Full wwPDB X-ray Structure Validation Report (i)

Dec 13, 2023 – 07:44 am GMT

PDB ID	:	4U62
Title	:	Trichodysplasia spinulosa-associated polyomavirus (TSPyV) VP1 in complex with 3'-sialyllactose
Authors	:	Stroh, L.J.; Stehle, T.
Deposited on	:	2014-07-26
Resolution	:	1.55 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 (i) 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 (i)) were used in the production of this report:

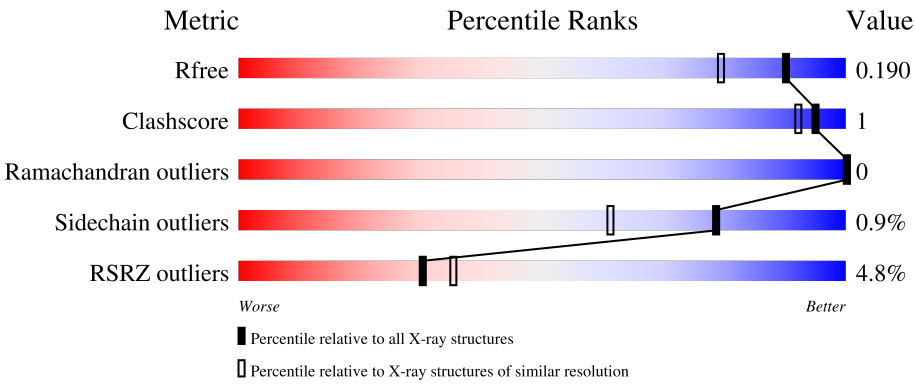
MolProbity	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 1.55 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	1483 (1.56-1.56)
Clashscore	141614	1529 (1.56-1.56)
Ramachandran outliers	138981	1498 (1.56-1.56)
Sidechain outliers	138945	1495 (1.56-1.56)
RSRZ outliers	127900	1465 (1.56-1.56)

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

Mol	Chain	Length	Quality of chain
1	A	280	% 93%
1	B	280	3% 93%
1	C	280	5% 90% 6%
1	D	280	8% 94%
1	E	280	2% 94%

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Mol	Chain	Length	Quality of chain
1	F	280	12% 92% 5%
1	G	280	5% 92% 5%
1	H	280	% 94%
1	I	280	4% 91% 5%
1	J	280	5% 93%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 23356 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 Structural protein VP1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	272	2115	1331	353	417	14	0	2	0
1	B	272	2123	1336	355	417	15	0	3	0
1	C	268	2065	1303	342	406	14	0	1	0
1	D	270	2092	1315	354	409	14	0	1	0
1	E	271	2106	1323	352	417	14	0	0	0
1	F	266	2053	1295	343	402	13	0	1	0
1	G	267	2062	1297	348	404	13	0	0	0
1	H	272	2119	1333	355	417	14	0	2	0
1	I	266	2056	1300	343	399	14	0	2	0
1	J	271	2101	1322	349	416	14	0	1	0

There are 60 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	24	GLY	-	expression tag	UNP E2ESL7
A	25	SER	-	expression tag	UNP E2ESL7
A	26	HIS	-	expression tag	UNP E2ESL7
A	27	MET	-	expression tag	UNP E2ESL7
A	28	ALA	-	expression tag	UNP E2ESL7
A	29	SER	-	expression tag	UNP E2ESL7
B	24	GLY	-	expression tag	UNP E2ESL7
B	25	SER	-	expression tag	UNP E2ESL7
B	26	HIS	-	expression tag	UNP E2ESL7

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Chain	Residue	Modelled	Actual	Comment	Reference
B	27	MET	-	expression tag	UNP E2ESL7
B	28	ALA	-	expression tag	UNP E2ESL7
B	29	SER	-	expression tag	UNP E2ESL7
C	24	GLY	-	expression tag	UNP E2ESL7
C	25	SER	-	expression tag	UNP E2ESL7
C	26	HIS	-	expression tag	UNP E2ESL7
C	27	MET	-	expression tag	UNP E2ESL7
C	28	ALA	-	expression tag	UNP E2ESL7
C	29	SER	-	expression tag	UNP E2ESL7
D	24	GLY	-	expression tag	UNP E2ESL7
D	25	SER	-	expression tag	UNP E2ESL7
D	26	HIS	-	expression tag	UNP E2ESL7
D	27	MET	-	expression tag	UNP E2ESL7
D	28	ALA	-	expression tag	UNP E2ESL7
D	29	SER	-	expression tag	UNP E2ESL7
E	24	GLY	-	expression tag	UNP E2ESL7
E	25	SER	-	expression tag	UNP E2ESL7
E	26	HIS	-	expression tag	UNP E2ESL7
E	27	MET	-	expression tag	UNP E2ESL7
E	28	ALA	-	expression tag	UNP E2ESL7
E	29	SER	-	expression tag	UNP E2ESL7
F	24	GLY	-	expression tag	UNP E2ESL7
F	25	SER	-	expression tag	UNP E2ESL7
F	26	HIS	-	expression tag	UNP E2ESL7
F	27	MET	-	expression tag	UNP E2ESL7
F	28	ALA	-	expression tag	UNP E2ESL7
F	29	SER	-	expression tag	UNP E2ESL7
G	24	GLY	-	expression tag	UNP E2ESL7
G	25	SER	-	expression tag	UNP E2ESL7
G	26	HIS	-	expression tag	UNP E2ESL7
G	27	MET	-	expression tag	UNP E2ESL7
G	28	ALA	-	expression tag	UNP E2ESL7
G	29	SER	-	expression tag	UNP E2ESL7
H	24	GLY	-	expression tag	UNP E2ESL7
H	25	SER	-	expression tag	UNP E2ESL7
H	26	HIS	-	expression tag	UNP E2ESL7
H	27	MET	-	expression tag	UNP E2ESL7
H	28	ALA	-	expression tag	UNP E2ESL7
H	29	SER	-	expression tag	UNP E2ESL7
I	24	GLY	-	expression tag	UNP E2ESL7
I	25	SER	-	expression tag	UNP E2ESL7
I	26	HIS	-	expression tag	UNP E2ESL7

