



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 22, 2023 – 11:04 PM JST

PDB ID : 7XRN
Title : Ethanolamine ammonia-lyase complexed with AdoMeCbl in the presence of substrate
Authors : Shibata, N.; Toraya, T.
Deposited on : 2022-05-10
Resolution : 2.07 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 : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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) : 2.36

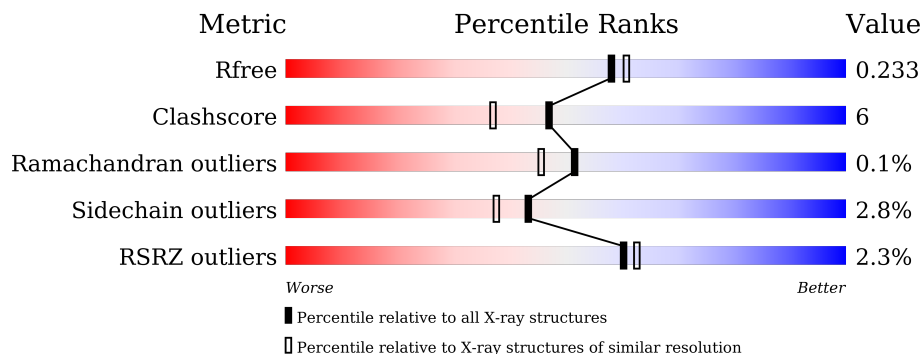
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.07 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}	130704	2684 (2.08-2.04)
Clashscore	141614	2801 (2.08-2.04)
Ramachandran outliers	138981	2768 (2.08-2.04)
Sidechain outliers	138945	2768 (2.08-2.04)
RSRZ outliers	127900	2646 (2.08-2.04)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	453	 89% 11%
1	C	453	 88% 12%
2	B	263	 5% 78% 17% .
2	D	263	 6% 76% 19% . .

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 11835 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 Ethanolamine ammonia-lyase large subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	453	3475	2177	595	681	22	0	2	0
1	C	453	3467	2172	593	680	22	0	1	0

- Molecule 2 is a protein called Ethanolamine ammonia-lyase small subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	252	1930	1205	351	364	10	0	2	0
2	D	252	1916	1197	347	362	10	0	0	0

There are 22 discrepancies between the modelled and reference sequences:

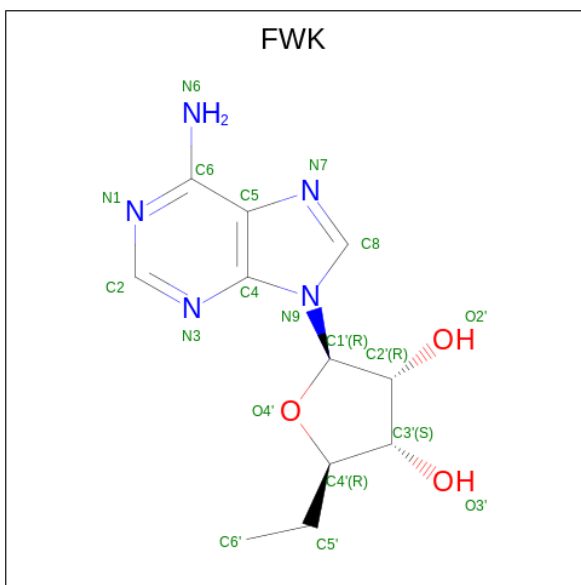
Chain	Residue	Modelled	Actual	Comment	Reference
B	33	MET	-	initiating methionine	UNP P19636
B	34	ASP	-	expression tag	UNP P19636
B	35	GLN	-	expression tag	UNP P19636
B	36	SER	-	expression tag	UNP P19636
B	37	SER	-	expression tag	UNP P19636
B	38	HIS	-	expression tag	UNP P19636
B	39	HIS	-	expression tag	UNP P19636
B	40	HIS	-	expression tag	UNP P19636
B	41	HIS	-	expression tag	UNP P19636
B	42	HIS	-	expression tag	UNP P19636
B	43	HIS	-	expression tag	UNP P19636
D	33	MET	-	initiating methionine	UNP P19636
D	34	ASP	-	expression tag	UNP P19636
D	35	GLN	-	expression tag	UNP P19636
D	36	SER	-	expression tag	UNP P19636
D	37	SER	-	expression tag	UNP P19636

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Chain	Residue	Modelled	Actual	Comment	Reference
D	38	HIS	-	expression tag	UNP P19636
D	39	HIS	-	expression tag	UNP P19636
D	40	HIS	-	expression tag	UNP P19636
D	41	HIS	-	expression tag	UNP P19636
D	42	HIS	-	expression tag	UNP P19636
D	43	HIS	-	expression tag	UNP P19636

- Molecule 3 is (2 {R},3 {R},4 {S},5 {R})-2-(6-aminopurin-9-yl)-5-ethyl-oxolane-3,4-diol (three-letter code: FWK) (formula: C₁₁H₁₅N₅O₃).



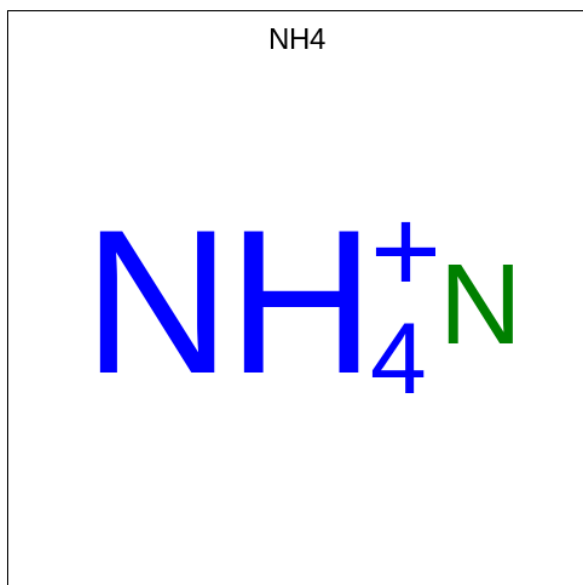
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
			Total	C	N			O
3	A	1	Total	C	N	O	0	1
			36	20	10	6		
3	C	1	Total	C	N	O	0	0
			18	10	5	3		

- Molecule 4 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).



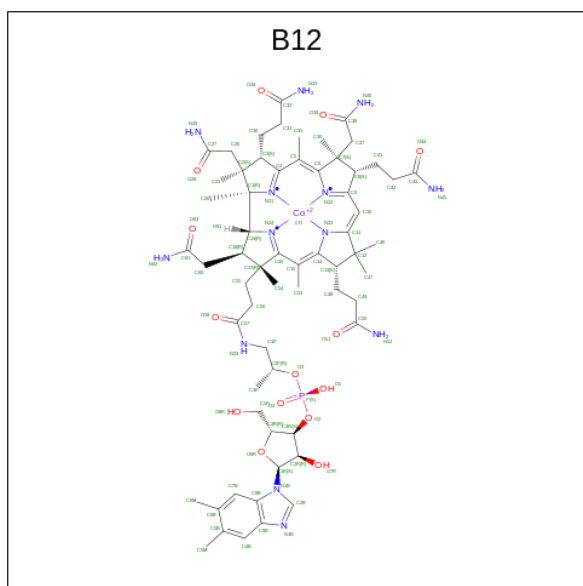
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C O 6 3 3	0	0
4	A	1	Total C O 6 3 3	0	0
4	B	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0
4	C	1	Total C O 6 3 3	0	0

- Molecule 5 is AMMONIUM ION (three-letter code: NH4) (formula: H₄N).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total N 1 1	0	0
5	C	1	Total N 1 1	0	0

- Molecule 6 is COBALAMIN (three-letter code: B12) (formula: $C_{62}H_{89}CoN_{13}O_{14}P$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	B	1	Total C Co N O P 95 64 1 14 15 1	0	1
6	D	1	Total C Co N O P 91 62 1 13 14 1	0	0

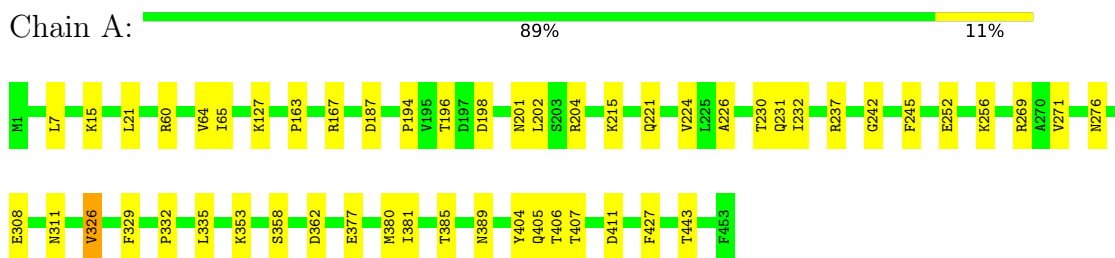
- Molecule 7 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	294	Total O 294 294	0	0
7	B	101	Total O 101 101	0	0
7	C	283	Total O 283 283	0	0
7	D	91	Total O 91 91	0	0

