W O R L D W I D E
wwPDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

Nov 3, 2024 – 05:40 AM EST

PDB ID	:	3SDX
Title	:	Crystal structure of human autoreactive-Valpha24 NKT TCR in complex with CD1d-beta-galactosylceramide
Authors	:	Clarke, A.J.; Patel, O.; Rossjohn, J.
Deposited on	:	2011-06-09
Resolution	:	3.12 Å(reported)

The following versions of software and data (see references ⓘ) were used in the production of this report:

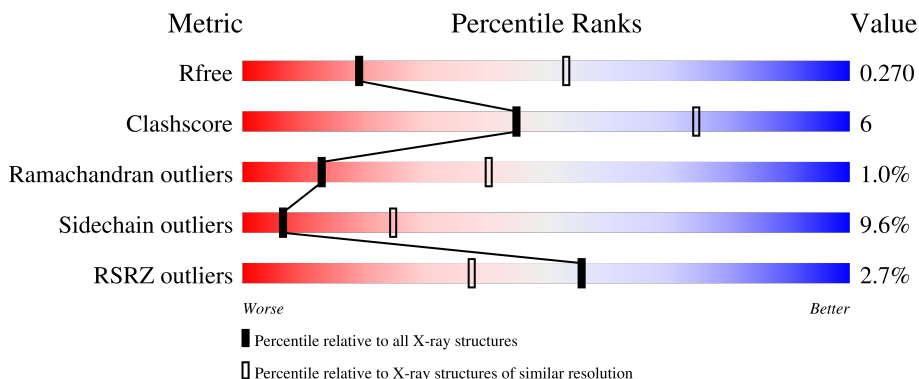|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.39

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 3.12 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.
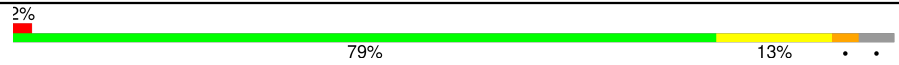

Metric	Percentile Ranks	Value
Rfree		0.270
Clashscore		6
Ramachandran outliers		1.0%
Sidechain outliers		9.6%
RSRZ outliers		2.7%

Worse   *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R$_{free}$	164625	1668 (3.14-3.10)
Clashscore	180529	1788 (3.14-3.10)
Ramachandran outliers	177936	1696 (3.14-3.10)
Sidechain outliers	177891	1696 (3.14-3.10)
RSRZ outliers	164620	1668 (3.14-3.10)

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 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	275	2% 79% 19% •
1	C	275	6% 74% 21% • •
2	B	99	2% 82% 14% • •
2	D	99	% 85% 12% • •
3	E	204	5% 82% 11% • •

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Mol	Chain	Length	Quality of chain
3	G	204	2% 79% 13% · ·
4	F	247	% 79% 17% · ·
4	H	247	% 80% 15% · ·

2 Entry composition ⓘ

There are 6 unique types of molecules in this entry. The entry contains 12830 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 Antigen-presenting glycoprotein CD1d.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	275	Total	C	N	O	S	0	1	0
			2190	1402	388	393	7			
1	C	268	Total	C	N	O	S	0	0	0
			2135	1368	370	390	7			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	278	HIS	-	expression tag	UNP P15813
A	279	HIS	-	expression tag	UNP P15813
A	280	HIS	-	expression tag	UNP P15813
C	278	HIS	-	expression tag	UNP P15813
C	279	HIS	-	expression tag	UNP P15813
C	280	HIS	-	expression tag	UNP P15813

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	97	Total	C	N	O	S	0	0	0
			783	501	133	147	2			
2	D	97	Total	C	N	O	S	0	0	0
			789	506	138	143	2			

- Molecule 3 is a protein called NKT TCR Valpha24 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	E	196	Total	C	N	O	S	0	0	0
			1485	925	246	305	9			
3	G	196	Total	C	N	O	S	0	0	0
			1507	938	251	309	9			

- Molecule 4 is a protein called NKT TCR autoreactive-Vbeta11 chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	F	242	Total	C	N	O	S	0	0	0
			1915	1208	330	369	8			
4	H	240	Total	C	N	O	S	0	0	0
			1870	1185	328	349	8			

- Molecule 5 is N-[(2S,3R)-1-(beta-D-galactopyranosyloxy)-3-hydroxyoctadec-4-en-2-yl]tetrac osanamide (three-letter code: GCY) (formula: $C_{48}H_{93}NO_8$).
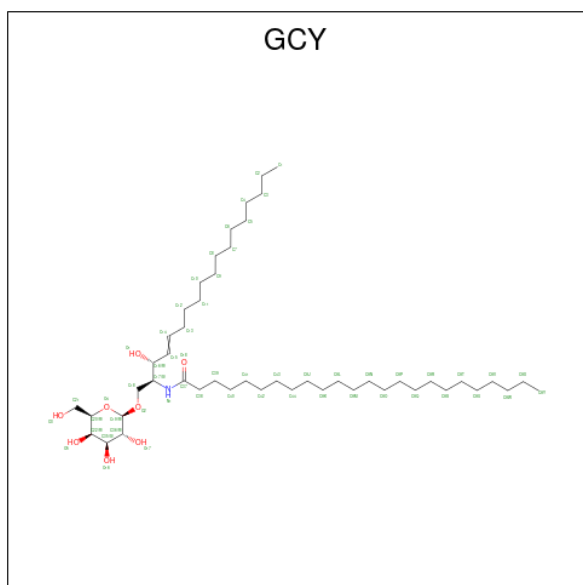
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			45	36	1	8		
5	C	1	Total	C	N	O	0	0
			45	36	1	8		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	20	Total	O	0	0
			20	20		
6	B	1	Total	O	0	0
			1	1		
6	E	9	Total	O	0	0
			9	9		
6	F	10	Total	O	0	0
			10	10		
6	G	7	Total	O	0	0
			7	7		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	C	10	Total 10	O 10	0	0
6	D	1	Total 1	O 1	0	0
6	H	8	Total 8	O 8	0	0

