



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 9, 2020 – 07:59 AM BST

PDB ID : 4WSV
Title : The crystal structure of hemagglutinin from A/Taiwan/1/2013 in complex with 6'SLN
Authors : Yang, H.; Carney, P.J.; Chang, J.C.; Villanueva, J.M.; Stevens, J.
Deposited on : 2014-10-28
Resolution : 3.10 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 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 : 2.13.1
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) : 2.13.1

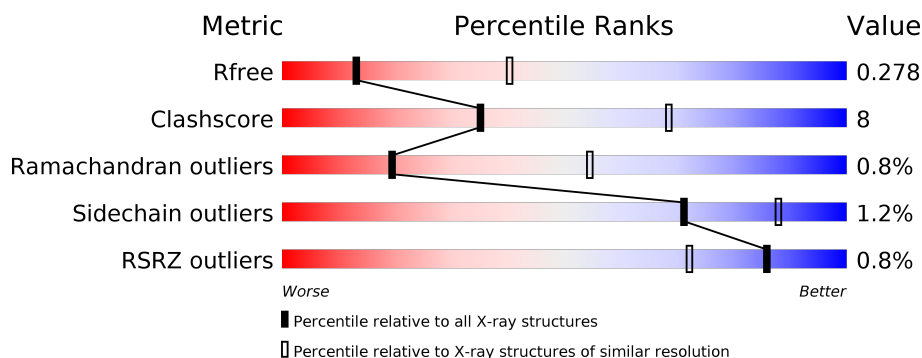
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.10 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	1094 (3.10-3.10)
Clashscore	141614	1184 (3.10-3.10)
Ramachandran outliers	138981	1141 (3.10-3.10)
Sidechain outliers	138945	1141 (3.10-3.10)
RSRZ outliers	127900	1067 (3.10-3.10)

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 on 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	334	<div> <div>%</div> <div> <div></div> <div>82%</div> <div>15%</div> <div>• •</div> </div> </div>
1	C	334	<div> <div></div> <div>81%</div> <div>16%</div> <div>• •</div> </div>
1	E	334	<div> <div>%</div> <div> <div></div> <div>80%</div> <div>16%</div> <div>• •</div> </div> </div>
2	B	181	<div> <div>%</div> <div> <div></div> <div>79%</div> <div>13%</div> <div>• 7%</div> </div> </div>
2	D	181	<div> <div>%</div> <div> <div></div> <div>75%</div> <div>17%</div> <div>• • 7%</div> </div> </div>
2	F	181	<div> <div>%</div> <div> <div></div> <div>75%</div> <div>15%</div> <div>• • 7%</div> </div> </div>

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	NAG	A	401	-	-	-	X
4	SIA	E	404	-	-	-	X

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 11923 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 Hemagglutinin HA1 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	325	Total	C	N	O	S	0	0	0
			2566	1626	437	490	13			
1	C	325	Total	C	N	O	S	0	0	0
			2566	1626	437	490	13			
1	E	325	Total	C	N	O	S	0	0	0
			2566	1626	437	490	13			

- Molecule 2 is a protein called Hemagglutinin HA2 chain.

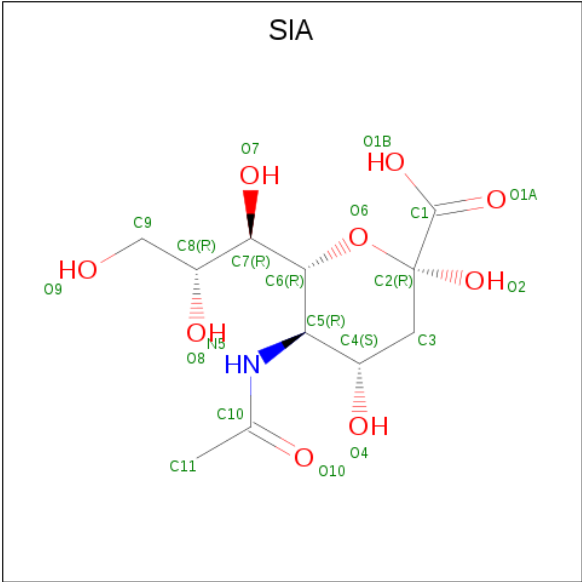
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	168	Total	C	N	O	S	0	0	0
			1353	845	234	267	7			
2	D	168	Total	C	N	O	S	0	0	0
			1353	845	234	267	7			
2	F	168	Total	C	N	O	S	0	0	0
			1353	845	234	267	7			

- Molecule 3 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	A	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1	Total	C	N	O	0	0
			14	8	1	5		
3	C	1	Total	C	N	O	0	0
			14	8	1	5		
3	E	1	Total	C	N	O	0	0
			14	8	1	5		
3	E	1	Total	C	N	O	0	0
			14	8	1	5		
3	E	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 4 is N-acetyl-alpha-neuraminic acid (three-letter code: SIA) (formula: $C_{11}H_{19}NO_9$).

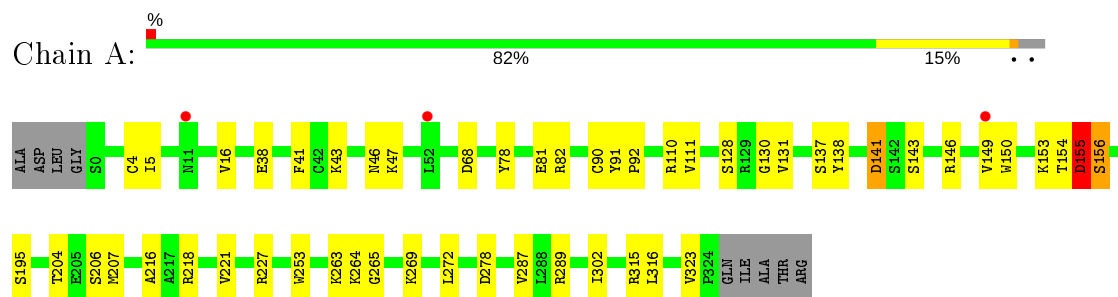


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			20	11	1	8		
4	E	1	Total	C	N	O	0	0
			20	11	1	8		

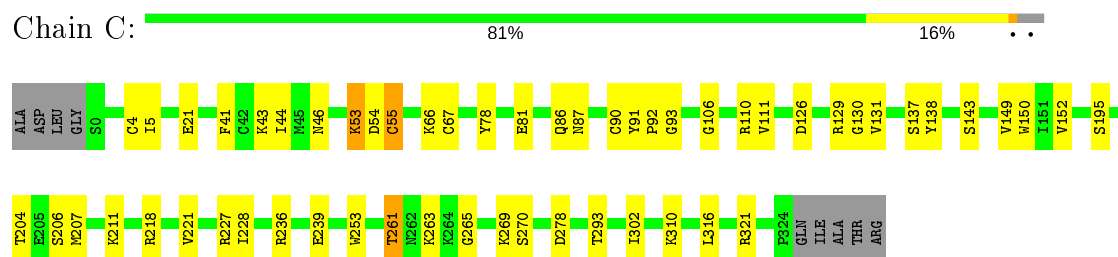
3 Residue-property plots [i](#)

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.

