Full wwPDB X-ray Structure Validation Report ⓘ

Nov 16, 2026 – 10:12 AM EST

PDB ID	:	9ZDS / pdb_00009zds
Title	:	DnrV in complex with Daunorubicin
Authors	:	Newmister, S.A.; Harte, R.J.; Boesger, H.A.; Metsa-Ketela, M.; Sherman, D.H.
Deposited on	:	2025-11-26
Resolution	:	2.30 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

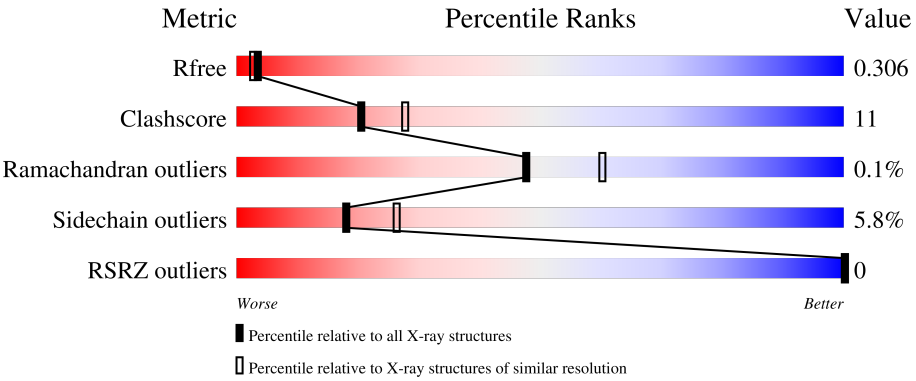
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 2.30 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.



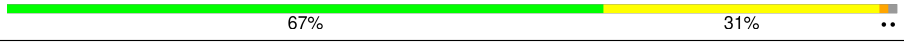
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	278	70% 27%
1	B	278	78% 19%
1	C	278	73% 25%
1	D	278	76% 22%
1	E	278	75% 23%

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Mol	Chain	Length	Quality of chain
1	F	278	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 12356 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 Anthracycline biosynthesis protein DnrV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			
1	B	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			
1	C	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			
1	D	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			
1	E	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			
1	F	275	Total	C	N	O	S	0	0	0
			2012	1273	347	385	7			

There are 18 discrepancies between the modelled and reference sequences:

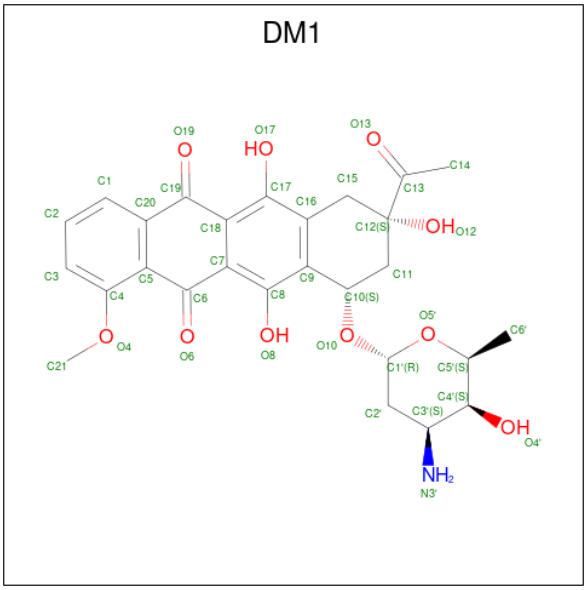
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	expression tag	UNP Q9ZAU2
A	-1	ALA	-	expression tag	UNP Q9ZAU2
A	0	SER	-	expression tag	UNP Q9ZAU2
B	-2	GLY	-	expression tag	UNP Q9ZAU2
B	-1	ALA	-	expression tag	UNP Q9ZAU2
B	0	SER	-	expression tag	UNP Q9ZAU2
C	-2	GLY	-	expression tag	UNP Q9ZAU2
C	-1	ALA	-	expression tag	UNP Q9ZAU2
C	0	SER	-	expression tag	UNP Q9ZAU2
D	-2	GLY	-	expression tag	UNP Q9ZAU2
D	-1	ALA	-	expression tag	UNP Q9ZAU2
D	0	SER	-	expression tag	UNP Q9ZAU2
E	-2	GLY	-	expression tag	UNP Q9ZAU2
E	-1	ALA	-	expression tag	UNP Q9ZAU2
E	0	SER	-	expression tag	UNP Q9ZAU2
F	-2	GLY	-	expression tag	UNP Q9ZAU2
F	-1	ALA	-	expression tag	UNP Q9ZAU2

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Chain	Residue	Modelled	Actual	Comment	Reference
F	0	SER	-	expression tag	UNP Q9ZAU2

- Molecule 2 is DAUNOMYCIN (CCD ID: DM1) (formula: $C_{27}H_{29}NO_{10}$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total C N O 38 27 1 10	0	0
2	B	1	Total C N O 38 27 1 10	0	0
2	D	1	Total C N O 38 27 1 10	0	0
2	E	1	Total C N O 38 27 1 10	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	31	Total O 31 31	0	0
3	B	28	Total O 28 28	0	0
3	C	8	Total O 8 8	0	0
3	D	36	Total O 36 36	0	0

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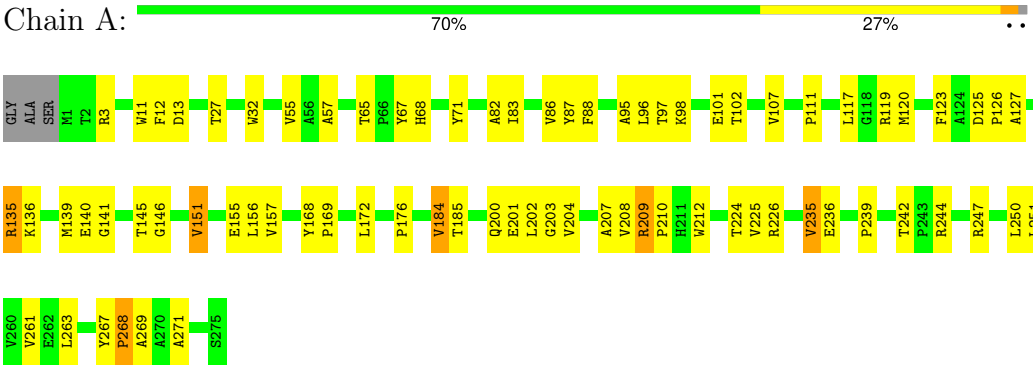
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	E	27	Total O 27 27	0	0
3	F	2	Total O 2 2	0	0

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.

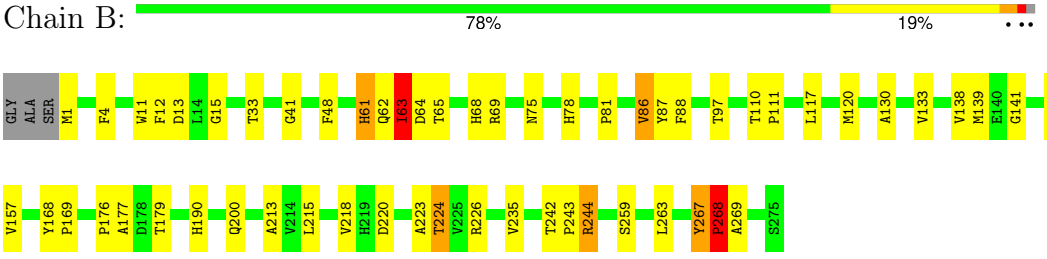
• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain A:



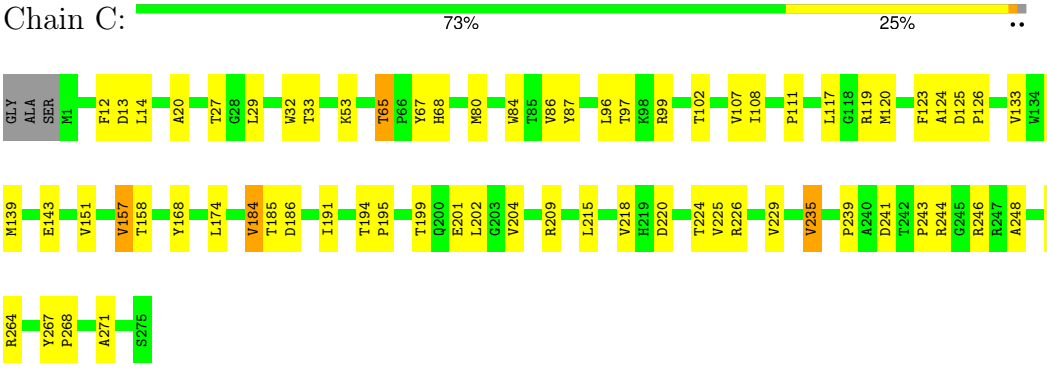
• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain B:



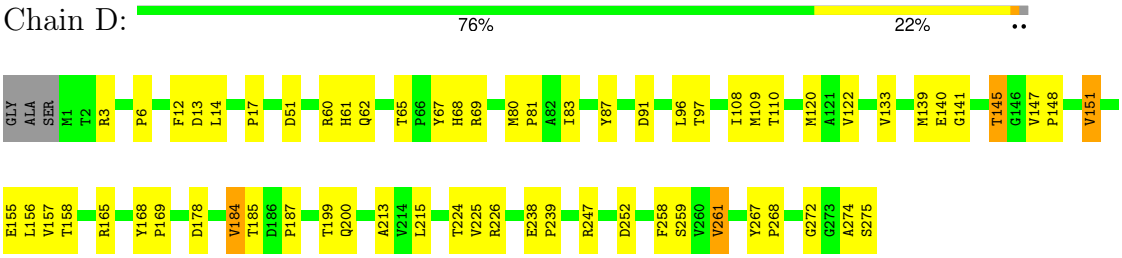
• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain C:



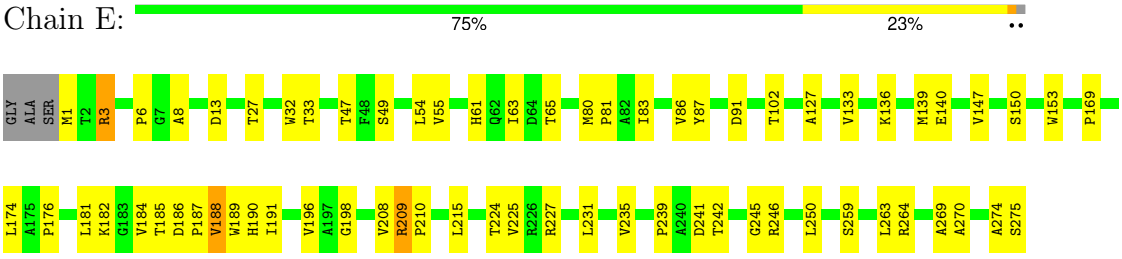
• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain D:



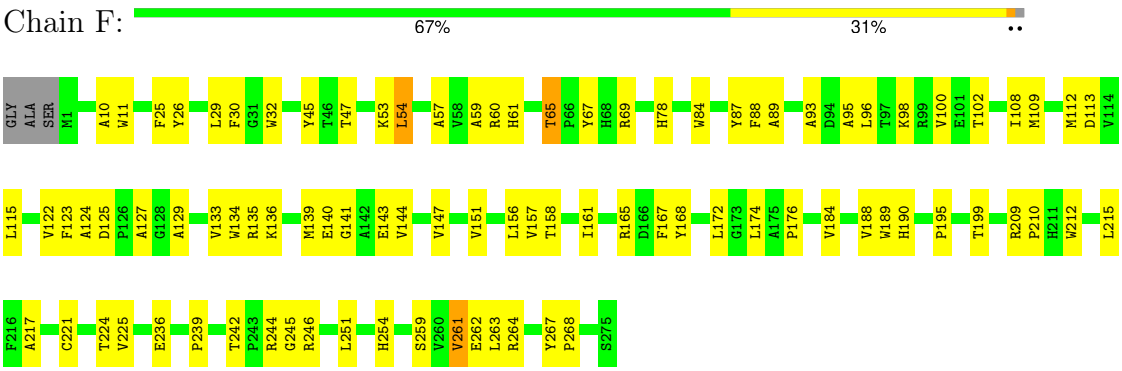
• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain E:



• Molecule 1: Anthracycline biosynthesis protein DnrV

Chain F:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	47.65Å 139.77Å 302.75Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.76 – 2.30 45.76 – 2.30	Depositor EDS
% Data completeness (in resolution range)	97.5 (45.76-2.30) 97.9 (45.76-2.30)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.03 (at 2.29Å)	Xtriage
Refinement program	PHENIX 1.21.2_5419	Depositor
R, R_{free}	0.228 , 0.301 0.235 , 0.306	Depositor DCC
R_{free} test set	1968 reflections (2.29%)	wwPDB-VP
Wilson B-factor (Å^2)	37.8	Xtriage
Anisotropy	0.376	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.35 , 29.7	EDS
L-test for twinning[2]	$< \|L\| > = 0.34$, $< L^2 > = 0.17$	Xtriage
Estimated twinning fraction	0.450 for h,-k,-l	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	12356	wwPDB-VP
Average B, all atoms (Å^2)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.82% 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: DM1

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	0.27	0/2070	0.56	0/2835
1	B	0.27	0/2070	0.61	5/2835 (0.2%)
1	C	0.18	0/2070	0.45	0/2835
1	D	0.21	0/2070	0.47	0/2835
1	E	0.18	0/2070	0.46	0/2835
1	F	0.15	0/2070	0.48	0/2835
All	All	0.22	0/12420	0.51	5/17010 (0.0%)

There are no bond length outliers.

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	B	267	TYR	CB-CA-C	10.54	123.64	109.42
1	B	64	ASP	N-CA-C	-9.04	99.59	110.44
1	B	268	PRO	CB-CA-C	6.47	122.23	111.56
1	B	62	GLN	N-CA-C	-6.03	105.10	112.88
1	B	63	ILE	N-CA-C	5.59	116.29	109.30

There are no chirality outliers.

There are no planarity outliers.

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	2012	0	1916	51	0
1	B	2012	0	1916	37	0
1	C	2012	0	1916	50	0
1	D	2012	0	1916	43	0
1	E	2012	0	1916	37	0
1	F	2012	0	1916	58	0
2	A	38	0	29	0	0
2	B	38	0	28	2	0
2	D	38	0	29	0	0
2	E	38	0	29	1	0
3	A	31	0	0	0	0
3	B	28	0	0	2	0
3	C	8	0	0	0	0
3	D	36	0	0	0	0
3	E	27	0	0	0	0
3	F	2	0	0	0	0
All	All	12356	0	11611	268	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 11.

