



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 15, 2024 – 03:30 PM EST

PDB ID : 3Q7F  
Title : Cryptococcus neoformans protein farnesyltransferase in complex with FPP and ethylenediamine inhibitor 1  
Authors : Hast, M.A.; Beese, L.S.  
Deposited on : 2011-01-04  
Resolution : 2.20 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](mailto: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>.

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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

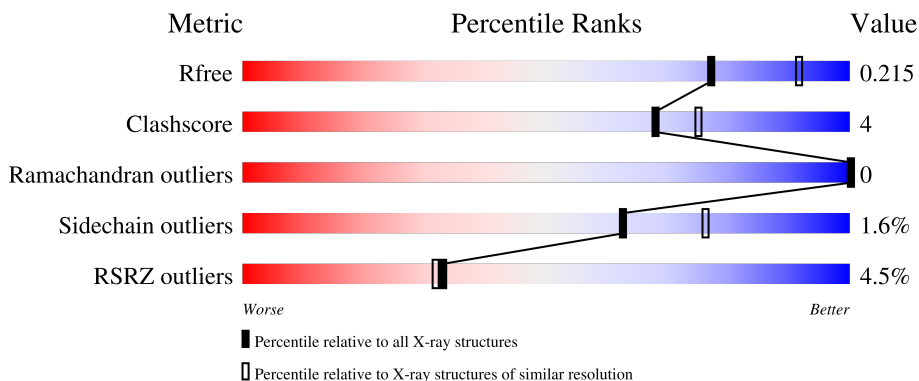
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.20 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	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)
RSRZ outliers	127900	4800 (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  $\geq 3$ , 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	349	 4% 84% 5% 10%
2	B	520	 4% 83% 10% 7%
3	C	2	 100%
3	D	2	 50% 50%
3	E	2	 50% 50%

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
3	GLC	C	1	X	-	-	-
3	FRU	C	2	X	-	-	-
3	GLC	D	1	X	-	-	-
3	FRU	D	2	X	-	-	-
3	GLC	E	1	X	-	-	-
3	FRU	E	2	X	-	-	-
5	3CX	B	522	X	-	-	-
5	3CX	B	523	X	-	-	-
5	3CX	B	524	X	-	-	-

## 2 Entry composition [i](#)

There are 9 unique types of molecules in this entry. The entry contains 7003 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.

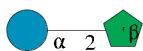
- Molecule 1 is a protein called Farnesyltransferase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	313	2606	1680	444	471	11	0	0	0

- Molecule 2 is a protein called Farnesyltransferase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	485	3730	2366	649	700	15	0	1	0

- Molecule 3 is an oligosaccharide called beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose.

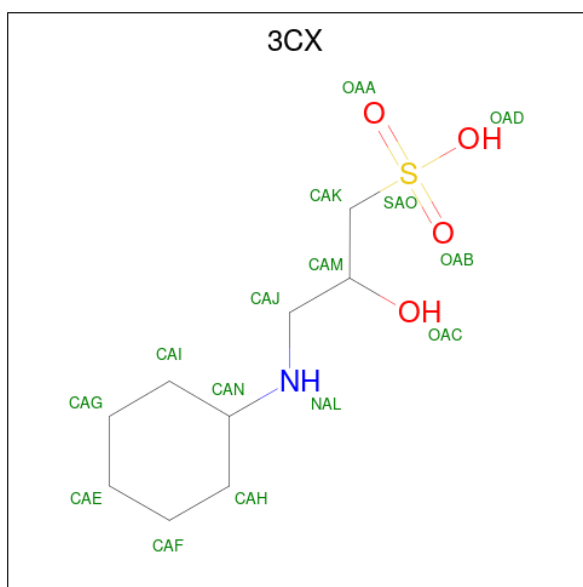


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	Trace
			Total	C	O			
3	C	2	23	12	11	0	0	0
3	D	2	23	12	11	0	0	0
3	E	2	23	12	11	0	0	0

- Molecule 4 is ZINC ION (three-letter code: ZN) (formula: Zn).

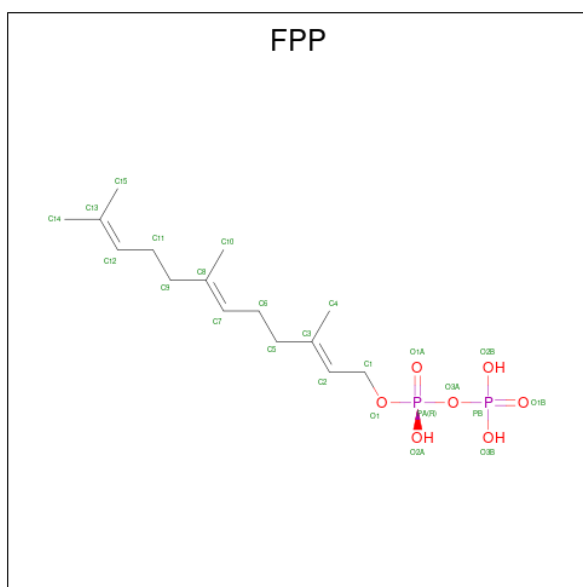
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total	Zn	0	0
			1	1		

- Molecule 5 is (2S)-3-(cyclohexylamino)-2-hydroxypropane-1-sulfonic acid (three-letter code: 3CX) (formula: C<sub>9</sub>H<sub>19</sub>NO<sub>4</sub>S).



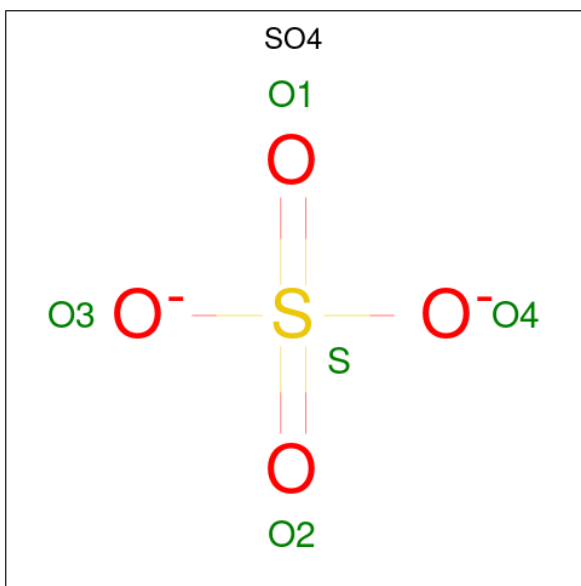
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	S	0	0
			15	9	1	4	1		
5	B	1	Total	C	N	O	S	0	0
			15	9	1	4	1		
5	B	1	Total	C	N	O	S	0	0
			15	9	1	4	1		

- Molecule 6 is FARNESYL DIPHOSPHATE (three-letter code: FPP) (formula:  $C_{15}H_{28}O_7P_2$ ).