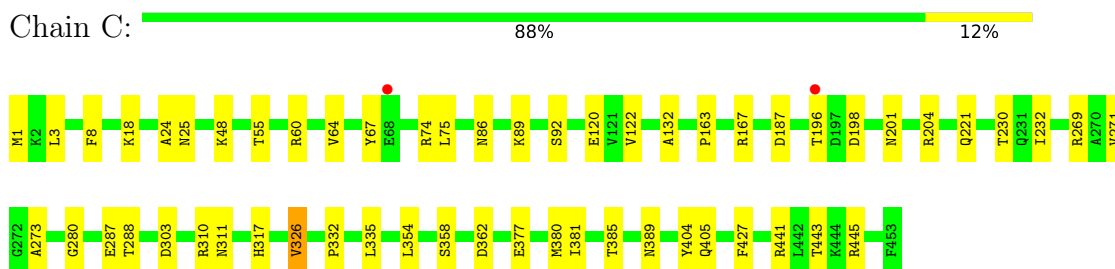
3 Residue-property plots

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

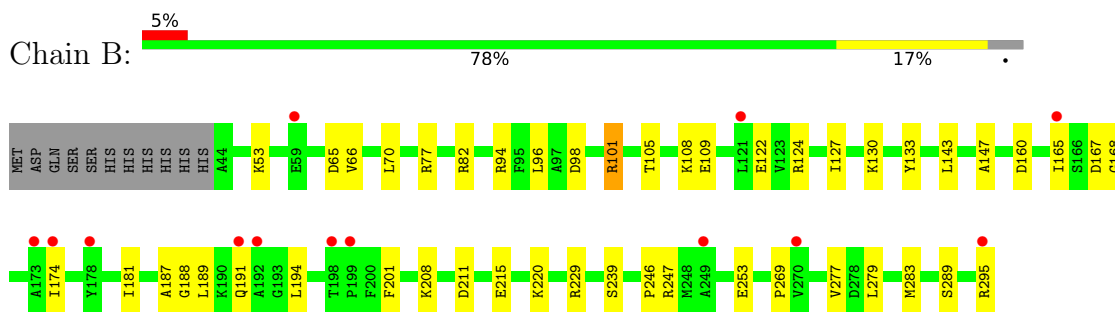
- Molecule 1: Ethanolamine ammonia-lyase large subunit



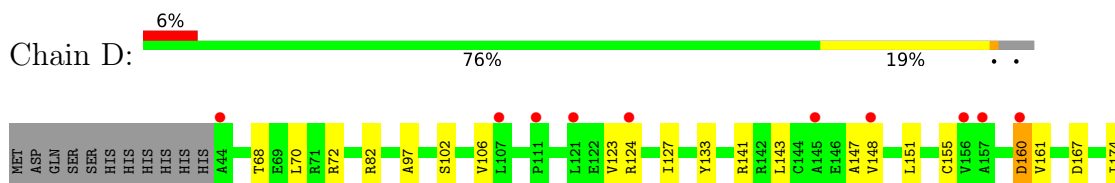
- Molecule 1: Ethanolamine ammonia-lyase large subunit



- Molecule 2: Ethanolamine ammonia-lyase small subunit



- Molecule 2: Ethanolamine ammonia-lyase small subunit





4 Data and refinement statistics

Property	Value	Source
Space group	P 63	Depositor
Cell constants a, b, c, α , β , γ	242.38Å 242.38Å 76.59Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.16 – 2.07 48.16 – 2.07	Depositor EDS
% Data completeness (in resolution range)	99.9 (48.16-2.07) 98.6 (48.16-2.07)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.70 (at 2.07Å)	Xtrriage
Refinement program	PHENIX 1.20.1_4487	Depositor
R, R_{free}	0.214 , 0.241 0.216 , 0.233	Depositor DCC
R_{free} test set	7806 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	27.4	Xtrriage
Anisotropy	0.238	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 33.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.36$, $\langle L^2 \rangle = 0.18$	Xtrriage
Estimated twinning fraction	0.110 for h,-h-k,-l	Xtrriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	11835	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.13% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: B12, FWK, GOL, NH4

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	0.24	0/3535	0.47	0/4787
1	C	0.24	0/3524	0.46	0/4772
2	B	0.24	0/1960	0.54	0/2655
2	D	0.24	0/1943	0.51	0/2633
All	All	0.24	0/10962	0.48	0/14847

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	3475	0	3433	31	0
1	C	3467	0	3424	29	0
2	B	1930	0	1990	27	0
2	D	1916	0	1973	36	0
3	A	36	0	0	2	0
3	C	18	0	0	1	0
4	A	12	0	16	0	0
4	B	6	0	8	0	0
4	C	18	0	24	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	1	0	0	0	0
5	C	1	0	0	0	0
6	B	95	0	8	3	0
6	D	91	0	88	9	0
7	A	294	0	0	3	0
7	B	101	0	0	2	0
7	C	283	0	0	6	0
7	D	91	0	0	1	0
All	All	11835	0	10964	131	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.