All (268) 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:C:184:VAL:HB	1:C:243:PRO:HB2	1.47	0.96
1:B:244:ARG:NH1	1:B:268:PRO:HB2	1.80	0.96
1:A:13:ASP:HB2	1:A:87:TYR:HE1	1.43	0.82
1:B:223:ALA:HA	1:B:226:ARG:HE	1.45	0.81
1:F:236:GLU:HG2	1:F:251:LEU:HD21	1.65	0.77
1:B:267:TYR:HD1	1:B:268:PRO:HD2	1.52	0.75
1:E:13:ASP:HB2	1:E:87:TYR:HE1	1.55	0.72
1:C:185:THR:HG23	1:C:199:THR:H	1.54	0.72
1:A:139:MET:HG3	1:A:141:GLY:H	1.53	0.72
1:C:67:TYR:HB3	1:C:209:ARG:HH12	1.56	0.71
1:C:157:VAL:HG23	1:C:202:LEU:HA	1.75	0.69
1:C:184:VAL:HG23	1:C:244:ARG:HB2	1.73	0.69
1:E:225:VAL:HG21	1:E:239:PRO:HG3	1.77	0.66
1:D:165:ARG:HH21	1:D:187:PRO:HB3	1.59	0.66
1:C:97:THR:HG23	1:C:107:VAL:HG21	1.78	0.66
1:B:13:ASP:HB2	1:B:87:TYR:HE1	1.62	0.64
1:E:8:ALA:HB2	1:E:191:ILE:HD13	1.80	0.64
1:E:174:LEU:HB3	1:E:189:TRP:HB3	1.81	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:156:LEU:HD22	1:F:199:THR:HG23	1.80	0.63
1:D:13:ASP:HB2	1:D:87:TYR:HE1	1.62	0.62
1:D:109:MET:HE1	1:D:120:MET:HE2	1.82	0.62
1:E:208:VAL:HG22	1:E:209:ARG:HH11	1.63	0.62
1:C:96:LEU:HD13	1:C:99:ARG:HH21	1.65	0.61
1:F:244:ARG:HH11	1:F:244:ARG:HA	1.66	0.61
1:A:27:THR:HA	1:A:32:TRP:HB2	1.82	0.60
1:F:139:MET:HG2	1:F:141:GLY:H	1.67	0.60
1:B:1:MET:HB2	1:D:226:ARG:HD3	1.83	0.60
1:A:146:GLY:HA3	1:A:271:ALA:HB2	1.83	0.60
1:A:139:MET:HE1	1:B:138:VAL:HB	1.84	0.59
1:A:203:GLY:HA2	1:A:207:ALA:O	2.01	0.59
1:A:244:ARG:CZ	1:A:268:PRO:HB2	2.32	0.59
1:E:55:VAL:HG21	1:E:150:SER:HA	1.84	0.59
1:D:60:ARG:HH21	1:D:62:GLN:HG2	1.67	0.58
1:F:11:TRP:HB2	1:F:141:GLY:HA2	1.86	0.58
1:F:168:TYR:HB3	1:F:174:LEU:HD12	1.84	0.58
1:C:117:LEU:HA	1:C:138:VAL:HG22	1.85	0.58
1:F:10:ALA:HB2	1:F:89:ALA:HB2	1.85	0.58
1:A:65:THR:OG1	1:A:68:HIS:HB2	2.04	0.57
1:C:191:ILE:HG13	1:C:194:THR:HB	1.85	0.57
1:C:119:ARG:HE	1:C:135:ARG:HD3	1.69	0.57
1:D:238:GLU:HG2	1:D:239:PRO:HD2	1.87	0.57
1:B:63:ILE:HG23	1:B:65:THR:H	1.70	0.57
1:B:130:ALA:HB2	3:B:402:HOH:O	2.04	0.57
1:D:157:VAL:HG22	1:D:200:GLN:HB2	1.87	0.57
1:F:215:LEU:HG	1:F:259:SER:HB2	1.85	0.57
1:D:275:SER:HB3	1:E:3:ARG:HH21	1.69	0.57
1:A:169:PRO:HG3	1:A:176:PRO:HD3	1.85	0.56
1:A:235:VAL:HG13	1:A:250:LEU:HD23	1.87	0.56
1:A:157:VAL:HG22	1:A:200:GLN:HB2	1.88	0.56
1:C:12:PHE:CE2	1:C:151:VAL:HG11	2.40	0.56
1:E:188:VAL:HB	1:E:190:HIS:HE1	1.69	0.56
1:F:100:VAL:HG22	1:F:167:PHE:HZ	1.71	0.56
1:C:184:VAL:HG13	1:C:185:THR:H	1.70	0.55
1:F:93:ALA:HB2	1:F:135:ARG:HB2	1.87	0.55
1:A:67:TYR:HB3	1:A:209:ARG:HD3	1.88	0.55
1:C:225:VAL:HG21	1:C:239:PRO:HG3	1.88	0.55
1:E:13:ASP:HB2	1:E:87:TYR:CE1	2.38	0.55
1:A:127:ALA:O	1:A:210:PRO:HG2	2.06	0.55
1:B:267:TYR:CD1	1:B:268:PRO:HD2	2.37	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:157:VAL:HG22	1:B:200:GLN:HB2	1.89	0.54
1:E:182:LYS:N	1:E:186:ASP:HB3	2.22	0.54
1:D:65:THR:HG23	1:D:108:ILE:HD13	1.89	0.54
1:A:96:LEU:HD11	1:A:172:LEU:HD23	1.88	0.54
1:E:182:LYS:HA	1:E:186:ASP:HB3	1.89	0.54
1:F:246:ARG:O	1:F:261:VAL:HA	2.08	0.54
1:D:215:LEU:HG	1:D:259:SER:HB2	1.88	0.54
1:F:189:TRP:CD1	1:F:199:THR:HG1	2.26	0.54
1:A:111:PRO:HA	1:A:120:MET:O	2.08	0.53
1:A:263:LEU:HD23	1:A:269:ALA:HB1	1.91	0.53
1:B:169:PRO:HG3	1:B:176:PRO:HD3	1.89	0.53
1:F:87:TYR:HD2	1:F:134:TRP:HB2	1.73	0.53
1:A:244:ARG:NH2	1:A:268:PRO:HB2	2.23	0.53
1:C:244:ARG:HH12	1:C:267:TYR:HB3	1.74	0.53
1:B:156:LEU:HD22	1:B:168:TYR:HE2	1.72	0.53
1:F:165:ARG:HA	1:F:189:TRP:HH2	1.74	0.53
1:C:264:ARG:HE	1:C:264:ARG:HA	1.74	0.52
1:C:218:VAL:HG11	1:C:260:VAL:HB	1.90	0.52
1:D:139:MET:HG2	1:D:141:GLY:H	1.74	0.52
1:C:29:LEU:HD11	1:C:224:THR:HG23	1.92	0.52
1:D:247:ARG:HB2	1:D:261:VAL:HG12	1.92	0.52
1:F:54:LEU:HB2	1:F:143:GLU:HG3	1.91	0.52
1:F:236:GLU:HG2	1:F:251:LEU:CD2	2.39	0.52
1:D:156:LEU:HD22	1:D:168:TYR:HE2	1.74	0.52
1:B:220:ASP:HB3	1:B:223:ALA:HB3	1.92	0.51
1:A:247:ARG:HB3	1:A:261:VAL:HG12	1.92	0.51
1:E:215:LEU:HG	1:E:259:SER:HB2	1.91	0.51
1:B:75:ASN:HB3	1:B:78:HIS:NE2	2.26	0.51
1:E:182:LYS:CA	1:E:186:ASP:HB3	2.40	0.51
1:E:139:MET:HE3	2:E:301:DM1:H2	1.93	0.50
1:C:111:PRO:HA	1:C:120:MET:O	2.11	0.50
1:A:242:THR:HG22	1:A:244:ARG:H	1.76	0.50
1:B:69:ARG:C	1:B:81:PRO:HB3	2.36	0.50
1:B:242:THR:HG22	1:B:243:PRO:HD2	1.92	0.50
1:C:13:ASP:HB2	1:C:87:TYR:CE1	2.47	0.50
1:C:239:PRO:HA	1:C:248:ALA:HB2	1.93	0.50
1:A:140:GLU:O	1:A:140:GLU:HG3	2.12	0.50
1:A:71:TYR:HB3	1:A:208:VAL:HG22	1.94	0.50
1:E:196:VAL:HG12	1:E:270:ALA:HA	1.94	0.50
1:F:26:TYR:HE2	1:F:84:TRP:HZ2	1.59	0.50
1:F:136:LYS:HG3	1:F:140:GLU:HA	1.93	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:87:TYR:HE2	1:B:120:MET:HE3	1.76	0.49
1:C:215:LEU:HG	1:C:259:SER:HB2	1.93	0.49
1:E:169:PRO:HG3	1:E:176:PRO:HD3	1.94	0.49
1:C:53:LYS:HA	1:C:143:GLU:OE1	2.13	0.49
1:A:13:ASP:HB2	1:A:87:TYR:CE1	2.35	0.49
1:C:168:TYR:HB3	1:C:174:LEU:HB2	1.95	0.49
1:D:13:ASP:HB2	1:D:87:TYR:CE1	2.47	0.49
1:B:15:GLY:HA3	1:B:61:HIS:CE1	2.48	0.49
1:C:136:LYS:HG3	1:C:139:MET:O	2.13	0.49
1:A:201:GLU:O	1:A:204:VAL:HG23	2.11	0.49
1:D:60:ARG:HG2	1:D:61:HIS:H	1.78	0.49
1:D:185:THR:HG23	1:D:199:THR:O	2.13	0.49
1:A:3:ARG:HB2	1:A:140:GLU:HG2	1.95	0.49
1:E:245:GLY:HA2	1:E:264:ARG:HH21	1.77	0.49
1:F:25:PHE:HD2	1:F:26:TYR:CD1	2.30	0.49
1:C:13:ASP:HB2	1:C:87:TYR:HE1	1.78	0.48
1:B:12:PHE:HD1	1:B:86:VAL:HG22	1.77	0.48
1:C:201:GLU:O	1:C:204:VAL:HG23	2.13	0.48
1:A:107:VAL:HA	1:A:123:PHE:HD1	1.78	0.48
1:A:156:LEU:HB2	1:A:212:TRP:CH2	2.48	0.48
1:B:139:MET:HG3	1:B:141:GLY:H	1.79	0.48
1:F:108:ILE:HD11	1:F:124:ALA:HB2	1.95	0.48
1:B:268:PRO:HD3	3:B:425:HOH:O	2.13	0.48
1:B:41:GLY:HA2	1:C:20:ALA:HB2	1.95	0.48
1:D:274:ALA:HA	1:E:275:SER:O	2.13	0.48
1:E:185:THR:HG23	1:E:198:GLY:HA3	1.96	0.48
1:A:11:TRP:HZ2	1:A:57:ALA:HB2	1.77	0.48
2:B:301:DM1:O8	2:B:301:DM1:H3'	2.14	0.48
1:D:147:VAL:HG12	1:D:148:PRO:HD2	1.96	0.47
1:F:53:LYS:HD2	1:F:144:VAL:HB	1.94	0.47
1:D:51:ASP:C	1:E:1:MET:H3	2.22	0.47
1:F:165:ARG:HG2	1:F:189:TRP:CZ2	2.49	0.47
1:F:195:PRO:CD	1:F:268:PRO:HB2	2.44	0.47
1:E:181:LEU:C	1:E:186:ASP:HB3	2.39	0.47
1:F:11:TRP:HZ2	1:F:57:ALA:HB2	1.78	0.47
1:D:96:LEU:HD21	1:D:133:VAL:HG11	1.95	0.47
1:E:27:THR:HA	1:E:32:TRP:HB2	1.97	0.47
1:F:242:THR:OG1	1:F:245:GLY:O	2.32	0.47