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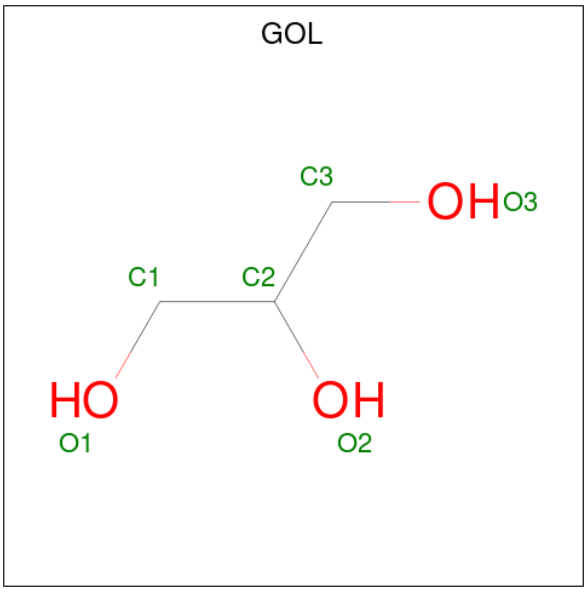
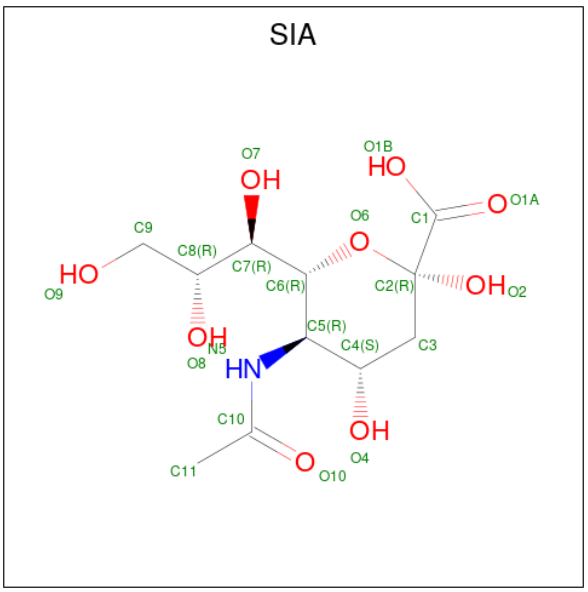
Chain	Residue	Modelled	Actual	Comment	Reference
I	27	MET	-	expression tag	UNP E2ESL7
I	28	ALA	-	expression tag	UNP E2ESL7
I	29	SER	-	expression tag	UNP E2ESL7
J	24	GLY	-	expression tag	UNP E2ESL7
J	25	SER	-	expression tag	UNP E2ESL7
J	26	HIS	-	expression tag	UNP E2ESL7
J	27	MET	-	expression tag	UNP E2ESL7
J	28	ALA	-	expression tag	UNP E2ESL7
J	29	SER	-	expression tag	UNP E2ESL7

- Molecule 2 is GLYCEROL (three-letter code: GOL) (formula: $C_3H_8O_3$).



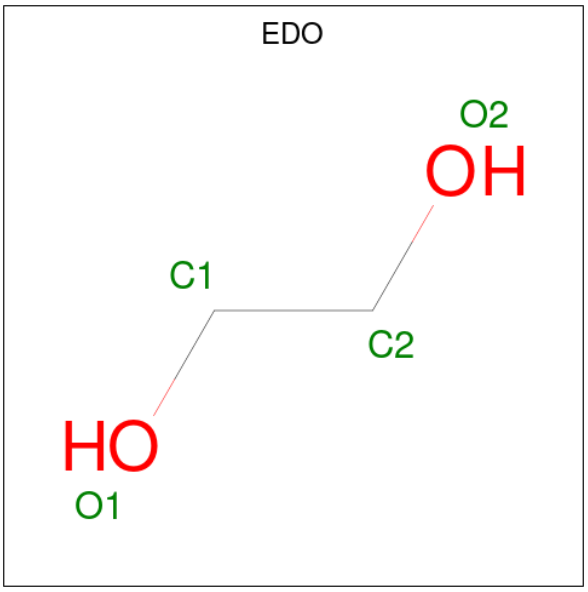
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
2	A	1	6	3	3	0	0
2	C	1	6	3	3	0	0
2	E	1	6	3	3	0	0
2	E	1	6	3	3	0	0
2	H	1	6	3	3	0	0
2	I	1	6	3	3	0	0
2	J	1	6	3	3	0	0

- Molecule 3 is N-acetyl-alpha-neuraminic acid (three-letter code: SIA) (formula: $C_{11}H_{19}NO_9$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	B	1	21	11	1	9	0	0
			Total	C	N	O		
3	C	1	21	11	1	9	0	0
			Total	C	N	O		
3	J	1	21	11	1	9	0	0

- Molecule 4 is 1,2-ETHANEDIOL (three-letter code: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
			Total	C	O		
4	G	1	4	2	2	0	0

- Molecule 5 is water.

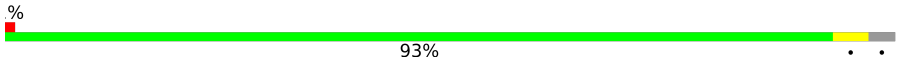
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
5	A	276	276	276	0	0
			Total	O		
5	B	264	264	264	0	0
			Total	O		
5	C	225	225	225	0	0
			Total	O		
5	D	207	207	207	0	0
			Total	O		
5	E	292	292	292	0	0
			Total	O		
5	F	179	179	179	0	0
			Total	O		
5	G	222	222	222	0	0
			Total	O		
5	H	253	253	253	0	0
			Total	O		
5	I	224	224	224	0	0
			Total	O		
5	J	213	213	213	0	0

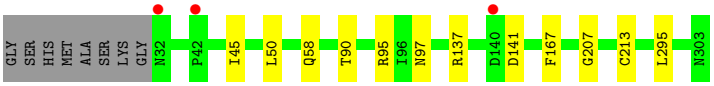
3 Residue-property plots (i)

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: Structural protein VP1

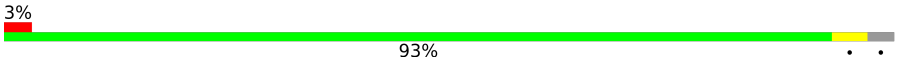
Chain A:

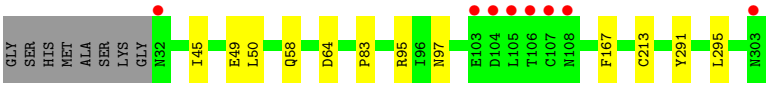




- Molecule 1: Structural protein VP1

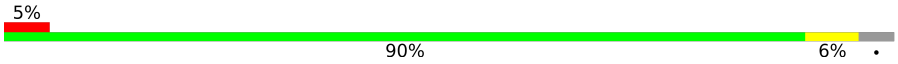
Chain B:

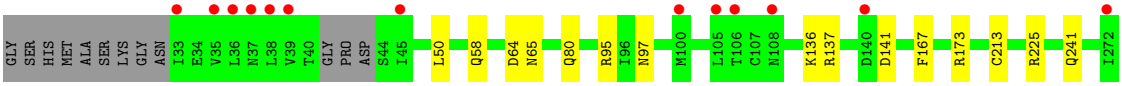




- Molecule 1: Structural protein VP1

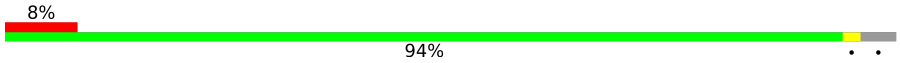
Chain C:

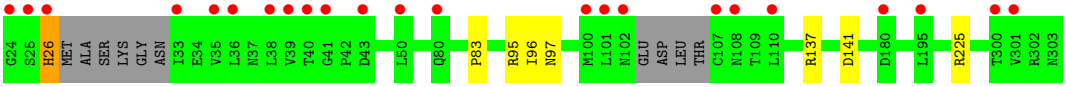




- Molecule 1: Structural protein VP1

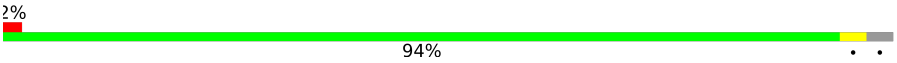
Chain D:

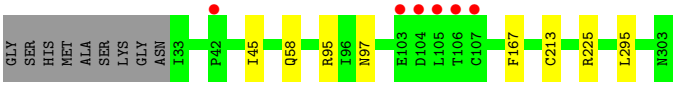




- Molecule 1: Structural protein VP1

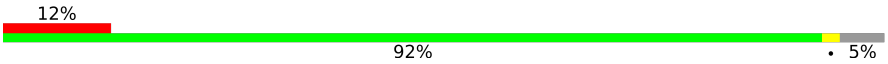
Chain E:

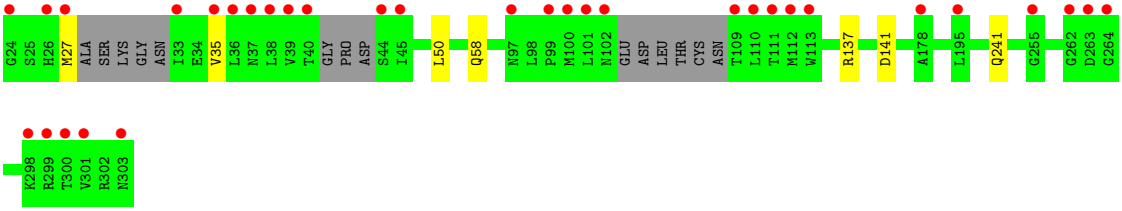




• Molecule 1: Structural protein VP1

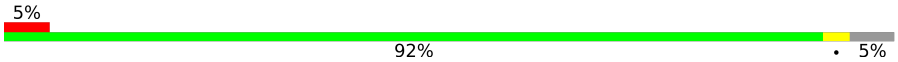
Chain F:

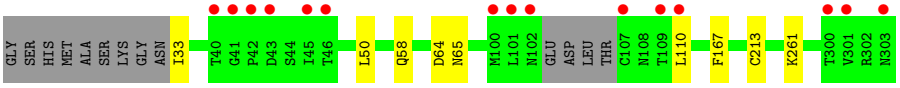




• Molecule 1: Structural protein VP1

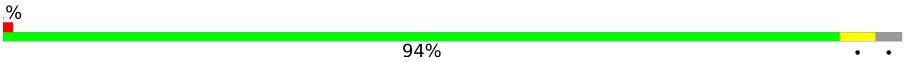
Chain G:

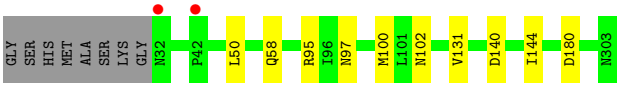




• Molecule 1: Structural protein VP1

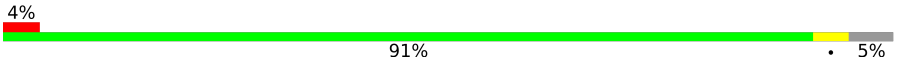
Chain H:

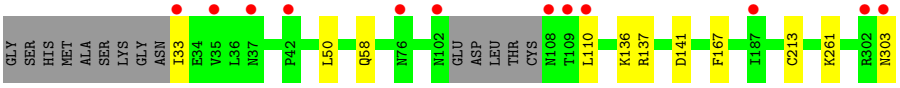




• Molecule 1: Structural protein VP1

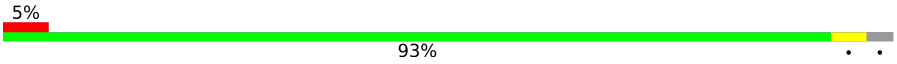
Chain I:

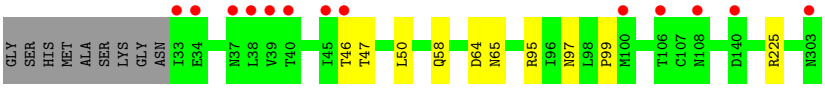




• Molecule 1: Structural protein VP1

Chain J:





4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	66.24Å 152.84Å 147.24Å 90.00° 92.34° 90.00°	Depositor
Resolution (Å)	40.00 – 1.55 39.18 – 1.55	Depositor EDS
% Data completeness (in resolution range)	97.8 (40.00-1.55) 97.8 (39.18-1.55)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.69 (at 1.55Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.155 , 0.180 0.167 , 0.190	Depositor DCC
R_{free} test set	20677 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å^2)	20.9	Xtriage
Anisotropy	0.380	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 39.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.012 for -h,-l,-k 0.006 for -h,l,k 0.039 for h,-k,-l	Xtriage
F_o,F_c correlation	0.97	EDS
Total number of atoms	23356	wwPDB-VP
Average B, all atoms (Å^2)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.19% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality (i)

5.1 Standard geometry (i)

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, GOL, SIA

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	0.50	0/2166	0.70	0/2946
1	B	0.47	0/2177	0.68	0/2958
1	C	0.45	0/2111	0.69	1/2871 (0.0%)
1	D	0.72	1/2139 (0.0%)	0.68	2/2904 (0.1%)
1	E	0.50	0/2151	0.71	2/2925 (0.1%)
1	F	0.43	0/2098	0.65	0/2848
1	G	0.43	0/2106	0.65	0/2864
1	H	0.45	0/2170	0.68	0/2949
1	I	0.45	0/2106	0.68	0/2861
1	J	0.46	0/2149	0.70	1/2923 (0.0%)
All	All	0.49	1/21373 (0.0%)	0.68	6/29049 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	26	HIS	C-O	25.64	1.72	1.23

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	26	HIS	CA-C-O	-6.67	106.10	120.10
1	E	225	ARG	NE-CZ-NH1	6.10	123.35	120.30
1	C	225	ARG	NE-CZ-NH2	-5.32	117.64	120.30
1	E	225	ARG	NE-CZ-NH2	-5.31	117.65	120.30
1	D	225	ARG	NE-CZ-NH1	5.19	122.89	120.30
1	J	225	ARG	NE-CZ-NH1	5.04	122.82	120.30

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	2115	0	2061	5	0
1	B	2123	0	2079	5	0
1	C	2065	0	1993	8	0
1	D	2092	0	2038	5	0
1	E	2106	0	2047	3	0
1	F	2053	0	1990	8	0
1	G	2062	0	2001	3	0
1	H	2119	0	2072	6	0
1	I	2056	0	2012	5	0
1	J	2101	0	2041	8	0
2	A	6	0	8	0	0
2	C	6	0	8	0	0
2	E	12	0	16	0	0
2	H	6	0	8	0	0
2	I	6	0	8	0	0
2	J	6	0	8	0	0
3	B	21	0	18	0	0
3	C	21	0	18	0	0
3	J	21	0	18	0	0
4	G	4	0	6	1	0
5	A	276	0	0	0	0
5	B	264	0	0	0	0
5	C	225	0	0	2	0
5	D	207	0	0	0	0
5	E	292	0	0	0	0
5	F	179	0	0	1	0
5	G	222	0	0	1	0
5	H	253	0	0	2	0
5	I	224	0	0	1	0
5	J	213	0	0	0	0
All	All	23356	0	20450	50	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 1.