All (131) 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)
2:B:160:ASP:HB2	2:B:194:LEU:HD13	1.58	0.85
2:D:180:GLU:HG2	2:D:270:VAL:HG23	1.73	0.69
1:A:237:ARG:NH1	7:A:601:HOH:O	2.26	0.68
1:A:201:ASN:OD1	1:A:204:ARG:NH2	2.27	0.66
2:D:160:ASP:HB2	2:D:194:LEU:HD12	1.80	0.63
1:A:232:ILE:HG23	1:A:271:VAL:HG21	1.82	0.62
1:A:252:GLU:HG2	1:A:256:LYS:HE3	1.84	0.59
1:C:280:GLY:O	7:C:601:HOH:O	2.17	0.58
1:C:287:GLU:OE1	3:C:501:FWK:O2'	2.22	0.58
1:A:242:GLY:O	1:A:276:ASN:ND2	2.36	0.57
2:D:141:ARG:HG2	2:D:208:LYS:HB2	1.87	0.57
2:B:165:ILE:HD11	2:B:174:ILE:HD12	1.86	0.57
1:C:273:ALA:HA	4:C:503:GOL:H12	1.85	0.57
1:A:269:ARG:NH1	7:A:611:HOH:O	2.37	0.56
2:B:124:ARG:HH11	2:B:124:ARG:HG3	1.69	0.56
2:D:127:ILE:HG21	2:D:133:TYR:HB2	1.87	0.56
2:B:122:GLU:HG3	2:B:201:PHE:HD2	1.71	0.55
1:C:326:VAL:HA	1:C:362:ASP:HB3	1.88	0.55
2:D:211:ASP:HA	2:D:246:PRO:HB2	1.88	0.55
2:D:238:LEU:HB3	2:D:262:ILE:HB	1.87	0.55
1:C:122:VAL:HG13	1:C:354:LEU:HD23	1.87	0.55
1:C:441:ARG:NH2	7:C:620:HOH:O	2.40	0.55
2:D:279:LEU:O	2:D:283:MET:HG3	2.07	0.55
1:A:245:PHE:HZ	3:A:501[A]:FWK:O2'	1.90	0.54
2:B:187:ALA:O	2:B:191:GLN:HG3	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:178:TYR:CZ	2:D:182:LEU:HG	2.42	0.54
6:D:601:B12:H552	6:D:601:B12:H531	1.90	0.53
1:C:288:THR:HB	1:C:311:ASN:HD22	1.73	0.53
2:D:195:LYS:NZ	7:D:704:HOH:O	2.40	0.53
1:A:187:ASP:OD1	1:A:187:ASP:N	2.37	0.53
1:A:196:THR:OG1	1:A:201:ASN:ND2	2.37	0.53
1:A:21:LEU:O	1:A:127:LYS:NZ	2.37	0.52
6:D:601:B12:H601	6:D:601:B12:H261	1.91	0.52
1:C:86:ASN:HA	1:C:89:LYS:HD3	1.92	0.51
1:C:232:ILE:HG23	1:C:271:VAL:HG21	1.92	0.51
1:A:231:GLN:NE2	1:A:245:PHE:O	2.42	0.51
1:C:269:ARG:NH2	7:C:625:HOH:O	2.43	0.51
2:B:283:MET:HE3	2:B:289:SER:HB3	1.94	0.50
2:B:279:LEU:O	2:B:283:MET:HG3	2.11	0.50
2:D:187:ALA:O	2:D:191:GLN:HG3	2.12	0.50
1:C:443:THR:O	2:D:82:ARG:NH2	2.44	0.50
2:B:211:ASP:HA	2:B:246:PRO:HB2	1.94	0.49
1:C:25:ASN:ND2	1:C:303:ASP:OD2	2.45	0.49
6:D:601:B12:C4	6:D:601:B12:H4B	2.42	0.49
1:C:55:THR:HA	1:C:92:SER:HA	1.94	0.49
2:D:187:ALA:HB1	2:D:191:GLN:HE21	1.78	0.49
2:B:143:LEU:HB3	2:B:147:ALA:HB3	1.93	0.49
1:C:1:MET:HE3	1:C:3:LEU:HD11	1.94	0.49
1:A:202:LEU:HD22	1:A:224:VAL:HG11	1.93	0.49
1:C:445:ARG:NH2	7:C:628:HOH:O	2.45	0.49
2:B:77:ARG:NH2	2:B:98:ASP:OD2	2.32	0.49
2:D:155:CYS:SG	2:D:198:THR:OG1	2.70	0.48
2:D:148:VAL:HG13	2:D:216:ILE:HD13	1.94	0.48
2:D:160:ASP:HA	2:D:220:LYS:HB2	1.95	0.48
1:C:377:GLU:HA	1:C:380:MET:SD	2.54	0.48
2:B:189:LEU:HG	2:B:277:VAL:HG22	1.95	0.47
1:A:326:VAL:HA	1:A:362:ASP:HB3	1.96	0.47
2:D:127:ILE:HD12	2:D:133:TYR:HA	1.96	0.47
1:C:358:SER:OG	1:C:389:ASN:ND2	2.40	0.47
2:D:151:LEU:HB3	2:D:217:LEU:HD21	1.96	0.47
2:D:106:VAL:HG22	2:D:230:PRO:HG2	1.97	0.47
2:D:160:ASP:HB2	2:D:194:LEU:CD1	2.45	0.47
2:B:127:ILE:HG21	2:B:133:TYR:HB2	1.97	0.46
1:C:75:LEU:HD11	1:C:317:HIS:CG	2.50	0.46
1:A:358:SER:OG	1:A:389:ASN:ND2	2.46	0.46
1:A:406:THR:OG1	1:A:407:THR:N	2.48	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:105:THR:HA	2:B:108:LYS:HG2	1.97	0.46
2:B:130:LYS:NZ	7:B:709:HOH:O	2.39	0.46
2:B:215:GLU:HG2	2:B:247:ARG:HE	1.79	0.45
1:C:24:ALA:O	1:C:48:LYS:NZ	2.41	0.45
1:C:187:ASP:HB3	1:C:427:PHE:CG	2.51	0.45
1:C:198:ASP:OD2	1:C:201:ASN:HB2	2.16	0.45
6:D:601:B12:H2B	6:D:601:B12:H482	1.98	0.45
6:D:601:B12:H351	6:D:601:B12:H372	1.98	0.45
2:D:143:LEU:HB3	2:D:147:ALA:HB3	1.99	0.45
2:B:160:ASP:HA	2:B:220:LYS:HB2	1.98	0.45
2:B:188:GLY:HA2	2:B:191:GLN:HE21	1.82	0.45
2:B:208:LYS:NZ	2:B:253:GLU:OE1	2.37	0.45
1:C:120:GLU:OE2	1:C:310:ARG:NH1	2.46	0.45
2:D:160:ASP:HB3	2:D:220:LYS:HE2	1.99	0.45
2:D:180:GLU:HB3	2:D:269:PRO:HB2	1.98	0.45
6:D:601:B12:H473	6:D:601:B12:H481	1.77	0.45
1:A:237:ARG:HG3	1:A:237:ARG:HH11	1.83	0.44
2:B:130:LYS:HG3	7:B:709:HOH:O	2.17	0.44
1:A:64:VAL:HG23	1:A:65:ILE:HG13	1.98	0.44
2:D:143:LEU:HD12	2:D:212:GLN:HG2	2.00	0.44
1:C:18:LYS:HD3	1:C:64:VAL:HG12	2.01	0.43
1:A:377:GLU:HA	1:A:380:MET:SD	2.58	0.43
2:D:216:ILE:HG22	2:D:217:LEU:HD23	1.98	0.43
2:D:281:LYS:O	2:D:285:GLU:HG3	2.18	0.43
6:D:601:B12:H301	6:D:601:B12:H253	1.67	0.43
2:D:161:VAL:HB	2:D:194:LEU:HD11	2.00	0.43
1:A:353:LYS:HD3	1:A:353:LYS:HA	1.87	0.43
2:B:181:ILE:HB	2:B:269:PRO:HB3	2.01	0.43
1:A:326:VAL:HG12	1:A:329:PHE:HB2	2.00	0.42
2:B:66:VAL:O	2:B:70:LEU:HD22	2.19	0.42
1:A:215:LYS:NZ	7:A:612:HOH:O	2.37	0.42
2:D:228:GLU:HA	6:D:601:B12:H1P2	2.02	0.42
1:A:332:PRO:HA	1:A:335:LEU:O	2.19	0.42
2:B:53:LYS:HG2	2:B:94:ARG:NH1	2.35	0.42
1:C:381:ILE:O	1:C:385:THR:HG23	2.19	0.42
2:D:167:ASP:N	2:D:167:ASP:OD1	2.52	0.42
2:D:181:ILE:HB	2:D:269:PRO:HB3	2.02	0.42
1:A:377:GLU:HB3	1:C:132:ALA:HB2	2.01	0.42
1:A:380:MET:SD	1:A:411:ASP:HB3	2.60	0.42
1:A:381:ILE:O	1:A:385:THR:HG23	2.19	0.42
2:B:101:ARG:HD3	1:C:8:PHE:CE2	2.54	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:160:ASP:H	2:D:195:LYS:HB3	1.84	0.42
4:C:503:GOL:O2	7:C:602:HOH:O	2.19	0.42
2:D:102:SER:OG	2:D:231:GLY:O	2.30	0.42
1:A:308:GLU:O	1:A:311:ASN:HB2	2.20	0.42
2:D:123:VAL:O	2:D:202:VAL:HA	2.19	0.42
2:D:174:ILE:O	2:D:178:TYR:HB2	2.20	0.42
2:B:65:ASP:OD1	2:B:65:ASP:N	2.52	0.41
6:D:601:B12:H562	6:D:601:B12:H18	1.91	0.41
1:A:198:ASP:OD1	1:A:201:ASN:HB2	2.19	0.41
1:A:443:THR:O	2:B:82:ARG:NH2	2.54	0.41
1:A:7:LEU:HD11	2:D:97:ALA:HB1	2.02	0.41
1:A:187:ASP:HB3	1:A:427:PHE:CG	2.56	0.41
2:D:283:MET:HE3	2:D:283:MET:HB3	1.91	0.41
1:A:194:PRO:HG3	1:A:226:ALA:HB2	2.02	0.41
2:B:165:ILE:O	2:B:201:PHE:HA	2.21	0.41
1:C:332:PRO:HA	1:C:335:LEU:O	2.21	0.41
2:B:167:ASP:OD1	2:B:168:GLY:N	2.54	0.40
1:C:67:TYR:CE2	1:C:74:ARG:HA	2.55	0.40
2:D:143:LEU:HB3	2:D:147:ALA:CB	2.51	0.40
1:C:204:ARG:NH1	7:C:639:HOH:O	2.52	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	453/453 (100%)	432 (95%)	20 (4%)	1 (0%)	47 39
1	C	452/453 (100%)	428 (95%)	23 (5%)	1 (0%)	47 39
2	B	252/263 (96%)	243 (96%)	9 (4%)	0	100 100
2	D	250/263 (95%)	245 (98%)	5 (2%)	0	100 100
All	All	1407/1432 (98%)	1348 (96%)	57 (4%)	2 (0%)	51 45

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	163	PRO
1	C	163	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	372/370 (100%)	364 (98%)	8 (2%)	52	46
1	C	371/370 (100%)	363 (98%)	8 (2%)	52	46
2	B	208/217 (96%)	202 (97%)	6 (3%)	42	36
2	D	206/217 (95%)	196 (95%)	10 (5%)	25	17
All	All	1157/1174 (99%)	1125 (97%)	32 (3%)	43	37

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	LYS
1	A	60	ARG
1	A	167	ARG
1	A	221	GLN
1	A	230	THR
1	A	326	VAL
1	A	404	TYR
1	A	405	GLN
2	B	96	LEU
2	B	101	ARG
2	B	109	GLU
2	B	229	ARG
2	B	239	SER
2	B	295	ARG
1	C	60	ARG
1	C	167	ARG
1	C	196	THR
1	C	221	GLN

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Mol	Chain	Res	Type
1	C	230	THR
1	C	326	VAL
1	C	404	TYR
1	C	405	GLN
2	D	68	THR
2	D	70	LEU
2	D	72	ARG
2	D	124	ARG
2	D	160	ASP
2	D	186	MET
2	D	194	LEU
2	D	229	ARG
2	D	236	GLU
2	D	239	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	191	GLN
2	B	261	ASN
2	B	264	GLN
1	C	10	ASN
1	C	13	GLN
1	C	87	GLN
1	C	201	ASN
1	C	217	ASN
2	D	60	ASN
2	D	154	GLN
2	D	158	ASN
2	D	191	GLN
2	D	261	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 14 ligands modelled in this entry, 2 are modelled with single atom - leaving 12 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
6	B12	B	601[A]	-	90,101,101	1.32	8 (8%)	137,166,166	1.21	18 (13%)
3	FWK	A	501[A]	-	17,20,21	1.13	1 (5%)	15,30,31	1.99	4 (26%)
3	FWK	C	501	-	17,20,21	1.12	1 (5%)	15,30,31	1.93	4 (26%)
4	GOL	A	503	-	5,5,5	0.89	0	5,5,5	0.98	0
6	B12	B	601[B]	-	90,101,101	1.31	8 (8%)	137,166,166	1.21	18 (13%)
3	FWK	A	501[B]	-	17,20,21	1.07	1 (5%)	15,30,31	1.70	4 (26%)
4	GOL	C	502	-	5,5,5	0.91	0	5,5,5	1.01	0
4	GOL	C	504	-	5,5,5	0.93	0	5,5,5	0.99	0
6	B12	D	601	-	90,101,101	1.32	10 (11%)	137,166,166	1.19	16 (11%)
4	GOL	A	502	-	5,5,5	0.91	0	5,5,5	0.98	0
4	GOL	B	602	-	5,5,5	0.90	0	5,5,5	1.01	0
4	GOL	C	503	-	5,5,5	0.96	0	5,5,5	1.00	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	B12	B	601[A]	-	-	14/52/223/223	0/3/11/11
3	FWK	A	501[A]	-	-	0/0/20/22	0/3/3/3
3	FWK	C	501	-	-	0/0/20/22	0/3/3/3
4	GOL	A	503	-	-	2/4/4/4	-
6	B12	B	601[B]	-	-	14/52/223/223	0/3/11/11

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	FWK	A	501[B]	-	-	0/0/20/22	0/3/3/3
4	GOL	C	502	-	-	2/4/4/4	-
4	GOL	C	504	-	-	2/4/4/4	-
6	B12	D	601	-	-	14/52/223/223	0/3/11/11
4	GOL	A	502	-	-	2/4/4/4	-
4	GOL	B	602	-	-	0/4/4/4	-
4	GOL	C	503	-	-	4/4/4/4	-