1:B:226:ARG:H	1:B:226:ARG:HG2	1.58	0.47
1:C:226:ARG:O	1:C:229:VAL:HG12	2.13	0.47
1:D:139:MET:HB3	1:D:139:MET:HE2	1.69	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:117:LEU:HA	1:B:138:VAL:HG22	1.96	0.47
1:B:155:GLU:HB2	1:B:213:ALA:HB3	1.97	0.47
1:F:112:MET:HG3	1:F:113:ASP:N	2.29	0.47
1:D:252:ASP:HB3	1:D:258:PHE:HE2	1.80	0.47
1:D:267:TYR:CD2	1:D:268:PRO:HD2	2.50	0.47
1:C:68:HIS:NE2	1:C:80:MET:HG3	2.30	0.46
1:C:117:LEU:HD23	1:C:138:VAL:HG23	1.96	0.46
1:B:215:LEU:HG	1:B:259:SER:HB2	1.96	0.46
1:B:263:LEU:HD13	1:B:269:ALA:HB1	1.96	0.46
1:D:65:THR:HG22	1:D:67:TYR:H	1.80	0.46
1:D:225:VAL:HG21	1:D:239:PRO:HG3	1.97	0.46
1:F:29:LEU:HD12	1:F:30:PHE:CE2	2.50	0.46
1:F:69:ARG:HD2	1:F:209:ARG:HD2	1.97	0.46
1:B:111:PRO:HA	1:B:120:MET:O	2.16	0.46
1:E:47:THR:HB	1:E:54:LEU:HD12	1.98	0.46
1:E:127:ALA:O	1:E:210:PRO:HG2	2.16	0.46
1:F:96:LEU:HD12	1:F:133:VAL:HG11	1.97	0.46
1:F:26:TYR:HD2	1:F:32:TRP:HZ3	1.64	0.46
1:D:109:MET:HE3	1:D:122:VAL:HG23	1.97	0.45
1:C:191:ILE:HG13	1:C:191:ILE:O	2.14	0.45
1:D:67:TYR:CE2	1:D:108:ILE:HD11	2.51	0.45
1:D:69:ARG:C	1:D:81:PRO:HG3	2.41	0.45
1:C:107:VAL:HG22	1:C:123:PHE:HD1	1.81	0.45
1:C:117:LEU:HA	1:C:138:VAL:CG2	2.47	0.45
1:A:184:VAL:HG12	1:A:185:THR:N	2.32	0.45
1:E:186:ASP:HA	1:E:187:PRO:C	2.41	0.45
1:E:227:ARG:O	1:E:231:LEU:HG	2.16	0.45
1:F:122:VAL:C	1:F:123:PHE:HD1	2.24	0.45
1:C:194:THR:CG2	1:C:271:ALA:H	2.30	0.45
1:F:47:THR:HG22	1:F:57:ALA:HB2	1.99	0.45
1:F:176:PRO:HB3	1:F:189:TRP:CE3	2.52	0.45
1:D:17:PRO:HB3	1:D:80:MET:HB3	1.98	0.45
1:D:275:SER:HB2	1:E:274:ALA:HA	1.98	0.45
1:C:244:ARG:NH1	1:C:267:TYR:HB3	2.31	0.45
1:D:165:ARG:NH2	1:D:187:PRO:HB3	2.29	0.45
1:F:129:ALA:HB1	1:F:212:TRP:NE1	2.31	0.45
1:B:244:ARG:HH12	1:B:268:PRO:HB2	1.74	0.44
1:E:136:LYS:HD2	1:E:140:GLU:HB3	1.99	0.44
1:F:11:TRP:HB3	1:F:87:TYR:HB2	1.98	0.44
1:A:226:ARG:CD	1:E:1:MET:HA	2.46	0.44
1:F:221:CYS:HB2	1:F:262:GLU:OE1	2.17	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:95:ALA:HA	1:A:98:LYS:HE2	1.98	0.44
1:A:107:VAL:HG13	1:A:123:PHE:HE1	1.83	0.44
1:D:165:ARG:O	1:D:169:PRO:HG2	2.16	0.44
1:E:235:VAL:HA	1:E:250:LEU:HD23	2.00	0.44
1:F:267:TYR:CG	1:F:268:PRO:HD2	2.52	0.44
1:A:202:LEU:HD21	1:A:208:VAL:O	2.17	0.43
1:A:236:GLU:HG3	1:A:251:LEU:HD13	2.00	0.43
1:B:33:THR:O	1:B:48:PHE:HA	2.18	0.43
1:F:95:ALA:O	1:F:98:LYS:HG2	2.19	0.43
1:F:109:MET:HE3	1:F:122:VAL:HG23	2.01	0.43
1:F:190:HIS:NE2	1:F:195:PRO:HB3	2.33	0.43
1:F:195:PRO:HD2	1:F:268:PRO:HB2	2.00	0.43
1:F:217:ALA:HA	1:F:261:VAL:O	2.19	0.43
1:C:117:LEU:HB3	1:C:139:MET:HB2	2.00	0.43
1:F:87:TYR:C	1:F:88:PHE:HD1	2.26	0.43
1:F:209:ARG:HA	1:F:210:PRO:HD3	1.79	0.43
1:B:88:PHE:H	1:B:133:VAL:HA	1.83	0.43
1:C:108:ILE:HD11	1:C:124:ALA:HB2	2.01	0.43
1:F:78:HIS:CD2	1:F:254:HIS:HA	2.54	0.43
1:F:109:MET:HB3	1:F:122:VAL:H	1.84	0.43
1:B:15:GLY:HA3	1:B:61:HIS:ND1	2.33	0.43
1:C:27:THR:HG23	1:C:32:TRP:O	2.19	0.43
1:A:139:MET:HE2	1:A:139:MET:HB2	1.54	0.43
1:C:218:VAL:CG1	1:C:260:VAL:HB	2.47	0.43
1:D:3:ARG:HB3	1:D:140:GLU:OE1	2.19	0.42
1:D:69:ARG:O	1:D:81:PRO:HG3	2.19	0.42
1:D:109:MET:HG2	1:D:110:THR:O	2.19	0.42
1:E:241:ASP:HA	1:E:246:ARG:HA	2.00	0.42
1:F:45:TYR:CE1	1:F:59:ALA:HB2	2.54	0.42
1:F:127:ALA:HB1	1:F:158:THR:HG21	2.01	0.42
1:A:119:ARG:HD3	1:A:135:ARG:NH1	2.34	0.42
1:C:14:LEU:HD13	1:C:84:TRP:CD1	2.54	0.42
1:A:267:TYR:CG	1:A:268:PRO:HD2	2.54	0.42
1:F:161:ILE:O	1:F:165:ARG:HG3	2.19	0.42
1:A:225:VAL:HG21	1:A:239:PRO:HG3	2.01	0.42
1:C:218:VAL:HG22	1:C:220:ASP:H	1.84	0.42
1:E:6:PRO:HG3	1:E:91:ASP:OD1	2.20	0.42
1:E:185:THR:HG22	1:E:185:THR:O	2.19	0.42
1:A:71:TYR:HA	1:A:208:VAL:HG22	2.00	0.42
1:A:82:ALA:HB3	1:A:256:ALA:HB2	2.01	0.42
1:A:156:LEU:HD22	1:A:168:TYR:HE2	1.84	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:165:ARG:HG2	1:F:189:TRP:HZ2	1.82	0.42
1:C:12:PHE:CE1	1:C:86:VAL:HG13	2.55	0.42
1:D:14:LEU:HD12	1:D:83:ILE:O	2.20	0.42
1:E:263:LEU:HD23	1:E:263:LEU:HA	1.91	0.42
1:D:12:PHE:CZ	1:D:151:VAL:HG11	2.54	0.42
1:E:33:THR:HB	1:E:49:SER:HB2	2.02	0.42
1:F:172:LEU:HB3	1:F:174:LEU:HG	2.02	0.42
1:F:225:VAL:HG21	1:F:239:PRO:HG3	2.02	0.42
1:F:54:LEU:HD13	1:F:143:GLU:OE1	2.20	0.41
1:A:155:GLU:CD	1:A:247:ARG:HH12	2.29	0.41
1:C:99:ARG:HA	1:C:102:THR:HG22	2.01	0.41
1:A:145:THR:O	1:A:271:ALA:HB2	2.20	0.41
1:D:145:THR:O	1:D:272:GLY:HA2	2.20	0.41
1:B:11:TRP:CD1	2:B:301:DM1:H211	2.55	0.41
1:B:177:ALA:HB3	1:B:190:HIS:CE1	2.56	0.41
1:A:98:LYS:O	1:A:101:GLU:HG2	2.20	0.41
1:D:184:VAL:HG22	1:D:185:THR:OG1	2.21	0.41
1:B:12:PHE:CD1	1:B:86:VAL:HG22	2.55	0.41
1:C:195:PRO:HG3	1:C:268:PRO:HB3	2.02	0.41
1:A:12:PHE:CZ	1:A:151:VAL:HG11	2.56	0.41
1:A:136:LYS:HD2	1:A:140:GLU:OE1	2.21	0.41
1:A:244:ARG:HA	1:A:244:ARG:HD3	1.81	0.41
1:D:67:TYR:HE2	1:D:108:ILE:HD11	1.86	0.41
1:E:153:TRP:HZ3	1:E:269:ALA:HA	1.85	0.41
1:F:190:HIS:CD2	1:F:195:PRO:HB3	2.56	0.41
1:F:263:LEU:HD23	1:F:263:LEU:HA	1.81	0.41
1:F:264:ARG:HE	1:F:264:ARG:HA	1.86	0.41
1:C:67:TYR:HB3	1:C:209:ARG:NH1	2.31	0.41
1:D:67:TYR:C	1:D:68:HIS:HD2	2.28	0.41
1:F:65:THR:C	1:F:67:TYR:H	2.29	0.41
1:A:202:LEU:HD12	1:A:210:PRO:HG3	2.02	0.40
1:C:225:VAL:HG13	1:C:235:VAL:HG21	2.02	0.40
1:F:60:ARG:HG3	1:F:61:HIS:H	1.85	0.40
1:A:117:LEU:HD21	1:B:138:VAL:HG21	2.04	0.40
1:A:125:ASP:HB2	1:A:126:PRO:HD2	2.03	0.40
1:C:65:THR:C	1:C:67:TYR:H	2.28	0.40
1:C:241:ASP:HA	1:C:246:ARG:HA	2.03	0.40
1:E:80:MET:HA	1:E:81:PRO:HD3	1.90	0.40
1:B:218:VAL:HG21	1:B:224:THR:OG1	2.22	0.40
1:C:125:ASP:OD1	1:C:126:PRO:HD2	2.22	0.40
1:D:155:GLU:HB2	1:D:213:ALA:HB3	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:82:ALA:O	1:A:256:ALA:HA	2.20	0.40
1:A:88:PHE:HE1	1:A:131:PHE:HB2	1.87	0.40
1:C:107:VAL:HG22	1:C:123:PHE:CD1	2.57	0.40
1:D:6:PRO:HG3	1:D:91:ASP:OD1	2.21	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	273/278 (98%)	260 (95%)	12 (4%)	1 (0%)	30	38
1	B	273/278 (98%)	263 (96%)	9 (3%)	1 (0%)	30	38
1	C	273/278 (98%)	263 (96%)	10 (4%)	0	100	100
1	D	273/278 (98%)	261 (96%)	12 (4%)	0	100	100
1	E	273/278 (98%)	260 (95%)	13 (5%)	0	100	100
1	F	273/278 (98%)	259 (95%)	14 (5%)	0	100	100
All	All	1638/1668 (98%)	1566 (96%)	70 (4%)	2 (0%)	48	60