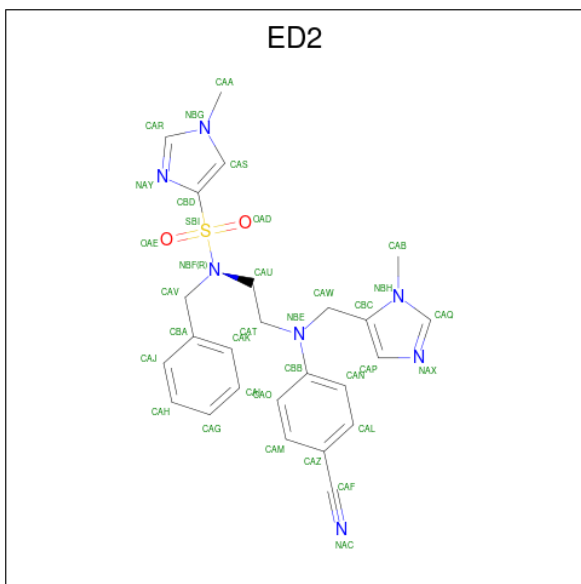
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	B	1	Total	C	O	P	0	0
			24	15	7	2		

- Molecule 7 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	O	S	0	0	
			5	4	1			

- Molecule 8 is N-benzyl-N-(2-((4-cyanophenyl)[(1-methyl-1H-imidazol-5-yl)methyl]amino)ethyl)-1-methyl-1H-imidazole-4-sulfonamide (three-letter code: ED2) (formula: C<sub>25</sub>H<sub>27</sub>N<sub>7</sub>O<sub>2</sub>S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	B	1	Total	C	N	O	S	0	0
			35	25	7	2	1		

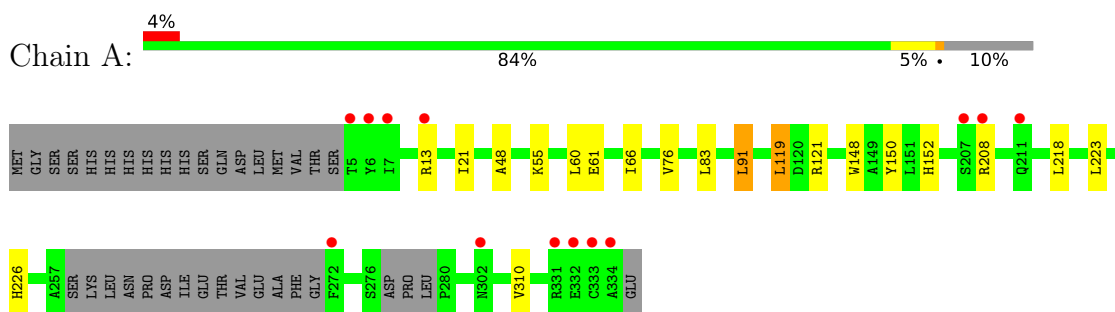
- Molecule 9 is water.

<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
9	A	171	Total 171	O 171	0	0
9	B	317	Total 317	O 317	0	0

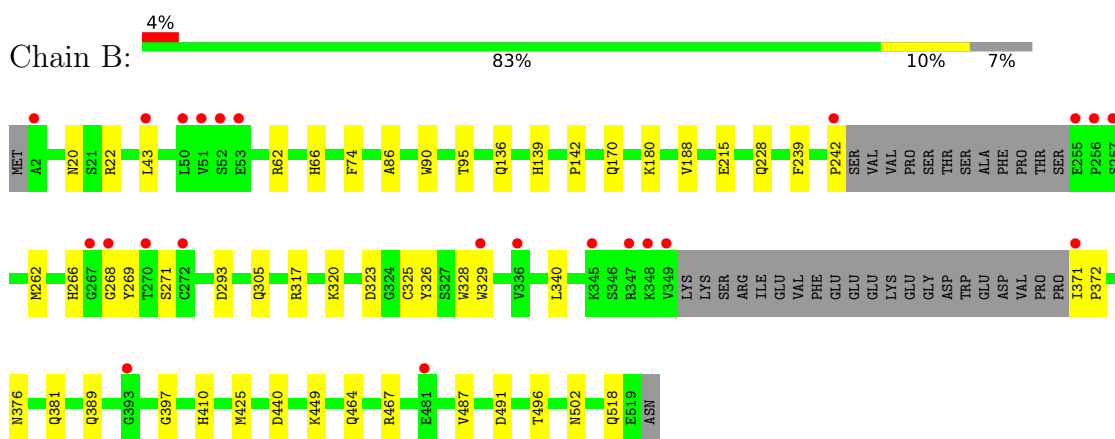
### 3 Residue-property plots [i](#)

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.

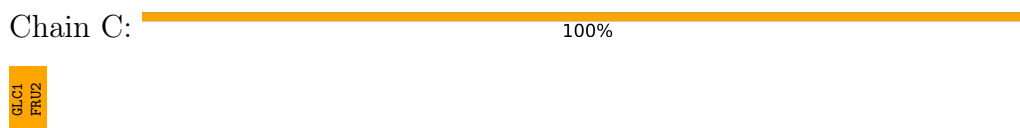
- Molecule 1: Farnesyltransferase alpha subunit



- Molecule 2: Farnesyltransferase beta subunit



- Molecule 3: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose



- Molecule 3: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose





- Molecule 3: beta-D-fructofuranose-(2-1)-alpha-D-glucopyranose

Chain E:  50% 50%

GLC1  
FRU2

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	143.58Å 143.58Å 130.72Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	44.94 – 2.20 44.94 – 2.20	Depositor EDS
% Data completeness (in resolution range)	99.1 (44.94-2.20) 99.1 (44.94-2.20)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.55 (at 2.20Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, $R_{free}$	0.191 , 0.213 0.194 , 0.215	Depositor DCC
$R_{free}$ test set	3447 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.7	Xtrriage
Anisotropy	0.052	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 43.2	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7003	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	38.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.08% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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: ED2, GLC, SO4, FPP, 3CX, ZN, FRU

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	0.35	0/2687	0.47	0/3657
2	B	0.37	0/3827	0.50	1/5198 (0.0%)
All	All	0.36	0/6514	0.48	1/8855 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	242	PRO	CA-N-CD	-8.53	99.56	111.50

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	2606	0	2526	10	0
2	B	3730	0	3657	37	0
3	C	23	0	21	0	0
3	D	23	0	21	0	0
3	E	23	0	21	0	0
4	B	1	0	0	0	0
5	B	45	0	48	1	0
6	B	24	0	25	3	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	B	5	0	0	0	0
8	B	35	0	27	5	0
9	A	171	0	0	1	0
9	B	317	0	0	1	0
All	All	7003	0	6346	49	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 4.