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	601[A]	B12	C14-N23	-5.23	1.28	1.35
6	B	601[B]	B12	C14-N23	-5.23	1.28	1.35
6	D	601	B12	C14-N23	-5.15	1.28	1.35
6	B	601[A]	B12	C8B-C9B	4.18	1.49	1.40
6	B	601[B]	B12	C8B-C9B	4.18	1.49	1.40
6	D	601	B12	C8B-C9B	4.15	1.49	1.40
6	D	601	B12	C11-N23	4.03	1.44	1.37
6	B	601[A]	B12	C11-N23	3.95	1.44	1.37
6	B	601[B]	B12	C11-N23	3.95	1.44	1.37
6	B	601[A]	B12	C16-C15	-3.91	1.33	1.44
6	B	601[B]	B12	C16-C15	-3.91	1.33	1.44
6	D	601	B12	C16-C15	-3.90	1.33	1.44
6	B	601[A]	B12	C6B-C5B	3.38	1.49	1.40
6	B	601[B]	B12	C6B-C5B	3.38	1.49	1.40
6	D	601	B12	C6B-C5B	3.34	1.49	1.40
6	B	601[A]	B12	C14-C15	2.77	1.50	1.38
6	B	601[B]	B12	C14-C15	2.77	1.50	1.38
6	D	601	B12	C14-C15	2.76	1.50	1.38
3	C	501	FWK	C5-C4	2.63	1.47	1.40
3	A	501[A]	FWK	C5-C4	2.52	1.47	1.40
6	D	601	B12	C10-C9	2.47	1.46	1.39
3	A	501[B]	FWK	C5-C4	2.45	1.47	1.40
6	B	601[A]	B12	C10-C9	2.42	1.46	1.39
6	B	601[B]	B12	C10-C9	2.42	1.46	1.39
6	D	601	B12	C19-N24	-2.23	1.44	1.48
6	B	601[A]	B12	C19-N24	-2.22	1.44	1.48
6	B	601[B]	B12	C19-N24	-2.22	1.44	1.48
6	D	601	B12	C1-C19	-2.16	1.50	1.55
6	D	601	B12	C1-C2	-2.08	1.54	1.58

All (64) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	501[A]	FWK	C5'-C4'-C3'	-5.06	110.39	115.70
3	C	501	FWK	C5'-C4'-C3'	-4.47	111.00	115.70
6	B	601[A]	B12	C17-C16-C15	3.53	131.82	126.26
6	B	601[B]	B12	C17-C16-C15	3.53	131.82	126.26
6	D	601	B12	C17-C16-C15	3.52	131.80	126.26
3	A	501[A]	FWK	C3'-C2'-C1'	3.46	106.19	100.98
3	A	501[A]	FWK	N3-C2-N1	-3.42	123.34	128.68
3	C	501	FWK	C3'-C2'-C1'	3.38	106.06	100.98
3	A	501[B]	FWK	C5'-C4'-C3'	-3.37	112.16	115.70
6	B	601[A]	B12	C9-C10-C11	-3.31	121.18	125.97
6	B	601[B]	B12	C9-C10-C11	-3.31	121.18	125.97
6	D	601	B12	C9-C10-C11	-3.29	121.22	125.97
3	A	501[B]	FWK	N3-C2-N1	-3.23	123.64	128.68
6	B	601[A]	B12	C13-C14-N23	3.22	113.48	109.10
6	B	601[B]	B12	C13-C14-N23	3.22	113.48	109.10
6	D	601	B12	C13-C14-N23	3.20	113.46	109.10
6	D	601	B12	C2P-C1P-N59	-3.20	108.22	112.93
6	B	601[A]	B12	C2P-C1P-N59	-3.13	108.32	112.93
6	B	601[B]	B12	C2P-C1P-N59	-3.13	108.32	112.93
3	C	501	FWK	N3-C2-N1	-2.98	124.02	128.68
6	B	601[B]	B12	C26-C2-C3	2.78	112.34	107.41
6	B	601[A]	B12	C26-C2-C3	2.78	112.33	107.41
6	D	601	B12	C13-C14-C15	-2.76	120.10	124.32
6	B	601[A]	B12	C30-C3-C2	-2.73	113.31	119.09
6	B	601[B]	B12	C30-C3-C2	-2.73	113.31	119.09
6	D	601	B12	C20-C1-N21	2.69	114.67	110.27
6	D	601	B12	C30-C3-C2	-2.65	113.48	119.09
3	A	501[B]	FWK	C3'-C2'-C1'	2.65	104.96	100.98
3	A	501[B]	FWK	C4-C5-N7	-2.62	106.67	109.40
6	B	601[A]	B12	C13-C14-C15	-2.57	120.40	124.32
6	B	601[B]	B12	C13-C14-C15	-2.57	120.40	124.32
3	C	501	FWK	C4-C5-N7	-2.49	106.80	109.40
6	B	601[A]	B12	C7-C8-C9	2.44	104.02	100.90
6	B	601[B]	B12	C7-C8-C9	2.44	104.02	100.90
3	A	501[A]	FWK	C4-C5-N7	-2.41	106.88	109.40
6	B	601[A]	B12	C41-C8-C9	2.40	115.42	111.19
6	B	601[B]	B12	C41-C8-C9	2.40	115.42	111.19
6	D	601	B12	C17-C16-N24	-2.36	107.52	111.15
6	B	601[A]	B12	C8-C9-N22	2.34	115.43	110.77
6	B	601[B]	B12	C8-C9-N22	2.34	115.43	110.77
6	B	601[A]	B12	C20-C1-N21	2.32	114.07	110.27
6	B	601[B]	B12	C20-C1-N21	2.32	114.07	110.27

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	601[A]	B12	C17-C16-N24	-2.31	107.58	111.15
6	B	601[B]	B12	C17-C16-N24	-2.31	107.58	111.15
6	D	601	B12	C7-C8-C9	2.31	103.86	100.90
6	D	601	B12	C54-C17-C18	-2.31	109.58	112.98
6	D	601	B12	C8-C9-N22	2.30	115.35	110.77
6	B	601[A]	B12	C60-C18-C17	-2.27	110.25	115.74
6	B	601[B]	B12	C60-C18-C17	-2.27	110.25	115.74
6	B	601[A]	B12	C54-C17-C18	-2.26	109.65	112.98
6	B	601[B]	B12	C54-C17-C18	-2.26	109.65	112.98
6	D	601	B12	C41-C8-C9	2.23	115.12	111.19
6	B	601[A]	B12	C18-C17-C16	2.20	103.34	100.67
6	B	601[B]	B12	C18-C17-C16	2.20	103.34	100.67
6	D	601	B12	C53-C15-C16	2.19	124.14	120.38
6	B	601[A]	B12	C53-C15-C16	2.18	124.13	120.38
6	B	601[B]	B12	C53-C15-C16	2.18	124.13	120.38
6	B	601[A]	B12	C3R-C2R-C1R	2.16	104.68	99.89
6	B	601[B]	B12	C3R-C2R-C1R	2.16	104.68	99.89
6	D	601	B12	C18-C17-C16	2.15	103.28	100.67
6	D	601	B12	C3R-C2R-C1R	2.10	104.54	99.89
6	B	601[A]	B12	C8-C9-C10	-2.05	118.89	123.32
6	B	601[B]	B12	C8-C9-C10	-2.05	118.89	123.32
6	D	601	B12	C8-C9-C10	-2.02	118.96	123.32

There are no chirality outliers.

All (54) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	503	GOL	C1-C2-C3-O3
4	A	503	GOL	O2-C2-C3-O3
4	C	502	GOL	O1-C1-C2-C3
4	C	504	GOL	C1-C2-C3-O3
4	C	504	GOL	O2-C2-C3-O3
6	B	601[A]	B12	C1-C2-C26-C27
6	B	601[A]	B12	C25-C2-C26-C27
6	B	601[A]	B12	C3-C2-C26-C27
6	B	601[A]	B12	C2-C3-C30-C31
6	B	601[A]	B12	C42-C41-C8-C9
6	B	601[A]	B12	C2P-O3-P-O5
6	B	601[B]	B12	C1-C2-C26-C27
6	B	601[B]	B12	C25-C2-C26-C27
6	B	601[B]	B12	C3-C2-C26-C27
6	B	601[B]	B12	C2-C3-C30-C31