All (50) 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:D:26:HIS:C	1:D:26:HIS:O	1.72	1.28
1:E:95:ARG:NH1	1:E:97:ASN:OD1	2.14	0.80
1:C:95:ARG:NH1	1:C:97:ASN:OD1	2.28	0.67
1:J:95:ARG:NH1	1:J:97:ASN:OD1	2.29	0.66
1:B:95:ARG:NH1	1:B:97:ASN:OD1	2.32	0.62
1:F:241:GLN:CG	5:F:540:HOH:O	2.48	0.62
1:F:27:MET:HE3	1:J:99:PRO:HG2	1.83	0.61
1:E:45:ILE:CG2	1:E:295:LEU:HD21	2.39	0.53
1:F:27:MET:HG3	1:J:47:THR:O	2.09	0.52
1:B:64:ASP:OD2	1:C:173:ARG:NH2	2.41	0.52
1:G:33:ILE:HD11	1:G:261:LYS:HE2	1.90	0.52
1:H:95:ARG:NH1	1:H:97:ASN:OD1	2.44	0.50
1:C:64:ASP:O	1:C:65:ASN:HB2	2.11	0.50
1:H:180:ASP:HB3	5:H:529:HOH:O	2.13	0.49
1:F:137:ARG:HG3	1:F:141:ASP:HA	1.93	0.49
1:H:100:MET:CE	1:H:102:ASN:OD1	2.61	0.48
1:F:27:MET:HE3	1:J:99:PRO:CG	2.43	0.47
1:B:45:ILE:CG2	1:B:295:LEU:HD11	2.44	0.47
1:I:137:ARG:HG3	1:I:141:ASP:HA	1.96	0.47
1:E:167:PHE:CE1	1:E:213:CYS:HB2	2.50	0.46
1:I:136:LYS:HE2	5:I:716:HOH:O	2.13	0.46
1:F:27:MET:HE1	1:J:99:PRO:HG3	1.98	0.46
1:A:45:ILE:CG2	1:A:295:LEU:HD11	2.45	0.46
1:C:167:PHE:CE1	1:C:213:CYS:HB2	2.51	0.46
1:C:137:ARG:HG3	1:C:141:ASP:HA	1.98	0.46
1:F:27:MET:CE	1:J:99:PRO:CG	2.94	0.46
1:G:64:ASP:O	1:G:65:ASN:HB2	2.17	0.45
1:J:64:ASP:O	1:J:65:ASN:HB2	2.17	0.45
1:D:26:HIS:O	1:D:26:HIS:CA	2.60	0.45
1:H:100:MET:HE2	1:H:102:ASN:OD1	2.17	0.44
1:G:167:PHE:CE1	1:G:213:CYS:HB2	2.52	0.44
1:C:80:GLN:HG2	5:C:525:HOH:O	2.17	0.44
1:F:27:MET:SD	1:J:46:THR:OG1	2.64	0.43
1:A:137:ARG:HG3	1:A:141:ASP:HA	2.00	0.43
1:D:96:ILE:HD12	1:D:96:ILE:N	2.34	0.42
1:C:241:GLN:CG	5:C:718:HOH:O	2.67	0.42
1:A:95:ARG:NH1	1:A:97:ASN:OD1	2.52	0.42
1:I:110:LEU:HD23	1:I:303:ASN:CB	2.50	0.42
4:G:401:EDO:H22	5:G:588:HOH:O	2.20	0.42
1:D:137:ARG:HG3	1:D:141:ASP:HA	2.00	0.42
1:I:167:PHE:CE1	1:I:213:CYS:HB2	2.55	0.42
1:H:131:VAL:HB	1:H:144:ILE:HB	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:I:33:ILE:HD11	1:I:261:LYS:HE2	2.01	0.41
1:C:136:LYS:HG3	1:C:278:GLY:O	2.20	0.41
1:H:140:ASP:HB3	5:H:752:HOH:O	2.21	0.41
1:D:95:ARG:NH1	1:D:97:ASN:OD1	2.52	0.41
1:B:49:GLU:OE2	1:B:291:TYR:OH	2.25	0.41
1:B:167:PHE:CE1	1:B:213:CYS:HB2	2.55	0.41
1:A:90:THR:OG1	1:A:207:GLY:HA2	2.22	0.40
1:A:167:PHE:CE1	1:A:213:CYS:HB2	2.56	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	272/280 (97%)	262 (96%)	10 (4%)	0	100	100
1	B	273/280 (98%)	265 (97%)	8 (3%)	0	100	100
1	C	265/280 (95%)	258 (97%)	7 (3%)	0	100	100
1	D	265/280 (95%)	257 (97%)	8 (3%)	0	100	100
1	E	269/280 (96%)	262 (97%)	7 (3%)	0	100	100
1	F	259/280 (92%)	252 (97%)	7 (3%)	0	100	100
1	G	263/280 (94%)	256 (97%)	7 (3%)	0	100	100
1	H	272/280 (97%)	264 (97%)	8 (3%)	0	100	100
1	I	264/280 (94%)	257 (97%)	7 (3%)	0	100	100
1	J	270/280 (96%)	262 (97%)	8 (3%)	0	100	100
All	All	2672/2800 (95%)	2595 (97%)	77 (3%)	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	239/246 (97%)	237 (99%)	2 (1%)	81	66
1	B	241/246 (98%)	238 (99%)	3 (1%)	71	49
1	C	229/246 (93%)	227 (99%)	2 (1%)	78	61
1	D	236/246 (96%)	235 (100%)	1 (0%)	91	82
1	E	238/246 (97%)	237 (100%)	1 (0%)	91	82
1	F	229/246 (93%)	226 (99%)	3 (1%)	69	44
1	G	231/246 (94%)	228 (99%)	3 (1%)	69	44
1	H	240/246 (98%)	238 (99%)	2 (1%)	81	66
1	I	230/246 (94%)	228 (99%)	2 (1%)	78	61
1	J	237/246 (96%)	235 (99%)	2 (1%)	81	66
All	All	2350/2460 (96%)	2329 (99%)	21 (1%)	78	61

All (21) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	50	LEU
1	A	58	GLN
1	B	50	LEU
1	B	58	GLN
1	B	83	PRO
1	C	50	LEU
1	C	58	GLN
1	D	83	PRO
1	E	58	GLN
1	F	35	VAL
1	F	50	LEU
1	F	58	GLN
1	G	50	LEU
1	G	58	GLN
1	G	110	LEU
1	H	50	LEU

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Mol	Chain	Res	Type
1	H	58	GLN
1	I	50	LEU
1	I	58	GLN
1	J	50	LEU
1	J	58	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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)

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	$\#\|Z\| > 2$
2	GOL	E	401	-	5,5,5	0.31	0	5,5,5	0.61	0
2	GOL	I	401	-	5,5,5	0.51	0	5,5,5	0.81	0
3	SIA	B	401	-	21,21,21	1.08	1 (4%)	25,31,31	1.05	2 (8%)
2	GOL	C	401	-	5,5,5	0.41	0	5,5,5	0.60	0
2	GOL	J	401	-	5,5,5	0.27	0	5,5,5	0.51	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
2	GOL	A	401	-	5,5,5	0.49	0	5,5,5	0.72	0
3	SIA	J	402	-	21,21,21	1.16	1 (4%)	25,31,31	1.04	2 (8%)
4	EDO	G	401	-	3,3,3	0.31	0	2,2,2	0.57	0
2	GOL	H	401	-	5,5,5	0.35	0	5,5,5	0.53	0
3	SIA	C	402	-	21,21,21	1.08	1 (4%)	25,31,31	0.83	1 (4%)
2	GOL	E	402	-	5,5,5	0.35	0	5,5,5	0.54	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
2	GOL	E	401	-	-	0/4/4/4	-
2	GOL	I	401	-	-	2/4/4/4	-
3	SIA	B	401	-	-	8/20/38/38	0/1/1/1
2	GOL	C	401	-	-	2/4/4/4	-
2	GOL	J	401	-	-	4/4/4/4	-
2	GOL	A	401	-	-	0/4/4/4	-
3	SIA	J	402	-	-	9/20/38/38	0/1/1/1
4	EDO	G	401	-	-	0/1/1/1	-
2	GOL	H	401	-	-	0/4/4/4	-
3	SIA	C	402	-	-	5/20/38/38	0/1/1/1
2	GOL	E	402	-	-	2/4/4/4	-

