



wwPDB EM Map/Model Validation Report ⓘ

Apr 10, 2016 – 01:49 PM BST

PDB ID : 3J8F
EMDB ID: : EMD-6147
Title : Cryo-EM reconstruction of poliovirus-receptor complex
Authors : Strauss, M.; Filman, D.J.; Belnap, D.M.; Cheng, N.; Noel, R.T.; Hogle, J.M.
Deposited on : 2014-10-20
Resolution : 3.70 Å(reported)
Based on PDB ID : 4FQP, 1HXS

This is a wwPDB EM Map/Model Validation Report for a publicly released PDB/EMDB entry.
For rigid body fitted models, validation errors reported here could stem from errors in the original structure(s) used in the fitting.
We welcome your comments at validation@mail.wwpdb.org
A user guide is available at
<http://wwpdb.org/validation/2016/EMValidationReportHelp>

MolProbity : 4.02b-467
Mogul : 1.7.1 (RC1), CSD as537be (2016)
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : trunk27241

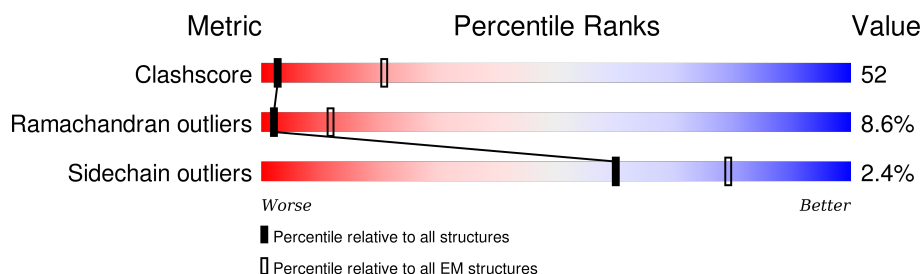
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.70 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)	EM structures (#Entries)
Clashscore	114402	924
Ramachandran outliers	111179	726
Sidechain outliers	111093	686

The table below summarises the geometric issues observed across the polymeric chains. The red, orange, yellow and green segments on the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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 $\leq 5\%$.

Mol	Chain	Length	Quality of chain
1	1	302	42% 47% 5% 6%
2	2	272	44% 47% 7% .
3	3	238	46% 45% 7% ..
4	4	69	41% 48% 10% .
5	7	423	27% 38% 7% 28%

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
9	NAG	7	516	-	-	X	-

2 Entry composition

There are 10 unique types of molecules in this entry. The entry contains 9263 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Capsid protein VP1.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	1	283	Total	C	N	O	S	0	0
			2221	1416	378	422	5		

- Molecule 2 is a protein called Capsid protein VP2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	2	267	Total	C	N	O	S	0	0
			2075	1312	357	392	14		

- Molecule 3 is a protein called Capsid protein VP3.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	3	235	Total	C	N	O	S	0	0
			1834	1169	299	349	17		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
3	123	SER	PHE	CONFLICT	UNP P03300

- Molecule 4 is a protein called Capsid protein VP4.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	4	69	Total	C	N	O	S	0	0
			534	333	91	109	1		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
4	1	MYR	-	MYRISTOYLATION	UNP P03300

- Molecule 5 is a protein called Poliovirus receptor.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	7	306	Total	C	N	O	S	0	0
			2342	1478	403	449	12		

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
7	418	HIS	-	EXPRESSION TAG	UNP P15151
7	419	HIS	-	EXPRESSION TAG	UNP P15151
7	420	HIS	-	EXPRESSION TAG	UNP P15151
7	421	HIS	-	EXPRESSION TAG	UNP P15151
7	422	HIS	-	EXPRESSION TAG	UNP P15151
7	423	HIS	-	EXPRESSION TAG	UNP P15151

- Molecule 6 is a polymer of unknown type called SUGAR (3-MER).

Mol	Chain	Residues	Atoms				AltConf
6	7	3	Total	C	N	O	0
			78	44	4	30	
6	7	3	Total	C	N	O	0
			78	44	4	30	

- Molecule 7 is a polymer of unknown type called SUGAR (5-MER).

Mol	Chain	Residues	Atoms				AltConf
7	7	5	Total	C	N	O	0
			60	34	2	24	

- Molecule 8 is a polymer of unknown type called SUGAR (2-MER).