All (49) 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:228:GLN:HE22	2:B:293:ASP:H	1.19	0.89
2:B:62:ARG:H	2:B:389:GLN:HE22	1.20	0.86
2:B:464:GLN:HE22	2:B:467:ARG:HH11	1.25	0.82
2:B:66:HIS:HD1	2:B:397:GLY:H	1.28	0.82
2:B:440:ASP:H	2:B:518:GLN:HE22	1.29	0.79
2:B:305:GLN:HE22	2:B:376:ASN:H	1.34	0.75
2:B:170:GLN:HE22	2:B:449:LYS:H	1.37	0.70
2:B:62:ARG:H	2:B:389:GLN:NE2	1.97	0.61
6:B:525:FPP:H102	8:B:1003:ED2:NAY	2.15	0.60
2:B:90:TRP:CD1	8:B:1003:ED2:HAG	2.37	0.60
2:B:317:ARG:HG3	2:B:320:LYS:HG3	1.86	0.57
1:A:148:TRP:O	1:A:152:HIS:HD2	1.86	0.57
2:B:180:LYS:HG3	9:B:2585:HOH:O	2.06	0.56
1:A:91:LEU:HD21	1:A:121:ARG:HD3	1.88	0.54
2:B:266:HIS:HD2	2:B:268:GLY:H	1.56	0.54
2:B:381:GLN:HE22	2:B:487:VAL:H	1.54	0.54
2:B:323:ASP:HB3	2:B:326:TYR:CD2	2.42	0.54
2:B:440:ASP:H	2:B:518:GLN:NE2	2.03	0.53
1:A:119:LEU:HD13	1:A:150:TYR:OH	2.10	0.52
2:B:86:ALA:HA	2:B:136:GLN:HE22	1.75	0.51
2:B:66:HIS:HD1	2:B:397:GLY:N	2.03	0.51
2:B:328:TRP:CZ2	2:B:502:ASN:HB2	2.45	0.51
2:B:464:GLN:HE22	2:B:467:ARG:NH1	2.02	0.51
1:A:226:HIS:H	2:B:20:ASN:HD21	1.59	0.50
2:B:139:HIS:HB3	2:B:142:PRO:CG	2.42	0.49
1:A:226:HIS:HB2	2:B:20:ASN:HD21	1.77	0.48
1:A:152:HIS:HE1	9:A:1787:HOH:O	1.96	0.47
6:B:525:FPP:PA	8:B:1003:ED2:HAAB	2.55	0.47
2:B:381:GLN:NE2	2:B:487:VAL:H	2.12	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:491:ASP:OD2	5:B:522:3CX:NAL	2.47	0.46
2:B:271:SER:HB2	2:B:329:TRP:O	2.15	0.46
2:B:139:HIS:HB3	2:B:142:PRO:HG2	1.97	0.46
2:B:305:GLN:NE2	2:B:376:ASN:H	2.09	0.46
2:B:170:GLN:HE22	2:B:449:LYS:N	2.09	0.45
2:B:74:PHE:CD2	2:B:95:THR:HG21	2.52	0.44
2:B:170:GLN:NE2	2:B:449:LYS:H	2.09	0.44
1:A:55:LYS:HD3	1:A:83:LEU:HD23	1.99	0.43
2:B:269:TYR:CE2	6:B:525:FPP:H41	2.53	0.43
8:B:1003:ED2:HATA	8:B:1003:ED2:HAVA	1.70	0.42
2:B:325:CYS:HB3	2:B:410:HIS:CD2	2.54	0.42
1:A:60:LEU:HA	1:A:83:LEU:HD13	2.01	0.42
2:B:425:MET:SD	2:B:496:THR:CG2	3.08	0.42
2:B:180:LYS:HE2	2:B:215:GLU:O	2.20	0.42
1:A:21:ILE:HD12	1:A:48:ALA:HA	2.02	0.41
2:B:139:HIS:CE1	2:B:188:VAL:HB	2.55	0.41
8:B:1003:ED2:CAN	8:B:1003:ED2:HAU	2.50	0.41
2:B:371:ILE:HG13	2:B:372:PRO:HD2	2.03	0.41
1:A:66:ILE:HG21	1:A:76:VAL:HG21	2.02	0.40
2:B:239:PHE:HB2	2:B:262[B]:MET:SD	2.61	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	307/349 (88%)	298 (97%)	9 (3%)	0	100	100
2	B	480/520 (92%)	472 (98%)	8 (2%)	0	100	100
All	All	787/869 (91%)	770 (98%)	17 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	283/316 (90%)	275 (97%)	8 (3%)	43	56
2	B	404/436 (93%)	401 (99%)	3 (1%)	84	91
All	All	687/752 (91%)	676 (98%)	11 (2%)	62	76

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	ARG
1	A	61	GLU
1	A	91	LEU
1	A	119	LEU
1	A	208	ARG
1	A	218	LEU
1	A	223	LEU
1	A	310	VAL
2	B	22	ARG
2	B	43	LEU
2	B	340	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	HIS
1	A	110	GLN
1	A	146	HIS
1	A	152	HIS
1	A	187	ASN
1	A	211	GLN
2	B	20	ASN
2	B	136	GLN
2	B	170	GLN
2	B	219	ASN
2	B	228	GLN

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Mol	Chain	Res	Type
2	B	266	HIS
2	B	304	GLN
2	B	305	GLN
2	B	319	ASN
2	B	381	GLN
2	B	389	GLN
2	B	414	ASN
2	B	464	GLN
2	B	495	ASN
2	B	518	GLN

### 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](#)

6 monosaccharides 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
3	GLC	C	1	3	11,11,12	1.29	1 (9%)	15,15,17	0.80	0
3	FRU	C	2	3	11,12,12	1.31	0	10,18,18	0.86	1 (10%)
3	GLC	D	1	3	11,11,12	1.30	1 (9%)	15,15,17	1.49	2 (13%)
3	FRU	D	2	3	11,12,12	1.27	0	10,18,18	0.87	0
3	GLC	E	1	3	11,11,12	1.34	1 (9%)	15,15,17	1.14	1 (6%)
3	FRU	E	2	3	11,12,12	1.25	0	10,18,18	0.71	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
3	GLC	C	1	3	2/2/4/5	0/2/19/22	0/1/1/1
3	FRU	C	2	3	2/2/4/4	5/5/24/24	0/1/1/1
3	GLC	D	1	3	2/2/4/5	0/2/19/22	0/1/1/1
3	FRU	D	2	3	2/2/4/4	2/5/24/24	0/1/1/1
3	GLC	E	1	3	2/2/4/5	2/2/19/22	0/1/1/1
3	FRU	E	2	3	2/2/4/4	1/5/24/24	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	1	GLC	O2-C2	-2.79	1.37	1.43
3	C	1	GLC	O2-C2	-2.78	1.37	1.43
3	E	1	GLC	O2-C2	-2.72	1.37	1.43

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	1	GLC	C1-C2-C3	4.01	114.59	109.67
3	E	1	GLC	C1-C2-C3	2.73	113.02	109.67
3	D	1	GLC	C1-O5-C5	-2.38	108.96	112.19
3	C	2	FRU	O5-C5-C6	2.06	114.58	108.85

All (12) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	C	1	GLC	C2
3	C	1	GLC	C3
3	C	2	FRU	C4
3	C	2	FRU	C5
3	D	1	GLC	C2
3	D	1	GLC	C3
3	D	2	FRU	C4
3	D	2	FRU	C5
3	E	1	GLC	C2
3	E	1	GLC	C3
3	E	2	FRU	C4
3	E	2	FRU	C5



