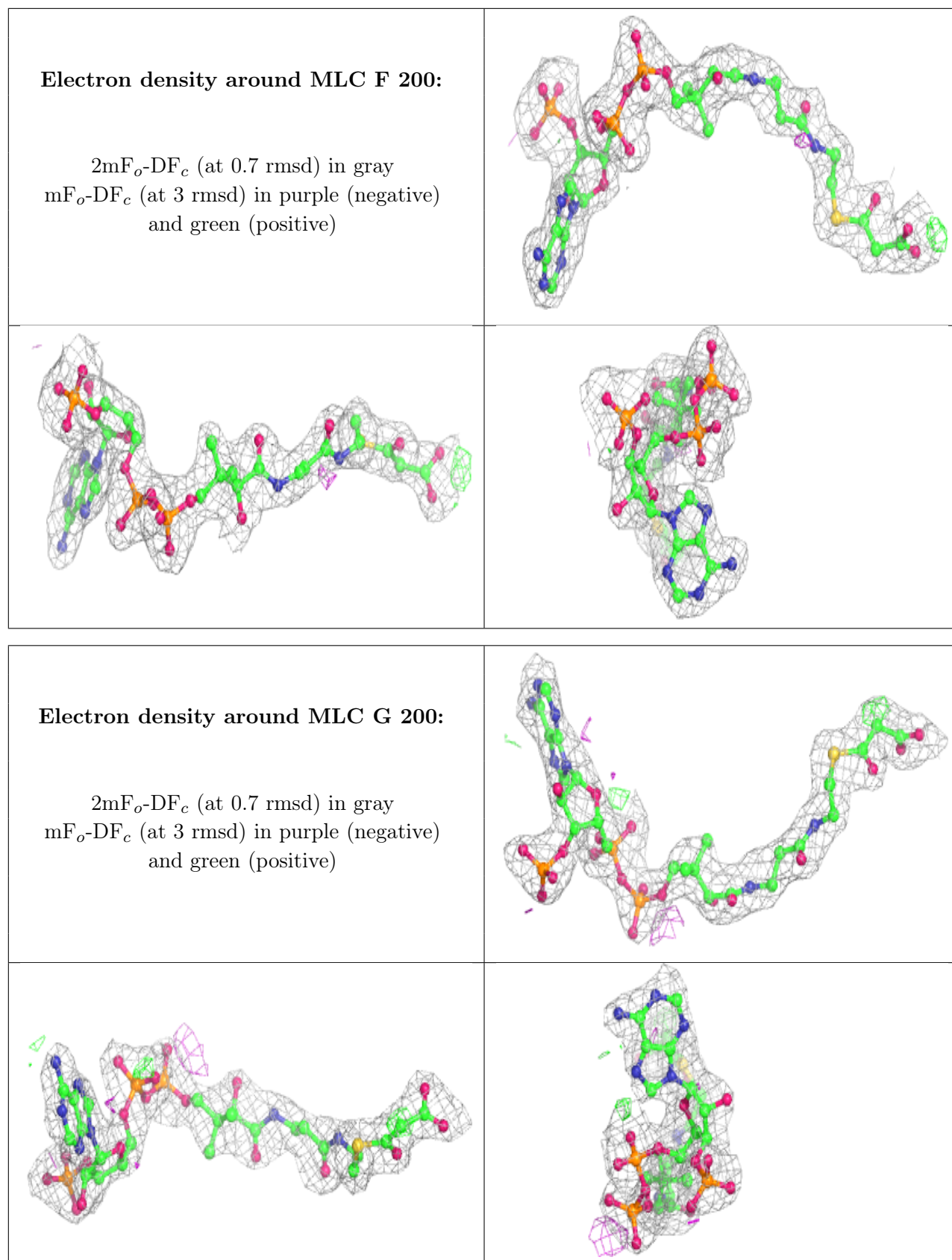
Electron density around MLC D 200:

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

Electron density around MLC E 200:

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

Electron density around MLC F 200:

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

Electron density around MLC G 200:

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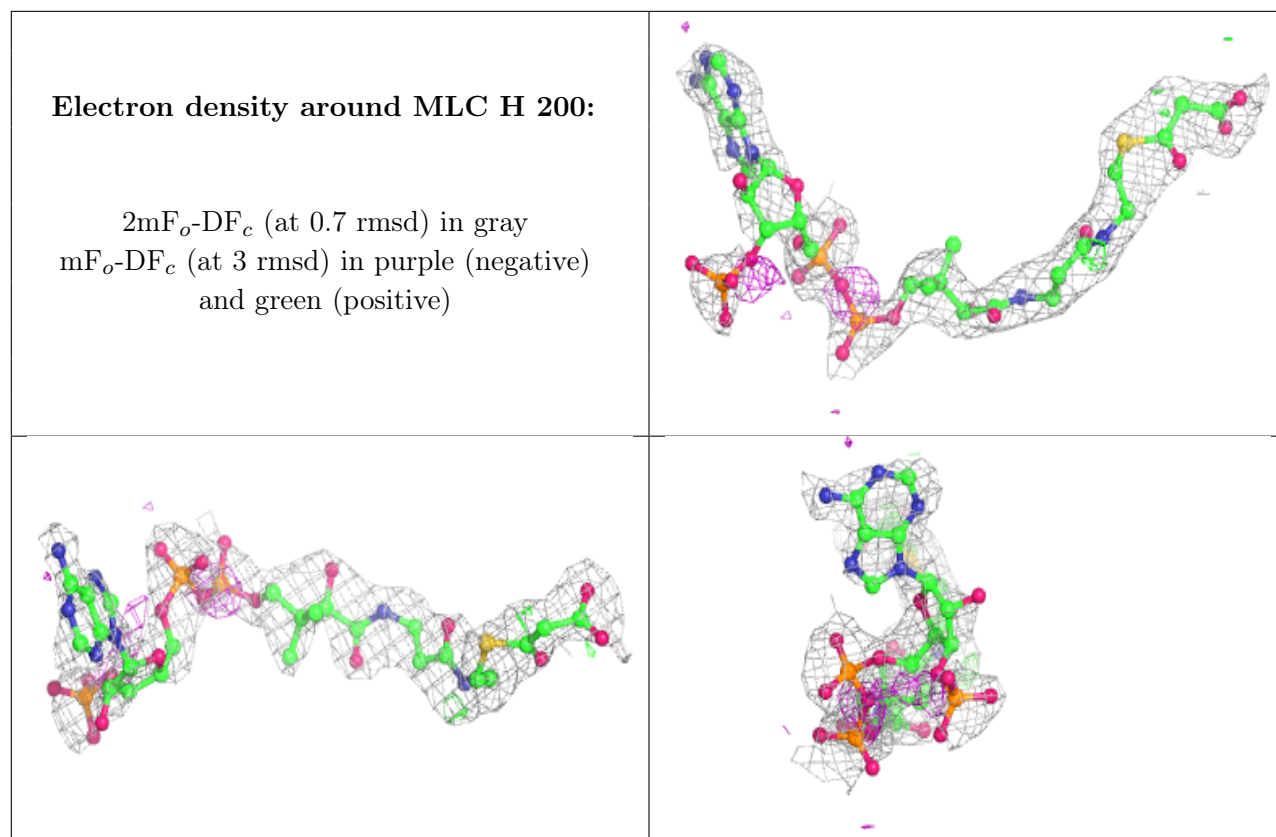$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around MLC H 200:

$2mF_o$-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 ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.