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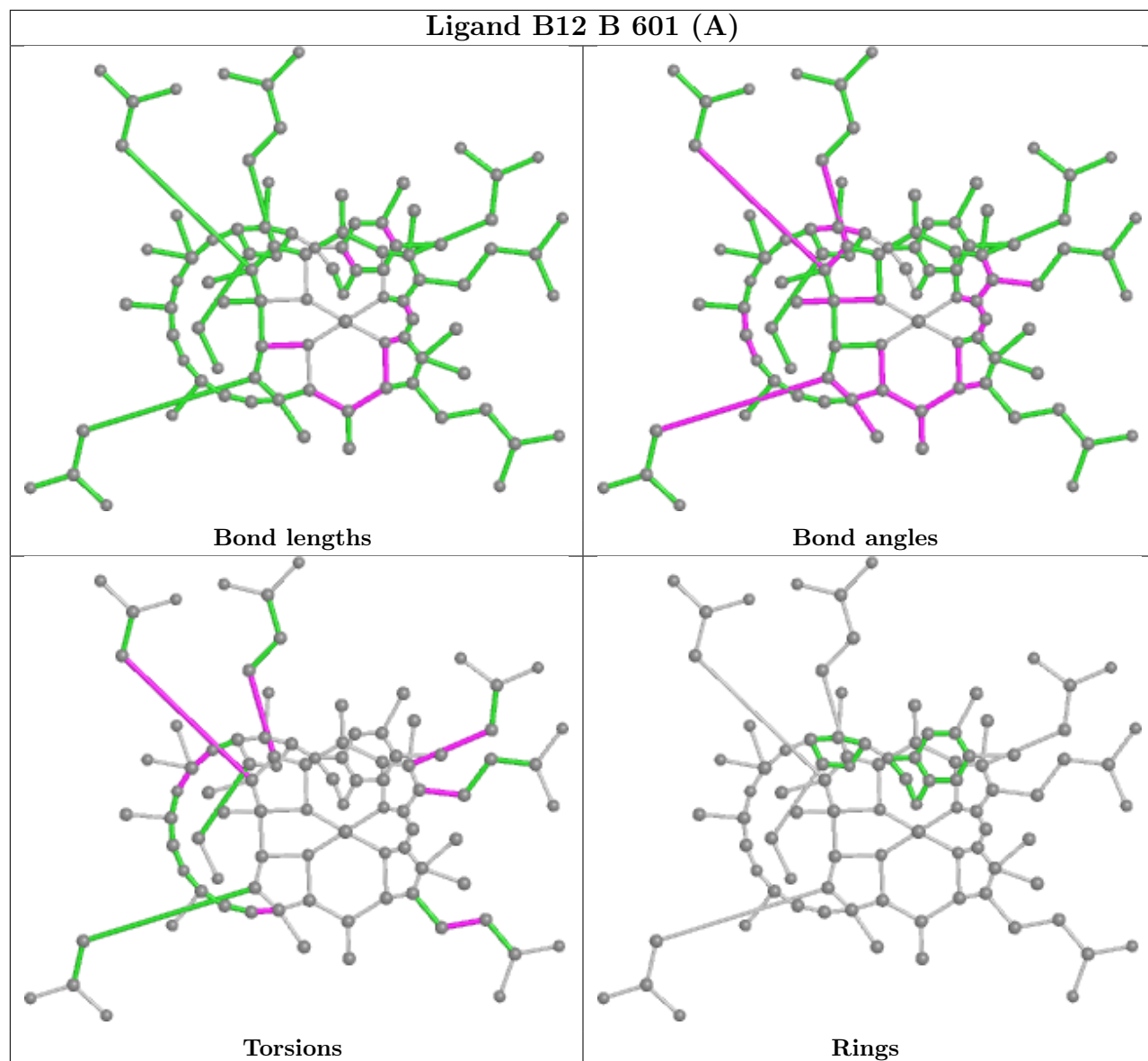
Mol	Chain	Res	Type	Atoms
6	B	601[B]	B12	C42-C41-C8-C9
6	B	601[B]	B12	C2P-O3-P-O5
6	D	601	B12	C1-C2-C26-C27
6	D	601	B12	C25-C2-C26-C27
6	D	601	B12	C3-C2-C26-C27
6	D	601	B12	C42-C41-C8-C9
6	B	601[A]	B12	C13-C48-C49-C50
6	B	601[B]	B12	C13-C48-C49-C50
6	D	601	B12	C13-C48-C49-C50
6	B	601[A]	B12	C4-C3-C30-C31
6	B	601[B]	B12	C4-C3-C30-C31
6	D	601	B12	C2-C3-C30-C31
4	A	502	GOL	O1-C1-C2-O2
6	B	601[A]	B12	C16-C17-C55-C56
6	B	601[B]	B12	C16-C17-C55-C56
6	D	601	B12	C16-C17-C55-C56
6	D	601	B12	C4-C3-C30-C31
4	A	502	GOL	O1-C1-C2-C3
4	C	503	GOL	O1-C1-C2-C3
4	C	503	GOL	C1-C2-C3-O3
4	C	502	GOL	O1-C1-C2-O2
4	C	503	GOL	O1-C1-C2-O2
6	B	601[A]	B12	C18-C17-C55-C56
6	B	601[B]	B12	C18-C17-C55-C56
6	D	601	B12	C3R-O2-P-O3
6	B	601[A]	B12	C2P-O3-P-O4
6	B	601[B]	B12	C2P-O3-P-O4
6	D	601	B12	C18-C17-C55-C56
6	B	601[A]	B12	C3R-O2-P-O3
6	B	601[B]	B12	C3R-O2-P-O3
6	D	601	B12	C18-C60-C61-O63
6	B	601[A]	B12	C2P-O3-P-O2
6	B	601[B]	B12	C2P-O3-P-O2
6	D	601	B12	C38-C37-C7-C36
4	C	503	GOL	O2-C2-C3-O3
6	D	601	B12	C3R-O2-P-O5
6	B	601[A]	B12	C38-C37-C7-C36
6	B	601[B]	B12	C38-C37-C7-C36
6	D	601	B12	C18-C60-C61-N62

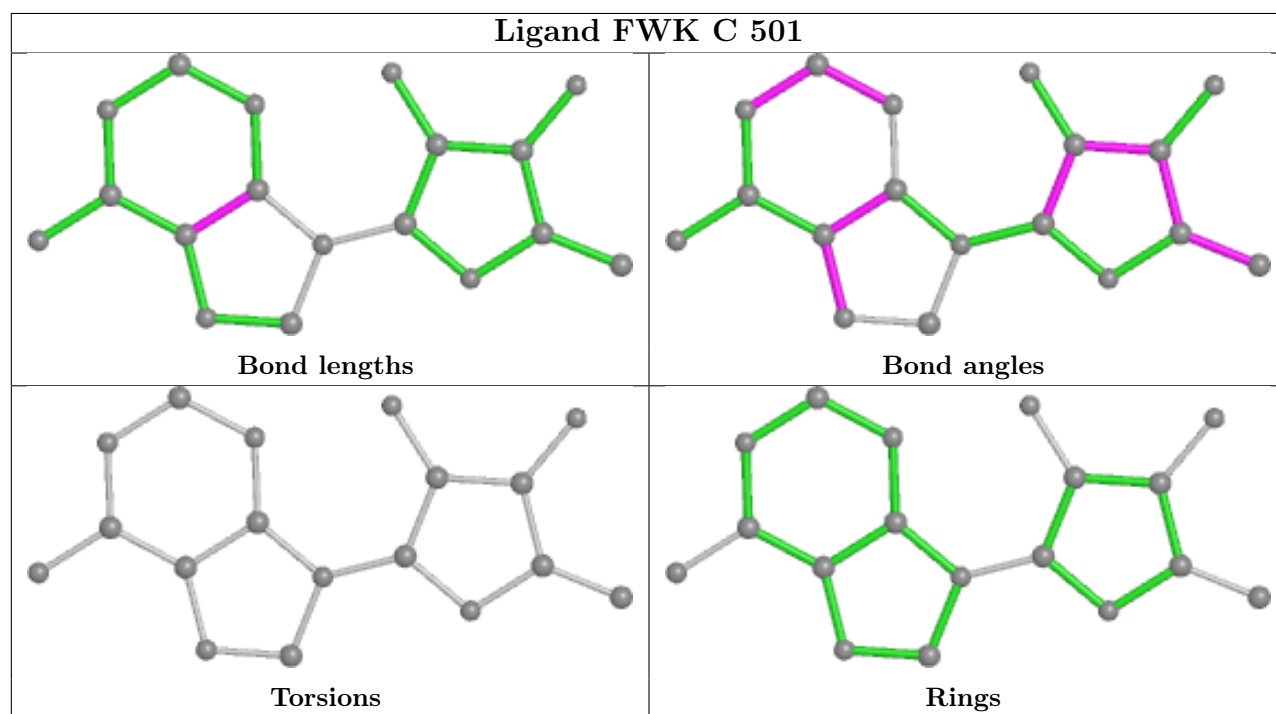
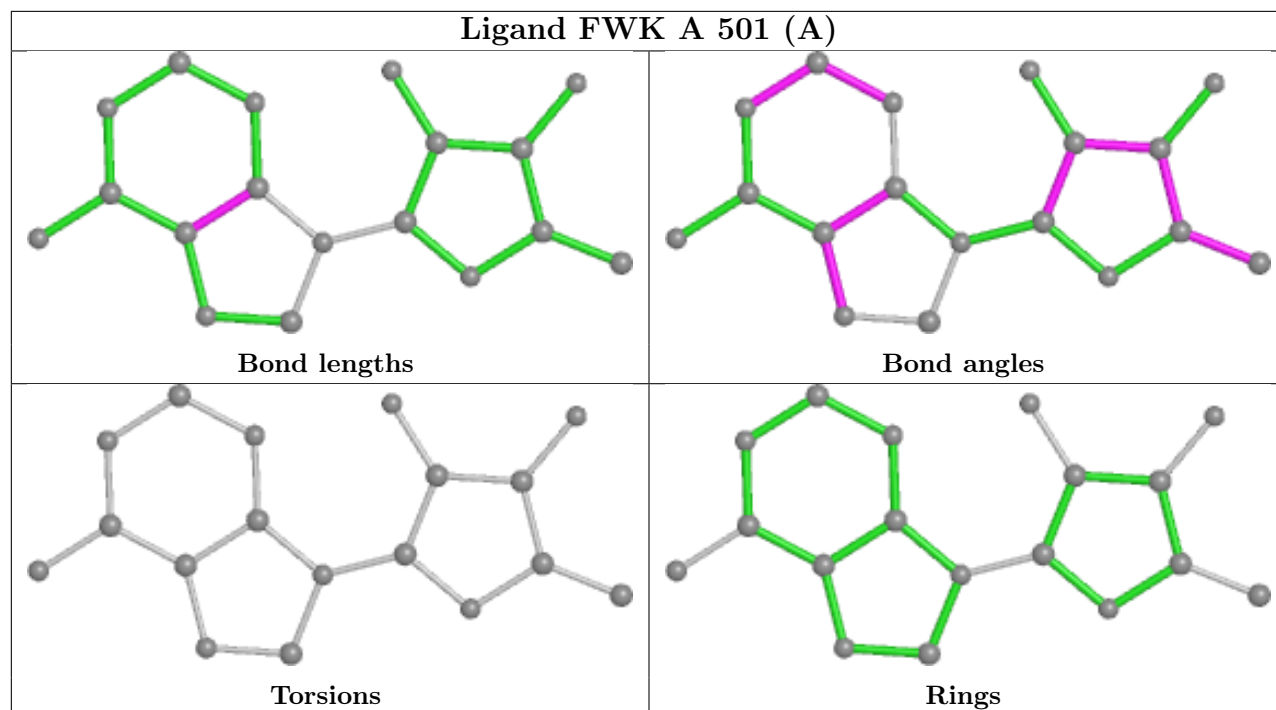
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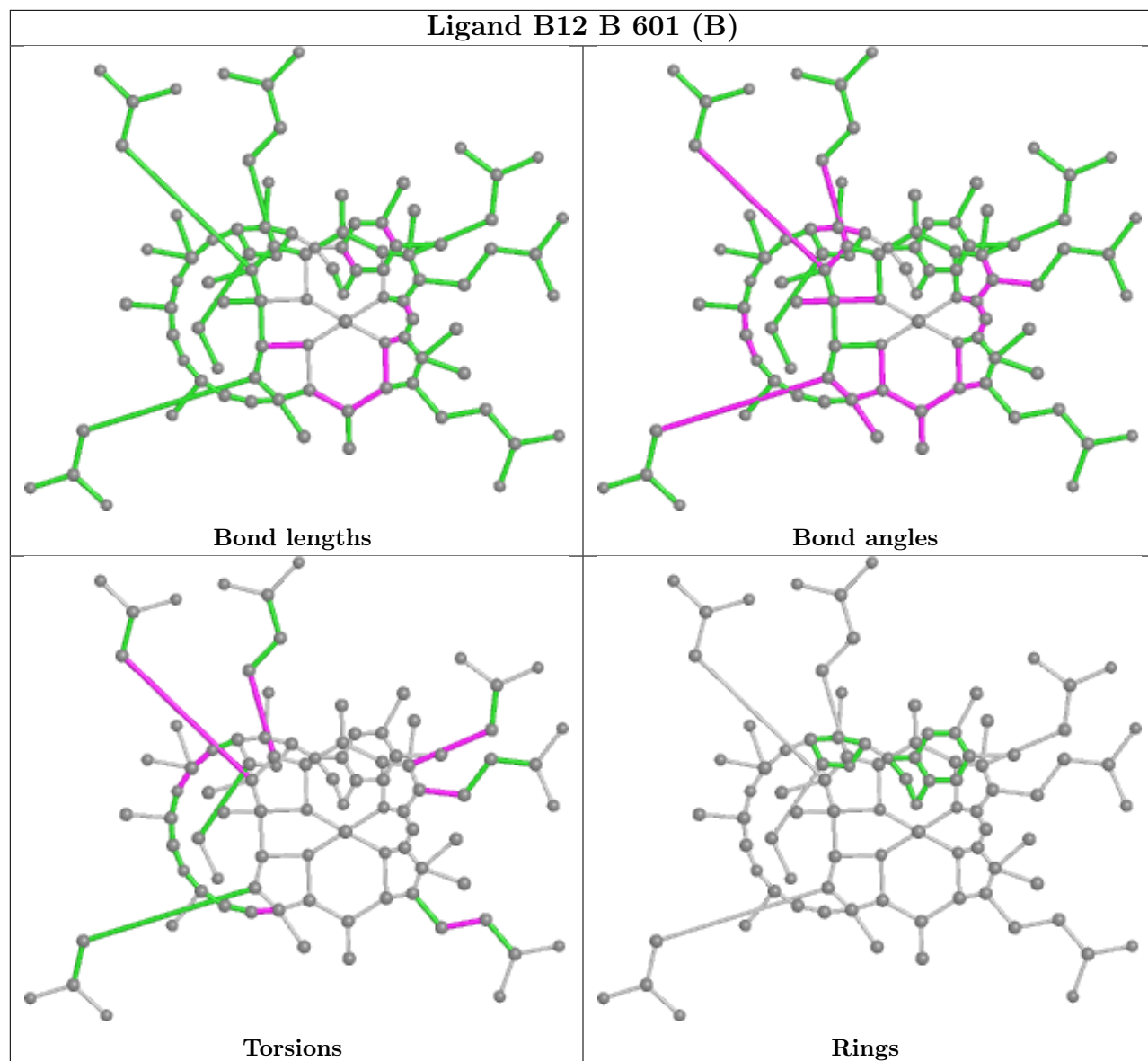
7 monomers are involved in 17 short contacts:

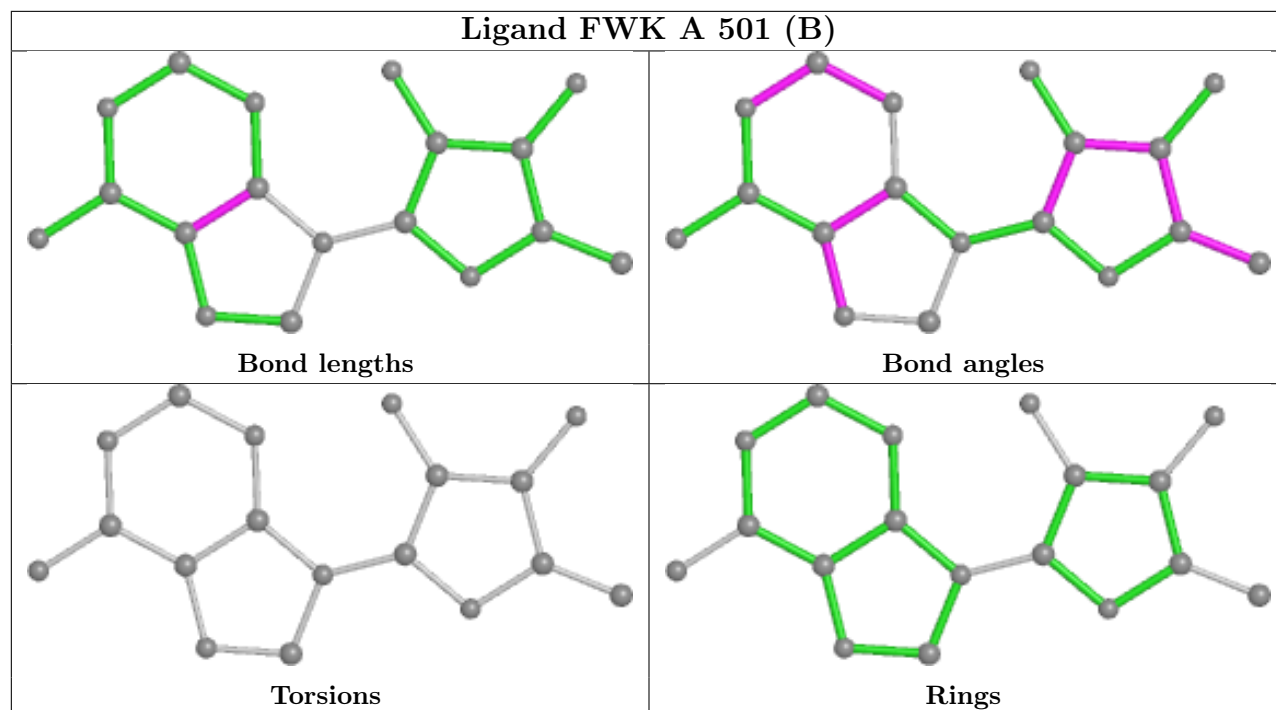
Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	601[A]	B12	1	0
3	A	501[A]	FWK	1	0
3	C	501	FWK	1	0
6	B	601[B]	B12	2	0
3	A	501[B]	FWK	1	0
6	D	601	B12	9	0
4	C	503	GOL	2	0