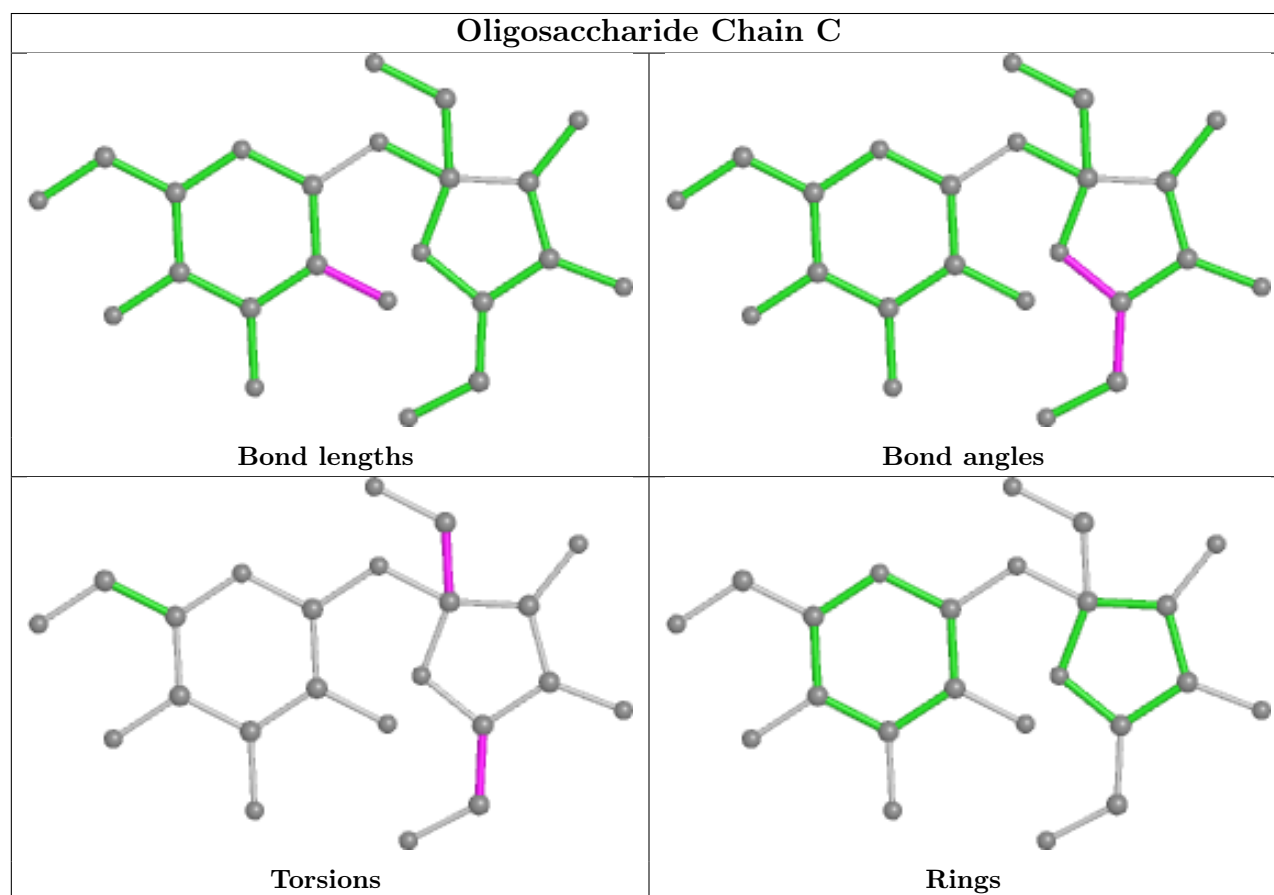
All (10) torsion outliers are listed below:

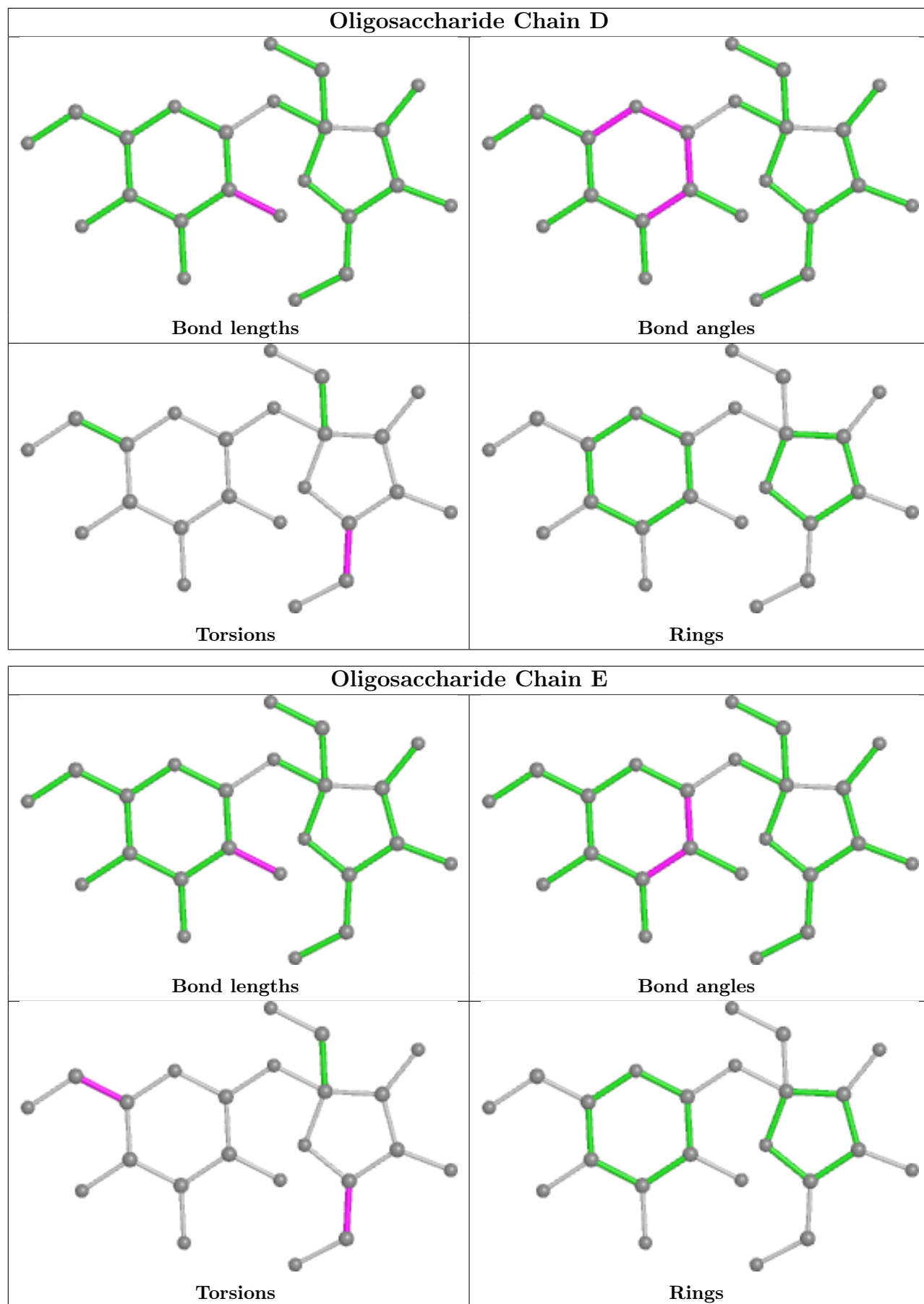
Mol	Chain	Res	Type	Atoms
3	C	2	FRU	O1-C1-C2-O2
3	D	2	FRU	O5-C5-C6-O6
3	D	2	FRU	C4-C5-C6-O6
3	E	1	GLC	C4-C5-C6-O6
3	E	1	GLC	O5-C5-C6-O6
3	C	2	FRU	O1-C1-C2-O5
3	C	2	FRU	O5-C5-C6-O6
3	E	2	FRU	C4-C5-C6-O6
3	C	2	FRU	O1-C1-C2-C3
3	C	2	FRU	C4-C5-C6-O6

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.