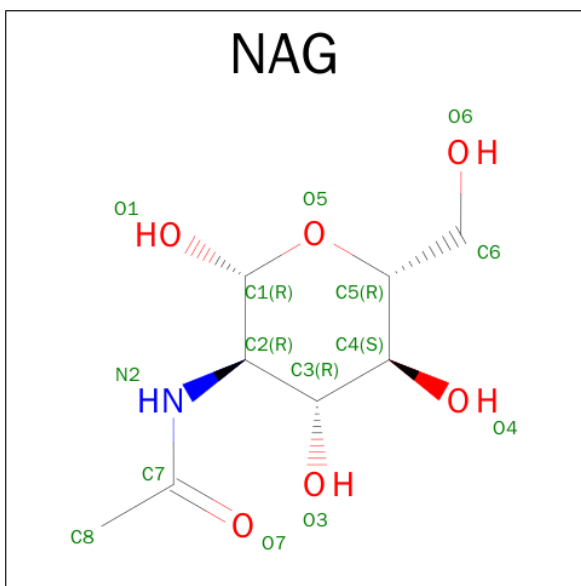
Mol	Chain	Residues	Atoms				AltConf
8	7	2	Total	C	N	O	0
			56	32	4	20	
8	7	2	Total	C	N	O	0
			56	32	4	20	

- Molecule 9 is a polymer of unknown type called SUGAR (4-MER).

Mol	Chain	Residues	Atoms				AltConf
9	7	4	Total	C	N	O	0
			49	28	2	19	

- Molecule 10 is SUGAR (N-ACETYL-D-GLUCOSAMINE) (three-letter code: NAG)

(formula: C₈H₁₅NO₆).