3 Residue-property plots ⓘ

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

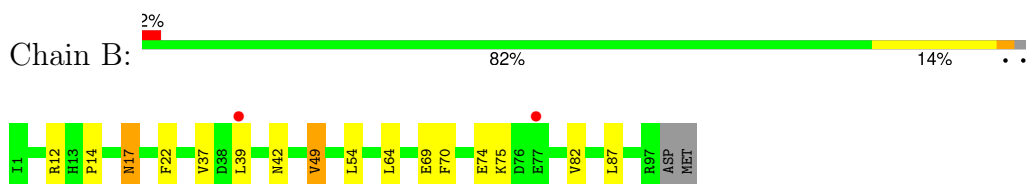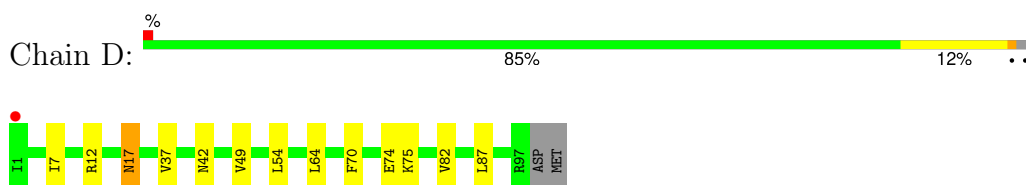- Molecule 1: Antigen-presenting glycoprotein CD1d
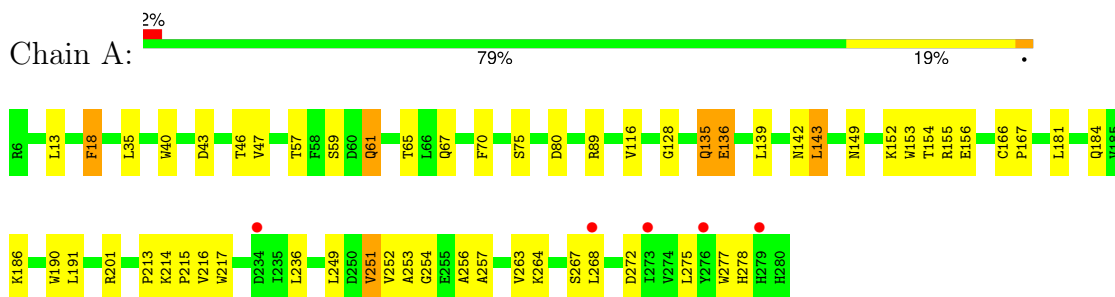
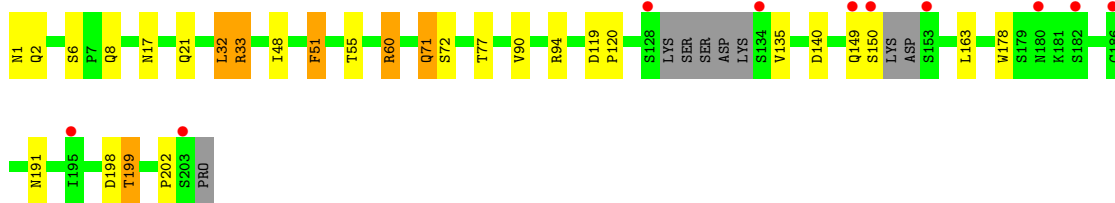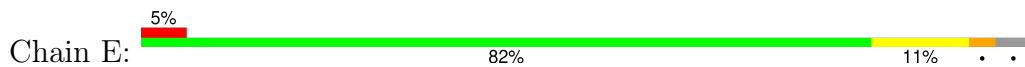- Molecule 1: Antigen-presenting glycoprotein CD1d
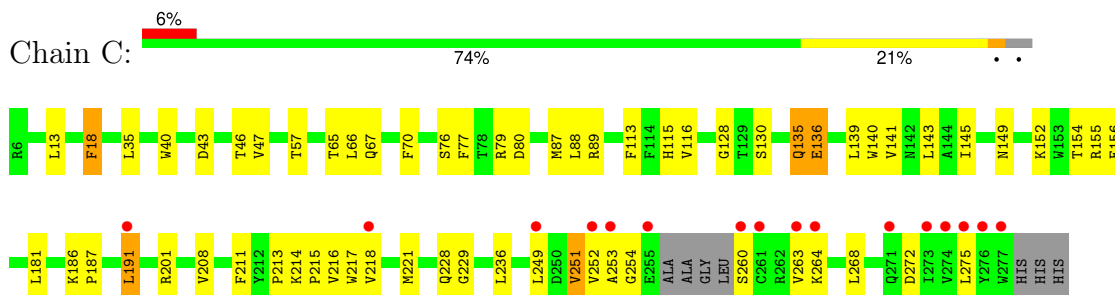
- Molecule 2: Beta-2-microglobulin

- Molecule 2: Beta-2-microglobulin

- Molecule 3: NKT TCR Valpha24 chain
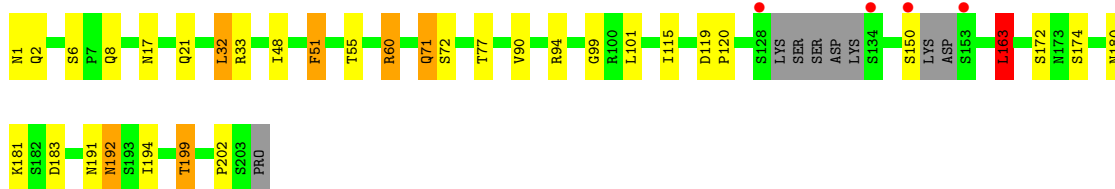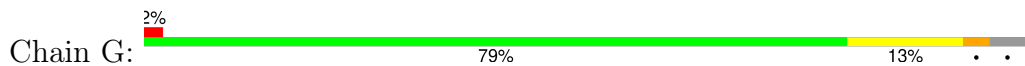
Chain E:

• Molecule 3: NKT TCR Valpha24 chain

Chain G:

• Molecule 4: NKT TCR autoreactive-Vbeta11 chain
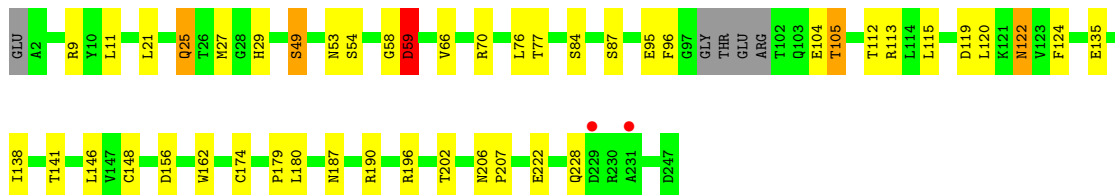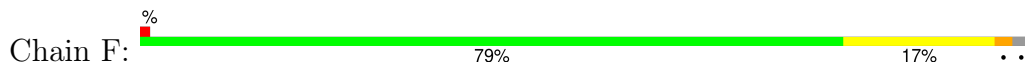
Chain F:

• Molecule 4: NKT TCR autoreactive-Vbeta11 chain

Chain H:
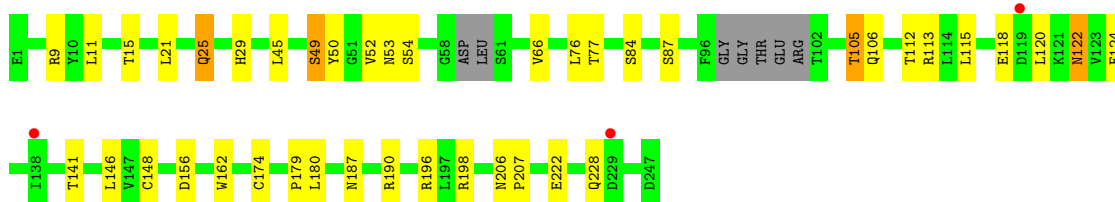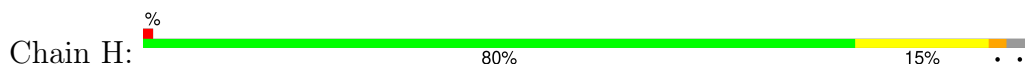
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α, β, γ	209.04Å 152.34Å 85.12Å 90.00° 97.24° 90.00°	Depositor
Resolution (Å)	122.77 – 3.12 122.77 – 3.12	Depositor EDS
% Data completeness (in resolution range)	99.0 (122.77-3.12) 99.2 (122.77-3.12)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$<I/\sigma(I)>$ [1]	2.53 (at 3.12Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.232 , 0.273 0.230 , 0.270	Depositor DCC
R_{free} test set	2362 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	61.7	Xtriage
Anisotropy	0.097	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.29 , 52.9	EDS
L-test for twinning[2]	$<\|L\|> = 0.46, <L^2> = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.90	EDS
Total number of atoms	12830	wwPDB-VP
Average B, all atoms (Å^2)	61.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.80% of the height of the origin peak. No significant pseudotranslation is detected.*

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[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 ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: GCY

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	0/2261	0.61	0/3081
1	C	0.55	0/2199	0.62	0/2997
2	B	0.46	0/806	0.55	0/1097
2	D	0.47	0/812	0.54	0/1102
3	E	0.53	0/1514	0.65	0/2062
3	G	0.52	0/1536	0.67	1/2089 (0.0%)
4	F	0.56	0/1968	0.61	0/2683
4	H	0.54	0/1922	0.59	0/2622
All	All	0.53	0/13018	0.61	1/17733 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	G	163	LEU	CA-CB-CG	5.33	127.57	115.30

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	A	2190	0	2104	33	0
1	C	2135	0	2048	37	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	B	783	0	727	5	0
2	D	789	0	752	3	0
3	E	1485	0	1370	14	0
3	G	1507	0	1421	20	0
4	F	1915	0	1786	24	0
4	H	1870	0	1744	21	0
5	A	45	0	65	5	0
5	C	45	0	65	7	0
6	A	20	0	0	0	0
6	B	1	0	0	0	0
6	C	10	0	0	0	0
6	D	1	0	0	0	0
6	E	9	0	0	1	0
6	F	10	0	0	2	0
6	G	7	0	0	1	0
6	H	8	0	0	1	0
All	All	12830	0	12082	144	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 6.