## 5.6 Ligand geometry

Of 7 ligands modelled in this entry, 1 is monoatomic - leaving 6 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
5	3CX	B	523	-	15,15,15	1.95	1 (6%)	16,20,20	1.58	3 (18%)
5	3CX	B	524	-	15,15,15	1.99	1 (6%)	16,20,20	1.49	3 (18%)
8	ED2	B	1003	4	33,38,38	1.91	9 (27%)	42,53,53	1.64	6 (14%)
7	SO4	B	526	-	4,4,4	0.13	0	6,6,6	0.10	0
5	3CX	B	522	-	15,15,15	1.90	1 (6%)	16,20,20	1.58	4 (25%)
6	FPP	B	525	-	21,23,23	1.20	1 (4%)	27,31,31	1.31	5 (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
5	3CX	B	523	-	1/1/3/4	7/10/18/18	0/1/1/1
5	3CX	B	524	-	1/1/3/4	6/10/18/18	0/1/1/1
8	ED2	B	1003	4	-	7/25/31/31	0/4/4/4
5	3CX	B	522	-	1/1/3/4	2/10/18/18	0/1/1/1
6	FPP	B	525	-	-	8/25/25/25	-

All (13) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	B	524	3CX	OAC-CAM	-7.02	1.22	1.43
5	B	523	3CX	OAC-CAM	-7.01	1.22	1.43
5	B	522	3CX	OAC-CAM	-6.71	1.23	1.43
8	B	1003	ED2	CAL-CAN	5.97	1.49	1.38
8	B	1003	ED2	CAM-CAZ	4.45	1.48	1.39
6	B	525	FPP	O1-C1	-3.37	1.38	1.43
8	B	1003	ED2	CAZ-CAF	3.05	1.51	1.44

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	1003	ED2	CAS-CBD	2.88	1.43	1.37
8	B	1003	ED2	CBD-SBI	-2.78	1.76	1.78
8	B	1003	ED2	CAS-NBG	2.74	1.42	1.38
8	B	1003	ED2	OAE-SBI	2.12	1.45	1.43
8	B	1003	ED2	CAO-CBB	2.03	1.43	1.39
8	B	1003	ED2	CAL-CAZ	-2.01	1.35	1.39

All (21) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	B	1003	ED2	OAE-SBI-OAD	-6.46	109.06	119.52
8	B	1003	ED2	OAE-SBI-NBF	5.10	111.34	106.69
5	B	522	3CX	OAC-CAM-CAJ	3.39	120.88	109.32
5	B	523	3CX	OAC-CAM-CAJ	3.03	119.66	109.32
5	B	524	3CX	OAD-SAO-CAK	2.96	110.46	105.74
5	B	523	3CX	OAB-SAO-CAK	2.91	110.40	106.94
5	B	524	3CX	OAC-CAM-CAJ	2.82	118.96	109.32
5	B	522	3CX	OAB-SAO-CAK	2.73	110.18	106.94
8	B	1003	ED2	NAX-CAQ-NBH	-2.63	108.35	112.26
5	B	524	3CX	OAA-SAO-CAK	2.50	109.91	106.94
5	B	523	3CX	OAA-SAO-CAK	2.45	109.85	106.94
5	B	522	3CX	CAM-CAJ-NAL	2.35	118.41	112.17
8	B	1003	ED2	OAE-SBI-CBD	2.34	111.71	107.50
5	B	522	3CX	OAD-SAO-CAK	2.34	109.47	105.74
6	B	525	FPP	PA-O3A-PB	-2.27	125.04	132.83
8	B	1003	ED2	CAU-NBF-SBI	-2.23	113.39	117.92
6	B	525	FPP	C4-C3-C2	-2.22	117.97	123.68
6	B	525	FPP	C1-C2-C3	-2.22	122.20	126.04
6	B	525	FPP	C15-C13-C14	2.16	119.38	114.60
8	B	1003	ED2	CAV-NBF-SBI	-2.08	112.49	117.35
6	B	525	FPP	C9-C8-C7	-2.06	116.95	121.12

All (3) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
5	B	522	3CX	CAM
5	B	523	3CX	CAM
5	B	524	3CX	CAM

All (30) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	522	3CX	NAL-CAJ-CAM-OAC
5	B	523	3CX	NAL-CAJ-CAM-CAK
5	B	523	3CX	CAM-CAK-SAO-OAA
5	B	523	3CX	CAM-CAK-SAO-OAB
5	B	523	3CX	CAM-CAK-SAO-OAD
5	B	524	3CX	NAL-CAJ-CAM-OAC
5	B	524	3CX	SAO-CAK-CAM-OAC
6	B	525	FPP	C1-O1-PA-O1A
6	B	525	FPP	C1-C2-C3-C4
6	B	525	FPP	C1-C2-C3-C5
8	B	1003	ED2	CAT-CAU-NBF-CAV
8	B	1003	ED2	CAU-NBF-SBI-CBD
6	B	525	FPP	C11-C12-C13-C15
8	B	1003	ED2	CAV-NBF-SBI-OAD
6	B	525	FPP	C11-C12-C13-C14
8	B	1003	ED2	CAU-NBF-SBI-OAD
8	B	1003	ED2	CAU-NBF-SBI-OAE
5	B	523	3CX	CAI-CAN-NAL-CAJ
5	B	524	3CX	CAI-CAN-NAL-CAJ
8	B	1003	ED2	CAV-NBF-SBI-CBD
6	B	525	FPP	C3-C5-C6-C7
5	B	522	3CX	SAO-CAK-CAM-OAC
5	B	523	3CX	SAO-CAK-CAM-OAC
6	B	525	FPP	PB-O3A-PA-O1A
5	B	524	3CX	CAM-CAK-SAO-OAB
5	B	523	3CX	CAH-CAN-NAL-CAJ
8	B	1003	ED2	CAV-NBF-SBI-OAE
5	B	524	3CX	CAH-CAN-NAL-CAJ
6	B	525	FPP	C4-C3-C5-C6
5	B	524	3CX	CAM-CAK-SAO-OAD