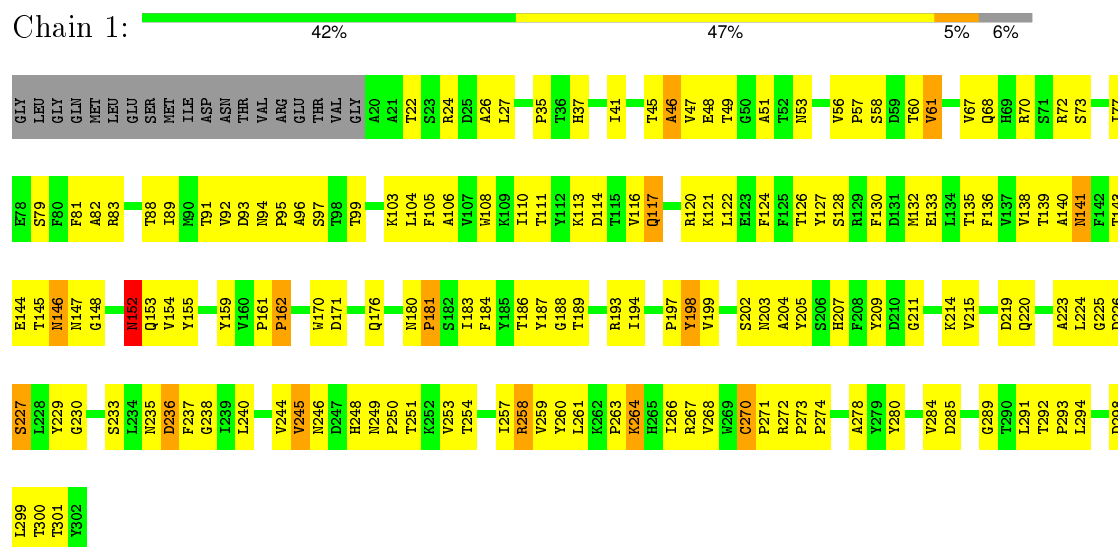


Mol	Chain	Residues	Atoms				AltConf
			Total	C	N	O	
10	7	1	14	8	1	5	0

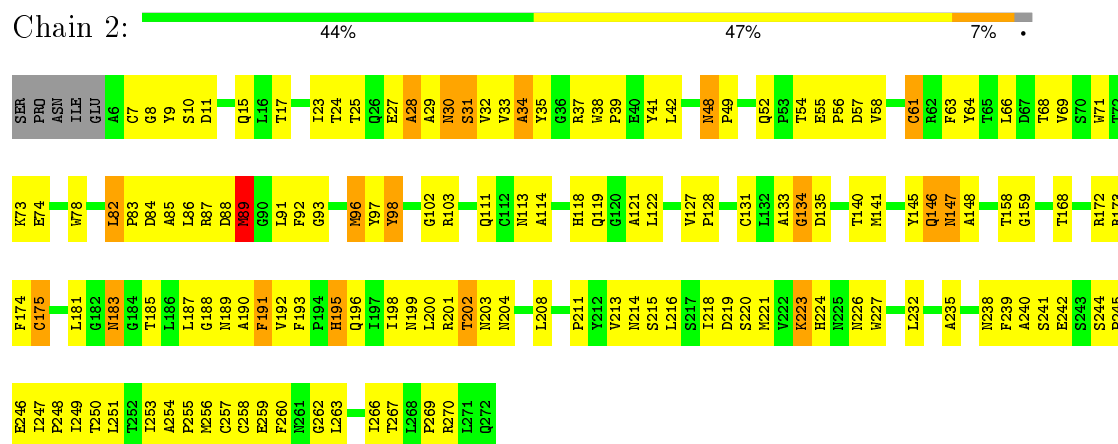
3 Residue-property plots

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

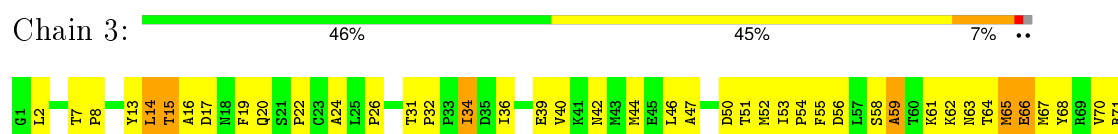
• Molecule 1: Capsid protein VP1

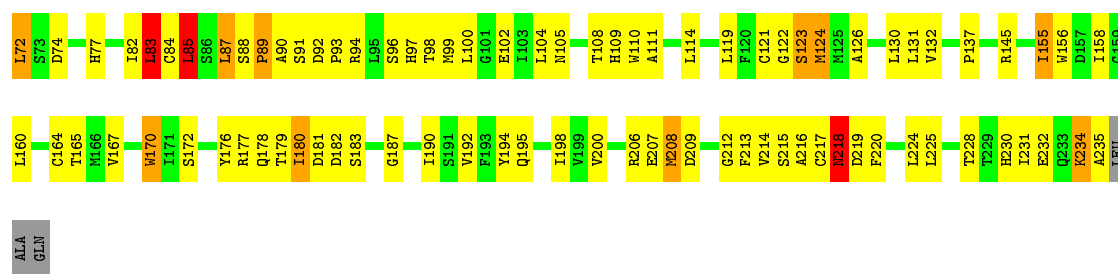


• Molecule 2: Capsid protein VP2

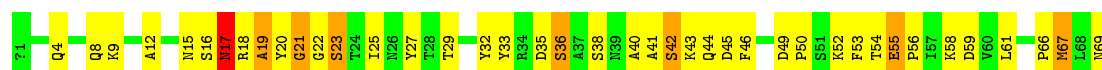


• Molecule 3: Capsid protein VP3

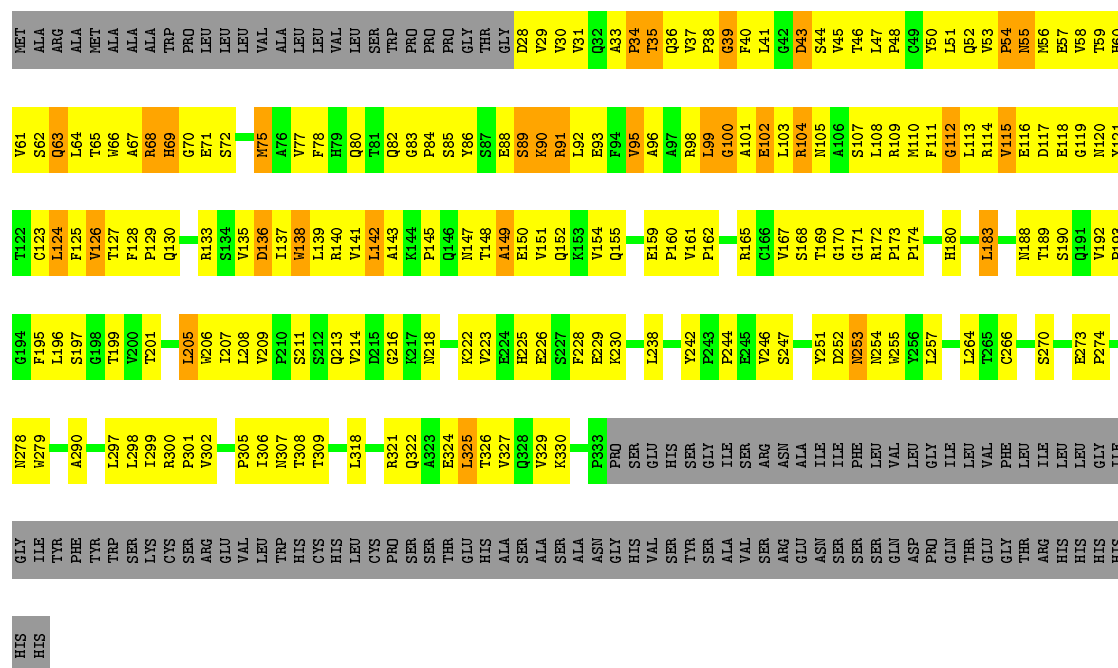




- Molecule 4: Capsid protein VP4



- Molecule 5: Poliovirus receptor



4 Experimental information

Property	Value	Source
Reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, I	Depositor
Number of images	9248	Depositor
Resolution determination method	FSC 0.143	Depositor
CTF correction method	per micrograph	Depositor
Microscope	FEI POLARA 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	25	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	27500	Depositor
Image detector	GATAN K2 (4k x 4k)	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FUC, MYR, BMA, NAG

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	$\# Z > 2$	RMSZ	$\# Z > 2$
1	1	0.56	0/2284	0.94	0/3124
2	2	0.56	0/2132	0.99	4/2916 (0.1%)
3	3	0.53	0/1881	1.00	6/2562 (0.2%)
4	4	0.61	0/528	0.97	1/714 (0.1%)
5	7	0.54	1/2400 (0.0%)	1.06	4/3286 (0.1%)
All	All	0.55	1/9225 (0.0%)	1.00	15/12602 (0.1%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	7	136	ASP	C-N	21.37	1.83	1.34

The worst 5 of 15 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	7	136	ASP	O-C-N	-40.95	57.18	122.70
5	7	136	ASP	C-N-CA	11.70	150.96	121.70
5	7	136	ASP	CA-C-N	9.80	138.76	117.20
3	3	14	LEU	CA-CB-CG	7.38	132.27	115.30
5	7	138	TRP	CB-CA-C	-6.46	97.47	110.40

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	1	2221	0	2173	205	0