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	268	PRO
1	B	268	PRO

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	196/197 (100%)	183 (93%)	13 (7%)	15	21
1	B	196/197 (100%)	184 (94%)	12 (6%)	17	24
1	C	196/197 (100%)	187 (95%)	9 (5%)	24	36
1	D	196/197 (100%)	188 (96%)	8 (4%)	27	41
1	E	196/197 (100%)	182 (93%)	14 (7%)	13	19
1	F	196/197 (100%)	184 (94%)	12 (6%)	17	24
All	All	1176/1182 (100%)	1108 (94%)	68 (6%)	18	26

All (68) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	55	VAL
1	A	83	ILE
1	A	86	VAL
1	A	97	THR
1	A	102	THR
1	A	133	VAL
1	A	135	ARG
1	A	151	VAL
1	A	184	VAL
1	A	209	ARG
1	A	224	THR
1	A	235	VAL
1	A	259	SER
1	B	4	PHE
1	B	61	HIS
1	B	63	ILE
1	B	68	HIS
1	B	86	VAL
1	B	97	THR
1	B	110	THR
1	B	151	VAL
1	B	179	THR
1	B	224	THR
1	B	235	VAL
1	B	244	ARG
1	C	33	THR
1	C	65	THR

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Mol	Chain	Res	Type
1	C	133	VAL
1	C	157	VAL
1	C	158	THR
1	C	184	VAL
1	C	186	ASP
1	C	235	VAL
1	C	258	PHE
1	D	97	THR
1	D	145	THR
1	D	151	VAL
1	D	158	THR
1	D	178	ASP
1	D	184	VAL
1	D	224	THR
1	D	261	VAL
1	E	3	ARG
1	E	61	HIS
1	E	63	ILE
1	E	65	THR
1	E	83	ILE
1	E	86	VAL
1	E	102	THR
1	E	133	VAL
1	E	147	VAL
1	E	184	VAL
1	E	188	VAL
1	E	209	ARG
1	E	224	THR
1	E	242	THR
1	F	54	LEU
1	F	65	THR
1	F	102	THR
1	F	115	LEU
1	F	125	ASP
1	F	147	VAL
1	F	151	VAL
1	F	157	VAL
1	F	184	VAL
1	F	188	VAL
1	F	224	THR
1	F	261	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such

sidechains are listed below:

Mol	Chain	Res	Type
1	D	200	GLN
1	E	190	HIS
1	E	200	GLN
1	F	78	HIS
1	F	200	GLN
1	F	237	ASN
1	F	254	HIS

5.3.3 RNA (i)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

4 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	DM1	A	301	-	40,42,42	0.42	0	53,66,66	0.56	0
2	DM1	B	301	-	40,42,42	0.41	0	53,66,66	0.70	1 (1%)
2	DM1	E	301	-	40,42,42	0.41	0	53,66,66	0.62	1 (1%)
2	DM1	D	301	-	40,42,42	0.49	0	53,66,66	0.80	2 (3%)

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	DM1	A	301	-	-	3/12/58/58	0/5/5/5
2	DM1	B	301	-	-	4/12/58/58	0/5/5/5
2	DM1	E	301	-	-	2/12/58/58	0/5/5/5
2	DM1	D	301	-	-	4/12/58/58	0/5/5/5

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	301	DM1	O5'-C1'-C2'	2.92	115.37	110.84
2	B	301	DM1	C2'-C3'-C4'	2.49	113.80	110.08
2	D	301	DM1	O4-C4-C5	2.05	118.75	115.84
2	E	301	DM1	O4-C4-C5	2.04	118.73	115.84

There are no chirality outliers.

All (13) torsion outliers are listed below:

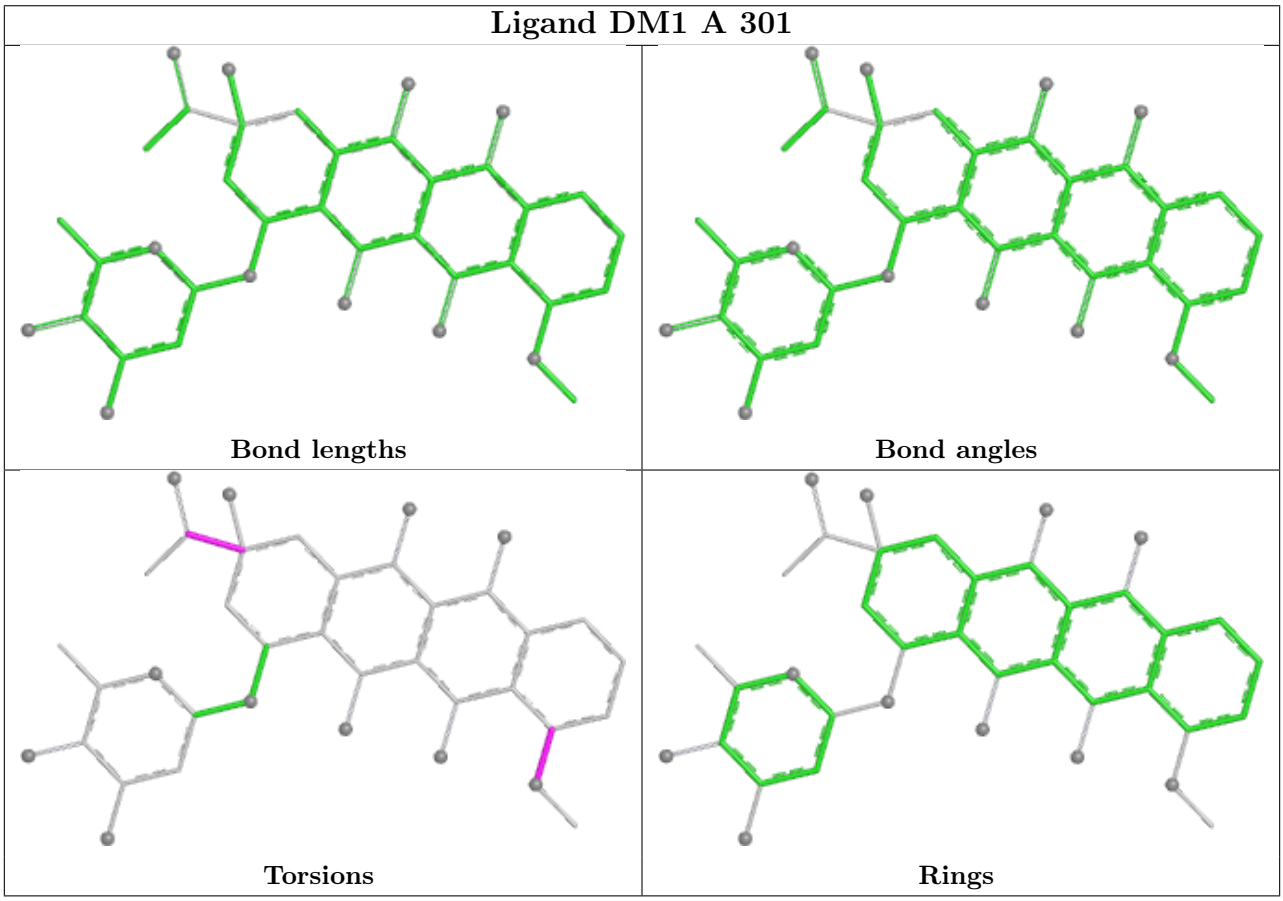
Mol	Chain	Res	Type	Atoms
2	B	301	DM1	C2'-C1'-O10-C10
2	B	301	DM1	C3-C4-O4-C21
2	B	301	DM1	O5'-C1'-O10-C10
2	B	301	DM1	C5-C4-O4-C21
2	A	301	DM1	C3-C4-O4-C21
2	D	301	DM1	C3-C4-O4-C21
2	A	301	DM1	C5-C4-O4-C21
2	D	301	DM1	C5-C4-O4-C21
2	E	301	DM1	C3-C4-O4-C21
2	E	301	DM1	C5-C4-O4-C21
2	D	301	DM1	C11-C10-O10-C1'
2	A	301	DM1	O12-C12-C13-O13
2	D	301	DM1	O12-C12-C13-O13

There are no ring outliers.

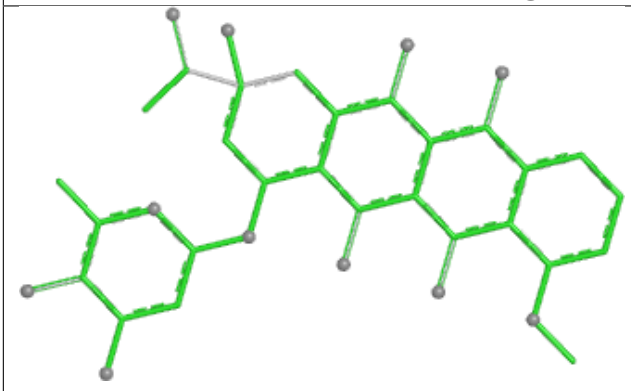
2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	301	DM1	2	0
2	E	301	DM1	1	0

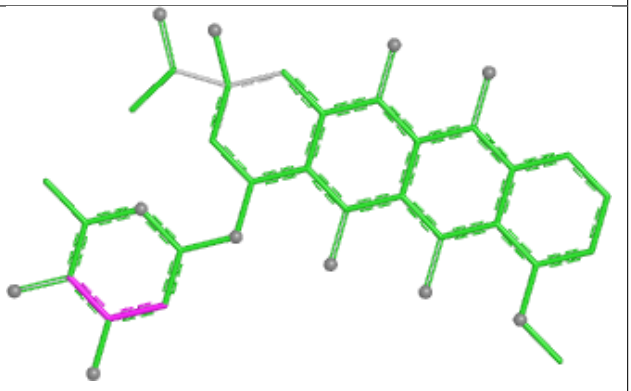
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.