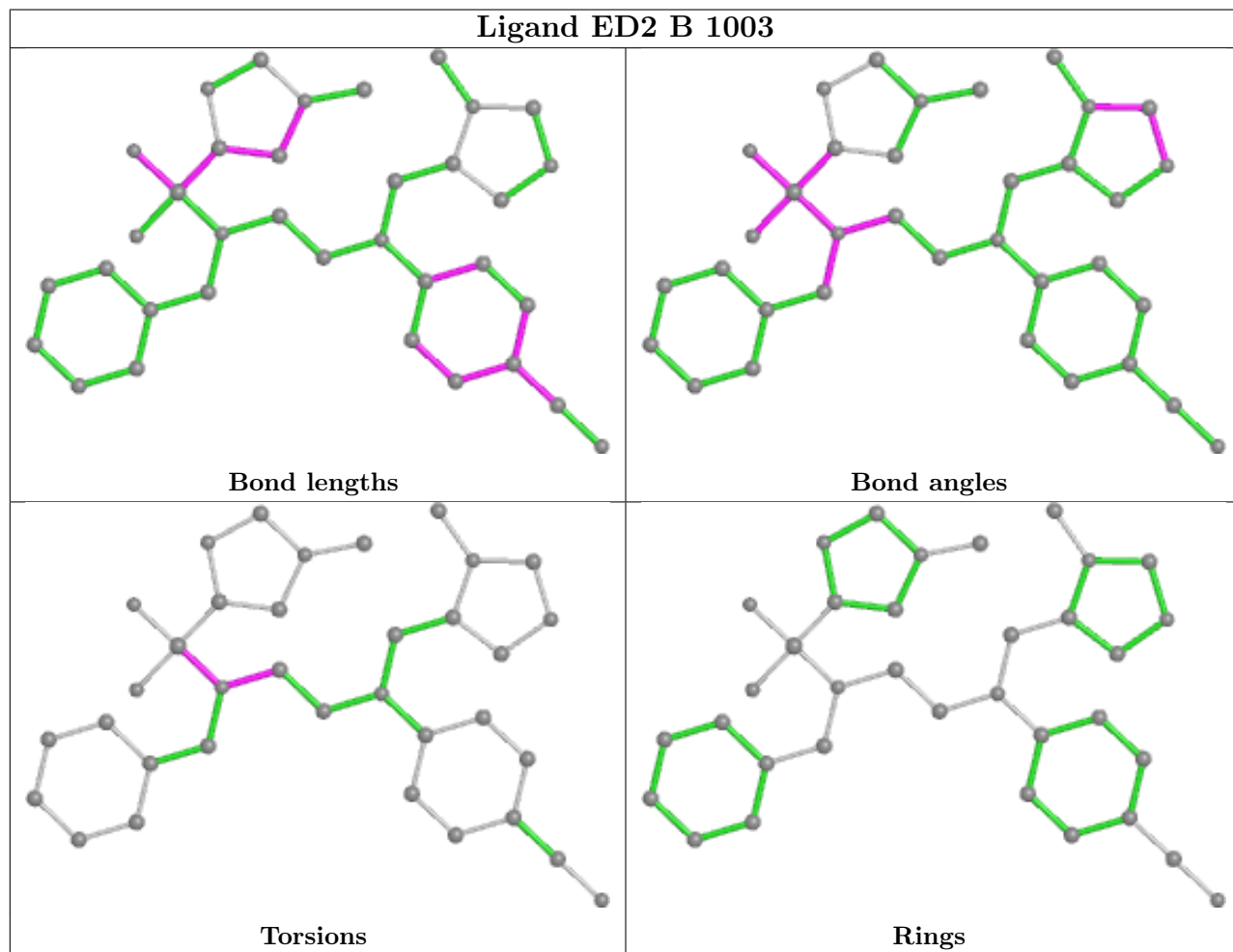
There are no ring outliers.

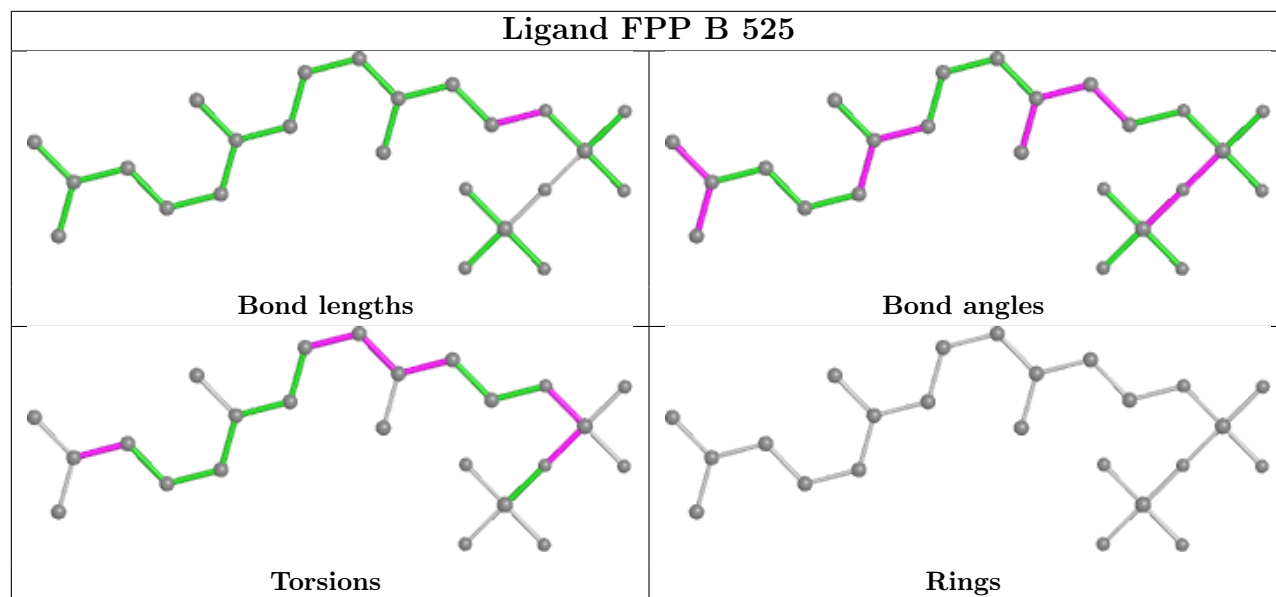
3 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	B	1003	ED2	5	0
5	B	522	3CX	1	0
6	B	525	FPP	3	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	313/349 (89%)	-0.10	13 (4%) 36 34	26, 41, 62, 71	0
2	B	485/520 (93%)	0.10	23 (4%) 31 30	21, 33, 49, 71	0
All	All	798/869 (91%)	0.02	36 (4%) 33 32	21, 36, 59, 71	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	349	VAL	8.0
2	B	255	GLU	5.8
1	A	5	THR	5.3
2	B	257	SER	5.3
1	A	333	CYS	5.0
2	B	348	LYS	4.3
2	B	2	ALA	4.2
2	B	242	PRO	4.2
2	B	51	VAL	4.0
2	B	256	PRO	3.8
2	B	371	ILE	3.7
1	A	334	ALA	3.3
1	A	302	ASN	3.2
1	A	207	SER	3.1
2	B	347	ARG	3.1
2	B	481	GLU	3.0
1	A	211	GLN	2.9
2	B	50	LEU	2.5
2	B	43	LEU	2.4
1	A	272	PHE	2.4
1	A	332	GLU	2.4
2	B	393	GLY	2.4
2	B	52	SER	2.4
2	B	53	GLU	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	331	ARG	2.3
1	A	6	TYR	2.3
1	A	208	ARG	2.3
2	B	272	CYS	2.2
1	A	7	ILE	2.2
1	A	13	ARG	2.1
2	B	345	LYS	2.1
2	B	268	GLY	2.1
2	B	270	THR	2.1
2	B	329	TRP	2.1
2	B	336	VAL	2.1
2	B	267	GLY	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](#)