2	2	2075	0	1994	155	0
3	3	1834	0	1816	169	0
4	4	534	0	523	59	0
5	7	2342	0	2292	422	0
6	7	78	0	68	2	0
7	7	60	0	52	11	0
8	7	56	0	50	3	0
9	7	49	0	43	10	0
10	7	14	0	13	0	0
All	All	9263	0	9024	948	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 52.

The worst 5 of 948 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)
5:7:29:VAL:CG1	5:7:53:VAL:HA	1.26	1.61
5:7:31:VAL:CG1	5:7:135:VAL:CG2	1.76	1.58
5:7:31:VAL:HG13	5:7:135:VAL:CG2	1.35	1.51
5:7:64:LEU:CD2	5:7:103:LEU:HD13	1.44	1.47
5:7:29:VAL:HG11	5:7:53:VAL:CA	1.47	1.45

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 PDB entries followed by that with respect to all EM entries.

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	1	281/302 (93%)	206 (73%)	52 (18%)	23 (8%)	1 17

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	2	265/272 (97%)	192 (72%)	51 (19%)	22 (8%)	1	17
3	3	233/238 (98%)	180 (77%)	37 (16%)	16 (7%)	1	23
4	4	66/69 (96%)	42 (64%)	14 (21%)	10 (15%)	0	5
5	7	304/423 (72%)	235 (77%)	41 (14%)	28 (9%)	1	15
All	All	1149/1304 (88%)	855 (74%)	195 (17%)	99 (9%)	2	16

5 of 99 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	1	37	HIS
1	1	46	ALA
1	1	61	VAL
1	1	113	LYS
1	1	224	LEU

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

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	1	245/261 (94%)	241 (98%)	4 (2%)	70	90
2	2	227/232 (98%)	222 (98%)	5 (2%)	60	86
3	3	210/212 (99%)	204 (97%)	6 (3%)	50	81
4	4	57/57 (100%)	55 (96%)	2 (4%)	43	78
5	7	263/361 (73%)	256 (97%)	7 (3%)	52	83
All	All	1002/1123 (89%)	978 (98%)	24 (2%)	60	85

5 of 24 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	3	124	MET
3	3	218	ASN
5	7	205	LEU
3	3	180	ILE

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Mol	Chain	Res	Type
3	3	208	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 34 such sidechains are listed below:

Mol	Chain	Res	Type
2	2	167	GLN
2	2	225	ASN
5	7	147	ASN
2	2	196	GLN
1	1	176	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

19 carbohydrates 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	$\# Z > 2$
6	NAG	7	501	5,6	14,14,15	0.56	0	15,19,21	0.72	0
6	NAG	7	502	6	14,14,15	0.53	0	15,19,21	0.80	0
6	BMA	7	503	6	11,11,12	0.22	0	15,15,17	0.61	0
7	NAG	7	504	5,7	14,14,15	0.55	0	15,19,21	0.79	0
7	NAG	7	505	7	14,14,15	0.53	0	15,19,21	0.76	0
7	FUC	7	506	7	10,10,11	0.64	0	13,14,16	0.77	0
7	BMA	7	507	7	11,11,12	0.32	0	15,15,17	0.87	1 (6%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	BMA	7	508	7	11,11,12	0.64	0	15,15,17	0.72	0
8	NAG	7	509	8,5	14,14,15	0.64	0	15,19,21	0.79	1 (6%)
8	NAG	7	510	8	14,14,15	0.57	0	15,19,21	0.59	0
8	NAG	7	511	8,5	14,14,15	0.53	0	15,19,21	0.81	1 (6%)
8	NAG	7	512	8	14,14,15	0.54	0	15,19,21	0.64	0
6	NAG	7	513	5,6	14,14,15	0.57	0	15,19,21	0.65	0
6	NAG	7	514	6	14,14,15	0.56	0	15,19,21	0.85	0
6	BMA	7	515	6	11,11,12	0.32	0	15,15,17	0.64	0
9	NAG	7	516	9,5	14,14,15	0.58	0	15,19,21	0.61	0
9	FUC	7	517	9	10,10,11	0.61	0	13,14,16	0.71	0
9	NAG	7	518	9	14,14,15	0.52	0	15,19,21	0.65	0
9	BMA	7	519	9	11,11,12	0.26	0	15,15,17	0.53	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	NAG	7	501	5,6	-	0/6/23/26	0/1/1/1
6	NAG	7	502	6	-	0/6/23/26	0/1/1/1
6	BMA	7	503	6	-	0/2/19/22	1/1/1/1
7	NAG	7	504	5,7	-	0/6/23/26	0/1/1/1
7	NAG	7	505	7	-	0/6/23/26	0/1/1/1
7	FUC	7	506	7	-	0/0/17/20	0/1/1/1
7	BMA	7	507	7	-	0/2/19/22	0/1/1/1
7	BMA	7	508	7	-	0/2/19/22	0/1/1/1
8	NAG	7	509	8,5	-	0/6/23/26	0/1/1/1
8	NAG	7	510	8	-	0/6/23/26	0/1/1/1
8	NAG	7	511	8,5	-	0/6/23/26	0/1/1/1
8	NAG	7	512	8	-	0/6/23/26	0/1/1/1
6	NAG	7	513	5,6	-	0/6/23/26	0/1/1/1
6	NAG	7	514	6	-	0/6/23/26	0/1/1/1
6	BMA	7	515	6	-	0/2/19/22	0/1/1/1
9	NAG	7	516	9,5	-	0/6/23/26	0/1/1/1
9	FUC	7	517	9	-	0/0/17/20	0/1/1/1
9	NAG	7	518	9	-	0/6/23/26	0/1/1/1
9	BMA	7	519	9	-	0/2/19/22	0/1/1/1

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	7	509	NAG	O5-C5-C4	-2.13	106.61	110.13
7	7	507	BMA	O3-C3-C2	2.08	113.82	110.01
8	7	511	NAG	C1-O5-C5	2.15	115.31	112.14

There are no chirality outliers.

There are no torsion outliers.

All (1) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	7	503	BMA	C1-C2-C3-C4-C5-O5

13 monomers are involved in 26 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	7	504	NAG	5	0
7	7	505	NAG	1	0
7	7	506	FUC	5	0
7	7	507	BMA	4	0
7	7	508	BMA	3	0
8	7	509	NAG	2	0
8	7	510	NAG	2	0
8	7	511	NAG	1	0
6	7	513	NAG	2	0
9	7	516	NAG	9	0
9	7	517	FUC	3	0
9	7	518	NAG	5	0
9	7	519	BMA	1	0

5.6 Ligand geometry [i](#)

1 ligand is 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	$\# Z > 2$
10	NAG	7	520	5	14,14,15	0.53	0	15,19,21	0.65	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
10	NAG	7	520	5	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.