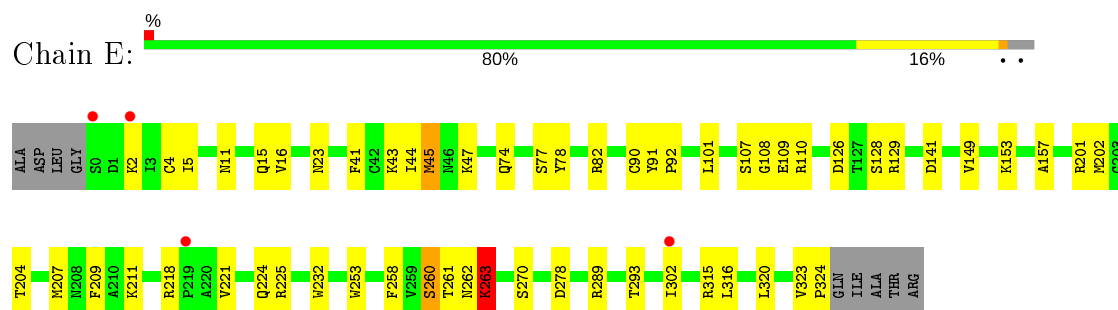
- Molecule 1: Hemagglutinin HA1 chain



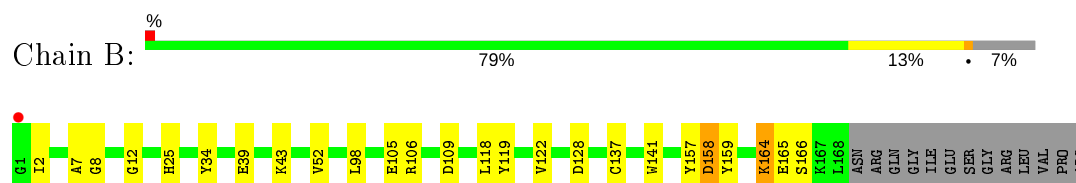
- Molecule 1: Hemagglutinin HA1 chain



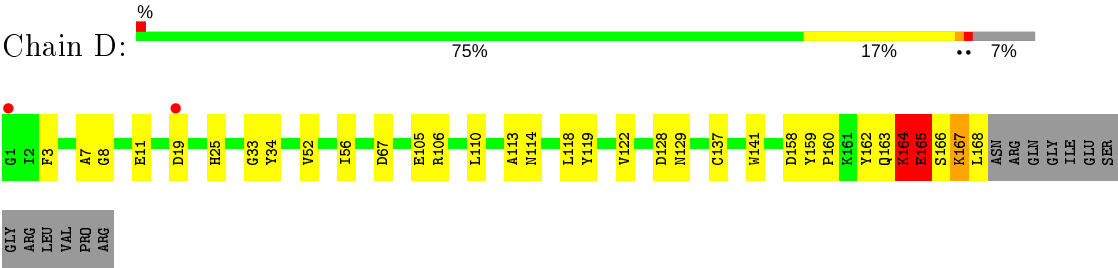
- Molecule 1: Hemagglutinin HA1 chain



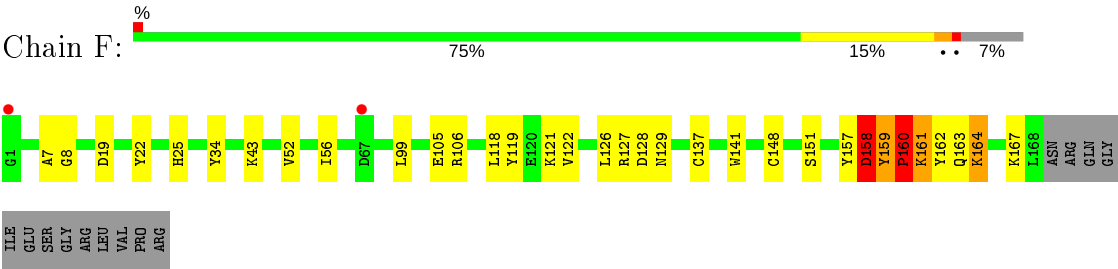
- Molecule 2: Hemagglutinin HA2 chain



● Molecule 2: Hemagglutinin HA2 chain



● Molecule 2: Hemagglutinin HA2 chain



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	186.44Å 99.58Å 134.22Å 90.00° 125.96° 90.00°	Depositor
Resolution (Å)	49.77 – 3.10 49.77 – 3.02	Depositor EDS
% Data completeness (in resolution range)	94.7 (49.77-3.10) 94.8 (49.77-3.02)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.14 (at 3.01Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.4_1496)	Depositor
R, R_{free}	0.246 , 0.279 0.244 , 0.278	Depositor DCC
R_{free} test set	1864 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	73.2	Xtriage
Anisotropy	0.135	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.27 , 29.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.88	EDS
Total number of atoms	11923	wwPDB-VP
Average B, all atoms (Å ²)	75.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.96% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SIA, 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 >5	RMSZ	# Z >5
1	A	0.28	0/2627	0.53	1/3574 (0.0%)
1	C	0.30	0/2627	0.59	2/3574 (0.1%)
1	E	0.29	0/2627	0.56	1/3574 (0.0%)
2	B	0.28	0/1381	0.56	0/1860
2	D	0.33	0/1381	0.60	1/1860 (0.1%)
2	F	0.38	0/1381	0.80	5/1860 (0.3%)
All	All	0.30	0/12024	0.60	10/16302 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	E	0	1
2	D	0	1
All	All	0	3

There are no bond length outliers.