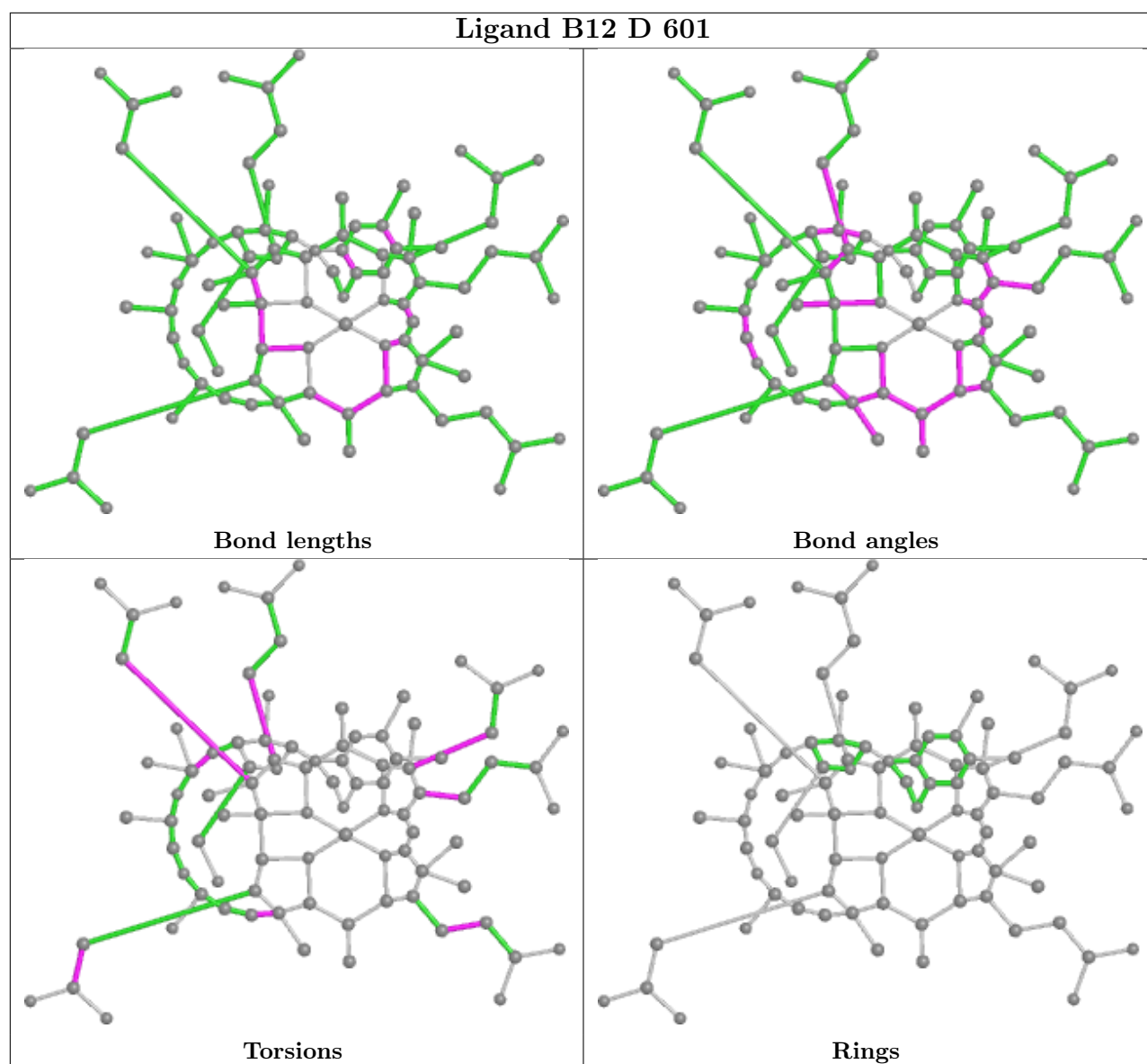
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included.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











5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	453/453 (100%)	-0.06	0 100 100	17, 27, 39, 51	0
1	C	453/453 (100%)	-0.07	2 (0%) 92 93	16, 28, 44, 67	0
2	B	252/263 (95%)	0.42	13 (5%) 27 27	26, 45, 59, 81	0
2	D	252/263 (95%)	0.50	17 (6%) 17 18	20, 50, 72, 96	0
All	All	1410/1432 (98%)	0.12	32 (2%) 60 63	16, 33, 60, 96	0

All (32) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	199	PRO	4.5
2	D	157	ALA	4.4
2	D	111	PRO	4.1
2	D	192	ALA	4.0
2	D	295	ARG	4.0
2	D	148	VAL	3.8
2	B	59	GLU	3.4
2	B	270	VAL	3.4
2	D	121	LEU	3.4
2	B	178	TYR	3.2
2	B	249	ALA	3.0
2	D	191	GLN	3.0
1	C	68	GLU	2.9
2	D	145	ALA	2.8
2	B	174	ILE	2.8
2	B	192	ALA	2.7
2	D	194	LEU	2.6
2	B	295	ARG	2.5
2	B	121	LEU	2.4
2	D	160	ASP	2.4
2	D	156	VAL	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	288	ALA	2.4
2	D	216	ILE	2.3
2	B	191	GLN	2.3
2	D	107	LEU	2.2
2	B	198	THR	2.2
2	B	165	ILE	2.2
1	C	196	THR	2.2
2	D	124	ARG	2.2
2	B	173	ALA	2.1
2	D	44	ALA	2.1
2	D	198	THR	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

6.3 Carbohydrates [i](#)

There are no 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, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

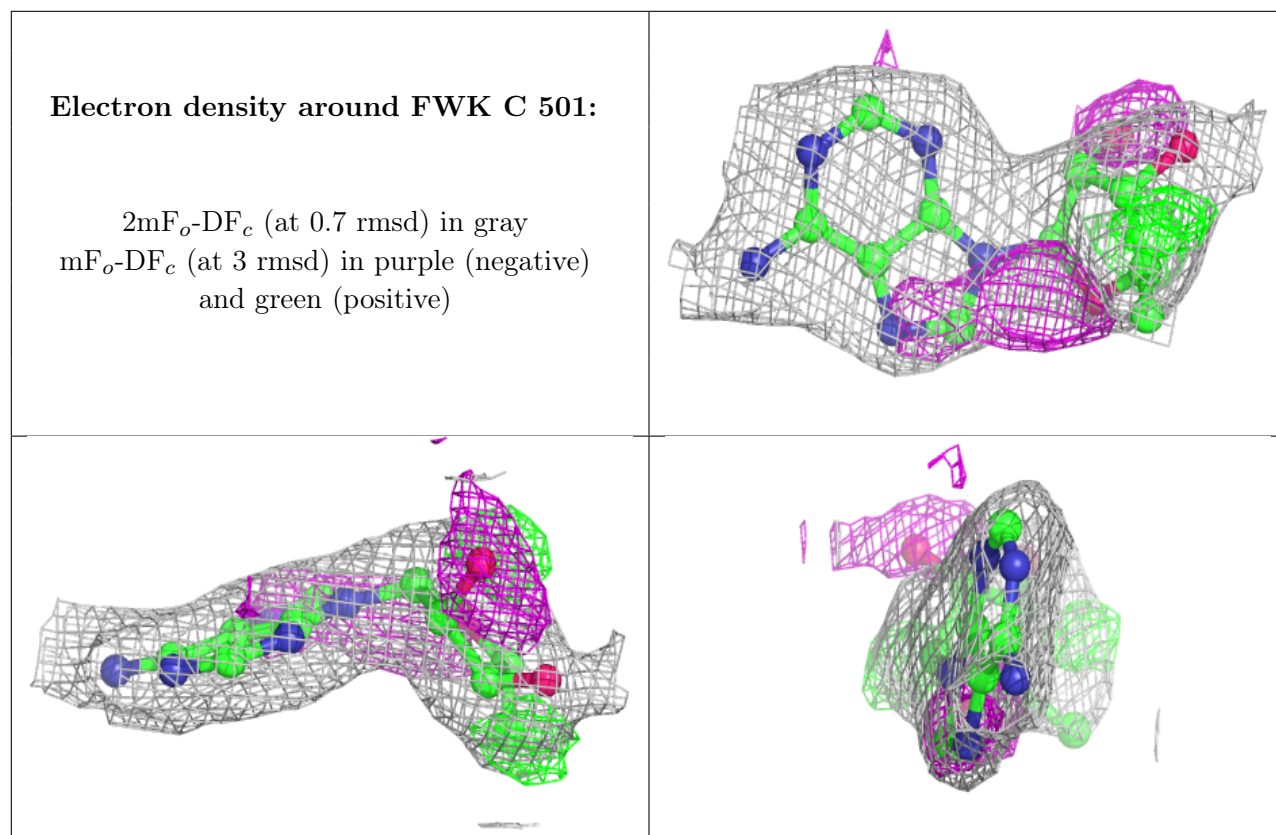
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	GOL	A	502	6/6	0.70	0.22	38,45,48,56	0
3	FWK	C	501	18/19	0.79	0.22	34,35,42,49	0
4	GOL	A	503	6/6	0.79	0.24	33,34,41,49	0
4	GOL	B	602	6/6	0.86	0.17	35,40,44,45	0
3	FWK	A	501[A]	18/19	0.89	0.25	28,31,32,33	18
3	FWK	A	501[B]	18/19	0.89	0.25	28,31,32,34	18
4	GOL	C	502	6/6	0.89	0.17	30,33,37,38	0
4	GOL	C	503	6/6	0.93	0.13	23,29,38,40	0
4	GOL	C	504	6/6	0.93	0.16	23,29,31,31	0
5	NH4	C	505	1/1	0.95	0.21	26,26,26,26	0
6	B12	B	601[A]	91/91	0.95	0.14	28,33,40,45	4
6	B12	B	601[B]	91/91	0.95	0.14	28,33,40,45	4

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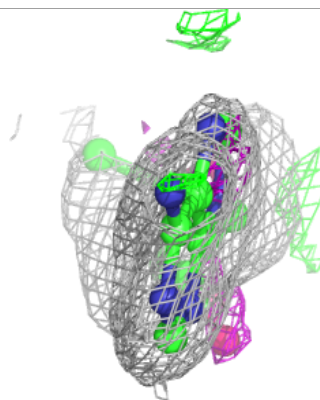
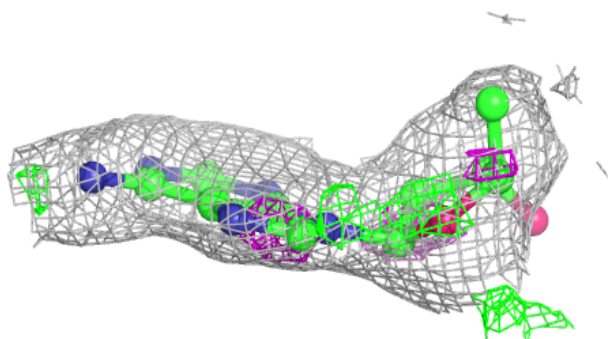
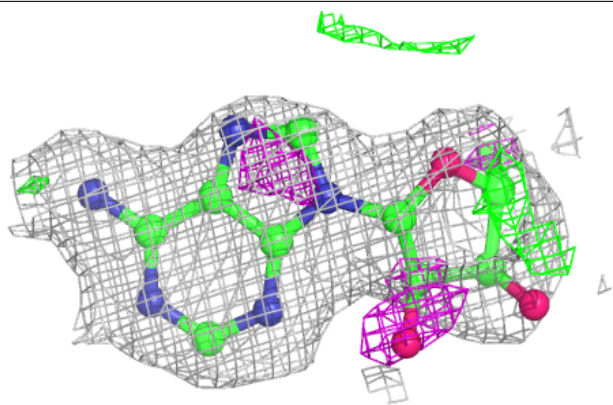
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	B12	D	601	91/91	0.95	0.13	33,35,41,45	0
5	NH4	A	504	1/1	0.97	0.11	21,21,21,21	0

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.