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	J	402	SIA	O2-C2	3.97	1.44	1.39
3	B	401	SIA	O2-C2	3.96	1.44	1.39
3	C	402	SIA	O2-C2	3.90	1.44	1.39

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	B	401	SIA	O2-C2-C3	-2.43	105.89	109.40
3	B	401	SIA	O1A-C1-C2	-2.33	120.06	123.59
3	C	402	SIA	O1A-C1-C2	-2.28	120.14	123.59
3	J	402	SIA	O1A-C1-C2	-2.10	120.41	123.59
3	J	402	SIA	C3-C4-C5	2.02	113.08	109.98

There are no chirality outliers.

All (32) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	C	401	GOL	C1-C2-C3-O3
2	E	402	GOL	C1-C2-C3-O3
2	E	402	GOL	O2-C2-C3-O3
2	I	401	GOL	O1-C1-C2-C3
2	J	401	GOL	O1-C1-C2-C3
2	J	401	GOL	C1-C2-C3-O3
2	J	401	GOL	O2-C2-C3-O3
3	B	401	SIA	C6-C7-C8-C9
2	J	401	GOL	O1-C1-C2-O2
3	B	401	SIA	C6-C7-C8-O8
3	J	402	SIA	C6-C7-C8-O8
2	C	401	GOL	O2-C2-C3-O3
3	B	401	SIA	O7-C7-C8-C9
3	J	402	SIA	C6-C7-C8-C9
3	B	401	SIA	O1A-C1-C2-C3
3	C	402	SIA	O1A-C1-C2-C3
3	B	401	SIA	O1A-C1-C2-O6
3	C	402	SIA	O1A-C1-C2-O6
2	I	401	GOL	O1-C1-C2-O2
3	J	402	SIA	O8-C8-C9-O9
3	C	402	SIA	C6-C7-C8-O8
3	C	402	SIA	C6-C7-C8-C9
3	J	402	SIA	O7-C7-C8-C9
3	B	401	SIA	O8-C8-C9-O9
3	J	402	SIA	O1A-C1-C2-C3
3	B	401	SIA	O7-C7-C8-O8
3	J	402	SIA	O1A-C1-C2-O6
3	C	402	SIA	O7-C7-C8-C9
3	B	401	SIA	O1A-C1-C2-O2
3	J	402	SIA	O1A-C1-C2-O2
3	J	402	SIA	C7-C8-C9-O9
3	J	402	SIA	O7-C7-C8-O8

There are no ring outliers.

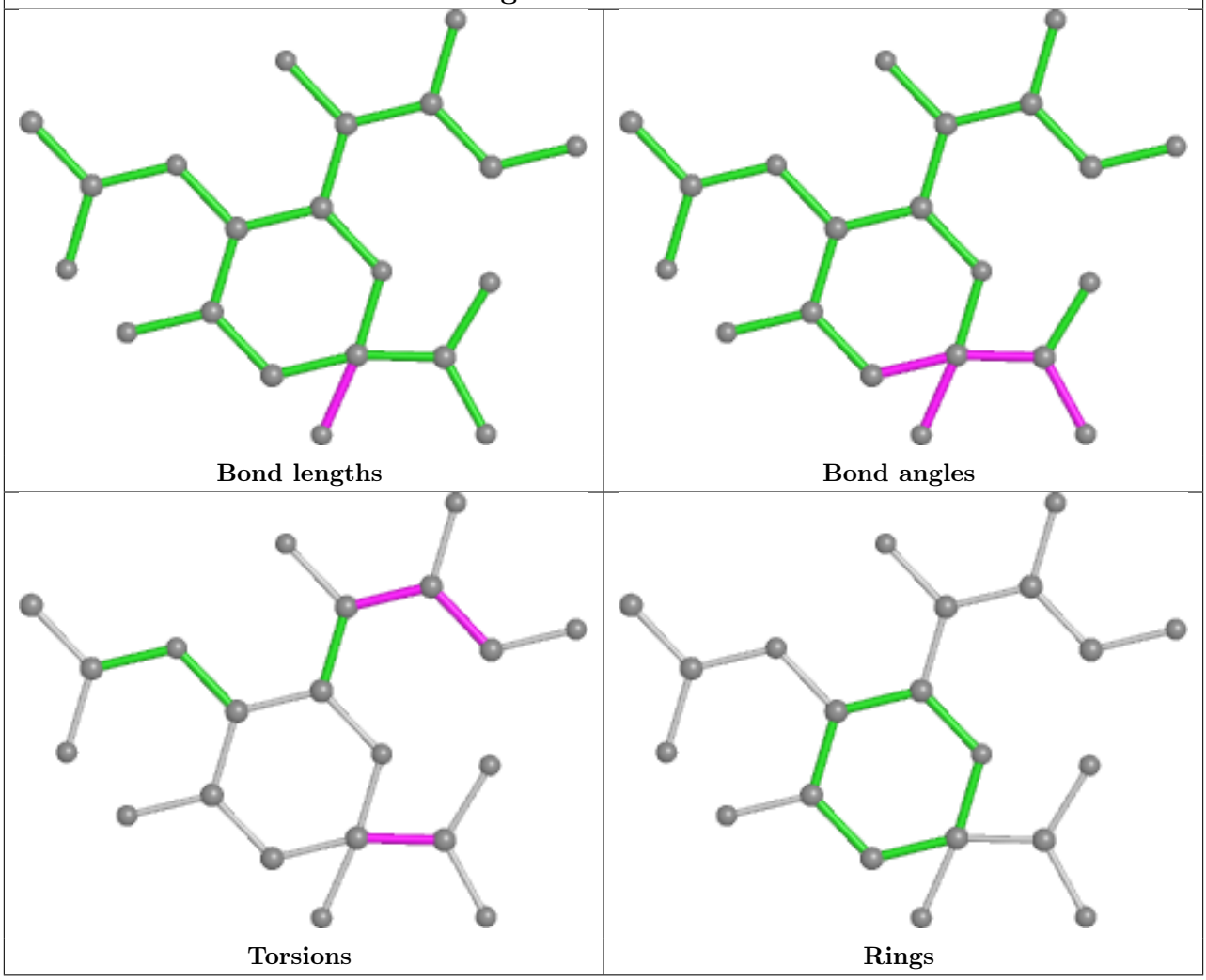
1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	G	401	EDO	1	0