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	159	TYR	C-N-CD	-14.91	87.79	120.60
2	F	159	TYR	C-N-CA	9.57	162.19	122.00
2	F	160	PRO	C-N-CA	7.32	139.99	121.70
2	D	165	GLU	CA-CB-CG	6.04	126.68	113.40
2	F	160	PRO	CA-N-CD	-5.94	103.19	111.50
1	A	155	ASP	CB-CG-OD1	5.70	123.43	118.30
1	C	53	LYS	CD-CE-NZ	5.42	124.17	111.70

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	161	LYS	CA-CB-CG	5.37	125.21	113.40
1	C	53	LYS	CA-CB-CG	5.08	124.57	113.40
1	E	45	MET	CA-CB-CG	5.06	121.90	113.30

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	156	SER	Peptide
2	D	164	LYS	Peptide
1	E	263	LYS	Peptide

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2566	0	2514	31	0
1	C	2566	0	2514	47	0
1	E	2566	0	2514	46	0
2	B	1353	0	1268	19	0
2	D	1353	0	1268	35	0
2	F	1353	0	1268	33	0
3	A	42	0	39	0	0
3	C	42	0	39	0	0
3	E	42	0	39	1	0
4	A	20	0	17	0	0
4	E	20	0	17	2	0
All	All	11923	0	11497	192	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 8.

All (192) 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:53:LYS:NZ	1:C:55:CYS:SG	2.21	1.11