All (144) 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:221:MET:HB2	1:C:260:SER:OG	1.42	1.16
1:C:228:GLN:HG3	1:C:229:GLY:H	1.38	0.89
1:C:221:MET:CB	1:C:260:SER:OG	2.20	0.89
1:C:89:ARG:HH12	4:H:53:ASN:HB3	1.50	0.77
1:C:228:GLN:HG3	1:C:229:GLY:N	1.98	0.76
3:G:192:ASN:ND2	3:G:192:ASN:H	1.84	0.74
4:F:49:SER:HB2	4:F:54:SER:O	1.87	0.74
4:H:49:SER:HB2	4:H:54:SER:O	1.89	0.72
3:E:1:ASN:N	6:E:532:HOH:O	2.14	0.72
4:F:122:ASN:H	4:F:122:ASN:HD22	1.39	0.71
3:G:94:ARG:NH1	1:C:80:ASP:OD1	2.25	0.69
1:C:77:PHE:HE2	5:C:602:GCY:H8	1.57	0.69
4:F:96:PHE:CE2	4:F:104:GLU:HG2	2.29	0.67
4:H:122:ASN:HD22	4:H:122:ASN:H	1.42	0.67
1:A:89:ARG:HH12	4:F:53:ASN:HB3	1.60	0.66
4:F:156:ASP:HB2	4:F:179:PRO:HG2	1.79	0.65
1:A:256:ALA:HB1	1:A:257:ALA:HA	1.78	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:H:122:ASN:H	4:H:122:ASN:ND2	1.96	0.64
1:A:154:THR:HG23	5:A:601:GCY:H38A	1.79	0.64
3:E:51:PHE:CD1	3:E:51:PHE:N	2.62	0.64
1:C:89:ARG:NH1	4:H:53:ASN:HB3	2.13	0.62
4:F:122:ASN:H	4:F:122:ASN:ND2	1.97	0.61
1:C:191:LEU:HD11	1:C:275:LEU:HB3	1.81	0.61
4:H:156:ASP:HB2	4:H:179:PRO:HG2	1.82	0.61
3:G:51:PHE:CD1	3:G:51:PHE:N	2.68	0.60
5:C:602:GCY:O17	5:C:602:GCY:H18	2.02	0.59
1:C:40:TRP:CH2	1:C:70:PHE:HB3	2.37	0.58
3:E:32:LEU:HD21	3:E:72:SER:HB2	1.86	0.58
3:G:60:ARG:HH11	3:G:60:ARG:HB2	1.69	0.58
1:A:142:ASN:OD1	4:H:52:VAL:HB	2.03	0.58
3:G:32:LEU:HD21	3:G:72:SER:HB2	1.87	0.56
3:G:101:LEU:CD1	4:H:106:GLN:HE22	2.18	0.56
5:C:602:GCY:O17	5:C:602:GCY:C18	2.54	0.56
1:C:154:THR:HG23	5:C:602:GCY:H38A	1.88	0.55
1:C:47:VAL:H	1:C:67:GLN:NE2	2.05	0.55
4:F:21:LEU:HD22	4:F:112:THR:HG21	1.87	0.55
1:C:201:ARG:HB2	1:C:251:VAL:O	2.06	0.55
5:A:601:GCY:O17	5:A:601:GCY:H18	2.07	0.55
4:H:21:LEU:HD22	4:H:112:THR:HG21	1.89	0.54
4:H:45:LEU:HD22	6:H:249:HOH:O	2.07	0.54
1:A:191:LEU:HD11	1:A:275:LEU:HB3	1.89	0.53
1:A:256:ALA:HB1	1:A:257:ALA:CA	2.37	0.53
3:G:32:LEU:HD21	3:G:72:SER:CB	2.38	0.53
3:G:60:ARG:HB2	3:G:60:ARG:NH1	2.24	0.53
1:A:135:GLN:O	1:A:136:GLU:CB	2.56	0.53
1:A:149:ASN:OD1	1:A:155:ARG:HD3	2.09	0.53
1:C:152:LYS:O	1:C:156:GLU:HG3	2.09	0.52
1:A:47:VAL:H	1:A:67:GLN:NE2	2.08	0.52
1:A:80:ASP:OD1	3:E:94:ARG:NH1	2.43	0.51
3:E:21:GLN:NE2	3:E:71:GLN:OE1	2.39	0.51
3:G:21:GLN:NE2	3:G:71:GLN:OE1	2.44	0.51
3:G:119:ASP:N	3:G:120:PRO:HD3	2.26	0.51
3:G:1:ASN:N	6:G:205:HOH:O	2.44	0.50
2:B:37:VAL:HG22	2:B:82:VAL:HG22	1.93	0.50
4:F:122:ASN:ND2	4:F:122:ASN:N	2.59	0.50
1:A:263:VAL:O	1:A:272:ASP:HB2	2.11	0.50
2:B:22:PHE:CE1	2:B:69:GLU:HG2	2.46	0.50
1:A:216:VAL:HG22	1:A:217:TRP:H	1.77	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:H:25:GLN:OE1	4:H:29:HIS:HB2	2.10	0.49
1:A:153:TRP:CZ3	5:A:601:GCY:H20	2.47	0.49
4:H:15:THR:HG22	4:H:118:GLU:HA	1.95	0.49
4:F:70:ARG:HD2	6:F:344:HOH:O	2.12	0.48
4:H:66:VAL:HG13	4:H:76:LEU:HD12	1.95	0.48
1:A:153:TRP:HZ3	5:A:601:GCY:H38	1.78	0.48
4:F:29:HIS:CD2	4:F:95:GLU:HB3	2.48	0.48
1:A:89:ARG:NH1	4:F:53:ASN:HB3	2.26	0.48
3:G:192:ASN:H	3:G:192:ASN:HD22	1.60	0.48
1:A:40:TRP:CH2	1:A:70:PHE:HB3	2.48	0.47
1:A:59:SER:OG	1:A:61[A]:GLN:HG3	2.14	0.47
3:E:32:LEU:HD21	3:E:72:SER:CB	2.44	0.47
1:C:88:LEU:HD13	1:C:140:TRP:CE3	2.50	0.47
1:A:201:ARG:HB2	1:A:251:VAL:O	2.13	0.47
4:F:135:GLU:HA	4:F:138:ILE:HD12	1.95	0.47
3:G:120:PRO:HB2	3:G:199:THR:HG23	1.96	0.47
2:D:37:VAL:HG22	2:D:82:VAL:HG22	1.97	0.47
4:F:66:VAL:HG13	4:F:76:LEU:HD12	1.97	0.47
3:G:48:ILE:HD11	4:H:105:THR:HG23	1.96	0.47
1:C:18:PHE:CD1	1:C:18:PHE:N	2.82	0.47
1:C:214:LYS:N	1:C:215:PRO:HD2	2.30	0.47
1:C:228:GLN:CG	1:C:229:GLY:N	2.74	0.47
4:F:148:CYS:HB2	4:F:162:TRP:CH2	2.50	0.46
4:F:25:GLN:OE1	4:F:29:HIS:HB2	2.16	0.46
4:F:70:ARG:HH21	1:C:130:SER:HB2	1.80	0.46
1:C:253:ALA:HA	1:C:254:GLY:HA2	1.59	0.46
1:C:135:GLN:O	1:C:136:GLU:CB	2.63	0.46
1:C:141:VAL:O	1:C:145:ILE:HG12	2.16	0.46
3:E:60:ARG:HB2	3:E:60:ARG:NH1	2.32	0.46
1:A:277:TRP:HA	1:A:278:HIS:HA	1.65	0.45
1:A:59:SER:HG	1:A:61[A]:GLN:HG3	1.81	0.45
1:A:153:TRP:CE3	5:A:601:GCY:H20	2.51	0.45
1:A:214:LYS:N	1:A:215:PRO:HD2	2.31	0.45
3:G:181:LYS:HB2	3:G:181:LYS:HE3	1.81	0.45
1:C:66:LEU:O	1:C:70:PHE:HD1	1.97	0.45
1:A:18:PHE:N	1:A:18:PHE:CD1	2.85	0.45
1:A:213:PRO:HB2	1:A:215:PRO:HD2	1.99	0.45
4:H:148:CYS:HB2	4:H:162:TRP:CZ2	2.52	0.45
3:E:48:ILE:HD11	4:F:105:THR:HG23	1.98	0.45
1:C:149:ASN:OD1	1:C:155:ARG:HD3	2.17	0.45
1:C:208:VAL:HG21	1:C:218:VAL:HG21	1.99	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:263:VAL:O	1:C:272:ASP:HB2	2.17	0.44
1:C:77:PHE:CE2	5:C:602:GCY:H8	2.45	0.44
1:C:76:SER:CB	5:C:602:GCY:O1	2.66	0.44
1:C:87:MET:HB2	4:H:50:TYR:CD2	2.53	0.44
4:F:70:ARG:NH1	6:F:344:HOH:O	2.43	0.44
3:G:192:ASN:ND2	3:G:192:ASN:N	2.58	0.43
2:D:7:ILE:HD11	2:D:82:VAL:HB	2.00	0.43
2:B:17:ASN:HD21	2:B:74:GLU:HG2	1.83	0.43
3:E:33:ARG:HH22	4:F:104:GLU:HB2	1.84	0.43
1:A:152:LYS:O	1:A:156:GLU:HG3	2.18	0.43
1:A:143:LEU:HD23	1:A:143:LEU:HA	1.86	0.43
1:A:253:ALA:HA	1:A:254:GLY:HA2	1.57	0.43
1:C:187:PRO:HB3	1:C:211:PHE:HB3	2.00	0.43
1:C:40:TRP:CD1	1:C:46:THR:O	2.72	0.43
4:F:148:CYS:HB2	4:F:162:TRP:CZ2	2.54	0.42
1:A:46:THR:HB	1:A:67:GLN:HE22	1.84	0.42
4:F:25:GLN:HE21	4:F:25:GLN:HB3	1.49	0.42
1:C:216:VAL:HG22	1:C:217:TRP:H	1.85	0.42
4:F:58:GLY:O	4:F:59:ASP:O	2.37	0.42
2:D:17:ASN:HD21	2:D:74:GLU:HG2	1.85	0.42
1:A:135:GLN:HE21	1:A:135:GLN:HB3	1.60	0.42
1:A:184:GLN:HE21	1:A:267:SER:HB3	1.85	0.42
1:C:213:PRO:HB2	1:C:215:PRO:HD2	2.01	0.42
1:C:76:SER:HB3	5:C:602:GCY:O1	2.20	0.41
3:E:119:ASP:N	3:E:120:PRO:HD3	2.35	0.41
3:E:120:PRO:HB2	3:E:199:THR:HG23	2.02	0.41
4:H:122:ASN:ND2	4:H:122:ASN:N	2.59	0.41
3:G:163:LEU:HD11	4:H:198:ARG:HB2	2.03	0.41
3:E:135:VAL:HG22	3:E:178:TRP:HB3	2.03	0.41
4:H:206:ASN:HA	4:H:207:PRO:HD3	1.84	0.41
3:E:51:PHE:N	3:E:51:PHE:HD1	2.14	0.41
4:F:9:ARG:NH1	4:F:9:ARG:HA	2.36	0.41
4:H:122:ASN:HD22	4:H:122:ASN:N	2.08	0.41
3:G:99:GLY:HA2	1:C:79:ARG:HH21	1.86	0.41
1:C:113:PHE:HB2	1:C:115:HIS:CE1	2.56	0.40
3:G:32:LEU:CD2	3:G:72:SER:HB2	2.51	0.40
4:H:9:ARG:HA	4:H:9:ARG:NH1	2.36	0.40
1:A:217:TRP:HB3	1:A:264:LYS:HB2	2.04	0.40
1:C:217:TRP:HB3	1:C:264:LYS:HB2	2.03	0.40
2:B:39:LEU:HD12	2:B:49:VAL:CG1	2.51	0.40
3:E:60:ARG:HB2	3:E:60:ARG:HH11	1.84	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
4:F:206:ASN:HA	4:F:207:PRO:HD3	1.83	0.40
1:A:166:CYS:N	1:A:167:PRO:HD2	2.37	0.40
1:A:190:TRP:CH2	2:B:14:PRO:HD3	2.57	0.40
3:G:115:ILE:HD11	3:G:172:SER:HA	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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	274/275 (100%)	247 (90%)	24 (9%)	3 (1%)	12	37
1	C	264/275 (96%)	240 (91%)	21 (8%)	3 (1%)	12	37
2	B	95/99 (96%)	88 (93%)	5 (5%)	2 (2%)	5	24
2	D	95/99 (96%)	88 (93%)	5 (5%)	2 (2%)	5	24
3	E	190/204 (93%)	174 (92%)	14 (7%)	2 (1%)	12	37
3	G	190/204 (93%)	173 (91%)	16 (8%)	1 (0%)	25	56
4	F	238/247 (96%)	221 (93%)	15 (6%)	2 (1%)	16	46
4	H	234/247 (95%)	216 (92%)	17 (7%)	1 (0%)	30	61
All	All	1580/1650 (96%)	1447 (92%)	117 (7%)	16 (1%)	13	40