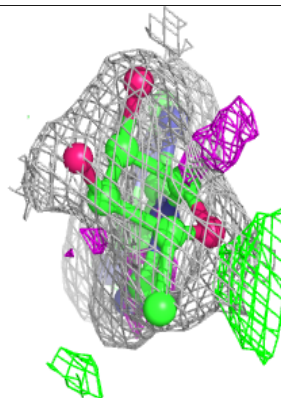
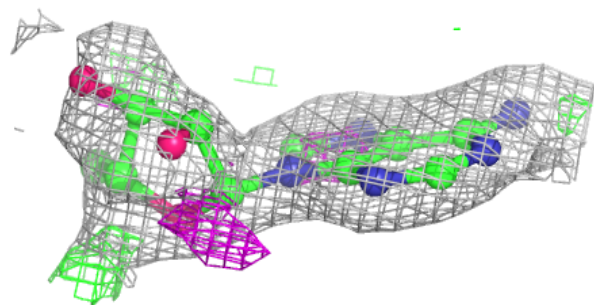
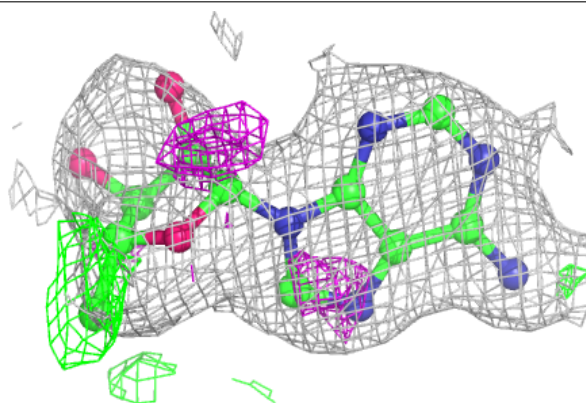


Electron density around FWK A 501 (A):

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

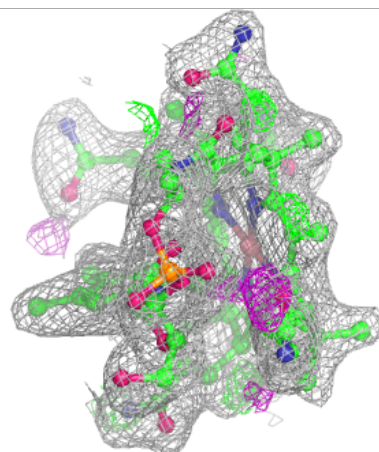
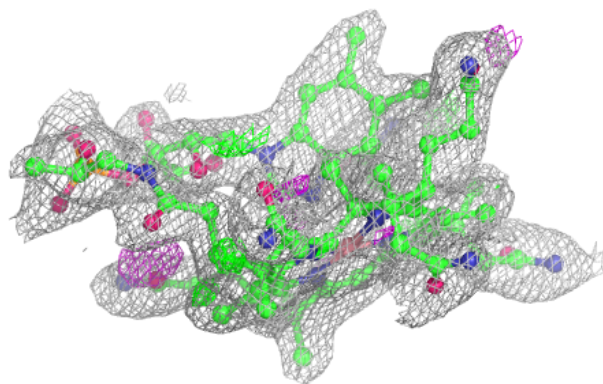
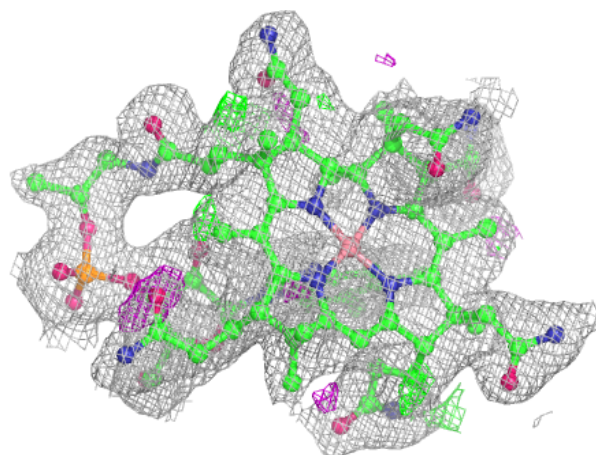
**Electron density around FWK A 501 (B):**

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



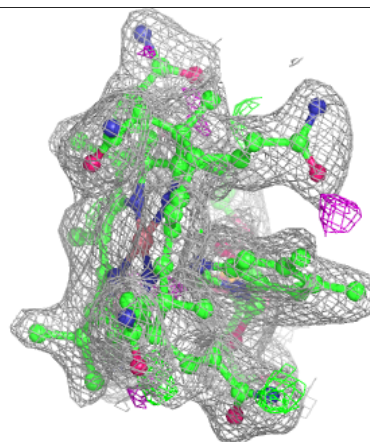
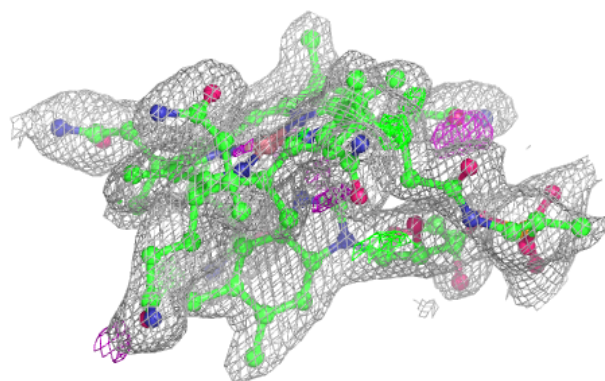
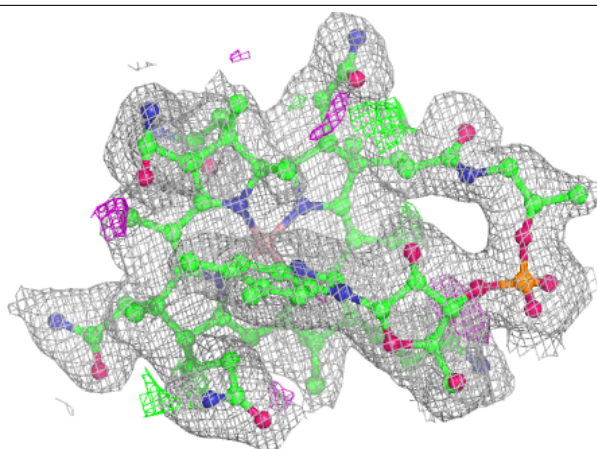
Electron density around B12 B 601 (A):

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



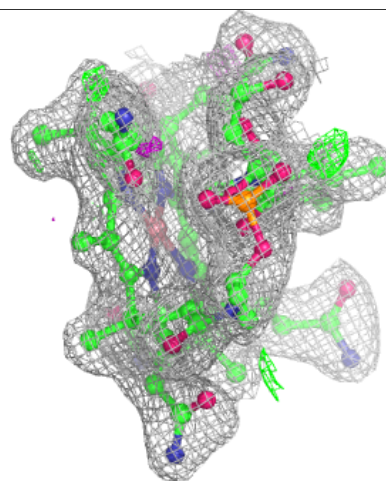
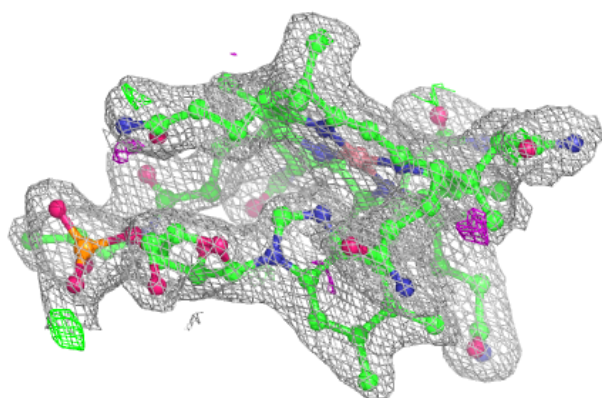
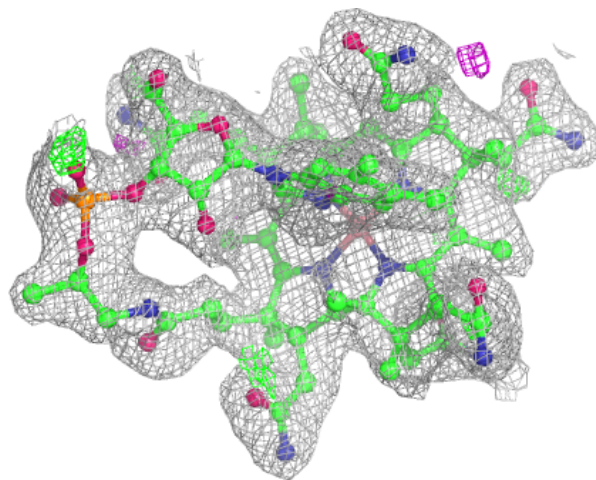
Electron density around B12 B 601 (B):

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



Electron density around B12 D 601:

$2mF_o-DF_c$ (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.