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:53:LYS:HG3	1:C:54:ASP:H	1.25	0.96
1:E:261:THR:H	1:E:263:LYS:HZ3	1.19	0.91
2:D:165:GLU:CD	2:D:166:SER:H	1.75	0.87
2:F:157:TYR:O	2:F:158:ASP:HB2	1.72	0.87
2:F:160:PRO:HD2	2:F:161:LYS:H	1.37	0.86
1:C:53:LYS:HG3	1:C:54:ASP:N	1.91	0.86
2:F:158:ASP:HB3	2:F:160:PRO:HG3	1.60	0.83
2:F:160:PRO:CD	2:F:161:LYS:H	1.93	0.81
2:F:158:ASP:C	2:F:160:PRO:HD3	2.03	0.80
2:D:160:PRO:HA	2:D:163:GLN:HG3	1.65	0.78
2:F:158:ASP:CB	2:F:160:PRO:HG3	2.16	0.76
2:F:158:ASP:O	2:F:160:PRO:HD3	1.86	0.73
1:E:108:GLY:HA2	1:E:260:SER:HB2	1.68	0.72
1:C:53:LYS:NZ	1:C:67:CYS:SG	2.61	0.72
1:C:46:ASN:ND2	1:C:278:ASP:OD2	2.23	0.71
4:E:404:SIA:O8	4:E:404:SIA:O6	2.06	0.71
1:E:153:LYS:HE2	1:E:157:ALA:O	1.91	0.69
2:D:162:TYR:O	2:D:165:GLU:HG3	1.92	0.68
2:D:164:LYS:O	2:D:167:LYS:HB3	1.93	0.68
2:F:148:CYS:O	2:F:151:SER:OG	2.11	0.68
1:E:278:ASP:O	1:E:289:ARG:NH2	2.26	0.68
1:E:258:PHE:CE1	1:E:260:SER:HB3	2.30	0.66
2:D:167:LYS:HG3	2:D:168:LEU:N	2.09	0.65
1:E:261:THR:H	1:E:263:LYS:NZ	1.94	0.64
1:E:44:ILE:HD13	1:E:78:TYR:HE1	1.64	0.63
1:A:82:ARG:NH1	1:A:272:LEU:O	2.30	0.62
1:C:204:THR:HB	1:C:207:MET:HG3	1.82	0.62
1:C:126:ASP:OD2	1:C:129:ARG:HG3	1.99	0.62
1:C:53:LYS:CG	1:C:54:ASP:H	1.92	0.62
1:A:155:ASP:OD1	1:A:156:SER:N	2.33	0.61
1:A:149:VAL:HG23	1:A:253:TRP:HB2	1.82	0.61
1:C:5:ILE:HG13	2:D:119:TYR:HA	1.80	0.61
1:C:204:THR:HG22	1:C:206:SER:H	1.65	0.61
2:D:165:GLU:CG	2:D:166:SER:H	2.13	0.61
2:F:158:ASP:HB3	2:F:160:PRO:CG	2.29	0.61
1:C:21:GLU:OE1	1:C:321:ARG:NH2	2.33	0.60
1:A:5:ILE:HG13	2:B:119:TYR:HA	1.84	0.60
1:A:278:ASP:O	1:A:289:ARG:NH2	2.34	0.60
1:E:149:VAL:HG23	1:E:253:TRP:HB2	1.82	0.60
2:B:39:GLU:O	2:B:43:LYS:HG3	2.02	0.60
1:C:149:VAL:HG23	1:C:253:TRP:HB2	1.84	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:224:GLN:HE22	4:E:404:SIA:H6	1.67	0.59
1:A:204:THR:HB	1:A:207:MET:HG3	1.85	0.58
2:B:2:ILE:HD13	2:B:109:ASP:OD1	2.04	0.58
2:D:128:ASP:OD2	2:D:159:TYR:OH	2.20	0.58
2:B:128:ASP:OD2	2:B:159:TYR:OH	2.20	0.58
1:A:264:LYS:NZ	1:A:265:GLY:O	2.31	0.57
2:D:128:ASP:OD1	2:D:128:ASP:N	2.38	0.57
2:F:164:LYS:O	2:F:167:LYS:HB3	2.05	0.57
1:A:204:THR:HG22	1:A:206:SER:H	1.68	0.57
2:F:43:LYS:O	2:F:43:LYS:HD2	2.05	0.56
2:D:25:HIS:HB2	2:D:34:TYR:CD1	2.40	0.56
2:D:7:ALA:N	2:D:8:GLY:HA3	2.20	0.56
1:E:204:THR:OG1	1:E:207:MET:HG3	2.05	0.56
2:D:165:GLU:OE1	2:D:166:SER:N	2.37	0.56
1:E:202:MET:HB2	1:E:209:PHE:HB3	1.86	0.56
1:A:316:LEU:HD23	2:B:52:VAL:HG22	1.87	0.56
1:C:54:ASP:OD1	1:C:86:GLN:N	2.38	0.56
1:A:264:LYS:HD2	1:A:265:GLY:H	1.70	0.55
1:C:316:LEU:HD23	2:D:52:VAL:HG22	1.89	0.55
2:F:7:ALA:N	2:F:8:GLY:HA3	2.21	0.55
1:C:43:LYS:O	1:C:44:ILE:HD12	2.07	0.55
1:E:45:MET:HB2	1:E:47:LYS:HG2	1.89	0.55
1:E:16:VAL:HG12	1:E:315:ARG:HG2	1.88	0.55
1:E:5:ILE:HD11	2:F:122:VAL:HG21	1.89	0.55
1:E:316:LEU:HD23	2:F:52:VAL:HG22	1.87	0.55
2:D:165:GLU:CG	2:D:166:SER:N	2.70	0.54
2:D:110:LEU:O	2:D:114:ASN:ND2	2.38	0.54
2:B:7:ALA:N	2:B:8:GLY:HA3	2.21	0.54
2:D:165:GLU:HG2	2:D:166:SER:OG	2.07	0.54
1:C:53:LYS:CG	1:C:54:ASP:N	2.61	0.54
1:E:126:ASP:OD1	1:E:128:SER:OG	2.25	0.54
1:A:16:VAL:HG12	1:A:315:ARG:HG2	1.90	0.53
1:E:218:ARG:O	1:E:225:ARG:HG2	2.07	0.53
2:F:159:TYR:N	2:F:160:PRO:HD3	2.15	0.53
1:C:110:ARG:HG2	1:C:111:VAL:N	2.24	0.53
2:D:164:LYS:HG3	2:D:165:GLU:N	2.24	0.53
2:F:160:PRO:CG	2:F:161:LYS:N	2.72	0.53
1:A:5:ILE:HD11	2:B:122:VAL:HG21	1.91	0.52
1:C:5:ILE:HD11	2:D:122:VAL:HG21	1.92	0.52
2:F:128:ASP:O	2:F:141:TRP:HD1	1.92	0.52
1:C:90:CYS:SG	1:C:91:TYR:N	2.82	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:F:163:GLN:OE1	2:F:163:GLN:N	2.39	0.52
1:C:44:ILE:HD13	1:C:78:TYR:HE1	1.73	0.52
1:E:109:GLU:HB3	1:E:263:LYS:HE3	1.91	0.52
1:E:11:ASN:ND2	3:E:401:NAG:O7	2.43	0.52
1:E:293:THR:HG21	2:F:56:ILE:HG12	1.91	0.52
2:F:126:LEU:O	2:F:129:ASN:HB2	2.10	0.51
1:C:53:LYS:NZ	1:C:87:ASN:HB2	2.24	0.51
1:A:153:LYS:HG3	1:A:154:THR:O	2.09	0.51
1:A:78:TYR:CD1	1:A:302:ILE:HD11	2.45	0.51
2:B:164:LYS:CG	2:B:165:GLU:N	2.72	0.51
1:E:90:CYS:SG	1:E:91:TYR:N	2.84	0.51
1:C:261:THR:HG23	1:C:263:LYS:HG2	1.92	0.51
1:E:107:SER:O	1:E:260:SER:HB2	2.10	0.51
1:E:45:MET:HB3	1:E:47:LYS:NZ	2.26	0.51
1:A:81:GLU:O	1:A:269:LYS:HA	2.11	0.50
2:B:164:LYS:HG2	2:B:165:GLU:H	1.76	0.50
1:C:53:LYS:HE3	1:C:66:LYS:O	2.11	0.50
1:C:206:SER:OG	1:C:236:ARG:NH2	2.44	0.49
2:F:127:ARG:HG3	2:F:159:TYR:CD1	2.48	0.49
2:D:19:ASP:OD1	2:D:19:ASP:N	2.41	0.49
1:C:137:SER:OG	1:C:138:TYR:N	2.46	0.49
1:E:5:ILE:HG13	2:F:119:TYR:HA	1.94	0.48
1:A:90:CYS:SG	1:A:91:TYR:N	2.86	0.48
1:A:137:SER:OG	1:A:138:TYR:N	2.46	0.48
1:A:264:LYS:HD2	1:A:265:GLY:N	2.29	0.48
1:C:218:ARG:HD2	1:C:227:ARG:HG3	1.94	0.48
2:D:167:LYS:CG	2:D:168:LEU:N	2.77	0.47
2:F:19:ASP:OD1	2:F:19:ASP:N	2.40	0.47
1:A:323:VAL:HB	2:B:12:GLY:HA2	1.96	0.47
1:A:110:ARG:HG2	1:A:111:VAL:N	2.28	0.47
1:A:4:CYS:HA	2:B:137:CYS:HA	1.96	0.47
2:B:106:ARG:HH22	2:D:105:GLU:CD	2.18	0.47
2:F:160:PRO:CG	2:F:161:LYS:H	2.27	0.47
1:C:310:LYS:O	1:C:310:LYS:HG2	2.15	0.47
2:D:129:ASN:ND2	2:D:162:TYR:O	2.48	0.47
1:C:211:LYS:HB3	1:C:211:LYS:HE3	1.73	0.47
1:E:47:LYS:HB2	1:E:77:SER:HB3	1.97	0.47
1:E:126:ASP:OD2	1:E:129:ARG:HG3	2.14	0.46
1:C:43:LYS:C	1:C:44:ILE:HD12	2.36	0.46
1:C:131:VAL:HG23	1:C:143:SER:HA	1.98	0.45
2:B:105:GLU:CD	2:F:106:ARG:HH22	2.19	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:92:PRO:HB3	1:C:221:VAL:HB	1.98	0.45
1:E:74:GLN:O	1:E:110:ARG:HA	2.16	0.45
1:A:43:LYS:HB3	1:A:47:LYS:O	2.17	0.45
1:C:53:LYS:HZ3	1:C:87:ASN:HB2	1.81	0.45
2:D:106:ARG:HH22	2:F:105:GLU:CD	2.19	0.45
2:D:164:LYS:HG2	2:D:164:LYS:H	1.58	0.45
1:E:44:ILE:HD13	1:E:78:TYR:CE1	2.48	0.45
2:F:25:HIS:HB2	2:F:34:TYR:CD1	2.52	0.45
2:D:166:SER:C	2:D:168:LEU:N	2.68	0.45
1:E:101:LEU:HD13	1:E:232:TRP:CD2	2.52	0.44
1:E:261:THR:HG22	1:E:262:ASN:N	2.31	0.44
1:C:4:CYS:HA	2:D:137:CYS:HA	2.00	0.44
1:A:131:VAL:HG13	1:A:143:SER:HA	2.00	0.44
1:C:53:LYS:HG2	1:C:55:CYS:HB2	1.99	0.44
1:E:141:ASP:OD2	1:E:141:ASP:N	2.51	0.44
2:B:157:TYR:O	2:B:158:ASP:HB3	2.18	0.43
2:B:25:HIS:CD2	2:B:34:TYR:CE1	3.05	0.43
2:D:3:PHE:CE2	2:D:113:ALA:HB2	2.53	0.43
2:D:167:LYS:O	2:D:168:LEU:HG	2.18	0.43
2:F:118:LEU:HA	2:F:118:LEU:HD23	1.88	0.43
2:B:141:TRP:HB3	2:B:166:SER:HA	1.99	0.43
2:D:162:TYR:C	2:D:165:GLU:HG3	2.37	0.43
1:E:4:CYS:HA	2:F:137:CYS:HA	2.01	0.43
1:C:261:THR:HG23	1:C:263:LYS:H	1.82	0.43
1:E:43:LYS:C	1:E:44:ILE:HD12	2.39	0.43
1:C:78:TYR:CD1	1:C:302:ILE:HD11	2.54	0.43
1:C:53:LYS:HE2	1:C:87:ASN:HD22	1.83	0.43
1:C:41:PHE:HE1	1:C:270:SER:HG	1.63	0.42
1:C:53:LYS:HG3	1:C:55:CYS:N	2.34	0.42
1:E:78:TYR:CD1	1:E:302:ILE:HD11	2.54	0.42
1:C:106:GLY:O	1:C:265:GLY:HA3	2.19	0.42
1:C:293:THR:HG21	2:D:56:ILE:HG12	2.01	0.42
1:E:323:VAL:HA	1:E:324:PRO:HD3	1.79	0.42
2:B:118:LEU:HA	2:B:118:LEU:HD23	1.90	0.42
2:B:98:LEU:HD21	2:F:99:LEU:HD13	2.01	0.42
1:E:261:THR:CG2	1:E:262:ASN:N	2.83	0.42
1:A:68:ASP:OD1	1:A:146:ARG:NH1	2.52	0.42
1:A:130:GLY:CA	1:A:150:TRP:HB3	2.49	0.42
2:B:164:LYS:HG2	2:B:165:GLU:N	2.34	0.42
1:E:45:MET:HB3	1:E:47:LYS:HZ1	1.84	0.42
2:D:25:HIS:HD2	2:D:33:GLY:O	2.03	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:130:GLY:CA	1:C:150:TRP:HB3	2.50	0.42
1:A:141:ASP:OD2	1:A:141:ASP:N	2.51	0.42
1:C:129:ARG:NH1	1:C:152:VAL:HG23	2.35	0.42
2:D:141:TRP:HB3	2:D:166:SER:HA	2.01	0.41
1:E:261:THR:CG2	1:E:262:ASN:H	2.33	0.41
1:A:216:ALA:HB2	1:E:201:ARG:HD2	2.01	0.41
2:D:167:LYS:NZ	2:D:168:LEU:HB2	2.36	0.41
1:E:211:LYS:HE3	1:E:211:LYS:HB2	1.60	0.41
1:C:41:PHE:HE1	1:C:270:SER:OG	2.04	0.41
2:D:11:GLU:HG2	2:D:11:GLU:H	1.67	0.41
2:F:159:TYR:N	2:F:160:PRO:CD	2.82	0.41
1:A:92:PRO:HB3	1:A:221:VAL:HB	2.02	0.41
2:D:118:LEU:HA	2:D:118:LEU:HD23	1.88	0.41
2:F:160:PRO:HG2	2:F:161:LYS:N	2.36	0.41
1:E:92:PRO:HB3	1:E:221:VAL:HB	2.03	0.41
2:F:129:ASN:ND2	2:F:162:TYR:HB2	2.35	0.41
1:A:41:PHE:CE1	1:A:272:LEU:HB2	2.56	0.41
1:A:38:GLU:HB2	1:A:287:VAL:HG13	2.03	0.41
1:E:218:ARG:O	1:E:225:ARG:CG	2.68	0.41
1:C:93:GLY:HA3	1:C:228:ILE:O	2.22	0.40
1:E:261:THR:N	1:E:263:LYS:HZ3	2.00	0.40
1:E:41:PHE:HB3	1:E:78:TYR:OH	2.21	0.40
1:E:82:ARG:HD3	1:E:270:SER:O	2.21	0.40
1:A:218:ARG:HD2	1:A:227:ARG:HG3	2.02	0.40
1:C:236:ARG:NH2	1:C:239:GLU:OE1	2.54	0.40
1:C:81:GLU:O	1:C:269:LYS:HA	2.21	0.40
1:E:15:GLN:OE1	1:E:23:ASN:ND2	2.31	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	323/334 (97%)	304 (94%)	16 (5%)	3 (1%)	17	52
1	C	323/334 (97%)	307 (95%)	16 (5%)	0	100	100
1	E	323/334 (97%)	305 (94%)	17 (5%)	1 (0%)	41	73
2	B	166/181 (92%)	152 (92%)	12 (7%)	2 (1%)	13	44
2	D	166/181 (92%)	149 (90%)	13 (8%)	4 (2%)	6	27
2	F	166/181 (92%)	150 (90%)	14 (8%)	2 (1%)	13	44
All	All	1467/1545 (95%)	1367 (93%)	88 (6%)	12 (1%)	19	54