All (16) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	128	GLY
1	A	136	GLU
3	E	202	PRO
4	F	59	ASP
3	G	202	PRO
1	C	136	GLU

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Mol	Chain	Res	Type
1	A	135	GLN
3	E	149	GLN
4	F	222	GLU
1	C	128	GLY
1	C	135	GLN
2	B	17	ASN
2	B	42	ASN
2	D	17	ASN
4	H	222	GLU
2	D	42	ASN

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	234/241 (97%)	215 (92%)	19 (8%)	9	31
1	C	231/241 (96%)	214 (93%)	17 (7%)	11	35
2	B	85/94 (90%)	78 (92%)	7 (8%)	9	31
2	D	86/94 (92%)	79 (92%)	7 (8%)	9	31
3	E	166/186 (89%)	148 (89%)	18 (11%)	5	20
3	G	174/186 (94%)	153 (88%)	21 (12%)	4	16
4	F	206/218 (94%)	182 (88%)	24 (12%)	4	17
4	H	196/218 (90%)	176 (90%)	20 (10%)	6	22
All	All	1378/1478 (93%)	1245 (90%)	133 (10%)	7	24

All (133) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	13	LEU
1	A	18	PHE
1	A	35	LEU
1	A	43	ASP
1	A	57	THR

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Mol	Chain	Res	Type
1	A	61[A]	GLN
1	A	61[B]	GLN
1	A	65	THR
1	A	75	SER
1	A	116	VAL
1	A	139	LEU
1	A	143	LEU
1	A	181	LEU
1	A	186	LYS
1	A	236	LEU
1	A	249	LEU
1	A	251	VAL
1	A	252	VAL
1	A	268	LEU
2	B	12	ARG
2	B	49	VAL
2	B	54	LEU
2	B	64	LEU
2	B	70	PHE
2	B	75	LYS
2	B	87	LEU
3	E	2	GLN
3	E	6	SER
3	E	8	GLN
3	E	17	ASN
3	E	32	LEU
3	E	33	ARG
3	E	51	PHE
3	E	55	THR
3	E	60	ARG
3	E	71	GLN
3	E	77	THR
3	E	90	VAL
3	E	140	ASP
3	E	150	SER
3	E	163	LEU
3	E	191	ASN
3	E	198	ASP
3	E	199	THR
4	F	11	LEU
4	F	25	GLN
4	F	27	MET

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Mol	Chain	Res	Type
4	F	49	SER
4	F	59	ASP
4	F	77	THR
4	F	84	SER
4	F	87	SER
4	F	105	THR
4	F	113	ARG
4	F	115	LEU
4	F	119	ASP
4	F	120	LEU
4	F	122	ASN
4	F	124	PHE
4	F	141	THR
4	F	146	LEU
4	F	174	CYS
4	F	180	LEU
4	F	187	ASN
4	F	190	ARG
4	F	196	ARG
4	F	202	THR
4	F	228	GLN
3	G	2	GLN
3	G	6	SER
3	G	8	GLN
3	G	17	ASN
3	G	32	LEU
3	G	33	ARG
3	G	51	PHE
3	G	55	THR
3	G	60	ARG
3	G	71	GLN
3	G	77	THR
3	G	90	VAL
3	G	150	SER
3	G	163	LEU
3	G	174	SER
3	G	180	ASN
3	G	183	ASP
3	G	191	ASN
3	G	192	ASN
3	G	194	ILE
3	G	199	THR

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Mol	Chain	Res	Type
1	C	13	LEU
1	C	18	PHE
1	C	35	LEU
1	C	43	ASP
1	C	57	THR
1	C	65	THR
1	C	116	VAL
1	C	139	LEU
1	C	143	LEU
1	C	181	LEU
1	C	186	LYS
1	C	191	LEU
1	C	236	LEU
1	C	249	LEU
1	C	251	VAL
1	C	252	VAL
1	C	268	LEU
2	D	12	ARG
2	D	49	VAL
2	D	54	LEU
2	D	64	LEU
2	D	70	PHE
2	D	75	LYS
2	D	87	LEU
4	H	11	LEU
4	H	25	GLN
4	H	49	SER
4	H	77	THR
4	H	84	SER
4	H	87	SER
4	H	105	THR
4	H	113	ARG
4	H	115	LEU
4	H	120	LEU
4	H	122	ASN
4	H	124	PHE
4	H	141	THR
4	H	146	LEU
4	H	174	CYS
4	H	180	LEU
4	H	187	ASN
4	H	190	ARG