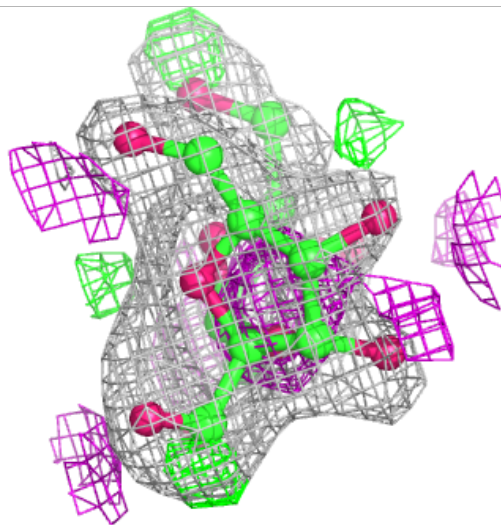
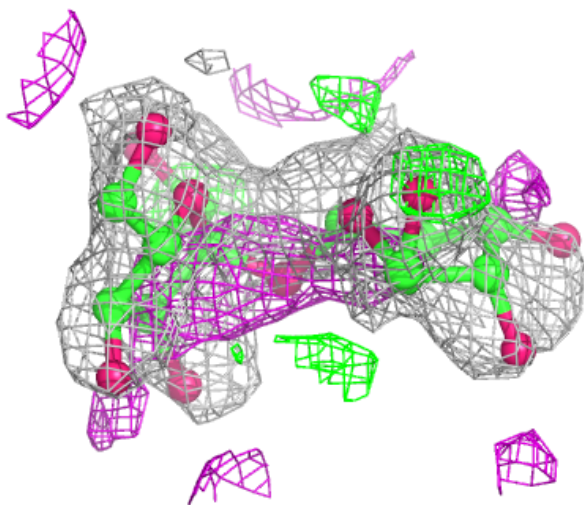
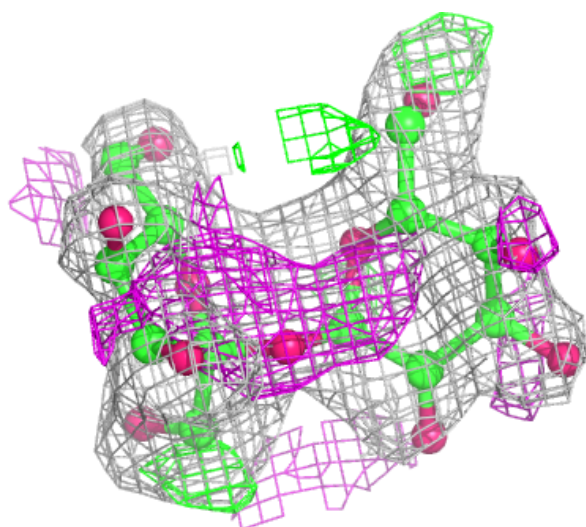
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å <sup>2</sup> )	Q<0.9
3	GLC	C	1	11/12	0.63	0.35	79,80,81,81	0
3	FRU	C	2	12/12	0.68	0.27	79,80,80,80	0
3	GLC	E	1	11/12	0.76	0.22	72,72,72,73	0
3	GLC	D	1	11/12	0.81	0.16	44,46,47,47	0
3	FRU	E	2	12/12	0.84	0.26	72,73,73,73	0
3	FRU	D	2	12/12	0.89	0.15	46,47,47,48	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

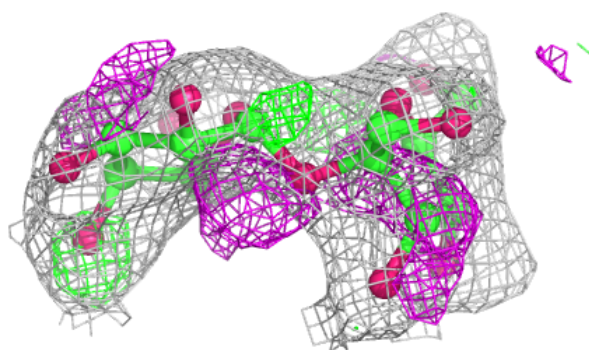
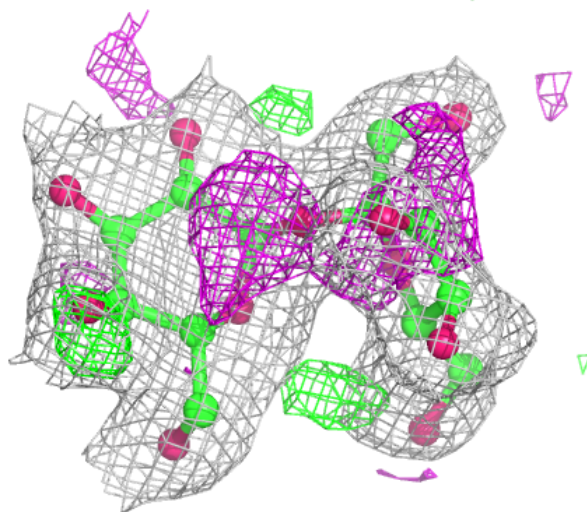
**Electron density around Chain C:**

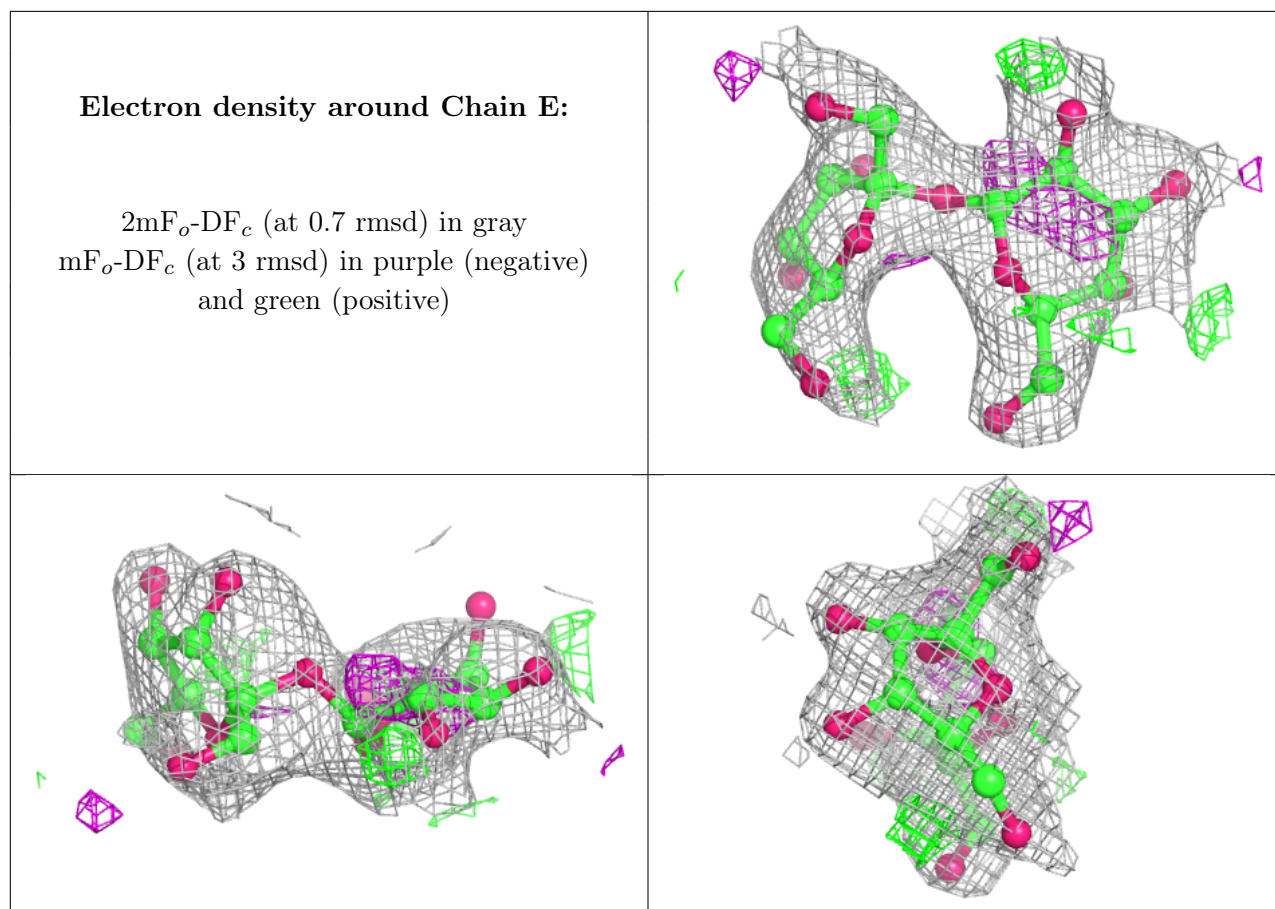
$2mF_o-DF_c$  (at 0.7 rmsd) in gray  
 $mF_o-DF_c$  (at 3 rmsd) in purple (negative)  
and green (positive)