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	263	LYS
2	D	158	ASP
2	D	167	LYS
2	B	158	ASP
2	D	164	LYS
2	F	158	ASP
1	A	46	ASN
1	A	263	LYS
1	A	141	ASP
2	D	165	GLU
2	B	164	LYS
2	F	164	LYS

5.3.2 Protein sidechains ⓘ

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	286/292 (98%)	283 (99%)	3 (1%)	76	90
1	C	286/292 (98%)	283 (99%)	3 (1%)	76	90
1	E	286/292 (98%)	282 (99%)	4 (1%)	67	86
2	B	143/154 (93%)	143 (100%)	0	100	100
2	D	143/154 (93%)	141 (99%)	2 (1%)	67	86

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
2	F	143/154 (93%)	139 (97%)	4 (3%)	43 73
All	All	1287/1338 (96%)	1271 (99%)	16 (1%)	71 88

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	128	SER
1	A	155	ASP
1	A	195	SER
1	C	55	CYS
1	C	195	SER
1	C	261	THR
1	E	2	LYS
1	E	260	SER
1	E	263	LYS
1	E	320	LEU
2	D	67	ASP
2	D	165	GLU
2	F	22	TYR
2	F	121	LYS
2	F	158	ASP
2	F	160	PRO

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	46	ASN
1	C	87	ASN
1	E	224	GLN
2	D	25	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

11 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
3	NAG	E	403	1	14,14,15	0.26	0	17,19,21	0.54	0
3	NAG	A	403	1	14,14,15	0.96	1 (7%)	17,19,21	1.19	2 (11%)
4	SIA	E	404	-	17,20,21	2.39	7 (41%)	21,28,31	1.62	4 (19%)
3	NAG	C	400	1	14,14,15	0.38	0	17,19,21	0.53	0
3	NAG	A	401	1	14,14,15	0.84	1 (7%)	17,19,21	1.57	3 (17%)
4	SIA	A	404	-	17,20,21	2.38	8 (47%)	21,28,31	1.05	2 (9%)
3	NAG	C	401	1	14,14,15	0.58	0	17,19,21	0.46	0
3	NAG	E	402	1	14,14,15	0.96	1 (7%)	17,19,21	0.63	0
3	NAG	A	402	1	14,14,15	0.49	0	17,19,21	0.52	0
3	NAG	E	401	1	14,14,15	0.99	1 (7%)	17,19,21	0.88	0
3	NAG	C	402	1	14,14,15	0.44	0	17,19,21	1.19	1 (5%)