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Mol	Chain	Res	Type
4	H	196	ARG
4	H	228	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (30) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	14	GLN
1	A	55	GLN
1	A	67	GLN
1	A	105	HIS
1	A	111	ASN
1	A	135	GLN
1	A	150	GLN
1	A	184	GLN
3	E	17	ASN
3	E	23	ASN
3	E	80	GLN
4	F	47	HIS
4	F	106	GLN
4	F	122	ASN
3	G	17	ASN
3	G	23	ASN
3	G	75	HIS
3	G	80	GLN
3	G	192	ASN
1	C	14	GLN
1	C	55	GLN
1	C	67	GLN
1	C	105	HIS
1	C	111	ASN
1	C	135	GLN
1	C	150	GLN
1	C	184	GLN
4	H	47	HIS
4	H	106	GLN
4	H	122	ASN

5.3.3 RNA (i)

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 oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 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	$\#|Z| > 2$
5	GCY	A	601	-	44,45,57	1.46	4 (9%)	51,53,65	1.18	7 (13%)
5	GCY	C	602	-	44,45,57	1.18	3 (6%)	51,53,65	1.68	7 (13%)

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	GCY	A	601	-	-	23/41/61/73	0/1/1/1
5	GCY	C	602	-	-	26/41/61/73	0/1/1/1

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	601	GCY	O1-C16	6.11	1.54	1.43
5	C	602	GCY	C16-C15	-5.75	1.40	1.50
5	A	601	GCY	C16-C15	-5.71	1.40	1.50
5	A	601	GCY	C22-C20	2.84	1.59	1.53
5	C	602	GCY	O1-C16	-2.74	1.38	1.43
5	C	602	GCY	C15-C14	2.03	1.40	1.31

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	A	601	GCY	C15-C14	2.01	1.39	1.31

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	C	602	GCY	C18-O2-C19	-8.08	96.48	113.80
5	C	602	GCY	O4-C19-O2	4.71	121.18	110.04
5	A	601	GCY	C18-C17-C16	-3.93	104.12	112.90
5	C	602	GCY	C18-C17-C16	-3.90	104.20	112.90
5	C	602	GCY	C13-C14-C15	-3.09	111.69	125.47
5	A	601	GCY	C16-C17-N1	-2.59	105.26	109.66
5	A	601	GCY	C13-C14-C15	-2.55	114.11	125.47
5	A	601	GCY	C18-C17-N1	2.43	113.11	109.66
5	A	601	GCY	O1-C16-C15	2.35	116.95	110.88
5	C	602	GCY	O1-C16-C17	2.24	113.76	107.85
5	C	602	GCY	C16-C15-C14	-2.16	120.20	124.69
5	C	602	GCY	C19-O4-C20	-2.16	109.50	113.72
5	A	601	GCY	C19-O4-C20	-2.15	109.51	113.72
5	A	601	GCY	O1-C16-C17	2.15	113.51	107.85

There are no chirality outliers.

All (49) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	601	GCY	O4-C19-O2-C18
5	A	601	GCY	C36-C19-O2-C18
5	A	601	GCY	C13-C14-C15-C16
5	A	601	GCY	C14-C15-C16-C17
5	A	601	GCY	C15-C16-C17-N1
5	A	601	GCY	C15-C16-C17-C18
5	C	602	GCY	O4-C19-O2-C18
5	C	602	GCY	C36-C19-O2-C18
5	C	602	GCY	C13-C14-C15-C16
5	C	602	GCY	C14-C15-C16-C17
5	C	602	GCY	O1-C16-C17-N1
5	C	602	GCY	O1-C16-C17-C18
5	C	602	GCY	C15-C16-C17-N1
5	C	602	GCY	C15-C16-C17-C18
5	C	602	GCY	N1-C17-C18-O2
5	C	602	GCY	C16-C17-C18-O2
5	A	601	GCY	C14-C15-C16-O1
5	C	602	GCY	C14-C15-C16-O1

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Mol	Chain	Res	Type	Atoms
5	C	602	GCY	C7-C8-C9-C10
5	A	601	GCY	C9-C10-C11-C12
5	A	601	GCY	C7-C8-C9-C10
5	A	601	GCY	C43-C44-CAJ-CAK
5	A	601	GCY	C44-CAJ-CAK-CAL
5	C	602	GCY	C39-C40-C41-C42
5	C	602	GCY	C2-C3-C4-C5
5	C	602	GCY	C4-C5-C6-C7
5	C	602	GCY	C9-C10-C11-C12
5	A	601	GCY	C3-C4-C5-C6
5	C	602	GCY	C11-C10-C9-C8
5	A	601	GCY	C5-C6-C7-C8
5	A	601	GCY	O4-C20-C21-O3
5	A	601	GCY	C39-C40-C41-C42
5	C	602	GCY	C5-C6-C7-C8
5	C	602	GCY	C6-C7-C8-C9
5	C	602	GCY	C44-CAJ-CAK-CAL
5	C	602	GCY	C11-C12-C13-C14
5	A	601	GCY	CAJ-CAK-CAL-CAM
5	A	601	GCY	C11-C10-C9-C8
5	A	601	GCY	C17-C18-O2-C19
5	C	602	GCY	C41-C42-C43-C44
5	C	602	GCY	C42-C43-C44-CAJ
5	A	601	GCY	C4-C5-C6-C7
5	C	602	GCY	C18-C17-N1-C37
5	C	602	GCY	C43-C44-CAJ-CAK
5	A	601	GCY	C2-C3-C4-C5
5	A	601	GCY	C12-C13-C14-C15
5	A	601	GCY	C42-C43-C44-CAJ
5	A	601	GCY	C22-C20-C21-O3
5	C	602	GCY	O4-C20-C21-O3

There are no ring outliers.

2 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	601	GCY	5	0
5	C	602	GCY	7	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 GCY A 601