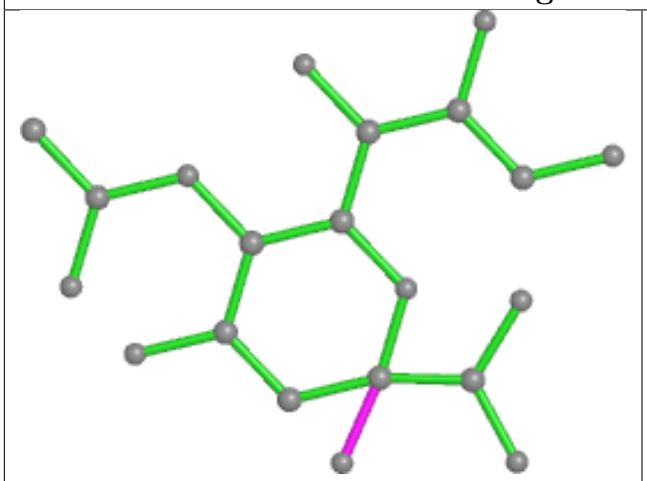
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths,

bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

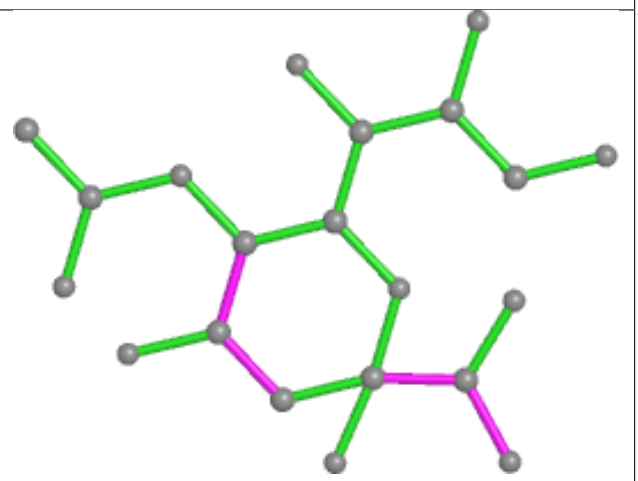
Ligand SIA B 401



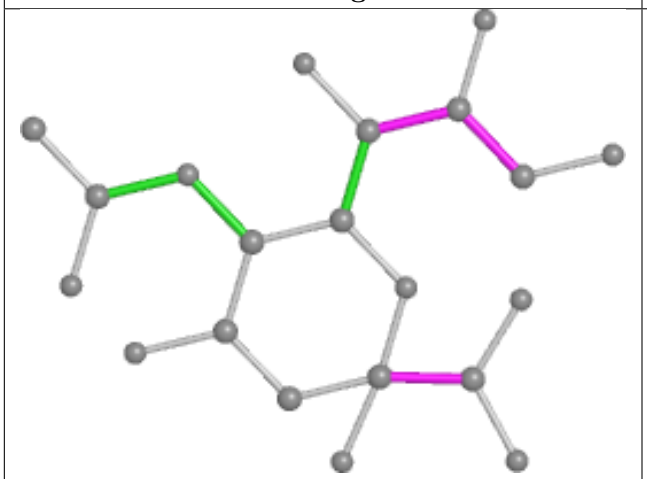
Ligand SIA J 402



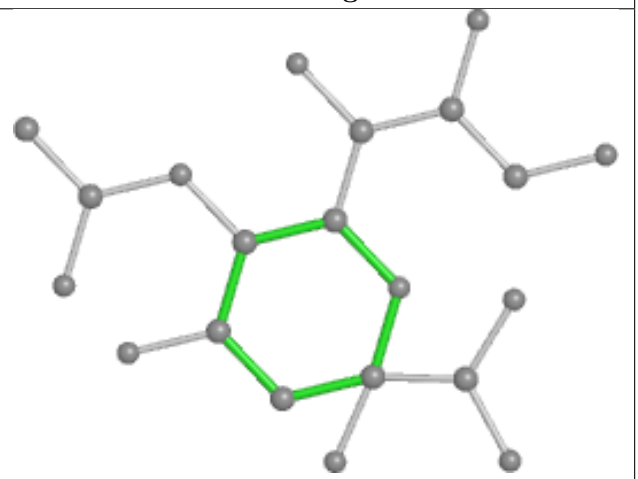
Bond lengths



Bond angles

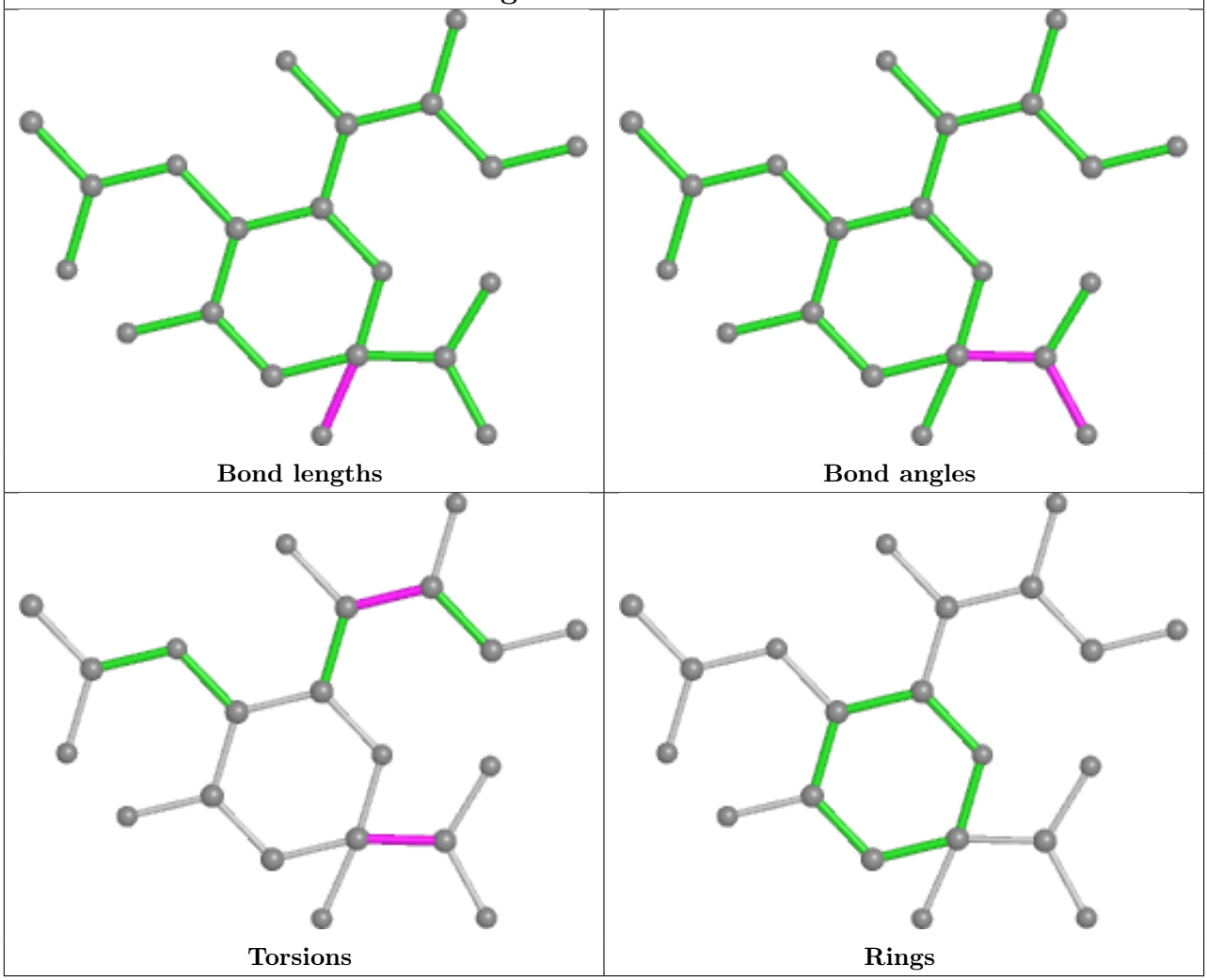


Torsions



Rings

Ligand SIA C 402



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 (i)