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	NAG	E	403	1	-	2/6/23/26	0/1/1/1
3	NAG	A	403	1	-	0/6/23/26	0/1/1/1
4	SIA	E	404	-	-	12/14/34/38	0/1/1/1
3	NAG	C	400	1	-	0/6/23/26	0/1/1/1
3	NAG	A	401	1	-	2/6/23/26	0/1/1/1
4	SIA	A	404	-	-	2/14/34/38	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	NAG	C	401	1	-	0/6/23/26	0/1/1/1
3	NAG	E	402	1	-	0/6/23/26	0/1/1/1
3	NAG	A	402	1	-	4/6/23/26	0/1/1/1
3	NAG	E	401	1	-	2/6/23/26	0/1/1/1
3	NAG	C	402	1	-	2/6/23/26	0/1/1/1

All (19) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	404	SIA	C4-C5	-5.68	1.48	1.53
4	E	404	SIA	C4-C5	-5.48	1.48	1.53
4	E	404	SIA	O6-C2	4.24	1.54	1.43
4	A	404	SIA	O6-C2	4.15	1.54	1.43
4	E	404	SIA	C10-N5	3.73	1.47	1.34
4	A	404	SIA	C10-N5	3.57	1.46	1.34
3	E	401	NAG	C1-C2	3.40	1.57	1.52
3	A	403	NAG	O5-C1	-3.21	1.38	1.43
3	E	402	NAG	O5-C1	-3.18	1.38	1.43
4	E	404	SIA	C5-N5	3.00	1.50	1.45
4	A	404	SIA	C5-N5	2.69	1.50	1.45
4	E	404	SIA	C6-C5	-2.57	1.48	1.53
4	A	404	SIA	C6-C5	-2.43	1.49	1.53
4	A	404	SIA	C3-C4	-2.21	1.49	1.52
4	E	404	SIA	O8-C8	-2.13	1.38	1.43
4	A	404	SIA	O8-C8	-2.13	1.38	1.43
3	A	401	NAG	C1-C2	2.10	1.55	1.52
4	E	404	SIA	C11-C10	2.04	1.54	1.50
4	A	404	SIA	C11-C10	2.01	1.54	1.50

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	E	404	SIA	C4-C3-C2	4.70	118.23	109.81
3	A	401	NAG	C1-O5-C5	-4.44	106.17	112.19
3	C	402	NAG	C1-O5-C5	4.08	117.72	112.19
4	E	404	SIA	C3-C4-C5	3.14	115.26	111.46
3	A	403	NAG	C3-C4-C5	3.10	115.76	110.24
3	A	403	NAG	C1-O5-C5	2.60	115.71	112.19
4	A	404	SIA	C8-C7-C6	-2.58	108.14	113.03
3	A	401	NAG	O5-C5-C4	-2.37	105.07	110.83
4	E	404	SIA	C11-C10-N5	2.31	120.02	116.10

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	404	SIA	C5-N5-C10	-2.23	117.74	123.18
4	E	404	SIA	C9-C8-C7	-2.19	107.66	112.41
3	A	401	NAG	C3-C4-C5	-2.16	106.39	110.24

There are no chirality outliers.

All (26) torsion outliers are listed below:

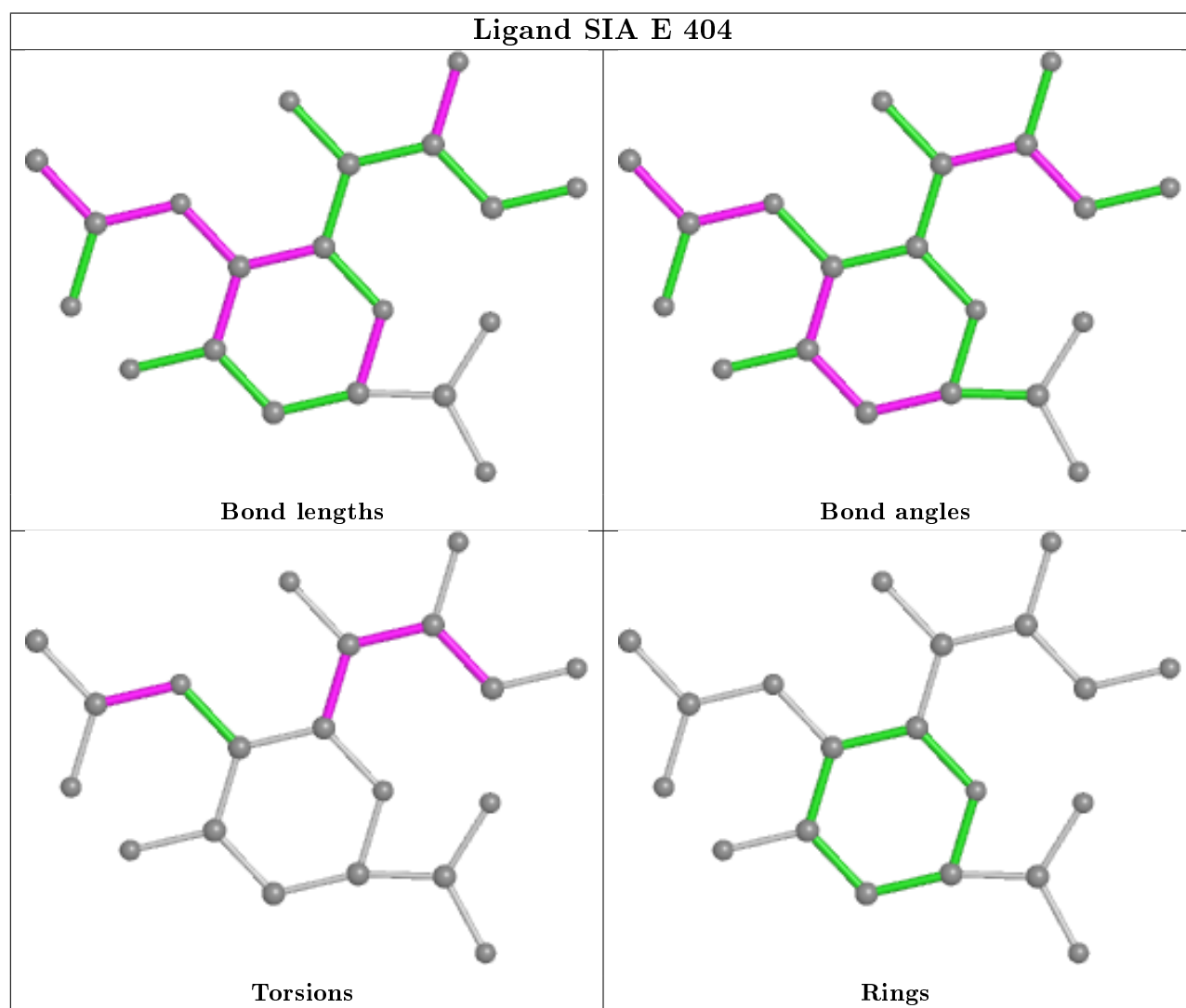
Mol	Chain	Res	Type	Atoms
4	E	404	SIA	C5-C6-C7-C8
4	E	404	SIA	C5-C6-C7-O7
4	E	404	SIA	O6-C6-C7-C8
4	E	404	SIA	O6-C6-C7-O7
4	E	404	SIA	C6-C7-C8-C9
4	E	404	SIA	O8-C8-C9-O9
3	E	401	NAG	C3-C2-N2-C7
3	C	402	NAG	O5-C5-C6-O6
4	E	404	SIA	C7-C8-C9-O9
3	A	401	NAG	O5-C5-C6-O6
3	C	402	NAG	C4-C5-C6-O6
4	E	404	SIA	C6-C7-C8-O8
3	E	403	NAG	O5-C5-C6-O6
4	E	404	SIA	O7-C7-C8-C9
3	E	403	NAG	C4-C5-C6-O6
4	E	404	SIA	C11-C10-N5-C5
4	E	404	SIA	O10-C10-N5-C5
4	A	404	SIA	C11-C10-N5-C5
4	A	404	SIA	O10-C10-N5-C5
4	E	404	SIA	O7-C7-C8-O8
3	A	401	NAG	C4-C5-C6-O6
3	A	402	NAG	C1-C2-N2-C7
3	A	402	NAG	O5-C5-C6-O6
3	E	401	NAG	C1-C2-N2-C7
3	A	402	NAG	C4-C5-C6-O6
3	A	402	NAG	C3-C2-N2-C7