Bond lengths

Bond angles

Torsions

Rings

Ligand GCY C 602

Bond lengths

Bond angles

Torsions

Rings
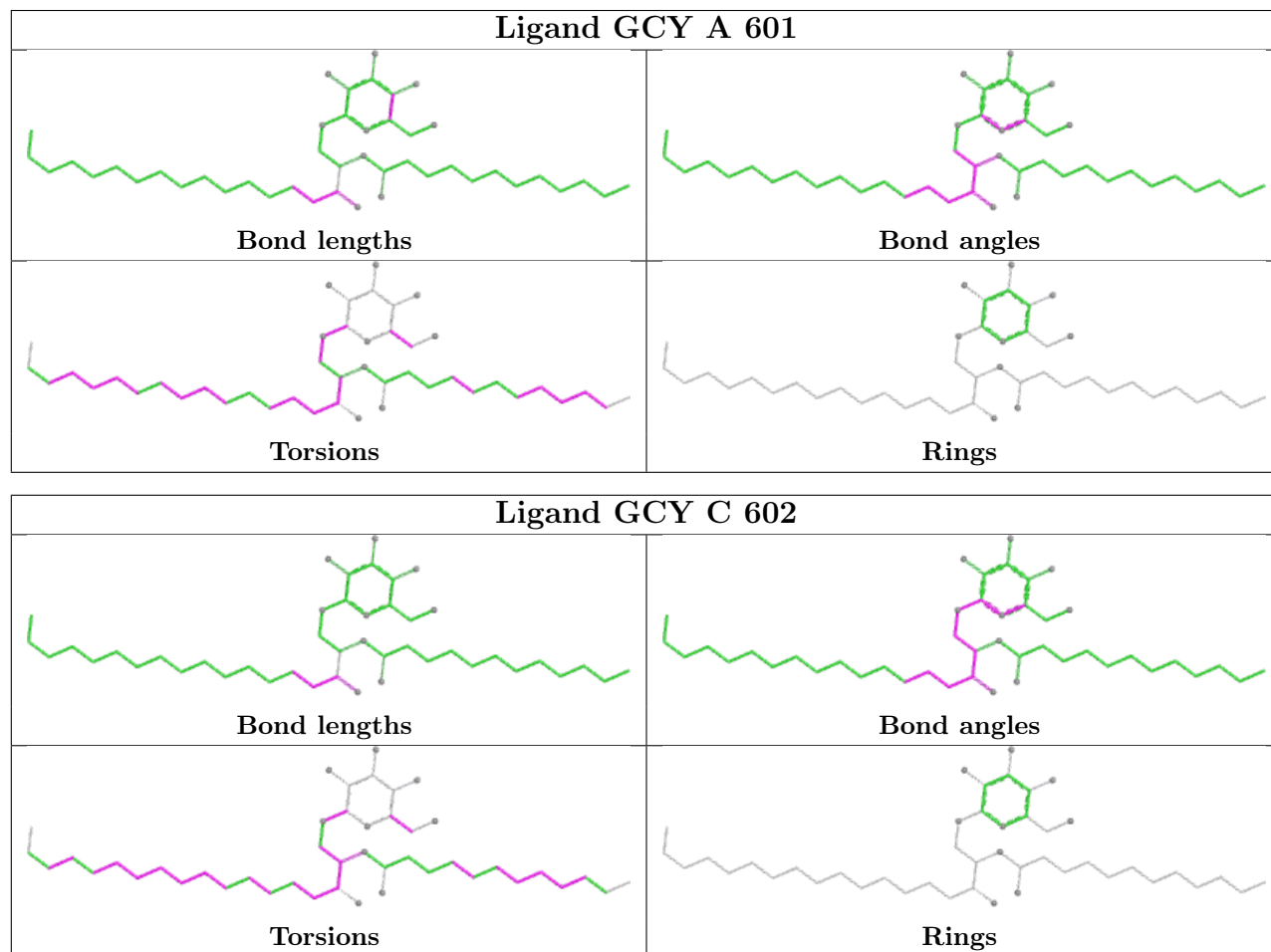
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	275/275 (100%)	0.11	5 (1%) 67	50	32, 54, 97, 124	1 (0%)
1	C	268/275 (97%)	0.14	16 (5%) 29	18	37, 54, 97, 118	0
2	B	97/99 (97%)	0.18	2 (2%) 63	45	46, 79, 92, 97	0
2	D	97/99 (97%)	0.27	1 (1%) 79	64	46, 79, 92, 97	0
3	E	196/204 (96%)	0.04	10 (5%) 34	21	34, 56, 79, 86	0
3	G	196/204 (96%)	-0.03	4 (2%) 64	47	34, 56, 79, 85	0
4	F	242/247 (97%)	-0.05	2 (0%) 82	68	35, 60, 84, 92	0
4	H	240/247 (97%)	0.03	3 (1%) 74	58	35, 60, 85, 90	0
All	All	1611/1650 (97%)	0.07	43 (2%) 56	38	32, 59, 93, 124	1 (0%)

All (43) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	E	150	SER	4.3
3	G	153	SER	3.5
1	C	260	SER	3.5
3	G	128	SER	3.4
3	G	150	SER	3.4
1	C	249	LEU	3.4
3	E	153	SER	3.4
1	C	276	TYR	3.3
1	A	279	HIS	3.1
1	C	275	LEU	3.0
1	A	273	ILE	3.0
1	C	277	TRP	2.9
1	C	255	GLU	2.9
2	D	1	ILE	2.7
1	C	253	ALA	2.7
3	E	195	ILE	2.6

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PROTEIN DATA BANK

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Mol	Chain	Res	Type	RSRZ
1	A	276	TYR	2.6
1	C	252	VAL	2.5
2	B	77	GLU	2.5
4	F	229	ASP	2.5
3	E	182	SER	2.4
3	E	180	ASN	2.4
2	B	39	LEU	2.3
1	C	271	GLN	2.3
1	C	191	LEU	2.3
3	E	128	SER	2.3
1	C	274	VAL	2.3
1	A	234	ASP	2.3
3	E	203	SER	2.3
4	H	138	ILE	2.2
3	E	134	SER	2.2
3	G	134	SER	2.2
3	E	149	GLN	2.2
1	C	263	VAL	2.2
1	C	273	ILE	2.2
1	A	268	LEU	2.1
4	H	119	ASP	2.1
4	F	231	ALA	2.1
3	E	186	CYS	2.1
1	C	218	VAL	2.1
4	H	229	ASP	2.0
1	C	264	LYS	2.0
1	C	261	CYS	2.0