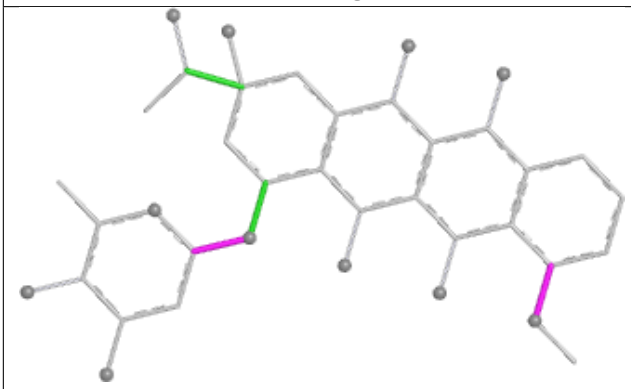
Ligand DM1 B 301



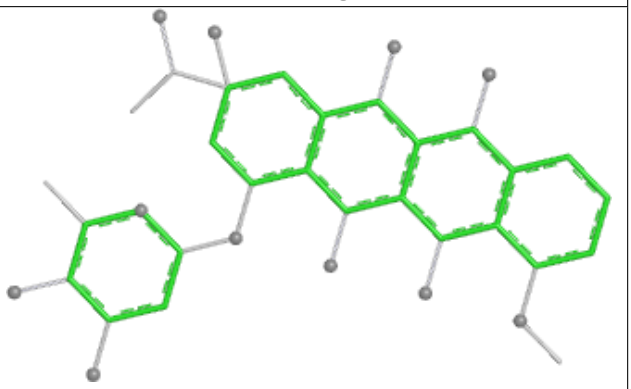
Bond lengths



Bond angles

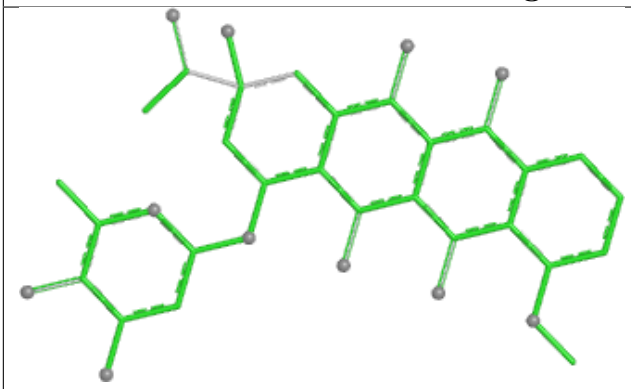


Torsions

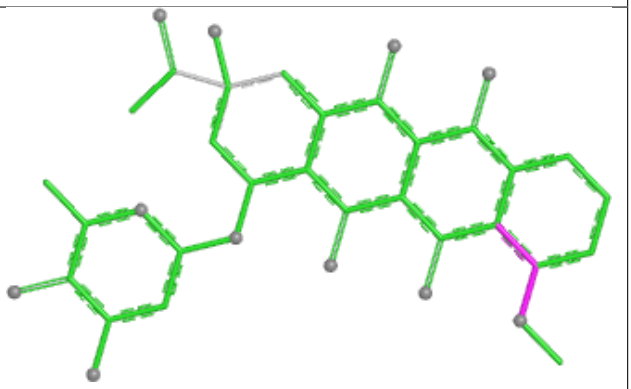


Rings

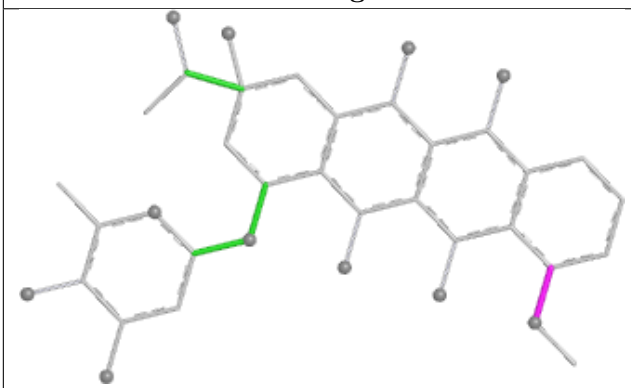
Ligand DM1 E 301



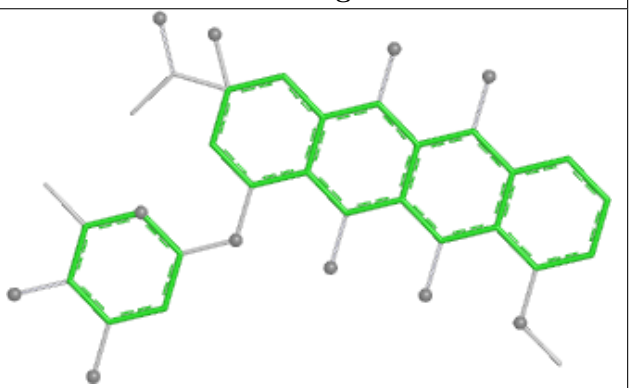
Bond lengths



Bond angles

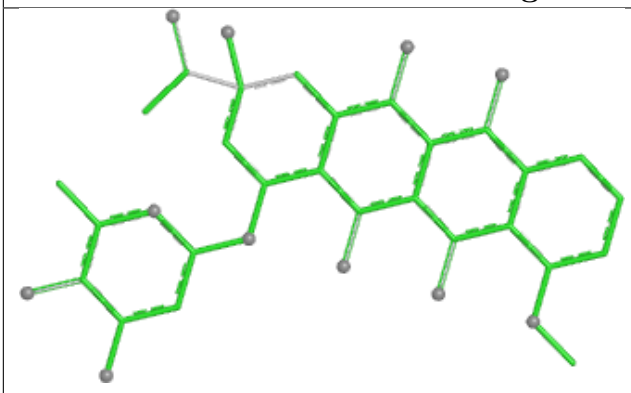


Torsions

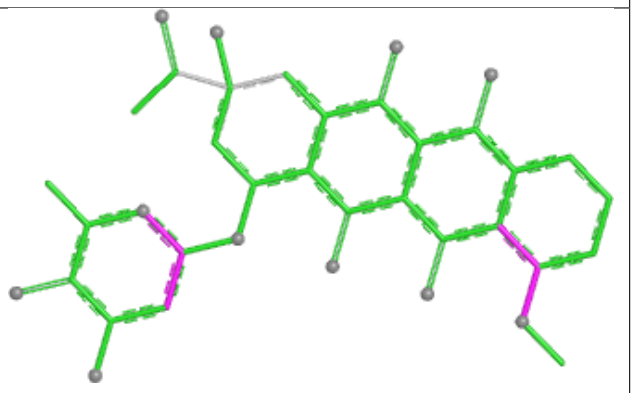


Rings

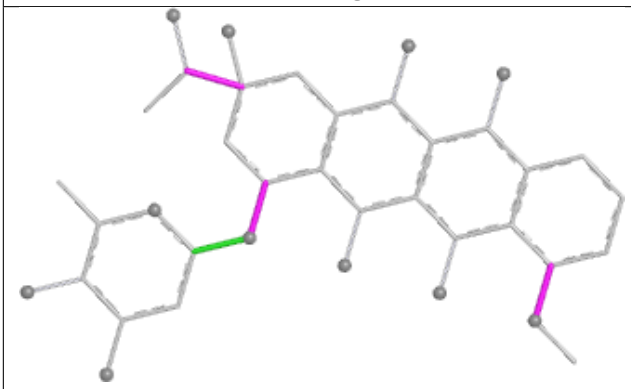
Ligand DM1 D 301



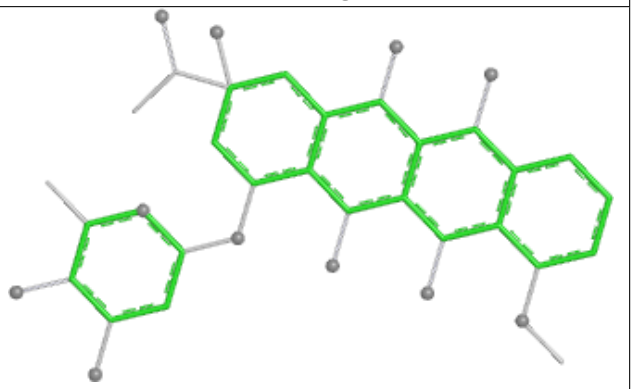
Bond lengths



Bond angles



Torsions



Rings

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	275/278 (98%)	-1.19	0	100	100	17, 26, 40, 50	0
1	B	275/278 (98%)	-1.21	0	100	100	17, 25, 38, 59	0
1	C	275/278 (98%)	-0.95	0	100	100	30, 43, 56, 68	0
1	D	275/278 (98%)	-1.10	0	100	100	20, 31, 45, 60	0
1	E	275/278 (98%)	-1.10	0	100	100	21, 32, 46, 58	0
1	F	275/278 (98%)	-0.74	0	100	100	33, 57, 73, 80	0
All	All	1650/1668 (98%)	-1.05	0	100	100	17, 33, 62, 80	0

There are no RSRZ outliers to report.

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

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

6.3 Carbohydrates

There are no oligosaccharides in this entry.

6.4 Ligands

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
2	DM1	B	301	38/38	0.98	0.05	21,32,38,40	0

Continued on next page...

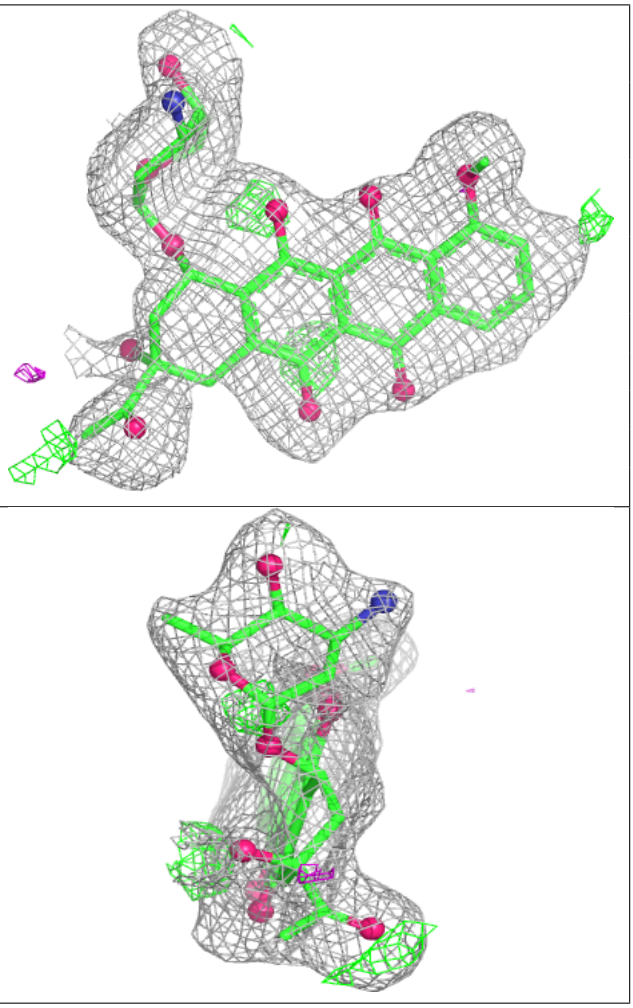
Continued from previous page...

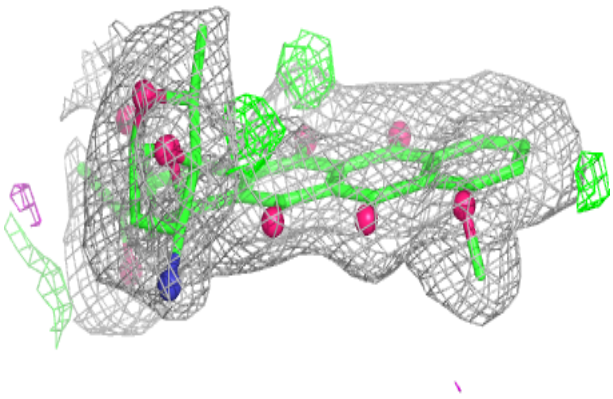
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	DM1	A	301	38/38	0.99	0.04	18,23,28,29	0
2	DM1	D	301	38/38	0.99	0.04	26,33,37,38	0
2	DM1	E	301	38/38	0.99	0.04	22,27,31,35	0

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 DM1 B 301:

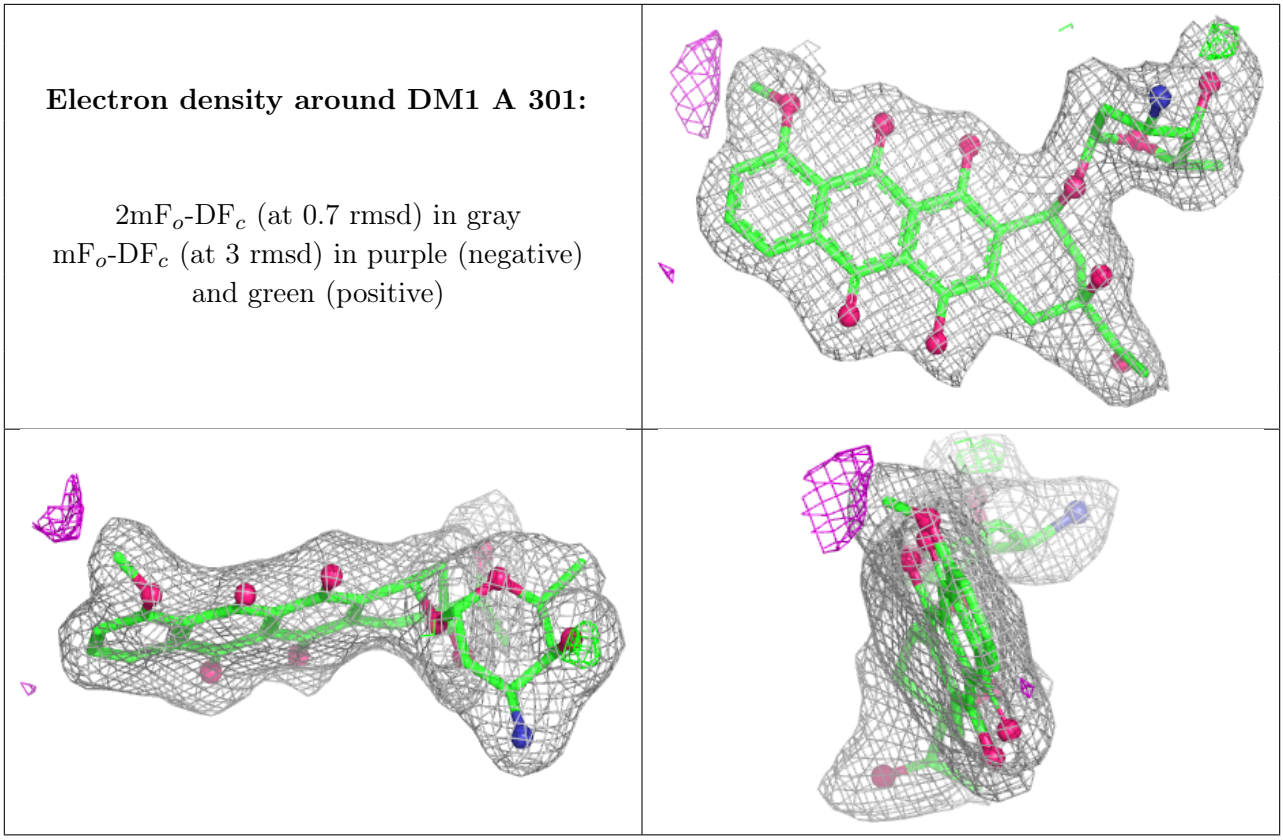
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)





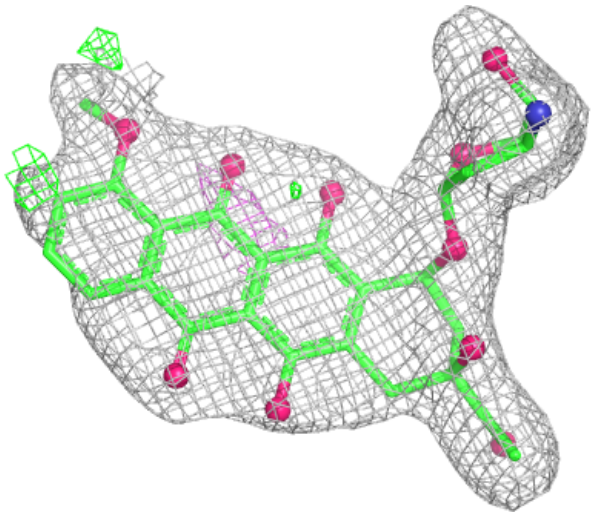
Electron density around DM1 A 301:

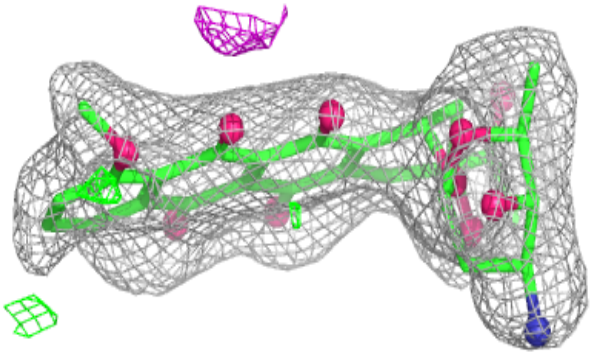
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative) and green (positive)

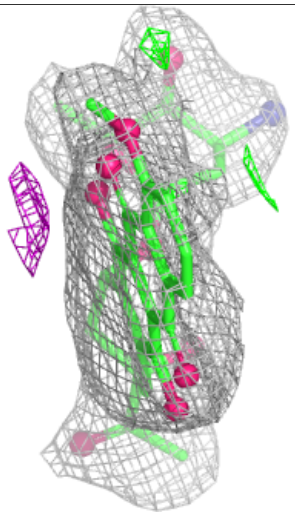


Electron density around DM1 D 301:

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

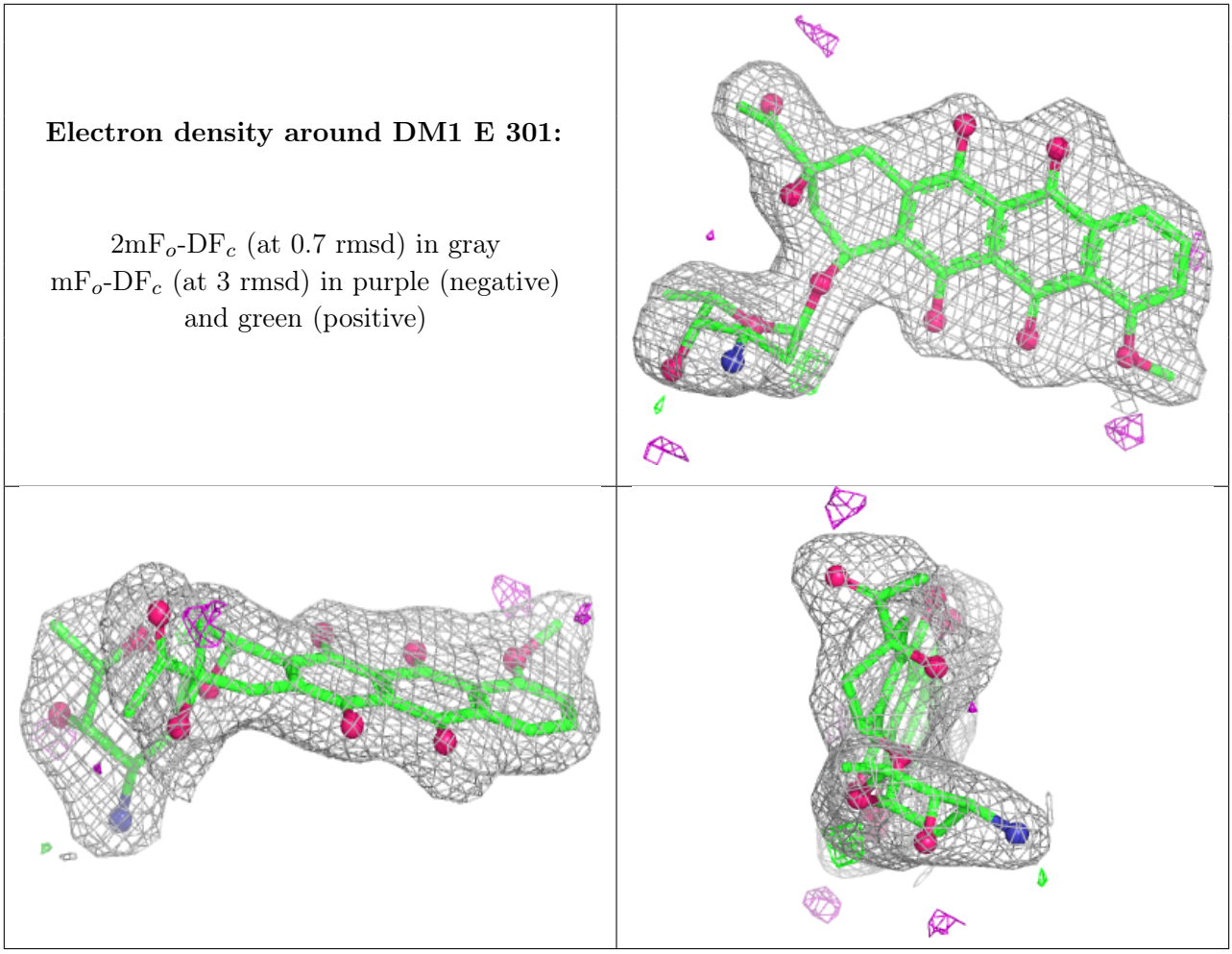






Electron density around DM1 E 301:

$2mF_o$-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

There are no such residues in this entry.