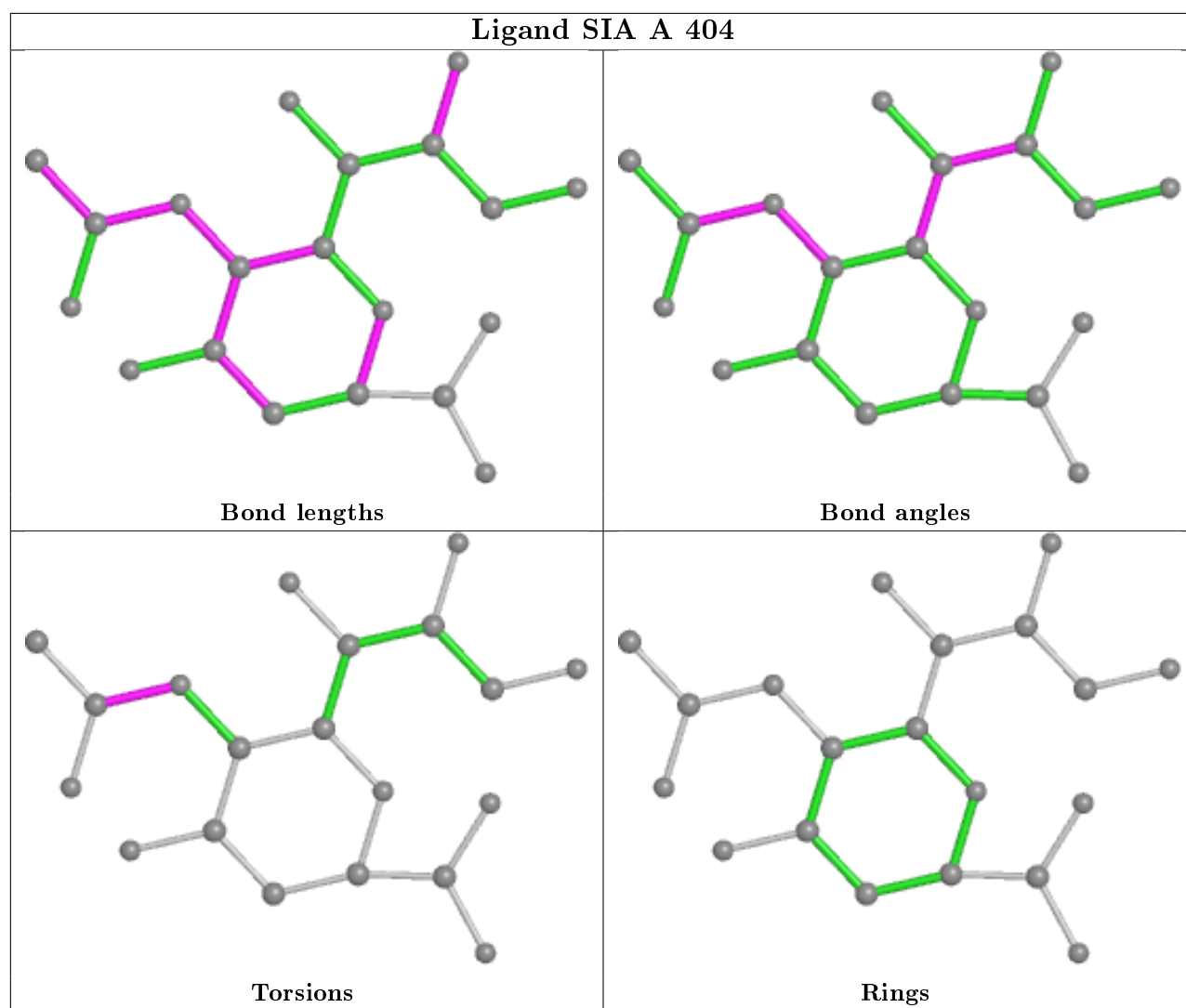
There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	E	404	SIA	2	0
3	E	401	NAG	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 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	325/334 (97%)	-0.06	3 (0%) 84 69	44, 78, 110, 178	0
1	C	325/334 (97%)	-0.20	0 100 100	45, 73, 109, 147	0
1	E	325/334 (97%)	-0.20	4 (1%) 79 61	46, 74, 107, 177	0
2	B	168/181 (92%)	-0.16	1 (0%) 89 78	40, 66, 98, 119	0
2	D	168/181 (92%)	-0.11	2 (1%) 79 61	45, 71, 109, 141	0
2	F	168/181 (92%)	-0.03	2 (1%) 79 61	43, 68, 109, 139	0
All	All	1479/1545 (95%)	-0.14	12 (0%) 86 72	40, 72, 109, 178	0

All (12) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	1	GLY	3.9
2	B	1	GLY	3.7
1	E	0	SER	3.5
2	F	1	GLY	3.3
1	E	302	ILE	3.0
1	A	149	VAL	3.0
1	E	2	LYS	2.7
2	F	67	ASP	2.3
1	A	52	LEU	2.2
1	E	219	PRO	2.1
2	D	19	ASP	2.1
1	A	11	ASN	2.1

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 monosaccharides in this entry.