6.1 Protein, DNA and RNA chains (i)

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	272/280 (97%)	-0.30	3 (1%)	80	84	15, 21, 35, 55	0
1	B	272/280 (97%)	-0.17	8 (2%)	51	59	16, 23, 44, 81	0
1	C	268/280 (95%)	0.01	14 (5%)	27	31	17, 25, 47, 66	0
1	D	270/280 (96%)	0.10	23 (8%)	10	12	17, 26, 62, 83	0
1	E	271/280 (96%)	-0.34	6 (2%)	62	67	15, 22, 39, 56	0
1	F	266/280 (95%)	0.43	33 (12%)	4	3	19, 31, 60, 81	0
1	G	267/280 (95%)	-0.05	15 (5%)	24	28	17, 28, 57, 79	0
1	H	272/280 (97%)	-0.27	2 (0%)	87	90	17, 23, 38, 51	0
1	I	266/280 (95%)	-0.14	12 (4%)	33	38	15, 24, 47, 73	0
1	J	271/280 (96%)	-0.03	13 (4%)	30	35	16, 24, 59, 74	0
All	All	2695/2800 (96%)	-0.08	129 (4%)	30	35	15, 24, 50, 83	0

All (129) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	36	LEU	9.6
1	B	105	LEU	8.4
1	B	107	CYS	7.9
1	F	39	VAL	7.7
1	F	110	LEU	7.5
1	B	106	THR	7.3
1	F	33	ILE	6.6
1	F	40	THR	6.2
1	F	38	LEU	6.2
1	G	110	LEU	6.1
1	F	301	VAL	6.1
1	I	303	ASN	6.0
1	F	101	LEU	5.9

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Mol	Chain	Res	Type	RSRZ
1	F	102	ASN	5.8
1	D	33	ILE	5.3
1	C	106	THR	5.2
1	F	35	VAL	5.2
1	B	303	ASN	5.0
1	C	105	LEU	4.7
1	F	109	THR	4.7
1	D	41	GLY	4.6
1	F	113	TRP	4.6
1	F	111	THR	4.5
1	F	37	ASN	4.4
1	I	109	THR	4.4
1	I	33	ILE	4.2
1	G	101	LEU	4.2
1	G	107	CYS	4.1
1	G	45	ILE	4.1
1	C	303	ASN	4.0
1	G	42	PRO	4.0
1	D	26	HIS	4.0
1	D	40	THR	4.0
1	C	36	LEU	3.9
1	F	45	ILE	3.9
1	J	303	ASN	3.9
1	C	35	VAL	3.9
1	C	38	LEU	3.8
1	J	37	ASN	3.8
1	G	43	ASP	3.6
1	J	40	THR	3.6
1	J	106	THR	3.6
1	C	39	VAL	3.5
1	I	108	ASN	3.5
1	F	178	ALA	3.5
1	D	38	LEU	3.5
1	A	42	PRO	3.5
1	D	107	CYS	3.4
1	D	110	LEU	3.4
1	F	300	THR	3.4
1	C	33	ILE	3.4
1	D	100	MET	3.4
1	E	106	THR	3.4
1	C	45	ILE	3.4
1	D	24	GLY	3.4

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Mol	Chain	Res	Type	RSRZ
1	I	110	LEU	3.3
1	E	103	GLU	3.3
1	D	39	VAL	3.3
1	D	50	LEU	3.3
1	F	303	ASN	3.2
1	I	35	VAL	3.2
1	J	33	ILE	3.1
1	E	107	CYS	3.1
1	F	262	GLY	3.1
1	E	42	PRO	3.1
1	F	27	MET	3.0
1	G	109	THR	3.0
1	H	42	PRO	3.0
1	G	300	THR	3.0
1	B	32	ASN	2.9
1	D	101	LEU	2.8
1	E	105	LEU	2.8
1	J	108	ASN	2.8
1	B	104	ASP	2.8
1	D	25	SER	2.7
1	J	39	VAL	2.7
1	D	36	LEU	2.7
1	J	34	GLU	2.7
1	J	45	ILE	2.7
1	G	40	THR	2.7
1	I	42	PRO	2.7
1	E	104	ASP	2.6
1	F	195	LEU	2.6
1	A	140	ASP	2.6
1	G	100	MET	2.6
1	F	99	PRO	2.6
1	G	102	ASN	2.5
1	F	44	SER	2.5
1	J	140	ASP	2.5
1	H	32	ASN	2.5
1	I	302	ARG	2.5
1	B	103	GLU	2.4
1	A	32	ASN	2.4
1	F	264	GLY	2.4
1	G	301	VAL	2.4
1	D	43	ASP	2.4
1	D	102	ASN	2.4

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Mol	Chain	Res	Type	RSRZ
1	I	76	ASN	2.3
1	D	35	VAL	2.3
1	C	100	MET	2.3
1	F	255	GLY	2.3
1	D	195	LEU	2.3
1	J	100	MET	2.3
1	F	24	GLY	2.3
1	D	300	THR	2.2
1	F	299	ARG	2.2
1	D	80	GLN	2.2
1	G	41	GLY	2.2
1	D	301	VAL	2.2
1	F	298	LYS	2.1
1	I	187	ILE	2.1
1	C	37	ASN	2.1
1	F	100	MET	2.1
1	D	180	ASP	2.1
1	C	272	ILE	2.1
1	C	108	ASN	2.1
1	F	97	ASN	2.1
1	I	102	ASN	2.1
1	J	38	LEU	2.1
1	F	112	MET	2.1
1	B	108	ASN	2.1
1	G	303	ASN	2.1
1	C	140	ASP	2.1
1	G	46	THR	2.1
1	J	46	THR	2.1
1	F	26	HIS	2.0
1	D	108	ASN	2.0
1	F	263	ASP	2.0
1	I	37	ASN	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)

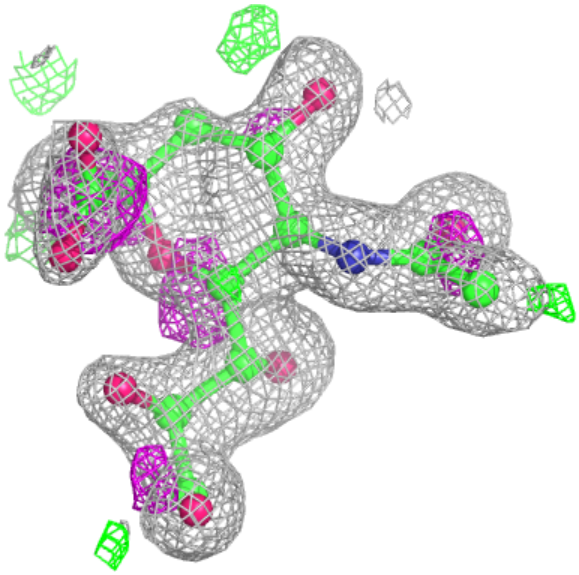
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