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

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

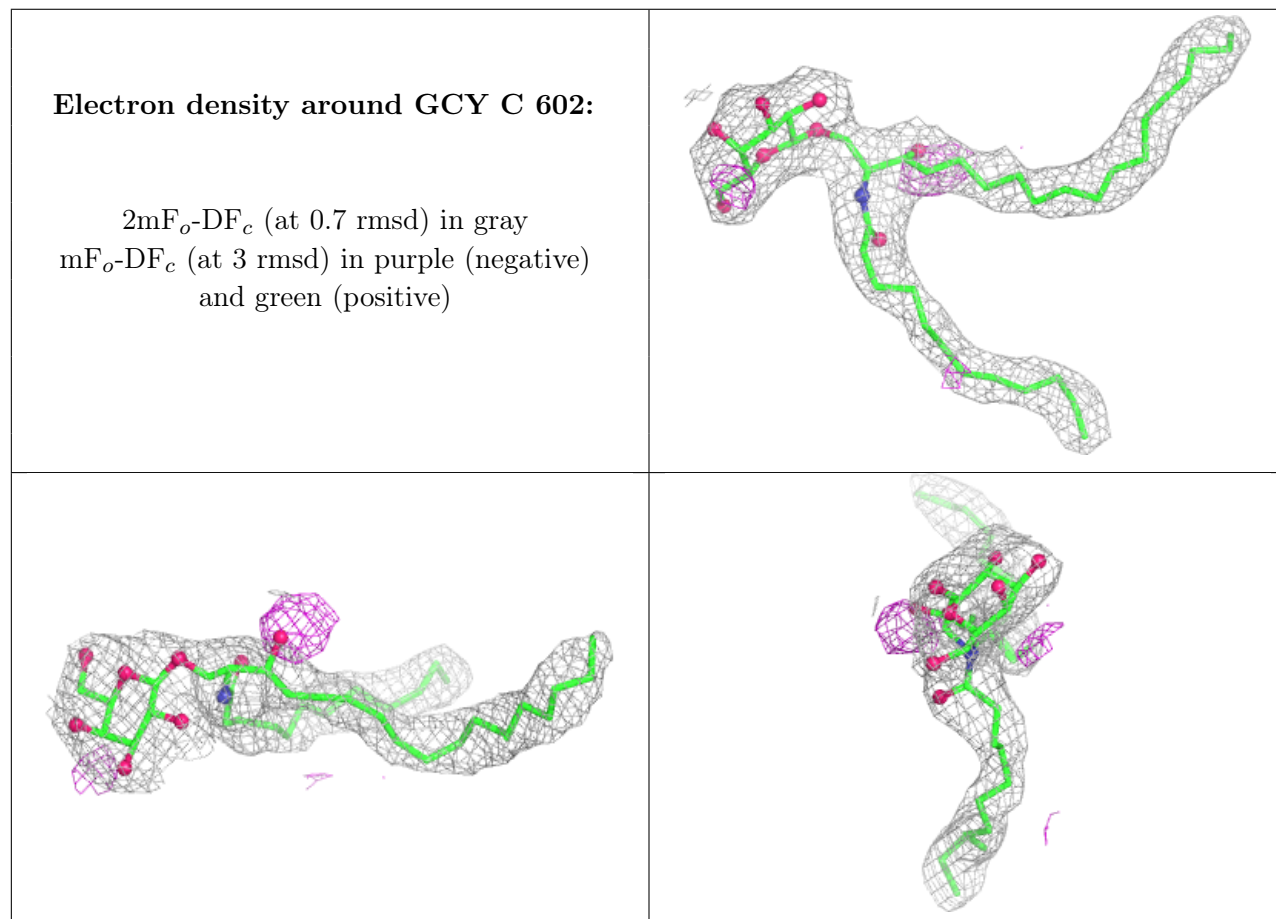## 6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.
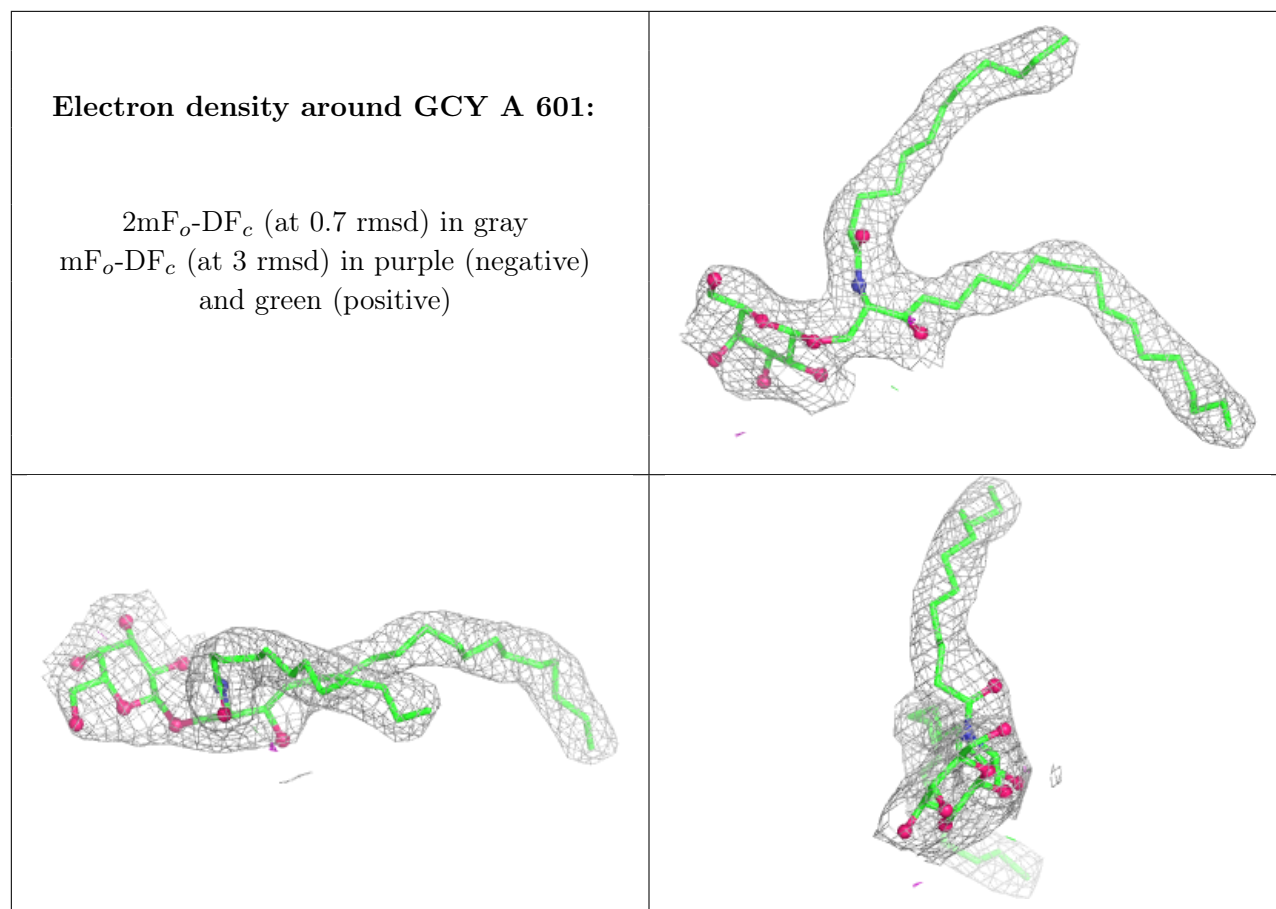
6.4 Ligands ⓘ

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
5	GCY	C	602	45/57	0.94	0.11	33,37,43,44	0
5	GCY	A	601	45/57	0.96	0.09	27,33,41,46	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 GCY C 602:

$2\text{mF}_o\text{-DF}_c$ (at 0.7 rmsd) in gray
$\text{mF}_o\text{-DF}_c$ (at 3 rmsd) in purple (negative) and green (positive)

Electron density around GCY A 601:

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

6.5   Other polymers ⓘ

There are no such residues in this entry.