6.4 Ligands ⓘ

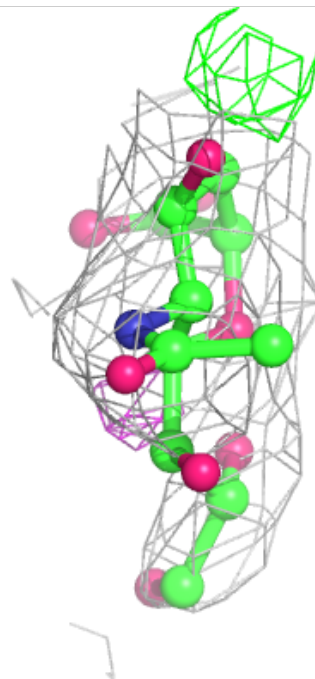
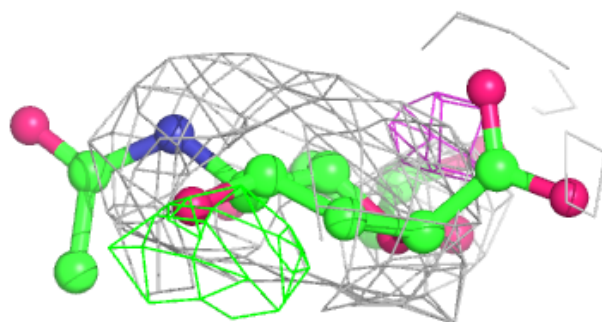
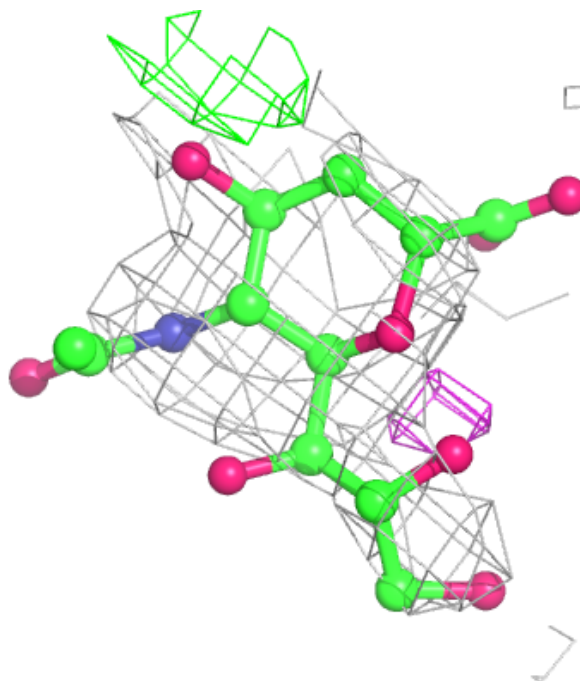
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	NAG	A	401	14/15	0.59	0.86	168,185,191,191	0
3	NAG	E	401	14/15	0.64	0.31	98,114,122,125	0
3	NAG	C	400	14/15	0.65	0.22	107,117,123,126	0
3	NAG	A	402	14/15	0.66	0.21	98,109,112,115	0
3	NAG	E	402	14/15	0.70	0.17	96,104,114,118	0
4	SIA	E	404	20/21	0.73	0.47	128,136,137,137	0
3	NAG	C	401	14/15	0.74	0.19	92,101,105,106	0
3	NAG	A	403	14/15	0.80	0.20	85,97,101,104	0
3	NAG	C	402	14/15	0.83	0.19	81,88,95,96	0
4	SIA	A	404	20/21	0.88	0.41	92,99,102,103	0
3	NAG	E	403	14/15	0.91	0.13	82,87,90,91	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.

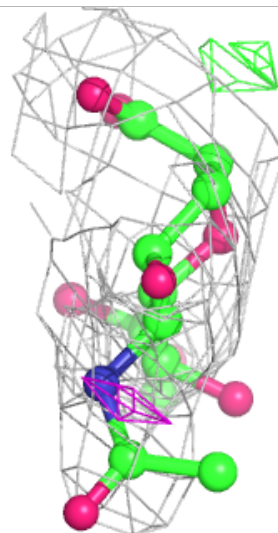
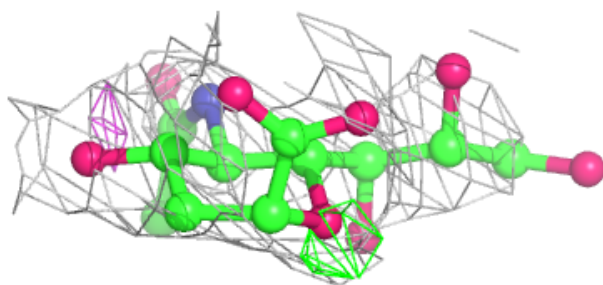
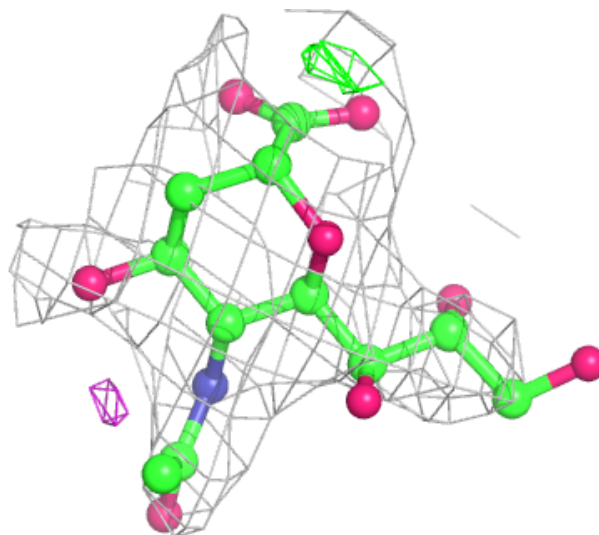
Electron density around SIA E 404:

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



Electron density around SIA A 404:

$2mF_o-DF_c$ (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.