**Electron density around Chain D:**

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





## 6.4 Ligands [i](#)

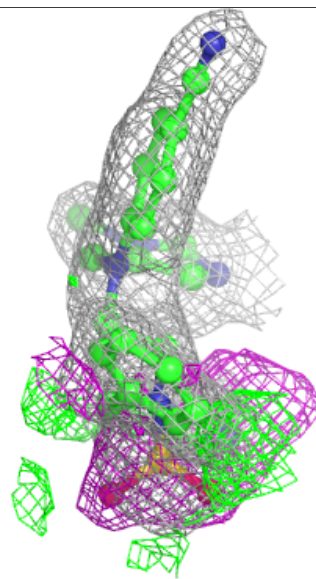
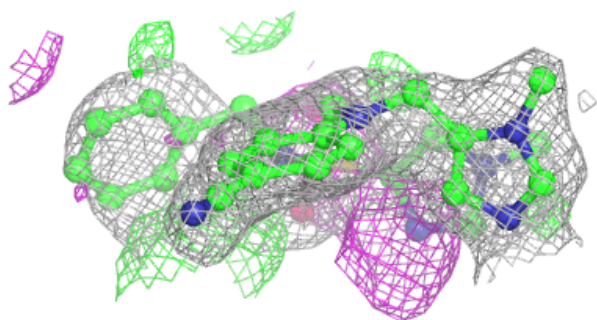
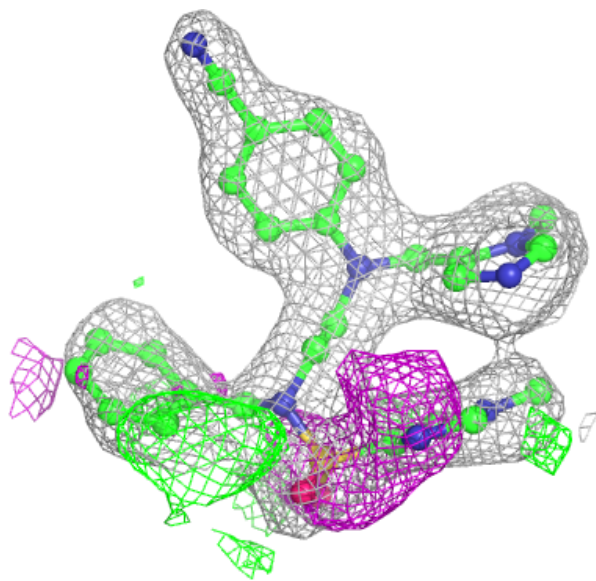
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95<sup>th</sup> percentile and maximum values of B factors of atoms in the group. The column labelled 'Q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

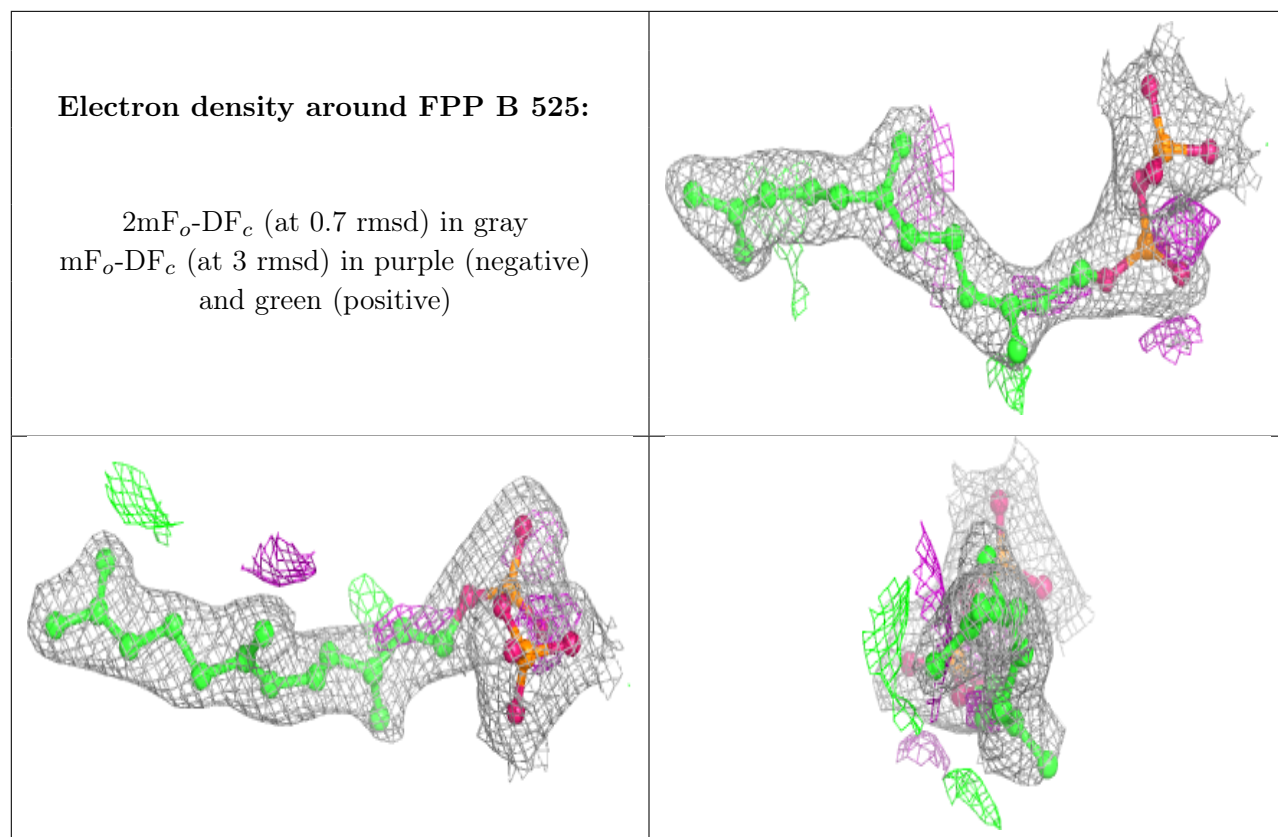
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	3CX	B	524	15/15	0.80	0.20	64,67,73,73	0
8	ED2	B	1003	35/35	0.86	0.21	45,52,62,62	0
7	SO4	B	526	5/5	0.92	0.25	79,79,79,79	0
6	FPP	B	525	24/24	0.95	0.22	33,37,41,42	0
5	3CX	B	523	15/15	0.96	0.14	46,47,48,50	0
5	3CX	B	522	15/15	0.98	0.11	27,28,30,31	0
4	ZN	B	521	1/1	1.00	0.14	27,27,27,27	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 ED2 B 1003:**

$2mF_o-DF_c$  (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.