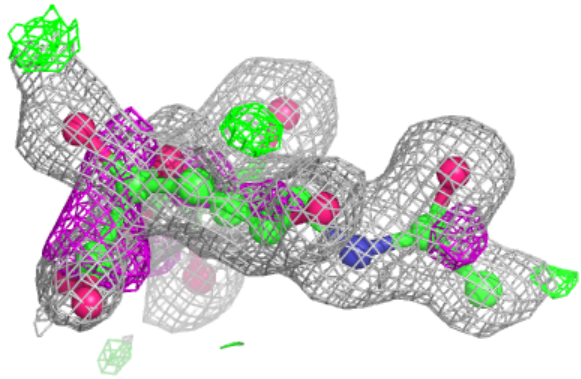
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	GOL	E	402	6/6	0.78	0.18	34,36,43,52	0
3	SIA	J	402	21/21	0.78	0.27	27,35,44,53	0
3	SIA	C	402	21/21	0.79	0.26	33,41,52,53	0
3	SIA	B	401	21/21	0.79	0.21	27,34,38,44	21
2	GOL	A	401	6/6	0.83	0.11	28,33,35,37	0
2	GOL	I	401	6/6	0.85	0.13	29,32,39,47	0
2	GOL	J	401	6/6	0.86	0.18	34,42,46,49	0
2	GOL	H	401	6/6	0.86	0.12	27,32,36,38	0
2	GOL	E	401	6/6	0.88	0.11	26,31,37,38	0
4	EDO	G	401	4/4	0.89	0.12	29,31,33,48	0
2	GOL	C	401	6/6	0.91	0.12	33,36,41,59	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 J 402:

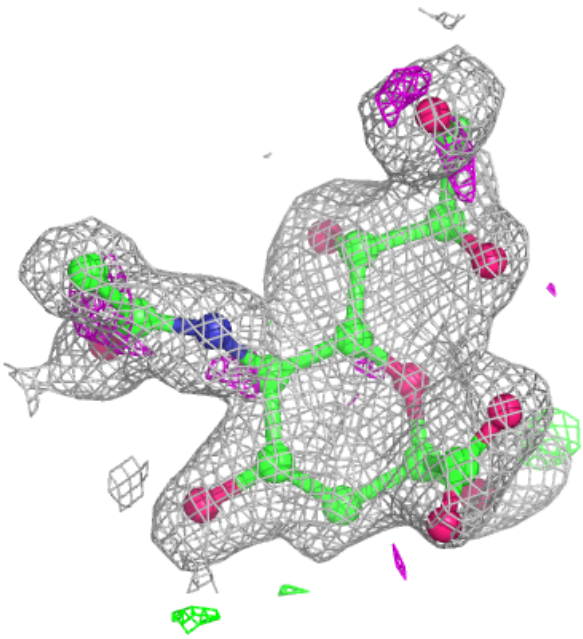
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

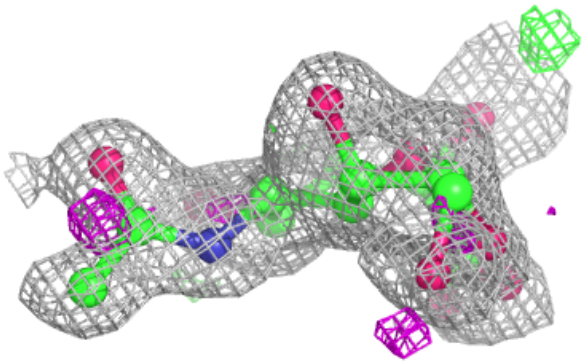


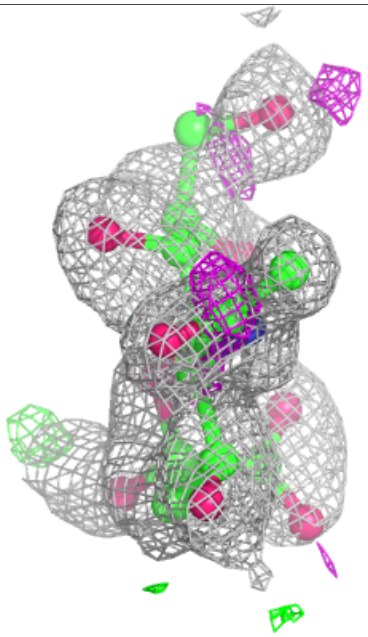


Electron density around SIA C 402:

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

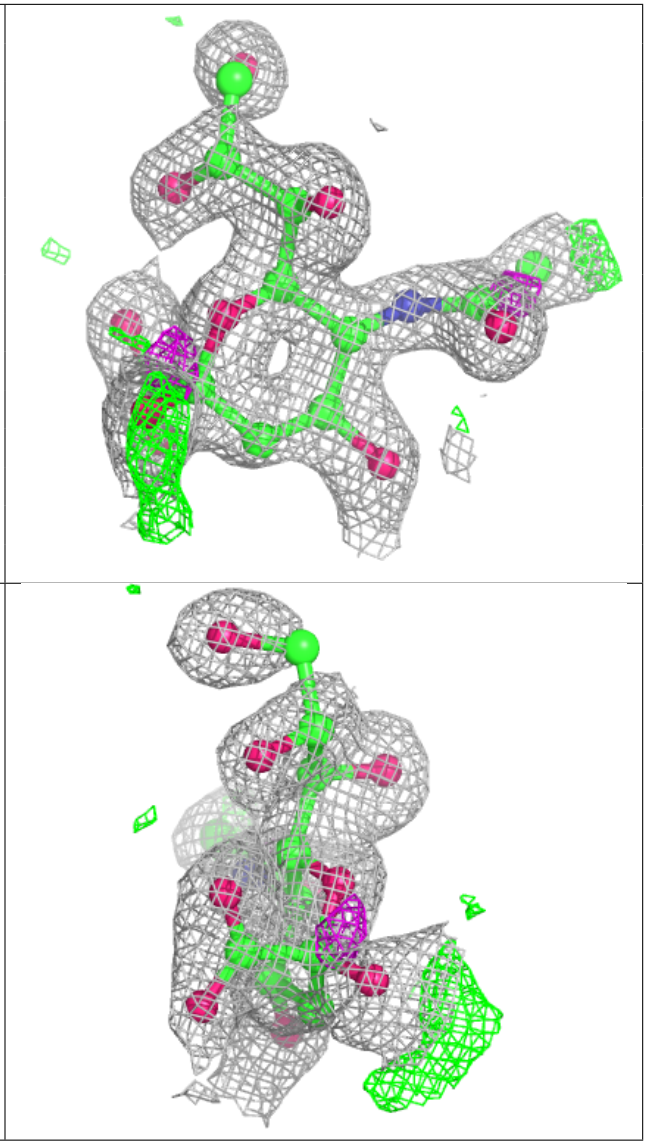






Electron density around SIA B 401:

$2mF_o$-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.